OECD Reviews of Digital Transformation: Going Digital in Colombia

BETTER POLICIES FOR BETTER LIVES

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Foreword

OECD Reviews of Digital Transformation: Going Digital in Colombia is part of a new series of OECD country reviews. The OECD Reviews of Digital Transformation analyse recent developments of the digital economy in countries, review policies related to digitalisation and make recommendations to increase policy coherence in this area.

Going Digital in Colombia examines recent developments in infrastructures for the digital economy, telecom markets, and related regulations and policies in Colombia. It reviews trends in the use of digital technologies by individuals, businesses and the government, and examines policies to foster diffusion. The Review also examines opportunities and challenges raised by digitalisation in key areas and analyses policy responses to these changes. The areas covered range from productivity and trade to innovation, the labour market and skills in the digital economy.

The Review reconsiders these policies in relation to their coherence among different domains and in order to foster synergies across government ministries, levels and institutions, based on the Integrated Policy Framework of the OECD-wide Going Digital: Making the Transformation Work for Growth and Well-being project.

Going Digital in Colombia was undertaken following an invitation by the Ministry of Information and Communication Technologies of Colombia, which also provided financial support. The Review was carried out by the OECD Directorate for Science, Technology and Innovation under the auspices of the OECD Committee on Digital Economy Policy.

The review was prepared by a team led by Vincenzo Spiezia and including Rory O'Farrell, Maximilian Reich, Jan Tscheke and Verena Weber, under the supervision of Anne Carblanc, Head of the Digital Economy Division. Anders Hektor, Science and Innovation Counsellor to the Swedish Embassy in Seoul, provided inputs as an independent "peer" reviewer.

The authors owe much to the support and co-operation of the Commission for Communications Regulation of Colombia, in particular Germán Dario Arias Pimienta, former Executive Director and Commissioner; Juan Manuel Wilches Duran, former Commissioner; Mariana Sarmiento, Co-ordinator; and Alejandro Delgado, Consultant.

The Review draws on the results of a series of interviews with a wide range of stakeholders during two missions to Colombia in December 2017 and September 2018, including: Víctor Muñoz and Felipe Buitrago (Presidencia de la República), Nicolas Palau (Ministry of Commerce, Industry and Tourism), Sylvia Constain (Ministry of Information and Communication Technologies), Martha Suárez (ANE), Paola Bonilla and Juan Pablo García (National Planning Department), Juan Daniel Oviedo (DANE), Catalina García-Cure (DIAN), David Melo (Ministry of Culture), Nelson Remolina (SIC), Camilo Fernández de Soto and Jennifer Pineda (Colombia Productiva), Martha Bustamante (Ministry of Labour), Renzo García (Colciencias), Diana Silva (Ministry of Education), Jairo Velasco (Ministry of Finance and Public Credit), Alberto Yohai (CCIT), Alberto Solano (Andesco), Santiago Pinzón (ANDI), Ximena Duque (Fedesoft), Jorge Caldas (CAOBA), Luis Carlos Trujillo (CEA), Alejandro Franco (RUTA N), Carolina Botero (Fundación Karisma), Freddy Castro (Banca de las Oportunidades), Sandra Villota (Superfinanciera), Felipe Lega (URF), Wilson Prieto (colCERT), Ignacio Gaitán (iNNpulsa), Mario Castaño (CINTEL), Flavia Toro (ProColombia), ANTV, Centro Cibernético Policial, Colombia Compra Eficiente, SENA, Cámara Colombiana de Comercio Electrónico, Claro, Telefónica, ETB, Avantel, Tigo-Une, Connect Bogotá, HubBOG and DIRECTV.

On 25 May 2018, the OECD Council invited Colombia to become a Member. At the time of publication the deposit of Colombia's instrument of accession to the OECD Convention was pending and therefore Colombia does not appear in the list of OECD Members and is not included in the OECD zone aggregates.

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Acronyms, abbreviations and units of measure

ACC	Audio-visual Content Commission
AI	Artificial intelligence
ALMP	Active labour market policy
ANE	National Spectrum Agency *Agencia Nacional del Espectro*
ANTV	National Television Authority *Autoridad Nacional de Televisión*
AWS	Advanced Wireless Services
BPO	Business process outsourcing
C4IR	Centre for the 4th Industrial Revolution
CC	Communication Commission
CIDED	Intersectoral Commission for the Development of the Digital Economy *Comisión Intersectorial para el Desarrollo de la Economía Digital*
COP	Colombian peso
CRC	Commission for Communications Regulation *Comisión de Regulación de Comunicaciones*
CTDE	Centre for business digital transformation *Centro de transformación digital empresarial*
DNP	National Planning Department *Departamento Nacional de Planeación*
DSTRI	Digital Services Trade Restrictiveness Index
EME	Emerging market economy
ETCB	Estonian Tax and Customs Board
EU	European Union
GDP	Gross domestic product
GHz	Gigahertz
GVC	Global value chain
FONTIC	Information Technologies and Communications Fund *Fondo para las Tecnologías de Información y las Comunicaciones*
FONTV	Fund for the Development of Television and Content
GB	Gigabyte
HEI	Higher education institution
ICT	Information and communication technology
IoT	Internet of Things
ISP	Internet service provider
IT	Information technology
ITA	Information Technology Agreement (World Trade Organization)
IWG	Inter-Ministerial Working Group (Brazil)
IXP	Internet exchange point
km	Kilometre
LAC	Latin America and Caribbean
MB	Megabyte
Mbps	Megabits per second
MHz	Megahertz
MIDE	Model of Education Performance Indicators

MinCIT	Ministry of Commerce, Industry and Tourism *Ministerio de Comercio, Industria y Turismo*
MinTIC	Ministry of Information and Communication Technologies *Ministerio de Tecnologías de la Información y Comunicaciones*
MNO	Mobile network operator
MVNO	Mobile virtual network operator
NTM	Non-tariff measure
OECD	Organisation for Economic Co-operation and Development
PDP	Productivity development policy
PES	Public Employment Services
PISA	Programme for International Student Assessment (OECD)
PND	National Development Plan *Plan Nacional de Desarrollo*
PPP	Purchasing power parity
PTP	Productive Transformation Programme *Programa de Transformación Productiva*
QoS	Quality of service
R&D	Research and development
SEDPE	Company that specialises in electronic deposits and payments *Sociedad especializada en depósitos y pagos electrónicos*
SENA	National Training Service *Servicio Nacional de Aprendizaje*
SIC	Superintendence of Industry and Commerce *Superintendencia de Industria y Comercio*
SMEs	Small and medium-sized enterprises
SNCCTI	National Competitiveness, Science, Technology and Innovation System
STI	Science, technology and innovation
USD	US dollar
TFI	Trade Facilitation Indicators
VAT	Value-added tax

Executive Summary

Colombia has been growing fast and converging to higher living standards since the early 2000s. Growth rates have been among the strongest in the Latin America and Caribbean (LAC) region and much higher than the OECD average.

Notwithstanding this remarkable performance, Colombia is facing a number of important challenges. Productivity remains low, with large differences among sectors, firms and regions. Skills are lower than in most OECD countries. A high level of informality in the labour market lowers incentives to innovate and reduces the tax base to finance public policies.

Digitalisation policies have a key role to play in tackling these issues. *Going Digital in Colombia* examines opportunities and challenges raised by digitalisation in Colombia. It looks at the policies in place and makes recommendations to improve them, based on the OECD Going Digital Integrated Policy Framework. The Review focuses on selected components of the framework according to the priorities expressed by Colombia.

Enhancing connectivity

Growth rates of fixed and mobile broadband subscriptions in Colombia have been among the highest in OECD and LAC countries since the early 2010s. Yet, Colombia has the lowest fixed and mobile penetration rates in the OECD. The share of fibre connections and the average broadband speed are lower than the OECD average while the prices for both fixed and mobile telecommunications tend to be higher.

To improve connectivity and foster competition, the Colombian government should:

- auction the spectrum in the 700 megahertz band as soon as possible. The auction should be designed as to pursue the two key policy objectives of coverage and competition simultaneously
- review import duties on handsets and lower the tax burden on telecommunication operators
- preserve the independence of the new "converged regulator" – for the telecommunication and broadcasting sectors – by preventing any undue pressure from the government, ensuring the financial autonomy of the regulator, and setting transparent and merit-based mechanisms for the appointment of its board.

Increasing adoption and use of digital technologies

Despite persistent differences in Internet use, there is evidence that information and communication technology (ICT) policies have been successful in reducing the digital divide in Colombia. Further actions are necessary to foster effective use of digital technologies among individuals, firms and the government:

- better target public funding for digital *puntos* and *kioscos*, i.e. Internet centres in poor and remote communities, on areas where ICT use is likely to remain limited or too costly
- secure new sources of funding for the Computers to Educate (Computadores para Educar) programme while improving targeting and co-ordination with general education policies
- promote greater use of e-banking, by exempting electronic payments from the tax on financial transfers (*4 por mil* or 4 x 1 000)

- improve consumers' trust in online retailers, by establishing a special department of the public prosecutor's office for cybercrime and a dedicated website for complaints related to online transactions
- increase the effectiveness of many small-scale programmes to promote the use of ICTs among firms, for example by pooling funds into a single agency
- facilitate access to loans at a preferential rate for ICT investments by micro, small and medium-sized enterprises, which account for 80% of employment in Colombia
- involve government institutions in further developments of Digital Government (Gobierno Digital) policy
- facilitate data sharing as well as own data access and control by citizens in the context of the Open Data (Datos Abiertos) initiative
- develop a centralised approach to ICT procurement to provide public institutions with shared ICT resources, e.g. cloud computing.

Fostering digital innovation

Colombia has introduced policies to promote a range of ICT companies with various levels of sophistication and to facilitate the adoption of their innovations. However, available supports to firms are complex and scattered among many programmes with overlapping aims. In order to boost their effectiveness, the government should:

- ensure greater stability of funds for the newly created Ministry of Science, Technology and Innovation
- strengthen local governments' capability and develop appropriate mechanisms to ensure that available funds for innovation are effectively spent
- develop an integrated view of innovation and promote a greater role for businesses
- strengthen the links between research and firms, in particular around the centres of excellence on big data (CAOBA) and the Internet of Things (CEA on IoT)
- assess and streamline programmes to support entrepreneurs and start-ups, e.g. Fondo Emprender, iNNPulsa, Colombia Bring IT On and App.co.

Developing skills and the labour market for the digital economy

Colombia is making progress in adapting its educational system and labour market for the digital transformation, though significant challenges remain. Further actions are necessary to address these challenges:

- increase investments throughout the formal education cycle
- develop lifelong learning for all working-age individuals, independently from their employment status
- ensure sufficient availability of ICT specialists, in particular by further developing the ICT Certificate (Bachillerato TIC)
- extend the accreditation system to all higher education institutions and courses, based on a larger set of quality indicators
- provide more timely information on the labour market outcomes of graduates through the Labour Observatory for Education (Observatorio Laboral para la Educación)
- streamline regulations on online job platforms to provide platforms and workers with incentives to share data with tax and labour authorities, thus reducing informality
- continue using digital technologies and big data analytics to improve job matching, simplify businesses' and workers' registration, enforce tax collection, and reduce evasion.

Seizing new growth opportunities from digital transformation

Digitalisation in services is creating new opportunities for Colombia to boost productivity and foster diversification of production. Several legislative initiatives have been put forward and should be pursed further:

- develop a more favourable regulatory environment for professional services as well as for the financial sector, including crowdfunding legislation and Fintech
- foster the use of digital technologies to promote trade in goods and services for which Colombia has a comparative advantage, including agriculture and mining
- reduce trade costs arising from non-tariff barriers, in particular by speeding up border procedures through the use of digital tools
- enhance interoperability of national contract rules and personal data protection for cross-border transactions and data transfers.

Building a National Digital Strategy for Colombia

Clearer long-term priorities, a stronger focus on larger scale programmes and better integration with other policies seem necessary to increase the effectiveness of digitalisation policies in Colombia. To achieve a whole-of-the-government approach, the government should:

- develop a National Digital Strategy through a multi-stakeholder process, followed by a public consultation
- finance digitalisation policies out of the general government revenue
- align the objectives of the Information Technologies and Communications Fund (Fondo para las Tecnologías de Información y las Comunicaciones [FONTIC]) with those set by the ICT Law (2009), i.e. “facilitate universal access and universal service”
- assess whether the FONTIC approach – a tax on the revenues of telecommunication operators and Internet service providers to finance public policies – is the most effective to achieve universal access and service
- strengthen the role of the Intersectoral Commission for the Development of the Digital Economy as the body that co-ordinates and monitors the implementation of the National Digital Strategy, under the chairmanship of the Presidential Advisor for Innovation and Digital Transformation.

Chapter 1

COLOMBIA IN THE DIGITAL TRANSFORMATION: OPPORTUNITIES AND CHALLENGES

Colombia has been growing fast and converging to higher living standards since the early 2000s. Growth has been among the strongest in the Latin America and Caribbean (LAC) region and much higher than the OECD average. Between 2008 and 2017, the poverty rate fell from 42% to 27% and the unemployment rate dropped from 11.3% to 9.4%, although both remain high by international comparison. Reforms have reduced informality and improved the business environment. The peace agreement is expected to further boost economic growth over time.

Notwithstanding this remarkable performance, Colombia is facing a number of important challenges, some arising from the international environment, others specific to the domestic economy. A drop in commodity prices has been eroding Colombia's exports and calls for strengthening its comparative advantage in different sectors, mainly services. Seizing the opportunities from the world market requires greater participation in global value chains (GVCs). Productivity remains low, with large variations among sectors, firms and regions. Skills are lower than in most OECD countries. A high level of informality in the labour market lowers incentives to innovate and reduces the tax base to finance public policies. Financial inclusion remains low, with negative consequences on individuals and firms.

Tackling these issues requires a variety of complementary measures. Among them, policies to enhance digital transformation have a key role to play. Digital technologies are an enabler for innovation and productivity in firms. They make it possible for businesses, including small ones, to manage productive activities across different locations and to connect to GVCs. Digitalisation may help foster financial inclusion and reduce informality. It can also increase the efficiency of the taxation system, therefore providing more resources for public policies. The deployment of high-speed broadband infrastructure gives individuals and firms access to government services and international markets, thus helping to reduce regional disparities. Online educational resources offer new tools for teaching and provide individuals and workers with opportunities for training and skills upgrading.

At the same time, the digital transformation may exacerbate existing inequalities, in particular between high- and low-skilled individuals, large and small firms as well as urban and rural regions. Policies are key to ensure that the potential benefits from the digital transformation are shared throughout the economy and society.

Fostering advanced services via digitalisation

Between 2008 and 2017, gross domestic product (GDP) in Colombia grew by an average of 3.8% in real terms, more than double the OECD average (1.7%). Sound macroeconomic policies and structural reforms contributed to this performance (OECD, 2019c). However, growth was mainly driven by the sharp rise in commodity prices, which boosted the value of exports and attracted a large share of total investment to the mining sector. In 2015, oil and its derivatives accounted for over 40% of total exports (DANE, 2018) and 21% of GDP (OECD, 2018a). The boom in mining generated a strong real appreciation of the currency, reducing the comparative advantages of other tradable goods, particularly in agriculture and manufacturing. It also attracted resources to non-tradable sectors, such as housing and construction.

The external environment, however, has changed significantly over the last few years: growth in the global economy has slowed down, international trade has weakened and commodity prices have fallen. These changes have reduced growth in Colombia, which is currently adjusting to the most severe terms-of-trade shock in Latin America (OECD, 2017c).

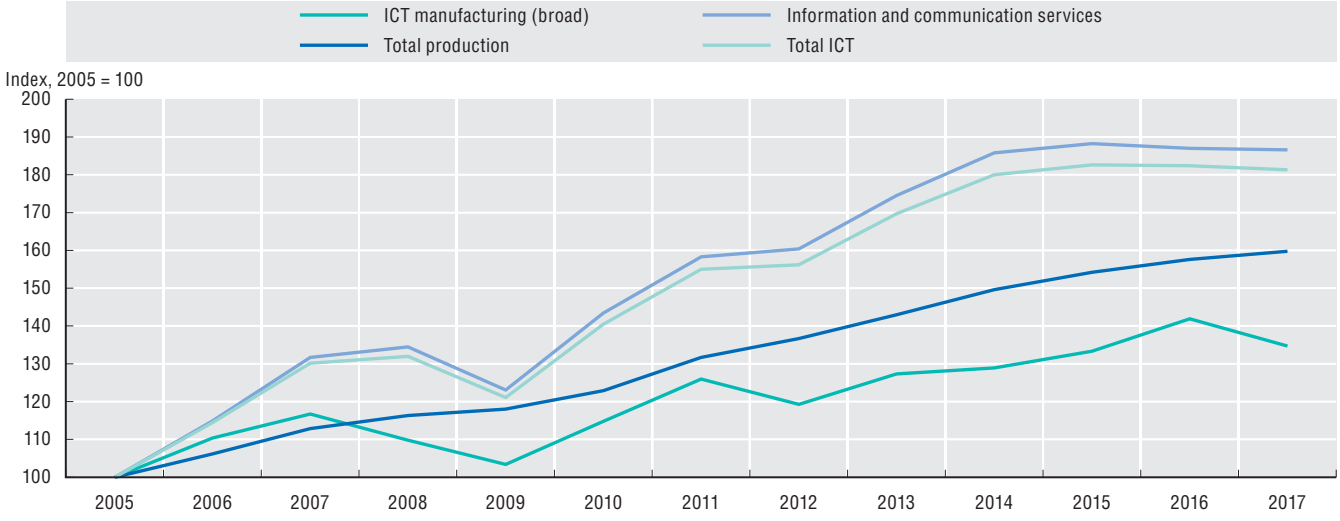
With the slowdown of international prices for commodities, the Colombian economy is now in search of new sources of growth. The digital transformation might offer such a catalyst for growth, by helping the commodity sector to become more competitive as well as enabling new business models to emerge in all economic activities.

In particular, digital transformation provides Colombia the opportunity to diversify its activities from a commodity-based to a high value-added services economy (see Chapter 4). The service sector plays a major role in the Colombian economy, accounting for nearly 60% of GDP and 70% of the workforce (DANE, 2019). Firms in the service sector innovate more than those in manufacturing, although productivity growth in services remains well below that of OECD and the large Latin American countries (OECD, 2017c).

Unlike most OECD countries, in Colombia, telecommunications account for the largest share of information and communication technology (ICT) services. Yet, the country has slowly begun to diversify its ICT services sector (Figure 1.1). While still small by international comparison, production and exports of ICT services (e.g. computer programming, consultancy and related activities) have been highly dynamic in recent years, with relatively high growth in content-related industries and audiovisuals.

Figure 1.1. Growth of value added in the ICT sector, Colombia

Constant prices (2005 = 100)



Notes: ICT = information and communication technology. Classification: CIIU Rev. 4 A.C. (60 groups). ICT manufacturing includes manufacturing of computer, electronic and optical products as well as electrical equipment (C52). ICT services include telecommunication services, IT services and consulting, broadcasting and media (J81-J84). Data for 2017 are preliminary.

Source: DANE (2019), "Principales agregados macroeconómicos, base 2015", *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales* (accessed on 15 April 2019).

More broadly, world trade in ICT-enabled services – i.e. services that can be delivered remotely over ICT networks (UNCTAD, 2015) – are likely to increase substantially over the coming years. Building on ICT-enabled services could be a good strategy to diversify Colombia's export portfolio (MinTIC, 2014, 2015). For instance, exports of financial services are growing fast and the creation of Fintech start-ups in Colombia has been very dynamic compared to other LAC countries (IDB and Finnovista, 2017).

Most of the ICT services value added produced in Colombia is absorbed domestically rather than exported. This is in sharp contrast to other emerging market economies (EMEs) that have successfully specialised in exporting ICT services. In order to foster Colombia's role as a provider of high value-added services to the world, policies have been put in place to establish an effective enabling environment for the development of the services sector.

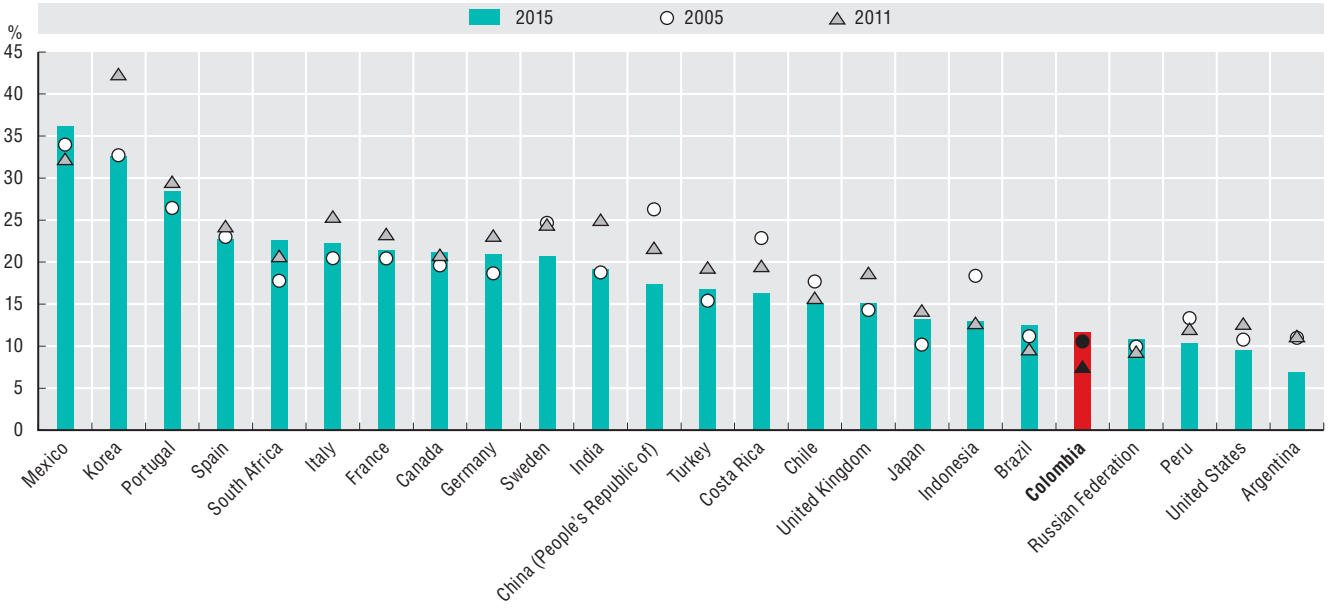
However, regulation in Colombia appears to be overly burdensome. For instance, regulation on broadcasting, telecommunications and insurance services remains restrictive (OECD, 2019c). Performance with advance rulings, appeal procedures, fees and charges, automation, the streamlining of procedures, external border agency co-operation and governance, and impartiality continue to be below best practice (Kowalski et al., 2015). With regard to the transfer of personal data across borders, interoperability of its data protection regulations with those in other countries would help dispel uncertainty about data localisation requirements for cloud computing services (Cory, 2017).

Fostering integration in global value chains through advances in digital technologies

Colombian participation in GVCs is lower than in other EMEs. The country's role in GVCs is mainly to supply primary inputs via downstream linkages, which reflects the large share of commodities in exports. Colombia participates little in sectors typically associated with dynamic GVCs like motor vehicles, electronics and offshoring of services (OECD, 2017c).

Participation in GVCs is particularly low for backward integration, which measures the share of foreign value added embodied in a country's gross exports (Figure 1.2). While low backward integration is normal for large countries like Argentina, Brazil or the United States, for smaller economies like Colombia, better integration into GVCs could significantly improve access to higher quality inputs, with potentially large effects on productivity overall (see, for example, Criscuolo, Timmis and Johnstone [2015]).

Figure 1.2. Colombia's backward integration into global value chains



Notes: Backward integration is measured by the share of foreign value added in domestic gross exports. Forward integration is measured by the share of domestic value added in foreign gross exports.

Source: OECD (2019f), "Trade in value added", *https://doi.org/10.1787/data-00648-en* (accessed on 23 May 2019).

Facilitating participation in GVCs requires reducing the costs of production and improving product quality (DNP, 2018). Tariffs are low, but high non-tariff barriers and restrictive practices in many service sectors remain significant. Costs of exporting/importing, such as transport and logistics, are also high due to poor infrastructure. High costs of quality certification, due to the small number of internationally certified laboratories, are an important barrier to participating in GVCs with countries with high-quality standards, such as in North America and Europe (Central Bank of Colombia, 2014; CONPES, 2019a).

Colombian firms have recently been slowly refocusing their backward linkages towards more advanced economies, which may be regarded as a gradual shift up the GVC. Business services and creative industries, in particular, have been increasing their contribution to OECD countries' final demand in value-added terms, although their level remains low. These services have a high degree of digitalisation, rely heavily on data and data analytics, and are likely to be deeply transformed by fast developments in artificial intelligence (AI) in the forthcoming years. Further development of advanced services is therefore essential to sustain growth in Colombia and to strengthen its integration in GVCs (see Chapter 4).

Increasing productivity through digital uptake

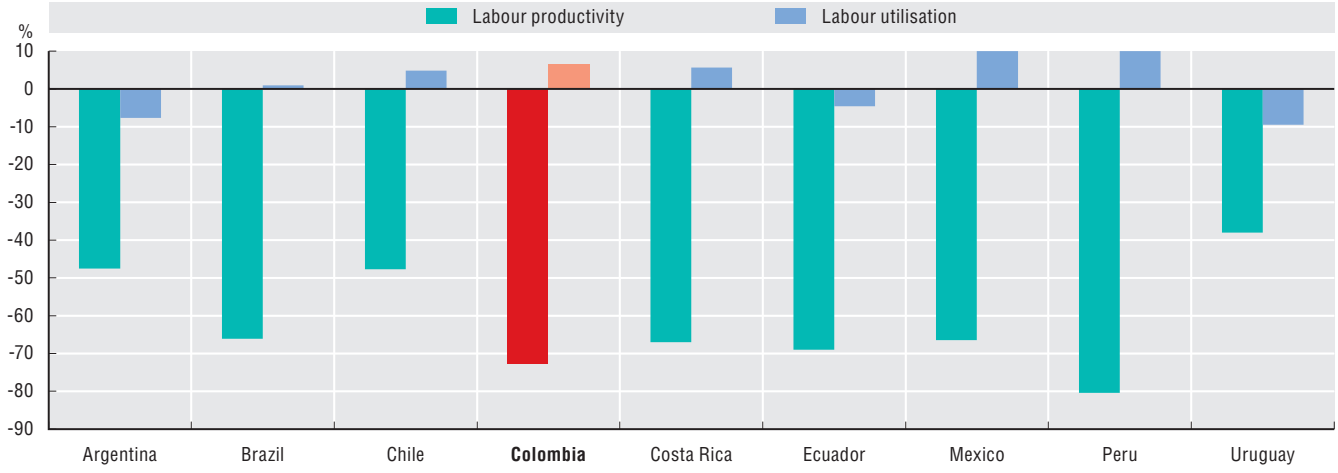
Colombian firms suffer from low productivity, which implies low wages and living standards. In 2018, the productivity gap with the OECD was larger in Colombia than in any other LAC country except Peru (Figure 1.3).

As part of the National Development Plan (Plan Nacional de Desarrollo [PND]), the government is promoting the use of ICTs in firms in order to raise productivity. Although ICT statistics show that adoption is in line with other OECD countries for medium-sized enterprises, this masks the fact that Colombia has a large number of microenterprises (firms with less than ten employees), which are not reported in OECD statistics.

Low competitive pressure seems to weaken incentives for firms to adopt ICTs. Over 90% of microenterprises that do not make use of ICTs report a lack of necessity as the reason for not using them (DANE, 2017). In addition, the particularly large dispersion of productivity between large and small firms and among subnational regions, as well as the low share of medium-sized firms (MGI, 2019), suggest inefficient allocation of resources and a lack of competitive forces to push out less-productive firms (Brown et al., 2016). In 2016, on average, labour productivity of micro, small and medium-sized enterprises (SMEs) in LAC countries was, respectively, 46%, 23% and 6% of large firms' productivity (OECD, 2019b).

Figure 1.3. Differences in GDP per capita accounted for by labour productivity and utilisation, 2018

Percentage difference from the OECD average



Notes: Labour productivity is measured as GDP per hour worked. Labour utilisation is measured as the ratio of total hours worked to total population.

Source: OECD, based on Conference Board, *Total Economy Database*, *https://www.conference-board.org/data/economydatabase/TED1* (accessed on 4 June 2019).

Although investment has been steadily increasing since 2000, Colombia suffers from poor infrastructure and high transport costs (DNP, 2018). Recent increases in investment can mainly be attributed to the mining sector. Despite significant improvements over recent years, the transport and logistics infrastructure remains less developed than in OECD or other Latin American countries (OECD, 2017c).

Investments are particularly needed in the telecommunication sector to expand and upgrade networks, increase access to the Internet, and improve the overall quality of the communication infrastructure (see Chapter 2). Indeed, broadband infrastructures are the backbone for trade in services and integration in GVCs.

Colombia has the lowest fixed broadband penetration among OECD countries. Most fixed broadband subscriptions are cable subscriptions and, despite a sharp increase in fibre connections in recent years, fibre penetration in Colombia (13% of all broadband connections) still lags well behind the OECD average (25%). This is reflected in the average connection speed for fixed broadband networks, where Colombia ranks well below the OECD average and its Latin American peers. Investments in mobile communication infrastructure rose until 2011, but have been declining since. There is a need to encourage investment to increase the availability of mobile services, especially in relation to 4G networks and their future upgrading to 5G.

To reduce these large infrastructure gaps, Colombia needs to sustain and amplify its public investment effort. Public investment to GDP has increased over the last decade and since 2012 has been above the OECD average. However, the level of investment per capita remains less than the OECD average. To foster infrastructure development and productivity growth, public investment in Colombia needs to be better articulated in coherent territorial strategies (OECD, 2016c). Greater horizontal co-operation is required, as for many development and investment projects the relevant scale goes beyond administrative boundaries. The lack of financial incentives to support cross-jurisdictional co-operation appears to be a significant obstacle.

Using digital opportunities to tackle informality

Informality has important implications for productivity, economic growth and income inequality (Jütting and de Laiglesia, 2009; Loayza, Serven and Sugawara, 2009; Dougherty and Escobar, 2013). To reduce high informality rates, policies should aim at further reducing non-wage labour costs; simplifying the complex procedures for the registration of companies and the affiliation of workers to social security (CONPES, 2019b).

Digitalisation can help to reduce informality. Colombia has already used technology to simplify business and worker registration (see Chapter 3). Continuing this simplification, with initiatives such as the Ventanilla Única Empresarial (one-stop shop) for licencing and business registration, could further foster formalisation (OECD, 2017c). In addition, technology can be used to enforce tax collection, as shown by the positive experience of other countries. For example, in Hungary a requirement for businesses to have electronic cash registers led to a significant increase in tax revenues. Finally, the use of algorithms to analyse the data collected by the tax administration can improve the detection of tax evaders (OECD, 2018b).

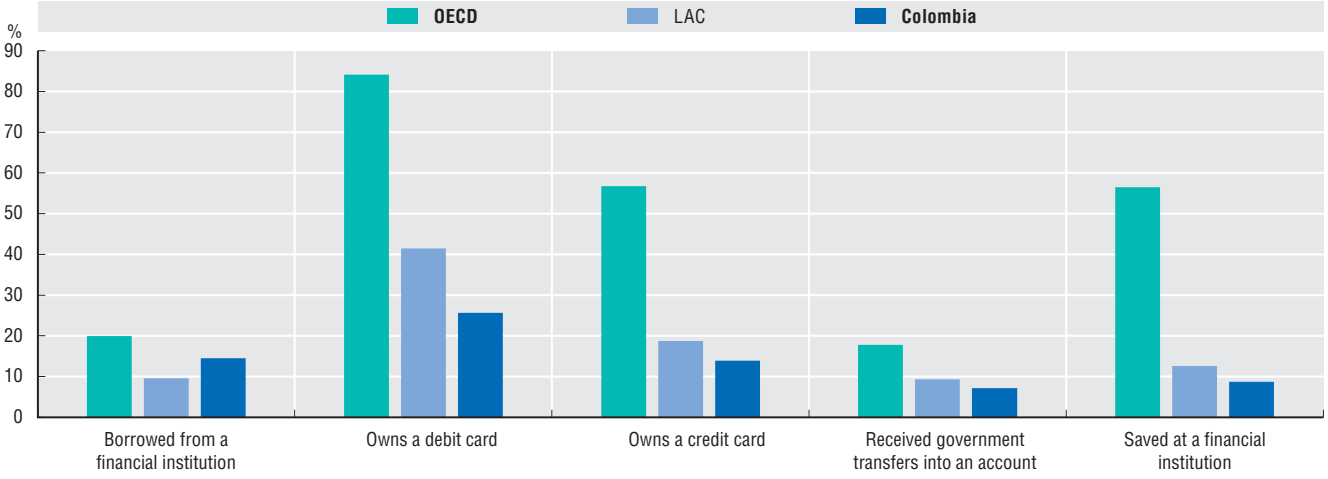
More efficient tax collection would increase the revenues from personal income taxes and make it possible to lower the relatively high corporate income tax rates, thus fostering growth and productivity (OECD, 2015a). It could help Colombia to increase the redistribution of income through the tax and transfer system. Little redistribution is currently taking place compared to OECD and many Latin American countries after considering taxes and transfers (OECD, 2017c).

Cash payments are at the core of informality. Promoting the uptake of digital tools of payment would reduce the scope for cash transactions and help informal economic activities to be unveiled. In particular, diffusion of e-wallets and other innovative payment methods could reduce the use of cash even for small transactions and at a negligible cost for the users (DNP, 2018).

Financial inclusion has been an important priority for the government for a number of years. Policies have mainly aimed at providing microcredit to the poor; spreading the use of the formal banking system; enhancing the use of electronic payments; and making financial services more affordable (Karpowicz, 2014). Despite steady improvements, financial inclusion is still relatively low (Figure 1.4), contributing to income inequality (Park and Mercado, 2015). The use of financial services is low and costs are high.

Figure 1.4. Participation in formal finance, 2017

As a percentage of the population aged 15 and above



Notes: OECD aggregate excludes Hungary, Iceland, Latvia, Mexico and Turkey. LAC refers to 23 countries and territories in Latin America and the Caribbean.

Source: World Bank (2017), *Global Findex Database 2017*, *https://globalfindex.worldbank.org/#data_sec_focus* (accessed on 4 June2019).

Digital platforms could help boost labour market formality. The use of online platforms to formalise word-of-mouth transactions can allow tax authorities to gain data on such transactions (OECD, 2018d). Countries take a variety of approaches to facilitate data sharing and reporting to labour inspection and taxation authorities. The development of a platform economy also requires clarification of the regulatory framework (see Chapter 5).

Enhancing skills for the digital transformation

Education and skills development play a key role in making growth more inclusive and raising productivity. Skills are also the most important and cross-cutting asset for effective use of digital technologies.

At present, many Colombians seem to lack the foundational skills to take advantage of the digital transformation. Only half of adults have an upper secondary education, compared to about three-quarters in the OECD (OECD, 2017a, 2016b). While there have been significant improvements in attainments in the past decade, many younger Colombians continue to leave school without the skills necessary for the future. More than 60% of students enrolled in secondary education do not have the basic skills necessary to participate in the formal labour market (OECD, 2015c). In addition, the urban-rural divide in school enrolment is wide for both lower and upper secondary education.

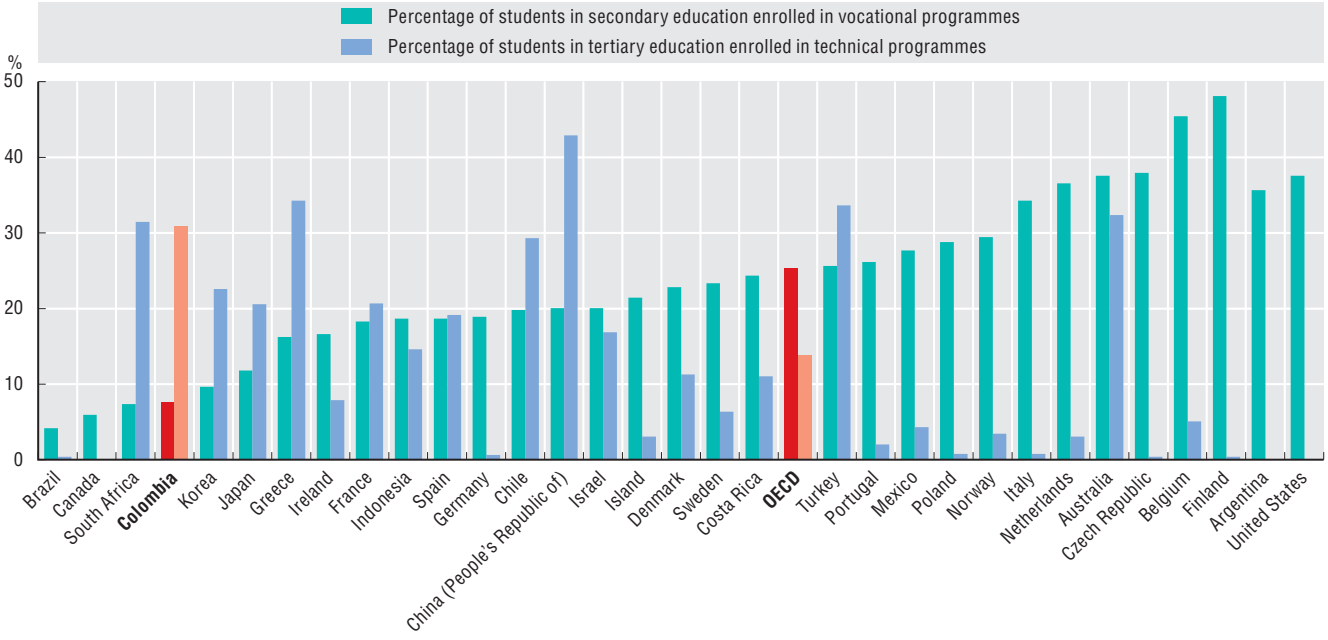
Increased sophisticated use of ICTs will require greater skills among users. Many computer users lack some basic computer skills, with a quarter of them unable to send emails with attachments, and a third unable to attach additional devices, such as printers (see Chapter 3). Colombia has a large number of computers per student, higher even than advanced countries such as Denmark and Sweden. However, only two-thirds of these are connected to the Internet.

The success of firms in the digital era depends not only on having workers with good literacy, numeracy, problem solving and generic ICT skills used at work, but increasingly on ICT specialists and data specialists.

About 30% of Colombian companies identify difficulties in finding skilled workers as the main obstacle to productivity growth (WEF, 2015). The most pressing skill shortage concerns technical workers, but the share of students enrolled in professional and technical degrees in Colombia is low, even in comparison to other EMEs (Figure 1.5). Skills shortages also contribute to poor managerial quality, which can hinder the adoption of innovative new technologies in firms (Andrews, Nicoletti and Timiliotis, 2018).

Figure 1.5. Students enrolled in professional and technical programmes, 2016

As a proportion of all students enrolled



Notes: Technical/vocational enrolment in secondary education (ISCED 2 and 3) includes teacher training. Enrolment in technical tertiary education is the enrolment at ISCED Level 5B programmes.

Source: UNESCO (2019), *UNESCO Institute for Statistics Database*, *http://data.uis.unesco.org* (accessed on 4 June 2019).

Increased public support will be required to the regions that are lagging behind in order to raise the quality of primary education. A national curriculum framework for school education should also be established, which would help set high and equal expectations for all children and provide guidance to teachers on what students should be learning at each stage. This should be complemented with the development of professional standards, improved teacher training and professional development (OECD, 2016b).

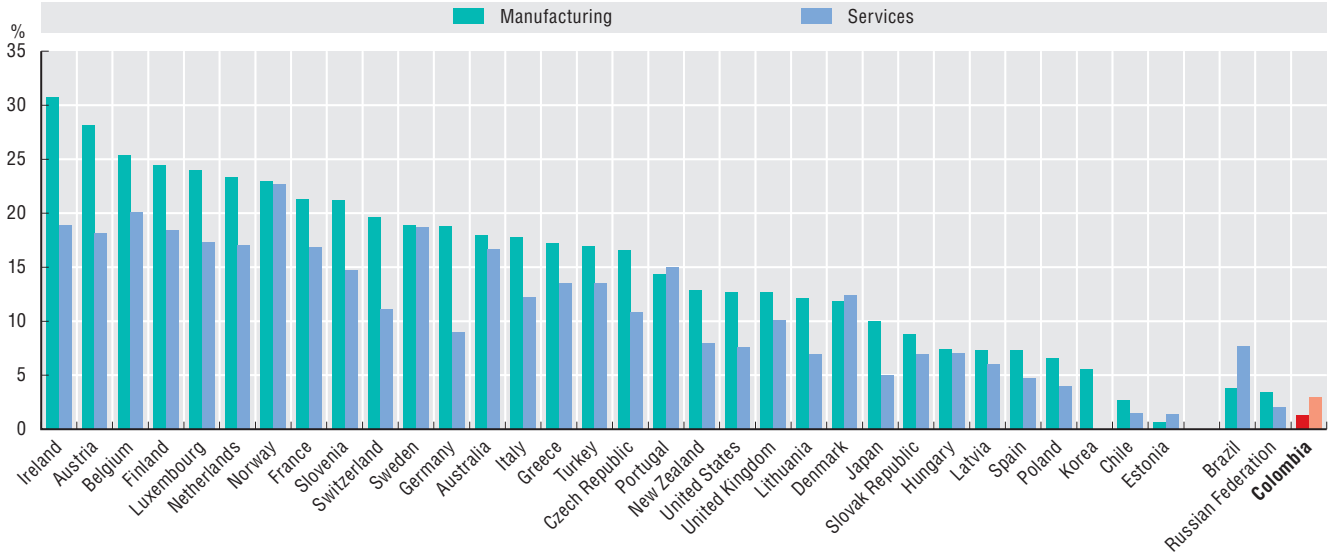
Promoting digital innovation

To use digital technologies effectively, firms need to invest not only in digital skills, but also in knowledge-based capital, including data, organisational change and complementary skills that enable high-performance work practices (OECD, 2017b). The improvements in the educational system, therefore, should be complemented with better innovation policies to generate knowledge-based capital.

Colombia's innovation system is still modest and lacks a strong business core. Research and development (R&D) expenditure is low at 0.2% of GDP, compared to 2.4% in the OECD (OECD, 2015b). Only 30% of total R&D is performed by the business sector, compared with 70% on average for OECD countries. Colombian firms engage little in innovation and only a small portion of firms introduce new products (Figure 1.6).

Figure 1.6. Firms introducing products new to the market, manufacturing and services, 2012-14

As a percentage of all firms in each sector within the scope of national innovation surveys



Note: Data for Colombia refer to 2014-15 (services) and 2013-14 (manufacturing).

Source: OECD (2019d), *OECD Innovation Statistics and Indicators* (database), *http://oe.cd/inno-stats* (accessed on 4 June 2019).

Framework conditions for innovation have improved significantly in Colombia in recent years, but there is scope for improvement. Efforts aimed at increasing the efficiency and effectiveness of innovation require improvements in knowledge diffusion channels. It is therefore essential to strengthen collaboration between businesses, education and research institutions, which is weak in Colombia.

The government has several strategies to promote innovation and R&D, including ICT-related innovation. However, there seems to be a large number of programmes with limited resources and, in some cases, overlapping objectives (see Chapter 5).

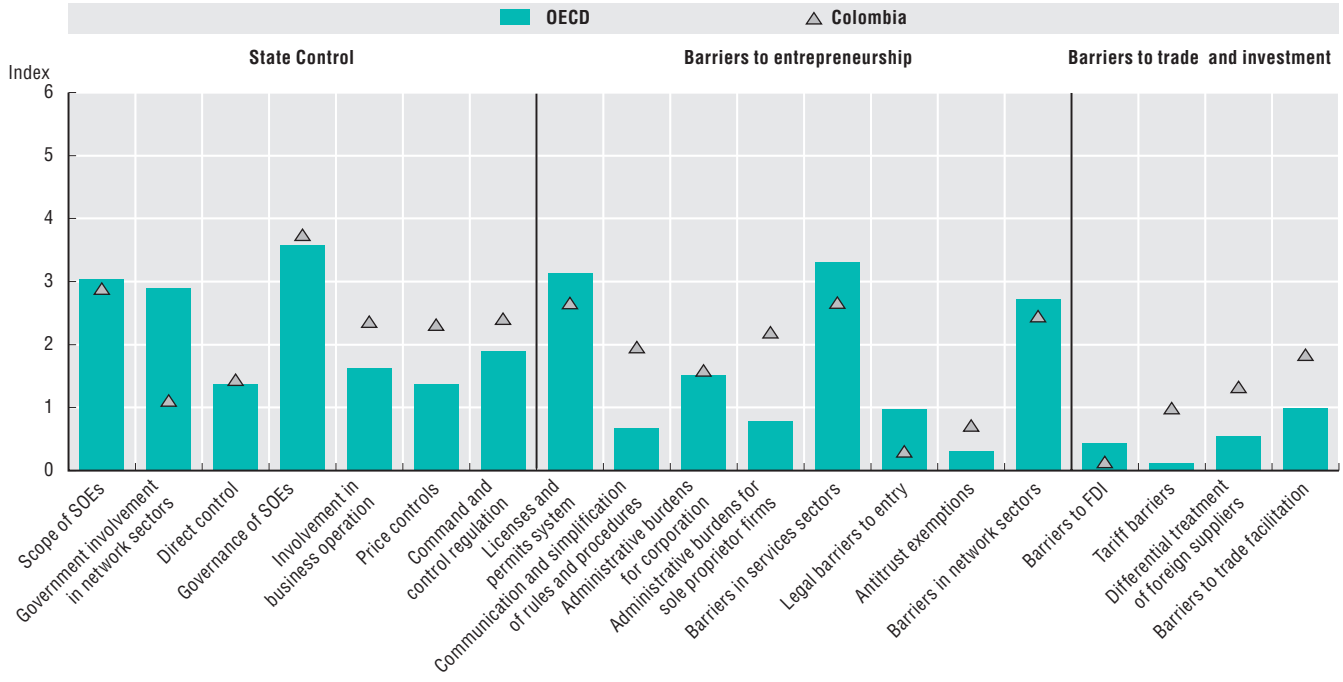
Setting a regulatory framework conducive to digitalisation

Colombia has significantly improved its regulatory environment over the last decade by simplifying the process to start a business, pay taxes and resolve insolvency, as well as by reducing entry costs and barriers to entrepreneurs. Colombia now ranks around the OECD average in about half of the

dimensions of product market regulation. However, product market restrictiveness remains above the OECD average in some important areas, such as the state's involvement in business operations, regulatory procedures in some sectors and competition in some network sectors (Figure 1.7).

Simulations suggest that aligning product market regulation with OECD best practices could boost GDP by 0.25% to 0.50% annually over five years (OECD, 2016a).

Figure 1.7. Product market restrictiveness, 2013



Note: SOE = state-owned enterprise; FDI = direct foreign investment. The OECD Product Restrictiveness Index scales from 0 to 6, from least to most stringent.; FDI: foreign direct investments. More information is available at: *www.oecd.org/economy/reform/indicators-of-product-market-regulation/*.

Source: OECD (2018c), *OECD Product Market Regulation Statistics* (database), *https://doi.org/10.1787/pmr-data-en*.

The costs of doing business in Colombia are exacerbated by the difficulties in enforcing contracts through the judicial system (World Bank, 2018; DNP, 2018). Enforcing a standard debt contract takes much more time than in OECD countries and other EMEs; and the experience of other LAC countries shows that the cost of lengthy procedures is particularly high for young firms (Arnold and Flach, forthcoming).

Getting regulation right in the telecom industry is essential for the development of broadband services, access to the Internet and uptake of advanced digital technologies. Colombia has taken steps to strengthen the independence of the communication regulator (the Commission for Communications Regulation [Comisión de Regulación de Comunicaciones, CRC]) following the main recommendations of the *OECD Review of Telecommunication Policy and Regulation* (OECD, 2014). The trend towards convergence of the telecommunication, broadcasting and content industries observed in many OECD countries calls for the prompt development of a converged regulatory framework in Colombia. The recently approved bill on the modernisation of the ICT sector aims to address these issues (see Chapter 2).

Policies for digital transformation in Colombia

Over the last decade, digitalisation policies in Colombia have been organised around three components. The first one is the ICT Law issued in 2009, which established the Information Technologies and Communications Fund (Fondo para las Tecnologías de Información y las Comunicaciones) "to finance plans, programs and projects to primarily facilitate universal access and universal service" (Law 1341 of 2009).

The second component consists of three PNDs issued in 2010-14, 2014-18 and 2018-22. The PND is the formal and legal instrument that establishes the objectives of government, setting programmes, investments and goals for a four-year period.

The third component are the ICT strategic sectoral plans set by the Ministry of Information and Communication Technologies (Ministerio de Tecnologías de la Información y Comunicaciones [MinTIC]): Live Digital (Vive Digital) (2010-14); its follow-up Live Digital for the People (Vive Digital para la Gente) (2014-18); and the newly launched The Digital Future is for All (El Futuro Digital es de Todos) (2018-22).

The PND 2018-2022 puts forward a Pact for the Digital Transformation of Colombia (Pacto por la Transformación Digital de Colombia) (DNP, 2018) with four main objectives:

1. promote the digital transformation of society and close the digital divide among individuals, businesses and territories
2. foster productivity in the government and in businesses through advanced digital technologies, e.g. big data, AI and the Internet of Things
3. foster investment and skills development for Industry 4.0
4. promote entrepreneurship, particularly for technology-based start-ups and in creative industries.

To achieve these objectives, the PND sets two major goals with several targets to be achieved by 2022 (Table 1.1).

Table 1.1. Pact for the Digital Transformation of Colombia 2018-22

Main targets

Colombia connects: Broadband deployment and digital inclusion for all Colombians	Towards a digital society and Industry 4.0: A more efficient, effective and transparent relationship among markets, citizens and the government
70% of households connected to the Internet, up from 50% in 2017	290 million digital transactions, up from 87 million in 2017
50% of households have fixed Internet, up from 38% in 2017	34 high-impact government services made available on line
80% of five-year olds and above use the Internet, up from 62% in 2017	3.5 million unique users of Servicios Ciudadanos Digitales
32 million Internet connections with more than 10 Mbps download, up from 15 million in 2017	90% of national and regional governmental entities identify and assess digital security risks, up from 11% in 2017
27 million 4G mobile Internet subscriptions, up from 12 million in 2017	50% of national governmental entities with open data or open source initiatives, up from 9% in 2017
3.57 million training courses on digital skills, up from 2.39 million in 2017	30% governmental entities use the Digital Government infrastructure, up from 18% in 2017

Source: DNP (2018), *Plan Nacional de Desarrollo 2018-2022 "Pacto por Colombia, Pacto por la Equidad"*.

The ICT strategic sectoral plan El Futuro Digital es de Todos articulates the PND around five axes (MinTIC, 2019):

- Effective use of ICTs by citizens. Citizens will trust, use and benefit from ICTs.
- Modernisation of the ICT sector. The legal and regulatory framework of the ICT sector will be updated to transform it into a modern, dynamic sector and an engine of inclusive growth.
- ICT-driven economy. The Colombian economy will be driven by a creative, innovative, entrepreneurial and export-oriented ICT sector that will become a regional leader.
- High-quality connectivity for all. Colombia will be connected to high-speed, with high-quality services at a fair price, thus closing the digital divide.
- Digitalisation of the public administration procedures and services. Colombia will achieve digitalisation of all public administration processes at the national level and of 50% at the regional level, thus becoming a regional leader in digital government.

Going Digital: An integrated policy approach in the digital age

The OECD has developed an Integrated Policy Framework to support a whole-of-government approach to coherent policy making in the digital age. The framework recognises technologies, data and business models as the driving forces underlying digital transformation, and builds on a cross-cutting analysis of the transformation across many different policy areas (OECD, 2019e). The framework itself includes seven integrated building blocks (Figure 1.8).

Figure 1.8. Going Digital Integrated Policy Framework

Source: OECD (2019a), *Going Digital: Shaping Policies, Improving Lives*, *https://doi.org/10.1787/9789264312012-en*.

These integrated building blocks do not represent discrete policy domains; rather, each of them brings together multiple policy areas (see more details on each building block below). They also do not stand in isolation, but are related to one another. This configuration underscores that leveraging the benefits and addressing the challenges of digital transformation requires identifying policy areas that are jointly affected and that need to be co-ordinated. It also underscores that all building blocks are needed to make digital transformation work for growth and well-being.

Access

Reliable communications infrastructures and services underpin the use of all digital technologies, and facilitate interactions between connected people, organisations and machines. Similarly, the data that flow through networks are also emerging as a source of value in the digital era, but their productive use is predicated on their availability.

As reliable communications infrastructures and services are essential to digital transformation, the first integrated building block concerns access to data, communications infrastructures and services (e.g. fibre optic backhaul, towers, spectrum, international cables), encompassing efficient, reliable and widely accessible broadband communication networks and services and key complementary enablers, (e.g. a co-ordinated system of international domain names, increasing uptake of IPv6 Internet addresses, Internet exchange points), data, software, and hardware. These act as the technical foundations for an open, interconnected and distributed Internet that enables both the global free flow of information and, more generally, digital transformation. Multiple policy domains need to be considered to ensure access, including: communications infrastructures and services, competition, investment, and regional development.

Use

Access to digital networks provides the technical foundation for the digital transformation of the economy and society, but does not necessarily ensure widespread diffusion of digital tools and their effective usage, which are needed for individuals, governments and firms to reap the benefits of digital transformation through increased participation, innovation, productivity and well-being. Diffusion and effective use crucially depend on investments in ICTs, complemented by investments in knowledge-based capital, including data and organisational change; on a favourable business environment (e.g. one that fosters business dynamism); on the availability and allocation of skills; and on trust. Therefore, multiple policy domains need to be considered under use: digital government, investment, business dynamism and SMEs, education and skills, and digital security and privacy.

Innovation

Innovation – another integrated building block – pushes out the frontier of what is possible, driving job creation, productivity growth, and sustainable growth and development. Digital innovation, in particular, has driven radical changes in the ways people interact, create, produce and consume. Digital innovation not only gives rise to new and novel products and services, it also creates opportunities for new business models and markets, and can drive efficiencies in the public sector and beyond. In addition, digital technologies and data drive innovation in a wide range of sectors, including education, health, finance, insurance, transport, energy, agriculture and fisheries, as well as the ICT sector itself. Multiple policy domains need to be considered to foster innovation, including entrepreneurship and SMEs; science and technology; competition; digital government; and sectoral policies such as energy, finance, education, transport, health and education, among others.

Jobs

Digital transformation has already begun to change the nature and structure of organisations and markets, raising important questions about which jobs might disappear and where new ones will come from, what they will look like and which skills will be required. At the same time, issues around who might be the most affected and what can be done to foster new job creation and to align skills development with the changing skills requirement of jobs have emerged. Technological advances and the introduction of new business models have given rise to the "platform economy" and have led to the emergence of new forms of work such as "crowd work", "gig work" and other forms of on-demand labour. Making sure that digital transformation leads to more and better jobs will depend on the kind of policies that accompany it, including in the areas of labour markets, education and skills, and social protection; since the impacts may be concentrated in some industries and regions, sectoral and regional policies will be important, too.

Society

Digital transformation affects society and culture in complex and interrelated ways, as digital technologies change the ways in which individuals, firms and governments interact among and with one another. For digital transformation to work for growth and well-being, it is essential that public policies support a positive and inclusive digital society. To do so, multiple policy domains need to be considered: social policies (e.g. housing and welfare), education and skills, tax and benefit policies, environment, health, and digital government. Digital transformation changes the distribution of benefits, raising the question of where life is getting better, and for whom, making social policies an important part of the policy toolbox. In particular, social policies can help address a range of digital divides.

Trust

Trust is fundamental to the digital transformation; without it, individuals, firms and governments won't fully use digital technologies, and an important source of potential growth and social progress will be left unexploited. Countries may benefit from greater cross-border co-operation if they develop comprehensive and coherent national strategies for digital security and privacy to address issues such as the protection of personal data, the resilience of essential services (e.g. water, energy, finance, public health and safety), the creation of incentives (e.g. cyber insurance, public procurement), support to SMEs and related skills development, in consultation with all relevant stakeholders. At the same time, it is important to continue promoting effective protection to consumers engaged in e-commerce and other online activities, as this will help the digital economy flourish as well as be inclusive.

Market openness

Digital technologies are transforming the environment in which firms compete, trade and invest. Market openness policies related to trade, investment, financial markets, competition and taxation play an important role in ensuring that favourable conditions exist for the digital transformation to flourish. Digital transformation also affects market openness policy domains, raising opportunities and posing challenges. Governments could benefit from periodically reviewing market openness policies and, where appropriate, update them to ensure that they are well suited to making digital transformation work for growth and well-being.

Going Digital in Colombia

This Review examines opportunities and challenges raised by digitalisation in Colombia in the areas highlighted above. It also looks at the policies in place and makes recommendations to improve them, based on the Going Digital Integrated Policy Framework. The Review focuses on selected components of the framework according to priorities expressed by the Colombian government.

Chapter 2 examines trends and structural features of the telecommunication market and discusses the institutional framework for sectoral regulation to enhance access and use of communication services.

Chapter 3 reviews recent trends in the use of digital technologies by individuals, businesses and the government in Colombia; analyses the skills required to use these technologies effectively; and provides policy recommendations.

Chapter 4 analyses recent changes in the economic structure of Colombia and examines how digital policies are interacting with several areas, including industrial and trade policies.

Chapter 5 examines opportunities and challenges raised by digitalisation in two key areas – innovation and skills – and analyses key policies in these areas and provides recommendations.

Chapter 6 reconsiders the policies analysed in the other chapters in relation to their coherence among policy domains and across levels of government and makes recommendations for Colombia's Digital Strategy.

References

Andrews, D., G. Nicoletti and C. Timiliotis (2018), "Digital technology diffusion: A matter of capabilities, incentives or both?", *OECD Economics Department Working Papers*, No.1476, OECD Publishing, Paris, *https://doi.org/10.1787/7c542c16-en*.

Arnold, J. and L. Flach (forthcoming), "Structural policies and the productivity of firms in Brazil", *OECD Economics Department Working Papers*, OECD Publishing, Paris.

Brown, J.D. et al. (2016), "Productivity convergence at the firm level: New evidence from the Americas", in: Thompson Araujo, J. et al. (eds.), *Understanding the Income and Efficiency Gap in Latin America and the Caribbean*, The World Bank, Washington, DC, *http://dx.doi.org/10.1596/978-1-4648-0450-2_ch5*.

Central Bank of Colombia (2014), "Una visión general de la política comercial colombiana entre 1950 y 2012", *Borradores de Economiá*, No. 817, Central Bank of Colombia, Bogotá, *www.banrep.gov.co/sites/default/files/publicaciones/archivos/be_817.pdf*.

CONPES (2019a), "Política Nacional de Laboratorios: Prioridades para mejorar el cumplimiento de estándares de calidad", Documento CONPES, No. 3957, National Council for Social and Economic Policy, Bogotá, *https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3957.pdf*.

CONPES (2019b), "Política de Formalización Empresarial", Documento CONPES, No. 3956, National Council for Social and Economic Policy, Bogotá, *https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3956.pdf*.

Cory, N. (2017), "Cross-border data flows: Where are the barriers, and what do they cost?", Information Technology & Innovation Foundation, *www2.itif.org/2017-cross-border-data-flows.pdf?_ga=2.219653402.2080636828.1533311065-794592145.1533311065*.

Criscuolo, C., J. Timmis and N. Johnstone (2015), "The relationship between GVCs and productivity", background paper for the Global Forum on Productivity, OECD, Paris, *www.oecd.org/global-forum-productivity/events/Relashionship_btween_GVCs_and_productivity_6_09_2016.pdf*.

DANE (2019), "Principales agregados macroeconómicos, base 2015", *Cuentas Nacionales Anuales* (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales* (accessed on 15 April 2019).

DANE (2018), "International trade: Exports", National Administrative Department of Statistics, *www.dane.gov.co/index.php/en/statistics-by-topic-1/foreign-trade/international-trade-exports* (accessed on 12 August 2018).

DANE (2017), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación – TIC en microestablecimientos", National Administrative Department of Statistics, *https://www.dane.gov.co/index.php/en/statistics-by-topic-1/technology-and-innovation/information-and-communication-technology-ict/basic-ict-indicators-in-enterprises* (accessed on 12 August 2018).

DNP (2018), *Plan Nacional de Desarrollo 2018-2022 "Pacto por Colombia, Pacto por la Equidad"*, National Planning Department.

Dougherty, S. and O. Escobar (2013), "The determinants of informality in Mexico's states", *OECD Economics Department Working Papers*, No. 1043, OECD Publishing, Paris, *https://doi.org/10.1787/5k483jrvnjq2-en*.

IDB and Finnovista (2017), "Fintech: Innovations you may not know were from Latin America and the Caribbean", Inter-American Development Bank, *http://dx.doi.org/10.18235/0000703#sthash.KPMCQIZ3.dpuf*.

Jütting, J. and J. de Laiglesia (2009), *Is Informal Normal?: Towards More and Better Jobs in Developing Countries*, Development Centre Studies, OECD Publishing, Paris, *https://doi.org/10.1787/9789264059245-en*.

Karpowicz, I. (2014), "Financial inclusion, growth and inequality: A model application to Colombia", *IMF Working Papers*, No. 14/166, International Monetary Fund, Washington, DC, *https://www.imf.org/external/pubs/ft/wp/2014/wp14166.pdf*.

Kowalski, P. et al. (2015), "Participation of developing countries in global value chains: Implications for trade and trade-related policies", *OECD Trade Policy Papers*, No. 179, OECD Publishing, Paris, *https://doi.org/10.1787/5js33lfw0xxn-en*.

Loayza, N. V., L. Serven and N. Sugawara (2009), "Informality in Latin America and the Caribbean", *Policy Research Working Paper Series*, No. 4888, The World Bank, *https://ideas.repec.org/p/wbk/wbrwps/4888.html*.

MGI (2019), *Latin America's Missing Middle: Rebooting Inclusive Growth*, McKinsey Global Institute.

MinTIC (2019), "Plan Estratégico Sectorial 2019-2022", draft, Ministry of Information and Communication Technologies, Bogotá, 20 January.

MinTIC (2015), "Vive Digital 2014-2018", English version, *https://www.slideshare.net/Ministerio_TIC/vive-digital-2014-2018-english-version* (accessed on 22 May 2019).

MinTIC (2014), "Vive Digital Colombia", *https://www.mintic.gov.co/portal/604/articles-5193_recurso_2.pdf* (accessed on 22 May 2019).

OECD (2019a), *Going Digital: Shaping Policies, Improving Lives*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264312012-en*.

OECD (2019b), *Latin American Economic Outlook 2019: Development in Transition*, OECD Publishing, Paris, *https://doi.org/10.1787/g2g9ff18-en*.

OECD (2019c), *OECD Economic Surveys: Colombia 2019*, OECD Publishing, Paris, *https://doi.org/10.1787/25222961*.

OECD (2019d), *OECD Innovation Statistics and Indicators* (database), *http://oe.cd/inno-stats* (accessed on 4 June 2019).

OECD (2019e), "Vectors of digital transformation", *OECD Digital Economy Papers*, No. 273, OECD Publishing, Paris, *https://dx.doi.org/10.1787/5ade2bba-en*.

OECD (2019f), "Trade in value added", *OECD-WTO: Statistics on Trade in Value Added* (database), *https://doi.org/10.1787/data-00648-en* (accessed on 23 May 2019).

OECD (2018a), "Detailed National Accounts, SNA 2008 (or SNA 1993): Value added and its components by activity – ISIC Rev. 4", *OECD National Accounts Statistics* (database), *https://doi.org/10.1787/data-00721-en* (accessed on 4 June 2019).

OECD (2018b), *Digital Government Review of Colombia: Towards a Citizen-Driven Public Sector*, OECD Digital Government Studies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264291867-en*.

OECD (2018c), *OECD Product Market Regulation Statistics* (database), *https://doi.org/10.1787/pmr-data-en*.

OECD (2018d), *Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS*, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264293083-en*.

OECD (2017a), *Education at a Glance 2017: OECD Indicators*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eag-2017-en*.

OECD (2017b), *OECD Digital Economy Outlook 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264276284-en*.

OECD (2017c), *OECD Economic Surveys: Colombia 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_surveys-col-2017-en*.

OECD (2016a), *Chile: Policy Priorities for Stronger and More Equitable Growth*, Better Policies, OECD Publishing, Paris, *https://doi.org/10.1787/9789264251182-en*.

OECD (2016b), *Education in Colombia*, Reviews of National Policies for Education, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264250604-en*.

OECD (2016c), *Making the Most of Public Investment in Colombia: Working Effectively across Levels of Government*, OECD Multi-level Governance Studies, OECD Publishing, Paris, *https://doi.org/10.1787/9789264265288-en*.

OECD (2015a), *OECD Economic Surveys: Colombia 2015*, OECD Publishing, Paris, *https://doi.org/10.1787/eco_surveys-col-2015-en*.

OECD (2015b), *OECD Science, Technology and Industry Scoreboard 2015: Innovation for Growth and Society*, OECD Publishing, Paris, *https://doi.org/10.1787/sti_scoreboard-2015-en*.

OECD (2015c), *Universal Basic Skills: What Countries Stand to Gain*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264234833-en*.

OECD (2014), *OECD Review of Telecommunication Policy and Regulation in Colombia*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264208131-en*.

Park, C.-Y. and R.V. Mercado, Jr. (2015), "Financial inclusion, poverty and income inequality in developing Asia", *ADB Economics Working Paper Series*, No. 426, Asian Development Bank, Manila, *http://hdl.handle.net/11540/2272*.

UNCTAD (2015), "International trade in ICT services and ICT-enabled services: Proposed indicators from the Partnership on Measuring ICT for Development", *UNCTAD Technical Notes on ICT for Development*, No. 3, United Nations Conference on Trade and Development, *http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d03_en.pdf*.

UNESCO (2019), *UNESCO Institute for Statistics Database*, *http://data.uis.unesco.org* (accessed on 4 June 2019).

WEF (2015), *The Human Capital Report 2015*, Employment, Skills and Human Capital Global Challenge Insight Report, World Economic Forum in collaboration with Mercer.

World Bank (2019), *Doing Business* (database), *www.doingbusiness.org/data* (accessed on 4 June 2019).

World Bank (2017), *Global Findex Database 2017*, *https://globalfindex.worldbank.org/#data_sec_focus* (accessed on 4 June 2019).

