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# DIGITAL ECONOMY FOR LATIN AMERICA AND THE CARIBBEAN

## Country Diagnostic:

 **Colombia**

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# Digital Economy for Latin America and the Caribbean Country Diagnostic: Colombia

June 2023

DDT



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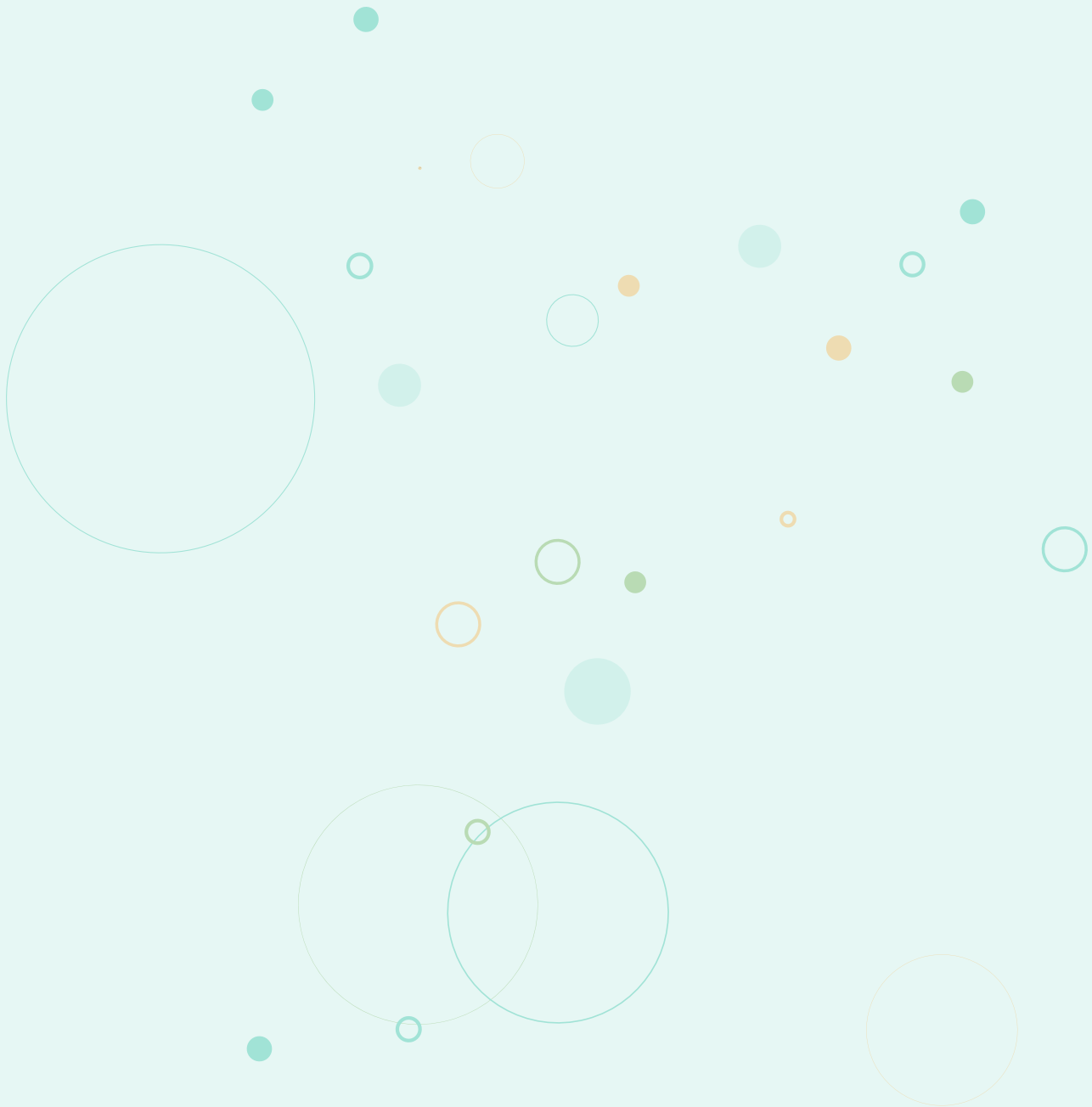


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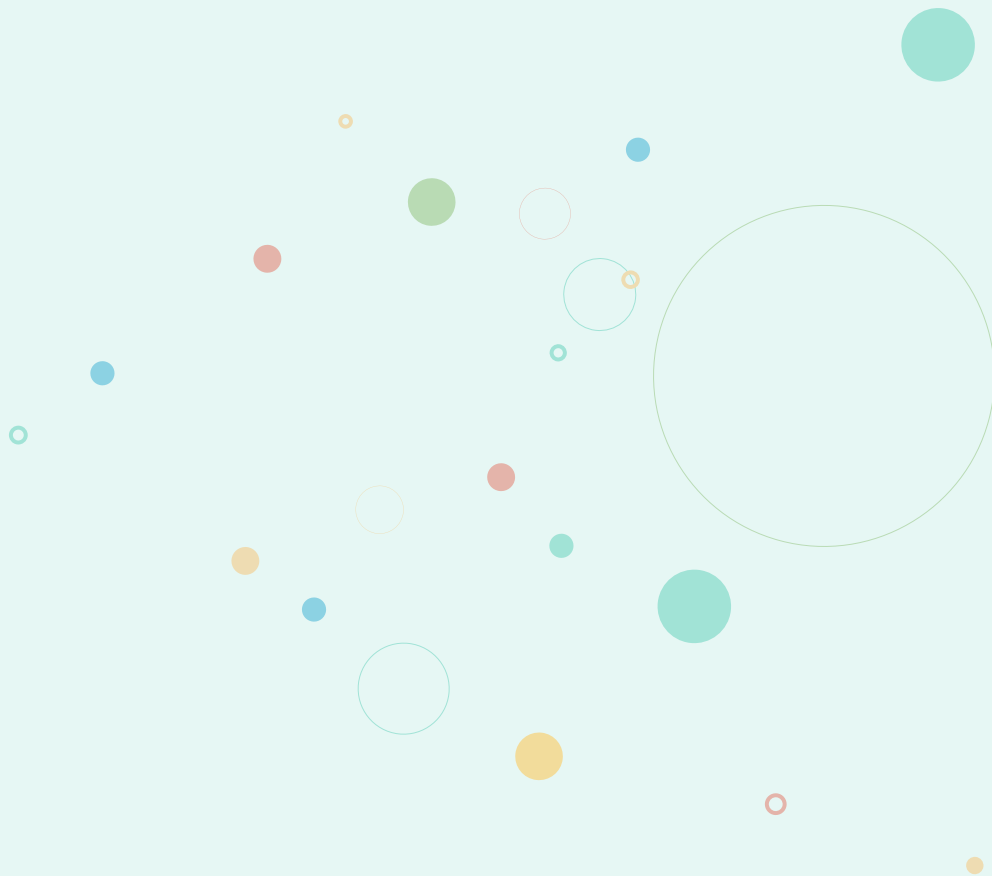
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# ABBREVIATIONS

|                    |  |
|--------------------|--|
| <b>ACH</b>         | Automated Clearinghouse  |
| <b>AI</b>          | Artificial Intelligence  |
| <b>AND</b>         | Agencia Nacional Digital (National Digital Agency)   |
| <b>ANE</b>         | Agencia Nacional del Espectro (National Spectrum Agency)   |
| <b>ArCo</b>        | Articulación para la Competitividad  |
| <b>BDO</b>         | Banca de las Oportunidades (Opportunity Bank)  |
| <b>BR</b>          | Banco de la República (Bank of the Republic)   |
| <b>CBJ</b>         | Circular Básica Jurídica (Basic Legal Circular)  |
| <b>CCD</b>         | Carpeta Ciudadana Digital (Digital Citizen File)   |
| <b>CDD</b>         | Customer Due Diligence   |
| <b>CIIEEF</b>      | Comisión Intersectorial para la Inclusión y Educación Económica y Financiera<br>(Intersectoral Commission on Financial and Economic Inclusion and Education)   |
| <b>CoICERT</b>     | Grupo Interno de Trabajo de Respuesta a Emergencias Cibernéticas de Colombia   |
| <b>CONPES</b>      | (Colombia's National Computer Emergency Response Team)<br>Consejo Nacional de Política Económica y Social (National Council for Economic<br>and Social Policy) |
| <b>CONPES-3975</b> | National Policy for Digital Transformation and Artificial Intelligence   |
| <b>CPE</b>         | Computadores para Educar (Computers for Education)   |
| <b>CRC</b>         | Comision de Regulacion de Comunicaciones (Communications Regulatory Commission)  |
| <b>CSIRT</b>       | Computer Security Incident Response Team   |
| <b>CUD</b>         | Sistema de Cuentas de Depósito (Deposit Accounts System)   |
| <b>DANE</b>        | Departamento Administrativo Nacional de Estadística (National Administrative Department<br>of Statistics)  |
| <b>DFS</b>         | Digital Financial Services   |
| <b>DGD</b>         | Dirección de Gobierno Digital (Digital Government Directorate)   |
| <b>DNP</b>         | Departamento Nacional de Planeación (National Planning Department)   |
| <b>EASPBV</b>      | Entidades Administradoras de Sistemas de Pago de Bajo Valor (Low-Value Payment<br>System Operators)  |
| <b>ECLAC</b>       | Economic Commission for Latin America and the Caribbean  |
| <b>EPA</b>         | Electronic Payment Acceptance  |
| <b>FUTIC</b>       | Fondo Único de Tecnologías de la Información y las Comunicaciones (Single Fund<br>for Information and Communications Technologies)                             |
| <b>GDPR</b>        | General Data Protection Regulation (EU)  |
| <b>GMF</b>         | Gravamen a los Movimientos Financieros (Financial Transaction Tax)   |
| <b>GNI</b>         | Gross National Income  |
| <b>GoC</b>         | Government of Colombia   |
| <b>HFPS</b>        | High Frequency Phone Survey (World Bank)   |
| <b>HHI</b>         | Herfindahl-Hirschman Index   |
| <b>ICCN</b>        | <i>Infraestructuras Cibernéticas Críticas Nacionales</i> (Critical National Cybernetic<br>Infrastructure)  |
| <b>ICT</b>         | Information and Communications Technology  |
| <b>IDB</b>         | Inter-American Development Bank  |
| <b>IGD</b>         | Índice de Gobierno Digital (Digital Government Index)  |
| <b>IMC</b>         | Intermediarios del Mercado Cambiario (Foreign Exchange Intermediaries)   |

|               |  |
|---------------|--|
| <b>IoT</b>    | Internet of Things   |
| <b>IP</b>     | Internet Protocol  |
| <b>ISP</b>    | Internet Service Provider  |
| <b>ITU</b>    | International Telecommunication Union  |
| <b>IXP</b>    | Internet Exchange Point  |
| <b>KYC</b>    | Know Your Customer   |
| <b>LAC</b>    | Latin America and the Caribbean  |
| <b>MEN</b>    | Ministerio de Educación Nacional (Ministry of National Education)  |
| <b>MHCP</b>   | Ministerio de Hacienda y Crédito Público (Ministry of Finance and Public Credit)   |
| <b>MinCIT</b> | Ministerio de Comercio, Industria y Turismo (Ministry of Commerce, Industry, and Tourism)                                  |
| <b>MinTIC</b> | Ministerio de Tecnologías de la Información y las Comunicaciones (Ministry of Information and Communications Technologies) |
| <b>MNO</b>    | Mobile Network Operator  |
| <b>MoD</b>    | Ministry of National Defense   |
| <b>MSME</b>   | Micro, Small, and Medium-Sized Enterprise  |
| <b>MTO</b>    | Money Transfer Operator  |
| <b>MVNO</b>   | Mobile Virtual Network Operator  |
| <b>NGO</b>    | Nongovernmental Organization   |
| <b>NPI</b>    | Non-pharmaceutical intervention  |
| <b>NPC</b>    | National Payments Council  |
| <b>OECD</b>   | Organisation for Economic Co-operation and Development   |
| <b>OPP</b>    | Operador de Servicios de Pago Postal (Postal Payment Service Operator)   |
| <b>PGD</b>    | Política de Gobierno Digital (Digital Government Policy)   |
| <b>PISA</b>   | Program for International Student Assessment   |
| <b>PND</b>    | Plan Nacional de Desarrollo (National Development Plan)  |
| <b>PNID</b>   | Plan Nacional de Infraestructura de Datos (National Plan for Data Infrastructure)  |
| <b>PSE</b>    | Pagos Seguros en Línea (Safe Online Payments)  |
| <b>QR</b>     | Quick Response   |
| <b>RNEC</b>   | Registraduría Nacional del Estado Civil (National ID and Civil Registry Agency)  |
| <b>SDC</b>    | <i>Servicios Digitales Ciudadanos</i> (Digital Citizen Services)   |
| <b>SDG</b>    | Sustainable Development Goal   |
| <b>SEDPEs</b> | Sociedades Especializadas en Depósitos y Pagos Electrónicos (Electronic Deposit and Payment Companies)                     |
| <b>SENA</b>   | Servicio Nacional de Aprendizaje (National Learning Service)   |
| <b>SES</b>    | Superintendencia de Economía Solidaria (Solidarity Economy Superintendency)  |
| <b>SFC</b>    | Superintendencia Financiera de Colombia (Financial Superintendency)  |
| <b>SIC</b>    | Superintendencia de Industria y Comercio (Superintendency of Industry and Commerce, or National Competition Agency)        |
| <b>SME</b>    | Small and Medium-Sized Enterprise  |
| <b>SNCI</b>   | Systema Nacional de Competitividad e Innovación (National System of Competitiveness and Innovation)                        |
| <b>SOC</b>    | Security Operations Center   |
| <b>SPBV</b>   | Sistema de Pago de Bajo Valor (Low-Value Payment System)   |
| <b>SPI</b>    | Sistema de Pagos Inmediatos (Fast Payment System)  |
| <b>STI</b>    | Science, Technology, and Innovation  |
| <b>UMIC</b>   | Upper-Middle-Income Country  |
| <b>VET</b>    | Vocational Education and Training  |

# EXECUTIVE SUMMARY

**Colombia's transition to a digital economy is well underway.** Colombia is among the countries in the Latin America and Caribbean (LAC) region furthest along on the path of digitalization. In 2020, more than two-thirds of the population used the internet by means of either fixed or mobile. As of 2021, Colombia had hosted approximately 13 percent of the region's digital solution providers. E-commerce, digital financial services, and the fintech ecosystem have been growing rapidly, especially since the onset of the COVID-19 pandemic. Colombia also stands among the most advanced countries in LAC in terms of digital government. Key enablers and safeguards to support digital transactions and data flows have already been established in the country, and a modern digital ID scheme is currently being deployed—important steps in consolidating a trust environment conducive to widespread digitalization.

**Colombia still faces a challenge in achieving universal access to the internet and other digital technologies, which is indicative of the prevalent inequality trends in the country.** Access to and effective use of digital technologies across Colombia's regions, sectors, and income groups are not uniform and are hindered by last-mile digital infrastructure challenges and low levels of digital skills. Although overall internet use has increased substantially, there are large gaps in access between rural and urban areas: more than half of urban households have access to fixed internet, compared to just 12 percent of rural households. Low levels of digital skills among the population hinder access: in 2019, Colombia ranked 94th out of 141 in the World Economic Forum's Digital Skills Index. Limited access to the internet and low levels of digital capabilities also constrain the private sector's capacity to generate value-added through the adoption of digital technologies.

**Promoting the widespread adoption of the internet and other digital technologies can help Colombia address its key development challenges: high inequality, slow productivity growth, limited economic diversification, and climate change.** Improving access to connectivity among remote and vulnerable communities can create economic opportunities and improve the delivery and efficiency of public services. For instance, enhancing rural connectivity is a necessary condition to developing a quality hybrid education system and to ensuring equitable access to telehealth services. Digital financial services that enable financial inclusion can play a key role in strengthening the economic resilience of the poor. Similarly, robust digital ID systems can help the public sector to better support vulnerable

communities, including Afro-descendants, indigenous people, and Venezuelan migrants. Digital technologies can also play a pivotal role in expanding Colombia's sources of economic growth, in particular away from non-extractive sectors, in a manner that is sustainable and inclusive. Firms' adoption of technology, alongside complementary investments in digital skills and organizational capacity, can drive innovation, improve the efficiency of productive processes, and open up new domestic and export markets for their products and services.

**The Government of Colombia (GoC) can build on its early successes to achieve universal access to the internet as the foundation for an inclusive, dynamic, and resilient digital economy.** Since the early 2000s, and through several recent national policy documents, the government has prioritized efforts to boost digital technology adoption among businesses, individuals, and the public sector. Indeed, the government can play a pivotal role in the digitalization of the economy as a key user of digital technologies to deliver public services; as coordinator and facilitator of initiatives from stakeholders in the private sector, civil society, and academia; as a regulator of the functions and activities associated with the digital economy; and as the lead actor in identifying and proactively mitigating the downside risks of widespread digitalization. Although Colombians in the public and private sectors have advanced on their digitalization path, digital inequality—the fractured and unequal access to critical digital networks and technology between and within countries—remains a critical challenge to the development of an equitable and resilient digital economy. For digital technologies to benefit everyone everywhere, the remaining digital divide must be closed. Harnessing the potential of digitalization will require a long-term vision and strategy to guide reforms and investments. Moreover, moving forward, an integral vision for digital transformation would benefit from placing greater emphasis on the distributional, environmental, and sustainability dimensions of widespread digitalization.

**This report analyzes the current state of, challenges to, and opportunities for the development of a digital economy and proposes six policy priorities for the GoC.** The report is based on the World Bank's Digital Economy Assessment methodology, which analyzes the digital economy across six pillars or foundational elements: digital infrastructure, digital platforms, digital financial services, digital businesses, digital skills, and trust environment. The six policy priorities outlined in the report are as follows:

1. **Invest in high-quality last-mile digital infrastructure to reach unserved and under-served areas.** The current deployment of fixed and mobile infrastructure represents a challenge to universal access and use of the internet and is therefore a barrier to an inclusive digital economy. One way to promote private investment in the mobile segment is for Colombia to release mobile spectrum in the 3.5 GHz band to promote 5G deployment. Where private investment is unlikely, public investment or other public initiatives aimed at promoting the development of a more capillary fiber network could be considered.
2. **Strengthen the interoperability of government systems and implement a robust governance framework for the data value chain within the public sector to ensure the flow of information, both for decision making and service delivery.** Colombia has made significant progress in the development of a data governance framework, particularly with the implementation of the National Plan for Data Infrastructure (PNID) and Decree 1389 (2022) on data governance. However, implementing and operationalizing this framework, encouraging proactive data sharing and fostering a culture of data-driven decision making across all public institutions continues to be a challenge. Thus, establishing a well-designed data management model in Colombia will be key. This will require ongoing efforts to overcome existing barriers and ensure that the framework is effectively integrated into institutional practices and operations.
3. **Capitalize on recent progress on financial inclusion to foster the digital financial services ecosystem by implementing key initiatives,** such as fast payments and open finance, establishing comprehensive and well-coordinated legal and institutional frameworks for digital financial services, and ensuring market competition and robust financial consumer protections.
4. **Address barriers to the growth of platform-based business models, cross-border e-commerce, and trade of digitally delivered services and improve access to finance for digital businesses** by enabling the development of capital markets, designing targeted lines of credit and guarantees, and strengthening financial infrastructure.
5. **Define a national strategy to guide the development of digital skills as well as an official national digital skills framework to foster the development of these competencies throughout the formal educational trajectory.** Given the lack of a national strategy and framework, digital skills have not yet been incorporated formally into the curricula throughout the country, nor are they being systematically developed at a foundational level at elementary, middle, or high school or at a more advanced level in technical, technological, and higher education. As a first step in developing a digital strategy and framework, the GoC should identify the digital competencies that will be demanded by the private and public sectors in the coming decade.
6. **Strengthen the framework for personal data protection and the protection of critical infrastructure assets owned by the private sector.** The data protection framework could be strengthened by integrating internationally recognized best practices, such as the right to data portability, the reporting of data breaches to the data subjects, expanded legal jurisdiction for processing personal data, and a focus on the challenges brought forth by emerging technologies, such as artificial intelligence. Moreover, given the sizable share of important digital resources operated by the private sector, these assets and essential services should be included under the country's Critical National Cybernetic Infrastructure regime.



# OVERVIEW

**The widespread adoption of digital technologies is transforming how individuals, businesses, and governments interact and at the same time creating new opportunities to address longstanding development challenges.** Digital technologies—defined as electronic tools, systems, devices, and resources that generate, store, or process data—have already begun to transform the way most people around the world, learn, work, shop, socialize, and access information.<sup>1</sup> The impacts of this transformation are diverse and dynamic, from productivity gains across economic sectors to improvements in the efficiency and quality of service delivery and the creation of new sources of value. For policy makers in emerging markets, digital technologies also offer new pathways to address long-standing development challenges.

**Rapid and extensive digitalization, alongside increased connectivity, the exponential growth of data and computing power, and deep cultural changes among individuals and organizations, is driving the development of the digital economy.** The concept of the digital economy as discussed in this report refers to all economic activity resulting from the use of information technology to create, adapt, market, or consume goods and services.<sup>2</sup> Data and digital technologies are the cornerstone of the digital economy, as they enable the growing interconnectedness of people, organizations, and machines through billions of daily online transactions.<sup>3</sup>

**By 2025, the contribution of the digital economy to global GDP is expected to reach 25 percent, up from 15.5 percent in 2016.**<sup>4</sup> The impact of digital technologies on economic growth is mediated through three main mechanisms: inclusion, efficiency, and innovation. The widespread adoption and use of digital technologies can facilitate the integration of firms into the world economy by enabling more businesses to trade their products and services. The digitalization of businesses procedures and systems can raise efficiency by allowing firms to make better use of their capital and labor. Moreover, digital technology can intensify competition and enhance innovation processes by enabling firms to exploit scale effects through online platforms.<sup>5</sup>

**Colombia is among the countries in the Latin America and Caribbean (LAC) region furthest along the path of digitalization.** In 2020, more than two-thirds of the population used the internet by means of either fixed or mobile. E-commerce, digital financial services (DFS), and the fintech ecosystem have been growing rapidly in the country, especially since the onset of the COVID-19 pandemic. As of 2021, Colombia had hosted

approximately 13 percent of the region's digital solutions providers.<sup>6</sup> Moreover, Colombia currently stands among the most advanced countries in LAC in terms of digital government, performing on par with such countries as Mexico, Peru, and Brazil.<sup>7</sup> Key enablers and safeguards to support digital transactions and data flows have already been established in the country, and a modern digital ID scheme is currently being deployed—important steps in consolidating a trust environment conducive to widespread digitalization.

**However, access to and effective use of digital technologies across Colombian's regions, sectors, and income groups is not uniform and is hindered by last-mile digital infrastructure challenges and low levels of digital skills among the population.** The uneven access to fixed Internet is also notable between departments. The percentage of households with access in Bogotá (66) is above the national average (44 percent), while in some of the least populated and most isolated departments, such as Guainía and Vaupés, less than 1 of every 100 households have access.<sup>8</sup> Low levels of digital skills among the population could be hindering the growth of electronic interactions between individuals and government entities: In 2019, Colombia ranked 94th out of 141 in the World Economic Forum's Digital Skills Index. Limited access to the internet and low levels of digital capabilities also impacts the private sector's capacity to generate value-added through the adoption of digital technologies.

**Deliberate efforts from the Government of Colombia (GoC) are needed to promote the development of an inclusive, dynamic, and resilient digital economy.** Although Colombian businesses, individuals, and the public sector have advanced in their digitalization path, the broader development benefits from using digital technologies have lagged behind. In order that digital technologies benefit everyone everywhere, the remaining digital divide must be closed, especially in terms of access to affordable and reliable internet service and the adoption of digital technologies by firms and individuals. However, greater digital adoption will not be enough. To maximize its digital dividends, is critical that the GoC strengthen its “analog complements” to digitalization by (i) bolstering regulations that ensure greater competition among internet service providers, financial service providers, and businesses in general to develop a legal framework that builds trust in digital transactions and (ii) supporting the upscaling and rescaling of workers' skills to meet the demands of the rapidly changing economy.

**Promoting the widespread adoption of digital technologies can help Colombia address many of its persistent development challenges.** High and persistent inequality, slow productivity growth, limited economic diversification, and the socioeconomic impacts of climate change pose significant development challenges for Colombia. With the decline in commodity prices during the second half of the past decade, Colombia's growth slowed, and gains in poverty reduction and shared prosperity stagnated—and then sharply reversed as a consequence of the COVID-19 crisis. Colombia needs to expand its sources of economic growth and to do so in a manner that is inclusive and sustainable—socially, fiscally, and environmentally. Digital technologies can be leveraged to improve the delivery and efficiency of public services, including programs to empower marginalized communities and reduce Colombia's high and persistent inequality. Improving access to connectivity among remote and vulnerable communities can create economic opportunities for marginalized groups. For instance, enhancing rural connectivity is a necessary condition to developing a quality hybrid education system and plays a critical role in ensuring that access to telehealth services is more equitable across regions, income groups, and ethnicities. DFS can play a key role in strengthening the economic resilience of the poor, for example, by fostering financial inclusion and enhancing the efficiency of social protection programs. Similarly, robust digital ID systems and digital public platforms can help the public sector to better identify the needs of, and provide support to, vulnerable communities, including Afro-descendants, indigenous people, and Venezuelan migrants ([Figure O.1](#)).

**Widespread digitalization among businesses has the potential to spur productivity growth in Colombia and promote export sophistication.** Colombia's dependence on extractives has risen since the turn of the century, and consequently its economy has become less diversified and sophisticated. Less than 20 percent of Colombian exports include some level of technology. Promoting productivity and competitiveness in non-extractive sectors is critical to supporting the country's long-term transition to lower oil prices, and digital technologies

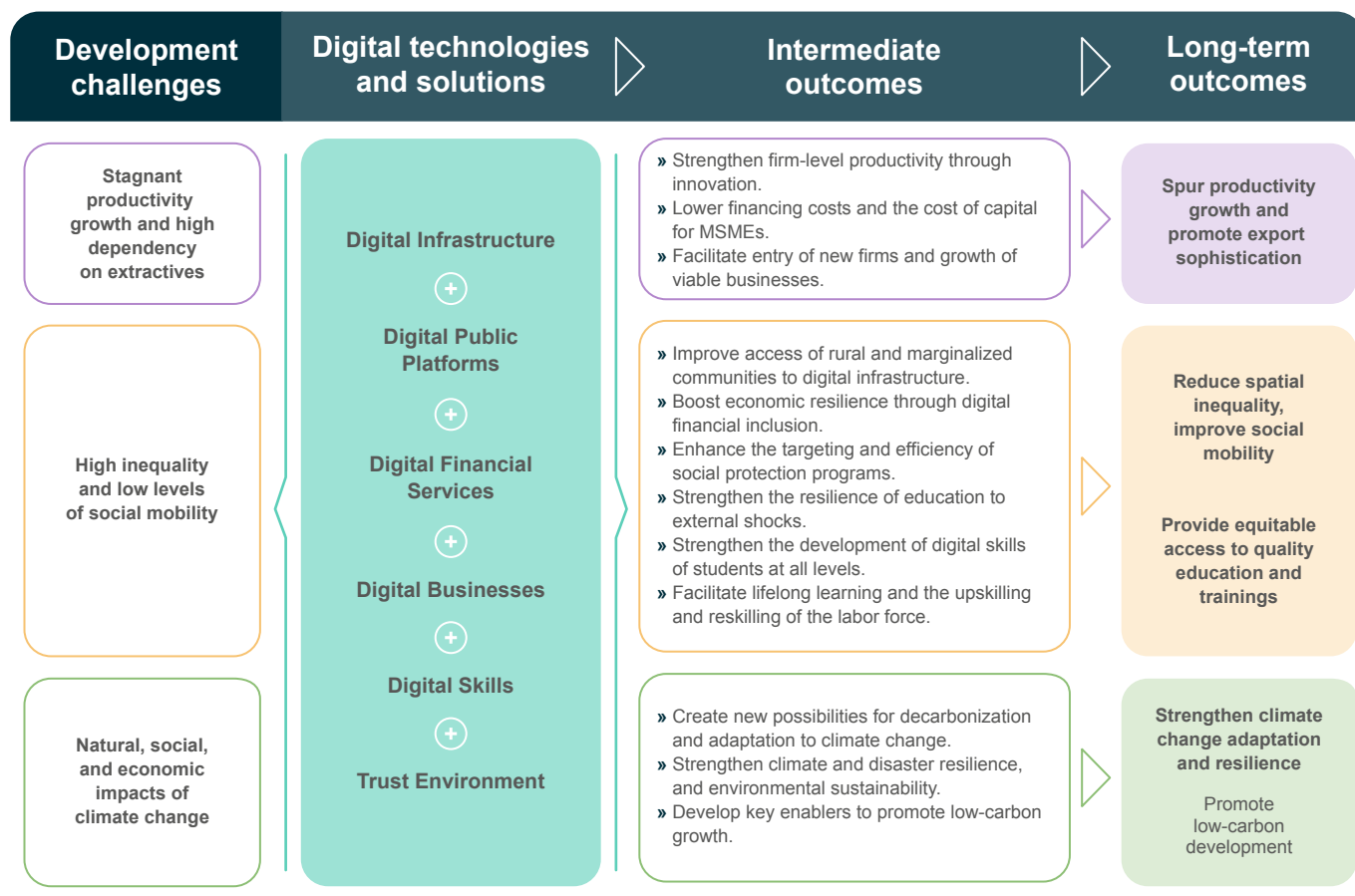
can play a pivotal role in this transition. Firms' adoption of technology, alongside complementary investments in digital skills and organizational capacity, can improve the efficiency of their productive processes and open up new markets to their products and services. Digital technologies can also enable firms—with support from academia and the public sector—to harness a rapidly increasing amount of data in order to effectively access new markets and sources of knowledge, streamline the production of good and services, and drive innovation. Moreover, DFS can bring down financing costs for micro, small, and medium-sized enterprise (MSMEs) and promote more efficient and convenient payments—a cornerstone of the e-commerce and platform-based business models ([Figure O.1](#)).

**Furthermore, promoting the digitalization of the public and private sectors strategically will enable Colombia to explore new avenues toward green, resilient, and inclusive development.** Climate change threatens to increase the risk of conflict and violence, intensify flooding along the coasts where poorer populations are concentrated, generate water shortages, and drive down productivity and growth. Facing the intertwined challenges of adapting to climate change, protecting the country's biodiversity, and meeting the ambitious national commitments for reducing greenhouse gas emissions will require rapid and far-reaching transitions, including the decarbonization of key sectors, such as power, agriculture, information and communication technologies (ICTs), and transport. Widespread digitalization can promote low-carbon growth in Colombia by increasing the contribution of the ICT sector to GDP growth, enabling the expansion of climate-smart agriculture, leveraging massive data and artificial intelligence (AI) systems to boost resource efficiency across industries, and accelerating a renewable energy transition. Recent estimates by Accenture and the World Economic Forum suggest that the widespread adoption of digital technologies could help drive down global emissions by up to 20 percent by 2050 (see [Figure O.1](#)).

Despite its enormous potential, the widespread digitalization of the economy carries risks that must be proactively identified and managed. Uneven provision of digital infrastructure can exacerbate, rather than mitigate, the already high levels of inequality and social exclusion in Colombia. In this regard, ensuring equitable access to fixed and mobile broadband by targeting efforts at remote and vulnerable communities will be critical. However, the provision of digital infrastructure must be carefully planned, as it can lead to a significant increase in energy consumption and emissions; for example, data centers are soon set to have a larger carbon footprint than the entire aviation industry. Moreover, the rapidly growing adoption of digital technologies also introduces new risks, including those related to personal data protection, fraud, cybersecurity, and cybercrime. Likewise, disruptive digital technologies, such as AI,

pose significant risks for the labor force that need to be addressed by the government, since in the absence of adequate legal, regulatory, competition, and skill development frameworks, the rise of industrial automation and platform-based businesses could perpetuate informality and underemployment. Managing these risks will require strong engagement with service providers and beneficiaries to identify and address threats and vulnerabilities. Furthermore, establishing and updating governance, legal, and regulatory frameworks will be crucial to creating an enabling environment for digital businesses, while also ensuring adequate levels of market competition and safeguarding labor standards, worker’s protection, and income security. The capabilities of public entities also need to be strengthened to monitor and defend against increasing cybersecurity threats.

Figure O.1. Digital Transformation in Colombia: Synthesis of a Theory of Change



Source: Authors, based on priorities identified in World Bank (2022).

**The GoC recognizes the potential of widespread digitalization to accelerate productivity growth, boost competitiveness, and reduce inequality and has prioritized efforts to bolster digital technology adoption among businesses, individuals, and the public sector.** The public sector can play a pivotal role in the digitalization of the economy as a key user of digital technologies to deliver products and services; as coordinator and facilitator for initiatives from stakeholders in the private sector, civil society, and academia; as a regulator of the functions and activities associated with the digital economy; and as the lead actor in identifying and proactively mitigating the downside risks of widespread digitalization. However, greater digital adoption will not be enough. Harnessing the potential of digitalization will require a long-term vision and strategy to guide forward-looking reforms, regulation, and investments. Moving forward, an integral vision for digital transformation would benefit from placing greater emphasis on the distributional, environmental, and sustainability dimensions of widespread digitalization.

**The report is based on the World Bank’s Digital Economy Assessment (DEA) methodology, which analyzes the current state of, challenges to, and opportunities for the development of six foundational elements for a digital economy.** By examining the international experiences of digital businesses and public sector institutions, the DEA identified a set of foundational elements that play a critical role in the digital transformation of economies. These are: the availability of internet or broadband that brings people online, the ability to identify and authenticate people digitally, and the ability to pay or transact digitally. Digital economies further energize when there is a sizable tech-savvy workforce and an ecosystem that supports digitally intensive firms in entering the market or scaling up.<sup>9</sup> Once those foundations are in place, a wide array of use cases can emerge. Use cases denote all the ways by which a digital economy may take shape, serving people, businesses, and government in a process typically referred to as digital transformation. The private sector is the main driver of use cases, offering major platforms and applications, including e-commerce, ride-sharing, gamification, and others. The government may also develop new government platforms, applications, and services to automate its functions, improving its efficiency and effectiveness (Figure O.2). In line with this methodology, the report provides a comprehensive overview of Colombia’s digital economy development across six pillars or foundational elements: digital infrastructure, digital platforms, digital financial services, digital businesses, digital skills, and trust environment.

» **Digital Infrastructure:** This refers to the facilities that are involved in the effort to collect, exchange, store, process, and distribute data across first-mile

(international links), middle-mile (backbone), and last-mile (access) networks. Digital infrastructure provides the way for people, businesses, and governments to get online and link with local and global digital services, thus connecting them to the global digital economy. Aside from connectivity, digital infrastructure encompasses the Internet of Things (such as with mobile devices, computers, sensors, voice-activated devices, geospatial instruments, and machine-to-machine and vehicle-to-vehicle communications) and data repositories (such as data centers and clouds). It also includes all the active and passive infrastructure necessary to develop the digital economy downstream.

» **Digital Public Platforms:** Digital public platforms developed for the public sector or as a public good—either by government agencies, in partnership with private companies, or through a hybrid model—can help deliver more and better services to individuals. The development of digital public platforms underpins the expansion of e-government services and can support the efficiency of core government systems. Digital public platforms can also boost accountability, including through providing new channels for public engagement and feedback and reducing opportunities for corruption. Likewise, they can provide a foundational layer to catalyze private sector innovation and new markets.

» **Digital Financial Services:** DFS provide individuals and households with convenient and affordable channels by which to pay as well as to save and borrow. Firms can leverage DFS to more easily transact with their customers and suppliers and build digital credit histories and seek financing. Governments can use DFS to increase efficiency and accountability in various payment streams, including for the disbursement of social transfers and receipt of tax payments. Digital payments are often the entry point for DFS and provide the infrastructure, or “rails,” through which additional products and use cases can be developed, as has been demonstrated by the evolution of M-PESA in Kenya and Alipay in China. Digital payments and financial services are critical to financial inclusion and key enablers of e-commerce and digitally empowered business models.

» **Digital Businesses:** Digital businesses can be divided into two categories, each with their distinct characteristics: (i) digital start-ups, which refer to early-stage ventures that create new digital solutions or business models as part of their core products or services, and (ii) established digital businesses, which are the digitally intensive businesses that have managed to scale up and consolidate their position

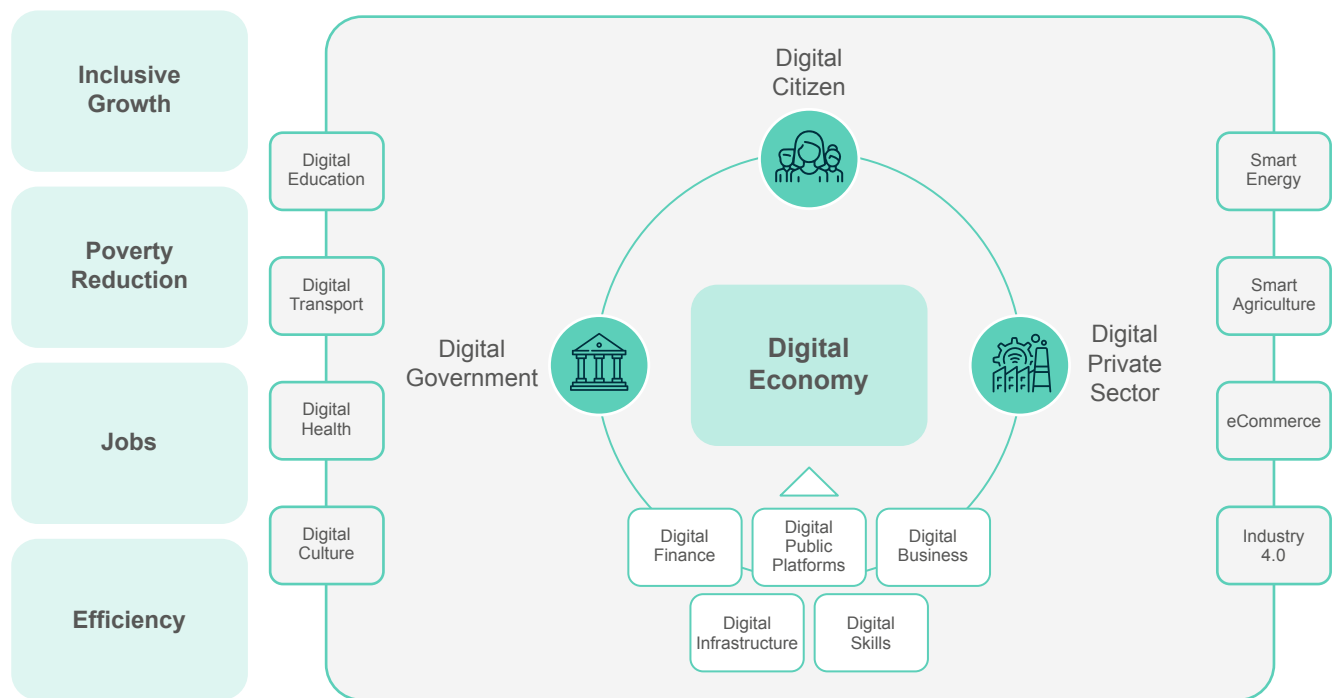
in local or international markets and which include medium and large platform-based and data-driven firms. Digital businesses, and the digitalization of less technology-intensive businesses, represent a unique opportunity for Colombia to nurture and scale up MSMEs, boost entrepreneurship, increase efficiency, generate more and better jobs, foster economic integration, and promote the integration of lagging populations and regions. Digital businesses thrive when other key enablers, such as digital infrastructure, skills, and payments, as well as a trust environment, are set in place.

- » **Digital Skills:** Economies require a digitally savvy workforce in order to build robust digital-intensive sectors and competitive markets. Digital skills encompass foundational, technology, and business

skills for building or running a digital start-up or running a digitally intensive business. Greater digital literacy further enhances the adoption and use of digital products and services among governments and the larger population.

- » **Trust Environment:** The rapid growth of the digital economy goes hand in hand with a rapid rise in cyber threats and increasing concerns about personal data protection. Therefore, the capacity of both the public and private sectors for cybersecurity and data protection needs to evolve quickly to meet current and future threats. This pillar assesses the presence of a governance framework that balances data enablers and safeguards and supports digitalization while protecting individuals, businesses, and institutions from cybersecurity risks.

**Figure O.2. The Digital Economy: Shared Prosperity and Reduced Poverty**



Source: World Bank (2020).

**The assessment finds that despite significant progress, there is scope for Colombia to accelerate its transition to the digital economy.** Gaps in the provision of key enablers of the digital economy (such as infrastructure, skills, and updated legal and regulatory frameworks) impact the private sector's ability to add value by going digital. Moreover, digital inequality—the fractured and unequal access to critical digital networks and technology, between and within countries—remains a critical threat to the development of an equitable and resilient digital economy in Colombia. To harness the full potential of digitalization, Colombia must bridge the significant digital divides between urban and rural dwellers, men and women, and those with and without access to meaningful connectivity.

**Six policy priorities for the development of a productive, inclusive, and sustainable digital economy in Colombia are:**

- 1. Invest in high-quality last-mile digital infrastructure to reach unserved and underserved areas.** The current deployment of fixed and mobile infrastructure represents a challenge to universal access and use of the internet and is therefore a barrier to an inclusive digital economy. One way to promote private investment in the mobile segment is for Colombia to release mobile spectrum in the 3.5 GHz band to boost 5G deployment. Where private investment is unlikely, public investment or other public initiatives aimed at promoting the development of a more capillary fiber network could be considered.
- 2. Strengthen the interoperability of government systems and implement a robust governance framework for the data value chain within the public sector to ensure the flow of information, both for decision making and providing services.** Colombia has made significant progress in the development of a data governance framework particularly with the implementation of the National Plan for Data Infrastructure (PNID) and Decree 1389 (2022) on data governance. However, successfully implementing and operationalizing this framework, encouraging proactive data sharing and fostering a culture of data-driven decision making across all public institutions continues to be a challenge. This will require ongoing efforts to overcome
- 3. Capitalize on recent progress on financial inclusion to foster the DFS ecosystem** by implementing key initiatives, such as fast payments and open finance, establishing comprehensive and well-coordinated legal and institutional frameworks for DFS, and ensuring market competition and robust financial consumer protections.
- 4. Improve access to debt and equity financing for digital businesses** by offering lines of credit and guarantees through state-owned financial institutions and the private sector, enabling the development of capital markets, and strengthening financial infrastructure. Additionally, it is critical to address the regulatory and technical constraints hindering the growth of platform-based business models, cross-border e-commerce, and trade in digitally deliverable services.
- 5. Define a national strategy to guide the development of digital skills as well as an official national digital skills framework to foster the development of these competencies throughout the formal educational trajectory.** Given the lack of a national strategy and framework, digital skills have not yet been incorporated formally into the curricula throughout the country, nor are they being systematically developed at a foundational level at elementary, middle, or high school or at a more advanced level in technical, technological, and higher education. As a first step in developing a digital strategy and framework, the GoC should identify the digital competencies that will be demanded by the private and public sectors in the coming decade.
- 6. Strengthen the framework for personal data protection and the protection of critical infrastructure assets owned by the private sector.** The data protection framework could be strengthened by integrating internationally recognized best practices, such as the right to data portability, the reporting of data breaches to the data subjects, expanded legal jurisdiction for processing personal data, and a focus on the challenges brought forth by emerging technologies, such as AI. Moreover, given the sizable

existing barriers and ensure that the framework is effectively integrated into institutional practices and operations.

share of digital resources operated by the private sector, these assets and essential services operated should be included under the country's Critical National Cybernetic Infrastructure (*Infraestructuras Cibernéticas Críticas Nacionales* [ICCN]) regime.

**The findings of the report are organized in six chapters, each dealing with a pillar of the digital economy.**



## 1. DIGITAL INFRASTRUCTURE

**Providing universal and affordable access to high-speed connectivity will help Colombia to address its high and persistent inequality.** Internet access is a crucial driver of productivity growth, and its importance will continue to increase as the economy advances on its digital transformation path. The expansion of digital infrastructure is needed to close the digital gap and reach the unconnected, who are often from among the most vulnerable segments of the population. Affordable and reliable internet access in rural and peri-urban areas is important to decrease the country's high socioeconomic inequality and promote the inclusive availability of digital public services.

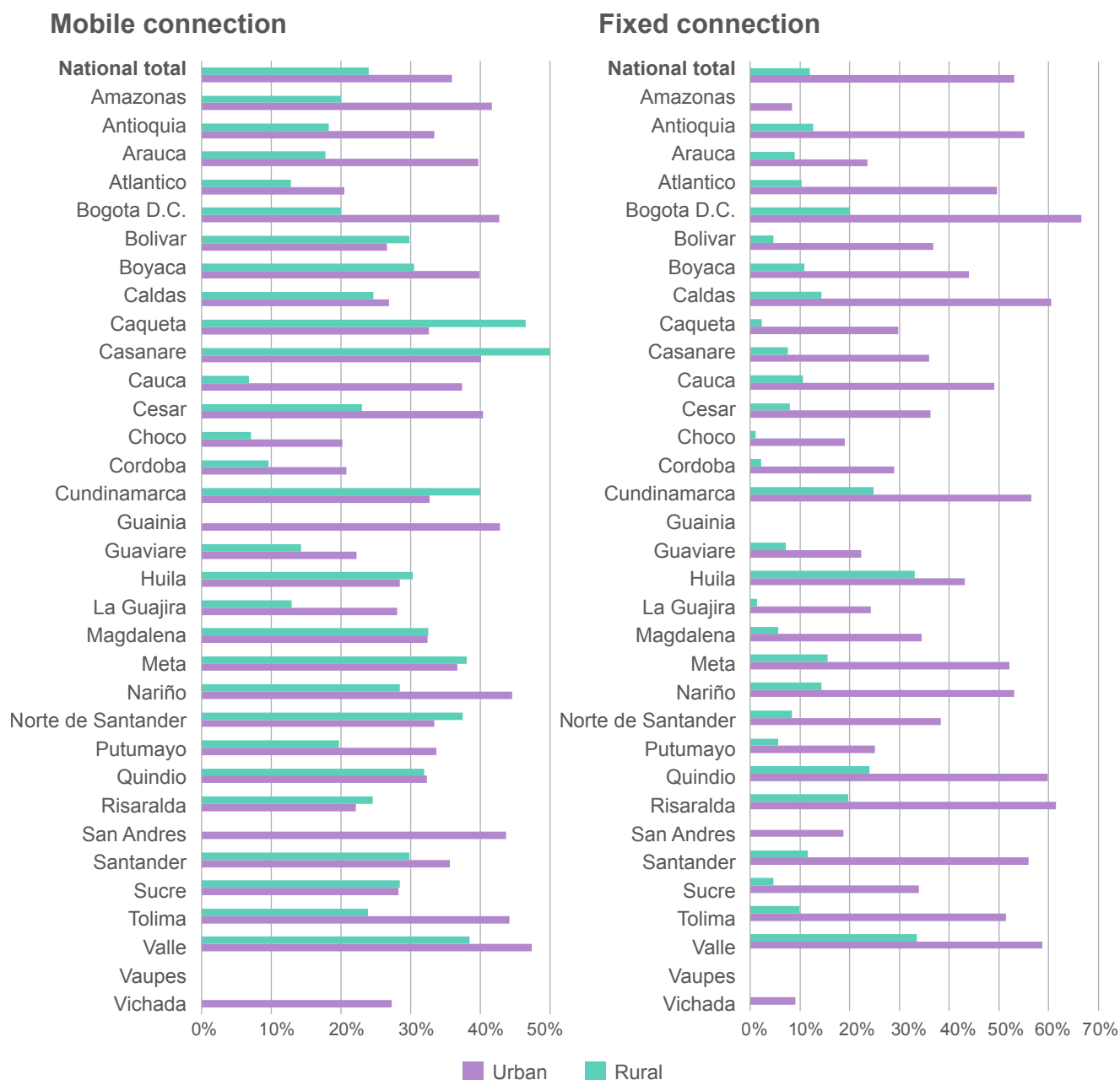
**Colombia enjoys well-developed international digital infrastructure commensurate with its large population, income level, and strategic location.** Relatively good quality infrastructure has enabled the growth of vibrant data centers and cloud markets that are essential to the widespread adoption of digital technologies across the private and public sectors. Despite robust international connectivity, however, utilized international bandwidth is low, reflecting a limited digital uptake within its borders.

**This limited deployment of fixed and mobile infrastructure represents an obstacle to universal access to and usage of the internet.** The footprint of Colombia's backbone network grew 25 percent between 2017 and 2020, increasing the share of the population that could be more easily reached with good quality connectivity service. However, 60 percent of the population still

does not have access to this level of connectivity. Moreover, Colombia has relatively underdeveloped mobile infrastructure, with less spectrum assigned, low tower density, and lagging 4G coverage compared to OECD countries and some regional peers. Although 3G is prevalent in all its departments, the limited development of 4G infrastructure is reflected in a low and unequal coverage of the 4G signal—less than a third of the *centros poblados* (population centers) have access to such technology. Overall, mobile infrastructure is insufficiently dense and widespread to ensure universal access to and productive usage of the internet across the territory.

**There is a clear need for further investment to improve equitable access across digitally deprived population segments in Colombia.** Additional investments are required to bring the backbone infrastructure closer to rural and peri-urban areas, allowing further utilization of the international connectivity capacity that the country enjoys and resulting in service quality improvements and a step change in terms of connection speeds for Colombians. Expansion of high-quality last-mile infrastructure to reach unserved and underserved areas is key to ensuring that all Colombians participate in the digital economy. Households in rural areas have low levels of Internet penetration, with only 12 percent having a fixed connection, 41 percentage points below urban areas. In certain departments such as Amazonas, Guainía, and Vaupés, the percentage of households in rural areas with a fixed Internet connection is 0 percent. Regarding mobile internet connection, only 24 percent of rural households have a connection, compared to 36 percent for urban households (a difference of 12 percentage points). Guaranteeing the provision of the best possible service in terms of reliability and speed is essential. However, telecom investment per capita in Colombia, particularly in the fixed segment has been below the figures for most of its regional peers in recent years. One useful way to encourage private investment in the mobile segment is for Colombia to make mobile spectrum in the 3.5 GHz band available to promote 5G deployment. Where private investment is unlikely, some form of public investment through the Single Fund for Information and Communications Technologies (*Fondo Único de Tecnologías de la Información y las Comunicaciones*) or other public initiatives should be considered.

**Figure O.3a and b. Percentage of Households with Mobile and Fixed Connection to the Internet, Urban vs. Rural (2022)**



Source: DANE (2022b).

**In spite of liberalizing entry into the fixed and mobile markets, telecommunications markets remain highly concentrated.** The fixed and mobile telephony and mobile internet segments in Colombia are populated by a limited number of players with large market shares. The retail mobile market in particular is highly concentrated. On the other hand, the fixed broadband market is more competitive compared to mobile, with none of the many market players holding more than 40 percent of the market share. Higher market concentration is suggestive of

lower competitive intensity, which may result in higher prices and lower service quality. Currently Colombia is embracing a “light touch” regulatory approach toward market power, but it may want to consider doing more to safeguard and promote efficient competition. To do so, in addition to relying on additional facilities-based entry to provide new competitive pressure, Colombia could also ensure that operators are appropriately regulated, including with respect to providing access to infrastructure, so that service-based competition may also flourish.



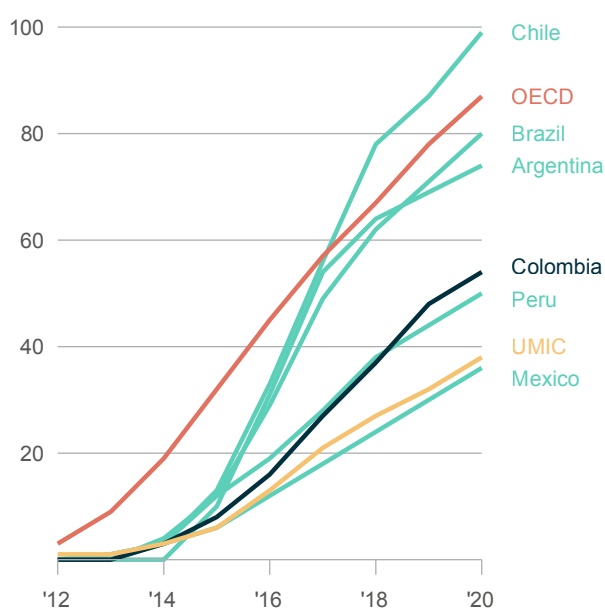
**An inclusive digitization requires more subscribers and higher data consumption.** Mobile broadband subscribers in Colombia use less data than in peer countries, and the growth of the subscriber base (46 percent between 2015 and 2020) has been comparatively slower. According to official statistics, Colombia’s number of 4G mobile broadband subscriptions per 100 inhabitants of 54 is just over half of the OECD average of 87 and below that of Chile (99), Brazil (80), and Argentina (74) (Figure O.4). The relatively low number of broadband users reflects a combination of supply-side factors (infrastructure and market structure) and demand-side factors broadly related to service affordability and the purchasing power of the population. Regarding the retail fixed broadband market, according to official statistics, Colombia has steadily increased its subscriptions in the past decade, although it has yet to catch up to its regional and OECD peers (Figure O.5). According to recent household survey data, progress may be less substantial. In either case, the distribution of fixed broadband subscriptions varies significantly across the territory and across socioeconomic groups, leaving a substantial percentage of the population behind. The departments with the three largest cities—Bogotá, Medellín, and Cali—have fixed household subscriptions well above 50 percent. In contrast, some of the less populous, more isolated departments, such as Amazonas, Vaupes, and Vichada, have rates below 5 percent, less than one-tenth the national

average. Reducing these digital divides is critical to tackling inequality in social and economic development.

**Fixed broadband prices in Colombia are a significant obstacle to getting online.** Internet users in Colombia pay 4.4 percent of gross national income (GNI) per capita per month for 5 GB of fixed internet, an amount higher than all regional comparators except Argentina. In 2020, out of the 41 percent of unconnected households, more than half identified affordability as a binding constraint to subscribing to fixed broadband. However, the affordability constraint seems to be less binding for mobile broadband, with Colombians spending on average less than 2 percent of GNI per capita to acquire 2 GB of mobile data, though the affordability of data packages continues to be an obstacle to connectivity for households at the lower end of the income distribution. Although it is important to foster competition to decrease prices, the new government in Colombia may wish to review the eligibility, duration, and scope of the Social Tariffs program to further promote internet affordability for low-income households.

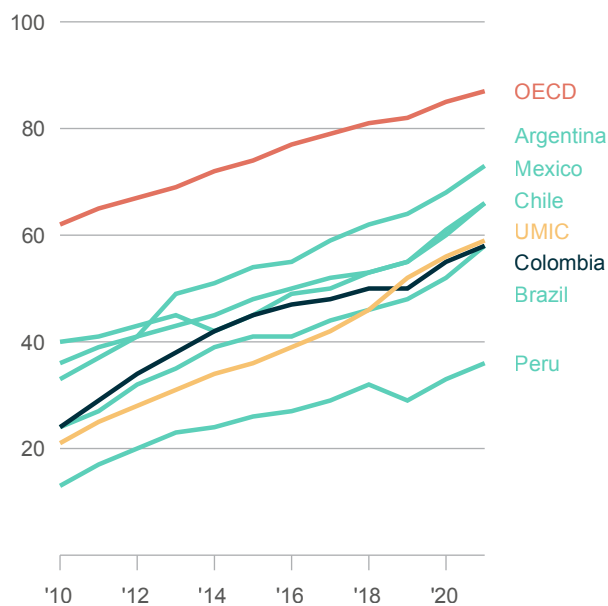
**The new administration has an opportunity to establish a fresh dynamic policy and regulatory agenda for the next planning period while building on Colombia’s inherent strengths and achievements to date.**

**Figure O.4. 4G Subscriptions per 100 inhabitants**



Source: GSMA (2021); World Bank, 2012-2020.

**Figure O.5. Fixed Broadband Household Penetration (%)**



Source: TeleGeography (2023b).

Its core objective could be to promote equitable access to digital development for all Colombians by reducing all forms of digital divides based on socioeconomic status and geography. This objective could be achieved by (a) maximizing private and, as needed, public investments in backbone, internet exchange points), and access infrastructure, (b) strengthening the competitive environment and safeguarding it through more rigorous *ex ante* regulation and effective enforcement, and (c) ensuring the efficient distribution of spectrum resources, such as the 3.5 GHz band, with the objective of maximizing coverage and investment.



## 2. DIGITAL PUBLIC PLATFORMS

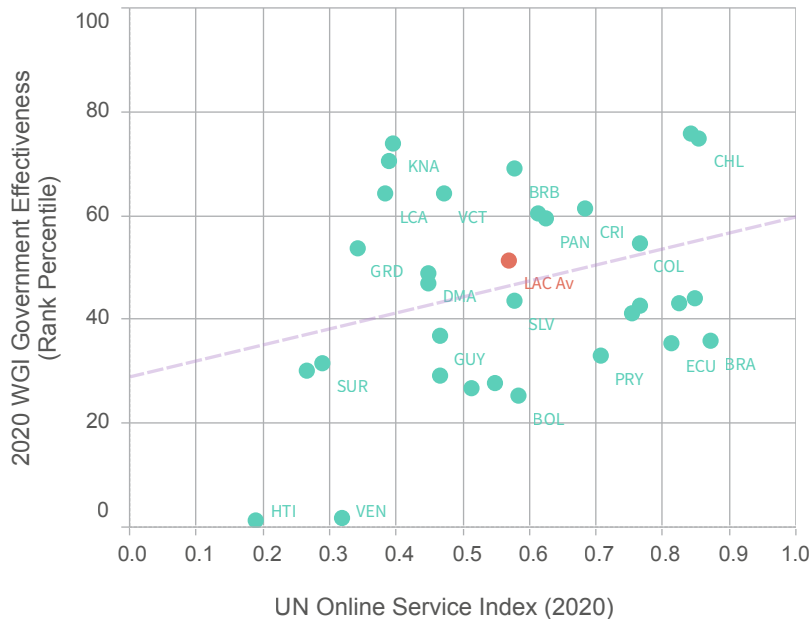
**Digital platforms are electronic tools designed to exchange goods, services, or information between producers and users.** In a nutshell, they facilitate the flow of information and transactions to enable producers and users to create value by interacting with each other. Digital platforms can be public or private, such as, for example, social networks and online marketplaces. The development of digital platforms is an important lever for the widespread digitalization of the economy. Digital platforms can transform the way governments interact with citizens and businesses and optimize public value by reducing costs and improving productivity (Figure O.6). They also enable new service delivery models and improve the management of public resources while

providing timely information for the design and implementation of public policies.

**The GoC has made substantial progress in its digital transformation and development of the underlying institutional framework.** Colombia has a consolidated digital government strategy and is implementing a building blocks approach to the delivery of digital public services and the construction of digital public platforms. Nevertheless, further coordination efforts between key stakeholders are needed. The nature of digital government implies the integration and collaboration of all the stakeholders in a whole-of-government approach. Exploring a federated coordination scheme and strengthening the role of the sector chief information officers could help to bolster the alignment of efforts.

**The government of Colombia is implementing an interoperability platform and developing digital authentication services, which are critical building blocks for the advancement of digital services.** Colombia has made progress on developing the Digital Citizen File as a centralized hub to access government services, but its rollout remains a critical challenge for the immediate future. Also, some of the digital services currently available reproduce analog processes. This poses a challenge in terms of efficiency, as the workflow of services could potentially contain redundant steps that could be redesigned or simplified to save both time and resources. Achieving the ambitious deadlines set by the normative framework to fully digitalize services would also require strengthening the capacity of both the

**Figure O.6. Digital Government: Correlation with Government Effectiveness**



Source: Authors' elaboration based on data from the World Bank (2023e); and the UN Online Service Index.

National Digital Agency [*Agencia Nacional Digital* [AND]] and sectors involved in the provision of services.

**Strengthening the interoperability of government systems is essential to ensuring the flow of information, both for decision making and service delivery.**

Interoperability, together with digital authentication and the availability of digital services, is foundational to the development of digital public platforms. The GoC has made considerable progress in setting up the regulatory framework and supplying the technologies to facilitate interoperability between government institutions. Colombia has adopted X-Road as the government interoperability platform, which provides the versatility needed to adapt to existing technological solutions, but its uptake has been limited for a variety of reasons, including technical factors and the steep learning curve needed. Out of 171 government entities, only 64 use X-Road, and only 27 processes are interoperating. To further promote interoperability, it is critical to ensure the harmonization of functional concepts in new system designs so that the systems are interoperable from the start.

**Colombia has made notable progress on advancing toward a data-driven public sector, but implementing its new framework could be a challenge.**

Implementing a governance framework of the data value chain (from collection to processing, sharing, and re-using) within the public sector is crucial for capitalizing on data as a strategic asset and thus promoting a data-driven public sector that transforms the design, delivery, and monitoring of policies and public services. Significant progress has already been made in the development of a data governance framework in Colombia, particularly with the implementation of the PNID and the Decree 1389 (2022) on data governance. The GoC has also established an IT management enterprise architecture and an interoperability framework for the public sector and data reuse guidelines for public entities. However, challenges in the establishment of a data management model and implementation of the PNID framework remain. Although PNID includes provisions on sharing and using data, these as well as data analytics are not yet widespread practices. It is particularly important that the GoC purposefully shift away from managing siloed datasets and enables data sharing between different digital government services. Successfully implementing and operationalizing the PNID framework, encouraging proactive data sharing and fostering a culture of data-driven decision making across all public institutions are challenges Colombia will face in upcoming years. This will require ongoing efforts to overcome existing barriers and ensure that the framework is effectively integrated into institutional practices and operations.

**Significant disparities remain in the scope and comprehensiveness of core government systems across regions.**

Although major urban centers have deployed robust systems to manage internal operations, small rural municipalities are still in the process of digitalizing core functions, such as budgeting, accounting, and human resource management. The government could define strategies to address regional disparities by, for example, (i) creating working groups in each region with representatives of the main stakeholders, the AND, local government, the Ministry of Information and Communications Technologies (*Ministerio de Tecnologías de la Información y las Comunicaciones* [MinTIC]), and the National Planning Department (*Departamento Nacional de Planeación* [DNP]), to identify the specific needs of subnational governments; (ii) expanding the approach of initiatives, such as the DNP's Territorial Management Model, to enable the provision of solutions and technical assistance to municipalities in a cost-effective way; (iii) expanding support in priority areas, such as ICT commissioning, digital services, and digital skills development; and (iv) providing shared technology infrastructure through cloud technologies for core back-office systems, such as financial, human resource, investment, and revenue management systems.

**The adoption of shared technology infrastructure could contribute to reducing the costs and improving the performance of both ICT infrastructure and service provision,**

as it would enable a cost-efficient expansion and greater interoperability between government systems using tools compliant with the data standards. A whole-of-government approach to the management and purchase of ICT presents a strategic area where intensifying the use of shared technology could yield considerable benefits. Although Colombia has the regulatory framework in place to aggregate demand for hardware and software and achieve savings through framework agreements developed by the public procurement agency (*Colombia Compra Eficiente*), the use of these tools is not widespread. Also, although the absence of a government-wide ICT procurement strategy offers great flexibility for line ministries, it weakens their bargaining power in relation to suppliers, which disproportionately affects smaller ministries.

**Colombia has made free, facilitated access to government data part of its policy priorities.**

The country operates under the principle of openness by default, and most government entities publish datasets in the open data platform. However, data management processes are not necessarily designed to facilitate data sharing, especially between government institutions. The government has made progress leveraging ICT technologies

to promote citizen engagement, and government institutions are required to develop citizen participation in the same way—an example of this is the Cristal Urn platform. Citizen engagement could be further promoted to generate public value. Key actions in this regard include (i) intensifying collaboration with the private sector, academia, and civil society organizations to increase the re-use of open data and to help build solutions for vulnerable groups; (ii) strengthening the measurement and evaluation of digital citizen engagement; and (iii) working with academia and civil society to foster the co-creation of digital solutions.



### 3. DIGITAL FINANCIAL SERVICES

**DFS are a critical enabler of the digital economy and can help to overcome the cost, accessibility, and product design barriers that have historically driven financial exclusion.** The G20 High-Level Principles for Digital Financial Inclusion define DFS as: “...financial products and services, including payments, transfers, savings, credit, insurance, securities, financial planning and account statements. They are delivered via digital/electronic technology such as e-money (initiated either online or on a mobile phone), payment cards and regular bank accounts.” Digital payments often serve as the entry point and “rails” for a DFS ecosystem and enable consumers to easily make and receive payments with friends, family, retailers, service providers, and government authorities. Greater uptake and usage of DFS helps foster the growth of digital businesses by ensuring convenient, fast, safe, and transparent payments. Universal access to DFS can also facilitate greater use of digital public platforms, including the rapid and efficient delivery of social transfer payments via digital channels.

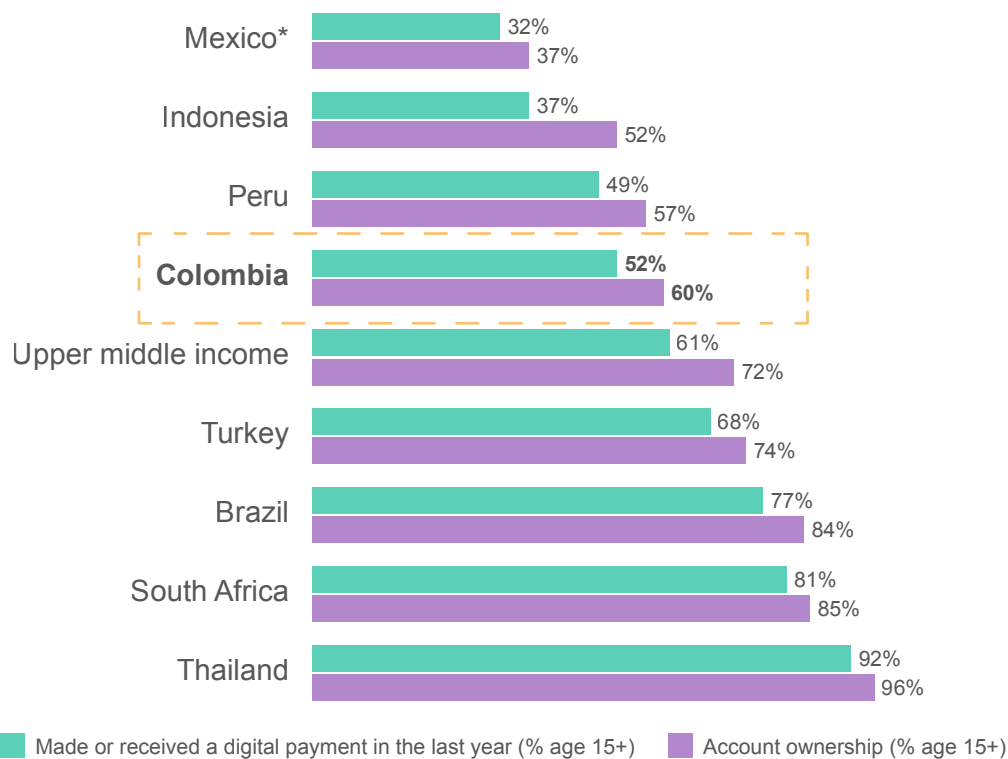
**Colombia has made notable progress in expanding access to DFS over the past decade.** Ownership of a transaction account among Colombian adults (ages 15+) has doubled from 30 percent in 2011 to 60 percent in 2021. More than half of adults in Colombia now report making or receiving at least some digital payments. This places Colombia above several country peers (e.g., Peru, Indonesia) in terms of access and usage of basic DFS, but still below the average for upper-middle-income countries (UMICs) as well as country peers that have seen greater progress in recent years (e.g., Brazil, Turkey) (Figure O.7). In Colombia, challenges remain in closing the gaps with still-excluded segments, promoting

the active usage of digital payments, and enabling the digitalization of a broader range of financial services. Despite recent growth in mobile wallets, most Colombians still rely on cash for daily transactions and the majority of MSMEs have not yet reaped the benefits of DFS to reach new customer segments and improve their productivity.

**Policy, legal, and regulatory reforms have contributed to development of Colombia’s DFS and fintech ecosystem.** Efforts by financial sector authorities over the past decade, including the program *Banca de las Oportunidades* and the 2014 Financial Inclusion Law, have been instrumental in helping to achieve near universal coverage of access points and to expand the uptake of DFS. The current regulatory framework facilitates the market entry of several types of innovative providers (e.g., electronic deposit and payment companies) and the use of new technologies (e.g., cloud computing) for the provision of DFS and sets rules for the management of the associated risks. Colombia’s regulatory sandbox provides supervised financial entities and unsupervised providers with a tool to test innovative technologies and business models. Authorities have also taken measures to address vertical integration, concentration, and high costs in Colombia’s credit cards market and respective infrastructure. Colombia now has the third largest fintech ecosystem in the region by number of companies, behind Brazil and Mexico.

**Further reforms can build on recent progress and foster a more mature stage of development for Colombia’s DFS and fintech ecosystem.** The recent Open Finance Decree is a key milestone in this regard, yet ensuring its effective implementation will require a mix of regulatory measures and market convening to ensure a common technical and commercial baseline for the development of a multilateral framework. Moreover, authorities should continue to adapt oversight and supervision frameworks to digital payments and DFS, particularly in light of outsourcing and new technologies and assets, in line with international standards and guidance. DFS users should be adequately and consistently protected, regardless of the regulatory perimeter. Indeed, there is scope to enact a more comprehensive legal and regulatory framework for payment services and digital credit that could serve to promote innovation and competition as well as coordinate authorities’ regulatory and supervisory responsibilities. Authorities should also consider how to further leverage crowdfunding to address access to finance constraints, given that just one platform is operating under the current regulatory framework.

**Figure O.7. Account Ownership and Use of Transaction Accounts in Colombia, International Comparison, 2021**



Source: Demirgüç-Kunt et al. (2022).

Note: Figures are for 2021, with the exception of Mexico (2017). The figure shows the percentage of respondents (adults) who report having an account (by themselves or together with someone else) at a bank or another type of financial institution or report personally using a mobile money service in the past 12 months.

**Colombia’s national payment system largely supports the provision of digital payments, but financial infrastructure barriers, uneven coverage, and limited interoperability may constrain uptake and active usage.** Electronic payment acceptance infrastructure has been expanding as a result of new business models and low-cost technologies (e.g., mini POS and quick response [QR] codes). Microbusinesses appear to be beginning to avail themselves of these opportunities amid consumer preference for cash. To the extent that many DFS models still require the use of financial institutions’ access points for cash-in and cash-out transactions, uneven coverage across urban and rural areas may affect DFS adoption by underserved segments. Furthermore, the lack of full interoperability and access barriers to key financial infrastructure constrain the potential of new business models to drive down acceptance costs/barriers. Authorities should continue to monitor the effectiveness of the retail payment system’s governance arrangements and induce change as necessary. Timely progress in the area of fast payments would benefit from the central bank (Banco de la República [BR]) articulating its role consistent with its mandate and in coordination with the industry.

**Significant opportunities remain for authorities to drive digitization efforts through government-to-person transfers and remittances.** Following the progress made on the digitalization of government salaries and pensions, social benefit programs could be shifted to direct automated clearinghouse (ACH) payments to beneficiaries’ preferred transaction accounts. Lessons from the large-scale digital disbursement of the *Ingreso Solidario* emergency financial support program during the COVID-19 pandemic should be considered. Likewise, the digitalization of remittances, which could be facilitated by new entrants, represents a large opportunity for increasing financial inclusion and the uptake of digital payments. To this end, the conditions to operate as a foreign exchange intermediary and the exclusivity agreements between international money transfer operators and their agents could be reviewed and, if necessary, addressed.

Looking ahead, Colombia should continue to implement ambitious reforms with strong public sector leadership and effective mechanisms for coordination with the private sector. The consolidation of various coordination bodies under the single Intersectoral Commission on Financial and Economic Inclusion and Education (*Comisión Intersectorial para la Inclusión y Educación Económica y Financiera* [CIIEEF]) is expected to streamline policy execution in the area of financial inclusion. Once the CIIEEF has been fully operationalized; future efforts could focus on better aligning financial inclusion targets and indicators to the ambitious policy agenda, reflecting a shift from access to effective usage and the changing ecosystem. The BR initiative to develop a fast payment system is also consistent with this direction. If well implemented, this initiative can help catalyze private sector commitment to interoperability and other public policy objectives.

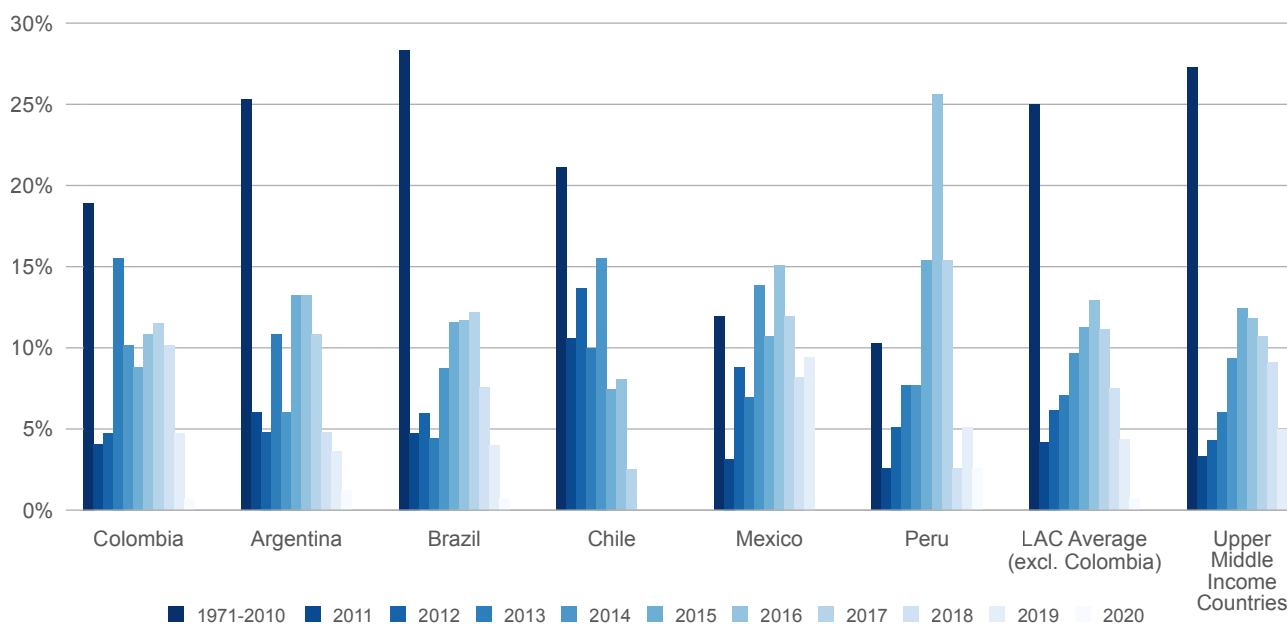


#### 4. DIGITAL BUSINESSES

The widespread adoption of digital technologies by businesses in Colombia represents a great opportunity to reignite the engines of economic growth but also poses a multidimensional challenge. In addition to their own contributions to productivity growth and competitiveness, both start-up and established digital enterprises are key enablers of growth through the digital transformation of traditionally offline businesses. Digital businesses supply new or improved digital technologies and services, facilitate access to larger and more dynamic markets for local firms, and generate strong network and demonstration effects that promote the adoption of innovative business models and digital technologies by offline companies.

Colombian firms in the digital subsectors face low barriers to entry but encounter significant challenges to scaling up. Colombia has a large pool of digital start-ups relative to regional peers. As of 2021, Colombia was home to approximately 13 percent of the formal digital businesses in the LAC region.<sup>10</sup> When compared to aspirational peers, such as Romania and Estonia, Colombia showed a spike in new digital businesses in 2013 and then some fluctuations afterwards, while Romania and Estonia have shown a steady increase of new businesses over the past decade (Figure O.8). However, for every six digital start-ups in Colombia, there is only one

**Figure O.8. Colombia and Regional Peers. Percentage of Formal Digital Business by Founding Years**



Source: Authors' elaboration with data from Pitchbook and CB Insights.

established digital business.<sup>11</sup> The proportion of Colombian digital start-ups to established digital businesses is similar to the UMIC average and aspirational comparators such as Romania and Estonia, but below the share observed in the LAC region and OECD countries. These figures suggest that there is a vibrant ecosystem in Colombia but that few digital start-ups manage to scale and mature. There is an opportunity to strengthen the competitiveness and innovation policy mix with instruments that target the key drivers of success, such as improving managerial capacity and providing more diverse and scalable sources of financing.

