OECD Development Pathways

Production Transformation Policy Review of Colombia

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Foreword

The Production Transformation Policy Reviews (PTPRs) are an OECD assessment and guidance tool that provide a comprehensive analysis of the policies for economic transformation. They are elaborated in response to countries' demands under the auspices of the OECD Policy Dialogue Initiative on Global Value Chains, Production Transformation and Development [the Initiative herein forward].

The PTPRs are structured around a framework that is the result of a collective process started in 2014 with a Working Group on Country Studies set up in the framework of the Initiative. They are a fifteen-month process based on peer-learning and multi-stakeholder dialogue to enable policy makers to better plan and act for the present and the future. They assess the economic structure, the upgrading potential and the governance for economic transformation, identify lessons learned and clarify priorities for reform. The PTPRs are part of the OECD Development Pathways Series that aims to enrich the perspective on economic transformation and governance for change.

The PTPR of Colombia was requested by the Colombian National Planning Department (DNP) with the financial contribution of the Swiss State Secretariat for Economic Affairs (SECO). It was carried out by the Structural Policy Unit of the OECD Development Centre in co-operation with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), the United Nations Conference on Trade and Development (UNCTAD) and the United Nations Industrial Development Organization (UNIDO).

The PTPR of Colombia involved an extensive process of consultation with multiple stakeholders. It benefited from the knowledge of international peers, Chile and Spain, who participated in field missions. It also involved the participation of several representatives of countries, private sector and international organisations in a Peer Learning Group that steers each PTPR process.

The purpose of the PTPR of Colombia is to provide a comprehensive understanding of the challenges and opportunities of the policy actions that are driving the Colombian production development agenda. More specifically, the review:

- Provides a revision of the national strategy for economic transformation based on its capacity to anticipate future changes and benefiting from new technologies;
- Contributes to identifying the key challenges involved in implementing the production transformation policy at regional level.
- Identifies the key areas for reforms to unleash inclusive and sustainable development through enhanced participation in global markets and enhanced benefits accruing to the domestic economy.

The PTPR of Colombia highlights the progress made by the country in maintaining a relatively stable and high growth in the last decades, its effective macroeconomic management and increasing openness to the global economy. The review also highlights

the persistent structural weaknesses of the domestic economy, including its low level of productivity, the limited sophistication and diversification of its exports and the bounded knowledge base.

It stresses how ongoing technological changes and digitalisation could open a window of opportunity for Colombia to transform its economy and overcome its structural weaknesses by leveraging on the uniqueness of each region and on the long-standing experience in development planning.

Acknowledgements

The PTPRs are the policy assessment and guidance tool of the OECD Initiative for Policy Dialogue on GVCs, Production Transformation and Development. This report is the result of a 15-month in-depth policy review and consensus building process in Colombia.

The report was produced by the OECD Development Centre in co-operation with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), the United Nations Conference on Trade and Development (UNCTAD) and the United Nations Industrial Development Organisation (UNIDO). Mario Pezzini, Director of the OECD Development Centre, Mario Cimoli, Deputy Executive Secretary, ECLAC, Richard Kozul-Wright, Director, Division on Globalization and Development Strategies, UNCTAD and Cecilia Ugaz Estrada, Director of the Department of Policy Research and Statistics, UNIDO, supported the partnership. Annalisa Primi, Head of Structural Policies and Innovation at the OECD Development Centre led the PTPR process and report elaboration. Manuel Toselli from the OECD Development Centre acted as PTPR co-ordinator. The report was drafted by a team from the authoring institutions, including Annalisa Primi and Manuel Toselli (OECD) Nicolo Gligo and Juan Carlos Ramírez (ECLAC), Piergiuseppe Fortunato (UNCTAD), Michele Clara, Johannes Dobinger and Keno Haverkamp (UNIDO). Elisabeth Lambrecht, Vasiliki Mavroeidi, Guannan Miao and Sebastian Nieto Parra (OECD) provided valuable inputs. The report benefited from valuable comments from (in alphabetical order) Nadim Ahmad, Nelson Amaya, Bob Diderich, Alexander Kolev, Ana Novik, Alberto Gonzalez Pandiella, Vincenzo Spezia, Rory O'Farrell, Verena Weber, Jan Tscheke and Naoko Ueda. Kim Millin and Antonela Leiva provided administrative support. Elizabeth Nash co-ordinated the publication process. Anne-Lise Prigent provided editorial advice. Elisa Lopez Roldan and Irit Perry contributed to the publication process. The report benefited from editing by Don Murray.

The PTPR of Colombia was requested by the Colombian National Planning Department (DNP). The authors relied on the knowledge, experience and support of two administrations during the entire process. Therefore, we are thankful to the two Directors of the DNP, Gloria Alonso and Luis Fernando Mejía, and to the two Deputy Directors, Rafael Puyana and Alejandra Corchuelo. The PTPR Colombia benefited immensely during the entire process, from the commitment and dedication of the Innovation and Private Sector Development Division of DNP led by the Director Juan Sebastian Robledo, assisted by the Vice Director Camilo Rivera. Maria Piedad Bayter and Andres Betancur provided valuable comments and excellent organisational support. The Colombian diplomatic authorities in France were essential in ensuring effective project implementation and smooth contact with local counterparts. We are thankful to the Ambassador of Colombia to France, Federico Renjifo, and to the former High Level Representative of Colombia to the OECD, Catalina Crane. Strategic advice since the project's inception and logistical support for the PTPR process came from the National Industrial Association (ANDI) and from the Private Council for Competiveness (CPC). The authors are particularly grateful to Imelda Restrepo, Director, Centre of Economic

Studies, ANDI, Rosario Cordoba, President of CPC, Santiago Matallana, Vice president of CPC and Helena Garcia, Vice president general of CPC.

Peer learning and knowledge sharing lie at the heart of the PTPR process. The PTPR of Colombia was shaped and enriched by the contributions of international peers who actively participated in the field missions and intellectually contributed to the review. We are grateful to the Directorate for Economic Affairs (DIRECON) of the Ministry of Foreign Affairs of Chile and in particular, to Viviana Araneda Urbina, Advisor, Bureau of International Trade Relations, and Rodrigo Monardes Counsellor, Permanent Delegation of Chile to the OECD and Chair of the Working Party of the Trade Committee of the OECD. Paulina Beato Blanco, Independent Non-Executive Director of TSB Banking Group and Senior Advisor at Repsol, Spain, shared information, visions and ideas with generosity throughout the whole process and ensured high quality inputs.

Valuable inputs originated from the PTPR Peer Learning Group hosted by the OECD in June 2018 that saw the participation of 50 high-level representatives from 12 countries, 4 business associations and companies, 5 universities, 5 nternational organisations and 4 OECD directorates. We are thankful to the Ambassador Mónica Aspe, Permanent Representative of Mexico to the OECD and Chair of the Governing Board of the OECD Development Centre. Peter Berkowitz, Head Smart and Sustainable Growth Unit, European Commission, Cristina Oyón, Head of Strategic Initiatives, Basque Business Development Agency (SPRI), Basque Country, Spain, Mounssif Aderkaoui, Director of Studies and Financial Planning Ministry of Economy and Finance, Morocco and Karl-Christian Göthner, Senior Expert, German National Metrology Institute (PTB), Germany were extremely helpful in shaping the discussion and the report through knowledge sharing and insightful practical experiences. Charles Wessner, Professor of Global Innovation Policy, Georgetown University, United States and Erik Reinert, Professor, Tallinn University of Technology, Estonia provided visions and information throughout the entire meeting.

The PTPR is the result of an extensive and open consultation process with diverse stakeholders in Colombia. The review team is thankful to the insightful knowledge shared and advice received by José Antonio Ocampo, Hernando José Gómez, Roberto Junguito, Jaime Acosta and Guillermo Perry. In addition, the PTPR benefited from:

- One meeting of the Task Force on Production Transformation. The Task Force was set up under the Technical Committee for Production Transformation to steer the PTPR process. It was chaired by the DNP and composed of representatives from key government and implementation agencies, including the Ministry of Agriculture, the Ministry of Trade, Tourism and Industry, iNNpulsa, PTP, Bancóldex, the Ministry of Labour, the National Training Service (SENA), the Presidency of Republic and the Administrative Department of Science, Technology and Innovation (Colciencias). The private sector was represented by the Confederation of Chamber of Commerce (Confecámaras), the CPC and the ANDI.
- One roundtable to discuss what policies, tools and partnerships are needed for a competitive Colombian economy. The event was hosted by ANDI with the co-operation of the CPC, and gathered 40 representatives from both private and public sectors. Leading companies were key in sharing their views about the future and shaping the content of this report. In particular we thank Corona Group, Bimbo, Enel, IBM, ACOPI, Acoplásticos, Analdex and Súper de Alimentos.

- One high-level consensus-building event hosted by the DNP and the OECD in co-operation with CPC and ANDI in Bogotá on 5 October 2019.The event gathered 50 high level representatives from business and government and key opinion shapers in the country. Three main topics were discussed during the meeting: i) methodologies for an effective prioritisation process, ii) instruments to sustain production transformation policies and iii) actions to accelerate the digitalisation process. The event benefited from the participation of Dr Paulina Beato, as peer-reviewer and of three lead discussants: José Antonio Ocampo, Co-director of the Colombia Central Bank, Enrique Moreno, High Presidential Counsellor for Policy Implementation, and Juan Benavides, Senior Consultant in the DNP.
- Semi-structured interviews with more than 50 experts from business, government and academia in Colombia. All interviews contributed to the process and were extremely relevant in shaping the report. In addition to the people mentioned above, we acknowledge the time and contributions of (in alphabetical order): Antonio Osorio Melo, National Vice President, ACOPI; Paola Buendía García, Executive Vice President, ANDI; Adriana Otoya Mejía, Program Manager, Avina Foundation; Bernardo Toro, President, Avina Foundation; Marco A. Llinás Vargas, Vice President for Competitiveness and Shared Value, Bogotá Chamber of Commerce (CCB); Julián Domínguez, President, Confecámaras; Rodrigo Mejía, Secretary General, Confecámaras; Ana Lucia Lenis, Senior Manager, Public Policy and Government Affairs, Google; Pedro Less Andrade, Director, Latin America, Google; Catalina Rengifo, Governmental and Regulatory Affairs, IBM; Alejandro Sarasti Montoya, former Director of Innovation, INNpulsa; Andres Mauricio Leon Lopez, Advisor (Ministry of Agriculture); Johan Schmidt, International Council of Swedish Industry (NIR); Felipe Torres, former Director, PTP; José Dario Castro Uribe, former Director of Professional Formation Affairs, SENA; Henry Luna Salcedo, Director of National Training System for Work, SENA.

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Acronyms and abbreviations

ANDI	Colombian National Business Association
BAM	German Federal Institute for Materials Research and Testing
BSR	Baltic Sea Region
CMCs	Calibration and Measurement Capabilities
CNC	Commission for Innovation and Competitiveness
Colciencias	Colombian Institute for Science and Technology
Confecámaras	Confederation of Colombia Chambers of Commerce
CONICYT	National Science and Technology Council
CONPES	National Council for Social and Economic Policy
COREs	Regional Counsellors
CORFO	Production Development Corporation, Chile
CPC	Private Council for Competitiveness
CRC	Regional Commission for Competitiveness
CT	Corporation Tax
DANE	Colombian National Department of Statistics
DH	Dinars
DIN	National Standardization Body
DNP	National Planning Department
ECLAC	Economic Commission for Latin America and the Caribbean
EMPIR	European Metrology Programme for Innovation and Research
ERDF	European Regional Development Fund
EU	European Union
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure in Research and Development
GVCs	Global Value Chains
IAAC	Interamerican Accreditation Cooperation
ICA	Instituto Nacional Colombiano de Agricultura
ICONTEC	Colombian Institute of Technical Standards and Certification
ICT	Information and Communication Technologies
IEA	Institute for Industrial Development
IEC	International Electrotechnical Commission
ILO	International Labour Organization
INM	National Institute of Metrology
INVIMA	Instituto Nacional de Vigilancia de Medicamentos y de Alimentos
IoT	Internet of Things
ISO	International Organization for Standardization
KRIS	Korean Standards Research Institute
LAC	Latin America and the Caribbean
LNI	Labs Network Industrie
MinCIT	Ministry of Commerce, Industry and Tourism
MNEs	Multinational Enterprises
MRA	National Business Environment Committee
NGOs	Non-Governmental Organisations

NIST	National Institute of Standards and Technology
NLP	National Physical Laboratories
OECD	Organisation for Economic Co-operation and Development
ONAC	Organismo Nacional de Acreditación de Colombia
PDP	Production Development Policy
PLG	Peer Learning Group
PPP	Purchasing Parity Power
PTB	German National Metrology Institute
PTP	Productive Transformation Programme
PTPR	Production Transformation Policy Review
QI	Quality Infrastructure
R&D	Research and Development
RCM	National Calibration Network
RIS3	Smart Specialisation Platform
RT	Income Tax
RTAs	Regional Trade Agreements
SIC	Superintendence of Industry and Commerce
SICAL	National Quality Subsystem
SMEs	Small and Medium Enterprises
SNR	National Royalties System
SPRI	Basque Business Development Agency
STI	Science, Technology and Innovation
STRI	Services Trade Restrictiveness Index
TFP	Total Factor Productivity
TiVA	Trade in Value Added database
UNCTAD	United Nations Commission for Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
WTO	World Trade Organization
ZIM	Central Innovation Program for SMEs

Editorial

No unique pathway to development exists. Each country's experience enriches our understanding of how development unfolds in different contexts and of the role that institutions and policies play in shaping development outcomes.

In an uncertain, complex and fast-changing global landscape, governments constantly need to anticipate and adapt to new scenarios to sustain growth and deliver benefits to societies. The Production Transformation Policy Reviews (PTPRs) respond to this challenge by providing a novel and timely assessment that relies on peer learning and consensus building. The PTPRs are implemented in the framework of the OECD Initiative for Policy Dialogue on Global Value Chains, Production Transformation and Development and provide an opportunity for our organisations to cooperate and respond to countries' demands.

Even though no "one size fits all" approach applies to development strategies and policies, some crosscutting principles still surface that enhance their quality and effectiveness. Policies need to anticipate and adapt to change, promote learning, facilitate interactions and build resilient linkages. The policies of tomorrow need to be increasingly able to bring together all relevant stakeholders. This not only enhances ownership and accountability of the policy process, but also is a key prerequisite for implementing effective policies and enabling an inclusive and sustainable economic transformation.

Colombia is a growing, stable economy in Latin America. The peace process opened up new opportunities and the main challenge now lies in ensuring that those opportunities benefit all territories in the country. To do so, Colombia is counting on an effective planning system to respond to society's multiple aspirations. The National Planning Department (DNP) is an institution with a good reputation and convening power, characterised by a tradition of dialogue with the private sector. These experiences represent an excellent foundation for Colombia to move forward and address its pending challenges of low productivity and high dependence on natural resources.

Indeed, Colombia is now looking at mobilising new drivers of transformation to tackle the issues that are holding back future progress. These obstacles include the low level of productivity, the scarse sophistication and diversification of exports, and poor investment innovation activities. Building on solid macroeconomic management, the country is experimenting with new forms of medium-term policies that aim at leveraging each region's competitive advantage. Delivering results will depend on the capacity to connect up-to-date planning functions to an effective implementation process and on the ability to reap the benefits of the new technological and industrial revolution.

With a GDP per capita of USD 14 900 (PPP) in 2017, Colombia is quickly approaching the middle-income level that would no longer make it eligible to receive Official Development Assistance. However, the country still needs to make further reforms to achieve inclusive growth and sustainable development. The policies implemented in the years to come will be crucial to sustain progress. The OECD Development Centre,

ECLAC, UNCTAD and UNIDO are ready to continue supporting Colombia towards prosperity through knowledge sharing and peer learning within the OECD Initiative for Policy Dialogue on Global Value Chains, Production Transformation and Development. This PTPR is another concrete way through which our organisations can continue supporting Colombia's priorities in identifying options for reforms to deliver better policies for better lives.

Mario Pezzini	Alicia Bárcena	Richard Kouzul Wright	Cecilia Ugaz Estrada
Director OECD Development Centre and Special Advisor to the OECD Secretary-General on Development	Executive Secretary ECLAC	Director Globalisation and Sustainable Development UNCTAD	Director of the Department of Policy Research and Statistics UNIDO

Country profile

Colombia is a unitary country with an administrative structure born of the constitutional reform of 1991. It is composed of 32 administrative departments and the Capital District of Bogota. Departments are divided into a total of 1 101 municipalities. Among them, five – Cartagena, Barranquilla, Bogotá, Buenaventura, Santa Marta and Villa de Mompox – are categorised as special districts due to their particular political, commercial, historical, industrial, cultural or environmental characteristics, according to a new regime adopted in 2013, and updated in 2017. Each department has a local government with a governor and assembly directly elected for four-year terms, and each municipality is headed by a mayor and a local council. The 1991 Constitution also accords special status to certain territories: 87 indigenous territories that account for 3.4% of the total population (DANE, 2006[1]).

Administrative departments of Colombia

Main economic indicators of Colombia 1970-2017

	1970	1980	1990	2000	2010	2017
	Population					
Population, total (million)	22.1	27.7	34.3	40.4	45.9	48.7
Labour force, total (million)	5.4	8.4	11.7	16.8	25.6	28.9
Unemployment, total (% of total labour force) (national estimate)	10.6	9.1	10.2	20.5	10.9	8.4
Employment-to-population ratio			55.2	51.5	60.2	63.0
	Aggregate economy					
GDP, USD million, (constant prices and constant PPPs, 2010)	106 840.5	180 159.7	254 290.3	328 894.6	490 405.4	637 206.3
GDP, USD million, current	7 198.4	33 400.7	402 74.2	99 886.6	28 7018.2	309 191.4
GDP per capita, USD, current	326.3	1 204.2	1 175.1	2 472.2	6 250.7	6 272.7
GDP per capita, USD, (constant prices and constant PPPs, 2010)	4 942.8	6 524.5	7 451.0	8 162.0	10 776.0	12 927.3
GDP growth (verge previous 10 years)	5.2	5.5	3.5	2.8	4.1	3.8[b]
Gross fixed capital formation (% of GDP)	18.1	16.8	16.6	14.1	21.9	23.4.[c]
Inflation, consumer prices (annual %)	6.9	26.5	29.1	9.2	2.3	4.3
	External sector					
Trade (% of GDP)	30.1	31.8	35.4	32.7	33.7	34.9
Exports of goods and services USD million constant 2010 prices)	5 875.7	10 258.1	18 501.0	30 642.1	45 739.2	55 785.4
Imports of goods and services (USD million constant 2010 prices)	4 979.1	8 634.4	9 761.7	23 003.0	50 988.4	72 770.4
External balance on goods and services (% of GDP)	-1.5	0.6	5.7	-0.8	-1.8	-4.5[c]
	Economic activities					
Agriculture value added, USD million constant 2010 prices	9 278.2	14 209.1	19 080.5	15 234.5	18 661.9	22 257.7[c]
(% of Gross value added)[d]	(25.7)	(19.9)	(16.7)	(8.9)	(7.1)	(6.6)
Industry value added, USD million constant 2010 prices	22 668.0	38 397.3	57 256.8	62 273.1	91 903.4	112 285.8[c]
(% of Gross value added	(38)	(37.6)	(40.2)	(35)	(35)	(33.5)
Of which manufacturing	13 250.6	23 702.0	31 676.5	26 189.6	36 620.7	41 189.4[c]
(% of Gross value added)	(21.2)	(23.9)	(20.6)	(15)	(13.9)	(12.3)
Services value added, constant 2010/USD	27 595.8	49 325.6	66 631.8	100 726.4	152 335.2	200 370.3
(% of GDP)	(46)	(47.6)	(45.4)	(61.6)	(57.9)	(59.8)
Total natural resources rents (% of GDP)	0.5	4.5	7.3	5.1	6.3	3.5[c]

Energy						
Electricity production from renewable sources, excluding hydroelectric (% of total)	1.5[d]	1.1	0.8	1.2	4.1	3.1[e]
Electricity production from hydroelectric sources (% of total)	65.1	69.9	75.6	74.4	68.0	71.1[e]
Renewable energy consumption (% of total final energy consumption)			38.3	28.0	27.9	24.5[e]
Renewable electricity output (% of total electricity output)			76.4	75.5	72.1	74.2[e]
Science and technology indictors						
GERD (Gross domestic expenditure Research and development expenditure % of GDP)	..	..	..	0.1	0.2	0.3
Percentage GERD financed by private sector	..	..	..	21.0	23.8	49.2[c]
Researchers in R&D (per million people)	..	..	70.0[g]	99.3	182.3	114.9[f]
High-technology exports (% of manufactured exports)	..	..	..	7.7	5.1	9.8[c]
Fixed broadband subscriptions (per 100 people)	..	..	..	..	5.7	11.8[f]
Mobile cellular subscriptions (per 100 people)	..	..	..	5.7	95.8	117.1[f]

Note: [a] Estimated value [b] from 2011 to 2017 [c] 2016, [d] 1975, [e] 2014, [f] 2015, [g] 1995,
Source: OECD National accounts, IE Statistics, International Telecommunication Union, World Telecommunication/ICT Development Report and database, United Nations Comtrade database, ILOSTT database, International Monetary Fund, International Financial Statistics, United Nations Education, Scientific, and Cultural Organization (UNESCO) Institute for Statistics and World Bank Statistics

Executive summary

Colombia, the fourth largest economy in Latin America, is back on stage after decades of conflict. In the last two decades, Colombia has made much progress. Its citizens live better. The GDP per capita doubled between 2000 and 2017, and the economy grew at an annual average of 4.3%, the second highest growth rate in Latin American after Peru and doubling the rate of growth of the region. In the same period, the poverty rate declined from 50% to 28%. However, the incidence of poverty is still higher than in other countries in the region, such as Peru (20%) and Chile (12%). Investors' confidence grew and the country has taken steps to re-brand itself as a nation open to business and innovation. In 2017, Colombia's inward stock of Foreign Direct Investment (FDI) reached 57% of GDP, ranking among the highest in the Latin America and Caribbean region and above the OECD average. In addition, firms in Colombia are starting to use digital technologies for business. Thanks to improved digital connectivity and targeted policies for start-up development, Colombia is now the fifth largest hub by number of start-ups in Latin America and the fourth largest by venture capital.

To continue progressing, Colombia needs to address the structural weaknesses that are holding back future progress. Productivity has not increased enough to bring Colombia on a par with more advanced economies. Since the 2000s, Colombia's labour productivity has been stable at 25% of that of the United States. Colombia could benefit more from trade and investment. The economy is specialised in exporting natural resources and, despite a relatively long tradition of manufacturing, this activity is becoming less relevant and less competitive. In 1990-2015, Colombia fell in the Competitive Industrial Performance Index, which benchmarks the ability of countries to produce and export manufactured goods competitively, from the 57th to the 69th position in the ranking. The share of manufacturing in GDP is nowadays half of what it was in the 1980s and domestic manufacturing is struggling to compete in global markets. In 2017, primary production and mining accounted for 80% of exports, 10% more than in the 1990s. In addition, few places are benefiting from trade and investment. In 2015-2017, three regions (Bogotá, Cundinamarca and Antioquia) accounted for more than 60% of total FDI inflows in 2015-2017. Moreover, Colombia continues to invest little in innovation. The research and development (R&D) expenditure over GDP is stable around 0.25% of GDP, well below the OECD average of 2.35%, and even below other countries in Latin America, such as Chile (0.39%). The private sector is also not investing enough. Business expenditure on R&D in Colombia is 0.11% of GDP, 15 times less than the OECD average. While the private sector gap in innovation is particularly high for SMEs, 46% of large firms innovate in Colombia, which is higher with respect to peers in the region, such as Chile (30%). This could prove an advantage for Colombia to fast track technology adoption and creation in the economy.

To move forward, Colombia can leverage on established and well-respected planning capacities and track record in policies to promote production development. Next to the DNP, the centre for national strategic planning, and the other line ministries, Colombia can count on a set of well-established private sector institutions. For example the National

Industrial Association (ANDI), the National Confederation of Chambers of Commerce (Confecámaras), and the Private Council for Competitiveness (CPC) convey private sector views on national policies for production development.

The Production Development Policy (PDP) 2016-2025 represents a good basis to move forward, notably on two fronts: i) it has explicitly created a mechanism to work with regions on identifying priorities for production development and ii) it has enabled co-ordination among different ministries in areas linked to strengthening the competitiveness of firms. In going forward, Colombia could put clearer emphasis on industry 4.0 and new technologies and ensure greater co-ordination of production transformation polices with science, technology and innovation. Additionally, production development policies need to gain higher priority in the national strategy. Only in this way, they can achieve the level of coordination, continuity and funding needed to secure impact.

Throughout this PTPR (Production Transformation Policy Review) process that involved an extensive consultation with multiple national and international stakeholders, three game changers emerged as key to enabling the country to move forward:

- *Strengthening the government's planning and anticipatory capacities to shape the future.* The country needs to update the planning process to cope with a fast-changing global landscape and to respond to growing demands for accountability and transparency. Colombia could update its planning structure by creating new incentives to shift the focus from drawing up documents to achieving a shared commitment to budget allocation and policy implementation, ensuring the participation of all stakeholders to the strategic thinking process, and endowing the DNP with a centre for strategic thinking and policy foresight.
- *Tapping the productivity potential of all regions*. To unleash its competitiveness potential, Colombia needs to enable all regions and territories to develop. This requires a two-track approach. The country needs to get the enabling factors right. Red tape and a poor communication infrastructure are holding back productivity and the competitiveness of firms. At the same time, it needs to consolidate past policy efforts and update them by improving the prioritisation process by adopting a challenge-driven and place-based approach, and by taking into account the opportunities of the Industry 4.0.
- *Activating mechanisms to benefit more from trade and investment.* To do so the country could improve its participation in global value chains in higher value added activities, such as services. This could be done by leveraging on a modern quality infrastructure system that would enable domestic firms to operate in an Industry 4.0 and fast-changing industrial landscape. At the same time, trade and investment agreements could include provisions to foster learning in domestic firms.

Advancing towards the realisation of a competitive and innovative nation and at the same time opening up opportunities for all territories and people is paramount for Colombia. In doing so, the country needs to leverage on its institutions and experience in policy planning to achieve a shared vision and create the conditions for implementing it within a time-horizon that goes beyond political cycles.

Assessment and recommendations

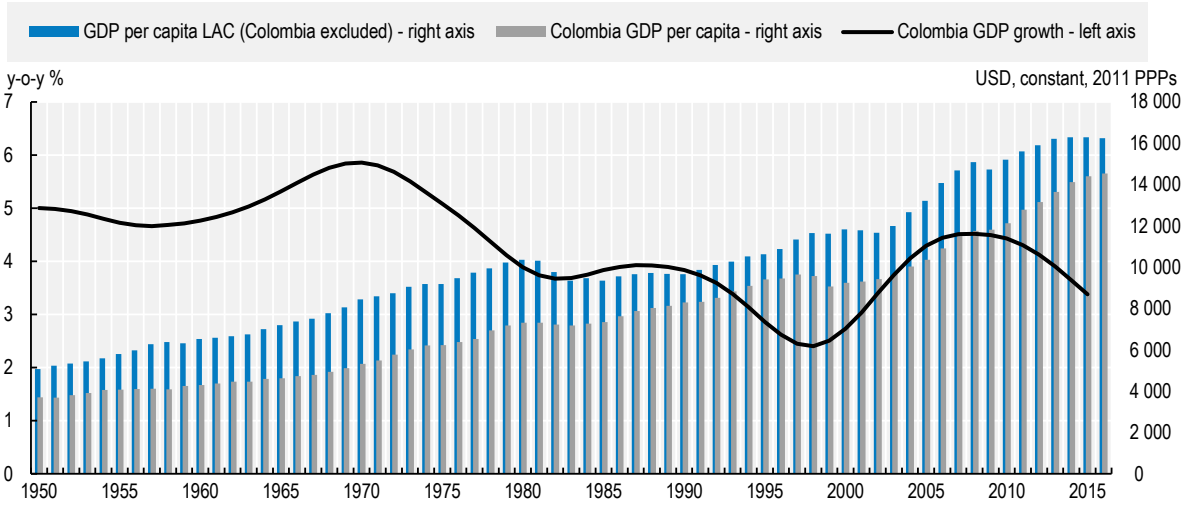
Colombia, a growing economy ready to shift up a gear

Colombia, the fourth largest economy in Latin America and the third in terms of population, is back on stage after decades of conflict. The country has a growing and relatively stable economy, and is looking to open up new opportunities for all its citizens and territories and to set the basis for more inclusive growth.

In the last two decades, Colombia has made much progress. Its citizens live better. The GDP per capita doubled in the period 2000-17, and the economy grew at an annual average of 4.3%, doubling the rate of growth of Latin America and recording the second highest growth rate in the region after Peru (Figure 0.1). In the same period, the poverty rate declined from 50% to 28%. The incidence of poverty is still higher than in other countries in the region, such as Peru (20%) and Chile (12%). More needs to be done but Colombia is on a good track.

Figure 0.1. GDP Colombia, 1950-2017

GDP growth (left axis) and GDP per capita (right axis).



Source: Authors' elaboration based on the Conference Board Total Economy Database™ (Adjusted version), 2017, https://www.conference-board.org/data/economydatabase/.

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At the same time, investors' confidence has grown and the country has taken steps to re-brand itself as a nation open to business and innovation. In 2017, Colombia's inward stock of Foreign Direct Investment (FDI) reached 59% of GDP, ranking among the highest in the Latin America and Caribbean region and above the OECD average. In

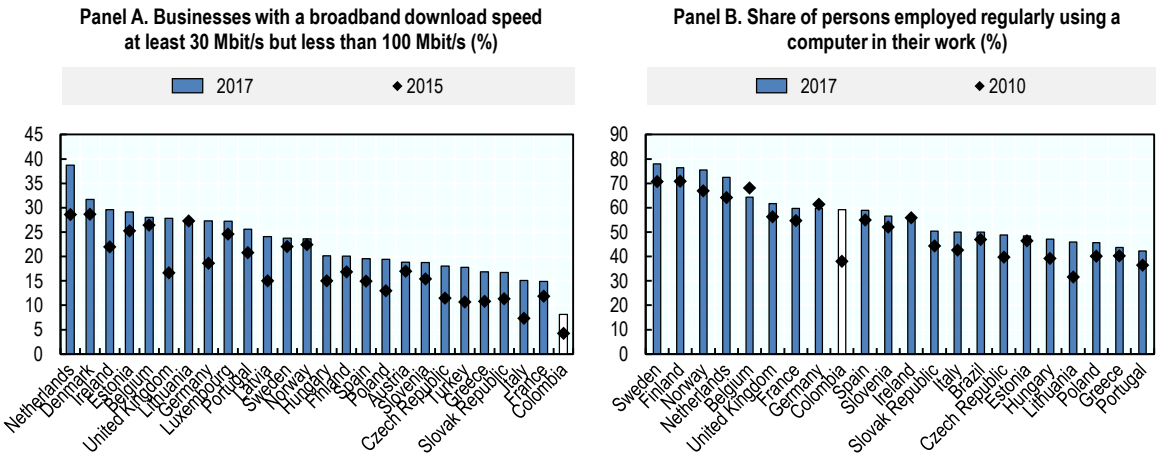
addition, a growing number of countries are looking at Colombia as a place to invest and do business. In the 2000s, the top three investing countries accounted for half of the total FDI to the country. Now the top three account for 40%. Brazil and China count among the new top investors while the United States remains the main trade and investment partner of Colombia.

More recently, the country has invested in improving digital connectivity. The number of broadband subscriptions per 100 inhabitants doubled from 6 to 12 in 2010-17, putting Colombia on a par with Mexico, but still among the lowest levels in OECD. The top OECD country in this respect (Switzerland) has three times the number of broadband subscriptions per inhabitant compared to Colombia.

Progress on broadband infrastructure, coupled with growing middle classes, and targeted policies, has also allowed Colombia to reap the benefits of a growing start-up scene in Latin America. Colombia is now the fifth largest hub by number of start-ups in Latin America, after Brazil, Mexico, Argentina and Chile, and the fourth largest by venture capital (VC). Start-ups have allowed new businesses to flourish. They have also contributed to improving the image of Colombia as a place to do business and innovate. Medellin, for example, has developed an effective public-private partnership (Ruta N) that provides financing and services to start-uppers. In 2016, after years of headlines as a city of crime, Medellin was named Innovative City of the Year by the Wall Street Journal and Citi Group.

Established firms in Colombia are also starting to use digital technologies for business. The share of businesses with high-speed broadband internet connections doubled in 2015-17. Even though their share in Colombia (8%) is still much below other OECD economies, such as Italy (15%) and the Netherlands (39%), the country has shown signs of improvement (Figure 0.2). In e-commerce, Colombian firms outpace the OECD. On average, 30% of domestic firms are engaged in digital trade, against an OECD average of 22%.

Figure 0.2. The connection speed and use of computers for businesses have increased



Note: Business enterprises refer to firms with ten or more persons employed.
Source: Authors' elaboration based on OECD Broadband Statistics 2018 http://www.oecd.org/sti/broadband/broadband-statistics/.

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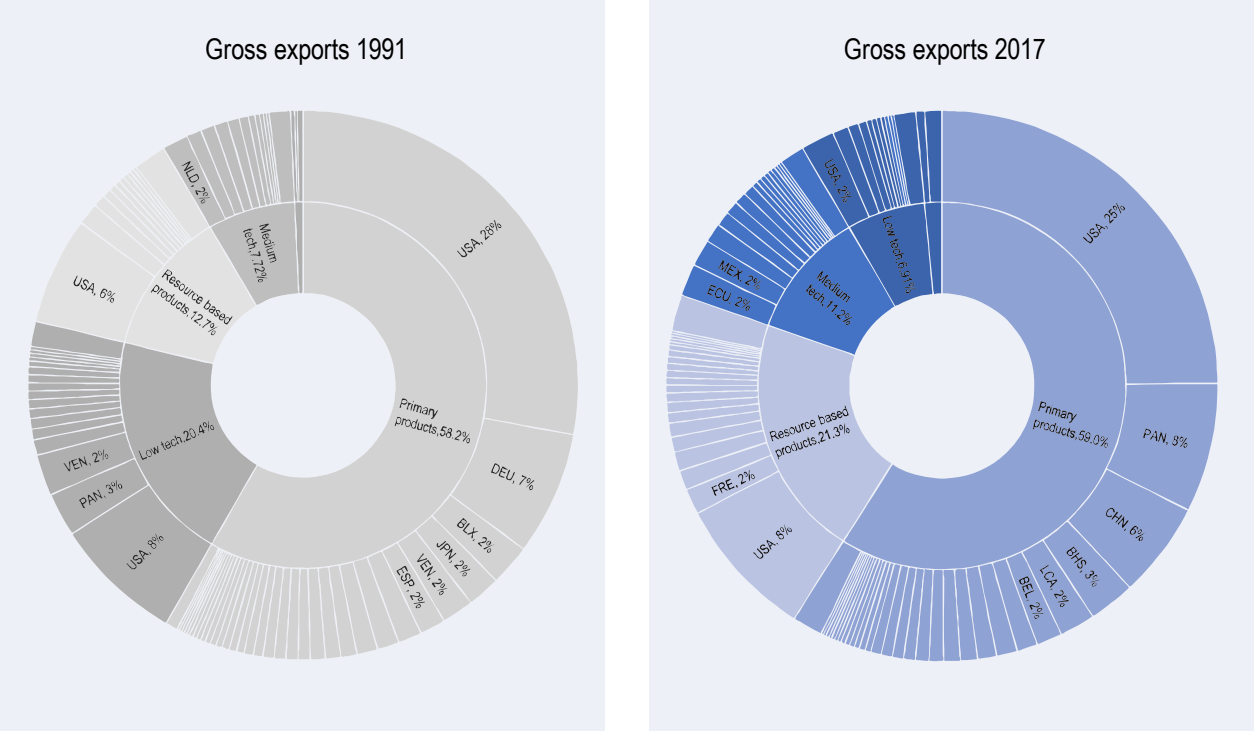
Persistent structural weaknesses are holding back future progress

Despite the progress achieved over the last two decades, Colombia still suffers from structural weaknesses that are hampering future progress.

Colombia is highly dependent on natural resources. In 2017, primary production and mining accounted for 80% of exports, 10% more than in 1991, in line with other countries in the region such as Brazil (Figure 0.3). In addition, despite a relatively long tradition of manufacturing this activity is becoming progressively less relevant and less competitive. The share of manufacturing in GDP is now half of what it was in the 1980s and domestic manufacturing is struggling to compete in global markets. In 1990-2015, Colombia fell in the Competitive Industrial Performance Index, which benchmarks the ability of countries to produce and export manufactured goods competitively, from the 57th to the 69th position. During the same period, Chile increased from 58th to 51st and Mexico from 31st to 19th.

Figure 0.3. Exports by partners and technology intensity, Colombia, 1991-2017



Note: The technological classification follows Lall, S. (2000) and Aboal et al (2015).
Source: Authors' elaboration based on UN (2018), Comtrade Database, https://comtrade.un.org.

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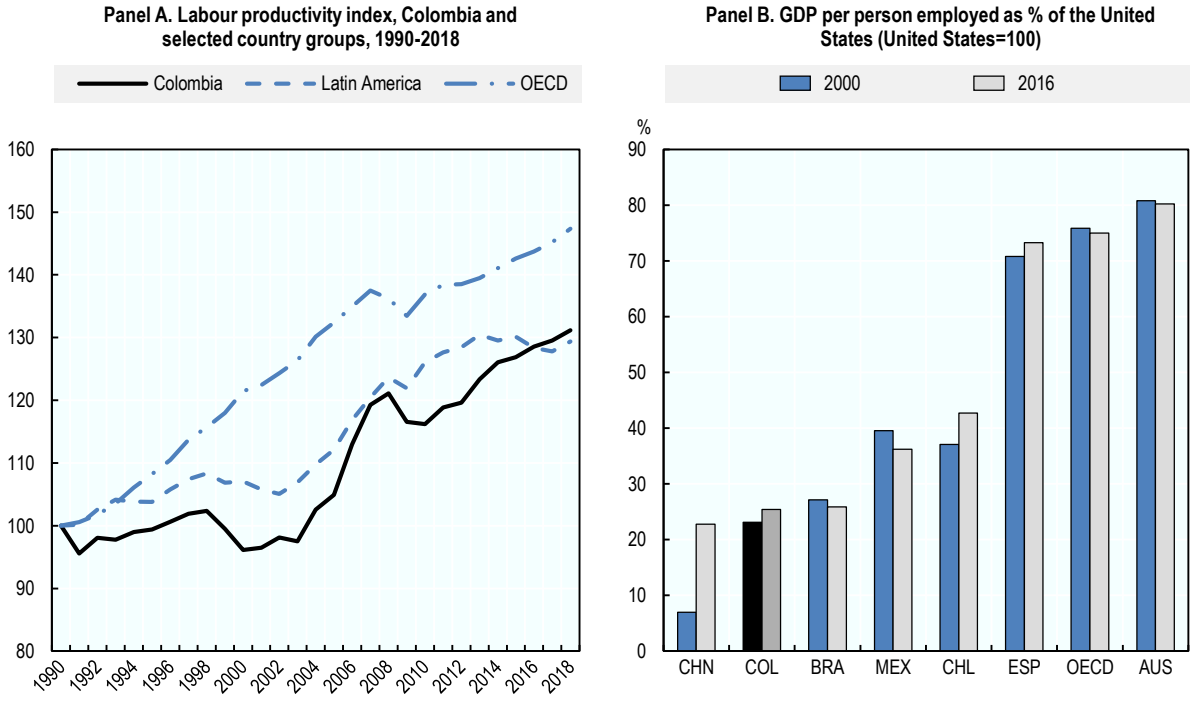
Productivity has not increased enough to bring Colombia up to the level of more advanced economies. Since the 2000s, Colombia's labour productivity has been stable at 25% of that of the United States (Figure 0.4). In contrast, during the same period, China's productivity gap relative to the United States decreased by 400%.