Note

Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Chapter 2

ACCESS TO COMMUNICATION SERVICES

This chapter focuses on one of the foundations for a digital transformation: communication infrastructure and services. High-quality fixed and mobile communication networks are crucial for the further development of the Colombian digital economy, as is ready access to these networks at competitive prices.

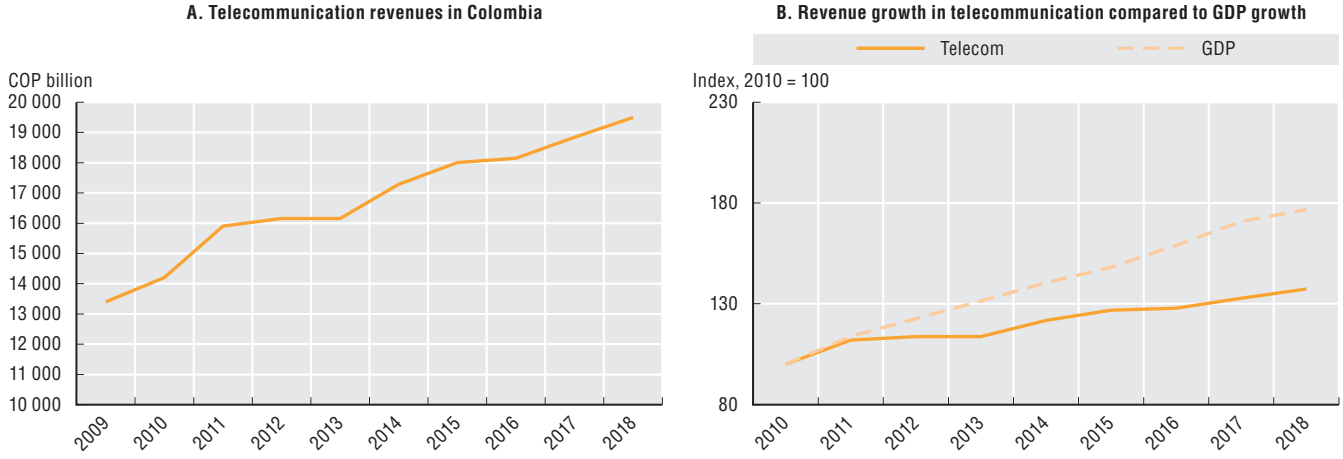
This chapter commences with an examination of the Colombian communication market. This includes a discussion of trends in the industry, including in the areas of revenues and investment, before analysing developments in access to services as well as prices in both fixed and mobile communication markets. It subsequently focuses on selected developments in market structure. The third and closing part of the chapter discusses the main regulatory and policy developments. It does so by examining the institutional framework for sectorial regulation and the activities by authorities to enhance access to and use of communication services. It also includes a discussion of Law 1978 of 2019 for the "modernisation of the ICT sector, the distribution of powers, the creation of a single authority, and other provisions", hereafter referred to as the "ICT Modernisation Law".

Developments in the Colombian communication market

Overview of the Colombian communication market

A range of indicators can be examined to assess developments in the Colombian communication market. A key starting point is the size of the communication sector and its development over recent years. In 2018, total communication revenues amounted to COP 19 500 billion, up from COP 13 400 billion in 2009 (Figure 2.1A). Revenues have been increasing constantly since 2009, which is in line with trends for countries that still have a significant level of unmet demand. Nevertheless, when comparing the industry's performance to overall gross domestic product (GDP) growth, the communication sector has done worse than the overall Colombian economy. From 2010 to 2018, Colombian GDP grew by 77%, while revenues in the communication sector only grew by 37% (Figure 2.1B).

Figure 2.1. Colombian GDP grew stronger than Colombian communication revenues



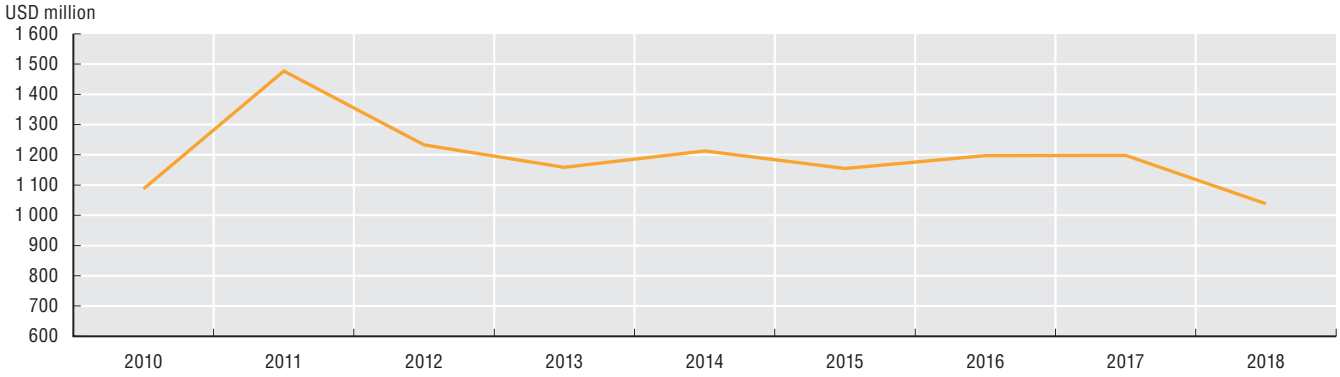
Note: GDP for 2018 is an estimate.

Source: OECD, based on CRC.

Besides revenue, the level of investments in the communication sector is also an important indicator. Investments are needed to expand networks, to upgrade networks and to improve the overall quality of the communication infrastructure in any country. Investments in mobile communication infrastructure rose between 2008 and 2011, but have been fluctuating around USD 1 200 million since and declining to USD 1038 million in 2018 (Figure 2.2). In light of the need to increase the availability of mobile services, especially when it comes to 4G networks, there is a need to encourage investment. In the future, upgrading these networks to provide 5G services will also require significant investment. There currently are no data available on overall investments in the communication sector.

Figure 2.2. Investments in mobile communication infrastructure rose until 2011, but have been stagnating since

Investments in mobile communication infrastructure in Colombia

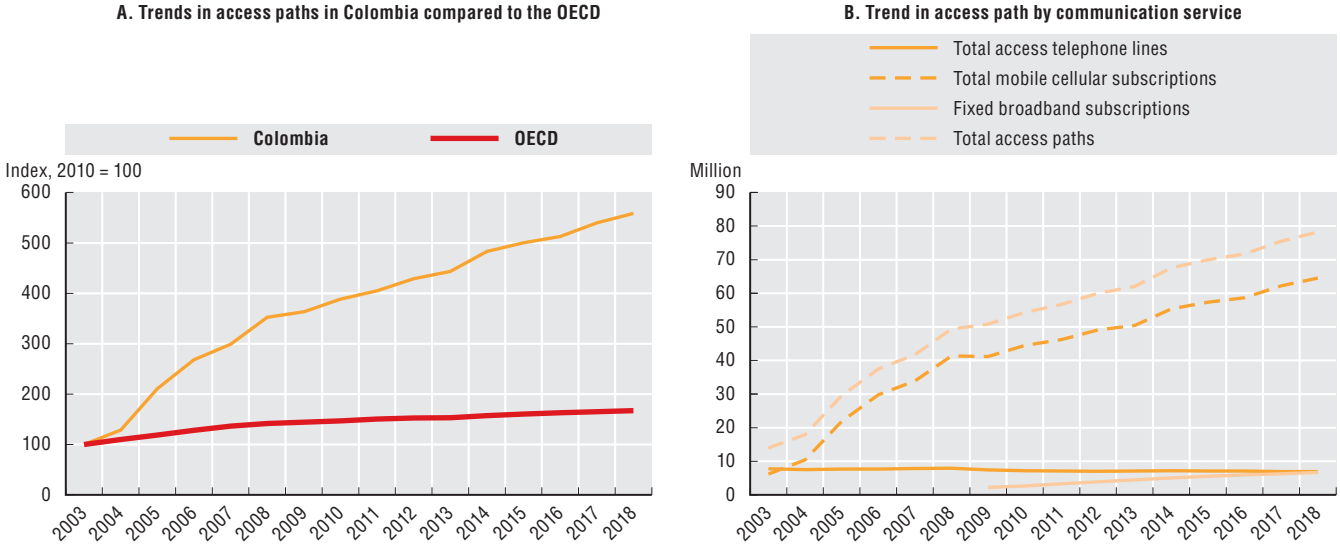


Source: GSMA Intelligence.

The number of total access paths has been growing in Colombia (Figure 2.3A). By 2018, there were 78.18 million access paths, compared to 54.32 million in 2010 (Figure 2.3B). The growth in access paths has been mainly driven by the growth in mobile subscriptions. The number of traditional fixed telephone lines is declining, which is in line with broader developments across the OECD, where users of communication services increasingly substitute fixed voice with other services such as mobile telephony.

The overall faster growth in access paths compared to the average OECD growth can be explained by the fact that Colombia needs to close an important gap with other OECD countries in terms of penetration, in particular with respect to fixed broadband. This is discussed in the following two sections on developments in fixed and mobile communication markets.

Figure 2.3. The number of total access paths has been growing, mainly driven by growth in mobile subscriptions



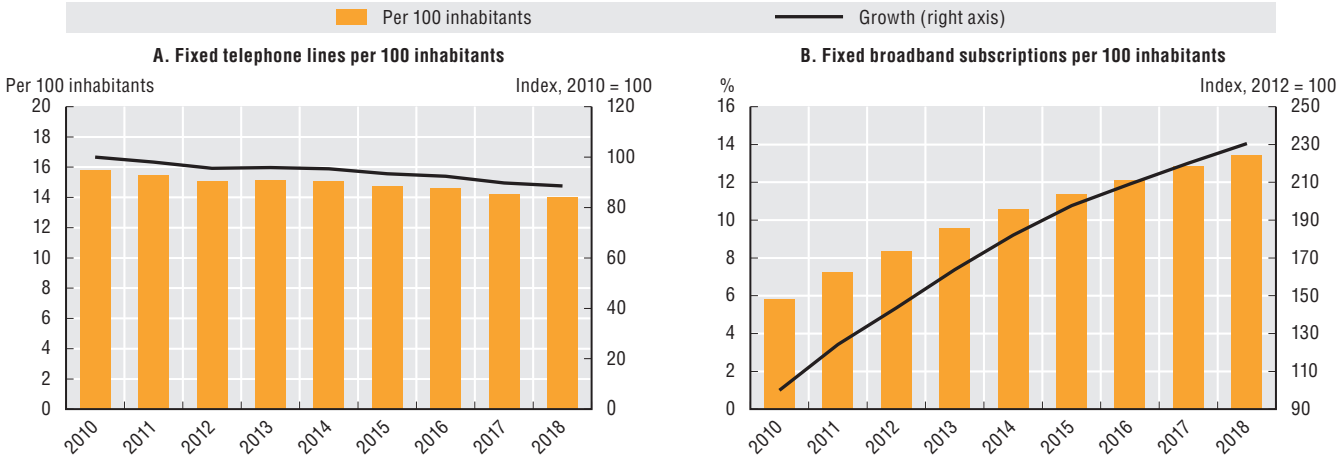
Source: OECD, based on CRC.

Fixed networks and quality of fixed networks

In recent years, the use of fixed communication infrastructure has evolved in different ways. The number of fixed telephone lines has slightly decreased, from 15.8 lines per 100 inhabitants in 2010 to 14.0 lines in 2018 (Figure 2.4A). Meanwhile, access has increased for fixed broadband (Figure 2.4B). Between 2012 and 2018, the penetration rate for fixed broadband subscriptions rose from 8.4 to 13.4 subscriptions

per 100 inhabitants. While Colombia had a higher year-on-year growth rate than the OECD average in 2017-18 (2.2%), its growth rate for fixed broadband subscriptions (4.4%) ranks after its peers Mexico (6.7%) and Chile (4.8%). More progress is needed to close the gap with other OECD countries.

Figure 2.4. Fixed telephone lines slightly decreased while fixed broadband subscriptions rates increased

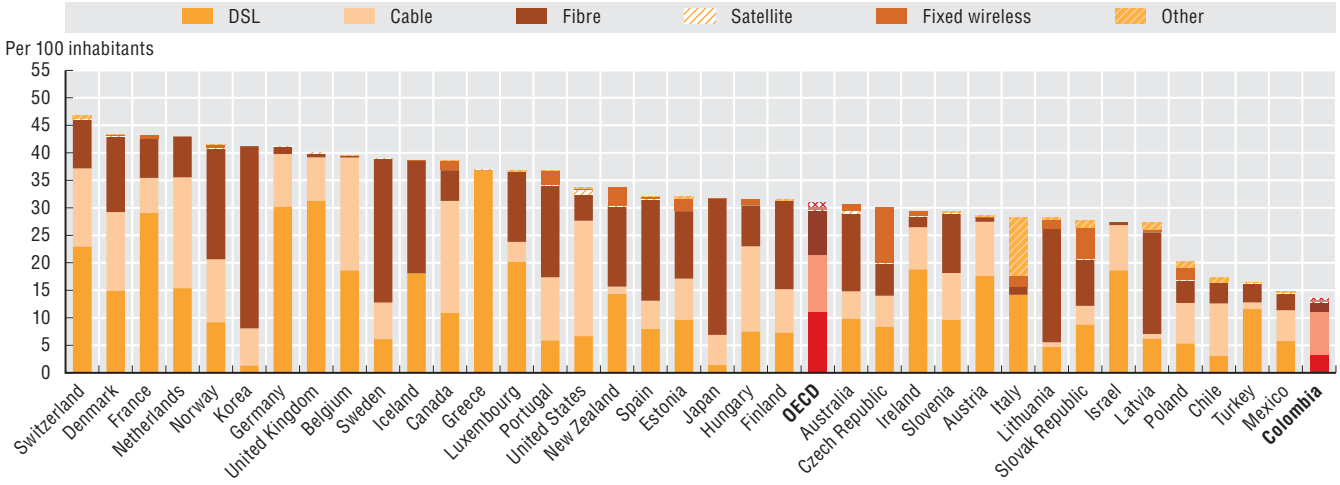


Source: OECD, based on CRC.

Compared to other OECD countries, Colombia has the lowest fixed broadband penetration, after Mexico, Turkey and Chile (Figure 2.5). While broadband growth in many Latin American countries is driven by mobile broadband, fixed broadband plays an important role in further increasing overall connectivity and in contributing to the quality of service (QoS) over all networks. As is the case for all OECD countries, fixed broadband networks can provide greater speeds. This is especially true for fibre connections. In addition, fixed networks play a critical role by offloading traffic from wireless networks. By way of example, according to CISCO, some 60% of mobile data was offloaded to fixed networks through Wi-Fi or femtocells in 2016, equivalent to 10.7 exabytes per month (CISCO, 2017). This issue becomes more important with an increasing volume of mobile Internet traffic.

Figure 2.5. Colombia has one of the lowest fixed broadband penetrations

OECD fixed broadband subscriptions per 100 inhabitants, December 2018, selected countries



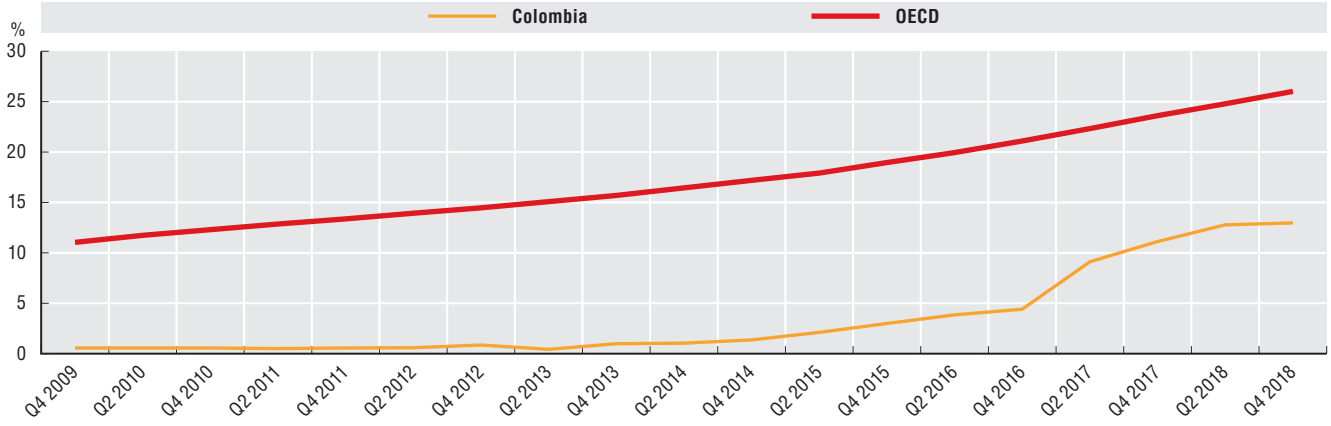
Notes: Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are not comparable with previous data for any broadband measures Australia reports to the OECD; Canada: Fixed wireless includes satellite; France: Cable data include VDSL2 and fixed 4G solutions; Italy: Terrestrial fixed wireless data include WiMax lines; Other includes vDSL services. Data for Canada, Switzerland and the United States are preliminary.

Source: OECD (2019), *Broadband Portal*, *www.oecd.org/sti/broadband/oecdbroadbandportal.htm*.

In terms of its technology mix, most of the fixed broadband subscriptions in Colombia are cable subscriptions (7.8 subscriptions per 100 inhabitants), followed by those using xDSL (3.3 subscriptions per 100 inhabitants). Fibre subscriptions in Colombia amount to 13.0% of total fixed broadband connections, compared to 21.6% in Chile and 20.1% in Mexico. Alongside the OECD average, Colombia has experienced a sharp increase in the use of fibre connections in recent years (Figure 2.6). This is a welcome development as it is one indicator of higher network capabilities stemming from greater fibre deployment. Nonetheless, despite this progress, Colombia still lags well behind the OECD average in terms of the percentage of fibre of total fixed broadband.

Figure 2.6. Colombia has experienced a sharp increase in the use of fibre connections in recent years

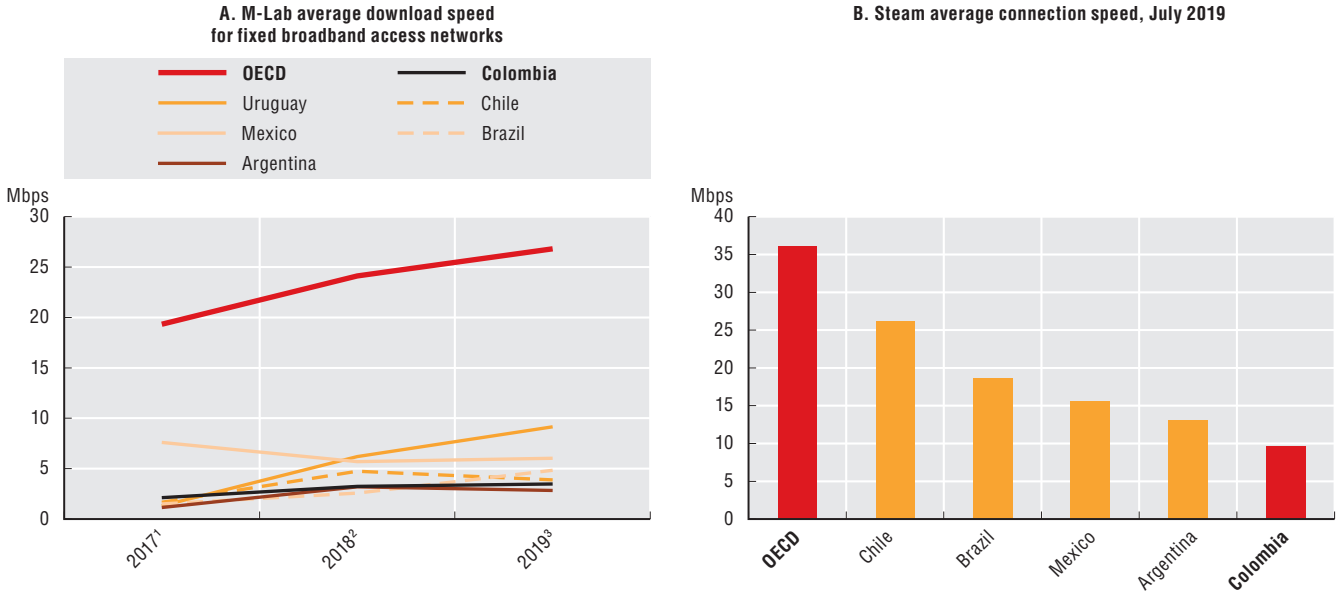
Fibre as a percentage of total fixed broadband



Source: OECD, based on CRC.

Figure 2.7. Colombia lags behind the OECD average and its Latin American peers on broadband speeds

Internet download speed, selected Latin American countries



1. Data for 2017 were measured between June 2016 and May 2017.

2. Data for 2018 were measured between June 2017 and May 2018.

3. Data for 2019 were measured between June 2018 and May 2019.

Sources: M-Lab (2019), "Worldwide broadband speed league 2019", *https://www.cable.co.uk/broadband/speed/worldwide-speed-league*; Steam (2019), *Steam download stats*, *http://store.steampowered.com/stats/content*.

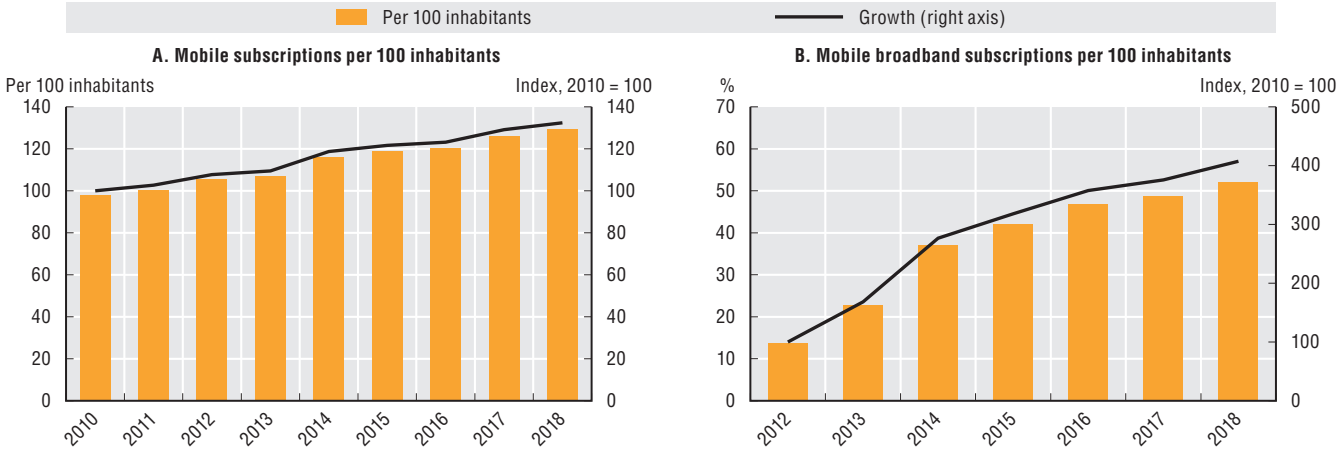
Aside from assessing the penetration of broadband use, it is equally important to evaluate the quality of networks. An important quality parameter is the speed of broadband networks. Higher network speeds are particularly necessary for demanding applications in areas such as health (e.g. medical imaging) or industry automation. Different entities measure the speed of Internet connections from their perspective. This is one reason multiple sources on speeds should be examined to provide a wider view of performance. M-Lab, for example, provides a broad view on broadband speeds due to the large amount of speed tests it compiles. For the average connection speed measured by M-Lab for fixed broadband networks, Colombia lags well behind the OECD average. It also ranks well below its Latin American peers. In 2018, the average download speed was 3.48 megabits per second (Mbps), compared to an OECD average of 26.81 Mbps and to 6.02 Mbps in Mexico and 3.89 Mbps in Chile (Figure 2.7A).

Looking at a community for which higher broadband speeds are very important is a further way to examine network capabilities in terms of the speeds experienced by users. The online gaming platform Steam, for example, collects data on the speeds experienced by gamers over fixed and mobile networks. This community is not only one of the most demanding user groups on the Internet, but also tends to be well informed and has an incentive to seek higher performance levels. As such, average speeds reported on this website are usually higher than the M-Lab data as only gamer subscriptions are being considered. In July 2019, average download speed for Colombia was 9.6 Mbps, compared to 26.2 Mbps in Chile, 15.6 Mbps in Mexico and an average of 36.1 Mbps for the OECD overall. While both sources, as would be expected, produce different benchmarks, the results are consistent for the performance of broadband speeds in Colombia in comparative terms. Overall, average network speeds are much lower than the OECD average and also for regional peers (Figure 2.7B).

Mobile networks and quality of mobile networks

The use of mobile services has been the primary driver for increasing connectivity in Colombia over recent years. From 2012 to 2018, mobile broadband subscriptions rose from 13.7 to 52.1 per 100 inhabitants, which represents a growth of 281% (Figure 2.8B). The large majority of subscriptions are voice and data subscriptions (98.5%) with few data-only plans.[1] Mobile voice subscriptions grew slower than mobile broadband subscriptions, from 97.7 subscriptions per 100 inhabitants in 2010 to 129.5 subscriptions per 100 inhabitants in 2018, which represents a growth rate of 32.5% (Figure 2.8A).

Figure 2.8. The use of mobile services has been the main driver for the increase in connectivity in Colombia

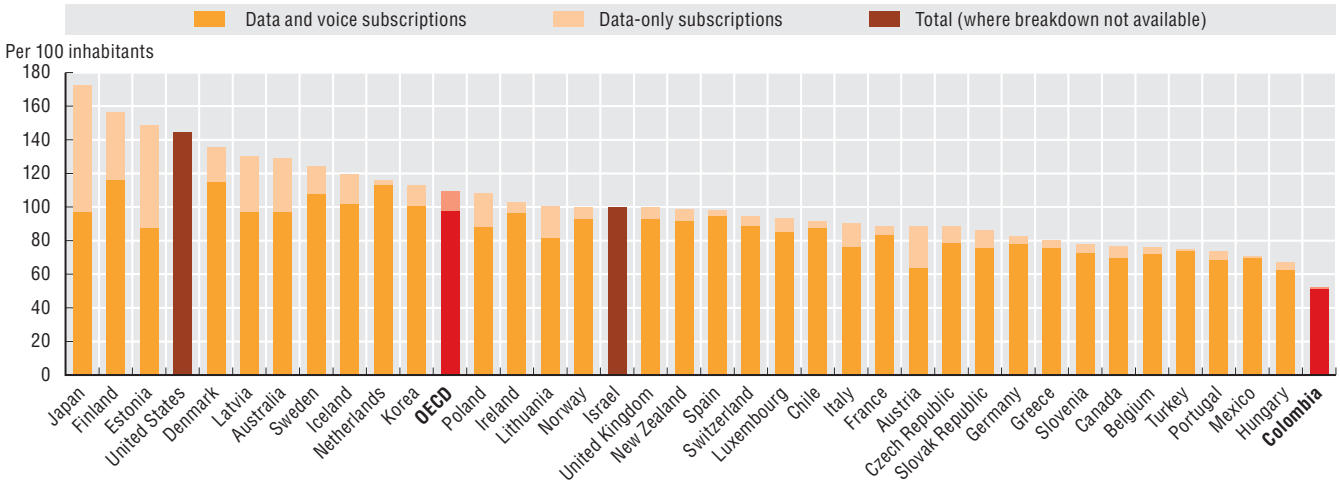


Source: OECD, based on CRC.

While the growth in mobile broadband subscriptions is laudable, it is very much needed to close the existing gap with OECD countries, both in terms of overall subscriptions and in terms of data usage. Currently, Colombia has the lowest penetration of mobile broadband among OECD countries (Figure 2.9) and a lower level of data usage. Colombian mobile broadband subscribers consume on average 1.62 gigabytes (GB) of data per month, which compares to an OECD average of 4.56 GB per month and 19.39 GB and 16.40 GB per month for the leading OECD countries Finland and Austria, respectively. It is also relevant to note that users in other countries have higher access levels to fixed network subscriptions than Colombians. In other words, they have a greater opportunity to substitute usage on these connections (e.g. using smartphones on residential Wi-Fi instead of cellular networks).

Figure 2.9. Colombia has the lowest penetration of mobile broadband among OECD countries

OECD mobile broadband subscriptions per 100 inhabitants, selected countries, December 2018



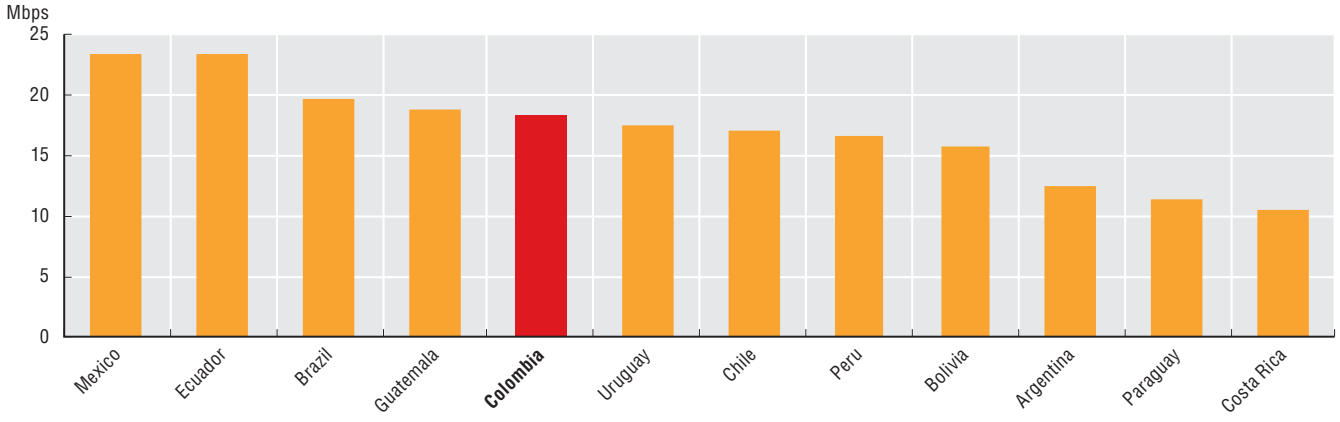
Notes: Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are incomparable with previous data for any broadband measures Australia reports to the OECD. Data for Canada, Switzerland and the United States are preliminary.

Source: OECD (2019), *Broadband Portal*, *www.oecd.org/sti/broadband/oecdbroadbandportal.htm*.

A perspective on mobile network performance can be provided from the data collected by OpenSignal, including over different network generations. OpenSignal collects real-time data from mobile phone users that have downloaded its application on their smartphone. This is done at different times of the day and from different locations (e.g. indoors, outdoors). The share of subscriptions of 4G (Long-Term Evolution networks) in Colombia reached 52.3% in the second quarter of 2018, up from a share of 12.8% in the second quarter of 2015, reflecting a compound annual growth rate of around 60% (CRC, 2019). For 4G networks, OpenSignal measured average download connection speeds of 18.42 Mbps for Colombia. This was roughly 5 Mbps less than Mexico, the leading country in Latin America at the end of 2017 (OpenSignal, 2018) (Figure 2.10). To further improve the performance experienced by users in terms of speed, operators will need to invest in upgrading their networks and look for other ways to accomplish this, such as enhancing Internet traffic exchange (i.e. transit and peering relationships). These investments can be fostered through competition in the market (see further below). Enhancing Internet traffic exchange is one of the attributes often noted by Internet service providers measured as providing the highest speeds to their users across OECD countries.

Figure 2.10. Colombia ranks in the upper mid-range in average Long-Term Evolution download connection speeds

OpenSignal average download connection speed on Long-Term Evolution networks, October-December 2017



Source: OpenSignal.

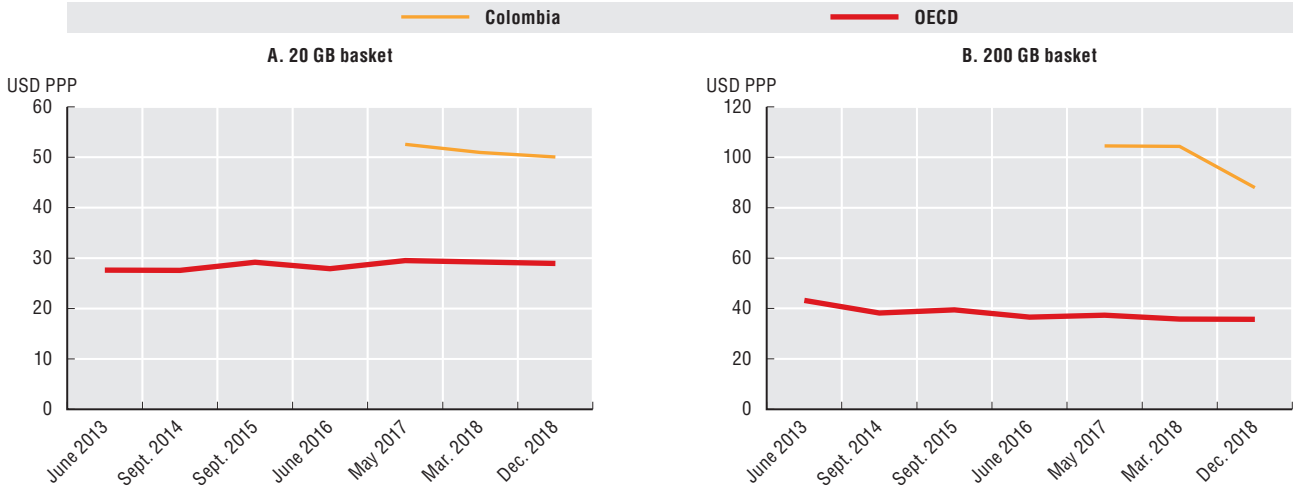
Prices for fixed and mobile broadband services

Communication prices are one indicator of the level of competition in a market and can of course influence the take up of services, especially in countries where there is unmet demand by low-income groups.

The OECD price baskets measure the prices for different patterns of usage across different countries and time. For fixed broadband, two baskets, one low-usage basket of 20 GB and one high-usage basket of 200 GB, are assessed in the context of this Review (Figure 2.11). Between May 2017 and December 2018, the price of Colombia's low-usage basket slightly fell by around 5%, from USD PPP 52.6 to USD PPP 50. This price, however, is nearly double the OECD average of USD PPP 29 in 2018. The difference between Colombia and the OECD average is even more striking for the high-usage basket. Although prices in Colombia fell between May 2017 and December 2018, Colombian users pay nearly 2.5 times as much, or USD PPP 88, as the OECD average of USD PPP 35.7 for the high-usage basket of 200 GB. These prices are also higher than in Mexico, another OECD country in the region. The Colombian price levels are consistent with the low penetration rates of fixed broadband discussed earlier in this chapter. High prices provide an important barrier for users, both consumers and businesses, in low-income groups and prevent them from benefiting from the opportunities created by access to fixed broadband.

Figure 2.11. High prices may prevent low-income groups from benefiting from the opportunities created by access to fixed broadband

Trends in fixed broadband prices

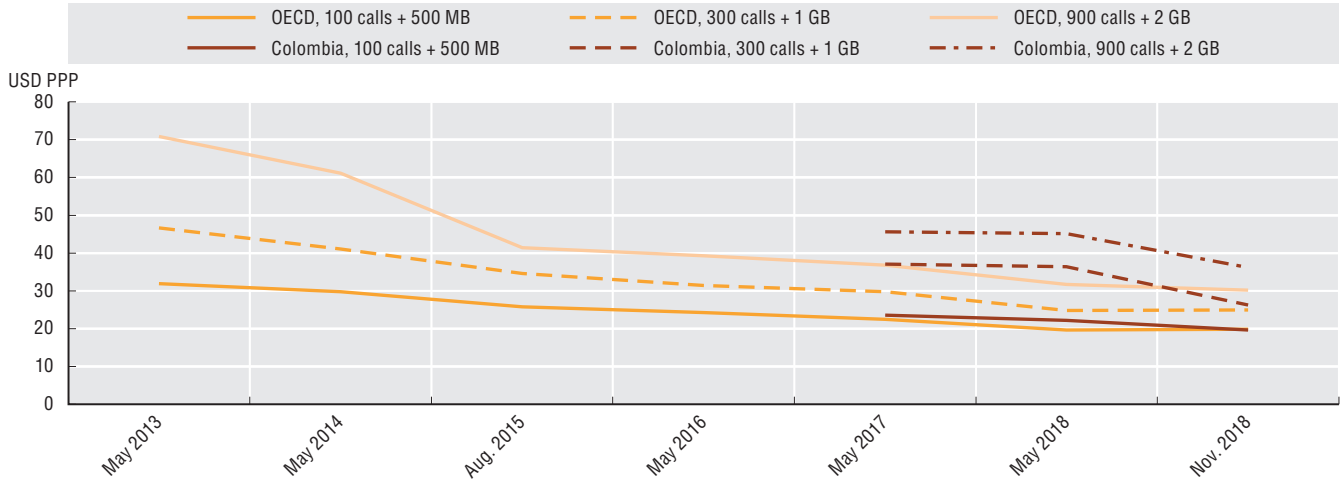


Source: OECD, based on Strategy Analytics.

Between 2016 and 2018, mobile broadband prices slightly fell in Colombia for the low- and high-usage mobile broadband baskets. The price of the low-usage basket with 100 calls and 500 megabytes, USD PPP 19.6, is slightly below the OECD average of USD PPP 19.9 (Figure 2.12). Prices in the medium- and high-usage baskets also decreased. However, they are still more expensive than the OECD average. In November 2018, the price for the medium-usage basket amounted to USD PPP 26.3, compared to an OECD average of USD PPP 24.9. For the high-usage basket with 900 calls and 2 GB of data, consumers in Colombia paid USD PPP 36.2, which represents roughly 20% more than the OECD average of USD PPP 30.2.

The overall price differences for mobile broadband services are lower than those for fixed broadband services, which is consistent with the increases in mobile broadband subscriptions in recent years. However, the price of the high-usage basket is still significantly higher than the OECD average. Given that mobile broadband is driving growth in access to communication services and that Colombia has a low penetration of overall mobile broadband, high prices are an important barrier to further increasing access to mobile communication services. At the same time, the importance of mobile communication is rising with further developments in the digital economy, from mobile payment to Internet of Things (IoT) applications for both consumers and businesses. Many of these applications could be used to reduce inequality in Colombia and to connect people, especially in lower income groups, to markets they have no access to so far, such as payment and banking services.

Figure 2.12. The price of the high-usage basket remains significantly higher than the OECD average



Note: MB = megabyte; GB = gigabyte; PPP = purchasing power parity.

Source: OECD, based on Strategy Analytics.

High prices in markets typically point to a situation of low levels of competition intensity. The next section will assess the structure of fixed and mobile communication markets as well as Internet traffic exchange.

Developments in market structure

Developments in the fixed and mobile broadband market

Colombia's fixed communication market is characterised by considerable market fragmentation. On the one hand, there are regional companies that arose from former regional monopolies (e.g. ETB, Emcali) with only a few that are able to profit from a larger scale (OECD, 2014a). On the other hand, there are firms operating at the national level with important market shares, which leads to a high level of concentration in several communication markets. These players include, for example, América Móvil and Telefónica. Both companies are large international players with a presence in multiple Latin American countries and can take advantage of benefits that arise from their scale. Currently, the Colombian government has a state participation of 32.5% in Telefónica Colombia. However, the government is trying to sell its stake under the condition that the terms of the sale are favourable.

The fixed line voice market currently has 18 participants providing local services and 10 participants providing long-distance services (Annex 2.A). Notwithstanding the numerous players, market concentration has increased in recent years. Four companies accounted for almost 90% of total market share in 2018, up from 80% in 2012. The company with the largest market share is Telmex, owned by América Móvil, followed by UNE EPM, Coltel and ETB (Figure 2.13). Of these, Telmex has seen the biggest increase in market share over the past five years, more than doubling its market share from 16.6% in 2013 to 33.6% in 2018.

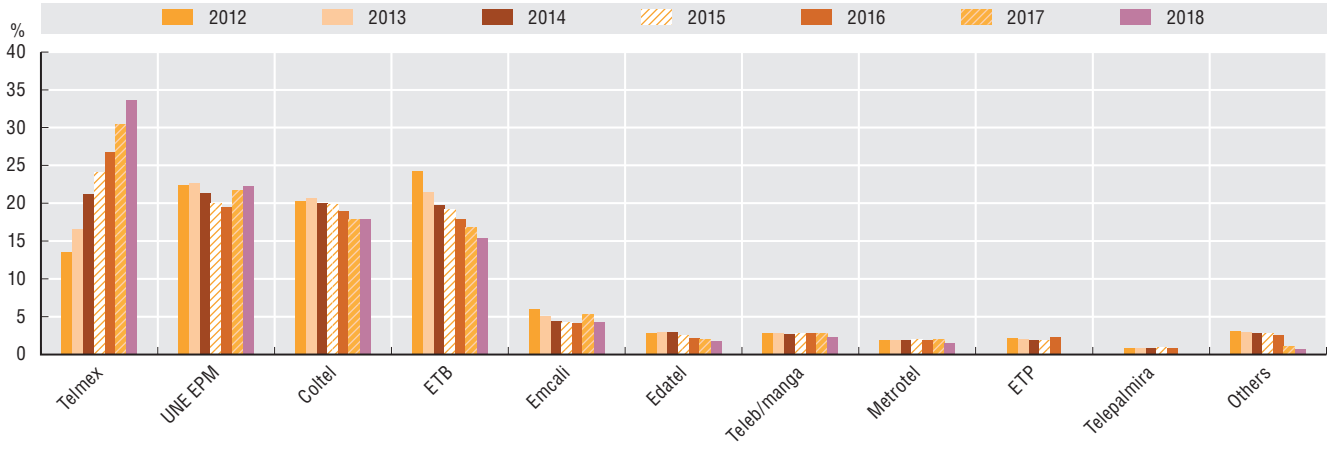
A similar tendency can be observed in the fixed broadband market (Figure 2.14). Telmex witnessed the biggest increase in market share since 2012, reaching 37.4% in 2018, up from 29.8% in 2012. For its part, UNE EPM experienced a decline in its market share of 23.6%. In 2014, however, Edatel became part of Tigo-Une Telecomunicaciones S.A. after the merger of Tigo and UNE. Taking this into account, the joint market share of UNE EPM and Edatel fell from 29.7% in 2012 to 23.7% in 2018, representing a decline of 20.3%. Movistar (Telefónica) equally saw its share declining (-17.2%). The joint market share of the three leading companies, Telmex, UNE EPM and Movistar, has seen little change over the past five years, amounting to 74.9% in 2012 and 73% in 2018.

The Colombian mobile market consists of four mobile network operators (MNOs) with their own network (Comcel [América Móvil], Movistar [Telefónica], Tigo-Une and Avantel) and several mobile virtual network operators (MVNOs). Avantel is the most recent MNO entrant to the Colombian market

and relies on a 4G-only network, complemented by the provision of voice services over 2G and 3G networks of other operators and using national roaming as an essential facility. It commenced services in 2014 in 22 municipalities in Colombia, in major Colombian cities such as Bogotá, Medellín and Cali. Several MVNOs (e.g. Éxito, Uff Móvil, Virgin) have entered the Colombian market; Uff Móvil was the first in 2010.

Figure 2.13. Market concentration in the fixed line voice market has increased in recent years

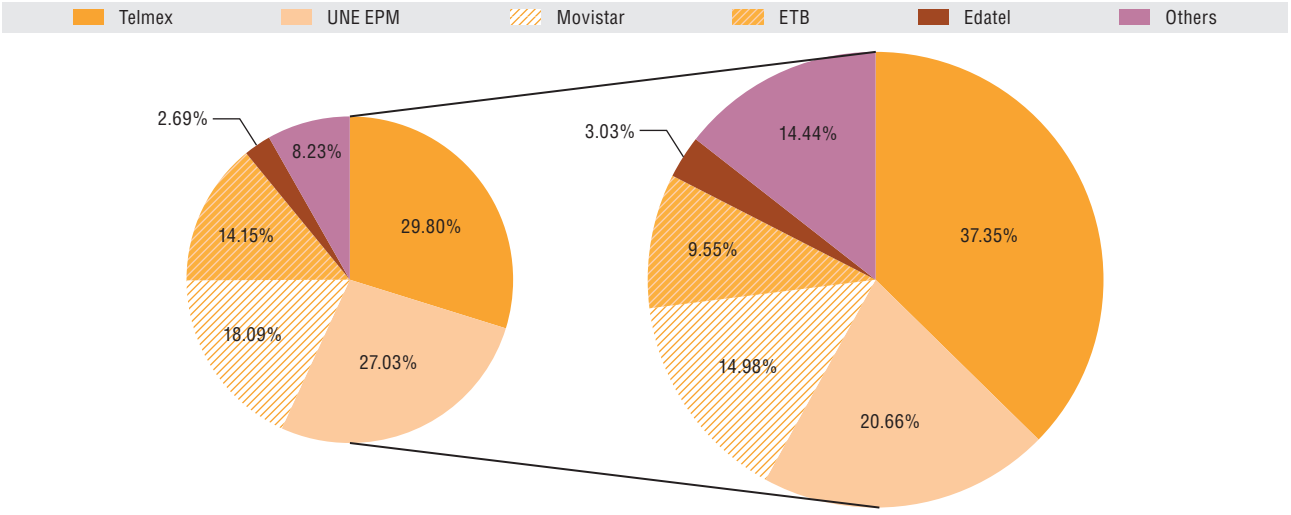
Market shares in the Colombian fixed line voice market, local calls



Source: CRC.

Figure 2.14. The three leading fixed broadband companies account for almost three-quarters of the market share

Fixed broadband market shares in Colombia, 2012 and 2018



Source: CRC.

As might be expected in a market with more operators with their own infrastructure, competition has developed faster for mobile than for fixed services. That being said, there is still a player with a substantial share of the mobile and fixed broadband markets. In August 2014, Tigo merged with the fixed line company UNE EPM, which allows the merged company to offer full bundles of fixed and mobile voice and data services as well as television services.

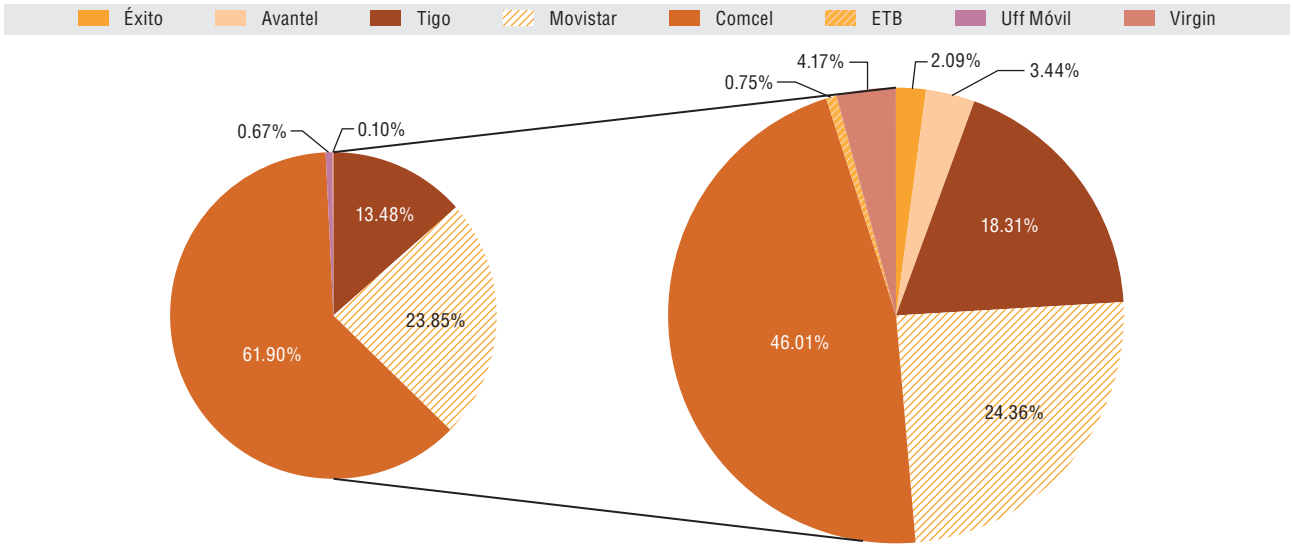
The mobile voice market currently has eight participants, with one provider, Mercanet, which has not started operations yet. In 2012, Comcel was the largest player in the mobile voice market. Comcel operates under the brand name Claro in Colombia, with a market share of 61.9%, followed by Movistar

(Telefónica) and Tigo with market shares of 23.9% and 13.5% at that time, respectively (Figure 2.15). The only MVNO that operated in 2012 was Uff Móvil, with a market share of 0.7%. Five years later, Comcel has lost some market share to attain a share of 46.0% in 2018. Movistar remained at about the same position while Tigo-Une was able to increase its market share to hold 18.3% of the voice market. Meanwhile, the MVNOs in the market have increased their market share and reached 7% of the total mobile voice market, with Virgin being the biggest player with a share of 4.2%.

The mobile broadband post-paid and prepaid markets show similar rankings in market share as the mobile voice market. In the mobile broadband post-paid market, Comcel increased its market share from 43.4% in 2012 to 52.3% in 2018 (Figure 2.16). Meanwhile, Movistar (Telefónica) and Tigo each lost market shares in the six-year period while Avantel increased its market share to 4.52% after its entry in 2014. The three biggest players hold 94% of the mobile post-paid market.

Figure 2.15. Comcel lost market share but remains the player with the highest mobile voice market share

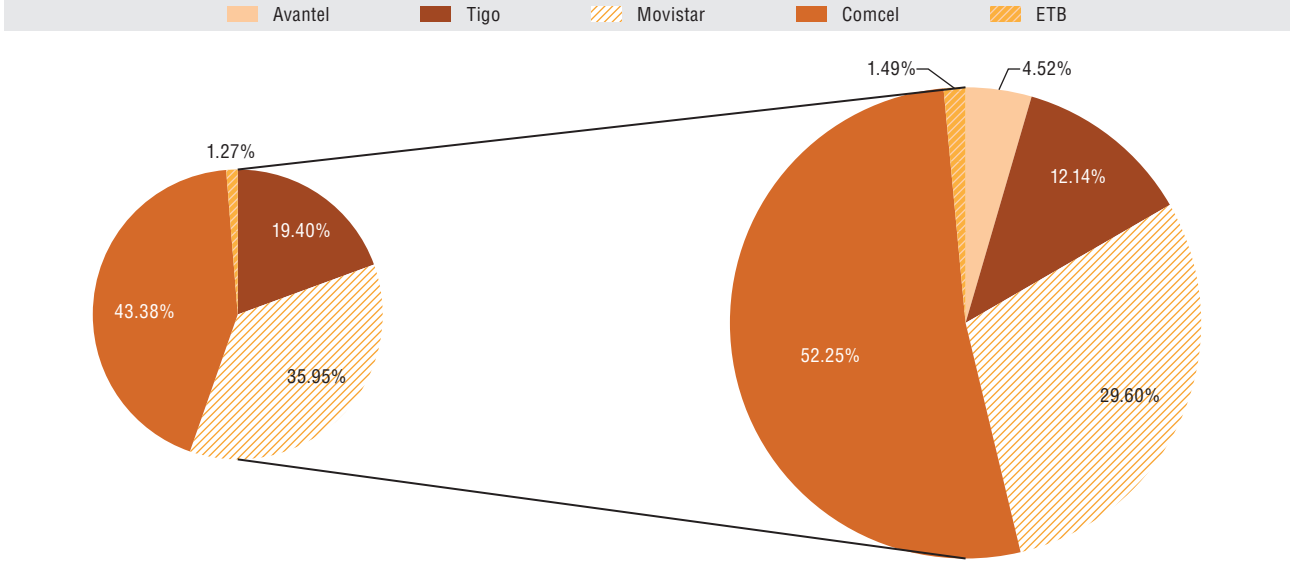
Mobile voice market shares in Colombia, 2012 and 2018



Source: CRC.

Figure 2.16. More than three-quarters of the mobile broadband post-paid market is shared by two players

Mobile broadband post-paid market shares in Colombia, 2012 and 2018

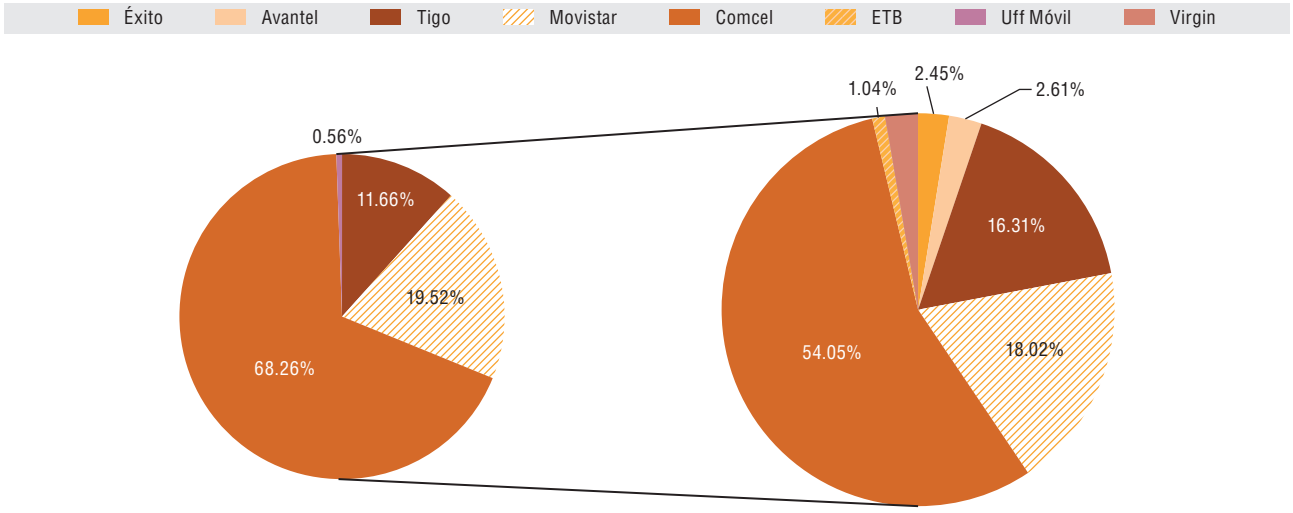


Source: CRC.

In the mobile broadband prepaid market, Comcel holds 54.1% of the market, down from 68.3% in 2012 (Figure 2.17). The company is followed by Movistar (Telefónica) and Tigo, which hold 18% and 16.3% of the market respectively. MVNOs could increase their joint market share to 6.11%, with Virgin being the biggest MVNO with a 2.61% market share.

Figure 2.17. More than three-quarters of the broadband prepaid market is shared by two players

Mobile broadband prepaid market shares in Colombia, 2012 and 2018



Source: CRC.

As a result of the Commission for Communications Regulation's (Comisión de Regulación de Comunicaciones [CRC]) review of the Colombian mobile market, the regulator issued Resolution 5108 of 2017, where a new relevant market called "mobile services" was defined, covering the simultaneous purchase of voice and mobile data services. The CRC established that *ex ante* regulation might be applied for this market because some of the existing competition problems may transition from the "mobile voice" market to the "mobile services" market. The regulator opened an investigation to determine whether or not Comcel has a dominant position in the "mobile services" market and whether or not competition problems transition from the "mobile voice" market to the "mobile services" market. Finally, the CRC did not take any decision as the ICT Modernisation Law has suspended this proceeding until the appointment of at least three commissioners of the newly created converged regulator.

To summarise, Colombian communication markets are characterised by a high level of concentration. The increase in the share of MVNOs is welcome as they spur competition in the market. On the other hand, the biggest player in the market managed to increase its market shares in the fixed voice market, the fixed broadband market and the mobile broadband post-paid market. A high market concentration is also in line with the high fixed broadband prices in Colombia.

Developments in Internet traffic exchange

A well-functioning communication infrastructure includes an efficient exchange of Internet traffic. In terms of connecting Colombia to other countries, the country is well served by multiple submarine fibre cables (Box 2.1). Important investments in submarine fibre infrastructure have taken place, which were also promoted by the digital agenda Live Digital (Vive Digital) (OECD, 2014b).

Aside from international interconnection, it is important for Colombia to have efficient Internet traffic exchange domestically and to host content within the country. Routing data via other countries is generally more expensive, as transit costs often increase and this can also increase latency. Routing domestic traffic internationally generally points to a suboptimal development of any country's Internet traffic exchange market.

Internet exchange points (IXPs) are important to keep traffic local (Weller and Woodcock, 2013). Colombia currently only has one significant IXP to exchange traffic at the national level, the NAP Colombia (*http://nap.co*), which is located in Bogotá and run by the Colombian IT and Telecommunication Chamber. When analysing the characteristics of this IXP, several issues are of concern.

Box 2.1. Submarine fibre cable landings: Colombia

Submarine fibre cables form the backbone of the international communication infrastructure. They are deemed less prone to failure than over-land cables and are capable of carrying important amounts of data. With 448 cables in service as of early 2018, around 99% of all intercontinental data exchanges take place via the submarine fibre infrastructure.[1] Being connected to these is vital for a country's exchange of Internet traffic. In the case of Colombia, this access is even more important as most of the content is provided by international hosts (OECD, 2014b). Currently, 11 cables are landing in Colombia, giving the country access to a network of cables amounting to almost 130 000 kilometres. Most of the cables are landing on the Caribbean coast, while one is landing on the Pacific coast (TeleGeography, 2018). Table 2.1 provides an overview of the submarine fibre cables and their respective landings in Colombia.

Table 2.1. Submarine cables and landings in Colombia

	Cable name	Owner	Landing(s)	Length
1	Deep Blue	Deep Blue Cable	Barranquilla	12 000 km
2	San Andreas Isla Tolu Submarine Cable (SAIT)	Energía Integral Andina	(San Andrés), Tolú	826 km
3	South American Crossing (SAC)/ Latin American Nautilus (LAN)	Telecom Italia Sparkle, CenturyLink	Buenaventura, Riohacha	20 000 km
4	ARCOS	Consortium	Cartagena	8 600 km
5	Pacific Caribbean Cable System (PCCS)	Consortium	Cartagena	6 000 km
6	America Movil Submarine Cable System-1 (AMX-1)	América Móvil	Cartagena, Baranquilla	17 800 km
7	Maya-1	Consortium	Tolú	4 400 km
8	GlobeNet	BTG Pactual	Barranquilla	23 500 km
9	Pan American (PAN-AM)	Consortium	Barranquilla	7 225 km
10	South America-1 (SAm-1)	Telxius	Barranquilla	25 000 km
11	Colombia-Florida Subsea Fiber (CFX-1)	C&W Networks	Cartagena	2 400 km

1. *https://www.newsweek.com/undersea-cables-transport-99-percent-international-communications-319072*.
Source: TeleGeography (2018), "Submarine cable map", *https://www.submarinecablemap.com* (accessed on 30 July 2018).

When comparing the Colombian IXP to IXPs that were established the same year, only a very small number of companies are exchanging traffic at the Colombian IXP (Table 2.2). The Milan Internet Exchange in Italy, for example, has nearly ten times more participants than the Colombian IXP. When taking a closer look at the 21 companies that interchange traffic at the NAP Colombia, the large majority are communication operators and transit providers and nearly no content providers are connected to the IXP. In addition, a strikingly low amount of Internet traffic is exchanged at this IXP compared to other IXPs.

Table 2.2. Exemplary comparison of Internet exchange points

Country	City	IXP name	Established	Traffic	Participants
Colombia	Bogotá	NAP Colombia	June 2000	68 G	21
Ukraine	Kiev	Ukrainian Internet Exchange	July 2000	378 G	180
Italy	Milan	Milan Internet Exchange	November 2000	428 G	209

Source: Packet Clearing House (2019), *IXP Directory*, *https://www.pch.net/ixp/dir*.

One reason expressed by industry players for not connecting to the Colombian IXP is the high cost. A fee of USD 25 000 to connect to this IXP is charged together with variable costs. It is thus highly advisable that Colombia assesses the current barriers as well as the reasons why practically no content providers connect to this IXP. In addition, the country could consider additional IXPs in larger

cities to increase the amount of Internet traffic that is exchanged locally in order to reduce costs and improve services. It has to be noted that at the moment of writing, an additional exchange, the "IXP del Caribe", is under construction in Colombia. Unlike other neutral exchanges operated by a third-party non-profit entity, this exchange will be run by Globenet, a large carrier with operations in Latin America.

Main regulatory and policy developments

This section examines the main regulatory and policy developments which have taken place in Colombia in recent years. One important change in the institutional framework is the creation of a converged regulator, which has been put forward in the ICT Modernisation Law. The section starts with an assessment of the law. It then discusses selected policies and developments since the 2014 *OECD Review of Telecommunication Policy and Regulation in Colombia* (hereafter "the 2014 Review"), which are considered important for the further development of the communication sector in Colombia.

Institutional framework and design: An independent and converged regulator

The ICT Modernisation Law has the potential to represent progress over the current institutional structure. Its emphasis on increasing access to and diffusion of communication services in Colombia is positive for the development of the Colombian digital economy. The ICT Modernisation Law does so by stating new objectives for the access to communication technologies and services, with a focus on information and communication technology (ICT) inclusion; modernising the institutional framework; increasing investment security and legal certainty; and relying on the private sector for project development and infrastructure deployment.

Specifically, there are six positive measures that should be highlighted:

1. the creation of a converged regulator (although with important reservations highlighted later in the section)
2. the reference to equal opportunities for all telecom providers regarding spectrum access in Article 3
3. the guarantee of efficient use of the spectrum to respect investment, maximise social welfare and set the right investment conditions in Article 4 (in the current situation, spectrum auctions must maximise public revenues from the auctions)
4. the extension of the period of the licenses for spectrum use in Article 9
5. the new purpose of the Information Technologies and Communications Fund (Fondo para las Tecnologías de Información y las Comunicaciones [FONTIC]), which is subject to periodic studies to determine its efficiency, effectiveness or impact on the use of the resources allocated in each project in Article 22
6. the establishment of a single fund and equal contribution of all players in the market in Article 23.

These measures will contribute to expanding access to communication services for Colombians and to improving investment conditions in the ICT sector.

Overall, the law aims at promoting investment in the telecom sector while fostering competition and protecting consumers, thus giving all three objectives an equally prominent role.

The law also follows some recommendations from the 2014 OECD Review. The extension of the licence period for spectrum, for example, will help reduce investment uncertainty.

While the above points are very positive, there are still areas with potential for improvement. These improvements could help create a robust legal and regulatory framework with strong and effective institutions based on good international regulatory practices. The different areas for improvement are discussed in more detail below.

The independence of the converged regulator

While the creation of a converged regulator is a very important aspect of the ICT Modernisation Law, there are some weaknesses with respect to its independence. The independence of a regulator is important to guarantee that it can exercise its mandate in an efficient manner, with the aim of promoting widespread

access to services at competitive prices. Indeed, separating policy formulation and regulation is regarded as a good practice in OECD countries. In addition, the regulator should have commensurate powers to carry out its role and remain at an arm's length from the government. The independence of the regulator, however, is not part of the general objectives set by the first article of the law.

Regulators also require governance arrangements that ensure their effective functioning, preserve their regulatory integrity and ensure the effective achievement of their mandate. The glossary of definitions and terms, which impacts the way regulation is undertaken, is a key instrument to achieve these objectives. In the past, the glossary used to be issued by the Ministry of Information and Communication Technologies (Ministerio de Tecnologías de la Información y Comunicaciones [MinTIC]) and the CRC jointly. The law (Article 5) seems to suggest that MinTIC will issue the glossary while the CRC will only serve as technical support. Although a joint issuance of the glossary of MinTIC and the CRC may take more time, it is important that the glossary be issued by the regulator, as this provision could diminish its independence.

The ICT Modernisation Law provides that the FONTIC will be attached to MinTIC, with the purpose to improve the administrative, operational and technical capacity of MinTIC and the National Spectrum Agency (Agencia Nacional del Espectro [ANE]). This provision could cause a conflict between the funding of the CRC and other institutions. Moreover, it raises a risk that the government may indirectly control the regulator's funding and limit its independence. A clear separation between the funding of the CRC and the funding of other entities operating in the sector should be made, especially those that are part of the government.

Article 16 of the ICT Modernisation Law eliminates loans as a component of the CRC's assets, thus making the contributions by the industry the main source of financing for the commission. While this change favours its independence, it also implies that the regulator is partly funded by the state budget, which may have the opposite effect.

The law also confirms some of MinTIC's attributions that could affect the independence of the regulator. These include the power to revoke the permission to use the radio spectrum from those who are not up-to-date with their obligations (Article 11) as well as the power to set the rates and fees associated with the concession. Furthermore, Article 38 confers MinTIC the functions of inspection, surveillance or control that were previously assigned to the National Television Authority (Autoridad Nacional de Televisión – [ANTV]). These functions should be performed by an independent regulator, acting as a non-political institution. Having the ministry undertake the functions of the regulator might weaken the ability of the public sector to ensure that the industry is complying with existing regulation, which is necessary to protect consumers (OECD, 2014c).

With respect to the economic compensation for the use of the radio spectrum, the amendment of Article 10 of the ICT Modernisation Law clarifies the amount of the compensation that can be paid by means of obligations (*obligaciones de hacer*), such as coverage obligations of up to 60% of the total amount. However, the rationale for a maximum threshold is unclear as are the criteria for setting the rate at 60%, as this limits the autonomy and flexibility of the entity responsible for setting spectrum fees.

Spectrum management is one of the most important tools for regulating competition in mobile markets. The ICT Modernisation Law confirms the power for MinTIC to assign permits for radio spectrum use. While the law provides that the assignment should be undertaken through an objective selection process, granting this function to MinTIC limits the set of tools available to the regulator. As already discussed in the 2014 OECD Review (OECD, 2014a), the power to issue radio spectrum permits should be granted to an entity independent from the government. In addition, the regulator should be able to deal with spectrum management, also in light of an increasingly converged communication sector. For this reason, the ANE should be part of the converged regulator, together with the CRC and the ANTV.

The appointment and election of commissioners

The independence of a regulator, both from those it regulates and from the government, is essential to establish confidence about the integrity of its regulatory decisions (OECD, 2014c). Regulators, therefore, should have the instruments necessary to prevent undue influence in their regulatory decision making to maintain trust in their competence. The independence of the Board of Commissioners and the qualification of its members are essential to ensure a high degree of regulatory integrity through

objective, impartial, consistent decision making, and to avoid the risks of conflict, bias or improper influence. The process of selection and appointment of the commissioners is, therefore, crucial for the independence of the regulator.

The ICT Modernisation Law provides that the ICT Minister – or the Vice Minister of Connectivity and Digitalisation if the ICT Minister wishes to delegate that function – should be a member of the CRC Board of Commissioners. As discussed in the 2014 OECD Review, the government should not have a seat on the board as this will undermine its independence (OECD, 2014a).