**The top four digital subsectors in Colombia are fintech, business management tech, e-commerce, and logistics tech, and healthtech also plays a leading role relative to regional peers.** Fintech is the top digital subsector across medium-sized firms in Colombia and other regional peers. E-commerce and related subsectors, business-to-business subsectors, and technology-focused services (big data, software, AI) also make up a large share of medium-sized digital firms in Colombia. The country shows a comparative advantage in terms of healthtech, as the share of medium-sized and large businesses in this subsector doubles that of regional peers. Moreover, about 20 percent of digital businesses in the country are built around platform-based or data-driven business models, above levels observed in country peers. However, most data-intensive services, such as big data analytics and provision of AI systems, are provided primarily by foreign firms. Digital businesses tend to be more concentrated around the largest economic centers (Bogotá and Medellín) compared to firms in other sectors, suggesting that they are more dependent on network interactions with buyers and suppliers. In addition, gender gaps regarding firm ownership are more pronounced in some digital business subsectors relative to the rest of the economy, suggesting that gender-specific bottlenecks and biases might be impeding women entrepreneurs from entering and succeeding in the provision of some digital goods and services.

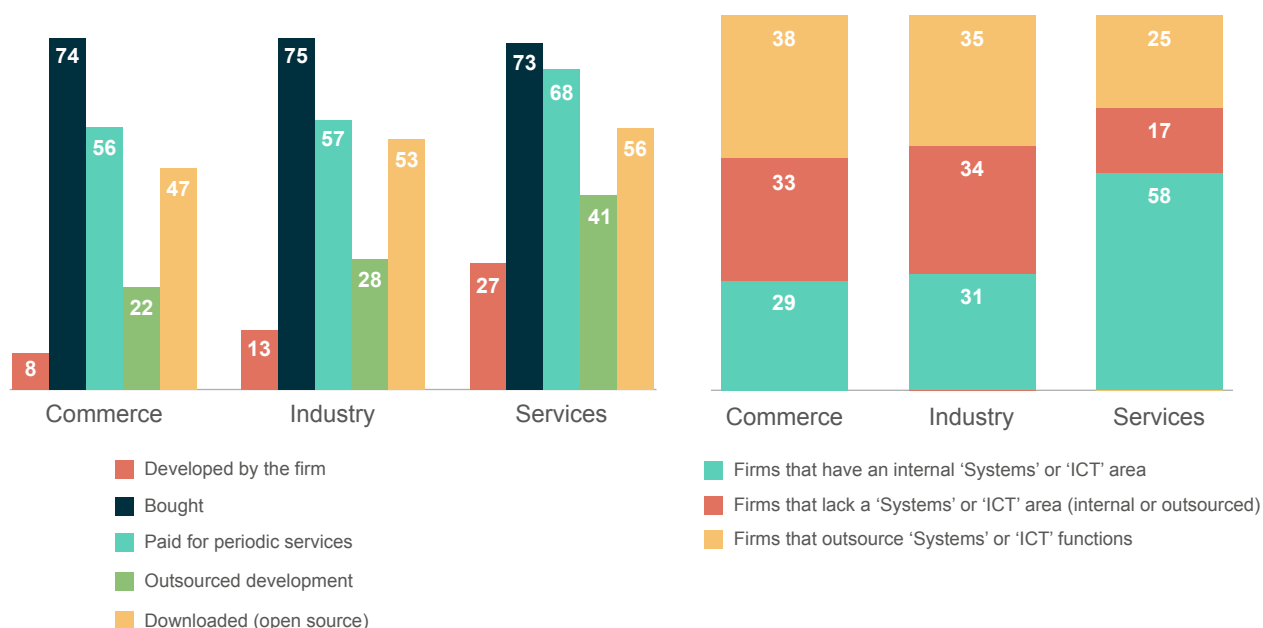
**E-commerce has been growing steadily since the onset of the COVID-19 pandemic, mostly driven by a boom in domestic trade and contributing 3.6 percent of GDP in 2021, up from 1.9 percent in 2018.**<sup>12</sup>

Yet, the cross-border e-commerce of goods remains constrained by the low automation of border control agencies, inefficient customs and tax revenue collection techniques, and limits imposed by the Customs Code on imports and exports by postal services. Implementing advanced border management solutions, such as updated approaches to revenue collection and dedicated automated systems for postal and expedited shipment data processing, could help ease these constraints.

**Most MSMEs in Colombia have adopted basic digital tools, but the use of these tools for productive purposes remains limited, particularly among microbusinesses.** Multiple factors constrain the capacity of Colombian firms to adopt digital technologies, from basic to advanced, including: (i) a limited understanding of available digital technologies; (ii) inadequate managerial capabilities; (iii) affordability constraints; and (iv) the limited digital skills of the workforce. The GoC's menu of policy instruments for digital transformation could be strengthened to better support firms' digital uptake through a mix of interventions focused on: raising awareness among MSMEs about the availability of digital solutions; strengthening the organizational, technical, and managerial capabilities of firms; and supporting the formation of high potential platform-based and data-intensive businesses.

**Only a small fraction of Colombian MSMEs currently have the capacity to develop and implement the technological solutions they require to operate in a digital environment.** Despite such low internal capacity, relatively few firms outsource ICT services—between 56 and 68 percent of firms across sectors pay for periodic services related to software and computer programs, and only one-third outsourced their systems or ICT functions ([Figure O.9](#)). The limited externalization of ICT services by MSMEs could hinder the capacity of digital businesses to mature and scale up. Intervention mechanisms that provide technical or financial support for MSMEs to outsource or externalize key processes intensive in the use of digital technologies (e.g., advisory services, networking events, vouchers) could help firms to circumvent infrastructure deficiencies and skills gaps constraining their technology uptake.

**Figure O.9. Share of Companies that Used Computer Applications or Programs (left), and Share of Firms that Have a Systems or ICT Department, internal or outsourced (right)**



Source: DANE (2021d).

**Digitally intensive businesses point to the limited access to external sources of financing as a key constraint to innovation and growth.** Debt financing through private banks accounts for less than 2 percent of ICT businesses' investments in scientific, technological, and innovation activities.<sup>13</sup> Access to risk capital in the early stages of development for digital start-ups has increased during the past decade, but its role remains limited, and private equity financing for later-stage digital businesses is still underdeveloped. Regulatory reforms that improve certainty for investors, passive support for early-stage financing, and measures to strengthen the financial infrastructure related to intangible capital could enhance digital businesses' access to diversified financing instruments suitable to their specific needs and development stages.

**The GoC has implemented multiple programs to promote business digitalization and support the formation and growth of Colombian digital start-ups.** About \$1 out of every US\$25 that the GoC budgeted to support the National System of Competitiveness and Innovation in 2022 was directed at policy instruments that seek to boost digital transformation. Currently, 70 government entities implement 376 policy instruments aimed at boosting competitiveness and innovation in Colombia, with a combined budget of US\$1,891 million, as reported by the *Articulación para la Competitividad* initiative. From these, three policy instruments specifically support the

formation and growth of digital businesses; six contribute to the progressive digitalization of businesses across multiple sectors, for instance, by supporting improved digital capabilities among small and medium-sized enterprises (SMEs); and 31 support the formation of foundational digital skills and the widespread adoption of digital technologies by government, nongovernmental organizations, and society at large, thus contributing to the creation of an enabling environment for digital firms to thrive.

**However, significant overlapping program objectives, inadequate targeting of beneficiaries, and a lack of intervention mechanisms to address access to finance constraints (among other key barriers to business digitalization) point to opportunities to improve the efficiency of public spending.** Most programs assessed do not adapt their offer of support instruments to account for subnational or cultural differences, and they also show a low segmentation of beneficiaries, which could lead to a significant duplication of effort. In this context, strengthening the articulation between policy instruments and improving selectivity criteria, as well as refocusing intervention mechanisms through sound logical frameworks and improving monitoring and evaluation capabilities, could play an instrumental role in minimizing duplications of effort while increasing the reach and impact of support programs and enhancing the efficacy of public spending.





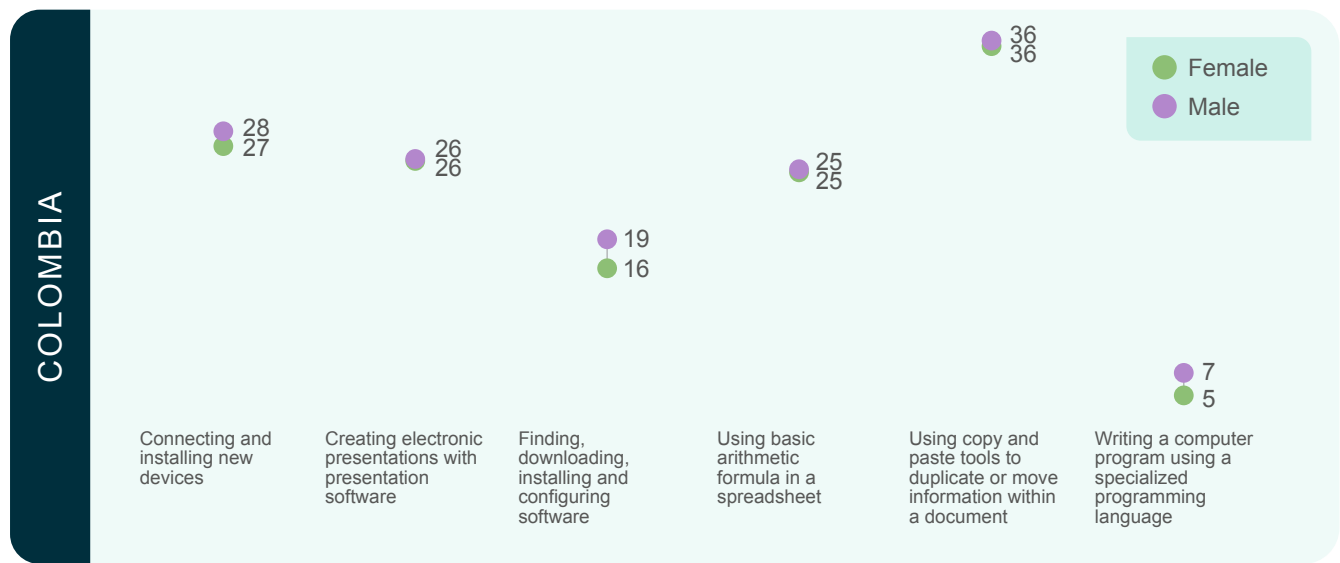
## 5. DIGITAL SKILLS

**The widespread adoption of digital technologies around the world is changing the nature of jobs and requiring new skillsets.** Colombia is no exception to this trend, as the country needs to foster better acquisition of digital skills through education and training. Digital skills encompass both technical skills—basic and advanced—as well as transversal skills. For instance, effective collaborative work through digital technologies clearly implies technical competencies, such as knowing how to use certain digital tools, but also requires transversal skills such as communication, cooperation, and empathy. As Colombia advances in its digital transformation path, there are basic or fundamental digital skills that all citizens need to master for their jobs and professions and for their everyday lives. For young people, the main way to acquire these skills is through the compulsory formal education system, and for adults through a workplace training system. At the same time, the more

advanced or specialized digital skills that are increasingly necessary for an ever-growing number of jobs are fundamentally acquired in formal higher education (technical or university) and in formal and informal training offered by a growing ecosystem of providers and by the technology industries themselves.

**Multiple barriers currently compromise the equitable acquisition of digital skills among the population and fuel the digital divide.** Chief among these challenges are the high number of young people who neither study nor work, the poor performance of the education system in foundational skills, the marked disparities in school life expectancy by socioeconomic groups, and the unequal access to digital infrastructure and equipment across the territory. Although the gap in digital skills among Colombian regions is significant, these skills appear to be similarly distributed between women and men. UN data for 2018–19 suggest that there is little difference between genders as regards basic computer skills in Colombia (Figure O.10).

**Figure O.10. Digital Literacy Gaps in Colombia (2019–19). Share of Youth and Adults**



Source: UNESCO, Sustainable Development Goal 4.4.1.

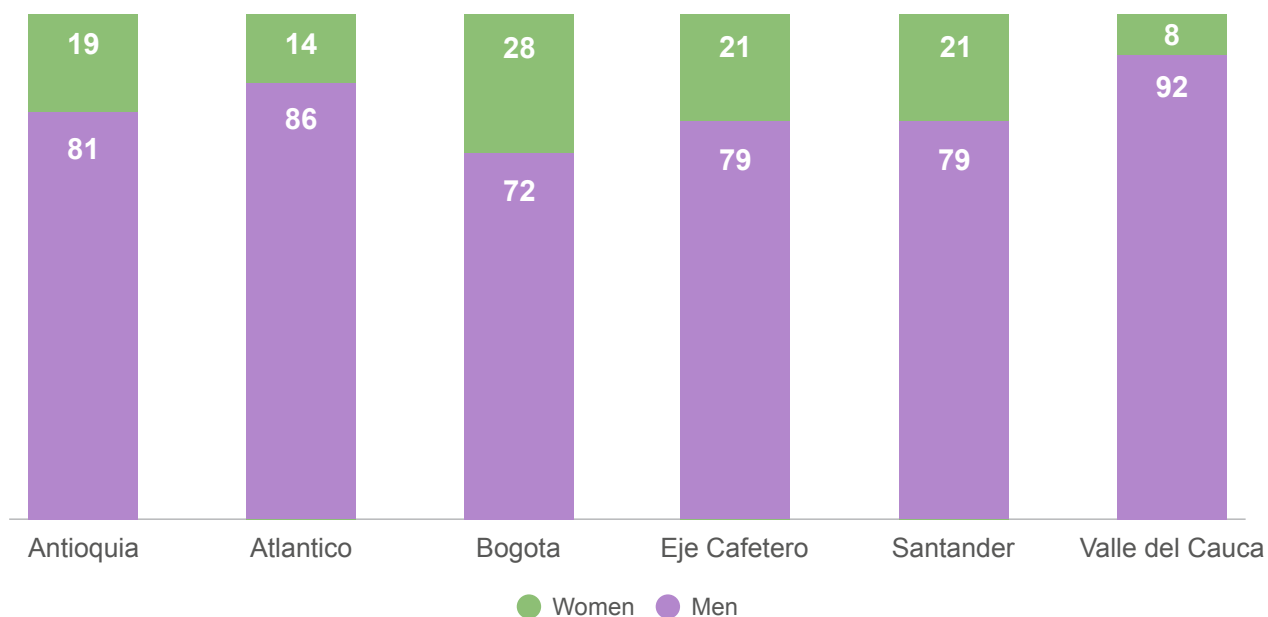
**Demand for digital skills in Colombia outpaces supply, and the gap is likely to widen as the economy continues on its digitalization path.**

Demand for basic digital skills is near universal among employers, while demand for advanced digital skills is high and increasing. Over half of formal firms across all sectors surveyed in 2014 reported difficulties in finding the right human talent.<sup>14</sup> The main reasons behind this mismatch were the absence of foundational and sector-specific skills and the lack of required knowledge and certifications. A 2020 study by the United Nations Development Programme, in collaboration with the Bogota Chamber of Commerce and focused on the financial services cluster, identified challenges related to quantity gaps (i.e., an insufficient number of professionals) and quality gaps (i.e., the lack of solid technical knowledge) in several profiles, such as software and application developers, data science specialists, user experience designers, and digital marketing, as well as a relevance gap in the training offered (i.e., a disconnect between the productive sector and the academy). Likewise, digitally intensive businesses are struggling to attract and retain employees with advanced digital skills, which are in high demand in the formal sector, hard to find, and show significant gender gaps, likely related to barriers to accessing formal education and training (Figure O.11). Developers, data scientists, cloud service administrators, and IT architects are consistently identified as the most critical ICT profiles and the most difficult human resource to obtain.<sup>15</sup>

**During the past decade, the GoC has launched important plans and programs to promote the use of technology and strengthen the development of digital skills.**

The main agents related to digital skills are MinTIC, the Ministry of National Education (*Ministerio de Educación Nacional* [MEN]), the Ministry of Labor, the Ministry of Commerce, Industry and Tourism (*Ministerio de Comercio, Industria y Turismo* [MinCIT]), the Agency for Entrepreneurship and Innovation of the National Government, and the National Learning Service (*Servicio Nacional de Aprendizaje* [SENA]). Likewise, universities, both public and private, stand out in the provision of formal education and training in digital skills. The main strategy for the development of basic digital skills among students and teachers has been the Computers for Education Program (*Computadores para Educar* [CPE]), which has been widely successful in providing access to equipment and has more recently shifted its focus to promote digital appropriation by teachers and students. In 2020, the GoC launched the Technologies for Learning National Policy, aimed at promoting innovation in educational practices. Additionally, MinTIC provides a wide variety of short training programs accessible to all Colombians, including the *Jugando y Kreando*, *Programación para Niños y Niñas*, *Ruta STEM*, and *TutoTIC* programs. In spite of this, large numbers of young people are leaving school without rudimentary digital skills and without the capacity to continue their digital education. Technical and higher education does offer advanced training, but

**Figure O.11. Occupation of ICT Positions by Males and Females in Six of the Main Regions of Colombia. Share of Total**



Source: Authors' elaboration based on Alianza TIC (2020).

Note: This figure considers only the surveyed people who answered the question. Between 1 and 5 percent of the surveyed population (depending on the region) did not answer.

the number of people enrolled remains low, and in many cases the offer trails behind the changing demands of the productive sector.

**Numerous education institutions are increasingly playing an important role in the formation of digital skills in Colombia.** However, newer formats of education, such as virtual courses and bootcamps, have not yet been properly evaluated and regulated, which impacts the acceptance of these modalities by employers and makes it difficult for these formats to coexist with the established education system.

**Colombia lacks a national strategy to guide the development of digital skills, as well as an official national digital skills framework to foster the development of digital competencies throughout the formal educational trajectory.** As noted, digital skills have not yet been incorporated formally into the curricula throughout the country, nor are they being systematically developed at a foundational level at elementary, middle, or high school or at a more advanced level in technical, technological, and higher education. In the absence of a national framework, not all the actors involved in the process of digital transformation have the same understanding of digital skills. This makes it difficult to assess the current situation, measure the gaps between the supply of and demand for digital skills, and design policies and interventions to develop the required capacity. In this sense, Colombia can benefit from adopting international frameworks, such as the Digital Competence Framework for Citizens (DigComp 2.1) of the European Commission or UNESCO's Digital Literacy Global Framework. As a first step in developing a digital strategy and framework, the GoC could implement a cross-sector diagnostic to identify the digital competencies that will be demanded by the private and public sectors in the coming decade and assess them against the current supply of digital skills to identify the critical gaps.

**Increasing the number of students in vocational education and training (VET) should be an objective for the technical and higher education system.** VET

plays a major role in addressing skills needs, preventing skills mismatches, and supporting youth employment. At the same time, it is essential to develop policies and programs that promote digital skills among the adult population through workplace training. This could occur both in the workplace or by supporting the processes of reskilling and upskilling centered on digital abilities. Likewise, implementing recognition systems for the skills acquired through workplace training or other modalities could facilitate labor insertion and increase the options for the later development of advanced digital skills.



## 6. TRUST ENVIRONMENT

**The regulation of data exchanges is indispensable to enabling the kind of interactions and data flows necessary to sustain a growing digital economy while at the same time ensuring that personal data are collected, processed, and stored fairly and lawfully.** As Colombia's digital economy becomes more inclusive, it is paramount to continue to strengthen data enablers and safeguards in order to provide a trusted environment for the growth of electronic transactions and data flows. The World Bank's *2021 World Development Report* categorizes data policies and regulations as enablers and safeguards. *Enablers* are policies and regulations that facilitate the use of data as a necessary condition for the digital economy, such as through data-sharing models that underpin e-commerce transactions and public and private intent data. On the other hand, *safeguards* encompass policies and regulations that protect personal and non-personal data and prevent data abuse, cyber-crime, and other misuse. Despite many advances, Colombia still faces barriers to establishing a reliable environment for strengthening international and domestic electronic transactions with a fair balance of data enablers and safeguards ([Table O.1](#)).

**Table O.1. Summary of Key Safeguards and Enablers for Colombia and Selected Benchmark Countries**

| Dimension          | Enablers                         |  |                      |                         | Safeguards                      |   |  |
|--------------------|----------------------------------|--|----------------------|-------------------------|---------------------------------|---|--|
|                    | E-commerce/<br>e-transaction law | Digital ID system for<br>online authentication | Open data act/policy | Data portability rights | Personal data protection<br>law | National cybersecurity<br>strategy/plan | Regulation<br>of non-personal<br>government data |
| Country            |                                  |  |                      |                         |                                 |   |  |
| El Salvador        | Yes                              | NO   | Yes                  | NO                      | NO                              | Yes                                     | NO   |
| Costa Rica         | Yes                              | Yes  | Yes                  | NO                      | Yes                             | Yes                                     | Yes  |
| Colombia           | Yes                              | NO   | Yes                  | Yes                     | Yes                             | Yes                                     | Yes  |
| Mexico             | Yes                              | NO   | Yes                  | Yes                     | Yes                             | Yes                                     | NO   |
| Dominican Republic | Yes                              | Yes  | Yes                  | NO                      | Yes                             | Yes                                     | NO   |

Source: Framework from World Bank (2021). For Colombia, Mexico, and the Dominican Republic, data from World Bank (2021); for El Salvador and Costa Rica, data are based on original analysis.

Note: recientemente se ha introducido un nuevo sistema de identificación digital, pero en el momento de redactar este informe su aceptación era escasa.

**Colombia has a comprehensive data protection framework that addresses critical aspects of data regulation and supports important major rights, such as right of access, rectification, and opposition.** Although key enablers and safeguards to support digital transactions and data flows are already established, there is room to strengthen the data protection framework further by integrating internationally recognized best practices, such as the right to data portability, the reporting of data breaches to the data subjects, and expanded legal jurisdiction for processing personal data. Some of these issues are currently being dealt with according to guidelines of the Superintendency of Industry and Commerce (Superintendencia de Industria y Comercio), but those guidelines are not codified in the legal framework and thus not mandatory. Moving forward, Colombia’s data protection framework could go further in addressing the challenges brought forth by emerging technologies, such as AI, blockchain, cloud computing, and others.

**In 2020, the National ID and Civil Registry Agency (Registraduría Nacional del Estado Civil) launched a novel digital ID system that enables access to digital services, and ensuring its inclusiveness, building public trust, and strengthening coordination will be essential to its success.** The digital ID card collects biographic and biometric data, such as full name, ID

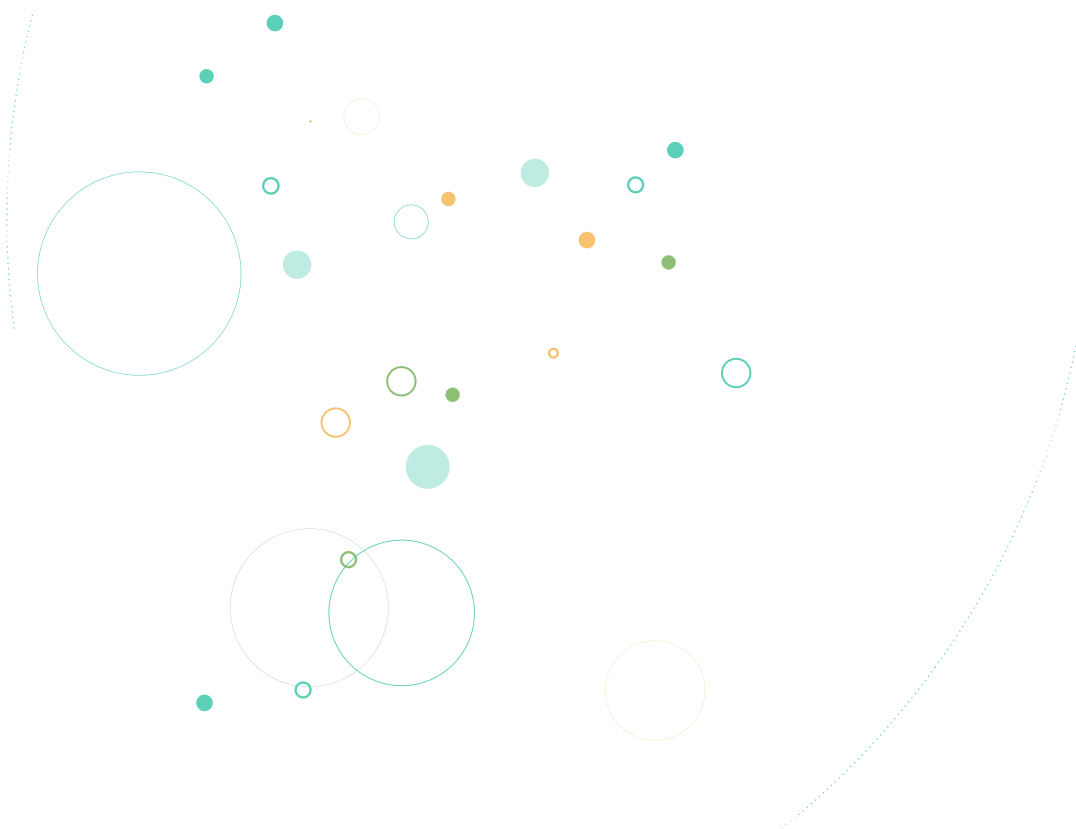
number, date and place of birth, gender, signature, picture, and fingerprints. The new digital ID card is provided in two formats: (i) the physical format, which is widely used to access offline services, and (ii) the digital format, which can be accessed from any electronic device (e.g., mobile phone) through an encrypted QR code that contains personal data, including biometric data, of the cardholder. The card streamlines the digital authentication process, enabling a series of benefits, such as allowing citizens to carry out internet-based transactions; helping to prevent and mitigate payment fraud and identity duplication; and allowing the portability of the ID card on mobile devices. In February–November 2022, the World Bank conducted a national ID4D Diagnostic of the new ID system with recommendations for its effective deployment. The latter included: (i) ensuring the inclusion of all, especially the indigenous population, remote communities (particularly those affected by the conflict in Colombia), and migrants; (ii) gaining societal trust before and during its deployment, for instance, by deploying communication campaigns, a citizen engagement process, and qualitative studies to increase uptake, to show the benefits of the new ID system; (iii) developing a sound digital service ecosystem based on smooth coordination among institutions; and (iv) strengthening the authentication platform within the ID agency and ensuring that fees charged to the private sector are not an obstacle to delivering digital services.

**In the past decade, Colombia has made consistent efforts to build its cybersecurity capabilities, but further strengthening is needed to match ever-growing challenges in the cybersecurity domain.** The country operates in an environment that is prone to significant cyberattacks and is not adequately prepared to face these threats, as identified by the 2020 National Trust and Digital Security Policy (CONPES 3995). Although there have been notable advances in the cybersecurity policy and strategy domain, establishing a national cybersecurity governance structure had remained a pending issue until recently. Through Decree 338 of 2022 the GoC defined a governance model with relevant mandates to strengthen digital security, network protection, critical infrastructures, essential services, and information systems in cyberspace. Ensuring the allocation of sufficient resources to the recently adopted cybersecurity governance structure will be instrumental to implementing the strategic objectives of CONPES 3995 and Decree 338 of 2022.

**Under the new governance structure, the ICCN regime seems to exclude resources for the private sector.** Decree No. 338 of 2022 clearly defines what are critical cybernetic infrastructures and essential services and establishes that MinTIC is responsible for taking stock of the public ICCN and essential services and updating that

inventory every two years. However, the decree does not include private sector ICCN assets and services in this national stocktaking. Given that many ICCN resources are operated by the private sector, it is important that those are integrated under the new ICCN regime.

**The development of human capital is the main strategic medium- to long-term challenge for Colombia as regards cybersecurity.** If not addressed, it could delay the progress of the cybersecurity domain for years to come. Dealing with this challenge will require consistent national efforts to strategically build human capital in cybersecurity by, for instance, offering academic careers in cybersecurity, including cybersecurity courses in primary and secondary education, and strengthening the cybersecurity or information security courses in the technology-based degree programs. There is a similar need to create better training opportunities—at the specialization level—for officials from law enforcement agencies, the Prosecutor’s Office, and the judiciary in the field of cybercrime and digital evidence. It is also vital that the competent authorities work closely with domestic chambers of commerce and other actors from the private sector, academia, and industry to coordinate in organizing regular awareness-raising activities for the private sector, including MSMEs, and society-wide.



**Table O. 2. Key Policy Recommendations to Accelerate the Digital Transformation in Colombia (1 of 3)**

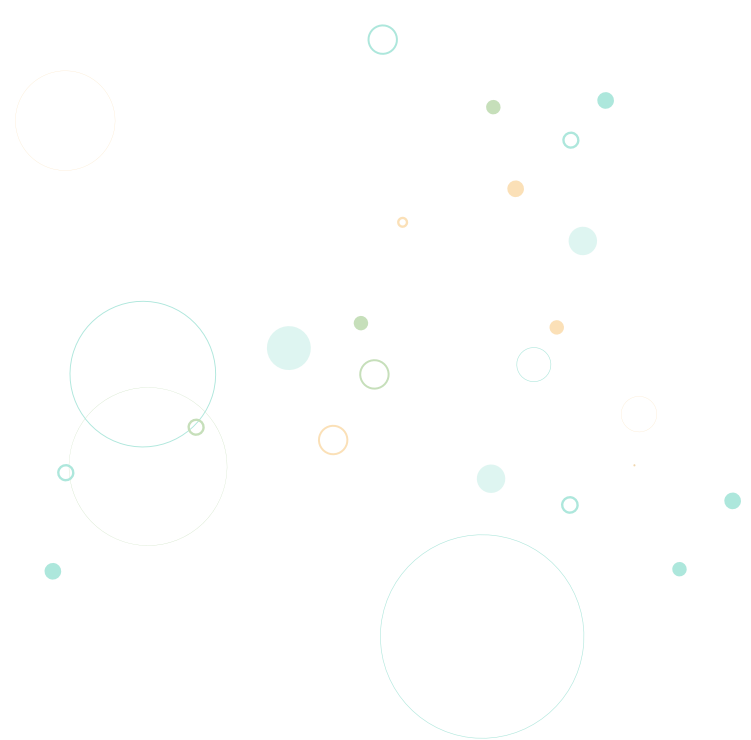
| Pillar                            | Short-Term Priorities  | Medium-Term Priorities and Structural Reforms   |
|-----------------------------------|--|---|
| <b>Digital Infrastructure</b>     | <ul style="list-style-type: none"> <li>» Undertake regular relevant market assessments to identify the dominant operators and impose appropriate ex ante obligations to promote and safeguard competition.</li> <li>» Review the eligibility, duration, and scope of the Social Tariffs program to further promote internet affordability for low-income households.</li> <li>» Improve mobile and fixed infrastructure coverage in unserved areas.</li> </ul>   | <ul style="list-style-type: none"> <li>» Release spectrum in the 3.5 GHz band to foster 5G development.</li> </ul>  |
| <b>Digital Public Platforms</b>   | <ul style="list-style-type: none"> <li>» Strengthen coordination mechanisms. The government should establish coordination mechanisms within two levels, strategic and operational, to ensure the appropriate level of performance and consistent use of digital technologies across government.</li> <li>» Develop an aggressive digitalization strategy and support tools, especially at the subnational level. This entails providing hands-on support in the simplification of processes and procedures, using new technologies, and enabling data sharing to set up services around life events.</li> <li>» Successfully implementing the PNID framework and establishing a proper data management model within the public sector (from collection to processing, sharing, and re-using).</li> </ul> | <ul style="list-style-type: none"> <li>» Increase interoperability between core government systems. Adoption of the X-Road platform has been slow. To further promote interoperability, one key issue is defining a government-wide data governance framework and ensuring the harmonization of functional concepts in new systems by design.</li> <li>» Strengthen the delivery model for the digitalization of public services. Consider scaling up the DNP's approach to providing key public management modules for beneficiary municipalities as a cloud-based services coupled with hands-on technical assistance.</li> </ul>   |
| <b>Digital Financial Services</b> | <ul style="list-style-type: none"> <li>» Develop a mandate and work program for the payment system forum (Foro Sistema de Pagos).</li> <li>» Develop uniform fast payment scheme rules (including requirements for the underlying clearing and settlement mechanisms), taking into consideration the rules' enforceability and the potential role of the BR in setting fast payment standards, in line with its mandate and functions. The design of a fast payment system (<i>Sistema de Pagos Inmediatos</i> [SPI-BR]) should emphasize low-cost access and connectivity of smaller participants and other third parties (e.g., payment initiation service providers), as well as support for new use cases/access channels.</li> </ul>  | <ul style="list-style-type: none"> <li>» Enact a legal framework for payment services.</li> <li>» Evaluate the impact of regulatory reforms on lowering access barriers to low-value payment systems (sistemas de pago de bajo valor [SPBVs]) and reducing costs. Depending on this evaluation, consider potential additional measures to strengthen public interest considerations, e.g., by prescribing changes to system rules and governance arrangements as appropriate.</li> <li>» Expand plans to migrate social benefit payments from the current system based on public tendering to ACH payments. Any legal barriers to discontinuing the current model should be removed. Integrate the use of digital ID for beneficiary authentication.</li> </ul> |

**Table O. 2. Key Policy Recommendations to Accelerate the Digital Transformation in Colombia (2 of 3)**

| Pillar                           | Short-Term Priorities  | Medium-Term Priorities and Structural Reforms  |
|----------------------------------|--|--|
| <p><b>Digital Businesses</b></p> | <ul style="list-style-type: none"> <li>» Understand constraints and raise awareness among MSMEs about the potential value of using the internet and integrating digital solutions into their business models and internal processes. Consider implementing awareness-raising campaigns targeted at women-owned, micro-, and rural businesses.</li> <li>» Assess the potential duplication of effort among public programs supporting digital businesses and the digital transformation of MSMEs, particularly in terms of the overlap of their objectives, beneficiaries, and intervention mechanisms. Based on the results of this assessment, strengthen the articulation across programs by minimizing redundancies and improving the exchange of information.</li> </ul>   | <ul style="list-style-type: none"> <li>» Review the regulations introduced in the context of the post-COVID-19 economic recovery plan following best practices to see if they can have a more permanent impact in the disintermediation market. These include: (i) authorization for simplified equity companies to issue debt; ii) subsidized guarantees offered by the National Guarantee Fund (Fondo Nacional de Garantías) on SME corporate debt issued by simplified equity companies and others; iii) portfolio guarantees by the National Guarantee Fund for private debt fund lending to SMEs to help establish these funds as a new asset class; and iv) revised investment regulations for pension funds and insurance companies, enabling them to invest in corporate debt funds.</li> <li>» Continue to work on the development of alternative collateral options to expand lending opportunities for entrepreneurs (e.g., track record of repayment performance, moveable assets); and improve credit information systems that better reflect the risks associated with financing digital start-ups.</li> </ul> |
| <p><b>Digital Skills</b></p>     | <ul style="list-style-type: none"> <li>» Elaborate and regularly update a cross-sector diagnostic to identify the digital skills and competencies required to prepare the labor force to take advantage of the opportunities set forth by digitalization. International examples of cross-sector diagnostic frameworks include Chile’s <i>Brechas de Inclusión Digital</i> and the European Union’s Digital Economy and Society Index (DESI). The ITU Digital Skills Assessment Guidebook also contains valuable guidance in this regard.</li> <li>» Create a national digital skills framework that clearly defines digital skills and competencies in Colombia. Relevant examples include the Digital Competence Framework for Citizens (Digcomp 2.1), for Educators (DigCompEdu), and for Educational Institutions (DigCompORg).</li> </ul> | <ul style="list-style-type: none"> <li>» Define a national digital skills strategy that recognizes the existing gaps (gender, educational level, regional, urban-rural). This national strategy could establish how digital skills should be developed on a continuum from a basic level (primary and secondary education) to a more advanced one (technical, technological, higher education, workplace learning).</li> </ul>   |

**Table O. 2. Key Policy Recommendations to Accelerate the Digital Transformation in Colombia (3 of 3)**

| Pillar                          | Short-Term Priorities  | Medium-Term Priorities and Structural Reforms  |
|---------------------------------|--|--|
| <p><b>Trust Environment</b></p> | <ul style="list-style-type: none"> <li>» Ensure that Colombia’s National Computer Emergency Response Team (Grupo Interno de Trabajo de Respuesta a Emergencias Cibernéticas de Colombia [CoICERT]) is re-established to manage the national-level incident response management cycle. Strengthen its human, technical, and financial resources to meet its mandate.</li> <li>» Ensure that the new cybersecurity governance structure becomes operational and functions in an inclusive and coordinated manner. Establishing various identified layers of the governance structure is vital to adequately implementing cybersecurity strategies and policies.</li> <li>» Include private ICCN assets and essential services under the ICCN regime.</li> <li>» Ensure that the competent authorities, with support from the private sector and academia, provide technical assistance and resources to enhance the cybersecurity capabilities of the private sector, including MSMEs.</li> <li>» Enhance the knowledge and capabilities of officials and professionals within law enforcement, prosecutor’s offices, and the judiciary. As a starting point, it is vital to assess existing capabilities to ascertain subsequent capacity-building actions</li> </ul> | <ul style="list-style-type: none"> <li>» Refine the data protection framework. Areas to strengthen are the right to data portability, the reporting of data breaches to the data subjects, and expanded legal jurisdiction for processing personal data, as well as mandatory appointment of a Data Protection Officer within the public and private sectors, among others.</li> <li>» Enhance the cybersecurity education offering at the tertiary level and create more affordable cybersecurity professional training. Also, consider creating more affordable professional training opportunities and industry certifications and developing a robust cadre of cybersecurity professionals and academics.</li> <li>» Expedite the integration of cybersecurity-related courses into primary and secondary school curricula, which is essential to improving the skills and knowledge of future generations.</li> </ul> |





# 1. INTRODUCTION



**The widespread adoption of digital technologies is transforming how individuals, businesses, and governments interact and at the same time creating new opportunities to address long-standing development challenges.** Digital technologies—defined as electronic tools, systems, devices, and resources that generate, store, or process data—have already begun to transform the way most people around the world learn, work, shop, socialize, and access information.<sup>16</sup> These technologies are disrupting business models and economic structures and in many cases driving significant productivity gains.<sup>17</sup> For policy makers in emerging markets, digital technologies also offer new pathways to address long-standing development challenges and can support better access to public services for citizens.

**By 2025, the contribution of the digital economy to global GDP is expected to reach roughly 25 percent, up from 15.5 percent in 2016.**<sup>18</sup> The concept of the digital economy as discussed in this report refers to all economic activity resulting from the use of information technology to create, adapt, market, or consume goods and services.<sup>19</sup> Data and digital technologies are the cornerstone of the digital economy, as they enable the growing interconnectedness of people, organizations, and machines through billions of daily online transactions.<sup>20</sup>

**The impact of digital technologies on economic growth is mediated through the three main mechanisms of inclusion, efficiency, and innovation.** As argued in the World Bank's World Development Report 2016: Digital Dividends, the widespread adoption and use of digital technologies can facilitate the integration of firms into the world economy by enabling more businesses to trade new products and services to new destinations. For instance, firms selling their goods online through e-commerce platforms tend to be smaller and younger, and to export more products to different destinations, than firms selling exclusively offline.<sup>21</sup> Digitalization of business processes and systems can raise efficiency by allowing firms to make better use of their capital and

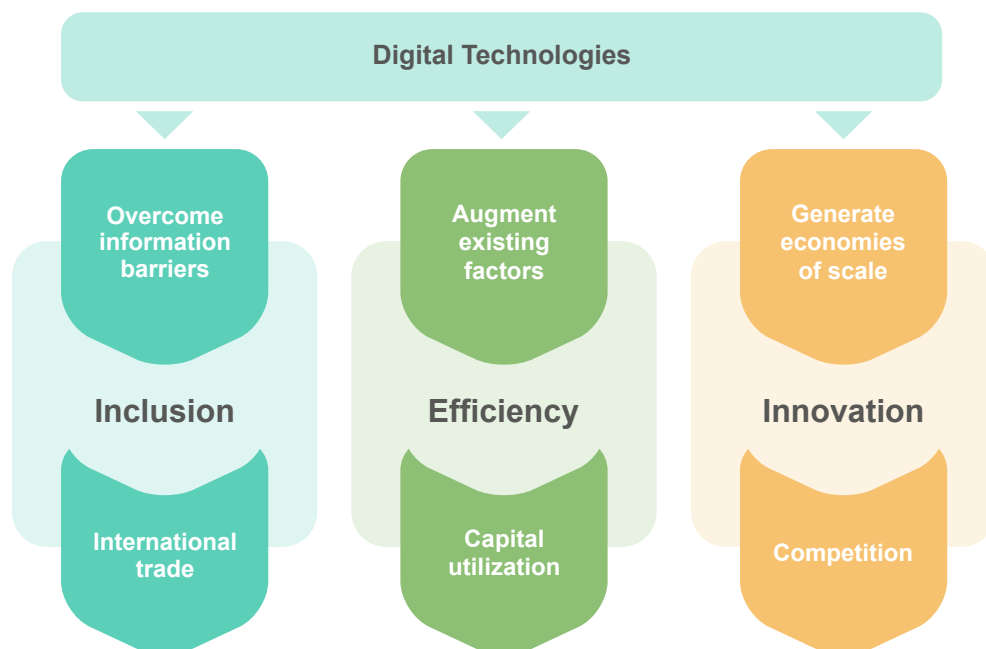
labor.<sup>22</sup> Moreover, digital technology can enhance innovation by enabling firms to exploit scale effects through online platforms and services that compete with conventional business models in retail, transport, and banking, among others. Together, these mechanisms contribute to economic growth by expanding trade, increasing capital and labor utilization, and intensifying competition (see [Figure 1.1](#)).<sup>23</sup>

**Colombia is among the countries in the Latin America and Caribbean (LAC) region farthest along on the digitalization path.** In 2020, about 70 percent of the population used the internet by means of either fixed or mobile devices at least once in the previous three months.<sup>24</sup> Digital financial services (DFS) and e-commerce have been growing steadily in the country, especially since the onset of the COVID-19 pandemic: as of 2021, 52 percent of the population aged 15+ had made or received a digital payment, and an estimated 25 million people had shopped online. Colombia's fintech ecosystem is growing rapidly and currently stands as the third largest in the region (after Brazil and Mexico), as measured by the number of fintech firms operating in the market. Similarly, Colombia ranks third in the number of digital businesses in LAC, hosting approximately 12.8 percent of the region's digital firms.<sup>25</sup> Digital government has also emerged as a key policy priority, and the Ministry of Information and Communications Technology (*Ministerio de Tecnologías de la Información y las Comunicaciones* [MinTIC]) is leading multiple initiatives to improve internet connectivity and access to online services. Colombia currently stands among the most advanced countries in terms of digital government in Latin America, performing on par with such countries as Mexico, Peru, and Brazil.<sup>26</sup> Moreover, key enablers and safeguards to support digital transactions and data flows have already been established in the country, and a modern digital ID scheme is currently being deployed—important steps in consolidating a trust environment conducive to widespread digitalization.

However, access to and effective use of digital technologies across Colombia's regions, sectors, and income groups is not uniform and is hindered by last-mile digital infrastructure challenges and low levels of digital skills among the population. Although over-

economy. Although digital technologies have spread rapidly in much of the world, the broader development benefits from using them (i.e., the digital dividends) have lagged behind. In many instances, digital technologies have fulfilled their promise of boosting productivity,

**Figure 1.1. Mechanisms of Digital Technologies and Growth**



Source: Adapted from World Bank (2016).

all internet use has increased substantially, there are large gaps in access between rural and urban areas: half of urban households have access to fixed internet, compared to just 12 percent of rural households.<sup>27</sup> Unequal access is also seen across departments with the three largest cities—Bogota, Medellin, and Cali—having fixed household subscriptions well above the average while, some of the less populous, more isolated departments, such as Amazonas, Vaupes, and Vichada, having rates below 1 percent.<sup>28</sup> Low levels of digital skills among the population and could be hindering the growth of electronic interactions between individuals and government entities.<sup>29</sup> In 2019, Colombia ranked 94th out of 141 in the World Economic Forum's Digital Skills subindex.<sup>30</sup> Limited access to the internet and low levels of digital capabilities also impact the private sector's capacity to generate value-added through the adoption of digital technologies.

**To take full advantage of the potential of digital technologies, deliberate efforts from the Government of Colombia (GoC) are needed to promote the development of an inclusive, dynamic, and resilient digital**

expanding opportunities, and improving service delivery, yet their aggregate impact is unevenly distributed.<sup>31</sup> In order that digital technologies benefit everyone everywhere, the remaining digital divide must be closed, especially in terms of access to affordable and reliable internet service and the adoption of digital technologies by firms and individuals. In Colombia, the public sector can play a pivotal role in the digitalization of the economy as a key user of digital technologies to deliver products and services; as a coordinator and facilitator of initiatives from stakeholders in the private sector, civil society, and academia; as a regulator of the functions and activities associated with the digital economy; and as a lead actor in identifying and proactively mitigating the downside risks of widespread digitalization. However, greater digital adoption will not be enough. To maximize its digital dividends, Colombia also needs to work on the "analog complements" to digitalization by (i) strengthening regulations that ensure greater competition among internet service providers and among businesses in general to build a legal framework that builds trust in digital transactions and (ii) adapting workers' skills to the demands of the rapidly changing economy.

**Promoting the widespread adoption of digital technologies can help Colombia address many of its persistent development challenges.**

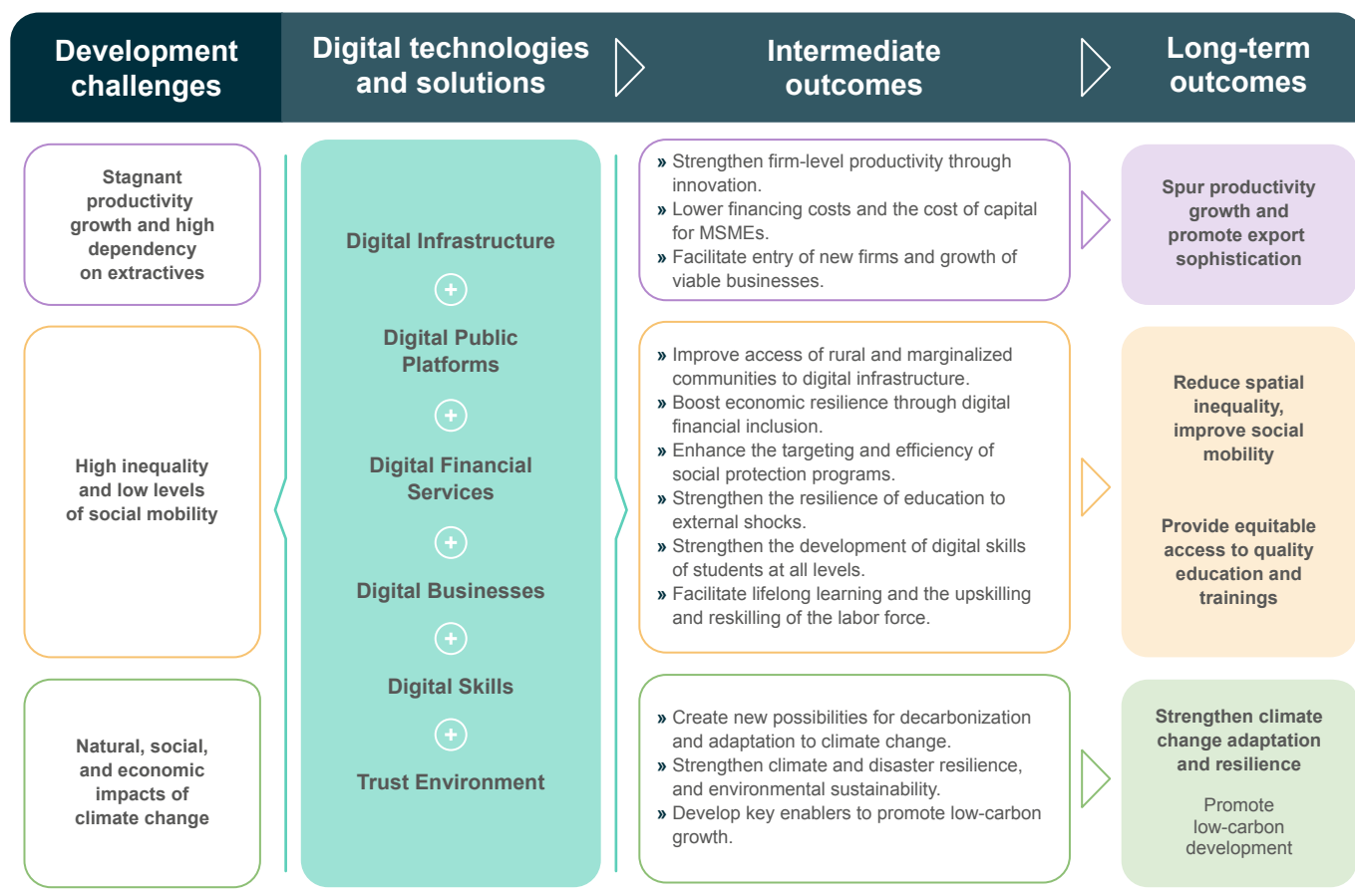
**Slow productivity growth, lack of economic diversification, persistent inequality, and the socioeconomic impacts of climate change pose significant development challenges for Colombia.** Between 2000 and 2019, Colombia's economy grew at an average annual rate of 3.8 percent.<sup>32</sup> Modest but sustained growth, underpinned by sound macroeconomic policies and high oil prices, allowed the country to make significant progress in reducing poverty and promoting shared prosperity. With the decline in commodity prices during the second half of the later decade, however, Colombia's growth slowed, and gains in poverty reduction and shared prosperity stagnated—and then sharply reversed as a consequence of the COVID-19 crisis.<sup>33</sup> Three interlocking development challenges have held the Colombian economy back and could further constrain growth and shared prosperity in the future: (i) declining productivity growth and a high dependence on extractives; (ii) substantial and persistent inequality; and (iii) the social and economic impacts of climate change. Colombia needs to expand its sources of economic growth and to do so in a manner that is inclusive and sustainable—socially, fiscally, and environmentally. [Annex 1](#) provides a detailed theory of change linking the provision of digital infrastructure, the adoption of digital technologies by the government and the private sector, and the configuration of a trusted environment for digital transactions to the achievement of key economic and social development outcomes in Colombia. [Figure 1.2](#) presents a synthesis of this theory of change.

**Widespread digitalization among businesses has the potential to spur productivity growth in Colombia and promote export sophistication.** Total factor productivity growth in Colombia has been negative during the past three decades, and growth has been predominantly driven by capital and labor expansions. The employment structure is dominated by low-productivity sectors, and exports are driven by natural resources. Colombia's dependence on extractives has risen since the turn of the century, and consequently its economy has become less diversified and sophisticated. Less than 20 percent of Colombian exports include some level of technology compared to about 80 percent of exports

in Mexico.<sup>34</sup> Promoting productivity and competitiveness in the non-extractive sectors is critical to supporting the country's long-term transition to lower oil prices, and digital technologies can play an important role in this transition. Firms' adoption of technology, alongside complementary investments in digital skills and organizational capacity, can improve the efficiency of their productive processes and open up new markets to their products and services.<sup>35</sup> Digital technologies can also enable firms—with support from academia and the public sector—to harness a rapidly increasing amount of data in order to effectively access new markets and sources of knowledge, streamline the production of good and services, and drive innovation. DFS can bring down financing costs for micro, small, and medium-sized enterprise (MSMEs) and promote more efficient and convenient payments—a cornerstone of the e-commerce and platform-based business models (see [Figure 1.2](#)).

**Digital technologies can be leveraged to improve the delivery and efficiency of public services, including programs to empower marginalized communities and reduce Colombia's high and persistent inequality.** Colombia faces extreme intergenerational income persistence, a consequence of both very high inequality and one of the lowest levels of social mobility in the world.<sup>36</sup> Uneven territorial development and provision of basic infrastructure, including digital infrastructure, and a limited state presence in much of rural Colombia have reinforced historical inequalities across the country's territory. At the same time, low levels of learning in the public education system fuel an intergenerational cycle of poverty along the public-private divide, which has been augmented by deep learning losses among the poorest due to the COVID-19 pandemic. Improving the provision of digital infrastructure, particularly in rural areas, can boost the access of marginalized communities to digitally delivered services. For instance, enhancing rural connectivity is a necessary condition to developing a quality hybrid education system and plays a critical role in ensuring that access to telehealth services is more equitable across regions, income groups, and ethnicities. DFS can play a key role in strengthening the economic resilience of the poor, for example, by fostering financial inclusion and enhancing the efficiency of social protection programs. Similarly, robust digital ID systems and public digital platforms can help the public sector to better identify the needs of, and provide support to, vulnerable communities, including Afro-descendants, indigenous people, and Venezuelan migrants. (see [Figure 1.2](#)).

**Figure 1.2. Digital Technologies: Synthesis of the Theory of Change**



Source: Authors, based on priorities identified in World Bank (2022).

**Promoting the digitalization of the public and private sectors strategically will enable Colombia to explore new avenues toward green, resilient, and inclusive development.** Climate change threatens to increase the risk of conflict and violence, intensify flooding along the coasts where poorer populations are concentrated, generate water shortages, and drive down productivity and growth. In a 2019 poll, 76 percent of Colombians identified climate change as a very serious threat to the country in the next 20 years.<sup>37</sup> Facing the intertwined challenges of adapting to climate change, protecting the country’s biodiversity, and meeting the ambitious national commitments for reducing greenhouse gas emissions will require rapid and far-reaching transitions, including

the decarbonization of key sectors, such as power, agriculture, information and communication technologies (ICTs), and transport. Widespread digitalization can promote low-carbon growth in Colombia by increasing the contribution of the ICT sector to GDP growth, enabling the expansion of climate-smart agriculture, leveraging massive data and artificial intelligence (AI) systems to boost resource efficiency across industries, and accelerating a renewable energy transition. Recent estimates by Accenture and the World Economic Forum suggest that the widespread adoption of digital technologies could help drive down global emissions by up to 20 percent by 2050.<sup>38</sup> (see Figure 1.2).

**Despite the opportunities, digital transformation carries risks that must be proactively identified and managed.** Uneven access to digital technologies can exacerbate, rather than mitigate, inequality and social exclusion. The adoption of digital technologies also introduces new risks, including those related to personal data protection, fraud, cybersecurity, and cybercrime. On top of that, expanding digital infrastructure can lead to a significant increase in energy consumption; for example, data centers are soon set to have a larger carbon footprint than the entire aviation industry.<sup>39</sup> Broadband-enabled devices contribute to electrical and electronic equipment waste (e-waste), which is one of the fastest growing waste streams in developed countries.<sup>40</sup> Moreover, in the absence of adequate legal, regulatory, and competition frameworks, the growth of platform-enabled businesses could perpetuate informality and precarious work.<sup>41</sup>

**These risks underscore the need for carefully designed digitalization policies.** Managing the risks of digital technology adoption will require strong engagement with service providers and beneficiaries to identify and address threats and vulnerabilities. Furthermore, establishing and updating institutional and legal frameworks will be crucial to ensuring transparency and accountability while also providing safeguards against the misuse of systems and data. Capabilities also need to be developed to monitor and defend against cybersecurity threats, especially for key infrastructure. Prioritizing technology and vendor neutrality (e.g., by adopting open standards and careful procurement procedures) will be critical to promoting full country ownership of systems and data.<sup>42</sup>

**The government of Colombia recognizes the potential of widespread digitalization and has prioritized efforts to boost digital technology adoption among businesses, individuals, and the public sector.**

**Since the early 2000s, the GoC has recognized the potential of widespread digitalization to accelerate productivity growth, boost competitiveness, and reduce inequality.** Early efforts and policy guidelines to promote the adoption of digital technologies focused on accelerating the digitalization of government services and processes and improving access to the internet. Starting in 2008, the government's vision of digital transformation—the GoC's preferred term to describe the widespread and progressive adoption of digital technologies and analog enablers for digital transactions—expanded to other dimensions of the digital economy, with the policy documents of the National Planning Department (*Departamento Nacional de Planeación* [DNP]) highlighting the role of digital technologies and solutions as a complement to other public policy instruments aimed at fostering productive development and the science, technology, and innovation (STI) system. Over the past decade, MinTIC has developed multiple support programs to increase digital adoption among individuals and businesses, focusing on human capital formation, technology uptake, and the development of productive capacities.<sup>43</sup>

**Harnessing the potential of digitalization will require a long-term vision and strategy to guide forward-looking reforms, regulation, and investments.** The government's National Development Plan (*Plan Nacional de Desarrollo* [PND]) 2018–2022 established four main objectives related to widespread digitalization: (i) promoting the digital transformation of society and closing the digital divide; (ii) fostering productivity through advanced digital technologies; (iii) fostering investments and skills development in Industry 4.0, and (iv) supporting entrepreneurship in technology-intensive and creative industries.<sup>44</sup> Following these efforts, a new PND for 2022–2026 was approved by the President in May 2023.<sup>45</sup> Additionally, in 2019 the government formulated the National Policy for Digital Transformation and Artificial Intelligence (known as CONPES 3975), which provides a comprehensive vision and strategy to guide the design of public policy instruments to accelerate the digital transformation of the public and private sectors.<sup>46</sup> The policy identifies critical constraints that need to be addressed in order to promote the widespread adoption of AI systems and foundational digital technologies and provides a roadmap to do so. It also establishes the strategic lines to foster the development of AI solutions in Colombia. In parallel, CONPES 3975 provides critical

guidelines and specific actions to prepare the Colombian workforce to face the disruptions in the labor market that could potentially occur due to the increasing automation of productive processes. Although biased toward the adoption of advanced technologies, PND 2022-2026, PND 2018–2022, and CONPES 3975 present important steps forward in the development of the digital agenda in Colombia.

**The GoC has made substantial progress on its own digital transformation, though mixed comparative results call for a review of the effectiveness and pace of the digital government strategy.** Colombia currently stands among the most advanced countries in digital government in the LAC region.<sup>47</sup> However, although the perceived quality of e-government has not decreased, the country has recently started trailing behind its income peers in terms of e-government effectiveness and the growth of e-participation.<sup>48</sup> These trends suggest that beyond adopting good international practices, it is critical that the government keep working on increasing the quantity, quality, and efficiency of its digital interactions with individuals and businesses, particularly in rural and remote areas.

**The Colombian government is working on multiple fronts to promote the widespread adoption and effective use of digital technologies by the private sector, but significant challenges remain.** In 2022, there were 376 policy instruments supporting the National System of Competitiveness and Innovation (*Sistema Nacional de Competitividad e Innovación* [SNCI]).<sup>49</sup> From these, three specifically support the formation and growth of start-ups intensive in the use of digital technologies and six contribute to the digitalization of business processes across diverse sectors, for instance, by supporting the development of the foundational digital capabilities of small and medium-sized enterprises (SMEs). More than 30 policy instruments facilitate the formation of foundational digital skills and the widespread adoption of digital technologies by government, nongovernmental organizations (NGOs), and society at large. Most policy instruments that support the digitalization of the private sector in Colombia focus on generating specific capabilities and building an enabling environment for businesses to progressively adopt and use digital solutions. However, some critical barriers to business digitalization and digital business growth, such as a relatively weak cybersecurity environment and limited access to information and financing, remain largely unaddressed by the policy instrument mix.

**The report highlights challenges and opportunities to accelerate Colombia's transition to a digital economy.**

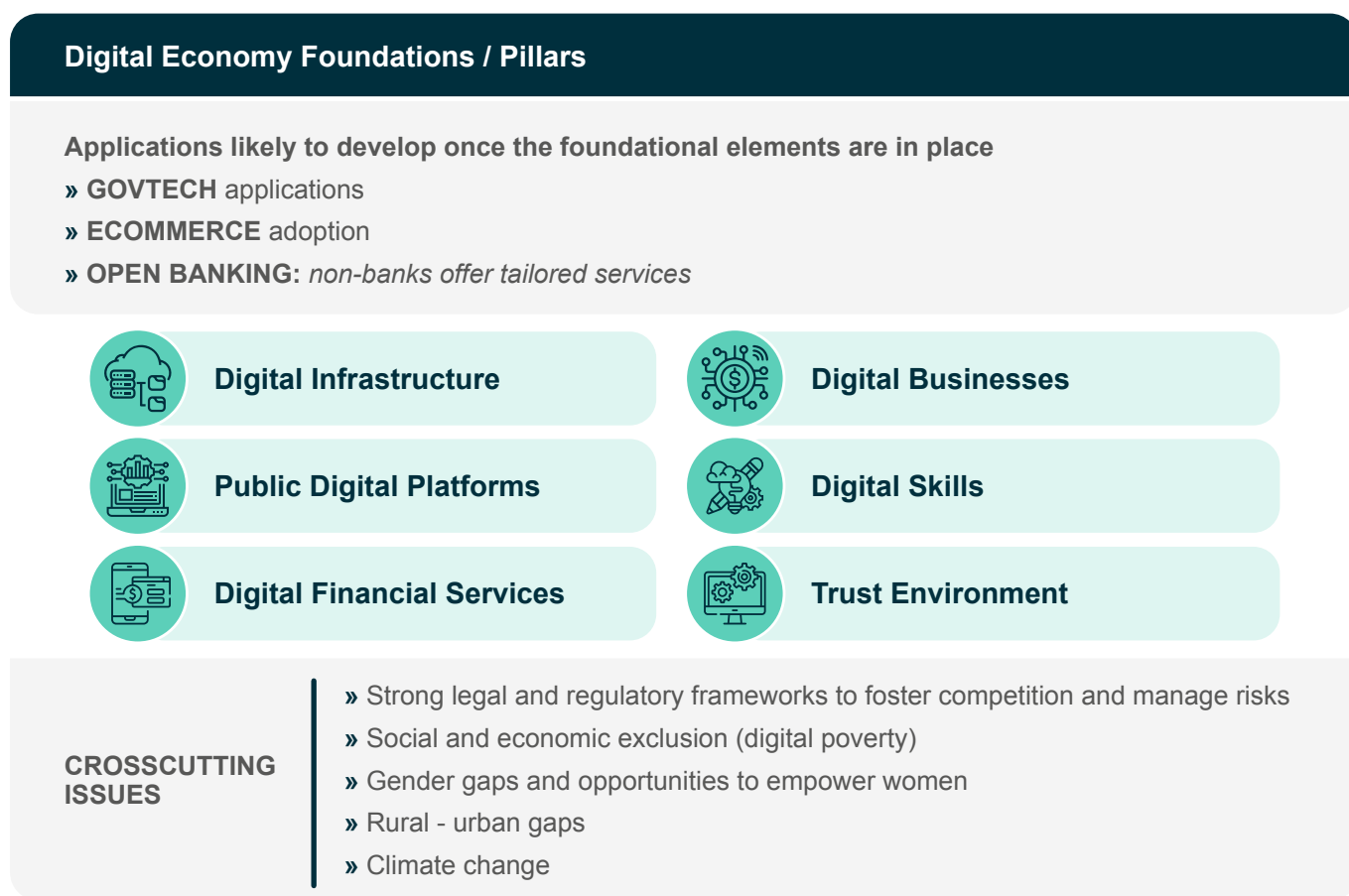
**This report provides a cross-cutting diagnostic of Colombia's digital economy and offers policy recommendations to help the country address its digital divide and accelerate the pace of digital transformation.** The analyses that follow are based on quantitative and qualitative assessments carried out during the second half of 2021, as well as extensive consultations with key public and private sector stakeholders in the country. The report is based on the World Bank's Digital Economy Assessment (DEA) methodology, which analyzes the current state of, challenges to, and opportunities for the development of six key foundational elements for a digital economy. By examining international experiences of digital businesses and public sector institutions, the DEA identified a set of foundational elements that play a critical role in the digital transformation of economies: the availability of internet or broadband that brings people online, the ability to identify and authenticate people digitally, and the ability to pay or transact digitally. Digital economies further energize when there is a sizable tech-savvy workforce and an ecosystem that supports digitally intensive firms in entering the market or scaling up. Once those foundations are in place, a wide array of use cases can emerge. Use cases denote all the ways by which a digital economy may take shape, serving people, businesses, and government in a process typically referred to as digital transformation. The private sector is the main driver of use cases, offering major platforms and applications, including e-commerce, ride-sharing, gamification, and others. The government may also develop new government platforms, applications, and services to automate its functions, improving its efficiency and effectiveness. The diagnostic, which is broadly aligned with the PND 2018–2022 and CONPES 3975, provides a comprehensive overview of Colombia's digital economy development across six pillars or foundational elements: digital infrastructure, digital platforms, DFS, digital businesses, digital skills, and trust environment.

- » **Digital Infrastructure:** This refers to the facilities that are involved in the effort to collect, exchange, store, process, and distribute data across first-mile (international links), middle-mile (backbone), and last-mile (access) networks. Digital infrastructure provides the way for people, businesses, and governments to get online and link with local and global digital services, thus connecting them to the global digital economy. Aside from connectivity, digital infrastructure encompasses the Internet of Things (IoT) (such as mobile devices, computers, sensors, voice-activated devices, geospatial instruments, and machine-to-machine and vehicle-to-vehicle communications) and data repositories (such as data centers and clouds). It also includes all the active and passive infrastructure necessary to develop the digital economy downstream.
  - » **Digital Public Platforms:** Digital public platforms developed for the public sector or as a public good—either by government agencies, in partnership with private companies, or through a hybrid model—can help deliver more and better services to individuals. The development of digital public platforms underpins the expansion of e-government services and can support the efficiency of core government systems. Digital public platforms can also boost accountability, including through providing new channels for public engagement and feedback and reducing opportunities for corruption. Likewise, they can provide a foundational layer to catalyze private sector innovation and new markets.
  - » **Digital Financial Services:** DFS provide individuals and households with convenient and affordable channels by which to pay as well as to save and borrow. Firms can leverage DFS to more easily transact with their customers and suppliers and to build digital credit histories and seek financing. Governments can use DFS to increase efficiency and accountability in various payment streams, including for the disbursement of social transfers and receipt of tax payments. Digital payments are often the entry point for DFS and provide the infrastructure, or “rails,” through which additional products and use cases can be developed, as has been demonstrated by the evolution of M-PESA in Kenya and Alipay in China.
- Digital payments and financial services are critical to financial inclusion and key enablers of e-commerce and digitally enabled business models.
- » **Digital Businesses:** Digital businesses can be divided into two categories, each with their distinct characteristics: (i) digital start-ups, which refer to early-stage ventures that create new digital solutions or business models as part of their core products or services, and (ii) established digital businesses, which are the digitally intensive businesses that have managed to scale up and consolidate their position in local or international markets and include medium and large platform-based and data-driven firms. Digital businesses, and the digitalization of less technology-intensive businesses, represent a unique opportunity for Colombia to nurture and scale MSMEs, boost entrepreneurship, increase efficiency, generate more and better jobs, foster economic integration, and promote the integration of lagging populations and regions. Digital businesses thrive when other key enablers, such as digital infrastructure, skills, payments, and a trust environment, are set in place.
  - » **Digital Skills:** Economies require a digitally savvy workforce in order to build robust digital-intensive sectors and competitive markets. Digital skills encompass foundational, technology, and business skills for building or running a digital start-up or running a digitally intensive business. Greater digital literacy further enhances the adoption and use of digital products and services among governments and the larger population.
  - » **Trust Environment:** The rapid growth of the digital economy goes hand in hand with a rapid rise in cyber threats and increasing concerns about personal data protection. Therefore, the capacity of both the public and private sectors for cybersecurity and data protection needs to evolve quickly to meet current and future threats. This pillar assesses the presence of a governance framework that balances data enablers and safeguards and supports digitalization while protecting individuals, businesses, and institutions from cybersecurity risks.

**Multiple cross-cutting themes impact these foundational elements, affecting the country's capacity to create an enabling institutional and policy environment.** The Digital Economy Framework addresses three cross-cutting themes: developing regulatory frameworks to foster competition and contribute to the Maximizing Finance for Development (MFD) agenda; managing the risks of the widespread adoption of digital technologies; and generating opportunities to empower women. Environmental considerations, including internet pollution and the role that digital technologies can play in implementing the green agenda, are also discussed throughout the report. The diagnostic emphasizes inclusive, equitable, and sustainable access to digital opportunities as a means to improve household welfare, particularly for poor and vulnerable populations.

The diagnostic includes practical and actionable recommendations in the form of a sequenced action plan that can inform relevant government efforts to promote widespread digitalization within government, businesses, and society at large. The report takes stock of existing digital transformation initiatives in Colombia and identifies key constraints and priority areas, proposing a mix of possible policy reforms, investments, and capacity-building interventions to harness the economic and social benefits of widespread digital technology adoption and to effectively mitigate the associated risks, particularly in the critical areas of a digital economy.

**Figure 1.3. Pillars of the Digital Economy**



Source: Original infographic based on World Bank, 2020a.



**The remainder of the report is organized as follows.**

[Chapter 2](#) discusses the accessibility, quality, and resilience of digital infrastructure in Colombia, as well as the availability and affordability of connectivity, which is essential to bringing more people online. [Chapter 3](#) looks at the presence and use of public sector digital platforms that can support better digital exchanges and transactions, enhance the access to and transparency of public services, and improve public service efficiency. [Chapter 4](#) examines the current state of DFS in the country, while [Chapter 5](#) assesses digital entrepreneurship and established digital businesses. [Chapter 6](#) examines demand

for, as well as the attainment and coverage of, digital skills in Colombia—a key enabler of the uptake of digital services and the application of digitally enabled solutions. [Chapter 7](#) looks at the legal and regulatory framework for cybersecurity and data protection, describing the challenges and opportunities in creating a trust environment conducive to further digitalization. Cross-cutting issues, including gender-based and urban-rural digital divides, digital poverty, and opportunities to promote green, resilient, and inclusive development through digitalization, are addressed in all chapters.



## 2. DIGITAL INFRASTRUCTURE



### KEY MESSAGES

- » **A dynamic data infrastructure and cloud market will drive Colombia's digital transformation in the next decade.** Given its robust international interconnectivity, Colombia has a strong opportunity to emerge as a regional hub and to leverage all the potential deriving from this industry. To achieve that, the country will need to further improve its infrastructure (data and telecom) and regulatory framework for data.
- » **Backbone and internet exchange point infrastructure need to be strengthened to provide potential for the growth of mobile and fixed access networks.**
- » **Mobile infrastructure is insufficiently dense and widespread to ensure universal access to and productive usage of the internet.** As a primary means to bridge the digital divide in Colombia, its development requires fostering investment to reach unserved and underserved areas. Its technology upgrade (from 4G to 5G) will provide benefits in terms of the environmental footprint.
- » **Almost half of all households do not use fixed internet.** Colombians would benefit from being able to access fast, affordable, and reliable fixed connectivity. Efforts should be devoted to promoting further expansion of the last-mile infrastructure footprint while establishing supply and demand policies to promote affordability.
- » **In spite of liberalized entry, many markets remain highly concentrated.** To increase the intensity of competition, Colombia should consider a focus on addressing competitive bottlenecks by imposing access and other obligations on dominant operators.
- » **The affordability of data packages is an obstacle to connectivity for low-income households.** Policies to support the poor's demand for connectivity may help to close the socioeconomic digital gap and promote inclusive growth.
- » **Limited connectivity is an obstacle to an inclusive digital economy.** Most Colombian MSMEs face low internet speeds, which is a constraint to the adoption of data-intensive technologies. At the same time, inadequate connectivity in rural areas prevents users from leveraging online applications such as DFS. Policies to promote the development of a more capillary fiber network may help unlock the benefits of the digital economy for all.

## 2.1. The importance of digital infrastructure

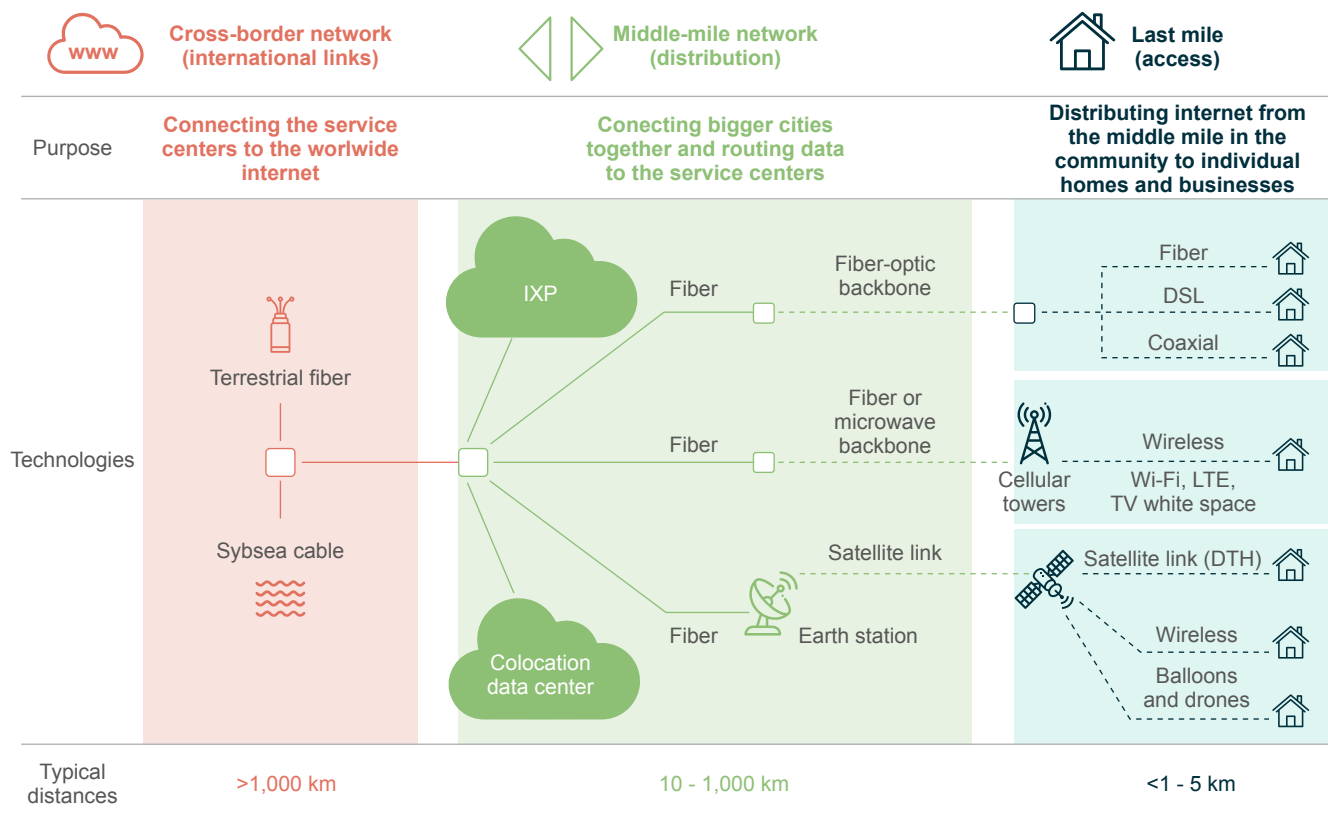
Digital infrastructure consists of all the facilities that are involved in the effort to collect, exchange, store, process, and distribute data.<sup>50</sup> It is formed by cross-border (international links), middle-mile (backbone and backhaul), and last-mile (access) networks.<sup>51</sup> These segments are interconnected, creating a data supply chain where public and private actors operate (Figure 2.1). An appropriate legal and regulatory framework for data management that ensures a smooth data flow is a key element of a flourishing digital ecosystem, as data can be fully and safely leveraged only if users trust the system and sensitive information is adequately protected.

**Universal and affordable access to connectivity will help Colombia to address key development challenges.** Internet access is a crucial driver of productivity growth and can support Colombia's economy

by limiting its dependency on extractives and creating new business opportunities within and beyond borders while strengthening the local job market. The expansion of digital infrastructure is needed to close the digital gap and reach the unconnected, who are often from among the most vulnerable segments of the population. Affordable and reliable internet access in rural and peri-urban areas is important to decrease the country's high socio-economic inequality and promote the inclusive availability of digital public services. Finally, a well-developed infrastructure supporting universal internet availability is an essential part of digital solutions that can strengthen climate change adaptation, monitoring, and resilience.

**This chapter assesses the current state of Colombia's digital infrastructure.** The analysis discusses the first, middle, and last miles of connectivity, adopting both demand and supply perspectives. The chapter highlights the strengths and weaknesses of local digital infrastructure and provides policy recommendations to support this key enabler for a dynamic digital economy.

Figure 2.1. The Data Infrastructure Supply Chain



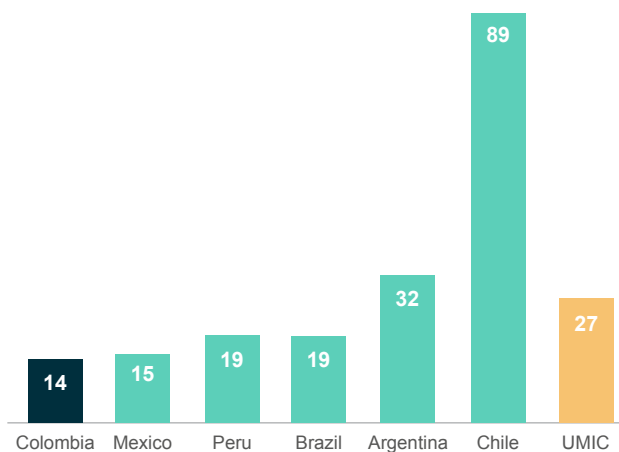
Source: Adapted from World Bank (2021).