Figure 0.4. The productivity gap persists in Colombia



Source: Authors' elaboration based on the OECD National Accounts and Conference Board Total Economy Database™ (Adjusted version), 2018, https://stats.oecd.org/; https://www.conference-board.org/data/economydatabase/.

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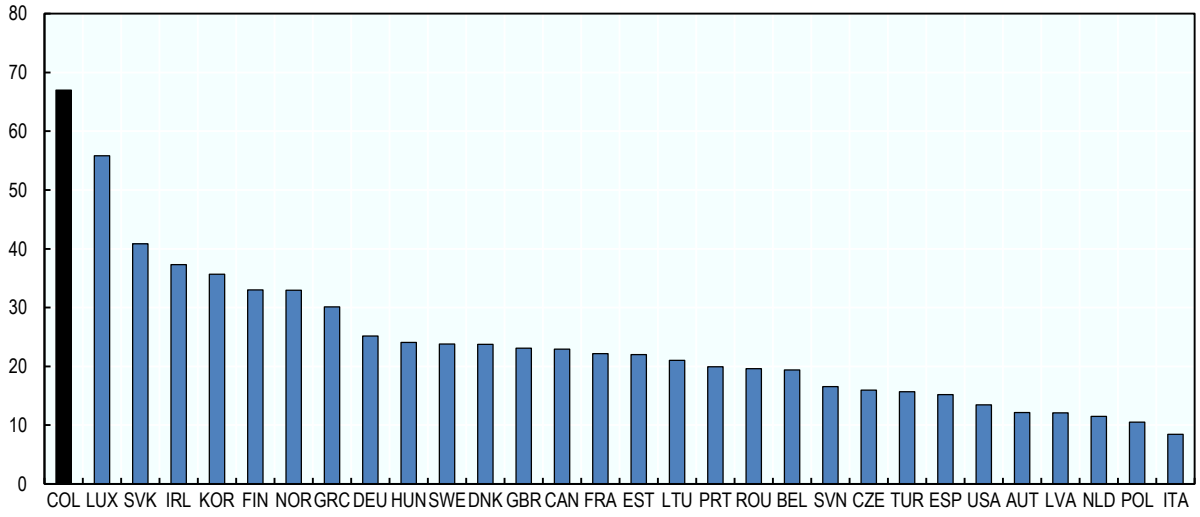
The structure of firms could be stronger and more diversified. Micro-firms account for 92% of total domestic firms, versus an OECD average of 80%. In addition, even though a growing number of firms are created every year (this number increased by 15% in 2001-15), seven out of ten firms fail within five years. At the same time, only a handful of companies benefit from trade. The top ten exporting firms account for 65% of exports. In contrast, in Spain and Germany these firms account, respectively, for 16% and 25% of exports (Figure 0.5).

Economic opportunities continue to be limited to a few territories. This is a common feature in Latin America, where territorial disparities are severe in several countries, including Chile and Brazil. Within the OECD, Colombia suffers from the second highest labour productivity gap between regions, after Mexico (Figure 0.6). Nariño, a small department with an agricultural vocation located in the southwest of the country, is 2.5 times less productive than the national average, and six times less productive than Meta, a territory specialised in mining and the top region for labour productivity. While heterogeneity in productivity across regions is common, an excessively high disparity reduces the aggregate productivity potential of the economy and limits the development of effective national supply chains. In Spain, for example, the top region (the Basque Country) is only 1.6 times more productive than the bottom region (Murcia). The gap between the top and the bottom in Colombia is more than three times higher. In addition, only a few regions are benefiting from growing FDI inflows. In 2015-17, three regions, Bogotá, Cundinamarca and Antioquia, accounted for more than 60% of total FDI inflows (Figure 0.7).

Figure 0.5. The top ten exporting firms account for 65% of exports

Share of top ten exporting firms of total value of exports, Colombia and OECD, 2015, or latest available year



Note: Data for BEL, CAN, CZE, ESP, EST, FIN, GBR, IRL, LUX, NLD, NOR, POL, ROU, USA, TUR refer to 2014.
Source: Authors' elaboration based on OECD TEC database, OECD SDBS database and RUES database - Registro Unico Empresarial [Single Enterprises Registry]-Confercamaras, Colombia, 2018 http://www.oecd.org/sdd/its/trade-by-enterprise-characteristics.htm; http://www.oecd.org/sdd/business-stats/; https://www.rues.org.co/.

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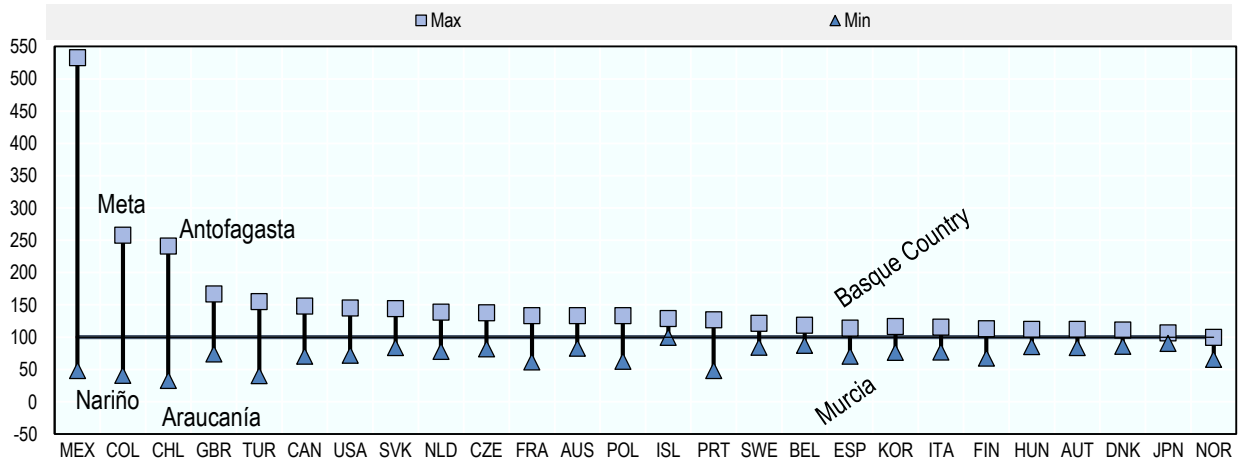
Figure 0.6. Regional variation in labour productivity, Colombia and selected countries, 2016

National average =100



Source: Authors' elaboration based on OECD Regional Statistics database, 2018. www.oecd.org/governance/regional-policy/regionalstatisticsandindicators.htm.

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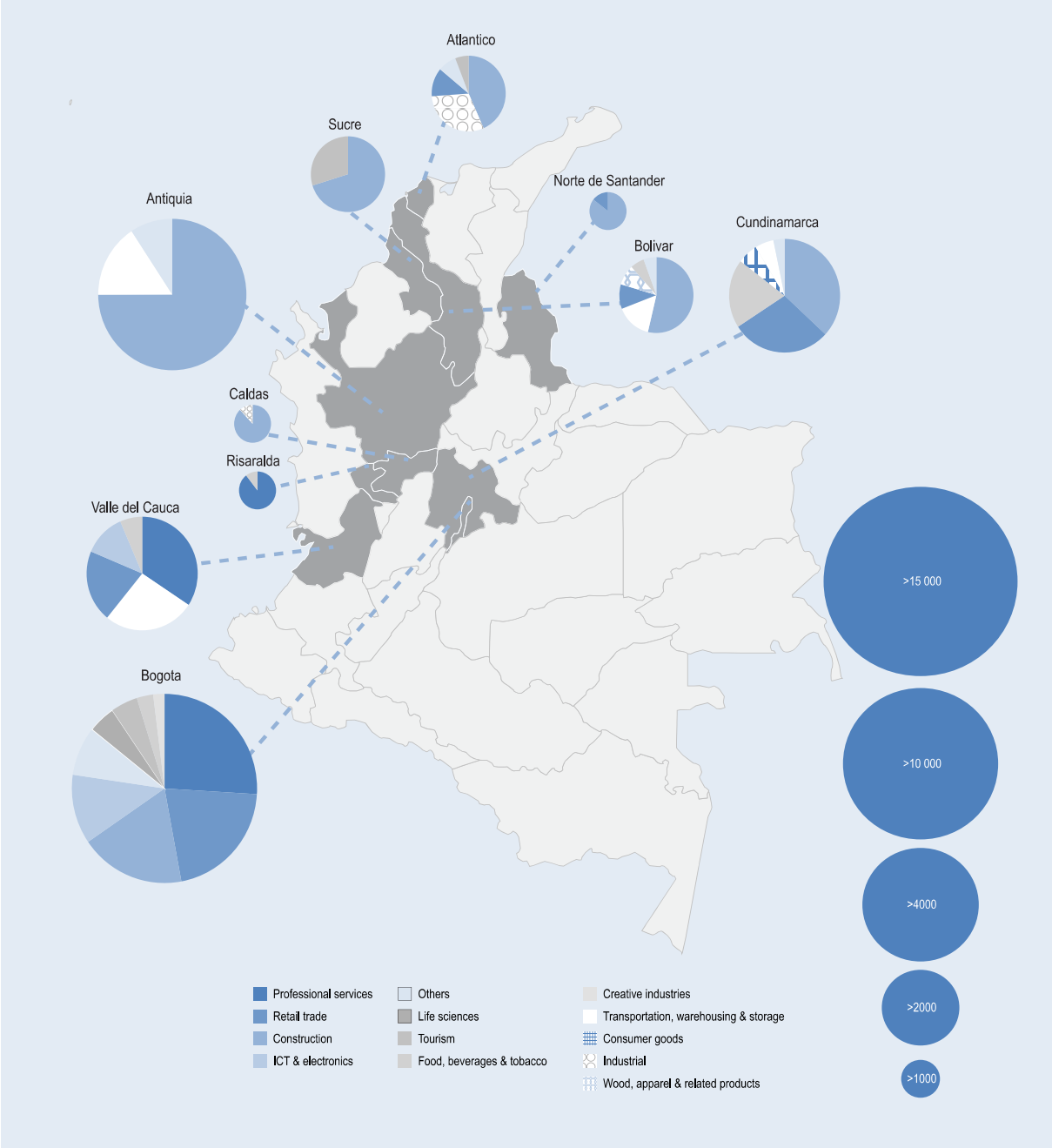
Figure 0.7. Three regions account for 63% of total FDI in Colombia

Share of total jobs created by Greenfield FDI by department and economic activities, Colombia 2015-17



Note: Only departments that account for at least 1 000 jobs created are displayed. Total jobs created in 2015-17 are 56 691 units. Nevertheless, only 49 505 jobs associated with complete information in terms of destination city and economic clusters are taken in consideration.
Source: Authors' elaboration based on Financial Times fDi Market database, 2018, https://www.fdimarkets.com/.

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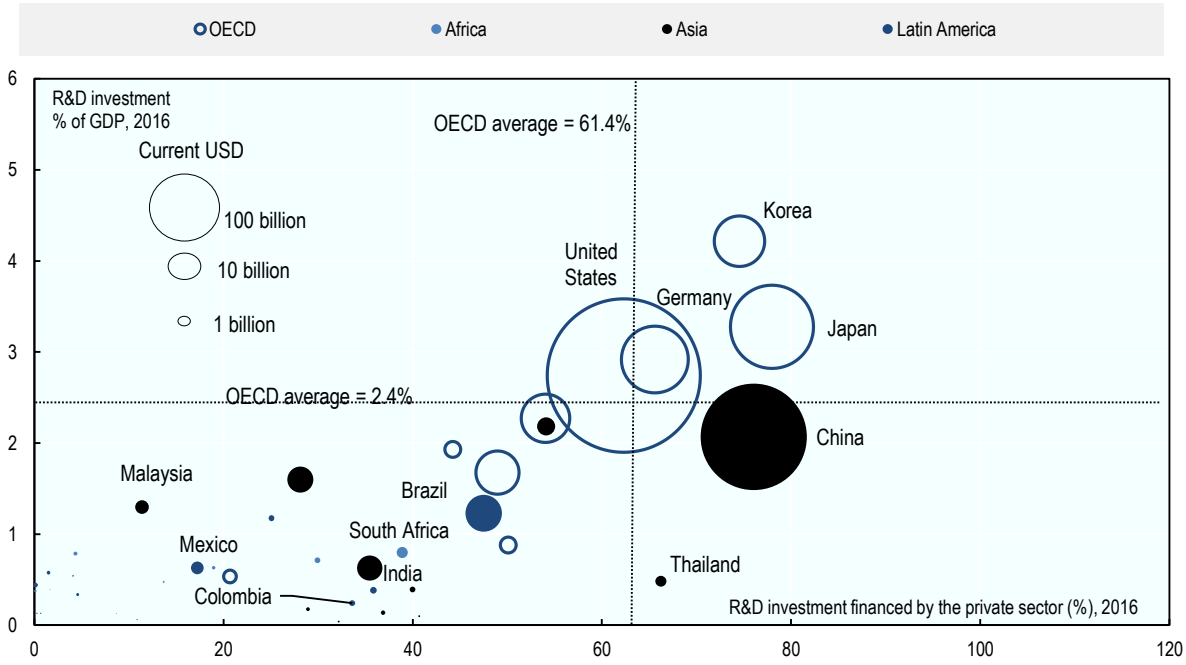
Colombia continues to invest little in innovation. The research and development (R&D) expenditure as a percentage of GDP is stable at around 0.25%, well below the OECD average of 2.35%, and even below other countries in Latin America, such as Chile (0.39%), Mexico and Argentina (both around 0.5%), and well below the top R&D investing country in the region, Brazil (1.2%). The private sector is also not investing enough. Business expenditure on R&D in Colombia is 0.11% of GDP, 20 times less than in Korea and 15 times less than the OECD average (Figure 0.8). The private sector gap in innovation is particularly high in Colombia for SMEs – only 21% of them innovate versus 35% in Spain and 65% in Germany. However, the economy counts with a relative advantage in Latin America. According to available data from national innovation surveys, large firms in Colombia innovate more than their peers in other countries of the region. In Colombia, 46% of large firms innovate, while, for example in Chile only 30% of these companies innovate. While this performance is still low compared to top performing economies such as Spain and Germany, where 77% and 94% of large firms innovate, it is still a good basis. Colombia could further capitalise on its large companies' culture and propensity to innovate to fast track technology adoption and creation in the whole economy (Figure 0.9).

Figure 0.8. Colombia invests little in R&D

Colombia is investing few resources in R&D



Note: GERD: Gross domestic expenditure in research and development; BERD: Business expenditure in research and development.
Source: Authors' elaboration based on OECD Main Science and Technology Indicators and OCYT Informe Anual de Indicadores de Ciencia y Tecnología 2017 and UNESCO Institute for Statistics http://www.oecd.org/sti/inno https://ocyt.org.co/ http://data.uis.unesco.org/.

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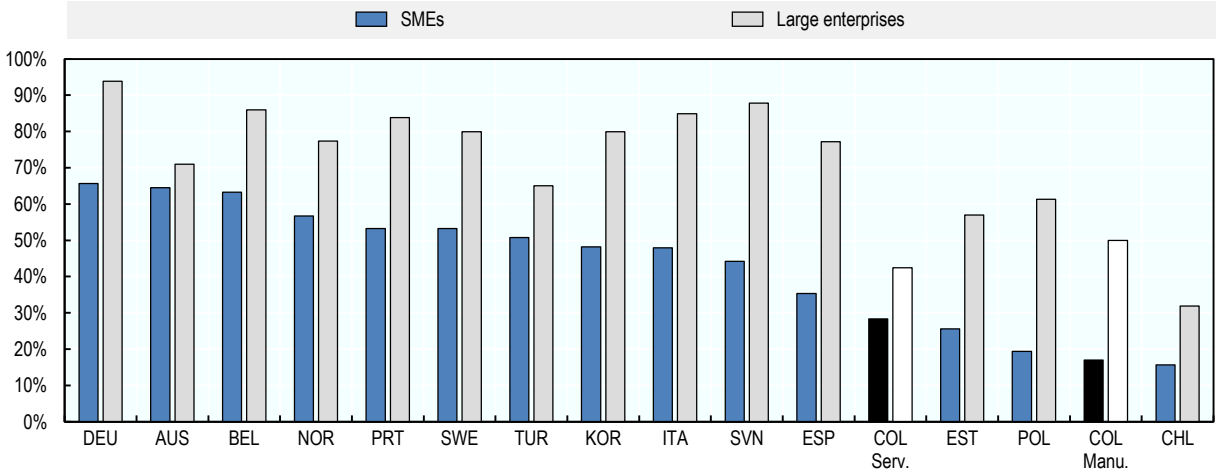
Figure 0.9. On average only 20% of Colombia's firms innovate

Share of innovative enterprises by size, Colombia and selected countries 2016



Source: Authors' elaboration based on EUROSTAT CIS 12 and 14, Colombia Manufacturing Innovation Survey EDIT-VIII and Services Innovation Survey EDITS-V, Chilean Enterprises Innovation Survey – IX, 2018, https://ec.europa.eu/eurostat/web/microdata/community-innovation-survey; https://www.dane.gov.co https://www.economia.gob.cl.

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Since 2006 Colombia has implemented reforms to fast-track economic transformation

To continue to progress, Colombia needs to address structural weaknesses holding back its development. To do so, the country can count on an established and well-respected planning structure, a set of public and private institutions with a tradition of debating and sharing ideas, and a track record of policies for production development.

The National Planning Department (DNP) was founded in 1958 as the centre for national strategic planning. It formulates the National Development Plan, draws up the budget in co-operation with the Ministry of Finance and Public Credit, and defines national policies that require inter-ministerial co-ordination. In defining policies for transforming the economy, Colombia can count on a set of well-established private sector institutions. These include the National Industrial Association (ANDI), set up in 1944, the National Confederation of Chambers of Commerce (Confecámaras), founded in 1969 to bring together the 57 local chambers, and the Private Council for Competitiveness (CPC), founded in 2011 as the body to convey large firms views on national policies for competitiveness.

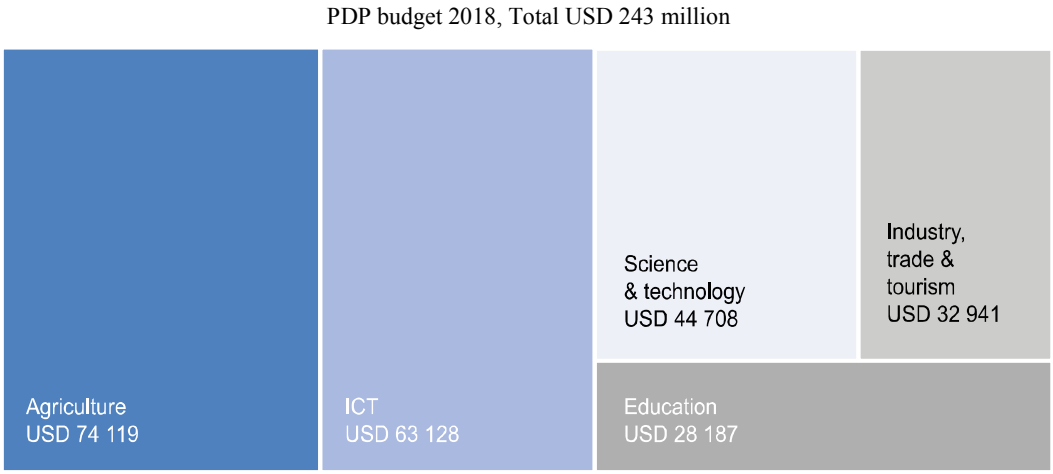
The evolution of policies for production development in Colombia has followed a path similar to that in other Latin American countries. The initial industrialisation policies of the 1930-40 suffered a halt from the 1980s, and particularly in the 1990s, when the country focused on modernising the economy through openness. Since the mid-1990s, different governments have tried to define and implement policies to foster competitiveness and innovation in the economy. This has resulted in no fewer than

11 programme documents in the period 1994-2018, but the lack of continuity in priorities and limited funding hampered implementation. In the last decade, the country has nevertheless implemented some reforms to address the productivity challenge. The most significant reforms include:

- Strengthening institutionality for science and technology. In 2019, the law 1951, transformed the Colombian Institute for Science and Technology (Colciencias) in the Ministry of Science, Technology and Innovation.
- Promoting industrial development in priority areas and fostering start-up promotion. In 2008, the Ministry of Trade, Industry and Tourism (MinCIT) launched the Productive Transformation Program (PTP) to stimulate competitiveness in 15 priority areas. In 2012, Colombia also established a new agency, iNNpulsa, to foster start-up development and business innovation.
- Modernising trade and investment institutions. In 2014, the national export promotion agency was transformed into ProColombia, merging the export promotion and the FDI attraction function, in line with OECD practices. In 2003, the national export development bank, Bancoldex, absorbed the functions of the former Institute for Industrial Development (IFI) and became responsible for facilitating access to finance for SMEs.
- Fast-tracking digital connectivity. In 2011, the Ministry of Information and Communications Technology launched the agenda *Vive Digital* to mobilise investments and implement reforms to improve digital infrastructure. This resulted in a major increase in digital connectivity. By 2017, 98% of municipalities were connected to the internet.
- Improving institutions and financing for regional development. Following on initiatives that go back to the mid-1990s, in 2006, 33 Regional Commissions for Innovation and Competitiveness (CRC) were established to foster innovation and production development in regions. In 2009, the regional development governance was further strengthened with the establishment of departmental Councils for Science, Technology and Innovation (CODECTI). In addition, in 2012, Colombia reformed its national royalties' system to allow all regions, and not only the mining ones, to receive royalties from extractive industries. The reform also included an amendment that earmarked 10% of these royalties to fund science, technology and innovation projects in regions.
- Modernising the quality infrastructure for competitiveness. Colombia has had a National Institute for Technical Standards and Certification (ICONTEC) since 1963. The country took steps to update its quality infrastructure system by creating a national agency in 2008, in charge of overseeing the technical competence of conformity assessment bodies, (*Organismo Nacional de Acreditación de Colombia*, ONAC), and in 2011, the National Metrology Institute (INM), which offers metrology services in line with regional and international best practices. Colombia today has a national quality infrastructure system on a par with regional leaders, such as Argentina, Brazil and Mexico.

Despite this progress, production development has struggled to become a key priority in the national development agenda. Colombia still lacks a shared, ambitious vision and a clear policy stance for transforming the economy. The Production Development Policy (PDP) 2016-2025 represents a step forward in this respect. The PDP was drawn up by the DNP in co-operation with several entities, including the Ministry of Trade, Industry and Tourism, the Ministry for Agriculture and Rural Development, the Ministry of National Education and the Ministry of Labour, and the National Training Service (SENA). It aims at increasing the productivity and export performance of existing firms by bringing together policy tools and financing managed by different ministries (Figure 0.10).

Figure 0.10. The PDP allocated budget by area, 2018



Note: The total budget of the PDP refers to the sum of each (financial and non-financial) instrument that reports financial resources. Industry, trade and tourism accounts for three instruments active in 2017. For agriculture, science & technology, and industry trade and tourism, the aggregate budget of some specific instruments is split according to the evolution of the budget of each ministry across the years.
Source: Authors' elaboration based on 2018 National Budget Law (Ley No. 1873-20/122017) and DNP information.

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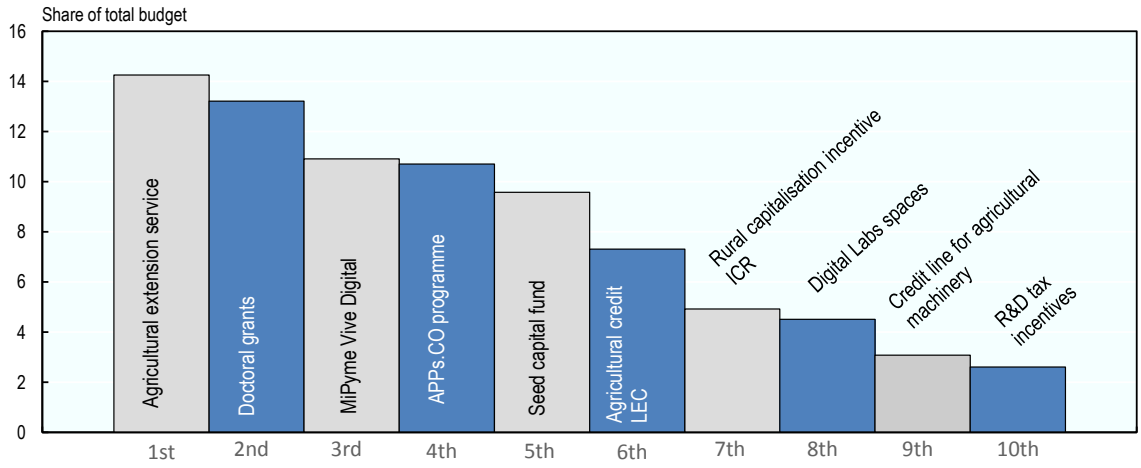
Even though the PDP has a policy mix with 83 instruments that can be mobilised by different ministries and implementing agencies to channel financing and services to firms, people and other institutions in the national innovation system, 10 of these account for more than 80% of the overall budget. Agricultural extension services are the most important tool and account for 14% of the total allocated budget for 2018. These are followed by non-repayable contributions to pursue PhDs (13%) and a mix of co-financed loans and services to foster the use of digital technologies by SMEs (11%) (Figure 0.11). Initiatives in science and technology and in industrial development are dispersed among many small and specific programmes. This undermines the capacity to engender a transformative change in the economy.

Figure 0.11. Ten instruments account for 80% of the PDP's allocated budget, 2018



Note: The Apps.co is a programme launched by the Ministry of Information and Communications Technologies (MinTIC) within the framework of its Plan Vive Digital to promote new businesses based on the use of ICT, with special emphasis on the development of mobile applications and software content.
Source: Authors' elaboration based on DNP information and Colombian Observatory on Science and Technology (OCYT, 2018[1]).

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Nevertheless, the PDP represents an advance. On the one hand, it sets goals until 2025, providing a basis for strengthening continuity in government support for production development. On the other hand, it is based on three principles that enable to define clear priorities through consensus building with key partners in every territory in the country (Table 0.1). The key principles are:

- *Regional differentiation:* identifying, through a participatory process, priority sectors in regions, based on productive capacities and comparative advantages in exports.
- *Evidence based:* applying a rigorous empirical methodology for identifying priority sectors and including piloting of actions as a pre-condition for scaling-up.
- *Participatory and co-ordinated:* including an articulated mechanism of co-ordination between different private and public stakeholders. The PDP also makes a step forward in advancing towards a place-based approach to policy by giving a key role to the Regional Commissions for Competitiveness.

Table 0.1. Progress overview of the Production Development Policy, 2016-2025

Governance dimensions		
Anticipation capacity	x	The policy aims at providing guiding principles until 2025, but it falls short in anticipating future potential scenarios and in taking into account the impact of the ongoing digital revolution. Increasing future-oriented strategic thinking would be required in defining priorities. Industrial development strategies work better when they have clear targets that, at the same time, leave room for manoeuvre to the private sector.
Adaptation capacity	√	The PDP fosters piloting actions before scaling them up and includes a monitoring mechanism that can support policy reforms if targets are not achieved.
Learning and upgrading potential	x	The PDP falls short in identifying future issues. Future efforts would benefit from putting a clearer emphasis on Industry 4.0, new technologies and innovation and in exploring how to unlock the transformative potential of large firms in the country. The prioritisation process identified key products and activities in each region. This approach risks limiting the potential for identifying big challenges and promoting broad innovations across the whole system. A production development policy would need to be defined in line with the national innovation strategy. Addressing the issues in two separate policy documents increases co-ordination failures.
Interconnectedness propensity	≈	**Within government**. While the PDP has a Technical Committee for follow-up to which all relevant government agencies are invited to participate, the PDP would benefit from explicit co-ordination with the innovation policy and with the digital agenda. The practice of addressing each issue in separate programme documents limits the possibilities for effective co-ordination.
	√	**With the private sector**. The PDP has spaces for co-ordination with the private sector. ANDI and CPC are members of the Technical Committee of the PDP and regularly contribute to policy definition. Their participation in this committee facilitates information-sharing. More could be done to mobilise private financing in specific lines of work of the PDP.
	√	**Regional entities**. The PDP works hand-in-hand with all regional governments and private sector representatives.
Embeddedness potential	≈	The place-based approach of the PDP is a positive step. There is a need to examine regional disparities related to financing, administrative capacities and defined mechanisms in order to offer more support to the regions.

Note: √: positive progress; ≈: room for improvement; x: reform needed. This progress overview contains information updated to October 2018.

Three game changers for a competitive, innovative and inclusive nation

For Colombia to realise its potential of a competitive and innovative nation while at the same time offering new opportunities to all its territories and people, the country needs to come to grips with transforming its production base and international insertion. To do so, Colombia needs to leverage on its institutions and experience in policy planning to achieve a shared vision for the future and to create the conditions for implementing it, with a time-horizon that goes beyond the political cycles. Throughout the PTPR, three game changers emerged as key to enabling the country to move forward.

Strengthening the government's planning and anticipatory capacities to shape the future

Colombia has a sound planning process. The country needs to update it to cope with a fast-changing global landscape and to respond to growing demands for accountability and transparency. Colombia also needs to modernise its planning structure to respond to growing societal demands for a quicker path to prosperity, as well as to the private sector call to achieve a more stable, sustainable and pro-business environment.

Using the strength and competence of its bureaucracy and the practice of consultation between different government bodies and the private sector, Colombia could update its planning structure by:

- Creating new incentives to shift the focus from drawing up documents to achieving a shared commitment to budget allocation and policy implementation. This commitment needs to be long-term to provide a major national vision for transforming the economy. A step forward in this direction could be including, as mandatory participation of the Ministry of Finance and Public Credit in the SNCCTI at strategic (Executive Committee) and technical levels (Technical Committees).
- Favouring an inclusive government planning process by requiring that planning documents address national policy challenges instead of specific policies linked to specific ministries. In this way, related topics would be handled in a synchronised way. This would reduce the number of documents elaborated for the CONPES and therefore the number of associated Technical Committees, and make planning more effective. In the past, science and technology, digitalisation and production development were addressed through separate planning processes and discussed in different Technical Committees. This undermined the capacity of national policies and tools to act in a co-ordinated way. The creation of the Ministry for Science, Technology and Innovation could facilitate a better articulation between trade, competitiveness, digitalisation and innovation agenda. The recent introduction of the Delivery Unit in the Presidency of the Republic also aims to respond to this co-ordination challenge. In going forward, this could be instrumental in updating the role of the DNP in the national governance system as strategic centre for policy planning endowed with more operational, results-oriented and forward-looking capacities. Some countries, like Malaysia with PEMANDU, have temporarily linked similar units to the Presidential office and then transferred their powers back to the reformed planning body.
- Advancing in ensuring the participation of all stakeholders to the strategic thinking process. Colombia has made progress in this respect; the PDP 2016-2025 facilitated co-ordination with all regions in the country and across ministries. Consultation with the private sector is now a fact. In going forward, it would be desirable to involve in the consultation an association representing the entrepreneurs to better factor in voices for change. To ensure a better participation of regional actors, Colombia could consider setting up a Conference of Regional Competitiveness Commissions (CRCs) with a rotating presidency. The president in charge could represent the CRCs in the Technical Committees of the SNCCTI to ensure an effective national-regional concertation.
- Endowing the DNP with a centre for strategic thinking and policy foresight. In line with good international practices, Colombia would benefit from increasing its strategic and forward-looking capacities by institutionalising a function to explore future issues and identify new challenges and opportunities. The DNP would seem the right body to host this function to ensure that the results of the strategic foresight processes are embedded in the national strategy as well as in different policies. Targeted training for experts in charge would also be needed and should be included in the overall training of public officials.

Tapping Colombia's productivity potential in all its regions

Colombia can build on its track record of policies and reforms to foster production development. The PDP 2016-2025 represents a step forward, but more needs to be done. Production development policies need to be given higher priority in the national strategy. Only if this is done they will achieve the level of co-ordination, continuity and funding needed to have an impact.

To unlock its competitiveness potential Colombia needs to enable all regions and territories to develop. This requires a two-track approach. The country needs to get the enabling factors right. Red tape and a poor communication infrastructure are holding back productivity and the competitiveness of firms. At the same time, it needs to consolidate past policy efforts and update them by acting on the following issues:

- Improving the prioritisation process. Defining policies based on evidence, as the PDP has done, is a good practice, but international experience shows that, in defining priorities for a national strategy for industrial and production development, a challenge-driven and place-based approach works better. Instead of prioritising products, using a mix of consensus building and pre-identification of activities with export potential based on available trade data, priorities could be better formulated in terms of major national challenges. Addressing key issues such as mobility or greening the economy could provide a clearer indication of major goals to achieve, offer public research institutes common goals to work toward, and provide room for the private sector to organise and co-invest in business and technological development. In defining priorities, it is important to take into account not only administrative regions, but also functional areas, sharing economic characteristics and vocations. This would make policy implementation more effective. It would facilitate the identification and provision of public goods and avoid duplication of efforts, and would transform regional policy into a key driver of national strategy. Working with functional regions requires mechanisms to enable cross-regional and cross-departmental co-operation, such as consortia or pacts for development.
- Openly addressing the opportunities and challenges of Industry 4.0, both for established industries and potential new ones. Colombia has advanced on digital connectivity, and it has taken steps to enable its SMEs to make better use of digital technologies for business. The country needs to complement the current policy focus on technology adoption by identifying potential areas in which it can become an innovator and a creator of knowledge-based solutions (Table 0.2). The setting up of a Ministry for Science, Technology and Innovation can be an important step in this direction, if it will be endowed with a proper budget and if adequate co-ordination mechanisms with the Ministry of ICT and of Industry and Commerce will be established. Several countries, from Germany to Italy, Spain and Chile, are taking steps to benefit from Industry 4.0. The governance of these emerging initiatives is specific to each country and region, but two key features are present in all approaches. There are cross-ministerial committees in which the agencies in charge of digitalisation or the ministries for information and communication technologies (ICT), participate. Furthermore, there are specific public-private committees where the government, the business community (both existing industries and large firms, and small firms and entrepreneurs) academia and research institutions meet to define priorities and respective funding needs and responsibilities. In going forward, Colombia needs to update governance for

production development by including the ministry for ICT in the technical committee in charge of the policy for production development, trade and innovation. Involving workers' associations in these committees would also help achieve better solutions. In Germany, for example, trade and labour unions are actively involved in the public-private dialogue to define the national vision for Industry 4.0.

Table 0.2. A key challenge for Colombia is to shift from technology adoption to creation

	Short term: Adopting digital technologies	Medium and long term: Innovating through digital technologies
Objectives	Improving quality of and access to internet infrastructure Fast-tracking technology adoption in businesses (processes, products, services and organisation) Favouring start-up development and enabling experimentation	Developing new products and services based on digital technologies
Lines of action	Public-private partnerships for infrastructure development. Financing and fiscal incentives for firms to facilitate digital transformation Services to raise awareness and transform mindsets to facilitate technology adoption Updates in public procedures and training for public officials to manage digital programmes for firms Targeted short-term training for entrepreneurs and workers to facilitate technology adoption	Public-private partnerships for strengthening the science and technology infrastructure Public financing for digital research and development through a mission-oriented research fund Public-private financing for disruptive innovation Public investment in innovative training of highly-skilled scientists, engineers and innovators
Beneficiaries	Start-ups, existing firms, employees	Start-ups, existing firms, research and technology centres, networks of innovators

Source: Authors' elaboration based on the High Level Consensus Building Event co-organised by the OECD Development Centre, DNP, ANDI and CPC in Bogotá, Colombia in October 2018.

- Better use of available resources of the funds from National Royalties System. The earmarking of 10% to regional innovation represents a positive reform. Colombia is also progressively making the royalties system more effective. Since 2018, the limitation that only public actors could present projects for approval has been removed, allowing private entities to present project proposals and obtain funding to implement them. The mechanism for project selection and disbursement is, however, quite cumbersome and, in many cases, available resources are not actually used. It is important simplifying the procedures and making them more operative, as well as establishing mechanisms to support weaker regions in developing high quality projects.
- Introducing a national challenges innovation fund. Colombia lacks instruments to address big challenges. The innovation fund in the National Royalties System can only finance projects presented by and implemented in the regions. The fund operates more as a series of regional innovation development funds than as a national innovation fund. Colombia could overcome this gap in financing mechanisms by introducing a para-fiscal fund targeting one or two major national innovation challenges, for example mobility and green economy. Para-fiscal funds are already used in Colombia to earmark certain government revenues to provide services and financing to specific programmes, including research and technology transfer in agriculture. If the country chooses this path, it should also address some of the weaknesses of this mechanism, such as the risk of capture by

established beneficiaries. An option would be to set up a tripartite management committee, with representatives from relevant government agencies, the private sector and the research community, to ensure a more effective and forward-looking use of these funds.

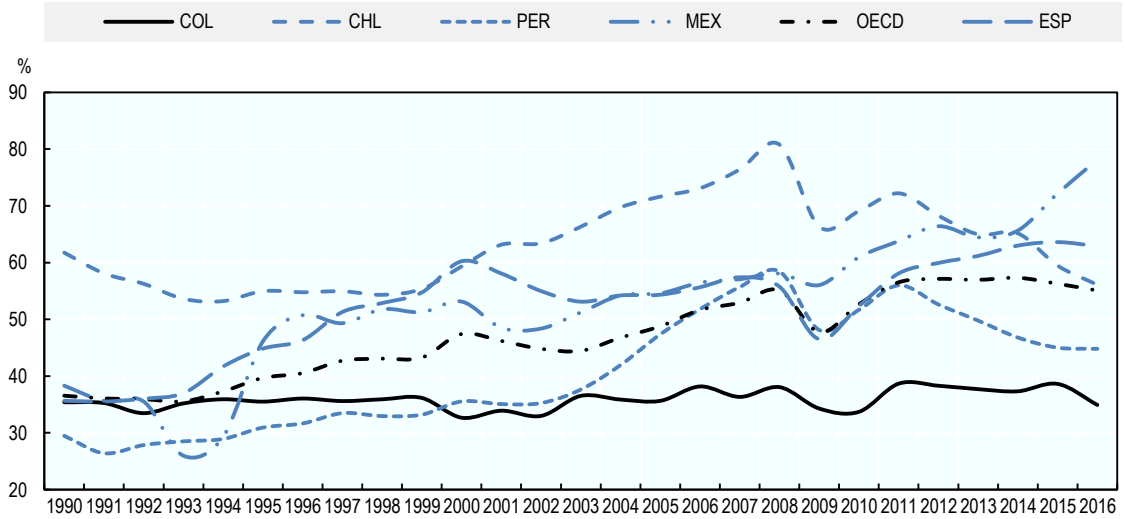
- Consolidating support for start-ups and creating mechanisms to link them to local ecosystems. Colombia has advanced in start-up promotion since 2012, when iNNpulsa was established, by the Ministry of Trade, Industry and Tourism, as an agency in charge of entrepreneurship. The country has updated its policy mix in line with international practices and now offers integrated support for start-uppers, matching financing with mentoring and access to services. It has also improved the legal framework for start-ups. It has revised the 114 procedures linked to setting up and managing a business by eliminating 5, simplifying 56, and digitalising 43. It passed a law in 2017 to regulate university spin-offs to facilitate technology transfer and then a decree in 2018 to regulate crowdfunding. Colombia would benefit from continuing to simplify the legal framework for doing business. The country could consider learning from the piloting of the one-stop shop that the city of Bogotá has implemented to facilitate access to information and government support for new businesses. Colombia would also benefit from defining targeted mechanisms to connect start-ups with the industrial ecosystems of the country. This could be done also through partnerships with large firms and research centres across the whole territory.
- Capacity building in lagging regions and territories. Colombia suffers from high heterogeneity in regional development and public policy capacities in regions and departments. Colombia could call on the capabilities of lead areas, such as Bogotá, Medellin, and Cali, to set up mechanisms for knowledge sharing with lagging regions and departments.