The mechanisms to appoint the Board of Commissioners are equally important. The appointment should be independent from any political influence from the government or any entities reporting to it. In addition, the process should be transparent and the commissioners appointed based on their merit, according to a clear set of criteria. Direct appointment of the commissioners by the president does not seem to meet these conditions. Other mechanisms can ensure the involvement of the president in the process while preserving an independent and merit-based appointment. For instance, the president could choose the commissioners among a shortlist of candidates selected through an open competition, a mechanism that is, indeed, considered in the law.

The appointment of one commissioner by the regional public TV operators raises concerns about a potential conflict of interest, i.e. a commissioner being appointed by some of the entities that it will have to regulate. While the commissioner must have broadcasting expertise, his appointment should follow the same transparent and merit-based process as for the other commissioners.

The ICT Modernisation Law, as recently approved by the congress, establishes a rather unusual governance system for the converged regulator by creating two parallel boards within the CRC. Article 20 states that the CRC will have an Audio-visual Content Commission (ACC) and a Communication Commission (CC).

The ACC will be composed of three commissioners. One is appointed by the regional public service operators of the television service. A second commissioner is selected by the civil society through a public competition managed by a university. The audiovisual sector commissioner is selected in an open public competition. These two commissioners are publicly elected by third parties, although the law states that they represent civil society and TV channels. The commissioners are in charge of guaranteeing pluralism and impartiality of information in audiovisual services, protecting informational pluralism, competition and the rights of viewers. The ACC is further tasked to monitor and sanction behaviours that may threaten the pluralism of information and promotes citizen participation. It has the power to fine operators, television space concessionaires and national television contractors for violations of constitutional and legal provisions that specifically protect the rights of families and children.

This leads to a potential conflict of powers between the ACC and the CC when regulating the audiovisual content market, as the CC is also in charge of this market,[2] especially with respect to competition in the "television market".

Having two boards has no precedent in other OECD countries and will be challenging, at least from an administrative and legal perspective. There is no legal framework in Colombia that specifies how to deal with those conflicts of competences as the General Code of Administrative Proceedings applies to different entities and not to conflicts within the same entity. It is also unclear whether the CRC Chairman should be part of the ACC or whether the ACC may take decisions autonomously; and whether the ACC can request information from private parties or even sanction operators that do not comply with regulation. While a government decree may help solve these issues, the establishment of two boards within the CRC will undermine the holistic approach that is at the very foundation of the converged regulator.

Finally, the article ruling the transition to the converged regulator should have deserved a closer examination. The transitional provision in the law that prescribes the suspension – until the new regulatory authority is established and at least three commissioners are appointed – of all proceedings and analyses currently undertaken by the CRC. This could set back the regulatory work by several years.

Similarly, in order to ensure some institutional memory in the converged regulator, the confirmation of the current commissioners should be based on their knowledge and experience, rather than on the residual length of their mandate.

The ANE

The 2014 OECD Review recommended that the ANE and all of its functions related to spectrum, including title provisions, should be part of the CRC. Its exclusion from the converged regulator increases the administrative costs in the sector. It will probably also hamper the efficiency, productivity and competitiveness of the sector. Furthermore, it may limit the independence of the regulator from the government. Therefore, the ANE should be merged into the CRC and all functions related to spectrum that are currently performed by MinTIC should be granted to the converged regulator.

"Benefits for stopping illegal conduct"

The "benefits for stopping illegal conduct" (Article 28) open the possibility for an operator under investigation by MinTIC to benefit from substantial reductions in fines (25% to 75%) when voluntarily stopping an illegal conduct within a set delay. These benefits undermine the sanction power of the public authority, as they reduce the effectiveness of sanctions. In addition, they are prejudicial to consumers, without any clear benefits for the communication sector, other than for the operators under investigation. No OECD country relies on this type of mechanism to discourage illegal conduct by telecom operators.

.CO

Article 14 of the law grants MinTIC the responsibility for the administration, maintenance and development policies of the Internet country code .co, which corresponds to Colombia. Multi-stakeholder approaches to Internet country code policies seem to have produced better outcomes. In Brazil, for example, the Brazilian Internet Steering Committee (Comitê Gestor da Internet no Brasil, CGI.br) is an autonomous entity co-ordinating all Internet service initiatives in the country and using the resources generated by the assignment of .br webpages to foster the Internet and traffic exchange ecosystem in Brazil.

Community networks

Article 8 of the law provides for the possibility to exempt some spectrum bands from payment with the purpose of extending coverage in rural areas. To the extent this measure facilitates the creation of community networks, similar, for instance, to those operating in Mexico, it would be a significant improvement over the current framework. Besides Mexico, other OECD countries have used municipal networks to "fill gaps or provide substantial areas of service in a region, city or smaller town surrounding locations" (OECD, 2015). These networks are

> *"one option to meet goals with the use of broadband in the absence of sufficient competition or when policies are pursued for reasons of equity that prevail upon weighing the (high) cost of rolling out infrastructure against assessed demand".*

Government and regulatory activities (to enhance access and use)

The following section discusses important developments since the 2014 OECD Review. It will focus on the upcoming spectrum auction in the 700 megahertz (MHz) band, other measures that aim at increasing the access to and use of communication services, as well as a discussion on the fees and taxes that are applied to the communication sector.

The 700 MHz auction

The spectrum in the 700 MHz band is highly valued by all players as it propagates well over greater distances. It is, for example, very well suited to increase connectivity in rural and remote areas, where progress needs to be made in Colombia. Many OECD countries use frequencies in this spectrum band for 4G services. The allocation of this spectrum would, therefore, provide the foundation for extending connectivity in Colombia and for extending mobile coverage across the country.

The Colombian government has planned to auction spectrum in the 700 MHz band since 2015. Nonetheless, the auction has repeatedly been delayed. In 2017, MinTIC issued a first public consultation on auctioning frequencies in the 700 MHz and the 1 900 MHz bands and started a discussion to increase spectrum caps which was a prerequisite for the auction. At the beginning of 2018, MinTIC, in conjunction with the ANE, initiated another public consultation with respect to the auction in both the 700 MHz and the 1 900 MHz bands. Subsequently, a second draft resolution was issued which

established the conditions for the auction. Shortly thereafter, however, one of the control organs of the Colombian state offset the auction until the end of the presidential election. The new government has expressed that the 700 MHz spectrum auction is a priority in 2019. Accordingly, MinTIC published an action plan on the auctioning process and its terms in the second quarter of 2019. Expressions of interest have been received and comments on the auctioning process and its terms are to be published in the third quarter of 2019 along with a draft resolution including the conditions for the auction. The auction is planned to take place in the last quarter of 2019.

Overall, Colombia is one of the last countries in the region to auction spectrum in the 700 MHz band; auctions have already taken place in Chile (2013-14), Argentina (2014), Brazil (2014), Mexico and Peru (both 2016).

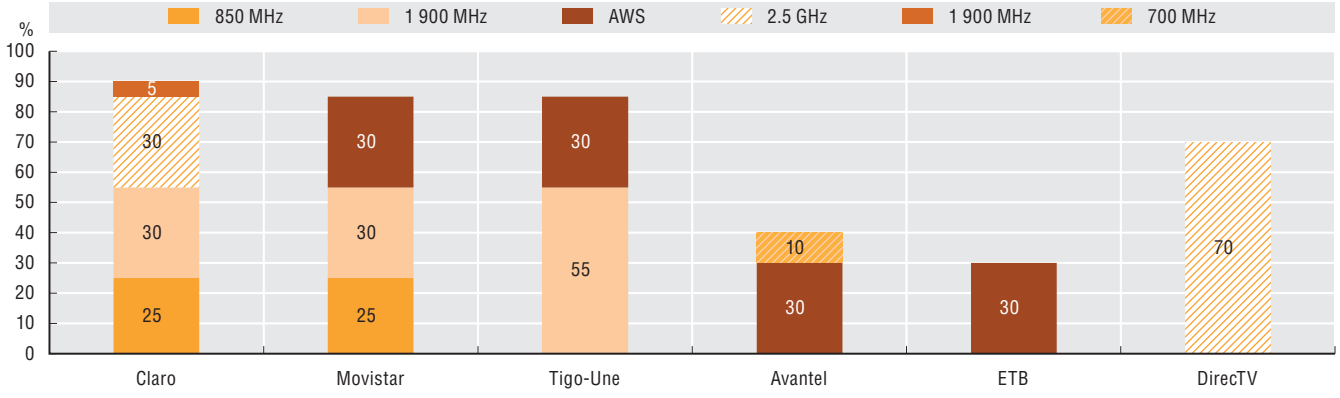
Besides the 700 MHz band, spectrum is also available in other frequencies, as the ANE has undertaken significant work to free up spectrum in multiple bands. In order to make additional spectrum available for communication operators in the market, the Colombian government has proposed a plan to undertake a multiband spectrum auction including other bands besides the 700 MHz band (i.e. the 1.9 gigahertz [GHz] and 2.5 GHz bands) (MinTIC, 2019). In doing so, Colombia is following the path of several OECD countries such as Australia and Italy that recently undertook multiband spectrum auctions.

The ICT Modernisation Law extends the spectrum license period to 20 years. This is desirable, as spectrum licenses should be awarded for periods longer than ten years.

It is highly recommended to auction the spectrum, which was freed several years ago, as soon as possible, especially in light of a growing mobile broadband market and the increase of mobile applications in markets – such as in mobile IoT applications – that will require a broad coverage of mobile networks. A further reason why the auction should be undertaken as a priority is the fact that not all MNOs have spectrum in the low frequency range, which puts them at a disadvantage with respect to the other players (Figure 2.18).

Figure 2.18. Not all mobile network operators have spectrum in the low frequency range

Available spectrum by operator, Colombia



Notes: AWS = Advanced Wireless Services; MHz = megahertz; GHz = gigahertz. The AWS spectrum refers to bands in the 1.7 GHz to 2.1 GHz range. By July 2019, Avantel uses a 10 MHz block under a temporary license in the 700 MHz band, authorised only for Bogotá and other limited municipalities. Claro also uses a temporary nation-wide block of 5 MHz in the 1 900 MHz band. Both licenses include that spectrum blocks must be reversed when the next auction takes place.

Source: OECD, based on CRC.

When planning the auction design, two key policy issues should be taken in mind simultaneously: coverage and competition. In order to extend coverage, it should be ensured that the auction is designed in a way to allow all operators in the market to bid for the spectrum they need. Coverage obligations are common across the OECD and can contribute to a broader coverage of the population in rural and remote areas. When designing the auction, it should be ensured, however, that the extent of the coverage obligation is not an impediment for certain actors to bid in the auction.

In order to allow all operators to be able to compete in the market on equal footing and to spur competition in the market, the auction design should take into account that some operators currently do not have spectrum in the low frequency range, making it more expensive and complex for them to deploy networks efficiently. One mechanism that could be envisaged is to design the auction in two rounds, with the first round being open for operators that currently do not have nation-wide spectrum in the low frequency range and the second round being open for all. This would allow to simultaneously strive for both goals of extending coverage and creating a level-playing field for operators in the country.

Finally, the spectrum auction should not be used to maximise public revenues from that auction. The revision of the objective to maximise public revenues has been put forward by the recently approved ICT Modernisation Law and is therefore a step in the right direction. It is further recommended that the conditions for the renewal of the licence are known well in advance and that the renewal follows a transparent process.

Initiatives directed at increasing connectivity (and its use)

This section discusses selected measures used by the government to increase connectivity. On the fixed communication side, it discusses the national fibre backbone; on the mobile side, it discusses the changes in the regulation of MVNOs since the 2014 Review.

Expanding access to fixed broadband networks

One of the major initiatives that can be commended in recent years is the deployment of a fibre backbone in a public-private partnership to connect most of the Colombian municipalities and the territory. This backbone provides an important foundation for connecting consumers and businesses. In particular, the rollout to remote municipalities can help close the important digital gap between urban and rural areas in Colombia. Through this initiative, the number of connected municipalities grew from about 200 in 2010 to 1 108 in 2018. Some 1 808 public institutions could by then be connected through the fibre backbone.

Increasing connectivity over the "last mile" while ensuring solutions that are financially sustainable in the long run remains a challenge. So far, the backbone reaches the centre of municipalities, but the next step will be to extend the reach of high-speed access to all businesses and households in the municipality. Currently, most of the existing operators do not connect to and use the fibre backbone, some due to QoS requirements. While the CRC has been working on solving this regulatory issue, further analysis should be undertaken on how the backbone could connect more businesses and homes and on how an environment could be created where private companies could leverage the existence of the backbone.

MinTIC has undertaken several measures to increase broadband access for people living in the low-income areas (strata 1 and 2). These measures included the development and implementation of projects aimed at lowering the entry bar for broadband access through subsidies for monthly subscriptions. They also included free delivery of computers to low-income households located in strata 1 and 2 of selected municipalities. To date, in sum 273 589 households in strata 1 and 2 have benefited from the strategies to expand broadband access. This includes 54 251 delivered computers.

During the second half of 2018, MinTIC undertook a study of a sample of 442 households, for which the subsidy period has ended, in order to explore the impact of the implemented measures. This study was carried out in particular with respect to the "Digital Connections Phase 1" project from which 98 340 households have benefited to date. The study found that 80% of the surveyed households decided to keep a broadband Internet access. Reasons for not keeping the broadband access after the subsidy period ended included that the households did not consider broadband access a useful service, that the service was not satisfying or the household was not able to afford broadband Internet access. In some cases, the operator decided to not provide the service anymore.

Future measures envisioned by MinTIC include closing the digital divide through, among others, two projects that are based on a technical segmentation of population centres. With the Sustainable Universal Access Project (Proyecto de Acceso Universal Sostenible), MinTIC furthers the installation of access solutions in areas that represent fewer difficulties in terms of connectivity than rural areas. The second project, the National Universal Access Project for Rural Areas (Proyecto Nacional de Acceso Universal para Zonas Rurales), is dedicated to benefit up to 10 000 rural communities through

improving the efficiency of investments via long-term contractual schemes. Last-mile connectivity is to be increased through projects that encompass supply side measures as well as demand side ones. Supply side measures include, for example, a project that seeks to stimulate the increase in fixed Internet penetration for households that do not have sufficient income to access fixed Internet. The project aims at generating at least 80 000 new fixed Internet connections, distributed in 220 municipalities in the country.

The role of MVNOs to increase mobile take up

As the first section of this chapter has shown, MVNOs have witnessed an increase in market share over recent years. This is welcome as MVNOs can enhance competition in the mobile market, thus fostering innovation in the market and contributing to more competitive prices.

The CRC undertook a careful analysis of the MVNO market in 2016. The point of departure was that in order to increase the welfare of users, the CRC needed to define rules for promoting the presence of new MVNOs, and therefore to diversify the supply of services. The CRC reviewed contracts signed between MNOs and MVNOs (sent to the CRC in accordance with Resolution CRC 4508 of 2015) and identified that MVNOs did not have enough means to access networks in a timely and transparent manner (CRC, 2016).

Resolution 5108 of 2017 defines certain obligations to facilitate agreements between MVNOs and MNOs so that MVNOs can access mobile networks more easily and have greater capacity to compete in the market.[3] The resolution defined MNO obligations, including: to provide access for the MVNO within a maximum period of four months, without including unwarranted delays; no restrictions for the use of terminals (only type approval); to provide the MVNO with the same services the MNO lends to its users. Some MVNO obligations include: to inform the MNO about the projected growth of users and traffic; to pay the MNO in a timely manner; and to guarantee that the mobile terminals to be marketed by the MVNO are approved in Colombia. Overall feedback from the MVNOs with respect to this regulation has been very positive and MVNOs have reported that the regulation has not only facilitated access to the market, but has also allowed them to become profitable. Nevertheless, MVNOs have highlighted that the burdens on them have drastically increased with the new rules on the registration of the mobile handsets of their users for theft prevention. However, in its 2019-20 Agenda, the CRC included measures to simplify the device registration and the approval process for the entire sector.

Taxes and fees applied to communication services and the communication sector

Currently, multiple taxes and fees are imposed on the consumption of communication services and on the communication sector. Taxes for consumers can be split into taxes on the usage of communication services and taxes on handsets (Table 2.3). Besides the standard value-added tax (VAT) of 19%, mobile voice and data services are subject to an additional tax of 4%. This "luxury" tax is hard to justify for communication services, which are the necessary foundation of the digital economy and for a sector with positive externalities for the entire economy. The additional tax on mobile services has a direct effect on the total cost consumers have to pay for their communication services and, as a consequence, risks hampering the adoption of communication services, and in turn innovation and investment in the sector. It is highly suggested to eliminate this tax.

Table 2.3. Overview of main consumer taxes on communication services in Colombia

	Description of the fee or tax	Amount
Taxes on the usage of communication services	Standard value-added tax (VAT)	19%
	Additional tax on mobile voice and data services (consumption tax)	4%
	Consumption tax exemption on mobile data services that cost less than COP 48 000 (around USD 15)	
Taxes on handsets	Standard VAT	19%
	Imported handsets: Custom duty	5%
	VAT exemption for handsets that cost less than COP 753 720 (around USD 238)[1]	

1. Exchange rate of January 2019.

For handsets, an import duty of 5% adds to the normal VAT, which renders handsets on average more expensive than in countries that do not impose such duties. However, the Colombian government introduced a VAT exemption for entry-level handsets in order to increase adoption of ICT services.

Currently this exemption holds for handsets that cost up to COP 753 720 (*ca*. USD 238[4]). While this measure seems to have increased demand for smartphones in Colombia and seems to have had positive effects, it would be beneficial to review whether import duties of 5% on all devices are necessary to avoid potential distortions in the market arising from duties on the one hand and specific tax exemptions on the other.

Communication companies in Colombia face a multitude of fees and taxes (Table 2.4). Some of the taxes apply to all sectors, while others are specific to the communication sector. The largest block of sector-specific fees are the contributions to the FONTIC, and the Fund for the Development of Television and Content (FONTV). The FONTIC finances most of MinTIC's policy programmes to spur the adoption and use of communication services and is the most important source of income for this ministry. The fund was created in 1976 and depends on MinTIC but has a separate legal status (Article 35 of the 2009 ICT Law) (OECD, 2014b). This contribution scheme will be modified by the ICT Modernisation Law with the establishment of the FONTIC. The amount will be set by resolution of the Minister of Information and Communication Technologies. The value of the fee may not be higher than the periodic contribution to the FONTIC (2.2%).

Table 2.4. Taxes and fees applying to the communication sector in Colombia

	Description of the fee or tax	Amount	Base
Regulatory/ policy fees	Information Technologies and Communications Fund (Fondo para las Tecnologías de Información y las Comunicaciones [FONTIC])	The amount of the fee is set via resolution of the Minister of Information and Communication Technologies. The amount of the fee may not be higher than the periodic contribution to the FONTIC (2.2%).	Under the ICT Modernisation Law, there will be a unique periodic fee for the FONTIC. It is paid by the respective provider of communication networks or services. Public television service operators keep the exemptions and exceptions applicable to them. In the case of free-to-air television services provided by operators that remain under the transitional regime with regard to licencing and audio broadcasting, the amount of the fee will be set by special rules. The operators of the community television service that are under the general authorisation regime and comply with the conditions that are defined in the regulations issued by the government, will be exempt from the payment of the periodic fee for the FONTIC for five years.
	Regulatory fee (CRC contribution)	0.15%	Of operator revenue (gross income) of the previous year.
	Contribution to the superintendencies	No ICT fees apply	While companies in Colombia are overseen by the Superintendence of Companies (and/or by other superintendencies), and some of them are subject to paying contributions, the latter are not ICT-related. On the contrary, while the Superintendence of Industry and Commerce (Superintendencia de Industria y Comercio [SIC]) carries out a special consumer protection on telecoms issues, the companies do not pay a direct fee for this purpose. The funds are transferred by the FONTIC to the SIC.
	Annual spectrum fee	Spectrum payments are derived from the permit to use licensed spectrum; hence they are not regulatory/policy fees as such	Bearing in mind the clarification presented to the left, please note that spectrum payments for licensed spectrum vary depending on several issues, such as the results of the auction (when applicable), the service to be offered (e.g. radio, communication specifications, social communication), the spectrum bands involved, and the like. The regulation provides formulas and figures (instead of percentage/income) which are the basis for calculating the annual spectrum compensation of the spectrum usage described therein.
Taxes: national level	Corporate tax (2018)	33% + 4% (surtax)	Of profit.
	Tax on financial transactions	0.004%	On financial transactions.
Taxes: municipal level	Industry and commerce tax	0.2% to 0.7% and 0.2% to 1%	For industry activities for commercial and services activities of total income.
	Property tax	Between 0.4% and 3.3%	Depending of the use of the property. It can be deductible from the corporate income tax.
	Specific municipal taxes	Depending on the municipality	e.g. taxes on mobile services in Barranquilla may range from VAT + USD 0.16 to VAT + USD 4.
	Fees for control organs of the state (Contraloría)	Depending on the company	Entities that dispose of public capital need to pay supervision fees to one of the control organs of the state (Contraloría).

Source: OECD, based on MinTIC.

Currently, communication operators need to contribute 2.2% of their revenues from mobile voice and data services, fixed voice and broadband services, interconnection and long-distance services as well as other value-added services to the fund, which represents a substantial amount for operators. The second fund, the FONTV, is used by the ANTV to finance programmes in the broadcasting area.

Operators' contributions to this fund vary between 1.5% and 8.18% (DNP, 2017) on television services offered by operators, which means they can even be higher than the contributions to the FONTIC. As operators increasingly offer bundled communication services with communication and broadcasting services, they contribute to both funds. This currently results in an artificial price setting for the different components of the bundles given the asymmetric fees.

Box 2.2. Key recommendations to improve Colombia's communication infrastructure and foster its digital potential

The establishment of a converged regulator (as put forward in the ICT Modernisation Law)

- While the law represents progress over the current institutional structure, it is essential that the independence of the new, converged regulator be preserved and even strengthened.
- In order to prevent any undue pressure from the government on the regulator, a clear distinction between the funding of the regulator and the funding of MinTIC should be provided.
- The prerogative to revoke permissions of spectrum use or to inspect, carry out surveillance or control any communication service should be granted to an independent and non-political institution, such as the CRC, which should also issue the glossary of terms and definitions of the telecom sector.
- The government should not have a seat on the Board of Commissioners, as this may undermine its independence. The appointment of the commissioner should be independent, transparent and based on merit. Direct appointment of the commissioners by the president does not seem to meet these conditions and alternative mechanisms should be considered.
- There should be one Board of Commissioners only. Establishing two parallel boards within the CRC has no precedent in OECD countries and may lead to conflicts of competences, particularly in relation to the regulation of the audiovisual content market.
- The article ruling the transition to the converged regulator should have deserved closer examination. The proposed suspension of proceedings and analyses currently undertaken by the CRC until the establishment of the new regulatory authority and the appointment of at least three commissioners could set back the regulatory work by several years and undermine the regulation of the communication sector.
- To ensure effective regulation, the ANE should be an integral part of the converged regulator.
- The proposal to create "benefits for stopping illegal conduct" in Article 28 should have been reconsidered as it may undermine the sanction power of the public authority and is prejudicial to the consumers. No OECD country relies on this type of mechanism to discourage illegal conduct by telecom operators.
- Finally, enhancing competition should have figured more prominently in the law and its importance should have been weighed against the goal to promote investment.

Enhancing access and usage of communication services

- Continue to spur competition in the Colombian fixed and mobile communication markets.
- Auction the 700 MHz spectrum as soon as possible. When designing the auction, pursue the two key policy objectives of coverage and competition simultaneously.
- Increase Internet traffic exchange in Colombia. Consider promoting additional IXPs in the country.
- Undertake further analysis of how to extend last-mile connectivity. One way is to build on the national fibre backbone to extend connectivity to more businesses and households.
- Review import duties on handsets and lower the tax burden and fees on communication operators.

Article 23 of the ICT Modernisation Law puts forward the establishment of a single fund and equal contribution of all players in the market. This is desirable for the administrative efficiencies that are created. The overall contributions to the current funds are very high and means should be identified to reduce them as the contributions could be in excess of MinTIC's needs. As mentioned above, MinTIC has set up important programmes to spur connectivity and increase adoption of ICT

services. While these can be maintained where they support policy priorities, the FONTIC currently funds numerous other programmes at the same time, which may lead to a dispersion of resources and efforts. In the ICT Modernisation Law, the FONTIC is a step in the right direction, as the fund will be subject to periodic studies to determine its efficiency, effectiveness or impact on the use of the resources allocated in each project (Article 22). The careful monitoring of MinTIC's programmes and the performance of clear cost-benefit analyses to determine the efficiency of the different programmes are highly recommended. Ideally, some streamlining of all the programmes that are financed by the fund should be undertaken.

In addition, 33% of the funds' resources were transferred to the Colombian Ministry of Finance from 2010 to 2015 (DNP, 2017) and it has been reported that similar transfers were undertaken for the subsequent years. The FONTIC contributions are paid by the communication industry and intended to finance policy programmes, including universal access programmes to extend connectivity and increase uptake of ICT services. Resources of the fund should not be used to close some general government budget gaps, as this would result in a clear double taxation of an industry which is vital for the development of the Colombian digital economy. Following the approval of the ICT Modernisation Law, it can be positively noted that a transfer of the funds to the general budget will not be possible any longer.

Aside from the current contribution to the FONTIC and the FONTV, which will be soon unified in the FONTIC, sector-specific fees include a regulatory fee of 0.15% of revenues to fund the CRC, as well as contributions to the superintendencies (*superintendencias*) and annual spectrum fees.

General taxes, both on national and municipal levels, add to the sector-specific fees. As summarised in Table 2.4, the tax code is complex and overall taxes of a non-industry specific nature imposed on companies are high compared to other OECD countries (OECD, 2017). At the national level, the corporate tax amounts to a total of 37%. In addition, any financial transaction is taxed with 0.004% of its amount. At the municipal level, an industry and commerce tax is levied and amounts to 0.2% to 0.7% for industry activities and 0.2% to 1% for commercial and service activities. Several other municipal taxes add to this, such as a property tax or specific taxes depending on each municipality. It was reported, for example, that Barranquilla charges additional taxes on mobile services, which represents an additional "luxury tax" besides the national additional tax on mobile services. Table 2.4 lists all of the taxes and fees applying to the communication sector in Colombia.

Overall, the taxation burden on the communication industry can be considered as very high and it is recommended to find ways to reduce the overall fees and taxes on the sector.

References

CISCO (2017), *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update 2016-2021*, *www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.html*.

CRC (2019), *4G Subscriptions in Colombia in 2018*, Commission for Communications Regulation, Bogotá.

CRC (2016), "Revisión de los mercados de servicios móviles", Commission for Communications Regulation, Bogotá, *https://www.crcom.gov.co/recursos_user/2016/Actividades_regulatorias/merc_moviles/160603%20_Documento_Mercados_Moviles.pdf*.

DNP (2017), "Esquema de financiación para el sector TIC y audiovisual en el marco de la convergencia tecnológica y de mercados", National Planning Department, Bogotá, *https://colaboracion.dnp.gov.co/CDT/Prensa/Publicaciones/20171006%20-%20Esquema%20de%20financiaci%C3%B3n%20TIC%20vpublicaci%C3%B3n.pdf* (accessed on 3 August 2018).

M-Lab (2019), "Worldwide broadband speed league 2018", Cable, *https://www.cable.co.uk/broadband/speed/worldwide-speed-league*.

MinTIC (2019), "Asignación de espectro para IMT".

OECD (2019), *Broadband Portal*, *www.oecd.org/sti/broadband/oecdbroadbandportal.htm*.

OECD (2017), *OECD Economic Surveys: Colombia 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_surveys-col-2017-en*.

OECD (2015), "Development of high-speed networks and the role of municipal networks", *OECD Science, Technology and Industry Policy Papers*, No. 26, OECD Publishing, Paris, *https://doi.org/10.1787/5jrqdl7rvns3-en*.

OECD (2014a), *OECD Review of Telecommunication Policy and Regulation in Colombia*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264208131-en*.

OECD (2014b), *OECD Reviews of Innovation Policy: Colombia 2014*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264204638-en*.

OECD (2014c), *The Governance of Regulators, OECD Best Practice Principles for Regulatory Policy*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264209015-en*.

OpenSignal (2018), "The state of LTE", Opensignal, London, *https://opensignal.com/reports/2018/02/state-of-lte* (accessed on 23 July 2018).

Packet Clearing House (2019), *IXP Directory*, *https://www.pch.net/ixp/dir*.

Steam (2019), *Steam download stats*, *http://store.steampowered.com/stats/content*.

TeleGeography (2018), "Submarine cable map", *https://www.submarinecablemap.com* (accessed on 30 July 2018).

Weller, D. and B. Woodcock (2013), "Internet traffic exchange: Market developments and policy challenges", *OECD Digital Economy Papers*, No. 207, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5k918gpt130q-en*.

Notes

1. Data-only plans are usually provided exclusively to people with auditory impairments.
2. According to functions 1, 2, 3, 4, 5 of Article 22.
3. The resolution is currently under revision: *https://www.crcom.gov.co/uploads/images/files/Documento%20soporte%20-%20OMV-RAN%20publicaci%C3%B3n(1).pdf*.
4. Exchange rate of January 2019.

ANNEX 2.A

Overview of market players in the Colombian communication market

Table 2.A.1. Key market participants in the fixed line voice market: Local calls

	Company name
1	Avantel S.A.S.
2	Colombia Telecomunicaciones S.A. E.S.P.
3	EDATEL S.A. E.S.P.
4	Empresa de Recursos Tecnologicos S.A. E.S.P.
5	Empresa de Telecomunicaciones de Bogotá S.A. E.S.P. (ETB)
6	Empresa de Telecomunicaciones de Bucaramanga S.A. E.S.P. Telebucaramanga
7	Empresa de Telecomunicaciones de la Costa Costatel S.A. E.S.P.
8	Empresa de Telecomunicaciones de la Orinoquía S.A. E.S.P.
9	Empresa de Telecomunicaciones de Popayán S.A. Emtel E.S.P.
10	Empresas Municipales de Cali E.I.C.E. E.S.P.
11	Gilat Colombia S.A. E.S.P.
12	Kiero Telecomunicaciones S.A.S.
13	Metrotel Redes S.A.
14	Sistemas Satelitales de Colombia S.A E.S.P.
15	Teléfonos de Cartago S.A. E.S.P.
16	Telmex Colombia S.A.
17	UNE EPM Telecomunicaciones S.A. E.S.P. – UNE EPM TELCO S.A.
18	Unimos Empresa Municipal de Telecomunicaciones de Ipiales S.A. E.S.P.

Source: CRC.

Table 2.A.2. Key market participants in the fixed line voice market: Long distance

	Company name
1	Cellvoz Colombia Servicios Integrales S.A. E.S.P.
2	Colombia Telecomunicaciones S.A. E.S.P.
3	Edatel S.A. E.S.P.
4	Empresa de Telecomunicaciones de Bogotá S.A. E.S.P. (ETB)
5	Empresas Municapales de Cali E.I.C.E. E.S.P.
6	Ipsofactum S.A. E.S.P.
7	Kiero IP Telecomunicaciones S.A.S.
8	Telmex Colombia S.A.
9	UNE EPM Telecomunicaciones S.A. E.S.P. – UNE EPM TELCO S.A.
10	UNIMOS Empresa Municipal de Telecomunicaciones de Ipiales S.A. E.S.P.

Source: CRC.

Table 2.A.3. Key market participants in the mobile market

	Company name	Brand name
1	Almacenes Éxito Inversiones S.A.S.	Éxito
2	Avantel S.A.S.	Avantel
3	Colombia Móvil S.A. E.S.P.	Tigo
4	Colombia Telecomunicaciones S.A. E.S.P.	Movistar
5	Comunicación Celular S.A. Comcel S.A.	Claro
6	Empresa de Telecomunicaciones de Bogotá S.A. E.S.P.	ETB
7	Mercanet	
8	Uff Móvil S.A.S.	Uff Móvil
9	UNE EPM Telecomunicaciones S.A. E.S.P. – UNE EPM TELCO S.A.	UNE
10	Virgin Mobile Colombia S.A.S.	Virgin

Note: Mercanet has not started operations.

Source: CRC.

Chapter 3

FOSTERING THE DIGITAL TRANSFORMATION AMONG INDIVIDUALS, FIRMS AND IN THE GOVERNMENT

The Colombian government has developed digital strategies with the overall aim of promoting integration of its territory and communities; reducing social gaps; and improving access to public goods, social services and information. Colombia has made progress in the use of information and communication technologies (ICTs) in many areas, such as digital government and among businesses in some sectors. Nonetheless, low incomes and high inequality keep Internet access out of the reach of many people.

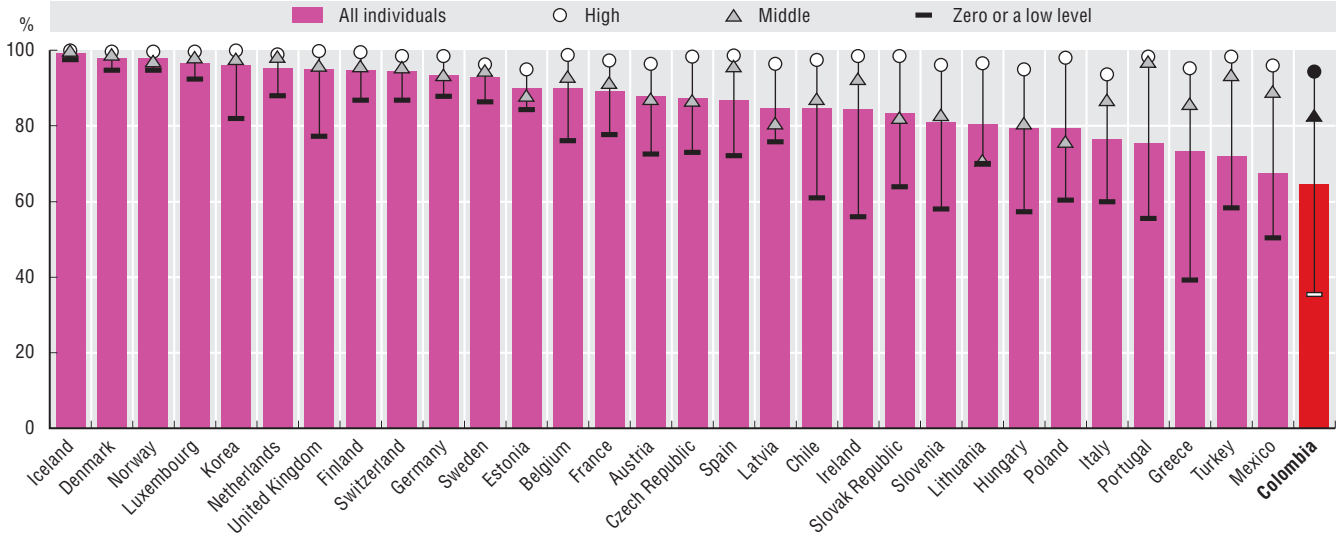
This chapter examines the usage of the Internet in Colombia. The first section looks at how Internet use by individuals and households is influenced by low incomes and inequality, and examines the government programmes aiming to overcome these barriers. The second section examines use of digital technology by firms, the factors that inhibit greater adoption and government policies to overcome these obstacles. The third section looks at how the government uses technology to provide services and increase transparency. The main conclusions and policy recommendations are presented in the final section.

There are wide disparities in Internet usage

For Colombia to achieve its goal of increasing the integration of its communities and territories through digital technologies, widespread use of such technologies is necessary. At present, Colombia is lagging behind in terms of Internet usage, with 64% of individuals using the Internet in 2017 (Figure 3.1). The relatively low rate of ICT use, however, is in line with other countries with similar gross domestic product (GDP) per capita (Figure 3.2). High inequality has left Colombia with a smaller middle class than in most OECD countries, putting Internet access at home out of the reach of many households (OECD, 2016b). As a result, many people are at risk of being left behind, with half of those without Internet access reporting high costs as the main barrier for not accessing the Internet (DANE, 2018a).

Figure 3.1. Colombian's use of Internet lags behind more advanced countries, 2017

Percentage of individuals using the Internet in the last 12 months, by education level



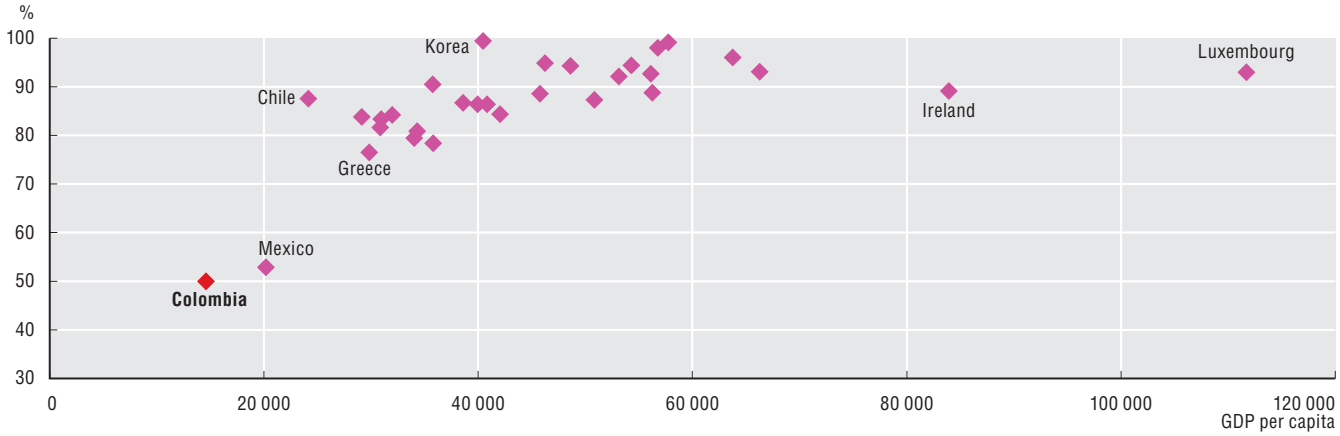
Note: Shows countries for which data are available.

Source: OECD (2018d), *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed in June 2019).

Large differences in Internet usage among social groups have the potential to prevent Colombia from achieving its aim of becoming a more equal society. Observed differences reflect the inequalities in the Colombian society, with education being the most important factor. Internet usage by the highly educated is nearing saturation levels, while usage by Colombia's large cohort with a lower education is below that of any OECD country (Figure 3.1). Income plays an important role in determining Internet usage, with Colombia showing a particularly wide gap between rich and poor (Figure 3.3). A rural-urban divide also exists, with only 37% of rural dwellers using the Internet, compared to 69% in urban areas (DANE, 2018a). Although age plays a role in Internet use, this gap is smaller in Colombia than in many OECD countries. In addition, Colombia benefits from a small gender gap in Internet use, which can be partially explained by policies to promote Internet use among under-represented groups.

Figure 3.2. Low home Internet usage is linked to low-income levels, 2017

Percentage of households with Internet access at home and GDP per capita (current prices, current PPPs)

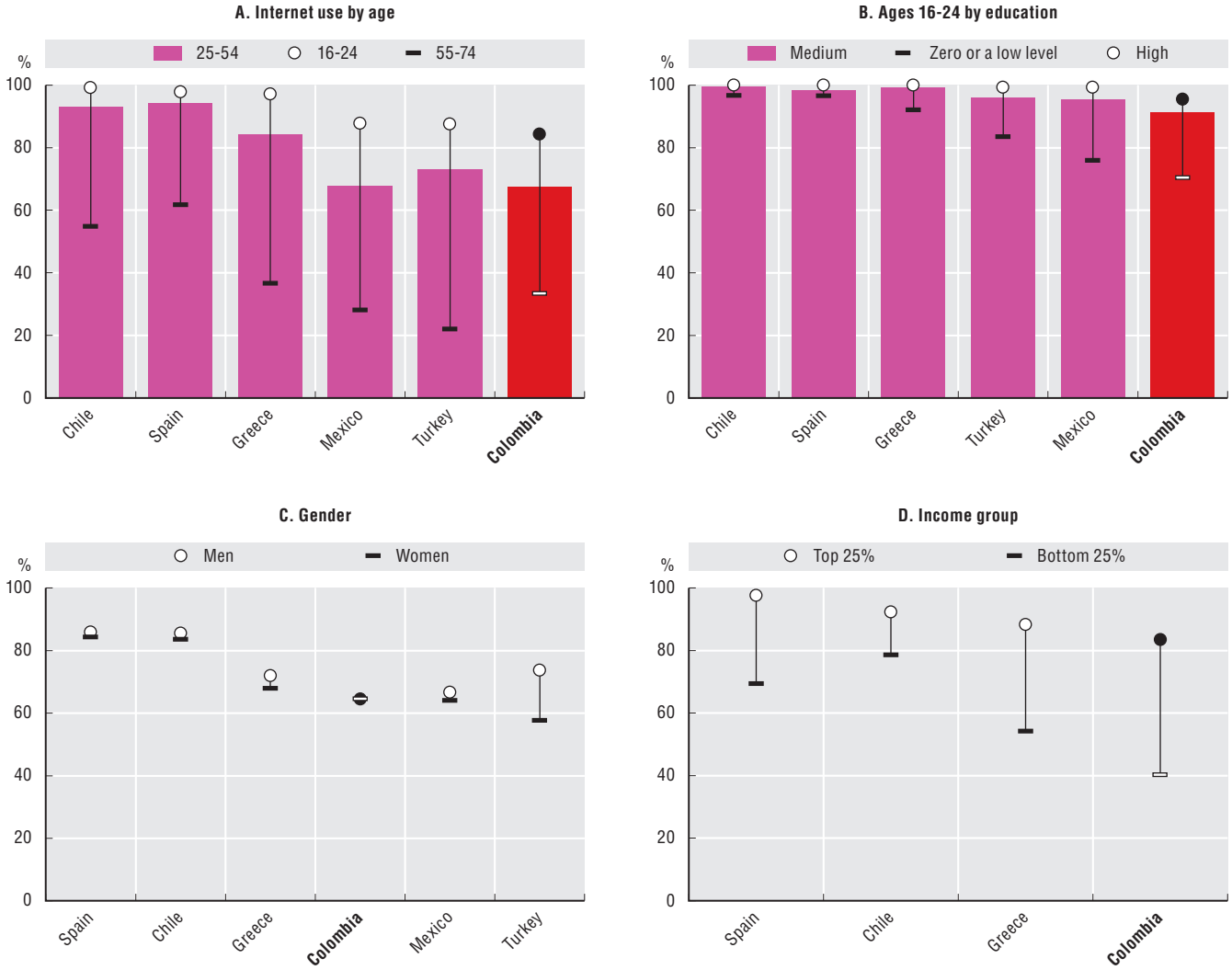


Notes: GDP = gross domestic product. Cross-country plot.

Sources: OECD calculations based on OECD (2018d), *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* and OECD (2018e), *National Accounts* (database), *https://doi.org/10.1787/na-data-en* (accessed in June 2019).

Figure 3.3. Internet use varies by group, 2017

Internet use in the past 12 months as a percentage of reference population



Source: OECD (2018d), *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed in June 2019).

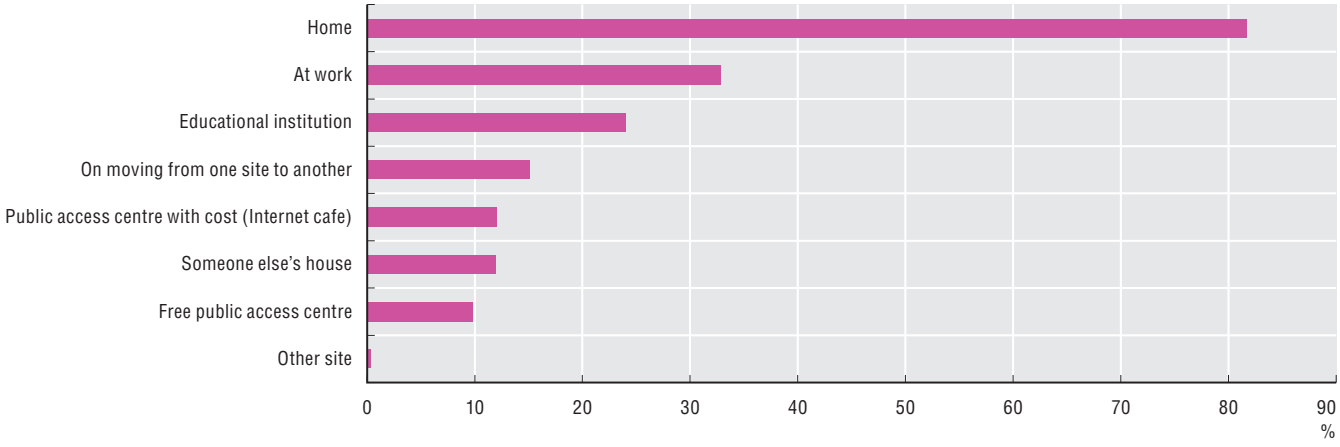
Government policies aim to increase affordability and boost Internet adoption

Increasing Internet use across households, firms and government was an important goal of the Live Digital for the People (Vive Digital para la Gente) plan, which ran from 2014 to 2018 (MinTIC, 2014). This plan was an iteration of Colombia's overarching strategy to increase the use of digital technologies in order to reduce poverty and create jobs, as well as to develop digital solutions to the problems faced by the Colombian society. The main goals for 2014-18 were to increase government transparency and efficiency and to establish Colombia as a world leader in developing apps to help the poorest in society (MinTIC, 2014). The plan follows on from the previous Live Digital (Vive Digital) plan (2010-14), which focused on developing Internet infrastructure and increasing widespread usage, while The Digital Future is for All (El Futuro Digital es de Todos) will run from 2018 to 2022 (MinTIC, 2014, 2019).

As part of the Vive Digital plan (2010-14), the government aimed to foster universal access, including for rural remote areas, by building Internet centres in villages, such as the Puntos Vive Digital in urban areas and the smaller rural-based Kioscos Vive Digital (OECD, 2014). Almost 900 Vive Digital access points were created in Colombia's poorer communities. By giving the public access to ICTs for entertainment, training and online government services, the Vive Digital access points have also helped users to develop their skills and serve as useful locations for training programmes (OECD, 2018a). As a result, almost a tenth of all individuals accessing the Internet in 2017 did so via public telecentres, many of which are located in schools, although most accessed the Internet from the home (Figure 3.4). However, some digital services (such as online banking) are not available in such centres for security reasons.

Figure 3.4. Most Internet users access from their own home, 2017

Percentage of Internet users



Source: DANE (2018a), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación: TIC em hogares y personas de 5 y más años de edad", *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2017.xlsx* (accessed in February 2019).

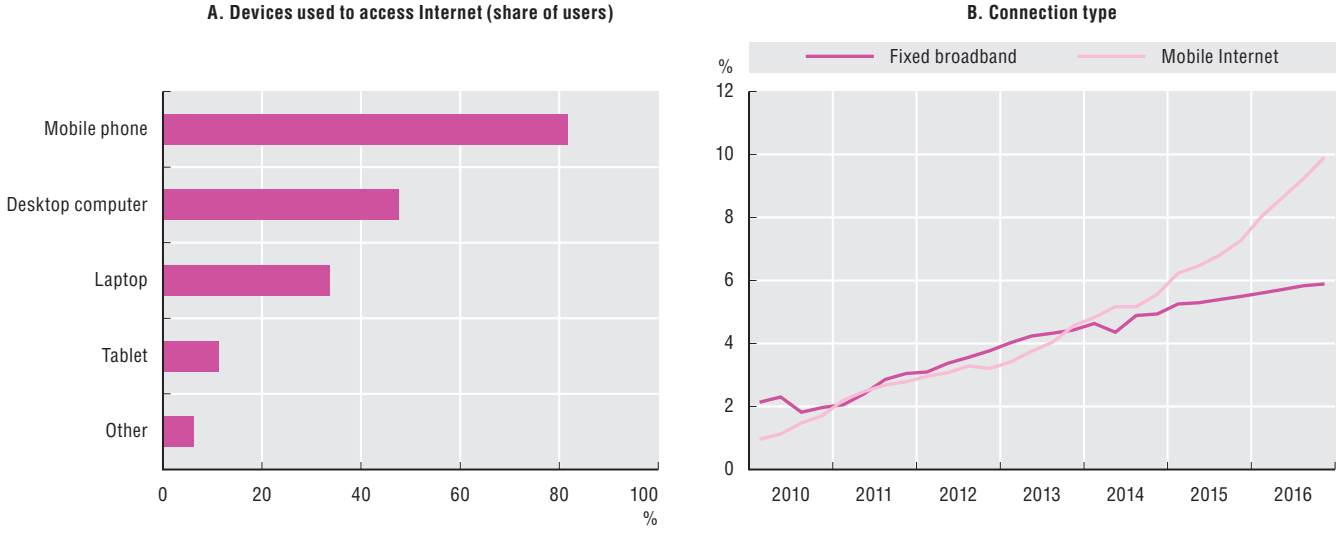
In order for such centres to continue to be effective, they must be appropriately funded to ensure that equipment and ICT infrastructure are maintained, and also that municipal staff receive appropriate training to use ICTs and to assist the public (OECD, 2018a). As accessing the Internet at home becomes more affordable and the use of mobile Internet more popular (see Chapter 2), the benefits from government-financed Internet centres will diminish, although they are likely to continue to play a role in promoting Internet usage in poorer communities. Indeed, the government plans to reduce the number of such access points by a quarter between 2019 and 2022 (and aims to provide universal access through new technologies in co-operation with the private sector) (MinTIC, 2019a). It is, therefore, important to better target existing resources towards areas and regions where Internet access is likely to remain limited or too costly while reducing public funding for Internet centres where usage has been declining in favour of access by market providers.

The government has also incentivised mobile access to the Internet, which has become the main connection channel in Colombia (Figure 3.5). The Internet Móvil Social para la Gente is a programme aimed to increase Internet usage of low-income and geographically isolated households that have

not used the Internet before by promoting mobile connections. The programme offers a subsidised smartphone, a 3 gigabyte (GB) to 4 GB data package for approximately USD 2, free off-peak access from 11 pm to 5 am, and free access to government services and educational content, in addition to some social media and messaging platforms. Users could also make use of publicly available Wi-Fi (MinTIC, 2016). As a result of this programme, only a fifth of mobile Internet users mainly used full-cost for access in early 2016: approximately 40% of mobile Internet users mainly connected through specified plans (which allow access to specific apps or sites, such as social media sites, for a period of time) while a quarter of them mainly used public Wi-Fi (A4AI, 2016, 2017). In addition, the government has removed value-added tax on lower cost smartphones (see Chapter 2).

Figure 3.5. Mobile Internet has become the main way to connect on line

Usage of devices to access the Internet, as a percentage of Internet users



Sources: DANE (2018a), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación: TIC em hogares y personas de 5 y más años de edad", *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2017.xlsx* (accessed in February 2019); MinTIC (2019b), "Colombia TIC – Estadísticas: Servicio de Comunicaciones", *https://colombiatic.mintic.gov.co/679/w3-propertyvalue-36342.html*.

Despite persistent differences in Internet use, there are signs that Colombia has been successful in reducing the digital divide since the introduction of the Vive Digital para la Gente plan (Figure 3.6). Since 2014, growth in Internet usage among more vulnerable groups, such as those with a low education, those in the bottom income quartile and those aged 55-74 has accelerated. Disparities have also been narrowing as the rate of usage by early-adopting groups is approaching the ceiling of 100%.

Internet users make little use of paid-for services

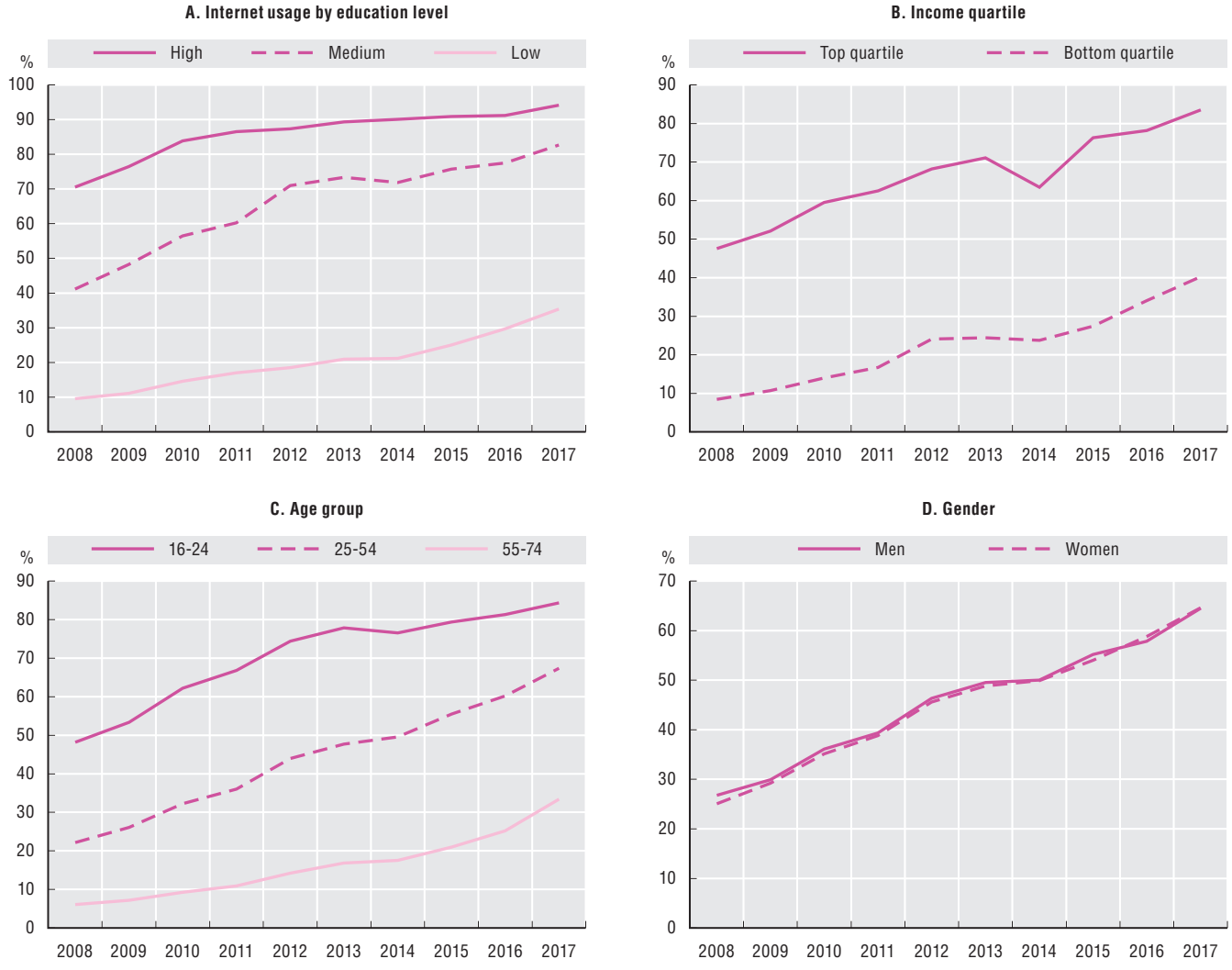
Greater use of the Internet by the Colombian population can help foster a more dynamic economy. The Internet can allow Colombian consumers to search for a wide range of goods and services (whether delivered on line or in a traditional manner), rather than rely on personal recommendations. In addition, it can allow services, both from the public and private sectors, to be delivered in a more efficient manner and promote formality in the economy (see below).

Against these opportunities, Internet users in Colombia tend to carry out simple activities online, e.g. e-mail and social media, while more sophisticated services such as e-commerce and e-banking are not so widespread (Figure 3.7). In general, the use of more sophisticated services is associated with higher levels of education attainment (OECD, 2017c). However, even highly educated individuals in Colombia make relatively little use of these activities (Figure 3.7).

Expansion of paid-for online services (such as online purchases) seems to be hampered by the relatively low level of financial development. Although 81% of the population had at least one financial product of some kind in 2018, only 68% of adults actively use their financial product and as few as 29% of adults have a credit card (Banca de las Oportunidades and Superintendencia Financiera de Colombia, 2019). As a result, Colombia lags behind several other Latin America and Caribbean countries, with the cost of

financial services being the main deterrent. Only 37% of adults have made or received a digital payment (such as using a credit card, receiving wages directly into a bank account or transferring money over the Internet) while more traditional forms of payment, such as cash-on-delivery for goods, continue to be widely used (World Bank, 2018; Nielsen, 2016).

Figure 3.6. The digital divide shows signs of stabilising

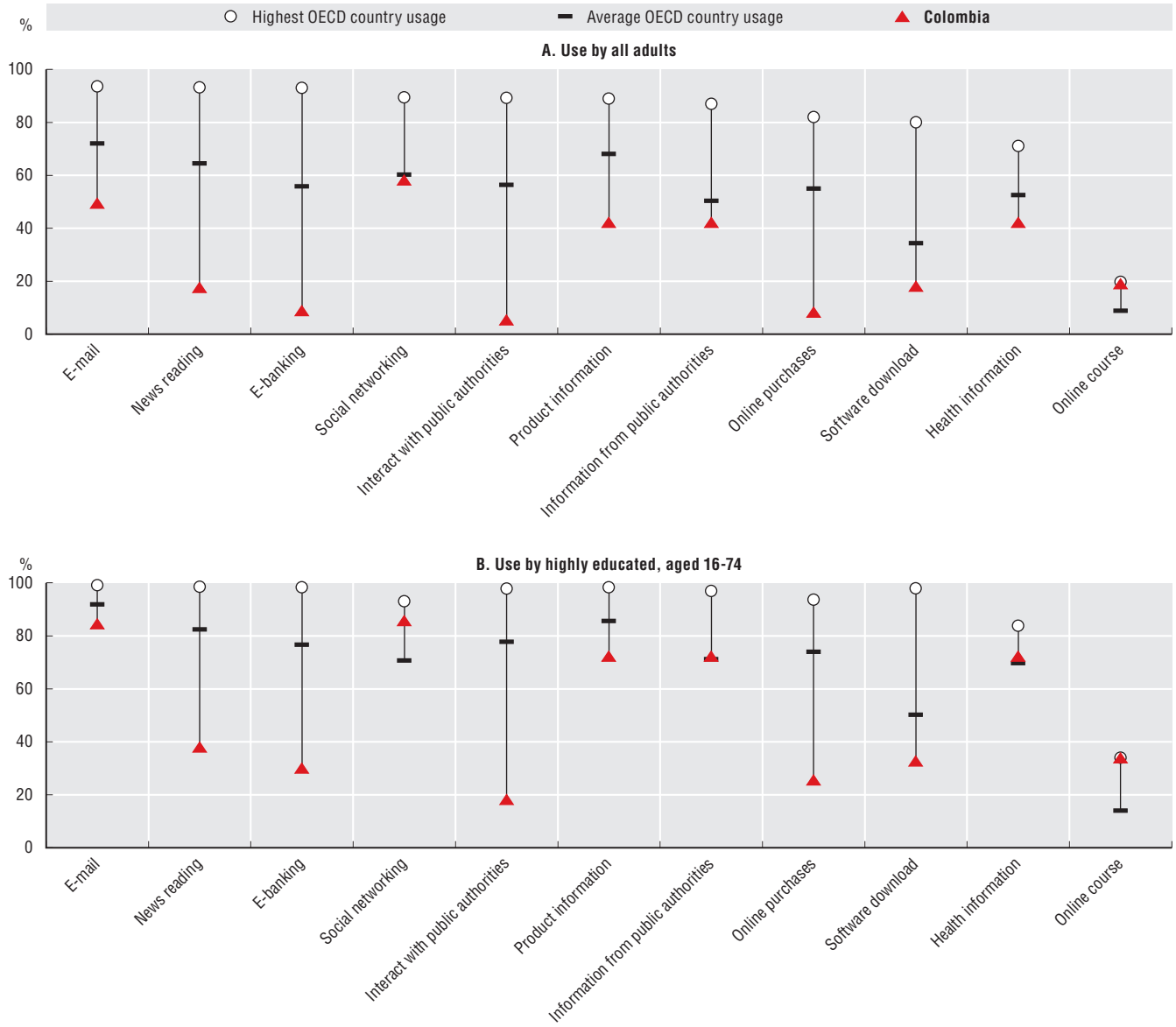


Source: OECD (2018d), *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed in June 2019).

The government has prioritised the promotion of formal financial products through the expansion of the physical banking network and by increasing the use of digital transactions. Electronic deposit accounts have been permitted since 2011 (Decree 4687 of 2011). Such accounts have a simplified opening procedure whereby customers only need an identity card and a registered mobile phone to open an account. As a result, the share of adults with an electronic deposit has been growing steadily, reaching 14% of adults by 2018, though this remains small relative to the share of adults (75%) with a traditional savings account (Banca de las Oportunidades and Superintendencia Financiera de Colombia, 2019). Further steps to promote e-banking were taken in 2014 (Law 1735 of 2014) by allowing the creation of companies which specialise in electronic deposits and payments (*sociedad especializada en depósitos y pagos electrónicos* [SEDPE]). SEDPEs allow customers to carry out financial transactions such as paying utility bills and making deposits, but are not permitted to offer loans, and in 2017 Celuplata became the first SEDPE to be granted a licence (MinHacienda, 2017).

Figure 3.7. Colombians lag behind in more sophisticated Internet activities

As a percentage of Internet users, 2017



Notes: Data for the highest OECD country and OECD country average include Colombia and OECD countries as of 2017, except Australia, Canada, Israel, Japan, Korea and the United States. Colombia uses a harmonised methodology for data on use of e-mail, social networking, interacting with public authorities and online purchases.

Source: OECD (2018d), *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed in June 2019).

Although such steps have been beneficial, further progress is needed. Exempting electronic payments from the tax on financial transfers (named for its rate of 4 *por mil* or 4 x 1 000) could help promote greater use of electronic banking and also boost formality in the economy (see Chapter 4).

A further obstacle to e-commerce uptake among individuals is a lack of trust in online retailers. According to some surveys, 70% of those making use of cash-on-delivery do so because they do not trust giving their bank details (with lack of a credit card being the second-most frequent reason) (Nielsen, 2016). Although low trust may be linked to a lack of familiarity of e-commerce among consumers, trust can also be undermined by incidents of online fraud (Gefen, 2000; Kim and Peterson, 2017). Indeed, the total number of recorded cybercrime incidents increased by 36% in 2018, when Colombia became the sixth largest target country of phishing attacks (Centro Cibernético Policial, 2017a, 2017b; RSA, 2018).

In order to combat cybercrime, a law to counter the illegal appropriation of electronically stored confidential information has been in force since 2009 (Law 1273 of 2009). In addition, in 2010 a Police Cyber Centre (Centro Cibernético Policial) was established to investigate and support the prosecution of cybercrime, while in 2018 the Finance Superintendent was given a mandate (Circular Externa 007/2018) regarding cyber-risk management of financial institutions (Council of Europe, 2015). However, criminal judges may lack expertise in dealing with online fraud. Establishing a special department of the public prosecutor's office to deal with cybercrime could improve confidence among consumers in the security of e-commerce. In addition, considering cybersecurity in ICT infrastructure and critical activities would be a means to enhance consumer confidence in the digital economy and increase uptake of digital services.

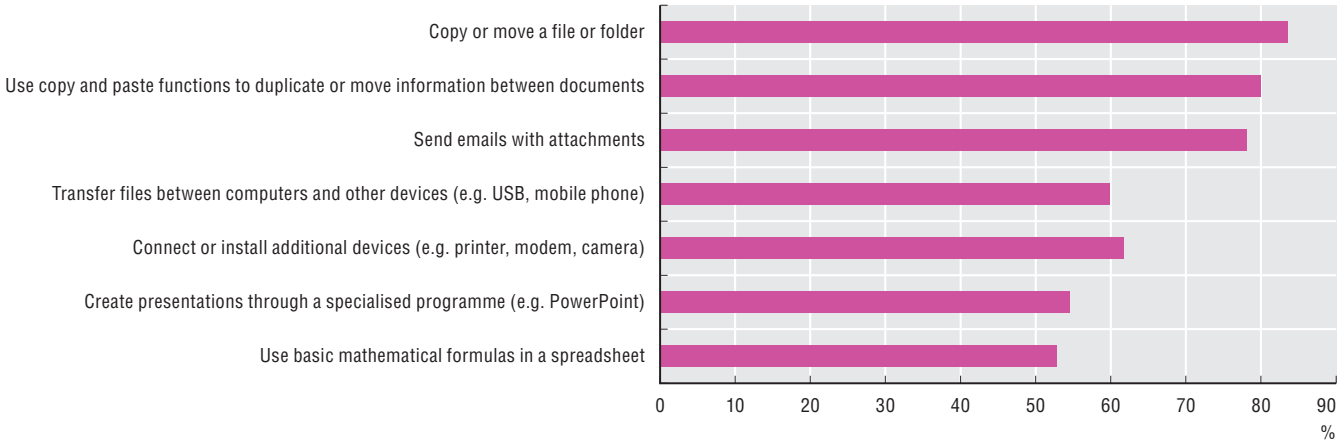
Consumers have also reported a high level of dissatisfaction with purchases they have made on line and 70% of individuals in Colombia are concerned that groceries purchased on line will not match their description (Meltzer and Pérez Marulanda, 2016; Nielsen, 2016). Dissatisfied consumers can make a civil complaint on line via the Superintendence of Industry and Commerce (Superintendencia de Industria y Comercio). Creating a dedicated website for such complaints could improve consumers' awareness of the remedies available to them if they are unsatisfied with the level of service they have received. Publishing data on the number of complaints received, the time taken to resolve them and the proportion resolved in the consumer's favour or compliant with regulations, could increase consumers' confidence in such a system and therefore in e-commerce. In addition, the introduction of a quality mark programme for retailers that reach high standards in quality and in dealing with customer complaints could help boost consumers' trust in online firms.

Improving digital skills is necessary to increase usage of ICTs by individuals

Higher sophistication in ICT use will require better skills among users. Many computer users in Colombia lack some basic computer skills, with a quarter of them unable to send emails with attachments, and a third unable to connect additional devices such as printers (Figure 3.8).

Figure 3.8. Many computer users lack the skills to make full use of their computer

Those with skills as a percentage of computer users, 2016



Source: DANE (2018a), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación: TIC em hogares y personas de 5 y más años de edad", *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2017.xlsx* (accessed in February 2019).

Improving the digital skills of individuals is an important component of the Vive Digital and El Futuro Digital es de Todos plans, with government programmes in place to support the development of a wide range of skills, from software development (see Chapter 5) to basic digital literacy.