## 2.2 Current state of digital infrastructure development

**Colombia enjoys well-developed international digital infrastructure commensurate with its large population, income level, and strategic bicoastal location.**

Access to the Pacific Ocean to its west and the Caribbean Sea on its north has enabled Colombia to have access to 10 submarine cable systems<sup>52</sup> that serve the Atlantic and Pacific coasts of South America, as well as those serving the Caribbean. However, utilized international bandwidth is low, reflecting a limited digital uptake within its borders despite a contained internet protocol (IP) transit tariff price compared to peers and the multiple internet submarine cables landing in the country (see Figure 2.2 and Figure 2.3).

**Figure 2.2. Used International Bandwidth, Mbps per 100 inhabitants**



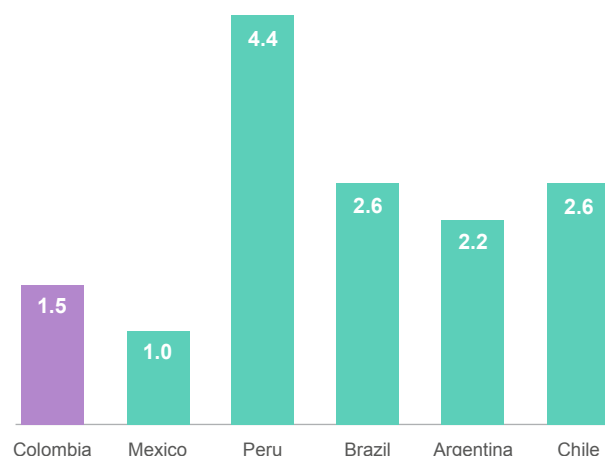
Source: "Submarine Cable Map," TeleGeography, <https://www.submarinecablemap.com/>.

**As a result of the relatively good quality infrastructure, Colombia has witnessed the growth of vibrant data centers and cloud markets that are essential to its own digital transformation and create an opportunity for the country to emerge as a regional hub for this type of industry.** The surge in data-intensive applications and services requires specific hardware and software infrastructure that can be provided only by modern data centers and cloud platforms. In this regard, Colombia has experienced significant growth in recent years of hyper scalers (IBM, AWS) and other actors (telco operators, colocation providers) offering colocation services, Infrastructure as a Service (IaaS), and other IoT and cloud products.

**Yet, despite its robust international interconnectivity, Colombia still has ample space to further develop its internet exchange point (IXP) infrastructure.** To date, only two IXPs have been established in Colombia, which is well below some regional peers, especially considering the country's population (Table 2.1). Colombia's relatively low number of IXPs and IXP participants means that it is not fully taking advantage of some of the IXP benefits, including reduced IP transit costs and lower latency, likely resulting in more expensive and lower-quality broadband. Well-developed IXPs are an essential input into the growth of broadband markets.

**The footprint of Colombia's backbone network grew 25 percent between 2017 and 2020, increasing the portion of the population that could be more easily reached with good quality connectivity service to 40**

**Figure 2.3. IP Transit Cost 2021 Q2, \$/Mbit, 10GigE, weighted median**



Source: "Submarine Cable Map," TeleGeography, <https://www.submarinecablemap.com/>.

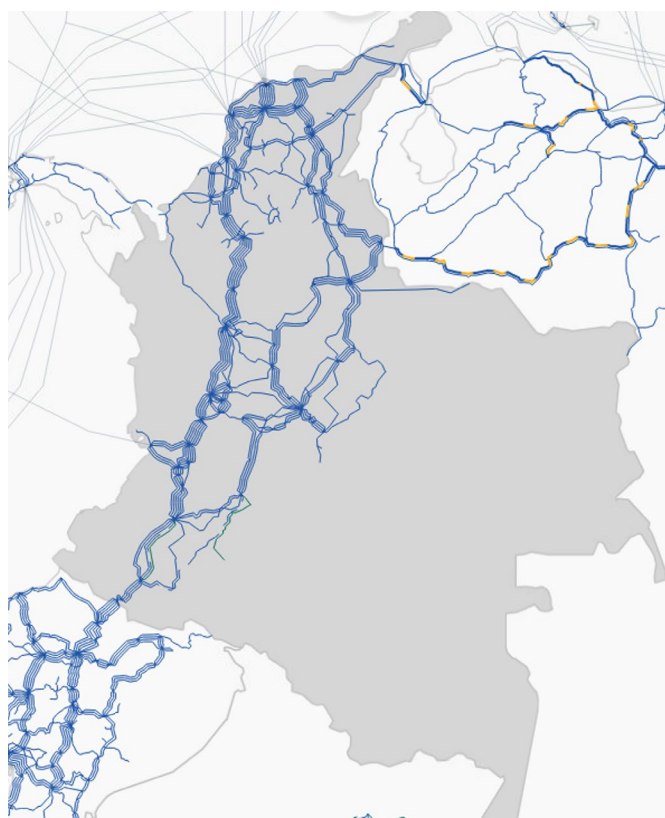
**percent.** Yet, the backbone footprint needs to be further expanded to support the growth of mobile and fixed access networks. The country currently relies on almost 60,000 kilometers of transmission network, and when that network was expanded, there was a surge of people living within 10 kilometers of backbone network nodes—from 25 percent of population in 2019 to 40 percent in 2021<sup>53</sup> (see Figure 2.4). Nevertheless, there is a need for additional investments to bring the infrastructure closer to the remaining 60 percent of the population, allowing further utilization of the international connectivity capacity that the country enjoys and resulting in service quality improvements and a step change in terms of connection speeds for Colombians.

**Table 2.1. IXP Characteristics and Distribution**

| Country         | IXPs     | Participants |           | IXPs       | Participants (per 10 million inhabitants) |            |
|-----------------|----------|--------------|-----------|------------|---|------------|
|                 |          | Median       | Mean      |            | Median                                    | Mean       |
| Argentina       | 28       | 10           | 15        | 6.2        | 2.1                                       | 3.4        |
| Brazil          | 34       | 47           | 157       | 1.6        | 2.2                                       | 7.4        |
| Chile           | 6        | 16           | 34        | 3.1        | 8.4                                       | 17.6       |
| Mexico          | 2        | 10           | 10        | 0.2        | 0.8                                       | 0.8        |
| Peru            | 2        | 33           | 33        | 0.6        | 10  | 10         |
| <b>Colombia</b> | <b>2</b> | <b>18</b>    | <b>18</b> | <b>0.4</b> | <b>3.4</b>                                | <b>3.4</b> |

Source: Packet Clearing House (2022).  
 Note: All IXPs with 0>participants.

**Figure 2.4. Fiber Backbone in Colombia**



Source: ITU interactive broadband maps, 2022,  
<https://bbmaps.itu.int/bbmaps/>.

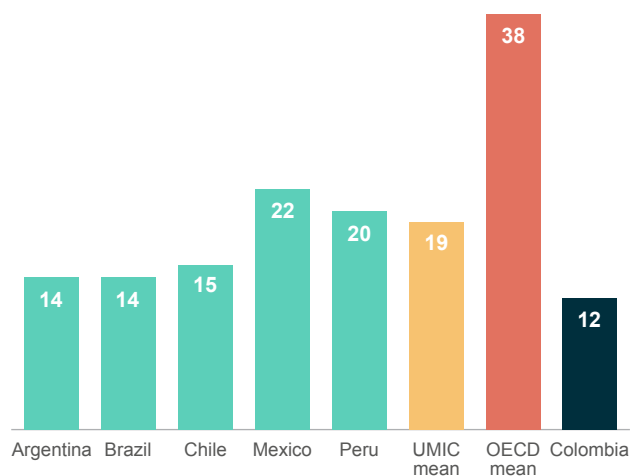
Colombia has relatively underdeveloped mobile infrastructure, with less spectrum assigned, lower tower density, and lagging 4G coverage compared to OECD countries and the five LAC comparator countries,<sup>54</sup> leaving 3G prevalent in all its departments.<sup>55</sup> The GSMA estimated that Colombia had assigned about 470 MHz of spectrum for mobile use across five bands. This was above the regional average of 400 MHz but well below Chile (almost 700), Brazil (above 600), Mexico (almost 600), and Argentina (almost 500). Colombia has 50 mobile cells per 10,000 inhabitants, one-fourth of the OECD average (201 mobile cells per 10,000 inhabitants) but also behind some of its regional peers.<sup>57</sup> A low number of cells results in a lower overall quality of mobile service to Colombians, in the form of either lower coverage or lower speeds. Focusing on the latest widely available mobile technology, Colombia has only six 4G mobile towers per 10,000 inhabitants, less than 10 percent of OECD countries (79 4G mobile towers per 10,000 inhabitants). Likewise, the percentage of 4G mobile cells is lower in Colombia (12 percent) than the OECD average (38 percent) and regional benchmarks (see [Figure 2.5](#)). There may be a number of reasons for this relatively low number of towers, from spectrum allocation to fiber backbone extension. The limited development of 4G infrastructure is reflected in the low percentage of the population covered by a 4G signal (79 percent), the lowest among regional benchmarks and OECD countries.<sup>58</sup> Moreover, as [Figure 2.7](#) shows, the distribution of 4G coverage in the country is unequal, with more than a third of the *centros poblados* (population centers)<sup>59</sup> not having access to such mobile technology. All the departments are widely covered by a 3G signal, pointing to the importance of strengthening mobile broadband infrastructure to ensure that Colombians can leverage a wider range of services and applications on their internet-enabled

devices. Moreover, since mobile is the prevalent technology in many rural areas, it is important to provide the best possible service in terms of reliability and speed.

**Advances in introducing 5G mobile technology would help Colombia to provide better mobile services to its people and also to improve the environmental footprint of its telecommunications sector.** 5G technology is characterized by substantially lower CO<sub>2</sub> emissions compared to 4G, as emissions are significantly lower with the provision high-speed services

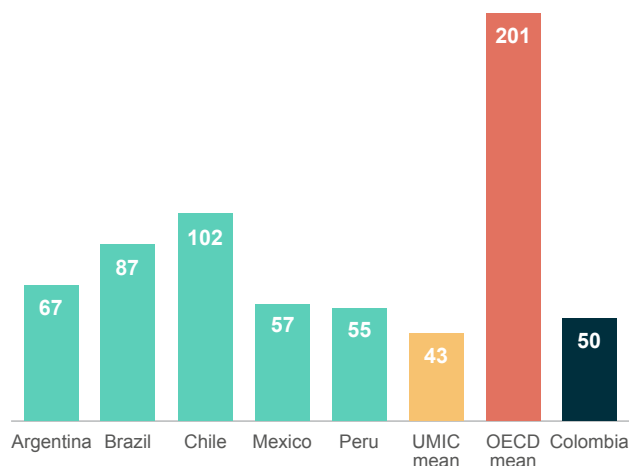
(10–20 Mbps per user) (see [Box 1](#)). Yet, commercial 5G services are still to be launched in Colombia. Claro and Movistar conducted the first 5G trials in 2018.<sup>60</sup> MinTIC, with technical support from the National Spectrum Agency (*Agencia Nacional del Espectro [ANE]*), initiated a public consultation on the 5G spectrum in April 2019 and in early 2020, awarding temporary 3.5 GHz licenses to major mobile network operators (MNOs). In December 2022, MinTIC published the action plan for a 5G auction, planned for the third quarter of 2023.<sup>61</sup>

**Figure 2.5. Percentage of 4G Mobile Cells**

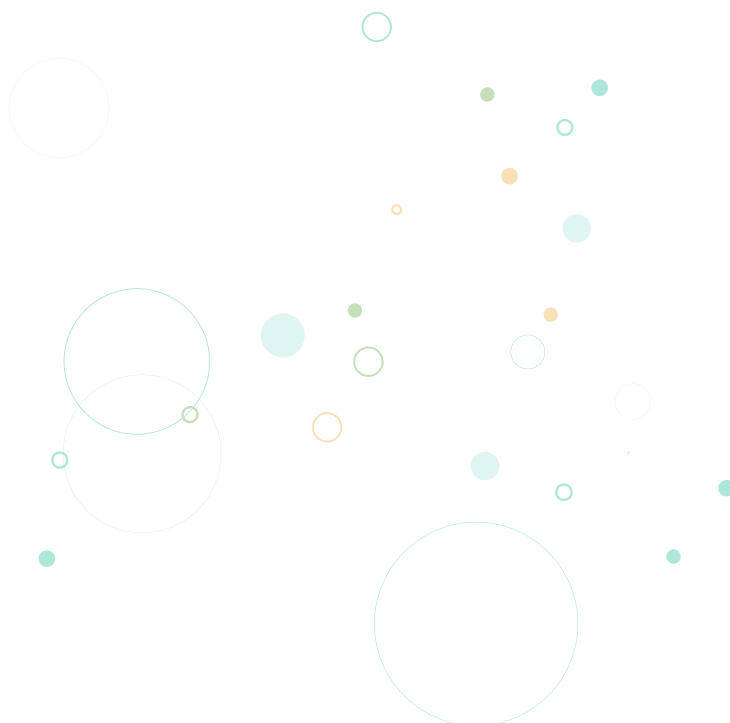


Source: World Bank (2020 data); OpenCellID (2022).

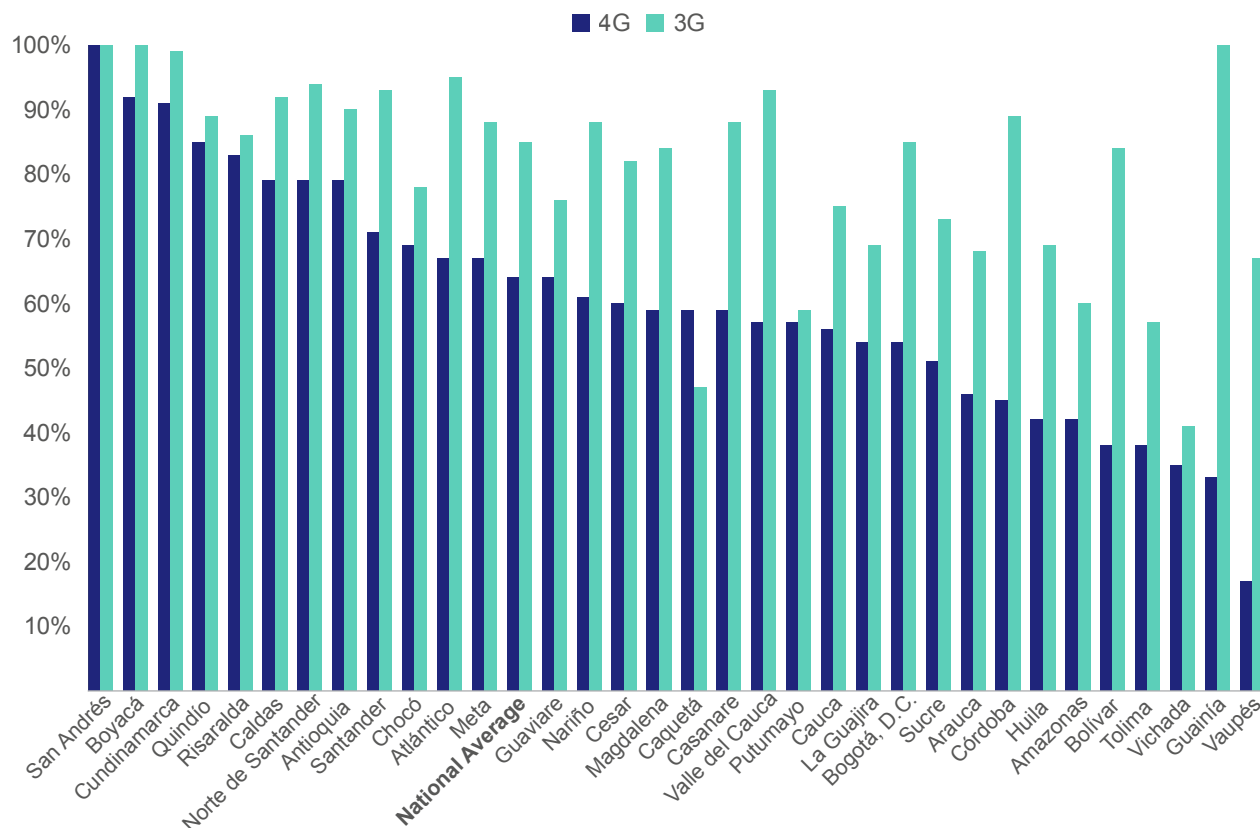
**Figure 2.6. Number of Mobile Cells per 10,000 Inhabitants**



Source: World Bank (2020 data); OpenCellID (2022).



**Figure 2.7. Percentage of Population Centers (Centros Poblados) by Department Covered by 3G and 4G**



Source: DANE

### BOX 1. Environmental Footprint of Mobile Broadband Infrastructure (1 of 3)

Digital technologies play a critical role in the climate agenda, resulting in both positive and negative effects on greenhouse gas emissions. On the one hand, digital technologies enable a wide range of services and applications that can reduce the carbon footprint. On the other hand, expanding digital infrastructure can have a direct negative effect on the environment, as broadband assets require electricity to function, and the traditional production of this energy releases carbon and other atmospheric emissions. Indeed, in Colombia alone it is estimated that approximately 19 percent of cellular sites with off-grid power utilize diesel generators, leading to the release of large quantities of atmospheric emissions.

Enhanced broadband is linked to increased CO<sub>2</sub> emissions, as more energy-consuming assets are needed to deliver new network capacity. [Figure Box 1.a.](#) visualizes the corresponding carbon emissions produced for different technology and capacity strategies in Colombia (for fixed [F] and wireless [W] backhaul), based on (i) the power source by mobile site and (ii) a forecast for the energy generation mix in operation between 2020 and 2030. For example, in the 25 GB per user target, approximately 3.5 megatons of CO<sub>2</sub> would be released for 5G with a wireless backhaul, compared to 4 megatons for 50 GB per user or 5 megatons for 100 GB per user. Moreover, 5G-related emissions increase less significantly than 4G when extra capacity per user is considered, thanks to the spectral efficiency improvements between these generations.

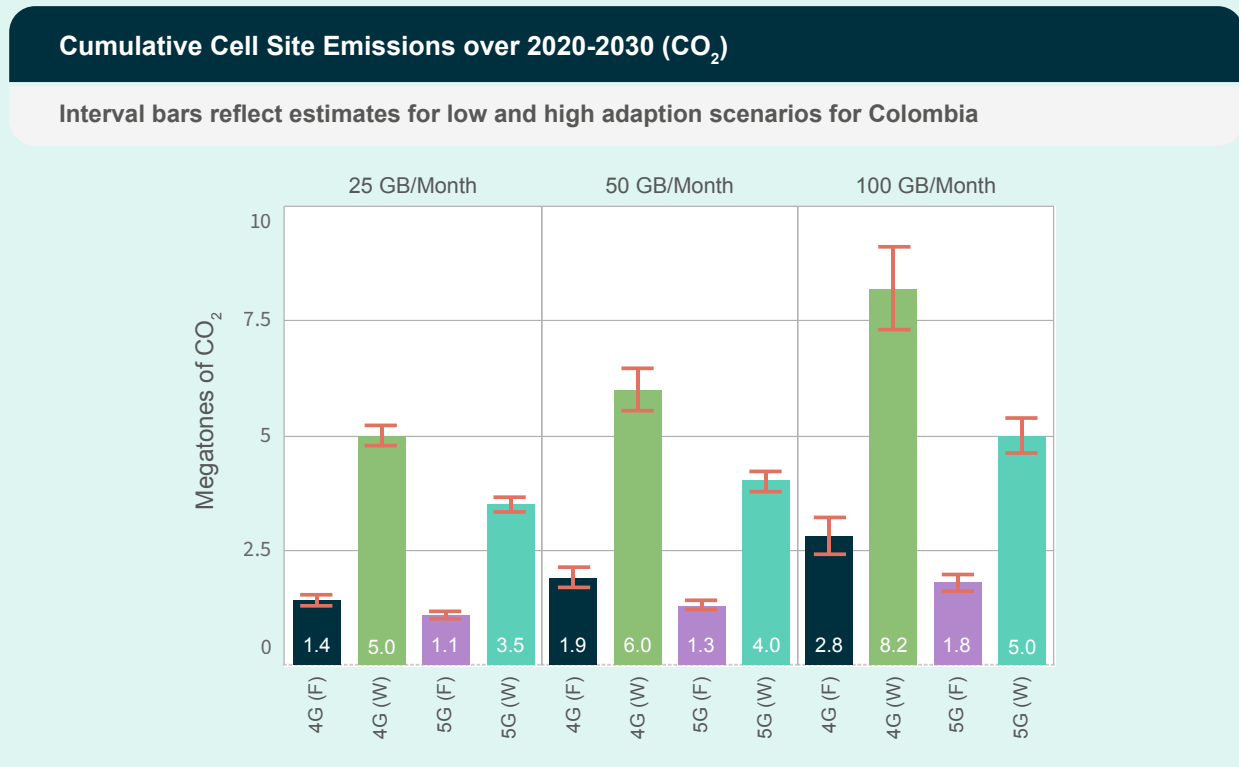
## Box 1. Environmental Footprint of Mobile Broadband Infrastructure (2 of 3)

Although broadband is generally considered to be an enabler of lower carbon emissions strategies, the deployment and operation of cellular sites uses energy and therefore has an environmental impact. To deliver a 50 GB/month per user target, the total CO<sub>2</sub> emissions quantity over the next decade in Colombia is estimated to be approximately 6.0 megatons of CO<sub>2</sub> for 4G with a wireless backhaul, compared to 4.0 megatons for 5G. To put this into perspective, production-based annual emissions for Colombia are estimated to be 89.1 megatons of CO<sub>2</sub> in 2020. Thus, the cumulative operating emissions for broadband infrastructure over the time period assessed here mean that cellular sites would contribute less than 0.01 percent of emissions over the next decade, far below other sectors such as transportation. One caveat to these results, however, is that this assessment considered only the Mobile Radio Access Network sites, and future

research should consider including energy consumption by consumer devices, fixed broadband, data centers, and other cloud processing infrastructure.

Implementing renewable power generation for off-grid cellular sites leads to CO<sub>2</sub> emissions savings of up to 38 percent when deploying 4G universal coverage. With one-fifth of sites in Colombia estimated to be using off-grid power via diesel generators, this raises questions about the environmental sustainability of this existing strategy. Given the current commitment in Colombia regarding renewable energy sources, this analysis explores the sustainability benefits from shifting cellular sites from diesel generators to renewable sources, such as photovoltaic and wind power systems. [Figure Box 1.b.](#) shows that by implementing a renewable energy strategy for cellular sites with 4G, up to a 38

**Figure Box 1.a. Universal Broadband Emissions over 2020–2030 (CO<sub>2</sub>)**



Source: Oughton and Comini (2022).

Note: Interval bars reflect estimates for low and high adoption scenarios.



## Box 1. Environmental Footprint of Mobile Broadband Infrastructure (3 of 3)

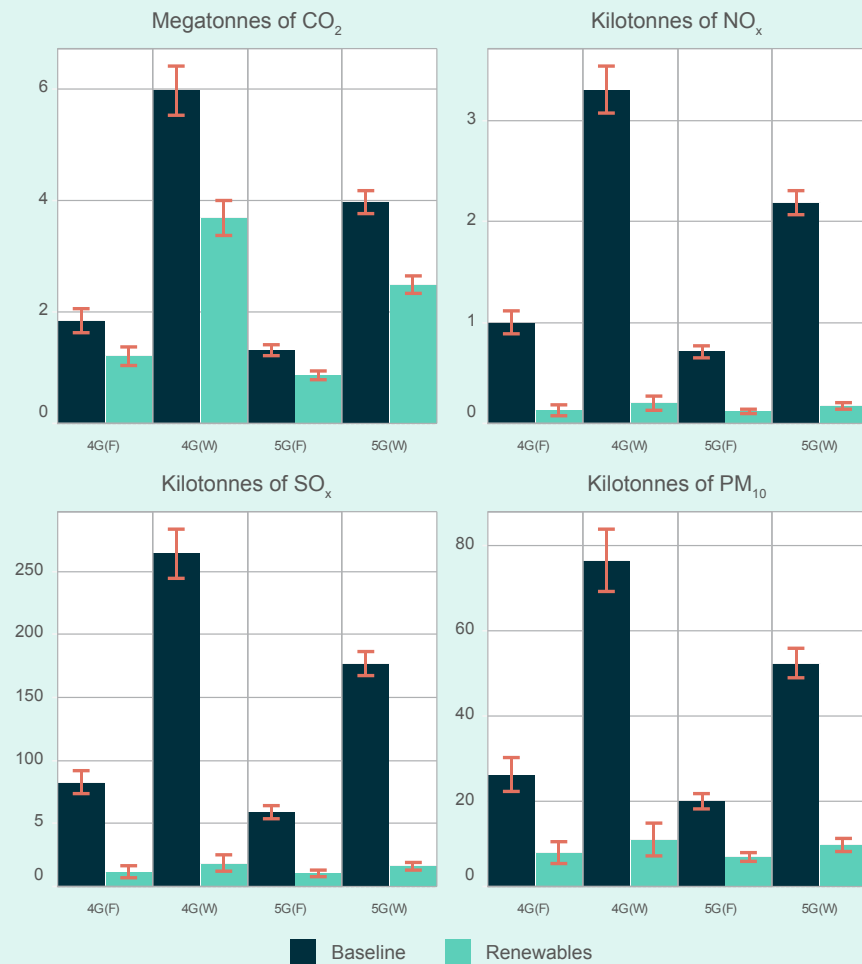
percent net carbon saving is estimated to be possible (when using a wireless backhaul), together with a reduction of other polluting gases, such as

nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), and particulate matter (PM<sub>10</sub>).

**Figure Box 1.b. Assessment of Carbon Emissions for Universal Broadband Options in Colombia**

### Impact of Shifting Off-Grid Diesel Generators to Renewable Site Power

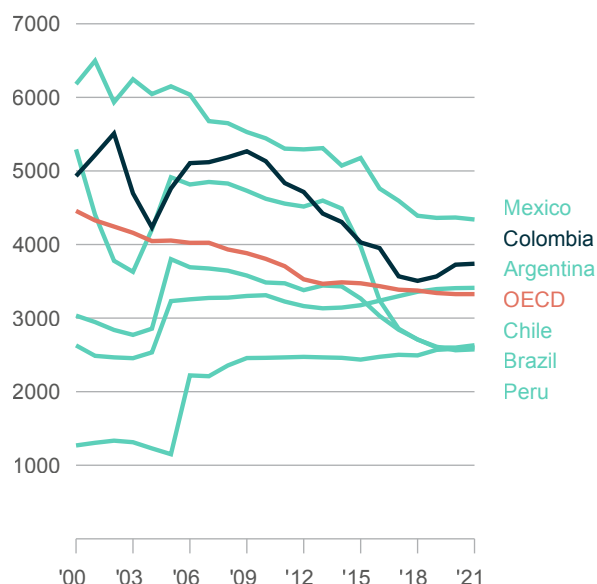
For 50 GB/Month per user with interval bars reflecting low and high adoption scenarios for Colombia



Source: Oughton and Comini (2022).

In terms of retail mobile market development, the market in Colombia is more concentrated, its subscribers use less data, and the growth of the subscriber base is slower than in benchmark countries. Colombia has traditionally had a higher Herfindahl-Hirschman Index (HHI) than the OECD average and regional benchmarks (except Mexico) over the past two decades (Figure 2.8).<sup>62</sup> Although market concentration declined in the period from 2010 to 2017 as in most other regional peers, it has increased since 2018 in stark contrast to its comparator countries, where it has continued to decline or has stabilized.

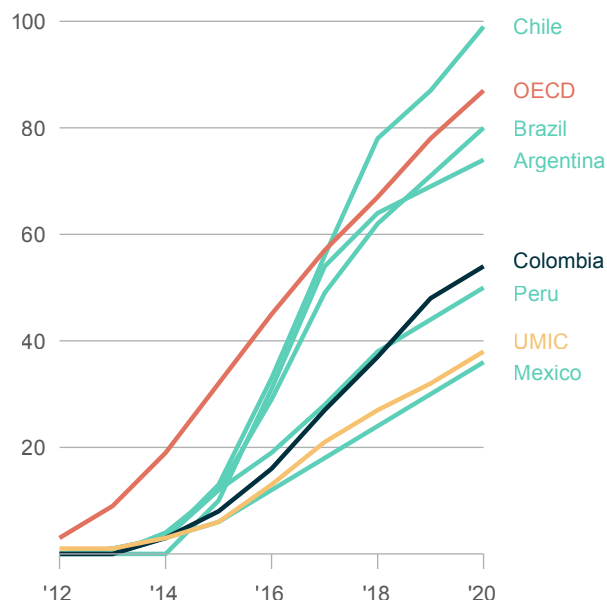
**Figure 2.8. Mobile Market HHI, 2000–21**



Source: GSMA (2021).

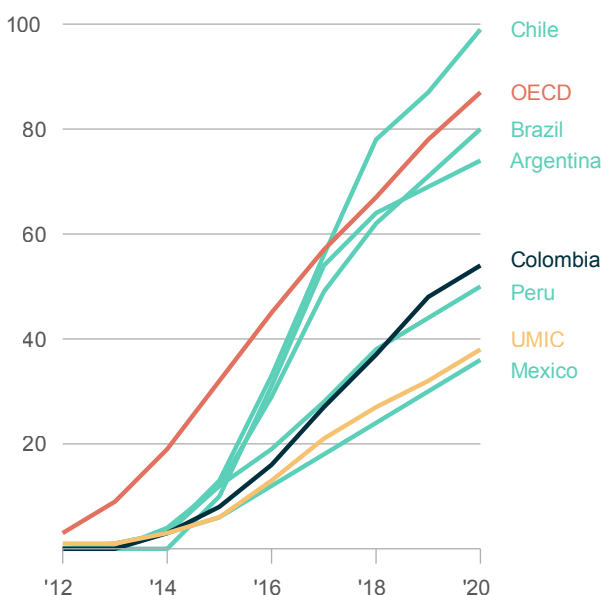
Higher market concentration is suggestive of lower competitive intensity, which will likely result in higher prices and lower quality.<sup>63</sup> Although slower than in some benchmark countries, according to official statistics, Colombia’s mobile broadband subscriptions increased 46 percent in the 2015–20 period. As Figure 2.9a shows, Colombia’s number of 4G mobile broadband subscriptions per 100 inhabitants of 54 is just over half the OECD average of 87 and below that of Chile (99), Brazil (80), and Argentina (74). This lower number of broadband users reflects a combination of supply-side factors discussed above (infrastructure and market structure) and demand-side factors broadly related to service affordability and the purchasing power of the population. Lower coverage and uptake of 4G resulted in the average Colombian mobile broadband subscriber in 2020 using less data per month (2.8 GB) than Mexicans (4.5 GB) and Chileans (12.8 GB). OECD mobile users use 7.5 GB/month, almost three times that of Colombia (see Figure 2.9b).

**Figure 2.9a. 4G Subscriptions per 100 inhabitants**



Source: GSMA (2021); World Bank, 2012–2020.

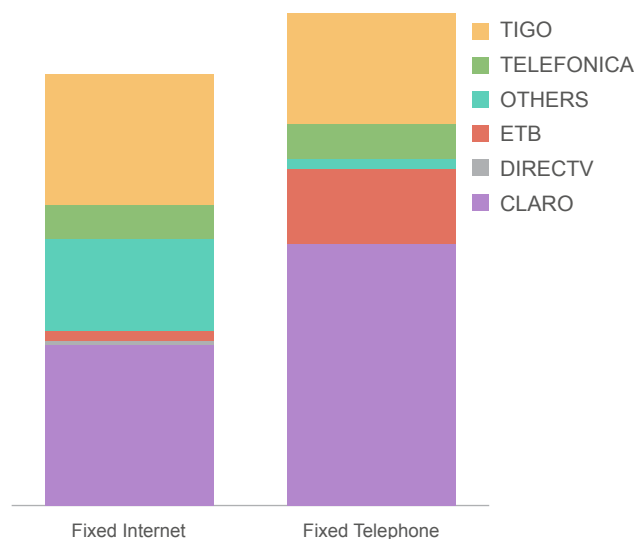
**Figure 2.9b. Mobile Data Usage per Mobile Broadband Subscription (GB/month)**



Source: OECD (2021).  
<https://www.oecd.org/sti/broadband/broadband-statistics/>

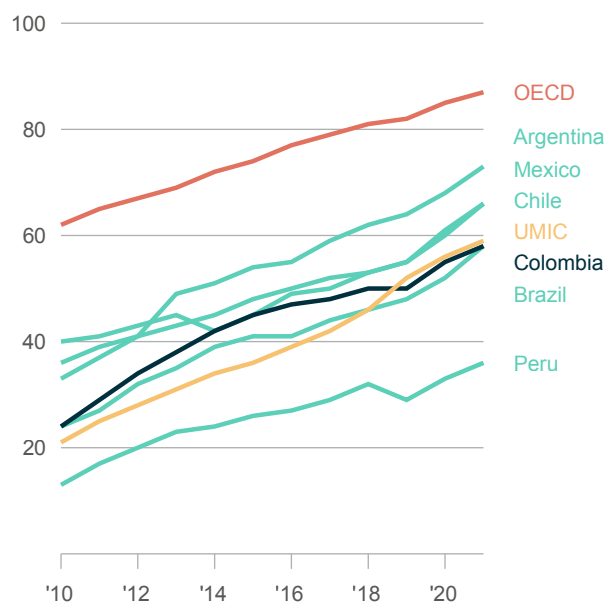
Although its retail fixed broadband market is less concentrated, Colombia has increased its fixed broadband subscriptions significantly, though it has yet to catch up to its regional and OECD peers. The market for fixed broadband in Colombia is more competitive compared to mobile, with none of the many market players holding more than 40 percent of the market share (Figure 2.10). Between 2011 and 2021, fixed broadband household penetration doubled, meaning that more than half of Colombian households currently have access to fixed internet. However, the country still lags in comparison to some regional benchmarks, such as Mexico, Argentina, and Chile, and is very far from OECD levels (Figure 2.11). Colombia relies on 20 percent fiber-based fixed broadband subscriptions and 60 percent cable.<sup>64</sup> The limited uptake of the fixed technologies that deliver the fastest internet may affect the quality of Colombian fixed broadband services, with an impact on the final user experience. Improving access to fixed internet is critical to performing certain activities, such as remote working and learning, and enabling data-intensive industries.

**Figure 2.10. HHI in Fixed Telephone and Fixed Internet Markets**



Source: MinTIC (2020c).  
 Note: This calculation considers other providers as a unique firm, an approach that minimally impacts the final output.

**Figure 2.11. Fixed Broadband Household Penetration (%)**

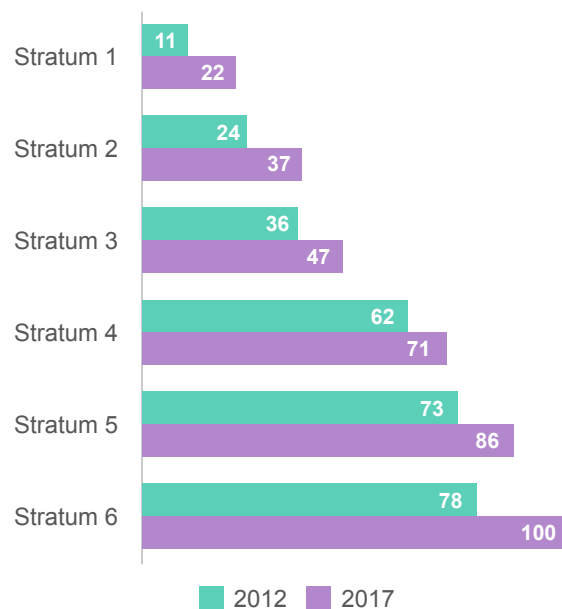


Source: TeleGeography (2023b).

In Colombia, distribution of fixed broadband subscriptions is uneven geographically and across socioeconomic groups, leaving a substantial percentage of the population behind, and reducing these digital divides is important to tackling inequality in social and economic development. Fixed broadband penetration varies significantly across Colombia’s 33 departments. The departments with the three largest cities—Bogotá, Medellín, and Cali—have fixed household subscriptions well above the average (Bogotá D.C., 75 percent; Antioquia, 62 percent; and Valle del Cauca, 53 percent) (Figure 2.12). In contrast, some of the less populous, more isolated departments, such as Amazonas, Vaupes, and Vichada, have rates below 5 percent, less than one-tenth the national average. Data from the recent households’ survey provides deeper insight into inequality between rural and urban areas, with almost three-fifths of urban households having access to fixed internet, compared to just 13 percent of rural households (Fig. 2.14). This unequal geographic distribution of fixed digital infrastructure correlates with the distribution of purchasing power and network deployment costs, which

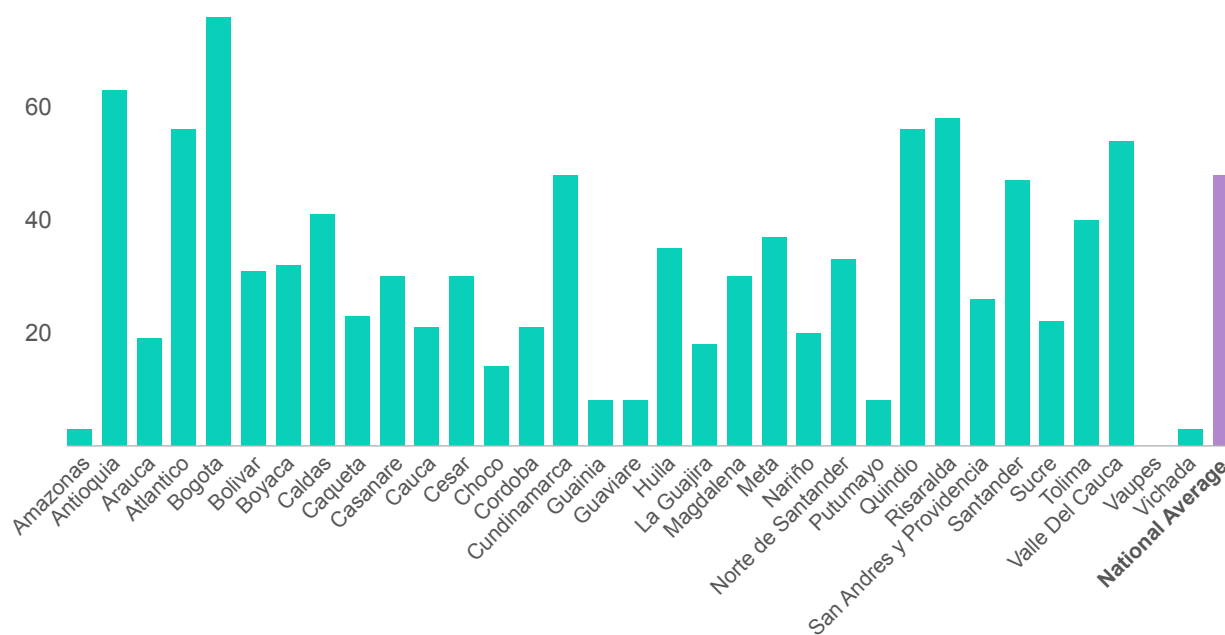
are lower in urban areas compared to suburban and rural areas. In 2012, the fixed broadband subscription of households in stratum 6 (78 percent) was seven times greater than that of stratum 1 (11 percent).<sup>65</sup> By 2017, stratum 6 had almost reached 100 percent, while stratum 1 had increased to only 22 percent.<sup>66</sup> It could be argued, however, that Colombia's strata correlate only weakly to household income, as many wealthier households live in lower strata and the reverse is also true. Either way, the socioeconomic digital divide is obvious and means that a significant segment of the population does not have access to some of the development opportunities related to fixed broadband, potentially increasing the already high inequality in the country. Tackling the digital divide requires a comprehensive strategy and a well-tailored set of policy and regulatory instruments.

**Figure 2.13. Fixed Broadband Penetration by Stratum**



Source: MinTIC (2019a).

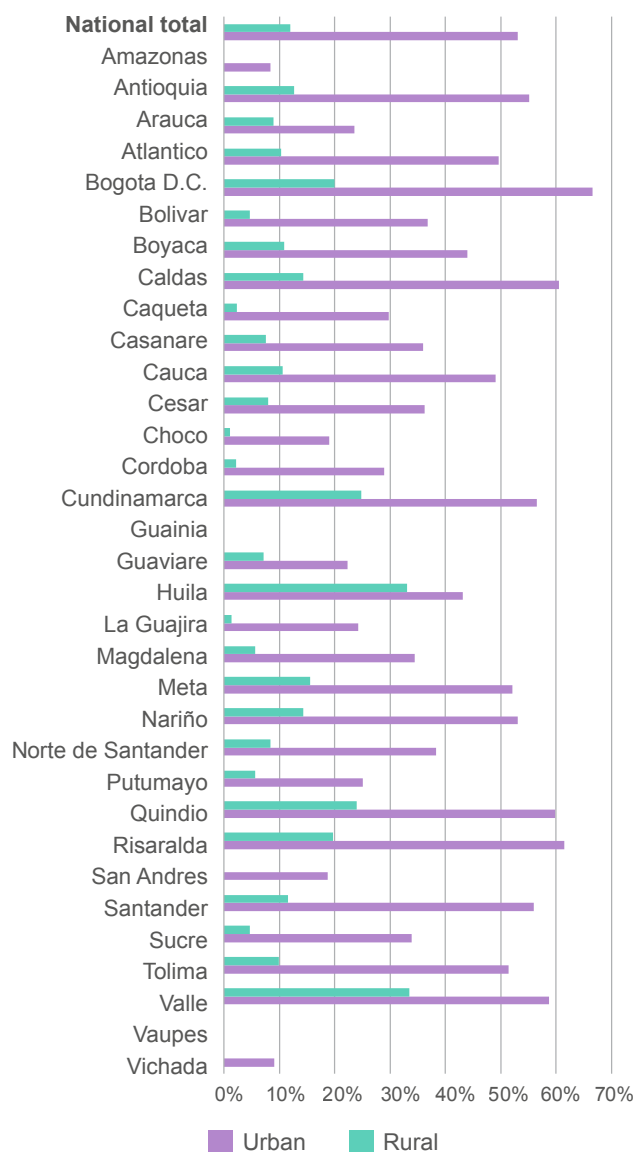
**Figure 2.12. Fixed Broadband Penetration by Department**



Source: MinTIC (2022a).

There is a clear need for further investment to improve equitable access across digitally deprived population groups in Colombia. Table 2.2 shows 10-year per capita investments in the telecommunications sector in LAC based on a recently available analysis of selected countries performed by the Inter-American Development Bank (IDB).<sup>67</sup> Colombia has had lower overall investment than some of its regional peers. For example, Colombia has invested less per capita on the fixed segment than Argentina, Chile, and Mexico, among others. This result is consistent with the findings reporting that Colombia has comparatively less fixed digital infrastructure than its peers and it is of lower quality. Colombia scores somewhat better in the mobile segment, still lagging behind its peers but suggesting that mobile investments have been favored. In terms of source of investment, on the one hand, Colombia's public contribution is comparable to regional peers Argentina, Chile, Mexico, and Peru. On the other hand, private investments have been lower than in other countries, which seem to have taken a private sector-driven approach in their telecommunications space.

**Figure 2.14. Households with Fixed Internet Connection, Urban vs. Rural (%)**



Source: DANE (2022b).

**Table 2.2. Cumulative 2008–17 Telecom Investment per capita (US\$, % of total)**

|           | Fixed     | Mobile    | Public    | Private   | Total |
|-----------|-----------|-----------|-----------|-----------|-------|
| Colombia  | 180 (42%) | 248 (58%) | 80 (19%)  | 348 (81%) | 428   |
| Argentina | 425 (63%) | 247 (37%) | 129 (19%) | 543 (81%) | 671   |
| Bolivia   | 66 (28%)  | 172 (72%) | 115 (48%) | 123 (52%) | 238   |
| Chile     | 256 (30%) | 605 (70%) | 9 (1%)    | 853 (99%) | 861   |
| Ecuador   | 254 (52%) | 237 (48%) | 93 (19%)  | 398 (81%) | 491   |
| Mexico    | 252 (64%) | 143 (36%) | 75 (19%)  | 320 (81%) | 395   |
| Peru      | 83 (21%)  | 309 (79%) | 8 (2%)    | 384 (98%) | 392   |

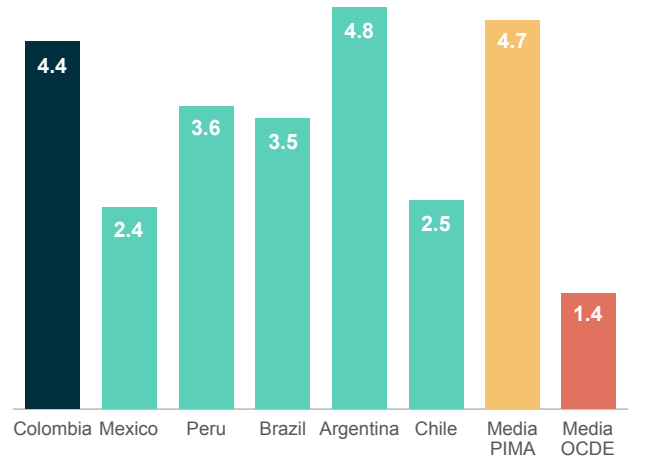
Source: World Bank analysis based on García *et al.* (2019).

**Data and device affordability, service quality**

country (UMIC) poverty headcount ratio of US\$5.50 a day compared to Argentina (14.4 percent), Brazil (19.6 percent), Chile (3.6 percent), Mexico (22.7 percent), and Peru (20.6 percent).<sup>69</sup>

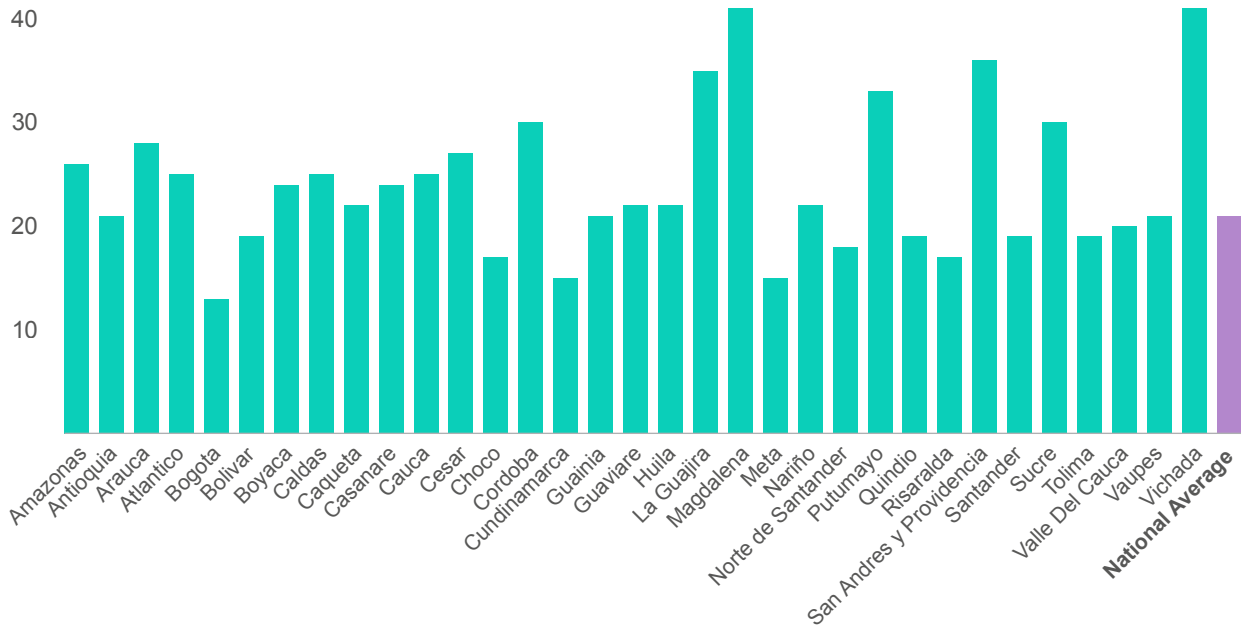
**Fixed broadband prices in Colombia are a significant obstacle to getting online.** Internet users in Colombia pay 4.4 percent of gross national income (GNI) per capita per month for 5 GB of fixed internet, an amount higher than all regional comparators except Argentina (Figure 2.15). In 2020, out of the 41 percent of unconnected households, more than half said they did not subscribe to fixed broadband because of lack of affordability (see Figure 2.16).<sup>68</sup> Likewise, only one-seventh of the households with no broadband (6 percent of all households) mentioned the unavailability of service at their residence as the reason for not having fixed broadband. This result is consistent with the World Bank’s Latin America High Frequency Phone Survey (HFPS) that found that Colombia had the highest percentage of respondents who were not connected to the internet because it was not affordable (50.6 percent). This affordability challenge is exacerbated by the high share of people living in poverty in Colombia. For example, 29.4 percent of Colombians are below the World Bank’s upper-middle-income

**Figure 2.15. Fixed-Broadband Basket (5 GB) price, GNI per capita/month (2021)**



Source: UIT (2021).

**Figure 2.16. Households for which Affordability is the Main Reason for not Having Fixed Internet (%)**



Source: DANE (2020a).

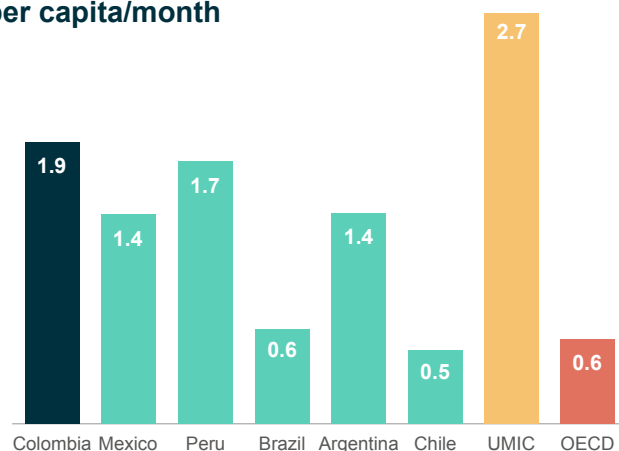
**The price of 2 GB mobile broadband in Colombia is higher than regional comparators and the OECD average.** Colombians pay a higher share of their GNI (1.86 percent) for 2 GB of mobile data compared to regional peers and the OECD average (Figure 2.17). Even if this figure is below the 2 percent affordability threshold,<sup>70</sup> the share of GNI per capita per month necessary to buy mobile data can be much higher for the bottom income segments. However, for other mobile packages, such as 5 GB and 10 GB, prices are below some international benchmarks. The high concentration affecting the market of mobile broadband may be contributing to this trend and deserves further analysis to better understand the potential impact on tariffs and therefore on the digital uptake.

**Smartphone penetration is above 85 percent, with forecasts for 2022 indicating that almost 100 percent of connected Colombians have access to such devices.** The average price of a smartphone in Colombia relative to monthly GNI per capita is higher than in Mexico, Brazil, Chile, and OECD countries, but cheaper than in Peru, Argentina, and the average UMIC. The World Bank’s Latin America HFPS reports that the price of devices is an obstacle to connectivity for only 7 percent of the unconnected. However, this figure may be significantly higher among potential users belonging to the lower-income segments.

**Fixed broadband speeds in Colombia lag behind its OECD peers and some regional comparators like Mexico and Chile and vary significantly by geography and socioeconomic strata.** This finding is consistent with the data highlighting the low penetration of fiber-based fixed broadband infrastructure. Based on OECD data, Colombia’s average actual experienced download speed (25.0 Mbps) is lower than that of Mexico (28.5) and Chile (69.7) and the OECD average (73.0) (see Figure 2.19). In the same way that there are marked differences across departments in Colombia on fixed broadband uptake, there are also very significant differences in the available quality of the connectivity. Actual experienced average download speeds for residential subscribers during the second quarter of 2020 and 2021 vary widely across regions. The departments of Bogota D.C., Valle del Cauca, and Antioquia increased the most over the year, generally from the range of 25–35 Mbps to double that figure. In contrast, the departments with the lowest availability and uptake, including Amazonas, Vaupes, and Vichada, report the slowest speeds (all well below 5 Mbps), with no progress in the analyzed time

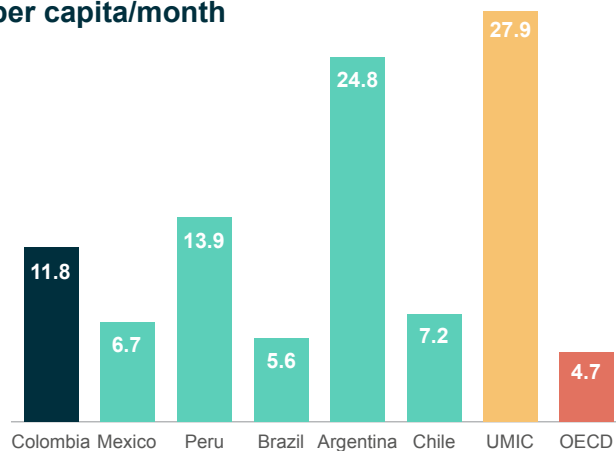
frame. Colombia’s inequality is reflected not only in the level of digital uptake among income segments of the population but also in the quality of service. Based on MinTIC data from December 2021, both strata 5 and 6 had subscribed to fixed broadband service with average speeds of about 120 Mbps; in contrast, average broadband speed for stratum 1 connections was 24.4 Mbps, or one-fifth of the average speed achieved by the upper strata (Figure 2.20). Deficiencies and inequality in the quality of broadband connections prevent Colombians from having equal access and from using data-intensive digital economy apps and software that could help them leverage the gains from a digital transformation.

**Figure 2.17. 2 GB Mobile Data GNI per capita/month**



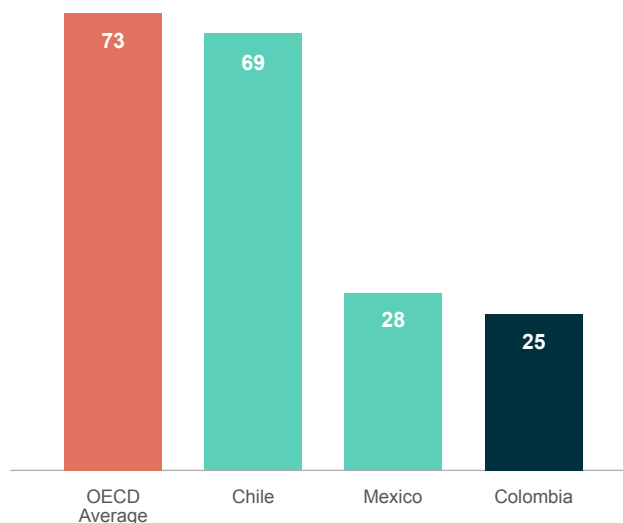
Source: A4AI (2021).

**Figure 2.18. Average Smartphone Price GNI per capita/month**



Source: A4AI (2021).

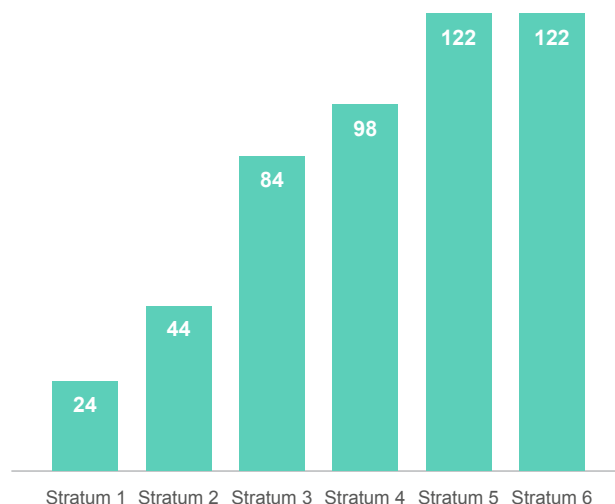
**Figure 2.19. Average Experienced Download Speed (Mbps) of Fixed Broadband Connections, 2020–21**



Source: OCDE (2021a).

Note: Averages from Speedtest, M-Lab, and Steam data. Speedtest (Ookla) data are for January 2021; M-Lab (Worldwide Broadband Speed League) speeds were measured from July 1, 2019, to June 30, 2020; and Steam data are for March 2021.

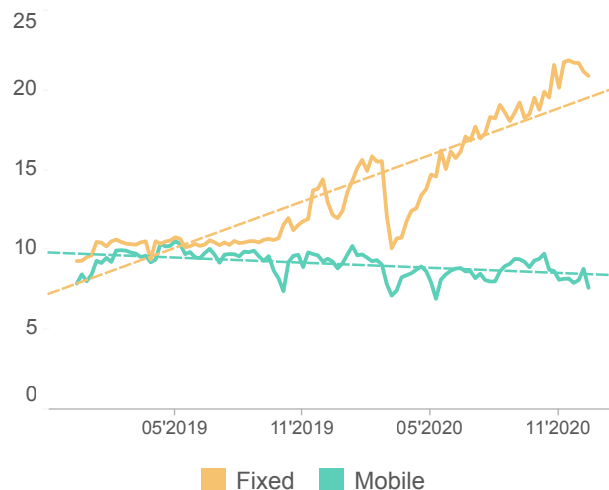
**Figure 2.20. Fixed Internet Download Speed (Mbps) by Stratum**



Source: MinTIC (2021a).

Between 2019 and 2020, fixed connection speeds showed an upward trend relative to mobile, which did not record any improvement. Fixed download speed tests on average were higher than mobile (Figure 2.21) but showed a gap between urban and rural areas.<sup>71</sup> As Table 2.3 shows, this difference is less evident for mobile, most likely because of the limited 4G uptake. It is also important to note that the network was only temporarily affected by the surge in data traffic due to the COVID-19 pandemic. The sudden shift to online activities due to the lockdown measures implemented by the government of Colombia affected service provision only temporarily, and both networks recovered promptly, thus confirming the existing trends (upwards for fixed, steady for mobile).

**Figure 2.21. Download Speed Changes for Fixed and Mobile Networks (Median, Mbps, 2019-2020)**



Source: World Bank analysis, based on Ookla® Speedtest Intelligence® data from January 2019 to January 2021.



**Table 2.3. Internet Speed in Urban and Rural Areas**

|                          | Fixed      |           | Mobile    |         |
|--------------------------|------------|-----------|-----------|---------|
|                          | Urban      | Rural     | Urban     | Rural   |
| N° of test               | 58 601 118 | 7 210 692 | 3 373 389 | 453 706 |
| Mean, Mbps <sup>72</sup> | 28.79      | 24.54     | 16.86     | 12.51   |
| Median, Mbps             | 14.91      | 8.95      | 9.35      | 6.17    |

Source: Ookla 2019–20.

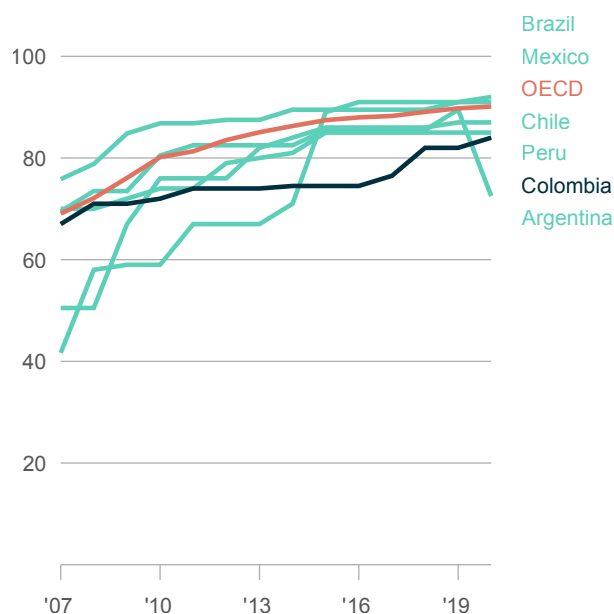
**Citizens with better connectivity moved less than average during the lockdown, suggesting that faster internet enhances resiliency during a health crisis.** Internet speed played a role in the adherence of Colombians to movement restrictions imposed by the government to contain the spread of COVID-19. A study conducted by the World Bank and the University of Greenwich for the purposes of this report found that users with a faster internet connection moved location less during the lockdown compared to the rest of the population, after controlling for income factors.<sup>73</sup> Better internet connectivity is therefore linked to higher compliance with restriction measures that were key to limiting exposure to COVID-19 and consequently the number of infections and deaths (see [Annex 3](#) for details).

**Regulatory environment, sector governance, and policy**

In 2007, Colombia emerged as a regional and global regulatory framework leader, but currently, the country’s regulatory mandate and regulatory regime are two areas identified by the International Telecommunication Union (ITU) as lagging most. In 2007 when the ITU first introduced its regulatory tracker,<sup>74</sup> Colombia scored well above regional benchmarks and was very close to the OECD average. Starting in 2009, however, Colombia’s score stabilized while other countries, such as Chile and Mexico, continued to make advances (Figure 2.22). The result of this divergence was that by 2016, Colombia was well below both the OECD average and some of the regional benchmarks. Today, the ITU recognizes the regulatory mandate and regime as two

areas that require the most improvement. With regard to the regulatory regime, it would be useful to enforce the regulatory measures already in place (such as infrastructure sharing) and promote pro-competitive policies (e.g., number portability, unbundled access, and spectrum trading). In the area of the regulatory mandate, there is a need to strengthen enforcement.<sup>75</sup>

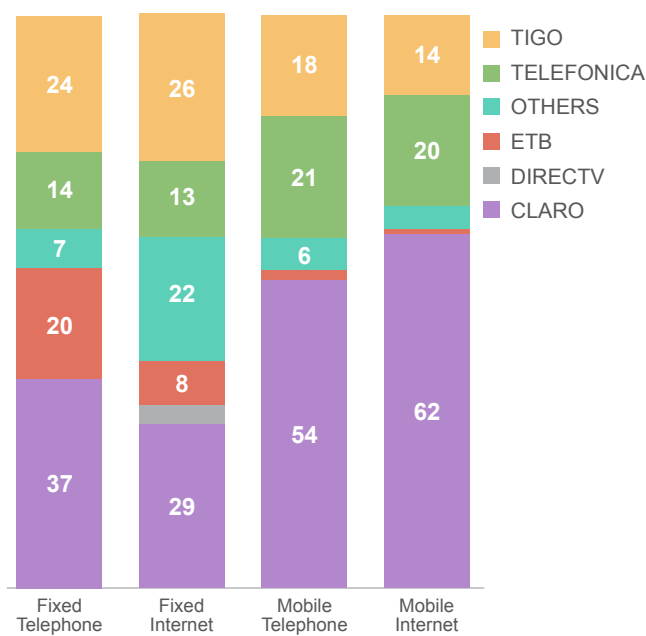
**Figure 2.22. ITU Regulatory Tracker Overall Score**



Source: Authors elaboration based on data from ITU’s “ICT Regulatory Tracker,” <https://app.gen5.digital/tracker/metrics>

**Many telecommunications markets in Colombia remain highly concentrated.** The fixed telephone, mobile telephony, and mobile internet segments in Colombia are populated by a limited number of players with large market shares (Figure 2.23) with Claro the largest in every segment (e.g., revenue market shares of 36.5 percent in fixed telephony, 28.7 percent in fixed broadband, 62 percent in mobile broadband, and 53.8 percent in mobile telephony). Some of these figures are at or are well beyond the 40 percent threshold above which firms may be considered to be dominant.<sup>76</sup>

**Figure 2.23. Market Shares by Revenue**



Source: MinTIC (2020c).

**Colombia is embracing a “light touch” regulatory approach toward market power but may consider doing more to safeguard and promote efficient competition.** Although the presence of dominance by itself does not imply anticompetitive behavior, over time it often leads to worsening market outcomes, especially for end users, that manifest in lower quality and less affordable services, both of which have been observed in Colombia. Despite concentrated markets for many years, Colombia has adopted a “light touch” regulatory approach that imposes relatively few obligations on all operators, including with respect to certain forms of support infrastructure sharing, like ducts and poles.<sup>77</sup> Its regulation of the mobile market did not yield results either as markets continue to be concentrated (see endnote for more information).<sup>78</sup> The experience of OECD countries shows

that to promote and safeguard efficient competition, targeted *ex ante* obligations in justified circumstances may prove to be efficient.<sup>79</sup> Annex 2 provides more detail on the status of *ex ante* regulation in the Colombian telecommunications markets.

**Colombia has well-established sector governance involving a full spectrum of public institutions to set and execute sectoral policies, with MinTIC<sup>80</sup> playing a key role and having a broad mandate to oversee the implementation of policies on ICTs.** The legislative framework in the telecommunications sector is based on Presidential Decree 1900 of 1990<sup>81</sup> and Law 142 of 1994, which created the Telecommunications Regulation Commission (*Comisión de Regulación de las Telecomunicaciones* [CRT]), which is currently the Communications Regulatory Commission (*Comisión de Regulación de Comunicaciones* [CRC]). The legislative framework was subsequently overhauled by Law 1341 of 2009, which revised responsibilities between the Ministry and the CRC,<sup>82</sup> and most recently by Law 1978 of 2019, which further revised institutional arrangements and the distribution of competencies.<sup>83</sup> Law 2108 of 2021 has also generated normative and legal changes with sectoral impact, as it establishes the internet as an essential public telecommunications service. The flagship MinTIC policy document is the national four-year ICT plan. The current “El Futuro Digital es de Todos”<sup>84</sup> expired in August 2022 (at the end of the past presidential administration). Likewise, given the expiration of the PND 2018-2022, the new PND 2022-2026 was approved by the President in May 2023. The National Directorate of Taxes and Customs (DIAN) is responsible for coordinating specific and broader fiscal policies applied to the digital sector. For example, the telecommunications sector is subject to the general value added tax (VAT) of 19 percent, as well as an extra 4 percent applied to mobile data and voice services. An import duty of 5 percent in addition to the VAT is applied to phones with a value higher than COP 753,720 (USD 190.90),<sup>85</sup> creating an extra burden on mobile consumers. On the other hand, MinTIC leads all the compensation revenue that come from the ISP and mobile operators as well as the payment for spectrum. Other specific sector fees include the financing of the Single Fund for Information and Communications Technologies (*Fondo Único de Tecnologías de la Información y las Comunicaciones* [FUTIC]) and CRC, as well as other discretionary municipal fees. The relatively high fiscal burden on the telecommunications sector may negatively impact the country’s digital development, and its revision could potentially unlock some private infrastructure investment.

**Competition matters in the digital economy sectors are under the jurisdiction of the CRC and the national competition authority, the Superintendency of Industry and Commerce (Superintendencia de Industria y Comercio [SIC]),<sup>86</sup> while the ANE is an independent spectrum management authority.** The independence of the CRC and of spectrum fees is an area that calls for some improvement. The CRC maintains responsibility for identifying the relevant markets, designating those that warrant *ex ante* obligations, and imposing such obligations on designated dominant operators. Under the current CRC governance structure, its decision-making process is executed by five designated Commission members, one of which is the Minister of TIC, which weakens the CRC's regulatory independence from the policy maker. The SIC was established as a competition agency in 1976. Law 1341 of 2009 sets out the distribution of competition responsibilities in the digital sector. The SIC is responsible for traditional *ex post* competition analysis and enforcement (e.g., abuse of dominance, etc.), as well as merger control. The ANE was created in 2009 as an independent spectrum management authority whose mandate is to assist MinTIC in the design of policies and plans related to spectrum.<sup>87</sup> According to GSMA, spectrum prices in Colombia are above the average, potentially representing an obstacle to private sector investment in the sector. In this regard, there is space to improve spectrum management through spectrum assignments that are tied to coverage and investment requirements, rather than maximizing spectrum fees (one time or annual).

**FUTIC, Colombia's universal service/development fund, is one of the largest in the world and could strengthen its assistance to improve affordability for all low-income households.** FUTIC revenues are mainly based on an annual sector contribution that has varied over the past two years between 1.9 and 2.2 percent of gross revenues and annual spectrum-related fees. It is appointed to MinTIC but has a separate legal status, and its revenues are earmarked and hence administered separately from general government funds.

FUTIC has had annual revenues in excess of US\$300 million at least since 2016<sup>88</sup> and is expecting expenditures of US\$365 million for 2022.<sup>89</sup> Hogares Conectados (Connected Homes) is a high-profile FUTIC program that finances internet service providers (ISPs) to provide subsidized "social tariffs" for a basic fixed broadband service plan for unconnected strata 1 and 2 households for a limited duration of time.<sup>90</sup> By the end of 2021, this program had connected about 346,000 households, with a medium-term total goal of 500,000<sup>92</sup> households. Colombia may wish to consider reviewing the eligibility criteria to include all strata 1 and 2 households (rather than just the unconnected) and extending the duration of the subsidy beyond the current 30–42 months to prevent low-income households from disconnecting after being required to pay the higher market price.

**The incoming administration has an opportunity to establish a fresh dynamic policy and regulatory agenda for the next planning period while building on Colombia's inherent strengths and achievements to date.** Its core objective could be to promote equitable access to digital development for all Colombians by reducing all forms of digital divides based on socioeconomic status and geography. This objective could be achieved by (a) maximizing private and, as needed, public investments in backbone, IXP, and access infrastructure, (b) strengthening the competitive environment and safeguarding it through more dynamic *ex ante* regulation and effective enforcement, and (c) ensuring the efficient distribution of spectrum resources, such as the 3.5 GHz band, with the objective of maximizing coverage and investment. While seeking those objectives, Colombia could build on its strong sector governance and regulatory capacity, favorable geographic location with extensive international interconnectivity, and growing data and cloud infrastructure market, which can significantly increase demand for high-speed broadband services through the opportunity to access cloud and data infrastructure services to all segments of the market: government, businesses, and citizens (see [Table 2.4](#)).

**Table 2.4. Key Digital Infrastructure Challenges and Opportunities**

| Strengths  | Areas for Improvement  |
|--|--|
| <ul style="list-style-type: none"> <li>» Developed regulatory framework</li> <li>» Developed sector governance</li> <li>» Growing cloud and data infrastructure market</li> <li>» Strategic geographic location and access to robust international interconnectivity</li> </ul>  | <ul style="list-style-type: none"> <li>» Expanding the reach of the Universal Service Fund to improve affordability</li> <li>» Decreasing the fiscal burden of the telecom sector</li> <li>» Improving the independence of the CRC and enforcement of regulatory decisions</li> <li>» Strengthening ex ante regulation to improve the competitive environment in some market segments such as mobile</li> <li>» Expanding broadband and IXP infrastructure</li> <li>» Expanding the density of mobile towers and footprint of the fixed broadband access network</li> <li>» Assigning 5G spectrum</li> </ul> |
| Opportunities  | Threats  |
| <ul style="list-style-type: none"> <li>» Becoming a regional hub for cloud and data infrastructure services</li> <li>» Achieving equitable access to high-speed broadband infrastructure</li> <li>» Developing DFS and data-intensive business models</li> <li>» Increasing the small but growing contribution of the ICT sector to GDP</li> </ul> | <ul style="list-style-type: none"> <li>» Large territorial inequality in the provision of and access to infrastructure and services (including digital) impacts the digital uptake of remote and vulnerable communities.</li> <li>» Affordability of mobile and fixed connectivity limits the digital uptake of the lowest income segments.</li> <li>» There are limited private sector investments compared to peers.</li> </ul>  |

### 2.3 Recommendations and next steps

**Colombia has a very solid base on which to build a world class digital infrastructure consistent with OECD countries.** Indeed, such fixed and mobile infrastructure is already available to middle- and high-income households in urban areas at regionally comparable prices. The challenge is to design and implement policies that will promote investment to expand the benefits of high-quality and affordable digital infrastructure to as many Colombians as possible, including those that reside in rural areas, while ensuring that there are sufficient public resources to provide ongoing affordability to Colombia’s many low-income households.

**The current deployment of fixed and mobile infrastructure represents an obstacle to universal access to and usage of the internet.** Further expansion of high-quality last-mile infrastructure to reach unserved

and underserved areas is key to ensuring that all Colombians are fully able to access all the benefits of the digital economy. One way to promote private investment in the mobile segment is for Colombia to release mobile spectrum in the 3.5 GHz band to promote 5G deployment. Where private investment is unlikely, some form of public investment via FUTIC or other public initiatives should be considered.

**In spite of liberalizing entry into fixed and mobile markets, including via mobile virtual network operators (MVNOs), telecommunications markets remain highly concentrated.** To increase the intensity of competition, in addition to relying on additional facilities-based entry to provide new competitive pressure, Colombia should also ensure that dominant operators are appropriately regulated, including with respect to competitive bottlenecks, so that new service-based competition may also flourish.

**Affordability of data packages continues to be an obstacle to connectivity for low-income households.** Colombia should consider expanding the eligibility, scope, and duration of its Social Tariffs program

to provide ongoing financing to ISPs so that they can offer basic internet packages to designated low-income households at below-market prices.

**Table 2.5. Digital Infrastructure: Policy Recommendations**

| Reform Area             | Recommendation   | Responsible Entity                   | Timing             | Legal Change Required?  |
|-------------------------|--|--------------------------------------|--------------------|-------------------------|
| Regulatory actions      | Undertake regular relevant market assessments to identify the dominant operators and impose appropriate ex ante obligations to promote and safeguard competition. <b>PRIORITY.</b> | CRC                                  | Short term         | No                      |
|                         | Release spectrum in the 3.5 GHz band to foster 5G development. <b>PRIORITY.</b>  | ANE                                  | Short/ Medium term | Yes                     |
|                         | Foster private investments through tailored policies.  | MinTIC, CRC                          | Short/ Medium term | No                      |
|                         | Revise the tax on the import of smartphones based on a cost-benefit analysis.  | National Tax and Customs Directorate | Short term         | Decree Number-2153/2016 |
|                         | Review spectrum fees to incentivize a more efficient allocation.   | ANE                                  | Short term         | No                      |
|                         | Review the eligibility, duration, and scope of the Social Tariffs program to further promote internet affordability for low-income households. <b>PRIORITY.</b>                    | FUTIC                                | Short term         | No                      |
| Domestic infrastructure | Promote the establishment of well-functioning internet exchange points (IXPs).   | MinTIC, CRC                          | Short term         | No                      |
|                         | Improve mobile and fixed infrastructure coverage in unserved areas. <b>PRIORITY.</b>   | MinTIC, CRC, FUTIC                   | Short term         | No                      |
|                         | Convert diesel generators into renewable options for the off-grid mobile towers.   | MinTIC, CRC                          | Short/ Medium Term | No                      |

# 3. DIGITAL PUBLIC PLATFORMS



## KEY MESSAGES

- » **The GoC has made substantial progress on its digital transformation and the development of the underlying institutional framework.** Colombia has a consolidated digital government strategy and is implementing a building blocks approach to the delivery of digital public services and the construction of digital public platforms.
- » **Currently, the government is implementing multiple key initiatives for the development and efficient provision of digital services.** Among these initiatives are the strengthening of government back-office systems, the implementation of an interoperability platform, and the development of digital authentication services.
- » **Further coordination efforts between key stakeholders are needed.** The nature of digital government implies the integration and collaboration of all the stakeholders in a whole-of-government approach. Exploring a federated coordination scheme and strengthening the role of the sector chief information officers could help to bolster the alignment of efforts.
- » **The development of the Digital Citizen File as a centralized hub to access government services shows substantial progress, but its rollout remains a critical challenge for the immediate future.**
- » **Although Colombia has made substantial efforts to strengthen core government management systems, further efforts are required to develop capacity at the subnational level.**
- » **Achieving the ambitious deadlines set by the normative framework to fully digitalize services will require strengthening the capacity of both the National Digital Agency and the sectors involved in the provision of services.**

### 3.1. The importance of digital public platforms

Digital platforms are electronic tools designed to exchange goods, services, or information between producers and users. In a nutshell, they facilitate the flow of information and transactions to enable producers and users to create value by interacting with each other. Digital platforms can be public or private, such as, for

example, social networks and online marketplaces. This chapter is focused on digital public platforms.