Activating mechanisms to benefit more from trade and investment

Since the 1990s, exports have tripled in volume, but trade as a percentage of GDP in Colombia has remained stable at 36%. This can be partly explained by the size of the economy and by a growing reliance on the domestic market with an increasing population and middle class. This figure is significantly below the OECD average of 55%, and differs from other countries in the region which show a more dynamic trade integration (Figure 0.12).

Figure 0.12. Trade over GDP remained stable and relatively low since the 1990s in Colombia

Trade as share of GDP, Colombia and selected countries, 1990-2016



Source: Authors' elaboration based on World Bank data, 2018,. https://data.worldbank.org/.

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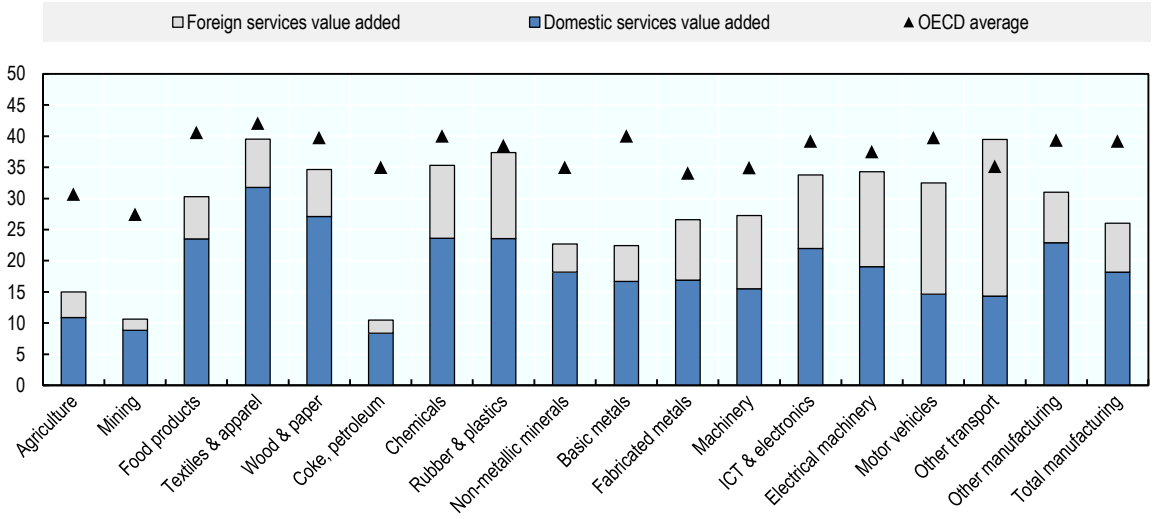
Colombia needs to activate mechanisms to benefit more from trade and investment. To do so the country could:

- Advance in achieving export diversification. As a way to decrease the dependency on natural resources, and especially oil, Colombia could look at deepening and benefiting more from regional integration and also pointing to improving its participation in global value chains (GVCs). Colombia's participation to GVCs is limited. The foreign value added content of domestic exports is among the lowest in Latin America: 9% for Colombia in 2014, compared to 20% for Chile, 13% for Peru and 12.5% for Argentina in the same year. This is explained by its export specialisation in natural resources, and also by the limited development of its domestic industrial base. Colombia could improve its participation in GVCs through services. In Colombia, the value added of services in gross domestic exports is 32% (according to the TiVA-Trade in Value Added- estimates for 2014), while the OECD average is 55%. This gap is particularly evident in mining, oil and coal, indicating the lack of sophistication of these activities in the country (Figure 0.13).

Figure 0.13. Colombia could improve its participation to GVCs through services

Share of services content in domestic industrial gross exports, 2014



Source: Authors' elaboration on OECD-WTO Trade in Value Added Nowcasting database, 2018 http://www.oecd.org/sdd/its/tiva-nowcast.htm.

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- Continue modernising the quality infrastructure to enable domestic firms to operate in an Industry 4.0 and fast-changing industrial landscape. Further progress could be achieved by implementing reforms in the following areas:
  - Making the quality infrastructure system work for innovation. The institutions are still perceived as "regulators" rather than catalysts for innovation. The recognition in 2018 of the INM as a national scientific research institute by Colciencias is a step forward. This reform brings Colombia in line with international practices, and it could help instil a pro-innovation attitude in the institute and enable its participation in public-private research projects. Continuing strengthening the quality infrastructure system a key component of the productivity agenda is a desirable step.
  - Creating a Scientific Advisory Board for INM. This could foster a pro-innovation attitude and facilitate co-ordination between different policies and with the private sector.
  - Supporting digitalisation more fully. The Laboratory for Electrical Magnitudes of the INM is preparing to support digitalisation. However, Colombia lacks laboratories in areas such as acoustics, photometry and radiometry, which are enabling factors for Industry 4.0.

- Increasing strategic co-ordination between industrial development, trade and investment policies. In 2014, the transformation, of the traditional export promotion agency into ProColombia, coupling export promotion and FDI, brought Colombia in line with OECD practices. More needs to be done to benefit from trade and investment. Trade and investment agreements, if properly negotiated, could include provisions to foster learning in domestic firms. While free trade agreements commonly include provisions for technology transfer and technical co-operation, Colombia has not taken advantage of this in its current bilateral agreements. Other countries in the region, such as Chile and Peru, are benefiting from such provisions.

Chapter 1. What is in Colombia's next economic chapter?

Colombia, the fourth largest economy in Latin America, is back on stage after decades of conflict. The country is looking to open up opportunities for all by addressing its structural challenges, benefiting more from trade and investment and increasing productivity. This chapter reviews the structural performance of Colombia in the last two decades and identifies opportunities going forward.

Introduction

Colombia is the fourth biggest economy in Latin America, after Brazil, Mexico and Argentina, with a GDP of USD 714 000 million (constant 2010 PPP), almost half that of Spain and 1.5 times that of Chile. It is also the third most populous country in the region, after Brazil and Mexico, with a population of 45.5 million inhabitants (DANE, 2018[1]). In the last decade, the country underwent a major transformation underpinned by the pacification process, which ended half a century of conflict. This has boosted investor confidence while the country has been looking to re-brand itself as a nation open to business and innovation

The goal of the National Development Plan 2018-2022 is to unleash opportunities for all while moving towards a more equal society (*Gobierno de Colombia, Bases del Plan Nacional de Desarrollo 2018-2022*). This Production Transformation Policy Review (PTPR) of Colombia provides elements based on peer-review and rigorous comparative analysis to help the country along its reform process.

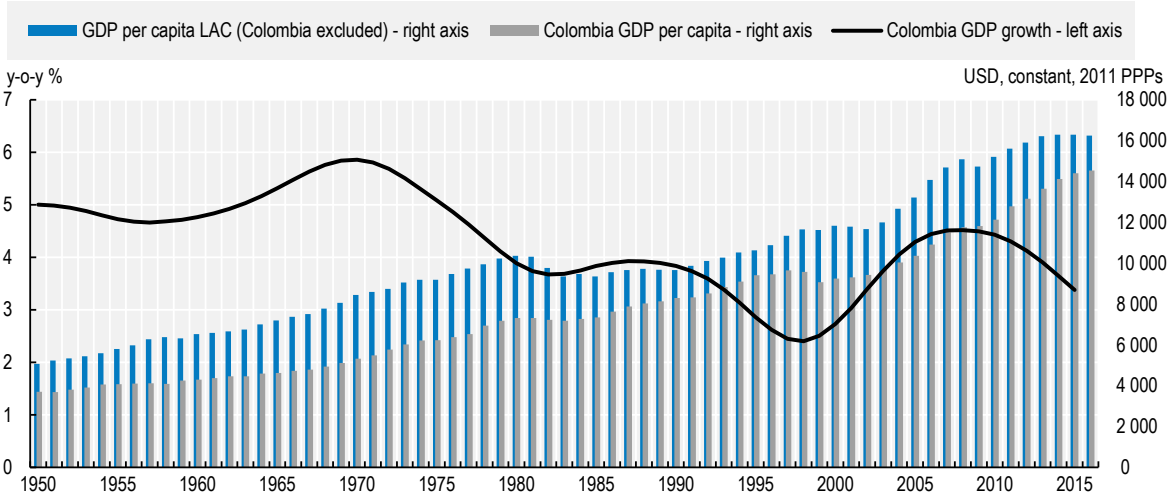
This chapter reviews the structural performance of Colombia, with a focus on the last two decades. It identifies three pending obstacles to Colombia's development and three gaps which must be addressed to achieve prosperity. The report is composed of two additional chapters; the second reviews governance and policies for production transformation, and the third focuses on how digital technologies could improve business development in the country.

A growing and relatively stable economy

Colombia is a growing, relatively stable economy. Since 2000, Colombia has been growing at an annual average rate of 4.3%, almost doubling the rate of growth of Latin America which grew on average 2.6% during the same period. GDP per capita also increased by 50% from USD 9 400 (PPP) in 2000 to USD 14 900 (PPP) in 2017 (Figure 1.1). As a consequence, middle classes now account for almost a third of the population and the poverty rate decreased from 50% to 28% between 2000 and 2016. However, much still needs to be done to end poverty in the country, and the economy has not achieved the progress of other countries in the region: in Chile, for example, the poverty rate is 12% and in Peru it is 20%.

Figure 1.1. GDP Colombia, 1950-2017

GDP growth (left axis) and GDP per capita (right axis).



Note: For the choice of the Lambda in HP filter we follow the guidelines from OECD (2016), *OECD Compendium of Productivity Indicators 2016*, OECD Publishing, Paris.
Source: Authors' elaboration based on the Conference Board Total Economy Database™, 2018 https://www.conference-board.org/data/economydatabase/.

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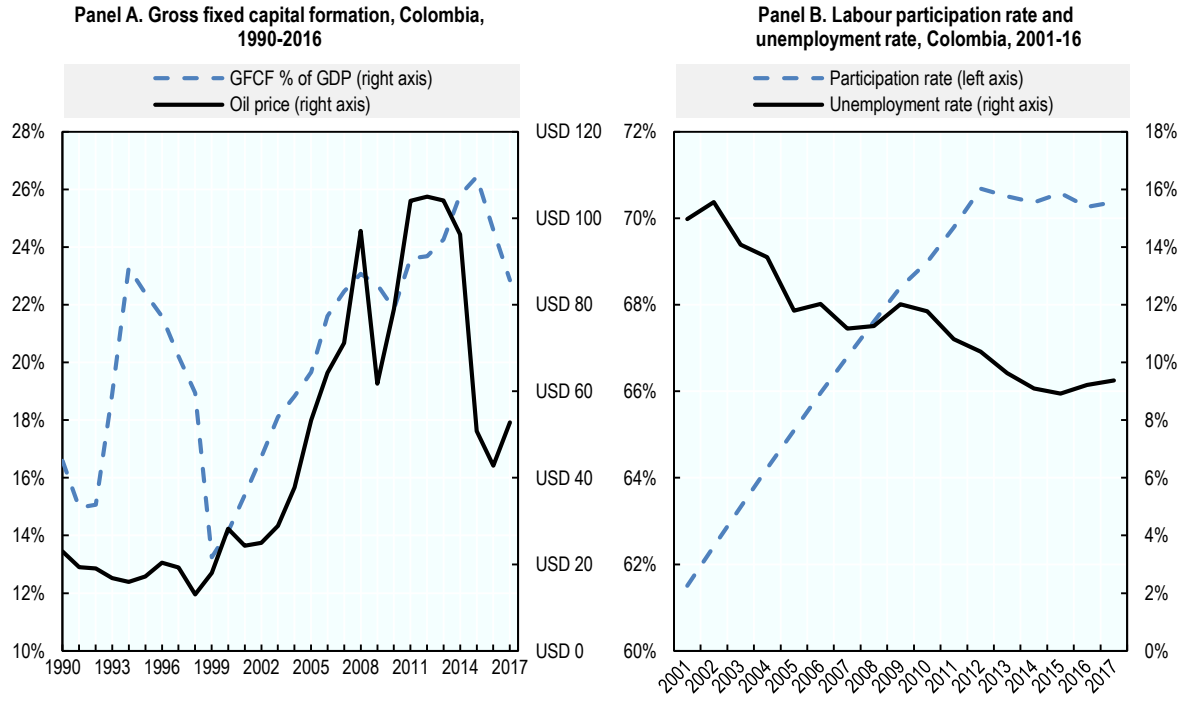
Capital investment and the expansion of labour supply have been the main drivers of growth since 2010. Average gross fixed capital formation (GFCF) reached 27.6% of GDP in 2010-17, compared to 20% in 2002-10 and 18% in the 1990s (Figure 1.2, Panel A). The labour force participation rate reached 74.1% in 2017, compared to 67% in 2007 and the unemployment rate declined from 15% in 2001 to 9% in 2017 (Figure 1.2, Panel B). However, the reforms which opened the economy starting in the early 1990s, favoured capital accumulation mostly in natural resource intensive activities. As an example, more than half of the country's total Foreign Direct Investment (FDI) stock is concentrated in the mining (34%) and oil sectors (19%), making Colombia vulnerable to reductions in global demand and the price volatility of commodities. Furthermore, the demographic bonus that supplied the labour market during the last twenty years is expected to come to an end. The share of population over 60 represented 7% of the total in 2000, but is expected to reach 15% in 2025 and 21% in 2050, with a consequent reduction of the working-age population (Gómez and Higuera, 2018[2]; UNDESA, 2014[3]).

Figure 1.2. Capital investment and labour participation have been the main driver of growth



Note: Crude Oil, simple average of three spot prices; Dated Brent, West Texas Intermediate, and the Dubai Fateh, USD per barrel.
Source: Authors' elaboration based on OECD Economic projections database, ILOSTAT database, International Monetary Fund, World Economic Outlook Database, 2018, https://stats.oecd.org/ https://www.ilo.org/ilostat;https://www.imf.org/en/Data.

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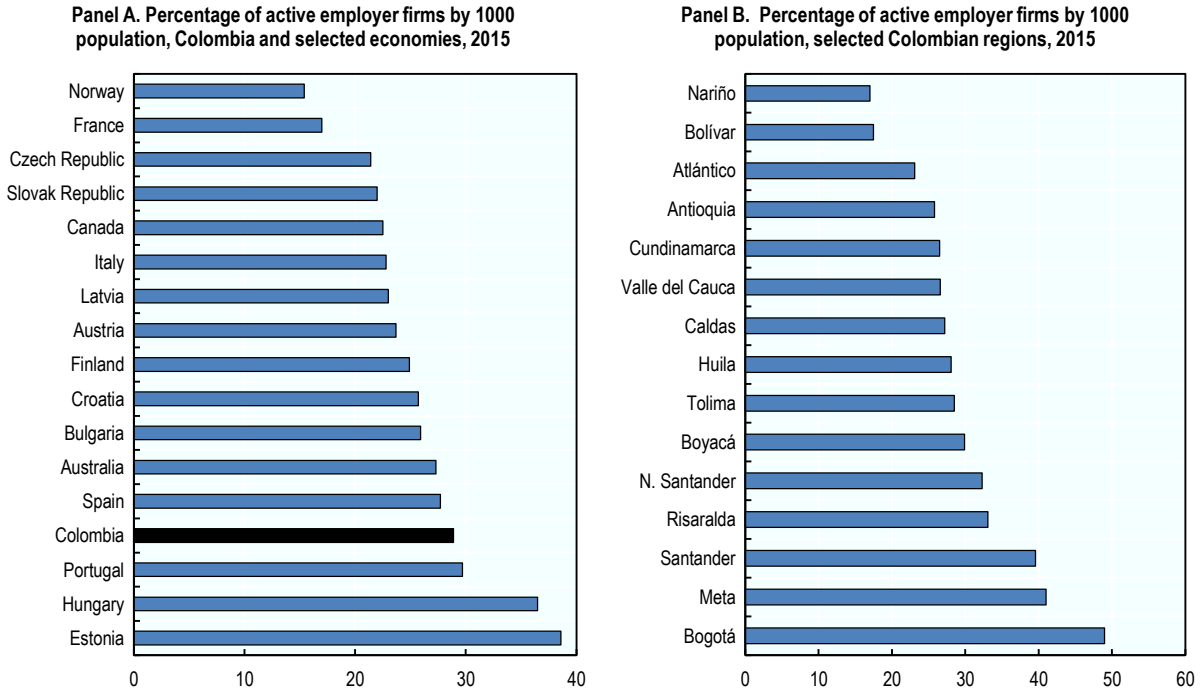
Firms' structure could be stronger

Colombia has a high firm density (number of active firms per 1 000 people) (Figure 1.3). However, the country has a comparatively high share of micro firms (92% of total firms) compared to the OECD average of 80% (Table 1.1). Moreover, even though a growing number of firms are created every year (the number of new firms increased by 15% in 2001-15), seven out of ten firms fail in the country within five years (Figure 1.4). Survival rates differ with respect to firm size. Large and medium-size firms in Colombia, as elsewhere in the world, have higher survival rates (71.4% of large firms and 68% of medium firms are still active after five years, while only 29% of micro-enterprises survive). In addition, the informal sector in Colombia offers uncertain job prospects. Nearly half of all workers in the main cities work in the informal sector, although the percentage has fallen in recent years (OECD, 2019). Colombia is taking steps to tackle business informality. In January 2019, the national government approved the Business Formalization Policy (reference document: CONPES 3956). This policy aims at reducing the costs associated with formalisation, and increasing the corresponding benefits.

Figure 1.3. Colombia has a high firm density



Source: Authors' elaboration based on OECD Regional Business Demography Database and RUES database and Registro Único Empresarial y Social [Single Enterprises and Social Registry]- Confecámaras, Colombia, 2018, http://www.oecd.org/cfe/regional-policy/regional-business-demography.htm; https://www.rues.org.co/.

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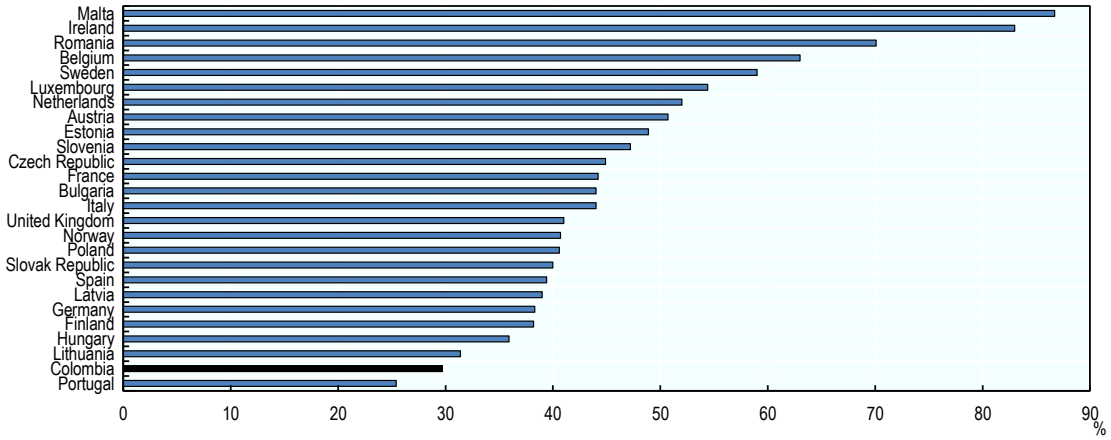
Table 1.1. More than 90% of firms in Colombia are micro-enterprises, 2015

	Type of firm	2011	2012	2013	2014	2015
	Large (200+)	4 036	4 837	5 425	5 822	6 361
		0.3%	0.4%	0.4%	0.4%	0.5%
SMEs	Medium (51-200)	12 129	14 619	16 780	18 376	19 980
		1.0%	1.2%	0.1%	1.3%	0.1%
	Small (11-50)	49 976	58 921	68 308	73 987	79 926
		4.2%	4.8%	5.3%	5.4%	5.8%
	Micro (up to 10)	1 131 432	1 154 360	1 208 278	1 272 292	1 273 017
		94.5%	93.6%	93.0%	92.8%	92.3%
	Total	1 197 573	1 232 737	1 298 791	1 370 477	1 379 284

Note: Size class classifications in Colombia are defined according to the parameters contained in Law 905 of 2004. This involves three different indicators with three different thresholds – the monthly salaries in force (SMMLV), the total assets and the number of employees. Size class definitions of OECD statistical indicators divide enterprises into four typologies: Micro (1-9 persons employed), Small (10-49 persons employed), Medium (50-249 persons employed) and Large (250+ persons employed). However, some countries, like Colombia and Australia, set the limit at 200 employees, while the United States considers SMEs to include firms with fewer than 500 employees.
Source: Authors' elaboration based on (Confecámaras, 2016[4]) .

Figure 1.4. In Colombia seven out of ten companies fail within five years of creation

Firms' survival rate after five years, Colombia and selected economies, 2015



Source: Authors' elaboration based on OECD SDBS Business Demography Indicators Database and RUES database - Registro Unico Empresarial y Social [Single Enterprises and Social Registry]-Confecámaras, 2018 Colombia, 2018 https://www.rues.org.co/ https://stats.oecd.org/

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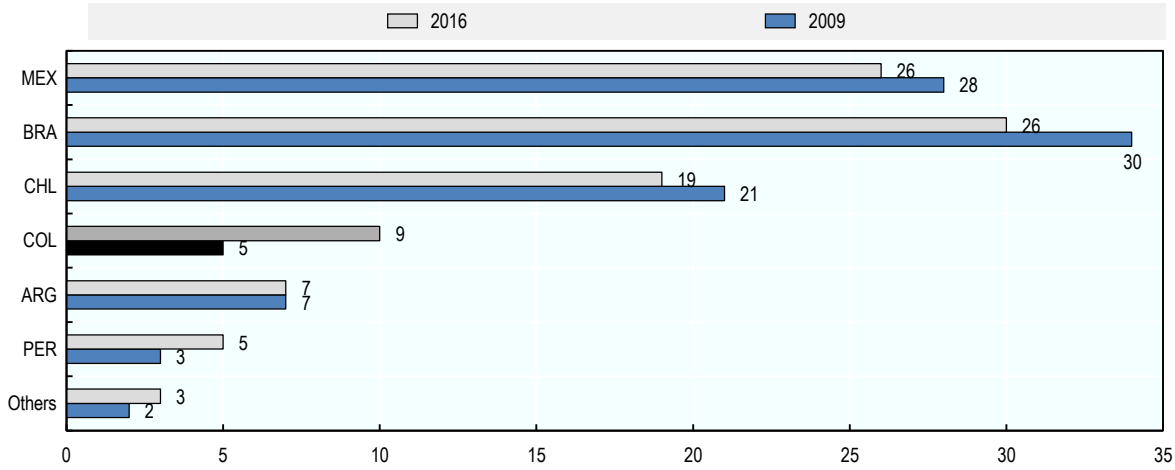
Colombia has few *multilatinas* but their number is growing. *Multilatinas* are Latin American companies that have outgrown their home markets and become multinational according to the America Economica Ranking (America Economica, 2016[5]). Colombia has doubled the number of these firms in the last decade. As of 2016, Colombia had 10 *multilatinas*, while Chile had 19 (Figure 1.5). Colombian *multilatinas* – the core business of which is aeronautics, food and beverage, manufacture of non-metallic products, finance and insurance, oil and gas, electricity and multisector products – generate on average 40% of their turnover abroad. These firms are less oriented to foreign markets than *multilatinas* from Chile and Mexico that generate slightly more than 50% of their turnover from operations abroad. In Brazil, however, these firms generate just 35% of their turnover in foreign markets.

Figure 1.5. Number of multilatinas, Colombia and selected economies, 2009 and 2016



Note: The ranking considers companies with over USD 250 million in 2015, originating from Latin American countries and with relevant operations in at least two countries different from the one of origin. The top 100 companies' ranking is measured as an index that accounts for: share of annual sales achieved outside the country of origin (25%): share of employees abroad (25%): Geographical coverage (20%), and Expansion (30%). For more detailed information see https://rankings.americaeconomia.com/2016/multilatinas/metodologia.
Source: Authors' elaboration with information from Multilatinas Ranking 2016, America Economía, 2018.

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Three unsolved matters in Colombia's economic development

This section provides an analysis of three main persistent challenges that Colombia needs to address to achieve greater prosperity: diversification, productivity and integration in the world economy.

The economy is becoming less diversified and sophisticated

Colombia's industrialisation process dates back to the beginning of the twentieth century. For example in 1907 Coltejer was founded in Antioquia. It went on to become one of the biggest textile companies in Latin America, The industrialisation process, strongly linked with the Antioquia region, accelerated in the aftermath of the 1929 financial crisis when importing from the United States and Europe became more difficult, and import substitution policies facilitated local industrial development. It was in those years that textile, food and beverage and chemical complexes started to develop (Ocampo, 2017[6]).

Since the 1990s, Colombia has witnessed a progressive specialisation in exporting natural resources and commodities, and the GDP structure has shifted towards social, personal and financial services, which now account for almost 40% of GDP. Manufacturing, which in the 1980s was the top economic activity as a percentage of GDP, now comes third, with its share of GDP falling to less than 12% (Figure 1.6). Wholesale, retail and business services, have been driving job creation. Employment grew at an annual average of 2% in 2001-2017, with employment in service sectors increasing the most. Almost 30% of the new jobs generated in the last decade have been in wholesale and retail (Figure 1.7).

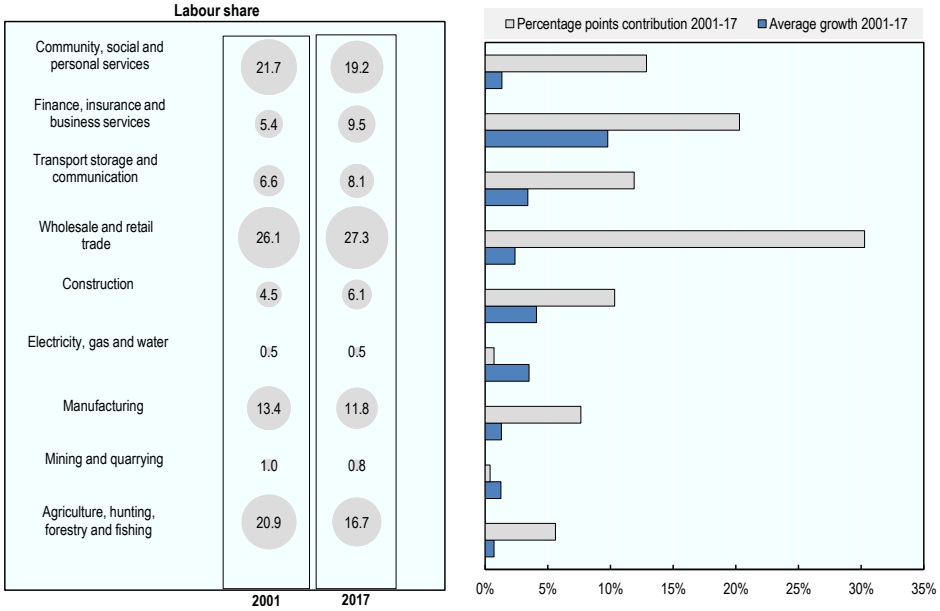
Figure 1.6. Manufacturing as a percentage of GDP in Colombia is today half of what it was in the 1980s

Share of GDP by economic activity

Source: Authors' elaboration on OECD National Accounts and DANE, 2018 https://stats.oecd.org/; https://www.dane.gov.co.

StatLink https://doi.org/10.1787/888933910509

Figure 1.7. Employment by economic activities, Colombia, 2001-17



Note: Data for 2017 are provisional.
Source: Authors' elaboration on OECD National Accounts and DANE, 2018 https://stats.oecd.org/; https://www.dane.gov.co.

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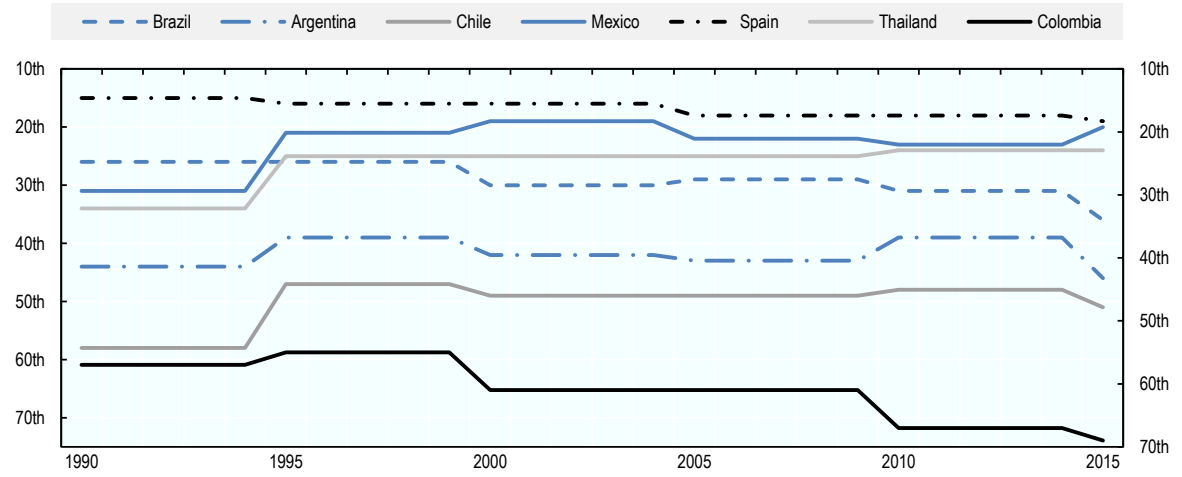
Despite a relatively long tradition of manufacturing in Colombia, this activity is becoming less relevant and less competitive. From 1990 to 2015, Colombia fell in the United Nations Industrial Development Organization (UNIDO) Competitive Industrial Performance (CIP) index ranking, which benchmarks the ability of countries to produce and export manufactured goods competitively, from 57th to 69th position. During the same period Chile moved from 58th to 51st and Mexico from 31st to 19th (Figure 1.8). Colombia's drop in the CIP ranking is explained by the decrease in the share of value added of medium and high technology manufacturing. It declined from 25% in 1995 to 21% in 2015. As countries develop, value added manufacturing as a percentage of GDP frequently decreases, but in Colombia the reduction happened at a relatively earlier stage when compared with other OECD countries (i.e. when the country was at a lower level of GDP per capita than OECD countries (Figure 1.9). This trend signals a premature loss of manufacturing capabilities that could weaken the capacity of the local productive system to develop and diversify in the future (UNIDO, 2017[7]; Martínez, Ortiz and Ocampo, 2011[8]; UNCTAD, 2016[9]; Ramírez and Higuera, 2017[10]).

Figure 1.8. Competitive Industrial Performance (CIP) index ranking, Colombia and selected countries, 1990-2015



Source: Authors' elaboration based on UNIDO CIP data, 2018 https://stat.unido.org/database/CIP.

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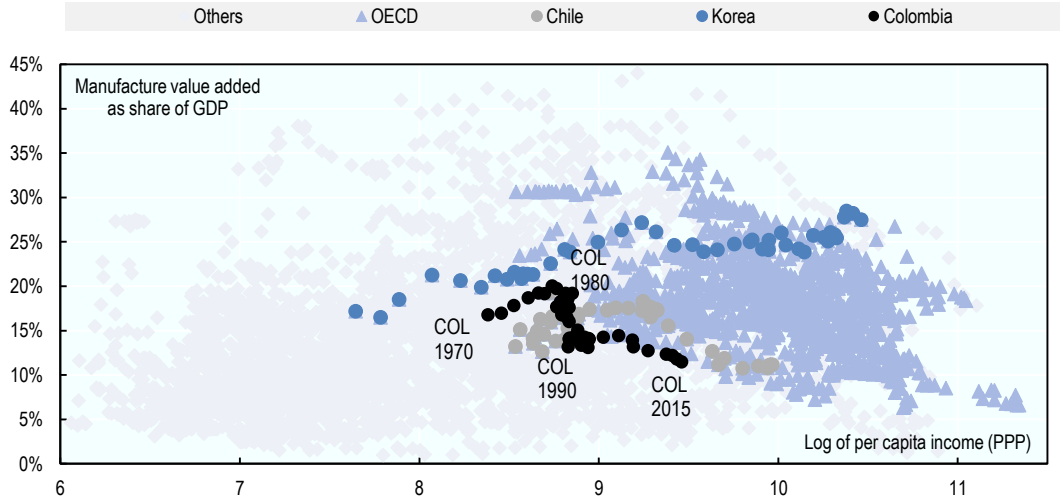
Figure 1.9. Manufacturing value added (MVA) and GDP per capita, Colombia and OECD economies, 1970-2015



Note: Per capita income is in purchasing power parity (PPP) to secure comparability across time and countries. The transformation in a log-scale is useful to inform to the relative changes (multiplicative) of the per capita income.
Source: Authors' elaboration based on UNIDO CIP data and World Bank Databank, 2018.

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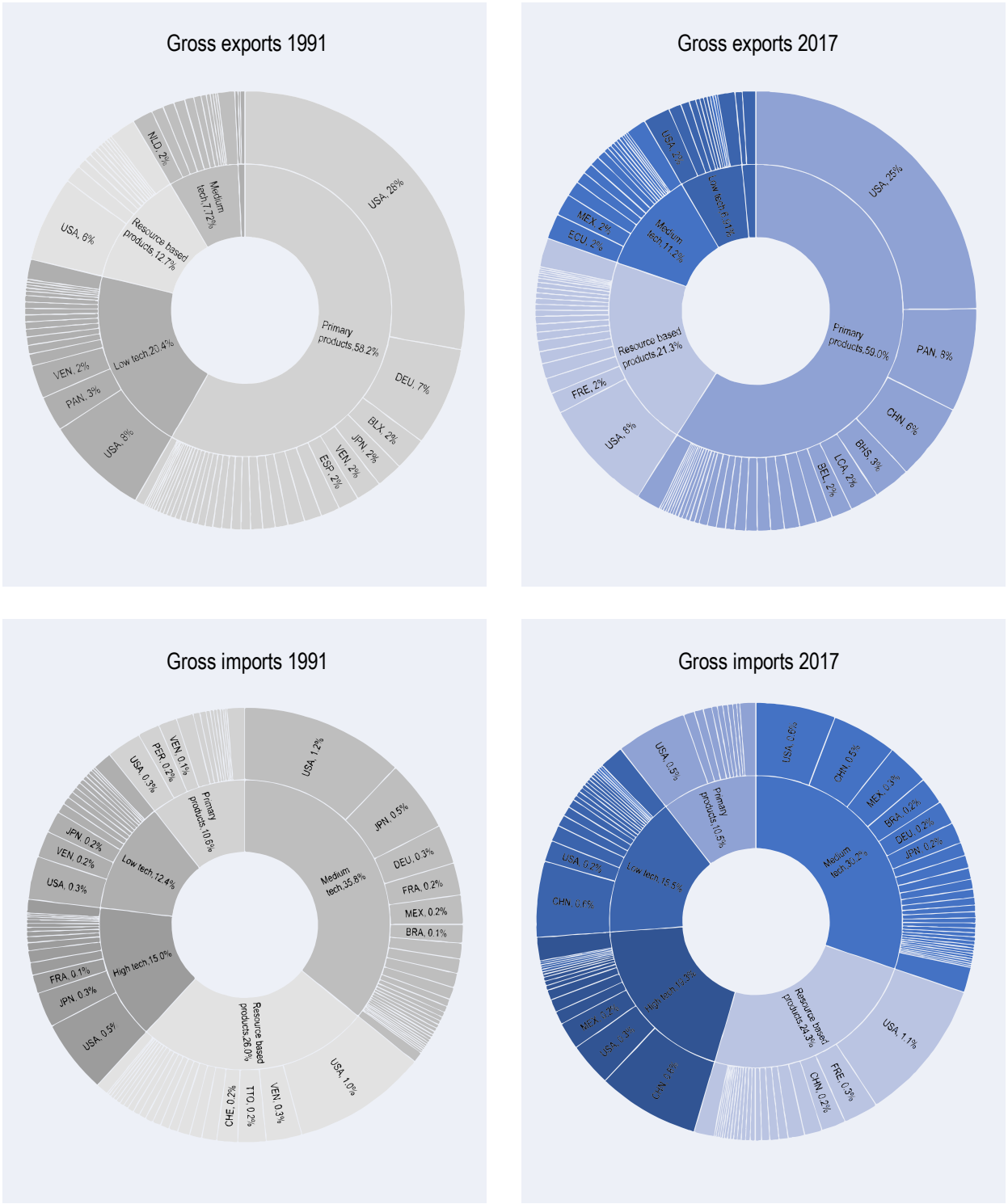
Colombia mostly exports natural resources. In 2017, primary production and natural resource-based products accounted for 80% of exports, 10% more than in 1990 (Figure 1.10). Medium technology-intensive exports account for 11% of total exports, followed by low technology (7%) and high technology (3%) exports. At the product level, of the total of USD 37.8 billion (FOB) of exported products 34.5% were oil and its related products; 19.6% coal, coke and briquettes; 8.1% chemical and related products; 4.8% gold, and; 3.7% flowers. These top five products accounted for 70% of all exports. The United States is the main trade partner for Colombia, but the country is diversifying its source and destination markets. The United States accounts for almost 30% of domestic exports, while in the 1990s that share was almost 40%. China, in line with what is happening in other countries in Latin America, is an increasingly important partner for Colombia. It accounts for more than 20% of Colombia's imports, displacing Japan, and second only to the United States. Colombia imports mostly high and low technology products from China and primary and medium technology products from the United States. China, accounts for 5.5% of total Colombian exports, mostly linked to natural resources.

Regional trade is still limited, though it has slightly increased since the 1990s. About 10% of Colombia's total gross exports goes to the countries of the Pacific Alliance. These countries accounted for only 6% of gross exports in the 1990s. Imports have also increased, and the Pacific Alliance accounts today for 11% of total domestic imports, up from 6.5% in the 1990s. As Venezuela declined in importance as a trading partner, Colombia has increased its commercial ties with other countries in the region. Brazil, Panama, and Ecuador, for example, are now among the top ten destination markets for Colombian products with 3%, 5.8% and 4% of exports respectively. In 2000 they absorbed 2%, 1.5% and 3.4% (UN, 2018[11]).

Figure 1.10. Exports and imports, by partners and technology intensity, Colombia, 1991-2017



Note: The technological classification follows Lall, S. (2000) and Aboal et al (2015).
Source: Authors' analysis based on UN (2018), Comtrade Database, https://comtrade.un.org.