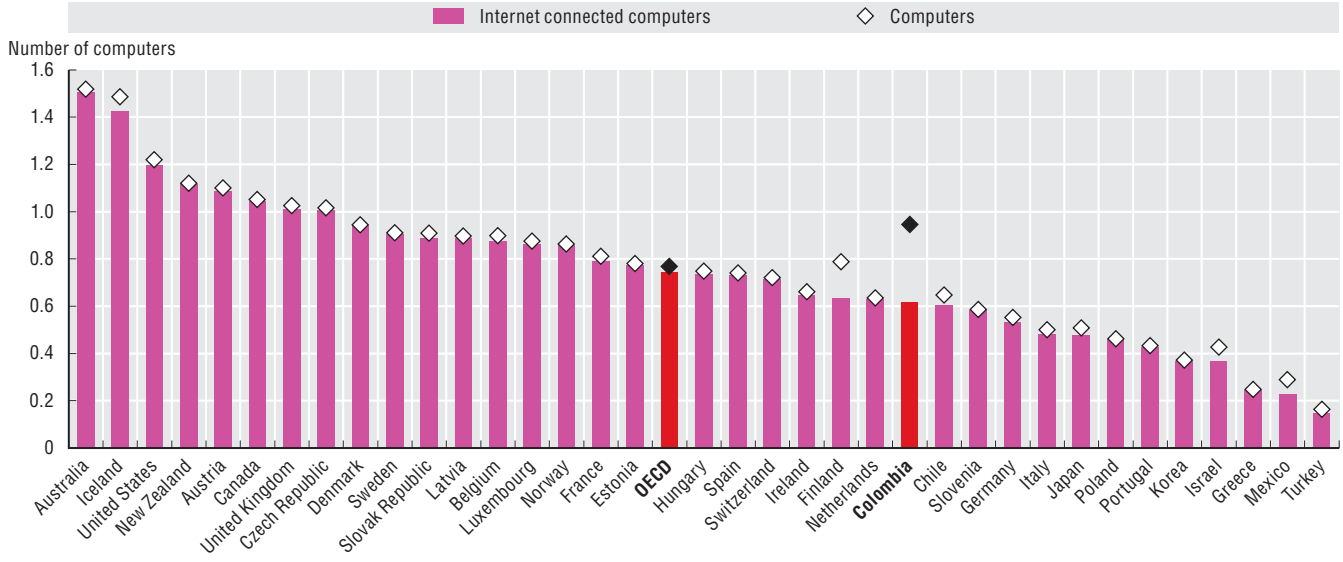
Numerous programmes have been put in place to improve basic digital skills among adults. In 2016, the Digital Citizens (Ciudadanía Digital) online training programme trained 1 392 000 people in digital literacy and ICT awareness, allowing them to be certified as "digital citizens". It covered topics such as online security, digital rights and aspects related to e-commerce (Ciudadanía Digital, 2018). Another

programme, Redvolución, made use of 50 000 volunteers to provide basic training to over 425 000 people (MinTIC, 2017c). Escuela TIC Familia was an ICT project that aims to help parents and teachers develop skills to look after children. In addition, some municipalities have established programmes to boost digital literacy of specific groups. For instance, Bogotá has 15 digital inclusion centres for women located in equal opportunities for women centres and the AdulTICoProgram (in the city of Armenia) targets older people (UNESCO, 2017; Roseth et al., 2018).

While it may be beneficial to have programmes that target the needs of specific groups, many programmes seem to overlap, as is the case of other policy initiatives in Colombia (see Chapter 5). This feature can lead to poor accountability and make it hard to assess whether programmes have been effective. As the use of digital technology matures, and digital skills become a necessity on par with literacy and numeracy skills, it would be preferable to integrate such programmes with general adult education policies.

The use of computers has already been integrated into the education system for younger Colombians. Under the Computers to Educate (Computadores para Educar) programme, the Ministry of Information and Communication Technologies (Ministerio de Tecnologías de la Información y Comunicaciones [MinTIC]) and the Ministry of Education aim to provide schools with computers and train teachers how to use computers in their teaching. In addition to training almost 50 000 teachers by 2016, more than 150 000 parents have been trained under this programme. However, the programme's funding is linked to the royalties received from the extractive sector, and has been cut due to the fall in commodity prices (Radinger et al., 2018). Nevertheless, as part of the Sectoral Strategic Plan 2019-2022 (Plan Estratégico Sectorial 2019-2022), the government plans to increase the number teachers trained to deliver ICT-related courses (such as a new Code for Kids programme) and the number of computers available in schools (MinTIC, 2019a).

Figure 3.9. Colombia has a large number of computers per student



Source: OECD (2016b), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, *https://doi.org/10.1787/9789264267510-en*.

As a result of the Computers to Educate programme, Colombia has a large number of computers per student, higher even than advanced countries such as Denmark and Sweden. However, only two-thirds of these computers are connected to the Internet, bringing the number of Internet-connected computers per student below the OECD average, though far ahead of countries with a similar overall level of Internet penetration, such as Mexico and Turkey (Figure 3.9). In addition, schools in rural areas or with students from low-income households are less likely to be connected, thus widening the digital divide among young people (OECD, 2016a).

Participation in the Computadores para Educar programme has been found to be associated with a reduction in the drop-out and repetition rates and a higher rate of progression to tertiary education and

better test results. However, such benefits are conditional on satisfactory training of teachers (Centro Nacional de Consultoría, 2015). In addition, teachers have been reluctant to make use of computers that are not connected to the Internet (Radinger et al., 2018).

The availability of computers in schools also has the advantage of increasing Internet accessibility for younger people, with a quarter of all users accessing the Internet via educational institutions (see Figure 3.4). However, despite the large availability of computers in schools, only a third of Colombian pupils are in a school that offers an extra-curricular club which focuses on computers and ICTs (compared to an OECD average of two-fifths) (OECD, 2016a). The experience of other OECD countries shows that greater use of extra-curricular activities can be useful to develop computer skills. For example, in 2004 Lithuania introduced an online "Bebras" (Beaver) competition for those aged 8-19 whereby contestants make use of computational thinking. The fact that this competition has spread to 35 other countries is proof of its success (Heintz et al., 2015).

Using ICTs to boost firm productivity and raise living standards

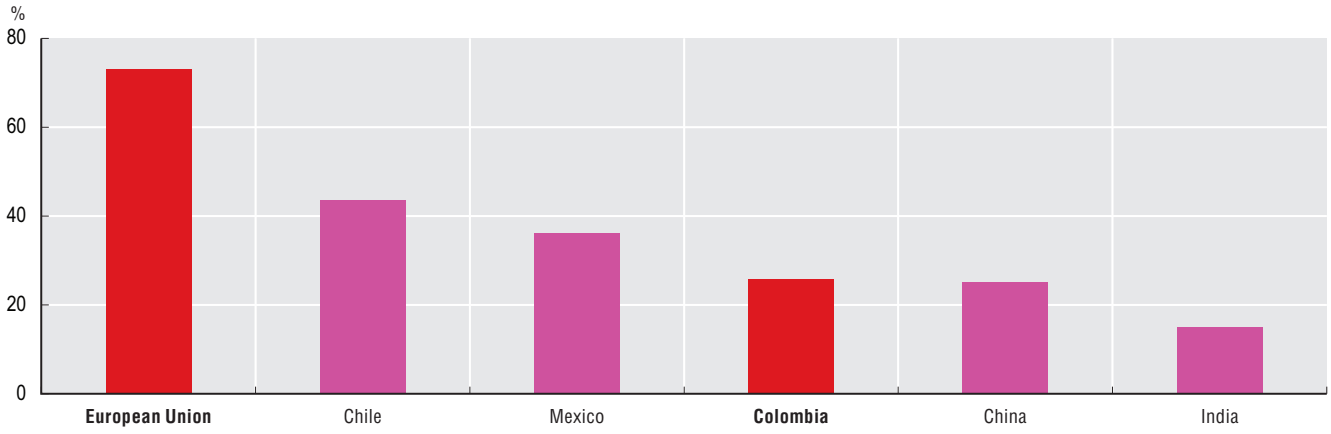
Colombian firms suffer from low productivity, leading to low wages and living standards. As part of the National Development Plan (Plan Nacional de Desarrollo [PND]), the government is promoting the use of ICTs in order to raise productivity within firms. However, ICTs can go beyond boosting individual firms to play a role in transforming the Colombian economy, as firms and consumers become less reliant on personal connections when seeking goods and services and access larger markets. Although ICT adoption is in line with other OECD countries for medium-sized firms, this conceals the fact that Colombia has a large number of micro-firms, i.e. less than ten employees, that are not reported in OECD statistics. Overall, there seems to be a lack of competitive pressures to spur the adoption of ICTs. In response, the Colombian government has introduced policies to promote usage of ICTs among firms.

Productivity is low and slowing

The Colombian economy is characterised by a large share of informal employment and family firms (see below) with low productivity (Figure 3.10) (OECD, 2017d). In addition, productivity growth has been persistently low (OECD, 2014, 2017d). Not only can greater use of ICTs raise the productivity of individual firms, but the Internet and ICTs more broadly can serve as a technology to improve communication and innovation across the economy and to spur productivity growth. Indeed, as part of MinTIC's Vive Digital strategy, the government aimed to promote business use of ICTs among small and micro-firms to boost innovation and efficiency (OECD, 2014). Likewise, the PND 2018-2022 "Pacto por Colombia, Pacto por la Equidad" seeks to raise productivity through the adoption of new technologies among companies and in the public sector, to promote electronic commerce and to stimulate entrepreneurship and the cultural sector.

Figure 3.10. Productivity is low in Colombia

GDP per person employed, as a percentage of the United States, current PPPs, 2018

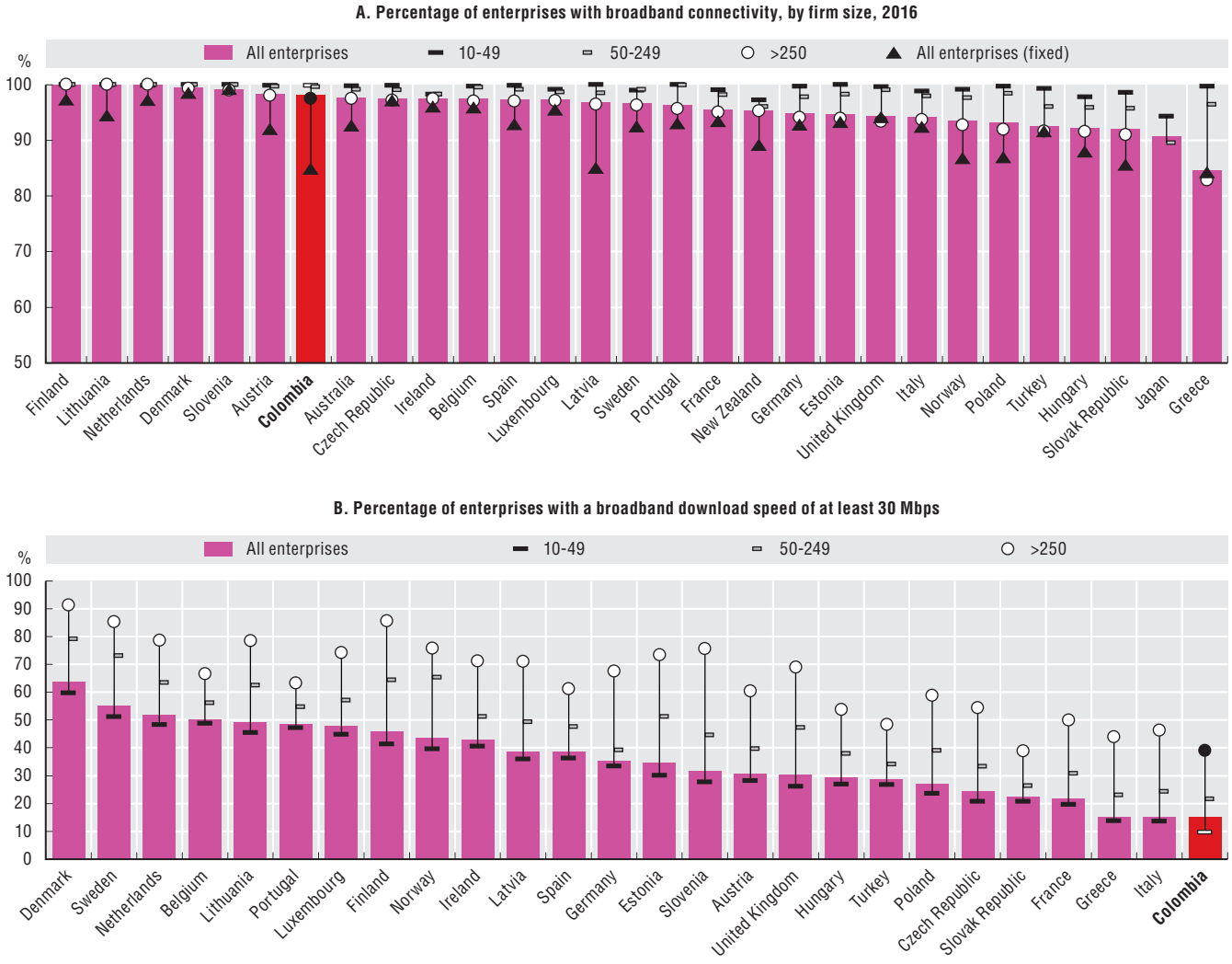


Source: OECD (2019a), *Productivity Statistics Database*, *https://doi.org/10.1787/pdtvy-data-en* (accessed in June 2019).

Colombian firms lag behind in their use of the Internet

While Internet connectivity among Colombian firms (with ten or more employees) is reasonably high by international standards, fixed broadband penetration remains low. As a result, firms generally have slow connection speeds, with only a minority of even larger firms having a connection speed greater than 30 megabits per second (Figure 3.11). Such comparisons are exacerbated by Colombia having a particularly large number of informal firms, which are not covered in international ICT statistics, and which tend to have even lower levels of connectivity (see below).

Figure 3.11. Most Colombian firms are connected to broadband, but speeds are slow



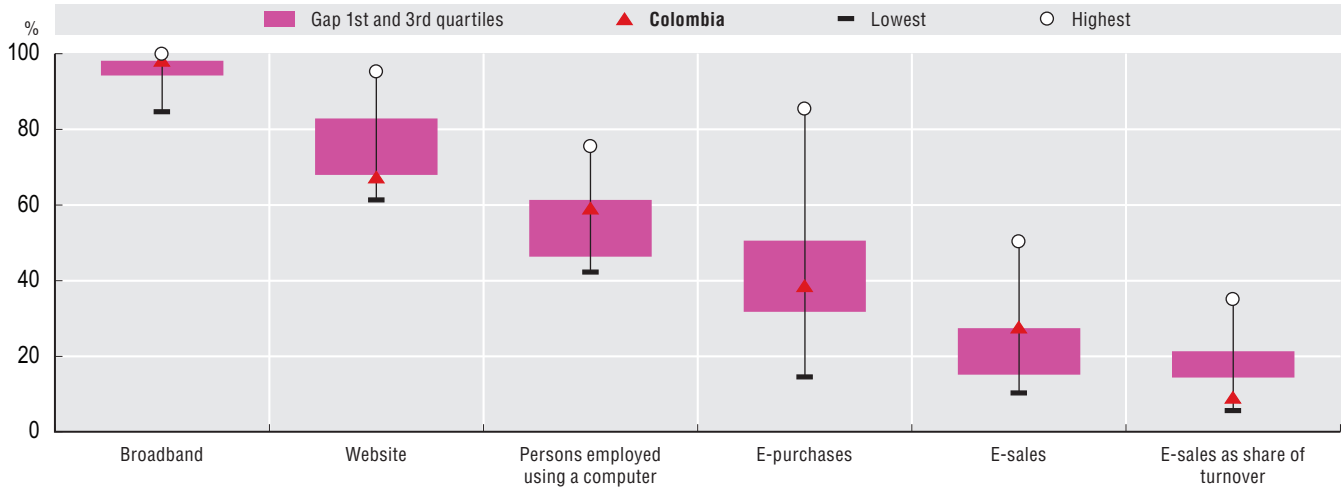
Notes: Except where otherwise stated, the sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more employees are considered. For Australia and New Zealand industrial classification, ANZSIC06 division is used instead of ISIC Rev.4 division. For Australia, data include agriculture, forestry and fishing. For Japan, data refer to businesses with 100 or more employees instead of 10 or more; medium-sized enterprises have 100-299 employees and large ones 300 or more. For industrial classification, JSIC Rev.13 division is used instead of ISIC Rev.4. Fixed broadband refers to a wired or fixed wireless broadband connection.

Source: OECD (2018c), *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed in June 2019).

Colombian firms lag behind those of other OECD countries, even for relatively unsophisticated Internet activities, such as use of a website (Figure 3.12). Although a relatively large share of firms receive orders over computer networks, including the Internet, e-commerce accounts for a small share of their turnover, even for larger firms (Figure 3.13).

Figure 3.12. Colombian firms do not make advanced use of ICTs

As a percentage of enterprises, 2016

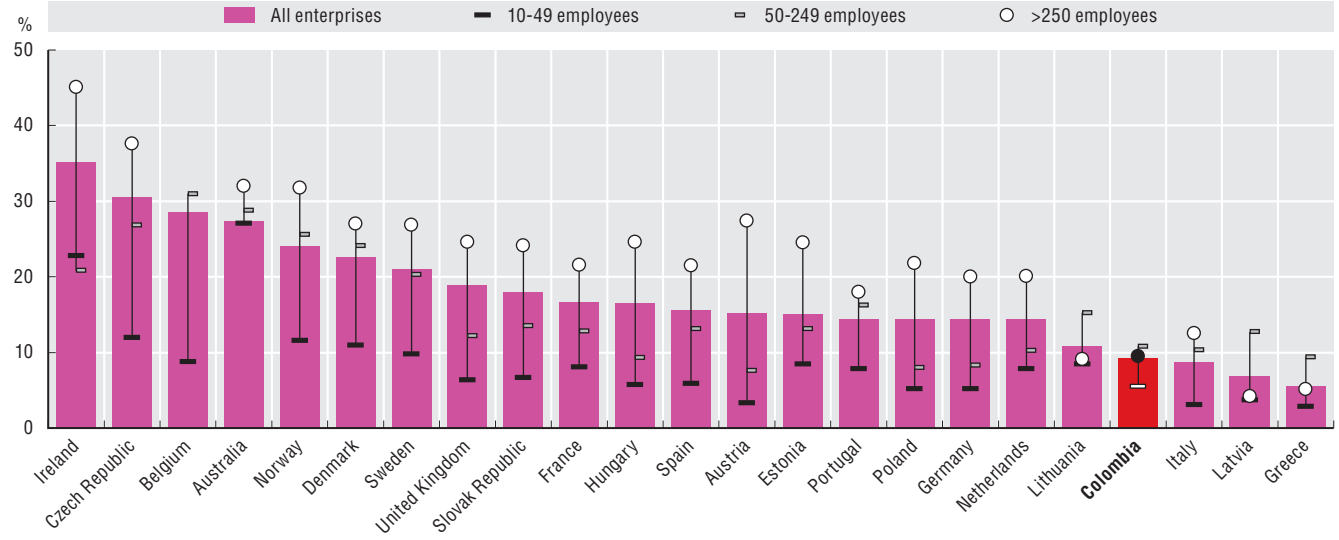


Notes: Except where otherwise stated, the sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more employees are considered.

Source: OECD (2018c), *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed in June 2019).

Figure 3.13. A small share of firm turnover is due to online sales

Orders received over computer networks as a percentage of turnover, 2016



Notes: Except where otherwise stated, the sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more employees are considered. For Australia and New Zealand industrial classification, ANZSIC06 division is used instead of ISIC Rev.4 division. For Australia, data include agriculture, forestry and fishing.

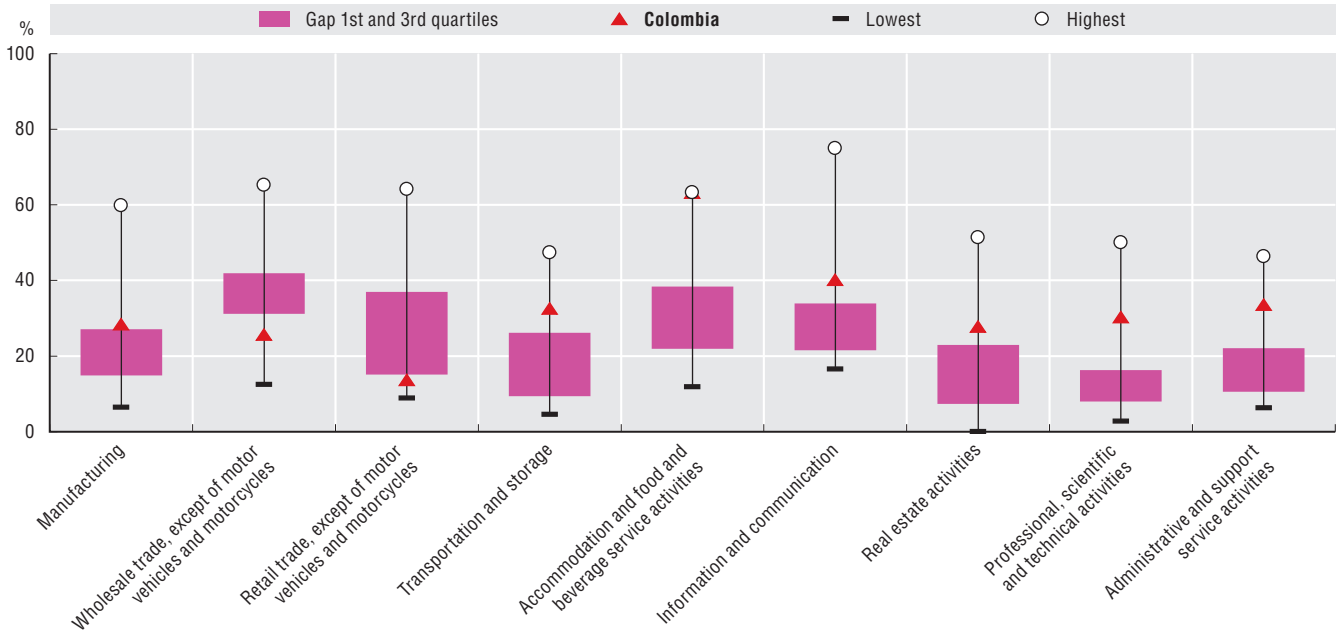
Source: OECD (2018c), *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed in June 2019).

Some sectors in Colombia have been more successful in adopting digital technologies. Tradable sectors, like accommodation and food, are leaders in terms of taking orders on line, in sharp contrast with more domestically oriented sectors, like retail, where most businesses do not engage in e-commerce (Figure 3.14).

Colombia ranks in the middle for the share of firms that place orders on line (e-purchases) and there is relatively little variation across sectors in the use of e-purchasing, suggesting that business to business online transactions are more advanced than sales to consumers (Figure 3.15). In addition, there is relatively little variation across sectors in the use of e-purchasing (in line with other countries), suggesting that the use of the Internet for business to business transactions is more mature than for business to consumer transactions (OECD, 2018c).

Figure 3.14. Several sectors are leaders for the ability to take orders on line

Businesses receiving orders over computer networks, as a percentage of enterprises with ten or more employees, 2016

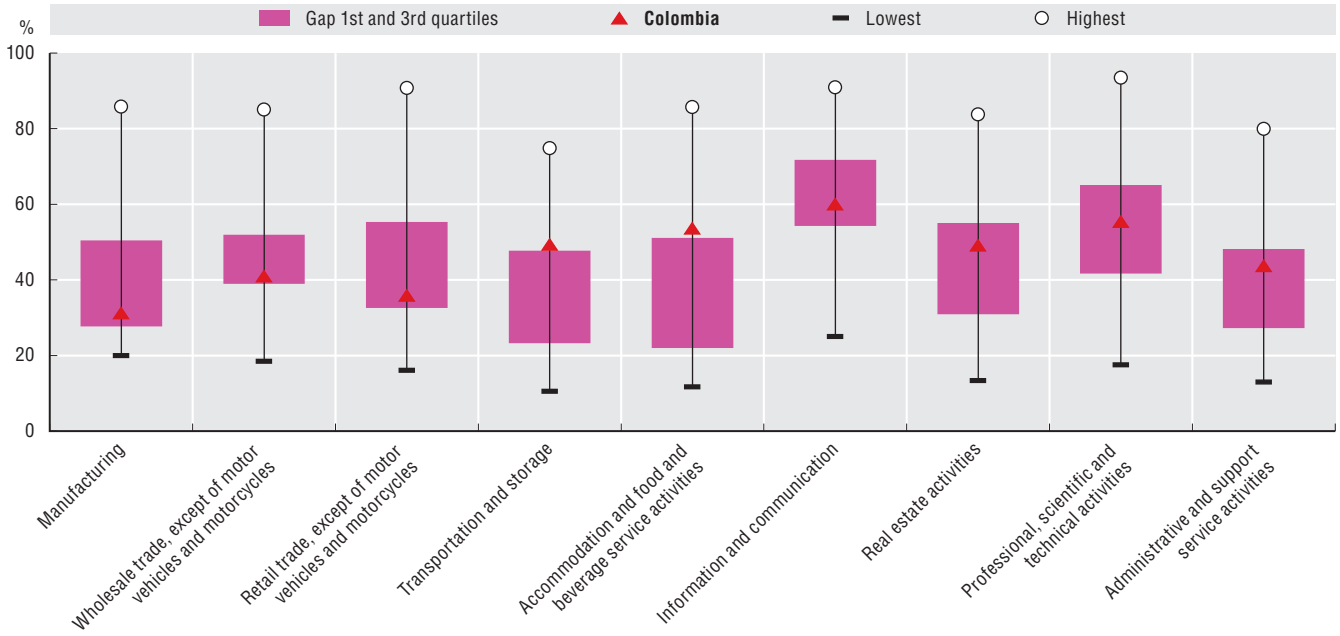


Notes: Except where otherwise stated, the sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more employees are considered.

Source: OECD (2018c), *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed in June 2019).

Figure 3.15. There is relatively little variation in the share of firms making e-purchases

Businesses placing orders on line as a percentage of enterprises with ten or more employees, 2016



Notes: Except where otherwise stated, the sector coverage consists of all activities in manufacturing and non-financial market services. Only enterprises with ten or more employees are considered. For countries in the European Statistical System, data on e-purchases relate to 2015 instead of 2016.

Source: OECD (2018c), *ICT Access and Usage by Businesses* (database), *http://oe.cd/bus* (accessed in June 2019).

Colombia also has a large share of micro- and informal firms with low-usage rates of ICTs. The usage of the Internet by micro-firms in many ways resembles that of households: while over 95% of firms with ten or more workers make use of Internet banking, less than a third of micro-firms do so (DANE, 2018b) (Figure 3.16). Therefore, policies that promote usage of the Internet among households, such as improving digital skills and financial inclusion (see above), are also likely to be of benefit to micro-firms.

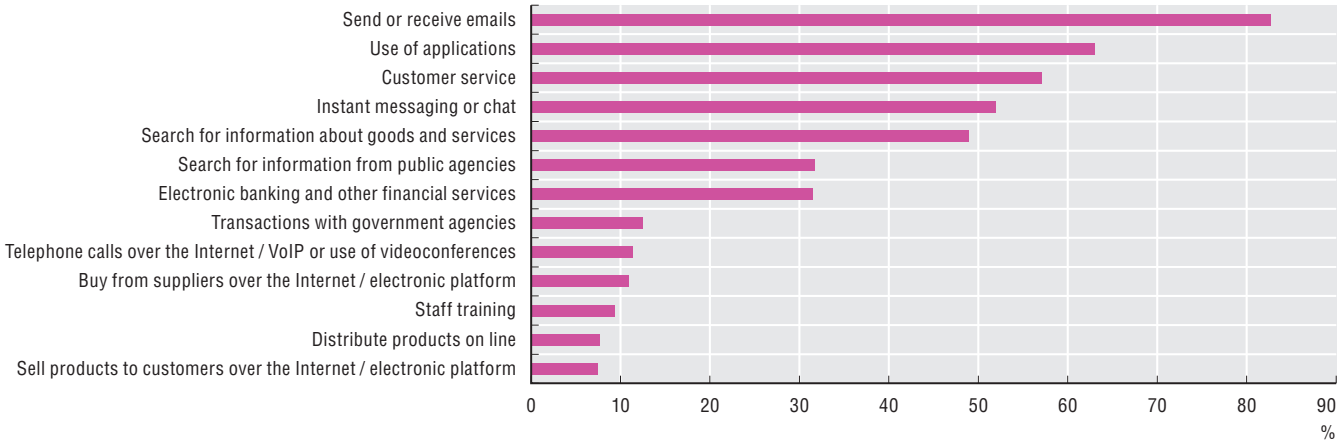
Adoption of ICTs is hindered by a lack of competitive pressures

Firms can be motivated to adopt new technologies, such as ICTs, in response to stronger competition from their rivals (Andrews, Nicoletti and Timiliotis, 2018). However, the particularly large dispersion of productivity between large and small firms in Colombia suggests inefficient allocation of resources, and a lack of competitive forces to push less productive firms out of the market (Brown et al., 2016; OECD, 2017d). Indeed, over 90% of micro-firms that do not make use of ICTs report a lack of necessity as the reason for not using them (DANE, 2017). Although Colombia has relatively few institutional restrictions on competition and the level of state control of the economy is in line with OECD countries, there are a number of non-regulatory barriers to competition (OECD, 2017d).

Poor infrastructure restricts the ability of productive firms to gain market share in nearby regions, and insulates less productive firms from competition. Although public investment has been steadily increasing since 2000, Colombia suffers high domestic transport costs. In addition, trucking services are provided by many one-truck firms with low productivity. The lack of integration into international markets (see Chapter 4), also insulates less productive firms, especially outside of the main cities (OECD, 2017d).

Figure 3.16. Internet activities carried out by micro-firms, 2016

As a percentage of micro-firms with Internet access



Note: VoIP = voice over Internet Protocol.

Source: DANE (2018b), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación – TIC en microestablecimientos", *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2017.xlsx* (accessed in February 2019).

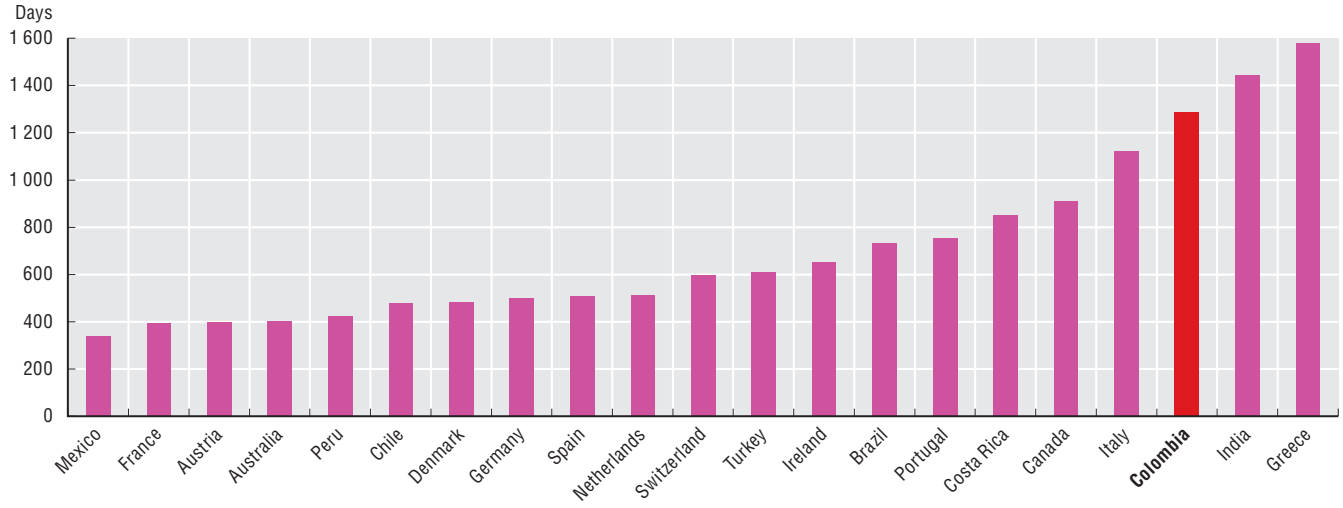
A relatively inefficient legal system and a tax code that favours family firms create incentives for entrepreneurs to rely on family structures when organising a firm (OECD, 2017d). The court system is very slow at resolving disputes compared to other OECD countries (Figure 3.17), which can lead to corruption and informality (OECD, 2017d). A lack of trust in the judicial process makes it difficult for minority shareholders to protect their rights (OECD, 2014). Therefore, entrepreneurs rely on granting positions of responsibility to trusted family members.

As a result, Colombia has a large share of family-controlled firms – 70% of firms in the manufacturing sector are family-controlled – and this can inhibit the adoption of ICTs (Lemos and Scur, 2018). Such firms are insulated from pressures by shareholders to maximise returns and to adopt the latest technologies and business practices. In addition, family firms rely on short-term finance from banks and suppliers as well as from family members and tend to be unwilling to cede control to external

investors, thus reducing the resources available to adopt new technologies (OECD, 2017d). Family firms also tend to lack the high-quality management that is needed for ICT uptake, as they have a smaller pool of potential managers to choose from (OECD, 2017d; Andrews, Nicoletti and Timiliotis, 2018). While the adoption of advanced technologies is linked to a firm's ability to manage such technologies, Colombia performs poorly for management quality relative to other countries (Katz, 2017; OECD, 2017d). Phasing out the preferential treatment of family firms in the tax code could boost adoption of ICTs.

Figure 3.17. The court system is slow to resolve disputes in Colombia

Time required to enforce a contract, 2018



Source: World Bank (2019), *Doing Business*, *www.doingbusiness.org/en/data*.

Linked to problems of family ownership, Colombia also has a large share of small and medium-sized enterprises (SMEs), which combined with micro-firms account for 80% of employment. Such firms have limited access to bank loans due to limited collateral, and Colombian SMEs face a higher interest rate spread (relative to large firms) than in any other OECD country (OECD, 2018b). As a result, such firms can lack the resources to invest in ICTs.

The high rate of informal employment (see Chapter 5) can also inhibit adoption of ICTs. Informal firms tend to be small, have low productivity, are typically run from a household, and lack access to credit, which can lead to low investment and low innovation (Oviedo et al., 2009; Stein et al., 2013). Bureaucracy can be a hindrance to the formalisation of firms, although in recent years progress has been made to reduce barriers to entry as procedures in setting up a business, registering property and paying taxes have been simplified (see below) and a new business formalisation policy was introduced in early 2019 (OECD, 2014, 2017d).

Finally, Colombian workers also lack many of the basic literacy, numeracy and digital skills that are necessary for greater adoption of ICTs (see Chapter 5).

Co-ordinating promotion efforts could improve results

Colombia has many programmes in place to promote the use of ICTs among firms. Some of these programmes are part of broader programmes to support the ICT sector, such as encouraging the development of apps and websites (see Chapter 5). There are also programmes targeting firms outside the ICT sector. However, dispersing efforts over a large number of firms, and a wide range of programmes, can limit their effectiveness.

The MiPyme Vive Digital plan promoted the use of ICTs among micro-enterprises and SMEs (MinTIC, 2017b). The plan included offering online courses, mentoring to entrepreneurs, support for firms conducting online commerce (for both business to business and business to consumers), incentives to produce custom applications and information campaigns to change attitudes towards ICTs (such

as online payments). Since 2011, over 200 000 entrepreneurs have received training and 37 000 firms have implemented ICT solutions, for a total cost of COP 71 000 million (USD 23.6 million).[1] In this way the programme replicates some of the functions of other business development programmes. While the programme was successful in achieving its target of connecting over 70% of firms to the Internet by 2018, it fell short in other areas, with only 36% of firms having a website (compared to a target of 50%) and only 38% using social networks (against a target of 54%) (MinTIC, 2018a). The government is planning to support the development of digital payment tools, in order to promote wider use of digital technologies by businesses.

MinTIC has used information campaigns (such as the No Desaparezcas, Transfórmate campaign [*https://www.mintic.gov.co/transformate/*]) to inform micro-firms of the benefits of ICTs, including from the use of relatively simple tools, such as social media. It is questionable whether promoting more advanced technologies, such as for stock management, are beneficial to micro-firms in a weakly competitive environment, such as firms in Colombia's retail sector. Resources could be allocated more efficiently by targeting firms that can already make a business case for the use of ICTs (such as for booking an appointment or exporting crafts). In addition, rather than focusing training on owners of micro-firms, such people could be helped by general programmes targeted to the population as a whole, such as those already put in place by MinTIC.

An approach with better targeting of resources has been recently undertaken by MinTIC and the Ministry of Commerce, Industry and Tourism (Ministerio de Comercio, Industria y Turismo [MinCIT]) (through iNNPulsa Colombia) who collaborated in establishing the centres for business digital transformation (*centros de transformación digital empresarial* [CTDE]). The centres have a budget of COP 9.6 billion (approximately USD 3 million) to help almost 10 000 firms (MinTIC, 2017b). As part of this programme, firms receive a diagnosis of their business situation, a plan to bring digital technologies into their operations, and an evaluation of whether they have the hard and soft skills necessary for its implementation. MinTIC and INNpulsa have planned to invest COP 8 billion (approximately USD 2.43 million) to finance the existing 14 CTDEs and to open 10 new ones, with the aim to increase coverage to 32 departments of the country by 2020.

Other agencies and ministries have also played a role in promoting use of ICTs by firms. The Colombian export promotion agency, ProColombia (see Chapter 4), has recently developed an online portal, ProColombia Market Place, to assist firms in exporting. MinCIT has created a plan to promote the use of information technology (IT) as part of the Productive Transformation Programme (Programa de Transformación Productiva) (now Productive Colombia [Colombia Productiva]). Most of these programmes seem small in scale. For example, the Fortalecimiento de Iniciativa Clúster Software y Servicios TI del Quindío, which aims to promote the more sophisticated use of ICTs in the coffee sector, has a budget of USD 44 600 and provides assistance to 30 companies only. Similarly, the Technology for Competitiveness (Tecnología para la Competitividad) programme promotes both the supply and demand of ICTs by subsidising the development of firm-specific software in the health sector, with a total contribution of USD 150 000, while Colombia Productiva and Fedesoft have established a platform (*www.SoftWhere.com.co*) to link firms and software providers. In order to avoid the fragmentation of these programmes, it would be preferable to pool the funding into a single agency or increase the co-ordination of programmes. In addition, concentrating assistance on firms which seek help would give laggard firms the incentive to adopt new technologies or risk losing market share to rivals.

Finally, reviewing regulations to ensure they are consistent with the digital transformation would further contribute to boosting use of digital technologies among firms. For instance, at present legal requirements discourage the use of online platforms in the tourist sector due to the necessity for each host to register their property with the commercial registry (Law 300 of 1996), though recent measures simplify registration (Decree 2063 of 2018). Similarly, despite recent changes, the legal requirement (Decree 2555 of 2010) that consumers sign hard copies of some application forms, e.g. for insurance, reduces online development of this sector.

The Colombian government is an advanced user of digital technology

Through use of ICTs the government aims to create a more open and transparent state and improve the delivery of its services. The Digital Government (Gobierno Digital) policy (outlined in Decree 1008 of 2018) serves as a firm basis to achieve these goals. However, the policy's full potential seems hampered

by limited co-operation among public institutions and the relatively low uptake of ICTs by the private sector and households. In addition, greater use of online procurement by all levels of government could be used to promote adoption of ICT by firms.

The Gobierno Digital policy aims to create an open, efficient state

The government's Gobierno Digital policy (which takes over from the previous Online Government Strategy) aims to use ICTs to both improve efficiency and to increase openness and public participation in government. The Colombian government is moving beyond the use of ICTs to improve routine internal processes and interactions with citizens (such as allowing online form filling) towards using digital technologies to provide new services (such as open access to data), referred to as "digital government" (OECD, 2017a). In addition, as changes driven by digitalisation affect many different government functions, Colombia has been taking a "whole-of-government" approach to its digital government strategy. The strategy was developed in co-ordination among several agencies, with MinTIC having the main responsibility for the formulation of the Gobierno Digital policy (OECD, 2017a; MinTIC, 2018a).

Up to 2018, four main components were included in the then Online Government Strategy:

1. "ICTs for services" aimed to improve procedures and digital public services to firms and households. It includes the Digital Citizen Services (Servicios Ciudadanos Digitales) initiative to facilitate the filing and accessing of key documents by citizens (such as birth certificates and medical history); while the No More Queueing (No Más Filas) e-services portal provides information on how to follow government procedures (OECD, 2017a).
2. "ICTs for open government" aimed to improve transparency and enable citizens to participate more fully in decision making. It includes the Open Data (Datos Abiertos) initiative to make government data publicly available and to facilitate the development of apps that use the data. In addition, the Crystal Urn (Urna de Cristal) initiative aims to create digital communication strategies, such as a portal (Redia Lab) that combines traditional media and digital means to promote dialogue with citizens (OECD, 2017a).
3. "ICTs for management" aimed to encourage the use of digital technology to improve decision making and managerial efficiency in the public sector. It includes several initiatives. One (Cofinanciación) provides financing to the private sector to create solutions to improve the efficiency of the public administration. In addition, the Territorial Platforms (Plataformas Territoriales) initiative gives technical assistance to municipalities and departments to help them implement the Gobierno Digital policy. The Excellence Route (Ruta de la Excelencia) project prioritises which government procedures and services should be available on line. The Online Government Excellence Programme (Programa para la Excelencia en Gobierno Electrónico) aims to promote an innovation culture within public sector management, while a Seal of Excellence (Sello de Excelencia) is awarded for online government services and procedures that reach a high standard (OECD, 2017a).
4. Finally, the "Information security and privacy" component aimed to protect information systems (OECD, 2017a).

Since 2018 these have been consolidated into two components: ICTs for the State, which focuses on the functioning of public entities and their use of ICTs, and ICTs for Society, which focuses on how citizens interact with the state, including accessing open data (MinTIC, 2018b). The aim of the modified policy is to: create and improve reliable and quality digital services; have safe and efficient processes by strengthening ICT management capabilities; take data-based decisions; empower citizens through the consolidation of an open state; and promote the development of smart territories and cities to solve social challenges and problems through the use of ICTs. To achieve this MinTIC has been developing initiatives such as a unique portal for the Colombian state (*www.gov.co*).

Although the majority of national level institutions consider the strategy a high priority or essential, most institutions found it difficult to align their development or institutional plan with the Gobierno Digital policy. MinTIC consulted some public institutions when developing the Gobierno Digital policy, but their participation was mainly limited to the implementation and evaluation stages (OECD, 2018a). Greater consultation may improve future iterations of the strategy. In addition, rather than performing operational roles, MinTIC should take a more strategic role, such as building skills in public institutions, providing money for digital government, and improving co-ordination mechanisms to ensure consistent use of ICTs across different levels and sectors of government (OECD, 2018a).

Colombia has moved beyond the provision of digital public services

At present, bureaucracy in Colombia can be slow and inefficient. It takes an average of 7.4 hours for citizens to complete a government transaction, the third longest duration in Latin America, and a quarter of transactions require three or more interactions with the government to be completed. Such inefficiencies can disproportionately affect those with low education, who find it difficult to navigate bureaucratic processes, and encourage people to pay bribes to expedite processes (Roseth et al., 2018).

The provision of digital public services can increase the efficiency of the public's interaction with government, and Colombia is advancing in its provision of such services. Colombia is currently developing an Online Citizen Folder (Carpeta Ciudadana Digital), which allow citizens to access documents such as medical, education and military records, and also help public entities to provide better services (MinTIC, 2017a). By 2017, however, only 15% of government transactions could be completed on line (compared to an EU average of 81%) (Roseth et al., 2018).

The use of digital public services by the public is also limited by the relatively low use of the Internet among households (see above). Although only 10% of people completed their last government transaction entirely on line, Colombia performs well relative to other Latin American countries with similar levels of broadband penetration. However, the demand for digital public services is likely to increase with Internet usage and educational attainment. Indeed, those who have already used digital public services are likely to do so again: the proportion of Internet users who completed their last transaction on line rises to 63% among advanced ICT users (based on a survey of mainly tertiary educated daily regular Internet users who were asked of their experience of digital public services), highlighting the potential for expansion (Roseth et al., 2018).

Some problems also exist with respect to the provision of digital public services, with 45% of people failing in their last attempt to complete a transaction online (Roseth et al., 2018). Although there is a high level of satisfaction with the digital public services provided by national level public institutions linked to culture, commerce, foreign affairs and communication, satisfaction with public institutions in justice, the interior and environment sectors lag behind. In addition, although municipalities account for 95% of government transactions, satisfaction with their digital services is also low (OECD, 2017a; Roseth et al., 2018). Digital identities could help improve the efficiency of digital transactions with the government by reducing duplication of data entry, and steps have been taken to introduce these (ANDI, 2018). In addition, the PND 2018-2022 aims to move all individuals' interactions with the government on line, unless a face-to-face interaction cannot be avoided.

Overall, Colombian institutions are ready for digital government but institutions tend to operate in silos and at different paces, which hampers an overall strategic approach (OECD, 2018a). Greater use of the interoperability framework and interoperable systems such as the Carpeta Ciudadana Digital would help to remove such barriers.

Colombia has also been advancing in promoting digital interaction with firms. All government entities must publish details of their procurement on an online public contracting information system, which consists of three main elements:

1. Secop I is an information portal that publishes contracts and procurement notices (OECD, 2016c). This allows firms to identify the needs of government entities and to offer their goods and services. However, procurement is frequently completed by direct contracts with suppliers rather than by tender. In 2018, 72% of total procurement spending was via Secop I.
2. Secop II is an evolution of Secop I. It is a transactional portal which allows for e-tendering and electronic submission of bids, along with other functions such as making complaints. Government entities are transitioning to Secop II and in 2018 it accounted for 26% of total procurement.
3. Virtual Shop (Tienda Virtual) is a platform linking government agencies with firms that have already reached a price framework agreement with Colombia Compra Eficiente (Colombia's central procurement body). This allows government entities to directly purchase relatively commonly bought items such as stationary and vehicles.

Use of the system is mandatory for central government, and over 13 000 state entities are registered (Colombia Compra Eficiente, 2019).

The Secop II transaction portal and Tienda Virtual have the potential to be a driving force in the digital transformation, especially in municipalities. The portal can help promote transparency in local level governance, encouraging the adoption of digital technologies by Colombian firms, and thus increase formality. Therefore, increased training of municipal staff, especially in more rural areas, to use the system (and making the interface user friendly) should be a priority for the government. In addition, further training should be provided to smaller local firms so that they can take advantage of the Tienda Virtual.

ICTs are supporting a more open state

Colombia has gone beyond the provision of digital public services and is using ICTs to create a more open and transparent state. The Transparency and Access to Information Law (2014) provides for a list of institutions that have an obligation to publish reports of their activities. The bulk of public institutions also have an ICT strategy in place to promote greater transparency, citizen participation and use of open data with the aim of building trust with the public (IMF, 2018; OECD, 2018a).

Several initiatives have been taken to improve open government. Urna de Cristal is an initiative to promote electronic citizen participation and government transparency, which makes use of a combination of traditional and digital media. This forum has received over 32 million submissions since 2011 and answered 160 000 questions. A Transparency Secretariat also exists to encourage citizens to report incidents related to corruption, e.g. parents are invited to send photos of the school meals of their children to ensure that they meet the required standards (OECD, 2018a). This secretariat complements the public contracting information system (above). Although perceptions of corruption may have increased since the introduction of transparency initiatives, this can be explained by greater public awareness of instances of corruption, rather than an increase in corruption itself (IMF, 2018).

As a result of such initiatives, there is evidence that the Gobierno Digital policy has increased trust in government, transparency in contracting and public sector integrity (OECD, 2017a). Colombia is among the world's top countries for e-participation, ranked 23rd in the world and mid-ranked relative to other OECD countries. Colombia performs well in terms of e-information (whereby the governments gives citizens information to make informed choices through ICTs) and also e-decision making, such as direct e-voting or rating options through social media. However, Colombia scores lower on e-consultation (whereby citizens are consulted on a policy or project through channels such as social media, online petitions and polls) (United Nations, 2018). Such use of e-decision making is perhaps inappropriate given the unequal access to the Internet of individuals (Figure 3.3). Indeed, public institutions consider the main barrier to greater digital participation to be the public's lack of access to technology, followed by their lack of knowledge or skills in the use of digital technologies (OECD, 2018a). Public participation also plays a role in contributing to high-quality digital services, as it is found that institutions with systems for petitions tend to have a higher level of quality and service satisfaction from users (OECD, 2017a).

Greater co-ordination among state agencies could also help Colombia further improve open government. For example, there are no clear links between the Transparency Secretariat and MinTIC's initiatives on open data (OECD, 2018a). In addition, the level of openness varies by level of government. Municipalities perform less well in terms of online transparency and open government, but perform better than national level institutions for digital participation, which is likely reflective of municipalities' role in local decision making. Open government could be further improved by ensuring that technical resources and implementation guides are made available, particularly for municipalities in less-developed regions (OECD, 2017a).

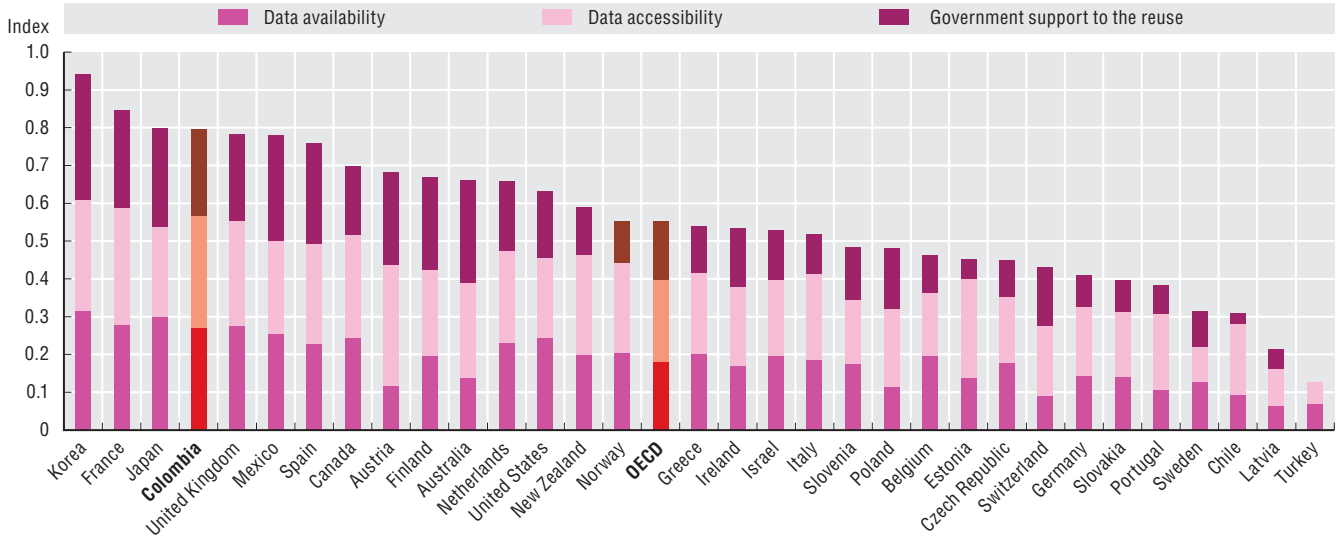
Colombia leads in the provision of open data

By making government data publicly available, the government boosts transparency and provides citizens with the information needed to influence policy in an informed manner. As part of the Datos Abiertos initiative, all government data of national level public institutions are required, by default, to be open. Indeed, Colombia has increased the number of open datasets available on an official open data portal (*datos.gov.co*), though a fee may be charged for data not available on line (OECD, 2018a; MinTIC, 2015). Such data are made accessible through the use of the machine-readable CSV format and the provision of metadata (OECD, 2015). Colombia has promoted the reuse of open data by the public through initiatives such as Datos a la U (targeted at university students), Máxima Velocidad (maximum speed in the participation of employees of public entities), rally Colombia (in which citizen

overseers participate) and Datatón (in which members of the Senate participate) (OECD, 2018a). As a result, Colombia scores highly at the central government level for implementing International Open Data Charter Principles, which aim to promote the accessibility, availability and reuse of government data by both public and private users (Figures 3.18 and 3.19) (OECD, 2017b). The government plans to continue this policy by increasing the number of public entities with an open data project from 9% in 2018 to half by 2020 (MinTIC, 2019a).

Figure 3.18. Colombia is a leader in providing open data

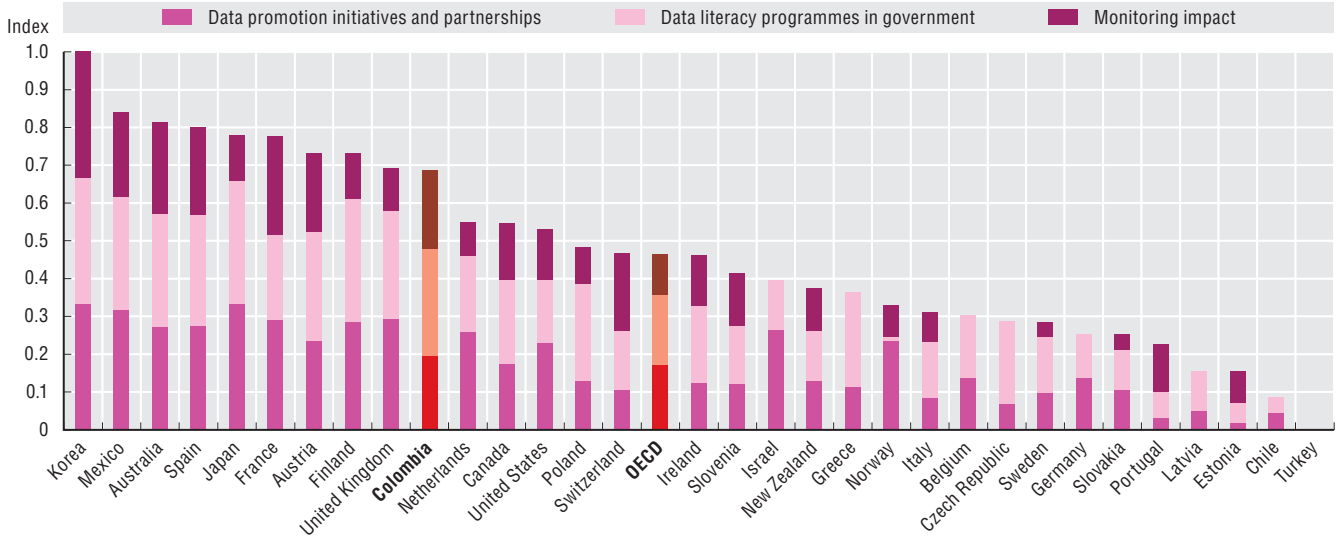
Open-Useful-Reusable Government Data Index (OURdata), 2017



Source: OECD (2019b), *OECD Survey on Open Government Data*, *https://www.oecd.org/gov/digital-government/open-government-data.htm* (accessed in April 2019).

Figure 3.19. Colombia promotes the reuse of government data

Open-Useful-Reusable Government Data Index (OURdata), government support for data reuse, 2017



Source: OECD Survey on Open Government Data, *https://www.oecd.org/gov/digital-government/open-government-data.htm*.

Despite this success, use of government data is hindered by a system of data governance that largely focuses on protecting security and privacy rather than facilitating data sharing and citizens' access and management of their own data. In addition, there is limited ability to leverage the expertise of

universities and the private sector, though attempts are being made to overcome this (see Chapter 5) (OECD, 2018a). Although the aim of open data is that all government data be published in an open format, achieving this may be unfeasible. Therefore, government should consult with potential end users – both citizens and other public institutions – in order to prioritise which data should be publicly available (OECD, 2018a).

Use of data has improved internal processes, but its full potential is yet to be harnessed

In addition to sharing data publicly, Colombia has a programme to promote the internal sharing of data to improve processes within the public administration. Colombia has taken a strategic approach to designing online services, with the development of an interoperability framework facilitating the sharing of information among institutions (United Nations, 2018; OECD, 2017c). The use of such data is beneficial as institutions that greatly made use of strategic data and data exchanges with other institutions were effective in improving their internal processes (OECD, 2017a).

Although almost half of national institutions use their own data to improve policies, very few use other institutions' data (OECD, 2018a). In particular, municipalities lag behind national level institutions and governorates in terms of data sharing within the public sector (OECD, 2017a). Only about 40% of municipalities exchange data with other institutions, compared to about two-thirds of national level institutions and governments, with this most commonly being done in response to an individual request (OECD, 2018a). In addition, only 61% of national entities are interoperable with other entities (Roseth et al., 2018). Following through with plans to develop an interoperability platform could help boost efficiency in data sharing. In addition, sharing public sector data would help improve transparency.

Despite government data being open by default, data management practices do not always facilitate data sharing. This could be improved by adopting a principle of openness by design. It is not common practice for institutions to document the information and data they have in the form of data catalogues. The use of such catalogues could help to avoid dataset duplication and could also highlight the potential of data (OECD, 2018a). Digital participation and collaboration could be further enhanced by setting ICT planning objectives within institutions, generalising ICT monitoring practices for the management of ICTs and ensuring the implementation of the online management policies that are part of the Gobierno Digital policy (OECD, 2017a). In addition, developing an appropriate regulatory framework for the data management practices based on the principles of openness by design and sharing by design could facilitate the sharing of data between government agencies (OECD, 2018a). In Spain, this has been done by allowing citizens the right to refuse to provide data to government agencies that are already held by another agency, thereby forcing agencies to share data. Meanwhile in Estonia, public agencies are not allowed to ask for data if they have already been provided to another agency.

Colombian institutions have begun to make use of more advanced data techniques to improve policies and services. While there have been several initiatives in data analytics and the Internet of Things (IoT), e.g. monitoring the risk of flooding, these techniques are not generally used (OECD, 2018a). The CAOBA Alliance, a partnership among the public, private and academic sectors, aims to promote the use of big data, while the Centre for IoT promotes the use of the IoT (see Chapter 5). However, such initiatives are generally limited to local issues, and are not part of an integrated programme (OECD, 2018a). In addition, a national Big Data Strategy has been developed (CONPES 3920) and pilot projects have been established to highlight applications of big data within public institutions (OECD, 2017c; DNP, 2018). However, only 41% of national level public institutions, 31% of governorates and as few as 7% of municipalities use data analytics to support decision making and design public policies (OECD, 2018a). The PND 2018-2022 instructs national level government entities to make greater use of such emerging technologies.

A lack of skills in relation to data management is an obstacle to the use of data within institutions, and interoperability with other institutions. To address this, MinTIC has created programmes to build skills within public institutions. In 2015 and 2016, eight new diploma courses aimed to improve civil servants' skills in relation to IT were introduced at the Cooperativa University. In addition, the Programme for Excellence of Digital Government (Programa para la Excelencia del Gobierno Digital) gives training to public servants at a national and regional level. Public institutions consider training to be the most useful resource to support the institution's technical capacities (OECD, 2018a).

In January 2017, a data science team was established in the National Planning Department (Departamento Nacional de Planeación) to help the government use data to improve efficiency and support decision making. The team both conducts projects for government departments and co-operates with other public entities. Projects completed in 2018 include tools to help measure recidivism, measure the efficiency of the Colombian judiciary, map the distribution of income in rural Colombia and use satellite images to identify tertiary roads.

Better results could be achieved through better project management

Greater monitoring and evaluation of ICT projects, which at present are not standard activities for public institutions, could lead to better outcomes. However, most Colombian public institutions lack the resources (such as skilled staff) to increase the monitoring and evaluation of digital government initiatives. In addition, a third of Colombian institutions report that the lack of a perceived need is an obstacle to monitoring and evaluation of projects (OECD, 2017a).

The Gobierno Digital policy includes a monitoring system for its implementation, including a *Digital Government Index* introduced to rank public institutions, and opinion polls of users. However, the strategy focuses on the supply of digital services, rather than their impact (OECD, 2018a). In addition, public institutions have been reluctant to report data to central government that could negatively impact their ranking in terms of implementing the Gobierno Digital policy. Moving away from a system of ranking towards impact assessments could give institutions a greater incentive to report the data they have (OECD, 2017a). Although most Colombian institutions monitor and evaluate their digital interactions with vulnerable groups, this is mainly done through the use of questionnaires. Greater use of data could be useful to evaluate the use of services. For example, the United Kingdom analyses the number of data request forms to assess the impact of open data (OECD, 2018a). The use of open government data may also reduce the burden of filling out questionnaires for assessments in the future (OECD, 2017a).

To help institutions in their information management, the government has set out several implementation guides, such as for IT strategy and IT governance. OECD research has found that use of these guides is linked to more advanced planning of ICT projects and higher quality digital services (OECD, 2017a). However, use of the guides has been limited, especially by municipalities (OECD, 2017a). Therefore, their promotion among municipalities should be accompanied by mentoring and technical advice (OECD, 2018a). Indeed, the government plans to increase technical assistance to regional governments as part of the Plan Estratégico Sectorial 2019-2022 (MinTIC, 2019a).

There is also room for improvement in the procurement of ICTs. While there are multiple framework agreements with ICT suppliers (managed by Colombia Compra Eficiente, see above), there is no government-wide procurement strategy for the procurement of ICTs. Although the lack of a central procurement strategy allows different agencies and ministries greater flexibility in procuring ICTs, some ministries do not have the capacity to take effective procurement decisions. The lack of integrated digital government solutions is shown by only a quarter of national level institutions sharing ICT infrastructure (OECD, 2018a). Therefore, the government should take steps to centralise procurement in order to increase its purchasing bargaining power and prevent individual ministries from becoming dependent on some IT providers, who may take advantage of their position. In addition, a more centralised approach could allow government institutions to take advantage of shared ICT resources and limit their exposure to the maintenance of infrastructure for which they are not well suited.

Conclusions

The Colombian government has followed a balanced approach to promote the adoption of digital technologies through its Vive Digital plan. The government has tackled low Internet uptake by poorer households by making free-of-charge Internet access points available and providing discounted mobile Internet plans. This is allowing Colombia to converge with advanced OECD countries. Nevertheless, Colombians make little use of paid-for services, such as online retail. While the government has taken action to remove some of the obstacles that inhibit greater use of paid-for services (such as by promoting financial inclusion), consumers' trust in online retailers remains low.

Low business to consumer e-commerce can also be explained by low adoption of more advanced digital technologies by firms. Although use of the Internet among businesses is widespread, connection speeds are slow. The government has put in place several programmes to promote the use of digital technologies, but low competitive pressures reduce the incentive for firms to improve their production processes. Boosting competition, for instance by increasing international openness and improving efficiency in the judicial system – thereby reducing the reliance on trusted family members in firms – could lead to greater adoption of new technologies and boost productivity. The government has already used ICTs to increase competition by streamlining procedures to establish a new business and reducing red tape.

Indeed, the Colombian government has gone beyond using the Internet to improve routine procedures and aims to improve transparency and democracy through digital technologies. Although households still make relatively little use of online government services, this can be explained by limited diffusion of the Internet. Digital government services can be easily scaled up as Internet uptake increases and the demand for such services rises. The government is also committed to making government data publicly available, which can help promote informed debate regarding government policies. Greater use of other public institutions' data could also help branches of government to improve services and policies.

Box 3.1. Key recommendations for fostering digital technologies among households, firms and in government

Fostering digital technologies among households

- Concentrate funding for digital access *puntos* and *kioscos* in areas where they are used most.
- Improve development of pupils' computer skills through extra-curricular activities such as computer clubs and online competitions.
- Improve conditions for use of paid-for Internet services by:
  - ❖ continuing to promote financial inclusion
  - ❖ creating a dedicated website to deal with consumers' complaints related to e-commerce
  - ❖ increasing trust of online retailers by introducing a quality mark for retailers that reach high standards.
- Promote consumer trust of e-commerce by establishing a special department of the public prosecutor's office to deal with cybercrime.

Fostering digital technologies among firms

- Increase competitive pressures on firms to adopt ICTs by:
  - ❖ increasing international openness
  - ❖ phasing out favourable treatment of family firms in the tax code.
- Focus funding to promote ICTs and modern management approaches on firms that request assistance, allowing competitive pressures to encourage laggard firms to increase adoption.

Fostering the digital transformation in government

- Improve alignment of public institutions' development plans with the Gobierno Digital policy by involving institutions at an earlier stage of developing the strategy.
- Incentivise use of the Colombia Compra Eficiente portal in municipalities and continue investment in the Secop platform.
- Improve open government by ensuring that technical resources and assistance are made available, particularly for municipalities in poorer regions.
- Increase consultation with potential end users of open data about prioritising which data are made available.
- Improve data sharing among public institutions by adopting a principle of openness by design, and increase the use of data catalogues.
- Reduce ICT costs by adopting a government-wide strategy for the procurement of ICTs.

References

A4AI (2017), "2017 affordability report", Alliance for Affordable Internet, Washington, DC, *https://a4ai.org/affordability-report/report/2017*.

A4AI (2016), "The impacts of emerging mobile data services in developing countries", webpage, Alliance for Affordable Internet, Washington, DC, *https://a4ai.org/the-impacts-of-emerging-mobile-data-services-in-developing-countries*.

ANDI (2018), *Colombia, un País Digital: Análisis, Ideas y Propuestas para Impulsar el Desarrollo de Colombia en la Nueva Economía*, Asociación Nacional de Empresarios de Colombia.

Andrews, D., G. Nicoletti and C. Timiliotis (2018), "Digital technology diffusion: A matter of capabilities, incentives or both?", *OECD Economics Department Working Papers*, No. 1476, OECD Publishing, Paris, *https://dx.doi.org/10.1787/7c542c16-en*.

Banca de las Oportunidades and Superintendencia Financiera de Colombia (2019), "Reporte trimestral de inclusión financiera – Septiembre de 2018", Banca de las Oportunidades and Superintendencia Financiera de Colombia, Bogotá, *http://bancadelasoportunidades.gov.co/sites/default/files/2019-03/REPORTE%20TRIMESTRAL%20DE%20INCLUSI%C3%93N%20FINANCIERA_SEP%20FINALLLLL_0.pdf*.

Brown, J. et al. (2016), "Productivity convergence at the firm level: New evidence from the Americas", in: Thompson Araujo, J. et al. (eds.), *Understanding the Income and Efficiency Gap in Latin America and the Caribbean*, The World Bank, Washington, DC, *http://dx.doi.org/10.1596/978-1-4648-0450-2_ch5*.

Centro Cibernético Policial (2017a), "Informe: Amenzas del cibercrimen en Colombia 2016-2017", Centro Cibernético Policial, *https://caivirtual.policia.gov.co/sites/default/files/informe_amenazas_de_cibercrimen_en_colombia_2016_-_2017.pdf*.