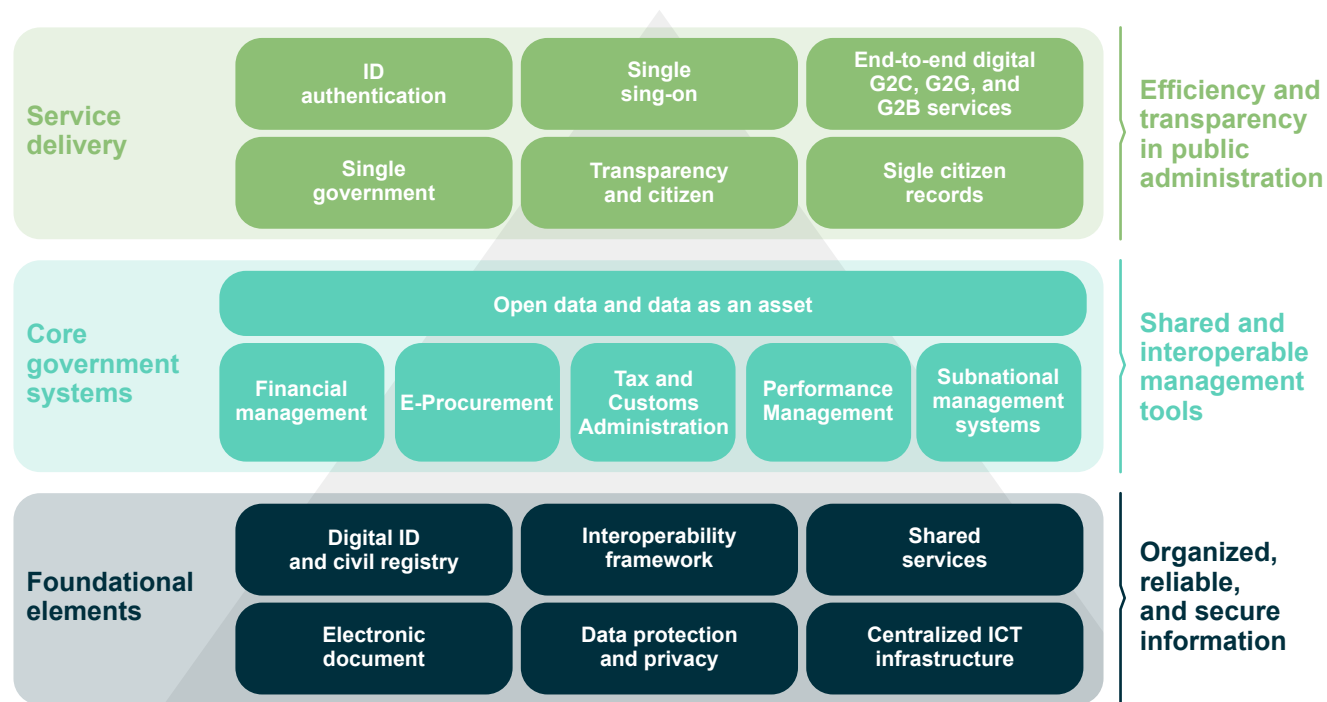
**Digital public platforms can increase operational and economic efficiency, improve service delivery, and facilitate innovation and economic development.** The development of digital platforms is an important lever for the digital transformation of the whole economy. They have the power to transform the way governments interact with citizens and businesses and to optimize public

value by reducing costs and improving productivity. They also enable new service delivery models and improve the management of public resources while providing timely information for the design and implementation of public policies. Governments operate digital public platforms to offer a diverse range of services, such as issuing birth certificates, renewing a driver's license, and paying taxes online, among others. In a nutshell, digital platforms connect people and public institutions virtually and have the power to improve lives by enhancing the operational efficiency and service delivery of government institutions.

**Digital public platforms help governments to fulfill their core functions and deliver effective services, which has become even more important in the context of recent global shocks.** Digital public platforms proved to be critical during the COVID-19 pandemic, as they enabled governments to quickly coordinate health care and emergency responses. They also enabled governments to ensure continuity and retain a minimum functioning level of key management systems, reduce disruptions to schools and universities, and provide a channel for safe social interaction by allowing citizens to access resources, information, and services without leaving their homes.

**Governments can boost digital public platforms by digitalizing their own operations and procedures.** Digital public platforms entail the operation of a set of foundational elements, including shared ICT infrastructure, such as a government cloud, an interoperability framework, application programming interface (API), digital ID, and a regulatory framework for data protection. A second layer is comprised of core cross-cutting back-office government management systems, such as public financial management information systems, human resource management e-procurement systems, and others. These systems produce information that can be used to generate public value and improve strategic decision making within the government through open data. An additional third layer is focused on the delivery of services leveraging the automation and information processes generated by cross-cutting systems and foundational elements. This layer consists of such key features as the development of single citizen records, a single digital services portal, and the development of ID authentication services for public and private sector institutions.

**Figure 3.1. A Building Blocks Approach to Digital Public Platforms**



Source: World Bank (2021).

Note: G2C = government to citizen; G2G = government to government; and G2B = government to business.

**Digital public platforms are key to Colombia’s national digital strategy.** Colombia has an extensive regulatory framework<sup>93</sup> covering digital public platforms, including CONPES 3975,<sup>94</sup> which provides MinTIC with a mandate to develop a digital platform to ensure interoperability and enable the provision of digital government services, both within government agencies and for the 46 entities of the executive branch. However, this requires the development of key foundational elements, such as digital ID and digital ID authentication. In this context, the Digital Government Policy (Política de Gobierno Digital [PGD]),<sup>95</sup> regulated by Decree 767 from 2022, provides strategic guidelines and standards to operationalize the digital transformation with an objective that seeks to “*Positively impact the quality of life of citizens, and in general the inhabitants of the national territory and the competitiveness of the country, promoting the generation of public value through the digital transformation of the State, in a proactive, reliable, articulated and collaborative manner between interest groups and allow the fulfillment of the rights of users of cyberspace.*”<sup>96</sup> To achieve these goals, the PGD identifies four cross-cutting foundational enablers: (i) security and privacy, (ii) government architecture, (iii) citizen services, and (iv) culture and appropriation. All four are closely related to the development of digital public platforms and make possible the development of digital authentication services as well as the rollout of an interoperability framework as key foundational elements. These elements would enable persons to validate their identity in relation to government and private sector institutions and allow the secure exchange of data with the person’s consent.

**One of the main initiatives led by MinTIC that illustrates the vision of the Colombian government regarding digital public platforms is the conceptualization of Digital Citizen Services (Servicios Digitales Ciudadanos [SDC]), with a “building blocks” approach.** Although SDC were envisioned by the Vive Digital II plan in 2014, the National Digital Agency (Agencia Nacional Digital [AND]) was established in 2017 to operationalize them. Overall, the SDC approach is based on three main pillars or services:

- » **Interoperability:** a secure, controlled, and governable information exchange tool.
- » **Digital Authentication:** a single authentication service for citizens and companies that allows them to access state services and procedures in a safe and reliable way.

- » **Digital Citizen File (Carpeta Ciudadana Digital [CCD]):** a way to offer unique digital access to consult and update the information stored in the public administration.

**The World Bank team assessed the maturity of Colombia’s digital public platforms using a customized approach.** The diagnostic was informed primarily by data collected through desk research, deep dive interviews with stakeholders, and existing analytical work. The analysis was focused on key enablers and constraints to the development of digital public platforms on six dimensions: (i) governance and institutions; (ii) identification and trust services; (iii) government back-office systems; (iv) government service delivery platform; (v) transparency and public engagement; and (vi) data as an asset.

### 3.2. Current state of digital public platforms

**The Colombian government has made substantial progress on its digital transformation and is among the most advanced countries in digital government in the region.** Colombia is in Group A<sup>98</sup> of the 2020 GovTech Maturity Index (GTMI) developed by the World Bank Group.<sup>99</sup> Colombia has also made progress as measured by the 2020 UN e-Government Development Index. However, although the country is well above the regional average, it lags behind other OECD countries.<sup>100</sup>

**Digital transformation is a complex and multidimensional process that often requires legal, institutional, technological, and cultural changes across government and across the wider digital ecosystems.** Making the necessary reforms and implementing concrete actions to drive digital transformation in a timely and effective manner entails high-level political commitment, a clear transversal mandate, and the development of technical capabilities and human resources to support diverse, multidisciplinary digital teams. The successful implementation of digital transformation policy begins with clear leadership and a vision of the desired outcomes and the potential policy pathways to achieve them.



**Figure 3.2. Digital Government is Correlated with Government Effectiveness**



Source: Authors' elaboration based on data from the World Bank (2023e); and the UN Online Service Index.

### Governance and institutions

**The governance and institutional framework for digital public platforms in Colombia is comprised of several agencies.** MinTIC is leading Colombia's digital transformation journey.<sup>101</sup> The Digital Government Directorate (Dirección de Gobierno Digital [DGD]) under MinTIC is responsible for developing the government's digital strategy and providing strategic guidance. Some of the DGD's core functions include:

- » Analyzing and proposing IT guidelines for the secure management of public information
- » Establishing and coordinating the implementation of IT procurement strategies that are effective and take advantage of economies of scale
- » Defining technical standards for the management of shared infrastructure and services that ensure the interoperability of government systems
- » Formulating and recommending standards and architecture frameworks for government that promote the interoperability of systems

- » Formulating policies, guidelines, and strategies for online government that promote efficient service delivery
- » Promoting cooperation with local governments

**The AND, on the other hand, is a decentralized entity under MinTIC whose main role is to operationalize the strategic approach provided by the national PGD and AND guidelines.** To achieve this, the AND promotes and articulates the development and delivery of digital services, including the rollout of the interoperability platform, single citizen file, and digital ID authentication. In this context, the AND provides support to government agencies in developing digital services on a case-by-case basis following the guidelines from MinTIC. To this end, the AND has developed an SDC model<sup>102</sup> that provides flexible hands-on support in digitalizing public services. Overall, the AND seeks to: (i) articulate SDC; (ii) develop STI initiatives aimed at creating an STI ecosystem; and (iii) develop plans and identify solutions for public sector challenges, leveraging open software and data analytics whenever possible.

**FUTIC is mapped under MinTIC, but with administrative and financial autonomy and its own assets.** Its representation, management, and administration are the responsibility of the Minister of TIC, who is its director and is empowered to delegate its functions. FUTIC is financed by telecom operators, and the funds are used to

increase connectivity and finance ICT projects, primarily in rural and underserved areas.

**Although the current institutional framework led by MinTIC through the DGD has been effective in implementing the digital government strategy, there is a need to strengthen the AND.** The DGD has made efforts to issue policy guidelines and standards and to directly implement the PGD instead of coordinating its deployment with other public institutions. This poses a challenge in terms of resources available at the DGD, as it requires a substantial degree of coordination and collaborative effort between the various institutions at both the central and subnational levels. Currently, under the guidance of MinTIC, the AND provides support to digitize public services through a team of experts in the field assigned to specific projects; however, the agency lacks the resources to fulfill its purpose in terms of implementing SDC and expanding its coverage nationwide. Projects that will allow access to SDC, such as the digital ID developed by the National ID and Civil Registry Agency (Registraduría Nacional del Estado Civil [RNEC]) focused on developing a digital ID authentication mechanism for persons, could also benefit from the strengthening of organizations such as the AND, as the widespread use of digital ID would be promoted through the mass use of SDC.

**The PGD has been a fundamental tool for the digital transformation in Colombia.** It provides the government with standards and guidelines to move forward and steer the modernization and digitization processes. The last update of this policy from May 2022 set as a key objective the improvement of interaction between the state and citizens. Its structure includes two transversal elements, 12 principles, four enablers, two lines of action, and guidelines, guides, and standards (extensive documentation). However, all of these elements result in a scheme that is complex for organizations to implement, particularly for subnational governments that often need strong support, given the disparities with the central government in terms of budget and human resource skills in the digital realm. The implementation of this policy is measured through an annual evaluation mechanism carried out by the Administrative Department of the Civil Service, which includes another 15 government policies, but the periodicity of the evaluation and its lack of strategic focus make the measurement insufficient for timely decision making.

## Identification

**The RNEC is the government agency tasked with the identification of persons. Although it has made efforts to digitalize the notary registry process, many registration procedures are still carried out in paper format.** The registry is based on the issuance of birth certificates by the network of RNEC offices and notaries nationwide in coordination with health centers. Currently the RNEC is working to provide digital services to obtain copies of life event certificates. Approximately 180 notary offices operate with the Digital Notary system, which requires the biometric enrollment of the person to be able to access remote notary services. The shift to the Digital Notary also requires that the notary have a digital signature granted by a certifying agency. With regard to the registry of births at health centers, approximately 94 percent operate online with the Civil Registry Information System (Sistema de Información del Registro Civil [SIRC]), which is a web-based application that enables the capture of information and the authentication of the parents' IDs with the main RNEC database at the National ID Archive. If the registry is performed through SIRC, the data are automatically stored in the RNEC database.

**The RNEC is taking steps to develop a digital ID and undertaking a process to strengthen both the ID and civil registry systems.** All persons over seven years old are required to obtain an ID card, followed by a citizenship card when reaching 18. The latter is a prerequisite to accessing most public and private services, such as opening a bank account or obtaining a SIM card. The current process to acquire a citizenship card involves a mix of manual and digital procedures. Out of the 1,176 registry offices, only 574 have integrated service stations that enable the capture of both biometric and biographic data. In the remaining offices, the registry process of fingerprinting is carried out manually with ink, and persons need to provide a photo that is compliant with the International Civil Aviation Organization standards. The RNEC procured an automated fingerprint identification system in 2005 and shifted to an automated biometric identification system in 2018 to strengthen the authentication infrastructure.

**The digital citizenship ID card was introduced in 2017 as part of a wider government movement toward digital services.** As per Decree No. 1413 of 2017, the digital citizenship ID card is to have the same legal validity as the physical citizenship card issued by the RNEC. The digital citizenship card is also being developed by the RNEC, which is working to advance digital ID authentication mechanisms. However, the digital

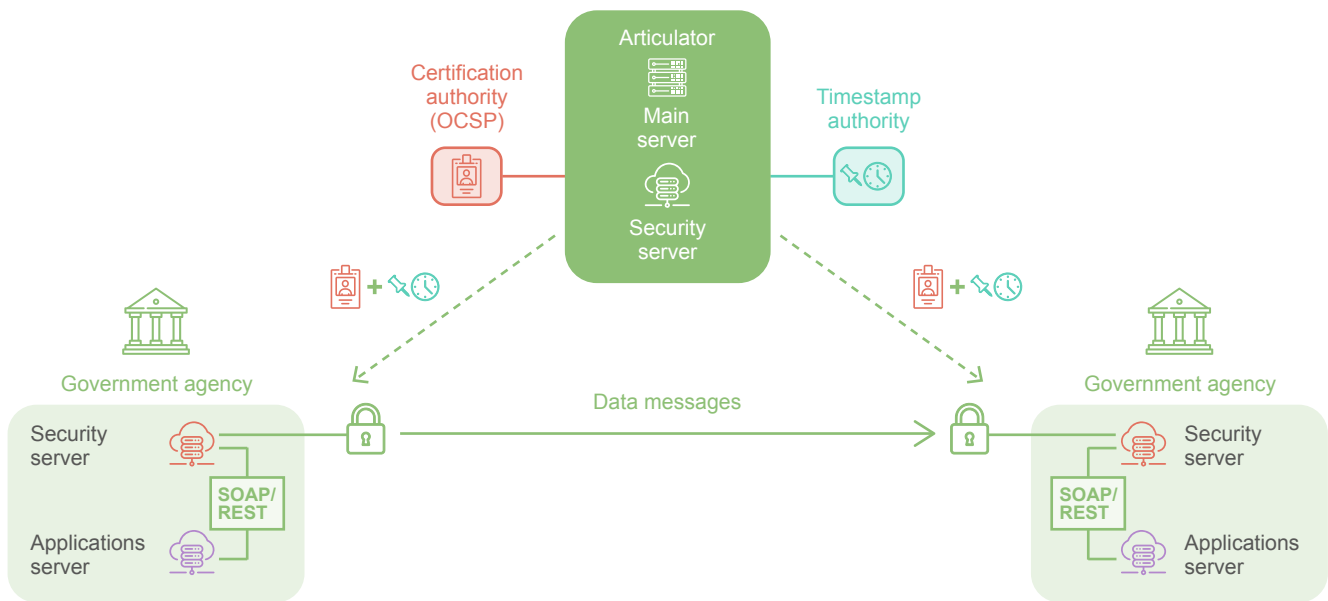
citizenship card's rollout and uptake have been limited. Since 2020, the RNEC has been working to strengthen the existing platform to issue a digital citizenship card through a mobile application with a defined set of scalability, integration, communication, and security requirements. A key feature is the control that individuals would have to manage the use of their digital citizenship card data. In parallel, the RNEC is looking to broaden a facial ID authentication service for nongovernmental institutions. The digital citizenship card can be downloaded and stored in a mobile phone with the RNEC application. Despite the announcement that the old citizenship card will no longer be issued, a key challenge for the new digital citizenship card is the implementation of communication campaigns to ensure that people know about it, its characteristics, and its potential uses, such as for accessing the CCD and opening a bank account. The CCD is a key mass use case for the digital citizenship card, and delays in the addition of entities to the CCD may also limit the use of the digital citizenship card.

### Interoperability framework

**The interoperability framework is critical to ensuring the flow of information between government systems, both for decision making and service delivery.** In Colombia, the interoperability platform is provided as a service by the AND, and government institutions that provide services can connect to this platform provided they comply with the requirements and standards issued by MinTIC.

**Colombia has adopted X-Road as the government interoperability platform, which provides the versatility needed to adapt to existing technological solutions, but its uptake has been limited.** X-Road is an open software interoperability platform developed by the Estonian government that has been implemented in Colombia since 2020. The decentralized X-Road architecture provides the versatility to adapt to the different technological solutions used by government institutions as it does not require a specific technology to operate and requires only the use of a security server to consult or transfer data between government institutions in an encrypted way. From a security point of view, it ensures that both the data provider and data consumer are always precisely known. This allows the person to know which

**Figure 3.3. The Colombian Interoperability Framework**



Source: MinTIC (2022a).

entities have and can access his or her information. The use of a digital signature and timestamps has further increased security. However, currently only 64 share information on X-Road.<sup>104</sup>

## Core government systems

**Government back-office systems are a key element of digital public platforms.** Back-office systems are used to manage government operations, and although they are not directly seen by citizens, they ensure the upstream delivery of public services. Such systems comprise processes in key cross-cutting areas, including budget management, accounting, customs, revenue administration, asset management, procurement, and payroll management, among others. The digitalization of government systems has played a key role in the initial stages of the digital transformation journey of many countries.

**The GoC has made substantial investments in the development of cross-cutting management systems, but there is room to strengthen the interoperability between back-office systems to increase efficiency.**

After going through several iterations, the different government entities at the national level have built a robust and comprehensive public management ecosystem that includes government-wide applications, such as the financial management system (SIIF-Nación), the human resource system (SIGEP), the procurement management platform (SECOP), the revenue management platform (MUISCA), and an investment management suite of applications operated by the DNP. At the sector level, most of the line ministries own and operate back-office systems that help them automate their day-to-day operations and record administrative data. However, the dissemination of tools has led to fragmentation and limited system interoperability to facilitate the flow of data. Data generated by these systems often reside in silos on ministerial databases with limited interoperation, which contributes to the data's underutilization.

**There are also regional disparities in the scope and comprehensiveness of core government systems at the subnational level.** For example, major urban centers, such as the cities of Bogotá or Medellín, have deployed robust commercial off-the-shelf systems to manage internal operations and support decision making. However, small rural municipalities and departments are still in the process of digitalizing such core functions as budgeting, accounting systems, and human resource

management. Although line ministries at the national level have made efforts to provide subnational entities with solutions for managing and reporting to the central government, their reach and uptake have not been widespread due to a combination of high staff turnover and limited coordination. Nevertheless, there are ongoing initiatives to streamline the support provided to subnational governments, such as the DNP's portfolio of management applications to facilitate smaller governments' reporting and decision making. The DNP's approach consists of the development of management tools and the provision of key public management modules, such as financial and revenue management, for beneficiary municipalities as a cloud-based service to subnational governments. This approach enables small local governments to access a robust and comprehensive IT platform without the need for substantial investments in hardware or software, thus generating savings and efficiency gains while at the same time facilitating the flow of information for monitoring and decision-making purposes.

## Government service delivery platform

**Service delivery platforms (SDPs) provide a standardized technology framework upon which to deploy digital public services.** An SDP is a set of components that provides a service(s) delivery architecture (such as service creation, session control, and protocols) for a type of service delivered to the consumer—whether a customer or other system. SDPs often require the integration of IT capabilities and the creation of services that cross technology and network boundaries. They typically provide environments for service control, creation, orchestration, and execution and monitoring.

**The government has made considerable progress in the provision of shared technology infrastructure and government to government services.** MinTIC has set up a government-wide enterprise architecture reference framework as well as an interoperability framework. Similarly, it has also issued guidelines for the adoption of cloud computing and the creation of a CCD. In parallel, the government has developed several data-driven initiatives, including the free data and software initiative, which provides public entities with cloud infrastructure where they can pilot big data projects and promote the use of open-source software throughout the public sector. These and other initiatives point to the adoption of a whole-of-government approach that the government is trying to expand to all sectors and levels.

**The CCD, launched in June 2021 and managed by the AND, is a centralized hub where citizens can access government services.** It is not a document repository but rather a space that enables persons to authenticate themselves and access digital public services and government agencies to access the personal data required to initiate administrative procedures (trámites) and deliver public services through interoperability. A key benefit of the CCD is the provision of a single user ID and password to access processes and services from the government. The responsibility for service delivery lies with each respective agency, but the users can access the service entirely from the CCD. Currently, 50 processes and services from 33 government institutions are available through the CCD. Some of these services are fully integrated into it, such as the copy of the Single Tax Registry certificate, which allows citizens to carry out their trámite from their account without having to go to the institution's website. In other cases, once the person has authenticated him or herself, the CCD platform provides links to direct the user to the website of the institution providing the desired service. However, both the information provided in the CCD platform and the processing of each service, including its digitalization, are the responsibility of the government institution in charge of providing said service rather than the AND. Between February and March 2022 there was a substantial increase in the uptake of the CCD according to AND data, which showed an increase from 180,000 to 980,000 users.

**The data are exchanged through the interoperability framework.** The CCD also allows the user to view the result of the requested service and to browse his/her "service history," making it possible, for example, to view the accessed services and download the certificates.<sup>105</sup> However, some of the digital services currently available reproduce analog processes. This poses a challenge in terms of efficiency, as the workflow of services could potentially contain redundant steps that could be redesigned or simplified to save both time and resources. In this context, it is key to strengthen the AND and implement a strategy to rapidly spread the use of the CCD. As per Decree No. 2106 from 2019,<sup>106</sup> no additional inter-administrative agreements between the AND and service providing agencies are required. In this context, rolling out the CCD on high-impact services is a fundamental challenge.

**Although the CCD as a centralized hub to access government services is an important milestone, further efforts are required to meet the deadlines set by the regulatory framework to fully digitalize public services.** The government has been working on the delivery of services through digital channels since 1995, with a strategy on the rationalization of trámites that

resulted in a solid catalog of services and clear regulations and procedures to identify, modify, and create new services. Nevertheless, according to a 2022 report<sup>107</sup> from the Administrative Department of the Civil Service (*Departamento Administrativo de la Función Pública* [DAFP]), 1,952 out of 2,900 trámites must undergo a rationalization. Although since 2000 this rationalization has been accompanied by the digitization of procedures, Decree No. 088 of 2022 set a deadline of 2026 for central government public institutions to digitalize their trámites and 2037 at the subnational level. This requires developing an aggressive digitalization strategy, especially at the subnational level.

### Transparency and public engagement

**Colombia has made free, facilitated access to government data part of its policy, albeit with some restrictions.** Decree No. 1712 issued in 2014 establishes that public or private entities that use public funds must make data available to citizens free and without restrictions. The released data must be timely, complete at a detailed level, obtained at source, machine readable, and free of any license requirements. In addition, the government has created an open data platform ([datosabiertos.gov.co](https://datosabiertos.gov.co)) as a central hub for publishing data from all public entities. Although most government entities publish datasets in the open data platform, and Colombia operates under the principle of openness by default, this does not mean that data management processes are designed to facilitate data sharing, especially between government institutions. Many still work in silos, and interoperation between systems is at a very early stage.

**The Colombian government has established a Transparency and Anti-Corruption Observatory.** The Observatory<sup>108</sup> was originally designed and launched by the Office of the Inspector General of Colombia in 2012. The Observatory is a tool for promoting integrity in government and society, to include citizens and the private sector. Currently, the Observatory is organized as a task force of the Transparency Secretariat of the Office of the President to promote integrity in public administration and tasked with the design of tools to measure and analyze corruption, working closely with citizens, academia, and the public and private sectors. The Observatory has four broad action areas: 1) measure corruption, which includes the gathering, analysis, and visualization of indicators on transparency and corruption; 2) educate the public by developing tools to promote transparency; 3) innovate with the use of technology, data science, and interoperability to strengthen analytical capacity and

provide early warnings; and 4) facilitate a dialogue space between citizens, academia, and the public and private sectors on anticorruption.

**The government has made progress leveraging ICT technologies to promote citizen engagement, and government institutions are required to develop citizen participation in the same way.** An example of this is the *Cristal Urn* platform ([urnadecristal.gov.co](http://urnadecristal.gov.co)) launched in 2010, which integrates different digital media and promotes citizen participation. Citizens without access to the internet can also participate through SMS and a call center. Citizens can post questions and influence public policy directly through opinions and comments about programs. This initiative devotes a section to showing the results of all citizen participation exercises carried out on the platform.

### Data as an asset

**Data should be treated as a key strategic asset to generate public value.** When governments approach data as a strategic asset, it can open the door to generating value by leveraging new technologies. Reaching the point of maturity, where enterprise strategy and operations are data driven, can require a combination of phased actions. In the case of Colombia, the country's Digital Government Index (IGD)<sup>109</sup> shows an evolution in the use of data for decision-making, with an index increase from 54.8 in 2019 to 73.3 in 2021. The PNID is an important step in the right direction to improve data governance and management in Colombia, but working to overcome challenges and advance towards a more mature data management culture focused on generating public value is key. It is particularly important that the government purposefully shift away from managing siloed datasets and reach a point where data become a driver for innovation and growth by improving strategic decision-making capabilities and enabling data sharing between different digital government services—orchestrated as per life events. How fast the government can start reaping the benefits depends on key supporting elements, such as a strong technical foundation, a strengthened data governance framework, and the prioritization of life events and the data sharing associated with the user journey in each event, as well as privacy and data protection settings.

**The GoC already meets several of the requirements to create a data-driven public sector but faces challenges in terms of the implementation of the governance framework and capacity for the use of data within that sector.** PNID and Decree 1389 (2022) are key governance frameworks for data infrastructure. PNID aims to promote data culture in the country, administrative records management, and the master data's and reference data's definition. Decree 1389 (2022) is also an essential step, as it strengthens the country's data infrastructure governance by allowing the articulation of actors, instances, regulations, among others, to implement, and manage data infrastructure. In addition, the government has also established an IT management enterprise architecture and an interoperability framework for the public sector and data reuse guidelines for public entities. Most initiatives, albeit promising, remain limited and do not transcend sectoral barriers. This is related to limitations in the institutional culture and capacity to deliver digital services at the scale required by Decree 620 issued in 2020.<sup>110</sup> Establishing an adequate data management model by implementing and operationalizing the PNID framework, encouraging proactive data sharing, and fostering a culture of data-driven decision making across all public institutions will be a key challenge in upcoming years. This will require ongoing efforts to overcome existing barriers and ensure that the framework is effectively integrated into institutional practices and operations.

**Advanced data analytics would require greater data sharing between government entities.** New data sharing models are being developed with the PNID, like data commons, data trust and data marketplaces. However, past efforts to use data to improve operations and support decision making have followed a piecemeal approach by the line ministries. Although MinTIC has attempted to address this challenge by providing government entities with technology infrastructure to deploy big data and AI pilots through a data SandBox<sup>111</sup> scaling up this initiative and ensuring its sustainability require stronger data governance, identified key use cases empowered by AI using voice commands, machine learning, flexible microservice architecture, and more developed capacity in some line ministries.

### 3.3. Recommendations and next steps

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**The GoC can further strengthen its digital public platforms through targeted investments in key areas and institutional capacity building.** Colombia has made important progress in terms of digital government. The digital strategy under implementation and the PDG provide a solid overarching mandate to advance with the government's digital transformation. Nevertheless, the government could strengthen the foundations of digital public platforms through the implementation of targeted measures such as the streamlining of digital services.

**The recommendations outlined below could be implemented in a progressive manner with an immediate focus on strengthening governance and coordination mechanisms between the different stakeholders.** ICT technologies are a necessary but not a sufficient condition for the digital transformation. This also requires addressing the analog elements to enable the government to improve operating efficiency and produce value for citizens. In this context, the government should continue to refine the conducive legal and regulatory framework regarding data protection and privacy for public sector institutions.

**Strengthen coordination mechanisms.** The digital transformation of the government should not be the sole responsibility of MinTIC or DNP. The nature of digital government implies the integration and collaboration of all stakeholders in a whole-of-government approach. The government should establish coordination mechanisms within two levels, strategic and operational, to ensure the appropriate level of performance and consistent use of digital technologies across government. Countrywide strategic decisions should continue to be led by MinTIC and their implementation by the AND. However, at the operational level, the government needs to address implementation challenges and bottlenecks and engage all relevant stakeholders for specific ICT initiatives, for example, through a federated coordination scheme, strengthening the role of the sector chief information officer. By granting a leading role to the leaders of the different economic sectors, they can help align the entities with MinTIC's strategy as well mobilize the necessary operational resources to achieve the strategic goals.

**Strengthen the monitoring of the Digital Government Policy (PGD).** Given the importance of knowing the progress of the government's implementation efforts, it is advisable to have strategic measurement mechanisms to monitor key initiatives and related investments. Although there are tools, such as the Single Management Progress Report Form (Formulario Único Reporte de Avances de la Gestión [FURAG]), to measure the implementation of public policy, they could be strengthened through indicators focused on results. Systematically monitoring the results could also provide insights into adjusting the PGD to facilitate understanding from public entities and to develop tailored support tools.

**Design strategies to address regional disparities.** As mentioned earlier, there are significant regional differences in Colombia, including wide variations in the levels of resources and capacities for digital government. These disparities present a challenge to formulating and implementing a national digital government strategy. The government should define strategies to address regional disparities, for example, by:

- » Creating working groups in each region with representatives of the main stakeholders, including for example, the AND, local government, MinTIC, and the DNP, to identify their specific needs and priorities.
- » Expanding the support provided to subnational governments in certain areas, such as ICT procurement, knowledge and resource sharing, and digital skills development.
- » Having MinTIC complement its support mechanisms with incentives to ensure consistency in the approach and pace of the digital transformation across different regions, such as securing funding to develop local digital services in partnership with the DNP and AND, coupled with signing inter-administrative agreements to boost the uptake of the CCD.

**Table 3.1. Key Digital Public Platforms: Challenges and Opportunities**

| Strengths  | Areas for Improvement  |
|--|--|
| <ul style="list-style-type: none"> <li>» The PGD has established important guidelines and standards, and the current institutional framework has been effective in implementing the digital government strategy.</li> <li>» There is an interoperability framework in place that allows fluid interaction between the different actors, with proper security levels.</li> <li>» The government has invested heavily in developing cross-cutting management systems, while subnational governments have turned to off-the-shelf systems to manage internal operations and support decision making.</li> <li>» Data access is embedded in the government’s digital policy, and the PGD provides a framework for data management with a whole-of-government approach.</li> </ul>  | <ul style="list-style-type: none"> <li>» Coordination and collaboration between the various institutions at both the central and subnational levels are hindered by the lack of efficient mechanisms.</li> <li>» Although there has been progress in the introduction of the digital ID card, deliberate actions must be taken for its effective deployment. Specifically, the tool should be inclusive, be socially trusted for widespread use, and have proper infrastructure in place (including a sound digital service ecosystem and authentication platform).</li> <li>» Poor interoperability between cross-cutting management systems makes the flow of data difficult.</li> <li>» Disparities in the availability of management tools at the subnational level and the capacity to use these tools effectively may reinforce the digital divide.</li> <li>» Lack of communication between efforts to increase the use of service delivery platforms provided by the government has hindered their impact.</li> <li>» The inadequate data governance framework and limited capacity have reinforced data silos and restricted the effective use of data within the public sector.</li> </ul> |
| Opportunities  | Threats  |
| <ul style="list-style-type: none"> <li>» Review the role of the AND and strengthen its capacities accordingly.</li> <li>» Expand the CCD as a mass use case of the digital citizenship ID card.</li> <li>» Shift from traditional to digital notary services.</li> <li>» Use the growing need for data exchange in the provision of digital services to accelerate the enrollment of entities in the interoperability platform.</li> <li>» Expand the scope of initiatives, such as the DNP’s Territorial Management Model.</li> <li>» Roll out the CCD on high-impact services.</li> <li>» Develop a digitalization strategy at the subnational level.</li> <li>» Improve strategic decision-making capabilities, enabling data sharing between different digital government services.</li> <li>» Foster pilot projects through initiatives like the data SandBox from MinTIC to achieve a wider demonstration effect.</li> </ul> | <ul style="list-style-type: none"> <li>» It is critical to align the actors involved in the PGD.</li> <li>» The technology and skills necessary for data management by public entities are lacking.</li> <li>» A whole-of-government data use model is currently absent.</li> <li>» It is necessary to boost inter-institutional dynamics to articulate back-office systems to increase efficiency.</li> <li>» The limited technical capacities of subnational entities hold back their digital transformation.</li> <li>» The significant data silos across government entities could be limiting the potential social benefits of the digital government.</li> <li>» Most individuals and businesses do not engage with and take advantage of the data provided by the government. This limits the potential of data to drive innovation and productivity growth.</li> </ul>   |



**Increase the use of shared technology infrastructure.** Shared technology infrastructure covers both hardware and software. The adoption of shared technology infrastructure, ideally using cloud technologies, would contribute to reducing the costs of both ICT infrastructure and service provision and improving performance, as it would enable a cost-efficient expansion and greater interoperability between government systems using tools compliant with the data standards. Strategic areas where increasing the use of shared technology could yield considerable benefits are:

- » A whole-of-government approach to the management and purchase of ICT resources could be strengthened. Although Colombia has the regulatory framework in place to aggregate demand for hardware and software and achieve savings through framework agreements developed by the public procurement agency (*Colombia Compra Eficiente*), the use of these tools is not widespread. Also, although the absence of a government-wide ICT procurement strategy offers great flexibility for line ministries, it weakens their bargaining power in relation to suppliers, which disproportionately affects smaller ministries with low capacity.
- » The management systems of subnational governments, as mentioned above, have considerable differences in terms of scope and quality. The national government could help reduce the capacity gap among subnational governments by providing shared technology infrastructure for core back-office systems, such as financial, human resource, investment, and revenue management systems. Ideally this should be done by leveraging cloud technologies in collaboration with the private sector so that regional ICT ecosystems can emerge.
- » The use of disruptive technologies should be promoted. Disruptive technologies, such as AI, machine learning, blockchain, and big data, among others, can greatly improve core government operations and online service delivery. However, for medium and small government entities, the cost and capacity challenges in adopting them are high. Efforts to foster data sharing could go hand in hand with the promotion of the use of data on the part of institutions through

visualizations, analysis of data, and capacity building in the use of disruptive technologies. A potential solution that could be leveraged is the approach taken by the DNP to provide management tools to small municipalities through the implementation of a territorial management model. That model includes the development of financial and revenue management modules as a cloud-based service, complemented by hands-on technical support to operate the tools and use the DNP's toolkits, which contain guidance, for example, on how to formulate land-use plans or link the development plans to the budget.

**Increase interoperability between core government systems.** Interoperability, together with digital authentication and the availability of digital services, is foundational to the development of digital public platforms. The GoC has made considerable progress in setting up the regulatory framework and supplying the technologies to facilitate interoperability between government institutions. However, adoption has been slow due to varied reasons, including technical factors and a learning curve in the uptake of the selected technology (X-Road). To further promote interoperability, successfully implementing and operationalizing the PNID will be key.

**Strengthen mechanisms for citizen collaboration through a citizen-driven approach.** Citizen engagement should be further promoted to strengthen accountability and generate public value. Some key initiatives could include:

- » Intensifying collaboration with the private sector, academia, and civil society organizations to increase the re-use of open data and to help build solutions for vulnerable groups
- » Strengthening the measurement and evaluation of digital citizen engagement
- » Working with academia and civil society to foster the co-creation of digital solutions

**The government should develop a data architecture framework that defines the decision rights and accountabilities needed to manage data as a strategic government asset.** The framework should specify the roles, processes, and information technologies required to create a consistent and proper handling of data across the whole of government. Colombian public institutions do not share data in a proactive fashion, and current data governance arrangements do not encourage them to do so, meaning that opportunities to create value remain low, and most institutions report that they exchange data based on individual requests. Establishing inter-institutional data exchange agreements (government to government) is complicated; furthermore, inefficiencies emerge on implementing said agreements because the same data can be requested twice if not up to date at the moment of use by the requesting institution. Developing a governance framework of the data value chain (from

collection to processing, sharing, and re-using) within the public sector is crucial for capitalizing on data as a strategic asset and thus promoting a data-driven public sector that transforms the design, delivery, and monitoring of policies and public services.

**Develop a comprehensive strategy for the digitization of services.** The success of key initiatives, such as the SDC and the CCD, require an effective service digitalization strategy in addition to the strengthening of the institutions responsible for its implementation. Considering the deadlines set by the regulatory framework, it is critical to formulate comprehensive actions that speed up the process. Although digitalization in Colombia was accelerated by the COVID-19 pandemic, it continues to be modest and has not been able to keep up with technological advances and citizen demands.

**Table 3.2. Digital Public Platforms: Policy Recommendations (1 of 4)**

| Area                        | Recommendation  | Responsible Entity               | Timing      | Legal Change Required? |
|-----------------------------|---|----------------------------------|-------------|------------------------|
| Governance and institutions | <p><b>Strengthen coordination mechanisms.</b> The government should establish coordination mechanisms within two levels, strategic and operational, to ensure the appropriate level of performance and consistent use of digital technologies across government. At the operational level, the government needs to address implementation challenges and bottlenecks and engage all relevant stakeholders for specific ICT initiatives, for example, through a federated coordination scheme, strengthening the role of the sector chief information officer.</p> <p><b>PRIORITY.</b></p> | MinTIC / AND / DNP               | Short term  | No                     |
|                             | <p><b>Design strategies to address regional disparities.</b> Heterogeneous capacity at the local level presents a challenge to formulating and operationalizing the digital government strategy. The government should define strategies to address regional disparities, for example, by: (i) creating working groups in each region with representatives of the main stakeholders, including, for example, the AND, local government, MinTIC, and the DNP, to identify their specific needs and priorities; and (ii) expanding the</p>  | MinTIC/ territorial entities/DNP | Medium term | No                     |

**Table 3.2. Digital Public Platforms: Policy Recommendations (2 of 4)**

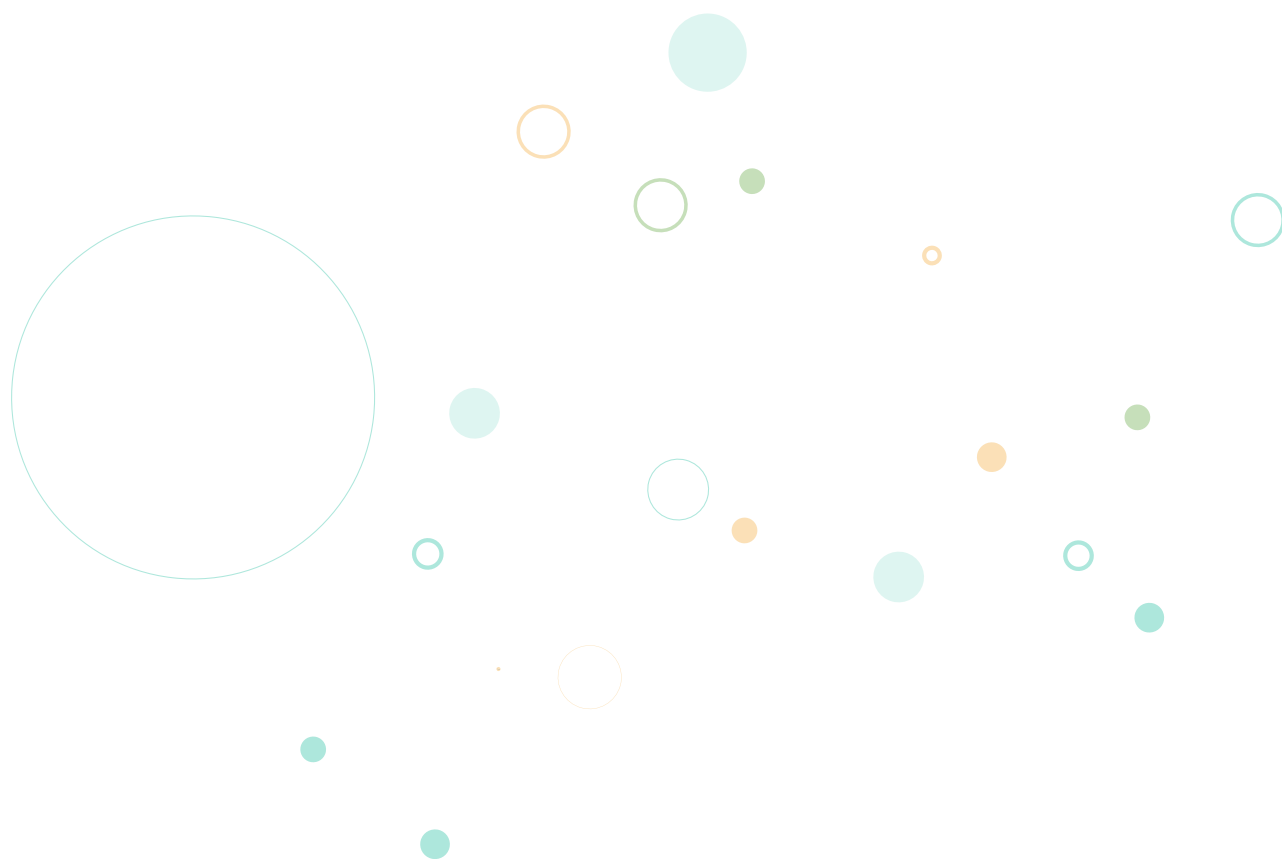
| Area                           | Recommendation   | Responsible Entity                                   | Timing      | Legal Change Required? |
|--------------------------------|--|--|-------------|------------------------|
|                                | <p>support provided to subnational governments in certain areas, such as knowledge and resource sharing and digital skills development, while securing funding as an incentive to develop local digital services in partnership with the DNP and the AND.</p>  |  |             |                        |
|                                | <p>Strengthen the monitoring of the PGD. Develop measurement tools to monitor key initiatives and related investments. Systematically monitoring the results could also provide insights into adjusting the PGD to facilitate understanding from public entities and to develop tailored support tools.</p>  | MinTIC / DNP   | Medium term | No                     |
| <b>Core government systems</b> | <p><b>Increase interoperability between core government systems.</b> Adoption of the X-Road platform has been slow. To further promote interoperability, one key issue is defining a government-wide data governance framework and ensuring the harmonization of functional concepts in new systems by design.<br/><b>PRIORITY.</b></p>                | Sectoral ministries/ subnational governments/ MinTIC | Medium term | No                     |
|                                | <p><b>Increase the use of shared technology infrastructure.</b> The adoption of shared technology infrastructure, ideally using cloud technologies, would contribute to reducing the costs of both ICT infrastructure and service provision and improving performance, as it would enable a cost-efficient expansion and greater interoperability.</p> | MinTIC/ sectoral ministries                          | Long term   | No                     |
| <b>Identification</b>          | <p><b>Ensure an inclusive deployment of the digital citizenship ID card, including the development of outreach campaigns.</b> A key challenge for the new digital citizenship card is the implementation of communication campaigns to ensure that people know about it, its characteristics, and its potential uses, such as for</p>                  | NIRC / MinTIC  | Medium term | No                     |

**Table 3.2. Digital Public Platforms: Policy Recommendations (3 of 4)**

| Area   | Recommendation   | Responsible Entity  | Timing                    | Legal Change Required? |
|--|--|---------------------|---------------------------|------------------------|
|  | <p>accessing the CCD and opening a bank account. The CCD is a key mass use case for the digital citizenship card, and delays in the addition of entities to the CCD may also limit the use of the digital citizenship card.</p>  |                     |                           |                        |
| <p><b>Government service delivery platform</b></p> | <p>Strengthen the delivery model for the digitalization of public services. The DNP has developed a way to provide key public management modules, such as financial and revenue management, to beneficiary municipalities as a cloud-based service coupled with hands-on technical assistance. Scaling up this approach could enable small local governments to access a robust and comprehensive IT platform without the need for substantial investments in hardware or software, thus generating savings and efficiency gains while at the same time facilitating the flow of information for monitoring and decision-making purposes. <b>PRIORITY.</b></p> | <p>MinTIC / AND</p> | <p>Short/ Medium Term</p> | <p>No</p>              |
|  | <p><b>Develop an aggressive digitalization strategy and support tools, especially at the subnational level.</b> Expanding the scope of the CCD is a critical challenge. Adding new government entities and trámites to the file would require an aggressive service digitalization strategy and capacity building in the institutions responsible for its digitalization. This entails hands-on support in simplifying processes and procedures, using the new technologies, and enabling data sharing to set up services around life events. <b>PRIORITY.</b></p>   | <p>MinTIC / AND</p> | <p>Short/ Medium Term</p> | <p>No</p>              |
| <p><b>Transparency and anticorruption</b></p>      | <p><b>Strengthen mechanisms for citizen collaboration.</b> Efforts should be made to intensify collaboration with the private sector, academia, and civil society organizations to increase the re-use of open data and to help build solutions for vulnerable groups.</p>   | <p>MinTIC / DNP</p> | <p>Medium term</p>        | <p>No</p>              |

**Table 3.2. Digital Public Platforms: Policy Recommendations (4 of 4)**

| Area                           | Recommendation   | Responsible Entity | Timing            | Legal Change Required? |
|--------------------------------|--|--------------------|-------------------|------------------------|
| <p><b>Data as an asset</b></p> | <p><b>Develop a well-established data management model.</b> Despite PNID being established, it is yet to be implemented. Colombian public institutions do not share data in a proactive fashion, and current data governance arrangements do not encourage them to do so, meaning that opportunities to create value remain low, and most institutions report that they exchange data based on individual requests. Successfully implementing the PNID framework and establishing a proper data management model (from collection to processing, sharing, and re-using) within the public sector will be crucial for capitalizing on data as a strategic asset and thus promoting a data-driven public sector that transforms the design, delivery, and monitoring of policies and public services. <b>PRIORITY.</b></p> | <p>MinTIC</p>      | <p>Short term</p> | <p>Yes</p>             |



# 4. DIGITAL FINANCIAL SERVICES



## KEY MESSAGES

- » **Colombia has implemented ambitious regulatory reforms and financial inclusion programs to foster the development of its digital financial services (DFS) and fintech ecosystem.** These efforts, including through the program “*Banca de las Oportunidades*” and the 2014 Financial Inclusion Law, have been instrumental in helping to achieve near universal coverage of access points and to expand the uptake of DFS.
- » **Increasing active usage of digital payments and enabling digitalization of a broader range of financial services remain key challenges.** Although mobile wallets have been gaining traction, cash still dominates retail payment transactions (at the point of sale and in domestic remittances). Most MSMEs have not yet reaped the benefits of DFS, given lagging digitalization in the microcredit sector and the nascent stage of crowdfunding.
- » **Further legal and regulatory reforms can build on recent progress and foster a more mature stage of development for Colombia’s DFS and fintech ecosystem.** The recent Open Finance Decree is a key milestone whose implementation should provide appropriate incentives for participation and ensure rigorous risk management. A comprehensive legal framework for payment services is yet to be enacted, and fintech companies that provide digital credit operate in a regulatory void. DFS users are not consistently protected and may experience service-level discrepancies.
- » **The lack of full interoperability and access barriers to key financial infrastructure constrain the potential of new business models (e.g., fast payments) to drive down acceptance costs/barriers.** Recent regulatory reforms have sought to address these issues by enhancing the governance of the retail payment system. The central bank began leveraging its operational and catalyst role to ensure an open and interoperable fast payment ecosystem.
- » **Following the progress made on the digitalization of government salaries and pensions, social benefit programs should also be shifted to direct payments to beneficiaries’ preferred transaction accounts.** Ongoing efforts should be accompanied by measures to ensure broad participation in the automated clearinghouse infrastructure and adequate design of transaction accounts.
- » **Strengthening Colombia’s institutional framework will require careful articulation of multiple authorities’ powers and effective mechanisms for DFS policy coordination.**

## 4.1. The importance of digital financial services

**DFS are a critical enabler of the digital economy and can mitigate the cost, accessibility, and product design barriers that have historically led to financial exclusion.** The G20 High-Level Principles for Digital Financial Inclusion define DFS as: “...financial products and services, including payments, transfers, savings, credit, insurance, securities, financial planning and account statements. They are delivered via digital/electronic technology such as e-money (initiated either online or on a mobile phone), payment cards and regular bank accounts.”<sup>112</sup> Digital payments often serve as the entry point and “rails” for a DFS ecosystem. Digital payments are more efficient and convenient than cash payments as they can be made on an instant or near-instant basis, without the need for an in-person transaction, and are also more effective since the payment is guaranteed. With greater uptake and usage of digital payments, consumers can make purchases online, receive digital government payments, and have remittances deposited directly into their accounts.<sup>113</sup> With more and more data generated from such transactions, credit scores can be generated to help offer credit, and consumers can be introduced to new products and services, such as insurance or the purchase of treasury bills, among others. DFS can also promote the reach of financial services into areas without brick-and-mortar financial institutions, thus promoting financial inclusion.

**The development of DFS is critical to Colombia’s digital transformation.** DFS’s promotion of more efficient and effective payments helps foster the growth of digital businesses by ensuring convenient, fast, safe, and transparent payments (see [Chapter 5](#)). Universal access to DFS can also facilitate greater use of digital public platforms, including the rapid and efficient delivery of social transfer payments via digital channels.

**Colombia’s experience shows that DFS have played a critical role in the COVID-19 era by decreasing the need for in-person transactions, speeding up payments, and improving payment efficacy.** Given the need for increased social distancing and remote transactions, DFS are positioned to keep payments flowing when physical interactions must be limited. Data from Colombia’s central bank, the Bank of the Republic (*Banco de la República* [BR]), show a drastic growth in the volume of transactions initiated via quick response (QR) codes—which exceeded 5 million in 2020 from fewer than 500,000 in 2019—and an 11 percent yearly increase in the share of international remittances paid to transaction accounts. DFS can also ensure timely payments, such as to rural beneficiaries, thus obviating the

need to transport cash or ensuring that business transactions clear instantly (checks are still very common in the country). The role of DFS in promoting transparency and efficiency is also important; since Colombia’s fiscal space is already limited, digital payments ensure that payments reach real and intended beneficiaries.

## 4.2. Current state of digital financial services

### Financial sector structure and supervision

**Colombia’s financial system is characterized by complex financial conglomerates and the role of banks as the main source of financing for households and nonfinancial corporations.** Financial conglomerates are at the center of Colombia’s interconnected financial system, with the five largest controlling 80 percent of banking sector assets. In turn, banks account for 93 percent of the total assets of financial intermediaries. The banking sector is moderately concentrated, with the combined market share of the top three banks standing at 56.7 percent of banking sector assets.<sup>114</sup> Commercial banks are the main providers of DFS in Colombia. State-owned financial institutions (SOFIs) also play a relevant role: the largest SOFI, holding a third of total SOFI assets, is a commercial bank (*Banco Agrario*) focused on the agriculture sector and the provision of financial services in rural areas. *Grupo Bicentenario* was recently created as a holding for SOFIs and is expected to become the third-largest financial holding in Colombia.

**The non-bank financial sector is characterized by the increasing role of electronic deposit and payment companies (*sociedades especializadas en depósitos y pagos electrónicos* [SEDPEs]).** SEDPEs, of which there were six as of March 2022, were created through the Financial Inclusion Law, with the explicit objective to broaden access to transactional financial services.<sup>115</sup> Like credit institutions, SEDPEs are deposit-taking financial institutions but cannot engage in lending. Although SEDPEs currently account for a small percentage of total electronic deposits (less than 10 percent), they operate some of the fastest-growing non-bank digital wallets on the market (e.g., Movii).

**Regulated entities of the solidarity economy sector also accept deposits and issue credit.** There are 177 (member-only) savings and credit cooperatives under the purview of the Solidarity Economy Superintendency (Superintendencia de Economía Solidaria [SES]),

whose aim is to “satisfy the needs of their members and contribute to the development of works of service to the community in general.”<sup>116</sup> Despite the high number of institutions, 23 percent of members are concentrated in the top four entities. In general, savings and credit cooperatives are small entities with low penetration in rural and underserved segments, characterized by limitations in relation to the supply of DFS.<sup>117</sup>

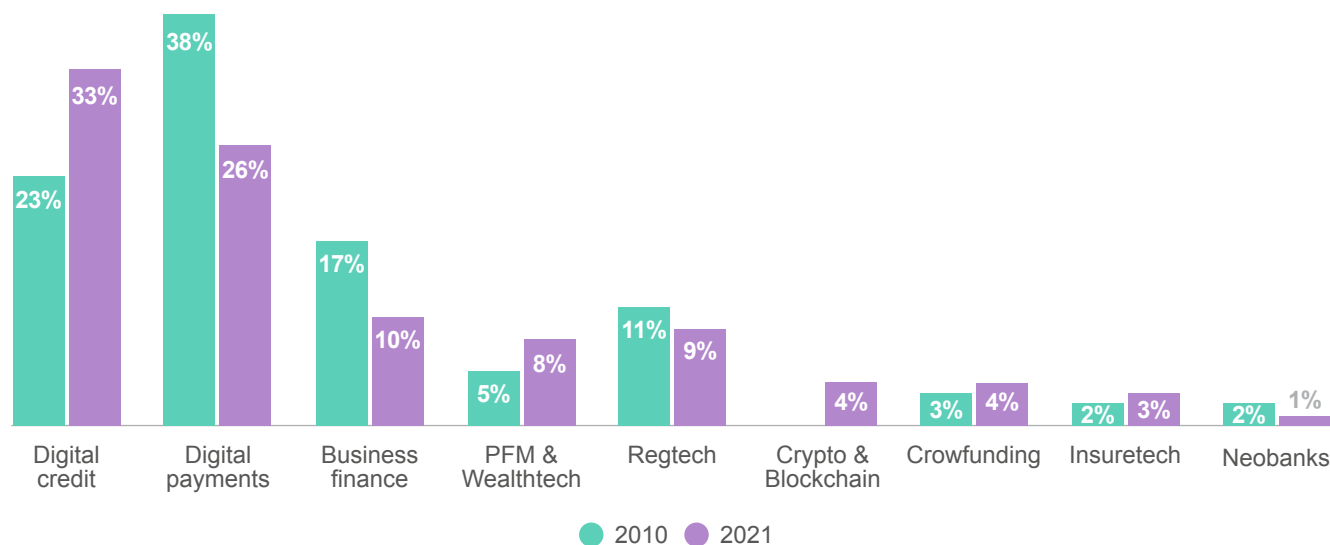
**Postal payment service operators (*operadores de servicios de pago postal* [OPPs]) engage in cash-based domestic and international money transfers (though the latter are the prerogative of the public postal service provider). OPPs operate under the Postal Service Law and are currently subject to the supervision of MinTIC.<sup>118</sup>**

**Colombia’s heterogeneous fintech ecosystem is the third largest in the region after Mexico’s and is most active in the area of digital credit, though digital payments represent the largest segment in terms of revenues.<sup>118</sup>** Colombia’s fintech ecosystem comprises both regulated and non-regulated entities as well as joint ventures across eight lines of business: digital credit, digital payments, business financing solutions, personal

financial management, regtech, crypto and blockchain, crowdfunding, and insurtech (Figure 4.1).<sup>120</sup> According to Colombia’s fintech association, the main target segments are large enterprises and unbanked individuals (see [Figure 4.2](#)).

**The *Financial Superintendency (Superintendencia Financiera de Colombia [SFC])* is an integrated supervisor, with a purview that includes banks, finance companies, insurance, securities, and other financial intermediaries.** Additionally, the SFC is also the bank resolution authority. The SFC is a technical body under the Ministry of Finance and Public Credit (*Ministerio de Hacienda y Crédito Público* [MHCP]) with delegated responsibility from the Presidency as specified in the Constitution to oversee all financial institutions except for non-deposit-taking cooperatives. It has separate legal personality, administrative and financial autonomy, and independent authority to regulate, supervise, and take resolution actions. The mandate of the SFC is to preserve the stability, safety, and confidence of the financial system; organize and develop the domestic capital markets; protect investors, depositors, and insurance policy holders; and assure protection for consumers of financial services.<sup>121</sup>

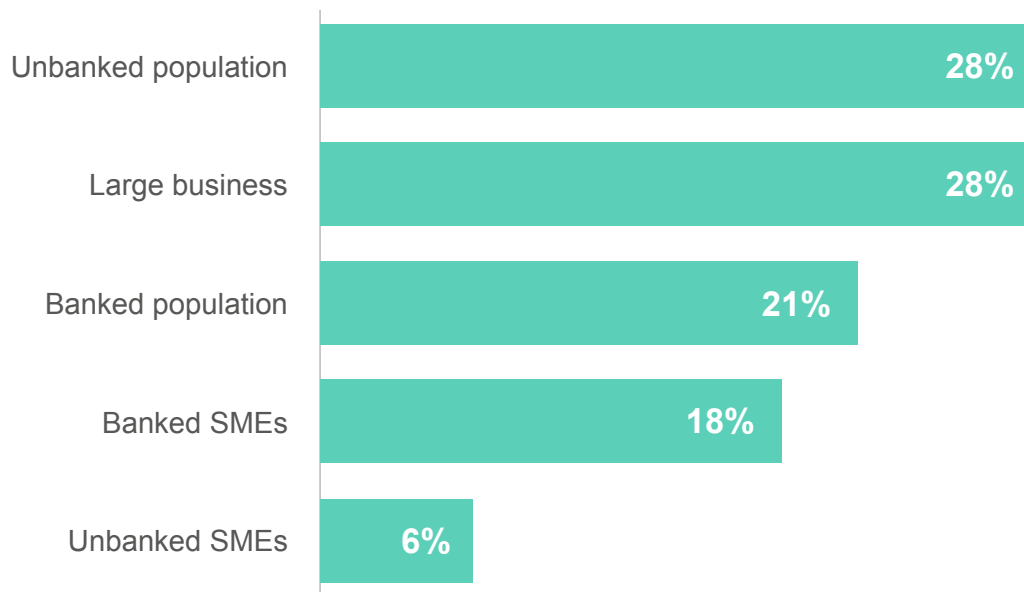
**Figure 4.1. Distribution of Fintech Segments in Colombia, 2010–21**



Source: Adapted from Colombia Fintech (2022). Based on data from CVN and Finnovista (2021).  
 Note: PFM = public financial management.



**Figure 4.2. Target Customer Segments of Colombian Fintech Companies, 2021**



Source: Adapted from Colombia Fintech (2022). Based on data from CVN and Finnovista (2021).

**Both the BR and the MHCP have regulatory and oversight/supervision responsibilities over payment systems.** The Central Bank Law grants the BR the power to regulate the domestic and external payments of the economy.<sup>122</sup> The BR exercises this faculty with respect to high-value payment systems. The regulation of payment systems and related activities that do not pertain to the BR falls within the purview of the national government.<sup>123</sup> On this basis, the Financial Regulation Unit (*Unidad de Regulación Financiera*) and the SFC (within the MHCP) have jointly developed the regulatory framework for low-value payment systems (*sistemas de pago de bajo valor* [SPBVs]). The BR is also entrusted with the monitoring of high-value payment systems, including the system operator, participants, and interdependent systems, while the SFC is responsible for licensing and supervising payment system operators.

**A new bill on “Access and Financing for Building Equity” grants the SFC and the SES supervisory powers in relation to entities that provide payment services.**<sup>124</sup> The bill envisages that entities currently under the respective remit of these two institutions may continue to provide payment services under their separate licenses. With regard to new payment service providers, the bill establishes that these may be subject to either authority’s supervision, depending on how these providers may be regulated in the future. Furthermore, the draft law derogates the regulatory and supervisory powers of MinTIC with respect to operators of OPPs.

### DFS uptake and ecosystem

**Based on Findex 2021, 60 percent of Colombian adults (age 15+) had an account at a financial institution, up from 46 percent in 2017, and 52 percent had made or received digital payments, up from 37 percent.** Notwithstanding these improvements, Colombia ranks below structural and income-level averages, though it performs better than most regional peers. On the other hand, the most recent Findex data show that though the gender gap in account ownership has narrowed to 4 percentage points (from 7 percentage points in 2017), it is still below both global and regional averages. It is worth noting that official financial inclusion statistics based on supply-side data suggest higher rates of account ownership. According to Opportunity Bank (*Banca de las Oportunidades* [BDO]) and the SFC, as of March 2021, 89 percent of Colombian adults aged 18+ had at least one financial product.<sup>126</sup>

**Electronic and simplified deposit products help to broaden access to transactional services.** According to SFC-BDO, as of March 2021, 31.2 million Colombians (representing about 88 percent of the adult population) had at least one deposit account. Most individuals (28.4 million) had savings accounts, followed by electronic deposits (12.7 million), simplified savings accounts (9.2

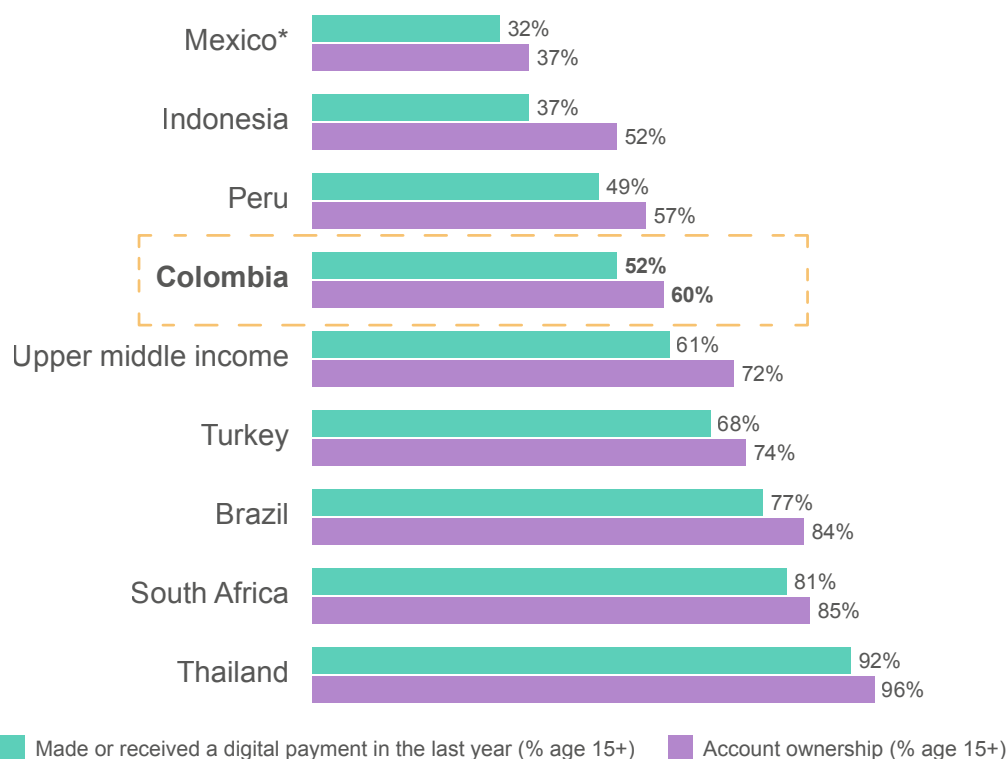
million), and other types of accounts.<sup>127</sup> In recent years, electronic transaction accounts have experienced the strongest growth, boosted by a few large banks and to some extent by the emergence of fintech companies. In 2020 alone, the percentage of adults with electronic deposits grew by 15 percentage points. These account types also tend to have lower inactivity rates than traditional deposit accounts.

**However, the use of transaction accounts to conduct day-to-day digital payment transactions is still lagging as a result of underdeveloped digital payment acceptance networks, which has led to a cash-heavy economy.** The BR estimates that 78.4 percent of store purchases (by number of transactions) are paid in cash.<sup>128</sup> The number of card transactions grew on average by 16 percent every year between 2018 and 2020, but it remains moderate by international levels. In 2019, every Colombian made on average nine debit card and seven credit card transactions. In the same period, in

Mexico there were 23 debit card and nine credit card transactions per capita, and in Brazil the figures were 52 and 48, respectively.<sup>129</sup> However, the COVID-19 pandemic may have contributed to the creation of a wave of new digital merchant payment users. The BR calculates that electronic payment acceptance has reached 50 percent of merchants, breaking the informality barrier in that one out of every two informal businesses now accepts electronic payments.<sup>130</sup> World Bank data show that 12 percent of Colombians used a digital merchant payment for the first time in 2020, doubling the previous rate of adoption.<sup>131</sup>

**According to SFC-BDO, as of March 2021 a third of the adult population (35.2 percent) had a credit product from a regulated financial sector entity.** The reported percentage of adults with a credit product has been declining (from 36.6 percent in 2019 to 35.2 percent in the first quarter of 2021).<sup>132</sup> Credit cards and consumer credit are the two most popular credit product

**Figure 4.3. Account Ownership and Use of Transaction Accounts in Colombia, International Comparison, 2021**



Source: Demirgüç-Kunt et al. (2022).

Note: Figures are for 2021, with the exception of Mexico (2017). The figure shows the percentage of respondents (adults) who report having an account (by themselves or together with someone else) at a bank or another type of financial institution or report personally using a mobile money service in the past 12 months.

categories, with 8.1 million and 6.9 million adults with an active credit card and consumer credit product, respectively. About 2.4 million adults have a microcredit product. In the aftermath of the COVID-19 crisis, microcredit shrank as the number of loans decreased by 34 percent in 2020, even though total value slightly increased (+17 percent). Official statistics do not make it possible to disaggregate digital credit products nor do they include all fintech companies, which are reportedly active in this segment (targeting both individuals and SMEs).

**The current status of individual access to financial services reveals stark inequalities.** Although in urban areas the percentages of adults who have at least one financial and one deposit product reach 96 and 94 percent, respectively, in rural and remote areas these percentages drop to 57 and 55 percent, respectively.<sup>133</sup> Adults over 65 years old and young adults (between 18 and 25 years old) have recently experienced significant gains in access to and usage of financial products, but gaps remain between these age groups and adults of other ages: only 61 percent of adults over 65 and 70 percent of those between 18 and 25 had a financial product that was active or in effect compared to 76 percent of adults between 26 and 40 and 80 percent of those between 41 and 65. Despite recent improvements, women's access to and usage of financial products remain below men's: 85 percent of women have a financial product (against 93 percent of men), and 72 percent of women have a financial product that is active or in effect (against 76 percent of men).

**Small firms in Colombia have high levels of access to basic financial products, although a quarter of these firms identify access to finance as a major constraint.** As of 2017, about 99 percent of small firms in Colombia reported having a checking or savings account, and 55 percent a bank loan or line of credit, above the regional and global averages. A high share of small

firms uses supplier or consumer credit to finance working capital (63 percent), much higher than the regional and global averages (48 and 25 percent, respectively). Forty-six percent of loans to small firms in Colombia required collateral, lower than the regional and global averages (57 and 73 percent, respectively).

**Microenterprises are affected by a financing gap (estimated in 2018 at US\$3.9 billion).**<sup>135</sup> 9 percent of microenterprises reported a lack of financial service provisions, and 18.7 percent reported a reduction in cash flow during the third trimester of 2022.<sup>136</sup> Only 17 percent of micro entrepreneurs can effectively access microcredit, and even fewer benefit from digital channels in this context. In 2019, less than 20 percent of micro entrepreneurs requested credit, with no significant differences between rural and urban areas. Funds were mostly used for the purchase of raw materials, inputs, inventory, and other operating expenses. About 72 percent of the credit requests were made to regulated financial institutions, 6 percent to microfinance institutions, 8 percent to family and friends, and 14 percent to predatory lenders (*prestamistas gota a gota*). Among the main reasons for not requesting credit are the perception<sup>137</sup> Moreover, there is a perception that credit has high costs<sup>138</sup> Digitalization has made small inroads into microcredit<sup>139</sup> with 33 percent of institutions making use of remote systems to process the data of prospective clients and 28 percent utilizing mobile banking, though no entity at all reported the use of biometric information for the identification of clients.

**Growth of crowdfunding borrowing has been limited.** Just one platform, sponsored by the Colombian Stock Exchange, has been launched to date, with only 82 projects financed since 2018. According to Colombia Fintech, the crowdfunding segment has a 4 percent participation rate in the fintech ecosystem. Therefore, crowdfunding thus far has not alleviated access to finance constraints.

## Enabling environment for DFS

**Colombia's financial inclusion policy emanates from the National Council for Economic and Social Policy (Consejo Nacional de Política Económica y Social [CONPES])<sup>140</sup> and the quadrennial PNDs, which have the force of law.** Established in 2006, the BDO financial inclusion program is aimed at promoting access to financial services by the unserved and underserved, particularly poor households and MSMEs. To this end, BDO (i) provides public subsidies and incentives for the development of new access channels/products and pilot projects to increase financial inclusion, (ii) performs technical assistance and financial education activities, and (iii) collects and analyzes financial inclusion data. The Intersectoral Commission for Financial Inclusion was created in 2015 and the Intersectoral Commission for Economic and Financial Education followed in 2016. In 2021, these bodies were consolidated into a single Intersectoral Commission on Financial and Economic Inclusion and Education (*Comisión Intersectorial para la Inclusión y Educación Económica y Financiera* [CIIEEF]): the BDO program.<sup>141</sup> The CIIEEF is in charge of coordinating the formulation and monitoring the implementation of the financial inclusion and education policy as well as the activities to be financed through the BDO.<sup>142</sup> CIIEEF's membership is limited to the public sector; although private sector representatives may be invited on a case-by-case basis, currently there is no standing mechanism to facilitate coordination with the private sector.

**PND 2018–2022 as well as PND 2022-2026 pave the way for greater financial inclusion by setting goals and actionable steps.** The PND 2018-2022 envisaged that by 2022, 85 percent of adults should have at least one financial product and 77 percent at least one active financial product. To this end, it proposed strengthening the retail payment ecosystem and competition and fostering the adoption of new payment technologies. CONPES document No. 4005 of 2020 articulates the financial inclusion policy for the 2020–25 period. It identifies four strategic directions, from increasing the reach and suitability of financial services to enhancing financial literacy and trust in the financial system, strengthening financial and digital infrastructure, and instituting a governing framework (see above), articulated into eight actions and two additional results indicators. PND 2022-2026, approved by the President in 2023, can continue paving the way as it sets goals and targets for financial inclusion.

**In the area of payments, the BR launched a payment system forum in August 2022.** Although the authorities leverage the inputs of industry associations to help guide the formulation of financial inclusion policies, no

actions stemming from the 2020 CONPES document are co-owned/co-implemented by the private sector. In the area of payments, the BR launched a payment system forum (Foro Sistema de Pagos) in August 2022. The Foro is expected to be consulted on a BR-led national payment system development agenda. This agenda revolves around: (i) the BR decision to develop a fast payment system, (ii) an analysis to enhance cross-border payments, and at a later stage, (iii) the exploration of a central bank digital currency.

## Legal, regulatory, and supervisory framework

**Colombia does not currently have a consolidated legal and regulatory framework for the provision of payment services.** The relevant rules and requirements are found in the laws and regulations that govern the activities of supervised institutions (i.e., credit institutions, SEDPEs). “Unsupervised acquirers” (i.e., acquirers other than supervised entities) are governed by specific rules, including registration before the SFC, subject to meeting capital and funds-safeguarding requirements, among others.<sup>143</sup> Processing entities for the issuer and the acquirer, aggregators (which collect merchants' funds on behalf of acquirers), and providers of acceptance technologies (collectively referred to as payment service providers) operate under the responsibility of the issuer/acquirer.<sup>144</sup> Non-financial entities that provide transaction accounts and/or perform payment activities (e.g., savings and credit cooperatives supervised by the SES, OPPs) are governed by their respective frameworks. In the absence of a consolidated framework, (i) it is not clear what constitutes a payment activity or the conditions that need to be fulfilled to undertake this activity (as a business); (ii) payment service innovation could be constrained insofar as service providers must conform to existing licenses; (iii) regulatory and technical standards governing payment activities may vary considerably, leading to inconsistent consumer protections and service levels; (iv) there is no regulatory framework that protects free competition or allows protection of consumers in these markets directly. A new bill on access and financing for building equity proposes that payment service regulation be consolidated under the purview of the MHCP and looking ahead may provide a basis for applying an activity-based approach, where appropriate.<sup>145</sup>

**The Open Finance Decree enhances legal certainty around consent-based use of consumer data by supervised institutions and creates payment initiation services, among other provisions.**<sup>146</sup> Although the current regulatory framework does not inhibit licensed institutions from using customer data, the Open Finance

Decree clarifies that they may process and commercialize consumer data only subject to prior consumer consent and compliance with habeas data and data protection. The Decree does not prescribe rules to grant and gain access to consumer data but entrusts the SFC with developing standards for open finance. The Decree provides that information access requests by payment initiation service providers should be processed through SPBVs and defers to the operators of those systems to establish technical standards and rules for the payment providers; it also prescribes certain minimum rules to ensure those providers' non-discriminatory access to SPBV services and the mitigation of potential conflicts of interest. It is worth noting that Colombia's legal framework for data privacy and protection is generally supportive of core consumer rights (e.g., to access, rectification, and opposition) and has recently presented a project to Congress that includes propositions on recognition of data portability (Articles 71 and 75).<sup>147</sup> [Chapter 7](#) discusses the current state of, as well as the challenges to and opportunities for, Colombia's legal and regulatory frameworks on data protection. Finally, the Open Finance Decree regulates the "digital ecosystem," including: (i) third-party service provision through the channels of supervised institutions; (ii) supervised entities' service provision through third-party channels; and (iii) commercialization of supervised entities' technology and infrastructure to third parties.

**Fintech companies active in the digital credit segment operate in a regulatory void.** There are extensive laws and regulations that address the issue of financial inclusion and consumer protection (see [footnote for specific laws](#)).<sup>148</sup> However, there are still regulatory gaps that must be addressed. This may generate both an unlevel playing field and legal uncertainty for these companies. Anecdotal evidence suggests that fintech companies that engage in digital credit specialize both in personal and consumer credit, catering also to unbanked individuals and business credit, including credit for microenterprises. In the absence of official data, it is unclear if this gap in the legal and regulatory framework may generate serious risk to the financial system.

**The regulatory sandbox launched in 2020 provides a tool to grant fintech companies temporary authorization.**<sup>149</sup> The sandbox is defined as a set of rules, procedures, plans, conditions, and prudential requirements for the testing of innovative technologies and business models in the context of regulated activities. Both supervised financial institutions (wanting to provide new services) and new or unsupervised providers may apply for authorization under the regulatory sandbox. The exit from the regulatory sandbox, after a maximum period of two years and subject to the successful completion of

the pilot, would trigger a transition process to a licensed financial institution (or, in the case of licensed institutions, a change in their activities). The regulatory sandbox is therefore not intended as a tool to broaden the perimeter of regulation or fill any regulatory gaps.

**The authorities regulate interest rates and have established mandatory investment requirements to fund the agriculture sector, thereby inadvertently causing distortions.** In Colombia, all credit is subject to interest rate ceilings and caps. Banks are also obligated to fund agricultural loans at the regulated rate or invest in special securities (Agricultural Development Titles, or *Títulos de Desarrollo Agropecuario [TDAs]*), which are remunerated at below market rates. FINAGRO, a wholesale agricultural development bank, lends funds from TDAs mostly to Banco Agrario to on-lend to small rural producers. These measures may be hindering the emergence of alternative credit providers that focus on riskier segments and may thus be introducing significant distortions.

**Extant regulation is silent on crypto-assets, though the SFC has been granting authorization to some banks and SEDPEs to offer services in relation to crypto-asset wallets under a controlled pilot regime.**<sup>150</sup> In these pilots, which may not exceed a one-year duration, financial institutions essentially provide the fiat on/off-ramps of crypto-asset exchanges, subject to certain limits to cash-in transactions, depending on the type of account. Crypto-asset service providers are currently unsupervised and are not subject to requirements for anti-money laundering. The BR and SFC have issued warnings to the public and financial institutions on the risks involved. The BR does not consider crypto-assets to be currency or money.

**The SFC sets comprehensive risk management requirements for licensed institutions and has adopted a risk-based supervision methodology that it applies consistently across all types of entities within its purview.** The provisions relating to the management of risks by supervised entities are prescribed in the SFC's Basic Accounting and Financial Circular (Circular Básica Contable y Financiera [CBCF]). The CBCF encompasses credit, liquidity, market, and operational risks. The SFC sets out rules on information and cyber security that require supervised institutions to create a dedicated function for managing these risks (including the roles of the board and senior management) and to report information and cyber incidents based on a standard taxonomy and communication protocol.<sup>151</sup> Outside the SFC's perimeter, the SES is in the process of modernizing and strengthening its supervisory process.