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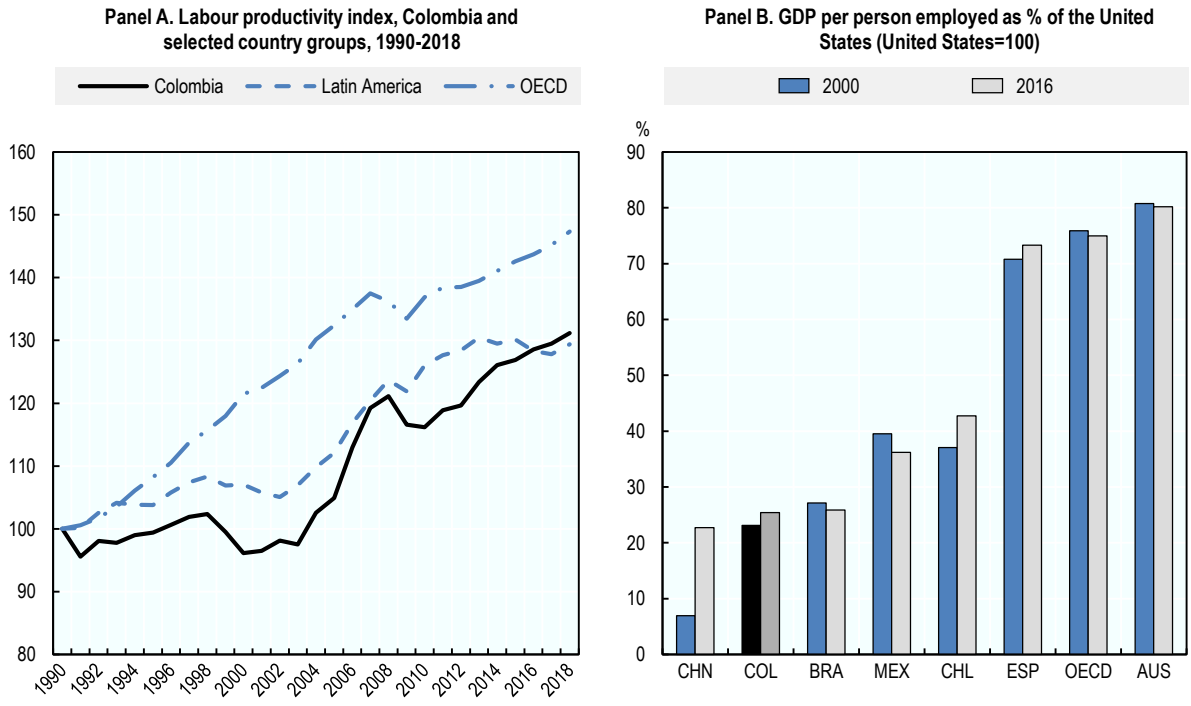
The productivity gap with the frontier persists

Labour productivity grew on average 1.8 % in 2001-2016 in Colombia, but the gap with frontier economies persists (Figure 1.11, Panels A and B). Since the 2000s, Colombia's labour productivity has been 25% of that of the United States. In contrast, during the same period, China's productivity gap with respect to the United States decreased by 400%. In addition, estimates suggest that the labour productivity gap between Colombia and the OECD explains four-fifths of the income gap between the two (OECD, 2017[12]).

Figure 1.11. The productivity gap persists in Colombia



Source: Authors' elaboration based on the OECD National Accounts and Conference Board Total Economy Database™ (Adjusted version), 2018 https://stats.oecd.org/; https://www.conference-board.org/data/economydatabase/.

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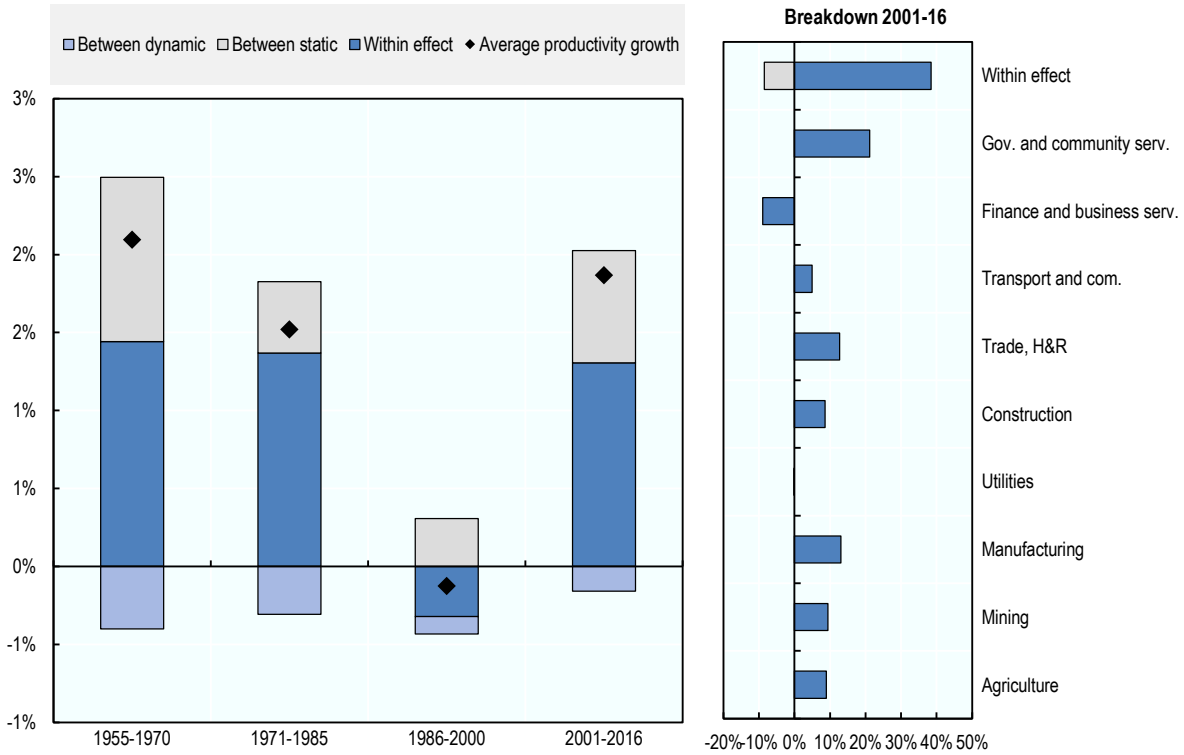
The absence of a shift of labour to more dynamic sectors – activities in which productivity grows faster than the average- contributes to explain the persistency of the productivity gap with respect to the frontier (Figure 1.12). This is common in Latin American countries, while the dynamics of productivity in South East Asian economies have been the opposite: productivity increases have been determined by a change in specialisation towards more dynamic activities (Lavopa and Szirmai, 2018[13]; Diao, McMillan and Rodrik, 2017[14]; UNCTAD, 2018[15]; Timmer, de Vries and de Vries, 2015[16]). In Colombia, efficiency improvements and technological change within sectors explain almost 70% of labour productivity gains between 2001 and 2016. In addition, persistent structural gaps, such as poor infrastructure, low investment in innovation and structural heterogeneity (i.e. a relatively higher share of employment in low productivity activities) hamper the impact of productivity growth (Figure 1.13).

Figure 1.12. Decomposition of labour productivity growth by effect and economic activities, Colombia



Note: The within effect measures the productivity growth in each sector of the economy due to capital, human and technological accumulation. The between effect (or reallocation) measures the productivity growth due to labour reallocation from less to more productive sectors. The between effect can be broken down into two effects: static, which measures the extent to which labour moved to sectors with above-average productivity level, and dynamic, which measures the joint effect of changes in employment shares and productivity growth in a sector.

Source: Authors' elaboration based on Penn State GGDC 10-Sector Database, DANE and OECD national accounts, 2018, https://www.rug.nl/ggdc/productivity/10-sector/; https://stats.oecd.org; https://www.dane.gov.co.

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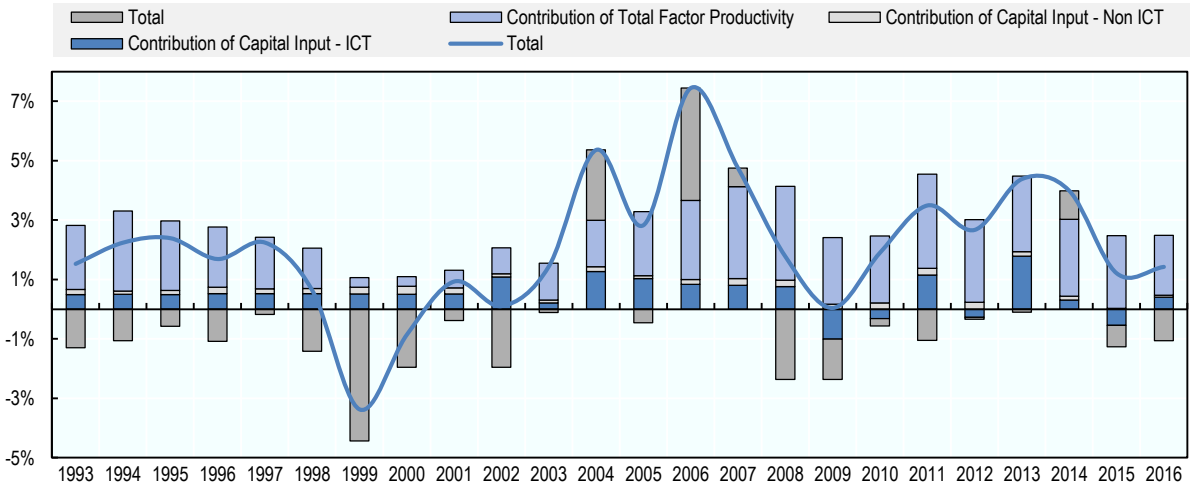
Figure 1.13. Decomposition of labour productivity growth, Colombia, 1993-2016



Source: Authors' elaboration based on the DANE and Conference Board Total Economy Database™ (Adjusted version), 2018, https://www.dane.gov.co; https://www.conference-board.org/data/economydatabase/index.cfm?id=27762.

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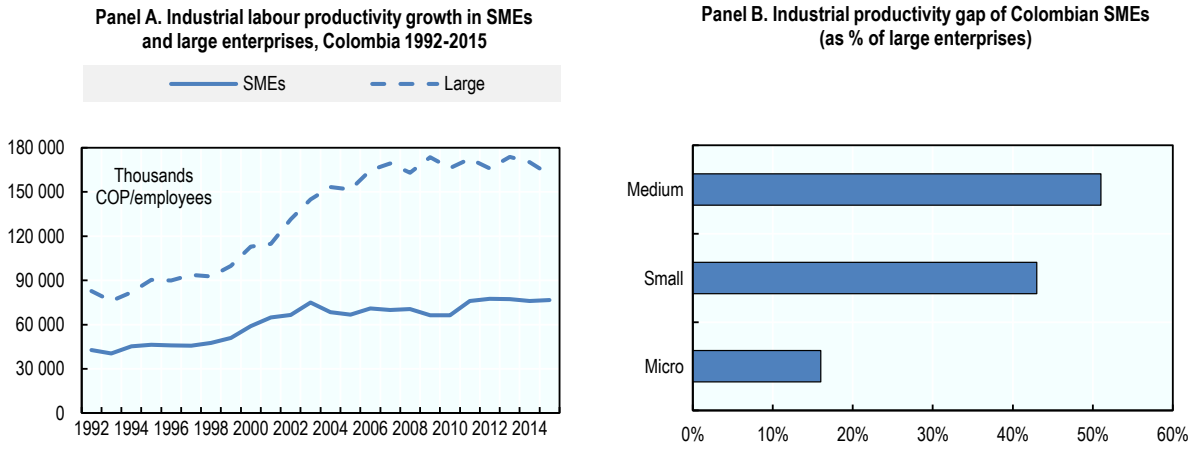
SMEs productivity lags in Colombia. In 2015, the labour productivity of micro-enterprises was just 16% that of large firms. For small and medium enterprises the figure was 43% and 51% respectively (Figure 1.14). Heterogeneity of firm-level productivity is common around the world, but the dispersion in Colombia is much higher than in OECD countries in general. In Colombia, firms in the 90th percentile of the productivity distribution are more than 500% more productive than those in the 10th percentile, in contrast with 200 % for equivalent firms in the United States (Busso, Madrigal and Pagés, 2013[17]; Olaberría, 2017[18]).

Figure 1.14. SMEs in Colombia face an increasing productivity gap



Source: Authors' elaboration based on DANE-EAM DANE-Microestablecimientos Colombia (2016) 2018. https://www.dane.gov.co.

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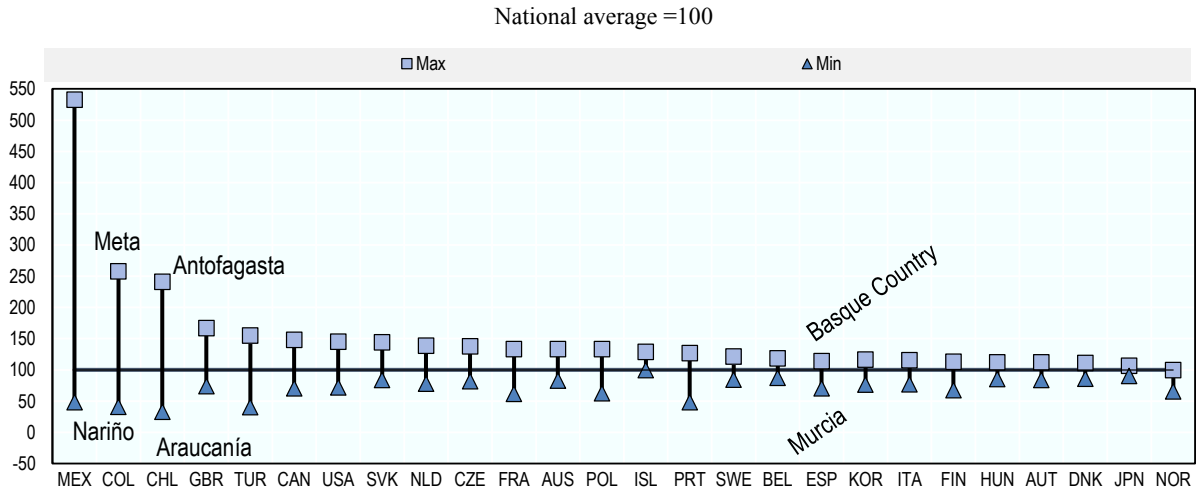
Colombia also suffers from the second highest labour productivity gap between regions in the OECD, after Mexico. This reflects regional differences in economic specialisation, such as mining, which drives up labour productivity in some regions (Figure 1.15). Nariño, a small department located in the south west of the country with an agricultural vocation, is 2.5 times less productive than the national average and 6 times less productive than Meta the top region, a department specialised in natural resource extraction. High inter-regional variation in productivity limits the development of effective national supply chains and reduces the aggregate productivity potential of the economy. In Spain, for example, the top region (the Basque Country) is only 1.6 times more productive than the bottom region (Murcia); the gap between the top and the bottom in Colombia is more than three times higher.

Figure 1.15. Regional variation in labour productivity, Colombia and selected countries, 2016



Note: The labour productivity is calculated by taking into account all business activities (ISIC 3.1)
Source: Authors' elaboration on OECD Regional Statistics database, 2018. http://www.oecd.org/governance/regional-policy/regionalstatisticsandindicators.htm.

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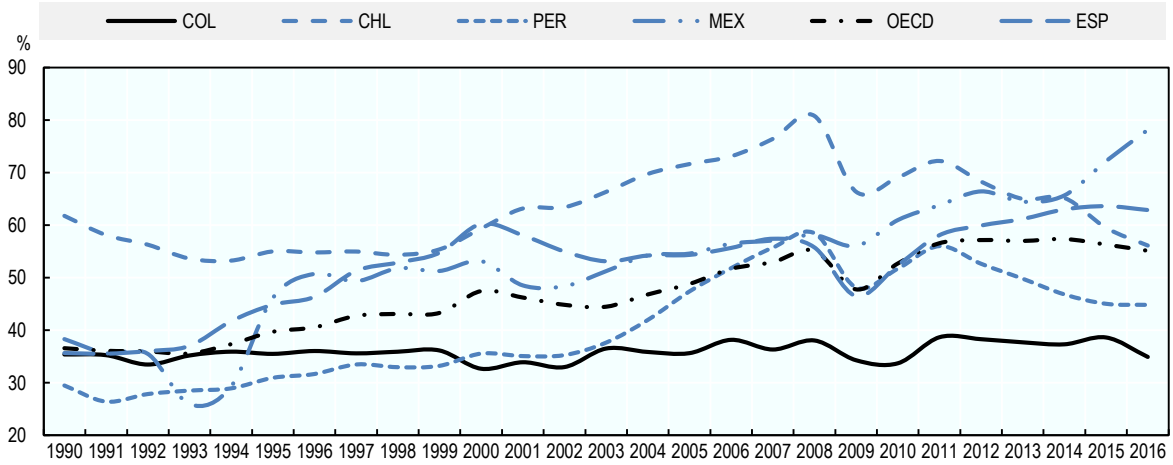
Trade and investment could deliver more to the local economy

Colombia has not yet fully reaped the dividends from trade and investment. It has been a member of the customs union of the Andean Community (with Ecuador, Peru and Bolivia) since 1969, and, in the mid-1980s, it ratified bilateral preferential trade agreements with its traditional partners (such agreements with Nicaragua and Costa Rica came into force in 1984). Since the 1990s, in line with other countries in the region, Colombia has embraced a targeted process of economic liberalisation. The creation of the Ministry for Foreign Trade in 1991 exemplified this willingness to prioritise trade openness as a driver of development. In the mid-1990s, bilateral and regional trade agreements were ratified with Central American and Caribbean trade partners and the country joined the World Trade Organisation (WTO). Free trade agreements were ratified with the United States in 2012, with the European Union in 2013 and with Korea and the Pacific Alliance in 2016, and represent additional important steps in the densification of the network of agreements of the country.

Since the 1990s, exports have tripled in volume, but trade as a percentage of GDP in Colombia has remained stable at 36%. Even though this could be explained by the size of the economy and by a growing capacity to rely on the domestic market with an increasing population and middle classes, this figure is significantly below the OECD average of 55%, and differs from other countries in the region that show more dynamic trade integration. Over the same period (1990-2016), Chile, Peru and Mexico almost doubled their trade as a percentage of GDP growing respectively from 35% to 56% (Chile), from 29% to 45% (Peru) and 38% to 76% (Mexico) (Figure 1.16). Colombia could do more to benefit from trade and investment. A positive aspect is that the country has a lower Services Trade Restrictiveness Index (STRI) than the OECD average. Colombia scores lower than the OECD average in 14 out of 22 sectors, with broadcasting being the sector ranking significantly higher than the average STRI across the OECD. This means that Colombia's national laws and regulations restrict trade in services less than in the average OECD country (Figure 1.17).

Figure 1.16. Trade as percentage of GDP has remained stable and relatively low since the 1990s in Colombia

Trade as share of GDP, Colombia and selected countries, 1990-2016



Source: Authors' elaboration based on World Bank data, and OECD National Accounts data, 2018. https://data.worldbank.org/ http://www.oecd.org/sdd/na/.

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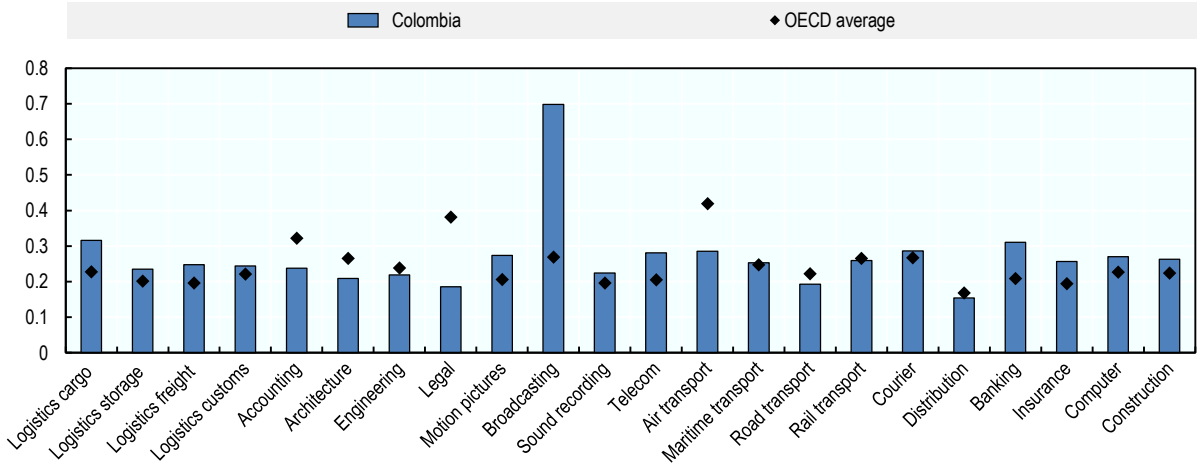
Figure 1.17. Services Trade Restrictiveness Index, Colombia 2017



Note: STRI indices take a value from 0 to 1. Complete openness to trade and investment gives a score of zero, while being completely closed to foreign services providers yields a score of one.
Source: Authors' elaboration based on OECD STRI database and FDI Regulatory Restrictiveness Index http://www.oecd.org/tad/services-trade/services-trade-restrictiveness-index.htm.

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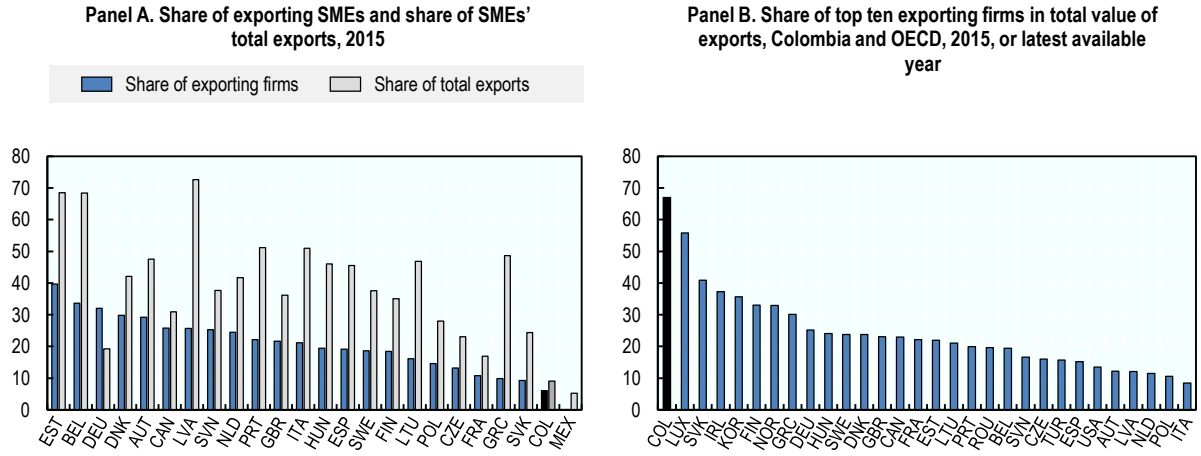
This poor trade performance is also explained by the fact that SMEs in Colombia have a low propensity to export. In 2015, only 6% of SMEs were engaged in exports, accounting for 9% of total export value. In contrast, in Spain and Poland, two countries with a firm structure and market size similar to Colombia, 14% and 19% of SMEs engaged in exports, contributing 45% and 30% of total exports respectively (Figure 1.18, Panel B). In Colombia, exports are concentrated in a few firms. This is similar to other countries specialising in natural resources. In Colombia, the top ten exporting firms account for 81% of exports in primary and resource-based products, and for 67% of total domestic exports. In contrast, in Spain and Germany, the top ten firms account for 16% and 25%, respectively, of total exports (Figure 1.18, Panel B).

Figure 1.18. The top ten exporting firms account for 65% of total exports



Note: Panel A. Data for FIN, HUN, ESP, SWE, LTU POL, CZE FRA refers to 2014; Panel B: Data for BEL, CAN, CZE, ESP, EST, FIN, GBR, IRL, LUX, NLD, NOR, POL, ROU, USA, TUR refer to 2014.
Source: Authors' elaboration based on OECD TEC database, OECD SDBS database and RUES database - Registro Unico Empresarial [Single Enterprises Registry]-Confercamaras, Colombia, 2018 http://www.oecd.org/sdd/its/trade-by-enterprise-characteristics.htm; http://www.oecd.org/sdd/business-stats/ https://www.rues.org.co/.

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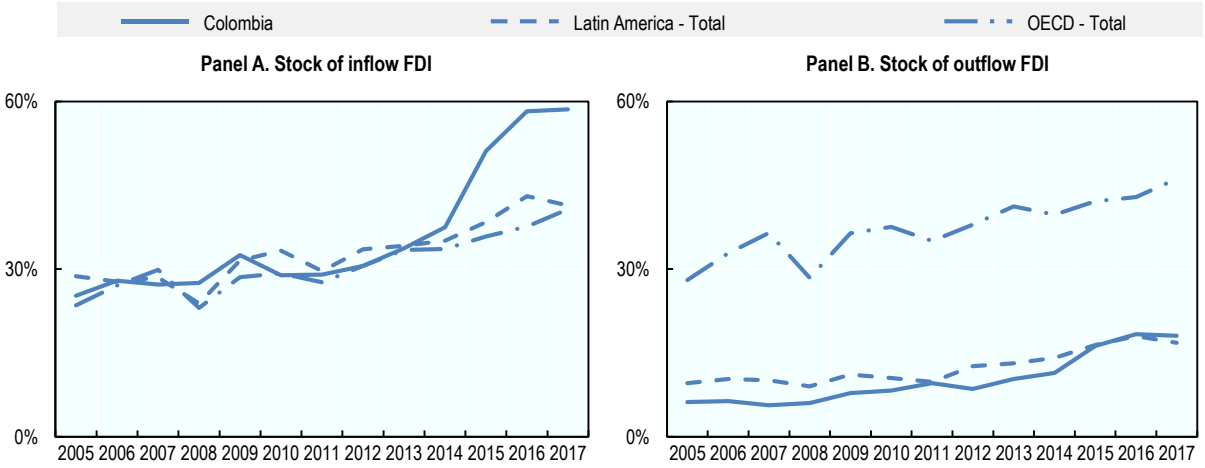
In 2017, Colombia's inward stock of Foreign Direct Investment (FDI) reached 57% of GDP, ranking among the highest in the Latin America and Caribbean region and above the OECD average. The Outward Foreign Direct Investment (OFDI) stock is in line with Latin America's average. It increased by three times in 2007-17, reaching 18% of GDP, but it remains below the OECD average (Figure 1.19). Inward FDI concentrates on natural resources, but is becoming more diversified both in terms of activities and investors. More than half of the country's total FDI stock is in mining (34%) and oil (19%) and 14% goes into manufacturing. However, new activities, such as communications, consumer products and construction are increasingly attracting investment. In the early 2000s, the top three investing countries (Spain, the United States and Switzerland) accounted for more than 50% of total FDI. Today the top three countries (Brazil, Spain and the United States) account for around 40% of total FDI (Figure 1.20).

Figure 1.19. FDI as share of GDP, Colombia, Latin America and OECD, 2005-17



Source: OECD Investment Division, Directorate for Financial and Enterprises Affairs, OECD based on IMF data, 2017 https://www.imf.org/en/Data.

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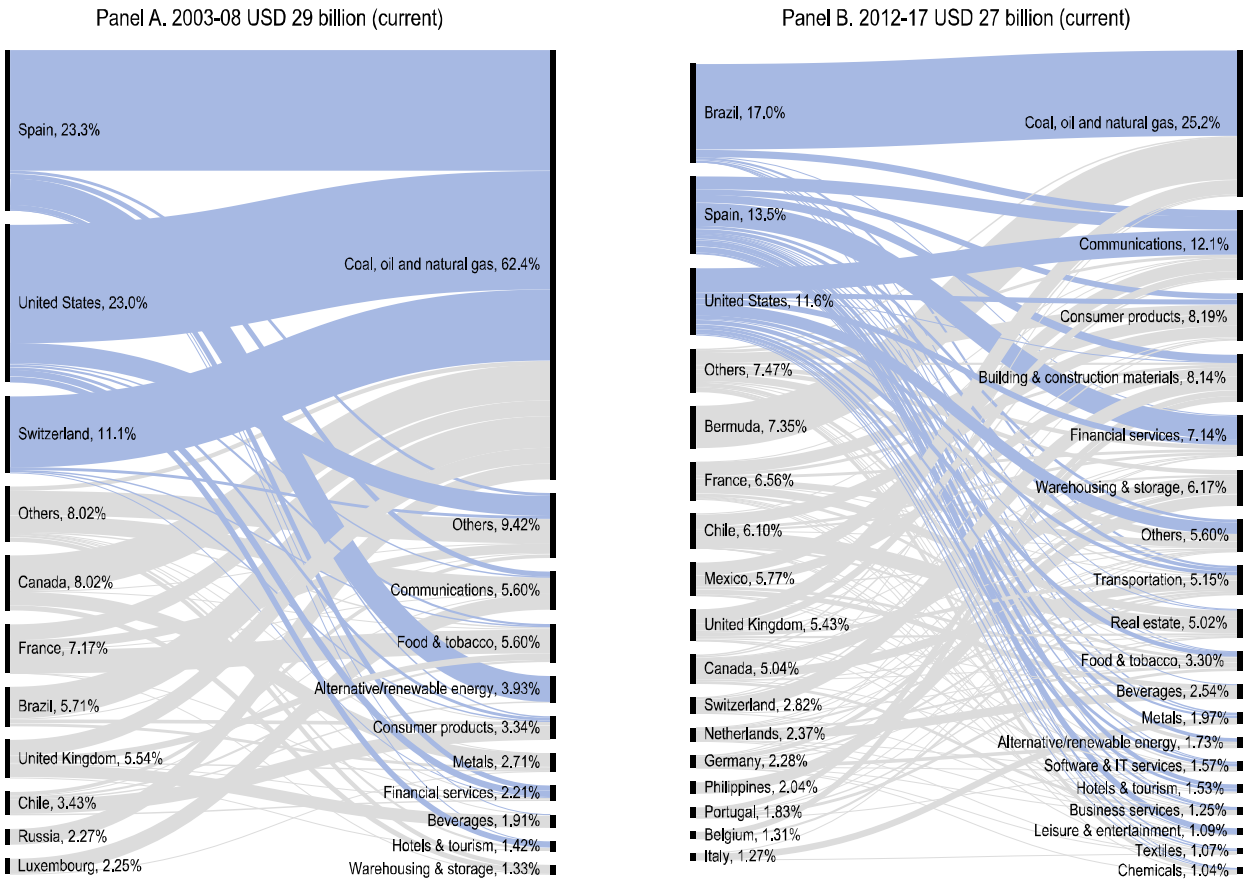
Greenfield FDI created jobs mostly in services and in the northern regions of the country. Around 25% of these jobs were created in the capital district of Bogotá and 20% in Antioquia. In Bogotá, FDI concentrated mostly in activities such as professional services, retail and construction. Tourism and creative industries have also emerged as relevant areas for FDI attraction. In Antioquia the majority of greenfield FDI jobs have been created in construction and transport activities (Figure 1.21).

Figure 1.20. Brazil, Spain and the United States are the top investors in Colombia

Share of total capital investment of Greenfield FDI to Colombia, by origin and industry of destination, 2003-08 and 2012-17.



Note: Sectors of destination refer to the North American Industry Classification System (NAICS) 2007. Countries and sectors with less than 1% are grouped into the categories "others". USD million at current prices.

Source: Authors' elaboration based on Financial Times FDI Market database, 2018. https://www.fdimarkets.com/.

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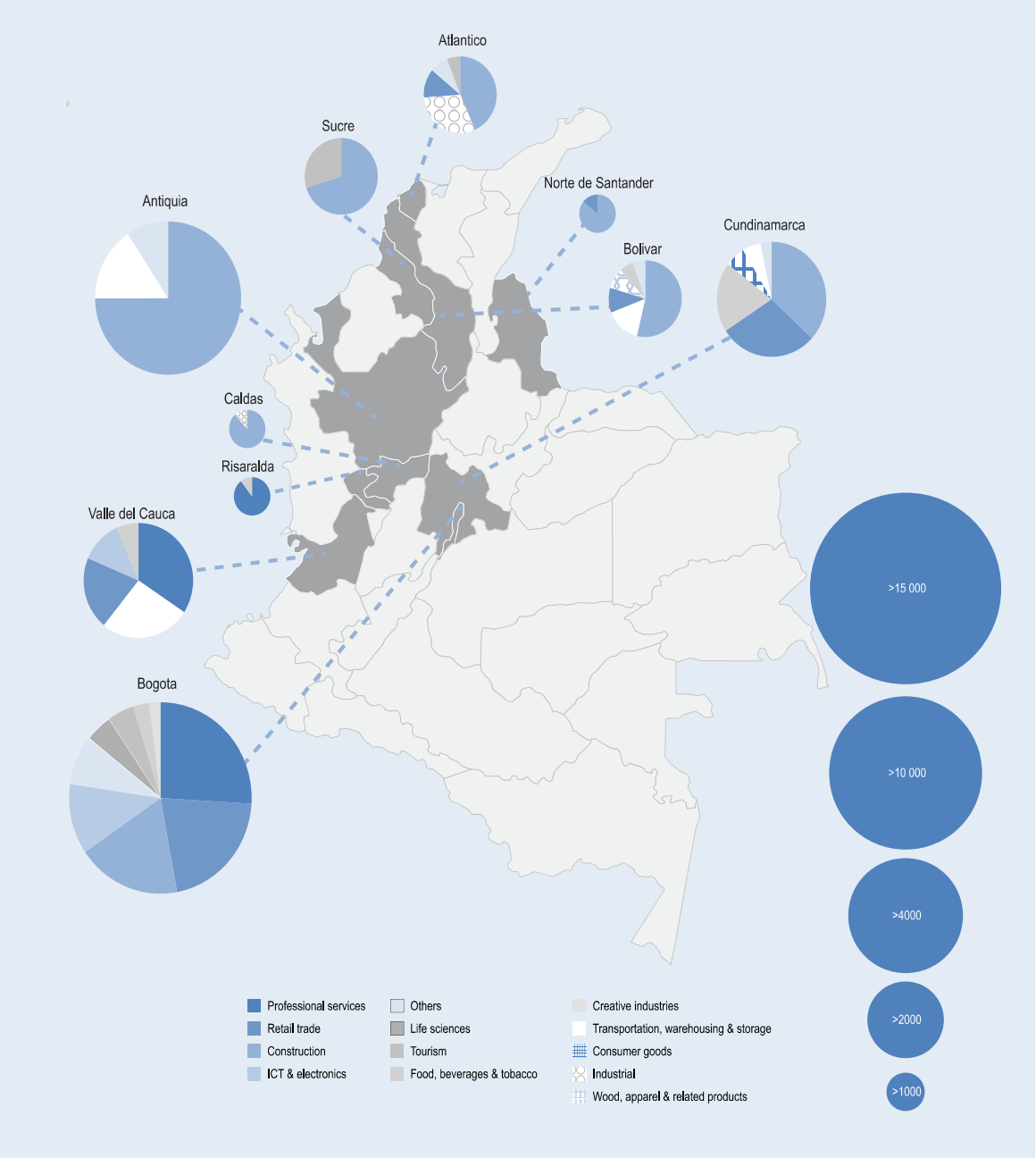
Figure 1.21. Three regions account for 63% of total inward FDI

Share of total jobs created by Greenfield FDI by department and economic activities, Colombia 2015-17.



Note: Only departments that account for at least 1 000 jobs created are displayed. Total jobs created between 2015-17 are 56 691 units. Nevertheless, only 49 505 jobs associated with complete information in terms of destination city and economic clusters are taken into consideration.
Source: Authors' elaboration based on Financial Times FDi Market database, 2018. https://www.fdimarkets.com/

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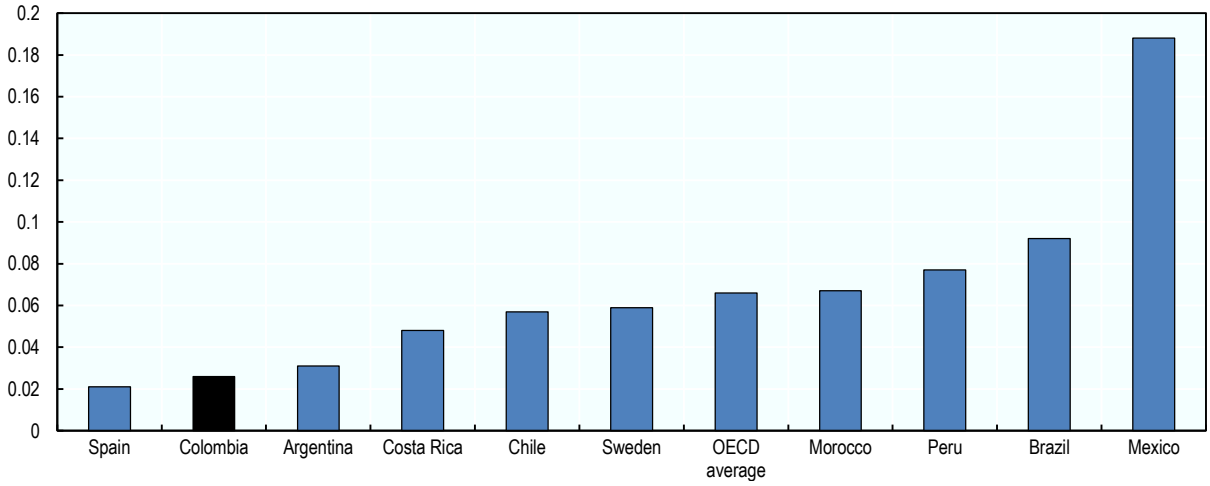
Colombia could benefit more from its openness to FDI. The FDI Regulatory Restrictiveness Index (see Box 1.1 for definition of the Index) is half the OECD average (Figure 1.22). The country could identify channels through which FDI could also enhance the impact of trade on wages and productivity. Estimates at the global level suggest that firms engaged in FDI, and export and import at the same time, are on average six times more productive and pay salaries three times higher than firms engaged only in import-export (Figure 1.23).

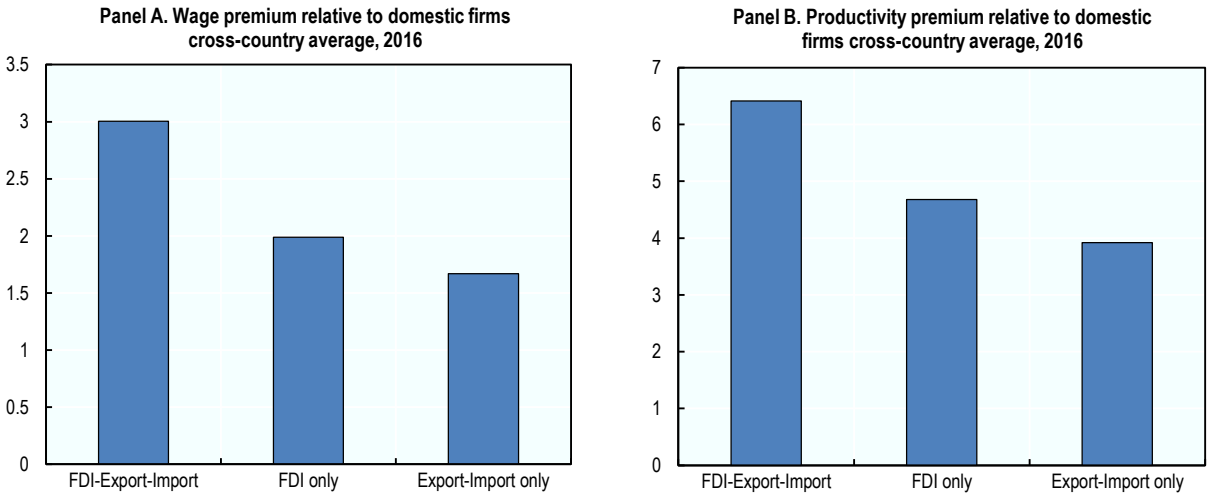
Figure 1.22. Restrictions to FDI are relatively low in Colombia



Source: OECD Investment Division, Directorate for Financial and Enterprises Affairs, OECD based on FDI Regulatory Restrictiveness Index http://www.oecd.org/investment/fdiindex.htm.

StatLink https://doi.org/10.1787/888933910813

Figure 1.23. OECD estimates suggest that trade and investment together have greater impact on wages and productivity



Note: Manufacturing firms, 2016 or last available year of all countries in the World Bank Enterprise Surveys.
Source: OECD Investment Division, Directorate for Financial and Enterprises Affairs, OECD, 2018.