Centro Cibernético Policial (2017b), "Informe: Balance cibercrimen en Colombia 2017", Centro Cibernético Policial, *https://caivirtual.policia.gov.co/sites/default/files/informe_cibercrimen_2017.pdf*.

Centro Nacional de Consultoría (2015), "Evaluación de impacto y de la sostenibilidad de computadores para educar en la calidad de la educación en las sedes educativas beneficiadas", *http://computadoresparaeducar.gov.co/sites/default/files/inline-files/Articulo_impacto_Computadores_para_Educar_Colombia.pdf*.

Ciudadanía Digital (2018), "Ciudadanía Digital", website, *www.ciudadaniadigital.gov.co/627/w3-channel.html*.

Colombia Compra Eficiente (2019), "Número de entidades registradas en el Sistema de Compra Público", *http://analitica.colombiacompra.gov.co/ciudadanos* (accessed in January 2019).

Council of Europe (2015), "Status regarding Budapest Convention", webpage, *https://www.coe.int/en/web/octopus/country-wiki/-/asset_publisher/hFPA5fbKjyCJ/content/colombia?_101_INSTANCE_hFPA5fbKjyCJ_viewMode=view* (accessed in February 2019).

DANE (2018a), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación: TIC en hogares y personas de 5 y más años de edad", National Administrative Department of Statistics, *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2017.xlsx* (accessed in February 2019).

DANE (2018b), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación – TIC en microestablecimientos", *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2017.xlsx* (accessed in February 2019).

DANE (2017), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación: TIC en microestablecimientos", National Administrative Department of Statistics, *https://www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_micro_2016.xls* (accessed in September 2019).

DNP (2018), *Política Nacional de Explotación de Datos (Big Data)*, National Planning Department.

Gefen, D. (2000), "E-commerce: The role of familiarity and trust", *Omega*, Vol. 28/6, pp. 725-737, *http://dx.doi.org/10.1016/s0305-0483(00)00021-9*.

Heintz, F. et al. (2015), "Computing at school in Sweden: Experiences from introducing computer science within existing subjects", in: Brodnik, A. and J. Vahrenhold (eds.), *Informatics in Schools. Curricula, Competences, and Competitions. ISSEP 2015. Lecture Notes in Computer Science*, Vol. 9378, Springer, Cham, Switzerland, *http://dx.doi.org/10.1007/978-3-319-25396-1_11*.

IMF (2018), "Colombia: Staff report for the 2018 Article IV Consultation", *IMF Country Report*, Vol. 18/128, International Monetary Fund, Washington, DC, *https://www.imf.org/en/Publications/CR/Issues/2018/05/29/Colombia-2018-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-45898*.

Katz, R.L. (2017), "El Observatorio de la Economía Digital de Colombia", presentation, *https://www.mintic.gov.co/portal/604/articles-61929_recurso_4.pdf*.

Kim, Y. and R. Peterson (2017), "A meta-analysis of online trust relationships in e-commerce", *Journal of Interactive Marketing*, Vol. 38, pp. 44-54, *http://dx.doi.org/10.1016/j.intmar.2017.01.001*.

Lemos, R. and D. Scur (2018), "All in the family? CEO choice and firm organization", *CEP Discussion Papers*, No. 1528, Centre for Economic Performance, London School of Economics and Political Science, London, *http://eprints.lse.ac.uk/88679*.

Meltzer, J.P. and C. Pérez Marulanda (2016), "Digital Colombia: Maximizing the global Internet and data for sustainable and inclusive growth", *Global Economy & Development Working Papers*, No. 96, Brookings Institution, Washington, DC, *https://www.brookings.edu/wp-content/uploads/2016/10/global-20161020-digital-colombia.pdf*.

MinHacienda (2017), "Con autorización de constitución de primer SEDPE en Colombia, se promueve un mayor acceso de los colombianos al sistema financiero", *Boletín*, No. 29, Ministry of Housing, City and Territory, Bogotá, *www.legisaldia.com/BancoMedios/Archivos/boletin-029-17.pdf*.

MinTIC (2019a), "Plan Estratégico Sectorial 2019-2022", draft, Ministry of Information and Communication Technologies, Bogotá, 20 January.

MinTIC (2019b), "Colombia TIC – Estadísticas: Servicio de Comunicaciones", *https://colombiatic.mintic.gov.co/679/w3-propertyvalue-36342.html*.

MinTIC (2018a), "'El futuro digital es de todos': La nueva política TIC", Ministry of Information and Communication Technologies, Bogotá, *https://www.mintic.gov.co/portal/604/w3-article-79186.html*.

MinTIC (2018b), *Manual de Gobierno Digital: Implementación de la Política de Gobierno Digital*, Ministry of Information and Communication Technologies, Bogotá, *http://estrategia.gobiernoenlinea.gov.co/623/articles-81473_recurso_1.pdf*.

MinTIC (2017a), "Así serán los servicios ciudadanos digitales", webpage, *https://mintic.gov.co/portal/604/w3-article-57706.html* (accessed in February 2019).

MinTIC (2017b), "MinTIC selecciona 18 Centros de Transformación Digital para que las MiPyme mejoren sus negocios", webpage, *https://www.mintic.gov.co/portal/604/w3-article-61600.html* (accessed in February 2019).

MinTIC (2017c), "Somos", webpage, *https://www.redvolucion.gov.co/index.php/somos* (accessed in February 2019).

MinTIC (2016), "Internet móvil social", presentation, Ministry of Information and Communication Technologies, Bogotá, *www.mintic.gov.co/portal/604/articles-16860_presentacion.pdf* (accessed on 14 July 2018).

MinTIC (2015), "Estrategia y plan de comunicación para el fomento de la apertura y la reutilización de datos", Ministry of Information and Communication Technologies, Bogotá, *http://estrategia.gobiernoenlinea.gov.co/623/articles-9407_plancomunicacion.pdf*.

MinTIC (2014), "Vive digital para la gente", webpage, *www.mintic.gov.co/portal/vivedigital/612/w3-propertyvalue-19436.html* (accessed on 14 July 2018).

Nielsen (2016), "Global connected commerce: Is e-tail therapy the new retail therapy?", webpage, *www.nielsen.com/us/en/insights/reports/2016/global-connected-commerce.html*.

OECD (2019a), *Productivity Statistics Database*, *https://doi.org/10.1787/pdtvy-data-en* (accessed in June 2019).

OECD (2019b), *OECD Survey on Open Government Data*, *https://www.oecd.org/gov/digital-government/open-government-data.htm* (accessed in April 2019).

OECD (2018a), *Digital Government Review of Colombia: Towards a Citizen-Driven Public Sector*, OECD Digital Government Studies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264291867-en*.

OECD (2018b), *Financing SMEs and Entrepreneurs 2018: An OECD Scoreboard*, OECD Publishing, Paris, *https://dx.doi.org/10.1787/fin_sme_ent-2018-en*.

OECD (2018c), *ICT Access and Usage by Businesses* (database), *http://stats.oecd.org/Index.aspx?DataSetCode=ICT_BUS* (accessed in June 2019).

OECD (2018d), *ICT Access and Usage by Households and Individuals* (database), *http://oe.cd/hhind* (accessed in June 2019).

OECD (2018e), *National Accounts* (database), *https://doi.org/10.1787/na-data-en* (accessed in June 2019).

OECD (2017a), *Assessing the Impact of Digital Government in Colombia: Towards a New Methodology*, OECD Digital Government Studies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264283282-en*.

OECD (2017b), *Government at a Glance 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/gov_glance-2017-en*.

OECD (2017c), *OECD Digital Economy Outlook 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264276284-en*.

OECD (2017d), *OECD Economic Surveys: Colombia 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_surveys-col-2017-en*.

OECD (2016a), "Ministerial Declaration on the Digital Economy ('Cancun Declaration')", OECD, Paris, *www.oecd.org/sti/ieconomy/Digital-Economy-Ministerial-Declaration-2016.pdf*.

OECD (2016b), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264267510-en*.

OECD (2016c), *Towards Efficient Public Procurement in Colombia: Making the Difference*, OECD Public Governance Reviews, OECD Publishing, Paris, *https://dx.doi.org/10.1787/9789264252103-en*.

OECD (2015), *Government at a Glance 2015*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/gov_glance-2015-en*.

OECD (2014), *OECD Reviews of Innovation Policy: Colombia 2014*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264204638-en*.

Oviedo, A.M. et al. (2009), "Economic informality: Causes, costs, and policies – A literature survey", *World Bank Working Papers*, No. 167, The World Bank, Washington, DC, *http://hdl.handle.net/10986/5917*.

Radinger, T. et al. (2018), *OECD Reviews of School Resources: Colombia 2018*, OECD Reviews of School Resources, OECD Publishing, Paris, *https://dx.doi.org/10.1787/9789264303751-en*.

Roseth, B. et al. (2018), *Wait No More: Citizens, Red Tape, and Digital Government*, Inter-American Development Bank, *http://dx.doi.org/10.18235/0001150*.

RSA (2018), *RSA Quarterly Fraud Report Q3 2018*, RSA.

Stein, P. et al. (2013), "Closing the credit gap for formal and informal micro, small, and medium enterprises", International Finance Corporation, Washington, DC, *https://openknowledge.worldbank.org/handle/10986/21728*.

UNESCO (2017), "Reducing the digital gap for senior citizens in Colombia", press release, *https://en.unesco.org/news/reducing-digital-gap-senior-citizens-colombia* (accessed on 14 July 2018).

United Nations (2018), *UN E-Government Survey 2018*, United Nations, New York, *https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018*.

World Bank (2019), *Doing Business*(database), *www.doingbusiness.org/en/data*.

World Bank (2018), *The Little Data Book on Financial Inclusion 2018*, The World Bank, Washington, DC, *https://openknowledge.worldbank.org/handle/10986/29654*.

Notes

Israel
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1. Information provided by MinTIC.

Chapter 4

DIGITAL PATHWAYS TO GROWTH AND COMPETITIVENESS

High commodity prices on international markets, followed by a surge in capital investments into the mining sector, have determined much of the good performance of the Colombian economy in past years. However, total factor productivity has contributed negatively to economic growth (OECD, 2017a). In order to reduce its dependency on commodity markets, Colombia needs a new growth strategy. The digital transformation provides Colombia with the opportunity to diversify its activities from a commodity-based to a high value-added services economy.

The first section of this chapter examines the changing structure of the Colombian production system. It shows the increasing role of the services sector and argues that the digital transformation could drive a change in sectoral specialisation, highlighting opportunities and challenges for different sectors. It also shows recent compositional changes in the information and communication technology (ICT) sector, arguing that a comprehensive policy approach might be required to foster sustainable growth in this sector.

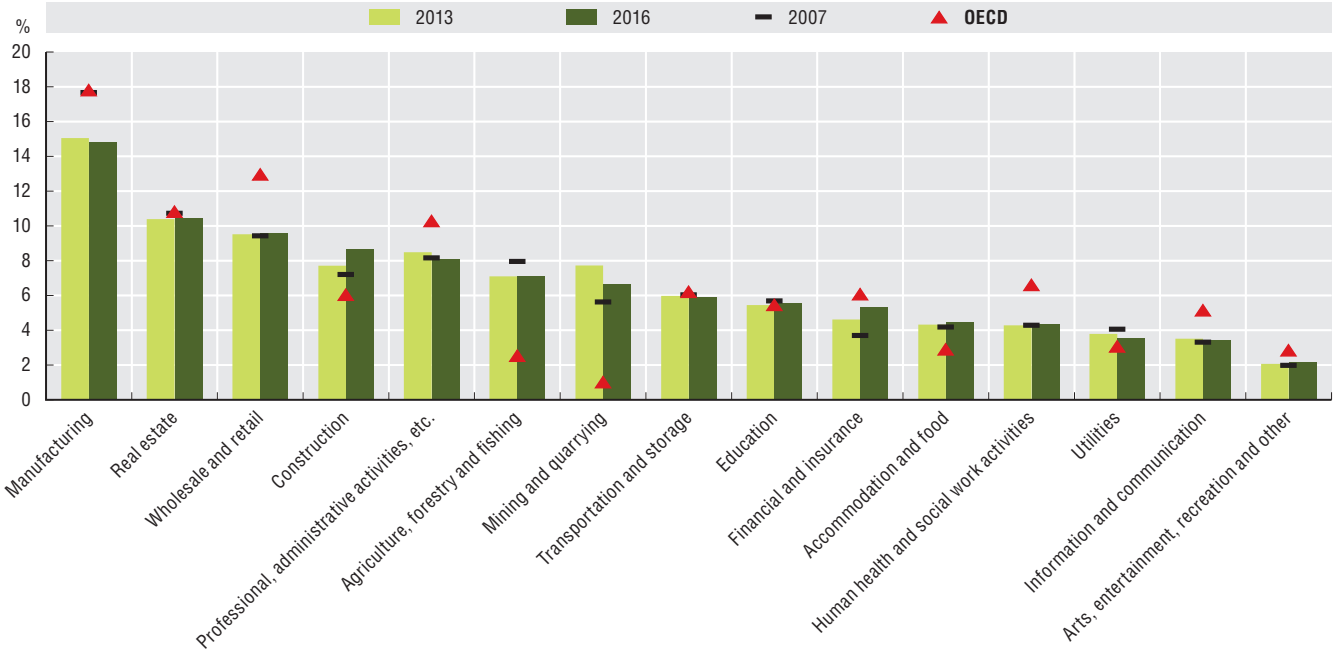
The second section examines different aspects of Colombia's current trade patterns. After briefly presenting some of the broader possibilities of digitalisation for trade, it digs deeper into certain service sectors, focusing mainly on ICT technologies. The evidence suggests that services have become increasingly important and could drive further export diversification. There are also signs of emerging potential for digitally enabled services, i.e. services that can be digitally transmitted. Finally, the section highlights the importance of access to information technology (IT) services from other countries and discusses how Colombia could improve its market openness in a digital world.

Fostering sectoral diversification through digital transformation

Colombia's production system is highly dependent on world market conditions and government spending

Over the last decade, the Colombian economy has seen important readjustments in the composition of its economic activities. To some extent, these dynamics reflect a systematic shift away from manufacturing towards services activities, following a global trend of "servicification" as well as increased competition from other emerging economies.

Figure 4.1. The share of manufacturing in Colombia's economy has declined



Notes: Value added from public administration and defence, compulsory social security and activities of households as employers are not included. Professional, administrative activities, etc. includes scientific, technical and support service activities. OECD is computed as a simple average over OECD countries.

Sources: Data for Colombia are drawn from DANE (2019b), "Principales agreagados macroeconómicos, base 2015", *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales*; data for OECD countries are drawn from OECD (2019d), "STAN Database for Structural Analysis (ISIC Rev. 4, SNA08)", *https://stats.oecd.org/index.aspx?DataSetCode=PDB_LV* (accessed on 15 April 2019).

Between 2007 and 2016, the share of manufacturing in Colombia's total value added declined from 17.7% to 14.8% (Figure 4.1). Conversely, the share of business services increased from 45.5% to 47.1% over the same period.[1] A similar dynamic has also been observed in OECD countries. However, the weight of both sectors in Colombia is lower than in OECD countries, where manufacturing and services accounted for, respectively, 17.8% and 54.5% of total value added in 2016.

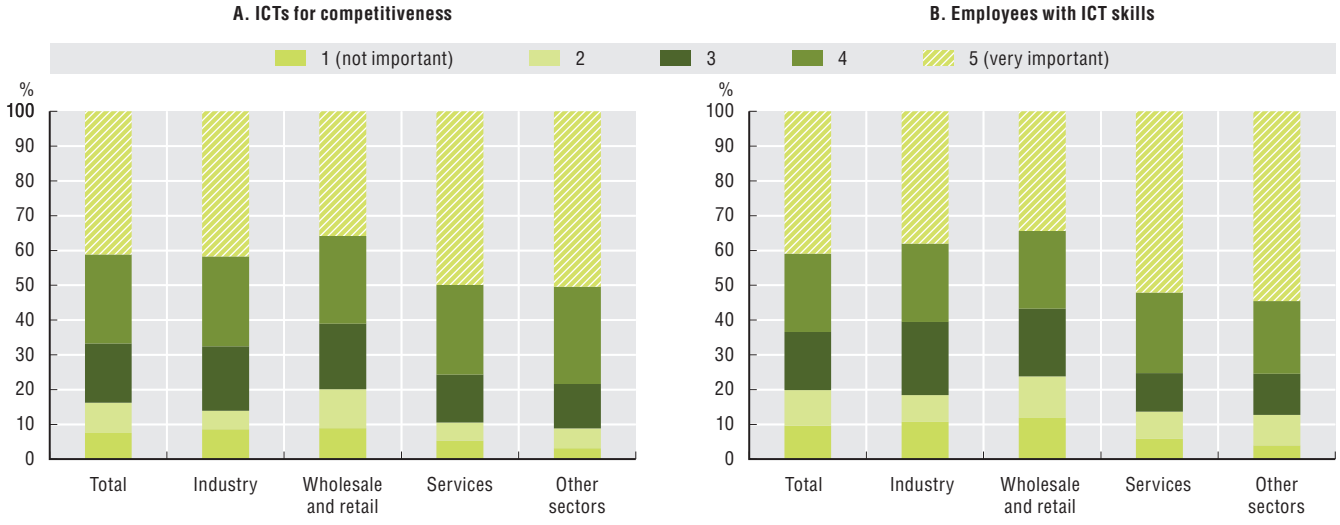
The lower share of both manufacturing and service activities in Colombia reflects the growing size of the mining and the agricultural sectors, and, more recently, an increase in construction activities. Between 2007 and 2013, the contribution of the mining sector to total value added rose by about 37%, from 5.6% to about 7.7%. Since 2013, the demand from emerging economies has slowed down substantially and brought the contribution of the sector down to 6.7% by 2016. However, the sector's significance remains over six times larger than in OECD countries (1%). Taking into account the relatively large agricultural sector (7.1% compared to 2.6% in OECD countries), it becomes apparent that the Colombian economy remains highly exposed to world market fluctuations of commodity prices (Hernández, 2013).

The value added share of the construction sector increased by over 10% between 2013 and 2016, driven by the government's renewed efforts to close the infrastructure gap in terms of both quality and quantity, which remains large compared to OECD countries. A USD 55 billion investment plan was launched in 2011 and scaled up more recently in a fourth-generation (4G) public-private investment infrastructure programme on road concessions, the most ambitious infrastructure development initiative in Colombian history (The Economist, 2011; OECD, 2017).

Many firms in Colombia underrate the importance of ICTs for innovation

Evidence for Colombia confirms that firms operating in services invest more in ICTs than manufacturers and that innovation in services is associated with higher labour productivity growth (Gallego, Gutiérrez and Taborda, 2015).

Figure 4.2. Firms operating in services sectors consider ICTs more important than firms in other sectors



Note: Other sectors include financial, transportation, social and ICT services as well as agriculture and construction.

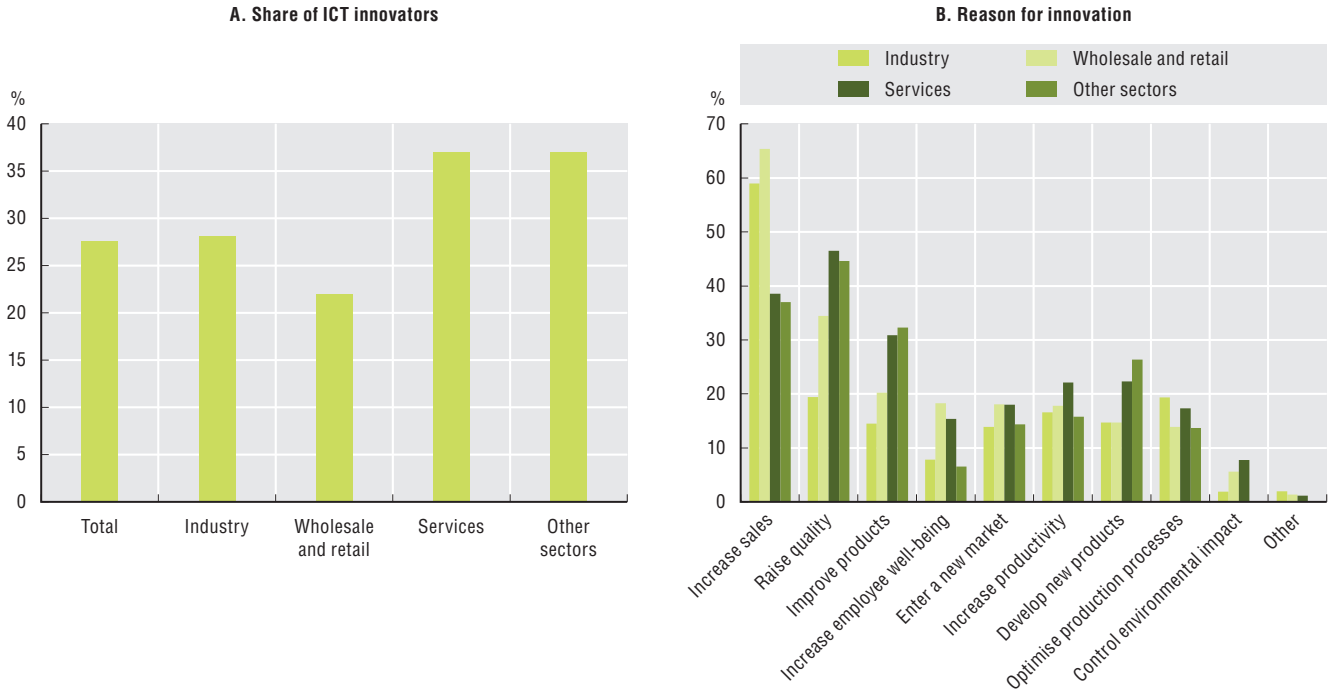
Source: MinTIC (2017), "Gran Encuesta TIC: Tabla de salida empresas", *https://colombiatic.mintic.gov.co/679/w3-article-74002.html* (accessed on 27 December 2018).

Recent results from a large ICT usage survey, the *Gran Encuesta TIC* (MinTIC, 2017), provide further support for the high relevance of ICT innovations for firms in services. About 50% of firms in service activities covered by the survey consider access to ICTs to be very important for their business model and competitiveness (Figure 4.2).[2] Furthermore, over 50% consider it very important for their employees

to possess ICT skills. These percentages are significantly higher than in the industrial sectors, where only 42% of firms consider ICTs very important for their business model and less than 40% consider ICT skills to be of high importance.

The wholesale and retail sectors stand out, with only slightly more than a third of firms regarding ICTs and ICT skills as being very important. In line with these responses, only 22% of firms in the wholesale and retail sector have used ICTs for innovation in the past two years (Figure 4.3). This contrasts starkly with other service sectors, where about 37% of firms used ICTs to innovate. At about 28%, the industrial sector was on middle ground.

Figure 4.3. Firms in many services sectors more frequently use ICTs for innovation, often to raise quality or to develop new products



Note: Other sectors include financial, transportation, social and ICT services as well as agriculture and construction.

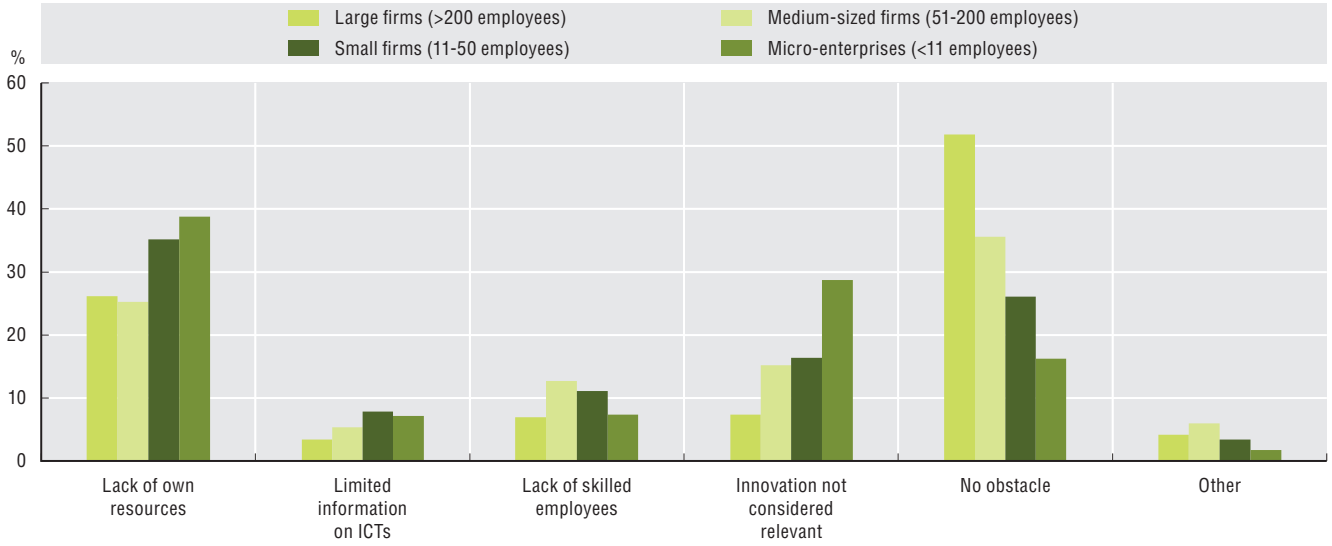
Source: MinTIC (2017), "Gran Encuesta TIC: Tabla de salida empresas", *https://colombiatic.mintic.gov.co/679/w3-article-74002.html* (accessed on 27 December 2018).

The reasons that led firms to (ICT-based) innovations thereby differ from sector to sector. While a majority of firms in industry, retail and wholesale engaged in innovations to increase sales, the most-cited reason for firms in the services sector was to raise quality (45% to 47%) and to improve their products (31% to 32%). Firms in the services sectors also used ICT innovations relatively more frequently to develop entirely new products. Overall, these numbers confirm the more fundamental role that innovations based on ICTs play for firms in the services sector.

The survey also shows a striking difference between large firms (more than 200 employees) and micro-enterprises (less than 11 employees). While 71% of large firms use ICTs to innovate, the corresponding number is only 19% for micro-firms. This is at odds with the potential for digital transformation to provide even very small firms with access to global markets (OECD, 2019c).

Figure 4.4 suggests that limited access to financial resources is the most likely explanation for this gap. The new ICT strategic sectoral plan 2019-22 launched by the Ministry of Information and Communication Technologies (Ministerio de Tecnologías de la Información y Comunicaciones [MinTIC]) (MinTIC, 2019) points out the need to improve businesses' access to credit for projects related to the digital transformation and proposes collaboration with the financial sector as a possible means to achieve this objective.

Figure 4.4. Small firms may lack the financial resources to use ICTs for innovation



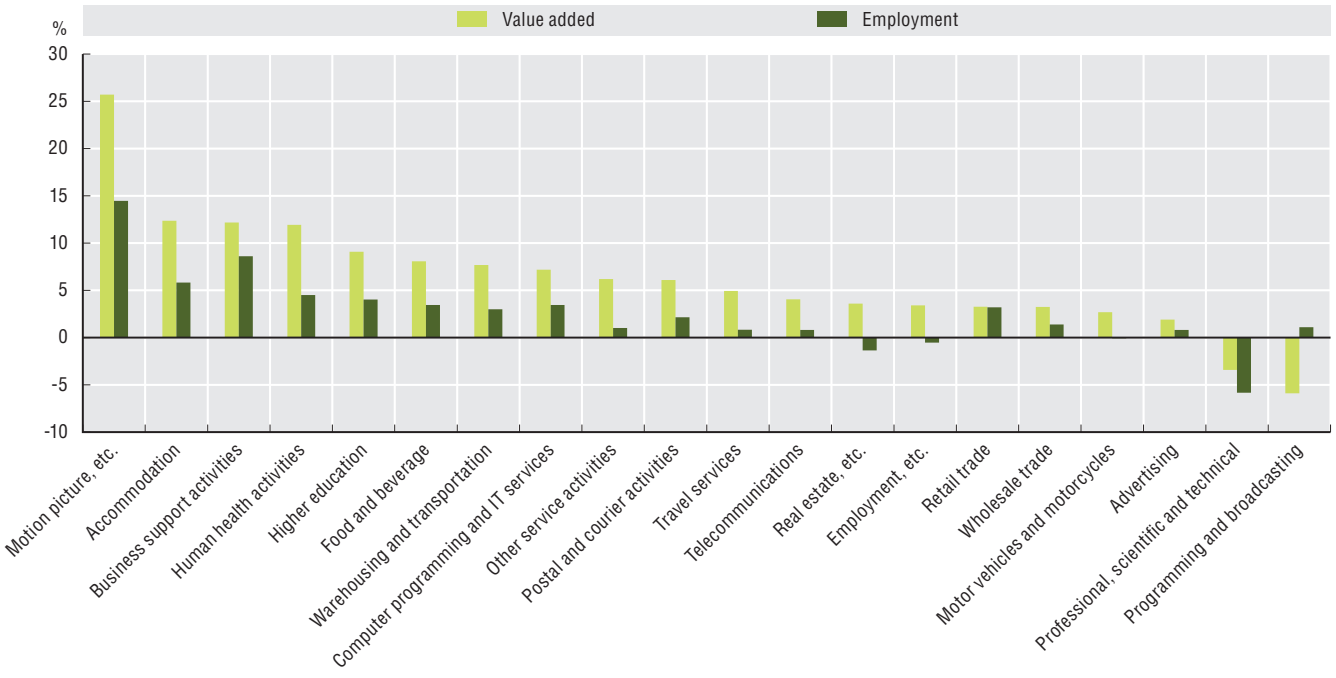
Note: ICT = information and communication technology.

Source: MinTIC (2017), "Gran Encuesta TIC: Tabla de salida empresas", *https://colombiatic.mintic.gov.co/679/w3-article-74002.html* (accessed on 27 December 2018).

The digital transformation is fostering growth in services

Many services sectors are profoundly affected by digital transformation and there is large heterogeneity with regard to growth dynamics between different services sub-sectors (Figure 4.5).

Figure 4.5. Growth rates vary significantly among services, 2014-17



Notes: Industry classification following ISIC Rev. 4 (CIIU Rev. 4 A.C.). Growth rates are computed as a simple average of yearly changes. Real estate, etc. includes rental and leasing activities. Motion picture, etc. includes video, television, sound and music. Employment, etc. includes security, buildings and administrative support.

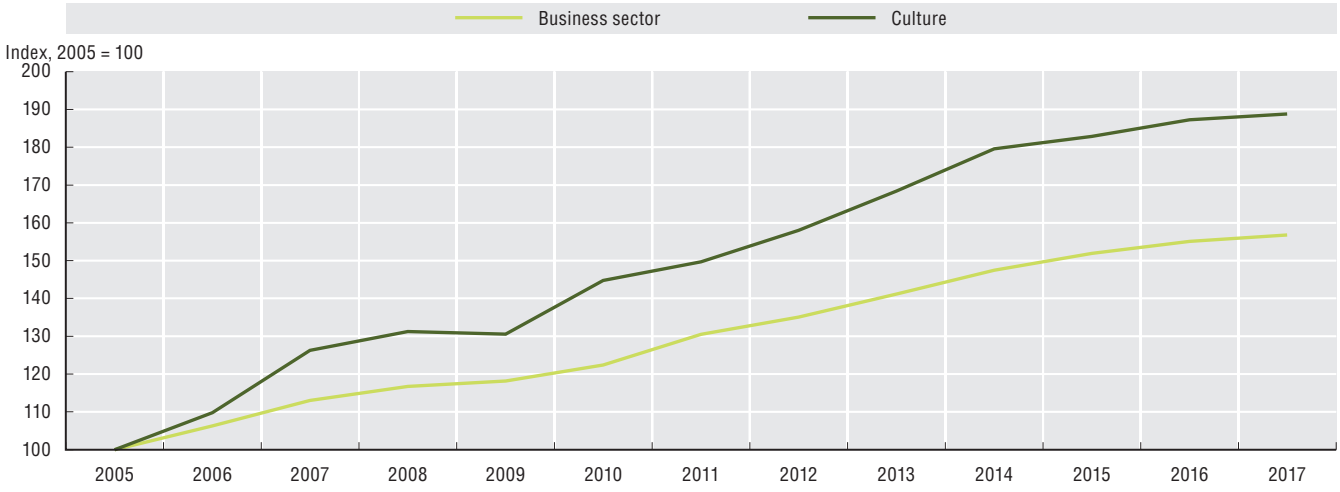
Sources: DANE (2017b, 2016b, 2015b), "Variaciones Porcentuales Corrientes – CIIU Revisión 4", *https://www.dane.gov.co/index.php/estadisticas-por-tema/servicios/encuesta-anual-de-servicios-eas* (accessed on 15 November 2018); DANE (2017a, 2016a, 2015a), "Anexos evolución CIIU Rev 4 A.C.", *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-interno/encuesta-anual-de-comercio-eac* (accessed on 15 November 2018).

The following sub-section reconsiders how various services sectors in Colombia have been affected by digital transformation and discusses how government policies can help foster the digital potential in services industries. The service sectors considered are: the so-called "Orange Economy"; accommodation; business support activities; e-health; wholesale and retail; logistics; professional, scientific and technical services; financial services; and ICT services.

The Orange Economy offers large potential for productive jobs in remote areas

Colombia's rich cultural assets and creative industries – the so-called "Economía Naranja" (Orange Economy) – has grown significantly faster than the business sector (Figure 4.6). The sector, which encompasses audiovisuals, design activities, cultural education, games and toys, music, books and other publications, accounted for about 1.1% of Colombia's total value added in 2017. Audiovisuals represent by far the largest share in the creative industries, accounting for over 40% of the total value added (DANE, 2018c).

Figure 4.6. The Orange Economy is growing faster than most sectors



Notes: Business sector includes all sectors except Public administration and defence compulsory social security (ISIC Rev. 4, Section O) and Activities of households as employers, undifferentiated goods- and services-producing activities of households for own use (Section T). Chained volume indices (base year 2015). Data for 2017 are provisional. See DANE, Satellite Account of Culture for a definition of the cultural sector.

Sources: DANE (2019b), "Principales agregados macroeconómicos, base 2015", *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales* (accessed on 15 April 2019); DANE (2019c), *Cuenta Satélite de Cultura* (CSC) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-satelite/cuenta-satelite-de-cultura-en-colombia* (accessed on 15 April 2019).

Several legislative changes have helped push the sector forward. The Film Act of 2003 (Law 814) stimulated cultural productions by creating tax incentives for individuals and companies investing in film projects as well as for film exhibitors that are screening Colombian short movies. The Colombia Filming Act of 2012 (Law 1556) fostered activities promoting Colombia as a film location and provided a cash rebate on production costs for companies filming in Colombia. Resources allocated to these measures included over USD 83 million to be spent over the years 2004-16 (Law 814) and USD 18 million for the Colombia Film Fund as well as over half a billion USD delivered in cash rebates between 2013 and 2016 (Law 1556). The measures involved yearly evaluations through the National Council of the Arts and Culture in Cinematography (UNESCO, 2017). As a result, the number of feature films produced in Colombia increased from 5 in 2013 to 41 in 2016 and the number of admissions for national films more than doubled, from 2.3 million in 2007 to 4.7 million in 2016 (UNESCO, 2018).

An initiative brought to congress by former senator and current President Iván Duque in 2017 (Law 1834) has now broadened the focus to a wider set of creative activities. Buitrago Restrepo and Duque Márquez (2013) identified the Orange Economy as a sector likely to benefit substantially from the digital transformation, turning it into a potential motor of growth for high-skilled services. In particular, the emergence of content created and distributed on line can significantly leverage human capital as productive input, reduce barriers to entry and allow new business models to prosper.

A newly formed National Council for the Orange Economy, headed by the Ministry of Culture, came together for the first time in October 2018 and unites seven ministries and five other entities in an attempt to provide a whole-of-government response to the challenges facing the sector. The strategy is also an important component of the new National Development Plan (Plan Nacional de Desarrollo [PND]) 2018-2022 (DNP, 2019) where it is included as a transversal pact focused on the protection and promotion of Colombian culture and the promotion of the Orange Economy for productivity and job creation. The plan highlights the complementarities between the Orange Economy and the tourism sector and their potential to transform the Colombian economy.

In particular, the PND aims to promote an environment that fosters the creation and distribution of cultural content as well as access to it, including through a strengthening of the property rights system. It also recognises the role that sectors like the Orange Economy can play in bringing employment opportunities to rural areas, in particular for young people. The Orange Economy is at present highly concentrated in Bogotá (El Espectador, 2018a).

While the plan highlights the complementarities between the Orange Economy and the tourism sector, the promotion of the Orange Economy in rural areas should extend beyond low-skilled activities in the tourism sector, incorporating high-tech and skill-intensive activities in the creative industries more broadly. With the creation of orange development areas (*áreas de desarrollo naranja*) the PND contains a conceptual framework for such policies which could be linked to other government objectives, such as MinTIC's recently proposed initiative to close the regional ICT skill gap (MinTIC, 2019).

Several other initiatives currently in planning or underway are likely to help foster the expansion of the Orange Economy. This includes, for example, MinTIC's Crea Digital 2019, aimed at small and medium-sized enterprises (SMEs) in the cultural industries and other innovative sectors, and New Media, fostering the creation of cultural products to be disseminated via online platforms, with a new call being foreseen in mid-2019.

The digital economy and regulatory changes are boosting accommodation services

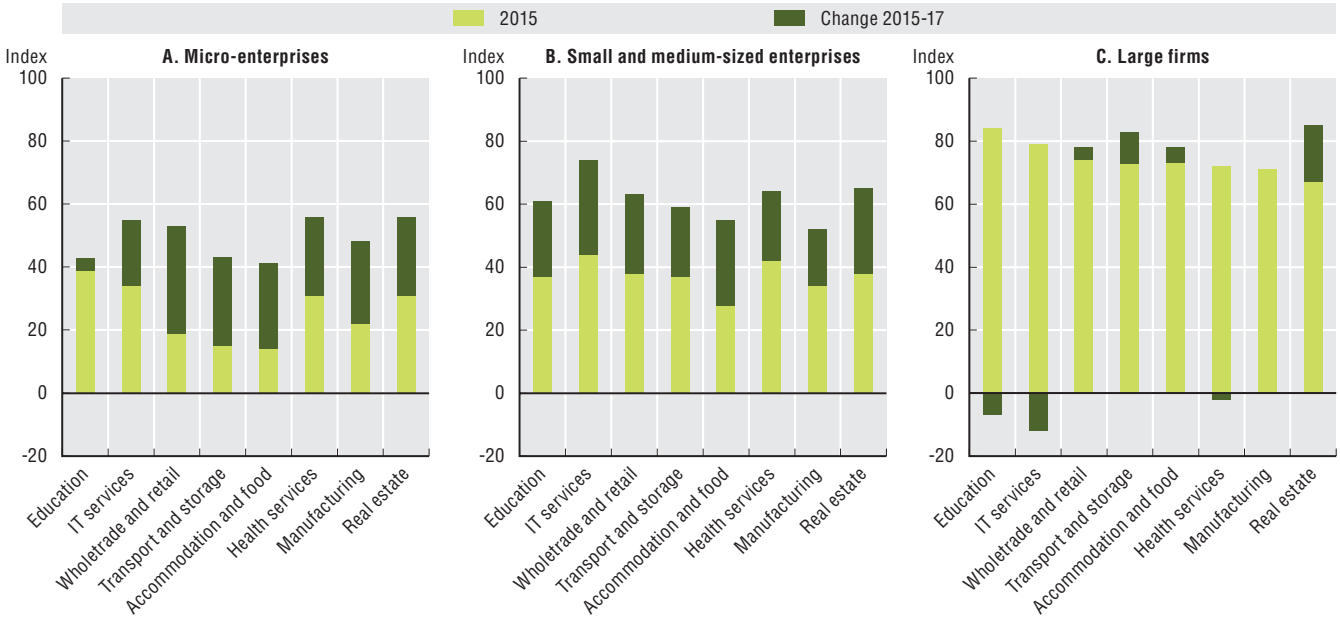
Employment in the accommodation sector grew by about 5.8% on average in each year between 2014 and 2017 (Figure 4.5). Data from the *Observatory of the Digital Economy* (MinTIC) suggests that digital transformation is likely to have driven part of this dynamic. The sector aggregate encompassing accommodation and food services, while overall still not a very intensive user of mature digital technologies relative to other sectors,[3] has seen relatively large increases in terms of digital intensity between 2015 and 2017, in particular among micro-enterprises and SMEs (Figure 4.7). This is not surprising given the ease with which in particular small hotel or restaurant owners today can set up their website or make an appearance on specialised online platforms.

The accommodation sector likely will further profit from recent regulatory adjustments that the Ministry of Commerce, Industry and Tourism (Ministerio de Comercio, Industria y Turismo [MinCIT]) introduced to simplify the formal registration of private accommodation service providers. While private persons previously were obliged to fulfil the same requirements as hotels in order to be registered in the National Tourism Registry, the new legislation has established an additional category for non-commercial service providers that simplifies registration in the National Tourism Registry (Decree 2063) and does not require registration in the Registry of Merchants (Decree 2119). Through this measure, MinCIT aims to reduce the high share of tourism service providers estimated to be operating in informality (41%) and to better account for the offer of rooms via peer-sharing platforms. While providers of accommodation services are, in principle, still obliged to pay a tax on their generated income, a threshold of 50 times the legal minimum wage reduces the burden for small-scale providers (El Espectador, 2018b).

Business support activities with large potential

In 2014-17, growth in value added (12.2%) and employment (8.6%) was also sustained in business support activities (Figure 4.5). The sector comprises many activities associated with business process outsourcing (BPO), such as financial planning, billing and record keeping, as well as call centres, and is likely to benefit significantly from digital transformation. The A.T. Kearney 2017 Global Services Location Index ranked Colombia 10th out of 55 countries analysed for offshoring potential, behind Brazil (5) and Chile (9) but ahead of Mexico (13), Peru (20) and Costa Rica (31). According to the report, Colombia won 12% of new BPO and shared services centres in Latin America and the Caribbean between 2011 and 2015 (A.T. Kearney, 2017).

Figure 4.7. Accommodation and food services are catching up in the use of mature technologies



Notes: IT = information technology. Micro-enterprises have up to 10 employees. SMEs are small (11-50 employees) and medium (51-200 employees) enterprises. Large firms have more than 200 employees.

Source: Katz, R.L. (2017), "El Observatorio de la Economía Digital de Colombia", *https://www.mintic.gov.co/portal/604/articles-61929_recurso_4.pdf*.

This positive outlook seems confirmed by Amazon's recent decision to open its first South American customer service centre in Bogotá, likely to generate as many as 600 jobs. Only a few months earlier, in April 2018, Coca Cola announced that it would shift its business unit for central Latin America from Costa Rica to the Colombian capital (Miranda, 2018).

The Productive Transformation Programme (Programa de Transformación Productiva [PTP]), established by MinCIT in 2008 to provide business development and technical assistance to companies, has singled out BPO, together with other outsourcing activities, software and IT as well as tourism, as a core pillar in its services strategy. However, for this policy to be sustainable, it is important to focus on outsourcing activities that rely on human interaction and are thus less likely to be automated in the near future (Brynjolfsson and McAfee, 2015). The current surge of customer service centres can therefore be seen as a positive development, even if activities are currently highly concentrated in Bogotá.

E-health services have large potential, but challenges remain with regard to connectivity, interoperability and data security

Between 2014 and 2017, valued added in the Colombian health sector grew by close to 12% a year (Figure 4.5). While still relatively small in comparison to the market in Brazil or Mexico, activities related to digital health have been supporting growth in the sector (Maia, Pasteiner and Martinez, 2018). In particular, micro-enterprises and SMEs in the health sector are already among the most intensive users of mature digital technologies across all sectors in Colombia (Figure 4.7).

In a country like Colombia, where a substantial share of the population lives in remote areas with difficult access to medical services, the potential for e-health solutions is large. With Law 1419 of 2010, the government provided the first regulatory ground for the development of e-health in Colombia. However, remaining limitations in last-mile connectivity (see Chapter 2), likely affecting remote areas in particular, and limited technical interoperability between health service providers might currently be keeping sector-level growth below potential. Today e-health services are therefore still concentrated in a small number of relatively densely populated areas like Antioquia, Cundinamarca and Valle del Cauca (Suárez, 2018). Besides access, the limited implementation of data security measures in healthcare facilities has also been cited as a problem that calls for government action (Cuellar, 28 September 2017).

With the new PND (Law 1955 of 2019) and the current revision of ICT policies, the Colombian government foresees action both with regard to access in remote areas and regulation on health data governance. For guidance in regard to regulation on health data governance, Colombia should refer to the OECD *Recommendation of the Council on Health Data Governance*. International best practices should, in particular, be followed when designing the technical, legal and administrative details for the legal framework on information flows within the Integrated Social Security System, which is foreseen in the PND.

Wholesale and retail services suffer from a lack of innovation, infrastructure and trust

Despite their increasing digital intensity (Figure 4.7), the wholesale and retail sectors have been largely underperforming in Colombia as motors of growth (Figure 4.5). Some studies suggest that a lack of competition could be responsible for the disappointing performance, in particular in the retail sector (OECD, 2015).

Nevertheless, new business models, enabled by digital technologies, are beginning to increase competitive pressure in the sector. These new businesses include large international online marketplaces, which are constantly increasing the variety of products on offer in Colombia (Vega Barbosa, 2018), as well as a rising number of domestic start-ups looking for innovative ways to overcome obstacles to e-commerce, e.g. low trust in online business transactions, high cost of digital payment methods, low quality of postal services and infrastructure (see Chapter 3, as well as CRC, 2017b). Some of these firms, including the unicorn Rappi, which is valued at more than USD 1 billion, are currently enlarging the range of their services to payment and postal services and are likely to increase the competitive pressure in those markets (CRC, 2017a).

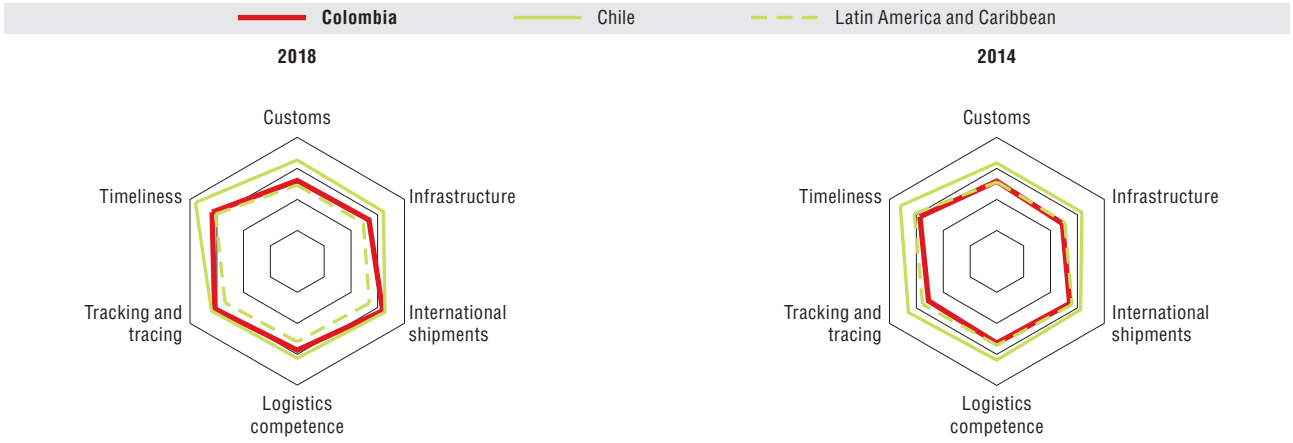
For e-commerce to fully develop its potential, it is important that the Colombian government supports the digital transformation of the retail sector. With the programme Colombia at 1 Click, PROCOLOMBIA has recently begun fostering the use of online sales channels in Colombia, aiming at higher participation rates in online marketplaces, organising training events, or providing consultancy on logistics or customs procedures (PROCOLOMBIA, 2019). However, integrating consumers in remote areas, as well as fostering trust through consumer protection and digital security, will also be crucial for the e-commerce market to flourish. A revision of the digital security strategy, including a reference to the role for trust, is currently under way in Colombia. The draft *OECD Recommendation on Digital Security of Critical Activities* and the revised *Recommendation of the Council on Consumer Protection in E-commerce* can provide useful guidance in this regard.

It will also be important to further reduce the high transaction costs associated with digital payments. The 24 digital payment intermediaries currently operating in Colombia could help reduce these costs. For the moment, these intermediaries are neither regulated nor supervised (El Tiempo, 2018a). The unit responsible for financial regulation in the Ministry of Finance and Public Credit has recently begun to address this issue (Prieto et al. 2018) and has set up a working group with the Central Bank and the Superintendence of Finance (SFC) to consider potential approaches. To support competition in the payment market, it will be crucial that any new legislation will keep regulatory hurdles low for new entrants. Article 166 of Law 1995 of 2019 now more generally foresees measures to facilitate the operation of innovative and tech-driven business models.

Use of robotics could pave Colombia's way to becoming a regional logistics hub

Recent results from the "Encuestra Nacional Logistica 2018" ("National Survey of Logistics") suggest a relatively high share of innovating firms in the warehousing and transportation support sector. Almost half of all firms in the sector (47.7%) had engaged in innovation over the past two years, with the number one reason for innovation being an increase in logistics efficiency (DNP, 2018a). Looking at the World Bank Logistics Performance Index confirms that Colombia has made substantial progress in recent years over a broad set of indicators. In terms of overall performance, Colombia moved its way up the world ranking from number 97 to 58, leaping ahead of Uruguay, Costa Rica, Ecuador, Paraguay, Guatemala, the Bolivarian Republic of Venezuela, Peru and Argentina, settling right behind countries like Brazil (56) and Mexico (51) and closing in on the regional leaders Chile (34) and Panama (38). The largest improvements were made in tracking and tracing and international shipments (Figure 4.8).

Figure 4.8. Colombia has made substantial progress in the World Bank's Logistics Performance Index



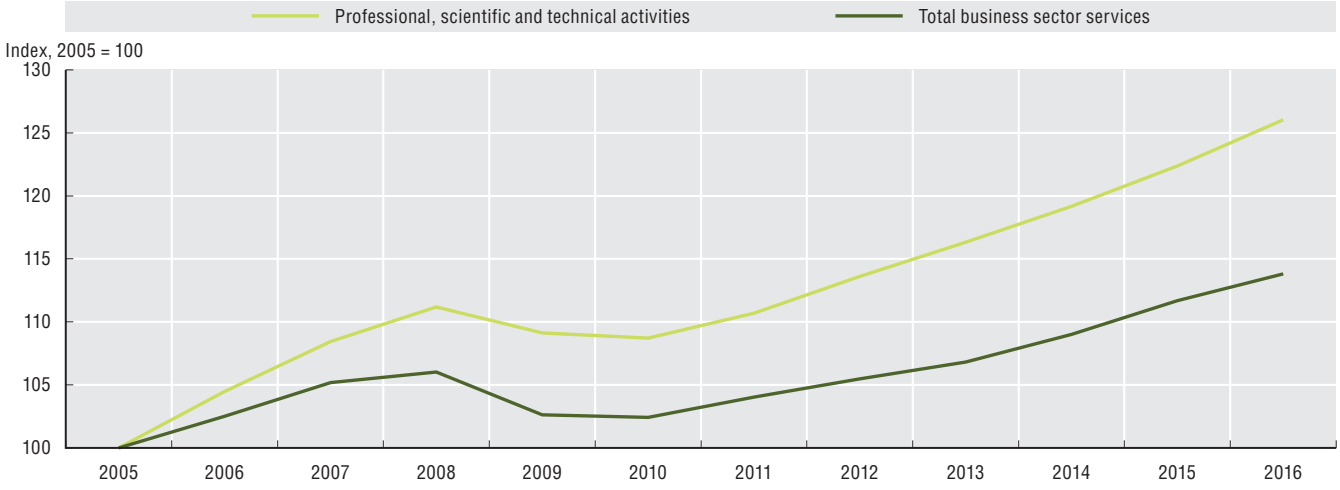
Source: World Bank (2018), "International LPI", *https://lpi.worldbank.org/international* (accessed in February 2019).

As the "National Survey of Logistics" suggests, the major cost component of logistics is related to warehousing and storage (46.5%), and the government should therefore foster the use of advanced technologies like robotics in warehousing to support the development of Colombia into a transport and warehousing hub for Latin America. In particular, the steady modernisation efforts in the port of Cartagena seem already to offer a basis for realistically aiming to become such a hub. While in terms of digital intensiveness the sector is relatively advanced for large firms (Figure 4.7), substantial potential for improvements exists in particular for SMEs. Improving access to finance for these firms could thereby play a crucial role.

A digital strategy is needed for professional, scientific and technical services

Professional, scientific and technical activities have been a growth industry and major source of employment in many countries (Figure 4.9). The sector, encompassing activities such as legal, architectural or engineering services, is considered knowledge intensive (see, for example, National Science Board [2018]) and thus can generate high-income jobs that are critical in evolving services markets like the one in Colombia.

Figure 4.9. Professional, scientific and technical services are growing faster than other business services in OECD countries



Notes: 2005 = 100. In Canada and Israel, employment is measured as the number of jobs rather than persons.

Source: OECD (2019d), "STAN Database for Structural Analysis (ISIC Rev. 4, SNA08)", *https://doi.org/10.1787/stan-data-en* (accessed on 15 April 2019).

However, in contrast to other countries, the sector shrank considerably in Colombia between 2014 and 2017 (Figure 4.5). This decline mostly occurred over the first two years of the period (2014-16), which is likely explained, at least to some extent, by the decline in mining activities. Between 2016 and 2017, value added began rising again while employment continued to decline (-2.5%), though significantly less than in the previous years (-7.5% on average). Because over the whole period the decline in value added was smaller than the decline in employment, labour productivity has likely been growing over time.

For the years 2018-22, the recently presented PND projects production in the sector to grow by close to 5% on average per year, topped only by financial and insurance activities (5.1%) and significantly above projected gross domestic product (GDP) growth (3.8%) (DNP, 2019). However, while the National Planning Department (Departamento Nacional de Planeación [DNP]) document recognises the role of digital transformation as a factor fostering growth in financial services, growth in scientific, professional and technical services are expected to be driven mostly by public construction work, mining as well as public administration.

Not least in the light of a growing potential for ICT-enabled services, for Colombia the digital transformation could open a route to diversification in knowledge-intensive services. However, to foster digital transformation in the sector and remain competitive, creating the right ecosystem for professional services will be of utmost importance (WEF, 2017). The government should therefore reassess whether the current regulatory framework is fit for the digital transformation.[4] The need to adapt to changing skill requirements for these jobs has been acknowledged, for example in CONPES document 3920 of 2018.

Digitalisation brings new growth opportunities for financial services

The Colombian financial services sector, in particular Fintech, has been very dynamic in recent years. The Inter-American Development Bank (IADB) (IADB, IDB Invest and Finnovista, 2018) shows that, out of 1 166 identified Fintech start-ups in 18 Latin American countries, 148 were Colombian. This places Colombia behind the regional leaders Brazil (380) and Mexico (273) but ahead of Argentina (116) and Chile (84). With an increase of 76% in the number of start-ups between 2017 and 2018, Colombia was the fastest growing Fintech ecosystem among these five countries.

According to the IADB study, about 45% of Colombian start-ups are currently still in relatively early stages of entrepreneurship, encompassing activities from product conceptualisation to product launch. The remaining 55% are in advanced stages of entrepreneurship, and thus ready to scale-up and expand. This compares to 64% of start-ups in advanced stages for the whole region and 78% for Brazil, implying that Colombian start-ups will profit relatively more from support in early stages of the start-up lifecycle. As the other four leading countries, Colombia has an active Fintech association (Colombia Fintech), established in 2016.

The largest segments of the Colombian Fintech market are payments and remittances. Data from a previous survey (Pombo et al., 2017) further reveal that outward orientation of Colombian entrepreneurs is more pronounced than in other countries: while 31% of respondents among Colombian entrepreneurs indicated activity in other Latin American countries, this share was only 11% for Brazil and 8.6% for Mexico, suggesting large internationalisation potential.

Compared to the fast growth of the sector, Fintech regulation in Colombia still appears to be overly burdensome: 26% of Colombian Fintech entrepreneurs considered current regulation to be excessive (Pombo et al., 2017), against 13% in Brazil, 4% in Chile, 14% in Mexico and 13% in Peru. External financing of Fintech entrepreneurship in Colombia also seems more problematic than in other countries. In 2018, only 53% of Colombian entrepreneurs obtained third-party funding, significantly less than in the other Latin American countries: 88% in Chile, 78% in Brazil, 67% in Venezuela and 65% in Mexico. This suggests scope to increase access to finance for the sector.

The government has taken some important steps to create a more favourable regulatory environment for the sector. With companies specialised in electronic deposits and payments (*sociedad especializada en depositos y pagos electronicos* [SEDPE]), the Ministry of Finance and Public Credit has created a new type of financial institution, mostly restricted to payment and transfer transactions, but subject to significantly lighter regulation than traditional banks. In addition, financial transactions below a certain threshold (roughly USD 580) are exempt from the usual financial transaction tax (Gravámen a los Movimientos Financieros), colloquially referred to as "*4 por mil*" ("4 x 1 000") (Ministry of Finance and Public Credit, 2018). The first SEDPE has now begun to operate in Colombia and several more are registered. This regulatory

change will likely help increase competition in the payment sector, reduce costs of financial transactions and thus enhance financial inclusion, potentially opening up the e-commerce market to more users in the country.

With Decree 1357 from July 2018, the government has also issued a first crowdfunding legislation, allowing crowdfunding platforms to collect funds for productive investment projects. The decree is limited to equity crowdfunding and does not apply to peer-to-peer lending. Crowdfunding platforms can only be established by authorised sole purpose stock corporations, stock exchanges or trading systems. The total amount that can be raised is limited, with the ceiling depending on the type of investors (Fradique-Méndez and Ordoñez, 2018).

Additionally, since December 2018, credit and banking institutions are allowed to invest in financial innovation and tech companies. The new regulation (Decree 2443) aims at fostering financial inclusion and entrepreneurship and an acceleration of the digital transformation in the banking sector.

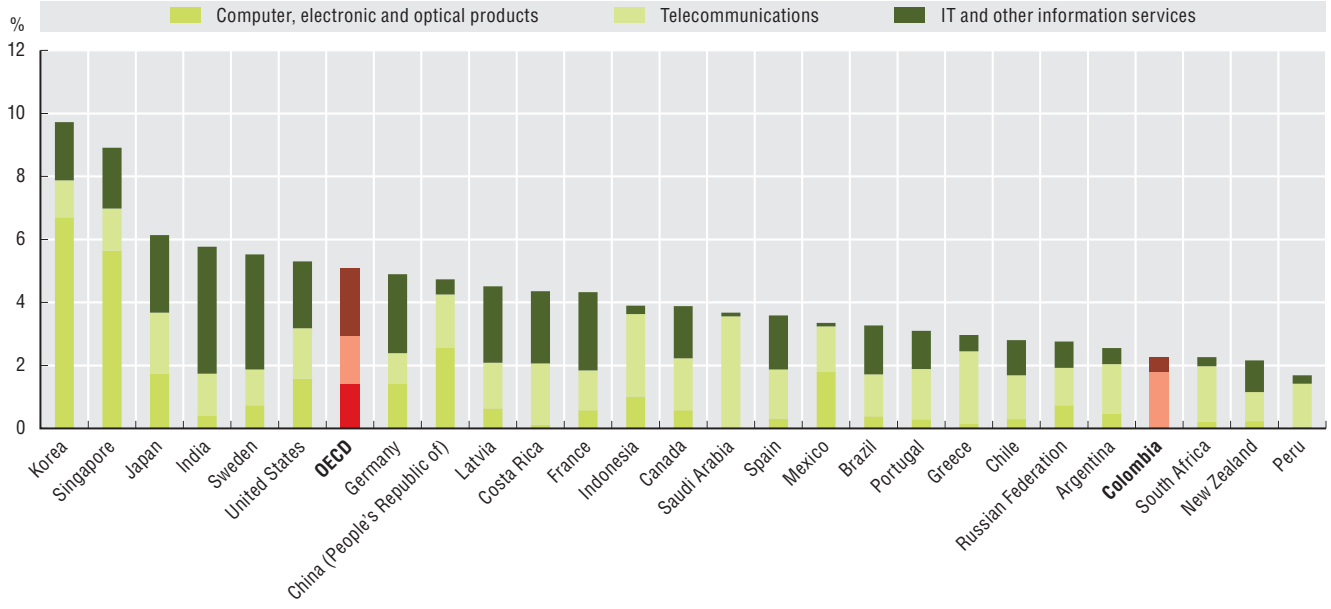
With innovaSFC, the SFC has launched a broader strategy for the promotion of sustainable and responsible innovation in the financial sector. As part of this strategy, the SFC has established additional channels to exchange with the sector on innovation (elHub) as well as a sandbox environment (laArenera) that allows firms to test new technologies and business models under observation. The first company initiated its activities under the scheme in February 2019 and four others have been approved since. Several more companies are currently being considered for approval or have indicated their interest in participation.

ICT services are gaining importance but would benefit from better government co-ordination

The ICT sector is the backbone of the digital economy. Compared to many advanced economies, the size of the sector in Colombia is relatively small, accounting for only 2.3% of value added, against 5.1% for OECD countries (Figure 4.10). The size of the sector is also small compared to regional peers, including Costa Rica (4.7%), Mexico (3.3%) and Brazil (3.3%), but also Chile (2.8%) and Argentina (2.6%).

The sector is dominated by telecommunications services, which account for 78.5% of total ICT value added. This share is significantly higher than in OECD countries (29.5%), but also compared to regional peers, including Brazil (40.7%), Mexico (43.3%), Costa Rica (44.5%), Chile (49.7) and Argentina (61.4%).

Figure 4.10. The ICT sector contributes relatively little to total value added in Colombia

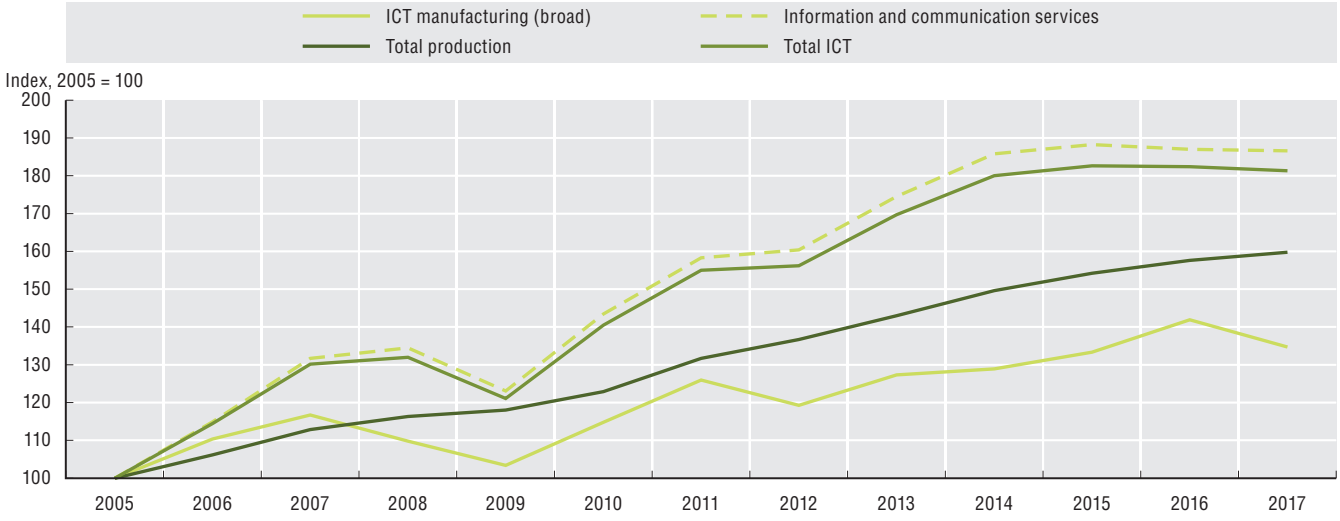


Note: The ICT sector includes computer, electronic and optical products (ISIC Rev. 4, D26), telecommunication services (D61), and IT and other information services (D62, D63).

Source: OECD (2019f), "Trade in value added", *https://doi.org/10.1787/data-00648-en* (accessed on 22 April 2019).

Despite its small size, the ICT sector as a whole has contributed positively to growth in Colombia over the past 12 years, increasing in size relative to other sectors (Figure 4.11). Growth was driven by ICT services, whereas the ICT manufacturing sector has been less dynamic. However, since 2014, growth in the ICT sector has been lagging behind growth in other sectors.

Figure 4.11. Despite its small size, the ICT has contributed positively to growth



Notes: ICT = information and communication technology. Classification: CIIU Rev. 4 A.C. (60 groups). ICT manufacturing includes manufacturing of computer, electronic and optical products as well as electrical equipment (C52). ICT services include telecommunication services, IT services and consulting, broadcasting and media (J81-J84). Data for 2017 are preliminary.

Source: DANE (2019b), "Principales agregados macroeconómicos, base 2015", *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales* (accessed on 15 April 2019).

According to data from a newly established satellite account for the sector, full-time equivalent employment in the telecommunications sector significantly diminished between 2015 and 2017, falling from 277 510 to 200 407. A decrease in employment was also observed in ICT wholesale (-17 093), infrastructure (-1 826) and manufacturing (-187). On the contrary, a significant number of jobs were created in IT services over the same period (22 289) and, to a lesser extent, in content and media services (1 190) (DANE, 2018b).[5]

In the light of overall slowing dynamics in some parts of the sector, the government should assess whether the relatively large number of government programmes aimed at the sector are being effective. In particular, many programmes tend to be relatively small and are operated in parallel by distinct government agencies, applying different approaches and following different objectives (PTP, 2017b). This can make the available programmes difficult to assess and access for firms in the sector.

The large gap in skilled ICT workers is also a challenge for the sector (Observatorio TI, 2017). The MinTIC programme IT Talent (Talento TI) tries to address this skill gap by offering financial support to students who want to pursue training in IT-related professions (see Chapter 5).

Productive transformation policy in Colombia requires a cross-sectoral approach to digitalisation

In 2008, MinCIT created the PTP with the aim of promoting productivity and competitiveness in Colombian firms in line with the priorities set in the National Productivity and Competitiveness Policy (CONPES 3527, 2008) and updated in the Productivity Development Programme of 2016 (CONPES 3866) (Box 4.1). The PTP reaches out to companies with calls for proposals and specialised programmes that aim at improving the efficiency of productive processes in targeted sectors. These activities can involve technical assistance, interventions and training programmes as well as financing and consultation for firms that engage in new methods and international standards aimed at improving productivity. The programme currently works with 18 economic sectors, supporting projects in 29 out of the 32 Colombian departments and has provided technical assistance to over 1 000 firms and 10 000 productive units.