Pursuant to 2020 regulatory reforms, low-value payments system operators (entidades administradoras de sistemas de pago de bajo valor [EASPBVs]) are required to develop risk management systems, including contingency plans and IT security measures, to ensure business continuity and the mitigation of legal, credit, liquidity, operational, and systemic risks. EASPBVs must adopt high operational, technical, and security standards and require the same of their participants. The regulation prescribes the minimum content of EASPBV rules, including the risk management models and procedures, and stipulates that EASPBV rules must be approved by the SFC. As of 2023, EASPBVs must also have a comprehensive risk management framework in place.

**The use of agents is permitted on an equal footing with credit institutions, SEDPEs, and savings and credit cooperatives supervised by the SES.**<sup>152</sup> Any natural or legal person may serve as an agent, provided they comply with the relevant fit and proper and technical-operational requirements pursuant to SFC's instructions.<sup>153</sup> Recent regulatory reforms enabled the provision of agent services outside a permanent physical facility by creating mobile and digital agents<sup>154</sup> and offer the basis for the provision, on an exceptional basis, of limited agent services in an offline environment.<sup>155</sup>

**The regulatory framework supports the use of new technologies, such as cloud computing, for the provision of DFS and sets rules for the management of the attendant risks.** The SFC laid out obligations in relation to the use of cloud computing services in the context of core business operations, the minimum content of contracts/service-level agreements with cloud service providers, business continuity measures, and SFC reporting requirements.<sup>156</sup> Furthermore, supervised entities must develop plans for migrating to a new service/platform in the event of service interruption/suspension or any other issues. The framework allows for the processing of information abroad, as long as the entity ensures that the foreign jurisdiction in which the information is processed has equivalent or higher data privacy and protection standards.

**The financial consumer protection regime applies only to the entities supervised by the SFC, whereas all other entities are subject to the general**

**consumer protection framework overseen by the SIC, a duality that may generate inconsistencies in service levels and safeguards between different providers of similar services.** The framework for financial consumer protection establishes the principle of transparency and accurate, sufficient, and pertinent information and prescribes the minimum information content to financial consumers.<sup>156</sup> Supervised entities must put in place a customer service system that includes a process for addressing consumer queries and complaints. In practice, this process represents the main channel for consumer recourse and dispute resolution and constituted 88 percent of total financial consumer complaints in 2020. The financial consumer advocate (defensor del consumidor financiero), appointed by the financial institution before the SFC, represents an additional, although underutilized, channel for consumer recourse and dispute resolution. Financial consumers may also submit complaints against supervised institutions before the SFC at any time; in this capacity, the SFC supports financial consumers by intermediating their relationship with financial service providers.

**The regulatory framework supports remote know-your-customer (KYC) and simplified customer due diligence (CDD), which, if more widely and consistently adopted across institutions, may lower compliance costs and enable financial service providers to pass on these savings to their customers.** SFC rules stipulate that financial institutions may adopt in-person or remote KYC procedures and allow the use of data held in public, third-party, or proprietary databases as long as the source is trustworthy and independent.<sup>158</sup> Regarding identity verification, the new rules allow financial institutions to verify a new client's identity through digital signature certificates, biometrics, strong customer authentication mechanisms, information stored in credit bureaus, and any other technologies that ensure the effective verification of identity. There are some incipient cooperation initiatives in this area (e.g., SoyYo). Under simplified CDD, clients are identified through their name and ID type, number, and date of issuance, and although identity verification is not required at the time of opening the account, it must be completed within three business days. Eligible products/circumstances for simplified CDD include accounts issued to the beneficiaries of certain government assistance programs, salary accounts, and low-value accounts (*depósitos de bajo monto*).

## Financial infrastructure

**Colombia's payment system largely supports the provision of digital payments.** The Deposit Accounts System (Sistema de Cuentas de Depósito [CUD]), the BR-operated real-time gross settlement system, enables final settlement in central bank money of interbank payments; money market, foreign exchange market, and securities and derivatives market transactions; and the net balances resulting from the main retail payment systems. As of December 2020, there were 131 participants in the CUD, including 25 banks, 10 financing companies, five EASPBVs, and two SEDPEs. The SPBV is comprised of: (i) one check clearinghouse; (ii) two larger automated clearinghouses (ACHs) and two other systems that process electronic fund transfers for specific groups of financial institutions; and (iii) six systems that process card payments and cash withdrawals. The two main ACHs are ACH-Colombia, owned by the banks, and ACH-Cenit, owned and operated by the BR. In terms of transaction volumes, ACH-Colombia processed 255.8 million payments in 2020 as compared to 10 million by ACH-Cenit. Credibanco and Redeban manage the largest point-of-service (POS) networks, together accounting for 74 percent and 68 percent of credit and debit card transaction volumes, respectively (based on September 2021 data). Redeban is also the largest ATM switch, serving 11 banks. The BR-operated check clearinghouse (Cedec) has experienced a gradual decline in the number and value of checks processed, a trend that has accelerated since the health emergency declaration due to the COVID-19 pandemic. Colombia's retail payment systems are generally characterized by local ownership/governance and do not use international communication standards.

**The number intrabank transactions outpace the number of interbank transactions processed via the two ACHs, indicating a large opportunity for increasing the reach, use, and interoperability of these infrastructures.** ACH-Colombia is owned by 15 banks. Although in the past its statute did not admit non-shareholders/non-banks as participants, in 2018 it developed access rules that are based on the fulfillment of legal, financial, and technical-operational requirements as well as a positive evaluation by an ad hoc access committee. Overall, ACH-Colombia has approximately 45 participating entities across services, of which only one SEDPE uses ACH transfers (transferencias interbancarias).

Participation in ACH-Cenit is subject to the entity's ability to open an account at BR and meet its stringent technical-operational requirements.<sup>159</sup> To date, no SEDPE has joined ACH-Cenit despite the eligibility decision by the Administrative Council of the BR (the largest SEDPE, Movii, is currently in the process of joining). Both ACHs offer credit transfers and direct debits and have adopted multi-batch settlement (four batches), thereby enabling same-day crediting of transactions submitted by 3:00 PM. Both ACHs use similar messaging standards (based on the National Automated Clearinghouse Association [NACHA]) but do not interoperate. Their roles differ in that a great majority of transactions currently processed by ACH-Cenit are government-to-government and government-to-person payments, whereas ACH-Colombia handles mostly business-to-person (e.g., payroll) payments, person-to-government and person-to-business payments, and person-to-person payments (in smaller percentage).

**A BR-led project under the umbrella of the Foro de Sistemas de Pago seeks to ensure the interoperability of, and broad access to, Colombia's fast payment infrastructure.** Notwithstanding the relevant market initiative, such as ACH-Colombia's "Transfiya," the uptake of fast payments appears to be impaired by several factors, including limited (non-bank) participation, few use cases, detrimental market practices (e.g., interchange fees), and the absence of a common QR code standard (see below). Furthermore, the absence of a mechanism to manage liquidity outside of the real-time gross settlement system's operating hours in the event that prefunded resources are depleted may constrain the growth and reliability of the service. In this context, the BR proposes to develop a fast payment system (Sistema de Pagos Inmediatos [SPI-BR]), interconnected with the private sector clearinghouses, as part of a broader ecosystem consisting of a (i) a common settlement service (in CUD balances), (ii) a central alias directory, and (iii) uniform operational, communication, and security standards, including QR code specifications and a common brand. SPI-BR is conceptualized as a real-time gross settlement system based on prefunding via the CUD; to this end, it is envisaged that SPI-BR participants that are not (direct) CUD participants may be granted indirect access via a (or sub-account held by a) CUD participant for the purposes of prefunding in the context of SPI-BR. Although the BR, in consultation with the Foro, has defined the broad contours of Colombia's fast payment architecture and operating model, several elements remain to be articulated, including with regard to liquidity management and participation arrangements, as well as other aspects that may require regulatory interventions (e.g., to issue binding scheme rules).

**Colombia's credit card market and respective infrastructure have been traditionally characterized by vertical integration, concentration, and high costs.**

Against this backdrop, the MHCP has sought to prompt changes in the business model to increase competition and foster innovation. Credibanco and Redeban process most of the domestic card transactions of a variety of international brands, including Maestro, Visa Debit, Visa, Mastercard, and other international schemes. The largest banks have ownership stakes in both companies. In fact, these companies operate several business lines across the payments value chain, from merchant affiliation on behalf of member banks to acceptance devices/technologies, authorization, clearing, crediting of merchant accounts, settlement of fees, and issuer processing. The emergence of roughly 100 payment gateways and aggregators (together known as “pasarelas”) brought to the surface conflict-of-interest and access issues associated with the card payment systems. In response to this situation, the regulator prohibited the operators of SPBVs from arbitrarily restricting access by new entities and imposing exclusivity conditions, among other measures.<sup>160</sup> The provision of services in addition to clearing and settlement—except for acquiring and issuing, which are forbidden to system operators—is subject to certain restrictions and the management of conflict-of-interest issues. A long-standing practice that allowed banks to set interchange fees and had raised competition and efficiency concerns was also phased out.

**Electronic payment acceptance infrastructure has been expanding as a result of new business models (e.g., pasarelas) and low-cost technologies (e.g., mini POS and QR codes).**

Microbusinesses appear to be beginning to avail themselves of these opportunities amid some disincentives and consumer preferences for cash. Although Colombia compares unfavorably to peers in terms of access points per 100,000 adults (see table 4.1.), it has ensured near-universal coverage of municipalities via agents, and POS terminals are the second-fastest-growing access points after agents. A 2020 BR survey revealed that payment cards are accepted by 40 percent of micro merchants as compared to 79 percent of small merchants and 92 percent of medium and large merchants. Credit transfers have become more prevalent in recent years; in fact, the share of micro merchants accepting credit transfers (49 percent) is greater than card acceptance. That said, cash continues to dominate merchant sales, mainly due to both perceived consumer preference and business operating expenses. Notably, one out of three merchants considers card payments to be more costly than cash.<sup>161</sup> Despite the availability of

low-cost acceptance technologies and the entrance of aggregators, regulatory (e.g., CDD) and tax compliance (particularly the withholding tax and the financial transaction tax [Gravamen a los Movimientos Financieros, or GMF]), as well as high merchant discount rates, may represent obstacles to expanding electronic payment acceptance among small merchants.<sup>162</sup> In Colombia, banks act as withholding agents with respect to card payments. Qualifying businesses may opt for a simplified tax regime (Régimen Simple de Tributación) which, in addition to easing the burden of compliance, lets businesses recuperate 0.5 percent of the value of purchases by debit/credit cards and other electronic means of payment.<sup>163</sup>

**Despite authorities' efforts to promote QR code interoperability through regulation, the most popular mobile wallets use proprietary QR codes.**

The SFC requires financial institutions that offer QR code payment solutions to comply with EMVCo QR (merchant-presented) standards and also requires EASPBVs to agree on certain common specifications to enable interoperability. However, it refrains from mandating the use of interoperable QR codes.<sup>164</sup> In practice, three card switches (Credibanco, Redeban, and ATH) developed EMV-compliant and interoperable QR codes that enable more than 200,000 terminals (dynamic QR) and 10,000 merchants (static QR) to accept mobile-initiated card payments (international brands) regardless of the user's wallet and issuing institution.<sup>165</sup> Meanwhile, the most popular mobile wallets in the market (that together would account for a larger number of merchants than the three EASPBVs) operate as closed-loop solutions, and only a few are accepted through interoperable QR.<sup>166</sup>

**To the extent that DFS may occasionally require the use of financial institutions' access points, uneven coverage across urban and rural areas may affect DFS adoption by underserved segments.**

Overall, Colombia compares unfavorably to international peers, except with regard to retail agent outlets (see table 4.1). BDO/SFC data suggest that there are at least four times as many access points (per 10,000 adults) in urban areas compared to rural areas. Cooperatives only partly fill this gap, but although they cover a small number of rural municipalities (22 out of 1,103) that would otherwise have no branch coverage, their access points mostly overlap with those of banks. Currently, Banco Agrario has the largest penetration in rural and remote areas and is the sole financial institution in 309 municipalities. Mobile and digital agent regulation aims at decreasing the costs of serving underserved areas, though these models are still in the early stages of implementation.<sup>167</sup>



## Credit infrastructure

### The flow of credit information through Colombia's credit infrastructure appears to be both complete and efficient.

In Colombia there are two (foreign-owned) private credit bureaus in operation that receive information from virtually all sectors of the economy on debtors who are both natural persons and legal persons, managing negative and positive information alike. Entities reporting information to the credit bureaus include both regulated and unregulated lenders/providers, from financial institutions (supervised by the SFC) to the entities of the solidarity sector (under the purview of the SES), retailers, unsupervised fintech companies, and utility companies, among others. The scope of credit products covered encompasses consumer and commercial credit, mortgage loans, microcredit, and overdrafts. Quality of information is reportedly high; nevertheless, one credit bureau reports undertaking further work to enhance its available information to better cater to fintech and microcredit segments in order to, for instance, include information on obligations with a weekly or bi-monthly repayment schedule and increase coverage of fintech firms. Credit bureaus also offer a variety of credit-scoring products.

However, transaction data remain largely untapped for credit decisions, and access to alternative data from government entities and utility companies is somewhat limited.

Telecommunications and utility companies mainly report demographic data and information on default payments. Credit bureaus do not currently manage information related to recurrent outgoing or incoming payments (e.g., utility payments, remittances) owing to the complexities surrounding the management of these data. Furthermore, credit bureaus currently do not have access to information from the immigration department (e.g., to facilitate access to credit by Venezuelan migrants in Colombia) or to information on government assistance programs administered by Prosperidad Social (Social Prosperity).<sup>168</sup> They also lack consistent access to gender data from the RNEC. More broadly, stakeholder interviews suggest that there are inefficiencies in the way RNEC data can be accessed by credit bureaus that would make it difficult to regularly update information, and there are also concerns about the data's associated costs. Finally, it is worth noting that although insufficient information does not seem to be a major limiting factor in providing credit to new clients, this problem becomes more acute with respect to the agriculture sector and is perceived to be a greater barrier by cooperatives as compared to banks and financing companies.<sup>169</sup>

**Table 4.1. Financial Access Points in Colombia: International Comparison (2020)**

|              | Branches | Non-Branch Retail Agent Outlets of Commercial Banks | Automated Teller Machines | Point of Sale Terminals |
|--------------|----------|---|---------------------------|-------------------------|
| Colombia     | 15       | 398   | 41                        | 1,595                   |
| Brazil       | 23       | 119   | 97                        | 6,720                   |
| Indonesia    | 19       | 298   | 52                        | 536                     |
| Mexico       | 17       | 48  | 62                        | 1,354                   |
| Peru         | 20       | 318   | 124                       | 1,461                   |
| South Africa | 14       | ...   | 59                        | 1,229                   |
| Thailand     | 18       | ...   | 112                       | 1,513                   |
| Turkey       | 25       | ...   | 82                        | 3,831                   |

Source: IMF (2023); BIS (2023).

Note: For every 100,000 adults.

## Leveraging recurrent payments to increase the usage of DFS

**Digitalization has made significant inroads in government disbursements, with the exception of social assistance payments, which still rely extensively on cash.** In 2020, the MHCP Treasury Department began enabling bulk payments of government salaries and pensions directly to recipients' accounts via ACH-Cenit, and today, this channel accounts for the near totality of these payments. The majority of vendor/supplier payments are also paid directly to these firms' accounts. The most significant social assistance program managed by Prosperidad Social, a conditional program for families in situations of poverty and extreme poverty called Familias en Acción, relies on a public tendering process repeated every year, as well as a combination of credit transfers to accounts opened at the awarded institution and cash. This generates inefficiencies and limits beneficiaries' choice (to the extent that they need to have an account at the awarded financial institution to receive a digital payment). During the COVID-19 pandemic, Prosperidad Social piloted a new delivery mechanism for *Ingreso Solidario* (Solidarity Income), an emergency relief program targeting 3 million poor and vulnerable households not covered by any other cash transfer program. This mechanism prompted beneficiaries without a transaction account via SMS or other communication channels to (remotely) open a low-value account among four different mobile wallets. Beneficiaries with a transaction account, on the other hand, received the funds through their banks, which the Treasury credited via the CUD in accounts at the BR. It is estimated that 37 percent of beneficiaries opened their first account through *Ingreso Solidario*.<sup>170</sup>

**An increasing share of government collections and utility payments are made via digital channels, particularly PSE.** Looking ahead, new payment services (e.g., payment initiation services) may further support this trend and reduce costs. In the wake of the COVID-19 pandemic, the Colombian tax authority enabled all taxpayers to electronically file and pay taxes. There are now two ways to pay taxes: (i) online through the PSE button, credit card (when filing electronically, see below), or a digital credit product, and (ii) in person, at the premises of banks authorized as tax collecting entities (Entidades Autorizadas para Recaudar [EARs]) through a variety of electronic and paper-based payment instruments (with or without an electronic tax declaration). Although in the past, EARs/in-person payments represented the main mechanism for paying taxes in Colombia, the National Directorate of Taxes and Customs (Dirección de Impuestos y Aduanas Nacionales) calculates that in 2020, about 54 percent of the income tax payments of legal persons and 40 percent of those of natural persons were initiated online, with PSE by far the most important online payment method. According to a 2018 IDB report, 77 percent of social security contributions (estimated at 136 million payments and US\$21,000 million a year) are paid via PSE. The pandemic reportedly resulted in an increase in the share of utility payments effected through digital means. One telecommunications company reported that electronic payments increased to 42 percent of total collections in 2020 from much lower levels in previous years that hovered at 10 percent.<sup>171</sup>

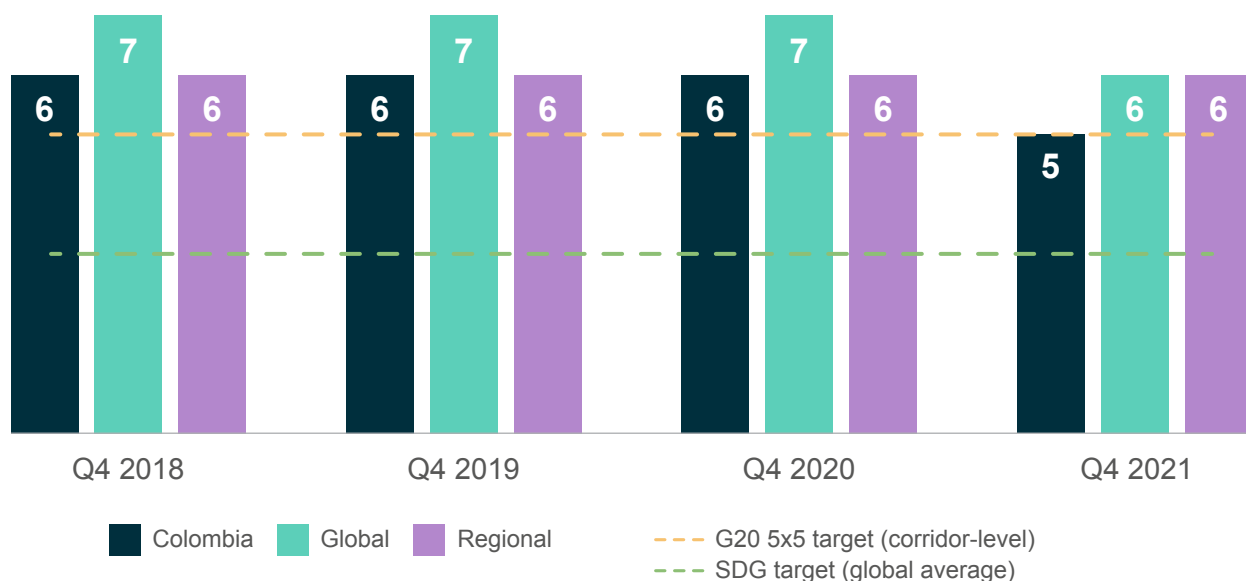
## Remittances

The share of international remittances paid to transaction accounts increased to 43 percent in 2020, an 11-percentage point increase from 2019. Colombia is a net remittance-receiving country from the United States (accounting for approximately 50 percent of the inflows), Spain, Chile, and the United Kingdom. According to the BR, the share of remittances channeled through transaction accounts had been relatively stable in the four years preceding the pandemic, oscillating between 27 percent (2017) and 32 percent (2019). Banks generally promote the crediting of international remittances to transaction accounts and report cross-selling relevant products to recipients (e.g., microcredit, using incoming flows to assess repayment capacity). Market participants report that digital-only models (e.g., Remitly, Xoom) have been gaining market share in the past few years. The average cost of sending money to Colombia hovers around the regional average but is yet to drop below the 5 percent target of the United Nations Sustainable Development Goals (SDGs) (see figure 4.4).<sup>172</sup> Anecdotal evidence suggests that Venezuelans living in Colombia are sending money back home; however, the main money transfer operators (MTOs) hardly serve this

corridor or impose very stringent requirements, pushing Venezuelan migrants to use unregulated channels and crypto-asset service providers such as Valiu.

**Colombia's market for international remittances is considered competitive in spite of situations of exclusivity.** Banks and financing companies are the main players, in partnership with a wide range of MTOs. Central bank regulations on the foreign exchange market establish the type of entities that may operate as foreign exchange intermediaries (intermediarios del mercado cambiario [IMCs]) and the activities they may perform, including sending and receiving international remittances. In addition to banks and financing companies, authorized IMCs include financial cooperatives, Financiera de Desarrollo Nacional (FDN) and Bancoldex (development banks), broker-dealers, foreign exchange houses (Sociedades de Intermediación Cambiaria y de *Servicios Financieros Especiales* [SICSEFs]), and SEDPEs, among others. SICSEFs and SEDPEs may undertake the business of international remittances subject to holding equity greater than or equivalent to the minimum capital required of financing companies. One financing company, Giros&Finanzas, operates as the exclusive agent of Western Union in the country and has a 24 percent market share. In turn, Efecty, the OPP with the largest network of access points, operates as an agent of Giros&Finanzas exclusively for Western Union. Western Union's exclusivity does not seem to inhibit the local agents

**Figure 4.4. Remittance Costs 2018–21: Average Cost of Sending US\$200, percentage of value sent**



Source: World Bank (2023d).

Notes: Remittance costs for Colombia represent the cost of sending US\$200 from the United States to Colombia. Dotted lines represent global commitments in the context of international efforts to reduce remittance costs. The G8 (L'Aquila, 2010) and the G20 (Cannes, 2011 and Brisbane, 2014) committed to reducing the Global Average Total Cost to 5 percent. The UN SDGs have indicated a target of 3 percent for the Global Average to be reached by 2030. At the same time, the UN SDGs have also committed to ensuring that in all corridors, remittances can be transferred for 5 percent or less.

from partnering with international card scheme solutions (e.g., Visa Direct and Money Send) and fintech companies. By law, OPPs (e.g., SuperGIROS, Efecty) can only participate in the market through authorized IMCs (e.g., banks), 4-72 being the only OPP participating in its own right (see also the [section above](#) on the legal, regulatory, and supervisory framework.)

**The size of Colombia’s domestic remittance market is significant and represents a large opportunity for increasing financial inclusion and digital payments.** One-fifth of the population receives domestic remittances, of which 41 percent do so through a

financial institution.<sup>173</sup> Postal service providers operate a cash-based domestic money transfer service with a physical presence in 99 percent of the national territory. MinTIC data show that the number of domestic remittances channeled through the postal sector increased from 81.3 million in 2015 to 134.7 million in 2019. Although the postal sector’s branch network is somewhat integrated into the financial institutions’ network of access points, thereby providing some access to financial services and digital payments, this link could be further strengthened through partnerships and by enabling OPPs to provide a broader range of payment services, subject to fulfilling the respective requirements.

**Table 4.2. Key Challenges and Opportunities for Digital Financial Services**

| Strengths   | Areas for Improvement   |
|---|---|
| <ul style="list-style-type: none"> <li>» Remarkable progress in access to financial services (14-percentage point increase from 2017 to 2021 based on Global Findex)</li> <li>» Demonstrated public sector commitment to strengthening financial and digital infrastructure to enhance access to financial services</li> <li>» Enabling regulatory framework for the provision of electronic deposits, basic/simplified products, and remote onboarding</li> <li>» Moderately developed payments infrastructure; central bank–led initiative to develop an interoperable fast payment infrastructure</li> </ul> | <ul style="list-style-type: none"> <li>» The institutional framework for financial inclusion did not achieve effective coordination and lacks a standing mechanism for private sector engagement.</li> <li>» The lack of a bespoke legal and regulatory framework for payment services may stall innovation and exacerbate market fragmentation.</li> <li>» The open finance legal framework does not provide strong incentives to share customer data within a multilateral setting, while the model for payment initiation rests on retail payment system operators.</li> <li>» Outstanding legal and technical barriers prevent the GoC from completely phasing out suboptimal delivery mechanisms for social assistance programs, to the detriment of beneficiaries’ choice and financial inclusion.</li> </ul> |
| Opportunities   | Threats   |
| <ul style="list-style-type: none"> <li>» Exponential growth of digital wallets and QR codes for electronic payment acceptance</li> <li>» Lessons learned from COVID-19 emergency assistance programs to guide efforts to digitize social protection transfers</li> <li>» Increase in the share of incoming remittances paid to transaction accounts</li> </ul>  | <ul style="list-style-type: none"> <li>» High propensity to cash out/high cash usage and low acceptance of digital payments (also linked to informality and taxation)</li> <li>» Cost-related barriers to access to SPBVs and low interoperability</li> <li>» Low connectivity in rural and remote areas and high costs preventing inhabitants from accessing and using DFS, leading to large urban-rural gap</li> <li>» Limited financial literacy and awareness</li> </ul>  |

### 4.3. Recommendations and next steps

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**Based on the analysis of the current state of digital financial services, Table 4.3 provides recommendations on ways to capitalize on identified strengths and opportunities while addressing areas of improvement.** The recommendations are organized into four main themes: (i) governance; (ii) law, regulations, and supervision; (iii) payment system and ancillary infrastructure; and, (iv) digitization of large reoccurring payment streams. The indication on timing takes into consideration the expected level of effort and/or anticipated time to implement the suggested actions; separately from the timing, some recommendations have been marked as high priority based on either the critical nature of the constraint they address (e.g., regulatory gaps or inconsistencies) or the opportunity to leverage momentum for existing and future initiatives (e.g., fast payments).

- » **Governance.** Colombia has implemented ambitious financial inclusion programs under strong public sector leadership. Looking ahead, institutional arrangements to coordinate the DFS agenda should strive to carefully articulate multiple authorities' powers and the effective mechanisms for coordination with the private sector. The BR initiative to create a payment system forum is consistent with this direction. The forum should have a clear mandate, strike a balance between broad representation and effectiveness, and develop a work program as well as the necessary organizational structures to deliver on it. If well implemented, this body can help catalyze private sector commitment to interoperability and other public policy objectives, including financial inclusion, through concrete actions. The consolidation of multiple entities under the CIIEEF is expected to streamline coordination in the area of financial inclusion; once the CIIEEF has been fully operationalized, consideration could be given to establishing a standing mechanism for private sector engagement in the development and implementation of financial inclusion policies and strategies.
- » **Laws, regulations, and supervision.** Over the past several years, Colombia has passed ambitious regulatory reforms to underpin financial inclusion by fostering sound risk management and protecting financial service users, while at the same time encouraging innovation and enabling new entrants. Further regulatory reforms can build on this and foster a more mature stage of development for Colombia's DFS and fintech ecosystem. In this respect, the

Open Finance Decree of 2022 is a key milestone: implementation should focus on establishing a common baseline (technical, commercial) for the development of a multilateral framework on data aggregation and portability, rather than the continuation of limited-scope partnerships. Regarding payment initiation, the critical role of SPBVs is likely to emphasize the effective governance and coverage of the retail payment infrastructure in Colombia. A comprehensive legal framework for payment services is a pre-condition to improving market structure and competition as well as coordinating authorities' responsibilities. Digital credit requires legal certainty and consumer safeguards; platform-based models (enabled by the Open Finance Decree) and banking-as-a-service could be explored. Authorities should continue adapting oversight and supervision frameworks to digital payments and DFS, particularly in light of outsourcing and new technologies and assets. DFS users should be adequately and consistently protected, regardless of the supervisory remit.

- » **Payment system and ancillary infrastructure.** The lack of full interoperability as well as access barriers to critical financial infrastructure constrain the potential of new business models (e.g., fast payments) to drive down acceptance costs/barriers and expand the use of digital payments in key areas (see below). Against this backdrop, regulatory reforms have sought to enhance the governance of the retail payment system. Looking ahead, authorities (the BR and SFC, each according to its respective mandates) should continue to monitor the effectiveness of the retail payment system's governance arrangements and induce change as necessary. More recently, the central bank began leveraging its operational and catalyst role to ensure an open and interoperable fast payment ecosystem. The BR is well-positioned to develop uniform fast payment scheme rules (including requirements for the underlying clearing and settlement mechanisms), though consideration should be given to their enforceability and the potential role of the BR in setting fast payment standards, in line with its mandate and functions. The design of the SPI-BR should emphasize low-cost access and the connectivity of smaller participants and other third parties (e.g., payment initiation service providers), as well as support for new use cases/access channels.
- » **Digitization of large reoccurring payment streams.** Following the progress made on the digitization of government salaries and pensions, social benefit programs could be shifted to direct payments

to beneficiaries' preferred transaction accounts in a timely fashion. This might entail a change from the current system based on public tendering to ACH payments; any legal barriers to discontinuing the current model should be removed. The GoC could consider integrating the use of digital ID in forthcoming pilots/implementations to enable e-KYC and beneficiary authentication. Ongoing efforts should be accompanied by measures to ensure broad participation in the ACH infrastructure (see above) and the

adequate design of transaction accounts. The digitization of remittances could be facilitated via new entrants; to this end, the conditions to operate as an IMC and the implications on market contestability could be reviewed. Similarly, exclusivity agreements between international MTOs and their agents, while not being prevalent in the Colombian market, persist in some cases and might have to be addressed.

**Table 4.3. Digital Financial Services: Policy Recommendations (1 of 3)**

| Reform Area                        | Recommendation  | Responsible Entity | Timing      | Legal Change Required? |
|------------------------------------|---|--------------------|-------------|------------------------|
| Governance                         | Operationalize the revised financial inclusion coordination framework and develop a standing mechanism for private sector engagement in the development and implementation of financial inclusion policies and strategies.  | MHCP               | Short term  | No                     |
|                                    | Ensure the continuity of the <i>Foro Sistema de Pagos</i> as a formal coordination mechanism and strategic body by developing a mandate and operating procedures. The Foro should support the objective of promoting financial inclusion from a payments perspective in keeping with the country's financial inclusion policy and institutional arrangements.<br><b>PRIORITY.</b> | BR                 | Short term  | No                     |
| Laws, regulations, and supervision | Enact a legal framework for payment services. <b>PRIORITY.</b>  | Congress, MHCP     | Medium term | Yes                    |
|                                    | Enhance legal certainty and consumer safeguards for users of digital credit by requiring authorization and imposing proportionate prudential rules with a view to ensuring a level-playing field.   | MHCP, SFC          | Medium term | Yes                    |
|                                    |   |                    |             |                        |

**Table 4.3. Digital Financial Services: Policy Recommendations (2 of 3)**

| Reform Area   | Recommendation  | Responsible Entity          | Timing              | Legal Change Required? |
|---|---|-----------------------------|---------------------|------------------------|
|   | Seguir adaptando los marcos de vigilancia y supervisión para pagos digitales y SFD a la luz de las nuevas tecnologías y modelos de negocio. Formular una política integral y un enfoque regulatorio para los criptoactivos e implementar estándares internacionales.  | BR, SFC                     | On an ongoing basis | No                     |
|   | Strengthen regulation and supervision of savings and credit cooperatives and build capacity to provide DFS with a focus on underserved segments.  | SES                         | Medium term         | Not necessarily        |
|   | Ensure consistent financial consumer protection across providers of equivalent services and the availability and effectiveness of alternative dispute-resolution schemes.   | SFC                         | Short term          | Possibly               |
|   | Establish minimum standards for payment initiation service provider access interfaces provided by retail payment systems; access requirements and operating rules should be approved by the SFC. Regarding account information/aggregation services, the SFC should develop regulations to help steer the market toward a multilateral framework through common technical standards and a single registration mechanism for third-party providers. <b>PRIORITY.</b> | SFC                         | Short term          | No                     |
| <b>Payment systems and ancillary infrastructure</b> | Evaluate the impact of regulatory reforms on lowering access barriers to SPBVs and reducing costs. Depending on this evaluation, consider potential additional measures to strengthen public interest considerations, e.g., by prescribing changes to system rules and governance arrangements as appropriate. <b>PRIORITY.</b>   | SFC in coordination with BR | Medium term         | No                     |
|   |   |                             |                     |                        |

**Table 4.3. Digital Financial Services: Policy Recommendations (3 of 3)**

| Reform Area  | Recommendation   | Responsible Entity                   | Timing      | Legal Change Required? |
|--|--|--------------------------------------|-------------|------------------------|
|  | Develop uniform fast payment scheme rules (including requirements for the underlying clearing and settlement mechanisms), taking into consideration their enforceability and the potential role of the BR in setting fast payment standards, in line with its mandate and functions. The design of the SPI-BR should emphasize low-cost access and the connectivity of smaller participants and other third parties (e.g., payment initiation service providers), as well as support for new use cases/access channels. <b>PRIORITY.</b> | BR                                   | Short term  | No                     |
|  | Enable regulated non-bank entities to open accounts at the BR while ensuring appropriate risk mitigation.  | BR                                   | Medium term | No                     |
|  | Ensure the interoperability of SPBVs with a view to enabling payment service providers participating in any platform (and their customers) to reach each other.  | BR, operators of SPBVs               | Medium term | No                     |
| <b>Digitization of large reoccurring payment streams</b> | Expand plans to migrate social benefit payments from the current system based on public tendering to ACH payments. Any legal barriers to discontinuing the current model should be removed. Integrate the use of digital ID for beneficiary authentication. <b>PRIORITY.</b>   | <i>Prosperidad Social</i> , MHCP, BR | Medium term | Possibly               |
|  | Evaluate the impact of (i) the current legal and regulatory framework for IMCs on the contestability of the market for international remittances and ensure that they continue to reflect risk-based considerations; (ii) exclusivity agreements between international MTOs and the local agents.  | BR                                   | Medium term | No                     |
|  | Further leverage the role of OPPs to digitize domestic remittances, including by enabling OPPs to broaden their range of services/activities, subject to meeting the relevant requirements.  | MHCP                                 | Medium term | Possibly               |



# 5. DIGITAL BUSINESSES



## KEY MESSAGES

- » **Colombia has a large pool of digital start-ups relative to regional peers, but few manage to scale and reach maturity.** As of 2021, Colombia was home to approximately 13 percent of the formal digital businesses in the LAC region, with a strong presence in fintech, business management tech, e-commerce, and logistics tech, and a dominant position in health-tech. However, for every six digital start-ups in Colombia, there is only one established digital business.
- » **The country's ICT sector, the backbone of the digital economy, remains relatively small.** It is contributing relatively little to total value-added, employment growth, and exports relative to the OECD average. Colombia is specializing in medium digital-intensive industries, contrary to peers, such as Costa Rica and Mexico, which are moving toward industries with high digital intensiveness.
- » **E-commerce has been growing steadily, driven mostly by a boom in domestic trade, but the proportion of online sales remains limited.** The cross-border e-commerce of goods is constrained by: (i) low automation of border control agencies, (ii) outmoded customs and tax revenue collection techniques, (iii) a partial *de minimis* regime for imported low-value shipments, and (iv) limits imposed by the Customs Code on imports and exports by postal services.
- » **Insufficient access to debt and equity finance could limit the growth potential of digital businesses.** Although there has been growth in early-stage financing for digital companies, particularly venture capital, low levels of private equity and debt financing could hinder the growth of mature and later-stage digital firms. Constraints to capital market development could hinder the capacity of Colombian digital businesses to attract more diverse and scalable private investments.
- » **Firms' declining use of and investment in digital technologies as COVID-19 mobility restrictions were lifted, and the limited externalization of related services, constrain digital businesses from gaining scale.** Advanced digital technologies for data processing and automation, such as AI, show enormous potential, but their adoption and use by firms—particularly MSMEs—remain limited, due to inadequate managerial capabilities, lack of knowledge, cultural factors, and affordability constraints.
- » **Less than 5 percent of the resources allocated to the National System of Competitiveness and Innovation in 2022 were directed at promoting the digital transformation of the private sector, and public expenditure inefficiencies remain.** Resources are heavily oriented toward improving workforce digital skills and strengthening firm capacity to adopt and use digital technologies productively. Limited public resources are allocated to improving access to finance.

## 5.1. The importance of digital businesses

**The widespread adoption of digital technologies by businesses in Colombia represents a great opportunity to reignite the engines of economic growth but also poses a multidimensional challenge.** In addition to their own contributions to productivity growth and competitiveness, both start-up and established digital enterprises are key enablers of growth through the digital transformation of traditionally offline businesses. Digital businesses supply new or improved digital technologies and services, facilitate access to larger and more dynamic markets for local firms, and generate strong network and demonstration effects that promote the adoption of innovative business models and digital technologies by offline companies. As discussed in [Chapter 2](#), the availability of adequate digital infrastructure plays a critical role in business digitalization, as it bolsters access to digital products and services, the dependable use of digital platforms, and the rate of technology adoption. Digital transformation requires innovative and efficient payment systems and financial services that allow businesses to seamlessly transact with customers and other firms (see [Chapter 4](#)); it also requires human capital with the adequate skillset to adopt and use technologies and create local digital solutions to meet the challenges facing Colombian companies (see [Chapter 6](#)). To support the growth and proliferation of digital businesses, it is critical that the government provide an enabling regulatory framework that promotes trust, innovation, and risk taking while also anticipating and preparing for the distortions that may arise as technology adoption accelerates.

**An innovation-oriented ecosystem is critical to helping digital entrepreneurs achieve their full growth potential.** Value creation often requires interaction and collaboration between entrepreneurs, the government, academia, and other key actors. Digital entrepreneurship ecosystems flourish when nurtured through networks of investors and entrepreneurs; targeted financial instruments; and access to knowledge and technology. Moreover, a healthy competitive market is crucial both to level the playing field so that the best performing digital businesses can have a fair chance to enter, compete, and scale and also to ensure consumer and supplier welfare.

**This chapter assesses the provision of digital goods and services by digital businesses (the supply side), their adoption and use by other firms in the manufacturing, commerce, and “other services” sectors (the demand side), policy instruments supporting the public sector’s digital transformation, and related challenges and opportunities.** Digital businesses can be divided into two categories: digital start-ups and established digital firms ([see endnote for definitions](#)).

This chapter discusses the current state of these businesses; the performance of the ICT sector, the backbone of the digital economy; the digital uptake among firms in other sectors; and the current mix of public policy instruments supporting the digital transformation of businesses in Colombia.

## 5.2 Current state of digital businesses

### Contribution of the digital economy to private sector development: the supply side

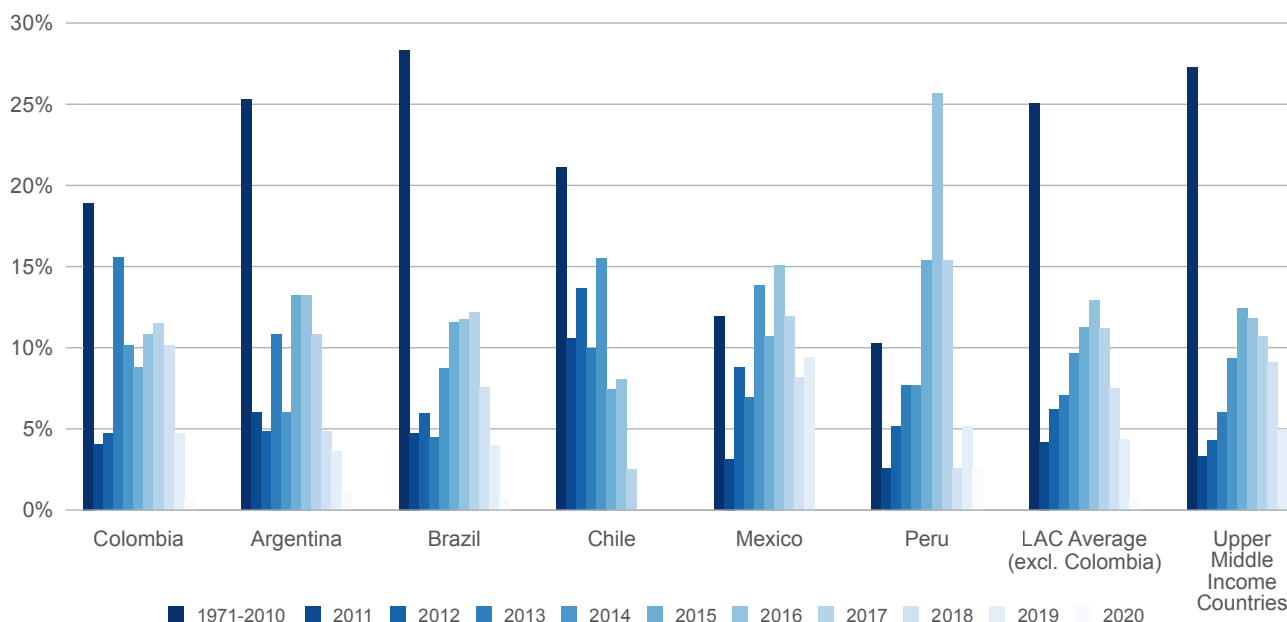
**Colombia ranks third in the number of digital businesses in the LAC region, and such firms tend to be relatively young.**<sup>175</sup> As of September 2021, Colombia was home to approximately 12.8 percent of the digital businesses in LAC. In fact, Colombia had more digital firms per GDP, after Brazil and Mexico, than the rest of the region. Digital businesses in Colombia are younger than in Argentina, Brazil, Chile, and most regional and income group comparators (i.e., they have a younger founding year distribution), with over 80 percent having emerged in the past decade ([Figure 5.1](#)). Colombian digital businesses are also on average younger than global frontier comparators with mature markets, such as OECD and high-income countries. When compared to aspirational peers, such as Romania and Estonia, Colombia showed a spike in new digital businesses in 2013 and then some fluctuations afterwards, while Romania and Estonia have shown a steady increase of new businesses over the past decade.

**For every six digital start-ups in Colombia, there is only one established digital business, suggesting that there is a vibrant ecosystem but that few digital start-ups manage to scale and mature.** The proportion of Colombian digital start-ups to established digital businesses is similar to some of the country’s regional comparators (Argentina, Chile, Mexico, Peru), the UMIC average, and aspirational comparators such as Romania and Estonia, but below the LAC region.<sup>176</sup> However, global frontier countries (OECD and high-income countries) and Brazil show a larger ratio of about two established digital businesses for every five digital start-ups. It is worth noting that Colombia’s digital start-ups start larger in size (number of employees), and both digital start-ups and established digital businesses are larger relative to regional peers. Moreover, 23 percent of Colombian digital start-ups reach the exit stage, mostly through merger and acquisitions (slightly above most regional and aspirational peers and close to OECD and high-income countries). Finally, the mortality rate of start-ups in 2019 was 18% with a relatively high churning rate (i.e., the frequency with which firms are created and existing ones

close down) for ICT software developers and providers of related services.<sup>177</sup> These findings suggest low entry barriers in the digital subsectors and a healthy “creative destruction” mechanism favorable to productivity growth. However, the findings could also indicate entry mistakes as entrepreneurs lack managerial capabilities and also challenges for the scaling-up of digital businesses in Colombia. There is therefore opportunity to strengthen the competitiveness and innovation policy mix with instruments that target the key drivers of success, such as improving managerial capacity and providing more diverse and scalable sources of financing, as discussed below.

**Digital businesses tend to be more concentrated around the largest economic centers compared to other firms, suggesting that they are more dependent on network interactions with buyers and suppliers.** Bogotá hosts 60 percent of digital start-ups and 18 percent of established digital businesses, and there is a nascent digital cluster in Medellín (concentrating 8.7 percent of digital businesses, mostly start-ups). Cali, Manizales, and Barranquilla host roughly 5 percent of the remaining digital businesses. Twenty-five other cities have at least one digital business but no more than five.

**Figure 5.1. Colombia and Regional Comparators: Digital Business by Founding Years**



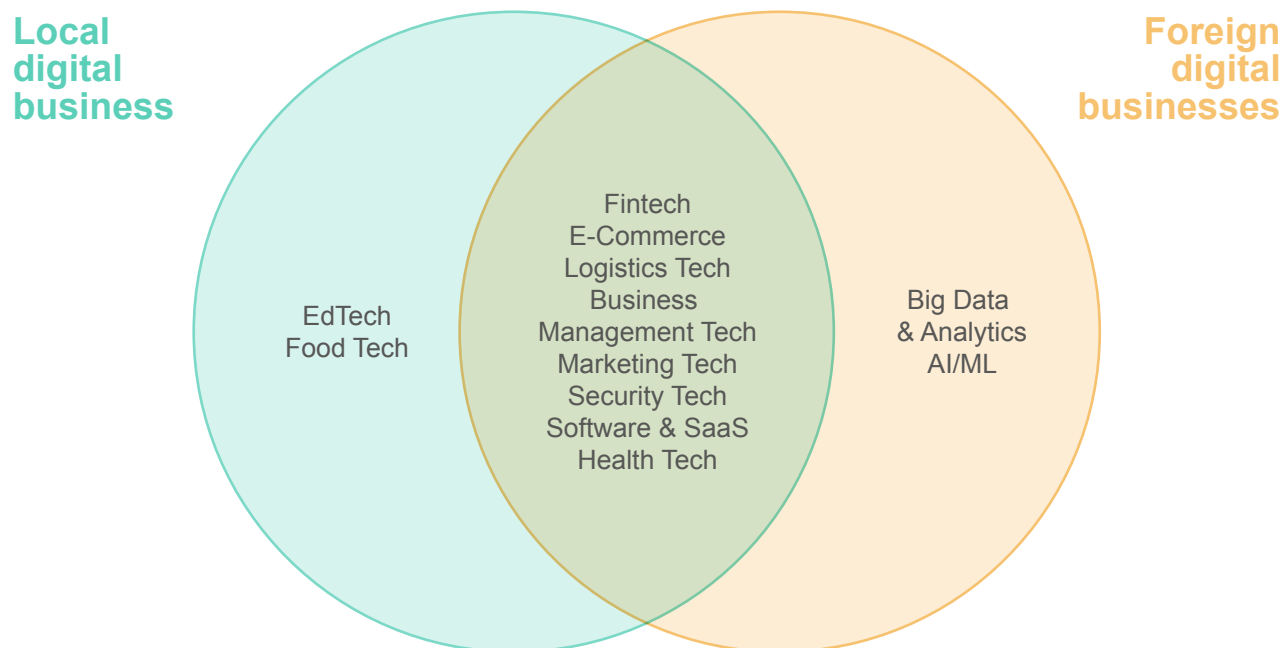
Source: Authors’ elaboration with data from Pitchbook and CB Insights.

**Roughly one-third of digital businesses operating in Colombia are headquartered outside the country, as foreign firms tend to be relatively more present in data-intensive tasks, such as big data analytics and services related to AI.** The United States is the top origin country of foreign digital businesses (35 percent of such companies), and another 38 percent are headquartered in Spain and other LAC countries (such as Chile, Brazil, and Mexico), suggesting that regional proximity and language compatibility may be critical factors for overseas digital businesses in operating in Colombia. Although foreign and domestic firms offer services in similar sectors, the former tend to be relatively more concentrated in data-intensive tasks that rely on big data, AI, and other emerging technologies (Figure 5.2).

**Gender gaps regarding firm ownership are more pronounced in some digital business subsectors relative to the rest of the economy.** At 24 percent, women entrepreneurs are relatively less present than men in ICT software development and the provision of related services compared to an average of 40 percent in the rest of the economy (DANE 2019 structural surveys).<sup>178</sup> This suggests that gender-specific bottlenecks and biases might be impeding women entrepreneurs from entering and succeeding in the provision of some digital goods and services.

**The top four digital subsectors in Colombia are fintech, business management tech, e-commerce, and logistics tech, and healthtech also plays a leading**

**Figure 5.2. Top Digital Business Subsectors for Foreign and Domestic Firms (2010–20)**



Source: Authors' elaboration based on data from Pitchbook and CB Insights.  
 Note: ML = machine learning; SaaS = software as a service.

**role relative to regional peers.** Recent data on registered digital businesses from Pitchbook and CB Insights show that fintech is the top subsector across medium-sized firms in Colombia and other regional peers.<sup>179</sup> E-commerce and related subsectors (such as logistics tech), business-to-business subsectors (business management and marketing tech), and technology-focused services (big data, software, AI) also make up a large share of medium-sized digital firms in Colombia. Moreover, the share of medium-sized and large healthtech businesses is double that of regional peers. Although the marketing tech subsector trails behind the regional average, it is one of the three subsectors in which a substantial number of companies have been created in Colombia in the past 20 years. Other emerging subsectors include digital media, AI, foodtech, educationtech, and propertytech. On the other hand, relatively fewer firms have entered the web services, insurtech, telecommunications, security tech, and software subsectors in that time frame.

**Twenty percent of digital businesses in Colombia have platform-based or data-driven business models, above levels observed in country peers.**<sup>180</sup> These firms are less likely to have a successful exit in terms of merger and acquisitions or initial public offerings (IPOs), suggesting low entry barriers relative to constraints to consolidating their market proposal and gaining scale. Colombia has a higher proportion of platform-based or data-driven business models than the OECD and UMIC

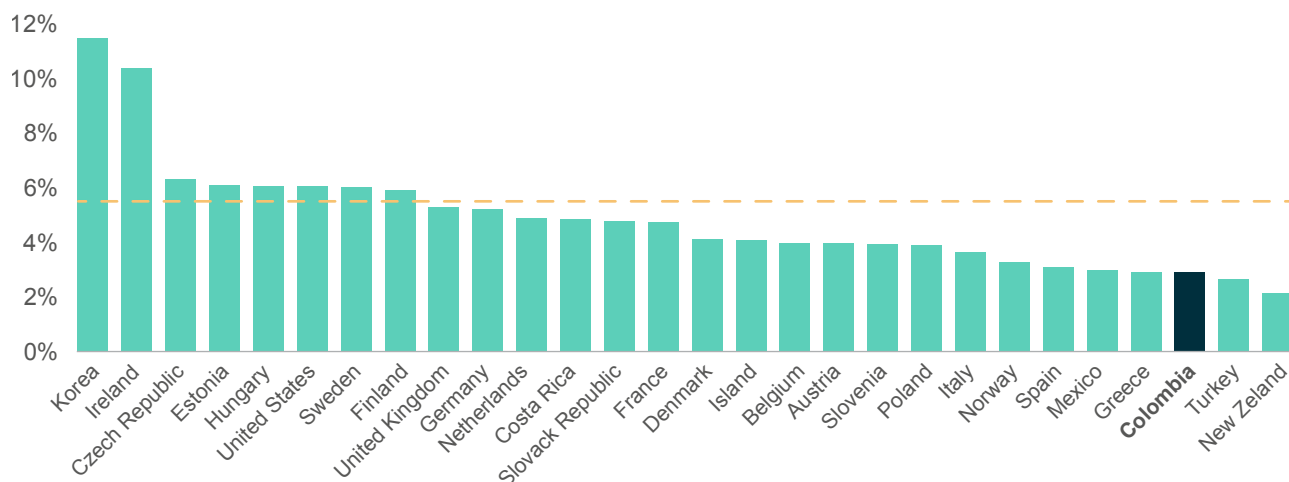
averages and relative to aspirational peers, although below some regional peers. Platform-based and data-intensive businesses help to build a digital ecosystem, provide strong network effects that reinforce digitalization, and strengthen the technology backbone supporting other digital businesses and thus play a critical role in the digital transformation of other firms. Platform-based businesses in Colombia tend to be small to medium sized (in terms of number of employees), and almost half are foreign firms. Moreover, few platform-based and data-driven businesses in Colombia achieve a successful exit compared to other types of digital business models. Only 7.1 percent of platform-based businesses and 12.6 percent of data-driven businesses in Colombia reach a successful exit in terms of mergers and acquisitions, IPOs, majority buyouts, stock distribution, asset sale, and dividend recapitalization, among others, in contrast to 25.8 percent for other digital business models.

**The ICT sector in Colombia, the backbone of the digital economy, contributes relatively little to total value-added (or manufacturing value-added) or to employment growth.** The ICT sector is a driving force in the development of the digital economy. In addition to its own contribution to growth, productivity, employment, and innovation, the sector provides multiple enablers (such as software, hardware, networks, services, and contents) for the formation and growth of digital businesses and the widespread adoption of digital technologies by businesses, government, and society at large.<sup>183</sup>

However, in Colombia, the ICT sector remains relatively small, contributing only 2.8 percent to total value-added in 2019 compared to 4.8 percent on average in OECD countries (see Figure 5.3).<sup>184</sup> ICT services capital contributed 0.10 percent to total value-added growth in Colombia in 2016, below the 0.16 percent in Costa Rica and Chile but above the 0.02 percent in Mexico.<sup>185</sup> However, its contribution to total value-added almost doubled over the next five years, reaching 0.19 percent in 2020 (although still one-fifth the contribution of non-ICT services capital). At the sectoral level, ICT services capital contributes substantially less to manufacturing value-added growth in Colombia relative to peer countries.<sup>186</sup> In financial services, insurance, and real estate, it experienced the fastest growing contribution to sectoral value-added growth, in line with the expansion of DFS in the country. Nevertheless, Colombia is the only OECD country with a negative employment growth rate of 4.4 percent in the ICT sector between 2014 and 2019, well below the OECD average employment growth rate of 3.7 percent and that of regional peers, such as Costa Rica (9.2 percent) and Mexico (5.18 percent).

**Colombia is specializing in medium digital-intensive industries, contrary to such peers as Costa Rica and Mexico that are moving toward industries with high digital intensiveness.**<sup>187</sup> Colombia registered a slight transformation away from low toward medium digital-intensive industries between 2014 and 2018. During that period, the value-added generated in both medium-low and medium-high intensive industries increased as a share of the total value-added in the economy. However, while regional comparators, such as Costa Rica and Mexico, have had further progress in high digital-intensive industries, Colombia has seen a reduction of this type of industry as a share of total value-added in the economy. In addition to strong demand from local and international markets, high digital-intensive industries require several inputs to grow, including connectivity through ICT infrastructure, specific financial products that cater to digital services, a qualified labor force, and regulation that allows digital businesses to innovate and other businesses to swiftly adapt and absorb new knowledge and technologies (see Chapters 2, 4, 6, and 7, respectively).

**Figure 5.3. The ICT Sector Contribution to Total Value-Added in OECD Countries (levels, 2019)**



Source: Authors' calculations, based on OECD (2020).

Notes: The ICT sector includes electronic and optical products, telecommunications, computer programming, consultancy and related activities, and information service activities (data processing, hosting, websites). The orange horizontal line at 4.8 percent represents the OECD average.

**The contribution of the ICT sector to exports in Colombia lags behind regional peers and is one-sixth of the OECD average.** Between 2015 and 2018, the contribution of the ICT sector to total export value in Colombia stagnated at 1.5 percent, below the OECD average of 9.2 percent and below such regional peers as Mexico (8.3 percent) and Costa Rica (6.5 percent) during the same period. As Figure 5.4 shows, ICT embodied in manufacturing exports represented 1.2 percent of gross export value, almost one-tenth of the OECD average and below countries integrated into global value chains such as Mexico (11 percent).<sup>188</sup> ICT embodied in service exports are also lagging in Colombia (3.3 percent) relative to the OECD average (7.4 percent) and countries such as Costa Rica (10.4 percent) (see Figure 5.5).

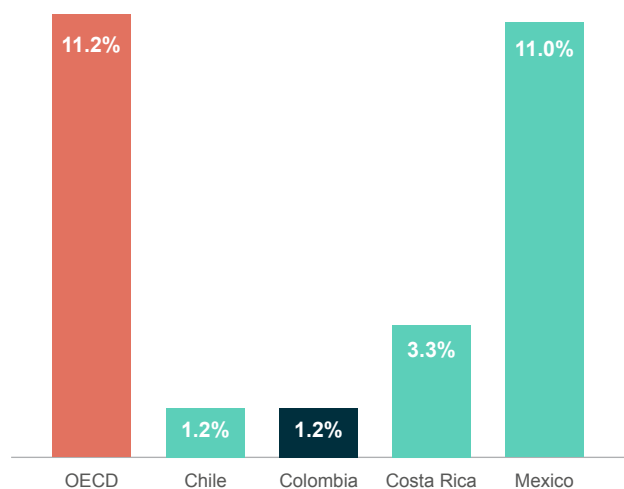
**The category of “other service exports” (which include ICT and other business services) has been gaining momentum and recovered faster from the post-COVID-19 crisis than the rest of the service exports.** Between 2010 and 2019, Colombian service exports increased by a factor of 1.75. However, due to the pandemic, service exports in 2020 returned to their 2010 levels, although they recovered substantially in 2021 to reach a factor of 1.25 relative to 2010.<sup>189</sup> Transport services have been losing relevance through the decade, while “other services” have been gaining momentum. The latter were able to recover faster from the pandemic, even surpassing the value of personal travel exports in

2020 and 2021. Computer service exports in particular, the fastest growing service sector over the past 10 years globally, grew by 17 percent in Colombia (among the highest rates in the region after Uruguay and Panama), boosted by a shift toward remote working and increased digitalization.<sup>190</sup>

However, during the past decade, exports of digitally deliverable services as a percentage of total service exports have stagnated at a low level relative to regional peers and to the OECD average. In 2019, digitally deliverable service exports remained low at 20.7 percent of total export services, well below regional and OECD comparators (Figure 5.6).<sup>191</sup> Their growth has stagnated for a decade, while other countries have registered a substantial expansion, such as Brazil (from 54 to 62 percent) and Costa Rica (from 37 to 50 percent) (Figure 5.7). Quantitative analysis suggests that developing countries will gain an increasing share of global trade, but the extent of that share will depend on their ability to catch up on the adoption of digital technologies.<sup>192</sup>

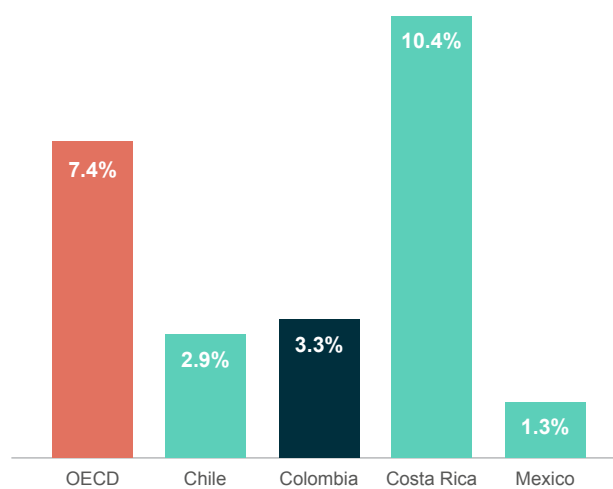
**E-commerce has been growing steadily, especially since the onset of the COVID-19 pandemic.** E-commerce as a share of GDP grew from 1.9 percent in 2018 to 3.6 percent in 2021. The number of parcels in Colombia for both the domestic and international markets grew 14.6 percentage points between 2010 and 2019, above the trend observed in Mexico (2.3 percentage points)

**Figure 5.4. ICT Embodied in Manufacturing Exports, percentage of gross exports**



Source: OECD (2021).  
Note: Data correspond to 2018.

**Figure 5.5. ICT Embodied in Service Exports, percentage of gross exports**



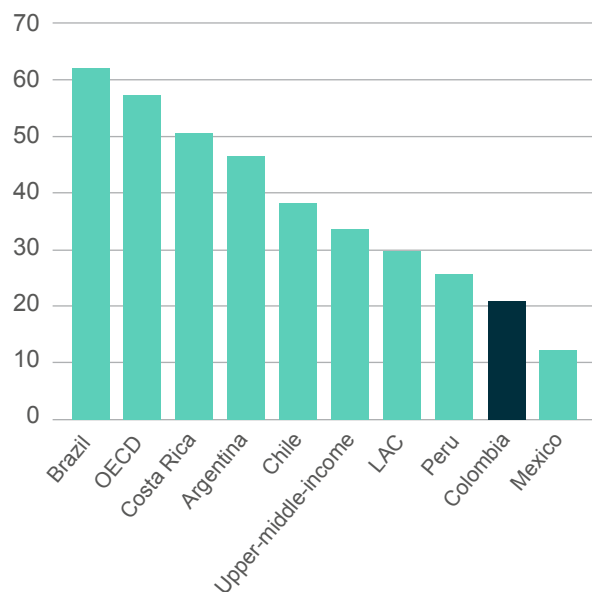
Source: OECD (2021).  
Note: Data correspond to 2018.

and Brazil (4.6 percentage points) but below Costa Rica (17.4 percentage points). Sales made through e-commerce in 2020 were 30.6 percent higher than in 2019, and transactions grew 86.2 percent in the same period. In 2021, e-commerce sales grew further by 40 percent, with 50 percent of Colombians making purchases online (though this was only 5.4 percent of their purchases) and spending on average over US\$200.<sup>193</sup>

**Most of the growth in e-commerce in Colombia has been driven by a boom in domestic trade.** The number of parcels delivered through the domestic postal service—a proxy of domestic e-commerce—grew 16 times between 2010 and 2019. Yet, in the 2010–20 period exported parcels increased by a factor of three, whereas imported parcels did not grow substantially relative to regional comparators.<sup>194</sup> However, sales via e-commerce are minimal across all sectors, with exports representing less than 1 percent of sales from SMEs and large firms on average in 2019, and e-commerce sales to the domestic market representing less than 8 percent of total sales, according to data from the 2019 Enterprise Survey on Information and Communications Technologies (*Encuesta de Tecnologías de la Información y las Comunicaciones* [ENTIC Empresas]).

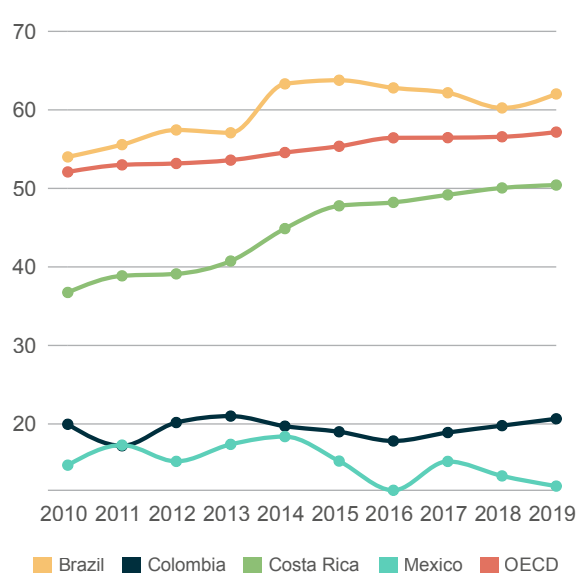
**Except for microenterprises, the COVID-19 pandemic boosted firms supply through e-commerce, although its use declined as mobility barriers were lifted, possibly due to a preference for cash-based payment transactions.** In 2019, 6 percent of firms in commerce, 25 percent in manufacturing, and 51 percent in “other services” performed an online product delivery in digitized form.<sup>195</sup> As the pandemic began to impose hurdles to physical transactions, many firms moved to digital channels to survive. By October 2020, about half of the registered SMEs and large companies reported using the internet as an adjustment mechanism to sell their products. However, by February 2022, this figure had dropped to 30 percent.<sup>196</sup> It is worth noting that even in a scenario of restricted mobility, the use of the internet by microenterprises for selling and buying inputs and delivering products has been declining over the past three years, from 10–12 percent in 2019 to 5 percent in December 2021.<sup>197</sup> The most frequently cited reason for not making use of e-commerce is people’s distrust of online payments (64 percent). It is estimated that more than 90 percent of all retail payment transactions are carried out in cash.<sup>198</sup> Although the share of the adult population that has made a digital payment leaped from 29 to 42 percent between 2019 and 2021, Colombia still lags

**Figure 5.6. Digitally Deliverable Services in 2019, percentage of total service exports**



Source: UNCTAD (2021).

**Figure 5.7. Evolution of Digitally Deliverable Services, percentage of total service exports 2010–19**



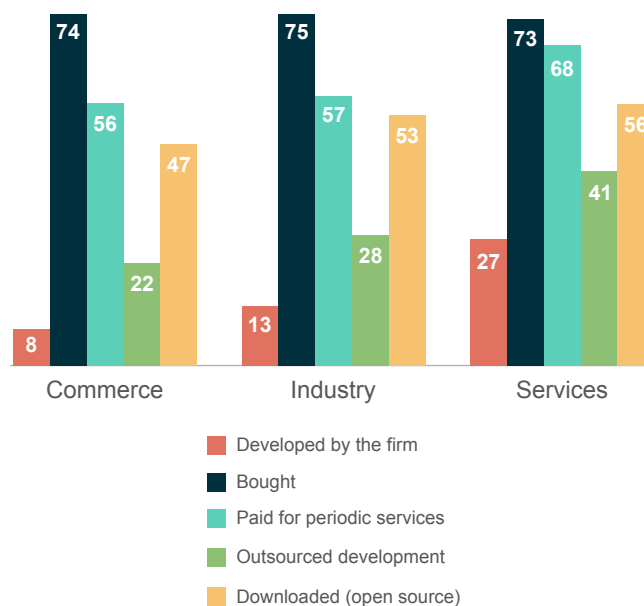
Source: UNCTAD (2021).

regional peers such as Argentina (59 percent), Brazil (71 percent), and Costa Rica (53 percent), and the OECD average (94 percent) in this dimension.<sup>199</sup> In a 2017 study by the CRC, only 2.9 percent of adults used PayPal to complete e-commerce transactions in 2015.<sup>200</sup> (Chapter 4 discusses the current state of and opportunities for the development of digital payments in Colombia.)

**Drivers of digital business performance: inadequate infrastructure provision, burdensome regulations, and limited demand scale and access to finance**

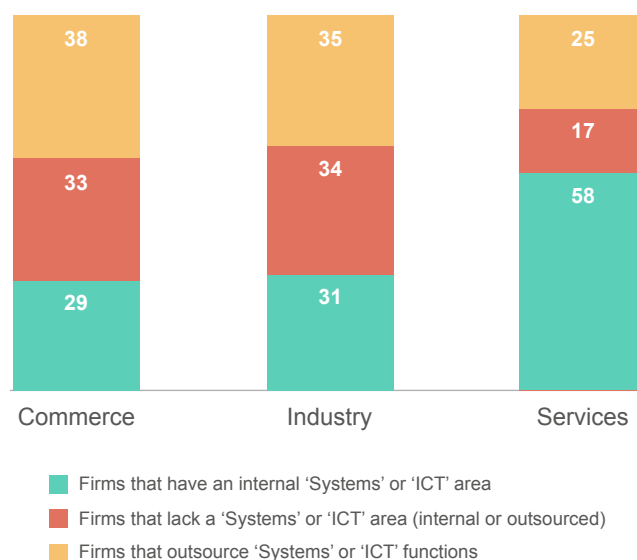
**The limited use of third parties in firms' development and application of ICT and related services presents an obstacle to the ability of digital businesses to gain scale.** Less than one out of every six small, medium, and large businesses in commerce and manufacturing have the capacity to develop the computer applications, programs, and other digital solutions they require to operate, although the share is slightly larger in the service sector (27 percent). Most firms that used software and computer programs in 2019 bought or downloaded them from an open source, and only a few of them, especially in the commerce and manufacturing sectors, outsourced the development of digital solutions to a third party. Between 56 and 68 percent of firms across sectors paid for periodic services related to software and computer programs, and only one-third outsourced their systems or ICT functions (Figure 5.9). Likewise for digital platforms, as 31 percent of firms in manufacturing, 39 percent in commerce, and 46 percent in "other services" reported using such platforms to order or buy supplies, and less than a third used them to receive orders. Big data and other advanced analytics have an even lower use, as less than 5 percent of firms in the commerce and manufacturing sectors implemented such technologies.<sup>201</sup> Overall, these findings at the firm level corroborate aggregate results on the limited contribution of the ICT sector to total value-added, due in part to the limited firm capacity to adopt and use digital technologies productively, whether in house or via third parties.

**Figure 5.8. Share of Companies that Used Computer Applications or Programs according to the Method of Obtaining the Software, by sector (%)**



Source: DANE (2021d).

**Figure 5.9. Share of Firms that Have a Systems or ICT Department (internal or outsourced)**



Source: DANE (2021d).

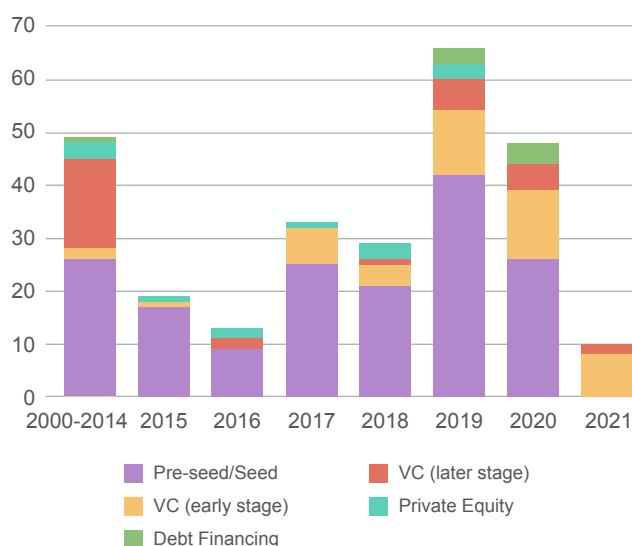


**Constraints to capital market development also limit Colombia’s capacity to attract more diverse and scalable private investments that cater to later-stage digital businesses.** The number of formal investment deals for Colombian digital firms have increased over the past decade, particularly early-stage financing (i.e., pre-seed/seed, such as grants, seed funds and angel investing, and early-stage venture capital), raising over US\$1.2 billion between 2010 and 2021 (Figure 5.10).<sup>202</sup> Close to one-third of digital business funding deals are venture capital, above regional and aspirational peers as well as the LAC average and similar to OECD and UMICs, indicating a growing early-stage start-up pipeline and subsequent investor interest.

**Private equity, debt financing, and other types of capitalization deals remain limited in number among digital businesses headquartered in Colombia relative to regional, income, and aspirational comparators.** Nevertheless, they represented the largest share of formal investment value, partly illustrating that these deals are key to enabling the growth of scalable businesses, even though few digital firms are ready for such investment. Less than 20 percent of digital businesses’ financing deals in Colombia during the past decade have been equity and debt financing. Other forms of capitalization, such as bonds, corporate asset purchases, or joint ventures, are also available, but relatively few Colombian digital firms have access to them. However, equity, debt financing, and other types of capitalization represented 70 percent of the formal investment funds raised (Figure 5.11). U.S investors are the most prevalent among well-funded Colombian digital businesses, and they are investing in large deals, along with Colombian and other international investors.<sup>203</sup> Exits through initial public offerings are very rare, indicating room for improvement in capital market development for digital businesses that have matured and also the need to keep nurturing digital start-ups to mature stages.

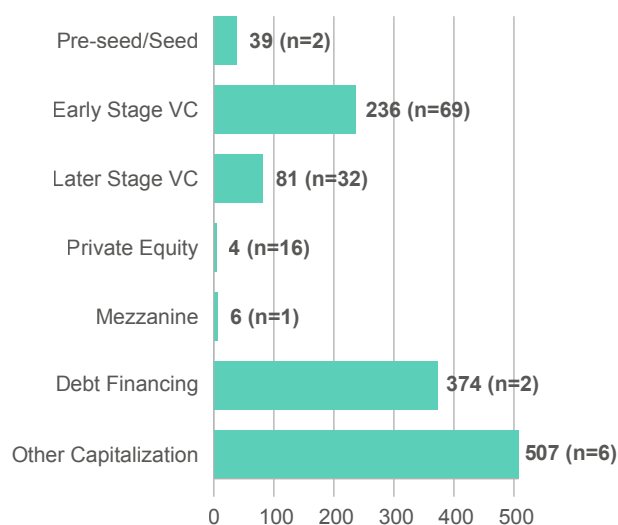
**Access to financing is a particularly important challenge to the innovation and growth of digital businesses.** More than half of innovative ICT firms in 2019–20 pointed to difficulties in accessing external financing as a constraint to innovation.<sup>204</sup> About 97 percent of innovative ICT businesses finance their STI activities with their own resources (in contrast to 84 and 78 percent of non-ICT firms in manufacturing and services, respectively).<sup>205</sup> Debt and equity financing play a minor role in supporting the STI investments of ICT firms, accounting for less than 2 percent of total funding for these types of activities.

**Figure 5.10. Number of Last Deals, by deal type**



Source: Authors’ calculations based on data from Pitchbook and DB Insights.

**Figure 5.11. Total Value of Investment by Funding Type (funding from 2010–21)**



Source: Authors’ calculations based on data from Pitchbook and DB Insights.

**Fintech, logistics tech, and e-commerce are the subsectors with the most formal investment deals over the past six years, while firms in miningtech, healthtech, and utilities tech have received the highest average deal sizes.** Investors have consistently invested in fintech and logistics tech over the years, while the number of investments in e-commerce increased significantly from 2017 onwards, taking its spot among the subsectors with the most formal investment deals from healthtech. Businesses in mobilitytech, foodtech, fintech, and e-commerce are raising funds faster than firms in other business-to-business and business-to-consumer subsectors in Colombia. Miningtech, healthtech, and utilities tech have achieved the highest average formal investment value per firm, reaching US\$589 million, US\$317 million, and US\$168 million in the 2015–20 period, respectively.<sup>206</sup> Healthtech, in particular, has received by far the largest average deal size, reaching US\$573 million, while for other sectors such figures are between US\$1 and \$6 million. Contrary to regional and structural comparators, fintech is not among the top five subsectors by number of private equity deals in Colombia, suggesting that on average, local businesses in this subsector may not have achieved a large enough scale for private equity rounds.

**Investors in Colombia are betting big on the value of data and the network effect of platform business models, but delays in raising funds for these firms could be impacting their scalability and international competitiveness.** Within Colombia, 94.6 percent of platform-based and 84 percent of data-driven businesses have received formal funding compared to 70.5 percent for other digital business models. However, although platform-based and data-driven businesses in Colombia are on average younger than similar firms in global frontier countries (OECD and high-income countries), they tend to be older and take longer to raise funds than firms in most regional comparators and aspirational peers (e.g., Romania and Estonia).

**Poor infrastructure and connectivity are among the biggest restrictions to the expansion of digitally enabled services in Colombia.** Colombia faces several restrictions to the expansion of digitally enabled services, including poor infrastructure and connectivity as well as low internet quality and speed (for a more expanded discussion on these factors, review [Chapter 2](#)). All OECD countries have a lower digital trade restrictiveness index than Colombia, except for Poland.<sup>207</sup> Poor infrastructure and connectivity make up over 93 percent of Colombia's weak score, and the remainder is related to restrictions on electronic transactions. Import tariffs do not seem to be an obstacle to the development of the ICT sector, which has among the lowest effective protection rates in Colombia (0.26 percent).

**Remaining gaps in horizontal digital platform regulation in Colombia regarding rules on intermediary liability could also be constraining the scalability of digital platform businesses.**<sup>208</sup> Colombia does not have a framework that explicitly addresses online intermediary liability regulating the relationship between platform intermediaries (websites and apps) and the firms or individuals offering their own products or services, something that is essential to the functioning of those digital transactions.<sup>209</sup> The lack of this kind of regulatory framework can disincentivize firms to offer their goods and services in digital platforms due to a lack of transparency and predictability regarding the violation of intellectual property rules (typically trademark protection).

**In terms of sector-specific regulation, the crowdfunding framework enacted in 2018 fails to foster the growth of borrowing through these platforms.** As highlighted in the Bank's Financial Sector Assessment Program for Colombia, "just one platform, sponsored by the Colombian Stock Exchange (BVC), has been launched to date, with only 82 projects financed since 2018. The low participation by the MSMEs in this new financing platform can be attributed to two reasons. First, only entities with a securities market license called 'Collaborative Financing Companies' can offer crowdfunding services. Second, regulation limits crowdfunding platforms to issue tradable debt and equity. Peer-to-peer lending is explicitly excluded from Decree 1235 of 2020, which, following experience from advanced and other emerging economies, is where the largest share of digital lending takes place for MSMEs."<sup>210</sup>

**Moreover, e-commerce is affected by inadequate fiscal policies and by low risk/fraud management standards that may be contributing to a perception of increased risk levels as well as to a general wariness of electronic payments and channels on the part of customers and merchants.** Based on the use of anti-fraud technology and innovation by online payment service providers in Colombia, users' mistrust should not be solely ascribed to sociocultural factors. Moreover, in Colombia, payments by means other than cash are also subject to a tax on financial transactions (the GMF). According to a recent World Bank survey of formal businesses in Colombia, 84 percent perceive the GMF as a serious impediment to the use of electronic payments, even to pay taxes.