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Box 1.1. The OECD FDI Regulatory Restrictiveness Index

The FDI Regulatory Restrictiveness Index (FDI Index) measures statutory restrictions on foreign direct investment across 22 economic sectors. It is a composite indicator with values between 0 (open) and 1 (closed). It measures the extent to which a country's laws and regulations discriminate against foreign-owned businesses. It is available for 68 countries, including all OECD and G20 economies. It gauges the restrictiveness of a country's FDI rules by looking at the four main types of restrictions on FDI:

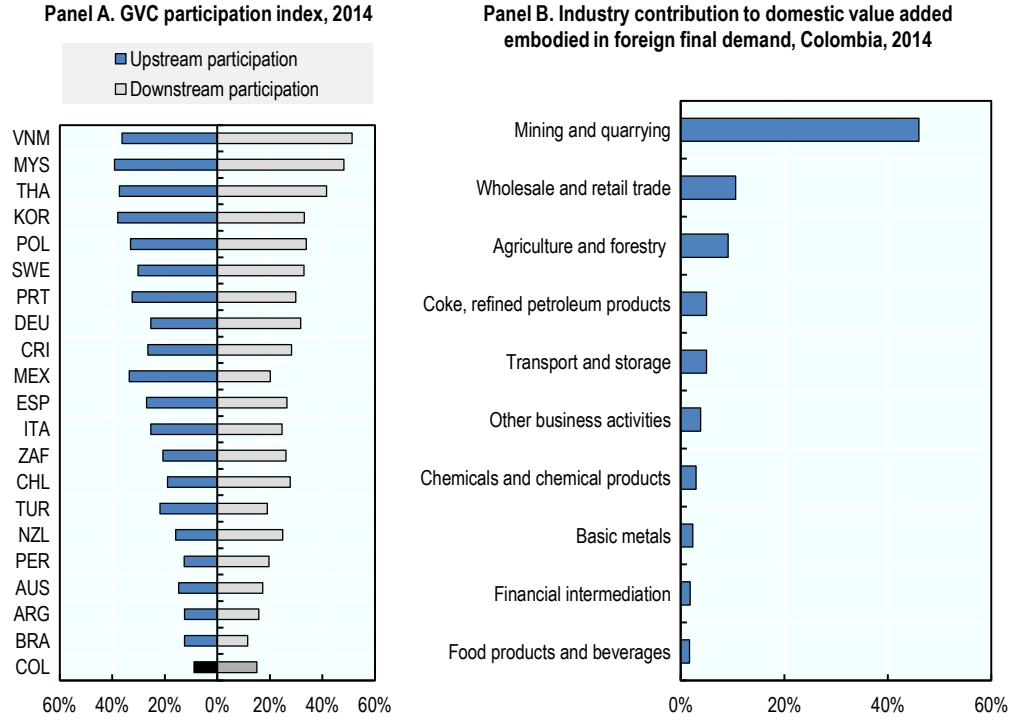
1. Foreign equity restrictions;
2. Screening and approval of foreign investment projects;
3. Key foreign personnel employment;
4. Operational restrictions (e.g. restrictions on capital repatriation and land ownership).

The overall restrictiveness index is the average of sectoral scores. The discriminatory nature of measures, i.e. when they apply to foreign investors only, is the central criterion for scoring a measure. State ownership and state monopolies, to the extent they are not discriminatory towards foreigners, are not scored. The FDI Index is not a full measure of a country's investment climate. Here, a range of other factors comes into play, including how FDI rules are implemented. Entry barriers can also arise for other reasons, including state ownership in key sectors. A country's ability to attract FDI will be affected by other factors such as the size of its market, the extent of its integration with neighbours and even geography, among others. Nonetheless, FDI rules can be a critical determinant of a country's attractiveness to foreign investors.

Source: OECD's FDI Restrictiveness Index: 2010 Update", *OECD Working Papers on International Investment* No. 2010.

Firms in Colombia are not highly integrated in global value chains (GVCs). The foreign value added content of domestic exports (i.e. the extent to which foreign inputs add value to the country's production and exports) is among the lowest in Latin America: 9% for Colombia in 2014, compared to 20% for Chile, 13% for Peru and 12.5% for Argentina in the same year (Figure 1.24, Panel A). This is partly determined by the size of the economy (some local value chains exist, and producers can source components locally) and especially by the economic specialisation of the country. Oil and coal mining account for 45% of Colombia's exports. The country specialises in providing raw materials such as oil to other countries which then transform them into higher value-added products such as fuel and derivatives (Figure 1.24, Panel B).

Figure 1.24. Colombia's participation to GVCs is amongst the lowest in Latin America



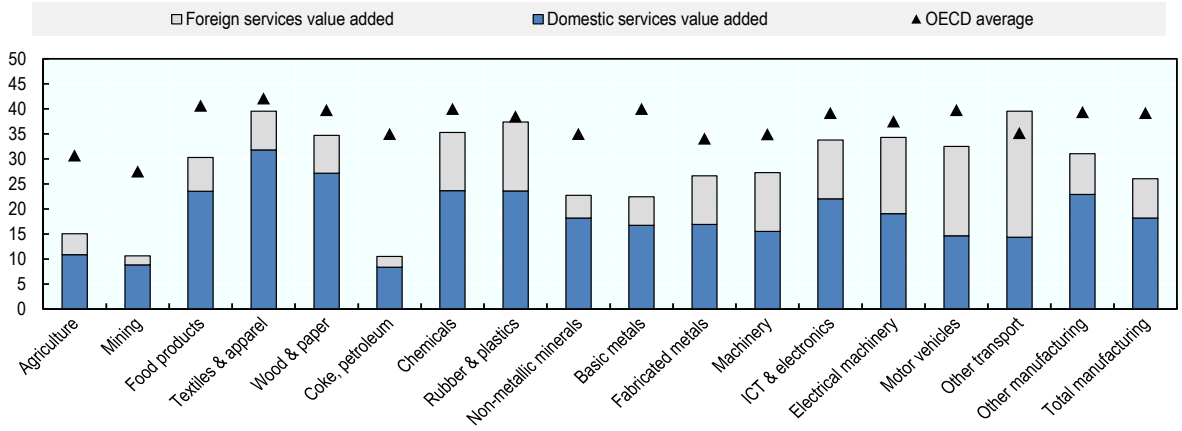
Note: Panel A. Upstream: Foreign value added embodied in domestic exports as share of gross exports. Downstream: domestic value added embodied in other countries' gross exports as share of gross exports. Panel B. Only industry with at least 2% of contribution are displayed.
Source: Authors' elaboration on OECD-WTO Trade in Value Added Now casting database, 2018. http://www.oecd.org/sdd/its/tiva-nowcast.htm.

StatLink https://doi.org/10.1787/888933910851

Services could contribute more to increase the domestic value added of exports. In Colombia, the value added of services in gross domestic exports is 32% (according to the latest TiVA estimates for 2014), while the OECD average is 55%. In Colombia, the gap in terms of services contribution to gross exports value added is particularly high in mining, oil and coal, indicating the lack of sophistication of these activities in the country. The OECD average in these industries is three times higher than in Colombia (Figure 1.25). Services could also contribute to improving Colombia's trade performance in traditional activities such as food manufacturing. For example, business services account for 35% of value added in Chilean food manufacturing exports, while in Colombia they represent only 28% (Figure 1.26). Increasing the competitiveness of agro-food in Colombia is not only linked to better articulating the value chain, it is also linked to better exploitation of natural resources. Colombia exploits only 4% of its almost 45 million hectares of agricultural land. Chile, by comparison, uses 8% of its almost 16 000 hectares (FAO, 2018[19]).

Figure 1.25. Colombia could improve its participation to GVCs through services

Share of services content in domestic industrial gross exports, 2014



Source: Authors' elaboration on OECD-WTO Trade in Value Added Now casting database, 2018 http://www.oecd.org/sdd/its/tiva-nowcast.htm.

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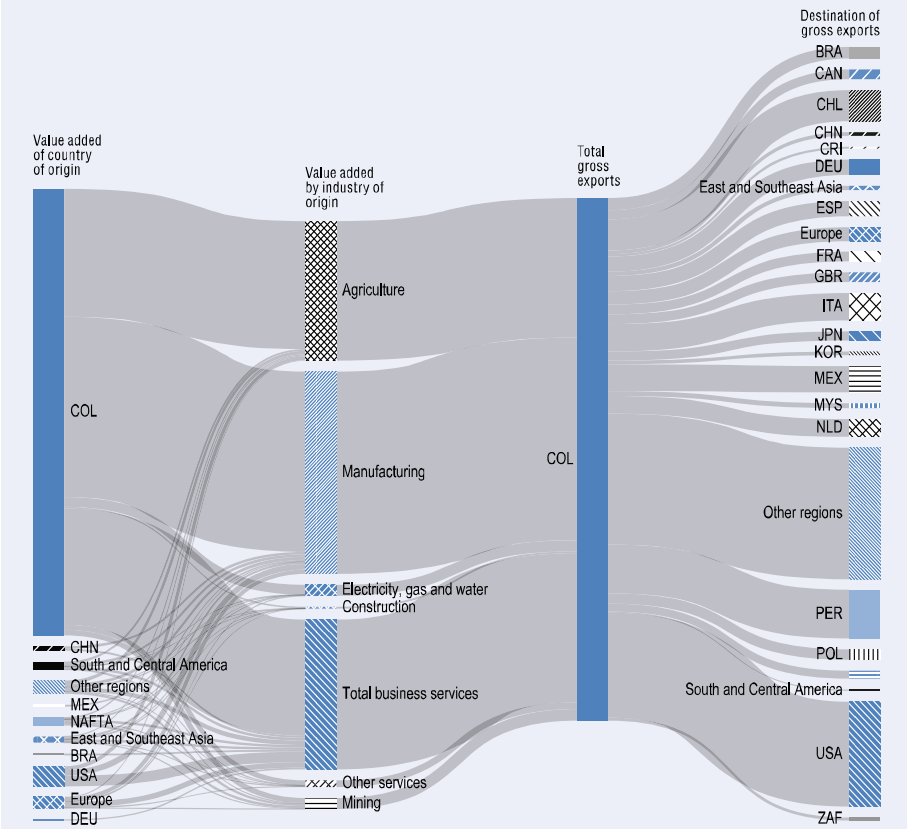
Figure 1.26. Food manufacturing gross exports by origin and destination, Colombia, 2014

Value added of exports by origin and destination (%).

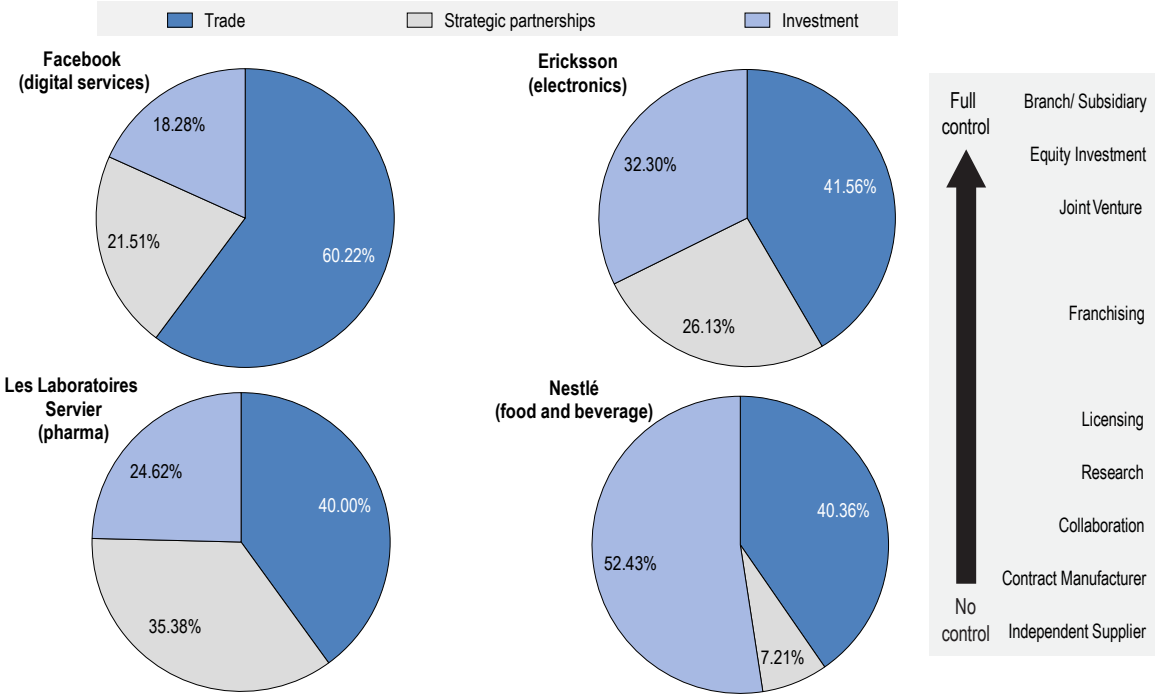


Note: Regional aggregates exclude member countries reported in the graph.
Source: Authors' elaboration on OECD-WTO Trade in Value Added Now casting database, 2018 http://www.oecd.org/sdd/its/tiva-nowcast.htm.

StatLink http://dx.doi.org/10.1787/888933910889

Increasing participation in GVCs could help Colombia benefit more from trade and investment. To do so the country needs to take into account that strategic partnerships are varied and are becoming increasingly relevant in the activities of Multinational Enterprises (MNEs) (Figure 1.27). These include simple supply chain agreements, and more complex forms of joint ventures, equity investments and subsidiary/branch relationships. These different forms of partnerships imply different levels of control of MNEs with respect to local partners. In defining conditions in agreements with MNEs, it is important to take into account these different forms to obtain better deals (OECD, 2018[20]).

Figure 1.27. MNEs establish different forms of partnerships in hosting countries



Source: OECD Investment Division, Directorate for Financial and Enterprises Affairs, OECD (2018[20]), *Micro-evidence on corporate relationships in global value chains*.

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Addressing three economic gaps to achieve prosperity

This section discusses three main economic gaps that, if addressed by effective public and private actions, could help Colombia to achieve prosperity for all.

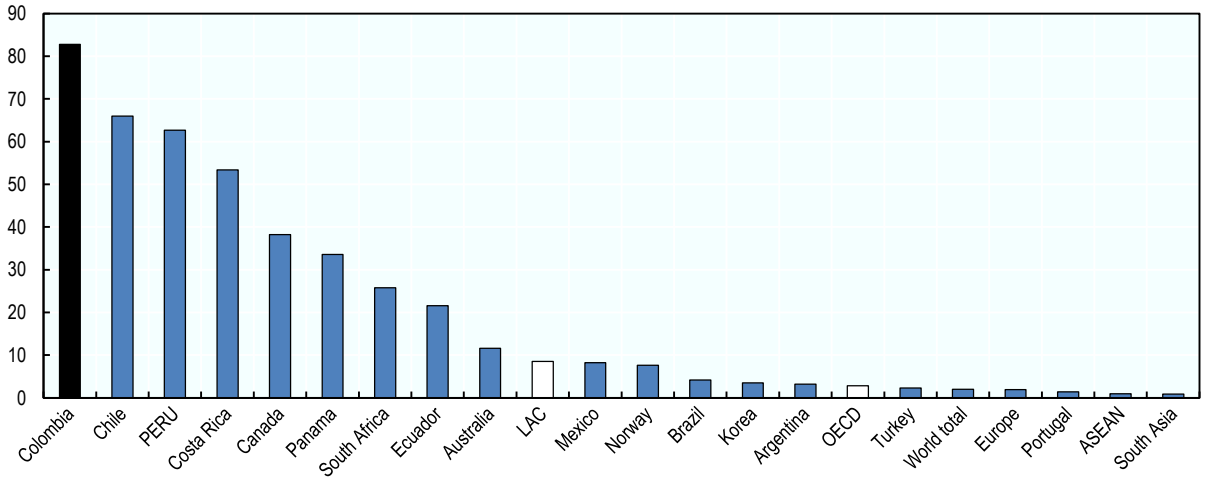
Modernising infrastructure

Infrastructure gaps in Colombia are holding back the country's growth. Existing infrastructure was dilapidated and investments in inter-urban transport networks have been limited during the country's turbulent past (OECD, 2016[21]). Colombia's geography has also been a factor, with mountainous regions in the middle of the country raising connection costs. As a result, the country had the lowest quality of road and railroad infrastructure among OECD countries and the second lowest quality of port infrastructure

after the Slovak Republic, according to data from the World Economic Forum. This limits Colombia's trade efforts. In 2016, the cost of exporting a container in Colombia was 1.5 times higher than the world average and 2.2 times higher than the OECD average (World Bank, 2018[22]). Infrastructure gaps in Colombia have a strong territorial dimension. An estimated two-thirds of the country's rural population lacks ready access to the road network (OECD, 2016). Information and communications technology (ICT) infrastructure in Colombia also needs modernisation to enable the country to reap the benefits of the digital revolution (see Chapter 3 of this report).

Colombia has taken steps to address the infrastructure gap, but more needs to be done to increase transport connectivity. The planned budget for infrastructure spending in the 2014-2018 National Development Plan has increased by 12% compared to 2010-14 and the country benefits from a Vice-Ministry of Infrastructure and a National Infrastructure Agency, created in 2012 to replace the former National Institute of Concessions. It has also streamlined public-private partnerships (PPPs) (OECD, 2016[21]). In 2014 the Colombian government launched a new generation PPP infrastructure programme (fourth generation, or 4G) for road concessions, with aggregate capital expenditures of USD 15 billion and targets to reduce transport costs by 20% and travel time by 30% (OECD, 2016[21]). However, investments in infrastructure need to increase beyond PPPs; in most OECD countries PPPs make up less than 10% of total infrastructure investments (OECD, 2016[21]). To make PPPs more effective, improvements started in the past years should continue in the country (Box 1.2). Tackling high transport costs in Colombia compared to tariffs (Figure 1.28) is a challenge and this requires broad based policies linked to the policy-making process in infrastructure investment and active logistics policies.

Figure 1.28. Ratio of freight costs to tariffs, 2012-15



Note: Calculations based on imports from the US market. This figure shows the ratio of freight cost to tariffs on imports to the United States. ASEAN = Association of Southeast Asian Nations. LAC consists of 21 countries. Values are calculated as the median among 2012-15 values.
Source: OECD (2016), *Multi-dimensional Review of Peru: Volume 2. In-depth Analysis and Recommendations*, http://dx.doi.org/10.1787/9789264264670-en.

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Box 1.2. Towards a more effective PPP framework for the transport sector

Colombia has substantially improved the infrastructure governance framework in the last decade. Road concessions in Colombia presented continuous renegotiations of contacts, costlier and more recurrent than in other Latin American economies, which in turn raised the ultimate fiscal cost to the equivalent of more than three times the initial cost of concessions (Bitran, Nieto-Parra and Robledo, 2013[23]).

However, in the recent years, a unified regulatory framework exclusively dealing with PPPs, the creation of a National Infrastructure Agency and a National Development Bank for Infrastructure, have increased private confidence and increased state capacity to deal with PPPs (OECD/CAF/UN ECLAC, 2018[24]). Furthermore, the government has new mechanisms in place to assess infrastructure needs and improve the quality of the project preparation phase (mainly in the transportation sector).

Despite the improvements, there are other infrastructure governance challenges that have not yet been addressed. In particular, affordability, sustainability and capacity for value for money could be improved to achieve efficient project finance in infrastructure and attract foreign capital. Achieving more efficient and transparent consultation processes with local communities also remains as key challenge. This is particularly important in remote areas where the infrastructure gap is higher.

Cutting red-tape and ensuring legal stability

Red-tape and lack of legal stability continue to be barriers to private sector development. Colombia's regulatory environment is complex, with a high number of laws and regulations at the national and local level that businesses often find hard to meet. Regulations are often redundant or even contradictory and this reduces legal certainty for entrepreneurs. In addition, norms and regulations are continually changed. The business community in Colombia finds it difficult to operate when 14 tax reforms were approved in 1990-2016 (ANDI, 2017[25]; CPC, 2017[26]; CPC, 2018[27]).

Colombia has taken steps to address this issue, but problems persist. The National Planning Department (DNP) and the Ministry of Trade, Industry and Tourism (MinCIT) are leading efforts to revise regulations that rely on technical substantiation. In 2005 MinCIT launched the one-stop shop that provides support for exporting firms to reduce the administrative burden on running a business. Additionally, as of 2018, a single one-stop shop has been set up in Bogotá (*Ventanilla Única Empresarial- VUE)*. Nowadays in Colombia, starting a business requires roughly the same number of procedures as in countries like Chile and Spain, although it remains above the OECD average. Moreover, the cost of starting a business is higher than in neighbouring countries and above the OECD average (OECD, 2019[28]) Trading across borders is still burdensome. Border compliance procedures in Colombia require almost 112 hours, almost double that of Chile and ten times more than the average of the OECD. Moreover, in 2018, settling commercial disputes requires 3.5 years, more than double than in Chile and Spain (Table 1.2).

Table 1.2. Colombia would benefit from cutting red-tape

	Colombia	Chile	Spain	OECD
Starting a business				
Number of procedures	8	7	7	4.9
Time required (days)	11	5.5	13	8.5
Getting electricity				
Number of procedures	5	5	5	4.7
Time required (days)	106	43	95	79.1
Registering property				
Number of procedures	7	6	5	4.6
Cost (% of property value)	1.9	1.2	6.1	4.2
Paying taxes				
Time (hours per year)	239	291	152	160.7
Total tax and contribution rate (% of profit)	69.7	33.0	46.9	40.1
Trading across borders				
Time to export: Border compliance (hours)	112	60	0	12.7
Cost to export: Border compliance (USD)	545	290	0	149.9
Enforcing contracts				
Time (days)	1 288	480	510	577.8
Cost (% of claim value)	45.8	28.6	17.2	21.5

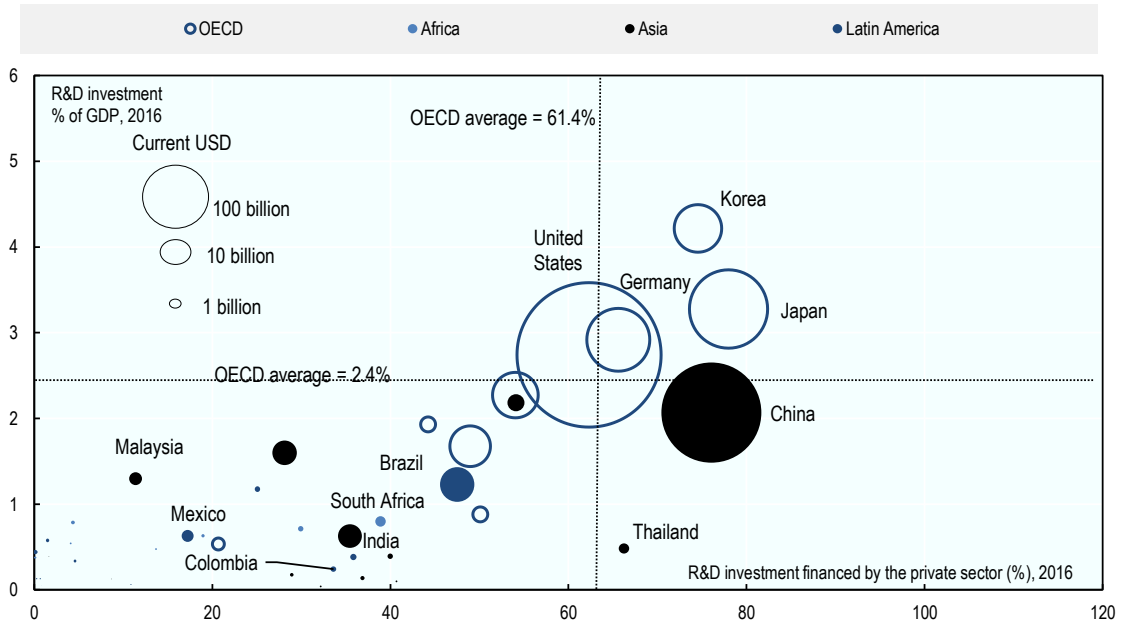
Note: For more information on methodology see http://www.doingbusiness.org.
Source: Authors' elaboration based on (World Bank, 2018[22]), *Doing Business 2018: Reforming to Create Jobs*.

Strengthening the knowledge base and fast-tracking innovation

Colombia invests little in science, technology and innovation. The share of research and development (R&D) expenditure as a percentage of GDP is stable at about 0.25% of GDP, well below the OECD average of 2.35%, and below other countries in Latin America such as Chile (0.39%), Mexico and Argentina (both around 0.5%) (Figure 1.29).

Private sector investment in innovation is also low. Business expenditure on R&D in Colombia is 0.11% of GDP, 20 times less than in Korea and 15 times less than the OECD average (Figure 1.29). Both SMEs and large firms in Colombia innovate less than firms in OECD countries. Of all SMEs in Colombia, only 21% claim to be innovative, versus 35% in Spain and 65% in Germany. In Colombia, 46% of large firms innovate. This figure is higher than Chile where only 30% of large firms declare to innovate, (OECD/UN, 2018[29]). However this share is lower than countries such as Spain, where 77% of large firms innovate, and Germany, where 94% of large firms innovate (Figure 1.30).

Figure 1.29. Colombia invests little in R&D



Note: GERD: Gross domestic expenditure in research and development; BERD: Business expenditure in research and development.
Source: Authors' elaboration based on OECD Main Science and Technology Indicators and OCYT Informe Anual de Indicadores de Ciencia y Tecnología 2017 and UNESCO Institute for Statistics http://www.oecd.org/sti/inno; https://ocyt.org.co/; http://data.uis.unesco.org/.

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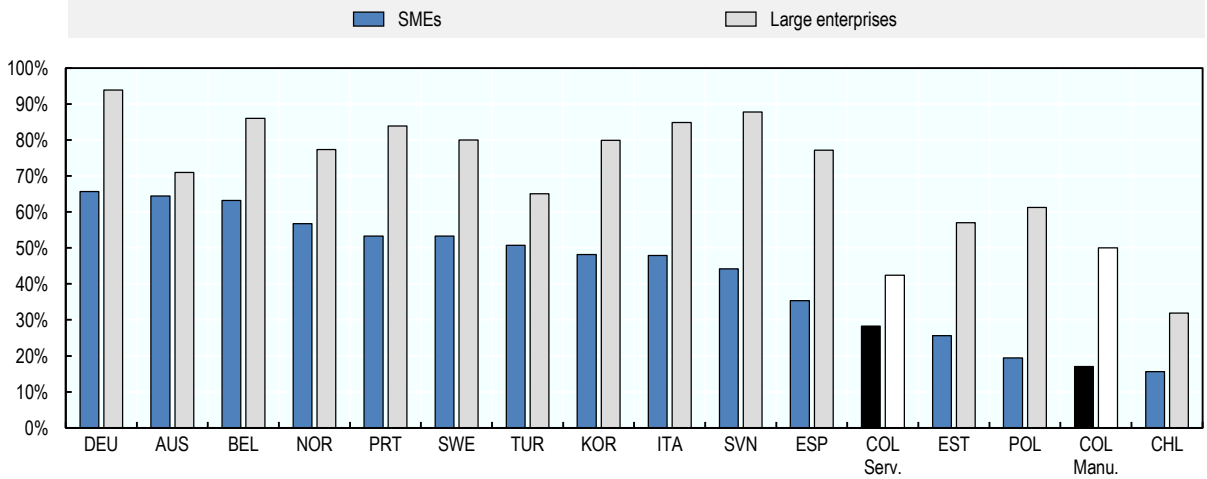
Figure 1.30. On average only 20% of Colombian firms innovate

Share of innovative enterprises by size, Colombia and selected countries 2016



Source: Authors' elaboration based on EUROSTAT CIS 12 and 14, Colombia Manufacturing Innovation Survey EDIT-VIII and Services Innovation Survey EDITS-V, Chilean Enterprises Innovation Survey – IX, 2018, https://ec.europa.eu/Eurostat; https://www.dane.gov.co; https://www.economia.gob.cl.

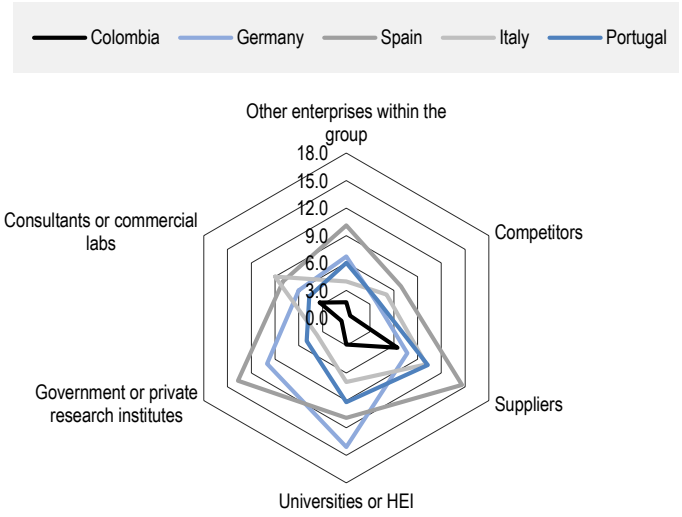
StatLink https://doi.org/10.1787/888933910965

Manufacturing firms in Colombia are among the least innovative in the country. The share of innovative firms in manufacturing is below the national average, at around 20%, versus 35% in services. In addition, the share of innovative firms in manufacturing in Colombia is lower than that of more advanced countries such as Spain, where 40% of manufacturing firms declare to be engaged in innovation activities; Italy and Portugal where more than half of all manufacturing firms innovate; and Germany where the share is 72%. This gap with advanced countries persists in all manufacturing activities, with food and beverages registering the highest gap (Table 1.3).

Despite the low propensity of the private sector to innovate in Colombia, the country has a network of research centres that has the potential to better support innovation. Colombia has 68 technology centres and laboratories accredited by Colciencias; more than 50% of them located in Bogotá, with 10% in Cali and 6% in Medellin. Among them, 19 are focused on health sciences, 10 on humanities and social sciences, 9 on agriculture and 5 on energy and mining. Colombia's research institutes work hand in hand with some businesses to sustain productivity in certain specialised agro-food research centres such as Cenicafé (Box 1.3). But these are exceptions. There is room for firms to increase business interaction with the national innovation system. Only 3% of innovative firms in Colombia co-operate with academia and only 0.5% with government and private research institutes. In Spain and Germany, 10% and 14% of firms are co-operating with universities and academia respectively, and 13.7% and 10% with Government and private research institutes (Figure 1.31).

Figure 1.31. Innovative firms in Colombia could co-operate more to innovate

Share of innovative firms that co-operate, by type of institutions, Colombia and selected countries, 2016



Source: Authors' elaboration based on EUROSTAT CIS 12 and 14, Colombia Manufacturing Innovation Survey EDIT-VIII and Services Innovation Survey EDITS-V, 2018, https://ec.europa.eu/eurostat; https://www.dane.gov.co.

StatLink https://doi.org/10.1787/888933910984

Table 1.3. Firms in Colombia tend to innovate less than in other countries

Share of innovative firms by manufacturing activities and their share in overall MVA, Colombia and selected countries, 2017

	Colombia		Germany		Spain		Italy		Portugal	
Economic activity	% of innovative firms	% of MVA	% of innovative firms	% of MVA	% of innovative firms	% of MVA	% of innovative firms	% of MVA	% of innovative firms	% of MVA
Food products, beverages and tobacco	25.39	27.71	56.5	7.11	40	17.63	56.7	11.12	55.9	20.11
Textiles, apparel and leather	18.87	9.91	76	1.17	29	18.25	36.7	9.90	44.5	4.08
Wood and products of wood and cork	13.98	1.11	67.6	1.14	26.9	4.35	45.1	1.93	47.8	1.38
Paper and paper products	24.35	3.58	69.4	1.77	40.6	4.10	51.2	2.16	60.3	2.12
Printing and reproduction of recorded media	16.78	1.71	70.9	1.19	33.9	1.94	41.9	1.75	59.9	2.27
Coke and refined petroleum products	30.36	9.77	78	0.92	61.4	2.70	70	0.97	61	2.07
Chemicals and pharmaceuticals	35.60	11.91	92.5	11.07	77	6.33	79	8.25	71	12.76
Rubber and plastics products	19.47	2.80	78.7	4.55	49.4	5.61	56.4	5.05	65.8	4.20
Non-metallic mineral products	21.39	12.27	66.1	2.66	27.3	5.78	40.1	3.95	53.1	3.74
Basic metals and metal products	16.21	5.49	67	11.96	41.3	10.51	49.5	15.24	61	12.68
Computer, electronic and optical products	33.33	1.97	76.3	12.81	41.8	4.62	62.5	8.07	67	5.67
Machinery and equipment n.e.c.	19.05	4.26	87.9	15.17	52.3	3.81	57.9	14.77	69.7	7.50
Motor vehicles and transport equipment	27.00	2.19	79	22.05	60.1	6.47	65	8.00	63	13.44
Furniture, other manufacturing	19.50	2.21	76.4	3.84	32.4	4.68	57.1	5.37	58.1	3.68
Repair and installation of machinery and equipment	23.08	3.12	64.7	2.55	24.2	3.21	44.8	3.56	45	4.30
Total manufacture	21.7		72.4		40.0		51.0		53.5	

Note: For Germany, Spain, Italy and Portugal the share of innovators refers to 2014 whereas the manufacturing VA refers to 2016. For Colombia the share of innovators refers to 2016 whereas the manufacturing VA refers to 2017.

Source: Authors' elaboration based on EUROSTAT community innovation surveys (CIS) 12 and 14, Colombia Manufacturing Innovation Survey EDIT-VIII and, OCYT: *Informe Anual de Indicadores de Ciencia y Tecnología* 2017, 2018.

Box 1.3. Partnerships foster innovation: Examples from the United States and Colombia

The United States relies on partnerships between the private sector and academia in emerging technologies (e.g. robotics and nanotechnology). Manufacturing USA was established in 2014 following the "Revitalize American Manufacturing and Innovation Act." It is a network of 14 institutes, operated by the interagency Advanced Manufacturing National Program Office (AMNPO), headquartered in the Department of Commerce. Federal funding is around USD 100 million in each institute and this is matched or exceeded by the private sector and other non-federal sources. Manufacturing USA aims to encourage linkages between stakeholders to facilitate the diffusion of knowledge, provide access to shared equipment, and target resources to identified priority issues.

Colombia is the third biggest coffee producer in the world with 810 000 metric tons produced annually. It has a dedicated private-funded research institute: Cenicafé. The centre was created in 1938 by the National Federation of Coffee Growers of Colombia (*Federación Nacional de Cafeteros de Colombia* FNC) and it is in charge of developing research and technologies to help small and large coffee producers in the country. Cenicafé has an extension programme that operates across the country and enables technology transfers. In the sugar sector, Cenicaña, founded in 1977 by the Association of Sugarcane Growers of Colombia (Asocaña), contributes to the development and competitiveness of the industry by generating and spreading technical knowledge. It is financed by private donations from sugar mills and cane suppliers located in the Cauca River Valley. Both Cenicafé and Cenicaña also implement projects co-financed by other entities, linked especially to programmes co-ordinated by Colciencias. Reinforcing public-private partnerships could unleash the potential for innovation in other sectors in Colombia.

Source: (NIST, 2018[30]; Cenicana, 2018[31]; Cenicafé, 2018[32]).

Conclusions

Colombia is a growing, relatively stable economy. Peace has led to new aspirations. But the country needs a new pact for development to deliver new opportunities for all. This requires addressing the pending structural challenges of the country (little economic diversification, persistence in productivity gap with more advanced economies and reduced local spillovers of trade and FDI) by adopting a two-fold development agenda. A short-term agenda focusing on those issues on which there is consensus and which, if properly addressed, could be solved relatively soon. These include cutting red tape, ensuring legal stability, and addressing the infrastructure gap (including digital connectivity as discussed in Chapter 3 of this report). But there is also a long-term agenda that shall focus on avoiding marginalisation and ensuring that the country can benefit more both from its own assets and from global opportunities. This means addressing structural transformation and enlarging the knowledge base of the economy to transform its production structure.

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Chapter 2. Production development policies in Colombia: Tapping the potential of all regions

To achieve prosperity Colombia needs to transform its economy and create opportunities for all. This entails a renewed policy approach that prioritises enlarging the knowledge base and increasing the benefits from trade and investment with a view to unlock the potential of all regions in the country. This chapter reviews the policy approach towards industrial development and economic diversification in Colombia, in comparison with other countries, and it identifies the key policy reforms needed to speed up economic transformation in the country.

Introduction

Colombia is a growing, relatively stable economy, but it needs to diversify, increase productivity and benefit more from trade and investment. The first chapter has highlighted this. The changes in the global landscape and the new aspirations of its society are opening up unprecedented opportunities to advance on a reform agenda that aims to achieve shared prosperity.

Colombia needs to tackle the issue of competitiveness. This means modernising its infrastructure and updating its regulatory framework to foster business development. The country also needs to mobilise more public and private investments and partnerships to modernise its production structure, and enlarge the domestic knowledge base, fostering competitiveness in new areas and in all regions of the country. To do so, Colombia can count on public and private institutions, which share a tradition of debating and sharing ideas. It also has a track record of policies for production development. Not all have been fully successful but they provide a base to build on.

This chapter reviews the planning process in Colombia. It analyses how Colombia compares to other countries in its approach towards industrial development and economic diversification, and it identifies the key policy reforms to forge ahead. The Production Transformation Policy Review (PTPR) looks at these reforms, including how to facilitate co-ordination with the digitalisation agenda and create mechanisms to allow the local production and innovation system to benefit from Industry 4.0. This topic is discussed in Chapter 3 of this report.

Colombia counts on an established planning process

Colombia has an institution in charge of long-term planning, the National Planning Department (DNP). The DNP is *primus inter pares* among national ministries. It formulates the National Development Plan, draws up the budget in co-operation with the Ministry of Finance and Public Credit, and defines national policies that require inter-ministerial co-ordination. These are then formalised in documents for the National Council for Social and Economic Policy (CONPES). Since its creation in 1958, the role of the DNP has evolved, as line ministries have strengthened. The DNP is perceived to be an eminent public institution, attracts top civil servants and plays a major role in co-ordinating public policies.