Box 4.1. Colombia's roadmap to productivity calls for policy coherence and co-ordination

In 2016, the DNP issued CONPES 3866, a productivity development policy (PDP) that includes a ten-year roadmap towards higher productivity. The document highlights a need to improve managerial capabilities with regard to entrepreneurship and technology absorption and to improve access to finance, with a focus on innovative firms. It also contains measures to close the skill gap and to raise quality standards in order to help Colombian producers compete on international markets. Throughout, the plan emphasises the need for diversification and a shift of the economy towards more advanced goods and services.

For the PDP to achieve its goals, it is crucial to overcome some problems that have hampered productivity policies over the last two decades. These include low coherence of a multitude of short-term government programmes, with changing priorities and limited funding. There is also evidence of poor co-ordination between government agencies at the regional and national level (Reina, Oveido and Tamayo, 2015; Reina, Castro and Tamayo, 2013).

CONPES 3866 points out the need for better policy co-ordination across policy silos as well as a clear governance structure and regular evaluations. It foresees this role for the National Competitiveness, Science, Technology and Innovation System (SNCCTI), established in 2015 through the merger of the National Competitiveness and Innovation System and the National Science, Technology and Innovation System. Within the SNCCTI, MinCIT has the technical lead on issues related to productivity development.

In October 2018, the executive committee of the SNCCTI came together to discuss the principal strategies to be followed for the next four years in line with the new PND 2018-2022. At this meeting, the executive committee reiterated the importance of co-ordinating public and private actors and of ensuring the continuity of policies (DNP, 2018b).

The selection of targeted sectors by the PTP is based on several criteria, including the potential to dynamise production, employment and exports and to increase sophistication of Colombian products. Targeted sectors include seven sectors in the agro-industrial complex (e.g. cacao and processed foods), seven manufacturing industries (e.g. cosmetics and fashion) as well as four services, including BPO, software and IT as well as wellness and nature tourism. Several sectors are grouped in distinct value chains. For example, cosmetics, pharmaceutics and plastics form part of the chemicals value chain, whereas BPO and software and IT services together form the Industry 4.0 value chain (PTP, 2017a).

With the exception of the Industry 4.0 value chain, the PTP currently does not have a transversal strategy for the digital transformation in sectors, even if digital technologies have been at the core of individual programmes and form part of the overall action plan to promote knowledge and technology transfers (PTP, 2017a). There is further no particular focus on services with digital export potential, apart from outsourcing activities and IT services. In particular, the PTP currently does not specifically target high-potential sectors such as creative industries or financial services.

iNNpulsa, the Colombian management unit of business growth of the national government, with the support of MinTIC, has recently put forward a new proposal for a Smart Manufacturing Program that aims to raise awareness among business leaders, identify manufacturing companies keen on investing in and adopting new technologies, to connect them to relevant research institutions and offer them financial incentives for the adoption of advanced manufacturing technologies. For the first year, the programme aims to assess the readiness of 40 companies, initiate 15 co-funded projects fostering the absorption of advanced manufacturing technologies and provide support to 10 start-ups active in the development of advanced manufacturing technologies (iNNpulsa, 2018).

As part of the strategy, the programme further aims to create or strengthen advanced manufacturing centres in the country. In January 2019, President Iván Duque and Murat Sönmez, head of the Centre for the 4th Industrial Revolution (C4IR) at the World Economic Forum in Davos, jointly signed an agreement for Medellín to host the first C4IR in Latin America. The network aims at facilitating the exchange of research and analysis in a trusted environment and expanded in 2018 to include centres in the People's Republic of China (hereafter "China"), India and Japan. Together with Colombia, Israel and the

United Arab Emirates have also announced the opening of centres in 2019. The Colombian centre will be institutionally based within Ruta N (see Chapter 5) and promote entrepreneurship and the development of new technologies in the region, with a focus on artificial intelligence (AI) and data science.

It will be crucial for Colombia to ensure that the multitude of activities supporting the productive transformation of the country are closely co-ordinated across government actors and over time. This involves close co-ordination between regional actors and the national government to promote efficient feedback of opportunities into the planning of new projects and spreading best practices across regions and programmes. It also involves the continuous co-ordination among government agencies to reduce duplication and create clear responsibilities for transversal objectives (e.g. skills or ICT sector policies). This likely requires the creation of an appropriate institutional setting that can ensure alignment of government programmes with the goals set in the national agenda for competitiveness and that hold government agencies accountable for the co-ordination of projects at the operational level. Constant evaluation and accountability should form a crucial part of such an institutional setting.

Box 4.2. Key recommendations for fostering sectoral diversification through digital transformation

- Foster digital uptake by businesses as a mean to diversify production activities.
- Complement infrastructure investments with a digital strategy for services to enhance overall productivity.
- Encourage technical interoperability and data security among e-health providers, following the OECD *Recommendation of the Council on Health Data Governance*; foster the use of e-health solutions in remote areas through access policies.
- Foster the diffusion of the Orange Economy into remote areas to capitalise on cultural diversity and create job opportunities for highly skilled workers.
- Foster the use of advanced technologies, e.g. robotics, to reduce costs in warehousing and storage; encourage use of digital tools among SMEs in the sector.
- Support the digital transformation in the retail and wholesale sector by improving (postal and other) infrastructure, fostering consumer trust and enhancing competition in the digital payment sector.
- Support the current surge in outsourcing activities in areas that are unlikely to be automatised in the near future (e.g. because they rely on human interaction); diversify the supply of these services among regions.
- Assess whether the regulatory framework for professional services is fit for digital transformation.
- Continue supporting the growth of the Fintech economy, by improving access to finance and providing regulatory flexibility, with a special focus on smaller firms.
- Streamline government programmes aimed at supporting the IT and information services.
- Foster policy coherence and co-ordination of productivity policies at the national and regional level and over time.

Digital market openness and the road to international competitiveness

Digital technologies are transforming the environment in which firms compete, trade and invest. They create new opportunities for trade by reducing trade costs, in particular for small firms, allowing for more efficient co-ordination of global value chains (GVCs), enabling the diffusion of technologies across borders, and connecting businesses and consumers globally (WTO, 2018; López González and Jouanjean, 2017).

Digitalisation is linked with more trade. Analysis shows that a 10% increase in "bilateral digital connectivity" raises goods trade by nearly 2% and trade in services by over 3%. A positive impact arises across all sectors of economic activity, from vegetables to food, mining to metals, footwear to textiles, manufacturing to services. However, it is highest for exports of more sophisticated manufactures and digitally deliverable services.

Digitalisation might also increase the benefits that can be drawn from regional trade agreements. When combined with a regional trade agreement, a 10% increase in digital connectivity increases exports by an additional 2.3%. Finally, there is a statistically significant relationship between ICT goods imports, digitalisation and services exports, suggesting that, just as services have become more important for goods exports, ICT goods increasingly enable the export of digitally deliverable services (López González and Ferencz, 2018).

Indeed, digital transformation has led to growing complementarities between goods and services, giving rise to more trade in "smart" products. Digitalisation has also led to more trade in parcels and lower value digital services (applications) and is increasing the tradability of services. As a result, today's international trade transactions are more numerous and complex, which raises new challenges for existing trade and trade policy frameworks. In this evolving environment, ensuring that the benefits of digital trade are reaped for businesses and consumers requires new approaches to market openness (López González and Ferencz, 2018; Casalini, López González and Moïsé, 2019).

Box 4.3. Digitalisation and agriculture and food trade

Digital transformation offers new opportunities for agriculture and food trade, including for more inclusive participation in agro-food GVCs. The wider adoption of technologies such as digital platforms, connected devices and sensors through the Internet of Things, cloud computing, AI and distributed ledger technologies (blockchain) are driving change and giving data a more central role in today's agrifood value chain.

Digitisation is boosting productivity as a range of digital tools allow producers to access information (e.g. product prices and standards) and services (e.g. payment services) more easily and at a much lower cost. New digital platforms and applications can give smallholders access to agricultural extension and advisory services that previously required the physical presence of experts. Small firms can now be "born global" and consumers can participate directly in trade, substituting traditional wholesalers or retailers with new types of digital intermediaries. These intermediaries often provide additional services through digital applications and platforms which can help smallholders access new and more lucrative markets.

But while digital technologies reduce some costs of engaging in trade, others remain: access to (efficient) transport and trade infrastructure still matters for accessing quality inputs and export markets, particularly for perishable products. Yet digitalisation can also help reduce some of these costs, by, for example, increasing the efficiency and reliability of customs management and the trade logistic chain. Digital technologies can support implementation of the World Trade Organization's Trade Facilitation Agreement, in particular for automation of processes and consultation and communication, as well as providing new tools for trade finance.

Digital technologies can also enable more automatic checks for compliance with standards, and a more transparent and efficient trade regulatory environment. Increased data management capacity can support improved product traceability and better monitoring of product integrity. That is, in addition to product safety, particularly for perishable products, digital technologies can make it possible to verify that a product is what it claims to be. Moreover, this increased information can create new markets in the agro-food chain for consumers willing to pay more for products they can verify as being produced in a certain way (such as sustainability, or by smallholders or female producers).

Digital technologies can transform the agriculture sector, from enabling further product differentiation and creating access to new markets to new ways to operate transactions and distribute value along the supply chain. However, many tools are at an early age of development and governments need to ensure the security and quality of new technologies and services. In addition, there is a need for greater knowledge among public and private stakeholders about the capacities and limits of new digital technologies.

Source: Jouanjean, M. (2019), "Digital opportunities for trade in the agriculture and food sectors", *http://dx.doi.org/10.1787/91c40e07-en*.

A digital trade transaction rests on a series of trade-related factors that enable or support the transaction. For example, ordering a "smart" speaker from a digital retailer requires access to the Internet, the cost of which is conditioned by the regulatory environment in the telecommunications sector. Access to the retailer's website depends on the regulatory environment which determines the conditions under which the retailer can establish the webpage. The purchase of the speaker also depends on factors such as the ability to pay electronically, the costs of delivering the product across borders, and the tariff and non-tariff barriers faced by the physical device.

A barrier on one of these linked transactions will affect the need or the ability to undertake the other transactions. This means that market openness needs to be approached more holistically, taking into consideration the full range of measures that affect the ability to undertake any particular transaction. From a trade policy perspective, the benefits of the digital transformation are therefore contingent on the combined and smooth functioning of issues which span goods, services and digital connectivity.

However, the nature of the measures that affect how modern firms engage in digital trade is changing; in the digital era old trade issues have new consequences. For instance, *de minimis* thresholds may have a higher impact today than they had in the past due to growing cross-border trade in parcels arising from new e-commerce business models. But there are also new measures that raise new issues, as might be the case of electronic payments or cross-border data flows. At the same time, access to digital networks and supporting digital services, including logistics and computer services, are increasingly important for digital trade in goods and services to flourish (López González and Ferencz, 2018; Casalini, López González and Moïsé, 2019).

With services increasingly embedded in goods and growing trade in digitally enabled services, restrictions to services trade are growing (Ferencz, 2019). Some of the most common measures relate to policies that impede access to communication infrastructure and movement of information across networks. Less common are barriers affecting electronic transactions and payments. However, other impediments such as the obligation to establish a local presence before engaging in digital trade are also common. A key emerging challenge is that the regulatory environment for digital trade is increasingly tightening, particularly for measures affecting infrastructure and connectivity, among which are measures affecting the movement of data (Ferencz, 2019).

The new era of digital trade provides a range of new opportunities for Colombia. While the impact of digitalisation is pervasive across all sectors, and digitalisation is transforming all forms of trade, including in more traditional sectors of Colombian comparative advantage such as agriculture (Box 4.3), in what follows, some of the focus is on the role of ICT technologies (Jouanjean, 2019).

Colombia should embrace the digital transformation to increase trade and diversify exports

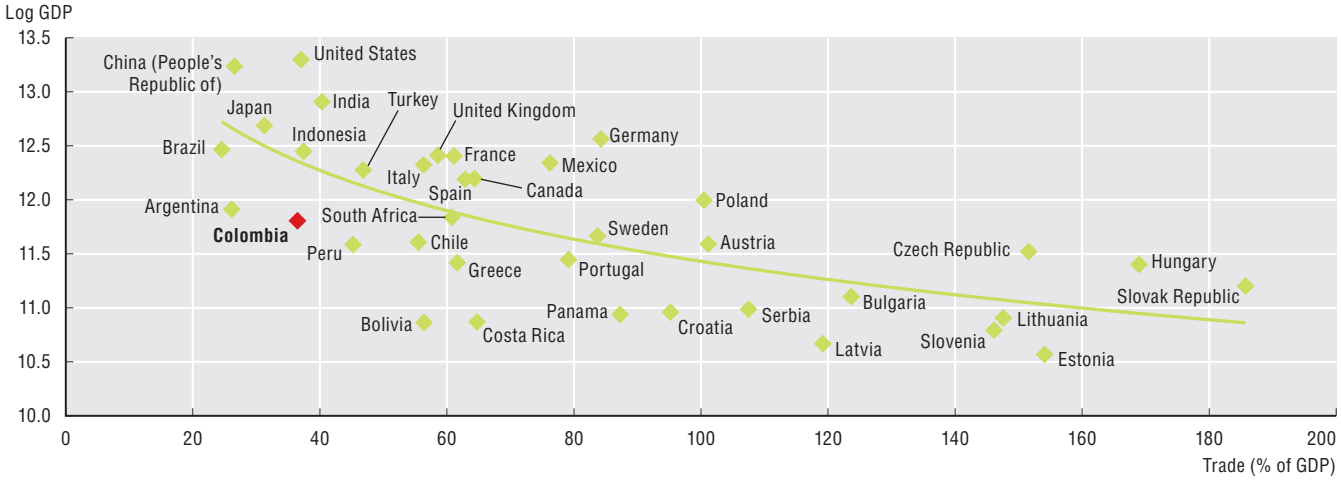
Colombia has a relatively low trade-to-GDP ratio (36.5%) compared to other countries of similar size (Figure 4.12). While trade relative to GDP tends to be lower for large countries, economies that are comparable to Colombia in terms of economic size (GDP), such as South Africa or Sweden, trade relatively more.

Colombia's exports have been, in part, driven by changes in world commodity markets over the last decade. Exports of the mining sector expanded substantially during the height of the commodity price boom, accounting for up to 57% of total goods export in 2012 (Figure 4.13). Manufacturing exports also grew substantially in that period, largely determined by the performance of refinement of petroleum, chemical products and basic metal products that jointly accounted for more than 56% of manufacturing exports.

Exports of the mining sector contracted significantly from 2013 onwards, when demand from emerging economies began to slow down. Exports of the manufacturing and agricultural sector profited from the subsequent currency depreciation, but at the same time were more affected than other sectors by the rising cost of raw materials (OECD, 2018a). Nevertheless, in 2016 mining activities still accounted for almost half of all Colombian goods exports (47%).

The digital transformation provides an opportunity for Colombia to increase and diversify its trade. Indeed, higher Internet penetration is associated with more open economies and exporting more products to more destinations. Digitalisation can also enable more trade across all sectors of the economy, including primary, manufacturing and services (López González and Ferencz, 2018).

Figure 4.12. Colombia has a relatively low trade-to-GDP ratio



Notes: Log GDP measured in purchasing power parity at constant (2011, international dollars) prices.

Source: World Bank (2019b), *World Development Indicators* (database), *https://databank.worldbank.org/data/reports.aspx?source=world-development-indicators (accessed on 30 July 2019)*.

Figure 4.13. Colombia's export performance for goods has been highly dependent on the world market for commodities

Notes: FOB = free on board. Industry classification ISIC/CIIU Rev. 4. Other includes electricity, gas, steam and air conditioning supply (D35); other activities (D36-D99); total waste (DWASTE) and unallocated or confidential activities.

Source: DANE (2018a), "Colombia, exportaciones totales", *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-internacional/exportaciones*.

Although from a low base, gross services exports are growing faster than in many other countries

Between 2005 and 2017, Colombian exports of services increased by a factor of 2.8, compared to a factor of 2.45 in China, 2.25 in Brazil and 1.85 in OECD countries on average (Figure 4.14). Only India (3.54), Poland (3.21), Ireland (3.18), Lithuania (3.1) and Iceland (2.84) had higher growth rates for services exports.

As a result, the share of services in Colombia's total exports almost doubled between 2011 and 2017, from 8.8% to 17.4%, surpassing South Africa (15.2%), Brazil (13.7%) and Chile (12.7%). However, the services share in exports remained far behind other countries, including Costa Rica (44.6%), India (37.8%), the United States (33.9%) and the EU28 (31.3%) (OECD, 2019a).

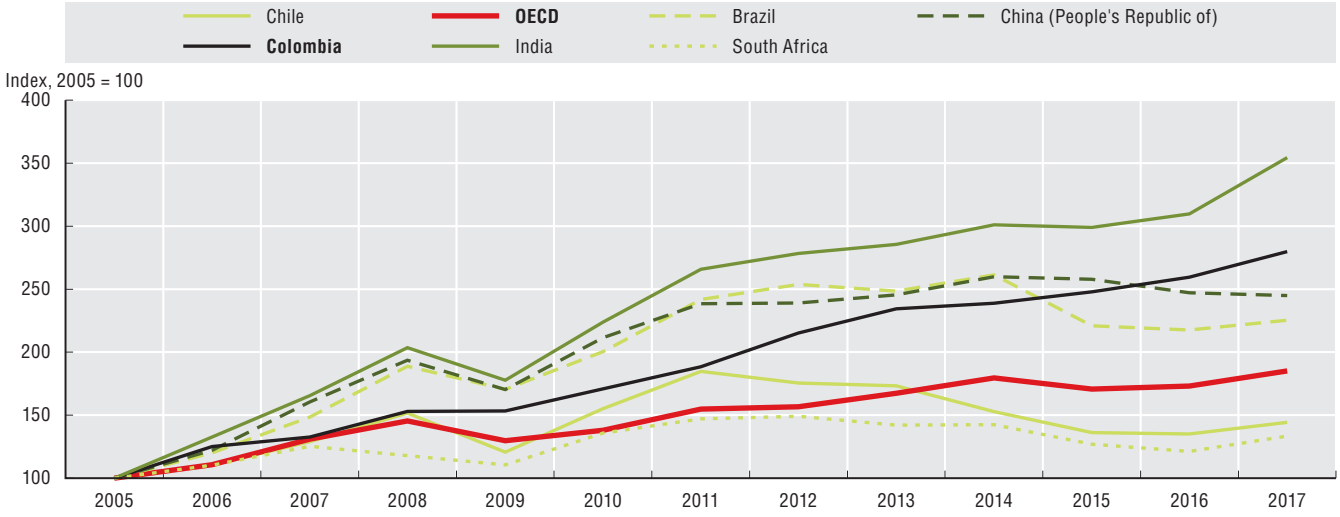
The composition of Colombia's gross exports in services has been changing since 2005. The most important service trade category, by far, is travel services, encompassing services consumed by non-residents, i.e. in the case of Colombia, mostly tourism services in the form of accommodation, food, beverages and

domestic transport services purchased by foreign visitors. The share of travel services in total services exports significantly increased between 2005 (51.4%) and 2017 (58.9%), a trend that is partly driven by improvements in the overall security situation. However, the digital transformation likely supported this process, for example by increasing real-time updates on the security situation and enhancing access to digital tourism services (e.g. online booking), price comparison websites and travel recommendations.

Several other sectors that contributed significantly to services exports either reduced their contribution in relative terms (e.g. transport services) or more or less sustained their contribution relative to other sectors (e.g. other technical and trade-related business services).

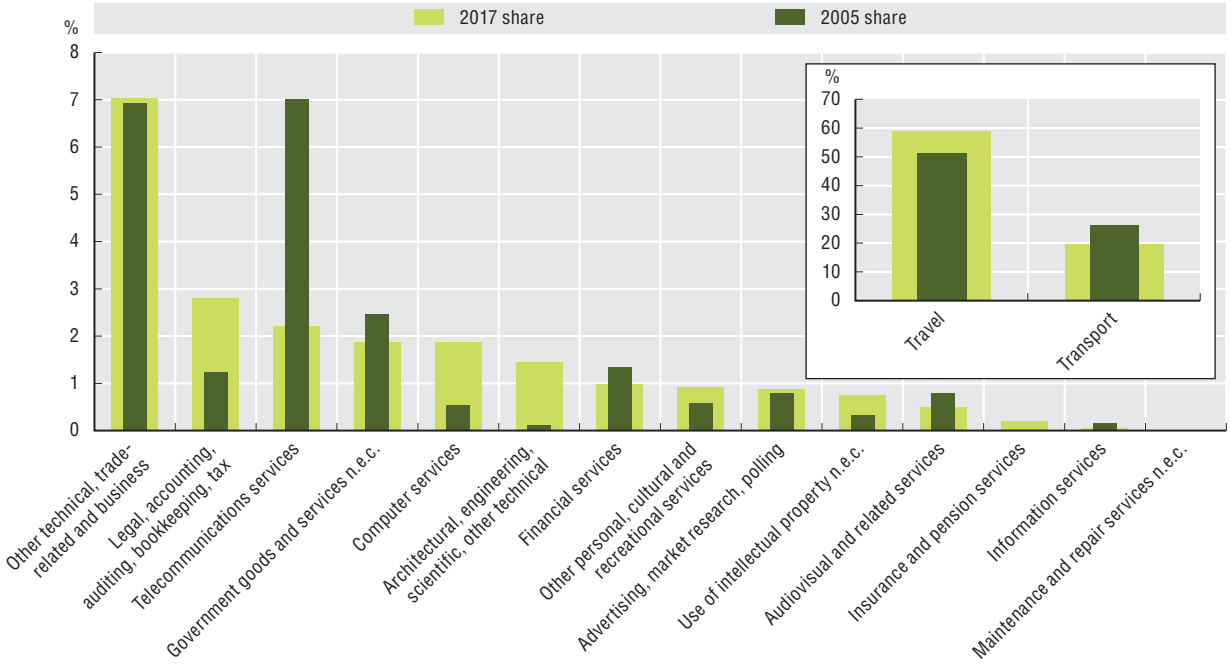
Figure 4.14. Services exports in Colombia are growing faster than in many other countries

Services credits, USD, seasonally adjusted



Source: OECD (2019a), *Balance of Payments BPM6* (database), *https://stats.oecd.org/Index.aspx?DataSetCode=MEI_BOP6*.

Figure 4.15. The share of ICT-enabled services in total services exports has significantly increased



Notes: n.e.c. = not classified elsewhere. Other technical, trade-related and business includes other business services n.e.c., trade-related services, operating leasing services, waste, agricultural and mining services (43-46).

Source: OECD (2019e), "Trade in services – EBOPS 2010", *https://doi.org/10.1787/data-00583-en* (accessed on 31 July 2019).

While relatively small in absolute terms, the contribution of several services that, at least to some extent, can be digitally delivered (potentially ICT-enabled services) increased. Thus, professional and management consulting services, and in particular legal, accounting, auditing, bookkeeping and tax consultation services, more than doubled between 2005 and 2017, from 1.25% to 2.8%. Even larger growth rates were observed for exports in technical services, such as architectural, engineering, scientific and other technical services, whose contribution, while small in absolute terms, significantly increased from close to 0 (0.13%) to 1.46%.

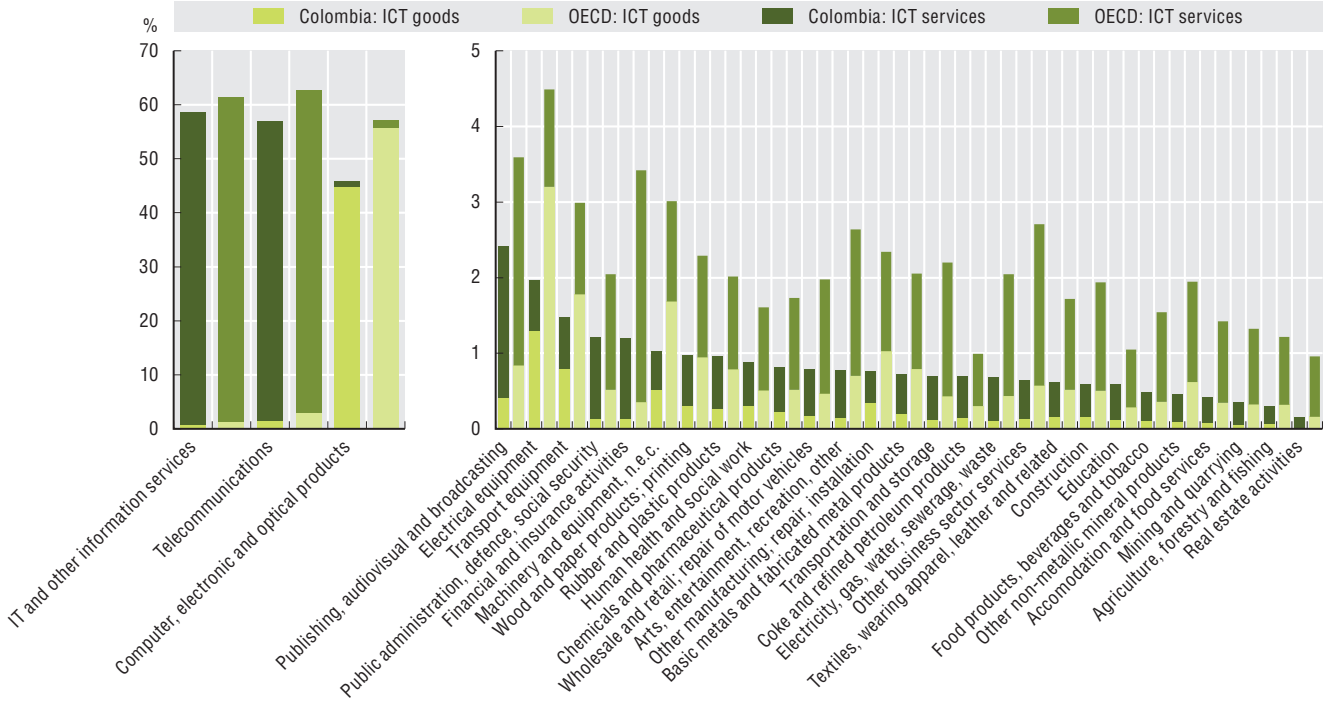
Other potentially ICT-enabled sectors, such as financial and audiovisual, grew significantly between 2005 and 2017 in absolute terms (103% and 75% respectively), but lost ground to other service sectors with higher growth rates. Exports of telecommunication services diminished significantly even in absolute terms (from USD 210 million to USD 183 million), in line with the reduction in employment and revenues discussed above and in Chapter 2.

Some of these dynamics were likely supported by the relatively open regulatory framework for most services sectors, including for computer, construction, professional services, telecommunications, distribution, transport, financial, audiovisual and logistics services, where Colombia compares favourably with OECD countries (OECD, 2018a).

ICT embodiment in Colombian exports and production is low

Compared to OECD countries, Colombia has a low share of ICT value added in exports. With the limitation that the embodiment of ICT value added in exports only captures ICT content embodied in purchased inputs and excludes in-plant or firm production, the embodiment in exports can more broadly serve as a proxy for the ICT intensity of production.[6] Depending on the sector, ICT value added, e.g. arising from the use of computers, cloud computing and other ICT products, contributed between 0.15% (real estate activities) and 58.6% (IT and other information services) to sector-level gross exports. This compares to shares ranging from 0.96% for real estate activities to 62.7% for telecommunications and 61.3% for IT and other information services in OECD countries (Figure 4.16).

Figure 4.16. The share of ICT value added in exports remains low, 2015



Notes: n.e.c. = not classified elsewhere. ICT goods include computer, electronic and optical products (D26); ICT services include telecommunications (D61) and IT and other information services (D62, D63). The figure gives the share of (purchased) ICT value added in gross exports by exporting industry.

Source: OECD (2019f), "Trade in value added", *https://doi.org/10.1787/data-00648-en* (accessed on 22 April 2019).

ICT value added content was particularly low for some key export products of Colombia, including agriculture, forestry and fishing (0.3% compared to 1.2% in OECD countries); mining and quarrying (0.4% to 1.3%); but also accommodation and food services (0.3% to 1.4%).

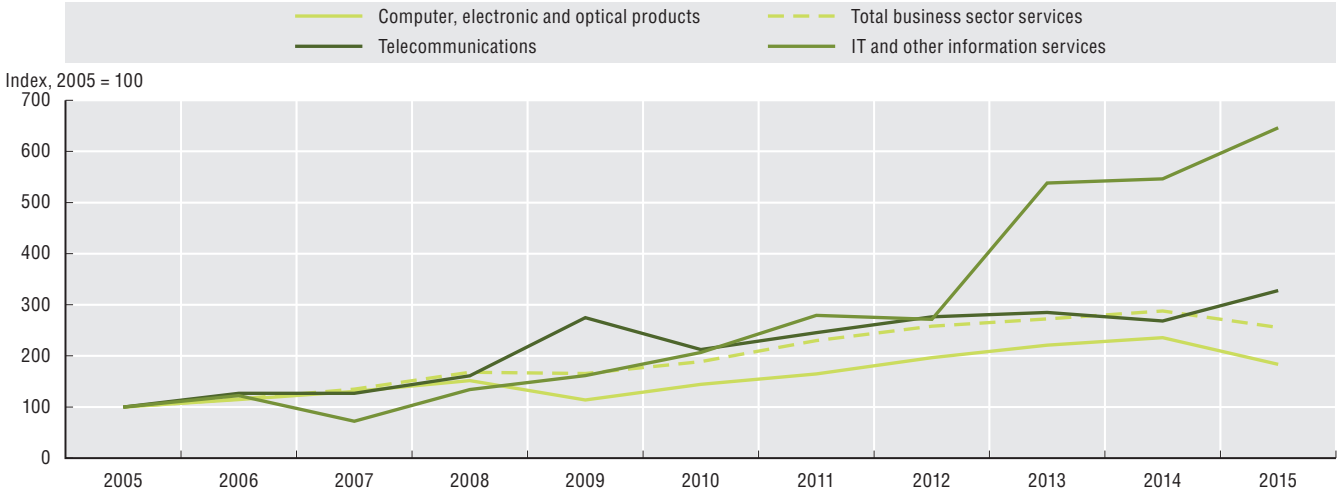
ICT services imports are growing fast

Because the domestic ICT services sector is relatively small in Colombia (Figure 4.10), the digital transformation of sectors crucially depends on the availability of ICT goods and services from world markets and the knowledge embedded within them.

In particular, with the rise of cloud services and ever-cheaper access to virtual computing power, an increasing share of these ICT inputs is now being delivered in the form of ICT services. This has fuelled fast growth in imports of ICT services, in particular IT and information services. Imports of IT and information services grew by a factor of 6.5 between 2005 and 2015, significantly faster than other business services (Figure 4.17).

Figure 4.17. Imports of IT and information services are growing faster than other imports

USD million

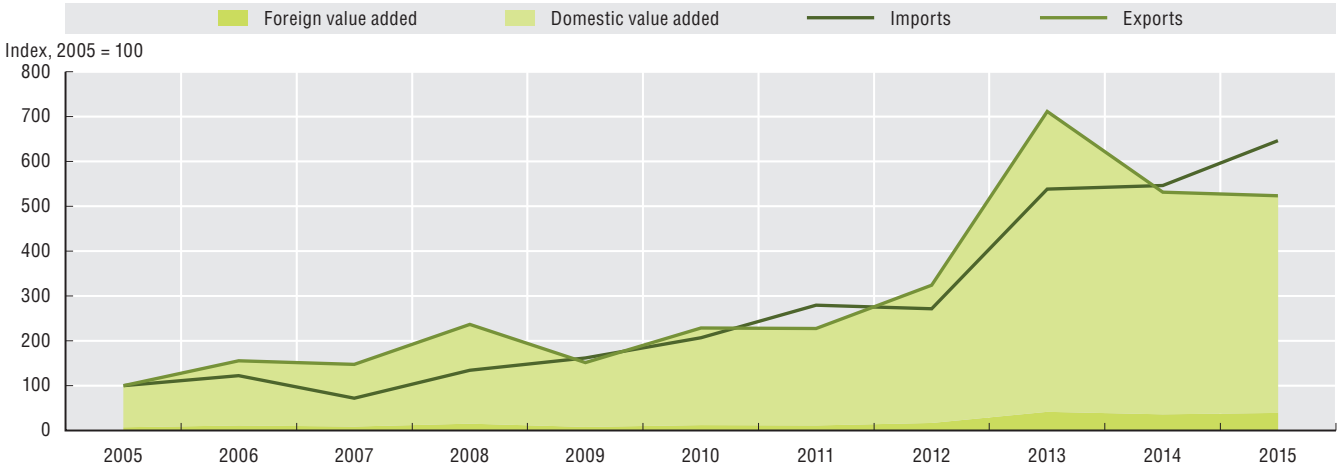


Note: Imports refer to gross imports worldwide.

Source: OECD (2019f), "Trade in value added", *https://doi.org/10.1787/data-00648-en* (accessed on 22 April 2019).

Figure 4.18. Exports of IT and information services have been growing as fast as imports

USD million



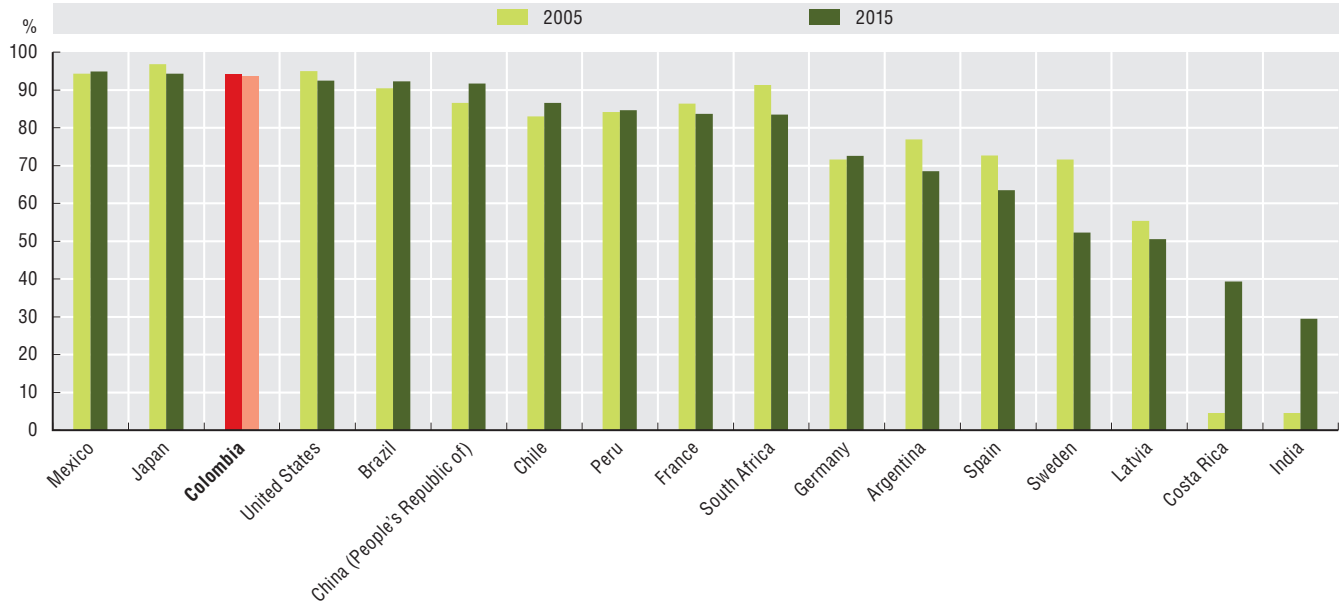
Note: World gross imports and exports. Foreign value added measures the value added produced abroad and embedded in gross exports; domestic value added measures the value added produced domestically and embedded in gross exports.

Source: OECD (2019f), "Trade in value added", *https://doi.org/10.1787/data-00648-en* (accessed on 22 April 2019).

Importantly, imported IT and information services are not only crucial inputs into digital transformation across sectors, but in particular for the domestic ICT sector. The increasing access to information services from world markets has accordingly likely helped to make the domestic IT services sector more competitive: while gross exports of the sector are still small compared to imports (12%), implying a negative trade balance, exports of Colombian IT and other information services have grown just as fast as imports over the past years (Figure 4.18).[7]

Despite the significant increase in exports, about 93.7% of value added created by the sector was absorbed domestically in 2015 (Figure 4.19). While this points to a relatively low export orientation of the domestic ICT sector, it could also reflect the activity of multinational enterprises that supply ICT services to the Colombian market via foreign direct investments and local affiliates rather than exports from abroad.

Figure 4.19. Value added created by the IT and information services sector was absorbed domestically



Notes: Share of domestic value added by IT and other information services (D62, D63) that is absorbed by total domestic final demand.

Source: OECD (2019f), "Trade in value added", *https://doi.org/10.1787/data-00648-en* (accessed on 22 April 2019).

Export promotion programmes would benefit from better co-ordination

The Colombian government is actively engaged in promoting exports by local firms and fostering their integration in GVCs, with some programmes focusing specifically on services and ICTs. The key agency in export promotion is PROCOLOMBIA, associated with MinCIT. PROCOLOMBIA is based on 3 pillars – namely exports, foreign direct investment and tourism – and currently has over 30 offices in Colombia and abroad, with a reach in 33 countries and 19 departments. Since 2012, all three pillars are supported by the country brand strategy Marca País Colombia (CO), aiming at promoting Colombia's value proposition to the world.

PROCOLOMBIA has several lines of action particularly linked to services sectors. In line with the sector strategy prioritised through the Productivity Transformation Programme, the agency specifically promotes foreign investments in the software and IT sector, outsourcing activities as well as wellness and nature tourism (see above), but also for data centres and connected goods and services. In 2015, MinCIT introduced the strategy Colombia Exporta Servicios, with the goal of increasing services exports to USD 9 billion by 2018 (MinCIT, 2015). The strategy has been realised with participation of PROCOLOMBIA. With services exports currently standing at USD 8.9 billion (2018), up from USD 7.6 billion in 2015, the programme will come close to reaching the original goal.[8]

The initiative is based on three strategic pillars, namely strengthening entrepreneurial capacity, trade promotion and improving the business climate. It provides guidance on the provision of several services to other countries, including digital animation and video games, mobile applications, audiovisuals, BPO, software, communications, engineering, and health. However, in spite of the potential for many of these services to be digitally delivered, this potential is not specifically addressed by the programme. Additionally, some dynamic and potentially competitive sectors with a relatively high outward orientation such as Fintech, are currently not explicitly included in the export strategy.

For the software and IT sector, PROCOLOMBIA has further been running the Colombia Bring IT On campaign since 2014, which is funded by MinTIC and aims at better positioning the Colombian IT and digital content industry in international markets (Apps.co, 2016). According to MinTIC, 2 645 firms have benefited from the programme as of 2019. The programme is further supported by the IT Mark, an acknowledgement by MinTIC for firms that help to better position the sector in the domestic economy and on world markets (see Chapter 5).

While Colombia Bring IT On and Colombia Exporta Services both fit into the MinCIT strategy, the initiatives are currently presented on different websites, with limited interlinkages between them. This can make it difficult for firms to find and access the available support for the sector. More generally, the alignment of existing government programmes relating to the software and IT sector has also been recommended by the PTP (2017b) as part of its recent assessment of the cluster.

For sectors beyond services, MinCIT is currently also fostering closer co-ordination with the IADB on the use of the IADB's digital e-commerce platform ConnectAmercias in order to better connect SMEs from Colombia with other SMEs across Latin American countries and the Caribbean.

International market openness in a digital age

As highlighted above in the context of Colombia's rising exports of IT and information services, the performance of the digital industry hinges crucially on access to technology and knowledge imports as well as competition from other countries. This links closely to the current policy debate on market openness principles for a digital world. New business models, deeply integrated GVCs and increasing cross-border data flows are changing the determinants of market openness and complicate policy making in this area (López González and Ferencz, 2018; López González and Jouanjean, 2017).

In terms of classical market openness for trade, Colombia has made great progress in developing a regulatory framework supportive of trade and investments. This involved improving the legal framework for intellectual property rights protection and signing numerous bilateral investment treaties and free trade agreements, including with its largest trade partner (the United States, Decree 993, 2012) as well as with the European Union and Peru (OECD, 2014; MinCIT, 2018). Significant progress has also been made in the area of digital trade policy and non-tariff trade barriers.

Since 2011, Colombia, together with Chile, Mexico and Peru, forms part of the Pacific Alliance, which aims at deeper integration of the region via the free movement of goods, services, resources and people. Importantly, along with several chapters that seem relevant in the context of digital transformation, including telecommunication or financial services, the Additional Protocol to the Framework Agreement to the Pacific Alliance further offers a relatively large number of e-commerce provisions that could determine digital trade among the participating countries over the coming years (Monteiro and Teh, 2017). This includes, for example, measures to facilitate commercial transactions realised by electronic means (e-commerce) and to avoid unnecessary barriers (Art. 13.3 and 4). The additional protocol furthermore recognises the importance of accounting for the interest of all stakeholders when defining e-commerce policy, including business, consumers, non-government organisations and relevant public institutions (Art. 13.3). Overall, the protocol incorporates more provisions on consumer protection than other trade agreements and stipulates that the parties shall standardise information provided to consumers in e-commerce, considering at least the conditions of use, prices, additional charges if applicable, and forms of payment (Monteiro and Teh, 2017). Countries have also explicitly stated an interest (non-binding) to negotiate commitments regarding cross-border flows of information in the future (Art. 13.11).

As most of these provisions are currently non-binding or best endeavours only, it is unclear to what extent they will translate into positive trade effects. Nevertheless, it is important for Colombia to enable trade in the digital era and to increase consumer trust into cross-border transactions. This will be crucial, as a lack of trust has been identified as one of the main factors that prevent Colombians from engaging in e-commerce and other forms of digitally enabled trade (CRC, 2017b).

In 2012, Colombia joined the World Trade Organization's Information Technology Agreement (ITA), which aims at liberalising trade in ICT products. This was a crucial step, in consideration of the low productivity of the domestic ICT manufacturing sector. More recently, Colombia also signed the ITA extension, which added 201 new product categories to the original agreement. Eliminating remaining tariffs on technology imports according to the agreed-upon schedule should now be a priority for Colombia.

Non-tariff measures and trade facilitation

Cadestin, Gourdon and Kowalski (2016) find that about 40% of Colombian imports involve products affected by so-called non-tariff measures (NTMs). These measures often relate to regulations and procedures put in place to assess the compliance of products with domestic quality or product safety standards. In some cases, NTMs can have an adverse trade effect, but in others they can have a positive impact, in particular when they help firms signal quality in their products (see Cadot, Gourdon and van Tongeren [2018]).

Consumer goods are often affected by these measures, meaning that the application of NTMs might be of particular relevance for cross-border business to consumer e-commerce transactions. These challenges have been confirmed in OECD interviews with businesses active in cross-border e-commerce in Colombia. To increase competition and broaden access to a larger variety of goods and services at lower prices, Colombia could aim at reducing unnecessary trade costs related to NTMs.

Trade facilitation refers to transparent, predictable and straightforward border procedures that expedite the movement of goods across borders. In terms of administrative procedures at the border, progress has been particularly noticeable in areas such as administrative simplification, customs reforms, or with respect to the streamlining the processes of preparing technical regulations and the management of import licencing via the single window for international trade transactions, the Ventanilla Única de Comercio Exterior, introduced in 2004 (OECD, 2018a). In the context of the single window, the government has recently launched a pilot that could help facilitate the submission of documents for air cargo shipments. In particular, as part of its anti-narcotics management, the national police requires all exporters to submit a "letter of responsibility" for each shipment. In 2014, this document was systematised for all maritime operations registered in the single window, benefiting 719 871 containerised cargo operations between 2017 and 2018 according to information provided by MinCIT. At airports, it is generally still required for the legal representative of the exporting company to sign this document and present it physically to the anti-narcotics officers. However, in October 2018, the government started a pilot to systematise the operations for air cargo (Circular No. 036), dropping the requirement of physical documentation for Avianca Airlines and 19 air cargo exporting companies selected by the anti-narcotics management. According to MinCIT, the new approach has the potential to eliminate about 2.2 million documents per year and significantly reduce response times in the context of anti-narcotics management.

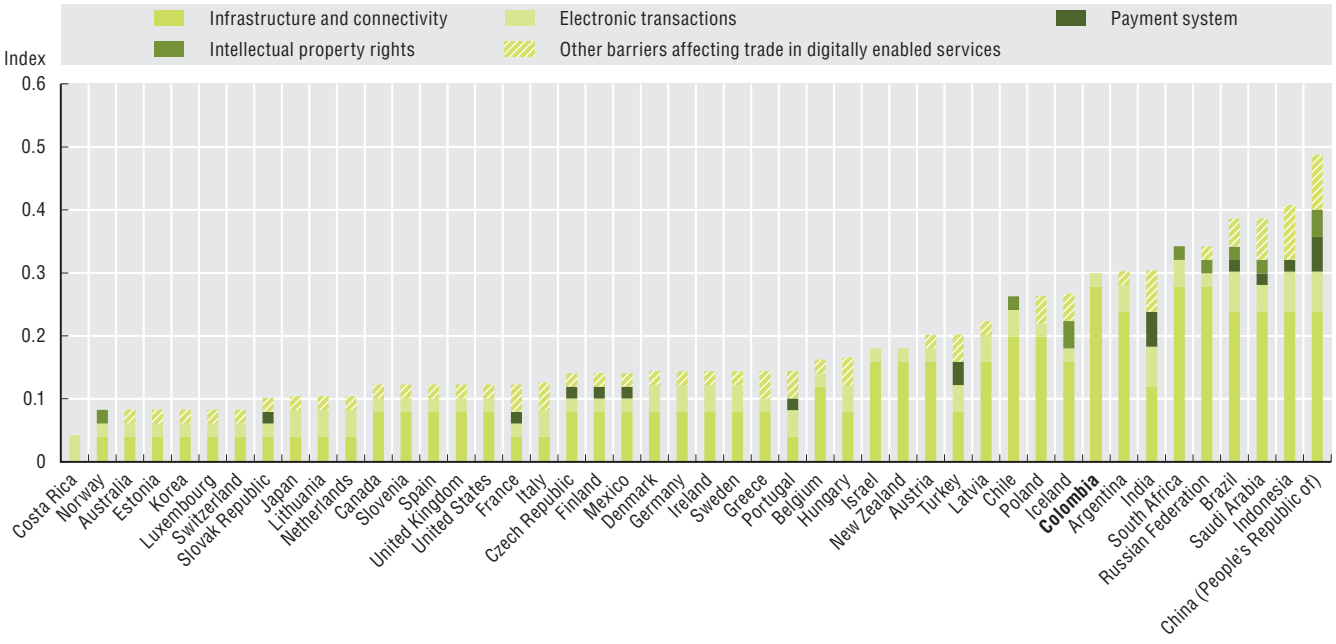
In international comparison, Colombia now outperforms other Latin America and Caribbean (LAC) countries in terms of the cost of documentary requirements for both imports and exports, but is still significantly behind OECD countries (World Bank, 2019a). However, obtaining, preparing and submitting documents for Colombian exporters still requires about 7.5 hours more than in regional peer countries (60 vs. 52.5 hours). Border processing itself, including customs clearance or inspections, still requires around 50 hours more (112 hours) than in other LAC countries (62-63 hours) for both imports and exports, indicating significant room for improvement. The World Bank's trading across borders indicator, summarising Colombia's performance in terms of time and costs for trade documentation and border compliance, shows that overall Colombia still ranks far behind OECD countries but also below the Latin American average, including countries such as Argentina, Brazil, Ecuador and Peru (World Bank, 2019a). The effective use of digital tools to streamline border processes should therefore be high on Colombia's trade policy agenda, an aspect that has been explicitly acknowledged in the PND 2018-2022, within the pact for entrepreneurship, formalisation and productivity (DNP, 2019). Full implementation of the Trade Facilitation Agreement could help cut Colombia's trade costs by up to about 14.5%, fostering the country's integration into GVCs (OECD, 2018b).

The latest OECD Trade Facilitation Indicators (TFI) show that in 2017 Colombia equalled or exceeded the average performance of upper middle-income countries in all TFI areas, in particular for areas such as automation, governance and impartiality, documents or trade community involvement.[9] Colombia achieved best or close to best practice performance with regard to information availability, trade community involvement, advance rulings, fees and charges, simplification and harmonisation of documents, automation, internal border agency co-operation, and governance and impartiality.[10] However, between 2015 and 2017 Colombia lost some ground with regard to information availability, involvement of the trade community and appeal procedures, highlighting a need to keep track with other countries.

Digital Services Trade Restrictiveness

With an index value of 0.299 in the new OECD *Digital Services Trade Restrictiveness Index* (DSTRI), Colombia ranked 38th out of 46 countries for which the DSTRI was available in 2018 (Figure 4.20). The DSTRI collects information on and measures cross-cutting barriers that affect trade in digitally enabled services. It is comparable across 46 countries and can help to identify regulatory bottlenecks to digital trade. Data are collected from publicly available laws and regulations. The framework of measures is comprised of 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. The index is based on a binary scoring system of 0s and 1s, where 1 indicates the presence of a restriction. The final index is derived by aggregating the weighted contribution of individual measures resulting in indices ranging between 0 (no barriers) to 1 (high barriers) (Ferencz, 2019).

Figure 4.20. Digital Services Trade Restrictiveness Index, 2018



Notes: Based on qualitative information, composite indices provide a weighted average over identified (binary) restrictions in five standard policy categories, with values between 0 and 1. Complete openness to trade and investment gives a score of 0, while being completely closed to foreign services providers yields a score of 1.

Source: OECD (2019c), "Digital Trade Restrictiveness Index", *https://stats.oecd.org/Index.aspx?DataSetCode=STRI_DIGITAL* (accessed on 12 February 2019).

All OECD countries have a lower DSTRI than Colombia, implying that there is room to improve the regulatory environment affecting digitally enabled services. Barriers related to infrastructure and connectivity are the main contributors to the index value. However, the index suggests that regulation in Colombia is not too far from Chile (0.262) in terms of restrictiveness and overall less restrictive than in Argentina (0.303) or Brazil (0.386).

In interpreting these scores, it is important to recognise that the DSTRI is designed as an analytical tool with a particular focus (trade restrictiveness), following an approach that tries to maximise international comparability. Accordingly, it highlights regulations that are likely to increase trade costs for firms supplying any kind of cross-border service digitally without prejudice to regulators' ability to protect legitimate public policy objectives through necessary and proportionate measures.

Personal data protection

Colombia's privacy framework considers personal data protection a fundamental right (habeas data). This right is contained in Articles 15 and 20 of the Colombian Constitution, establishing a right to privacy and a right to rectification (DLA Piper, 2019). Personal data processing is further regulated by Law 1266 of 2008, which regulates the processing of financial data, credit records and commercial information and establishes basic data-processing principles, as well as by Law 1581 of 2012, which regulates databases, defines special categories of personal data, such as sensitive data, and the corresponding processing rules. Law 1581 is applicable to all data collection and processing in Colombia that are not regulated otherwise (e.g. by Law 1266).

Like in many other countries (see Casalini and López González [2019]), Colombia's data protection law, and in particular Law 1581 of 2012, requires certain conditions to be met before data can be transferred to or processed in other countries. In Colombia, this includes, for example, the written consent of the data subject or an adequate level of data protection in the receiving country. Although hard to capture, data flow restrictions could affect trade flows (OECD, forthcoming).

The current list of countries that are considered adequate in terms of data protection includes the member countries of the European Union, all countries considered adequate by the European Commission, as well as Costa Rica, Japan, Korea, Mexico, Peru and the United States (SIC, 2017). The level of data protection in Colombia, which is also addressed in CONPES 3920 of 2018 on big data analysis, is itself currently not considered adequate under European General Data Protection Regulation, potentially raising the cost of trade with EU countries.[11]

From a trade perspective, it will be important for Colombia to foster the interoperability of its data protection regulations with those in other countries, and in particular its key trading partners. Ongoing discussions in international fora show that this is by no means an easy task, given that different countries have chosen different approaches to data protection (Casalini and López González, 2019). There seems, however, to be broadly consensus about two fundamentals, namely: 1) that setting the level of personal data protection should be the responsibility of national lawmakers; and 2) that once the level is set, regulations should be transparent, non-discriminatory, aiming for least trade restrictiveness and the highest possible interoperability with the frameworks in other countries.

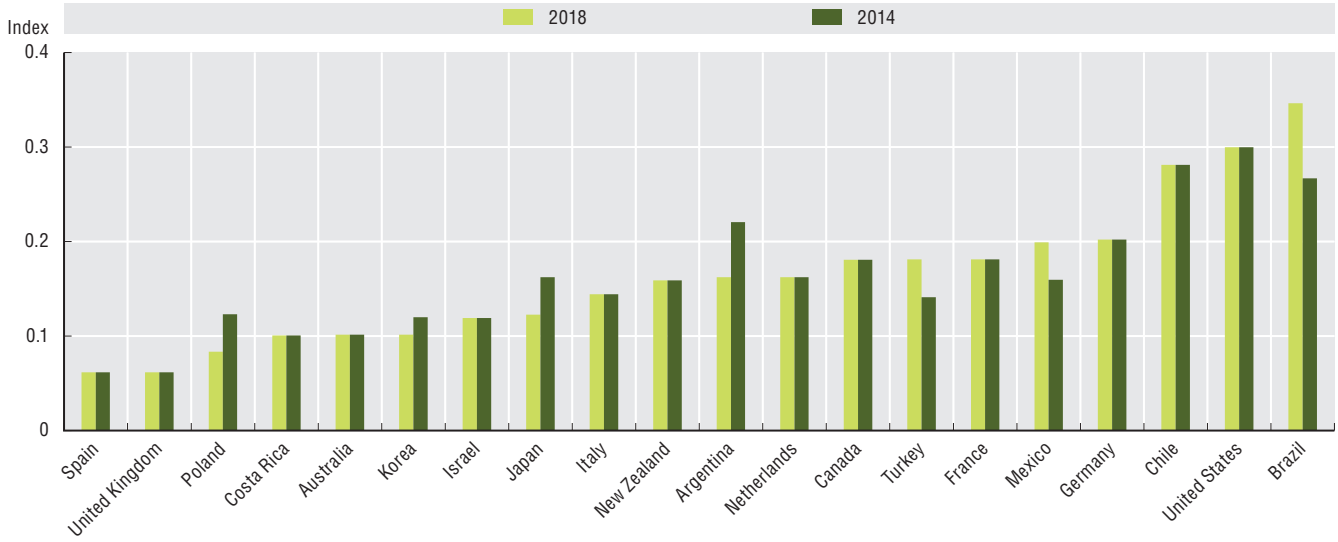
Given its current regulatory setting, Colombia could enhance interoperability by fostering the availability of mechanisms that create an alternative legal basis for personal data transfers to third countries, for example by adopting a regulation regarding binding corporate rules, which is foreseen in Law 1581 but has not been issued yet (Law Reviews, 2018). Additionally, it might be able to enhance interoperability with General Data Protection Regulation by regulating the appointment of data protection officers, to the extent that this does not create additional incompatibilities with regard to other key trading partners (IADB, 12 February 2019).

Regulation on digital services trade in Colombia is similar to European countries but quite different from the United States

More generally, the interoperability of national regulatory frameworks is becoming an increasingly important determinant for international trade. The DSTRI includes a set of bilateral indexes of regulatory heterogeneity to measure the differences in regulations between each pair of countries. Regulatory heterogeneity can be assessed by comparing divergences measure by measure in country pairs. For each measure, the country pair has a score of zero if both countries have the same answer (similar regulation) and one if they have different answers (diverging regulation). The scores are then aggregated using the STRI methodology in order to develop regulatory heterogeneity indices for each country pair. The regulatory heterogeneity indices measure a different source of cost of trading across borders than the DSTRI, namely the cost of having to comply with different regulatory requirements. Each pairwise index varies between 0 (similar restrictions) and 1 (different restrictions).

The DSTRI shows that Colombia's regulatory environment in 2018 was most similar to regulation in many European countries as well as in Australia, Costa Rica and Korea (Figure 4.21). On the other hand, differences in regulations were relatively large with regard to Brazil, Chile and the United States. Over 2014-18, there was also some regulatory convergence between Colombia, on the one hand, and Argentina and Japan on the other. Regulatory differences have increased with regard to Brazil and Mexico, the two largest markets in the region.

Figure 4.21. Regulatory heterogeneity for Colombia



Notes: The OECD DSTRI heterogeneity indices are built from assessing – for each country pair and each measure – whether or not the countries have the same regulation. For each country pair and each sector, the indices reflect the (weighted) share of measures for which the two countries have different regulation. Data shown reflect heterogeneity with regard to Colombian regulation.

Source: OECD (2019b), "Digital STRI Heterogeneity Index", *https://stats.oecd.org/Index.aspx?DataSetCode=STRI_DIGITAL*.

Regulatory differences often involve compliance costs for firms, and Colombia should aim at enhancing interoperability with regard to the regulatory framework of key partner countries. However, because different partner countries choose different regulatory approaches, at least in the short to medium run, this is likely to involve trade-offs. The government, therefore, should pursue multilateral solutions and enhanced international co-operation that reduce regulatory frictions, for example through the WTO e-commerce negotiations. With most partner countries currently updating regulations in different policy areas in response to the digital transformation, this strategic task requires a constant tracking of regulatory changes in partner countries, allowing the Colombian government where possible to align domestic with foreign policy changes and thus to ease trade integration.

Innovators and foreign investors would benefit from better co-ordination in terms of regulation and communication

OECD (2014) found that Colombia could significantly benefit from improvements in areas such as regulatory predictability and the formalisation of consultation processes. Some progress has been made in this regard, for example by Decree 270 of 2017, which requires new regulation to be publicly available for at least 15 days before being signed off by the president. The aim of this decree is to ensure that the public and all interested parties can actively participate in the normative process.

Nevertheless, many businesses, and in particular foreign investors, still complain about the high level of regulation in Colombia and the low predictability of government positions on some key issues. The government is making good progress in addressing the former problem. This includes the Menos Trámites, Más Simples campaign, involving the elimination, simplification or automation of regulatory processes, such as the reduction of forms required for the declaration and payment of the (local) industry and commerce tax from 100 to only 1 (Presidencia, 2018; see also Presidential Directive No. 7 of 2018). The government has further established the participative platform SUCOP, which aims to identify regulatory challenges through stakeholder participation.

Colombia could, however, improve the government's communication on regulatory matters in some cases. The ride-hailing services provides a case in point. These services pose regulatory challenges for most countries, but in Colombia different branches of the government have sent out conflicting signals about their legality (e.g. Semana, 2017). A co-ordinated communication strategy and a prompt response to the underlying regulatory issues might have reduced the uncertainty that arose for both users and providers.[12]

Box 4.4. Key recommendations for digital market openness and international competitiveness

- Create an enabling environment for digital trade, including through regulatory and services reform and by reducing barriers to importing.
- Foster the use of digital technologies to promote trade in goods and services for which Colombia possesses a comparative advantage, including agriculture and mining.
- Co-ordinate the existing programmes promoting the internationalisation of the ICT sector and simplify access to the relevant information.
- Extend collaborations with cross-regional online platforms to help Colombian SMEs to connect to firms in other Latin American markets.
- Enhance trust in digital transactions through effective and easily accessible consumer protection mechanisms and information campaigns.
- Reduce unnecessary trade costs arising from NTMs by extending the set of procedures that can be electronically processed and use digital tools to reduce the time required for border procedures.
- Enhance interoperability of national contract rules for cross-border transactions by ratifying the UN Convention on the Use of Electronic Communications and International Contracts.
- Enhance interoperability of personal data protection via mechanisms that create an alternative legal basis for personal data transfers to third countries, e.g. regulations on binding corporate rules.
- Improve regulatory predictability and government communication to create trust in the regulatory environment.

References

Apps.co (2016), "Con Colombia Bring IT On MinTIC y PROCOLOMBIA buscan mostrar al mundo las oportunidades que ofrece Industria de Contenidos Digitales y TI", 25 November", *https://apps.co/comunicaciones/noticias/con-colombia-bring-it-on-mintic-y-PROCOLOMBIA-busc*.

A.T. Kearney (2017), "2017 A.T. Kearney Global Services Location Index: The widening impact of automation", A.T. Kearney, Inc., *https://www.atkearney.com/documents/20152/799350/The+widening+Impact+of+Automation.pdf/95d8d519-e2b0-0e4f-994d-15e8716b339e*.

Brynjolfsson, E. and A.J. McAfee (2015), "The jobs that AI can't replace", BBC News, 13 September, *https://www.bbc.com/news/technology-34175290*.

Buitrago Restrepo, F. and I. Duque Márquez (2013), *The Orange Economy: An Infinite Opportunity*, Inter-American Development Bank, Washington, DC, *https://publications.iadb.org/en/orange-economy-infinite-opportunity*.

Cadestin, C., J. Gourdon and P. Kowalski (2016), "Participation in global value chains in Latin America: Implications for trade and trade-related policy", *OECD Trade Policy Papers*, No. 192, OECD Publishing, Paris, *https://doi.org/10.1787/5jlpq80ts8f2-en*.

Cadot, O., J. Gourdon and F. van Tongeren (2018), "Estimating ad valorem equivalents of non-tariff measures: Combining price-based and quantity-based approaches", *OECD Trade Policy Papers*, No. 215, OECD Publishing, Paris, *https://doi.org/10.1787/f3cd5bdc-en*.

Casalini, F. and J. López González (2019), "Trade and Cross-Border Data Flows", OECD Trade Policy Papers, No. 220, OECD Publishing, Paris, *https://doi.org/10.1787/b2023a47-en*.

Casalini, F., J. López González and E. Moïsé (2019), "Approaches to market openness in the digital age", *OECD Trade Policy Papers*, No. 219, OECD Publishing, Paris, *https://doi.org/10.1787/818a7498-en*.

CRC (2017a), "Diagnostico de barreras regulatorias del sector postal y hoja de ruta", *Informe 2: El Comercio Electrónico en Colombia: Análisis Integral y Perspectiva Regulatoria*, Commission for Communications Regulation, Bogotá, *https://www.crcom.gov.co/recursos_user/2018/ac_reg/hoja-postal/4-analisis-oferta-demanda.pdf*

CRC (2017b), "El comercio electrónico en Colombia: Análisis integral y perspectiva regulatoria", documento soporte, Versión Comité de Comisionados, April, Commission for Communications Regulation, Bogotá.

Cuellar, D. (28 September 2017), "e-Health o la transformación del sector salud", El Tiempo Blog, *http://blogs.eltiempo.com/seguridad-digital/2017/09/28/e-health-o-la-transformacion-del-sector-salud*.

DANE (2019a), "Muestra Trimestral de Comercio Exterior de Servicions" (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-internacional/muestra-trimestral-de-comercio-exterior-de-servicios* (accessed on 23 May 2019).

DANE (2019b), "Principales agregados macroeconómicos, base 2015", *Cuentas Nacionales Anuales* (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-nacionales-anuales* (accessed on 15 April 2019).

DANE (2019c), "Cuenta Satélite de Cultura (CSC)" (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-satelite/cuenta-satelite-de-cultura-en-colombia/cuenta-satelite-de-cultura-nacional* (accessed on 15 April 2019).

DANE (2018a), "Colombia, exportaciones totales", *según CIIU Rev. 4, 1995-2018* (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-internacional/exportaciones*.

DANE (2018b), "Cuenta satélite de las tecnologías de la información y las comunicaciones (CSTIC) – 2014-2017", *Boletín Técnico*, 6 December, National Administrative Department of Statistics, Bogotá, *https://www.dane.gov.co/files/investigaciones/pib/tic/bt-satelite-tic-2014-2017p.pdf*.

DANE (2018c), "Cuenta satélite de cultura (CSC) – 2016-2017", *Boletín Técnico*, 31 July, National Administrative Department of Statistics, Bogotá, *https://www.dane.gov.co/files/investigaciones/pib/sateli_cultura/2005_2017/Bole_Cta_Sat_Cul_2005_2017.pdf* (accessed on 15 November 2018).

DANE (2017a), "Anexos evolución CIIU Rev 4 A.C.", *Encuesta Anual de Comercio* (EAC) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-interno/encuesta-anual-de-comercio-eac* (accessed on 15 November 2018).

DANE (2017b), "Variaciones Porcentuales Corrientes – CIIU Revisión 4", *Encuesta Anual de Servicios* (EAS) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/servicios/encuesta-anual-de-servicios-eas* (accessed on 15 November 2018).

DANE (2016a), "Anexos evolución CIIU Rev 4 A.C.", *Encuesta Anual de Comercio* (EAC) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-interno/encuesta-anual-de-comercio-eac* (accessed on 15 November 2018).

DANE (2016b), "Variaciones Porcentuales Corrientes – CIIU Revisión 4", *Encuesta Anual de Servicios* (EAS) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/servicios/encuesta-anual-de-servicios-eas* (accessed on 15 November 2018).

DANE (2015a), "Anexos evolución CIIU Rev 4 A.C.", *Encuesta Anual de Comercio* (EAC) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/comercio-interno/encuesta-anual-de-comercio-eac* (accessed on 15 November 2018).

DANE (2015b), "Variaciones Porcentuales Corrientes – CIIU Revisión 4", *Encuesta Anual de Servicios* (EAS) (database), *https://www.dane.gov.co/index.php/estadisticas-por-tema/servicios/encuesta-anual-de-servicios-eas* (accessed on 15 November 2018).

DLA Piper (2019), "Data protection laws of the world: Colombia", website, *www.dlapiperdataprotection.com/index.html?t=law&c=CO*.

DNP (2019), "Bases del Plan Nacional de Desarrollo 2018-2022: Pacto por Colombia – Pacto por la equidad", National Planning Department, Bogotá, *https://www.dnp.gov.co/Plan-Nacional-de-Desarrollo/Paginas/Bases-del-Plan-Nacional-de-Desarrollo-2018-2022.aspx*.

DNP (2018a), "Encuesta Nacional Logistica 2018: Presentacion de resultados", National Planning Department, Bogotá, *https://onl.dnp.gov.co/es/Publicaciones/SiteAssets/Paginas/Forms/AllItems/Presentaci%C3%B3n%20Encuesta%20Nacional%20Log%C3%ADstica%202018.pdf*.

DNP (2018b), "Gobierno lideró la reactivación del Comité Ejecutivo del Sistema Nacional de Competitividad, Ciencia, Tecnología e Innovación", webpage, National Planning Department, Bogotá, 25 October, *https://www.dnp.gov.co/Paginas/Gobierno-lider%C3%B3-la-reactivaci%C3%B3n-del-Comit%C3%A9-Ejecutivo-del-Sistema-Nacional-de-Competitividad,-Ciencia,-Tecnolog%C3%ADa-e-Innovaci.aspx*.