**International e-commerce of goods is also limited by the lack of automation among border control agencies, outmoded customs and tax revenue collection procedures for processing postal and expedited shipments, a partial *de minimis* regime for imported low-value shipments, and import and export limits on postal services imposed by the Customs Code.**

Colombia performs better than the OECD average in terms of service trade restrictiveness for postal services. However, measures that affect the regulatory transparency of customs procedures, among other obstacles, are constraining the development of international e-commerce for goods.<sup>211</sup> Despite initial modernization initiatives to improve postal and express consignment procedures, such as the advance reception of cargo manifest data, Colombia's customs and border controls remain largely based on sorting parcels and shipments by physical and non-intrusive inspections, instead of more advanced solutions for revenue collection and dedicated automated systems for postal and expedited shipment processing. Also, a 10 percent import duty is applied to the imported value (including transport costs and insurance), or the import duty corresponding to the customs product category, to imports through postal and expedited shipments. Although a *de minimis* regime exists exempting imports below US\$200, it exempts only merchandise from countries with which Colombia has signed a free trade agreement from import duties, and only imports from the United States from VAT.<sup>212</sup> The Customs Code also limits the value of imports to US\$2,000 per shipment and the value of exports by postal services to US\$1,000 (except for the beneficiary MSMEs of the *Exporta Fácil* Program, which can export up to US\$5,000). These measures make border control procedures unnecessarily complex and constrain the development of e-commerce at scale, especially for larger firms.

### The demand side: adoption and use of digital technologies and solutions

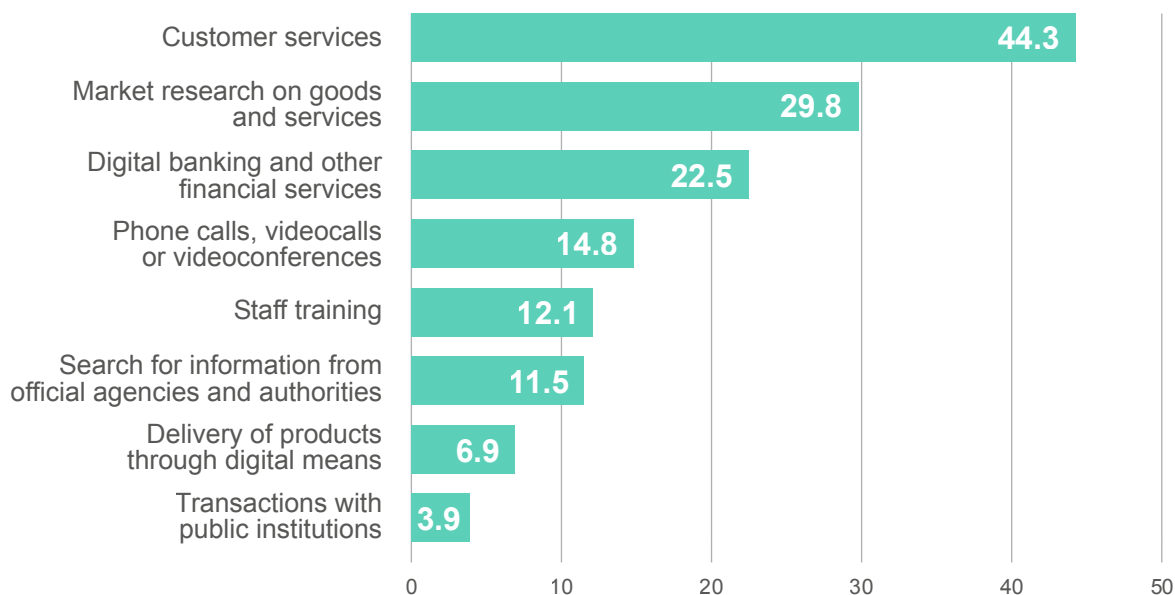
**More than half of SMEs and large firms in commerce and manufacturing access the internet through low bandwidth connections, which constrains their capacity to perform everyday digital transactions and adopt more data-intensive technologies.** According to the U.S. Federal Communications Commission's current standards, a broadband connection must offer at least a 25 Mbps download speed and a 3 Mbps upload speed to allow for everyday tasks, such as exchanging files, using cloud-based software, and videoconferencing.<sup>213</sup> Yet, in 2019, roughly 60 percent of firms in commerce and manufacturing in Colombia accessed the internet at speeds below 30 Mbps. Although the average bandwidth in the "other services" sector is higher, one in three businesses in this sector operates near or below the 25 Mbps threshold.<sup>214</sup> As business procedures and service delivery become more intensive in their use of digital technologies, ensuring the adequate speed and reliability of internet

connections becomes critical to boosting the competitiveness of the Colombian private sector. ([Chapter 2](#) delves into the key challenges to and opportunities for improving the availability and quality of fixed broadband in Colombia.)

**Most microbusinesses have adopted basic digital tools, but they make limited use of these tools for productive purposes beyond customer services.** By 2020, more than 90 percent of microbusinesses had a desktop or laptop and internet connection, yet 85 percent of them did not use their computers for commercial purposes (e.g., digital delivery of products, purchases from suppliers, or online sales). Moreover, among microbusinesses with access to the internet, only 5 percent have their own website. Close to 80 percent of microbusinesses also connect to the internet through mobile phones, and about 26 percent of those with access to the internet have some presence on social networks. As [Figure 5.12](#) shows, microbusinesses use the internet mostly for customer services (44.3 percent), market research (29.8 percent), and digital banking and other financial services (22.5 percent).

**Although microenterprises that invested in ICT equipment performed relatively better (both in revenue and value-added) during the COVID-19 pandemic, few firms invested, and their number has not recovered to pre-pandemic levels.** ICT equipment (smartphones, tablets, computers, internet connection, etc.) provide an advantage to businesses, but it also implies periodic investments to keep software and hardware up to date. In 2019, only 6 percent of microbusinesses that declared that they had invested in the previous year actually invested in digital technology and connectivity. The sectors with the highest number of microenterprises that had invested in ICT equipment and connectivity are: real estate; professional and administrative services; retail, accommodation, and food services; transportation and storage; and education, health, and social services ([Table 5.1](#)). The drop in sales and temporary closure of microenterprises during the height of the COVID-19 pandemic probably affected their capacity to invest in ICT. In 2020, the number of microenterprises making these investments had decreased significantly in almost all sectors, except for agriculture. Sales and value-added from microenterprises in the agriculture sector have been relatively less affected by the impacts of COVID-19,<sup>215</sup> and these firms were thus better positioned to invest in ICT equipment to offer and sell their products. By 2021, as economic activities returned to normal, the number of microbusinesses investing in ICT equipment grew by 10 percent relative to 2020 but did not reach 2019 levels.

**Figure 5.12. Activities Performed by Microbusinesses through the Internet (%)**



Source: Authors' elaboration with data from DANE (2022c).

**Table 5.1. Number of Microenterprises Investing in ICT**

In the previous year in your business or activity you invested in the purchase or acquisition of:

|   | ICT equipment |               |                | ICT equipment |               |               |
|---|---------------|---------------|----------------|---------------|---------------|---------------|
|   | 2019          | 2020          | % change       | 2020          | 2021          | % change      |
| Agriculture. Livestock. Hunting. Forestry and fishing. Mining                               | 491           | 2,793         | 469.00%        | 2,793         | 113           | -96.00%       |
| Manufacturing   | 2,782         | 1,341         | -51.80%        | 1,341         | 760           | -43.30%       |
| Construction  | 1,776         | 1,520         | -14.40%        | 1,520         | 357           | -76.50%       |
| Retail; Accommodation and food services   | 14,131        | 13,777        | -2.50%         | 13,777        | 16,323        | 18.50%        |
| Transportation and warehousing; IC; Education; Human health care and social work activities | 12,823        | 8,996         | -29.80%        | 8,996         | 13,822        | 53.70%        |
| Real estate. Professional and administrative services                                       | 15,313        | 13,005        | -15.10%        | 13,005        | 16,103        | 23.80%        |
| Arts. Entertainment. Recreation. Leisure and other service activities                       | 4,962         | 4,767         | -3.90%         | 4,767         | 3,346         | -29.80%       |
| <b>Total</b>  | <b>12,823</b> | <b>46,200</b> | <b>-11.60%</b> | <b>46,200</b> | <b>50,824</b> | <b>10.00%</b> |

Source: DANE (2022c) and World Bank (forthcoming, a).

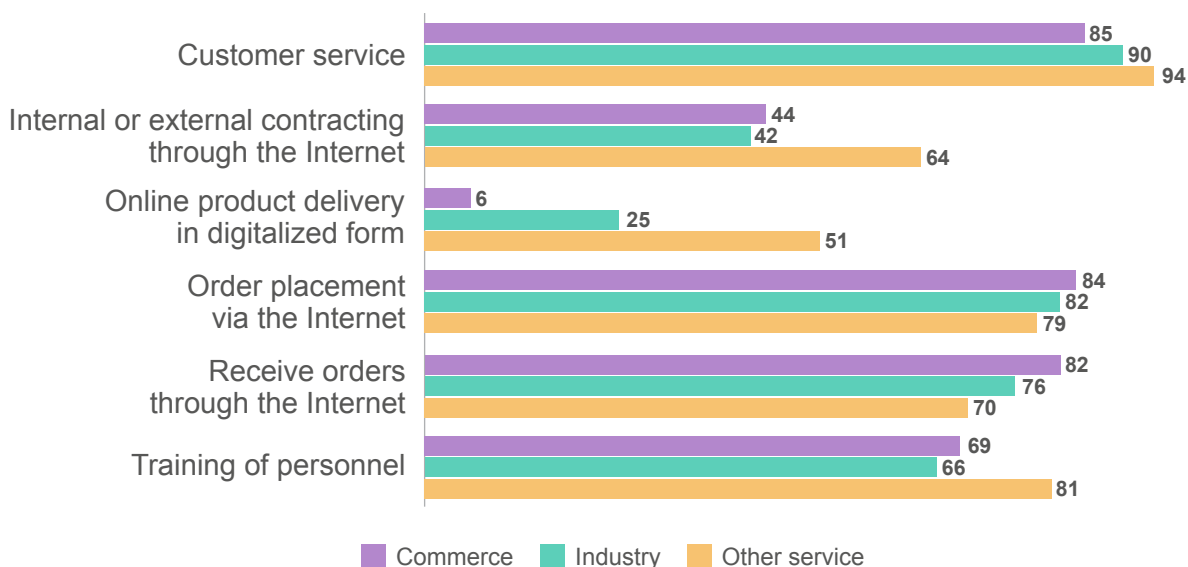
**SMEs and large companies could have a more productive application of their basic digital tools in core business functions.** In 2019, 99.6 percent of small, medium, and large manufacturing companies used a computer and internet in their operations. About 78 percent of service firms had their own website, and 74 percent had a presence on social networks, while for manufacturing firms the rate was lower at 53 percent and 56 percent, respectively.<sup>216</sup> As Figure 5.13 shows, the internet is used mostly to provide customer service (more than 85 percent of firms), place or receive orders through the internet (more than 70 percent), and train personnel (more than 66 percent). Online product delivery in digitized form is relatively rare, including for firms in the commerce and “other services” sectors where business models are more likely to be compatible with digital delivery modalities. Internal or external contracting through the internet is also relatively low across all sectors. Service firms as well as larger companies tend to have more digitalized procedures.

**The use of e-commerce to purchase inputs declined in all type of firms as the mobility barriers placed in response to COVID-19 were lifted, and smaller firms had a lower tendency to use such technology.** The use of the internet by microbusinesses to purchase inputs followed a declining trend during the pandemic, from 10–15 percent in 2019 to 5 percent in December 2021.<sup>217</sup> Medium-sized and large enterprises followed a similar trend, with a decrease in the share of these businesses purchasing inputs online between 2020 and the third quarter of 2021 and then a subsequent stabilization, and even a slight rebound in the first months

of 2022. This upward trend can be observed across all sectors, although more prominently among businesses in the commerce and construction sectors. However, online input purchases for medium-sized and large businesses are still below the levels observed in October 2020.<sup>218</sup> Although the use of cross-border trade decreased as a result of the pandemic, within Colombia online purchases increased by 40 percent due to new buyers and increases in the number of sales caused by the days without VAT.<sup>219</sup>

**Small, medium, and large enterprises prefer to use digital platforms over their own websites for buying supplies or selling products.** Before the COVID-19 pandemic, 31 percent of firms in manufacturing and 39 percent in commerce reported using digital platforms to order or buy supplies, and about a third reported receiving requests or orders through this means.<sup>220</sup> Only about one in every three firms with their own websites across all sectors had integrated online shopping and reservation functionalities into their websites. Data from the DANE’s Business Pulse Survey (*Encuesta de Pulso Empresarial*) for the third quarter of 2022 show that although the use of internet or digital platforms among firms to sell products or services has remained fairly stable (around one-third of firms), the share of online sales through own websites or other digital platforms increased for firms across all sectors during the past year. In July 2022, 15 percent of firms reported having sold more through digital platforms than in the same period of the previous year, and firms in the “other services” sector reported an increase of 19.6 percent. Still, online sales represent a relatively low share of firms’ income: as of July 2022,

**Figure 5.13 Share of Small, Medium, and Large Firms Using the Internet To Carry Out Everyday Business Activities**



Source: Authors’ elaboration with data from DANE (2021d).

on average only 16.2 percent of firms reported generating more than 10 percent of their income through online sales.<sup>221</sup>

**Although the majority of e-commerce transactions in Colombia are completed using a mobile device, about half of SMEs and large businesses across all sectors have yet to adopt mobile friendly websites.**

According to data from VTEX Colombia, in 2021 about 72 percent of online shoppers in the country preferred to shop with their mobile devices. Moreover, eMarketer estimations suggest that mobile commerce accounted for 73 percent of all online sales in 2021.<sup>222</sup> Despite the importance of mobile commerce, a large proportion of firms of every size have yet to adapt to this trend. The most recent available data (for 2019) show that only about 59 percent of firms in the “other services” sector with access to the internet had mobile friendly websites, and this share was lower for firms in commerce and manufacturing at 44 and 45 percent, respectively.<sup>223</sup>

**Telework was one of the least used solutions by SMEs and large companies during the pandemic, as few firms had the capacity to enable this modality for at least half of their workforce, partly due to the lack of ICT equipment.**

In October 2020, only 2.5 percent of SMEs and 5 percent of large businesses had implemented telework measures for at least half of their payroll. By February 2022, these figures had dropped to practically zero for small businesses and to 1 percent for medium-sized and big firms. This finding might be partially explained by the fact that before the pandemic, most enterprises (except for small service ones) had more than two workers per available computer, suggesting that firms did not have enough equipment to ensure telework for every employee. Thus, among businesses that did implement telework measures, only a limited share of their employees were able to telecommute. However, the need to telework decreased as measures to restrict mobility were lifted.

**DFS (including digital banking) had the best uptake across the full business span, even as the pandemic started to wane (albeit to a lesser extent).**

This tool had a significant uptake among microbusinesses, rising from 15 percent in January 2019 to almost 40 percent in December 2021. The percentage of SMEs and large businesses making payments online was 80 percent in October 2020 but dropped to 65 percent in February 2022 (see [Chapter 4](#) for further discussion).

**The use of advanced digital technologies and tools for data analytics, such as big data analytics, remains limited.**

More than 30 percent of firms in data-intensive industries, such as business development services, private education, and software development, reported

having implemented data analytics during 2019, while real estate, lodging, and private health were among the less data intensive in the “other services” sector, with 12–17 percent of these firms using data analytics.<sup>224</sup> In contrast, less than 10 percent of firms in commerce and manufacturing reported the use of data analytics in the same period, and among those, the use of big data was still incipient (less than 5 percent implemented this type of analytics in 2019).<sup>225</sup>

**AI shows enormous potential to boost productivity and accelerate economic growth in Colombia in the medium to long term, but it also involves significant public policy challenges.**

According to recent IDB projections, widespread adoption of AI could lead to a boost of up to 0.8 percentage points (from 3.7 to 4.5 percent) to the annual GDP growth rate by 2035.<sup>226</sup> Aware of this transformative potential, the Colombian government formulated CONPES 3975 in 2019.<sup>227</sup> The policy identifies critical challenges that need to be addressed in order to promote the widespread adoption of AI (and other digital technologies) among Colombian businesses and to prepare the workforce to face the disruptions in the labor market likely to occur due to the increasing automation of productive processes. CONPES 3975 also establishes 20 specific actions to create an enabling environment for the development of AI solutions in Colombia.<sup>228</sup>

**Although Colombia stands as one of the LAC countries with the most progress among digital start-ups in harnessing AI, the adoption and use of this technology by established businesses is still incipient.**

The diffusion and use of AI technologies is still at an early stage of maturity across most countries, including frontier economies such as OECD countries, as businesses implement more foundational digital technologies before progressing to sophisticated AI applications. In Colombia, only 9 percent of the small, medium, and large businesses surveyed between May and July 2022 reported having used any AI solutions in their operations.<sup>231</sup> Among the businesses that did employ AI, the most common uses were in administrative procedures (36.5 percent), marketing or sales (32.5 percent), and cybersecurity (23.3 percent). Businesses cite three main reasons behind the low uptake of AI: the technologies are not useful for the firm (41.4 percent), the costs of adoption are too high (32.9 percent), and firms do not have the necessary experience to use them (32.5 percent).

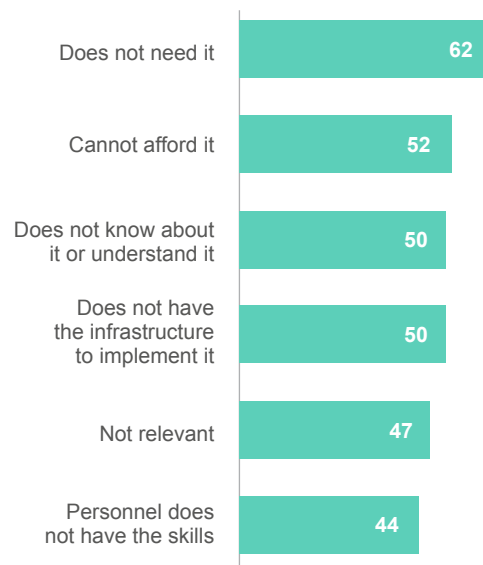
**As for government-to-business services, most SMEs and large firms with access to the internet in Colombia reported knowing the website of the municipal or regional government where their businesses operate, though other important government portals (such as those for open data) are not as well-known, including by firms that perform data analytics.**

For instance, less than one-third of SMEs and large firms reported knowing the “Portal Único del Estado Colombiano,” the digital government website. Few firms reported knowledge of the government’s open data portals, such as the data portal (datos.gov.co) or the transparency portal “Urna de Cristal.” Out of the firms that performed data analytics in 2019, only 18 percent of those in the “other services” sector and 16 percent in commerce and manufacturing reported using open data from the Colombian public sector.

**Drivers of and constraints to the adoption and use of digital tools**

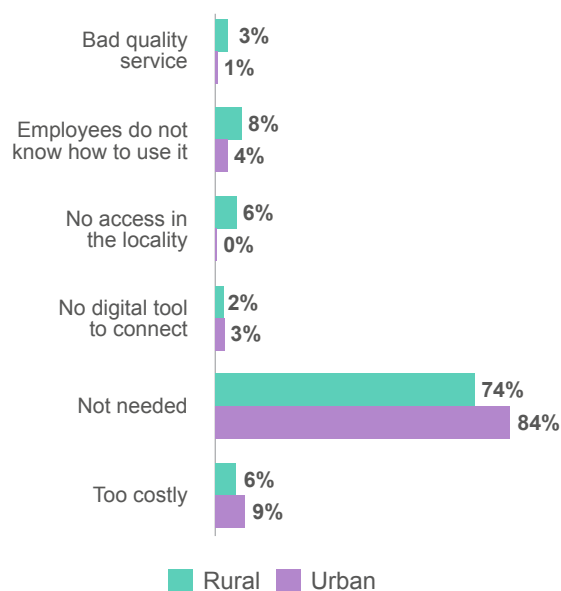
**Inadequate managerial capacity is one of the main reasons behind the low uptake of digital technologies among MSMEs and large firms in Colombia.** Despite evidence in Colombia and internationally that the use of digital technologies is associated with improved firm performance,<sup>232</sup> a large share of Colombian enterprises of all sizes consider them unnecessary. As Figure 5.14 shows, the main reason cited in 2019 for not implementing more advanced technology is that the firm: believes it does not need it (62 percent); does not know about or understand the technology (50 percent); does not have the infrastructure to implement it (50 percent); or found it not relevant (47 percent). Moreover, roughly 44 percent of these firms reported that their employees did not have the skills to implement and use digital solutions. The case of microbusinesses is similar, as 84 percent that do not use the internet in urban areas and 74 percent in rural areas consider it unnecessary, in contrast to less than 10 percent that consider it too costly or cannot access it (Figure 5.15). These figures suggest that managers have limited understanding of the potential benefits of adopting digital technologies and externalizing ICT services for productive purposes to circumvent infrastructure deficiencies or employee skills gaps. In fact, the 2019 Digital Transformation Survey of the National Business Association of Colombia (*Asociación Nacional de Empresarios de Colombia* [ANDI]) finds that among the main six challenges for their digital transformation, firms identify four related to managerial capabilities and business culture. These are: lack of culture promoting the exploration of new technologies (57 percent); lack of knowledge on available technologies (55 percent); inadequate mindset of leadership (42 percent); and lack of leadership (26 percent).<sup>233</sup> As for using government-to-business services, SMEs and large firms still report a preference for human interactions, and roughly half of these surveyed firms mention a lack of knowledge of the services and procedures that are available online.

**Figure 5.14. Main Reasons Small, Medium, and Large Firms Do Not Implement New Software or Technological Solutions**



Source: DANE (2021d).

**Figure 5.15. Microbusinesses’ Main Reasons for Not Using the Internet**



Source: DANE (2022c).

**The affordability constraint is also an important reason for not implementing technological solutions among SMEs and large firms.** More than half of these firms mention that they do not implement new software or technological solutions because they cannot afford it (Figure 5.14). Although affordability seems to be less of a constraint for microenterprises, digital-related expenditures still represent the third largest expense item for these businesses, after transport and shipping (21 percent of total expenditure) and leasing of movable and immovable assets (17.4 percent). Paying for internet, data, TV, and telephone represented 15.2 percent of total monthly expenses for the average microbusiness in Colombia in 2019.<sup>234</sup>

**Employee skills might be an additional constraint to digital technology adoption, although this could be partially addressed by externalizing ICT services to third parties.** More than one-third of SMEs and large firms in commerce and manufacturing did not have an ICT or systems department (either internal or outsourced), suggesting that they did not have the human resources to make the best use of services rendered by ICT tools.<sup>235</sup> Most firms also lack in-house capacity to operate and manage ICT systems.<sup>236</sup> Less than half of the firms in the commerce and manufacturing sectors have a department, a position, or personnel in charge of data protection (44 and 45 percent, respectively), a critical function for the adoption and productive and safe use of digital solutions, particularly those involved in transactions that require sensible personal data. It is worth noting that firms in the “other services” sector display more robust ICT capabilities. In 2019, 70 percent of these firms performed ICT functions in house, and 63 percent mentioned having a department, a position, or personnel in charge of data protection. ([Chapter 6](#) discusses the challenges to and opportunities for strengthening digital skills in Colombia, and [Chapter 7](#) examines the enablers and safeguards necessary to promote a safer environment for personal data as the economy becomes increasingly digital.)

### Policy instruments supporting digital businesses and business digitalization

**Policies, institutions, and public programs that provide support to firms at different stages of development can play a crucial role in strengthening the**

**digital business ecosystem.** The interaction between entrepreneurs that supply and demand digital solutions and support programs run by governments, the private sector, or other ecosystem enablers is a critical component of a vibrant business ecosystem. Support instruments vary in nature and may target different elements of an ecosystem, ranging from infrastructure, financing, and regulations to human capital development, among others. Additionally, the different institutions participating in the policy mix often have different objectives and may compete for resources and beneficiaries. Poorly designed public programs can be ineffective and even displace or inhibit private initiative and innovation. This section looks at the menu of policy instruments and support programs in Colombia’s competitiveness and innovation system, the SNCI, particularly those aimed at promoting business digitalization and digital business growth, in order to identify their key strengths and potential areas for improvement.<sup>237</sup>

**About \$1 out of every US\$25 that the government budgeted to support the SNCI in 2022 was directed to policy instruments that seek to boost digital transformation.** Currently, 70 government entities implement 376 policy instruments aimed at boosting competitiveness and innovation in Colombia, with a combined budget of US\$1,891 million,<sup>238</sup> as reported by the *Articulación para la Competitividad* (ArCo) initiative. From these, three policy instruments specifically support the formation and growth of digital businesses; six contribute to the progressive digitalization of businesses across multiple sectors, for instance, by supporting improved digital capabilities among SMEs; and 31 support the formation of foundational digital skills and the widespread adoption of digital technologies by government, NGOs, and society at large, thus contributing to the creation of an enabling environment for digital firms to thrive. MinTIC, iNNpulsa (the government’s agency for innovation and entrepreneurship), and the National Learning Service (*Servicio Nacional de Aprendizaje* [SENA]) are the government entities in charge of administering most of the policy instruments that support digital businesses and promote business digitalization, and they play a significant role in the implementation of instruments for digital transformation. The 40 instruments have a combined budget for 2022 of approximately US\$83 million, or about 4.4 percent of the budget assigned to policy instruments for the SNCI. [Box 2](#) presents further details on the ArCo methodology and the classification of policy instruments developed for the purpose of this analysis.



## BOX 2. ArCo Methodology and Classification of Policy Instruments

In 2020, the Colombian government started implementing the “*Articulación para la Competitividad*” (ArCo) methodology, a tool that seeks to raise the quality of public spending in matters of competitiveness, productivity, entrepreneurship, and STI through the articulation and coordination of policy instruments, based on the needs of entrepreneurs, researchers, and citizens in general. Specifically, ArCo seeks to (i) improve the efficiency of public spending; (ii) integrate *ex ante* evaluation tools to help optimize the offer of policy instruments before their implementation; (iii) promote the articulation of policy instruments through a user-centered approach; and (iv) adopt a results-oriented budget approach to minimize the atomization of spending on instruments that do not reach a minimum scale of impact to achieve their policy goals. The methodology contemplates three articulation mechanisms: the mapping of policy instruments as well as functionality tests and budget flowcharts for each instrument.

Based on ArCo’s instrument mapping for 2022, a word search was applied to the policy instrument’s objective statements and short descriptions to identify and classify policy instruments in four groups:

- i. those that specifically support the formation and growth of established digital businesses and digital start-ups (e.g., incubators for digital businesses)
- ii. those that seek to boost the digitalization of business processes, products, and

services through diverse channels (e.g., enhancing digital capabilities of firms, providing technology extension services, etc.)

- iii. those that support the formation of foundational digital skills and the widespread adoption of digital technologies by government, NGOs, and society at large (e.g., through public platforms and Massive Open Online Courses to boost foundational to advanced digital skills)
- iv. all other policy instruments of the SNCI that are not directly related to the progressive digitalization of businesses and society

Words used included digital, software, smart, orange, technology, electronic, and communications, among others. Afterwards, a manual search was performed to validate the groupings. Although most instruments aimed at promoting business digitalization and digital entrepreneurship are administered by MinTIC and can be easily identified, many instruments of the SNCI can potentially impact the digital transformation of businesses, the government, and individuals through indirect channels. Thus, the resulting list of instruments supporting the formation of foundational digital skills and the widespread adoption of digital technologies by diverse stakeholders must be understood as a rough approximation.

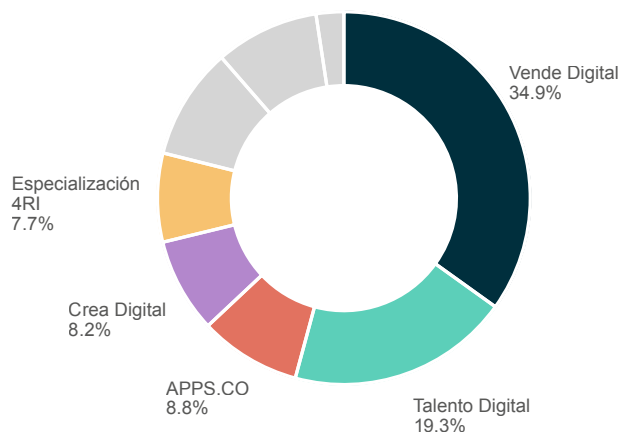
Source: DNP and Swisscontact (2021).

Resources aimed at supporting the growth of digital businesses and the digital capabilities of firms are concentrated in a few policy instruments. Two programs administered by MinTIC (*Vende Digital* and *Talento Digital*) account for more than 50 percent of the resources allocated in 2022. The three policy instruments that specifically target digital businesses and support their development and growth—*Especialización 4RI*, *Crea Digital*, and APPS.CO—make up an additional 24.7 percent (Figure 5.16). Among the group of 31 policy instruments that support the formation and upgrading of digital skills and the adoption of digital technologies by government, NGOs, and individuals, resources are likewise fairly concentrated in a few programs and entities (Figure 5.17).<sup>239</sup>

Although a concentration of scarce resources in a few instruments could reduce fragmentation risks, it could also create support gaps in key policy areas for the digital transformation of the private sector. Critical drivers of business digitalization and digital business growth are being addressed by the largest support programs, such as the formation of intermediate and advanced digital skills among the youth (*Misión TIC*) and the adoption and use of e-commerce, digital platforms, and digital payments by MSMEs (*Vende Digital*). However, other instruments with complementary approaches to the digital transformation of the private sector, for example, those that address affordability constraints or the cultural factors that limit trust in digital technologies, may face budgetary caps that could prevent them from meeting their objectives and generating an impact.<sup>240</sup>

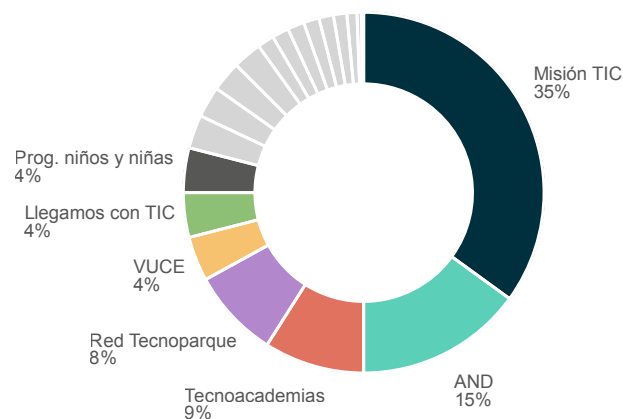
Most policy instruments supporting the digitalization of the private sector in Colombia focus on building specific capacity and an enabling environment for businesses to progressively adopt and use digital solutions. Improving the digital skills of the workforce, strengthening firms' technological, managerial, and organizational capacity, accelerating the adoption of e-commerce, and promoting innovations based on the use of digital technologies figure prominently among policy objectives, in line with the key challenges identified by CONPES 3975. However, beyond boosting firms' adoption of digital solutions, few instruments address barriers to digital entrepreneurship and digital businesses, particularly those affecting the growth and formalization of early-stage digital firms (APPS.CO being a clear exception).<sup>241</sup> Moreover, no program from this group contemplates improving firms' access to finance as a main objective, which translates into only rarely using financing as an instrument and instead mostly targeting the adoption and use of digital solutions (Figure 5.18).

**Figure 5.16. Main Programs Supporting Digital Businesses and the Digitalization of Business Procedures and Services**



Source: Authors' calculations with DNP (2020)  
Note: Share of total budget to support the SNCI.

**Figure 5.17. Main Programs Supporting the Formation of Foundational Digital Skills and the Widespread Adoption of Digital Technologies**

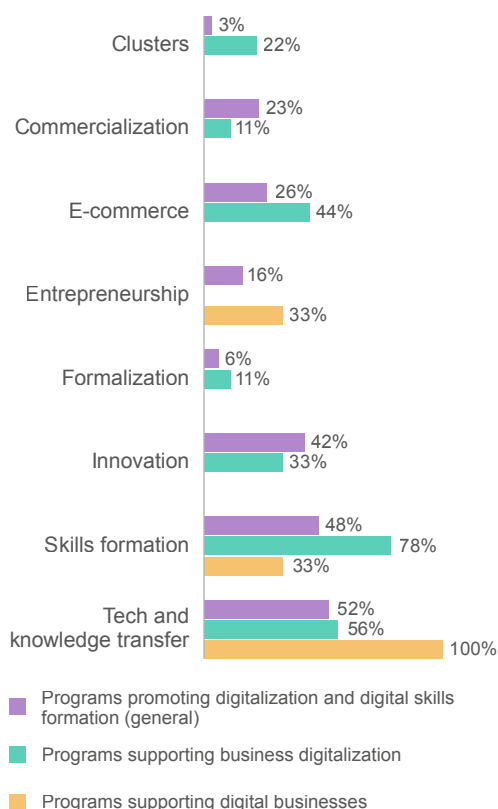


Source: Authors' calculations with DNP (2020)  
Note: Share of total budget to support the SNCI.

Training and the provision of educational resources are the dominant intervention mechanisms in the digital transformation policy mix, both in the number of instruments and the dedicated budget. Advisory services and networking tools, such as events, platforms, and business databases, are also prevalent among programs that support the growth of digital businesses and business digitalization (Figure 5.19). Again, the provision of public finance is used sparingly as a tool to drive business digitalization, and only a few programs currently employ grants, vouchers, or public procurement to this end (for instance, the Crea Digital program, which provides grants to digital content creators).<sup>242</sup>

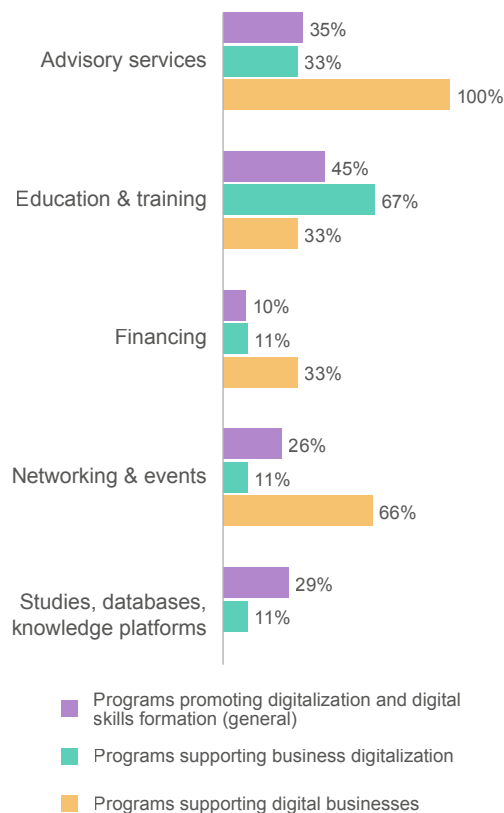
Overlapping program objectives, inadequate targeting of beneficiaries, and a lack of intervention mechanisms to address access to finance constraints point to opportunities to improve the efficiency of public spending. Most programs assessed do not adapt their offer of support instruments to account for subnational or cultural differences, and they also show a low segmentation of beneficiaries, which could lead to a significant duplication of effort.<sup>243</sup> In this context, strengthening the articulation between policy instruments and improving selectivity criteria could play an instrumental role in increasing the reach and impact of support programs and in enhancing the efficacy of public spending.

Figure 5.18. Main Program Objectives



Source: Authors' calculations with data from DNP (2020).

Figure 5.19. Main Intervention Mechanisms



Source: Authors' calculations with data from DNP (2020).

Moreover, some critical barriers to business digitalization and digital business growth remain unaddressed by the mix policy instruments.<sup>244</sup> Multiple instruments seek to strengthen the intermediate-level digital skills of the workforce (e.g., programming and cybersecurity awareness), business networks, and firms' digital capabilities (e.g., use of digital marketing and e-commerce or the adoption of business plans for investing in digital services). However, efforts to address other critical barriers affecting digitalization remain limited. For instance, although lack of knowledge about available digital solutions, technological skepticism, and affordability concerns limit the adoption of digital solutions among MSMEs, few programs facilitate access to digital infrastructure and equipment through partially subsidized financing mechanisms or engage in technology transfers through advisory services (Figure 5.19).

Access to financing is a particularly important challenge to the innovation and growth of digital businesses that the current mix of policy instruments seems ill-equipped to address. This suggests an opportunity to strengthen the policy mix with instruments that can facilitate and promote both debt and private equity financing for high-potential digital innovators. Likewise, the public sector currently plays a negligible role in the financing of innovative ICT businesses, even

though public resources account for up to 14 percent of financing of STI activities in non-ICT service firms. Firms identify the scarcity of information on public support instruments, as well as their conditions and requirements, as a potential barrier to financing STI activities through public funds.

**Programs supporting digital businesses and the use of digital solutions suffer from relatively weak logical frameworks, difficulties in generating and leveraging data, and limited articulation with other programs and stakeholders.** Functionality tests applied to the policy instruments mapped following the ArCo methodology

point to important areas for improvement.<sup>245</sup> Regarding design, relatively few instruments have been developed based on robust logical frameworks, and differences in needs at the subnational level are usually not accounted for. During the implementation phase, information management still presents a challenge for many programs, and relatively few instruments adequately collect and leverage data to iterate and improve their design. Moreover, there is room for improvement in the articulation and communication between instruments, although on average, programs aimed at promoting digital transformation score on par with other instruments of SNCI in this dimension.

**Figure 5.20. Main Mechanisms by Instrument Supporting Digital Business Development and Other Firms' Adoption/Use of Digital Solutions**

| Objective of support instrument | Entity      | Program/ tool                                    | Supply side factors               |                   |                                 | Allocation barriers |             |  | Demand side factors        |                  |   |
|---------------------------------|-------------|--|-----------------------------------|-------------------|---------------------------------|---------------------|-------------|--|----------------------------|------------------|---|
|                                 |             |  | Market access and internalization | Firm capabilities | Entrepreneurial characteristics | Access to finance   | Regulations | Business networks and cultural factors | Access to physical capital | Skills formation | Access to information, technology and knowledge capital |
| Support digital businesses      | MinTIC      | APPS.CO  |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 |             | Crea Digital                                     |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 |             | Especialización 4RI                              |                                   |                   |                                 |                     |             |  |                            |                  |   |
| Promote business digitalization | MinTIC      | Vende Digital                                    |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 |             | Talento digital                                  |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 |             | Teletrabajo                                      |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 | Inpulsa     | CTDE   |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 | Procolombia | Herramientas digitales para internacionalización |                                   |                   |                                 |                     |             |  |                            |                  |   |
|                                 | SENA        | MiPyme Se Transforma                             |                                   |                   |                                 |                     |             |  |                            |                  |   |

Source: Authors' elaboration based on data from DNP (2022). Framework adapted from Cruz and Zhu (forthcoming); and Cusulito and Maloney (2018).

Note: The key entrepreneurial pillars are grouped into the following sections:

1. Resource endowment factors (physical, human, and knowledge capital) that shape the demand of firms for digital technologies and solutions (demand-side).
2. Factors that drive the formation and growth of digital businesses, such as market access and firm capabilities, entrepreneur characteristics, such as appetite for risk and opportunity vs necessity entrepreneurship, or multinational experience (supply-side).
3. Barriers to resource allocation, such as access to finance, regulations, business networks, and cultural factors (e.g., social perception or status of entrepreneurs, gender biases in entrepreneurship and management, etc.).

**Table 5.2. Digital Businesses: Key Challenges and Opportunities**

| Strengths   | Areas for Improvement   |
|---|---|
| <ul style="list-style-type: none"> <li>» The national policy for digital transformation (CONPES 3975) provides strategic guidelines to create digital capabilities and boost digital uptake among government, firms, and individuals.</li> <li>» A set of policy instruments to promote the digital transformation of businesses and the formation and growth of digital start-ups is already in place.</li> <li>» Early-stage funding for digital businesses, while still nascent, has increased consistently over the past decade.</li> <li>» Significant advances in the digitization of government services, high mobile phone penetration, and a data-rich environment (relative to regional peers) provide key enablers for the development of data-intensive and platform-based businesses.</li> </ul> | <ul style="list-style-type: none"> <li>» More than half of SMEs and large firms in the commerce and manufacturing sectors access the internet through low bandwidth connections, which constrains their capacity to adopt data-intensive technologies.</li> <li>» Low automation of border control agencies, outmoded customs and tax revenue collection techniques, and a partial de <i>minimis</i> regime for imported low-value shipments, among other factors, constrain cross-border e-commerce of goods.</li> </ul> <p>Inadequate organizational capabilities and lack of knowledge about digital technologies hold back the pace of the digital transformation of Colombian businesses.</p> <ul style="list-style-type: none"> <li>» Programs supporting digital businesses and the use of digital solutions suffer from relatively weak logical frameworks, difficulties in generating and leveraging data, and limited articulation with other programs and stakeholders.</li> </ul> |
| Opportunities   | Threats   |
| <ul style="list-style-type: none"> <li>» Colombia has a vibrant digital start-up ecosystem, particularly in the areas of logistics tech, foodtech, and healthtech.</li> <li>» Domestic e-commerce has been growing steadily, especially since the onset of the COVID-19 pandemic.</li> <li>» Advanced digital technologies, such as AI, show enormous potential to boost productivity and accelerate economic growth in Colombia. However, their adoption and use by local firms remain limited.</li> <li>» The overlapping efforts of public programs supporting firms' adoption of digital solutions point to significant opportunities to increase the efficiency of public spending through improved articulation between programs.</li> </ul>  | <ul style="list-style-type: none"> <li>» The ICT sector, the backbone of the digital economy, remains relatively small in Colombia, contributing little to total value-added, employment growth, and exports.</li> <li>» Firms' investment in digital technologies declined as mobility restrictions to control the spread of COVID-19 were lifted.</li> <li>» Limited externalization of the development and application of ICT and related services by firms prevents digital businesses from gaining scale.</li> <li>» Constraints to capital market development could limit the capacity of Colombian digital businesses to attract more diverse and scalable private investments.</li> </ul>   |

### 5.3. Recommendations and next steps

**The digital business diagnostic identified five key challenges that need to be addressed in the short and medium term** to promote the widespread adoption of digital technologies by firms and create an enabling environment where digital start-ups and established businesses thrive. Based on these challenges, this section presents a set of broad policy recommendations and examples of international good practices.

**Low digital uptake among firms.** Most MSMEs in Colombia have adopted basic digital tools, but the use of these tools for productive purposes remains limited, particularly among microbusinesses. Moreover, the uptake of more advanced digital technologies (such as cloud computing, big data analytics, or AI systems) is still nascent and biased toward foreign and large firms. Likewise, only a small share of firms have adopted platform-based or data-driven business models. Thus, a strategy to promote the local demand for new technologies to ensure greater uptake will be key. The Colombian government's menu of policy instruments for digital transformation could be strengthened to better support firms' digital uptake through a calibrated mix of intervention mechanisms focused on: raising awareness among MSMEs about the availability of digital solutions and their benefits to improving firm performance; strengthening the organizational, technical, and managerial capabilities of firms; doubling down on efforts to support the interaction between the demand for and supply of digital solutions; encouraging the use of advanced digital technologies among firms with the necessary capabilities; and supporting the formation of platform-based and data-intensive businesses.

**Limited externalization of ICT services.** Only a small fraction of Colombian MSMEs have the capacity to develop and implement the technological solutions they require to operate in a digital environment. Despite such low internal capacity, relatively few firms outsource ICT services. Low demand of ICT services by MSMEs could hinder the capacity of digital businesses to mature and scale up. Intervention mechanisms that provide technical or financial support for MSMEs to outsource or externalize key processes intensive in the use of digital technologies (e.g., advisory services, supplier directories, networking events, grants, or vouchers) could help firms to circumvent infrastructure deficiencies and skills gaps, allowing them to uptake digital solutions for productive purposes.

**Regulatory and technical constraints to platform-based business models, cross-border e-commerce, and trade of digitally deliverable services.**

Multiple regulatory and infrastructure-related factors constrain the scalability of digital platforms, the cross-border e-commerce of goods, and the export of digitally deliverable services. In terms of horizontal regulations, the absence of a regulatory framework explicitly addressing online intermediary liability in Colombia is likely to lead to court decisions to fill the gaps, creating costs for firms that offer their goods and services through these platforms due to a lack of transparency and predictability as well as potentially to odd or suboptimal results as courts are bound to apply other rules and principles not tailored to the digital context.<sup>246</sup> In terms of sector-specific regulations, Colombia could align the crowdfunding regulatory framework enacted in 2018 to good practices to enable the scalability of crowdfunding platforms, which is expected to expand in particular digital lending to MSMEs. Moreover, the country still needs to implement more advanced border management solutions, such as new approaches to revenue collection and dedicated automated systems to receive and process data on postal and expedited shipments.<sup>247</sup> Reviewing the *de minimis* regime and lifting value ceilings for trade through postal services are a priority to scale international e-commerce, especially for MSMEs. As discussed by Chimienti and Valencia, raising the bar in fraud prevention and management, together with financial literacy activities to educate consumers and businesses on the risks and benefits alike of electronic payment products, is also key.<sup>248</sup> In addition, it is critical that the market invests in advanced analytics (e.g., fraud scoring) and fraud reporting services. Finally, tax incentives that decrease the cost of accepting card/electronic payments by merchants may stimulate the growth of acceptance terminal networks.<sup>249</sup>

**Limited access to debt and equity financing for digital businesses.** Digital businesses point to the limited access to external sources of financing as a key constraint to innovation and growth. Debt financing through private bank accounts for less than 2 percent of ICT firms' investments in STI activities. Additionally, constraints to capital market development hinder the capacity of Colombian digital businesses to attract more diverse and scalable private investments. Although access to risk capital in the early stages of development for digital start-ups has increased during the past decade, the role of pre-seed/seed capital, angel investing, and venture capital remains limited. Moreover, private equity financing for later-stage digital businesses is underdeveloped compared to country peers. The GoC, in coordination with financial institutions, could play a greater role in supporting measures to enhance the access of digital businesses to diversified financing instruments suitable to their specific needs and development stages, for example, through regulatory reforms that improve certainty for investors, tax incentives, and regulations, building on those introduced by Colombia in response to COVID-19,

to foster the development of capital markets that have the potential to have a more permanent impact. For instance, as highlighted by the Financial Sector Assessment Program, Bancóldex could develop a direct lending pilot program targeting viable riskier firms and auction their credit lines to institutions offering lower rates on a portfolio basis. FINAGRO and Bancoldex could also actively support fintech developments targeting underserved segments to create markets and increase their reach.<sup>250</sup> Finally, measures to strengthen the financial infrastructure related to intangible capital could also be needed.

**Overlaps and gaps in policy instruments for the digital transformation of businesses.** MinTIC, among other public entities, has implemented multiple programs to promote business digitalization and the formation and growth of Colombian digital start-ups. However, there are significant overlaps between program objectives, beneficiaries, territorial coverage, and intervention mechanisms, while key constraints to digital transformation (e.g., low externalization of ICT services, inadequate managerial and organizational capabilities, limited access to finance) remain unaddressed. Moreover, among public programs supporting digital transformation, relatively few base their intervention approach on robust logical frameworks, and most report challenges to information management and monitoring and evaluation. The offer of these support programs—as most other

SNCI instruments—shows little adaptation to social, cultural, and territorial differences at the subnational level. Enhancing the coordination between policy instruments, refocusing their intervention mechanisms through sound logical frameworks, and improving their monitoring and evaluation capabilities could help minimize duplications of effort and allow the government to focus scarce resources on other key enablers of digital transformation, contributing to more efficient public spending.

**The policy recommendations included in [Table 5.3](#) are intended to be broad guidelines to support the current efforts of the GoC and other key players in the digital ecosystem to accelerate and deepen the digital transformation of Colombian businesses.**

The implementation timeline and prioritization for these recommendations is based on four criteria: (i) the anticipated time to advance the reforms; (ii) the capacity of reforms to trigger demand for and supply of digital solutions and enable a dynamic digital entrepreneurship ecosystem (e.g., addressing business scale-up challenges); (iii) the potential of reforms to provide key analog enablers for digital transformation, such as improved access to finance for digital start-ups with growth potential; and (iv) the potential of reforms to address underlying factors limiting the adoption of digital technologies by MSMEs, such as e-commerce regulation.



**Table 5.3. Digital Businesses: Policy Recommendations (1 of 5)**

| Reform Area   | Recommendation   | Responsible Entity   | Timing             | Legal Change Required? |
|---|--|--|--------------------|------------------------|
| <p><b>Adoption and use of digital technologies by MSMEs</b></p> | <p>Understand constraints and raise awareness among MSMEs about the potential value of using the internet and integrating digital solutions into their business models and internal processes. Consider implementing awareness-raising campaigns targeted at women-owned, micro-, and rural businesses. <b>PRIORITY.</b></p>   | <p>MinTIC</p>  | <p>Short term</p>  | <p>No</p>              |
|   | <p>Strengthen the links between technical/ technological training programs and firms demanding ICT specialists and digitally competent workers. Develop a continuous dialogue channel to identify key technical skills demanded by firms. Align incentives for firms to implement on-the-job training for digital skills.</p>  | <p>SENA, MinTIC</p>  | <p>Short term</p>  | <p>No</p>              |
|   | <p>Develop a mechanism for public-private dialogue to identify the key constraints, enablers, needs, and priorities for SMEs and large firms in the adoption of AI and other advanced digital technologies. This mechanism could also serve to engage with the Colombian diaspora and facilitate the mobilization of their know-how and capital.</p>   | <p>MinTIC, Ministry of Science, Technology and Innovation (Minciencias), Ministry of Commerce, Industry and Tourism (MinCIT)</p> | <p>Short term</p>  | <p>No</p>              |
|   | <p>Encourage and facilitate the adoption of advanced digital technologies among businesses with more mature digital capabilities.</p> <ul style="list-style-type: none"> <li>» Creating a data rich environment is critical for firms to harness the potential of advanced digital technologies. Align incentives for the private sector to contribute industry-level data to public open data trusts, and create public-private repositories of data that can be used by all firms. Likewise, consider funding commercially relevant research, on the condition that the data generated are made publicly available.</li> </ul> | <p>MinTIC, iNNpulsa, national development banks</p>  | <p>Medium term</p> | <p>Potentially</p>     |



**Table 5.3. Digital Businesses: Policy Recommendations (2 of 5)**

| Reform Area   | Recommendation  | Responsible Entity  | Timing               | Legal Change Required? |
|---|---|---|----------------------|------------------------|
|   | <ul style="list-style-type: none"> <li>» Consider providing funding to eligible firms to cover the costs of training on, and testing and implementation of, AI systems, big data analytics tools, and cloud services, among other digital solutions.</li> </ul>   |   |                      |                        |
| <b>Cross-border e-commerce and digitally deliverable services</b> | Invest in the automation of border control agencies, update customs and tax revenue collection techniques to specificities of cross-border e-commerce, and review/remove the <i>de minimis</i> regime for imported low-value shipments and the limits imposed by the Customs Code on imports and exports by postal services.                                    | Directorate of National Taxes and Customs                 | Short to Medium term | Yes                    |
|   | Conduct a quantitative cost-benefit analysis of the consequences for government revenue and network expansion of introducing tax incentives that decrease the cost of accepting card/electronic payments by merchants.  | Ministry of Finance, National Tax and Customs Directorate | Short term           | Yes                    |
|   | Leverage the Colombian National Economic and Financial Education Strategy to enhance awareness of and trust in transaction accounts and electronic payment instruments and channels (e.g., delivery awareness and educational activities that address the risks, costs, and benefits of transaction accounts and electronic payment instruments and channels.). | SFC   | Short term           | No                     |
|   | Raise the bar in fraud prevention and management within the industry, and incentivize the market to invest in advanced analytics (e.g., fraud scoring) and fraud reporting services.  | SFC   | Short term           | No                     |

**Table 5.3. Digital Businesses: Policy Recommendations (3 of 5)**

| Reform Area                  | Recommendation   | Responsible Entity                 | Timing      | Legal Change Required? |
|------------------------------|--|------------------------------------|-------------|------------------------|
| Fintech                      | Align the crowdfunding regulatory framework to good practices in order to (i) enable more entities to offer such services, (ii) allow such platforms to issue tradable debt and equity; and (iii) enable peer-to-peer lending (by revising Decree 1235 of 2020).   | SFC                                | Short term  | Yes                    |
|                              | As per the Financial Sector Assessment Program, state-owned financial institutions could have dedicated units to engage with the buoyant Colombian fintech industry to explore financial solutions and encourage the development of such solutions through the provision of credit lines and equity investments.   | State-owned financial institutions | Medium term | No                     |
| Growth of digital businesses | Promote the externalization of ICT services by considering the implementation of an “ICT innovation vouchers” program. Vouchers can be used by MSMEs to acquire ICT services from pre-approved service providers, allowing firms with limited digital capabilities and innovation experience to adopt digital solutions tailored to their needs. Likewise, by partially subsidizing ICT innovation for eligible firms and services, the program would support the demand for ICT services while the digital ecosystem matures. The region of Murcia, Spain, provides an interesting case study of ICT innovation vouchers. | MinTIC                             | Medium term | No                     |
|                              | Strengthen access to finance for digital businesses and support a more diversified financial offer in coordination with the private sector.<br><br>» As identified in the Financial Sector Assessment Program, review the regulations introduced in the context of the post-COVID-19 economic recovery plan following best practices to see if they can have a more permanent  | MHCP, National Guarantee Fund      | Medium term | Yes                    |

**Table 5.3. Digital Businesses: Policy Recommendations (4 of 5)**

| Reform Area | Recommendation  | Responsible Entity  | Timing                 | Legal Change Required? |
|-------------|---|---|------------------------|------------------------|
|             | <p>impact on the disintermediation market: (i) authorization for simplified equity companies (SAS) to issue debt; ii) subsidized guarantees offered by the National Guarantee Fund (FNG) on SME corporate debt issued by SAS and others; iii) FNG portfolio guarantees for private debt fund lending to SMEs, helping establish these funds as a new asset class; and iv) revised investment regulations for pension funds and insurance companies, enabling them to invest in corporate debt funds.</p> <p>Continue to work on the development of alternative collateral options to expand lending opportunities for entrepreneurs (e.g., track record of repayment performance, movable assets); and improve credit information systems that better reflect the risks associated with financing digital start-ups, young entrepreneurs, and SMEs in general. <b>PRIORITY.</b></p>   |   |                        |                        |
|             | <p>Assess the constraints limiting digital businesses' access to risk capital and private equity throughout their life cycles. Based on the specific challenges identified, consider providing digital businesses with financial and non-financial support, for instance, through an investment-matching program<sup>251</sup> or through the provision of pre-seed and seed financing for digital start-ups that show high growth and innovation potential.<sup>252</sup> In particular, as highlighted in the Financial Sector Assessment Program, Bancoldex could launch a pilot lending program targeting viable riskier firms (typically younger, technologically savvy firms) by leveraging its MSME training and consulting programs, and a recent pilot program implemented with IDB support that generated three new credit analysis methodologies for early-stage companies to be used by financial intermediaries.<sup>253</sup></p> | <p>iNNpalsa/<br/>MinCIT,<br/>Minciencias,<br/>SENA<br/>Emprende,<br/>national<br/>development<br/>banks</p> | <p>Medium<br/>term</p> | <p>Potentially</p>     |
|             |   |   |                        |                        |

**Table 5.3. Digital Businesses: Policy Recommendations (5 of 5)**

| Reform Area   | Recommendation   | Responsible Entity                               | Timing      | Legal Change Required? |
|---|--|--|-------------|------------------------|
|   | Assess if and how the lack of provisions on online intermediary liability is being managed by courts and its impact on platform-based digital business growth in order to design a roadmap for platform regulation.  | MinTIC, Ministry of Justice                      | Medium term | Yes                    |
| <b>Public policy instruments for the digital transformation of businesses</b> | Map the digital business landscape in Colombia and periodically collect data on digital start-ups, established digital businesses, and digital uptake among MSMEs. Present key findings in a clear dashboard that can be followed by all stakeholders. Leverage the data in the design of logical frameworks and the monitoring and evaluation system of public support programs targeting the digital transformation of the private sector. | DANE, MinTIC                                     | Short term  | No                     |
|   | Assess the potential duplication of effort among public programs supporting digital businesses and the digital transformation of MSMEs, particularly in terms of the overlap of their objectives, beneficiaries, and intervention mechanisms. Based on the results of this assessment, strengthen the articulation across programs by minimizing redundancies and improving the exchange of information. <b>PRIORITY.</b>                    | MinTIC, iNNpulsa                                 | Short term  | No                     |
|   | Assess the key factors constraining the growth of the digital business ecosystem in Colombia and assess the suitability of the current offer of public support programs to overcoming these constraints. Identify significant policy gaps and strengthen the offer of support programs accordingly.  | DNP, MinTIC, SENA, iNNpulsa, Minciencias, MinCIT | Short term  | No                     |
|   | Fine tune the current offer of public support programs to account for subnational differences in firms' composition, digital capabilities, connectivity and access to digital infrastructure, access to business networks, and sociocultural factors.  | DNP, MinTIC, SENA, iNNpulsa, Minciencias, MinCIT | Medium term | No                     |

# 6. DIGITAL SKILLS



## KEY MESSAGES

- » **Deep geographic, socioeconomic, and ethnic inequities in the access to and quality of education and in school life expectancy could bias the potential gains from a digital transformation, fueling the digital divide.** In this sense, it is critical to ensure the equitable provision of digital, foundational, and socio-emotional skills so that all groups can participate and be productive in an increasingly digitalized economy.
- » **Colombia has made significant efforts over the past decade to develop digital skills among its citizens.** However, the country must overcome multiple critical challenges to advance this process, chief among them: the low level of basic skills among children and youth; the education system's inadequacies as assessed by the Program for International Student Assessment; the uneven provision of and access to key enablers such as learning technologies; the low enrollment in middle-level vocational training; and weak reskilling and upskilling systems.
- » **Limited connectivity and unequal access to digital infrastructure present a barrier to the acquisition of digital skills, especially in rural areas.** To improve computer usage and proficiency, it is important to improve technological infrastructure and increase public schools' quality of and access to internet connectivity.
- » **The country lacks a national strategy to guide the development of digital skills and coordinate public and private sector support programs.** Colombia has conducted diagnostic exercises that focus on supply of and demand for digital competencies, such as the "Brechas de Capital Humano del sector TIC" programs. However, to design and implement a proper digital skills strategy, the country needs a cross-sector integrated analysis to articulate all public and private efforts and the respective evaluation program.
- » **Colombia would benefit from a national digital skills framework with a clear governance structure to guide the design of training programs** at the levels of both compulsory education and technical and higher education training. This framework could be leveraged to help design and implement a national digital skills strategy, including guidelines to train teachers in the pedagogical use of ICT. By including clear provisions for governance structure, this framework can also help assign responsibilities to the country's different stakeholders.
- » **Developing an inter-agency and cross-sectoral monitoring and evaluation framework is critical to ensuring the effective implementation of a national digital skills strategy,** as well as to assessing the impact of national training programs on closing the existing skills gaps. A robust framework for monitoring and evaluation will help Colombian policy makers and institutions to iterate and refine their efforts to provide the digital skills needed to sustain the digital transformation process over the long term.

## 6.1. The importance of digital skills

**Digitalization is reshaping every aspect of daily life, redefining relationships, disrupting economic systems, and restructuring service delivery.** Keeping up with these changes requires that Colombians know and manage a set of key digital skills. A 2021 study by the Economic Commission for Latin America and the Caribbean (ECLAC) suggests that most of the jobs that will remain in high and medium productivity sectors will be subject to changes that will require at least basic digital skills to perform rudimentary hardware, software, and online operations, and many will demand intermediate or higher-level digital skills and knowledge, such as programming, network management, AI, big data, cybersecurity, or IoT.<sup>254</sup> It is therefore paramount to develop strong and impactful digital skills policies for the population in order to close the gaps and to catch up to the most advanced economies. It is equally urgent to improve equity and inclusion by supporting those who are outside the digital economy and offering transformative human capital opportunities to allow the Colombian people to play a more active role in an increasingly digitized economy.

**The concept of digital skills encompasses both technical skills—basic and advanced—as well as transversal skills.**<sup>255</sup> For instance, effective collaborative work through digital technologies clearly implies technical competencies, such as knowing how to use certain digital tools, but also requires transversal skills such as communication, cooperation, and empathy. As Colombia advances in its digital transformation, there are basic or fundamental digital skills that all citizens need to master for their jobs and professions and for their everyday lives. For young people, the main way to acquire these skills is through the compulsory formal education system, and for adults, through a workplace training system. At the same time, the more advanced or specialized digital skills that are increasingly necessary for an ever-growing number of jobs are fundamentally acquired in formal higher education (technical or university) and in formal and informal training offered by a growing ecosystem of providers and by the technology industries themselves. It is also critical to understand that digital skills are not static but constantly evolving; many of the skills considered advanced a few years ago are now looked at as elementary and essential for many jobs.

**Improving the education level and strengthening the digital skills of the labor force could help boost Colombia's labor productivity and contribute to per capita GDP growth.** Colombia's productivity gap with respect to the OECD average in 2018 was larger than in most other LAC countries with the exception of Peru.<sup>256</sup> Low labor productivity in Colombia is partially related to the level of education and worker skills.<sup>257</sup> Nearly 30 percent of people aged 25–34 have no upper secondary education, twice the OECD average, and almost two-thirds of students lack basic literacy and numeracy skills compared to the OECD average of one-fifth.<sup>258</sup> Recent research suggests that increases in digital capabilities as measured by CAF's Digitization Index are significantly associated with increases in GDP per capita. In Colombia, an increase of 10 points in CAF's Digitization Index (which ranges from 0 to 80 points) would be associated with a 0.14 percent increase in GDP. Colombia ranks 56th out of 64 countries in the 2021 edition of the World Ranking of Digital Competitiveness of the International Institute for Management Development (IMD). Wiley's 2021 Digital Skills Gap Index ranks Colombia 85th out of 134 countries; in regional terms, Colombia ranks above Mexico (92nd), Brazil (96th), Chile (98th), but below Peru (61st). Colombia's ranking primarily reflects the country's large digital skills divide, the gap between the demand for digital skills and the capacity to respond to the talent deficit. Increasing the number of ICT specialists, closing the existing skills gaps, and revamping the professional skills of the labor force are all critical steps for Colombia to harness the full potential of its digital economy.

**Digital technologies have the potential to improve development outcomes and lift millions out of poverty, but they can also heighten political divisions and exacerbate inequality.**<sup>262</sup> Gaps in access to digital technologies can be compounded by social and territorial disparities in the accumulation of digital skills, leading to significant differences in the ability of diverse segments of the population to use available digital technologies productively. Without equitable access to these fundamental skills across the country, widespread digitalization could amplify the challenges Colombia currently faces in its pursuit of inclusive development.

**By fostering a digitally competent society, Colombia can also mitigate the impact of COVID-19.** In Colombia, the COVID-19 crisis caused the economy to

contract and exacerbated labor market weaknesses, leading to an estimated loss of 2.4 million jobs in 2020.<sup>263</sup> During this period, the unemployment rate increased by 50 percent, reaching 15.9 percent, with large increases in urban areas. Women, youth, the self-employed, and workers in rural, remote, or dispersed areas—who often face barriers to connectivity and access to technological infrastructure and devices—were disproportionately affected. The pandemic has also had a substantial impact on the education sector, as school closures affected an estimated 10 million students.<sup>264</sup> Between March 2020 and March 2021, Colombia completely closed its schools for 23 weeks and then partially for more than 52 weeks after that. Although the number of weeks with fully closed schools is lower than in other countries in the region (e.g., Brazil, Mexico, and Peru), if the weeks of complete and partial closure are combined, the immediate impact was spread over two school years. As a response to the pandemic, the Colombian government supported students, teachers, and parents using a multi-channel approach. The Ministry of National Education (*Ministerio de Educación Nacional* [MEN]) provided a wide variety of educational resources for free and in diverse formats to the educational community through its platform *Aprender Digital* (Digital Learning). MEN also created the teacher platform “Contacto Maestro,” focused on supporting teachers and school leaders. In order to make these resources available online to learners and to guarantee access, MEN, in coordination with MinTIC, published a decree determining that mobile operators should provide zero-rating conditions for the education community.<sup>265</sup> Additionally, other initiatives complemented this multi-channel approach, with examples such as “Aprender la Onda (ALO),” a program to develop and distribute audio learning podcasts through WhatsApp, local radio stations, and other streaming platforms,<sup>266</sup> or the strategy of educational continuity, “Aprende en Casa - AeC” (Learn At Home), which included educational television and radio programs that were broadcast twice a day on national TV channels and radio stations with content for different ages and subjects.<sup>267</sup>

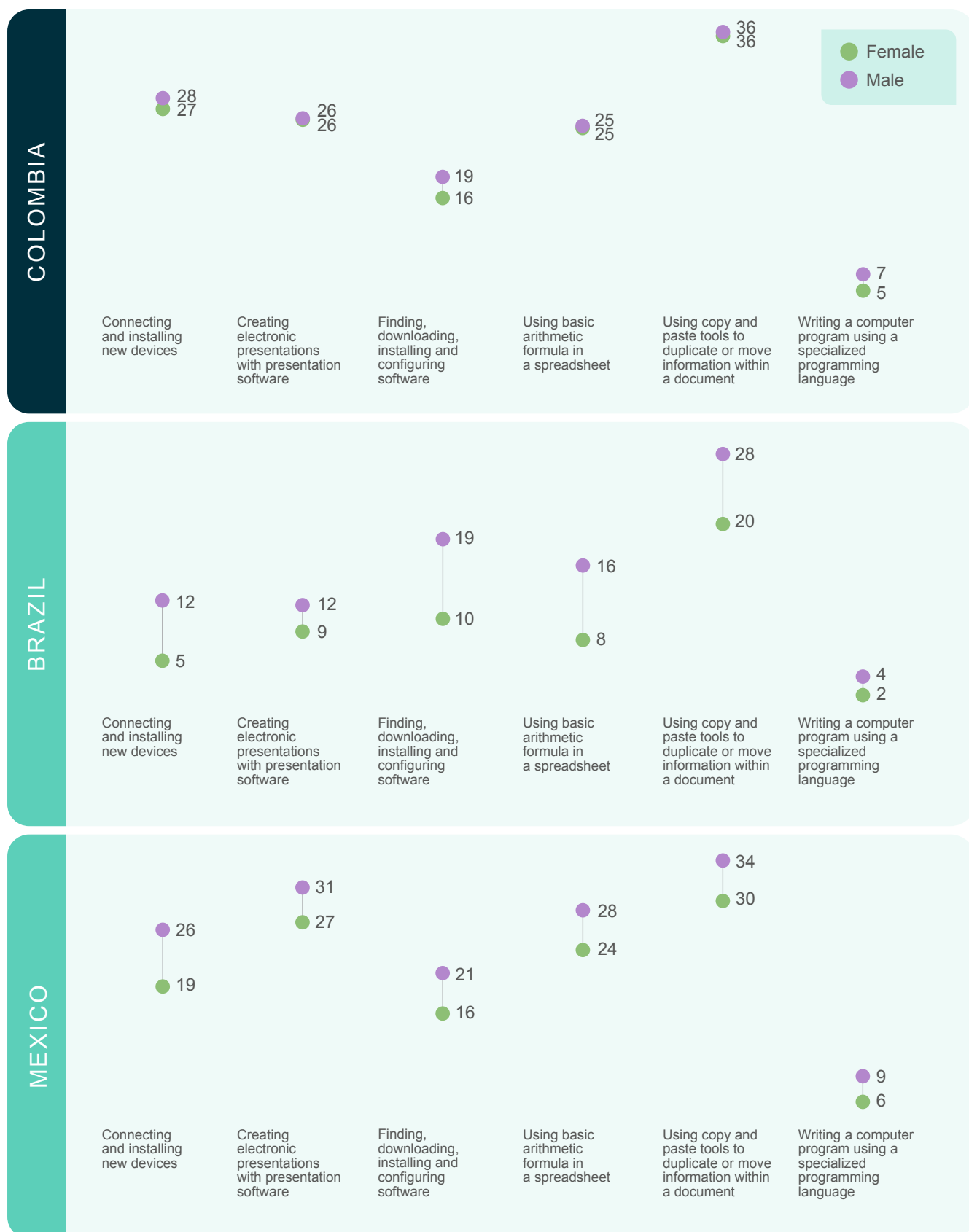
## 6.2. Current state of digital skills

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**In recent years, the GoC has launched important plans and programs related to the development of digital skills.** The main actors related to digital skills are MinTIC, MEN, the Ministry of Labor, the Ministry of Commerce, Industry and Tourism; the Agency for Entrepreneurship and Innovation of the National Government; and SENA. In addition, universities, both public and private, stand out in the provision of formal education and training in digital skills. The 2018–2022 PND, the 2018–2022 ICT Plan: Digital Future for All, and the 2016–2026 National Decennial Education Plan (PNDE)<sup>268</sup> recognize the importance of developing digital skills among the Colombian population and establish a series of goals and programs that directly contribute to this end.<sup>269</sup> The PNDE sets specific goals to increase the number of school sites with access to the internet and basic ICT infrastructure to support the implementation of the Institutional Education Program (*Programa de Educación Institucional*) and to increase the percentage of 5–24-year-olds who use the internet for educational and learning activities. These long-term goals are developed and complemented in the medium term in the 2018–2022 PND, which has the ambitious objective of providing 500,000 trainings for the development of digital competencies. Finally, the 2018–2022 ICT Plan focuses on bridging the digital gap and preparing Colombians for the Fourth Industrial Revolution, setting in motion massive training programs for all citizens to accomplish the goals established in the PND.

**Although there is a significant gap in digital skills among regions, these skills appear to be similarly distributed between women and men.**<sup>270</sup> UN data for 2018–19 suggest that there is little difference between genders as regards to basic computer skills in Colombia, especially when compared to regional peers such as Mexico and Brazil ([figure 6.1](#)).<sup>271</sup> On the other hand, there is a large gender gap in ICT careers in Colombia, with only 17 percent of ICT roles occupied by women, even though 61 percent of Colombia’s female population have expressed an interest in being trained in ICT.<sup>272</sup>

**Figure 6.1. Digital Literacy Gaps in Colombia, Brazil, and Mexico (2019).**  
Share of Youth and Adults



Source: UNESCO, SDG 4.4.1.



**Colombia lacks a digital skills framework.** Not all the actors involved in the process of digital transformation have the same understanding of digital skills. This makes it difficult to assess the current situation, measure the gaps between the supply of and demand for digital skills, and design policies and interventions to develop the required skills. In this sense, Colombia can benefit from adopting international frameworks, such as the Digital Competence Framework for Citizens (DigComp 2.1) of the European Commission or UNESCO's Digital Literacy Global Framework (DLGF).<sup>273</sup> The latter defines digital literacy as “the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies for employment, decent work and entrepreneurship. It includes skills that are called computer literacy, ICT literacy, information literacy and media literacy.”<sup>274</sup> The recent definition of a qualifications framework in the ICT sector, under the guidelines of the National Qualifications Framework, constitutes an opportunity to support the identified needs of the sector, such as the high demand for the specialization and training of technical and/or professional personnel.<sup>275</sup>

### Supply side

**Despite government efforts in the past 20 years to provide technological infrastructure and train teachers and students in the use of technology for educational purposes, capacity remains limited.** Unequal access to the internet has turned into unequal access to school and learning—and thus skills development—at a time when new knowledge and skills are most needed. A representative survey of households with children in public schools shows that between March 2020 and June 2021, only 49 percent of students had access to educational platforms, with a major gap between rural (32 percent) and urban (54 percent) areas. The main media used to connect with students and carry out educational activities were WhatsApp (82 percent) and printed guides (77 percent in rural areas compared to 65 percent in urban areas).<sup>276</sup> Lack of access to suitable technological devices and connectivity, as well as the inability of teachers and students to adequately handle technology for educational purposes (lack of digital skills), were among the main reasons for the difficulties in maintaining educational services during the pandemic.<sup>277</sup>

**Multiple actors, both from the public and private sectors, formal and informal, are actively involved in the development of digital skills in Colombia.** In addition to the government agencies outlined above and

the country's public and private universities, there are numerous education institutions playing an increasingly important role in the formation of digital skills in Colombia but whose training or certifications have not yet been regulated by the national government.<sup>278</sup> These include companies and multinationals, such as Amazon, CISCO, Globant, Google, IBM, Microsoft, ORACLE, Ruta N, SAP, Siemens, and Huawei, and such organizations as CoSchool, Sumanti, ProTalento, Fundación Saldarriaga, Fundación Corona, and Fundación Luker. Other actors providing training in digital skills include the different chambers of commerce of the country's larger cities.

**The main strategy for the development of basic digital skills among students (pre-school, primary, and secondary education) and teachers has been the Computers to Educate (*Computadores para Educar [CPE]*) program.**<sup>279</sup> Initially focused on providing technological infrastructure, CPE is transforming to become the foremost teacher and student training program for technological appropriation. The program has been extremely successful in providing access to such technological devices as laptops, desktops, and tablets with preloaded content for schools, reducing the national ratio of students per computer terminal from 24 in 2010 to three in 2020. As of 2020, CPE had reached all the municipalities in the country, distributed more than 2.4 million devices (computers and tablets), and impacted 45,830 school sites, over 9.4 million students, 1,103,988 family members and caregivers, and 321,125 teachers. An impact evaluation of the CPE program carried out between 2014 and 2018 showed that during the four years of the observation window, the average annual rate of repetition in participating schools went from 3.1 to 2.7 percent and the inter-annual dropout rate from 13 to below 12 percent.<sup>282</sup>

**In 2020, the government launched the Technologies for Learning National Policy aimed at promoting innovation in educational practices.** The Policy transformed the CPE program and set its focus primarily on four aspects: (i) increasing the access to digital technologies, (ii) improving connectivity, (iii) promoting the appropriation of digital technologies by the education community, and (iv) strengthening monitoring and evaluation practices for the use, access, and impact of digital technologies in the education sector.<sup>283</sup>

**MinTIC provides a wide variety of short training programs accessible to all Colombians.** MinTIC's 2018–2022 ICT Plan established massive training programs to contribute to the 2018–2022 PND goal of training 500,000 Colombians in digital competencies. The ministry's strategy focuses on three main age groups: (a) basic training for children, (b) strengthened skills for youth, and (c) advanced qualifications for adults. The implementation of this strategy has led to training programs for more than

150,000 children (ages four–eight) and 5,000 educators to foster the development of computational thinking (*Jugando y Creando* Program), trainings for 8,500 teachers in programming basics (*Programación para Niños y Niñas*), and STEM [science, technology, engineering, and math] trainings for 10,000 teachers (Ruta STEM).<sup>284</sup> Furthermore, in order to bridge the gap in the software development sector, the government set an ambitious goal to train 100,000 youth and adults in basic programming. Recently, MinTIC has increased its focus on reinforcing basic competences in science, mathematics, reading comprehension, and English to ensure individuals can successfully complete this training. In 2021, *TutoTIC* was created, a free program for students of any public or private school that provides tutoring in these four subjects. MinTIC also offers more advanced training courses on a much more modest scale, focusing on data science skills for undergraduate students, C-Level training for managers, and more specialized training in AI and cybersecurity for those interested.<sup>285</sup>

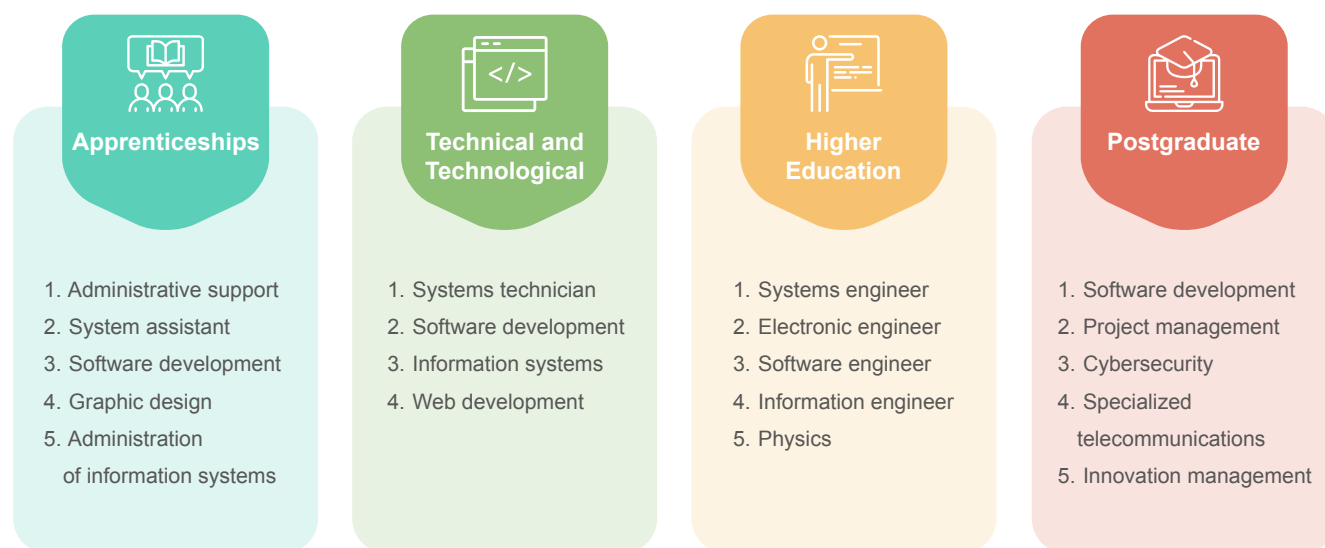
**Numerous education institutions are increasingly playing an important role in the formation of digital skills in Colombia, and some have become public sector allies in the implementation of various initiatives.** For example, the government launched a call in 2020 to train 50,000 unemployed individuals in digital and business skills through 3,800 courses by means of its agency *iNNpulsa*, in alliance with the Coursera platform.<sup>286</sup> By December 2020, in the city of Medellín, of the 26,700 people registered, 7,927 had already completed the courses and 15,510 were in the training process.<sup>287</sup> There are numerous schools and platforms that offer training in digital skills, especially in bootcamp format.<sup>288</sup> Bootcamps seem to be quite effective at identifying the needs of the industry, quickly adjusting their teaching modalities to its requirements and the latest trends. There are private organizations that claim to certify the quality of bootcamp training such as *Switch Up*.<sup>290</sup> However, bootcamp programs can be difficult to implement and require links with potential employers, and while they can be catalyzed through policy interventions, they must be regulated to ensure certifications are comparable in quality.