In the area of production development and innovation the DNP facilitates co-ordination among different agencies, including the Ministry of Trade, Industry and Tourism (MINCIT), the Ministry of Agriculture and Rural Development (MADR) and the Administrative Department for Science, Technology and Innovation (Colciencias). In 1991, Colombia set up an industrial development bank that operates as a second-tier bank (Bancoldex). It also has two development banks specialised in agro and rural development (Finagro) and infrastructure (FDN), and FINDETER that operates as second-tier bank at the regional level. To implement policies, Colombia has different specialised agencies. Pro-Colombia, created in 1992, fosters export promotion and investment attraction. The Productive Transformation Program (PTP), launched in 2008 and reformed in 2011 to strengthen its operational capacities, provides financing and services to foster competitiveness in specific industrial areas, including agro-food, tourism and pharmaceuticals. In addition, iNNpulsa, created in 2012, fosters entrepreneurship and start-up development. These three agencies now answer to the Ministry of Trade, Industry and Tourism. Colombia set up a National Training Service

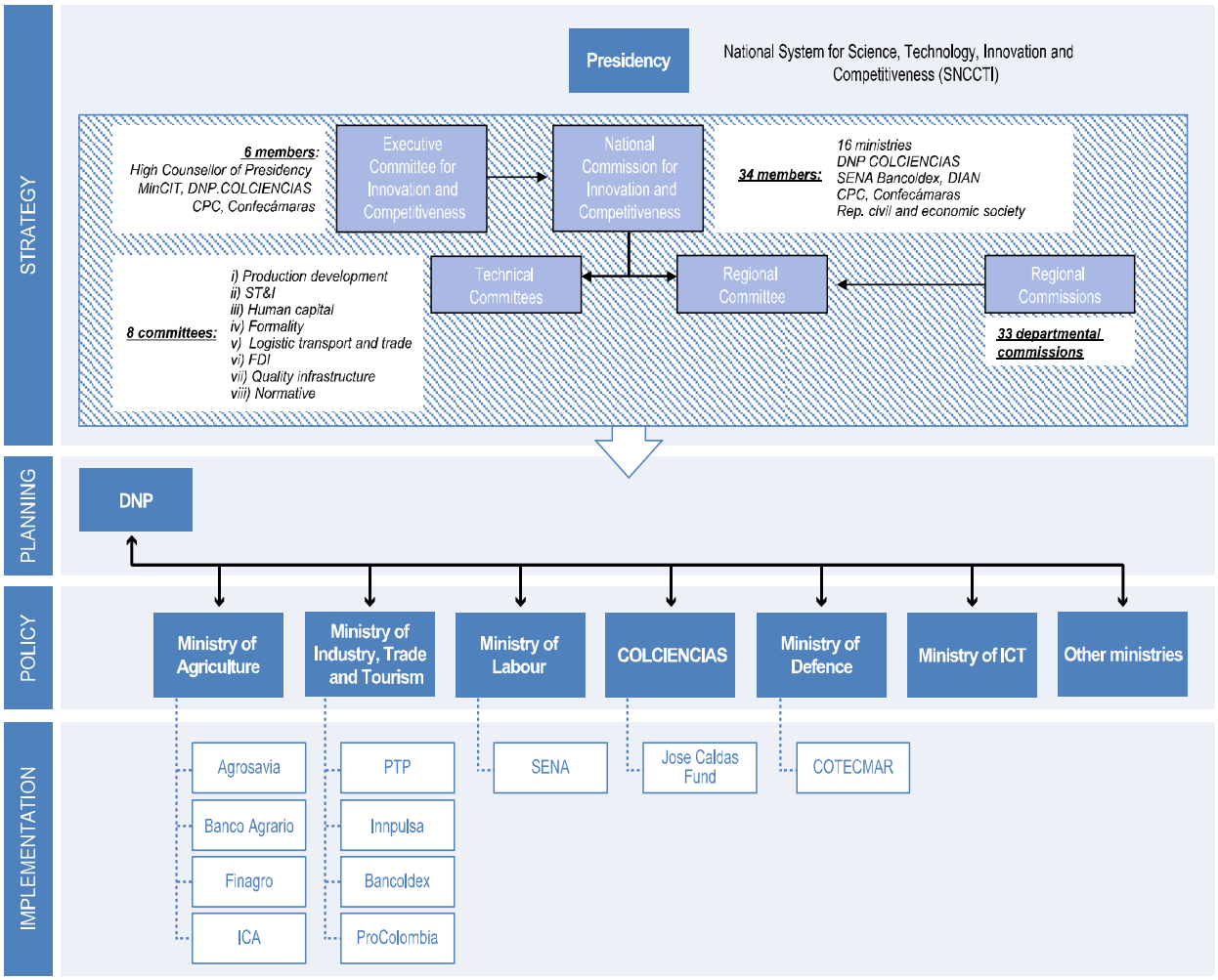
(SENA) in 1957, and it provides technical training in the country and answers to the Ministry of Labour (Figure 2.1).

Colombia has multiple spaces for co-ordination both within government and between government and the private sector and there is discussion and follow-up on policy implementation. However, the enforcement capacity of these spaces to mobilise joint actions is limited. The DNP facilitates co-ordination in areas such as production development and innovation, which are cross-ministerial and cross-agency, but co-ordination is limited to public-private committees which discuss and support the elaboration of policy documents, and does not always include mechanisms to generate shared financing lines or concrete joint projects.

A relevant high-level co-ordination space is provided nowadays by the National System for Science, Technology, Innovation and Competitiveness (SNCCTI). This system is led by the President and it is co-ordinated by the High Advisory Body for Private Sector and Competitiveness (*Alta Consejería para el Sector Privado y la Competitividad*). The SNCCTI is in charge of co-ordinating, proposing, synthetizing and guiding the discussion on production transformation polices that will eventually be translated into policy actions. The system counts with a National Commission for Innovation and Competitiveness, where high-level private and public stakeholders meet to identify shared priorities and it includes specific spaces for co-ordination with regional actors. The current system was actually first created in 2012 with a focus on competitiveness, and in 2015 its mandate has been enlarged to enable co-ordination in competitiveness, science, technology and innovation.

Colombia has a well-established culture of private sector institutions which play an important role in shaping public policies. The National Confederation of Chambers of Commerce (Confecámaras), founded in 1969, groups the 57 local chambers in the country. The Chambers of commerce in Colombia have played an important role in private sector development in the country, especially in poorer, remote regions where government capabilities were weaker. The National Industrial Association (ANDI) was set up in 1944 as a voice for the industrial sector in the country. Since 2006, Colombia also has a Private Council for Competitiveness (CPC) composed of the main domestic and foreign large firms in the country. As of 2018, its members include more than 30 large firms from different industries, such as energy, transport and food manufacturing. The Council is particularly active in shaping the national policy debate.

Figure 2.1. Institutional governance for production development and innovation, Colombia, 2018



Note: This figure does not include all institutions in Colombia; it only includes the principal ones linked to policies for production development and innovation.
Source: Authors' elaboration based on DNP official information, 2018.

The country has a vision for transforming the economy

Since the mid-1990s Colombia has experimented with different approaches to foster production development

In Colombia, policies for economic transformation, i.e. policies to foster industrialisation, upgrading and to reduce dependency on natural resources, have followed a similar path to other Latin American countries (UNIDO, 2013[1]). Such approaches are present in the national debate, but fail to achieve an effective alignment between aspirations, plans and actual achievements (Peres and Primi, 2009[2]; Peres and Primi, 2019[3]). Production development policies in Colombia have been dispersed across several relevant, but small initiatives. There has been no major co-ordinated effort towards economic transformation. Some notable exceptions have been registered in policies for competitiveness and SMEs development and in the agro-food industry (Dini and Stumpo, 2011[4]). Here Colombia

relies on private and public laboratories for applied research and technology transfer, as in the case of sugarcane and palm production, and specific forms of organisation for small producers. One example is the coffee cooperatives, notably the Coffee Producers Federation of Colombia (*Federación de Cafeteros*) (Kotler and Gertner, 2002[5]; Doner and Schneider, 2000[6]). They are effective intermediary institutions capable of thinking long-term and fostering innovation,

The story of production development policies in Colombia resembles that in other countries in Latin America. There was an initial period where foundations were laid for domestic industrialisation. This stretched from the aftermath of World War II until the mid-1970s. Since then, the country has witnessed a halt in targeted policies for building capabilities in domestic industries. From the mid-1970s until the 1990s, Colombia adopted a liberalisation and structural reforms agenda. This corrected certain imbalances and inefficiencies in the early import substitution efforts, but also hampered some industrialisation processes and reinforced the country's specialisation in natural resources (Peres and Primi, 2019[3]; Cimoli et al., 2005[7]; Ocampo, 2017[8]).

The mid-1990s saw a return of industrial development policies, under the umbrella of "competitiveness" (Porter, 1990[9]; Ocampo, 2017[8]; Meléndez and Perry, 2010[10]). The interest in fostering technological development, innovation and competitiveness coincided with the negotiation of the Free Trade Agreement (FTA) with the United States (which was signed in 2006, and entered into force in 2012). At that time, business associations and entrepreneurs highlighted the need to strengthen the domestic economy to increase the benefits of trade and to effectively compete in global markets (ANDI, 2017[11]; CONPES 3866, 2016[12]; CPC, 2017[13]; Cimoli et al., 2017[14]). Responding to this, different governments since the mid-1990s have tried to define and implement new approaches to foster competitiveness and innovation in the economy. This has resulted in no fewer than 11 programme documents in the period 1994-2018, but little continuity and implementation (Table 2.1).

Table 2.1. Policy documents on competitiveness and production development, Colombia, 1994-2018

Document/law	Year	Title	Objective	Policy areas	Main outcomes
CONPES 2724	1994	For a competitive Colombia	Promoting competitiveness of specific value chains	**Competitiveness**	**Not approved**
CONPES 2739	1994	Strategic export plan	Strengthening Colombian exports in the long term based on competitive advantages	**Export promotion**	Trade facilitation reforms
CONPES 2748	1994	National Policy for Science and Innovation	Definition of guidelines and strategy to foster innovation	**Science and innovation**	Introduction of policy evaluation mechanisms
CONPES 3297	1998	A methodology for an Internal agenda for productivity and competitiveness	Improving institutionality for production development and export promotion	**Competitiveness & export promotion**	Not available
CONPES 3439	2006	Institutionality and principles for competitiveness and productivity policy	Modernisation of governance	**Competitiveness & productivity**	Creation of the National System for Competitiveness (SNC) and the National Commission for Competitiveness (CNC)
CONPES 3527	2008	National policy for competitiveness and productivity	Fostering upgrading and exports of priority sectors	**Competitiveness & export promotion**	Creation and implementation of the Productive Development Programs (PTP),

				& Regional development	Creation of the Regional Commission of Competitiveness (CRC)
CONPES 3582 and Law 1286	2009	National policy for science, innovation and technologies	Improve the capacity to generate and use scientific and technological knowledge in the country	**Science, technology and Innovation**	A reformed Colciencias becomes an Administrative Department at ministerial level.
Legislative decree 1500	2012	Definition of organisation, articulation and operation of the National Administrative System of Competitiveness and Innovation	Institutional reforms	**Competitiveness & trade & Start-ups**	Creation of the National System of Competitiveness and Innovation (SNCI); CRCs embedded in the SNCI; Expansion of PTP programmes and; Creation of iNNpulsa
CONPES 3834	2015	Fiscal incentives for R&D and innovation	Fostering private investment in science, technology and innovation	**Science, technology and Innovation**	Introduction of fiscal incentives for R&D and innovation
National law 1753	2015	National Development Plan PND 2014 –2018: Todos por un nuevo país	Institutional reforms	**Competitiveness & Science, technology and innovation**	Reform of the SNCI into National System for Science Technology, Innovation and Competitiveness (SNCCTI)
CONPES (draft)	2015	National Policy for Science, Technology and Innovation 2015-2025	Fostering STI activities in the country	**Not approved**	**Not approved**
CONPES 3866	2016	Production Development Policy (PDP) 2016-2025	Fostering production development and increasing productivity in existing firms in all regions	**Productivity & export promotion & Start-ups & Regional Development**	Ongoing
CONPES 3956	2019	Business Formalisation Policy	Improve the information about an enterprise's dynamics and its formalisation level and improve benefit-cost relation to be formal.	**Formalisation & Enterprise development**	Ongoing
CONPES 3957	2019	National Laboratory Policy	Fostering international trade and STI activities	**Productivity & Science, technology and innovation**	Improve the technical capabilities of laboratories

Note: The table only includes main policy documents.
Source: Authors' elaboration based on CONPES 3866, Espinal and Roldán, 2000[1]; Martínez and Ocampo, 2011[2] and interviews in the framework of the PTPR of Colombia, February and April 2018.

1. Over the years, production development policies evolved from cluster-based and competitiveness à la Porter (1990), to a new approach, which looks at productivity as a key development driver and at regions as main agents for change. Nevertheless, a persistent weakness of the prevailing policy approach in Colombia, which is common to many countries in Latin America, is the insufficient co-ordination between production development, and the innovation and trade agenda (Cimoli et al., 2005[7]; Ocampo, 2017[8]). During the last decade, the country has implemented reforms to address the productivity challenge in several areas. Among the most significant reforms are:

2. *Strengthening the institutionality for science and technology*. In 2009, the Colombian Institute for Science and Technology (Colciencias) was reformed. It became an Administrative Department, with a director at ministerial level. Then

in 2019, the law 1951 further transformed Colciencias into the Ministry of Science, Technology and Innovation.

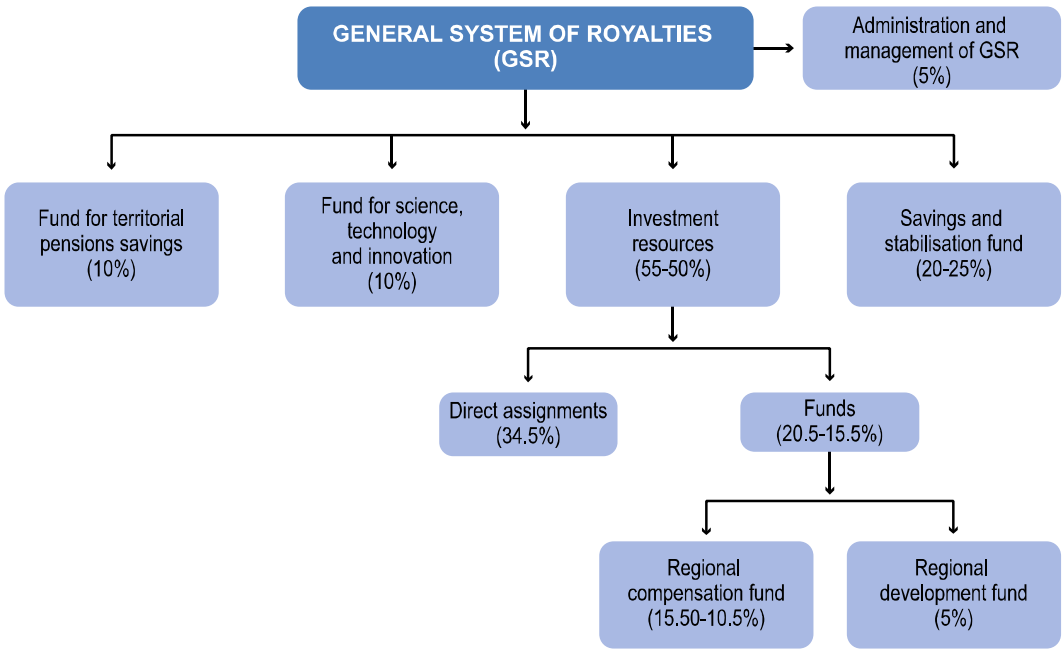
3. *Promoting industrial development in priority areas and fostering start-ups.* In 2008, the Ministry of Industry Commerce and Tourism (MinCIT) launched the Productive Transformation Program (PTP). This co-ordinates activities to sustain productivity and competitiveness in 15 economic areas. In 2012, MinCIT created iNNpulsa, to foster entrepreneurship and innovation.

4. *Modernising trade and investment institutions.* In 2014, Proexport, the governmental agency in charge of promoting non-traditional exports, was transformed into ProColombia, merging export promotion and the FDI attraction function, in line with OECD standards. In 2015, Bancoldex absorbed the functions of the former Institute for Industrial Development (IFI). It is now responsible for facilitating access to finance also for SMEs.

5. *Fast-tracking digital connectivity.* Colombia took a lead in Latin America in expanding its digital infrastructure and facilitating connectivity across the country. In 2011, the Ministry of Information and Communications Technology (MINTIC) launched the agenda *Vive Digital* to mobilise investments and implement reforms to improve digital infrastructure. This resulted in a major increase in digital connectivityand by 2017 98% of municipalities were connected to the internet.

6. *Improving financing for innovation and regional development.* In 2006, in parallel with the creation of the National Commission for Innovation and Competitiveness (CNC), 33 Regional Commissions for Innovation and Competitiveness (CRC) were established to foster innovation and production transformation at the regional level. This was a key step in putting regions at the core of national development. In 2009, regional development governance was further strengthened with the establishment of Councils for Science, Technology and Innovation (CODECTI) at the departmental level, building on pre-existing departmental committees. In addition, in 2012, Colombia reformed its national royalties system to allow all regions to receive resources. Until then, only mining regions and departments could benefit from these funds and, in practice, 80% of the resources accrued to nine departments. Since 2012, all regions and departments can access these resources, through a complex allocation mechanism. Each region and department had to set up a targeted body for resource allocation and management (OCAD, *Órganos Colegiados de Administración y Decisión*). The 2012 reform also included an amendment that earmarks 10% of these royalties to fund science, technology and innovation activities (Figure 2.2). However, the distributed funds to regions and departments can finance only projects linked to those territories. As a result, they operate more as a series of regional innovation development funds than as a national innovation fund. This limits their capacity to act as sources of financing for major national innovation challenges. Colombia is progressively making the royalties system more effective. Since 2018, the limitation that only public actors could present projects for approval has been removed, allowing private entities to propose and help decide funding. The mechanism for project selection and disbursement is, however, quite cumbersome and, in many cases, available resources are not actually used.

Figure 2.2. National Royalties System of Colombia, 2018



Note: The % in brackets indicate the distribution by funds
Source: Authors' elaboration based on DNP information, Sistema General de Regalías, February 2018.

Despite some progress over the years, none of these policies and reforms have really managed to kick-start a process of deep economic transformation in the country nor to make production development a key priority in the national development agenda.

The Production Development Policy (PDP) 2016-2025: a step forward

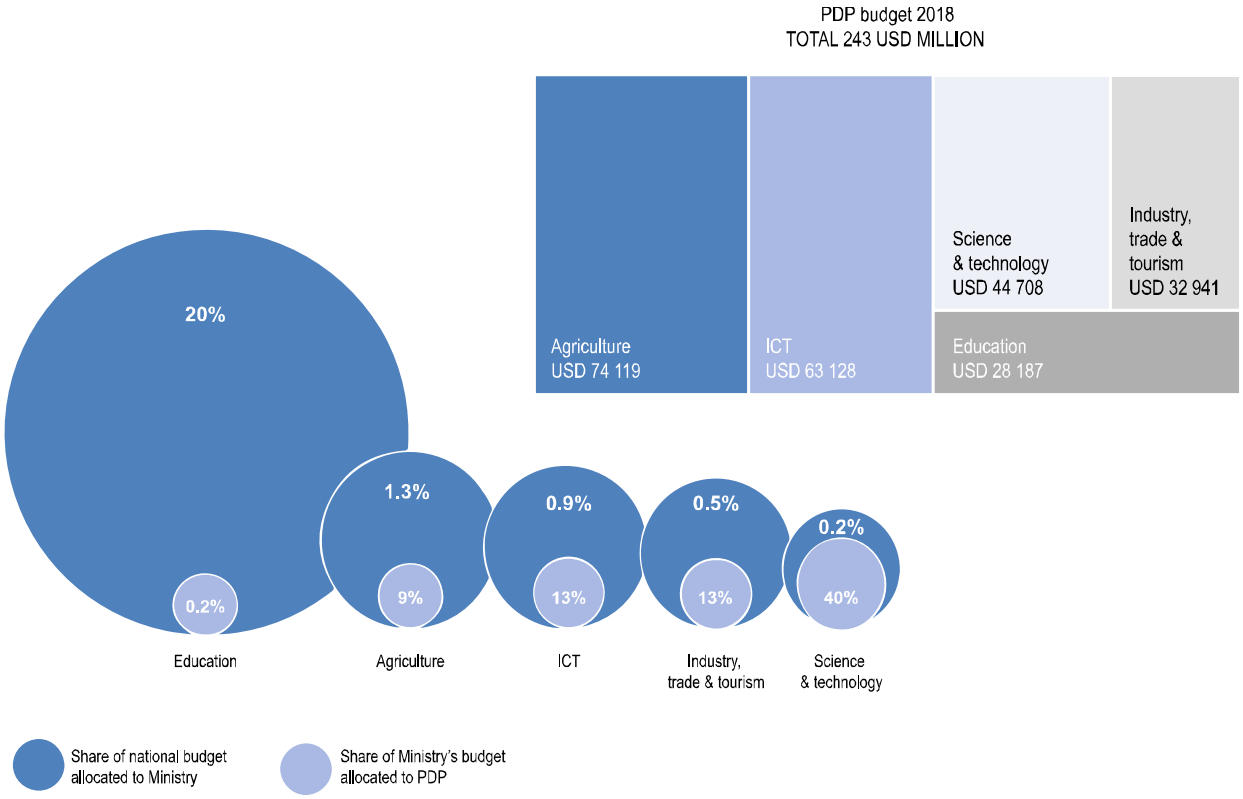
In 2016, the DNP, with the co-operation of entities such as the Ministry of Trade, Industry and Tourism, the Ministry for Agriculture and Rural Development, the Ministry of National Education and the Ministry of Labour, as well as with the support of the National Training Service (SENA), released the Production Development Policy (PDP) 2016-2025. The PDP was approved by the National Council on Economic and Social Policy in 2016, with a provisional budget equal to 0.04% of 2017 GDP. The PDP is a step forward in consolidating efforts to transform the economy.

The PDP is based on three principles:

1. *Regional differentiation:* the PDP identifies, through a participatory process, priority sectors in regions, based on local comparative advantages and productive capacities.
2. *Evidence based:* the policy applies a rigorous empirical methodology for identifying priority sectors; it also fosters piloting of actions and scaling-up upon effective results.
3. *Co-ordination*: national, regional and private sector entities work together to define the priorities and lines of action of the PDP. The 33 CRC (Regional Commissions for Innovation and Competitiveness) have been the key actors in the PDP process.

The PDP articulates actions from different ministries and functions: 30% of the budget is linked to agriculture (USD 74 million), 26% to ICT (USD 63 million) and 18.5% to science and technology (USD 45 million). While the PDP includes 40% of the total national budget for science and technology, it only accounts for 13% of the total budget for industry and trade (Figure 2.3).

Figure 2.3. The PDP budget allocation by ministry, 2018



Note: A. the share of each ministry in the total budget is calculated on the total national budget net of debt. B. Industry, trade and tourism accounts for three instruments active in 2017. C. For agriculture, science, technology, and industry trade and tourism, the aggregate budget of specific instruments is split according to the evolution of the budget of each function category across the years. D. The total budget of the PDP refers to the sum of each (financial and non-financial) instrument that reports financial resources.
Source: Authors' elaboration based on 2018 National Budget Law (Ley No. 1873-20/122017) and DNP information.

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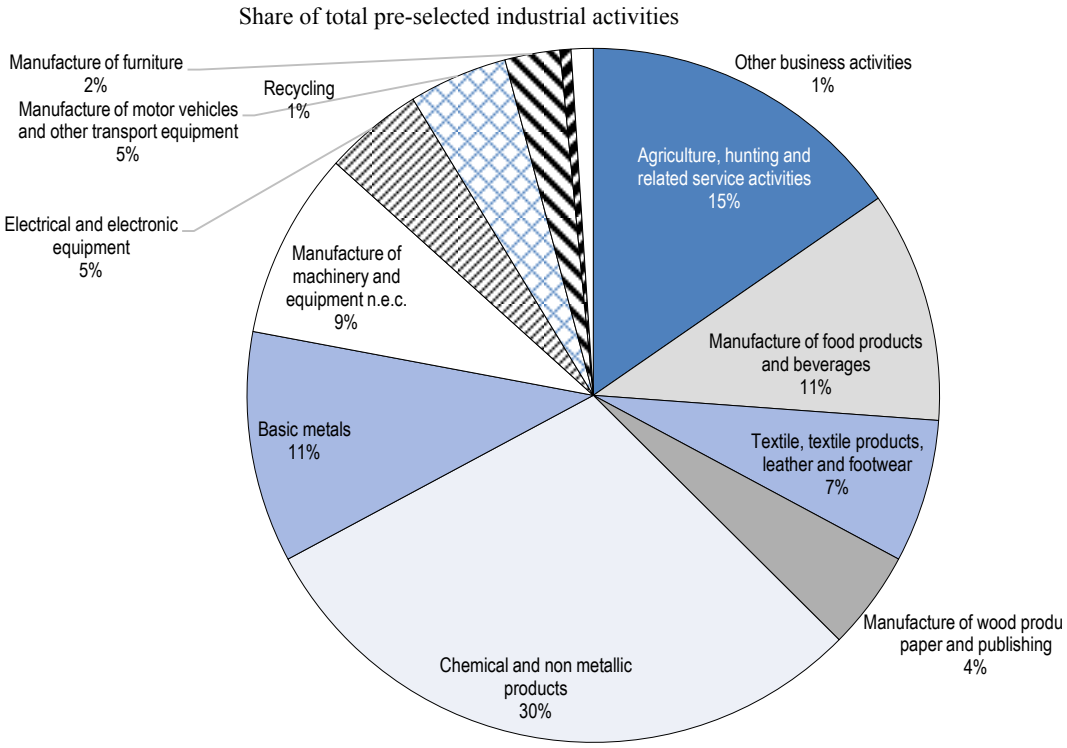
The PDP followed an evidence-based prioritisation methodology. This included the pre-identification of sectors with comparative and latent competitive advantages based on export data. Then, based on these pre-identified priority areas, some were selected through consultations with national and local actors; the methodology also included the identification of products that showed limited growth due to the existence of specific barriers (e.g. lack of information on market potential or technology). The pre-identification phase identified 195 sub-sectors across the 33 regions. These sub-sectors can be clustered in 12 industrial activities: 30% of these pre-identified activities are linked to chemicals and non-metallic products, 15% are agricultural products, 11% are

linked to food and beverages manufacturing, 11% with basic metals and 9% with machinery equipment (Figure 2.4).

Figure 2.4. Distribution of pre-selected industrial activities identified by PDP, 2016-25



Note: Products have been grouped into ISIC REV 3.1 divisions and industry cluster according to the OECD grouping in Trade in Value Added (TiVA) database. For more information, see http://stats.oecd.org/. The final selection is run by the SNCTII based of the pre-selected sectors presented here.
Source: Authors' elaboration based on CONPES 3866, DNP 2018.

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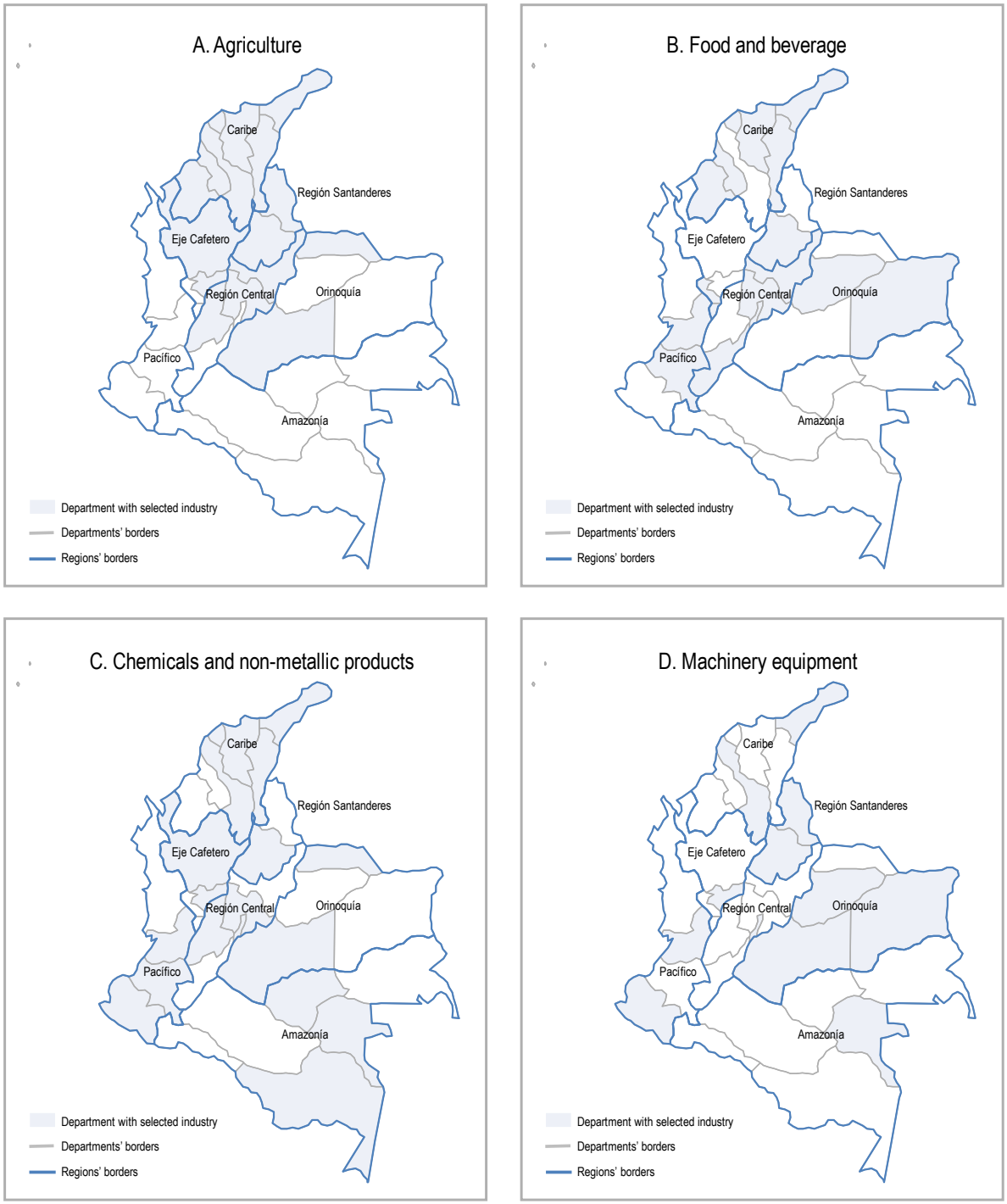
While empirically rigorous, this selection process presented a main challenge as it limits the scope of the PDP to the existing industrial base and does not leave room for identifying new areas or activities in which the country could, through shared public and private efforts, develop new capabilities. In going forward, the PDP could include a scenario-setting exercise to identify priorities, which would entail innovation and diversification in the current production matrix (as for example, identifying shared commitment to greening the economy). Prioritising by adopting a functional territorial approach could increase the effectiveness of policies and enable a more forward-looking approach (OECD, 2011; (Barca, McCann and Rodríguez-Pose, 2012[15]; OECD, 2013[16]). For example, 75% of the total prioritised sectors of the PDP correspond to four industrial activities: i) agriculture, ii) food and beverages, iii) chemicals and non-metallic products, and iv) machinery and equipment). These are clustered in areas of the country that span two or more regions. For example, the activities linked to agricultural, farming and food products are clustered in the centre and northern regions. Planning strategies centred on those functional regions could increase policy impact and facilitate synergies, especially in areas linked to infrastructure and services for industrial development (Figure 2.5).

Figure 2.5. Geographical distribution of PDP of selected industrial clusters, 2016-25

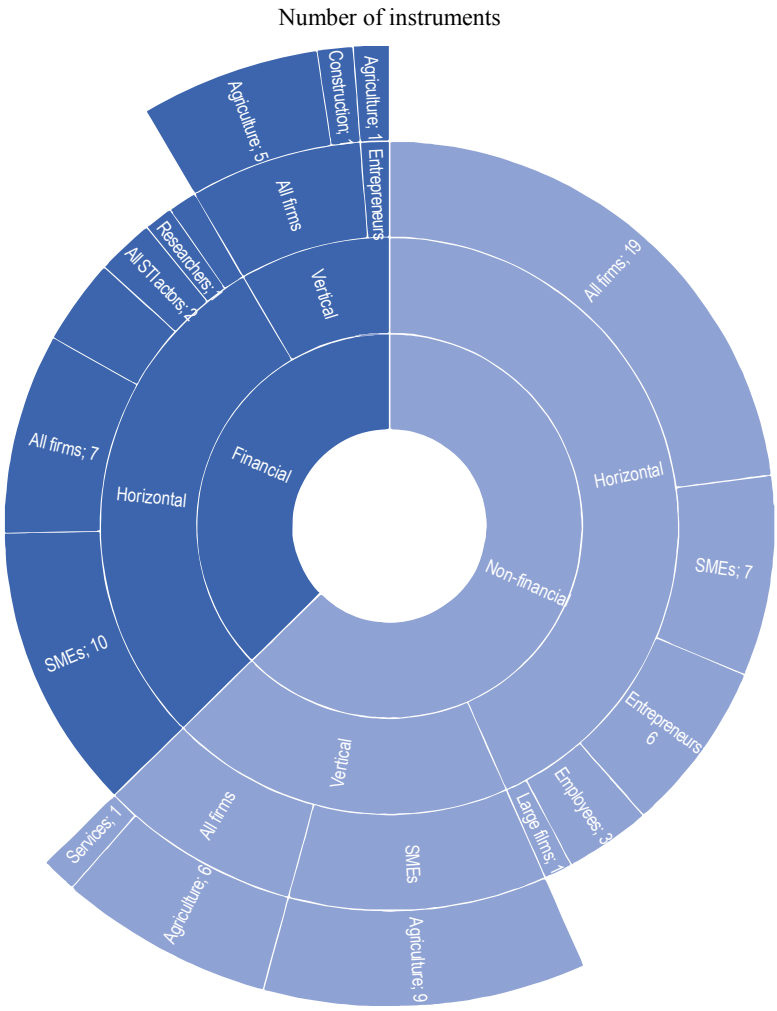


Note: Products are grouped according to ISIC REV 3.1 divisions and industrial clusters. The maps are indicative and rely on the pre-selected sectors. The final selection is run by the SNCTII based of the pre-selected sectors shown here.
Source: Authors' elaboration based on CONPES 3866, DNP 2018.

As of 2018, the PDP has identified 83 instruments that can be mobilised by different ministries and implementing agencies to channel financing and services to firms, people

and other institutions in the national innovation system (Figure 2.6). The policy mix of the PDP mobilises actions that address market and co-ordination failures by providing public goods in the prioritised sectors and by offering horizontal support to firms, establishing also specific lines of actions for SMEs. More than 60% of the instruments are linked to services, including rural extension services and platforms to connect buyers and suppliers. The other 40% include financial instruments, which, for the most part (68%), are co-financed loans (68% of all financial instruments). The others include non-repayable contributions. Since 2014, Colombia also has a tax incentive for R&D. More than 70% of these instruments are horizontal. The few targeted instruments are aimed mostly at agriculture and some specifically target SMEs.

Figure 2.6. Policy mix associated with the PDP, by type, Colombia, 2018



Source: Authors' elaboration based on DNP information, 2018.

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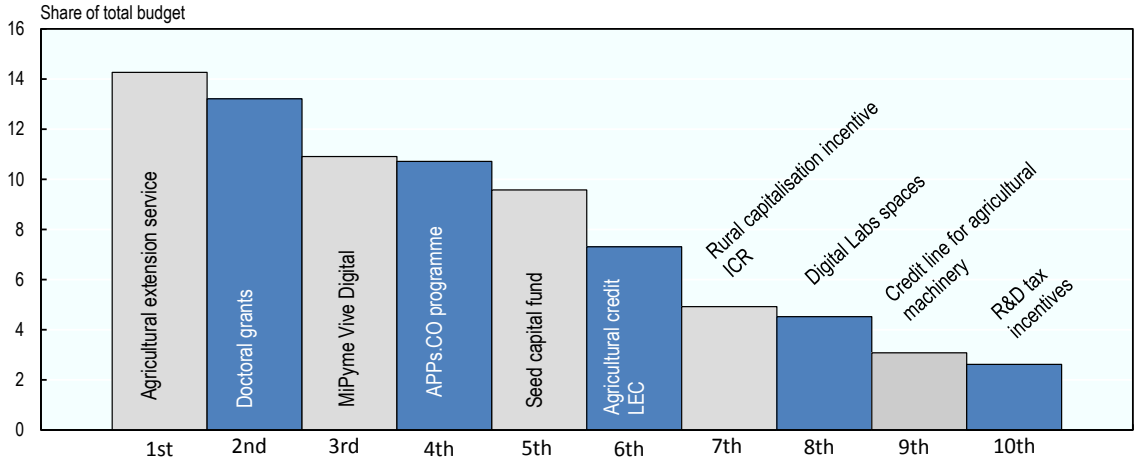
Just 10 out of 83 instruments of the PDP account for 81% of the total budget. Agricultural extension services make up 14% of the total, the highest budget allocation. These extension services are managed by the Rural Development Agency (ADR) and offer integrated technical support to small farmers on issues related to technology adoption,

marketing and good agricultural practices to develop marketable sustainable products. The second most important instrument, with 13% of the total budget, are the grants to students obtaining PhDs abroad, managed by Colciencias. The third instrument, which accounts for 11% of total budget, is *MiPyme Digital*. It fosters the use of ICT for SMEs, and is managed by the Ministry of ICT (Figure 2.7).

Figure 2.7. Ten instruments account for 80% of the PDP's budget, 2018



Source: Authors' elaboration based on DNP information and Colombian Observatory on Science and Technology (OCYT, 2018[17]), 2018.

StatLink https://doi.org/10.1787/888933911060

Overall the PDP 2016-2025 represents a step forward in production development policies in Colombia, notably on two fronts: i) it has explicitly created a mechanism to work with regions on identifying priorities for production development and innovation and ii) it has enabled co-ordination among different ministries in areas linked to strengthening the competitiveness of existing firms. The PDP, through its Technical Committee, has benefited from a continual dialogue between different public and private stakeholders. In future, more information on incentives would help the Committee to co-ordinate and implement shared actions between the different stakeholders. The PDP, however, falls short in identifying future issues. Therefore future efforts should put clearer emphasis on Industry 4.0 and new technologies (this issue is further discussed in Chapter 3 of this report) and on ensuring co-ordination with science, technology and innovation policies. The practice of approving separate policy documents for production development and innovation makes progress on both fronts in a synchronised way more complicated. Table 2.2 summarises a progress overview of the PDP following the pillars of the Production Transformation Policy Review (PTPR) (OECD, 2017[18]).

Table 2.2. Progress overview of the Production Development Policy, 2016-2025

Governance dimensions		
Anticipation capacity	x	The policy aims at providing guiding principles until 2025, but it falls short in anticipating future potential scenarios and in taking into account the impact of the ongoing digital revolution. Increasing future-oriented strategic thinking would be required in defining priorities. Industrial development strategies work better when they have clear targets that, at the same time, leave room for manoeuvre to the private sector.
Adaptation capacity	√	The PDP fosters piloting actions before scaling them up and includes a monitoring mechanism that can support policy reforms if targets are not achieved.
Learning and upgrading potential	x	The PDP falls short in identifying future issues. Future efforts would benefit from putting a clearer emphasis on Industry 4.0, new technologies and innovation and in exploring how to unlock the transformative potential of large firms in the country. The prioritisation process identified key products and activities in each region. This approach risks limiting the potential for identifying big challenges and promoting broad innovations that could spill over to the whole system. A production development policy would need to be defined in line with the national innovation strategy. Addressing the issues in two separate policy documents increases co-ordination failures.
Interconnectedness propensity	≈	**Within government**. While the PDP has a Technical Committee for follow-up to which all relevant government agencies are invited to participate, the PDP would benefit from explicit co-ordination with the innovation policy and with the digital and green economy agendas. The practice of addressing each issue in separate programme documents limits the possibilities for effective co-ordination.
	√	**With the private sector**. The PDP has spaces for co-ordination with the private sector. ANDI and CPC are members of the Technical Committee of the PDP and regularly contribute to policy definition. Their participation in this committee facilitates information sharing. More could be done to mobilise private financing in specific lines of work of the PDP.
	√	**Regional entities.** The PDP works hand in hand with all regional governments and private sector representatives.
Embeddedness potential	≈	The place-based approach of the PDP is a positive step. There is a need to examine regional disparities related to financing and administrative capacities and defined mechanisms in order to offer more support more to the regions.