El Espectador (2018a), "Concejo aprueba acuerdo para fortalecer e impulsar la economía naranja en Bogotá", 6 June, El Espectador, *https://www.elespectador.com/noticias/bogota/concejo-aprueba-acuerdo-para-fortalecer-e-impulsar-la-economia-naranja-en-bogota-articulo-792938*.

El Espectador (2018b), "Gobierno establece marco legal para formalizar alojamiento turístico", 21 November, El Espectador, *https://www.elespectador.com/economia/gobierno-establece-marco-legal-para-formalizar-alojamiento-turistico-articulo-824794*.

El Espectador (2018c), "Se calienta el mercado de las app de transporte en Latinoamérica", 8 April, El Espectador, *https://www.elespectador.com/economia/se-calienta-el-mercado-de-las-app-de-transporte-en-latinoamerica-articulo-748882*.

El Tiempo (2018a), "Intermediario de pagos en internet, negocio que crece con poco control", 26 January, El Tiempo, *https://www.eltiempo.com/economia/sector-financiero/intermediarios-de-pagos-por-internet-en-colombia-no-estan-muy-controlados-175320*.

El Tiempo (2018b), "La aplicación Uber pierde una nueva batalla legal en Colombia", 12 January, El Tiempo, *www.eltiempo.com/justicia/cortes/nuevo-fallo-de-la-corte-constitucional-sobre-uber-170250*.

Ferencz, J. (2019), "The OECD Digital Services Trade Restrictiveness Index", *OECD Trade Policy Papers*, No. 221, OECD Publishing, Paris, *http://dx.doi.org/10.1787/16ed2d78-en*.

Fradique-Méndez, C. and M.C. Ordoñez (2018), "Colombia: New crowdfunding decree", 17 October, *International Financial Law Review*, *www.iflr.com/Article/3838996/Colombia-New-crowdfunding-decree.html*.

Gallego, J.M., L.H. Gutiérrez and R. Taborda (2015), "Innovation and productivity in the Colombian service and manufacturing industries", *Emerging Markets Finance and Trade*, Vol. 51/3, pp. 612-634, *https://doi.org/10.1080/1540496X.2015.1026698*.

Hernández, G. (2013), "Terms of trade and output fluctuations in Colombia", *CEPAL Review*, No. 110, pp. 109-131, August, *https://www.cepal.org/en/publications/36988-terms-trade-and-output-fluctuations-colombia*.

IADB (12 February 2019), "Data privacy reform gains momentum in Latin America", IADB Open Knowledge Blog, *https://blogs.iadb.org/conocimiento-abierto/en/data-privacy-reform-gains-momentum-in-latin-america*.

IADB, IDB Invest and Finnovista (2018), "Fintech: Latin America 2018: Growth and consolidation", Inter-American Development Bank, *http://dx.doi.org/10.18235/0001377*.

iNNpulsa (2018), "Smart Manufacturing Program", unpublished presentation.

Jouanjean, M. (2019), "Digital opportunities for trade in the agriculture and food sectors", *OECD Food, Agriculture and Fisheries Papers*, No. 122, OECD Publishing, Paris, *http://dx.doi.org/10.1787/91c40e07-en*.

Katz, R.L. (2017), "El Observatorio de la Economía Digital de Colombia", presentation, *https://www.mintic.gov.co/portal/604/articles-61929_recurso_4.pdf*.

Law Reviews (2018), "The Privacy, Data Protection and Cybersecurity Law Review – Edition 5 – Colombia", website, October, *https://thelawreviews.co.uk/edition/the-privacy-data-protection-and-cybersecurity-law-review-edition-5/1175627/colombia*.

López González, J. and J. Ferencz (2018), "Digital Trade and Market Openness", OECD Trade Policy Papers, No. 217, OECD Publishing, Paris, *https://doi.org/10.1787/1bd89c9a-en*.

López González, J. and M. Jouanjean (2017), "Digital trade: Developing a framework for analysis", *OECD Trade Policy Papers*, No. 205, OECD Publishing, Paris, *https://doi.org/10.1787/524c8c83-en*.

Maia, B., D. Pasteiner and C. Martinez (2018), "Latin America offers sound diagnosis for e-health investors", 12 September, Forbes, *https://www.forbes.com/sites/mergermarket/2018/09/12/latin-america-offers-sound-diagnosis-for-e-health-investors/#1caf1ea7164b*.

MinCIT (2018), "Acuerdo Comercial entre la Unión Europea, Colombia y Perú", website, *www.tlc.gov.co/publicaciones/18028/acuerdo_comercial_entre_la_union_europea_colombia_y_peru*.

MinCIT (2015), "Colombia Exporta Servicios: Estrategia para la internacionalización del sector servicios", Ministry of Commerce, Industry and Tourism, Bogotá, *www.colombiaexportaservicios.co/sites/default/files/colombia_exportador_de_servicios.pdf*.

Ministry of Finance and Public Credit (2018), "ABC: Ley de Inclusión Financiera: Sociedades Especializadas en Depósitos y Pagos Electrónicos", Ministry of Finance and Public Credit, Bogotá, *www.minhacienda.gov.co/HomeMinhacienda/ShowProperty;jsessionid=E7FQHDfKTgKY9e8iYWAtbm1JUIYI_gQf2cy-0Lpq35aDLQe5kPbc!949853518?nodeId=%2FOCS%2FMIG_31620604.PDF%2F%2FidcPrimaryFile&revision=latestreleased*.

MinTIC (2019), "Plan Estratégico Sectorial 2019-2022", draft, Ministry of Information and Communication Technologies, Bogotá, 20 January.

MinTIC (2017), "Gran Encuesta TIC: Tabla de salida empresas", *Gran Encuesta TIC* (database), Ministry of Information and Communication Technologies, Bogotá, *https://colombiatic.mintic.gov.co/679/w3-article-74002.html* (accessed on 27 December 2018).

Miranda, B. (2018), "Amazon en Colombia: Por que el gigante de ventas eligió este país para instalar su primer centro de servicio en Sudamerica (y no a Chile o Argentina)", 18 October, BBC News, *https://www.bbc.com/mundo/noticias-america-latina-45887866*.

Monteiro, J.-A. and R. Teh (2017), "Provisions on electronic commerce in regional trade agreements", *WTO Staff Working Paper*, No. ERSD-2017-11, World Trade Organization, Geneva, *http://dx.doi.org/10.30875/82592628-en*.

National Science Board (2018), *Science and Engineering Indicators 2018*, National Science Foundation, *https://nsf.gov/statistics/2018/nsb20181/assets/nsb20181.pdf*.

Observatorio TI (2017), "Indicatores semanales – Brecha del talento digital", Government of Colombia/Fedesoft, *https://www.observatorioti.gov.co/uploads/files/58_3acaca09-cca4-4a2a-9a2c-f920efab9e4d.pdf*.

OECD (forthcoming), "International agreements on cross-border data flows and international trade: A statistical analysis", *OECD Digital Economy Papers*, OECD Publishing, Paris.

OECD (2019a), *Balance of Payments BPM6* (database), *https://stats.oecd.org/Index.aspx?DataSetCode=MEI_BOP6*.

OECD (2019b), "Digital STRI Heterogeneity Index", *Services Trade Restrictiveness* (database), *https://stats.oecd.org/Index.aspx?DataSetCode=STRI_DIGITAL* (accessed on 12 February 2019).

OECD (2019c), "Digital Trade Restrictiveness Index", *Services Trade Restrictiveness* (database), *https://stats.oecd.org/Index.aspx?DataSetCode=STRI_DIGITAL* (accessed on 12 February 2019).

OECD (2019d), "STAN Database for Structural Analysis (ISIC Rev. 4, SNA08)", *OECD Structural Analysis* (database), *https://stats.oecd.org/index.aspx?DataSetCode=PDB_LV* (accessed on 15 April 2019).

OECD (2019e), "Trade in services – EBOPS 2010", *OECD Statistics on International Trade in Services* (database), *https://doi.org/10.1787/data-00583-en* (accessed on 31 July 2018)

OECD (2019f), "Trade in value added", *OECD-WTO: Statistics on Trade in Value Added* (database), *https://doi.org/10.1787/data-00648-en* (accessed on 22 April 2019).

OECD (2018a), "Market openness review of Colombia", TAD/TC/ACS(2014)3/FINAL (internal document), OECD, Paris.

OECD (2018b), *Trade Facilitation and the Global Economy*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264277571-en*.

OECD (2017), *OECD Economic Surveys: Colombia 2017*, OECD Publishing, Paris, *https://doi.org/10.1787/eco_surveys-col-2017-en*.

OECD (2015), *OECD Economic Surveys: Colombia 2015*, OECD Publishing, Paris, *https://doi.org/10.1787/eco_surveys-col-2015-en*.

OECD (2014), "Market openness review of Colombia", OECD, Paris, *www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=TAD/TC(2014)4&docLanguage=En*.

Palacio Valencia (2014), "Diagnostico y recomendaciones sobre la situación regulatoria de las profesiones de riesgo social en Colombia", Ministry of Commerce, Industry and Tourism, Bogotá, *www.colombiaexportaservicios.co/sites/default/files/20141016_marco_general_estudio_0.pdf*.

Pombo, C. et al. (eds.) (2017), "Fintech: Innovations you may not know were from Latin America and the Caribbean", Inter-American Development Bank, *http://dx.doi.org/10.18235/0000703*.

PROCOLOMBIA (2019), "ProColombia lanzó 'Colombia a un clic' para impulsar el e-commerce", website, *www.procolombia.co/noticias/procolombia-lanzo-colombia-un-clic-para-impulsar-el-e-commerce*.

Presidencia (2018), "Con paso firma avanza la campaña 'Menos trámites, más simples'", website, Presidencia de la República: 5 Feburary, *http://es.presidencia.gov.co/noticia/180205-Con-paso-firma-avanza-la-campana-Menos-tramites-mas-simples*.

Prieto, A.M. et al. (2018), "Estudio sobre los sistemas de pago de bajo valor y su regulación", Ministry of Finance and Public Credit, Bogotá, *www.irc.gov.co/webcenter/content/conn/MHCPUCM/path/Contribution%20Folders/SitioWeb/urf/ProyectoDecreto/Estudios/20180724%20Documento%20Tecnico%20PAGOS.pdf*.

PTP (2017a), "Gestion 2016 – Acciones 2017", Productive Transformation Program, September, *https://www.ptp.com.co/CMSPages/GetFile.aspx?guid=67db77c3-9962-4b7a-b286-5616366944a3*.

PTP (2017b), "Plan de acción a corto y mediano plazo: sector software y servicios TI", Cluster Development, Productive Transformation Programme, March, presentation, *https://www.ptp.com.co/CMSPages/GetFile.aspx?guid=f79f90d1-35f9-49c0-8f98-6235de819f84*.

Reina, M., F. Castro and L. Tamayo (2013), "20 años de política industrial en Colombia", Fedesarrollo, Centro de Investigación Económica y Social, Bogotá, *https://www.repository.fedesarrollo.org.co/bitstream/handle/11445/203/Informe%20BID%20Competitividad%20Dic%2019%2C%2013%20FINAL.pdf?sequence=2&isAllowed=y*.

Reina, M., S. Oviedo and L. Tamayo (2015), "Elementos para una nueva Política de Desarrollo Productivo en Colombia", Fedesarrollo, Centro de Investigación Económica y Social, Bogotá, *https://www.repository.fedesarrollo.org.co/bitstream/handle/11445/2548/Repor_Febrero_2015_Reina_Oviedo_y_Tamayo.pdf?sequence=2&isAllowed=y*.

Semana (2017), "Uber es legal: MinTIC", 4 November, Publicaciones Semana S.A., *https://www.semana.com/nacion/articulo/uber-es-legal-mintic-la-economia-digital-es-politica-publica-en-colombia/546061*.

Suárez, R. (2018), "Telemedicina: Un servicio que sigue lejos de las zonas apartadas", 23 July, El Tiempo, *https://www.eltiempo.com/vida/salud/panorama-de-la-telemedicina-en-colombia-segun-estudio-246560*.

SIC (2017), "Circular Externa 008", Superintendencia de Industria y Comercio, 15 December, *http://suin-juriscol.gov.co/viewDocument.asp?ruta=Circular/30035608*.

The Economist (2011), "Colombia's infrastructure: Bridging the gaps", 17 September, The Economist, *https://www.economist.com/the-americas/2011/09/17/bridging-the-gaps*.

Vega Barbosa, C. (2018), "Mercado libre está tranquilo ante la competencia de Amazon en Colombia", 7 September, El Espectador, *https://www.elespectador.com/economia/mercado-libre-esta-tranquilo-ante-la-competencia-de-amazon-en-colombia-articulo-810913*.

UNESCO (2018), *Re/Shaping Cultural Policies: Advancing Creativity for Development*, 2005 Convention Global Report, United Nations Educational, Scientific and Cultural Organization, Paris, *http://uis.unesco.org/sites/default/files/documents/reshaping-cultural-policies-2018-en.pdf*.

UNESCO (2017), "Promotion of the cinematographic activity in Colombia, Law 814 of 2003 or Film Act, and promotion of the national territory as stage for the filming of cinematographic works, Law 1556 of 2012 or Colombia Filming Act", webpage, *https://en.unesco.org/creativity/policy-monitoring-platform/promotion-cinematographic*.

WEF (2017), "Digital transformation initiative: Professional services industry", White Paper, World Economic Forum in collaboration with Accenture, January, *http://reports.weforum.org/digital-transformation/wp-content/blogs.dir/94/mp/files/pages/files/wef-dti-professional-services-white-paper.pdf*.

World Bank (2019a), *Doing Business 2019, Economy Profile of Colombia*, 16th edition, World Bank, *http://documents.worldbank.org/curated/en/502521541068480480/pdf/WP-DB2019-PUBLIC-Colombia.pdf*.

World Bank (2019b), *World Development Indicators* (database), *https://databank.worldbank.org/data/reports.aspx?source=world-development-indicators* (accessed on 30 July 2019).

World Bank (2018), "International LPI", *Logistics Performance Index* (database), *https://lpi.worldbank.org/international* (accessed in February 2019).

WTO (2018), "World Trade Report 2018 – The future of world trade: How digital technologies are transforming global commerce", *https://www.wto.org/english/res_e/publications_e/world_trade_report18_e.pdf*.

Notes

Israel
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1. OECD calculations based on the same data used for Figure 4.1.
2. Here the term "service sector" captures the average of the bars containing service sectors and other sectors in the figure. While other sectors include the agriculture, mining and construction sector, several important services are also subsumed in this category, such as financial, transport, social and ICT services. As both categories tend to be relatively similar in their responses, the term services sector is used for simplicity.
3. Mature digital technologies include the use of broadband Internet, purchases of inputs by electronic means, use of online platforms, use of electronic payments, use of customer relationship management or enterprise resource planning software, etc.
4. In 2014, MinCIT commissioned a study on the regulatory framework for professional services in Colombia, with a special focus on transborder mobility (Palacio Valencia, 2014). However, this assessment did not consider the effects and potential of digital disruption.

5. The slightly positive average annual employment change over the years 2014-17 depicted in Figure 4.5 hides the drop-in employment for the telecommunication sector. However, the underlying survey data confirm the negative employment growth for the telecommunications sector and the positive employment growth for IT services between 2015 and 2017. As the magnitude of changes in the survey data underlying Figure 4.5 in some cases deviates significantly from changes in the satellite account data (Figure 4.11), the absolute size of changes over time should be considered with caution.
6. An implicit assumption for the construction of the Trade in Value Added indicators is that, at the most detailed level of industry, the same mix of intermediates is used for production, irrespective of whether the products are consumed domestically or exported. Therefore, the share of ICT products embodied in exports also serves as a proxy for ICT embodiment in total production.
7. According to the data underlying Figure 4.18, in 2015 Colombia exported USD 65.4 million worth of IT and information services, and imported about USD 542.7 million.
8. Data based on DANE (2019a).
9. Other areas covered by the TFI are fees and charges, procedures, internal and external border agency co-operation, information availability, advance rulings and appeal procedures. See OECD TFI database.
10. Based on OECD TFI assessment: *http://compareyourcountry.org/trade-facilitation?cr=oecd&lg=en&page=0&visited=1*.
11. See OECD (forthcoming) for evidence on the trade effects of international data protection agreements.
12. One of the last legislative changes in this regard by the transport ministry (Law 1753 of 2015) did not solve the regulatory challenge of peer-to-peer right-hailing services and a recent constitutional court ruling confirmed the current absence of a legal framework for these transactions (e.g. El Espectador, 2018c). According to press reports, the uncertainty, partly sustained by the conflicting government messages, are bearing a cost and 16 709 drivers were sanctioned by the police for providing a private transportation service in 2017 alone (El Tiempo, 2018b).

Chapter 5

SEIZING THE OPPORTUNITIES FROM THE DIGITAL TRANSFORMATION FOR JOBS AND INNOVATION

The digital transformation has the potential to cut across all economic and societal activities, raising opportunities and challenges. Taking advantage of these changes requires a workforce that can adapt to technological changes and firms that are able to innovate. Colombia needs to continue its reforms of education and labour market institutions and take measures to boost innovation in firms in order to seize the opportunities from the digital transformation.

The first section of this chapter identifies some of the challenges that the Colombian labour market faces in providing workers with the necessary skills, outlines actions being taken by the Colombian government, and suggests further reforms to educational and labour market institutions to promote job quality. The second section reviews Colombia's recent innovation performance, examines the main policy initiatives in support of research on and diffusion of information and communication technologies (ICTs), and formulates recommendations to foster digital innovation.

Preparing the labour market for the digital transformation

Colombia is making progress in adapting its labour market for the digital transformation, though significant challenges remain. Digitalisation can increase wages due to higher productivity and benefit those with skills that complement new technologies. However, those with lower skills are at risk of being displaced, face spells of unemployment and may be left behind due to the lack of a social safety net. At the same time, digital technologies can increase information for students regarding what courses to pursue, and also improve targeting of social protection. In addition, use of digital platforms can help bring the large number of informal workers into the formal economy.

The Colombian labour market is experiencing change

The Colombian labour market has been undergoing significant changes in the past decade. Strong economic growth from the mid-2000s, in large part due to a commodity boom, has helped to boost employment, especially for marginal labour groups (such as youth, women and older workers) (OECD, 2016d, 2017c). These gains, in combination with welfare programmes, have reduced poverty and inequality (OECD, 2017c). Such changes are enduring as, although unemployment has increased slightly in the past few years, Colombia has weathered the commodity downturn better than most countries in the region (OECD, 2018c; 2019a). Nevertheless, inequality and gender gaps remain high (OECD, 2017c).

Changing the skill mix in the economy and adapting institutions will be necessary to take full advantage of the digital transformation and ensure that further progress is achieved. In recent decades technical change has globally tended to be skill-biased, improving wages for those with a tertiary education. The digital transformation can potentially benefit lower skilled workers, by reducing the fixed costs of exporting for smaller firms (through the use of platforms) that tend to employ more low-skilled workers. However, such workers are also at risk of being displaced due to automation, especially in emerging markets. Meanwhile, improved labour market matching can improve outcomes for all workers (Dutz, Almeida and Packard, 2018; OECD, 2019b). Nevertheless, a growing supply of highly educated workers is necessary to meet the growing needs of the digital economy. Whether or not the digital transformation benefits most workers, and helps to reduce inequality, in large part depends on whether gains in educational attainment keep pace with technical change (Goldin and Katz, 2010).

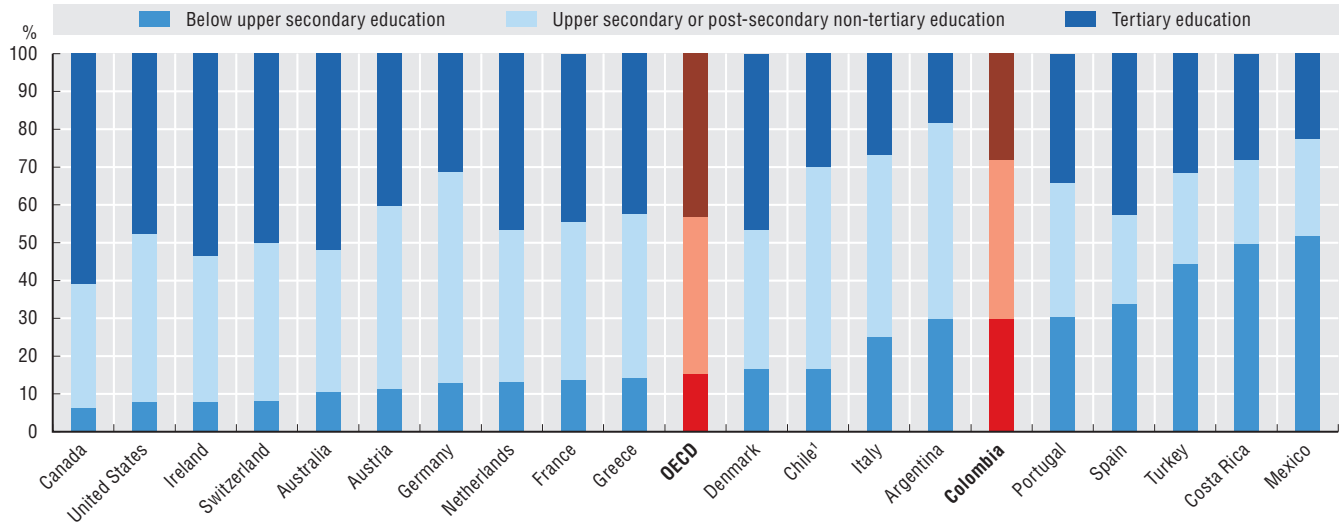
Many Colombians lack basic skills

At present, many Colombian workers lack the foundational skills to take advantage of new technologies. Due to a legacy of poor educational attainment, only half of adults have an upper secondary education, compared to about three-quarters in the OECD (OECD, 2017b, 2017c). There have been improvements in attainment over the past decade as school enrolment has increased (with upper secondary education becoming compulsory) and, in an international assessment of the skills and knowledge of 15-year olds (PISA) average scores have improved, especially in science (Radinger et al., 2018; OECD, 2017c).

Despite these improvements, many younger Colombians continue to leave education without the skills necessary for the future. Almost 30% of 25-34 year-olds do not have an upper secondary education, twice the OECD average, and almost two-thirds of current students do not gain even basic literacy and numeracy skills, compared to a fifth for the OECD average (Figure 5.1) (OECD, 2017c). In addition, there is a strong urban-rural divide, with a 20 percentage point gap in enrolment for both lower and upper secondary education, with rural students achieving lower literacy and numeracy skills than urban students (Radinger et al., 2018).

Figure 5.1. Educational attainment is low in Colombia

Educational attainment of 25-34 year-olds, 2017



1. Data for Chile refer to 2015 instead of 2017.

Source: OECD/ILO/UIS (2018), *Education at a Glance Database*, *www.oecd.org/education/education-at-a-glance-19991487.htm*.

There is also evidence of an inappropriate skill mix in the workforce, with a lack of workers with professional and technical training relative to those with a university education (OECD, 2014). Almost half of workers in Colombia are either under- or overqualified for the job they are in, higher than the OECD average, though in line with neighbouring countries (OECD, 2019a). This is compounded by weak incentives for firms to provide training due to the risk of workers moving to another company (OECD, 2014).

Meeting the skill needs in the future can be achieved by continuing to invest in general education. This will require greater investment in the foundational stages of education for young Colombians. Also, as tertiary education expands, measures will need to be put in place to ensure that quality is maintained (OECD, 2016a). However, as many have already left education in recent years with low skills, it will also be necessary to strengthen adult and continuing education for older Colombians. Finally, Colombia will need to ensure that a sufficient pool of workers with ICT-specific skills is available to take advantage of the digital transformation.

Colombia is taking steps to improve ICT specialist skills

In addition to policies to increase upper secondary or vocational qualifications, Colombia has taken measures to increase the number of ICT specialists. This complements programmes to boost basic ICT skills, such as the Computers to Educate (Computadores para Educar) programme (see Chapter 3).

The Ministry of Education has developed a new curriculum that allows students to specialise in ICT-related subjects in the final two years of their secondary education. The aim is to give students skills in areas such as programming and web design, and to encourage them to pursue tertiary level ICT-related courses, with students receiving a specialised ICT Certificate (Bachillerato TIC) (Colombia aprende, 2018). So far almost 100 000 students have participated in this programme, with the first students graduating in December 2018. However, only four schools delivering the information technology (IT) specialisation have been allowed to award the specialised ICT Certificate, with students in other institutions only being awarded a standard Leaving Certificate (MinTIC and Ministry of Education, 2018). Increasing the number of schools allowed to award the specialised Leaving Certificate, as planned by the government, has the potential to increase participation in the programme. In addition, in order to keep pace with technological change, it will be necessary to regularly update other modules to ensure their relevance and provide continuous training for teachers. Other programmes being implemented by the government include Programming for Boys and Girls (Programación para Niños y Niñas) and an agreement with the Code.org Foundation to allow secondary school students access the platform under the guidance of trained tutors.

Technical training provided is relevant to Colombia's skills needs

Post-secondary technical training is provided by the National Training Service (Servicio Nacional de Aprendizaje [SENA]), which also plays a role in providing employment services and seed financing to entrepreneurs. SENA typically provides vocational and technical training to those who have completed an upper secondary education, and training is provided free of charge (SENA, 2016).

SENA offers a range of IT-related courses, which are delivered on line or in a traditional manner. These include relatively short 40-hour courses to update a workers' skills (such as how to apply ICTs in various occupations), or serve as an introduction to ICT specialist occupations (such as database management). Though online courses can be useful for updating a worker's skills, they are appropriate for those who are already strongly motivated and aware of the skills they need. Therefore, increasing the availability of courses delivered through traditional channels should be a priority. In addition, SENA offers two-year programmes delivered in person, e.g. analysis and development of information systems (*análisis y desarrollo de sistemas de información*) and short-cycle tertiary courses (SENA, 2019; Marta Ferreyra et al., 2017). Such courses are available from the vocational level (*calificados*) up to the managerial level.

SENA has the ability to adapt its courses as technologies change. The relevance of SENA's offering is ensured by employers providing work placements for elective practical modules. In addition, employers and experts participate in sectoral roundtable meetings (*mesas sectoriales*), which play a role in setting curricula and establishing labour competency norms (*normas de competencia laboral*) (SENA, 2018a, 2018b). As a result, SENA's programmes are effective in improving the labour market prospects of graduates (Novella and Rosas-Shady, 2018).

Financial support is offered to encourage students to pursue IT technical vocational training (in addition to support to pursue tertiary level education, see below). In September 2017 it was announced that 8 600 scholarships would be given for technical vocational training in ICT-related subjects (relative to an estimated shortage of over 45 000 ICT professionals for 2018). In 2017, over 9 000 people were studying ICT-related courses at a technical, technological or university level, and received forgivable loans from the IT Talent (Talento TI) scholarship (MinTIC, 2017a).

Although new forms of training, such as coding bootcamps or web-based learning, may be beneficial in teaching digital skills, it is important that such novel approaches are systematically evaluated. Coding bootcamps have been used in Colombia in order to give students employable programming skills (in Ruby, Rails, HTML, JavaScript) following 12 weeks of intense training. However, following a randomised control trial in Medellín (in association with Ruta N, see below) it was found that the training had no significant effect on the employment rates of participants, although there was a positive (though statistically insignificant) effect on the probability of finding a better quality job (World Bank, 2018). Evaluating new teaching approaches can help ensure effective use of resources.

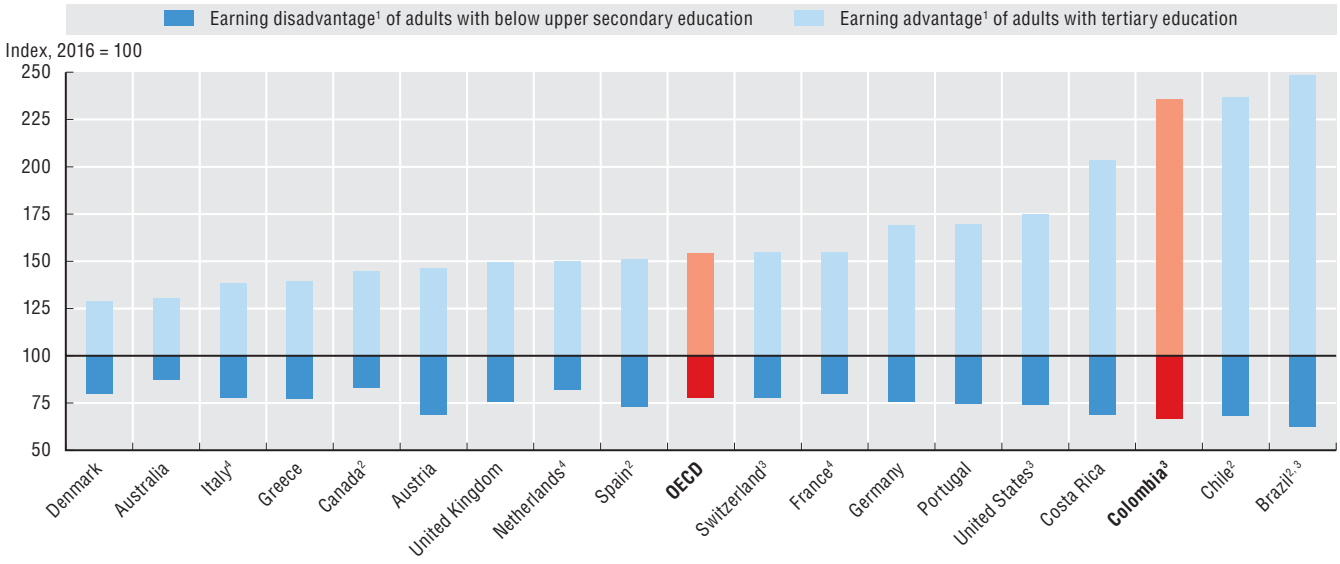
There is a lack of tertiary educated workers and ICT specialists

Low educational attainments are also visible in the shortage of tertiary educated workers, in both ICT-related professions and for those whose skills are complementary to digital technologies. A relatively low share of 25-34 year-olds have a tertiary education, leading to a particularly high tertiary wage premium (Figures 5.1 and 5.2). This shortage also contributes to poor quality of management in Colombia, even in comparison to other emerging markets, which can hinder the adoption of innovative new technologies in firms (see Chapter 3). In line with several other Latin America and Caribbean (LAC) countries, Colombia has made strides in recent years to increase access to tertiary education, with access rates having increased since 2000 due to a combination of higher secondary school completion rates and increased progression rates (Marta Ferreyra et al., 2017).

Although the share of graduates that studied an ICT-related subject in 2015 (5%) is in line with the OECD average, Colombia is at risk of losing these graduates to other countries, with the highly skilled being over-represented in emigration (OECD, 2017a, 2016d). Salaries for ICT specialists are approximately five times the national minimum wage (ranging from approximately COP 13.2 million annually or USD 4 500 for service engineers to COP 55 million annually or USD 18 000 for senior software architects) (Observatorio TI, 2017). However, salaries are only the seventh highest in Latin America, and less than a quarter of the wage in the United States (OECD, 2018a).

Figure 5.2. The demand for skills is reflected in a high tertiary wage premium

25-64 year-olds with income from employment; upper secondary education = 100, 2016



1. For adults with upper secondary education, relative earnings are 100 and earnings (dis)advantage is 0.

2. Data refer to 2015 instead of 2016.

3. Upper secondary education refers to the combined ISCED Levels 3 and 4 of the educational attainment levels in the ISCED 2011 classification.

4. Data refer to 2014 instead of 2016.

Note: Tertiary education includes short-cycle tertiary, bachelor, master, doctoral or equivalent degrees.

Source: OECD/ILO/UIS (2018), *Education at a Glance Database*, *www.oecd.org/education/education-at-a-glance-19991487.htm*.

To encourage more people to pursue an IT career, in 2012 the government launched Talento TI, which was part of the Live Digital (Vive Digital) plan. Approximately 6 400 people have benefited of the scholarship to pursue ICT-related tertiary level education, and 21 700 have benefited from funding to pursue continuing education, though this is far below the estimated shortage of over 45 000 ICT professionals (Talento TI, 2011; 2016). In addition, a budget of COP 10 billion (about USD 3 million) was made available to cover university fees (MinTIC, 2017a). The government has replaced this programme with one whereby the government funds 50% of the cost of courses for 131 firms that meet specific requirements and have a deficit of digital skills.

ICT-related tertiary educated is largely provided by leading public higher education institutions

Tertiary education in Colombia is provided by an approximately equal number of public and private higher education institutions (HEIs). Since 2000, the number of suppliers of tertiary education has increased, especially for private HEIs, with the number of programmes also increasing. Bogotá has a large number of HEIs (40) (Bonilla, Bottan and Ham, 2017). Tuition in public HEIs is about a fifth of that in private HEIs, and public HEIs also provide discounts to poorer students, while semester fees at private HEIs may be more than the equivalent of the annual minimum salary (Marta Ferreyra et al., 2017). Student loans are available, but require a co-signer, who must undergo a credit check, thus making access to these loans more difficult for those from a low-income background (Bonilla, Bottan and Ham, 2017). Although HEIs are independent, Colombia can steer the HEI system through discretionary research-oriented funding, such as the CREE (Technical and Technological Improvement Fund).

The quality of Colombia's HEIs varies. About 6% of Colombia's HEIs belong to LAC's top 50 universities (as ranked by Quacquarelli Symonds), in line with other LAC OECD countries; and two Colombian HEIs appear in Latin America's Top 20 (according to the Times Higher Education rankings) (Marta Ferreyra et al., 2017). However, Colombian HEIs do relatively poorly in terms of income earned from activities such as innovation or consulting, which may hamper Colombia's innovation potential (see below) (OECD, 2014). In addition, Colombia has a large number of low-quality private "garage universities", which tend to cater to disadvantaged students (OECD, 2019a).

Given the rapid pace of technological change, it is important that HEIs have the ability to create new programmes and adapt curricula to meet changing demand. New engineering or education programmes are usually created by higher end public HEIs. This is as opening new science and technology programmes tend to have a high fixed cost, making it unprofitable for private HEIs, unless they already have a similar programme in existence which they can adapt (Marta Ferreyra et al., 2017).

Greater use of data could improve the quality of tertiary education

There is evidence that students take poorly informed decisions regarding what tertiary course to pursue. In addition, there is wide variation in the return to tertiary education, with dispersion between institutions and subject areas. Approximately 30% of Colombian graduates earn negative net returns, which is especially the case for those in technical and technological programmes (González-Velosa et al., 2015). Colombia also has also one of the highest drop-out rates in LAC, with a third of drop-outs doing so in the first year (Marta Ferreyra et al., 2017).

Colombia has taken steps to provide information on programmes' outcomes and enforces disclosure of information on public HEIs, though only some private HEIs also do so. Colombia ranks HEIs (though not individual courses) using MIDE (Model of Education Performance Indicators), which is based on factors such as student attendance, international links, learning and graduate outcomes (such as employability), and the level of teacher qualifications and research outcomes. In addition, the Labour Observatory for Education (Observatorio Laboral para la Educación) tracks the labour market outcomes of graduates, although much of the information provided is dated, with wage data dating from 2014. Despite this, it is found that giving secondary education students such information can direct them towards attending more selective HEIs, although students maintain inflated expectations regarding future earnings (Bonilla, Bottan and Ham, 2017). Providing more timely information could help improve prospective students' decisions.

A system of accreditation is used to signify the quality of individual courses, though this can potentially hinder the adaptation of courses as technologies change. However, accreditation is only compulsory for some programmes (such as teaching), and can voluntarily be applied for other courses, with the share of accredited programmes having increased from 6% in 2004 to 23% in 2013 (Marta Ferreyra et al., 2017). However, the information signal of accreditation is limited as it rarely includes outcomes, despite such data being collected. Indeed, evidence shows that that accreditation does not attract students with higher entry scores (Marta Ferreyra et al., 2017). Including information regarding outcomes, and including the participation of potential employers, in the accreditation process could help improve its value as a signal of quality. In addition, creating a system similar to MIDE for individual courses could help improve information for students.

Using technology to facilitate learning

The Colombian government is committed to a Special Rural Education Plan to reduce the rural-urban divide. Although use of ICTs is not strongly linked with better results among primary and secondary students, digital technology has the potential to broaden student options, especially in rural areas (OECD, 2016b; Radinger et al., 2018). Colombia already makes extensive use of computers in secondary education, though their use in rural areas is hindered by a lack of Internet access (see Chapter 3).

ICTs can also play a role in bridging the 35 percentage point difference in the share of 18-24 year-olds attending tertiary education between urban and rural areas. Colombia already has a relatively high number (over 12% in 2013) of students enrolled in distance learning programmes; however, only a tenth of these are in Internet-based programmes (OECD, 2016a). In addition to online courses, other learning aids appropriate to tertiary education are available. Online laboratories allow students to conduct experiments remotely (or simulate virtual experiments), and ICTs can allow students to collaborate with others remotely. ICTs also offer the advantage of real-time formative assessment; and a combination of online and traditionally delivered courses has been found to be effective (OECD, 2016b).

Although online courses are not a substitute for traditionally delivered courses, they can be of benefit to autonomous learners (OECD, 2016b). However, distance learning also requires appropriate teaching and counselling support for students (OECD, 2016a). There is also a risk that remotely delivered programmes do not meet the needs of the regional labour market. Therefore, having local involvement in setting out curricula is important. Incentivising universities to provide distance learning options, or establishing

a distance education university (such as the United Kingdom's Open University), could help improve access for those in rural areas, though this is reliant on continued expansion of the broadband network, and the outcomes for students of such courses needs to be closely monitored.

The Internet also gives Colombia the opportunity to export services (see Chapter 4), including education services. This can be seen with the success of the Colombian start-up Platzi, which live-streams interactive classes in addition to pre-recorded classes as with other common online courses. Platzi has already expanded into other Spanish-speaking countries and has begun to add courses delivered in English.

Finally, use of technology could also facilitate students applying to HEIs. There is a lack of a national clearing house for transitioning from school to university. This can make accessing higher quality HEIs more difficult for disadvantaged students that are unable to navigate the process (OECD, 2014). Creating such a system could help ease the application process, and be combined with information on course quality to improve student decisions.

Colombia lacks a safety net for those left behind

Continued public support is necessary to maintain the digital transformation. However, job losses can be expected for some workers, especially those who perform routine tasks that can be easily automated (OECD, 2016c). Policies are therefore necessary to assist workers that become unemployed as a result of digitalisation, something which the Pact for the Digital Transformation of Colombia (Pacto por la Transformación Digital de Colombia) aims to address (DNP, 2019).

Compared to most OECD countries, Colombia lacks an effective system of unemployment insurance, active labour market policies (ALMPs), social protection and social dialogue. Social security spending is very low, with the tax system having only a minor redistributive effect. In addition, most self-employed workers are in unregistered businesses and are not covered by social security (OECD, 2016d). Meanwhile, the extensive use of temporary work agencies, non-regular employment contracts and the near absence of trade unions has led to a low level of job security (OECD, 2016d, 2017c). Good labour relations and social dialogue are important for managing transitions; however, in Colombia labour relations are particularly weak, with the lives of trade union organisers regularly threatened, especially in rural areas (OECD, 2019a, 2019b).

Protection for unemployed workers was improved somewhat in 2013 with the introduction of an unemployment protection system (*mecanismo de protección al cesante*), which includes unemployment benefits, a jobs database and ALMPs. All unemployed workers (whether formal or not) can make use of the national Public Employment Services (PES). However, payments are only available for formal workers, and in 2016 only 10% of the unemployed received support payments (OECD, 2017c). In addition, minimal funding for ALMPs limits the support they can provide to unemployed workers (OECD, 2016d).

By increasing resources devoted to ALMPs, the government can help the unemployed adjust to the new world of work. Policies that aid job-search and referrals to training programmes could help people find new work (OECD, 2016c). However, such programmes are unlikely to be helpful to those whose skills have become obsolete. Given the lack of social payments, there may be little immediate incentive for workers to engage with ALMPs, and workers may find it more beneficial in the short term to work in the informal economy rather than pursue retraining. Therefore, linking ALMPs with a general system of adult education could help protect such workers.

Use of big data and web scraping may help Colombia create a more effective vacancies database (OECD, 2016c). The PES includes a network of agencies, with one administered by SENA (see above). Although SENA collects data on vacancies through it labour market observatory (with firms having a legal obligation to notify vacancies), the use of such data is limited and the PES only accounts for 1% of job matches in Colombia, compared to almost 10% in the European Union (Pignatti Morano, 2016; OECD, 2019a). The use of other technologies, such as web scraping, could help the PES improve the information it provides on vacancies and improve matching. However, despite the benefits of technology, human interaction remains necessary. The analysis of data from 2008-14 suggests the PES is more effective (in terms of matching candidates with better quality jobs) when delivered face-to-face than on line (Pignatti Morano, 2016).

In addition, the use of ICTs could help improve the targeting of social protection, making it more effective. Colombia uses a strata (*estratos*) system to determine eligibility for subsidised public services, where geographical areas are grouped into six strata (with 1 being the poorest and 6 the richest). This system is complemented by a separate information system (SISBEN) that identifies those families eligible to social programmes (OECD, 2016d). In the absence of better data, the strata system can have some benefits. However, it is inefficient: people with a relatively high income may wish to move to an area ranked as a lower strata and take advantage of public subsidies, and the reorganisation of strata boundaries may be controversial. Use of ICT and big data could allow a more targeted use of social spending, aligned with the eligibility conditions identified by SISBEN.

Use of digital technologies could help reduce informality

Like other countries with a similar level of gross domestic product (GDP) per capita, Colombia suffers from widespread labour informality (IMF, 2018). The majority of the workforce is in informal employment, and although informality is higher among the low skilled, half of the medium to high-skilled are also in informal employment (OECD, 2016d; IMF, 2018). In addition, transitions from informal to formal employment are low (OECD, 2016d). Use of digital technologies may offer Colombia a route to greater formalisation in the labour market.

Colombia has promoted formalisation with a "Formalisation and Job Creation Law of 2010" and tax reform in 2012 which helped to reduce informality by 5 percentage points (OECD, 2016d). Such programmes have shown some success, with the share of workers not paying social security falling from 70% in 2007 to 62% in 2017. The government is currently introducing a single affiliation system for the different forms of social insurance which will help reduce bureaucratic hurdles to formalisation (OECD, 2016d; IMF, 2018). In addition, a shifting composition of the workforce due to greater educational attainment has played an important role in reducing informality (IMF, 2018). Nevertheless, there continues to be limited incentives for workers to formalise (OECD, 2016d).

Digital platforms could help play a role in boosting labour market formality, a key priority of the new government. In addition, some platform-based services, such as ride-sharing, have the potential to increase employment, including in rural areas. On the other hand, there is a risk that some employee relationships are misclassified as self-employed, a practice already widespread in Colombia (see Box 2.4 of OECD, 2019b; OECD, 2019a). Digital platforms can reduce costs of formalisation by allowing workers complete some of the steps to formalisation via the platform. In addition, the use of online platforms to arrange transactions which previously took place due to word of mouth can allow tax authorities to gain data on such transactions (OECD, 2018e). This can be advantageous in Colombia, where informality is highest in the primary (fishing and agriculture) sector, but also in the hotel and restaurant sector, for which several digital platforms are already in existence (OECD, 2016d).

Whether platforms boost formality depends on whether transactions are reported to tax authorities, and a variety of approaches having been taken by different countries to facilitate data sharing. In Estonia, a co-operation agreement was reached between the Estonian Tax and Customs Board (ETCB) and several ride-sharing platforms on information sharing which allows for entirely filling tax forms electronically. Under this approach, platforms first gain permission from drivers to share their data with the ETCB. These data are then sent to the ETCB, which prefills drivers' income tax returns with the relevant data, simplifying the tax return process. Meanwhile, the Finnish Tax Administration has used legislation to collect data from platforms within Finland, and a combination of web scraping and co-operation with the tax administrations of other countries to access data. Finally, in Mexico, platform drivers are required to obtain an electronic tax certificate before registering with the platform. Drivers are also able to use the platform to send invoices to the tax authorities and to customers (OECD, 2018e).

However, the development of a platform economy is in part inhibited by a lack of clarity regarding regulation, with different ministries on occasion issuing conflicting regulations (Alejandra Medina and Hernández Bonilla, 2017). Clarifying and streamlining regulation can help the sector to develop.

Other digital technologies can also aid formalisation. Colombia has already used technology to simplify business and worker registration, and plans are in place to introduce digital identities (see Chapter 3). Continuing this simplification, such as by introducing a one-stop shop for licencing and business

registration, could further foster formalisation, and also simplify regulation of platforms (OECD, 2017c). In addition, technology can be used to enforce the collection of taxes, with Hungarian value-added tax (VAT) revenue having increased by 15% following a requirement for businesses to have electronic cash registers. The use of electronic invoicing can reduce fraud and Colombia has already taken steps to implement this, although the original plan that all companies which pay VAT have electronic invoicing in place by 1 January 2019 has been postponed (Roseth et al., 2018; ANDI, 2018). Finally, the use of algorithms to analyse the data collected by the tax administration can improve the detection of tax evaders (OECD, 2018e). For example, the District of Bogotá has put in place a system to detect tax evasion on gasoline through the analysis of a large database on the payment history of each taxpayer over the last ten years.

Boosting innovation to take advantage of the digital transformation

For Colombia to seize the opportunities of the digital transformation, it is necessary to have innovative firms. However, Colombia spends relatively little on research and development (R&D) and innovation, and this expenditure is largely focused on science and research in HEIs rather than on promoting innovation within firms. Colombia has introduced a multitude of policies implemented by various agencies to promote a range of ICT companies with various levels of sophistication and to facilitate the adoption of their innovations. Streamlining these policies could boost their effectiveness.

Growth has been led by extractive industries rather than by innovation

Raising productivity is necessary in order to increase living standards. However, economic growth has largely been driven by expansion of extractive industries, rather than increases in productivity. Indeed, in recent years labour productivity has begun to stagnate (OECD, 2019a). In order to move Colombia's economy up the value chain, it is necessary to nurture and grow innovative firms which not only use ICTs, but use them in novel ways in order to raise productivity.

R&D presently plays a small role in Colombia, with the share of GDP spent on R&D stagnating at a low level relative to other countries with a similar GDP per capita, particularly among businesses (Figure 5.3). In addition, total spending on broader science, technology and innovation (STI) activities as a share of GDP has also stagnated (Martínez and Poveda, 2018). The share of intellectual property in investment is low, even in comparison to other emerging markets (Figure 5.4). In addition, the share of STI workers is small (OECD, 2014, 2017c). As a result, STI output is low, with relatively few scientific papers published or patents granted (OECD, 2014).

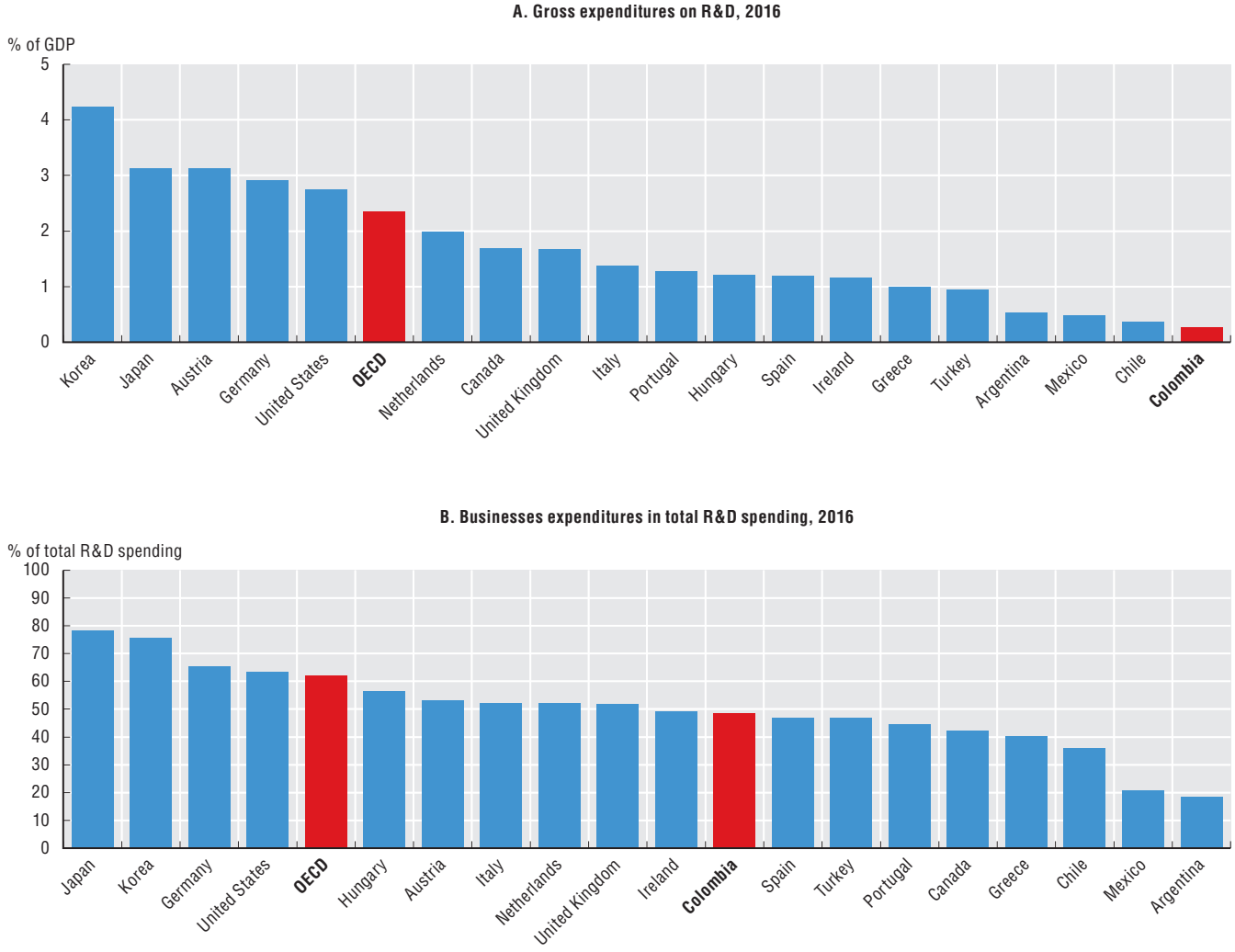
Colombia lacks many of the drivers that promote business innovation, such as competitive pressures (see Chapter 3). Nevertheless, the framework conditions for innovation have improved in the past decade with a stable macro environment, a reduction in red tape, and competition policy within international norms (OECD, 2014).

Innovation is predominantly state-led

Colombia has been building its research capacity, and improving links between HEIs and firms. Nevertheless, STI activity remains largely state-led and science-focused. In addition, available government supports to firms' R&D and innovation activity are complex, with many programmes with overlapping aims. Many programmes are run jointly by different agencies, reducing accountability.

Innovation has a prominent place in the Colombian government's National Development Plan (Plan Nacional de Desarrollo [PND]) 2018-2022, which includes a Pact for the Digital Transformation of Colombia (OECD, 2014; DNP, 2018, 2019). The formulation of STI policy is the responsibility of the government agency Colciencias, together with the National Planning Department (Departamento Nacional de Planeación), the Ministry of Commerce, Industry and Tourism (Ministerio de Comercio, Industria y Turismo [MinCIT]) and iNNpulsa. Colciencias is also responsible for developing innovation and research capacities and programmes for higher education and the business research sector, and developing skills in research and innovation. It has strong links to academia, though less so with business. The National Commission on Competitiveness and Innovation (which aims to improve competitiveness) is a separate public-private co-ordination body with separate strategies (OECD, 2014). In 2019, Conciencias' competencies and resources were transferred to the newly created Ministry of Science, Technology and Innovation (Law 1951 of 2019).

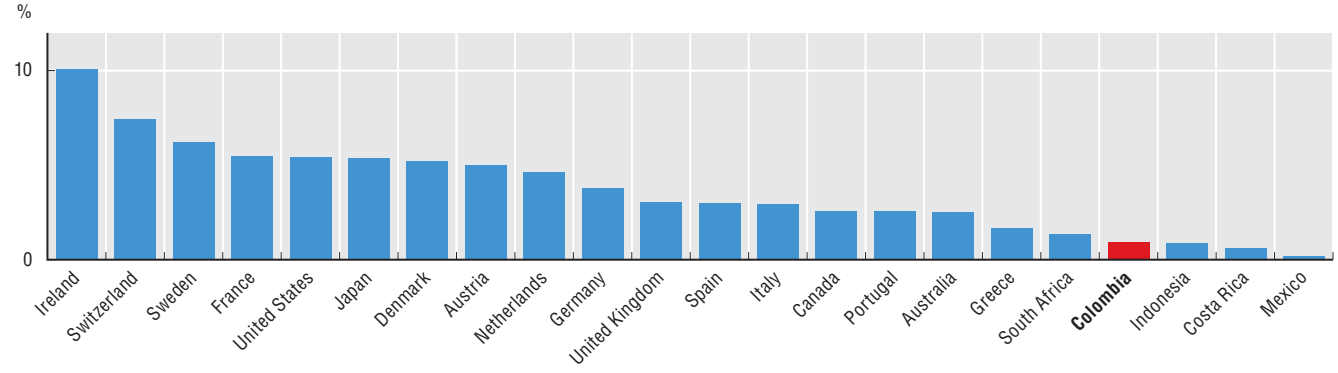
Figure 5.3. R&D spending is low



Sources: OECD (2019c), *Main Science and Technology Indicators Database*. *http://oe.cd/msti* (accessed in June 2019); Torralba Barreto and Cotte Poveda (2018), "Bibliographic production", *http://bit.ly/2uA2NGo*.

Figure 5.4. The share of investment in intellectual property products is low

Gross fixed capital formation of intellectual property products, as a percentage of GDP, 2017



Source: OECD (2018b), *National Accounts* (database), *doi.org/10.1787/na-data-en* (accessed in June 2019).

As part of the 2014-18 PND, the government aimed to double R&D spending to 1% of GDP by 2018, a target it is unlikely to have met. Under the General Royalty System (Sistema General de Regalías) of 2011, which distributes oil and related royalties, 10% of non-renewable resources were to be allocated to an STI fund, leading to a large increase in resources for STI. However, a proportion of the money was earmarked for local governments with limited capacity to evaluate projects, and due to governance issues, not all of the available funding has been spent (OECD, 2017c, 2019a; World Bank, 2016).

This method of funding of Colciencias has led to a fluctuating budget and high staff turnover of some of its programmes, especially of younger researchers (World Bank, 2016; Martínez and Poveda, 2018). Some of Colciencias' responsibilities have shifted to the Ministry of Education as part of the Colombia Cientifica programme, such as funding PhD scholarships (which accounted for approximately 70% of Colciencias' current expenditure) and promoting research networks (Ecosistema Cientifico). This has had the benefit of reducing the financial burden on Colciencias, allowing it to focus on innovation and competitiveness (World Bank, 2016). Nevertheless, greater financial stability would allow the new Ministry of Science, Technology and Innovation to develop its capacity in a sustainable manner and reduce its reliance on temporary staff.

Overall, Colombia has been lacking an integrated policy perspective on innovation, and strongly relies on state actors. The prevalence of a "science push" approach – where (largely public) "knowledge producers" are on the supply side of the innovation process and businesses constitute the demand side – may be partly explained by Colciencias' original role as a science funder, and the relative weakness of the role of industry in the innovation system. In any case, this approach does not facilitate the building of innovation capacity *within* firms, which helps strengthen their absorptive capacity and is critical to transforming them into innovators in their own right (OECD, 2014).

Improvements have been made to infrastructure of innovation

Research currently plays a limited role in Colombian HEIs, with research activity concentrated in a small number of higher quality HEIs. Only a small share of university teachers have a PhD, though this is higher in leading HEIs where many did their PhD abroad. In addition, a small proportion of university funding comes from scientific output such as Colciencias-managed grants, with minimal industrial grants (OECD, 2014).

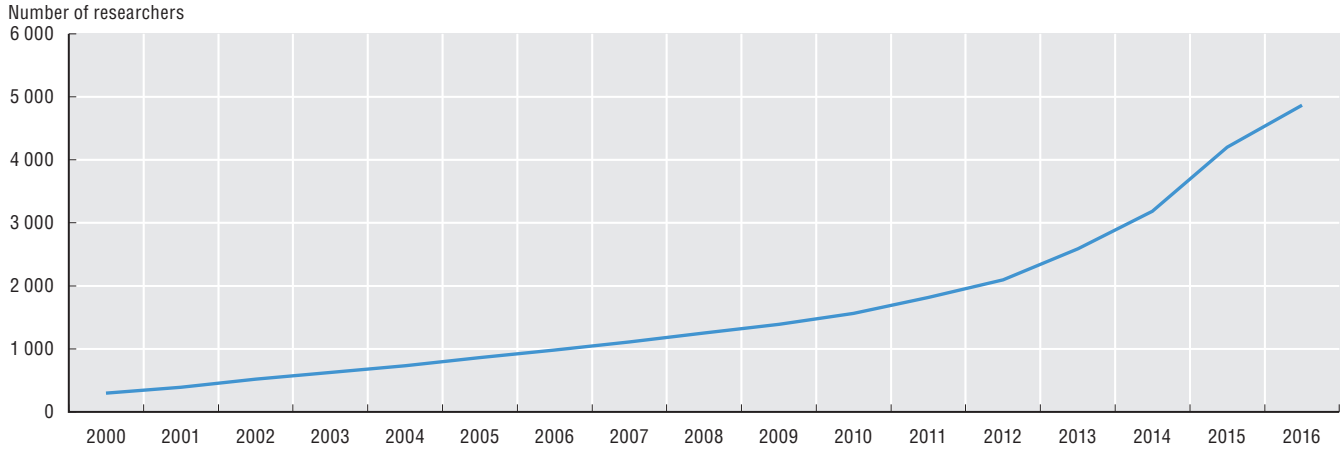
However, the government has made efforts to improve the educational infrastructure of innovation (such as HEIs and training agencies), and to improve research skills (OECD, 2014). Support for students completing a PhD within Colombia has expanded and the number of PhDs awarded in Colombia has increased, from less than 100 in 2007 to over 600 in 2016, although this remains low relative to other OECD countries. Support has also increased for Colombians pursuing PhD studies abroad. In addition, the number of active researchers (of which almost 30% work in the field of engineering and technology) has increased dramatically and research output in terms of publications and patents has also increased substantially (Figure 5.5) (Martínez and Poveda, 2018).

Measures have also been taken to facilitate the development of research careers, which also serves to increase Colombia's research and innovation potential. Research funding has been made available for postdoctoral research, which had been absent in the past (Colciencias, 2018). In addition, Colombia has begun to develop centres of excellence (see below), which can help create an effective system employing researchers at various stages of their career (OECD, 2014). Finally, the law regarding the spinning-off of firms by HEIs has also been reformed (Law 1838 of 2017). Public researchers can now profit from a share of spin-off companies, whereas previously they were not allowed to have income other than their salary (OECD, 2014). The spinning-off of firms also has the benefit of giving public institutions a greater link to the business sector.

Strengthening intellectual property rights could further boost Colombia's infrastructure of innovation. HEIs use intellectual property as evidence of their research abilities when they wish to collaborate with business. However, the intellectual property system suffers from backlogs and poor enforcement (in line with Colombia's overall slow judicial system). The use of copyright and trademarks should be supported in addition to patents. Schemes to encourage the use of intellectual property could also become more effective if simplified (OECD, 2014).

Figure 5.5. The number of active researches has increased substantially

Active researchers associated with a research group



Source: Torralba Barreto and Cotte Poveda (2018), "Bibliographic production", *http://bit.ly/2uA2NGo*.

Links between firms and higher education institutions are improving

Involving firms in innovation can ensure that innovations are created which match a market need, and such involvement is enhanced by promoting links between the public and private sectors. This allows firms to play a greater role in identifying innovation opportunities. Despite firms lacking in-house R&D capacity, there are limited academic-industry links (OECD, 2014). Providing incentives for collaboration between firms and HEIs would boost collaboration, although public officials are reluctant to subsidise business due to past examples of corruption (OECD, 2017c, 2014). Links could also be improved through the secondment of staff of public research institutions, and those with research training (such as PhDs) to firms (OECD, 2014).

Such links are being facilitated through the development of centres of excellence (*centros de excelencia y apropiación* [CEA]), which are supported by the Ministry of Information and Communication Technologies (Ministerio de Tecnologías de la Información y Comunicaciones [MinTIC]) and Colciencias. Two such centres, for big data (CAOBA) and the Internet of Things (IoT) (CEA en IoT) have been established as collaborations between several HEIs based in Bogotá, Cali and Medellín, private and public companies (including Colombian firms and multinational enterprises), and the state. Each centre has approximately 50-100 staff including masters, doctoral and postdoctoral students. Some funding is received from the government (mainly to cover the cost of scholarships, administration and designing R&D projects), with the remainder coming from participating firms. In addition to producing scientific publications, the centres also support the development of spin-off companies (CAOBA, 2018). A Centre for the Fourth Industrial Revolution was recently opened in Medellín, with a technological focus on artificial intelligence (AI), the IoT and blockchain. Meanwhile, an agreement between the Medellín-based Ruta N (Box 5.1) and the US-based Institute for Robotic Process Automation and Artificial Intelligence has been made to promote the development of machine learning and robotic process automation technologies (Ruta N, 2017). Ensuring stability of funding is necessary so that centres of excellence can continue to develop their capacity.

Links between firms and HEIs have been promoted by reforms to the tax law (see below). Firms benefit from a tax incentive for R&D, which includes providing scholarships (Law 1607 of 2012). However, the vast majority of PhDs continue to be funded by state agencies, with a relatively small number having been funded by Mazda and Ecopetrol – ICP (Martínez and Poveda, 2018).

In addition to HEIs, Colombian research and technology organisations exist to produce knowledge for industry, although they tend to be focused on narrow sections of the economy (such as rubber and plastics), rather than on technologies as in other countries. They therefore play a small role in ICT-related innovation (OECD, 2014). Meanwhile SENA also aims to diffuse new technologies in firms as part of the SENNOVA programme, operating through a network of Tecno Academia (which promote research by those with a secondary education) and Tecnoparques (which bring people together to develop prototypes, including ICT and digital technology). Colombia also has basic research institutes and government laboratories; however, these do not play a direct role in innovation.

Box 5.1. Ruta N: A local institution navigating complex supports

Ruta N offers support to start-ups and entrepreneurs in the city of Medellín, and offers one method to navigate the complexity of Colombia's various supports for start-ups. It is a public-private partnership which was launched by the Medellín Mayor's Office, Tigo-Une Telecommunications and Empresas Públicas de Medellín as part of a broader strategy to transform the city, such as through improving public transport. Ruta N operates with national level agencies (such as iNNPulsa) to complete projects, using its knowledge of local needs. It links firms, entrepreneurs and academia; and focuses on the digital, biotech and energy sectors.

Ruta N collaborates with other organisations (such as with SocialAtom Ventures) to provide physical infrastructure to start-ups, such as mentoring and co-working places (OECD, 2016e). In addition, in 2017 Ruta N, co-operated with Medellín's municipal authorities to launch a Creation Laboratory to train 2 000 people and help firms create 800 prototypes (Ruta N, 2018). Ruta N also provides both non-repayable and repayable financial support and has a capital fund (managed by Vellum Ventures) (OECD, 2016e).

Ruta N continues to develop and advance its activities and is currently developing a centre of excellence to work on robotic process automation and AI. In addition, Ruta N hosts the Centre for the Fourth Industrial Revolution.

Source: Ruta N (2018), *Informe de Gestión 2017*.

Attempts have been made to promote R&D within firms

Attempts have also been made to increase research activity within firms. Colombia has expanded tax incentives to increase the amount of R&D carried out by firms. Up to 2015, such incentives mainly benefited firms in extractive industries, but it is now easier for any company to use the R&D tax credit regardless of its size or sector, with the National Council for Tax Benefits (Consejo Nacional de Beneficios Tributarios, CTeI) deciding whether projects qualify (OECD, 2019a). The use of such incentives has increased in recent years and since 2016 the total quota of tax benefits has been assigned (Colciencias, 2015; OECD, 2019a).

There is evidence firms' innovation efforts have increased; however, innovation activities are being concentrated in a smaller number of firms. Although the amount spent on STI activities by firms has been increasing, the share of manufacturing and services firms engaged in innovation was halved from 2008 to 2015, and the number of employees participating in innovation activities in these sectors shows considerable fluctuation (Martínez and Poveda, 2018).

There are several programmes to support entrepreneurs, but they tend to overlap

Since the 2010-14 PND there has been a greater emphasis on supporting entrepreneurs and start-ups in the challenges they face (OECD, 2016e). Start-up firms report difficulties in accessing capital, which can be linked to problems related to protection of minority shareholders (see Chapter 3) and strict regulations surrounding investments (introduced to restrict pyramid schemes and financing of the drugs trade) (OECD, 2014). Data from 2015 show that less than 10% of Colombian tech firms received an institutional investment (World Bank and Endeavour Insight, 2015). In addition, entrepreneurs have other non-financial needs, such as mentoring or co-working spaces. To meet these different needs, the Colombian government has put in place a number of support programmes for entrepreneurs across sectors.

iNNpulsa was established by MinCIT in 2012 to promote entrepreneurship and overcome the financing difficulties of start-ups. iNNpulsa provides (non-repayable) seed capital to high-potential export-oriented start-ups. iNNpulsa helps firms that have already been in the market for two years (including digital start-ups) and have already made some sales, but wish to expand into the external market (OECD, 2016e; 2014). Although 95% of its funding is from public funding, it has private rules in terms of setting contracts, which allows greater flexibility in allocating funding. In 2017, iNNpulsa provided funding of COP 87 000 million (USD 29 million), with an additional COP 30 000 million (USD 10 million) being contributed by third parties.

iNNpulsa also provides mentoring and business training (as part of the Aldea and MegaUP programmes), helping 178 firms in 2017. In addition, iNNpulsa runs programmes to promote a culture of entrepreneurship and administers the MiPyme programme to promote the use of digital technologies

among small firms (see Chapter 3) (iNNpulsa, 2018). In association with MinTIC, iNNpulsa launched C Emprende with the aim of becoming the largest entrepreneurship campus in Latin America.

Colombia's largest seed capital organisation (with approved resources of COP 570 000 million, or USD 190 million) is the Fondo Emprender, which is a part of SENA. The aim of the fund is to allow graduates of SENA's programmes to use the training they have received in order to establish a company. Applications can be received from SENA's apprentices and participants of SENA's graduate training programme, in addition to those who have graduated (up to PhD level) within the past five years (SENA, 2018c; OECD, 2016e). Similar to iNNpulsa, SENA also has programmes to promote a culture of entrepreneurship and provides mentoring.