**Although the Colombian government is working to provide basic digital skills in primary and secondary education, a large number of young people are leaving school without rudimentary digital skills and without the capacity to continue their digital education.** Technical and higher education does offer advanced training, but the number of people enrolled remains low, and in many cases the offer is not flexible enough to adapt to the changing demands of the productive sector.

### Demand for digital skills

**Over half of the firms in Colombia surveyed by Manpower Group in 2014 reported difficulties in finding the right human talent.**<sup>291</sup> The reported reasons behind this mismatch are the absence of generic and sector-specific skills (40 percent of companies), lack of required knowledge and certifications (30 percent), and lack of experience (25 percent). In a major study conducted by the ICT Alliance (*Alianza TIC*) in 2020 to identify the human capital gaps for the ICT sector in Colombia, a total of 595 relevant programs were identified in the five regions analyzed, out of which 37 percent were technical or technological, 30 percent higher education, and 33 percent post-graduate.<sup>292</sup> Of the total programs available, 42 percent were being offered in Bogotá. The greatest deficits were found in specialized telecommunications training programs (-42 percent); analysis and development of information systems (-30 percent); and database development (-23 percent).<sup>293</sup> A report by the United Nations Development Programme, in collaboration with the Bogota Chamber of Commerce and focused on the financial services cluster, identified challenges related to quantity gaps (i.e., an insufficient number of professionals) and quality gaps (i.e., the lack of solid technical knowledge) in several profiles, such as software and application developers, data science specialists, user experience designers, and digital marketing, as well as a relevance gap in the training offered (i.e., a disconnect between the productive sector and the academy).<sup>294</sup> [Table 6.1](#) identifies critical areas where there is a deficit of training programs, by educational levels.

**Table 6.1. Training Programs Needed in the ICT Sector by Educational Level**

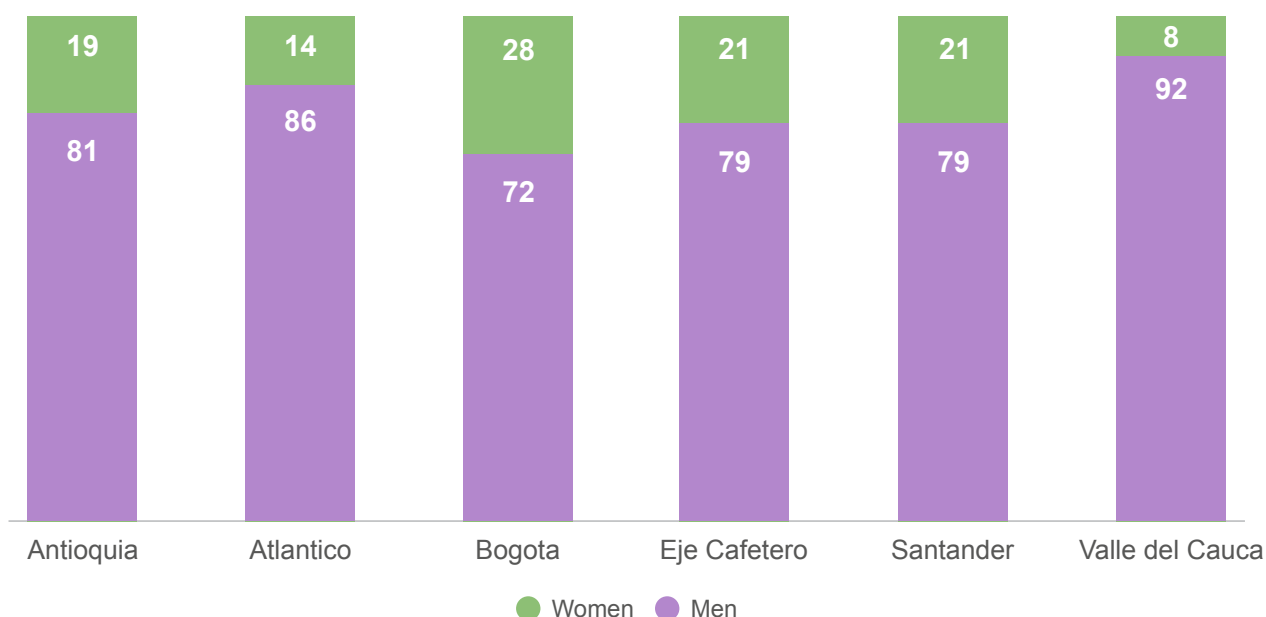


Source: Alianza TIC (2020).

**Companies in the digital sector are struggling to attract and retain employees with advanced digital skills.** Advanced digital skills are in high demand in the formal sector and hard to find, and the significant gender gaps are likely related to barriers to accessing formal education and training. A 2020 government study analyzed human capital gaps in the ICT sector in six of the main regions of the country: Antioquia, Atlántico, Bogotá, Santander, Valle del Cauca, and Eje Cafetero.

The study identified a total of 274,386 people and 51,842 companies (3.6 percent of the total number of formal businesses) working in the country's ICT sector. Most of them were located in Bogotá (32.9 percent) and Medellín (12.1 percent). The study also found a disproportionate participation of men (56.6 percent) in the sector in all six regions (see figure 6.2). Developers were consistently identified as the most critical ICT profile for companies, the most difficult human resource to obtain, the profile

**Figure 6.2. Occupation of ICT Positions by Males and Females in Six of the Main Regions of Colombia. Share of Total**



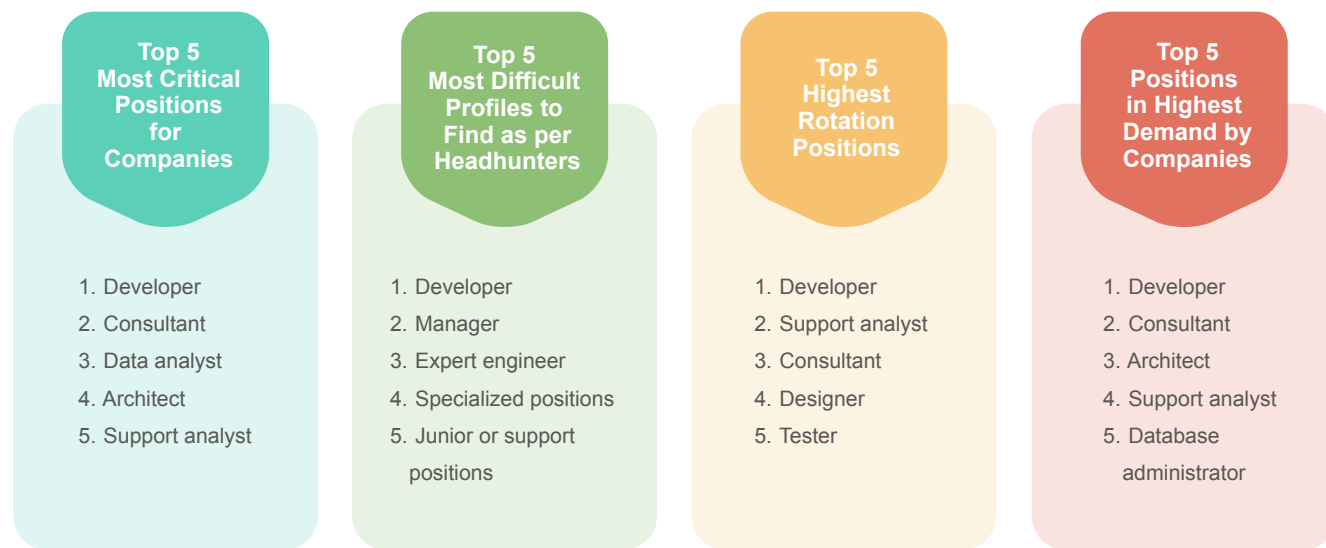
Source: Authors' elaboration based on Alianza TIC (2020).

Note: This figure considers only the surveyed people who answered the question. Between 1 and 5 percent of the surveyed population (depending on the region) did not answer.

with the highest turnover, and the most demanded profile by businesses in the sector (see table 6.2). The same study showed that the positions identified as the most relevant for the coming years were data scientists, cloud service administrators, and IT architects and analyzed the ability of the higher education institutions in each region to provide individuals with the skills required by the labor market. It is worth noting that while the ICT

sector is just one among many sectors participating in the digital economy, this kind of analysis helps to clarify the strengths and key gaps in terms of intermediate and advanced digital skills. Table 6.3 summarizes some of the main training gaps in each region by identifying programs that do not exist or are offered by few higher education institutions despite being in wide demand by the labor market.

**Table 6.2. Critical, Most Sought Out, and Difficult-to-Find Profiles in the ICT Sector in Six of the Main Regions in Colombia**



Source: MinTIC (2020d).

**Table 6.3. Training Deficit for Positions in High Demand in the ICT Sector in Six of the Main Regions in Colombia**

| Position               | Type of Training in High Deficit <sup>295</sup>                               | Regions                |
|------------------------|---|------------------------|
| Data scientist         | Statistics, data analytics  | Antioquia, Coffee Axis |
| Developers             | Innovation and development, front end specialization, mechatronic engineering | Bogotá                 |
| IT Directors           | Big data, blockchain, and artificial intelligence                             | Santander, Coffee Axis |
| IT Directors           | Computer management   | Bogotá, Coffee Axis    |
| Database administrator | Development of cloud applications   | Coffee Axis            |
| Developer              | Software engineering  | Atlantic               |
| Developer              | Mechatronic engineering   | Valle del Cauca        |

Source: Authors' own elaboration based on MinTIC (2020d).

## Assessing constraints

The future of work demands continuous upgrading and retraining, but the capacity of people to train throughout life and update their skills is highly linked to the acquisition of key abilities during the initial years of schooling. In the past two decades, the Colombian education system has undergone an important transformation in terms of access to education, school life expectancy, participation in early childhood education, and tertiary education. Despite these improvements, early dropout, low school life expectancy, and low academic results hinder educational trajectories. Moreover, Colombia faces complex challenges in terms of educational quality and equity. Many of the goals set by the government in recent years to improve education are still outstanding, from implementing the full school day to expanding early childhood education and care, closing the rural educational gap, and boosting the inclusion of students with special needs.<sup>296</sup> Efforts to improve the quality of education are weighed down by serious problems of inequity: schools in Colombia rank among the most segregated in Latin America.<sup>297</sup>

important challenge for the future development of new competencies, especially those related to STEM, including digital and technical skills.

**A marked disparity in school life expectancy by socioeconomic groups skews the acquisition of both basic and advanced digital skills in Colombia toward the richest segments of the population.** Colombia ranks among the countries with the highest school segregation by socioeconomic level in the world.<sup>299</sup> Inequalities begin early on, causing marked differences in the acquisition of key skills. Many children from economically and socially disadvantaged backgrounds do not go to school, do not start their schooling on time, or attend low-quality schools. The school life expectancy of students from the poorest backgrounds (Stratum 1) is only six years compared to 12 years for the richest, and only 9 percent enroll in higher education compared to 53 percent of the richest families (Stratum 6).<sup>300</sup> Although enrollment in school is almost universal, it drops off rapidly after age 16 for rural students and those from poor families.<sup>301</sup> In 2019, three quarters of students in rural areas were still enrolled in formal education at age 16, but that percentage dropped to 38 percent at age 18. In terms of completion rates, 45 percent of rural youth finished their studies without completing upper secondary education compared to only 27 percent in urban areas, 45 percent

**Table 6.4. Results for Reading, Math, and Science from PISA Tests for Colombia, Chile, Mexico, and Peru**

| Minimum level of proficiency attained (Level 2) | Chile | Colombia | Mexico | Peru |
|---|-------|----------|--------|------|
| Reading   | 68%   | 50%      | 55%    | 46%  |
| Math  | 48%   | 35%      | 44%    | 40%  |
| Science   | 65%   | 50%      | 53%    | 46%  |

Source: OCDE (2019a).

The Colombian educational system has a low and uneven performance measured in terms of competencies assessed by the Program for International Student Assessment (PISA). Only 35 percent of the 15-year-old population achieved at least the minimum level of proficiency in mathematics in the 2018 PISA test, substantially below the OECD average of 76 percent, and almost 40 percent performed poorly in all three subjects tested (math, reading, and science, see table 6.4). Moreover, boys outperformed girls in mathematics by 20 points, a gender gap larger than the average gap in mathematics across all OECD countries.<sup>298</sup> The low performance in mathematics and the marked gender gap just before leaving compulsory education represent an

of indigenous youth, and 35 percent of Afro-descendant youth. This means that a disproportionate number of young people, particularly from the most vulnerable sectors of society, are not completing their educational trajectories. Moreover, there is a significant divide in terms of access to and quality of education between urban and rural departments.<sup>302</sup> Rural students in Colombia scored an average of 38 points below those in urban areas of the country in the 2015 PISA test—a differential equivalent to more than one year of schooling. Early dropout and low academic results also hinder educational trajectories and weaken the acquisition of key skills, including digital skills, particularly among disadvantaged students.<sup>304</sup>

**The high number of young people who neither study nor work, added to the poor performance of the educational system and disparities in educational life expectancy, compromises the equitable acquisition of digital skills among the population.** According to data from the National Administrative Department of Statistics (*Departamento Administrativo Nacional de Estadística* [DANE]), between November 2021 and January 2022, more than 3 million people of working age in the country were neither working nor studying (around one in three young people of working age). This indicator suggests that workplace learning is at risk and could limit the ability of the government and private sector organizations to develop or update digital skills for a large portion of the population.

**Colombia does not yet have a cross-sector diagnostic that clearly identifies the digital competencies that will be necessary in the coming decade to enable both the private and public sectors to progress in their digital transformation paths.** Although there are various studies identifying the human capital gap for specific sectors or regions of the national economy, Colombia does not have a cross-sector diagnostic of the skills required for the country's digital transformation. The most recent characterization of the human capital gap in the ICT sector was carried out under the National Qualifications Framework and is based on partial and somewhat outdated surveys by Manpower Group in 2014, FEDESOFTEC in 2015, the Software and Information Technology Cluster of Bogotá in 2017, GAN Colombia, ITACA Project in 2020, and MinTrabajo in 2020. Digital skill gaps in other sectors critical to the development of a dynamic digital economy are yet to be analyzed.

**The lack of a cross-sector diagnostic of the supply of and demand for digital competencies has delayed the design and implementation of a national strategy for digital skills development.** Such a strategy is essential to coordinating public and private sector efforts to help Colombians develop critical digital competencies. Despite the multiplicity of alliances and partnerships that have been created to provide the relevant training programs, these are not necessarily linked to the human capital gaps across the economy. There is no single mechanism to map and articulate the actions of all the stakeholders in the digital skills sphere that could ensure that efforts are not duplicated and that all key areas are covered. Moreover, there currently is no mechanism in place to monitor activities related to digital skills development or to evaluate their impact, hindering the creation

of a comprehensive baseline or unified evaluation of digital skills programs.

**Colombia also lacks an official national digital skills framework to foster the development of digital competencies throughout the formal educational trajectory and later, during an individual's professional development.** Colombia has no national curriculum; schools and higher education institutions are responsible for designing their own curricula using MEN's guideline documents, the national standards, and the Basic Learning Rights for each grade level document.<sup>305</sup> MEN has provided a conceptual framework and general guidelines to train teachers in the pedagogical use of ICT and students in technology, but it has not yet provided a digital skills framework that requires students to develop related competencies at each grade level.<sup>306</sup> As a result, digital skills have not yet been incorporated formally into the curricula throughout the country, nor are they being systematically developed at a foundational level at elementary, middle, or high school or at a more advanced level in technical, technological, and higher education. Not having a national framework implies the lack of corresponding monitoring and evaluation mechanisms to assess the development of digital skills in a standardized manner.<sup>307</sup>

**Limited connectivity and unequal access to digital infrastructure and equipment (see [Chapter 2](#)) compound the challenges to strengthening digital literacy and developing a digitally competent workforce.** Regarding technological infrastructure in schools, in 2011, MinTIC and MEN created the Total Connection Program (*Conexión Total*), which provides guidelines and technical assistance to guarantee high-level connectivity for all official school sites. The ratio of students to computers in the country is 3:1—one of the lowest among Latin America's PISA countries and lower than the average for OECD countries.<sup>308</sup> Furthermore, a survey carried out by the *Conexión Total* program in 2020 and 2021 shows that 91 percent of rural school sites still do not have access to a LAN network compared to 58 percent of urban school sites, and only 22 and 49 percent, respectively, of the sites that do have networks regularly maintain them. In terms of other ICT infrastructure, only 39 percent of rural school sites report having ICT classrooms compared to 89 percent of urban sites. The median for laptops in rural school sites is four compared to 30 for urban schools, while the average number of tablets and desktops in rural areas is 10 and two respectively, compared to 82 and 16 in urban centers.<sup>309</sup>

**Deficiencies in teacher training, decontextualized learning practices, and an unfavorable perception of ICTs by many teachers, administrators, and parents also hamper the development of digital skills.** National programs have focused heavily on the provision of technological infrastructure and, more recently, on the appropriation of that technology for educational innovation. Although teachers have received training on educational innovation, the share of meaningful classroom practices that involve the use of ICT in 2016 was only 8.3 for every 10,000 teachers, a decline from 13.7 in 2015.<sup>310</sup> Furthermore, CPE’s impact evaluation for the 2014–18 period showed no statistically significant impact on ICT appropriation by trained teachers or administrators, nor on the students of trained teachers.<sup>311</sup>

**Moreover, newer forms of education, such as virtual courses and bootcamps, have not yet been properly regulated, nor do they have robust and standardized evaluation mechanisms, which affects the acceptance of these certificates by employers and makes it difficult for these formats to coexist with the formal education system.**<sup>312</sup> Large international companies, such as Amazon and Google, have developed their own mechanisms to bypass this constraint, implementing their own tools to assess the digital qualifications of potential employees.

**Table 6.5. Key Digital Skills: Challenges and Opportunities**

| Strengths   | Areas for Improvement  |
|---|--|
| <ul style="list-style-type: none"> <li>» The government has prioritized the digital transformation agenda, placing significant emphasis on the development of digital skills.</li> <li>» The GoC is strengthening the legal and regulatory framework to enable the development of the digital economy, including digital skills.</li> <li>» Government agencies and private sector actors are increasingly collaborating to provide training programs to boost digital skills.</li> <li>» Existing initiatives, such as the CPE program, have proven to be successful in providing technological infrastructure and training to students, teachers, parents, and caregivers.</li> </ul> | <ul style="list-style-type: none"> <li>» The lack of a cross-sector, countrywide diagnostic that clearly identifies digital competencies presents a key barrier to the creation of a national digital skills strategy.</li> <li>» There is no framework that defines digital skills or competencies and guides the design of indicators to monitor the development of digital skills among Colombians.</li> <li>» The current offering of support programs for the development of digital skills has not been designed according to a cohesive vision and strategy, and consequently, it currently consists of a complex, dispersed, and inefficient network of programs.</li> </ul> |
| Opportunities   | Threats  |
| <ul style="list-style-type: none"> <li>» Demand for advanced digital skills is high and increasing in Colombia, while demand for basic digital skills is near-universal among employers.</li> <li>» There is a wide range NGOs and other private sector actors offering training services or programs to foster the development of digital competencies beyond initial education.</li> <li>» Widespread digitalization of government and businesses may create further incentives for individuals to acquire digital skills.</li> </ul>   | <ul style="list-style-type: none"> <li>» Internet connectivity and supporting ICT infrastructure are still limited at many school sites and households across the country, with great rural-urban disparities in access.</li> <li>» A very high percentage of 15-year-old students do not reach a minimum proficiency level according to PISA tests, the rates of both early childhood and upper secondary education are low, and there is a high educational dropout rate, with many young people not continuing their studies beyond lower secondary education.</li> </ul>   |

### 6.3. Recommendations and next steps

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**Demand for basic digital skills is near-universal among employers, while demand for advanced digital skills is high and increasing.**<sup>313</sup> The educational system (basic, non-compulsory secondary, and higher education) is a key piece to ensuring the development of basic and advanced digital skills among young people who enter the labor market. In terms of digital skills, the main challenge for basic education has less to do with requiring students to learn robotics or programming than with ensuring that everyone, regardless of socioeconomic context, territory, gender, or cultural tradition, acquires the key skills needed to support learning, and ensuring that young people remain in the system beyond compulsory education, thus increasing school life expectancy and reducing early school dropout.

**Increasing the number of students in vocational education and training (VET) and in science and engineering careers should be a critical objective for the technical and higher education system.** Being competitive in today's digital and globalized economy involves more than just expanding higher education. Attention also needs to be paid to technical and vocational education. VET plays a major role in promoting innovation and productivity, addressing skills needs, preventing skills mismatches, and supporting youth employment. This will require a greater commitment from the productive sector in the definition and implementation of a vocational training system that promotes the development and certification of competencies, among both young people and the working-age population.

**At the same time, it is essential to develop policies and programs that promote digital skills among the adult population (active or unemployed) through workplace training.** This could occur both in the workplace or by the supporting processes (formal and informal) of reskilling and upskilling centered on digital skills, providing continuous and specific training opportunities in concrete digital skills to complement the formal training of students and workers.

**Widespread access to digital skills is key if the benefits of digitalization are to be spread throughout the country.** Given the great differences between rural and urban populations and among Colombian regions, it is crucial that special emphasis be placed on lower-income groups and remote areas.

**It is important that the government implements a recognition system for the skills acquired for work.** This recognition could facilitate labor insertion and increase the options for later development of advanced digital skills. Investing in higher-level technical ecosystems that can provide skills alternatives to a university degree is also critical.<sup>314</sup>

**Efforts toward these objectives should be monitored and—when feasible—evaluated.** Designing an agile monitoring system would help to identify, measure, and quantify the need for digital qualifications in the productive sector. Colombia would also benefit from designing and implementing a system for monitoring achievement in the acquisition of basic digital skills during initial training, as this would facilitate the fine tuning of the school curricula to integrate key digital competencies.

**An effective national human capital diagnostic should identify skills gaps in all sectors of the economy so that it can be compared against existing formal and informal training strategies, allowing policy makers to identify where existing programs are failing to impart the skills required by the market.** To the extent possible, this diagnostic should identify gaps among the different population groups, such as women, rural and indigenous communities, the elderly, and people with disabilities. The current diagnostic prepared by the Ministry of Labor has a sound methodology and provides a good basis for a cross-sector review that covers the whole of the formal economy, but a cross-sector analysis focused on human capital gaps for digital transformation that goes beyond the country's main economic regions is also needed. The ITU Digital Skills Assessment Guidebook contains valuable guidance in this regard.<sup>315</sup>

**It is important to deploy a clear and stable legal and governance framework to guide and support the different public and private agents involved in the development of digital skills.** Also important is a national training system that begins with initial training and follows people's learning paths in successive stages: intermediate, technical, higher, continuous (post education), and workplace training.

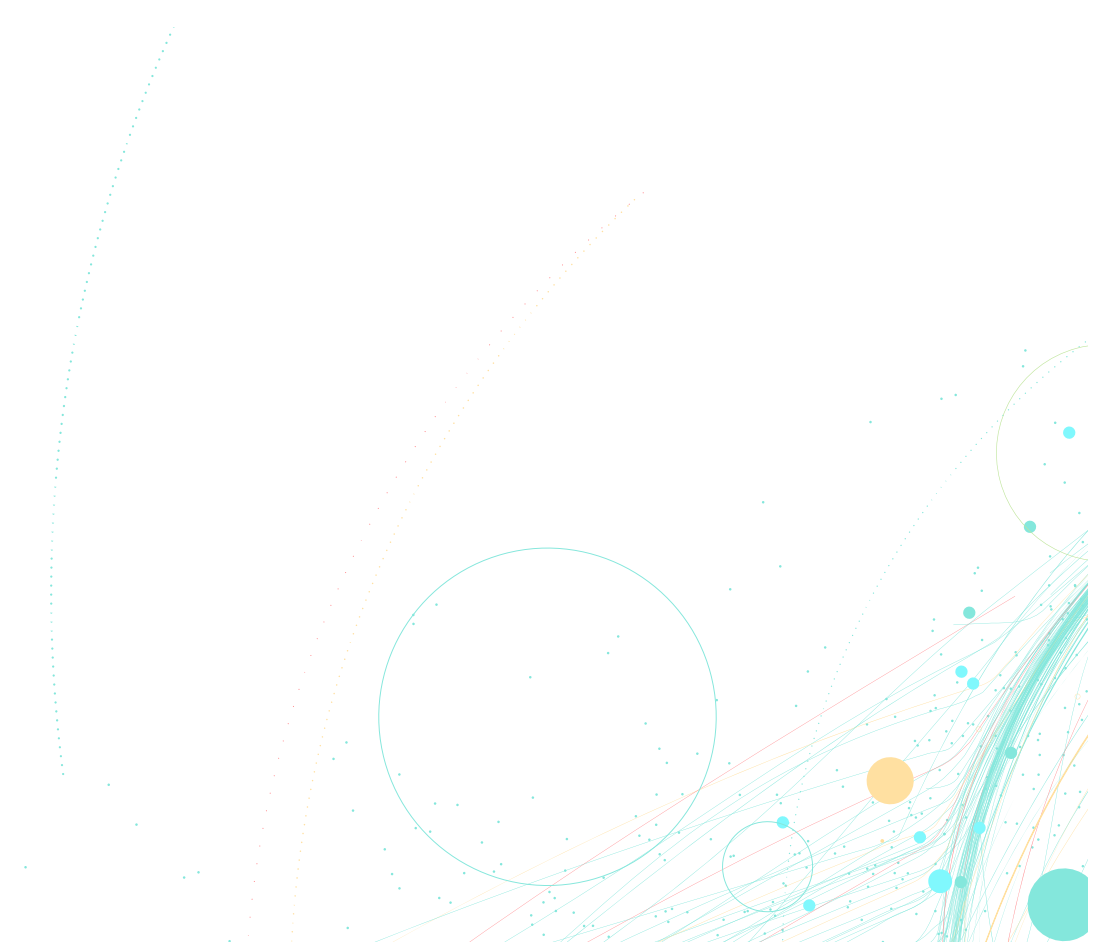
**Colombia would benefit from implementing a national common framework to clearly identify the digital competencies and skills that industry demands and that education should develop.** Not all the actors involved in the process of digital transformation have the



same understanding of digital skills. This can make it difficult to accurately assess the current situation, measure the gaps between supply and demand, and design the policies and interventions needed to address the problem areas. Moreover, improving coordination among the different government actors (national, regional, and local) and between them and the relevant economic and social agents in order to design pertinent and complementary training measures requires a shared national digital skills framework and strategy agreed upon by all parties.

**The public policy recommendations outlined below were selected and prioritized based on three main criteria:** (i) gaps in the implementation or performance of current programs to develop digital skills in Colombia and guiding principles or international practices, with suggestions on areas for improvement; (ii) the technical and political feasibility of the recommended actions: recommendations that require no or few legislative changes have been given greater weight; and (iii) the involvement

of multiple stakeholders from different sectors in the design and implementation of the recommended actions, as a collaborative approach would better reflect the supply of and demand for digital skills and thus contribute to more robust and sustainable policies and reforms. Providing the appropriate skills to promote and sustain a long-term process of digital transformation requires strong foundations during schooling and an adequate workplace learning system that ensures the constant upskilling and reskilling of the workforce, as well as agile regulations and government support programs to create an enabling environment that spurs the participation of the private sector. The recommendations emphasize three groups in particular that offer a strategic opportunity to boost digital transformation in the short and medium terms: (i) early leavers from education and training systems; (ii) people who are neither employed nor in education or training; and (iii) adults without qualifications and the unemployed.



**Table 6.6. Digital Skills: Policy Recommendations (1 of 3)**

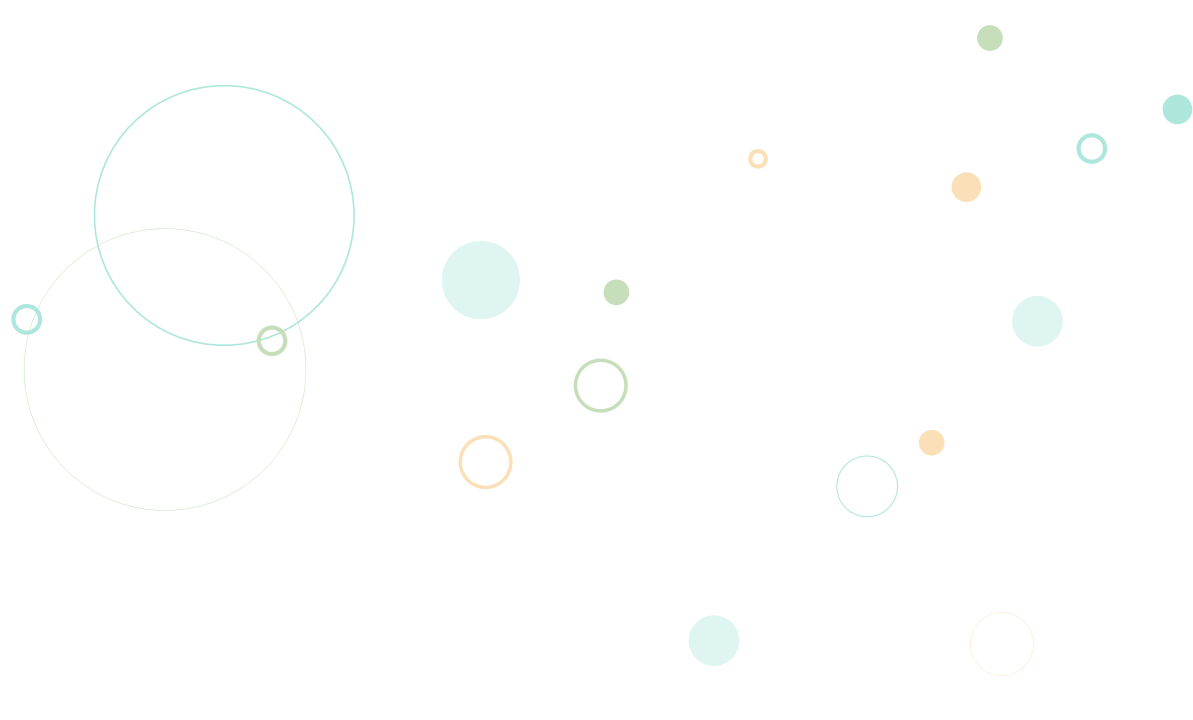
| Reform Area   | Recommendation  | Responsible Entity  | Timing             | Legal Change Required? |
|---|---|---|--------------------|------------------------|
| <p><b>Diagnostic, national framework, and national strategy</b></p> | <p><b>Elaborate and regularly update a cross-sector diagnostic to identify the digital skills and competencies required to prepare the labor force to take advantage of the opportunities set forth by digitalization.</b> International examples of cross-sector diagnostic frameworks include Chile’s Brechas de Inclusión Digital (Martínez, Mata, and Vega 2021) and the European Union’s Digital Economy and Society Index (DESI). The ITU Digital Skills Assessment Guidebook also contains valuable guidance in this regard (ITU 2020). <b>PRIORITY.</b></p> | <p>MinTIC and Ministry of Labor</p>   | <p>Short term</p>  | <p>None</p>            |
|   | <p><b>Create a national digital skills framework that clearly defines digital skills and competencies in Colombia.</b> Relevant examples include the Digital Competence Framework for Citizens (Digcomp 2.1), for Educators (DigCompEdu), and for Educational Institutions (DigCompORg). <b>PRIORITY.</b></p>   | <p>MinTIC, MEN, and SENA</p>  | <p>Short term</p>  | <p>None</p>            |
|   | <p><b>Define a national digital skills strategy</b> that recognizes the existing gaps (gender, educational level, regional, urban-rural). This national strategy could establish how digital skills (based on the skills framework) should be developed on a continuum from a basic level (primary and secondary education) to a more advanced one (technical, technological, higher education, workplace learning). <b>PRIORITY.</b></p>   | <p>Government, Chambers of Commerce, Industry associations, Employers</p>                                 | <p>Short term</p>  | <p>Yes</p>             |
| <p><b>Monitoring and evaluation</b></p>                             | <p><b>Develop an inter-agency, cross-sector monitoring and evaluation framework that allows the government to track the progress made on the indicators set in the national digital skills strategy and to assess the impact of the national training programs on closing existing gaps.</b> Measurements should be carried out regularly to assess the impact of training programs and how they are advancing the indicators</p>   | <p>MinTIC, in collaboration with MEN, SENA, Ministry of Labor, and other relevant government agencies</p> | <p>Medium term</p> | <p>None</p>            |

**Table 6.6. Digital Skills: Policy Recommendations (2 of 3)**

| Reform Area  | Recommendation   | Responsible Entity   | Timing      | Legal Change Required? |
|--|--|--|-------------|------------------------|
|  | established in the digital skills framework, as well as the national strategies contemplated in the PND and other sector (ICT, education, etc.) plans.   |  |             |                        |
| <b>Secondary and higher education system</b>                             | <b>Elaborate a national vocational training plan to help identify and respond to the training needs of the productive sector.</b> This plan should be linked to the vocational training and vocational training for employment subsectors and based on the National Qualifications Framework. Ideally, the plan should be updated periodically, based on continuous public-private collaboration.  | MEN, Secretarías, SENA, Chambers of Commerce, Industry associations, Employers, MinCIT, Academia | Medium term | None                   |
| <b>Adult education, workplace learning, and professional development</b> | Develop a national digital skills second-chance plan. Develop a specific second-chance plan to address the needs of young people who are not in employment, education, or training (NEET), offering opportunities to develop, enrich, and improve their digital skills and acquire qualifications. Both the VET Toolkit for Tackling Early Leaving <sup>317</sup> and the VET Toolkit for Empowering NEETs <sup>318</sup> from the European Center for the Development of Vocational Training (CEDEFOP) provide relevant references in this respect. | SENA, Secretarías, Chambers of Commerce, Industry associations, Employers                        | Short term  | None                   |
|  | <b>Define a national plan for reskilling in digital skills</b> for adults who need this training (with different skill packages, levels, and duration) to re-enter the productive system, update their portfolio of skills, progress in their professional career, and launch business initiatives in the digital economy sector.  | SENA, Ministry of Labor, Chambers of Commerce, Industry associations                             | Short term  | None                   |

**Table 6.6. Digital Skills: Policy Recommendations (3 of 3)**

| Reform Area                       | Recommendation  | Responsible Entity                | Timing                 | Legal Change Required? |
|-----------------------------------|---|-----------------------------------|------------------------|------------------------|
| Public basic and medium education | Develop a “support and reinforcement plan” for secondary education to reduce absenteeism and early school leaving, especially in centers that serve the most disadvantaged populations, with the aim of increasing the number of young people with a better skills base (including digital skills) and the percentage of young people who continue their studies with technical and higher education training.                                    | MEN, MHCP, Education Secretariats | Short term             | None                   |
| Regulatory                        | Link the vocational training subsystems of the education system and vocational training for employment into a single system. It is also important to facilitate the recognition of skills acquired outside the formal system. To that end, ensure that the national catalog of qualifications guides this process and allows workers to progress in training itineraries that lead to accreditations, certificates, and degrees with recognition. | Government                        | Short and medium terms | Yes                    |



# 7. TRUST ENVIRONMENT



## KEY MESSAGES

- » **Key enablers and safeguards to support digital transactions and data flows are established in Colombia.** However, the country's comprehensive data protection framework does not govern some core aspects of personal data protection. Areas to strengthen are the right to data portability, the reporting of data breaches to the data subjects, and expanded legal jurisdiction for processing personal data.
- » **As Colombia is starting to deploy a new digital ID scheme, three factors are vital to its success:** (1) ensuring its inclusiveness, (2) gaining societal trust as the new ID system is implemented, and (3) developing a sound digital service ecosystem based on smooth coordination among institutions.
- » **Under the newly adopted cybersecurity governance structure, new instructions were tasked with overseeing the assets and essential services of critical national cybernetic infrastructure** (*infraestructuras cibernéticas críticas nacionales* [ICCN]). However, the current ICCN regime excludes private ICCN assets and services. It is crucial to extend the ICCN regime to include the sizable private share of national ICCN.
- » **Dedicating further resources to combating cybercrime needs to remain a priority as the number of cases continues to grow.** Colombia faces important challenges in terms of insufficient qualified staff and a deficit of financial and technical resources. The training of the judicial branch in cybercrime is not systematic in Colombia, and the country may wish to address this as a priority in order to ensure formation of a consistent case law through the courts.
- » **The development of human capital is the main strategic medium- to long-term challenge for Colombia as regards cybersecurity.** If not addressed, it could delay the progress of the cybersecurity domain for years to come. Consistent political will, accompanied by support from industry, academia, and the public sector, will be essential to deal with this challenge.

### 7.1. The importance of a trust environment

Previous chapters of this report have demonstrated how the digital economy and its various aspects hold tremendous developmental promise. However, building a digital economy in a weak trust environment will inevitably jeopardize this promise. There is a growing understanding across the world that digital technologies will evolve into essential parts of the supply chain for many critical services, including social services. The integrity and availability of those services have become

major national security concerns and challenges, to which a country's failure to respond could end up sacrificing its potential economic value. Yet, security concerns are slowing the adoption of some technologies, especially cloud-based services, which is in turn preventing many countries from making the most of innovation to boost economic efficiency. For developing countries that seek a hyper-connected future, priority must be given to building a trust environment around digital technologies and their associated assets that today are often thought to be the most important infrastructure of this century.

**As Colombia's digital economy becomes more inclusive, it is paramount to continue to strengthen data enablers and safeguards in order to provide a trusted environment for the growth of electronic transactions and data flows.** The World Bank's 2021 World Development Report categorizes data policies and regulations as enablers and safeguards. Enablers are policies and regulations that facilitate the use of data as a necessary condition for the digital economy, such as through data-sharing models that underpin e-commerce transactions and public and private intent data. *Safeguards* encompass policies and regulations that protect personal and non-personal data and prevent data abuse, cybercrime, and other misuse.<sup>319</sup> The regulation of data exchanges is indispensable to enabling the kind of interactions and data flows typical of an advanced digital economy and at the same time ensuring that personal data are collected, processed, and stored fairly and lawfully, that is, for a specific purpose only, in a manner that is not excessive in relation to that purpose, and for no longer than necessary.

## 7.2. Data regulation

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**Despite many advances, Colombia still faces barriers to establishing a reliable environment for strengthening international and domestic electronic transactions with a fair balance of data enablers and safeguards.**

**Colombia's data protection framework is comprehensive and supports important major rights, such as right of access, rectification, and opposition.** The data protection framework consists of two primary statutory laws and several complementary regulations, decrees, and sectoral directives. Existing constitutional safeguards, laws, secondary regulations, and decrees address critical aspects of data regulation and personal data protection (see [Annex 7](#)). In December 2008, the Congress of Colombia enacted Statutory Law No. 1266 (later amended by Law No. 2157 of 2021), which governs habeas data in the finance sector. This law regulates the processing of information contained in personal databases related mainly to financial data, credit records, and commercial and service information. The law also establishes general principles governing the processing of personal data, namely, accuracy and quality, (legitimate) purpose, limited circulation, obsolescence, the safeguarding of constitutional rights, security, and confidentiality.<sup>320</sup> Moreover, Statutory Law No. 1581, enacted by the Congress of the Republic in October 2012, establishes general provisions for protecting personal data based on constitutional rights stated in article 15 of the Political Constitution of 1991. This law applies to individuals, private and public entities, and government

agencies that collect, process, and store personal data related to data subjects in Colombia, regardless of whether the data processing is carried out on Colombian territory or abroad.<sup>321</sup> In case of cross-border data flows, Colombia, along with some other LAC countries, adopts a conditional transfer model aligned with the EU's General Data Protection Regulation<sup>322</sup> (GDPR). This approach provides space for regional harmonization.<sup>323</sup>

**The country's data protection framework could be strengthened with some currently missing core elements, such as recognition of the right to data portability, the obligation to report data security breaches, and an additional legal basis for lawful data processing.** At the time of this writing, the data portability right was not part of the data protection framework in Colombia, and there was no obligation to report data security breaches to the data subjects. The principle of accountability (*Principio de Responsabilidad Demostrada*) could be further strengthened through an obligation to appoint a Data Protection Officer within public and private organizations. Apart from that, Colombia would need to consider broadening the legal jurisdiction for processing personal data, which currently includes only one legal basis compared to six listed under the EU's GDPR.<sup>324</sup> These issues are partially governed by Decree No. 1377 of 2013, Decree No. 620 of 2020, and the SIC Accountability Guidelines, the latter of which are not mandatory.<sup>325</sup> In a recent breakthrough, the Andean Community (*Comunidad Andina* [CAN]) in July 2022 adopted Resolution No. 897,<sup>326</sup> which, in article 4, explicitly recognizes the principle of accountability (*Principio de Responsabilidad Demostrada*) and the right to data portability (*Derecho a la Portabilidad de los Datos*). This resolution provides a term of two years to integrate its provisions into the domestic telecom regulations and will be mandatory for telecom operators, users, and member states. Furthermore, enhancing the existing data protection framework could help Colombia to fulfill critical conditions needed to join internationally recognized data protection conventions, such as the Council of Europe's Convention 108+.<sup>327</sup> In 2019, Colombia started discussions with the Council about the possibility of joining this Convention as an observer.<sup>328</sup>

**Through the Data Protection Delegation's office, the SIC operates as Colombia's data protection authority<sup>329</sup> for the private sector and is active in raising public awareness of personal data protection.<sup>330</sup>** The SIC has trained administrative and professional staff to supervise and enforce the domestic data protection framework, including Law 1266 of 2008 and Law 1581 of 2012. The SIC regularly provides online courses and training concerning Law No. 1581 and Decree 1377 of 2013 to domestic companies and individuals and routinely conducts awareness-raising campaigns, including on social media outlets, targeting the general public.

**The SIC also plays a proactive and rigorous role in overseeing compliance with personal data protection provisions.** For instance, the administrative fines imposed by the SIC increased by 127 percent in 2021. In that year, the SIC received more than 28,610 complaints (75 percent more than in 2020) and issued 2,457 administrative decision orders for non-compliance. Most complaints (90 percent) were related to violations of Law 1266 of 2008 (involving habeas data in the finance sector), and the other 10 percent to violations of Law No. 1581 of 2012.<sup>331</sup> To increase efficiency in the resolution of disputed cases, the SIC recently implemented an online alternative dispute resolution system in which affected data subjects and data controllers can settle the dispute more quickly (<https://sicfacilita.sic.gov.co>). On average, 81 percent of the requests submitted through this system were satisfactorily resolved in 20 days or fewer.<sup>332</sup>

**Despite being one of the leading data protection agencies in the LAC region, the SIC does not fully avoid typical challenges, such as contending with limited resources, maintaining institutional independence, and building a broader societal commitment to personal data protection.** Although the SIC almost tripled its staff between 2018 and 2021 (from 48 to 120), the high volume of complaints means that internal capabilities need to be progressively improved, for instance, through the adoption and effective use of adequate digital solutions. Moreover, maintaining the SIC's institutional independence, including through avoiding potential influence from other government authorities and big tech companies (e.g., lobbyists, lawyers) that operate in Colombia, is paramount in sustaining societal trust in the national data protection system. It is also critical that the SIC double down on its efforts to boost the ethical commitment in regulated organizations and spread nationwide the idea that data protection is a shared responsibility.

**Processing personal data in the public sector presents a challenge.**<sup>333</sup> The entity in charge of monitoring public institutions is the Attorney General's Office (*Procuraduría General de la Nación*), but compared to the relatively more active SIC, this agency has the capacity to become more visible in supervising and enforcing the personal data provisions. The transparency, accountability, and enforcement mechanisms in the public sector are central to maintaining a high level of trust in the national institutions that are processing personal data. Society should be well aware that there is diligent oversight ensuring that public servants comply with the personal data protection provisions and that adequate sanctions are applied to those who breach the law.

**Moving forward, Colombia's data protection framework should go further in addressing the challenges brought forth by emerging technologies, such as AI, blockchain, cloud computing, and others.** It should also ensure that the accountability of data processing, privacy-by-default, and security breaches, among other concerns, are currently being dealt with according to SIC guidelines, which are not codified in the legal framework and thus not mandatory. Also, the current data protection framework does not expressly address the challenges resulting from the evolving digital environment, such as the protection of personal data before using AI technologies.

**Colombia's performance on key data flow enablers identified in the 2021 World Development Report is on par with other middle-income countries.** Overall, most LAC countries score higher on enablers than on safeguards for data transactions, with a high variance within the region. However, Colombia is an exception to this trend (see [Table 7.1](#)).

- » **Enablers for e-commerce transactions.** Colombia has a range of enablers in place to facilitate e-commerce transactions, including e-commerce legislation (Law No. 527 of 1999), a digital ID system (Decree No. 1413 of 2017 and Law No. 1955 of 2019), and legal recognition of electronic signatures (Law No. 527 of 1999).
- » **Enablers for public intent data.** Colombia has a robust open data framework that includes articles 20 and 74 of the Constitution (access to information as a constitutional right), Law No. 1712 of 2014, National Data Usage Policy - BIG DATA (CONPES 3920 of 2018), MinTIC Resolution No. 1519 of 2020, and several open data guidelines that cover quality and interoperability standards, an open data roadmap, a business architecture framework, a common language standard, and anonymization, among others.<sup>334</sup>
- » **Enablers for private intent data.** Colombia's data protection framework does not explicitly regulate mandatory data portability, and data owners do not have the right to data portability unless the particular domestic organization's internal privacy policies recognize this right.
- » **Safeguards for cross-border data flows.** Cross-border data flow is governed by Law No. 1581 of 2012. In principle, cross-border data flow is prohibited unless the data destination is within those countries with adequate data protection levels (SIC Circular Unica, article 3.2. Title V).

- » **Safeguards for personal data.** Colombia has an overall robust personal data protection framework, though it could be further strengthened (see [Annex Z](#)).
- » **Safeguards against cybercrime.** Law No. 1273 of 2009 integrates various cybercrime offenses into the Colombian Penal Code and is considered the primary substantive cybercrime legislation in the country. Law No. 527 of 1999 recognizes digital evidence as

probative material within judicial investigation processes. Other procedural cybercrime provisions are contemplated in the General Procedure Code (Law No. 1564 of 2012), Penal Procedure Code (Law No. 904 of 2004), and Law No. 270 of 1996 and in several resolutions of the Prosecutor’s Office that address relevant topics such as chain of custody procedures. Since 2020, Colombia has been a signatory party to the Convention on Cybercrime of the Council of Europe, known as the Budapest Convention.<sup>335</sup>

**Table 7.1. Summary of Key Safeguards and Enablers for Colombia and Selected Benchmark Countries**

| Dimension          | Enablers                         |  |                      |                         | Safeguards                      |   |  |
|--------------------|----------------------------------|--|----------------------|-------------------------|---------------------------------|---|--|
|                    | E-commerce/<br>e-transaction law | Digital ID system for<br>online authentication | Open data act/policy | Data portability rights | Personal data protection<br>law | National cybersecurity<br>strategy/plan | Regulation<br>of non-personal<br>government data |
| Country            |                                  |  |                      |                         |                                 |   |  |
| El Salvador        | Yes                              | NO   | Yes                  | NO                      | NO                              | Yes                                     | NO   |
| Costa Rica         | Yes                              | Yes  | Yes                  | NO                      | Yes                             | Yes                                     | Yes  |
| Colombia           | Yes                              | NO   | Yes                  | Yes                     | Yes                             | Yes                                     | Yes  |
| Mexico             | Yes                              | NO   | Yes                  | Yes                     | Yes                             | Yes                                     | NO   |
| Dominican Republic | Yes                              | Yes  | Yes                  | NO                      | Yes                             | Yes                                     | NO   |

Source: Framework from World Bank (2021). For Colombia, Mexico, and the Dominican Republic, data from World Bank (2021); for El Salvador and Costa Rica, data are based on original analysis.

Note: recientemente se ha introducido un nuevo sistema de identificación digital, pero en el momento de redactar este informe su aceptación era escasa.



## 7.3. Digital ID

In 2020, the RNEC, the main government agency tasked with the identification of persons, launched a novel digital ID system enabling access to digital services. The current digital ID card (*Cedula Digital*), which is not yet mandatory, was authorized according to Decree No. 1413 of 2017 and Law No. 1955 of 2019.<sup>336</sup> The digital ID card collects biographic and biometric data, such as full name, ID number, date and place of birth, gender, signature, picture, and fingerprints. The new digital ID card has two formats: (i) the *physical format*, which is old and widely used to access offline services, and (ii) the *digital format*, which can be accessed from any electronic device (e.g., mobile phone) through an encrypted QR code that contains personal data, including biometric data, of the cardholder.<sup>337</sup> The new ID

card streamlines the digital authentication process, enabling a series of benefits, such as: (i) allowing citizens to carry out internet-based transactions, (ii) helping to prevent and mitigate payment fraud and identity duplication, and (iii) allowing the portability of the ID card on mobile devices. Moreover, the digital ID can also be used as an official ID for traveling within the countries of the Andean community.

**As Colombia is starting to deploy a new digital ID scheme, three factors are vital to its success:** (1) ensuring its inclusiveness, (2) gaining societal trust before and during its deployment, and (3) developing a sound digital service ecosystem based on smooth coordination among institutions. Between February and November 2022, the World Bank conducted a national ID4D Diagnostic of the new ID system that proposed recommendations for its successful deployment (see Box 3).

### BOX 3. Summary of Recommendations of the ID4D Diagnostic

In February–November 2022, the World Bank conducted a national ID4D Diagnostic of the new ID system with recommendations for its effective deployment. These include:

- i. Ensure the inclusion of all, especially the indigenous population, remote communities (particularly those affected by the conflict in Colombia), and migrants (who are mostly Venezuelans).
- ii. Enhance coordination with MinTIC to facilitate the uptake of the new ID system, selecting key services to be provided digitally.
- iii. Ensure that the *Carpeta Ciudadana* (Citizen File) and the new ID system are aligned with the country's digital priorities and that both tools are interoperable.
- iv. Continue strengthening the authentication platform within the ID agency and ensure that fees charged to the private sector are not an obstacle to delivering digital services.
- v. Deploy communication campaigns, a citizen engagement process, and qualitative studies to increase uptake, showing the benefits of the new ID system. These campaigns and interactive processes should be focused on increasing public trust.
- vi. Ensure that the enrollment campaigns for the new ID card are carefully designed and promote inclusion by reaching vulnerable and remote populations.
- vii. Design a risk-based approach for authentication by implementing various levels of assurance.<sup>338</sup>
- viii. Increase cybersecurity awareness and capabilities within the ID agency to manage the increasing flow of data.
- ix. Conduct a data privacy assessment (a privacy impact assessment [PIA]) to identify risks in the deployment of the new ID system and ways to mitigate them and implement a privacy-by-design approach.

Source: World Bank, "ID4D Country Diagnostic: Colombia" (Washington, DC: World Bank, 2022).

## 7.4. Cybersecurity and cybercrime

**COVID-19 has accelerated the digitalization process worldwide, leading to business innovation and rapid technological change, but it has also revealed vulnerabilities and brought about new cybersecurity threats and risks.** Cyberattack vectors, such as ransomware, phishing, and distributed denial of service, are causing severe harm to critical infrastructure operations, economic value, and livelihoods.<sup>339</sup> Even when there is no tangible damage, concerns among citizens and consumers regarding potential cyber risks undermine trust in the adoption and usage of digital products and services. As the world is increasingly interconnected and digital technologies underpin personal lives and business activities across many sectors, cybersecurity must become an integral and instrumental component of the overall digital ecosystem.

**In the past decade, Colombia has made consistent efforts to build its cybersecurity capabilities, but further strengthening is needed to match ever-growing challenges in the cybersecurity domain.** The country operates in an environment that is prone to significant cyberattacks. The current National Trust and Digital Security Policy adopted in 2020 (CONPES 3995) highlights the relatively low level of cyber preparedness in Colombia.<sup>340</sup> Indeed, Password Managers' 2020 Cybersecurity Exposure Index ranks Colombia 54th out of 108 countries in its global ranking and the 5th most exposed country in South America—the region with the second-highest average country exposure to cyber threats.<sup>341</sup> In 2021, there were approximately 623 million ransomware attacks worldwide, nearly 20 ransomware attempts every second, according to the 2022 SonicWall Cyber Threat Report—a doubling of ransomware attempts year over year. The report ranked Colombia 5th in the top 10 countries with the highest number of ransomware attacks, with 11.3 million attacks during 2021.<sup>342</sup> Likewise, a 2021 Citrix report found that at least 53 percent of domestic companies have been attacked in Colombia.<sup>343</sup> The Colombian Prosecutor's Office reported 20,000 cybercrimes in 2021, representing a 35 percent increase over the reported incidents in 2020.<sup>344</sup> Furthermore, the ITU's 2020 Global Cybersecurity Index (GCI) ranked Colombia 81st out of 182 countries and 9th in the Americas region, suggesting a moderate cybersecurity commitment in technical measures, capacity development, and cooperative actions, but a lag in legal and organizational measures.<sup>345</sup> Likewise, the E-Governance Academy's National Cybersecurity Index gives Colombia a score of 46.75 out of 100 in cybersecurity preparedness and ranks the country 74th out of 160.<sup>346</sup>

**Despite a notable advance in the cybersecurity policy and strategy domain, Colombia only recently established a national cybersecurity structure.**<sup>347</sup> Since 2011, Colombia has adopted several national cybersecurity strategies. The new PND 2022-2026 proposes several public policy measures so that the country has the necessary capabilities to ensure adequate and timely management of digital threats, and that interactions in digital environments can take place safely and reliably. One measure corresponds to the design and implementation of a strategy to safeguard the country's critical cyber infrastructure and the definition of measures to protect the information of government entities and individuals from possible cyberattacks and cybercrimes. In addition, CONPES 3995, has a Monitoring and Action Plan detailing several strategic activities for 2020–22 and the following three strategic objectives (i) strengthening the digital security of citizens and the public and private sectors, (ii) updating the national cybersecurity governance framework, and (iii) reviewing the adoption of cutting-edge digital security models, standards, and frameworks, with an emphasis on new technologies to prepare the country for the challenges and opportunities brought forth by the Fourth Industrial Revolution.<sup>348</sup> The national cybersecurity governance structure had been an unsolved issue for decades and was resolved only recently. Decree No. 338 of 2022<sup>349</sup> defines a governance model with relevant mandates to strengthen digital security, network protection, critical infrastructures, essential services, and information systems in cyberspace. The newly adopted governance model establishes the following decision-making layers: (i) National Digital Security Coordination Body, (ii) National Digital Security Committee, (iii) Digital Security Working Groups, (iv) Digital Security Working Tables, and (v) Digital Security Unified Command Posts.

**The strengthening of the cybersecurity legal frameworks is a priority for the country.** In this regard, the PND 2022-2026 proposes the creation of a roadmap that integrates inter-institutional efforts in regulatory matters to adopt national legislative measures and international cooperation aimed at combating cybercrime, such as those dealt with in the Budapest Convention. Furthermore, CONPES-3995 has tasked the Ministry of Justice, MinTIC, Prosecutor's Office, and Ministry of National Defense (MoD) with conducting a diagnostic of the existing cybersecurity legal framework and ascertaining how it is affecting (i) the free and peaceful exercise of digital citizenship, (ii) the country's defense and national security, and (iii) the criminalization, investigation, and prosecution of the punishable conduct committed through the use of ICTs. At the time of this writing, that work was ongoing and intended to result in a roadmap with proposed

amendments. It is envisioned that those amendments will seek alignment with the relevant regulatory directives adopted by the sectoral regulators and address the challenges brought forth by new and emerging technologies, such as IoT, operational technologies, big data, cloud computing, and AI, among others.

## Incident response

**The Cybersecurity Emergency Response Group (*Grupo Interno de Trabajo de Respuesta a Emergencias Cibernéticas de Colombia [ColCERT]*) is recognized as the national-level computer emergency response team.** Together with the Government Computer Security Incident Response Team (Gov CSIRT), the Defense CSIRT, the Intelligence CSIRT, and sectoral CSIRTs, ColCERT forms the national cybersecurity incident response effort. Establishment of ColCERT was mandated in 2011 through the first national cybersecurity strategy (CONPES 3701) under the administration of the MoD. In 2013, MoD Directive No. 3933 legally established ColCERT and defined its roles and responsibilities.<sup>350</sup> CONPES 3995-2020 further developed the area of incident response by establishing CSIRTs within the intelligence and social security sectors and creating a central registry of national-level cyber incidents as a coordinated effort and a national incident response management system.<sup>351</sup> Decree No. 338 of 2022 brought other incident response teams, such as the Gov CSIRT, the Defense CSIRT, the Intelligence CSIRT, and sectoral CSIRTs, as part of the incident response effort and transferred from the MoD to MinTIC the functions related to defining the national incident response model, the functions and responsibilities of ColCERT,<sup>352</sup> and implementation of the corresponding incident reporting and information-sharing platforms, among others. Transition of the incident response function oversight from defense to a civil institution was motivated by the objective to facilitate a trusted environment for information exchange and communication with all members of the community and ecosystem at large. ColCERT remains a focal point of contact at the national and international levels concerning incident response matters.

**Transition from the MoD to MinTIC has been a major challenge for ColCERT, which had to start its operations from zero in the new institution.** Reporting incidents by private sector organizations and developing a trust environment within the community present other key challenges. The transitioning of ColCERT to MinTIC did not include the transition of staff and equipment; in 2022, MinTIC therefore was addressing the major challenge of ensuring ColCERT's uninterrupted operation. Since March 2022, Gov CSIRT has been backing ColCERT up with national-level incident response management while MinTIC bridges the gaps in terms of qualified staff and technical resources. There is no formal incident reporting framework in place to obligate private sector organizations to report their cyber incidents, which therefore remain underreported. Among other challenges for ColCERT in protecting the country's cybersecurity was the identification and protection of the assets of the public sector's critical national cybernetic infrastructure (*infraestructuras cibernéticas críticas nacionales [ICCN]*).

**Two other major CSIRTs in Colombia are the Gov and Defense CSIRTs.** The former was formally established in 2018 through the CONPES 3701 and CONPES 3854 strategies and after the National Police and MinTIC reached a collaborative agreement to set it up.<sup>353</sup> This CSIRT is managed by MinTIC and is located in the technological complex led by the National Police (Command, Control, Communications, and Computing Center [C4]) in Bogotá. The Gov CSIRT has reached an operational level and provides technical support to public institutions with their incident response management cycle. The Gov CSIRT also assists MinTIC in implementing the Security and Privacy of the Information Framework (MSPI) to strengthen public institutions' ICT infrastructure and information systems.<sup>354</sup> With regard to military concerns, the former staff and equipment used by the MoD to operate ColCERT are now part of the Defense CSIRT protecting the ICT infrastructure of the armed forces and the group of companies linked to the defense sector (GSED).

**Large organizations within Colombia's telecommunications, financial, and energy sectors have developed their own incident response management capacities, either on-premise or through headquarters or satellite support or outsourced services, though SMEs and MSMEs have very little or no capacity to handle cyber incidents.** According to the Forum of Incident Response Security Team's portal, there are 20 CSIRTs and security operations centers (SOCs) duly

registered.<sup>355</sup> There are also dedicated incident response capabilities within the critical sectors of finance, energy, and telecommunications (see [Annex 8](#)). All the existing public and private sector CSIRTs in Colombia have good channels of communication and information sharing with ColCERT and even among themselves. Despite the progress, Colombia's incident response capacity in the SME and MSME community, which are vital components of the Colombian economy, remains nascent.<sup>356</sup>

## Cybercrime

**Colombia has adopted a comprehensive package of cybercrime legislation, and it joined the Budapest Convention in 2020, albeit with some reservations.**<sup>357</sup> Law No. 1273 is considered the primary substantive cybercrime legislation in the country, which is supplemented by the following legal acts: Penal Code (Law No. 599 of 2000), adoption of the Budapest Convention (Law No. 1928 of 2018), and child pornography and sexual exploitation laws (Law No. 300 of 1996, Law No. 679 of 2001, and Law No. 1336 of 2009). The admissibility of digital evidence as probative material within judicial investigation procedures is expressly recognized by Law No. 527 of 1999 – Law on E-Commerce, Digital Signature. Other procedural cybercrime provisions are contemplated in the General Procedure Code (Law No. 1564 of 2012), the Penal Procedure Code (Law No. 904 of 2004), Law No. 270 of 1996, and several resolutions of the Prosecutor's Office, which address relevant topics such as chain of custody procedures. Though Colombia joined the Budapest Convention,<sup>358</sup> it was with reservations concerning the application of Article 20 (collection of real-time transit data) and Article 21 (interception of content data) due to domestic regulations on personal data and protection of the right to privacy.<sup>359</sup>

**In 2010, the National Police established a specialized cybercrime unit, the Police Cybernetic Center, under the Directorate of Criminal Investigation and Interpol, with robust forensic investigation capabilities and cutting-edge facilities (known as C4).**<sup>360</sup> The Police Cybernetic Center has a portal called the *Virtual Immediate Attention Center* to interact with citizens on cybercrime activities and other cyber incidents in the country. Cybercrime victims can report incidents—24/7 and free of charge—to law enforcement authorities and also receive guidance on what type of legal actions the victims can take. CAI Virtual has multiple reporting channels available to the general public, including an email

address and an online platform called *Adenunciar* and also via popular social network outlets, such as Twitter, Facebook, and Instagram.<sup>361</sup> Within the CAI Virtual portal, citizens can find information about cybercrime activities, best practices for preventing them (e.g., guidelines, flyers, videos), and applications for safe internet browsing.<sup>362</sup>

**At the height of the COVID-19 pandemic, the Colombian authorities recorded a 45 percent increase in reported cybercrime cases.** In 2019, the general public reported 30,410 cybercrimes to the National Police, while in 2021, 48,000 cases were reported, many of which have been prosecuted and had sentences imposed. As a result of the social distancing restrictions and the increase in cybercrime cases, the National Police have been promoting the application *Adenunciar* for victims to report traditional and cybercrime offenses—currently 62 percent of crimes can be reported virtually.

**The investigation and prosecution of cybercrime cases in the country is the responsibility of the Office of the Attorney General (*Fiscalía General de la República*), which is not immune to the near universal challenge of a deficit of qualified staff (mostly lawyers specializing in cybercrime and digital evidence) as well as of financial and technical resources.** For the investigation of cybercrime cases, this office can rely on the Criminal Investigation Directorate of the National Police<sup>363</sup> and the Judiciary Police under the Technical Agency for Criminal and Judiciary Investigations (CTI). Following the implementation of Law No. 2197, a specialized unit in cybercrime was created within the Attorney General's Office in 2022 that brought together 137 staff, including administrative staff, prosecutors, and investigators.<sup>364</sup> It is planned that this specialized unit will reach an operative level by the second half of 2022, though at the time of this writing, the unit was still recruiting trained staff and procuring equipment. Given the sharp increase in the number of cybercrime activities and victim complaints, it is likely that the existing staff may be insufficient to handle all investigations and prosecutions.

**The Attorney General's Office regularly trains its staff on cybercrime and digital evidence matters in the academic and training center (*Escuela de Estudios e Investigaciones Criminalísticas y Ciencias Forenses*).** Each annual one-week training session involves 50–100 public servants and covers basic knowledge of cybercrime and digital evidence. However, the training offered needs to be strengthened to keep up with the required specialization level. Expanded training and capacity-building opportunities for staff from other domestic law enforcement organizations (e.g., National

Police) or international partners (e.g., Council of Europe, as part of the GLACY+Project) would be a valuable addition to the annual training program.

**The judiciary system is responsible for adjudicating cybercrime cases.** However, judges and magistrates need formal and systemic training at the specialization level to deepen their understanding of cybercrime offenses and digital evidence collection and of handling work according to domestic cybercrime legislation and internationally recognized standards and best practices. There is no specialized cybercrime unit within the judiciary system. Even though there is a training center (*Escuela Judicial*) within the judiciary and cybercrime training is delivered occasionally,<sup>365</sup> most judges and magistrates still have limited knowledge of cybercrime and digital evidence matters.

### Cybersecurity awareness raising and skills development

**CONPES 3995-2020 establishes the strengthening of cybersecurity education as a national priority and defines activities to enhance this education as well as digital culture capacities in the public and private sectors.** The 2022 Cybersecurity Skills Gap Global Research Report published by Fortinet reveals five key findings: (i) cybersecurity affects every organization, (ii) recruitment and retention of talent is a problem, (iii) organizations are looking for individuals with certified skills, (iv) organizations are looking for more diversity, and (v) raising cybersecurity awareness remains a key challenge.<sup>366</sup> CONPES 3995 establishes a coordinated strategy for capacity building in digital security that unifies initiatives to raise awareness and develop skills among Colombian citizens with the goal of mitigating duplication of isolated efforts and strengthening the digital security capabilities of citizens. Although multiple ongoing awareness-raising campaigns are organized by the Colombian government, the private sector, and civil society, they are not conducted or deployed in a coordinated manner. Despite this, the impact of the awareness-raising programs and campaigns seems to be high.

**Although the curricula of primary and secondary schools usually cover some basic training in informatics, it does not yet include cybersecurity-related courses.** CONPES 3995 contemplates the design and implementation of a strategy to promote the development of cybersecurity capabilities and digital trust in the different levels of formal education. However, implementing this will require planning and resources. Authorities have

identified this issue in the past and carried out various activities to promote and enhance the cyberculture of primary and secondary students, in some cases with the support of the private sector and civil society organizations. For instance, in 2004, MEN launched a program called Colombia Aprende ([colombiaaprende.edu.co](http://colombiaaprende.edu.co)) that offers interactive and well-structured courses and material addressing relevant topics, such as safe internet browsing and other cybersecurity-related concerns. Within this virtual campus, there is also a program targeting teachers, tutors, and directors of schools to enable them to better support the students' learning process. In 2021, MEN, in partnership with CISCO, started offering three courses—in its first phase—targeting primary and secondary students, teachers, and parents. These courses, which are available in the Colombia Aprende portal, address the following basic topics: introduction to cybersecurity, cybersecurity essentials, and security in the cloud.<sup>367</sup>

**The Colombian Chamber of Informatics and Telecommunications (CCIT) revealed that the demand for cybersecurity services increased on average by 40 percent in 2020 as more public and private sector organizations are allocating additional budget for cybersecurity activities to protect their ICT infrastructures from cyberattacks.** This growth also represents an increase in the demand for qualified security professionals and cybersecurity products and services, incentivizing the domestic marketplace.<sup>368</sup> The Colombian authorities consistently identify this high demand for qualified security professionals in the CONPES. Acting on this demand, SENA, in collaboration with the private sector, has reached two significant agreements to train students in cybersecurity. The first involves training for more than 23,000 students by 2024,<sup>369</sup> and the second, with the support of Los Andes University, for more than 68,000 students, of which at least 20,000 must be women.<sup>370</sup>

**CONPES 3995 notes that the academic offering of cybersecurity education at the tertiary level is still insufficient to supply the country's current demands.** Until 2020, MEN reported 41 academic programs in digital security, of which 36 were postgraduate degrees, including three master's and five undergraduate degree programs. CONPES 3995 also states that in Colombia, there is a very limited academic offering of cybersecurity-related content even in ICT education. For instance, in engineering degrees, such as informatics, systems, software development, telecommunications, and so on, there is only one cybersecurity or information security-related course within the entire academic program. As digitalization becomes more present in daily life, technology-based careers would greatly benefit from a robust offering of cybersecurity courses. ([Chapter 6](#)

discusses the role of the education system in the formation and upgrading of digital skills in Colombia, to include cybersecurity-related knowledge and competencies.)

**Research and development projects in cybersecurity are at an incipient stage.** Several universities are developing research projects addressing a number of relevant topics, such as the security of software, blockchain, and cryptography, as well as security in smart and sustainable cities and AI, among others. Various universities and other academic entities created the Colombian Cybersecurity Research Network Foundation (*Red Colombiana de Investigación en Ciberseguridad* [RedCIC]), a non-profit academic organization focused on cybersecurity research and development. There is a cadre of specialists in academic cybersecurity programs but not yet enough to meet the domestic demand. No national scholarship program focuses on cybersecurity careers, though MinTIC, in collaboration with international partners, has awarded scholarships to public servants in cybersecurity and cyber defense.

### Protección de infraestructuras críticas

**Between 2016 and 2017, Colombia officially identified the national strategic sectors and critical national cybernetic infrastructure (ICCN).** In 2016, the Joint Cyber Command (*Comando Conjunto Cibernético*), in collaboration with ColCERT, identified 13 national essential services<sup>371</sup> and also made an inventory of the ICCN in 2016 that was updated in 2017. In 2018, the Colombian government adopted a National Plan for the Protection and Defense of Critical Information Infrastructures (a classified document), after which each strategic sector was required to adopt a similar sectoral plan as well as plans for ICCN operators. Although some sectors and ICCN operators followed the national plan and

adopted sectoral and organizational plans, due to the lack of follow-up mechanisms there is no evidence to suggest that those were fully implemented or audited. CONPES 3995 and its Action Plan do not set out specific activities to monitor, protect, and regulate the ICCN.

**Under the new governance structure,<sup>372</sup> other instructions laid out tasks for overseeing the public ICCN assets and essential services, though it would appear that the current ICCN regime excludes private ICCN resources.** Decree No. 338 of 2022 clearly defines what critical cybernetic infrastructures and essential services are and establishes that MinTIC is responsible for taking stock of the public ICCN and essential services and updating that inventory every two years.<sup>373</sup> However, the decree does not include private sector ICCN assets and services in this national stock-taking. Given that many ICCN resources are operated by the private sector, it is important that those are integrated under the new ICCN regime.

**Decree No. 338 of 2022 establishes certain obligations for the identified ICCN operators and essential service providers, such as adopting plans related to digital security, network protection, critical cybernetic infrastructures, essential services, and information systems in cyberspace.** Moreover, ICCN operators and essential service providers must regularly conduct security digital risk assessments and adopt the necessary policies, procedures, and technological, administrative, and human resources to manage the risks adequately. Decree No. 338 also defines the parameters and procedures that MinTIC should follow while establishing the thresholds for significant damage to the ICCN. It is worth noting that though Decree No. 338 set out the foundation guidelines for MinTIC to develop a public sector ICCN and essential service protection framework, this work did not start from scratch. The Joint Cyber Command and ColCERT had already taken some actions in this area, as had many sectoral regulators by formulating mandatory cybersecurity requirements in their respective sectors ([Annex 8](#)).

**Table 7.2. Key Trust Environment Challenges and Opportunities**

| Strengths   | Areas for Improvement  |
|---|--|
| <ul style="list-style-type: none"> <li>» Decade-long national cybersecurity policy making and implementation experience</li> <li>» Leading agency (MinTIC) with a clear mandate and strong motivation</li> <li>» Recently adopted new national cybersecurity governance structure with clarified mandates</li> <li>» Well-structured cybersecurity policies and action plans in place</li> <li>» Comprehensive cybersecurity, cybercrime, and data protection legal and regulatory frameworks in place, though could be further refined</li> <li>» New digital ID system being implemented</li> </ul>   | <ul style="list-style-type: none"> <li>» National-level incident response capacity is stretched while CoCERT is being re-established within MinTIC.</li> <li>» There is inadequate cybercrime investigation, prosecution, and judiciary capacity; more resources and capacity-building opportunities are required.</li> <li>» There is a deficit of cybersecurity professionals and academics to satisfy national demand in the public and private sectors.</li> <li>» Public support to MSMEs to enhance their cybersecurity capacities is limited.</li> <li>» Capacity to oversee adherence to data protection measures within public sector institutions is insufficient.</li> </ul>  |
| Opportunities   | Threats  |
| <ul style="list-style-type: none"> <li>» Rapid digitalization of businesses and the public sector in Colombia is pushing up the demand for cybersecurity specialists, products, and services, enhancing the domestic cybersecurity marketplace.</li> <li>» International development partners (e.g., World Bank, OECD, Council of Europe, Organization of American States [OAS], among others) are interested and willing to support the strengthening of cybersecurity.</li> <li>» Successful implementation of a digital ID scheme can help strengthen the trust environment by mitigating payment fraud and identity duplication.</li> </ul> | <ul style="list-style-type: none"> <li>» Limited human capital in cybersecurity could delay development of the cybersecurity domain for years to come. Improving human capital will require consistent political will and significant resources from the government, academia, and industry.</li> <li>» The current framework for the protection of the ICCN does not take into consideration the significant share of essential services and infrastructure operated by private sector organizations.</li> <li>» Limited cybersecurity academic offerings mean that technology-based degree programs should integrate more cybersecurity courses into the curricula.</li> <li>» Local governments are not thoroughly integrated into national cybersecurity policies and plans, which constrains the country's ability to strengthen its cybersecurity resilience.</li> </ul> |

## 7.5. Recommendations and next steps

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This chapter identifies three main areas where considerable effort should be undertaken to improve Colombia's trust environment:

- » **Cybersecurity strategy and governance structure.** The formal establishment and allocation of sufficient resources to the recently adopted cybersecurity governance structure is instrumental to implementing the strategic objectives of CONPES 3995 and Decree No. 338 of 2022. Among those objectives is the establishment of the National Coordinator of Digital Security and the operation of ColCERT as the National CERT, but newly under the administration of MinTIC. The latter assumes more leadership functions and responsibilities delegated by Decree No. 338, among them, the identification and inventory of critical cybernetic infrastructures and essential services within the public sector.
- » **Legal and regulatory framework.** The current comprehensive cybersecurity and data protection framework has room to be refined to integrate internationally recognized best practices, such as the right to data portability, the reporting of data breaches to the data subjects, and expanded legal jurisdiction for processing personal data. Moving forward, Colombia's data protection framework should go farther in addressing the challenges brought forth by emerging technologies. The protection of critical infrastructure could be strengthened by including the sizable critical infrastructure assets and essential services operated by the private sector under the ICCN regime. At the same time, the incident response framework could be improved by mandating the reporting

of cyber incidents to the competent authorities (e.g., ColCERT, Gov CSIRT?).

- » **Capacity building and skills and knowledge development.** There needs to be a consistent national effort to strategically build human capital in cybersecurity by, for instance, offering academic careers in cybersecurity, including cybersecurity courses in primary and secondary education, and strengthening the cybersecurity or information security courses in the technology-based degree programs. There is a similar need to create better training opportunities—at the specialization level—for officials from law enforcement agencies, the Prosecutor's Office, and the judiciary in the field of cybercrime and digital evidence. It is also vital that the competent authorities work closely with domestic chambers of commerce and other partners from the private sector, academia, and industry to coordinate in organizing regular awareness-raising activities for the private sector, including MSMEs, and society-wide.

**The primary stakeholders of the entire digital ecosystem, mainly Colombia's citizens, stand to benefit from implementing reforms and policies and making investments to strengthen these three key areas.** By creating a more trustworthy digital environment, Colombia will enhance its level of cyber resilience and become a more attractive destination for both national and foreign private investment in the technology industry from financial sources that care about doing business in a country where there is highly qualified human capital and a high level of commitment to promoting reliable digital security. [Table 7.3](#) offers recommendations along the priorities identified above.