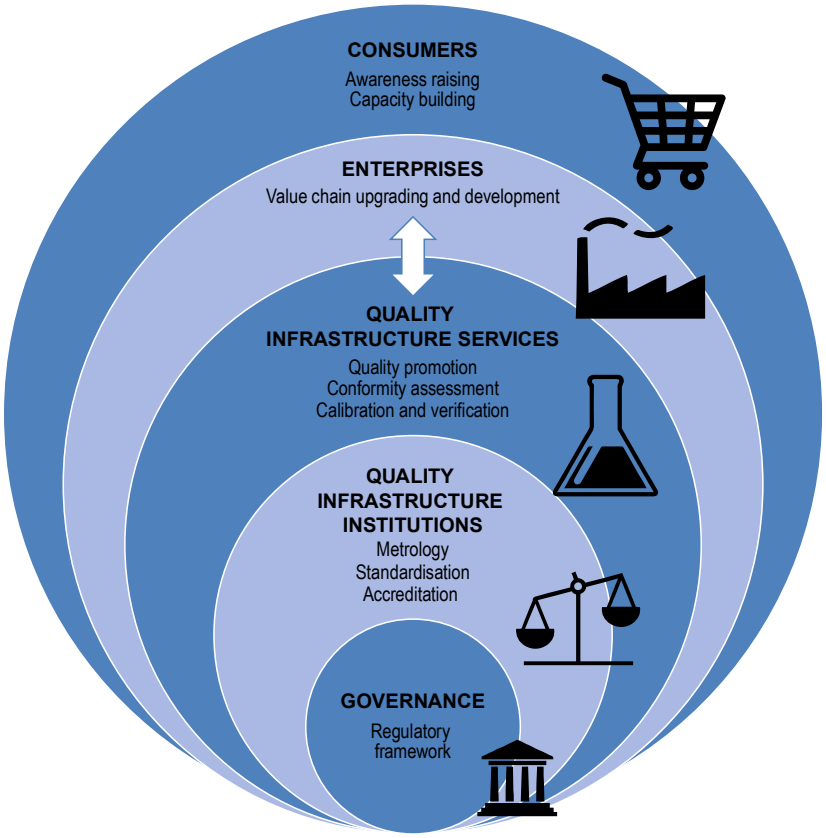
Note: √: positive progress; ≈: margin for improvement; x: reform needed. This progress overview contains information updated until October 2018.

Colombia counts on a quality infrastructure system in line with regional leaders

A national quality infrastructure system, which means public and private institutions in charge of defining, implementing and ensuring the conformity of scientific, legal and industrial standards, is a key component of an effective production and innovation ecosystem. In Germany, for example, the National Metrology Institute (PTB) and the National Standardization Body (DIN) were founded in 1887 and in 1917 respectively. These agencies have been the cornerstone of the development of the domestic manufacturing system in the country. In fact, a well-performing quality infrastructure system fosters competitiveness by improving the quality of domestic products and services, by ensuring compliance with international standards and by signalling the conformity and quality of domestic products and services.

There is no blueprint or ideal model for organising a national quality infrastructure system. In each country, institutions related to governance are set up and evolve according to the specificities of the productive system. In general, these institutions are organised around three functions: metrology, normalisation and standards development, and accreditation and conformity assessment (Figure 2.8).

Figure 2.8. Key functions and actors of a quality infrastructure system



Source: (UNIDO, 2017[19]) *Quality Infrastructure. Building Trust for Trade*, https://www.unido.org/sites/default/files/2016-05/UNIDO_Quality_system_0.pdf.

In Colombia, the National Institute for Technical Standards and Certification (ICONTEC) was set up in 1963 as part of the early national industrialisation strategy. The institute is a private non-profit organisation in charge of defining norms and ensuring compliance with domestic and international standards. Since 2006, with the elaboration of the "Guidelines for a national quality policy" (CONPES Document 3446), Colombia has consolidated its national quality infrastructure system. In 2008, the national agency charged with overseeing the technical competence of the conformity assessment bodies, *Organismo Nacional de Acreditación de Colombia*, ONAC was set up and, since 2011, the country has had the National Metrology Institute (INM), which offers metrology services in line with regional and international best practices. Regional and international co-operation and peer learning has been important in strengthening the domestic national quality infrastructure. Colombia has benefited from international technical co-operation with the National Institute of Standards and Technology (NIST) of the United States, the German National Metrology Institute (PTB), the Korean Standards Research Institute (KRIS) and with the United Nations Industrial Development Organization (UNIDO), which has recently focused on supporting quality infrastructure for the cosmetics and automotive industries.

Colombia today can point to a national quality infrastructure system on a par with regional leaders, such as Argentina, Brazil and Mexico, and not far behind global leaders, such as Germany, Korea and the United States (Figure 2.9).

Figure 2.9. Colombia has a national quality infrastructure system in line with regional leaders

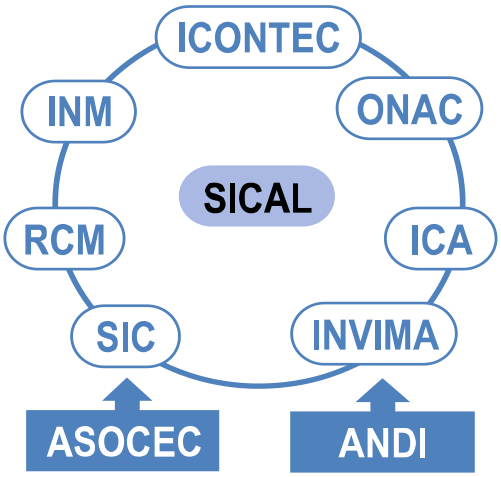
After 2006 (CONPES 3446) Colombia consolidated the National QI

ICONTEC - Standardisation
- 1963 founded
- ISO and IEC Member State
- Secretariat ISO Subcommittee for Coffee
- National IEC Committee (one of 5 in LA)

INM – Metrology
- 2011 founded
- 2013 Full Member State of Meter Convention
- 9 labs internationally recognised
- 60 CMCs

ONAC – Accreditation
- 2007 Creation
- Assignation of 9 MRA/MLA + BLP (OECD)
- Chair of the MLA Committee of IAAC

SIC – Legal metrology
- OIML Member State
- Chair OIML-CS Management Committee



RCM – National Metrology Network

ICA – Instituto Colombiano de Agricultura

INVIMA – Instituto Nacional de Vigilancia de Medicamentos y de Alimentos

Source: Karl-Christian Göthner, German National Metrology Institute (PTB), presentation at the PTPR Peer Learning Group (PLG) of Colombia, Paris, 26 June 2018.

A quality infrastructure system is recognised as an important component for economic transformation and export sophistication in Colombia. The National Development Plan (NDP) 2014-18, identified the update of the national quality infrastructure as a priority to increase participation in global and regional value chains. In line with the priorities established by the NDP, the PDP, launched in 2016, includes the development of high quality national laboratories as a key to helping innovation and the competitiveness of Colombian enterprises and to attracting foreign investment. Colombia has adhered to the OECD Principles of General Laboratory Practices. This creates opportunities for mutual acceptance of data. It avoids testing duplication by industries, reduces non-tariff trade barriers and facilitates co-operation between countries.

Yet, when compared with international practices, Colombia's quality infrastructure system still suffers from weaknesses that hamper its capacity to enhance productivity and innovation in firms. The participants at the PLG meeting highlighted the following ones:

A predominantly top-down governance system. The quality infrastructure system in Colombia is still driven by a top-down process within the government. The bottom up approach, however, has advantages as consumers and firms take a proactive role in informing the national policy.

The regulation mind-set prevails over the innovation mind-set. While standards and norms are necessary to ensure competitiveness, an excessive proliferation of regulations can result in barriers to productivity and innovation. At present, there are 345 norms in place in the automotive sector in Colombia. A conclusion of the Peer Learning Group meeting of the PTPR of Colombia was that the National Metrology Institute is perceived as an instrument to ensure standards, rather than as a tool to foster innovation. This is

reflected in the current governance system, where the National Quality Subsystem (SICAL) is subordinate to the Directorate for Regulation of the Ministry of Industry, Tourism and Trade of Colombia.

Lack of strategic co-ordination. Even though specific roadmaps exist in each institution, there is little co-ordination between the national quality infrastructure embedded in the PDP and the science and innovation polices. This limits the capacity to foster innovation, and reinforces the regulation versus productivity-enhancing approach. In Germany, by contrast, a Scientific Advisory Board for PTB ensures strategic and forward-looking decision-making (Box 2.1).

More agile governance could increase effectiveness. The autonomy of quality infrastructure institutes, such as the INM, could be increased. For example, participation in international activities is subject to Presidential decrees, hampering these agencies' ability to operate in a network with international counterparts. It also burdens ordinary procedures with bureaucracy. Since its creation, INM has been hampered by high turnover at the top level, creating a lack of stability. This adversely affects long-term strategic decision-making.

Proximity with industrial and innovation ecosystems could be improved. Accredited calibration and testing laboratories should be close to their users to ensure high performance. In Colombia, most of these laboratories and services are concentrated in the main industrial centres and cities (Bogotá, Medellín and Cali) (Unidad de Planeación Minero Energética, 2015[20]) hampering increased industrial development in other regions. Collaboration among laboratories and research centres in different regions should be encouraged to provide services because local demand may not be high enough to justify localised institutions. Regional co-operation in Latin America could also help. For example, the European Metrology Programme for Innovation and Research (EMPIR) facilitates co-operation between European national metrology institutes in research on metrology, traceability of measurements, international recognition of national measurement standards and related Calibration and Measurement Capabilities (CMC).

Ensuring that the standards and norms are effectively used by small and medium size enterprises (SMEs). There is a need to raise awareness in SMEs about the quality infrastructure system and its potential support to productivity. It is also necessary to identify mechanisms through which standards and norms can work as productivity enhancers and not as barriers to market participation for small firms. For example, in Germany, the Ministry of Economy and Energy launched the Central Innovation Programme for SMEs (ZIM) in 2012. It provides SMEs with services to foster standard compliance, such as advice on standards' implementation, market research access to databases, specialised libraries, use of office space and laboratories for labels, tests and certifications.

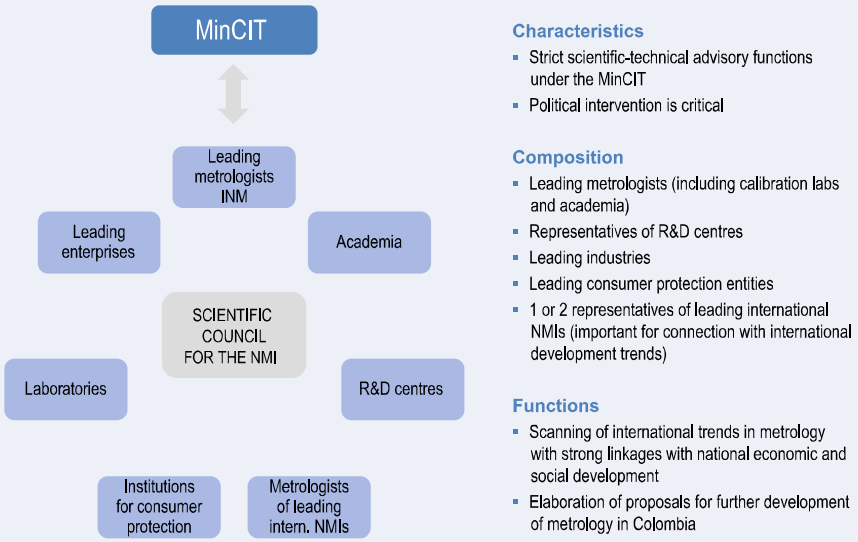
Box 2.1. Increasing co-ordination between QI, science and innovation: The experience of Germany and the United Kingdom

Countries where the quality infrastructure systems act as innovation enhancers have governance systems that generate incentives for strategic co-ordination between different policies. A way to achieve this is to endow the metrology institutions with Scientific Advisory Boards that can facilitate long-term strategic decision making. The participation of leading metrologists, scientists, representatives of R&D centres and entrepreneurs can boost the performance of existing institutions. In Germany, the PTB has an advisory board chaired by the Ministry of Economy and Energy (Table 2.3). In this respect, creating a stable management structure in the NMI and recognising the scientific and technical character and the importance of the institution will quicken implementation of the QI policy in Colombia (Figure 2.10).

Table 2.3. Composition of scientific advisory boards of metrology and laboratory institutes, Germany and UK

National Metrology Institute (PTB)-Germany	National Physical laboratories (NPL)-United Kingdom
Kuratorium (Advisory Board)	Science & Technology Advisory Council
26 members	18 members
President: Representative of the Ministry of Economy and Energy (BMWi) Vice-President: Director of an Institute of the University of Hannover Representatives of leading Research Institutes (University, Leibniz-and Helmholtz-Institutes) Representatives of industry (mostly researchers and developers) Representative of the Institute for Consumer Protection and Food Security Representative of the Siemens Family 3 Nobel Prize Winners Guest: Ministry of Economic Cooperation and Development	Chair: National Laboratory for Nuclear Physics Representatives of leading Physical Research Institutes 5 representatives of industry 2 representatives of NIST (U.S.A.)

Figure 2.10. Improving co-ordination through a Scientific Council for NMI in Colombia



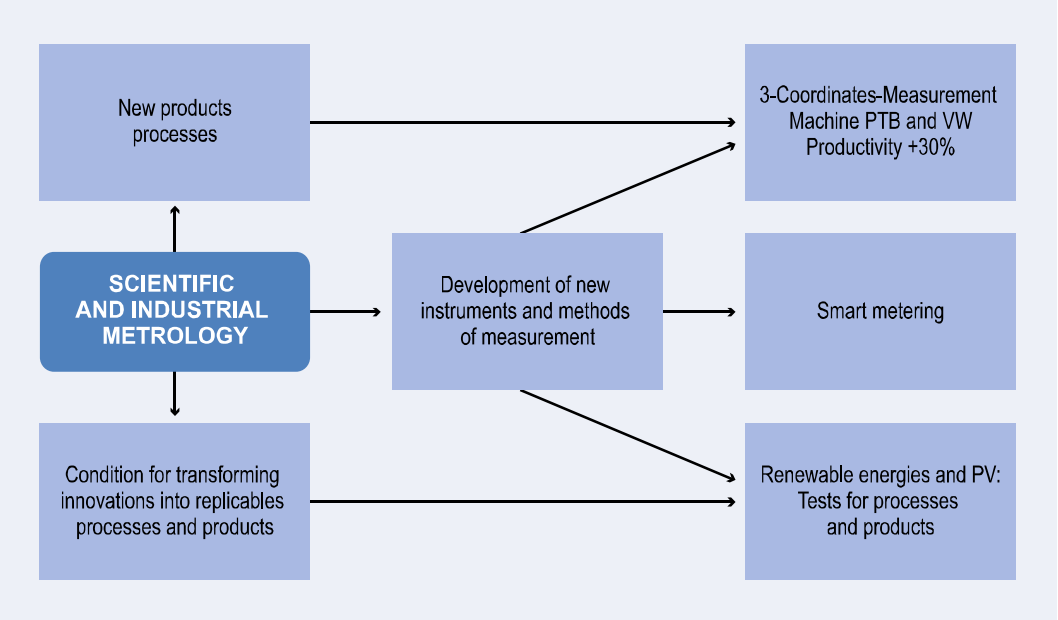
Source: Karl-Christian Göthner, German National Metrology Institute (PTB), Presentation at the PTPR Peer Learning Group (PLG) of Colombia, Paris, 26 June 2018.

In future, it will be important to modernise the quality infrastructure system to make it effective in an Industry 4.0 environment. Updating the quality infrastructure system is necessary to increase industrial productivity and innovation in firms. Advanced countries are already taking steps in this direction (Box 2.2).

Colombia is doing the same. The Laboratory for Electrical Magnitudes of the INM is preparing to support digitalisation. However, important reference laboratories are still missing in the country in areas such as acoustics, photometry and radiometry. In addition, co-ordination between the INM and the innovation system and policy is weak. The official recognition in 2018 of the INM as a national scientific research institute by Colciencias is a positive step forward. This reform brings Colombia in line with good international practices.

In Colombia, private lead firms (such as the local providers to Airbus and the coffee producers in *Valle del Cauca*) tend to operate through international channels and have few links to and little trust in the domestic public quality infrastructure system and the local ecosystem. While several university laboratories are accredited, a more rigorous screening process is needed to ensure that accuracy, reliability, and traceability of measurements match international standards. Such improvements would encourage lead firms to strengthen their co-operation with the national quality infrastructure system. A good example is the Research and Training Institute for Plastic and Rubber (ICIPC) in Colombia, which follows the German model. Germany is known for its capacity to articulate public and private partnerships for metrology, innovation and services to firms. It is now modernising its metrology system to foster digitalisation. In particular, the quality infrastructure system in Germany is fostering Industry 4.0 through public-private partnerships (Figure 2.11).

Figure 2.11. Metrology in Germany is enabling innovation in Industry 4.0



Source: Karl-Christian Göthner, German National Metrology Institute (PTB), presentation at the PTPR Peer Learning Group (PLG) of Colombia, Paris, 26 June 2018.

Box 2.2. Quality infrastructure for Industry 4.0: Examples from Germany

Innovation and production development policies in Germany co-ordinate innovation and quality infrastructure policy for Industry 4.0 through collaborative platform initiatives. Germany places a strong emphasis on SMEs.

Germany has at least three initiatives for innovation and production development that come with quality infrastructure components:

- Industry 4.0 Platform: Companies and industrial associations related to this platform set up the Labs Network Industry 4.0 (LNI). The LNI fosters knowledge transfer, develops certifications and benchmarks measurements related to new disruptive technologies.
- Central Innovation Programme for SMEs (ZIM): One of the ZIM's core aims is to facilitate access to standards for SMEs.
- Innovation policy of the Federal Ministry for Economic Affairs and Energy (BMWE): This initiative aims at the upgrading of the national quality infrastructure (standardisation, accreditation, conformity assessment, metrology, product safety, market surveillance). This will be achieved by strengthening co-operation between the German National Metrology Institute (PTB) and the Federal Institute for Materials Research and Testing (BAM). PTB will lead research in areas like Q-communication, Q-cryptography and Q-radiometry, Q-simulation and applications of the Q-logics for precision measurements. It will be the co-ordination point for quantum technology with a strong private sector demand.

Source: Karl-Christian Göthner, German National Metrology Institute (PTB), presentation at the PTPR Peer Learning Group (PLG) of Colombia, Paris, 26 June 2018.

Sustaining progress in quality infrastructure: Key takeaways for Colombia

Since 2006, Colombia has taken several steps towards best practices in accreditation and standardisation. The next challenge is to provide the production system, national and foreign, with high-level testing and calibration laboratories. The goal is to be competitive in global markets, to boost the reputation, brand and stakeholder value of companies, and to meet the demands of aware consumers.

Colombia needs to improve its governance system to make the quality infrastructure system work for innovation and productivity, and not only as a "regulator". It also needs to update its tools in line with Industry 4.0 requirements and strengthen the INM to offer up to date metrological services to the Colombia industrial base.

Improving co-ordination between innovation, production development and quality infrastructure policies.

- Greater co-ordination between MinCIT, Colciencias and the Quality Infrastructure institutions is needed. Innovation and production development projects should also include the necessary metrology and standardisation component.

Strengthening the calibration and testing laboratory network

- Upgrading technical competences is needed in accordance with the national economic structure and development strategy. Traceability from the INM must be ensured via secondary calibration laboratories to the testing labs and the industry.
- The needs of industrial ecosystems throughout the country beyond Bogotá, Medellin and Cali must be considered.
- Regional co-operation with other countries in Latin America has to be fostered to enhance the quality infrastructure services provided in Colombia.

Strengthening public-private partnerships

- Increased co-operation and trust between lead firms, SMEs and quality infrastructure institutions is needed, especially in the context of Industry 4.0 where proximity to plants is increasingly relevant.
- Specific instruments to facilitate access to metrology, standardisation and testing and accreditation services for SMEs are needed (e.g. special financial lines, platforms, shared laboratories).
- Recognising the technical nature of INM and setting up management incentives is needed to simplify its functioning to make it more responsive to private sector and innovation.

Reforming governance to make it more pro-innovation

- The creation of a Scientific Advisory Board for INM could foster a pro-innovation attitude and increase co-ordination between different policies and with the private sector.
- Increased international co-operation and increased exposure of national representatives of quality infrastructure institutions and R&D laboratories to international trends could enhance innovation.
- Existing strategic initiatives should be implemented, e.g. SICAL Roadmap, Strategy for Metrology and the National Laboratory Policy (CONPES Document 3758)

Increasing awareness of the role of quality infrastructure for national socio-economic development

- Awareness-raising activities for policy makers, entrepreneurs and consumers across the country, and not only in main industrial centres, should be undertaken. The goal is to make these actors aware of the role and potential of the quality infrastructure institutions and to increase their participation in the different quality infrastructure activities. This will help foster the client-orientation of the national quality infrastructure system.

Key policy reforms to transform the economy

The traditional drivers of growth are becoming exhausted, the global economic landscape is changing fast and Colombia is aspiring to advance towards a new pact for prosperity.

In this context, it becomes more urgent than ever to address the pending challenges of diversification, productivity and increased benefits from integration in the regional and world economy. To do so Colombia can best use the existing governance system and its experience in planning and implementation to address some of the problems that are holding back change in the economy.

This PTPR has identified four key areas to advance the transformation of the economy. These include: i) modernising planning and ensuring increased co-ordination between industrial, innovation and trade policies; ii) refining prioritisation through a place-based and challenge-driven approach; iii) updating the policy mix to facilitate implementation: iv) unleashing the transformative potential of digital technologies for production development. The following paragraphs will address points i) to iii). Chapter 3 will focus on point iv).

Modernising planning

Colombia needs to modernise its planning process. The DNP would benefit from increasing its strategic and forward-looking capacities by institutionalising a function to explore future issues and identify new challenges and opportunities.

Colombia's anticipatory capacities could be assigned as a function to the DNP. This could support the presidency in defining innovative and game changing approaches. Different countries have structured this function in different ways, according to their institutional governance and historical patterns. Most countries now recognise the need to have someone in the public sector in charge of long-term thinking (Box 2.3).

Clearer and stronger linkages between planning and budgeting would help to shift incentives towards implementation. It would also reinforce the relationship between the planning body and the presidency. Policy documents seem to have lost their operative function. Institutional incentives seem to be more oriented towards accomplishing document elaboration and approval, rather than towards using these documents as tools to reach agreements on funding and partnerships for change. The experimentation with a Delivery Unit in the presidential office seems to be a step in this direction. In going forward, this could be instrumental in redefining the role of the DNP in the national governance system towards a more operative, results-oriented and forward-looking body. Some countries, like Malaysia with PEMANDU, have temporarily linked such units to the Presidential office and then transferred their capacities to other reformed bodies, (Box 2.4).

Box 2.3. Anticipatory capacities enhance planning quality

What are government anticipatory capacities?

They refer to a structured, systematic approach to thinking about the future. This requires exploring and preparing for a range of plausible alternative futures. Most of the work in public policy is on the expected possible outcome of existing events. Anticipatory capacities provide decision makers with an analysis of potential future scenarios to define better policies for today and tomorrow. The pace of change at the global level is so rapid and uncertain that it is impossible to do responsible policy making without preparing for a range of alternative possible futures.

Good practices

There is no single best way to increase governments' anticipatory capacities. Several countries have invested heavily in developing these capabilities, including Canada, Finland, Sweden and Singapore. From their experience it is possible to identify six key features required for an effective governance of anticipatory capacities:

1. Political demand. High-level political demand is a precondition, because foresight in policy making requires a prior cultural change. In Finland, for example, the Parliament calls for future scenarios to be developed. In the United States, potential scenarios are developed and given to the new President at the beginning of each mandate.
2. A dedicated centre of expertise. There is no ideal institutional arrangement, and each country needs to identify the solution that best fits its institutional governance and culture. However, a common approach is to identify and empower a dedicated centre of expertise in charge of strategic foresight.
3. Co-ordination of foresight exercises across the whole government. The experience of countries, which have advanced the most in the elaboration and use of scenarios for public policies, shows that the most interesting changes and solutions have come from interactions across different institutions, and not just within institutions.
4. Targeted training for experts in charge. This should be part of the overall training of public officials.
5. Multi-stakeholder dialogue. Strategic foresight cannot be done behind closed doors and in isolation. There is a need to bring unusual stakeholders and disruptive voices on board. Strategic foresight can also be a powerful tool to align shared visions across different groups. Very often ideologically polarised views tend to move into alignment when looking at medium- and long-term perspectives.
6. Integration of strategic foresight in a national strategy setting. There should be a mechanism to ensure that the results of the strategic foresight processes are embedded in the national strategy. They should then trickle down to each policy area.

Source: OECD (2017), Key Outcomes of the Peer Learning Group (PLG) Meeting of the PTPR of Chile, hosted by the OECD in Paris, May 2017.

Box 2.4. Co-ordinating actions and monitoring implementation: PEMANDU in Malaysia

Since its independence in 1957, Malaysia's development has been guided by five-year development plans and longer-term ones that set broad goals for the country. These are drafted by the Economic Planning Unit (EPU) in the Prime Minister's Department. The EPU also serves as the secretariat to the National Planning Council (NPC), which is chaired by the Prime Minister and has ultimate responsibility for the content of development plans. The position of the EPU close to the decision-making centre of the government has been key in reducing the gap between plans and implementation in the country. The EPU prepares the development budget in co-ordination with the Ministry of Financing and other implementing agencies, linking development priorities to the country's budget (World Bank, 2017).

In 2010, the country announced a ten-year plan (New Economic Model, NEM), with the aim of doubling national per capita income by 2020 and making the economy more inclusive and sustainable. In order to achieve these goals, a new implementation agency, the Performance Management and Delivery Unit (PEMANDU) was created. The agency operates within the Prime Minister's Department, and is in charge of elaborating and monitoring the implementation of the ten-year plan. PEMANDU was set up as an independent agency with flexibility over hiring and procurement but still subject to government's transparency regulations. PEMANDU's first CEO was a highly experienced private sector figure. The agency had 135 employees in 2015, including 33 support staff, drawn from the civil service and the private sector. To attract experienced staff, competitive salary packages were offered. PEMANDU contributed to some of the successes achieved by Malaysia in 2010-17, including the reduction in the gap of income per capita compared to high-income countries. But it was not meant to be a permanent feature of the government. It aimed at creating an implementation-focused and performance-based culture that could be mainstreamed. In 2017, PEMANDU was disbanded and its portfolio was passed to the Civil Service Delivery Unit (CSDU) under the Economic Planning Unit.

Source: (Brown et al., 2017[21]; Sabel and Jordan, 2015[22]; PEMANDU, 2018[23]),

Ensuring increased co-ordination between industrial, innovation and trade policies

To transform the economy, Colombia needs to align actions across several ministries and agencies. Production development, trade, FDI and science, technology and innovation have been historically planned and managed in separate ways. Realising the potential of their synergies could be a major game changer for Colombia. While these agendas target different firms and agents in the production system and respond to different objectives, their transformative impact is higher when they act together. Production development policies should identify mechanisms to increase productivity by learning from exporting and FDI by working hand in hand with research and technology centres. At the same time, technical training programmes work better when they are conceived in partnership with the private sector.

To be effective, the production development policy would need to be accompanied by and co-ordinated with a research and innovation agenda. The PDP 2016-2025 assumed that another policy (and therefore another budget) would be approved to address

innovation and technological development. The innovation pillar, however, was never approved, leaving the PDP 2016-2025 lacking that forward-looking component. Despite that, some components to foster innovation in existing firms were included in the PDP. Drawing up separate budgets and policy tools for innovation and production development undermines the transformative potential of the competitiveness agenda. But Colombia has made advances in co-ordinating production development and trade and investment policies. The PDP 2016-2025 includes a target to increase national exports. However, more can be done at the level of trade negotiations and strategic partnerships. Trade and investment agreements, if properly negotiated, could include provisions to foster learning in domestic firms (Box 2.5). While free trade agreements commonly include provisions for technology transfer and technical co-operation, Colombia has not taken advantage of this in its current bilateral agreements. Other countries in the region, such as Chile and Peru, are benefiting from such provisions (Table 2.4).

Table 2.4. Provisions to foster learning in FTAs, selected countries

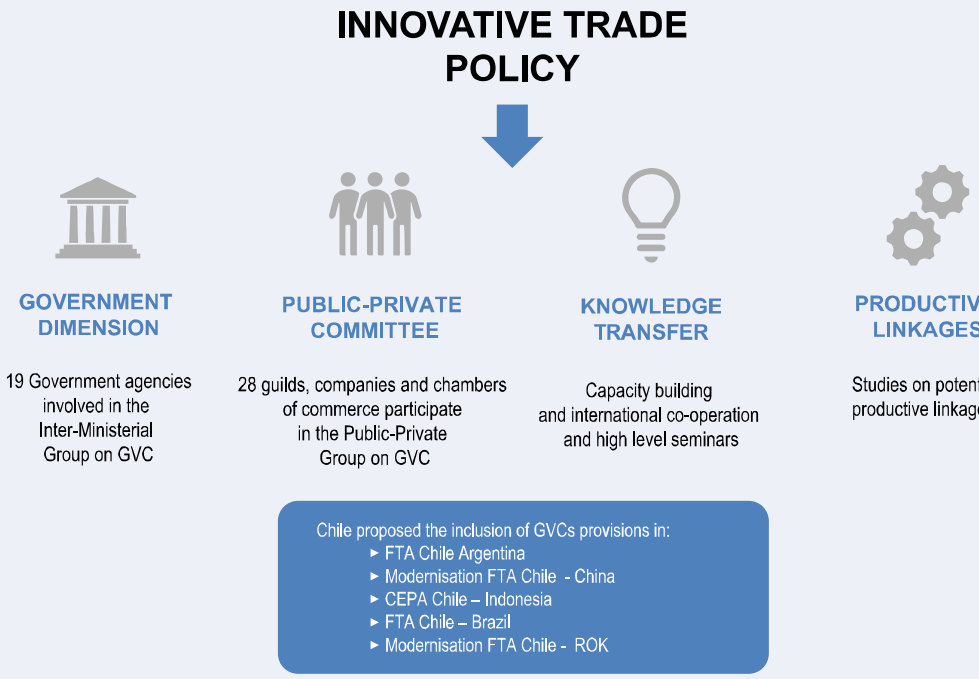
Trade agreement	Entry into force	Technical co-operation	Technology transfer	R&D and innovation	Patents and intellectual property
CHILE-CANADA	05/07/1997	YES	No	No	No
CHILE-CHINA	10/01/2006	YES	YES	YES	YES
CHILE-USA	01/01/2004	YES	No	YES	YES
COLOMBIA-CANADA	**15/08/2011**	**No**	**No**	**No**	**No**
COLOMBIA-USA	**15/05/2012**	**No**	**No**	**No**	**No**
COSTA RICA-CANADA	01/11/2002	YES	No	No	No
COSTA RICA-CHINA	01/08/2011	YES	YES	YES	YES
PANAMA-CANADA	01/04/2013	YES	No	No	No
PANAMA-USA	31/10/2012	YES	YES	YES	YES
PERU-CANADA	01/08/2009	YES	No	YES	No
PERU-CHINA	01/03/2010	YES	YES	YES	YES
PERU-USA	01/02/2009	YES	YES	YES	YES

Source: (Chelala and Martínez-Zarzoso, 2017[24]) based on the legal texts of the agreements, WTO and OAS.

Box 2.5. Facilitating GVCs participation in trade agreements: The experience of Chile

Chile has a long-standing, effective trade policy (OECD/UN, 2018[25]). The country keeps updating its policies to face emerging challenges including, for example, ensuring better participation of domestic firms in GVCs. In particular, following the recommendations included in the PTPR of Chile (OECD/UN, 2018[25]), the country set up an inter-ministerial group on GVCs. The group, led by the General Directorate for International Economic Affairs (Direcon) in the Ministry of Foreign Affairs, is composed of 19 public institutions. This group has elaborated concrete proposals to include GVCs provisions in trade agreements. In addition, Direcon also hosts a public-private committee on GVCs where local firms willing to increase exports and participation in GVCs can share their experiences and knowledge to identify potential solutions.

Figure 2.12. Chile innovates in trade policy and adds provisions to benefit from GVCs in trade agreements



Source: Viviana Araneda Urbina, Head Global Value Chain Division, Bureau of International Trade Relations, Ministry of Foreign Affairs, Chile Presentation at the PTPR of Colombia PLG meeting, Paris, 26 June 2018

The benefits of trade and FDI do not automatically trickle down to the local economy. Many emerging economies are taking steps to turn increased participation in the world economy into a driver of industrialisation. In Colombia the current regime of Free Trade Zones, most of which are linked to specific enterprises, does not work well enough to drive trade and investment for local industrial development. Morocco, for example, is acting on several fronts to attract FDI, increase trade and industrialise its domestic economy (Box 2.6).

Box 2.6. Learning from FDI: The experience of Morocco

Morocco has invested in a targeted strategy to strengthen basic infrastructure to connect the country. Morocco is pursuing infrastructure building to leapfrog in certain areas. These include the use of renewable energy, and in particular solar energy. In parallel, the country is reforming its policy mix to improve its business environment and to define appropriate framework conditions for trade and investment. In priority areas, such as the automotive industry, Morocco is also defining new relationships with foreign investors. It is setting up innovative partnerships that enable local providers to learn and upgrade, and to benefit from specific conditionalities in the supply chain partnership agreements. In particular, the country is:

1. Defining an appropriate framework for investment and exports:

- Creation of national and local investment and export agencies (AMDIE, CRI)
- Liberalised capital account for non-resident transactions
- Free Zones with preferential regimes, offshore areas and Casablanca Finance City
- Free trade and investment protection agreements concluded with a large number of countries
- Adopting legislative and regulatory reforms such as a Charter on Corporate Social Responsibility

2. Improving the business environment:

- Strengthening the position of the National Business Environment Committee (NBEC) as the only platform for public-private dialogue through the simplification of administrative procedures related to the promotion of private investment;
- Strengthening institutions in charge of good governance and the promotion of ethics;
- Implementation of a strategy to fight corruption (2015-25);
- Deepening the public administration modernisation

3. Modernising the financial sector to support investment dynamics through the diversification of financial instruments, the strengthening of the stock exchange and the consolidation of Casablanca Finance City.
4. Increasing support to companies, through Innov Invest Fund, a special fund created to support start-ups and innovative projects.
5. Adopting legislative and regulatory reforms such the Investment Charter, the Charter on Corporate Social Responsibility, the Public-Private Partnership Contracts Act, the decree on Public Procurement, the General Regulation of Construction, the Supreme Council of the Judiciary and the Statute of Magistrates.
6. Simplification and digitalisation of administrative procedures for businesses by introducing an online platform to reserve the company name and reducing registration fees, opening a one-stop shop for obtaining building permits, improving the online system for filing and paying taxes, implementing a paperless customs clearance system.

Morocco is also implementing targeted policies in priority sectors. In the automotive sector, for example, the country has set up industrial zones in partnership with foreign investors, and has developed a targeted policy mix for investment (Table 2.5).

Table 2.5. Policy mix for investment in automotive industry, Morocco, 2018

Tax and customs exemption (indirect)	Financial support provided by the Hassan II Fund (direct)	Specific support
In Free Trade Zones - Total exemption from income tax (RT) for the first 5 years, then an 80% tax abatement on gross taxable business income for the next 20 years - Total exemption from corporation tax (CT) for the first 5 years, then the application of a rate of 8.75% for the next 20 years - Total exemption from business tax and urban tax for 15 years - Exemption from the tax on shares, dividends and similar income for non-residents and the reduction of this tax to 7.5% for residents - Exemption from registration and stamp duties on acts of incorporation or capital increase of the company, as well as on the acquisition of land - Total exemption from import duties and simplified customs procedures	**Direct financial support for:** - 30% of professional construction costs, limited to 180 € / m² - 15% of equipment costs for investment in machinery - Contribution of the fund to 15% of the investment amount, capped at D30 million	**Specific aid for large-scale projects:** i.e. Renault Tangier project in a PPP approach - Provision of land and off-site infrastructure, - Creation of the Training institute for automotive industry jobs, - Construction of a railway line linking Renault - Construction of the Port Tangier Mediterranean factory

Source: Mounssif Aderkaoui, Director of Studies and Financial Planning Ministry of Economy and Finance, Morocco. Presentation at the PTPR PLG of Colombia, Paris 26 June 2018.

Refining prioritisation through a place-based and challenge-driven approach

Identifying priorities for public investment in industrial and technological development is the million-dollar question in public policy making. There is no consensus on the best approach to prioritise and despite improvements in evidence-based policy making, political and managerial feasibility plays a major role in defining priorities. In Latin America and in Colombia since the 1980s, there has been a generalised mistrust of government's capacity to select winners and prioritise sectors. This, combined with the action of strong established interests and lobbies, has often maintained the *status-quo* of existing incentives. Overlong priority lists, which include all existing activities in the economy, have led to a dispersion of already limited budgets into a multiplicity of small actions and programmes (Peres and Primi, 2019[3]; Cimoli et al., 2017[14]).

The PDP 2016-2025 marks progress by focusing on evidence-based priorities and by fostering dialogue and concentration at the regional and departmental level. Colombia should refine the prioritisation process by adopting a place-based approach and by introducing a challenge-driven focus. This means working on production development policies together with the territories and not behind closed doors at central government level. In Europe, the Smart Specialisation approach offers valuable insights into this approach. It also requires focusing on technologies and challenges that joint public and

private forces can address, instead of prioritising specific industrial sectors. This is how leading economies such as the United States, Germany and, more recently, China operate.

Working with functional and economic regions and not only with administrative borders would bring Colombia in line with the good practices of some OECD countries (OECD, 2013[26]). Functional regions are territories that do not have specific administrative borders and agencies in charge, but that share specific features that make them worth considering as units for planning and implementing and policies. In Colombia, a good example is the coffee-area (known as *Eje Cafetero*), or the textile cluster in Italy which spans between Emila Romagna, Tuscany and Umbria regions. Identifying priorities through functional regions also helps in identifying needed public goods that could be effectively provided across regions. It also helps in clarifying future challenges. In going forward, Colombia also needs to address the asymmetries in administrative capabilities between regions and departments. These could be done by channelling part of the resources accruing to regions from the national royalties system to foster knowledge sharing among regions and to train local administrators to strengthen execution and planning capacities in regions.

Identifying priorities based on challenges rather than on improving competitiveness of existing products and sectors could also improve the PDP methodology. Prioritising products, as the PDP 2016-2025 does, risks limiting the potential for diversification and innovation to existing goods and services. Some countries and regions have made manufacturing a priority. China is a case in point, as is the Basque Country. It aims to have 25% of its GDP generated by industry by 2020. Morocco wants to increase the share of industry in GDP from 14% to 23% by 2020. Major challenges, such as mobility and greening the economy could provide an indication of major goals to achieve and leave room for the private sector to organise and co-invest in business and technological development.

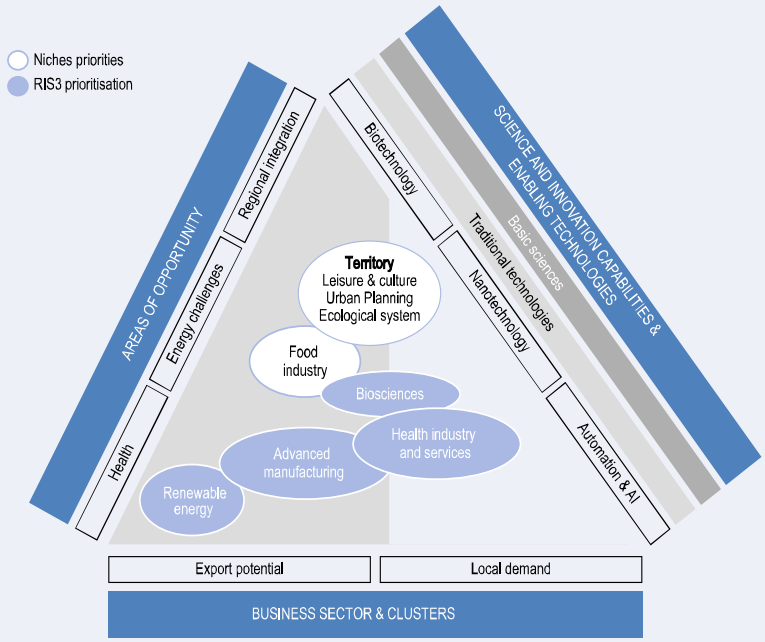
Prioritisation also benefits from clear targets that make tracking and communicating easier. Societies increasingly demand accountability. Governments today need to be able to show progress in a transparent and regular way, even if developing industrial capabilities takes time. The EU Smart Specialisation Strategy has enabled several regions in Europe to advance by easing access to resources. It has also engendered a prioritisation mechanism that is participatory and transparent. The Basque Country has adapted the EU methodology to its own institutional characteristics and has come up with a plan with clear, shared objectives (Box 2.7).