In addition to national agencies, both private sector actors and regional governments play a role in supporting entrepreneurs. The private fund SocialAtom Ventures is an important mediator for mentorship connections, although most start-up founders find their mentors while at university (World Bank and Endeavour Insight, 2015). Meanwhile, Ruta N (Box 5.1) in Medellín is a prominent example of the support delivered at a regional level. Attempts have been made to establish start-up hubs in Bogotá and Medellín (OECD, 2016e). Meanwhile, in Cali, the Fundación Bolívar and the Cali Chamber of Commerce run the Valle Impacta acceleration programme to support the scale-up of firms (OECD, 2016e).

Overall, the aims and objectives of SENA's Fondo Emprender and iNNPulsa tend to overlap, a problem which is general to government programmes in Colombia, which makes accountability difficult (DNP, 2018). In addition, small and medium-sized enterprises find it hard to navigate all the various supports (OECD, 2019a). Clearer divisions of responsibility between different agencies could improve the effectiveness of programmes and allow agencies develop their core expertise.

Programmes targeting the ICT sector frequently overlap with other programmes

In addition to general programmes to support entrepreneurs, there are several programmes which focus on entrepreneurs in the digital sector. Though this can be beneficial to the extent that the needs of entrepreneurs in this sector differ from those in other sectors, it adds to the number of overlapping supports for entrepreneurs.

Several programmes have been launched that specifically aim to promote entrepreneurship in the ICT sector as part of the Strengthening the Information Technology Industry (Fortalecimiento de la Industria de las Tecnologías de la Información) strategy (OECD, 2014). These programmes aim to develop an ecosystem of app developers and ICT service providers, and complement programmes to promote the use of ICTs among firms (see Chapter 3). Two main programmes involving MinTIC are Apps.co and Colombia Bring IT On.

Colombia Bring IT On is a collaboration between MinTIC and the export promotion agency ProColombia (see Chapter 4). It aims to promote exports of digital services, and also digital solutions in sectors such as agriculture (such as the app Farmapp which is used for pest control) and tourism (supporting the development of *www.Turkiis.com*) and is not specific to start-ups.

In contrast, the Apps.co programme was established to support app developers from the very initial stages of forming a company, with the aim of providing coding skills to 67 000 people in Colombia, with free online courses available. Supports follow several stages and include giving potential entrepreneurs software development training (provided by third parties); advice on developing a business model; support to scale-up a business by accessing new markets and customers; and finally, an acceleration stage to help start-ups to grow steadily (OECD, 2014). Indeed, some firms have progressed from working with Apps.co to iNNPulsa. The programme has had some success, as with the app tappsi.co which boosted the efficiency of taxis and placed a great emphasis on security. Nevertheless, there is some overlap with the aims of SENA's programmes.

Also overlapping somewhat with the aims of Apps.co is the Vive labs programme. This aims to create digital content, with 17 Vive labs offering free training courses in content development (such as creating apps and video games). However, these labs lack output targets and are not connected to the Apps.co programme or Tecnoparques (run by SENA) (OECD, 2014). Between 2012 and 2014, over 79 000 entrepreneurs registered, leading to the development of 2 000 apps (OECD, 2016e).

Meanwhile, MinTIC has several small programmes that aim to promote digital entrepreneurship, such as Colombia en Línea, which gives awards for the best digital initiatives designed in the country and IT Mark certification is awarded (in co-operation with Colciencias) for proficiency in business and technical

methods ISO 29110 quality management model (MinTIC, 2017b). MinTIC and iNNpulsa have recently launched C Emprende, with the ambition to create the largest entrepreneurship campus in Latin America.

MinCIT has also created a plan to promote the IT industry as part of the Productive Transformation Programme (Programa de Transformación Productiva [PTP], now Productive Colombia [Colombia Productiva]). The plan aims to increase the sophistication of products offered by the IT sector, identify where IT can increase productivity in other sectors and bring the IT sector up to international standards. However, some programmes appear small, and overlap with MinTIC programmes. For example, the PTP's aSALESelerator (2018-19) programme (with a budget of USD 71 000) aims to help entrepreneurs develop business models and grow their software and ICT companies in the Caribe region (PTP, 2018). In this way, it overlaps with the Apps.co programme.

Overall, there is considerable overlap in the aims, target groups and methods of the various programmes to support digital entrepreneurs. In the attempt to promote ICT-related entrepreneurship, it is logical to make use of pilot programmes to assess which methods of innovation are most appropriate. However, as the industry is maturing, integrating such programmes into the general system of innovation is likely to be the best approach. In addition, effective monitoring and collection of data of such programmes is essential in order to assess their effectiveness.

Conclusions

In order to begin to take full advantage of the digital transformation, Colombia must invest not only in physical telecoms infrastructure, but also in complementary assets. In particular, improving the skills of the workforce and the innovation capacity of firms are necessary to enable Colombia to take advantage of changing technology. Colombia has taken great strides in improving education and innovation, and has launched many programmes and initiatives, and it is necessary that such progress is maintained.

Colombia has launched many programmes to support skills development and innovation in firms, with many of these being pilot programmes from which valuable lessons can be drawn. However, as the digital transformation matures, it will be less feasible to promote ICT through stand-alone programmes. Therefore, integrating such programmes into Colombia's labour market and innovation institutions would be beneficial.

Box 5.2. Key policy recommendations

Creating an adaptable workforce

- Strengthen investment in general education.
- Increase investment in adult and continuing education.

Increasing the number and skills of ICT specialists

- Systematically evaluate the benefits of novel teaching approaches, such as coding bootcamps.
- Increase the number of schools which award the ICT Certificate (Bachillerato TIC).
- Include information regarding the labour market outcomes in the HEI course accreditation process, and also include the participation of potential employers. Create a system (similar to MIDE) for ranking individual courses.
- Create a central clearing house for applications to HEIs.

Using ICTs to improve the efficiency of the labour market

- Ensure more regular updates of information provided by the Labour Observatory for Education.
- Use webscraping to improve the monitoring of SENA's jobs vacancy database.
- Create a system to share data between digital platforms and the tax authority.

Boosting Colombia's innovation system

- Ensure the newly created Ministry of Science, Technology and Innovation has stable funding by breaking the link with oil and related royalties.
- Strengthen intellectual property rights.
- Streamline innovation policies, ensuring clearer divisions of responsibility and reducing overlaps of the aims of different programmes.

References

Alejandra Medina, C. and J.M. Hernández Bonilla (2017), "*¿Tiene implicaciones en Colombia la decisión de la Unión Europea sobre Uber?*", El Espectador, 20 December, *https://www.elespectador.com/tecnologia/tiene-implicaciones-en-colombia-la-decision-de-la-union-europea-sobre-uber-articulo-729552*.

ANDI (2018), *Colombia, un País Digital: Análisis, Ideas y Propuestas para Impulsar el Desarrollo de Colombia en la Nueva Economía*, Asociación Nacional de Empresarios de Colombia.

Bonilla, L., N. Bottan and A. Ham (2017), "Information policies and higher education choices: Experimental evidence from Colombia", *Universidad de los Andes: Documentos de Trabajo*, Vol. 2017/50.

CAOBA (2018), *Alianza CAOBA Centro de Excelencia big data y Data Analytics*, *www.alianzacaoba.co*.

Colciencias (2018), "Banco definitivo de elegibles de la fase No. 1", Colciencias, *https://www.colciencias.gov.co/sites/default/files/banco_definitivo_version_consulta.pdf*.

Colciencias (2015), "Documento Conpes 3834: Lineamientos de Política para Estimular la Inversión Privada en Ciencia,Tecnología e Innovación a Través de Deducciones Tributarias", *http://repositorio.colciencias.gov.co/handle/11146/34011*.

Colombia aprende (2018), "Currículos exploratorios Tic", webpage, *http://aprende.colombiaaprende.edu.co/en/curriculostic* (accessed in January 2019).

CONPES (2018), Política Nacional de Desarrollo Productivo, Documento CONPES, No. 3866, National Council for Social and Economic Policy, Bogotá, *https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3866.pdf*.

CONPES (2008), Política Nacional de Competitividad y Productividad, Documento CONPES, No. 3527, National Council for Social and Economic Policy, Bogotá, *https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3527.pdf*.

DNP (2019), "Pacto por la Transformación Digital de Colombia", National Planning Department, *https://www.dnp.gov.co/DNPN/Plan-Nacional-de-Desarrollo/Paginas/Pactos-Transversales/Pacto-transformacion-digital-de-Colombia/Transformacion-digital.aspx*.

DNP (2018), *Bases del Plan Nacional de Desarrollo 2018-2022*, National Planning Department, Bogotá.

Dutz, M., R. Almeida and T. Packard (2018), *The Jobs of Tomorrow: Technology, Productivity, and Prosperity in Latin America and the Caribbean*, The World Bank, Washington, DC, *http://dx.doi.org/10.1596/978-1-4648-1222-4*.

Goldin, C. and L. Katz (2010), *The Race Between Education and Technology*, Harvard University Press, Cambridge, Massachusetts.

González-Velosa, C. et al. (2015), "Returns to higher education in Chile and Colombia", *IDB Working Paper Series*, No. IDB-WP-587, Inter-American Development Bank, Washington, DC, *https://publications.iadb.org/en/returns-higher-education-chile-and-colombia*.

IMF (2018), "Colombia: Staff report for the 2018 Article IV Consultation", *IMF Country Report*, No. 18/128, International Monetary Fund, Washington, DC, *https://www.imf.org/en/Publications/CR/Issues/2018/05/29/Colombia-2018-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-45898*.

iNNpulsa (2018), "Informe de gestion 2017", iNNpulsa, *https://www.innpulsacolombia.com/sites/all/themes/sitetheme/assets/informe_iNNpulsa2017.pdf*.

Marta Ferreyra, M. et al. (2017), *At a Crossroads: Higher Education in Latin America and the Caribbean*, The World Bank, Washington, DC, *http://dx.doi.org/10.1596/978-1-4648-1014-5*.

Torralba Barreto, D. and A. Cotte Poveda (2018), "Bibliographic production", in C.I. Pardo Martínez and A. Cotte Poveda (eds.), *Science and Technology Indicators 2017*, Colombian Observatory of Science and Technology, Bogotá, *http://bit.ly/2uA2NGo*.

MinTIC (2017a), "Ministerio TIC y OIT entregarán 8.596 becas para formación técnica laboral en programas TI", webage, *https://mintic.gov.co/portal/604/w3-article-60638.html* (accessed in January 2019).

MinTIC (2017b), "MinTIC y Colciencias lanzan convocatoria para la certificación de calidad de empresas TI", webpage, *https://www.mintic.gov.co/portal/604/w3-article-51094.html* (accessed in February 2019).

MinTIC and Ministry of Education (2018), "El proyecto 'Currículos Exploratorios' y su reto de Bachilleres TIC en Colombia", *https://comunicaciones.utp.edu.co/noticias/38214/el-proyecto-curriculos-exploratorios-y-su-reto-de-bachilleres-tic-en-colombia*.

Novella, R. and D. Rosas-Shady (2018), *Productivity, Human Capital and New Technology in Latin America and the Caribbean*, Economy, Employment, and Skills: European, Reegional and Global Perspectives in an Age of Uncertainty, Fondazione Giacomo Brodolini.

Observatorio TI (2017), "Remuneración laboral promedio del sector", *https://www.observatorioti.gov.co/batteries/42* (accessed in January 2019).

OECD (2019a), *OECD Economic Surveys: Colombia 2019*, OECD Publishing, Paris, *https://doi.org/10.1787/25222961*.

OECD (2019b), *OECD Employment Outlook 2019: The Future of Work*, OECD Publishing, Paris, *https://doi.org/10.1787/9ee00155-en*.

OECD (2019c), *Main Science and Technology Indicators Database*, *http://oe.cd/msti* (accessed in June 2019).

OECD (2018a), *Digital Government Review of Colombia: Towards a Citizen-Driven Public Sector*, OECD Digital Government Studies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264291867-en*.

OECD (2018b), *National Accounts Database*, *doi.org/10.1787/na-data-en (accessed in June 2019)*.

OECD (2018c), *OECD Economic Outlook, Volume 2018 Issue 1*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_outlook-v2018-1-en*.

OECD (2018d), *Research and Development Statistics* (database), *http://oe.cd/rds*.

OECD (2018e), *Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS*, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264293083-en*.

OECD (2017a), *Education at a Glance 2017: OECD Indicators*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eag-2017-en*.

OECD (2017b), *OECD Digital Economy Outlook 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264276284-en*.

OECD (2017c), *OECD Economic Surveys: Colombia 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_surveys-col-2017-en*.

OECD (2016a), *Education in Colombia*, Reviews of National Policies for Education, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264250604-en*.

OECD (2016b), *Innovating Education and Educating for Innovation: The Power of Digital Technologies and Skills*, Educational Research and Innovation, OECD Publishing, Paris, *https://dx.doi.org/10.1787/9789264265097-en*.

OECD (2016c), "New markets and new jobs", *OECD Digital Economy Papers*, No. 255, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5jlwt496h37l-en*.

OECD (2016d), *OECD Reviews of Labour Market and Social Policies: Colombia 2016*, OECD Reviews of Labour Market and Social Policies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264244825-en*.

OECD (2016e), *Start-up Latin America 2016: Building an Innovative Future*, Development Centre Studies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264265660-en*.

OECD (2014), *OECD Reviews of Innovation Policy: Colombia 2014*, OECD Reviews of Innovation Policy, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264204638-en*.

OECD/ILO/UIS (2018), *Education at a Glance Database*, *http://stats.oecd.org*.

Pignatti Morano, C. (2016), "Do public employment services improve employment outcomes? Evidence from Colombia", *Research Department Working Paper*, No. 10, International Labour Office, Geneva, *https://www.ilo.org/wcmsp5/groups/public/@dgreports/@inst/documents/publication/wcms_460473.pdf*.

PTP (2018), "Proyecto 'aSaleslerator' para empresas de servicios", Programa de Transformación Productiva, *https://www.ptp.com.co/ptp-servicios/ptp-proyectos/servicios/asaleslerator* (accessed on 8 August 2018).

Radinger, T. et al. (2018), *OECD Reviews of School Resources: Colombia 2018*, OECD Reviews of School Resources, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264303751-en*.

Roseth, B. et al. (2018), *Wait No More: Citizens, Red Tape, and Digital Government*, Inter-American Development Bank, *http://dx.doi.org/10.18235/0001150*.

Ruta N (2018), *Informe de Gestión 2017*.

Ruta N (2017), "Medellín tendrá el primer Centro de Excelencia en Inteligencia Artificial del país", *https://www.rutanmedellin.org//es/noticias-rutan/item/medellin-tendra-el-primer-centro-de-excelencia-en-inteligencia-artificial-del-pais* (accessed in January 2019).

SENA (2019), "Buscar oferta de programas: SofiaPlus", *http://oferta.senasofiaplus.edu.co/sofia-oferta/buscar-oferta-educativa.html* (accessed in January 2019).

SENA (2018a), "Mesas sectoriales puerta de entrada al SENA", webpage, *www.sena.edu.co/es-co/Empresarios/Paginas/mesasSectoriales.aspx* (accessed in January 2019).

SENA (2018b), *Normalización de Competencias Laborales SENA*, *www.sena.edu.co/es-co/Empresarios/Paginas/competenciasLaborales.aspx* (accessed in January 2019).

SENA (2018c), "Que es Fondo Emprender", webpage, *www.fondoemprender.com/SitePages/Que%20es%20FondoEmprender.aspx* (accessed in January 2019).

SENA (2016), "Training SENA", webpage, *www.sena.edu.co/en-us/Pages/training.aspx* (accessed in January 2019).

Talento TI (2016), "*¿Quiénes somos?", webpage*, *www.talentoti.gov.co/635/w3-article-14158.html*.

Talento TI (2011), *Convocatoria Para Financiar Estudios: Segundo Semestre de 2012*, *http://talentoti.gov.co/635/articles-8612_recurso_1.pdf*.

References

World Bank (2018), "Coding bootcamps for youth employment: Evidence from Colombia, Lebanon, and Kenya", The World Bank, Washington, DC, *http://documents.worldbank.org/curated/en/274491523523596058/pdf/125169-WP-P156294-PUBLIC-decoding-bootcamps.pdf*.

World Bank (2016), "Implementation completion and results report on a loan in the amount of US$25 million to the Republic of Colombia for the strengthening the National System of Science, Technology and Innovation Project in support of the first phase of the Science, Technology and Innovation Program", *http://documents.worldbank.org/curated/en/900331472576165185/P117590-ICR-180816-clean-08262016.docx*.

World Bank and Endeavour Insight (2015), "The Colombian tech ecosystem: A study of connections among entrepreneurs, with recommendations for growth", Endeavour Insight, *https://herramientas.datos.gov.co/sites/default/files/3_Diagnostico_Ecosistema_de_Innovacion_colombiaFinalReport_Ingles.pdf*.

Chapter 6
POLICY RECOMMENDATIONS

Going Digital in Colombia: An Integrated Policy Framework

The previous chapters of this Review have analysed recent developments in several policy fields in relation to digitalisation in Colombia. The analysis has led to an assessment of performance and a set of policy recommendations for each field. These recommendations are discussed below and mapped against the Going Digital Integrated Policy Framework presented in Chapter 1 and summarised in Figure 6.1.

The components of the framework under analysis were those expressed by the Colombian authorities as priorities: access, use, innovation, jobs and market openness.

Figure 6.1. Going Digital Integrated Policy Framework

Source: OECD (2019), *Going Digital: Shaping Policies, Improving Lives*, *https://doi.org/10.1787/9789264312012-en*.

Access

Reliable communications infrastructures and services underpin the use of all digital technologies, and facilitate interactions between connected people, organisations and machines. High-quality fixed and mobile communication networks are crucial for the further development of the digital economy in Colombia as is ready access to these networks at competitive prices.

Enhance access to broadband

Growth rates of fixed and mobile broadband subscriptions in Colombia have been among the highest in OECD and Latin America and Caribbean (LAC) countries since the early 2010s. Despite rapid growth, Colombia still has the lowest fixed and mobile penetration rates in the OECD. Data usage is also lower than the OECD average. While the number of fibre connections has shown a sharp increase in recent years, Colombia lags behind and the average broadband speed is lower than the OECD average and other LAC countries.

In recent years, the deployment of a fibre backbone through a public-private partnership has connected most of the Colombian municipalities and regions. While the backbone reaches the centre of municipalities, connecting the "last mile" has proven challenging. The Commission for Communications Regulation (Comisión de Regulación de Comunicaciones [CRC]) should continue addressing regulatory issues as to create the market conditions for telecommunication operators to connect more businesses and homes through the backbone. Connecting the "last mile" in remote municipalities is particularly important to close the digital gap between urban and rural areas.

The Ministry of Information and Communications Technologies (Ministerio de Tecnologías de la Información y Comunicaciones [MinTIC]) should also continue supporting broadband access for people living in low-income areas (Strata 1 and 2), through temporary measures which have proved to have long-run effects, including subsidies for monthly subscriptions and free delivery of computers.

Spur competition in fixed and mobile communication markets

Prices for both fixed and mobile telecommunications in Colombia have decreased in recent years, but tend to be much higher than the OECD average. High telecommunication prices typically point to low competition. While the increase in the share of mobile virtual network operators (MVNOs) has spurred competition, Colombian communication markets remain characterised by a high level of concentration.

As of December 2018, the prices of the low-usage (20 gigabytes [GB]) and high-usage (200 GB) fixed broadband baskets were, respectively, about 2 and 2.5 times higher than the OECD average. While decreasing, the prices for the medium- (300 calls and 1 GB of data) and high-usage (900 calls and 2 GB of data) mobile baskets were also more expensive than the OECD average.

In 2017, the CRC issued a new regulation to facilitate agreements between mobile network operators (MNOs) and MVNOs. While the new regulation has facilitated market access and improved conditions for MVNOs, the CRC, as planned in its 2019-20 Agenda, should look into the new rules for the registration of the mobile handsets as to avoid an excessive burden on MVNOs.

Move ahead the 700 MHz spectrum auction

The spectrum in the 700 megahertz (MHz) band is highly valued as it propagates well over greater distances. It is well suited for connectivity in remote areas and is used for 4G services in many OECD countries.

The Colombian government has planned to auction spectrum in the 700 MHz band since 2014, but the auction has repeatedly been delayed. In the second quarter of 2019, MinTIC published an action plan on the auction design and conditions. Expressions of interest have been received and comments on the auction design and process are expected to be published in the third quarter of 2019 along with a draft resolution that includes the auction conditions. The auction is planned to take place in the last quarter of 2019.

It is highly recommended to auction the 700 MHz spectrum as soon as possible to meet the increasing demand from mobile applications, e.g. the Internet of Things (IoT). A further important reason why the auction should be undertaken as a priority is that not all MNOs have spectrum in the low frequency range, which puts them at a disadvantage with respect to the other players.

When planning the auction design, two key policy issues should be taken in mind simultaneously: coverage and competition. In order to extend coverage, the auction should be designed as to allow all operators in the market to bid for the spectrum that they need. Coverage obligations are common across the OECD and can further contribute to a broader coverage of the population in rural and remote areas. The extent of the coverage obligation, however, should not be an impediment for certain operators to bid in the auction.

Some operators currently do not have spectrum in the low frequency range, making it more expensive and complex for them to deploy networks efficiently. One mechanism that could be envisaged to allow all operators to compete on equal footing is to design the auction in two rounds, with the first round being open for operators that currently do not have nation-wide spectrum in the low frequency range and the second round being open for all. This would allow to strive simultaneously for both goals of extending coverage and creating a level-playing field for the operators.

The allocation of spectrum should not be used to maximise public revenues from the auction as telecommunication infrastructures provide the foundation for the digital economy. By setting investment and social welfare as the objectives of spectrum use, the ICT Modernisation Law seems to embrace this orientation.

Increase local Internet traffic exchange

A well-functioning communication infrastructure includes an efficient exchange of Internet traffic. Colombia is well served by multiple submarine fibre cables, with large investment promoted by the Live Digital (Vive Digital) plan. Yet, only a very small number of companies are exchanging traffic at the Colombian Internet exchange point (IXP) "NAP Colombia". In addition, a strikingly low amount of Internet traffic is exchanged at this IXP.

Colombia should assess the current barriers to the use of this IXP and consider the opportunity to build additional IXPs in larger cities as to reduce costs and improve services. A new IXP, "IXP del Caribe", is currently under construction. Unlike other neutral exchanges, which are operated by a third-party non-profit entity, this exchange will be run by a large private carrier.

Increasing access to 4G networks and their upgrading for 5G services require significant investment. Investments in mobile communication infrastructure rose from 2008 to 2011 but have been declining since. Policies should help to reverse this negative trend and create conditions conducive to investment.

Enhance effective regulation in converged markets

Colombia has recently issued a new law on "the modernisation of the ICT sector, the distribution of competences, the creation of a single authority, and other provisions". One key feature of the law is the creation of a "converged regulator" and one single fund for the telecommunication and broadcasting sectors.

While the law represents progress over the current institutional structure, it is essential that the independence of the new, converged regulator be preserved and even strengthened.

In order to prevent any undue pressure from the government on the regulator, a clear distinction should have been made between the funding of the regulator and the funding of MinTIC.

MinTIC should not have the power to revoke permissions of spectrum use nor to inspect, carry out surveillance or control any communication service. These functions should be granted to an independent institution, such as the CRC, which should also issue the glossary of terms and definitions of the telecom sector.

Neither the Minister nor a Vice Minister of MinTIC should have a seat on the CRC Board of Commissioners. With respect to the election of commissioners, the proposed selection process should be amended, in particular by revoking the faculty of the president to select commissioners and the exclusivity of regional public TV channels to select the broadcasting commissioners. All members of the board should be elected through a merit-based procedure.

The transition regime should also been designed as to ensure the independence of the regulator. The suspension of all proceedings and analyses currently undertaken by the CRC should be revoked: a suspension would set back the regulatory work by several years and undermine the regulation of the telecommunication sector.

To ensure effective regulation, the National Spectrum Agency (Agencia Nacional del Espectro) should be an integral part of the CRC.

Finally, competition should have been included among the key goals and criteria for decision making. More broadly, the enhancement of competition should have had a larger role in the law and its importance weighted against the goal to promote investment.

Use

Access to digital networks provides the technical foundation for the digital transformation of the economy, public sector and society but does not ensure widespread diffusion of digital tools and their effective usage, which are needed for individuals, governments and firms to reap the benefits of digital transformation through increased participation, innovation, productivity and well-being.

Diffusion and effective use crucially depend on investments in information and communication technologies (ICTs) complemented by investments in knowledge-based capital, including data and organisational change; on a favourable business environment, for example one that fosters business dynamism; on the availability and allocation of skills; and on trust.

Concentrate resources for public Internet centres in communities that need them most

Colombia is lagging behind in Internet usage, with 64% of individuals using the Internet in 2017, a position achieved by most OECD countries in the mid-2000s (OECD, 2018b). Despite persistent differences in Internet use, there is some evidence that the digital *puntos* and the smaller digital *kioscos*, i.e. Internet centres in poor and remote communities, have been successful in reducing the digital divide. By giving the public access to ICTs for entertainment, training and online government services, these access points have also helped users to develop their skills and serve as useful locations for training programmes.

These centres require appropriate funding to maintain ICT equipment and infrastructure and train municipal staff to assist the public in using ICTs. Public funding, therefore, should be better targeted to communities where ICT use is likely to remain limited or too costly, and away from areas well served by market providers. Indeed, the government plans to reduce the number of these access points by a quarter between 2019 and 2022 (MinTIC, 2019).

Strengthen programmes to improve computer skills among pupils and adults

Higher sophistication in ICT use requires better skills among users. Many computer users in Colombia lack some basic computer skills, with a quarter of them unable to send emails with attachments, and a third unable to connect additional devices, such as printers (DANE, 2017).

The Computers to Educate (Computadores para Educar) programme has been successful in providing Colombian schools with computers as well as training 50 000 teachers and 150 000 parents on the use of ICTs for educational purposes. As the programme is linked to the royalties from the extractive sector, its funding has dropped further due to the fall in commodity prices. New sources of funding should be found to continue this programme.

Better targeting of the beneficiary schools and better co-ordination with other programmes aimed at increasing Internet access is necessary. For instance, Computadores para Educar has systematically financed the purchase of computers in schools without Internet access. As a result, the number of computers per student in Colombia is among the highest in OECD countries, but the number of Internet-connected computers per student is below average (OECD, 2016).

Extra-curricular activities to develop computer skills, such as computer clubs and online competitions, should also be developed, following the positive experience of other OECD countries.

Numerous programmes are in place in Colombia to improve basic digital skills among adults. While it may be beneficial to have programmes targeting specific groups, many of them seem to overlap, with very little assessment of their effects. These programmes should be better co-ordinated and integrated within adult education policies.

Improve conditions for the use of paid-for Internet services

Internet users in Colombia tend to carry out simple activities on line, e.g. e-mail and social media, while more sophisticated services such as e-commerce and e-banking are less widespread.

Expansion of paid-for online services seems to be hampered by low financial development and the high cost of financial services. The government has prioritised the promotion of formal financial products through the expansion of the physical banking network and increasing the use of digital transactions. Although such steps have been beneficial, further progress is needed. In particular, exempting electronic payments from the tax on financial transfers (*4 por mil* or 4 x 1 000) would help promote greater use of electronic banking and boost formality in the economy.

A further obstacle to e-commerce uptake among individuals is a lack of trust in online retailers. Although Colombia does not have specific legislation to target cybercrime, a law to counter the illegal appropriation of electronically stored confidential information has been in force since 2009. In addition, a Police Cyber Centre (Centre Cibernético Policial) was established in 2010 to investigate and support the prosecution of cybercrime. However, criminal judges may lack expertise in dealing with online fraud. Establishing a special department of the public prosecutor's office to deal with cybercrime could improve confidence among consumers in the security of e-commerce.

Dissatisfied consumers can already make a civil complaint on line via the Superintendence of Industry and Commerce (Superintendencia de Industria y Comercio). A number of further steps could help to improve consumers' trust and promote e-commerce. These include the creation of a dedicated website for complaints related to online transactions; the publication of data on the number of such complaints received and the time taken to resolve them; as well as the introduction of a quality mark for online retailers that are most responsive to customer complaints.

Promote competition as a driver for digitalisation in firms

Colombian firms lag behind those of other OECD countries, even for relatively unsophisticated Internet activities such as use of a website or interacting with public authorities. A relatively large share of firms receive orders over computer networks, including the Internet, but e-commerce accounts for a small share of their turnover, even for larger firms.

Low competition in the product markets seems to be the main reason for low digital uptake by firms. Although institutional restrictions on competition and state control of the economy in Colombia are in line with other OECD countries, the government should work to reduce a number of non-regulatory barriers to competition: poor infrastructure, a slow court system and a tax code that favours family firms (OECD, 2017c).

Imperfect capital markets also result in slow digital uptake by businesses. Policies should facilitate access to loans at a preferential rate for ICT investments by micro, small and medium-sized enterprises (SMEs), which have limited access to bank loans and account for 80% of employment in Colombia.

The high rate of informal employment can also inhibit adoption. Informal firms tend to be small, have low productivity, are typically run from a household and lack access to credit, which can lead to low investment and innovation. Bureaucracy can be a hindrance to the formalisation of firms. The ongoing simplification of the administrative procedures should be continued in relation to setting up a business, registering property and paying taxes.

Foster digital uptake by firms

Colombia has many programmes in place to promote the use of ICTs among firms. Some of these programmes are targeted to ICT firms, such as encouraging the development of apps and websites, while others benefit firms in all sectors. Dispersing efforts over a large number of firms and a wide range of programmes tends to reduce their effectiveness. In order to avoid fragmentation, Colombia should consider pooling the funding of the existing programmes into a single agency.

Reviewing existing regulations to ensure they are consistent with the digital transformation would further contribute to boosting the use of digital technologies among firms. For instance, further simplifying the registration requirements for firms in the tourism sector would stimulate the use of online platforms. Similarly, removing the legal requirement that consumers sign hard copies of a contract, for example when buying insurance, would foster the development of online services.

Improve institutional co-ordination of the Gobierno Digital

With its Digital Government (Gobierno Digital) policy, the Colombian government is moving beyond the use of ICTs to improve internal processes and interactions with citizens (such as online form filling) towards using digital technologies to provide new services such as the Digital Citizen Services (Servicios Ciudadanos Digitales). The policy was developed in co-ordination with several agencies, with MinTIC having the main responsibility for its co-ordination and design.

Although the majority of national level institutions consider Gobierno Digital to be a high priority, many found it difficult to align their development plans with it. This seems due to the fact that the consultation within government occurred at a late stage – during the implementation and evaluation phases. In the future version of the policy, government institutions should be involved at an earlier stage of development. In addition, MinTIC should take a more strategic role, such as improving skills in public institutions and developing standards for digital government.

Foster open data in government

Further to its Open Data (Datos Abiertos) initiative, Colombia scores highly at the central government level for implementing the International Open Data Charter Principles (OECD, 2017a), which aim to promote the accessibility, availability and reuse of government data by both public and private users. Use of government data, however, is hindered by a system of data governance that largely focuses on protecting security and privacy.

The government should facilitate data sharing as well as access and management of its own data by citizens. It should also leverage the expertise of universities and the private sector. Although the aim of Datos Abiertos is that all government data be published in an open format, this may prove unfeasible in some cases. Therefore, the government should consult with potential end users, citizens, firms and other public institutions in order to prioritise which data should be made publicly available.

Ensure interoperability among public institutions

In addition to sharing data publicly, Colombia has a programme to promote the internal sharing of data to improve processes within the public administration, based on the interoperability framework (OECD, 2017a). Although almost half of national institutions use their own data to improve policies, very few use the data of other institutions.

The government should develop an interoperability platform to boost efficiency in data sharing among public institutions. It should also adopt a principle of openness by design and promote the use of data catalogues in order to help avoid dataset duplication and to highlight the potential applications of data (OECD, 2018a).

Digital participation and collaboration could be further enhanced by setting ICT planning objectives within institutions, generalising ICT monitoring practices and ensuring the implementation of the online management policies that are part of the Gobierno Digital.

Improving the dissemination of good practices among public institutions would also promote the use of advanced data techniques for better policies and services, according to the Colombia's national Big Data Strategy.

Enhance monitoring and evaluation of ICT programmes

More regular monitoring and evaluation of ICT projects, which at present are not standard activities for public institutions, could lead to better outcomes. However, most Colombian public institutions lack the resources and skills to carry out monitoring and evaluation of digital government initiatives.

The Colombian government uses a *Digital Government Index* to rank public institutions on the implementation of the Gobierno Digital policy. The index focuses on the supply of digital services rather than their impact. In addition, public institutions have shown a reluctance to report data to central government that could negatively impact their ranking. Moving away from a system of ranking towards impact assessments could give institutions a greater incentive to report the data they have.

To help institutions in their information management, the government has distributed several implementation guides, such as for information technology (IT) strategy and IT governance. However, use of the guides has been limited, especially by municipalities. Their promotion among municipalities should be accompanied by mentoring and technical advice.

Develop a government-wide approach to the procurement of ICTs

There is room for improvement in relation to procurement of ICTs. While there is a framework with ICT suppliers (managed by Colombia Compra Eficiente), there is no government-wide procurement approach for ICTs. The lack of a central procurement approach allows different agencies and ministries greater flexibility in their procurement of ICTs. However, some ministries and agencies do not have the capacity to take effective decisions on these technical matters.

The government should take steps to centralise ICT procurement in order to increase its bargaining power and prevent some public entities from becoming dependent on a few IT providers. A more centralised approach would also provide public institutions with shared ICT resources (such as cloud computing) and limit their exposure to the maintenance of infrastructure for which they are not well suited.

Innovation

For Colombia to seize the opportunities of the digital transformation, it is necessary to have innovative firms. Colombia presently spends relatively little on innovation, with a focus on science and research in higher education institutions (HEIs) rather than on innovation in firms. Colombia has introduced policies to promote a range of ICT companies with various levels of sophistication and to facilitate the adoption of their innovations. However, available supports to firms are complex, with many programmes with overlapping aims. Streamlining these policies could boost their effectiveness.

Ensure resources and capabilities for innovation policies

Resources for science, technology and innovation (STI) policies in Colombia, which are financed out of the oil and related royalties, have decreased significantly in recent years following the fall in commodity prices. At the same time, a proportion of the money earmarked for local governments was not spent due to their limited capability to evaluate projects.

The government should ensure greater stability of funding for the newly created Ministry of Science, Technology and Innovation. Capabilities of local governments should also be strengthened and appropriate mechanisms developed to ensure that available funds for innovation are effectively spent. More broadly, Colombia should develop an integrated view of innovation and promote a greater role for businesses.

Strengthen links between research and firms

The creation of two centres of excellences, one on big data (CAOBA) and another on the IoT (CEA en IoT), has been successful to promote co-operation in innovation between several HEIs based in Bogotá, Cali and Medellín; private and public companies (including Colombian firms and multinational enterprises); and the state. However, the funding of these two centres over the forthcoming years is uncertain. Ensuring adequate resources is necessary to strengthen links between research and firms around big data and the IoT.

Streamline support for entrepreneurship

The Colombian government has put in place a number of programmes to support entrepreneurs and start-ups in recent years. Some programmes, for example Fondo Emprender and iNNPulsa, are open to firms in all sectors, while others, such as Colombia Bring IT On and App.co, are targeted at the ICT sector.

While these programmes have shown some success, there is a significant overlap in their aims, target groups and methods. Colombia should make an assessment of these programmes, scale-up those that are more successful and terminate the others. Clearer divisions of responsibility among different agencies would improve the effectiveness of the programmes and allow agencies to develop their core expertise. The selected programmes should be integrated into the general system of innovation rather than being scattered initiatives. This would also make it easier for firms, particularly SMEs, to navigate among the various supports.

Jobs

Colombia is making progress in adapting its labour market for the digital transformation, though significant challenges remain. Digitalisation can increase wages due to higher productivity and benefit those with skills that complement new technologies. However, those with lower skills are at risk of being displaced and left behind due to weak social safety nets in Colombia. At the same time, digital technologies can increase information for students about the courses to pursue, improve targeting of social protection and reduce informality in the labour market.

Invest in skills for the digital transformation

Changing the skill mix in the workforce is necessary to take full advantage of the digital transformation. Only half of adults had an upper secondary education in Colombia in 2016, compared to about three-quarters in the OECD. While there have been improvements in attainments over the past decade, many younger Colombians, particularly in rural regions, continue to leave education without the skills necessary for the future (Radinger et al., 2018).

In order to meet the skill needs for the digital transformation, Colombia must invest more throughout the education cycle. The foundational stages of education for young Colombians should be strengthened in terms of resources and content. As tertiary education expands, measures will need to be put in place to ensure that quality is maintained. It will also be necessary to strengthen adult and continuous education for older Colombians, as many have left education in recent years with low skills. Finally, Colombia needs to ensure that a sufficient number of ICT specialists are available to take advantage of the digital transformation.

Scale-up programmes to improve ICT specialist skills

Colombia has recently introduced a new curriculum allowing students to specialise in ICT-related subjects in the final two years of their secondary education, leading to an ICT Certificate (Bachillerato TIC). However, only four schools have been allowed to award this certificate. Increasing the number of such schools has the potential to increase participation in the programme. In order to keep pace with technological change, it is also necessary to regularly update other modules and provide continuous training for teachers.

The Colombian National Training Service (Servicio Nacional de Aprendizaje [SENA]) offers a range of free-of-charge IT-related courses to individuals with upper secondary education, either on line or in classrooms. These include short 40-hour courses to update workers' skills and as an introduction to ICT occupations. As drop-out rates for online courses tend to be high, increasing the availability of courses delivered through traditional channels should be a priority for this programme.

Other forms of ICT training, such as coding bootcamps, have been used extensively as part of the Apps.co programme. While there is no systematic evaluation, available evidence suggests that they did not have any significant effect on the employment rates of participants nor on their probability of finding a higher quality job. Therefore, coding bootcamps should not be continued unless clear evidence of their benefits is found.

Use data to improve the quality of tertiary education

There is evidence that students in Colombia take poorly informed decisions regarding what tertiary course to pursue. Colombia has taken steps to provide students with information on public HEIs, though only some private HEIs also do so. It also ranks HEIs – but not individual courses – based on a number of quality indicators. The Labour Observatory for Education (Observatorio Laboral para la Educación) tracks the labour market outcomes of graduates, although much of the information provided is outdated. Providing more timely information would help prospective students take better informed decisions.

A system of accreditation is used to signal the quality of individual courses, but is only compulsory for some programmes and based on a small set of information. Including information about students' outcomes would improve the accreditation process and better reflect quality. In addition, extending the ranking system currently applied to HEIs to individual courses would improve information for students.

Strengthen the safety nets along the digital transformation

Digitalisation benefits workers with skills that complement new technologies whereas individuals with low skills or performing routine tasks are at risk of being displaced and facing unemployment spells.

Compared to most OECD countries, Colombia lacks an effective system of unemployment insurance, active labour market policies (ALMPs) and social protection. Protection for unemployed workers has improved with the introduction of an unemployment protection system (*mecanismo de protección al cesante*) in 2013. However, ALMPs remain available for formal workers only. Given the large size of the informal economy, opportunities for training should be provided to all working-age individuals out of work and financed by the general system of adult education.

Use of big data and web scraping may help Colombia improve the match between labour demand and supply. Although firms have a legal obligation to notify vacancies to SENA, the use of such data is limited and the Public Employment Services (PES) only accounts for a very small proportion of job matches in Colombia. The use of big data and web scraping could help SENA improve information on vacancies. Yet, the PES should be supported by an adequate number of well-trained counsellors.

The use of ICTs could improve the targeting of social protection and make it more effective. The strata system currently in place to determine geographical areas eligible for subsidised public services is inefficient: people with a higher income may move to a lower strata area to take advantage of public subsidies. In addition, the reorganisation of strata boundaries may be controversial. Use of ICTs and big data would allow a more targeted use of social spending, based on up-to-date information on the income of households and individuals rather than on their area of residence.

Use digital technologies to reduce informality

Like other countries with a similar level of gross domestic product per capita, Colombia suffers from widespread labour informality. Use of digital technologies may offer a route to increase formality in the labour market, which is a priority for the new government.

The use of online platforms to undertake transactions that previously took place through word of mouth can allow tax authorities to gain data on such transactions. The different approaches taken by some countries, such as Estonia, Finland and Mexico, can help Colombia to facilitate data sharing between platforms and tax authorities. Clarifying and streamlining regulation on online platforms would also increase incentives for data sharing.

Colombia should continue using digital technologies to simplify business and worker registration, in particular with initiatives such as the Ventanilla Única Empresarial (a one-stop shop for business registration). Promoting electronic invoicing in firms can help to enforce tax collection and reduce frauds. Finally, the use of algorithms to analyse administrative data can improve the detection of tax evasion.

Market openness

High commodity prices on international markets, followed by a surge in capital investments into the mining sector, have determined much of the good performance of the Colombian economy in past years. However, total factor productivity growth has been negative. To reduce dependency on commodity markets, Colombia requires a new growth strategy. The digital transformation provides Colombia with the opportunity to diversify its activities from a commodity-based to a high value-added services economy.

Seize new growth opportunities from digitalisation in services

The digital transformation represents an opportunity for improving productivity growth by enabling innovation and reducing the costs of a range of business processes. This involves a process of search and experimentation with new technologies and business models, where some firms succeed and grow and others fail and exit (Andrews and Criscuolo, 2013). Establishing a business environment that enables this process is crucial for Colombia to seize the benefits from digital transformation.

Colombia's rich cultural assets and creative industries – the Economía Naranja (Orange Economy) – provide great potential for productive jobs, including in remote areas. Several legislative changes have helped push the sector forward and should be continued in the forthcoming years.

To fully develop the potential of e-commerce, the government should foster consumer trust through stronger consumer protection. It is important to reduce transaction costs associated with digital payments and keep regulatory hurdles low for small entrants. Improving access to finance for micro-enterprises and SMEs in the warehousing and transportation sector should be a priority to promote innovation in the sector.

Digitalisation also brings new growth opportunities for financial services and Colombia has an active Fintech scene. Fintech regulation, however, appears to be overly burdensome and access to funds for Fintech start-ups more problematic than in other countries. The government has taken some important steps to create a more favourable regulatory environment for the sector, including crowdfunding legislation. These efforts should be continued to accompany the development of Fintech.

E-health services also have great potential, but challenges remain with regard to connectivity in remote areas, interoperability and data security.

Creating the right ecosystem for professional services will be of utmost importance. The government should therefore reassess whether the current regulatory framework is fit for the digital transformation.

More generally, it is crucial to ensure that the multitude of policy programmes supporting the productive transformation of the country are closely co-ordinated across government actors and over time, as to reduce duplications and create clear responsibilities for cross-sector objectives such as skills or digital uptake.

Export policies for ICTs should be better co-ordinated

The Colombian government is actively engaged in promoting exports by local firms and fostering their integration into global value chains (GVCs), with some programmes focusing specifically on services and ICTs, e.g. Colombia Bring IT On and Colombia Exporta Servicios. Better alignment of these programmes could help firms to find and access available support more easily.

Enhance market openness in the digital era

Colombia has made great progress in developing a regulatory framework supportive of trade and investments. This included improvements in the legal framework for intellectual property rights protection and numerous bilateral investment treaties and free trade agreements. Significant progress has also been made in the area of digital trade policy and non-tariff trade barriers.

New business models, deeply integrated GVCs and increasing cross-border data flows are changing the determinants of market openness and related policies in the digital economy. In order to promote cross-border e-commerce, Colombia should extend collaborations with multinational online platforms to help SMEs to connect to Latin American markets. It should also enhance trust in digital transactions through effective and accessible consumer protection mechanisms and information campaigns.

To increase competition among domestic producers and provide access to a larger variety of goods and services at lower prices for consumers, Colombia should reduce the relatively high level of non-tariff measures. In particular, it should extend the number of procedures that can be processed electronically using digital tools to reduce the time required for border procedures.

Colombia should also enhance interoperability of national contract rules for cross-border transactions, in particular by ratifying the UN Convention on the Use of Electronic Communications an International Contracts.

Interoperability of data protection regulations, particularly with key trading partners, is essential from a trade perspective. It is also important to improve regulatory predictability and government communication to create trust in the regulatory environment.

Building a National Digital Strategy for Colombia

Digital transformation affects different parts of the economy and society in complex and interrelated ways, making trade-offs between public policy objectives difficult to navigate. This section analyses digitalisation policies in Colombia in terms of coherence across different domains, with a view to foster synergies across government ministries, levels and institutions. Its aim is to help Colombia build a coherent and cohesive whole-of-government approach to better respond to digital transformation and make it work for growth and well-being.

Digitalisation policy is spreading thin on too many programmes

Over the last decade, digitalisation policies in Colombia have been organised around three components. The first one is the ICT Law issued in 2009 (Ley 1341 de 2009). Under Title IV "Promoting access and use of information technology and communications", the ICT Law has given the Information Technologies and Communications Fund (Fondo para las Tecnologías de Información y las Comunicaciones [FONTIC]) the objective

> *"… to finance plans, programs and projects to primarily facilitate universal access and universal service when appropriate to do so, all the inhabitants of the country for information technology and communications, and support the activities of the ministry and the National Spectrum Agency …".*

The second component of digitalisation policies in Colombia consists of three National Development Plans (Planes Nacionales de Desarrollo [PNDs]) issued in 2010-14, 2014-18 and 2018-22. The PND is the formal and legal instrument that establishes the objectives of government, setting programmes, investments and goals for a four-year period.

The PNDs are developed, monitored and evaluated by the National Planning Department (Departamento Nacional de Planeación [DNP]), which is an administrative department of the executive branch that reports directly to the president. As an administrative department, the DNP is a technical body, at the same level as ministries but without legislative initiative. Any government agency seeking to implement investment projects interacts closely with the DNP. In particular, all investments made by MinTIC need to be approved by the DNP, including those funded by resources drawn from FONTIC.

The third component of digitalisation policies in Colombia are the ICT strategic sectoral plans set by the MinTIC: Live Digital (Vive Digital) (2010-14); its follow-up Live Digital for the People (Vive Digital para la Gente) (2014-18); and the newly launched The Digital Future is for All (El Futuro Digital es de Todos) (2018-22).

While FONTIC provides the bulk of the budget for digitalisation policies, the programmes undertaken over the last decade have resulted from the interaction between the PNDs and the ICT plans.

The PND and the ICT plan 2010-14 were mainly aimed at increasing Internet access for households, businesses, schools and the government. The subsequent plans, however, set a larger number of objectives with a broader scope.

The new objectives require policies in fields well beyond the typical boundaries of MinTIC: education, industry, economy, international trade, labour, culture and public administration. However, the co-ordination between MinTIC and the other ministries with competences in those areas has remained unclear. Similarly, the fact that FONTIC was by far the main source for financing these programmes has resulted in a number of small-scale projects, with little integration with the policies undertaken in these areas.

Between 2010 and 2017, FONTIC financed 47 different programmes. Two of them – Social communications (38%) and Computers for Education (20%) – together accounted for about 58% of FONTIC investment over the period. Ten other programmes accounted for an additional 25%. The remaining 17% of FONTIC investment, therefore, was spread over 35 programmes. In addition, while Social communications and Computadores para Educar were financed over the whole period, many others were short lived: 28 new programmes were initiated over 2011-17 and 20 terminated over the same period (DNP, 2018a).

Clearer long-term priorities, a stronger focus on larger scale programmes and better integration with other policies are necessary to increase the effectiveness of digitalisation policies in Colombia.

FONTIC does not live up to the ambitions of digitalisation policies in Colombia

Policies for the digital transformation are financed out of FONTIC. This fund is a special administrative entity with separate legal status and patrimony, dependent on MinTIC.

All registered market participants providing telecommunication networks and services, including Internet service providers (ISPs), are obliged to contribute 2.2% of their gross revenues from the provision of the networks and services to FONTIC. Revenues from spectrum tenders also go to FONTIC.

As any other tax, the contributions by telecom operators and ISPs to FONTIC has a direct negative impact on the growth of the sector, either via lower profit margins and investment or via higher prices and lower demand by consumers. On the other hand, by financing public policies to promote universal access and use of ICTs, FONTIC stimulates the demand for telecommunications services and fosters the growth of the sector. The effects of the tax, therefore, depend on the balance between these two opposite effects.

While it may be argued that telecommunication operators and ISPs benefit most from public policies to promote universal access to ICTs, thus potentially offsetting the negative effect of the tax on the sector, the rationale for a sector-specific tax to finance policies that benefit a much wider set of industries, businesses and institutions becomes much weaker.

Indeed, FONTIC's missions have been extended to include the promotion of digital uptake by the government and businesses; support to software, digital content and social applications for health, agriculture, SMEs and poverty alleviation; support of exports of digital content; enhancing human capital in ICTs; as well as the improvement of education through the use of ICTs. The benefits from these programmes go well beyond the scope of telecom operators and ISPs, spreading to the whole society and economy. As such, these programmes should not be financed by a sector-specific tax, but instead out of general revenues of the central government.

The same arguments apply to the proposal in the PND 2018-2022 of single fund resulting from a merger of FONTIC and the Fund for Development of Television and Content, which is financed out of the contributions from TV operators.

Not only does FONTIC provide for the bulk of expenditures for digitalisation policies in Colombia, it also contributes to other policies beyond digitalisation. On average, 20% of FONTIC's annual expenditures in 2010-17 were redirected to the general state budget while an additional 8% went to other national and international current transfers. Therefore, FONTIC has been acting *de facto* as a transfer of resources from the ICT sector to other industries of the Colombian economy (DNP, 2018a).

Finally, FONTIC's revenues have been declining since 2015, further to the decline of the revenues in the telecommunication sector. While the reasons of the latter trend remain unclear, it is not unlikely that the sector's contribution to FONTIC contributes to hampering its growth, thus reducing the very tax basis for the fund.

For Colombia to undertake digitalisation policies that reflect its ambition, it is necessary to finance these policies out of the government's general revenues. This requires that the appropriation for these policies' resources be earmarked in the state budget.

At the same time, FONTIC's objectives should be narrowed down, to those put forward by the ICT Law: "facilitate universal access and universal service". Furthermore, the law calls for the development of public programmes "when appropriate to do so". Therefore, an assessment should be carried out on whether the current approach – a tax on telecommunication operators and ISPs to finance public policies – is the most effective one to achieve the objectives of universal access and universal services. There are a variety of models used in OECD countries to achieve these objectives, which may be better suited to Colombia, ranging from bidding and tenders to grants, loans and direct investments (OECD, 2017b).

Colombia needs a National Digital Strategy

The broadening missions for FONTIC and the increasing number of objectives sets by the PNDs and the ICT strategic sectoral plans are a clear indication of the pervasiveness of digital transformation and the need for policies to address it across several policy areas.

To do so, Colombia needs a National Digital Strategy, where priorities and objectives for digitalisation policies are set coherently across policy areas and budgetary appropriations are allocated accordingly.

The new PND 2018-2022 points out that a long-term vision and a robust governance framework are required to "co-ordinate and articulate the needs of all sectors of government and the private sector with a transversal perspective and in the context of the digital economy" (DNP, 2018b). It does not, however, seem to develop the general lines of a National Digital Strategy nor a path towards it.

While acknowledging that the digital transformation is not only important for the ICT sector, the Pact for the Digital Transformation of Colombia (Pacto por la Transformación Digital de Colombia) (Section VII) tends to focus on a limited number of core areas, such as the institutional setting of the ICT sector, connectivity and access, including social inclusion (VII.A) and digital government (VII.B).

A few sections go beyond these narrow areas, e.g. skills (VII.B.3.b) and productive transformation (VII.B.3.b), but are not linked to other policy areas addressed in the document in a whole-of-government approach. These areas include primary education (I.C); inclusive labour markets (I.F); productivity (II); sustainable development (IV); STI (V); mining (IX); and culture (I.G and X).

This narrow focus is also reflected in the limited amount of resources devoted to the Pact for the Digital Transformation of Colombia: 1.5% of the provisional budget 2019-22. While some of the budget allocated to other areas may contribute to digitalisation policies, e.g. entrepreneurship and productivity, the plan would benefit from a clearer vision about the cross-sectoral nature of digital transformation.

Yet, the proposal for a Pact for the Digital Transformation of Colombia put forward by the PND 2018-2022 is a right step towards a National Digital Strategy. Like a pact, a national strategy requires the voice of the government as well as of businesses, academia, the civil society and the technical community.

The advantages of a National Digital Strategy would be threefold. First, it would bring the policy discussion about digital transformation out of the limited political circle and closer to the people, businesses and institutions that need to embrace the transformation. Second, policy making would benefit from different expertise and the perspectives of all stakeholders, which is particularly useful in a field that is still poorly understood by policy makers. Finally, it would help the country build a long-term vision about digital transformation, which does not seem to have emerged yet.

Building a National Digital Strategy through a multi-stakeholder participative process is not an easy endeavour. However, some countries have succeeded. For instance, in March 2018, Brazil launched its Digital Transformation Strategy, E-digital, as the result of the broad engagement of the private sector, the scientific and academic community as well as the civil society, through many stages of a participative process culminating in a public consultation (Box 6.1).

Box 6.1. Brazil's E-digital: A multi-stakeholder process to the National Digital Strategy

The development of the first Brazilian Digital Transformation Strategy, E-Digital, began in February 2017 with the establishment of an Inter-Ministerial Working Group (IWG), tasked to prepare a draft document of the strategy for submission to public consultation.

The IWG set up five subgroups (Infrastructure; Citizenship and Digital Government; Research, Development and Innovation; Trust and Security in the Digital Environment; and Digital Economy). The work of the subgroups involved intense interaction with government agencies and other public entities, providing an exchange of knowledge and ideas as well as the co-ordination of government initiatives in the digital economy. Overall, the IWG held 9 meetings, in addition to the 25 meetings of its subgroups.

The IWG also sponsored a preliminary consultation focused on a group of 130 experts in government, academia and the private sector, aimed to identify relevant topics for a digital transformation strategy for the country and indicate priority strategic actions.

A series of meetings provided further engagement of representatives of the private sector, non-governmental entities and government agencies. These events, known as "sectoral meetings", covered the following topics: education; ICT in health; application service providers and the ICT industry; social impacts of the digital transformation; banks, fintechs and venture capitalists, among others.

Finally, four major workshops and seminars were held on Privacy and Data Protection; Education in the Digital Age; ICT Indicators and Metrics; and Cyber Security. All of these events actively engaged representatives of civil society, academia, the private sector and the government.

The conclusions of this process led to the first version of the strategy, submitted to public consultation in August-September 2017 on a dedicated Internet platform. Over 2 000 participants accessed the platform. Among these, more than 700 individuals and organisations offered suggestions and contributions.

Based on the contributions from the public consultation, the IWG prepared a revised version and submitted it, accompanied by draft normative instrument, to the consideration of the President of the Republic. On 21 March 2018, the president signed a decree enacting the "Brazilian Digital Transformation Strategy. E-Digital".

Source: MCTIC (2018), *Brazilian Digital Transformation Strategy. E-Digital.*

Colombia should develop a whole-of-government policy for the digital transformation

Traditionally, MinTIC has been the main agency responsible for policies related to ICTs, in particular for the implementation of the ICT strategic sectoral plans. As the policy objectives of these plans have moved from promoting universal access and services of ICTs to technology uptake by firms, digital content, exports promotion, training and education, the need to involve ministries and agencies responsible for these areas has become apparent. This has led to two main policy initiatives: the creation of the Intersectoral Commission for the Development of the Digital Economy (CIDED) and the appointment of a Presidential Advisor for Innovation and Digital Transformation.

The Intersectoral Commission for the Development of the Digital Economy

The first initiative to improve policy co-ordination was the creation of the CIDED in 2018 (Decree 704, 20 April 2018). The CIDED is mandated to provide

> *"co-ordination and guidance … of functions and socio-economic activities enabled by ICTs to promote the development and consolidation of the digital economy in Colombia".*

The decree defines the digital economy as being composed of three components: ICT infrastructures, digital business processes and e-commerce transactions. Accordingly, the CIDED is composed of the following members:

- the Minister of ICTs, which leads policies for ICT access and use
- the Minister of Commerce, Industry and Tourism, which leads policies to promote digital uptake by businesses, including e-commerce, online platforms and the collaborative economy
- the Minister of Education, with leads skill policies for the digital transformation
- the Director of the DNP, which is responsible for the PNDs, including policy objectives related to ICTs
- the Director of National Tax and Customs, which is competent for the "commercial, economic and legal conditions" that are conducive to digital transformation, particularly in relation to e-commerce, online platforms and the collaborative economy.

The decree provided that the CIDED be chaired by MinTIC, which will also act as the Technical Secretariat to the Commission, through its Directorate of Digital Transformation.

The committee may invite other public entities to its meetings, whose representatives will have the right to vote when the issues addressed by the CIDED fall within the functions and powers of the entities they represent. Representatives of the private sector, academia and the civil society may also be invited to intervene depending on the topics addressed at the meetings, but with no voting power.

The functions of the CIDED are to:

- serve as a forum for dialogue and co-ordination for the implementation of socio-economic activities enabled by ICTs
- recommend the formulation and implementation of policies, plans, programmes, projects and draft law proposals that may serve to support agencies and entities to take actions in relation to economic and social activities enabled by ICTs in their sector of competence
- recommend to local authorities the formulation and implementation of guidelines, policies, programmes, plans and projects related to socio-economic activities enabled by ICTs, in compliance with the autonomy and the functions conferred to local authorities by the law
- advise the government on the position to take before the public opinion and in national and international organisations on issues related to economic and social activities enabled by ICT
- issue its own rules.

In relation to the latter point, the rules of the CIDED are approved by simple majority in the first session of the commission. They shall set the frequency of meetings, the quorum required to deliberate, the co-ordination mechanisms with other commissions and any other aspects necessary to ensure the functions of the commission.

By addressing the cross-sectoral implications of the digital transformation, the CIDED is an attempt to improve policy co-ordination within government. There are, however, several issues that may limit its effectiveness.

The first issue relates to its composition. The scope for policy co-ordination required by the digital transformation is much broader than the policy fields covered by the current members of the CIDED. In order to be effective, the CIDED should ensure that the perspectives of all governmental stakeholders are voiced in its discussion and contribute to its decisions. For instance, the Ministries of Finance, Labour and Transport or the Administrative Department of Public Service have an important role in the digital transformation. Similarly, it is not clear why the National Tax and Customs is a member of the commission while its ministry of reference (the Ministry of Housing, City and Territory) is not.

The second issue is related to the rules for decision making in the CIDED. In order to implement a decision taken by majority, the CIDED should have the power to enforce such decision on CIDED members who may have voted against it. As the commission does not have this power, its decisions may remain ineffective if not taken unanimously.

The decree provides that the CIDED may invite other ministries and agencies, but does not set an obligation to do so. In principle, therefore, the commission may take decisions in some policy areas without the participation of the ministries and agencies competent for these areas. Not only would such decisions be difficult to implement, they would also miss the very aim of the CIDED: policy co-ordination.

An additional issue arises from the choice of the Technical Secretariat and its functions. The decree grants the Directorate of Digital Transformation in MinTIC the power to "monitor compliance of decisions, agreements and commitments" originated from the activities of the commission. Granting this authority to the Technical Secretariat, but not to the CIDED, tends to create an imbalance in favour of MinTIC, which is also the chair of the commission. Furthermore, it is unclear whether, given its mandate, the technical expertise in MinTIC extends to the much broader range of policy fields that the CIDED is expected to address.

More fundamentally, the CIDED seems to lack political support even by some of its members. The PND 2018-2022 argues that the CIDED continues to have a sectoral focus on ICTs, unaware that the digital economy is transversal and that the ICT sector is only an enabler. It further argues that intersectoral commissions in Colombia have a history of low effectiveness, providing as an example the Intersectoral Commission for Information Policy and Management in the Public Administration (COINFO) as well as the National Commission for Digital and State Information (CNDIE). Since all members of these intersectoral commissions are at the same hierarchical level, it is difficult to reach binding decisions or ensure effective co-ordination. Therefore, the DNP's view seems to be that, in order to be effective, the CIDED should report directly to the president.

The Presidential Advisor for Innovation and Digital Transformation

The second initiative to co-ordinate digitalisation policies is the appointment of a Presidential Advisor for Innovation and Digital Transformation in 2019 (Decree 179 of 8 February 2019). The advisor is one of the 14 presidential advisors established by the same decree.

The functions of the Presidential Advisor for Innovation and Digital Transformation are wide and include:

- advise the President of the Republic and the government on technology appropriation, technological architecture, digital transformation, e-commerce, digital government, technology price framework agreements, innovation and digital security
- co-ordinate the governmental actors involved in the policy implementation in the above fields, including the adoption of smart regulations for the development of the digital economy
- advise on the monitoring and implementation of policies, guidelines and instructions issued by the President of the Republic and the national government in relation to the digital economy
- lead the CIDED
- lead the development of the digital ecosystem among public entities, the private sector and the national government

- recommend actions that guarantee that the state and society have the level of human capital required for the digital economy
- provide guidelines for the investment of public resources in the development of technology and associated services
- follow up on the OECD digital agenda, the Pacific Alliance and other international organisations.

The presidential advisor does not have influence on the budget, personnel or functions of the ministries, although he participates directly in the Council of Ministers as well as the meetings with other presidential advisors.

The presidential advisor's budget was allocated by MinTIC in 2019 but is expected to be set by the Presidency from 2020 onwards. As part of the Administrative Department of the Presidency of the Republic, the presidential advisor's Office for Innovation and Digital Transformation consists of the presidential advisor himself, two advisors and one secretary.

By granting the presidential advisor the leadership of the CIDED, the decree introduces some uncertainty about the role of MinTIC, which, according to the 2018 decree establishing the CIDED, should chair the commission.

From the above description, it is apparent that the functions of MinTIC, the CIDED and the presidential advisor overlap to a large extent. Among these three institutions, MinTIC is the only one with the authority to take policy initiatives related to the digital economy and the resources to implement them. The CIDED and the presidential advisor have, in principle, a much wider mandate, but their role is, *de facto*, mainly limited to advising on issues related to the digital economy and making non-binding recommendations on how to improve co-ordination. This situation creates incentives for MinTIC to spread its resources thin on too many programmes, without necessarily the expertise and institutional channels that the implementation of such programmes would require.

A National Digital Strategy with a whole-of-government approach

Colombia needs to develop a National Digital Strategy that sets a long-term vision and high-level objectives. As argued above, the strategy should be developed by the government through a multi-stakeholder process, followed by a public consultation.

Opportunely reorganised, the CIDED could become the body that co-ordinates and monitors the implementation of the National Digital Strategy. It would set the targets, define the policy instruments to achieve them, and agree on the role of each ministry and agency according to the strategy.

Ministries would maintain the policy initiatives in their respective areas of competence but would have to reach out to other ministries and develop proposals for joint policy programmes according to the strategy. They would then submit these proposals to the CIDED, which may approve, suggest changes or reject them. A similar process would occur at regular intervals for monitoring the programmes approved by the CIDED.

The CIDED should consist of a small number of permanent members but systematically involve all other ministries and agencies as required by the policy areas addressed. This setting would facilitate the operation of the commission while promoting a whole-of-the-government approach.

One proposal is for the CIDED to be composed of three permanent members only: the presidential advisor for Innovation and Digital Transformation, who would chair the committee as the direct representative of the president; the Director of the DNP, as the representative of the body that develops and monitors the four-year PNDs; and the Minister of ICTs, as the main agency responsible for programmes to support access to and use of digital technologies, which are a pre-condition for any further policies related to the digital transformation.

Any other ministry, agency or local government should be entitled to participate in the CIDED meetings and vote on the proposals submitted to the commission. Non-governmental institutions, businesses, experts and individuals can also participate, but cannot vote.

Meetings of the CIDED are called by the chair, who sets the agenda and invites participants, after consultation with the other two permanent members. This rule grants the chair the institutional responsibility to involve all relevant stakeholders in the decision making of the commission.

In order to ensure policy coherence, the CIDED should take decisions by unanimity of the permanent members and invited governmental entities together. In case of absence of any permanent member or invited governmental entity or in case of disagreement, the chair would submit a proposal to the president of the Republic for his/her validation. This mechanism would create incentives for all participants to reach an agreement within the CIDED. It would also strengthen the role of the chair and ensure that the CIDED reports to the president through the presidential advisor, without charging the president with the day-to-day operation of the commission.

Finally, the CIDED Chair should be given the authority and adequate resources to recruit a team, with the adequate range of expertise and reporting directly to the chair, to serve as the Technical Secretariat of the commission.

References

Andrews, D. and C. Criscuolo (2013), "Knowledge-based capital, innovation and resource allocation", *OECD Economics Department Working Papers*, No. 4, OECD Publishing, Paris, *https://doi.org/10.1787/5k46bh92lr35-en*.

DANE (2017), "Indicadores básicos de tenencia y uso de tecnologías de la información y comunicación: TIC en hogares y personas de 5 y más años de edad 2016", National Administrative Department of Statistics, *www.dane.gov.co/files/investigaciones/boletines/tic/Anexos_TIC_hogares_2016.xls*.

DNP (2018a), *Evaluación de los programas del Plan Vive Digital para la gente financiados con recursos del Fondo de Tecnologías de la Información y las Comunicaciones (FONTIC)*, National Planning Department.

DNP (2018b), *Plan Nacional de Desarrollo 2018-2022 "Pacto por Colombia, Pacto por la Equidad"*, National Planning Department.

MCTIC (2018), *Brazilian Digital Transformation Strategy. E-Digital*, Ministry of Science, Technology, Innovation and Communications, Brasília.

MinTIC (2019), "Plan Estratégico Sectorial 2019-2022", draft, Ministry of Information and Communication Technologies, Bogotá, 20 January.

OECD (2019), *Going Digital: Shaping Policies, Improving Lives*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264312012-en*.

OECD (2018a), *Digital Government Review of Colombia: Towards a Citizen-Driven Public Sector*, OECD Digital Government Studies, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264291867-en*.

OECD (2018b), *ICT Access and Usage by Businesses* (database), *http://stats.oecd.org/Index.aspx?DataSetCode=ICT_BUS*.

OECD (2017a), *Government at a Glance 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/gov_glance-2017-en*.

OECD (2017b), *OECD Digital Economy Outlook 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264276284-en*.

OECD (2017c), *OECD Economic Surveys: Colombia 2017*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/eco_surveys-col-2017-en*.

OECD (2016), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264267510-en*.

OECD (2014), *OECD Review of Telecommunication Policy and Regulation*, OECD Publishing, Paris, *https://doi.org/10.1787/9789264208131-en*.

Radinger, T. et al. (2018), *OECD Reviews of School Resources: Colombia 2018*, OECD Reviews of School Resources, OECD Publishing, Paris, *https://dx.doi.org/10.1787/9789264303751-en*.

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