**Table 7.3. Trust Environment: Policy Recommendations (1 of 4)**

| Reform Area                                     | Recommendation   | Responsible Entity                                    | Timing      | Legal Change Required?        |
|---|--|---|-------------|-------------------------------|
| Cybersecurity strategy and governance structure | <p><b>Efficiently implement CONPES 3995 and its action plans,</b> including regular monitoring, reporting, and evaluations based on collected metrics during the implementation stage, in order to enhance key stakeholder performance, avoid duplication of effort, and maximize resources.</p>   | MinTIC  | Short term  | No                            |
|   | <p><b>Ensure that CoICERT is re-established to manage the national-level incident response management cycle.</b> Due to recent administrative changes, CoICERT is in need of robust human, technical, and financial resources to meet its mandate. <b>PRIORITY.</b></p>  | MinTIC  | Short term  | No                            |
|   | <p><b>Ensure that the new cybersecurity governance structure becomes operational and functions in an inclusive and coordinated manner.</b> Establishing various identified layers of the governance structure is vital to adequately implementing cybersecurity strategies and policies. <b>PRIORITY.</b></p>  | MinTIC  | Short term  | No                            |
|   | <p><b>Integrate municipalities into cybersecurity strategies and policies to enhance national cybersecurity capacities.</b> Municipalities are not part of the current national cybersecurity effort. Integrating subnational institutions into this effort will enable it to be more inclusive and bring it closer to the people.</p>   | MinTIC and the Colombian Federation of Municipalities | Medium term | No                            |
| Legal and regulatory framework                  | <p><b>Refine the data protection framework.</b> Areas to strengthen are the right to data portability, the reporting of data breaches to the data subjects, and expanded legal jurisdiction for processing personal data, as well as mandatory appointment of a Data Protection Officer within the public and private sectors, among others. Consider enhancing oversight and enforcement of the data protection measures within the public sector. <b>PRIORITY.</b></p> | MinTIC and SIC  | Medium term | Yes<br>Statutory Law No. 1581 |

**Table 7.3. Trust Environment: Policy Recommendations (2 of 4)**

| Reform Area   | Recommendation   | Responsible Entity                                 | Timing     | Legal Change Required?        |
|---|--|--|------------|-------------------------------|
|   | <b>Regularly review and update the substantive and procedural cybercrime framework</b> to ensure that it is harmonized with internationally recognized standards and best practices.   | MinTIC, Ministry of Justice                        | Mid term   | Yes                           |
|   | <b>Include private ICCN assets and essential services under the ICCN regime</b> to ensure that national critical infrastructure and services are protected fully (not just those of the public sector). <b>PRIORITY.</b>   | MinTIC, CoLCERT, sectoral regulators               | Short term | Yes<br>Decree No. 338 of 2022 |
|   | <b>Establish a mandatory incident response and information-sharing framework</b> to strengthen collaboration among stakeholders and strengthen incident response effectiveness.  | MinTIC, CoLCERT, sectoral regulators               | Short term | Yes                           |
| <b>Capacity building and skills and knowledge development</b> | <b>Establish a nationally coordinated cybersecurity awareness-raising effort</b> , with support from the private sector and civil society organizations, covering a wide range of issues and demographics, including vulnerable groups, such as the elderly, children, and female heads of households, as well as MSMEs, among others. | MinTIC, CoLCERT, Chambers of Commerce and industry | Short term | No                            |
|   | <b>Ensure that the competent authorities, with support from the private sector and academia, provide technical assistance and resources to enhance the cybersecurity posture of the private sector, including MSMEs. PRIORITY.</b>   | MinTIC, CoLCERT, Chambers of Commerce and industry | Short term | No                            |
|   | <b>Establish a skills and knowledge development program for public servants.</b> It is recommended that systematic capacity-building activities be carried out, followed by skills tests, to strengthen cybersecurity capabilities in  | MinTIC, MHCP, CoLCERT                              | Short term | No                            |

**Table 7.3. Trust Environment: Policy Recommendations (3 of 4)**

| Reform Area | Recommendation   | Responsible Entity   | Timing     | Legal Change Required? |
|-------------|--|--|------------|------------------------|
|             | the public sector and thus mitigate the negative impact of cyberattacks.   |  |            |                        |
|             | <p><b>Build the knowledge and capabilities of CoICERT staff.</b> Since CoICERT recently started a new management period, it is highly important that its staff are regularly trained to meet the challenges related to the incident response management cycle. It is also highly recommended that an internal training policy be defined that has sufficient resources and cooperative training arrangements with international partners (ITU, World Bank, OAS, FIRST,<sup>374</sup> Cyber4Dev, etc.).</p>   | MinTIC and CoICERT, Ministry of Foreign Affairs  | Short term | No                     |
|             | <p><b>Enhance the knowledge and capabilities of officials and professionals within law enforcement, prosecutor's offices, and the judiciary.</b> Due to increasing cybercrime activities in the country, the competent authorities should consider joining efforts to provide sufficient resources for systematic training at the specialization level. As a starting point, it is vital to assess existing capabilities to ascertain subsequent capacity-building actions. <b>PRIORITY.</b></p>   | MinTIC, Ministry of Justice, Law Enforcement, Prosecutor's Office, and judicial branches | Short term | No                     |
|             | <p><b>Enhance the cybersecurity education offering at the tertiary level and create more affordable cybersecurity professional training opportunities.</b> Competent authorities should consider reviewing and expanding the academic offerings related to cybersecurity in the different degree plans and integrate more cybersecurity-related courses into the technology-based degree curricula. Also, consider creating more affordable professional training opportunities and industry certifications and developing a robust cadre of cybersecurity professionals and academics. It is recommended that a working group be established (composed of government, industry, and academia) to identify current national priorities and needs in the education field.</p> | MinTIC, MEN, SENA  | Mid term   | No                     |

**Table 7.3. Trust Environment: Policy Recommendations (4 of 4)**

| Reform Area | Recommendation  | Responsible Entity | Timing | Legal Change Required? |
|-------------|---|--------------------|--------|------------------------|
|             | Expediting the integration of cybersecurity-related courses into primary and secondary school curricula is also essential to improve the skills and knowledge of future generations. <b>PRIORITY.</b> |                    |        |                        |

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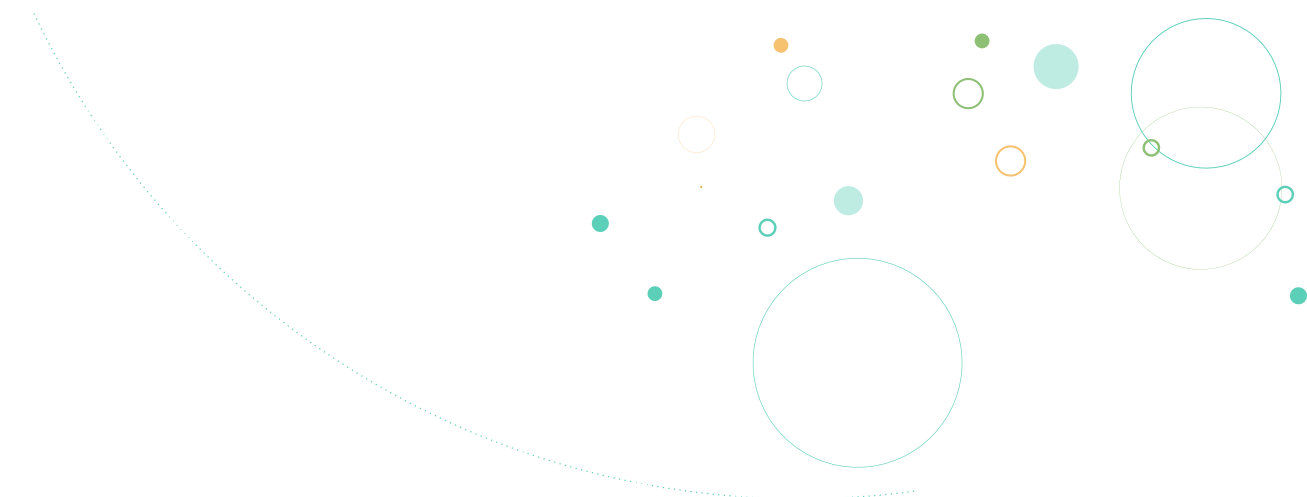


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# ANNEXES

## Annex 1. Digital Technologies to Help Colombia Address its Persistent Development Challenges. A Theory of Change



Source: Prepared by the authors, based on priorities identified in the World Bank (2022).

## Annex 2. Status of *Ex Ante* Regulation in the Colombian Telecommunications Markets

In the context of a series of reform initiatives, Presidential Decree 2870 of 2007 required that the regulatory agency (CRT/CRC) undertake a relevant market analysis process to designate any dominant operators and to impose the obligation of a wholesale reference interconnection or access offer on any designated dominant operators.<sup>375</sup>

By means of Resolution 2058 of 2009, the CRT identified 16 relevant markets, 10 retail and six wholesale.<sup>376</sup> Based on adoption of the European Union's "three criteria test," it designated six markets that warranted *ex ante* regulation. Both the former and latter lists were revised and expanded, most recently in Resolution 5108 of 2017, to include two additional markets that called for *ex ante* regulation, for a total of eight.<sup>377</sup>

By Resolution 5110 of 2017, the CRC initiated a proceeding to determine whether Claro is dominant in any of these eight markets, and if so, whether to impose any of the proposed *ex ante* regulatory measures.<sup>378</sup> This proceeding was concluded nearly four years later via Resolution 6146 of 2021 that designated Claro as dominant in one of the markets warranting *ex ante* regulation, "mobile services."<sup>379</sup> However, the CRC decided not to impose any of the specific *ex ante* measures it had originally proposed in Resolution 5110 or any others, instead committing to undertake further study of the "mobile services" market within two years (January 2023).

In parallel, the CRC has also analyzed fixed relevant markets but determined that there is a one-way substitution from mobile to fixed markets, based on which it did not designate any significant market player (SMP)/ dominant operator in any fixed relevant market.<sup>380</sup> Correspondingly, it did not impose any specific *ex ante* regulatory measures on fixed segment operators, including any of the wholesale access *ex ante* obligations that are common in most OECD countries.<sup>381</sup>

## Annex 3. The Impact of Non-Pharmaceutical Interventions during the COVID-19 Pandemic and the Role of Digital Infrastructure in Colombia

Non-pharmaceutical interventions (NPIs) put in place in Colombia during the COVID-19 pandemic forced many economic, educational, and social activities to move online and thus encouraged the use of virtual platforms for education and teleworking. The quality of digital infrastructure influences the ability, together with other factors, to carry out activities remotely and thus adherence to NPIs. A recent study by the World Bank investigates the link between these factors by analyzing several large-scale datasets, such as Movement Range Maps (mobility) and Relative Wealth Index (income), from Meta's Data for Good program and Ookla's geo-localized speed tests (internet speed).

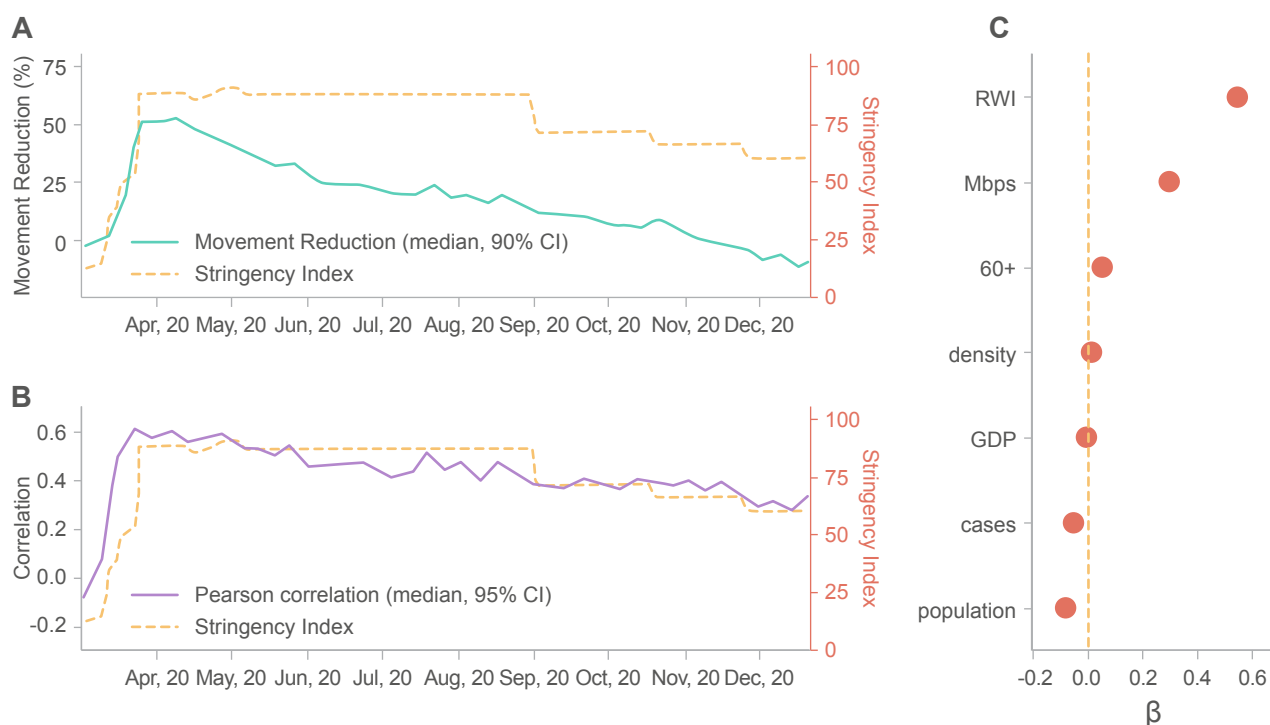
In Colombia in March 2020, mobility dropped sharply, reaching a median reduction of 53 percent [37 percent, 68 percent] in early April (see [Figure A](#)). Afterward, the trend was inverted and approached the pre-pandemic baseline by late 2020. However, the reduction was not homogeneous across regions, as mobility declined more in municipalities with more reliable digital infrastructure. Indeed, [Figure B](#) shows a significant correlation between the decrease in movement following NPIs and internet speed in different municipalities. [Figure B](#) also shows the Stringency Index, a measure of the strictness of policies implemented to curb COVID-19. Interestingly, the correlation between mobility reduction and digital infrastructure quality is stronger when stricter countermeasures to fight COVID-19 are in place. Adherence to NPIs and digital infrastructure quality is known to correlate with wealth. Hence, the analysis focused also on its partial correlation using the Relative Wealth Index as a control. The partial correlation computed during the period of maximum movement reduction remains significant (Pearson partial  $\rho=0.32$ , 95 percent CI [0.23, 0.42]).

The study also assessed to what extent municipalities reduced mobility according to a set of features, including socioeconomic status (i.e., Relative Wealth Index, GDP per capita), fixed download speeds from Ookla, number of COVID-19 cases reported, and demographic indicators (population, density, and fraction of the population aged 60+). To further investigate the link between response to NPIs and its drivers, Figure C reports the importance of different regressors for the prediction of the independent variable (i.e., maximum mobility reduction). The average download speed of the municipality is the

second most important regressor, as higher download speed is associated with higher mobility reduction.

To conclude, the study found evidence that access to a better digital infrastructure was linked to higher adherence to NPIs in Colombia during the first COVID-19 wave. Additionally, these effects remained visible after controlling for other socioeconomic factors. The findings suggest that better connectivity can mitigate vulnerability in the face of health shocks.

**Figures A, B, and C. Digital Infrastructure and Response to NPIs in Colombia**



Source: Gozzi, Comini, and Perra (2022).

Notes: A) Percentage reduction of movement in Colombia throughout 2020 from Meta Movement Range Maps (median and 90 percent confidence intervals computed on movement changes in different municipalities). The orange dashed line is the Stringency Index capturing the strictness of policies put in place to control COVID-19. B) Correlation between percentage movement reduction following NPIs and Ookla fixed download speed in different municipalities across 2020. C) Distribution of standardized regression coefficients (median and 95 percent confidence intervals) with maximum mobility reduction as an independent variable.

**Annex 4. Top 30 Active Investors in Colombia  
(by volume of deal)**

| <b>Top 30 Active Investors<br/>(by volume of deal)</b> | <b>HQ Country<br/>of the Top Investor</b> |
|--|---|
| Darby Overseas Investments                             | USA                                       |
| Ecopetrol  | Colombia                                  |
| I Squared Capital                                      | USA                                       |
| Petrominerales   | Colombia                                  |
| Protección Pensiones                                   | Colombia                                  |
| Andreessen Horowitz                                    | USA                                       |
| BoomStartup  | USA                                       |
| Burch Creative Capital                                 | USA                                       |
| CSC UpShot Ventures                                    | USA                                       |
| Delivery Hero  | Germany                                   |
| DST Global   | Hong Kong                                 |
| Erik Torenberg   | USA                                       |
| FJ Labs  | USA                                       |
| Floodgate Fund   | USA                                       |
| Foundation Capital                                     | USA                                       |
| FundersClub  | USA                                       |
| Grupo Bolivar  | Colombia                                  |
| Innogest Capital                                       | Italy                                     |
| Investo  | Mexico                                    |
| INVX   | Colombia                                  |
| Monashees  | Brazil                                    |
| Palm Drive Capital                                     | USA                                       |
| Plug and Play Tech Center                              | USA                                       |
| Redpoint eventures                                     | USA                                       |
| Sequoia Capital  | USA                                       |
| SoftBank Group   | Japan                                     |
| SoftBank Investment Advisers                           | Japan                                     |
| Soma Capital   | USA                                       |
| ONEVC  | USA                                       |
| Omega Venture Partners                                 | USA                                       |

Source: Authors' elaboration with data from Pitchbook and CB Insights.



**Annex 5. Government Policies Related to the Development of Digital Skills in Colombia 2018–21**

The description of each of these policies purposely focuses on those aspects relevant to the development of digital skills, though these are not the only topics addressed by the policy documents.

| Year      | Legal or Policy Document   | Description  |
|-----------|--|--|
| 2018      | Decree 1008 Online Government Strategy   | Provides a unified vision of digital transformation for the country based on innovation, competitiveness, and security of information.   |
| 2018      | CONPES 3920 Big Data   | Focuses on identifying human capital gaps related to competencies for data analysis and developing actions to bridge those gaps, including by incorporating the prescribed actions into the design and development of the National Qualifications Framework for said competencies.   |
| 2018-2022 | NDP Pact for Equity, Pact for Colombia   | Sets two avenues for the digital transformation of Colombia: (1) massification of broadband internet and the digital inclusion of all Colombians and (2) implementation of advanced technologies, such as blockchain, the Internet of Things, and artificial intelligence, among others. It also establishes a goal to provide 500,000 trainings that contribute to the development of digital skills.   |
| 2018-2022 | ICT Plan 2018–2022 The Digital Future for All  | Focuses on bridging the digital gap and preparing Colombians for the Fourth Industrial Revolution. This will be achieved through four axes: ICT environment for digital development; digital social inclusion; citizens and households empowered by the digital environment; and digital and sectoral transformation.  |
| 2019      | CONPES 3975 Digital Transformation and Artificial Intelligence   | Focuses on the digital transformation of Colombia to take advantage of the opportunities and challenges presented by the Fourth Industrial Revolution: reducing the barriers that prevent the use and adoption of digital technologies, both in the business sphere and by state entities; creating the enabling conditions for digital, private, and public innovation; and strengthening the skills of human capital.                                  |
| 2020      | CONPES 3988 Technologies for Learning  | Promotes innovation in educational practices based on digital technologies by increasing access to digital technologies for the creation of innovative learning spaces; improving internet connectivity within official educational institutions; promoting the appropriation of digital technologies in the educational community; and strengthening the monitoring and evaluation of the use, access, and impact of digital technologies in education. |
| 2021      | CONPES 4001 Declaration of Strategic Importance of the National Project for Universal Access to ICTs in Rural and Remote Areas | Proposes a strategy to provide internet access to rural areas in 32 departments of the country for eight years, the installation of high-quality internet access at rural educational sites, and the optimization of public investment to promote universal access in rural areas.   |

## Annex 6. Government Programs and Strategies Related to the Development of Digital Skills in Colombia 2018–22

| Program  | Focus Area   | Offering   | Institution   | Beneficiaries  |
|--|--|--|---|--|
| <b>Teacher at Home</b> <sup>382</sup><br>( <i>Profe en tu Casa</i> )                 | Basic competencies and citizenship                       | 200 episodes available online and via RTVCPlay focused on basic competencies and citizenship   | MEN   | NA   |
| <b>STEM Route</b> <sup>383</sup><br>( <i>Ruta STEM</i> )                             | Science, technology, engineering, and mathematics        | Teacher training in critical and computational thinking, problem solving through the use and appropriation of science and technology   | MEN-MinTIC  | 36,738 teachers  |
| <b>Programming for Girls and Boys</b><br>( <i>Programación para Niños y Niñas</i> )  | Science, technology, engineering, and mathematics        | Computational thinking   | MEN, in alliance with the British Council           | 20,129 teachers and 516,892 students                         |
| <b>TutoTIC</b> <sup>384</sup>  | Ciencia, tecnología, ingeniería y matemáticas            | Clase magistral y tutoría en línea   | MEN   | 59,967 alumnos   |
| <b>TutoTIC</b> <sup>385</sup>  | Science, mathematics, reading comprehension, and English | Additional training in leadership, teamwork, assertive communication, and English  | MinTIC, in alliance with IBM, Oracle, and Microsoft | 59,995 individuals, out of which 45,382 gained certification |
| <b>A Ticket for the Future</b> <sup>386</sup><br>( <i>Un Ticket para el Futuro</i> ) | ICT skills   | Scholarships and financial assistance to pay for (up to 90%) tuition fees for ICT-related international training   | MinTIC  | NA   |
| <b>Playing and Creating</b><br>( <i>Jugando y Kreando</i> )                          | ICT skills   | Training in problem solving, innovation, and adaptation to change  | MinTIC  | 5,000 teachers and 153,879 students (1st and 2nd grade)      |
| <b>Arriving</b> <sup>387</sup><br>( <i>Llegamos con TIC</i> )                        | Digital skills   | Free online courses and content aimed at fostering digital skills, literacy, culture, and activism. Certificates are available upon completion of minimum requirements and can be obtained within a day. | MinTIC  | 450,887 certificates   |

| Program  | Focus Area  | Offering  | Institution                             | Beneficiaries  |
|--|---|---|---|--|
| <b>Chronicles with Gabo</b> <sup>388</sup><br><i>(Cronicando con Gabo)</i>                             | Digital journalism                                      | Training for parents, teachers, and students on digital narratives and online journalism, inspired by the stories and legacies of Gabriel García Marquez          | MinTIC, in alliance with Fundación Gabo | 5,730 individuals  |
| <b>1, 2, 3 X TIC (previously En Tic Confio+)</b> <sup>389</sup>  | Safety and security                                     | Training to utilize ICTs and safely address the risks associated with their use and the use of the internet   | MinTIC                                  | 4,464,526 individuals  |
| <b>STEAM Girls</b><br><i>(Chicas STEAM)</i>  | Science, technology, engineering, arts, and mathematics | Virtual training aimed at fostering the interest of young girls in STEAM curricula  | MinTIC                                  | 6,567 girls and young women  |
| <b>Be the 1 Challenge</b> <sup>390</sup>   | English language  | App created to assist 6th to 11th graders in learning English   | MEN                                     | 282,000 students   |
| <b>Strengthening Territories</b>   | Educational innovation                                  | Technical assistance to the 96 certified Departments of Education to create educational innovation plans  | MEN, in alliance with EAFIT University  | 96 Departments of Education  |
| <b>Co-Lab (Laboratories for Educational Innovation and Digital Transformation in Higher Education)</b> | Educational innovation and digital transformation       | Generate enabling conditions in the context of the 4th Industrial Revolution to create future perspectives for education through research and project development | MEN, in alliance with EAFIT University  | 126 higher education institutions and 20,000 higher education teachers |

## Annex 7. Main Laws and Regulations Governing the Data Protection Framework in Colombia

In addition to the two primary statutory Laws No. 1266 of 2008 and No. 1581 of 2012, the Colombian legal system covers the following data protection provisions:

- » The Constitution of the Republic of Colombia (1991), in article 15, safeguards the right to privacy (*derecho a la intimidad personal*) and demands data collection, processing, and transfer to respect the liberties and other guarantees enshrined in the Constitution.<sup>391</sup> Furthermore, article 20 of the Constitution recognizes the right to data rectification as a fundamental right.<sup>392</sup>
- » Law No. 527 of 1999 regulates data messages, electronic commerce, and digital signature.
- » Law No. 1273 of 2009 establishes unlawful and unauthorized personal data processing as a crime and incorporates it into the Criminal Code (article 269F).
- » Law No. 1480 of 2011 regulates consumer data rights in traditional and electronic transactions.<sup>393</sup>
- » Law No. 2015 of 2020 regulates interoperable electronic medical records.
- » Law No. 1712 of 2014, the Law on Transparency and the Right of Access to National Public Information.
- » Decree No. 1727 of 2009 determines how operators of data banks with financial, credit, and commercial information and data from third countries must present the information on the data subjects.
- » Decree No. 2952 of 2010 partially regulates Law No. 1266 of 2008.
- » Decree No. 1377 of 2013 partially regulates Law No. 1581 of 2012, including the appointment of either a specific person or a designated group within the company to be in charge of data processing matters, accountability, specific requirements for processing personal data from minors (individuals under 18 years old), and the obligation to develop privacy policies and the minimum requirements involved.
- » Decree No. 886 of 2014 partially regulates Law No. 1581 of 2012, particularly the obligation that data controllers have to register in the National Database Registry the specific information in their databases that contains personal data and whose processing is subject to Colombian legislation.

- » Decree No. 1074 of 2015 partially regulates Law No. 1581 of 2012.
- » Decree No. 90 of 2018 establishes the criteria for the mandatory registry of databases on the National Database Registry.
- » Circular Unica of the SIC contains all the general administrative decisions issued by the SIC's data protection delegation office. Those decisions that are not included in the Circular Unica are understood to have been repealed.
- » External Circular No. 002 of 2015 requires, among other responsibilities, that all entities that are incorporated in Colombia and registered with the local Chamber of Commerce acting as data controllers must record certain aspects of how they process personal data in each of the databases they control in the National Database Registry managed by the SIC. Circular No. 002 lists all the countries that, according to the SIC, meet the standards guaranteeing an adequate level of personal data protection.<sup>394</sup>
- » External Circular No. 005 of 2017.
- » External Circular No. 007 of 2018.
- » External Circular No. 004 of 2019 regulates data processing in interoperable information systems.
- » External Circular No. 002 of 2020 regulates the protection of "physical or electronic fingerprints" to collect biometric information (sensitive data) to prevent the spread of COVID-19 through indirect contact.
- » External Circular No. 001 of 2020 regulates the provision of information to the National Planning Department and other government entities that require such information to prevent, treat, or control the spread of COVID-19.

The following judicial cases are also significant to the data protection framework in Colombia:

- » From 1991 (the year of the adoption of the current Constitution) to 2012 (the year of the adoption of Statutory Law No. 1581) the legal basis for personal data protection in Colombia was extensively developed through constitutional rulings due to the lack of a general regulation on the issue.
- » A Constitutional Court ruling (C-748/2011) states that the *right to be forgotten* is part of the rights related to habeas data; therefore, the *right to be forgotten* is jurisprudential.

## Annex 8. Major Sectoral Cybersecurity Measures

**In the electricity sector**, the National Council of Operations (*Consejo Nacional de Operaciones* [CNO]), a private body established by Law No. 143 of 1994, created a supervision and cybersecurity committee that has developed several cybersecurity guidelines (Resolutions 701, 788, 1004, 1043, 1241, 1347) for electricity sector operators (National Interconnected System [*Sistema Interconectado Nacional* [SIN]) addressing the identification of critical assets, continuity and recovery plans, and incident response plans, among other cybersecurity requirements. Also, the Energy and Gas Regulator (GREG) adopted the Integral Digital Security Strategy for the Electric Sector (Document No. 65 of 2019).

The CNO also developed certain mandatory cybersecurity guidelines and standards based on the Critical Infrastructure Protection (CIP) standards of the North American Electric Reliability Corporation (NERC) used in the United States and Canada and NIST 800-53, ISO 27.001, and COBIT 5. The CNO organizes trainings and awareness-raising activities. There are sectoral CSIRTs and SOCs, both managed by XM, the operator of the Colombian electric system. There is also an information-sharing mechanism called Col-ISAC to exchange information on cyber threats, risks, and vulnerabilities.

**In the financial sector**, the Financial Superintendency (SFC) is rigorous in supervising the deployment of emerging technologies, including how operational risks are contained and managed, which incorporates cybersecurity risks. In 2018, the SFC issued Circular Externa 007, which outlined the minimum requirements for managing cybersecurity risks, including the establishment of security controls, incident reporting obligations,

disclosure of the security measures adopted to contain cyber incidents, and the need to establish or outsource SOC services and adopt a business continuity plan, among others. Also in 2018, the SFC adopted Circular Externa No. 008, which established the security standards for e-payment platforms to protect consumer information. In 2019, the SFC adopted Circular Externa No. 005 concerning security in the use of cloud computing. In 2020, the SFC adopted Circular Externa No. 033, which defined, among other items, the adoption of the Traffic Light Protocol for information sharing, the format of the metrics report for information security, and the taxonomy of cyber incidents.

There is a membership-based CSIRT managed by Asobancaria. CSIRT Financiero is the focal point for information sharing and fosters collaboration and information-sharing practices among the different members of the community.

**In the telecommunications sector**, the Communications Regulatory Commission (CRC) recognizes the importance of integrating cybersecurity measures into the regulatory framework to ensure the quality and uninterrupted delivery of communications services in Colombia. Although not as rigorous as the SFC, the CRC has adopted Resolution No. 5050 of 2016 (modified by Resolution No. 5569 of 2018) concerning the security of the network.

There is a sectoral CSIRT (CSIRT-CCIT) that was established in 2009 by the Colombian Chamber of Informatics and Telecommunications (CCIT). CSIRT-CCIT has been a member of FIRST since 2013. Its constituents are the companies in the ICT sectors. CSIRT-CCIT manages the Colombian Internet Exchange Point (NAP Colombia2).



1. See Fan and Ouppara (2022).
2. Adapted from Santander (2022).
3. WEF and Deloitte (2022).
4. Knickrehm *et al.* (2016).
5. See World Bank (2016).
6. Based on data from Pitchbook and CB Insights.
7. Based on UN (2022a).
8. DANE (2022b).
9. World Bank (2020).
10. This is a conservative estimate with data from a new World Bank global digital business database that leverages data from two providers: Pitchbook and CB Insights.
11. The term “digital business” as used in this report refers to digital solution providers that develop and manufacture digital technology products or provide services enabled through digital means. The term “digitally intensive businesses” refers to both digital businesses and other companies that leverage digital technologies to provide (non-digital) goods and services. [Chapter 5](#) discusses the degree of digital intensiveness of industries based on the classification by Calvino *et al.* (2018).
12. Based on data from Sava (2021) and the Colombian Chamber of E-Commerce.
13. Based on data from the 2020 EDIT for digitally intensive manufacturing and service firms.
14. Based on data from Manpower Group (2023).
15. Alianza TIC (2020).
16. See Fan and Ouppara (2022).
17. See, for instance, OECD, “Digitalisation and Productivity: A Story of Complementarities,” OECD Economic Outlook 2019, no. 1 (2019): 55–83.
18. Knickrehm *et al.* (2016).
19. Adapted from Santander (2022).
20. WEF and Deloitte (2022).
21. See World Bank (2016, 50).
22. For instance, real-time data can help manufacturers forecast optimal stock levels, improve order management, and speed up inventory turnover. See Grainger (2020).
23. See World Bank (2016).
24. World Bank (2023b).
25. Based on World Bank (forthcoming, a), with data from Pitchbook and CB Insights.
26. UN (2022a).
27. DANE (2022b).
28. DANE (2021b).
29. UN (2022b).
30. World Bank (2022).
31. World Bank (2016).
32. World Bank (2022).
33. World Bank (2022).
34. IFC (unpublished).
35. See, for instance, Cusolito *et al.* (2020), y Brynjolfsson and Petropoulos (2021).
36. World Bank (2022).
37. Lloyd’s Register Foundation (2022).
38. George *et al.* (2022).
39. Pearce (2018).
40. According to the European Commission, some 9 million tons were generated in the European Union in 2005, which grew to more than 12 million tons by 2020.
41. ECLAC (2020) and Chui *et al.* (2018).
42. See World Bank (2022).
43. Decrees 704/18 and 1651/19 cemented MinTIC as the public entity in charge of coordinating and articulating the activities, functions, and policy instruments related to the digital economy.
44. OECD (2018b).
45. DNP (2022b).
46. CONPES (2019).
47. UN (2022b).
48. Between 2010 and 2022, Colombia lost 39 positions in the UN E-Government Index ranking. It is well positioned in terms of electronic interaction with the government (ranking 26 out of 63) but has lost three positions since 2017.
49. As reported by the Articulación para la Competitividad (ArCo) initiative.
50. This report uses “digital infrastructure” and “data infrastructure” as synonyms.
51. World Bank (2021).
52. Two submarine cables are currently under construction. See “Submarine Cable Map,” TeleGeography, <https://www.submarine-cablemap.com/>.
53. “Transmission network” refers to the physical length of fiber optic cable in a network irrespective of the number of optical fibers contained within the constituent cables of that network (see ITU 2020). Nodes are one of the ways of access to the main domestic internet network; hence, a low percentage of population living close to them highlights the need to strengthen the middle and last-mile infrastructure in the country.
54. The five LAC comparator countries are Argentina, Brazil, Chile, Mexico, and Peru.
55. Departments are first-tier administrative geographic areas. See “Internet Dedicado,” <https://colombiatic.mintic.gov.co/679/w3-propertyvalue-47271.html>.
56. GSMA (2021).
57. OpenCellID (2022).
58. GSMA (2021).
59. Centro Poblado, a concept created by the National Administrative Department of Statistics (Departamento Administrativo Nacional de Estadística [DANE]) for statistical purposes, defines a concentration of at least 20 adjoining, neighboring, or semi-detached dwellings located in the rural area of a municipality. These areas present urban characteristics, such as the delimitation of vehicular and pedestrian routes.
60. See <https://www.mintic.gov.co/portal/inicio/Sala-de-prensa/MinTIC-en-los-medios/145864:MinTIC-le-asigno-espectro-a-Claro-para-desarrollar-pruebas-5G-durante-seis-meses>
61. MinTIC (2022b).
62. The HHI is a measure of market concentration and is obtained by squaring the market share of each firm competing in the same relevant market and then summing the resulting numbers. A higher HHI indicates larger market concentration.
63. OECD (2018b).
64. OECD (2021a).
65. Pursuant to Law 142 of 1994, Colombia established a national system of designating all residences in the nation from stratum 1 (lowest socioeconomic level) to stratum 6 (highest). The designation was based on buildings, streets, and neighborhood characteristics but not on the income of the particular household at any particular time.
66. MinTIC (2019a).
67. García *et al.* (2019).
68. DANE (2022c).
69. World Bank (2023c).
70. A4A1 (2021).
71. The speed test provider recorded a total of 69.6 million tests: 65.8 million for fixed and 3.8 million for mobile. An analysis of Ookla’s SpeedTest data performed on fixed and mobile connections in Colombia between January 2019 and January 2021 was conducted for the purposes of this report.
72. Outliers in the data can be due to several factors, such as temporary network issues or tests performed by network operators.

73. Gozzi *et al.* (2022).
74. The ITU Regulatory Tracker Index assesses the following macro categories: (i) Regulatory Authority: detailed assessment of accountability, enforcement power, and autonomy in decision making of the separate regulator; (ii) Regulatory Mandate: assessment of regulatory bodies in different fields of digital infrastructure, that is, service quality monitoring, licensing, radio frequency allocation, etc.; (iii) Regulatory Regime: what regulation exists in major areas, such as the requirement for different types of licenses and mandated infrastructure sharing, as well as the adoption of a national plan that involves broadband; and (iv) Competition Framework: level of competition in the main market segments: international mobile telecommunications, fixed line services, and international gateways. Also, this last category includes an assessment of restrictions on foreign participation/ownership. See “ICT Regulatory Tracker,” <https://app.gen5.digital/tracker/metrics>.
75. Colombia’s disaggregated score in ITU’S 2020 ICT Regulatory Tracker is available at <https://app.gen5.digital/tracker/country-cards/Colombia>.
76. EC (2018).
77. Martínez *et al.* (2020).
78. Since 2010, MinTIC has encouraged the entry of MVNOs, which have now reached 7 percent of the market share (see TeleGeography, 2023b). In spite of this, however, markets continue to remain concentrated, partly because the MVNO policy is not mandatory, and hence most of the terms and conditions are left to commercial negotiations, rather than regulation. Indeed, most of the MVNOs have entered into agreements with the second and third largest MNOs, rather than with the largest. See “List of Mobile Network Operators of the Americas,” [https://en.wikipedia.org/wiki/List\\_of\\_mobile\\_network\\_operators\\_of\\_the\\_Americas](https://en.wikipedia.org/wiki/List_of_mobile_network_operators_of_the_Americas).
79. These could take the form of cost orientation, publication of reference offers, non-discrimination, mandatory access to infrastructure, economic replicability tests, and other measures.
80. Función Pública (1990).
81. Función Pública (1990).
82. Función Pública (2009).
83. Función Pública (2019b).
84. MinTIC (2019b).
85. Currency exchange as of April 26, 2022.
86. <https://www.sic.gov.co/>.
87. Relevant laws applying to the ANE are Law 1341/2009, Decree 4169/2011, Law 1753/2015, and Law 1978/2019.
88. García Zaballos *et al.* (2021).
89. MinTIC (2021b).
90. MinTIC (2020d).
91. MinTIC (2021a).
92. MinTIC (2021c).
93. The National Policy on Digital Transformation and Artificial Intelligence (Política Nacional para la Transformación Digital e Inteligencia Artificial) was set up by the National Council for Economic and Social Policy (Consejo Nacional de Política Económica y Social [CONPES]) through CONPES policy document No. 3975.
94. See CONPES (2019). CONPES-3975 seeks to boost the generation of social and economic value by leveraging digital government and developing an enabling environment. The policy outlines 13 action areas, and action 7 is focused on digitalizing government services and streamlining the delivery of digital public services in a single government portal.
95. MinTIC (2022c).
96. MinTIC (2022b).
97. The AND is tasked with the rollout of digital government services, as per Decree No. 620 issued in 2020. This Decree also provides an overarching framework for the use of digital ID authentication mechanisms and establishes a governance framework.
98. The GTMI seeks to capture the maturity of GovTech across countries based on a survey with 48 key indicators in four dimensions: core government systems, public service delivery, citizen engagement, and GovTech enablers. Countries in group A are those that have demonstrated advanced solutions and good practices in all four dimensions. For additional details on the GTMI, see World Bank, “GovTech: Putting People First,” <https://www.worldbank.org/en/programs/govtech/gtmi>.
99. Dener *et al.* (2021).
100. UN (2022a).
101. [https://www.mintic.gov.co/portal/715/articles-149186\\_recurso\\_1.pdf](https://www.mintic.gov.co/portal/715/articles-149186_recurso_1.pdf)
102. MinTIC (2020a).
103. RNEC (2022)
104. See [https://www.convergencialatina.com/Seccion-Analisis/33871-5-3-50-Unas\\_64\\_entidades\\_de\\_Colombia\\_y\\_comparten\\_informacion\\_sobre\\_XRoad](https://www.convergencialatina.com/Seccion-Analisis/33871-5-3-50-Unas_64_entidades_de_Colombia_y_comparten_informacion_sobre_XRoad)
105. This service allows the user to consult, among others: 1) social workers’ backgrounds, 2) driver’s license records, and 3) parafiscal contributions. Similarly, it allows the user to obtain certificates from the National Cadaster Registry and Professional Affiliation Registry, as well as payroll and pension retentions and employment verification certificates for public sector employees.
106. Función Pública (2019a).
107. Función Pública (2022b).
108. See <http://anticorrupcion.gov.co/Paginas/observatorio.aspx>.
109. See <https://colombiatic.mintic.gov.co/679/w3-propertyvalue-3667-5.html>
110. Decree No. 620 establishes guidelines for the use and operation of SDC and requires government institutions to set up electronic offices that allow persons to digitally complete procedures and access public services.
111. See <https://gobiernodigital.mintic.gov.co/portal/Iniciativas/Espacio-colaborativo-Data-Sandbox#!/terminosCondiciones>.
112. GPFI (2016).
113. For many, this might be their first formal account, and thus a connection to the formal financial sector.
114. IMF (2022b).
115. Función Pública (2014).
116. Función Pública (1998).
117. For instance, 76 percent of customers of savings and credit cooperatives live in urban areas. Limitations faced by cooperatives include: (i) the lack of economies of scale and limited integration into the country’s financial infrastructure; (ii) technological and operational constraints due to outdated software and the lack of digital transactional channels; and (iii) strong competition from banks and other market players that are more cost-efficient or can offer more competitive rates (often leveraging the discount facilities of FINAGRO, a second-tier development bank).
118. At the time of writing, there were five postal payment service providers operating in Colombia.
119. Finnovista *et al.* (2022).
120. Colombia’s fintech association (Colombia Fintech) has adopted a definition of a fintech firm as any undertaking that leverages technical developments to provide innovative financial services. Based on this definition, Colombia Fintech estimates that there are 299 fintech companies, the majority of which are registered at the Chamber of Commerce.
121. To enhance saving and credit cooperatives’ risk management and value proposition, the SES embarked on a project to implement risk-based supervision, which is yet to be completed. This project aims at strengthening the institution’s capacity to supervise and inspect savings and credit cooperatives, while also increasing its effectiveness—among other objectives.
122. Función Pública (1992).
123. Función Pública (2003).
124. Senado (2022). See art. 33 of Proyecto de Ley No. 337 of 2022 “Por la cual se dictan normas relacionadas con el acceso y financiamiento para la construcción de equidad, y se dictan otras disposiciones.”
125. The scope of payment services entailed in the draft bill is broad

and open, including the execution of funds transfers, acquiring of payment transactions, issuing of payment instruments, payment initiation services, clearing and settlement, and national and international remittance services, as well as any other services authorized by the regulator.

126. BDO and SFC (2021). Note that the large discrepancy (between demand-side and supply-side data) may be partly explained by the lack of awareness and infrequent use of accounts. When looking at active deposits in isolation, as of the fourth quarter of 2020, 68.4 percent of adults had an active deposit, hovering closer to Findex estimates of account ownership.
127. *Ibid.* Individuals may have more than one account.
128. Arango-Arango *et al.* (2021).
129. BR (2021). The year 2020 was an exception to the continuous growth in card transactions, with the number of transactions decreasing from 2019 because of the shock to economic activity created by the COVID-19 pandemic.
130. Arango-Arango *et al.* (2021).
131. Demirgüç-Kunt *et al.* (2022).
132. BDO and SFC (2021). It is worth noting that since 2019, the number of adults with a credit product no longer includes adults whose loans have been written off. This change in measurement may contribute to explaining the decline to some extent.
133. BDO and SFC (2021).
134. World Bank (2023a). Small firms are classified as those with five to 19 employees. The survey does not collect data that allow for comparison between countries regarding the levels of access to finance of micro enterprises (fewer than five employees).
135. Based on SME Finance Forum's MSME Finance Gap Database (updated October 2018). See <https://www.smefinanceforum.org/data-sites/msme-finance-gap>.
136. DANE (2022c).
137. BDO (2021).
138. Estrada and Hernández (2019).
139. Due to the absence of a univocal definition of microcredit as a basis for data collection and analysis, it is difficult to obtain an accurate picture of this market.
140. The CONPES was created by Law No. 19 of 1958. The CONPES is the highest national planning authority and acts as an advisory body to the government in all aspects related to the economic and social development of the country. The DNP performs the functions of executive secretariat of the CONPES and is the entity in charge of coordinating and presenting all the documents to be discussed in session.
141. Función Pública (2021).
142. BDO's objectives are: (i) promoting access to credit and other financial services by low-income households and MSMEs, and (ii) supporting the development and implementation of financial inclusion and education public policy, with a focus on the educational community and the general public. It is still unclear how the CIIEEF's mandate compares to the role of CONPES.
143. Through Decree No. 1692 of 2020.
144. See Decree No. 1692 of 2020, see art. 2.17.1.1.1 par. 20.
145. See art. 33 of Proyecto de Ley No. 337 of 2022.
146. Función Pública (2022a).
147. DNP (2022b)
148. Regulations that address the issue of financial inclusion and consumer protection include:
  - Laws 527 of 1999 E-Commerce Law
  - Law 1266 of 2008 Habeas financial data law and management of information in personal databases
  - Law 1328 of 2009 Financial Consumer Protection Law
  - Law 1273 of 2009 Law on Cyber Crimes
  - Law 1581 of 2012 Personal Data Protection Law
  - Law 1735 of 2014 Financial Inclusion Law
  - CONPES 4005, 4011, and 4012
  - Decree 1074 of 2015 Unmonitored credit
  - Decree 2443 of 2018 Investments in Fintech by entities supervised by the SFC
- Decree 222 of 2020 Financial products and mobile and digital correspondents
- Decree 1692 of 2020 Low value payment systems
149. Función Pública (2020).
150. The list of approved pilots can be consulted at <https://www.superfinanciera.gov.co/jsp/10099575#piloto>.
151. See SFC External Circulars No. 007 of 2018 and No. 033 of 2020 amending the Basic Legal Circular (Circular Básica Jurídica [CBJ]).
152. Decree 2555 of 2010 (Parte 2, Libro 36, Título 9, as recently amended by Decree 222 of 2020) and the SFC CBJ (CE 029 of 2014, Parte I, Título II, capítulo I, as amended), regulate the use of agents by credit institutions, securities broker-dealers, pension funds, trust companies, and insurance companies. Art. 2.36.9.1.20 of Decree 2555 applies the same regime to SEDPEs, based on Law 1735 of 2014 (art. 1 par. 4) authorizing SEDPEs to operate through agents to perform their activities. Similarly, Decree 1068 of 2015 authorizes savings and credit cooperatives and multi-active cooperatives with a savings and credit section to engage agents and also subjects the cooperatives to the same provisions contained in Decree 2555.
153. See SFC External Circular No. 002 of 2021.
154. See Decree No. 222 of 2020.
155. Provided operations are registered and reflected in the systems of the financial institution by the end of the day on the same day in which customer funds are received.
156. Through SFC External Circular No. 005 of 2019. These provisions contemplate the need to ensure (i) the observance of information security standards (e.g., through the relevant certifications); (ii) the backup of the information processed in the cloud; and (iii) the continuous availability of services (99.95 percent at a minimum), among other measures.
157. The framework is made up of the Estatuto Orgánico del Sistema Financiero (art. 97), Law No. 1328 of 2009 (as amended), Decree 2555 of 2010 (Title 4), and the CBJ.
158. As well as data from Prestadores de Servicios Ciudadanos Digitales, which are public or private entities that provide SDC, namely, digital authentication, the CCD, and interoperability under the rules established by MinTIC.
159. Current participants include all the banks, four financial cooperatives, two financial corporations, the National Treasury, the central securities depository, and all the operators of social security payments (Operadores de Información), as well as the BR.
160. Through Decree 1692 of 2020. Furthermore, in the case of systems whose participants are also shareholders, one-fourth of the board of directors must include independent members and can have no influence on interchange fees and participation fees, which must be established by the management of the entity operating the payment system. This is provided that the respective payment instruments are not branded, or only the scheme can impose interchange fees.
161. Arango-Arango *et al.* (2021).
162. Based on a few observations, it is estimated that a small merchant may pay between 2.99 and 3.49 percent in merchant discount rates.
163. Only small grocery/food shops and hairdressers opting for the simplified tax regime are exempted from VAT; under no circumstances would merchants be exempted from the GMF, although the amount paid can be deducted from the income tax payment (where that applies).
164. Through External Circular No. 003 of 2019.
165. The use of QRs on e-commerce websites is incipient. In 2020, Credibanco reported having deployed its QR at 28 online merchants.
166. For instance, Nequi and Daviplata are accepted at Nequi QR and Qué Rápido QR, respectively, as well as Redeban's QR.
167. See Decree No. 222 of 2020.
168. Prosperidad Social is an agency of the national government created through Decree No. 4155 of 2011.



- 169.** Gómez *et al.* (2021).
- 170.** Partly inspired by this achievement, two government assistance programs (Devolución de IVA, Jóvenes en Acción) are currently undergoing a limited-scale pilot through ACH-Cenit.
- 171.** Large billers generally rely on own and third-party distribution networks and apps/websites with a payment button (PSE again the most used).
- 172.** See World Bank (2023d).
- 173.** See Demirgüç-Kunt *et al.* (2022).
- 174.** Digital start-ups refer to early-stage ventures that create new digital solutions or business models as part of their core products or services. Established digital businesses are mainly mid-sized and large platform-based and data-driven firms that have passed the initial start-up stage, having rapidly acquired suppliers, contractors, and consumers.
- 175.** According to CIU, the following may be classified as digital firms. Code 6201: computer systems development activities, planning, analysis, design, programming, testing; Code 6202: computer consulting activities and management activities of computer facilities; Code 6209: Other information technology activities and computer service activities; Code 6311: Data processing, accommodation (hosting) and related activities.
- 176.** This section is based on a conservative estimate with data from a new World Bank global digital business database that leverages data from three providers: Pitchbook, CB Insights, and Briter Bridges (the LAC region is covered only by Pitchbook and CB Insights). The database defines digital businesses as digital solution providers that develop and manufacture digital technology products or provide services enabled through digital means. To differentiate digital businesses from digitalized “traditional” companies, the database uses a list of digital solution-related keywords in company descriptions as a filter. These include: software, automate, cloud, application, AI, data, and so on. Applying these keyword filters results in at least 90 percent of the sample being digital solution firms, as compared to manual checks of a random subsample.
- 177.** Following the firm life cycle, digital start-ups are early-stage digital businesses, while established digital businesses consist of established platform and data-driven firms that have achieved economies of scale and scope.
- 178.** Based on data from DANE, “Encuestas Económicas Estructurales Anuales,” 2017–2020.
- 179.** DANE (2019).
- 180.** For instance, PayU Latam is a Colombia-based online payment provider among the leaders in Latin America (together with Paypal and MercadoPago) that has been successfully expanding in six other markets in the region.
- 181.** Platform-based firms facilitate interactions across many participants. Platform businesses do not own the means of production but rather create and facilitate the means of connection. The role of the platform business is to provide a governance structure and a set of standards and protocols that facilitate interactions at scale so that network effects can be unleashed. Data-driven firms systematically and methodically collect or aggregate large datasets and use advanced analytics (such as AI, big data, and blockchain) to create value, leveraging data as a key element of their business model. Data-driven businesses can also help traditional industries upgrade through servicification to optimize production processes, increase sales, streamline decision making, and even re-think revenue models.
- 182.** Blumberg *et al.* (2020).
- 183.** Authors’ calculations based on data from Pitchbook and CB Insights.
- 184.** Deloitte (2013).
- 185.** The ICT sector includes computer, electronic, and optical products, telecommunications services, and IT and other information services.
- 186.** IDB (2021).
- 187.** The sectors where ICT services capital contributed above the average to sectoral value-added in 2020 include, in decreasing order, transport, warehousing, and communications services; mining and other extractive activities; financial services, insurance, and real estate; and commerce, hospitality, and restaurants. The digital intensiveness of industries as used in this chapter is based on the taxonomy by Calvino *et al.* (2018), which classifies sectors according to their digital capabilities and their investments in and adoption of digital technologies. The indicators used to classify 36 ISIC (the UN International Standard Industrial Classification of All Economic Activities) revision 4 sectors over the 2001–15 period according to their digital intensiveness are: share of ICT tangible and intangible (i.e., software) investment; share of purchases of intermediate ICT goods and services; stock of robots per hundreds of employees; share of ICT specialists in total employment; and the share of turnover from online sales. High digital-intensive sectors include ISIC Rev.4 Divisions 29–30, 61–66, 69–82, and 94–96. Medium-high digital-intensive sectors include divisions 16–18, 26–28, 31–33, 45–47, 58–60, 84, and 90–93. Medium-low digital-intensive sectors include divisions 13–15, 19–23, 24–25, and 85–88, and low digital-intensive sectors include divisions 01–03, 05–12, 35–39, 41–43, 49–53, 55–56, and 68. See Calvino *et al.* (2018).
- 188.** Indeed, oil, coal, gold, and other primary goods with limited transformation represented more than 70 percent of Colombia’s total goods export value in 2019. The services export basket is also concentrated at 96 percent in personal travel, transportation, and other business services; personal travel includes tourism, which has a low digital intensity as it requires face-to-face interaction and accounts for more than half of service exports. However, in line with the increasing digitalization of the transport industry globally, Colombia has significantly improved the digitalization of its transport industry, as illustrated by the improvement of its tracking and tracing performance as per the Logistics Performance Indicator for 2018.
- 189.** Based on data from the United Nations Conference on Trade and Development (UNCTADSTAT) – Services (BPM6). Regional comparators, such as Costa Rica and Mexico, have shown greater resiliency, as they were able to almost return to their pre-pandemic export service level in 2021.
- 190.** WTO (2021).
- 191.** Authors’ calculations based on data from UNCTAD (2021).
- 192.** Aguiar *et al.* (2019); Acemoglu and Restrepo (2018); y Aghion *et al.* (2019).
- 193.** Based on 2020 data from the Colombian E-Commerce Chamber (CCCE), <https://www.ccce.org.co/conocimiento-confianza/>.
- 194.** UPU (2021).
- 195.** Ibid.
- 196.** DANE (2022e).
- 197.** DANE (2022c).
- 198.** Banco de la República (2017).
- 199.** Demirgüç-Kunt *et al.* (2022).
- 200.** Moreover, since 2015, PayPal has suspended the possibility of utilizing online payments for domestic local currency transactions in Colombia.
- 201.** Among the few firms that have implemented an AI solution, most outsourced its development and rollout (68 percent of firms in commerce and 72 percent in manufacturing). In the service sector the picture is more heterogeneous, with industries, such as software development and telecom, developing their own AI solutions, while less knowledge-intensive industries (e.g., lodging, restaurants, and travel) outsourcing most of these functions. See DANE (2021d).
- 202.** As the database does not distinguish the funding information of multinational firms by their operating location, the analysis only uses firms headquartered in the country to avoid overcounting the funding raised by multilateral companies in the international benchmarking. The database records the latest funding for each

- firm, so this captures at most one most recent funding per firm rather than multiple deals per firm across the years. Formal investment information comes from the latest investment reported by the firms or through web scrapping, indicating that informal investments (e.g., friends and families) are likely underreported.
203. See [Chapter 4](#) for a list of the top 30 investors in digital businesses headquartered in Colombia by volume.
  204. Based on data from DANE (2020). ICT firms, as defined in this chapter, include ICT-intensive manufacturing firms and ICT service providers. The former is composed of divisions 26 and 27 of the CIIU Revision 4 A.C. (“manufacture of computer, electronic and optical products” and “manufacture of electrical equipment,” respectively), and the latter by divisions 61 and 62/63 of the CIIU Revision 4 A.C. (“telecommunications” and “development of computer systems and data processing,” respectively). See DANE, “Clasificación Industrial Internacional Uniforme de Todas las Actividades Económicas Revisión 4 Adaptada para Colombia” (Bogotá: DANE, 2020), [https://www.dane.gov.co/files/acerca/Normatividad/resoluciones/2020/CIIU\\_Rev\\_4\\_AC.pdf](https://www.dane.gov.co/files/acerca/Normatividad/resoluciones/2020/CIIU_Rev_4_AC.pdf).
  205. DANE (2021c).
  206. World Bank’s calculations based on data from Pitchbook and CB Insights.
  207. The OECD Digital Trade Restrictiveness Index collects information on de jure barriers that affect trade in digitally enabled services. Data are collected from publicly available laws and regulations. The framework covers measures in five policy areas: 1) infrastructure and connectivity, 2) electronic transactions, 3) measures affecting payment systems, 4) intellectual property rights, and 5) a cluster of other cross-cutting barriers.
  208. Intermediary liability rules are the set of provisions that distribute the liability between intermediaries (website and apps) and actual vendors or content developers when things go wrong.
  209. World Bank (forthcoming, a).
  210. IMF (2022a)
  211. Customs procedures are particularly important to trade in courier services. As the provision of such services is often time sensitive, reduction and elimination (where possible) of complex, time-consuming customs procedures are desirable. Thus, in addition to the time required for customs clearance, three other measures capturing general “simplification principles” are included in the OECD Services Trade Restrictiveness Index for courier services: pre-arrival processing, a *de minimis* regime, and the release of goods before determination and payment of duties. These three streamlined release procedures are especially important for expedited shipments.
  212. Amendment of Art. 261 of Customs Code (Decree 1165/19) by Decree 1090/20, and Decree 2155/ 21.
  213. Velazco (2022).
  214. Based on data from DANE (2021d).
  215. World Bank (unpublished, b).
  216. DANE (2021d); and DANE (2022c)
  217. Based on data from DANE (2022c).
  218. Specifically, between October 2020 and February 2022, the share of medium-sized businesses that purchased inputs online dropped from 50 to 40 percent, while in the case of large businesses the decline was much lower, from 35 to 32 percent.
  219. See <https://www.larepublica.co/empresas/las-ventas-de-e-commerce-en-colombia-crecieron-40-y-llegaron-a-40-biliones-3305200>
  220. Firms in “other services” reported a higher usage of digital platforms for both buying inputs (46 percent) and receiving orders (32 percent), according to data from DANE (2021d).
  221. Based on data from DANE (2022e).
  222. Forbes (2021).
  223. DANE (2021d).
  224. Ibid.
  225. The following activities from the “other services” sector show greater adoption of big data: ICT and software development (29.5 percent); administrative and business support services (24.2 percent); and private higher education (19.5 percent).
  226. Ovanessoff y Plastino (2018).
  227. CONPES (2019).
  228. See the action lines 13 “Generate enabling conditions to promote the development of AI in Colombia” and 14 “Promote the development of digital technologies for the 4IR in Colombia” of CONPES-3975 (CONPES 2019).
  229. Gómez Mont *et al.* (2020).
  230. For instance, in the case of the United States, new data from the National Science Foundation show that in 2018 (the most recent year available), about 90 percent of businesses in both manufacturing and services did not use AI as a production technology for their goods or services. See National Science Foundation, “Annual Business Survey: 2019,” <https://ncses.nsf.gov/pubs/nsf22315>.
  231. DANE (2022e).
  232. Heredia *et al.* (2022); Martínez-Caro *et al.* (2020).
  233. ANDI (2019)
  234. Based on data from DANE (2022c). Calculations are made on the basis of the previous year’s expenditures.
  235. DANE (2021d).
  236. However, among firms with ICT or systems departments, only about 10 percent reported having trouble filling vacancies.
  237. This section discusses policy instruments and support programs. Policy instruments refer to the set of interventions used by the government to promote certain policies and achieve predefined goals (e.g., promote widespread adoption of digital technologies by the private sector). These include regulations and government programs, systems, and services, among others. The term “public support program” refers to a group of specific actions implemented by a government entity in order to realize one or various specific objectives (e.g., improve access to finance for ICT-intensive businesses) and contribute to the achievement of a policy goal.
  238. Equivalent to COP 7,535,990 million, using an exchange rate of USD/COP 0.00025, average for the period January–July 2022. See Banco de la República, “Serie Histórica de Periodicidad Mensual.”
  239. Misión TIC, the Tecnoacademias, and the Tecnoparques network, as well as the diverse support modalities provided by the AND, account for over two-thirds of the budget of this group of policy instruments, while 27 other programs account for the remaining third.
  240. This constitutes a challenge that permeates to other areas of the SNCI, as discussed in DNP and Swisscontact (2021). Note that some programs mentioned here might be altered or cleared with the new administration.
  241. APPS.CO is a MinTIC program that aims to promote and enhance the generation, creation, and consolidation of digital businesses. The program seeks to strengthen the skills and competencies of Colombian digital entrepreneurs by means of mentors and advisors, adjusting to the needs of digital entrepreneurs and the maturity of their ideas or digital businesses. See <https://apps.co/portal/>.
  242. Public funding can sometimes have a distortionary effect on private markets. However, given the overall stage of development of the digital business and entrepreneurship ecosystem in Colombia, distortionary effects are likely to be small. Further, there are sound economic reasons why it could be appropriate to use grants or other public funding instruments to incentivize specific activities with the potential to provide positive externalities to the ecosystem (such as research and development). See Cruz *et al.* 2022.
  243. In 2020, most instruments of the SNCI targeted three or more types of beneficiaries. Although user segmentation for the average SNCI instrument has improved due to the implementation of ArCo’s recommendations, more than 80 percent of programs

- have no subnational differentiation, and programs that support the digital transformation of the private sector still had on average more than three target beneficiaries in 2022. See the analysis carried out by the DNP as discussed in DNP and Swisscontact (2021).
- 244.** Among the broader group of policy instruments that support the formation of foundational digital skills and the widespread adoption of digital technologies by government, NGOs, and society at large, the assessment finds a more diversified set of objectives and intervention mechanisms. For instance, some of these instruments seek to promote cultural shifts among businesses and entrepreneurs, others support market access and the internationalization of digital services, and others fund the creation and dissemination of knowledge capital to facilitate the adoption of digital technologies. Yet, challenges related to beneficiary segmentation and overlapping objectives in programs geared toward business digitalization are also observed across this broader group of policy instruments.
- 245.** In addition to the instrument mapping exercise, program managers must carry out *ex ante* functionality tests to assess the design, implementation, and governance of their instruments. Instrument managers must self-assess 24 results-based management indicators, ranging from the selection of target populations and the implementation of logical frameworks (design) to information management, monitoring and evaluation (implementation), and instrument articulation and external barriers (governance). Each indicator is then assigned a grade on a scale of 5 points (where 5 is the best practice). Further details are available in DNP and Swisscontact (2021).
- 246.** World Bank (forthcoming, a).
- 247.** Checcucci and Saslavsky (2021).
- 248.** In particular, making strong(er) customer authentication (e.g., two-factor authentication, PIN number) mandatory when a payer initiates a payment transaction online should be considered.
- 249.** Colombia has been taking steps in this direction (see Monotributo tax category exempts electronic payments from tax withholdings).
- 250.** Innovative fintech solutions are being implemented in many countries, providing, for example, credit to taxi/Uber drivers with repayment profiles tailored to income data generated or creating a marketplace and logistic platform for small agricultural producers to sell directly. For additional information, see Arvai *et al.* (2022).
- 251.** See, for instance, the Industry Matching Fund created in 2019 by the Technology Innovation Agency in South Africa, based on a blended finance model and a risk-sharing mechanism as an instrument to attract co-investments.
- 252.** See, for instance, the “Seedfinancing Deep Tech Program” implemented by the Austrian Promotional Bank (Austria Wirtschaftsservice), which aims to bridge the financing gap in innovative start-ups’ ability to develop deep-tech products while also providing coaching and advisory services to help them reach additional sources of financing. See <https://www.aws.at/en/aws-seedfinancing-deep-tech/>.
- 253.** Given the structural features of Bancoldex, the Business Development Bank of Canada (BDC) can be relevant. BDC offers loans at higher rates than competitors to riskier, typically younger, and technologically savvy firms. Consulting services are offered for a fee with the loan, though the firm may decline them.
- 254.** See ECLAC (2021).
- 255.** See GAN Colombia (2020).
- 256.** See OECD (2019b).
- 257.** See MinTIC (2019).
- 258.** See OECD (2019b).
- 259.** See Katz, Callorda, and Lef (2016). The index is built on six equally weighted components that constitute a development path to a digital society: affordability, infrastructure reliability, network access, capacity, usage, and human capital.
- 260.** See IMD (2021). The World Ranking of Digital Competitiveness of the IMD evaluates three factors: knowledge, technology, and readiness for digital transformation.
- 261.** Wiley (2021).
- 262.** Ingram (2021).
- 263.** Becerra *et al.* (2021).
- 264.** García *et al.* (2021).
- 265.** Sánchez Ciarrusta (2020).
- 266.** Saenz *et al.* (2020).
- 267.** Sanz de Santamaria and Reimers (2020).
- 268.** In addition, policy documents like CONPES 3975, CONPES 3988 and CONPES 402 have also complemented these initiatives.
- 269.** The PND is the executive administrative agency of Colombia in charge of defining, recommending, and promoting public and economic policy. It led to the development of important policy documents on big data (2018), digital transformation and artificial intelligence (2019), and technologies for learning (2020), and a draft policy on science, technology and innovation that is currently under revision.
- 270.** MinTic (2021c).
- 271.** UNESCO (2022).
- 272.** Perficient (2019).
- 273.** Carretero *et al.* (2018).
- 274.** Law *et al.* (2018).
- 275.** Colsubsidio (2019)
- 276.** The survey found WhatsApp to be used equally in rural and urban areas.
- 277.** This was repeatedly mentioned in the interviews undertaken for this report (note the interviews with Maribel Velasco, Andres Muñoz, Diana Silva, and Marta Laverde).
- 278.** GAN Colombia (2020).
- 279.** A national government program that integrates the three main national agents involved with training and technologies: MinTIC, MEN, and SENA. See <https://www.computadoresparaeducar.gov.co/>.
- 280.** CONPES (2020).
- 281.** Computadores para Educar (2020). As of 2020, Colombia had 8 million students, 53,484 school sites, and 434,500 teachers and administrators. DANE (2021a).
- 282.** See Universidad Nacional de Colombia (2017).
- 283.** CONPES (2020).
- 284.** Information shared by Denis Palacios, subdirector of Digital Competencies at MinTIC.
- 285.** Ibid.
- 286.** iNNpulsa Colombia (2020).
- 287.** See Ruta N (2021).
- 288.** Bootcamps are short-term intensive programs, lasting between three and six months. Teaching takes place in a hands-on learning environment in which real work situations are introduced.
- 289.** Cathles and Navarro (2019).
- 290.** <https://www.switchup.org/>.
- 291.** Manpower (2023).
- 292.** Talent gap studies focus their analysis on three types: quantity gaps (differences between the supply of and demand for training programs); relevance gaps (between the skills taught in these programs and those required by the productive sector); and quality gaps (quality of these skills as perceived by the productive sector).
- 293.** See Alianza TIC (2020). Alianza TIC Colombia is made up of the Ministry of Labor, MinTIC, MEN, and SENA, among others.
- 294.** UNDP (2019).
- 295.** The deficit occurs if 10 percent or more of educational institutions (higher, technical, and technological) of the region do not offer the training program. A high deficit is considered when 75–100 percent of these institutions do not offer it.
- 296.** Radiger *et al.* (2018).
- 297.** Murillo and Carrillo-Luna (2021).
- 298.** See OECD (2019a).
- 299.** Murillo and Carrillo-Luna (2021).
- 300.** Colombia uses a socioeconomic stratification system that classifies the population by strata with similar economic levels. Strata are defined by observable characteristics of the dwelling and

urban environment in which households live. The system is organized in six levels: stratum 1 is the poorest; strata 2, 3, and 4 include the population with low to medium income; and strata 5 and 6 include the households in the upper tail of the income distribution.

301. See ICFES (2020).
302. Colombian departments are a subnational administrative division and correspond to? groupings of municipalities. Colombia is made up of 32 departments and a Capital District.
303. See MEN (2020).
304. See Granvik *et al.* (2018).
305. The Derechos Básicos de Aprendizaje (Basic Learning Rights) are a tool designed for all members of an educational institution (parents, caregivers, teachers, and students) that allows them to identify the basic knowledge that must be acquired at each grade level for mathematics and language. See Law 115 of February 1994 at [https://www.mineducacion.gov.co/1621/articles-85906\\_archivo\\_pdf.pdf](https://www.mineducacion.gov.co/1621/articles-85906_archivo_pdf.pdf).
306. See MEN (2013) and (2008), respectively.
307. Furthermore, businesses have also determined that educational programs, such as those concerning information systems analysis, client orientation, cooperation, resilience, SQL, PHP, management skills, and angular language are misaligned to the current and future needs of the productive sector and are therefore not producing individuals with the needed competencies (MinTIC 2020d).
308. CONPES (2020).
309. MEN (2021).
310. CONPES (2020).
311. Universidad Nacional de Colombia (2017).
312. GAN Colombia (2020).
313. WorldSkills (2021).
314. DfE (2021).
315. ITU (2020).
316. See <https://digital-strategy.ec.europa.eu/en/policies/desi>.
317. CEDEFOP (2017).
318. CEDEFOP (2023).
319. Following the conceptual framework presented in World Bank (2021).
320. This law requires data controllers to grant access to information only to authorized persons, adopt internal policies and processes to ensure compliance with the law, abide by high-security standards to guarantee the integrity of the information, and attend to the queries and complaints of data subjects, among others. According to a decision of the Constitutional Court (C-1011/2008), Law No. 1266 did not correspond to a general data protection law; instead, it contains sectoral data protection provisions focused on financial and credit services.
321. Its scope of application excludes, among others, the data under the scope of Law No. 1266 of 2008. According to a Constitutional Court decision (C-748/2011), Law No. 1581 contains comprehensive personal data protection provisions. See “Colombia – Data Protection Overview,” <https://www.dataguidance.com/notes/colombia-data-protection-overview>.
322. “Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation),” Official Journal of the European Union, L 119, May 4, 2016, p. 1, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679>.
323. World Bank (2021).
324. Article 6 of “Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data.”
325. Escuela de Privacidad, “Guía Comparativa del Reglamento General de Protección de Datos Europeo y el Régimen Colombiano de Protección de Datos Personales,” <https://escueladeprivacidad.co/2021/05/05/guia-comparativa-del-reglamento-general-de-proteccion-de-datos-europeo-y-el-regimen-colombiano-de-proteccion-de-datos-personales/>.
326. See <https://www.comunidadandina.org/DocOficialesFiles/decisiones/DECISION897.docx>
327. Once the data protection law is adopted and the Data Protection Authority is established, the latter, with the support of other stakeholders, could begin the process of joining Convention 108+. See <https://www.coe.int/en/web/data-protection/convention108-and-protocol>.
328. Council of Europe, “Colombia: A First Step towards Convention 108+,” August 30, 2019, <https://www.coe.int/en/web/data-protection/-/Colombia-a-first-step-towards-convention-108->.
329. As per Decree No. 4886 of 2011.
330. See <https://www.sic.gov.co/historia>.
331. SIC (2022).
332. SIC (2021).
333. Interview with Dr. Nelson Remolina Angarita, former Data Protection Delegate from the SIC (October–March 2022). The interview took place on May 18, 2022.
334. See <https://www.datos.gov.co/>.
335. Council of Europe (2023).
336. Colombia Ágil, “Cédula de Ciudadanía Digital,” <https://www.colombiaagil.gov.co/tramites/intervenciones/cedula-de-ciudadania-digital>.
337. “La Cédula Digital Colombiana,” <https://www.registraduria.gov.co/?page=cedula-digital>.
338. ID4D (2023).
339. Nabe (2023).
340. CONPES, “Confianza y Seguridad Digital. Documento CONPES 3995,” <https://www.fundacionmicrofinanzasbbva.org/revistaprogreso/confianza-seguridad-digital-documento-conpes-3995/>.
341. Frisby (2020).
342. SonicWall (2022).
343. “Más de la Mitad de las Empresas Colombianas Sufrieron Ciberataques el Último Año,” La República, March 1, 2022, <https://www.larepublica.co/empresas/mas-de-la-mitad-de-las-empresas-colombianas-sufrieron-ciberataques-el-ultimo-ano-3295151>.
344. CCIT (2021)
345. The number of rankings is higher than the number of countries as some countries are assigned the same rank. ITU (2023a).
346. See <https://ncsi.ega.ee/country/co/>.
347. CONPES 3701-2011, CONPES 3854-2016, and CONPES 3995-2020.
348. <https://www.csirtasobancaria.com/publicaciones/conpes-3995-politica-nacional-de-confianza-y-seguridad-digital>.
349. Decreto-338-de-2022-Gestor-Normativo (funcionpublica.gov.co).
350. See Resolución MinDEFENSA 3933 2013 - Colpensiones - Administradora Colombiana de Pensiones.
351. This includes incident reporting, vulnerability disclosures, and information-sharing mechanisms, among other relevant activities.
352. ColCERT has 10 staff members, including administrative staff and highly qualified specialists with technical and legal backgrounds, but more technical staff will be required. ColCERT will continue supporting the same community and operating under the existing website, communication channels, and incident management protocols and procedures, and with previously agreed collaboration arrangements with domestic and international partners (e.g., INTERPOL, EUROPOL, CSIRT Americas Network, etc.).
353. “Entra en Operación el CSIRT de Gobierno,” August 6, 2018, <https://gobiernodigital.mintic.gov.co/portal/Noticias/77743:Entra-en-operacion-el-CSIRT-de-Gobierno>.
354. The new function is per Decree No. 338 of 2022.
355. See <https://csirtasobancaria.com/>.
356. According to the latest data provided by DANE, 78 percent of jobs in the country are generated by MSMEs. The figures show that

there are currently 5.8 million formal and informal micro-businesses that employed 21.4 million people and generated 54.9 billion pesos in added value in 2021. See “DANE: El 78 % del Empleo en Colombia es Generado por las MIPYMES,” June 27, 2022, <https://www.infobae.com/america/colombia/2022/06/27/dane-el-78-del-empleo-en-colombia-es-generado-por-las-mipymes/>.

357. CE (2023).
358. Ibid.
359. In May 2022, Colombia signed the second additional protocol, which aimed at enhancing cooperation and disclosing electronic evidence, such as direct cooperation with service providers and registrars, effective means of obtaining subscriber information and traffic data, and immediate cooperation in emergencies or joint investigations, that is subject to a system of human rights and the rule of law, including data protection safeguards. This second additional protocol will enter into force once ratified by five state members. See Council of Europe (2022).
360. See <https://www.policia.gov.co/direccion/investigacion-criminal/organigrama>.
361. For information on Adenunciar, see <https://adenunciar.policia.gov.co>.
362. <https://www.policia.gov.co/files/%C3%AD-trabajamos-contra-el-ciberdelito-en-el-centro-cibern%C3%A9tico-policial-policiadecolombia>.
363. [https://jurinfo.jep.gov.co/normograma/compilacion/docs/resolucion\\_fiscalia\\_0694\\_2021.htm](https://jurinfo.jep.gov.co/normograma/compilacion/docs/resolucion_fiscalia_0694_2021.htm).
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365. <https://escuelajudicial.ramajudicial.gov.co/noticia/decimo-ciclo-de-capacitacion-en-tic-ciberdelito>.
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367. MEN, “El Ministerio de Educación y CISCO Lanzan la Estrategia de CiberEducación Enfocada en Ciberseguridad para Toda la Comunidad Educativa,” October 30, 2021, <https://www.mineducacion.gov.co/portal/salaprensa/Comunicados/407506:El-Ministerio-de-Educacion-y-CISCO-lanzan-la-estrategia-de-CiberEducacion-enfocada-en-Ciberseguridad-para-toda-la-comunidad-educativa>.
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369. SENA, “El SENA y MNEMO Preparan a los Colombianos para Suplir la Creciente Demanda en Ciberseguridad,” October 20, 2020, <https://www.sena.edu.co/es-co/Noticias/Paginas/noticia.aspx?IdNoticia=4475>.
370. Segurilatam, “Microsoft Capacitará a más de 68.000 Colombianos en Ciberseguridad,” March 29, 2022, [https://www.segurilatam.com/actualidad/microsoft-capacitara-a-mas-de-68-000-colombianos-en-ciberseguridad\\_20220329.html](https://www.segurilatam.com/actualidad/microsoft-capacitara-a-mas-de-68-000-colombianos-en-ciberseguridad_20220329.html).
371. These are: government; security and defense; information and communications technologies; electricity; finance; education; energy and mining; industry, commerce and tourism; environment; health and social protection; water; transport; and agriculture and food.
372. Following Decree No. 338, MinTIC must identify, based on three requirements, the sectors and subsectors that have critical cybernetic infrastructures and render essential services to maintain social and economic activities. Also, MinTIC must define the identification methodology used to carry out this stocktaking process in the ensuing 12 months after the official adoption of the Decree. The latter also instructs that the identified ICCN and essential service providers work closely with MinTIC and CoCERT and that MinTIC should establish operational guidelines and standards based on Title 9 (IT Guidelines and Policy) of Decree No. 1078 of 2015.
373. Decreto-338-de-2022-Gestor-Normativo ([funcionpublica.gov.co](http://funcionpublica.gov.co)).
374. Forum of Incident Response and Security Teams. See [www.first.org](http://www.first.org).
375. Función Pública (2007).
376. CRC, Resolución 2058/09.
377. CRC, Resolución 5223/17.
378. CRC, Resolución 5225/17.
379. CRC (2021).
380. OECD (2016a).
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382. <https://www.rtvccplay.co/competencias-basicas-ciudadanas-y-socioemocionales/profe-en-tu-casa>.
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392. See CMS, “Data Protection and Cybersecurity Laws in Colombia,” <https://cms.law/en/int/expert-guides/cms-expert-guide-to-data-protection-and-cyber-security-laws/colombia>; DLA Piper, “Data Protection Laws of the World: Colombia,” <https://www.dlapiper-dataprotection.com/index.html?t=authority&c=CO>; and Carolina Pardo, “Colombia: Data Protection Overview,” Data Guidance, December 2021, <https://www.dataguidance.com/notes/colombia-data-protection-overview>.
393. OECD (2020a).
394. Pardo, “Colombia: Data Protection Overview,” <https://www.dataguidance.com/notes/colombia-data-protection-overview>.