Box 2.7. Prioritising industry: The experience of the Basque Country

The Basque Country has promoted industrial development for 35 years. Its main priorities have remained constant. Currently, the Basque country has a vision towards 2020 based on sustainable, human and smart growth. Using the EU Smart Specialisation Strategy, the Basque Country has identified two criteria for priority action:

- Investing in areas where the region has identifiable strengths including a competitive business sector and some local technological and scientific capabilities;
- Focusing on challenges in which the Basque Country has the capacity to provide knowledge-based solutions.

Figure 2.13. Priorities of the Basque Country regional smart specialisation strategy



Source: Cristina Oyon, Head of Strategic Initiatives, Basque Business Development Agency (SPRI), Basque Country, Spain. Presentation at the PTPR Peer Learning Group (PLG) of Colombia, Paris, 26 June 2018.

Updating the policy mix to facilitate implementation

Colombia would benefit from updating its policy mix to facilitate implementation. Like many countries in Latin America, Colombia has too many lines of action. A one-window system for firms and research centres to access all the instruments offered by the country would help. This would create incentives for the different agencies to co-ordinate and create synergies among similar programmes. Currently start-up programmes are offered by several institutions including universities, iNNpulsa and the national training institute (SENA) (ref. Chapter 3 of this report). It would also help raise awareness among potential beneficiaries. In addition, Colombia would benefit from strengthening the tools for technology transfer and for fostering innovation in firms.

Colombia lacks instruments to address big challenges. Despite the 2012 reform in the National Royalties System which earmarked 10% of funds for innovation, these resources are still channelled and used by departments and regions. The country still lacks a major fund for national innovative challenges. This new fund could be based on existing practices in the system, with updates to deal with new issues. For example the country could consider introducing a cross-sectoral para-fiscal fund targeting specific major challenges (such as mobility and green energy). It could start by identifying two or three main challenges and piloting the creation of targeted funds, benefiting from the experience of the para-fiscal funds. Para-fiscal charges are used in sectors such as agriculture. These financial resources are earmarked to provide specific services and programmes, including research and technology transfer and technical assistance. In this respect, Colombia could also take a further step and address some of the weaknesses of these mechanisms, such as the risk of capture. One innovation would be to focus on major

national challenges, going beyond specific sectors, through a tripartite management committee, with representatives from relevant government agencies, the private sector and the research community. This would ensure that the management of these challenge-driven funds would be innovative and future-oriented.

Conclusions

Fostering diversification, increasing productivity and benefiting more from trade and investment are shared objectives in Colombia. To tackle these challenges, the country needs not only to address basic competitiveness gaps, such as in the infrastructure and regulatory framework, it also needs to identify mechanisms to foster production development across all its regions.

Through the PDP, the country has moved to define a long-term policy for production transformation. It has also made progress in creating a consultative and open process with the private sector and regional stakeholders. Now Colombia must update its planning capacities to cope with the complex economic and political landscape of today and tomorrow. This would also allow the country to advance in accomplishing the objectives of the Agenda 2030. The challenges ahead include:

- Strengthening the capacity to think long-term, addressing production transformation from a comprehensive point of view, fostering co-ordination on trade, investment and innovation, and shifting attention, and therefore governance and incentives, from planning to implementation.
- Improving the prioritisation process by identifying future industrial scenarios and the impacts on existing production chains and on new activities that the country could develop. Improving the place-based approach and working with regional actors to identify priorities. Focusing on challenges and on value chains rather than a conventional approach linked to specific products and services, avoiding leaving more space for private sector initiative.
- Updating the policy mix by facilitating access through a one-window system and by piloting the introduction of new, challenge-oriented funds to address the current gap in tools for financing and fostering major production development and innovation projects.
- Unleashing the potential of digital technologies for economic transformation and productivity. This issue is addressed in Chapter 3 of this report.

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Chapter 3. Transforming industries: Unleashing the potential of Industry 4.0 in Colombia

Colombia needs to speed up digitalisation to transform its firms and industries. The country has advanced in digital connectivity. It has taken steps to update its training in digital skills and has a buoyant start-up scene. Now it needs to complement the current focus on technology adoption by identifying potential areas in which it can be an innovator and creator of knowledge-based solutions. This chapter reviews the progress Colombia has made in its digital transformation. It focuses on start-ups and existing firms, and concludes with a call to integrate the digital dimension in future policies for production development.

Introduction

Digital technologies are reshaping business dynamics. All countries, regardless of their level of development, now face the challenge of updating their policies and tools to benefit from new technologies. They are redefining how and where businesses operate and how consumers interact with them. The rapid convergence of multiple digital technologies is not just reshaping production and consumption; it is redefining the competitive landscape.

An understanding of new technologies and how they are transforming economies is paramount. It will help enhance industrial competitiveness and help businesses contribute to more inclusive and sustainable societies. It may also lead to ways to deal with the growing divide between pockets of industrial excellence and the territories and people left behind. The PTPR process of the Production Development Policy 2016-2025, presented in Chapter 2 of this report, highlighted as a major policy weakness the absence of any analysis of how digital technologies could help Colombia transform its economy.

This chapter focuses on digitalisation, Industry 4.0 and its potential transformative impact on Colombia's production and innovation system (Box 3.1). It reviews the progress Colombia has made in digital connectivity and skills. It discusses the advances in start-up development enabled by the digital economy and by targeted policies, and it analyses how existing firms could benefit more from digital technologies. It concludes by calling for a digitalisation dimension to be included in the future agenda for production development.

Box 3.1. What is Industry 4.0?

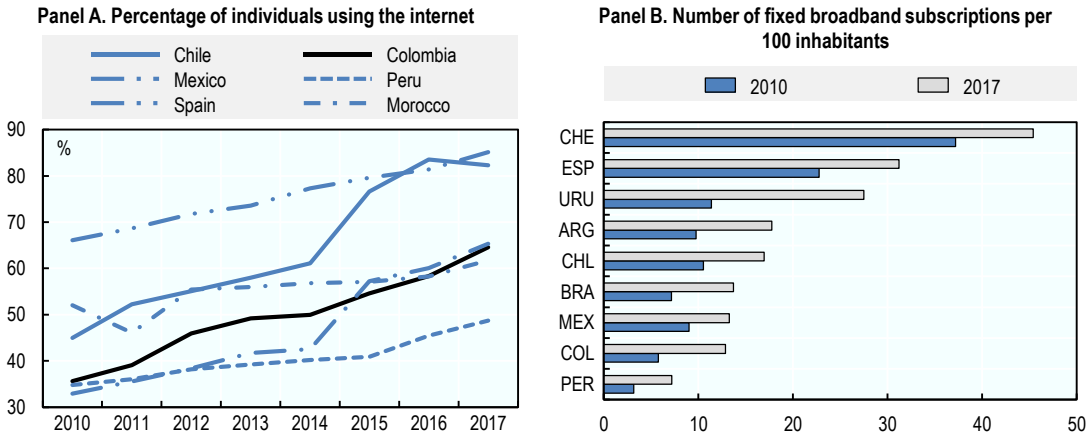
The term Industry 4.0 originates from the 2011 German high-tech strategy *Industrie 4.0* which promotes the computerisation of manufacturing. It refers to the use of advanced digital technologies in industrial production and service delivery processes to enable new and more efficient processes for the production of goods and services combining traditional and digital technologies. Industry 4.0 encompasses several technologies, including 3D printing, the Internet of Things (IoT) robotics, artificial intelligence and big data.

Source: (BMBF, 2016[1]; Forbes, 2018[2]; OECD, 2017[3]).

Colombia has taken steps to close the digital gap

Colombia has improved digital connectivity. The Live Digital Plan (*Plan Vive Digital*) boosted investments in digital infrastructure. As of 2017, 98% of municipalities were connected to the internet (MINTIC, 2018[4]). However, the gap between urban and rural areas remains large. Only 10% of households in rural areas have an internet connection (OECD, 2019[5]). Estimates from the United Nations suggest that 3G coverage covers 100% of the population, higher than the world average of 85% (ITU, 2017[6]). The share of individuals using the internet nearly doubled from 35.6% in 2010 to 64.6% in 2017, reaching a share similar to that of Mexico (65.3%), but still below Chile's share of 82.3%. In 2010-17, the number of broadband subscriptions per 100 inhabitants doubled from 6 to 12, bringing Colombia on a par with Mexico. However, this is still among the lowest levels in OECD countries (Figure 3.1).

Figure 3.1. The share of individuals using the internet has doubled since 2010



Source: Authors' elaboration based on OECD ICT Access and Usage by Households and Individuals database, http://www.oecd.org/sti/broadband/broadband-statistics and ITU (2018) Country ICT data, https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx.

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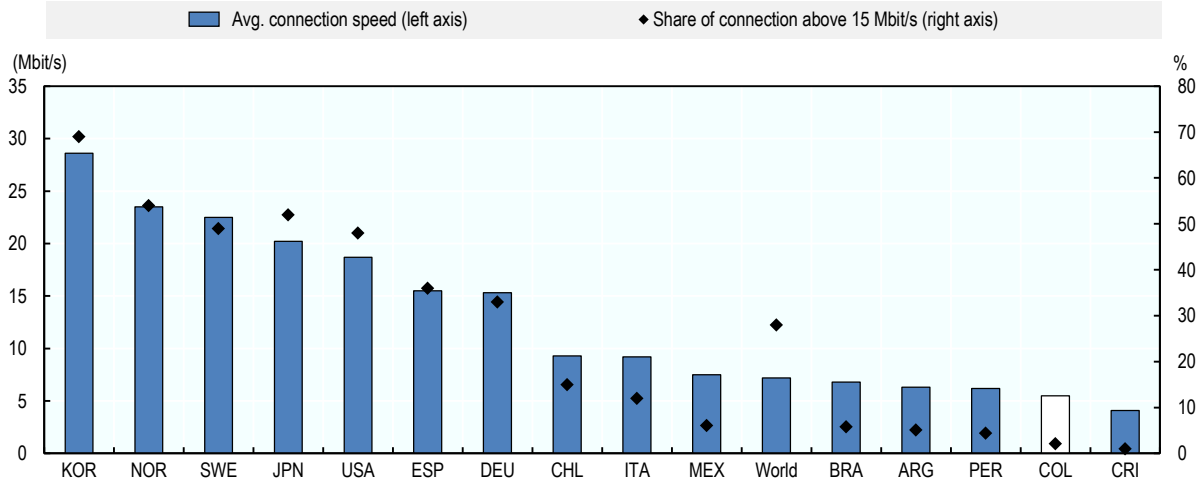
Much progress is still required to address the last-mile connectivity challenge, and to put the country on a par with regional peers and frontier economies. For example, Switzerland, the top OECD country in 2017, had three times the amount of broadband subscriptions per 100 inhabitants compared to Colombia. And while Colombia's density of fixed broadband subscriptions was similar to that of Mexico and Brazil, it was almost 2.4 times lower than that of Spain (Figure 3.2). The average internet connection speed in Colombia is 5.5 Mbit per second, lower than the world average of 7.2. The share of high-speed connections (connections with a speed higher than 15 Mbit per second) is also extremely low, 2.2% in 2017, compared to 69% in Korea, 36% in Spain and 15% in Chile in the same year (Akamai, 2017[7]). Resolution 5161 (2017) of the Commission for Regulation and Communication (CRC) of the MINCIT, stipulates that, as of January 2019, internet providers will be allowed to commercialise only broadband connections equal to or greater than 25 Mbit per second (MINTIC, 2017[8]). This connection quality gap is a major barrier for businesses, as many of their digital-related functions need a high quality, high-speed connection. This is especially true if firms aspire to operate in globally interconnected digital supply chains (OECD, 2017[9]; OECD, 2017[3]).

Figure 3.2. Average Internet connection speed and share of connections above 15 Mbit/s, 2017



Note: Mbit/s: megabytes per second.
Source: Authors' elaboration based on Akamai (2017), "State of the Internet report, 2017", www.akamai.com/us/en/about/our-thinking/state-of-the-internet-report.

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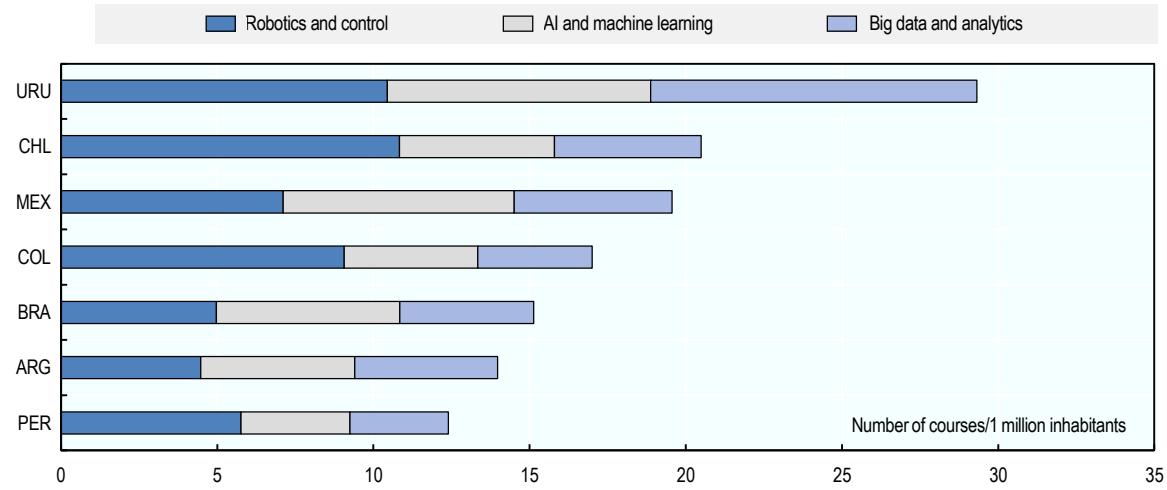
The country is investing in closing the skills gap. While Colombia faces a gap in education coverage and quality (OECD, 2016[10]) it has made progress in offering training in digital skills. In the last decade, Colombia's universities have updated their curricula to offer training in digital technologies. According to estimates from the Economic Commission for Latin America and the Caribbean (ECLAC) (2018), Colombia has the fourth highest number (among the seven countries for which data is available) of training programmes in digital technologies per million inhabitants in Latin America, after Uruguay, Chile and Mexico (Figure 3.3). The training focuses on robotics and control (53%), artificial intelligence and machine learning (25%), and big data and analytics (22%), a pattern similar to that of Chile. Colombia has also introduced technical diplomas and certificates that offer short-term training more in line with the fast-changing demands of employers. Colombia, with 119 short-term courses, is second among the seven countries analysed, behind Brazil with 711. Once normalised for the entire population, Colombia ranks fourth, behind Uruguay, Chile and Brazil. However, Colombia offers a lower number of postgraduate courses (masters and PhDs) compared to other countries in the region that focus on digital technologies. The country has 1.66 postgraduate courses per million inhabitants; about 2.5 times lower than the top economy, Uruguay. This gap is more pronounced in doctoral programmes; Colombia offered 13 doctoral programmes, or 0.27 per million inhabitants, the lowest in the region.

The availability of human capital ready to work on the digital revolution is increasing. The number of engineering and science graduates grew at an annual rate of 8.25%, increasing from 37 949 in 2004 to 105 506 in 2016. Additionally, with 22% of graduates among enrolled students, Colombia is the second country in the region in graduation rates in engineering and technology courses after Mexico, with 24%. Chile and Argentina have a graduation rate of 16% and 9% respectively. Further development of the digital ecosystem will require a larger number of graduates in digital disciplines. This will mean

improving teaching capacities at secondary level to provide an adequate base for more advanced digital courses. Computer science needs to be embedded in educational systems for organisational, pedagogical and innovation reasons (ECLAC, 2018[11]).

Figure 3.3. Number of training courses in digital technologies per millions of people, Colombia, 2017



Source: ECLAC (2018), Data, algorithms and policies: redefining the digital world, https://repositorio.cepal.org/bitstream/handle/11362/43515/7/S1800052_en.pdf.

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Digital technologies are contributing to start-up development in Colombia

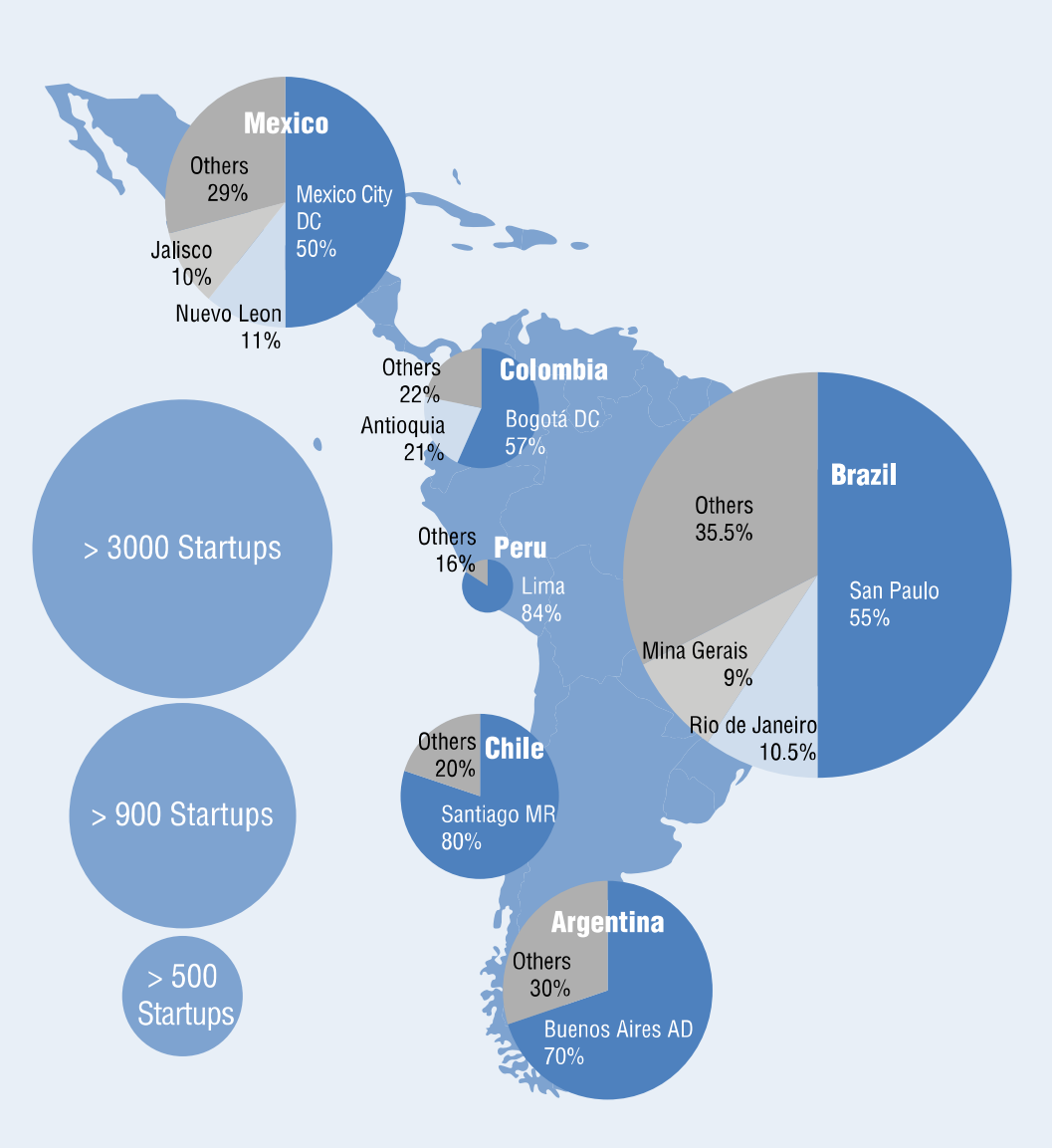
Start-ups are flourishing in the country

Only a decade ago start-ups were far from being a reality in Latin America. Since then the countries of the region have increased opportunities for new businesses to flourish (OECD, 2016[12]; OECD, 2013[13]). Since 2010, with the introduction of the programme Start-Up Chile, the region has witnessed fast progress in the creation and expansion of start-ups (OECD, 2016[12]; OECD, 2013[13]). Even though, the start-up reality in Latin America is still far from what happens in main global start-up hubs, the advancements on the digital agendas in the region coupled with targeted programmes for start-up development and legal reforms made it easier to expand and wind up businesses (ECLAC, 2018[11]; ECLAC, 2018[14]).

The progress on broadband infrastructure, coupled with growing middle classes, has allowed Colombia to reap the benefit of the rising start-up scene in Latin America (OECD, 2016[12]). Colombia is now the fifth largest hub by number of start-ups in Latin America after Brazil, Mexico, Argentina and Chile, and the fourth largest by venture capital (VC) (LAVCA, 2017[15]). Start-ups in Colombia cluster in the traditional industrial hubs of Bogota and Antioquia, making Colombia's start-up ecosystem one of the most territorially diversified in the region, along with Mexico and Brazil. While Bogota accounts for 57% of all start-ups in the country, other countries in the region show higher concentration rates. For example in Chile, the metropolitan region of Santiago concentrates 80% of all start-ups (Figure 3.4). Start-up development in recent years has also contributed to improve the image of Colombia and of certain cities in particular.

After decades of conflict, they are now known for their vibrant innovative ecosystem. Medellín is a case in point. The city has developed an effective public-private partnership through Ruta N that fosters start-up development in the city. After years of headlines as a city of crime, Medellin was named "Innovative City of the Year" by the Wall Street Journal and the Citi Group in 2016. These changes would have not been possible without the advancements on digital infrastructure (ECLAC, 2018[11]; ECLAC, 2018[14]).

Figure 3.4. Start-ups in Latin America and their distribution by region and departments, 2006-18



Source: Authors' elaboration on Crunchbase (2018) database, https://www.crunchbase.com/.

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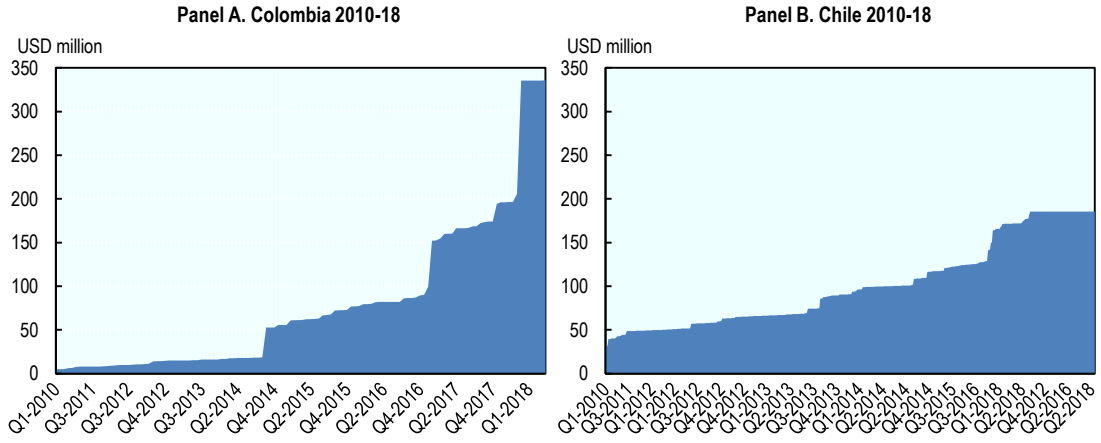
Venture Capital (VC) has increased in Colombia. In 2010-18, VC investment reached approximately USD 340 million, almost double that of Chile (USD 185 million)

(Figure 3.5). Colombia's venture capital is mainly concentrated in the expansion stage (71% of total funding), while early stage and seed deals absorbed 6% VC investments. The Chilean ecosystem is different, also due to public policies that actively support the development of a domestic VC industry. In Chile, VC offer comparably more financing in the seed and early stage (21% of VC) (Table 3.1). VC in Colombia depends largely on the United States, which accounts for almost 50% of total VC investments (in Chile the share is 36%), local investors account for 25%, and the rest is dispersed among different investors. Spain, the United Kingdom, Mexico, Brazil and Argentina are among the top ten VC funds in Colombia (Crunchbase, 2018[16]). In 2006-18, ten industrial activities absorbed 95% of VC. Food and grocery delivery services alone absorbed 63%, followed by financial services (12%), and enterprises that exploit and develop new digital technologies such as bitcoin (6%) (Figure 3.6). In Colombia, VC invests in a few start-ups with considerable resources. In 2010-2018, one start-up, Rappi, the last-mile logistics start-up founded in 2015 offering delivery services from food to cash withdrawal and known as the Amazon of Colombia, absorbed 57% of total VC investments. The top ten start-ups accounted for almost 90% of all VC, whereas, in Chile, ten start-ups accounted for 73% of total VC funds in the same period.

Figure 3.5. VC investments (USD million), Colombia and Chile, 2010-2018



Source: Authors' elaboration on Crunchbase (2018) database, https://www.crunchbase.com/.

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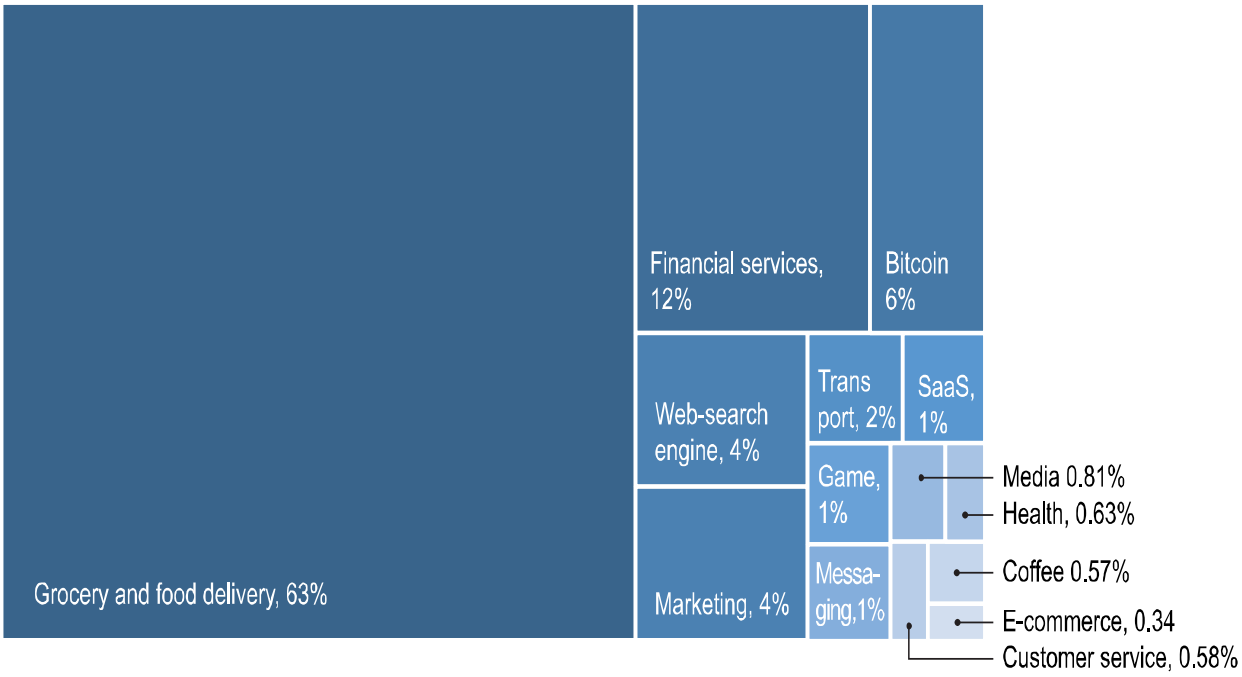
Table 3.1. Venture capital by stage, Chile, Colombia, 2010-2018

	Colombia			*Chile*		
	Number of investments	Total investment USD	Average investment USD	Number of investments	Total investment USD	Average investment USD
Seed	64 (51%)	3 631 673 *(1%)*	56 744	371 *(82%)*	17 721 494 *(10%)*	47 766
Early stage (Start-up)	35 *(28%)*	14 75 575 *(4%)*	425 016	48 *(11%)*	21 098 138 *(11%)*	439 544
Later stage (Growth)	23 *(18%)*	80 500 000 *(24%)*	3 500 000	28 *(6%)*	94 514 176 *(51%)*	3 375 506
Expansion	4 (3%)	236 765 000 *(71%)*	59 191 361	4 *(1%)*	52 000 000 *(28%)*	13 000 000
Total	126	335 772		451	185 333	

Note: Seed refers to an investment below or equal to USD 150 000, Early stage investment refers to financing greater than USD 150 000 and below or equal to USD 1 million, Later stage investment refers to financing greater than USD 1 million and below or equal to USD 10 million, Expansion refers to an investment above USD 10 million.
Source: Authors' elaboration of Crunchbase (2018) database, https://www.crunchbase.com/.

Figure 3.6. Top ten start-ups account for 90% of total VC investments

Venture capital funds received by sector, 2008-18



Note: a) Only sectors that absorbed at least USD 1 million are displayed, b) SaaS refers to Software as a Service, which are software distribution models in which a third-party provider hosts applications and makes them available to customers over the Internet. These includes among others business applications, CAD software, HRM software, and service desk management.
Source: Authors' elaboration of Crunchbase (2018) database, https://www.crunchbase.com/.

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Policies played an important role in enabling start-up development in Colombia

Chile pioneered start-up promotion in Latin America with the introduction of Start-Up Chile in 2010. Colombia followed shortly afterwards with iNNpulsa in 2012 as a specialised agency of MinCIT in charge of channelling funds to innovative firms (OECD, 2013[13]). Since then, the country has experimented with different policy approaches and has advanced in consolidating the institutionality for start-up promotion. iNNpulsa has been reformed into an implementing agency in charge of start-up promotion, always responding to the Ministry of Commerce, Trade and Tourism (MinCIT), but not linked to Bancoldex anymore. However, Colombia has not yet consolidated the institutional set-up for start-ups and it does not have a unique agency in charge. For example, the national training institute (SENA) offers seed capital and technical assistance to entrepreneurs through the Entrepreneurship Fund. Since 2016, that fund also supports start-ups in less developed regions such as Guajira and Chocó. Bancoldex, a state owned business development bank, also provides financing for start-ups at the expansion phase.

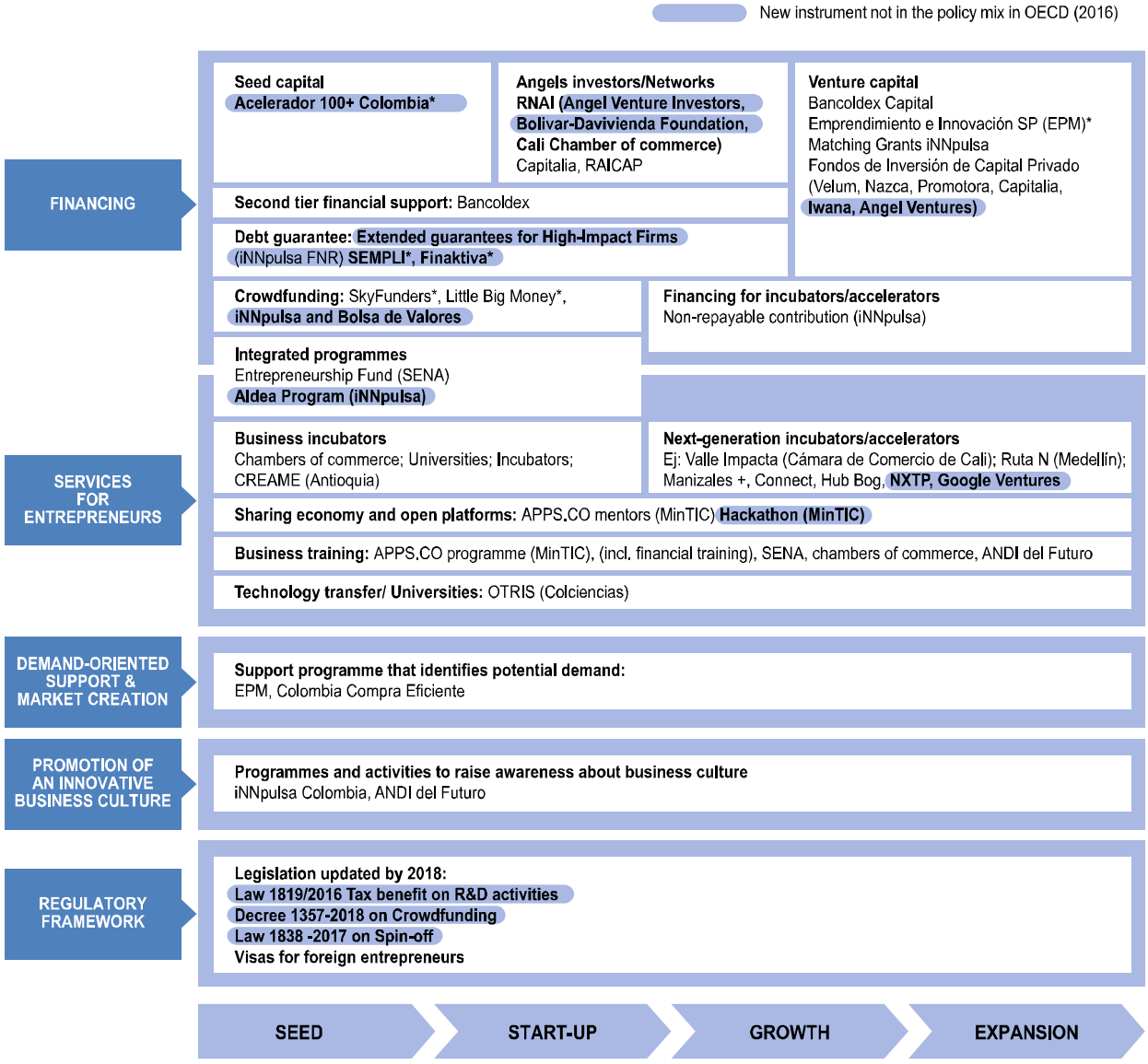
Start-up promotion has been a relatively dynamic area of public policy in Latin America; institutions and instruments for start-up promotion have been monitored, assessed and reformed in relatively short periods. This shows a capacity to adopt results-based polices lacking in other areas of industrial and innovation policies (OECD, 2016[12]). Colombia has updated its policy mix since 2016. Based on the results of monitoring and evaluation, it has strengthened financing, services for entrepreneurs and the regulatory framework (Figure 3.7).

In line with global trends, iNNpulsa has reformed and streamlined its policy mix. The ALDEA programme, since 2016, offered an integrated approach. The programme is similar to that in Chile, with a multi-phase platform. The aim is to ensure a better selection of beneficiaries and to ease the transition from the start-up to the growth and expansion phases. The firms are selected by experts. They assess potential growth and impact, and whether a firm can raise seed capital ranging between USD 15 000 and USD 40 000 for one-year projects. Beneficiaries are start-ups in existence for less than four years with a turnover of at least USD 95 000. Beyond financial support, the programme offers technical assistance from mentors, advisers, investors and credit institutions, to help overcome financial and managerial barriers. In 2016-18, 108 companies were supported by the ALDEA programme. Among the successful start-ups are Soft Cafeteria, a company that connects school canteens and parents and provides information on the quality of children's diets, and Ubits, a digital technology company that helps large companies to conduct online corporate training. Large firms are starting to look at Colombia as a potential innovation hub. Google set up a Venture Accelerator programme in 2018 that offers selected start-uppers three-month intensive support. This includes mentorship and access to networks and contacts to enable start-ups to grow internationally.

Colombia has improved the legal framework for start-ups. As part of the e-government agenda (Decree 1078/2015 and Decree 1008/2018) the MinCIT introduced the programme "fewer, easier procedures" (*menos trámites más fácil*), covering 114 revised procedures (5 eliminated, 56 simplified and 43 completely digitalised) (CPC, 2018[17]). Additionally, in 2017, the government passed a law (no.1838) that regulates university spin-offs to facilitate technology transfer. The Decree 1357, in 2018, regulates crowdfunding and enables banks and firms to create crowdfunding platforms. This makes access to finance easier but it limits the development of more sophisticated instruments

such as crowd factoring and requires pre-conditions, such as the prior authorisation by the Superintendencia Financiera (Ministry of Finance and Public Credit, 2018[18]). Colombia issues a business visa, but this only targets large investors. They need to contribute equity investment in a domestic company of at least 100 times the national minimum wage. Chile makes it much easier. It offers a one-year working visa, with minimal requirements for investors setting up businesses in the country (OECD, 2016[12]).

Figure 3.7. Policy mix to support start-ups in Colombia, 2016 and 2018



Note: Items marked with an asterisk (*) are private initiatives.
Source: Authors' elaboration based on official information from DNP, iNNpulsa and Bancoldex, 2018; OECD (2016), *Start-up Latin America Latina: Building an Innovative Future*, and OECD (2013), *Start-up Latin America: Promoting Innovation in the Region*.

Identifying mechanisms connecting start-ups to the different production and innovation ecosystems is key to reaping benefits from new technologies that will speed up economic transformation in Colombia. This would allow to increasingly rely on digital technologies, not only as platforms that enable the development of application, but also as business areas where start-ups could provide targeted solutions and services for existing firms. Some private entities are already advancing in this respect. New digital providers are facilitating innovation in Colombia. For example, in Medellin, Ruta N, the innovation and business platform of the city, and Bancolombia, are relying on SUNN (Startups Neural Network) a private company that provides an open platform to increase dynamism and connections in their business ecosystem. The platform is based on artificial intelligence, and aims to connect upstream (innovative start-ups) and downstream (traditional business) actors. It uses artificial intelligence to map and discover projects that start-ups, experts and other firms could collaborate on in a specific ecosystem. The system provides a dashboard to monitor the ecosystem's activity.

Fast-tracking digitalisation in firms could increase productivity

Identifying opportunities to foster start-up development using digital technology is only part of the picture. The technology is also a key competitive and transformative factor for existing businesses. A coherent and cohesive whole-of-government approach to better respond to digital transformation is paramount in a fast changing technology world (Box 3.2). This section provides a short overview of how firms in Colombia are using digital technologies. It also provides examples of what policies could do to enable existing firms and production clusters to benefit from the potential of Industry 4.0.

Box 3.2. OECD reviews of digital transformation: Going digital in Colombia

The OECD is undertaking the Reviews of Digital Transformation: Going Digital in Colombia. The aim of the Review is to help policy makers in Colombia ensure a coherent and cohesive whole-of-government approach to better respond to digital transformation and make it work for growth and well-being.

The Review enables benchmarking of digital technology and policy-related developments in Colombia *vis-à-vis* other OECD countries, building on the integrated policy framework and body of good practices developed by the OECD. It examines the economic performance of Colombia and its key policies and regulations related to the digital transformation. It considers developments in the communication infrastructure for the digital economy, telecom markets and related regulations and policies. It analyses trends in the use of digital technologies by individuals, businesses and the government, and examines policies to foster diffusion. The Review also considers other policy areas of the OECD's integrated policy framework, such as innovation, productivity, trade and jobs.

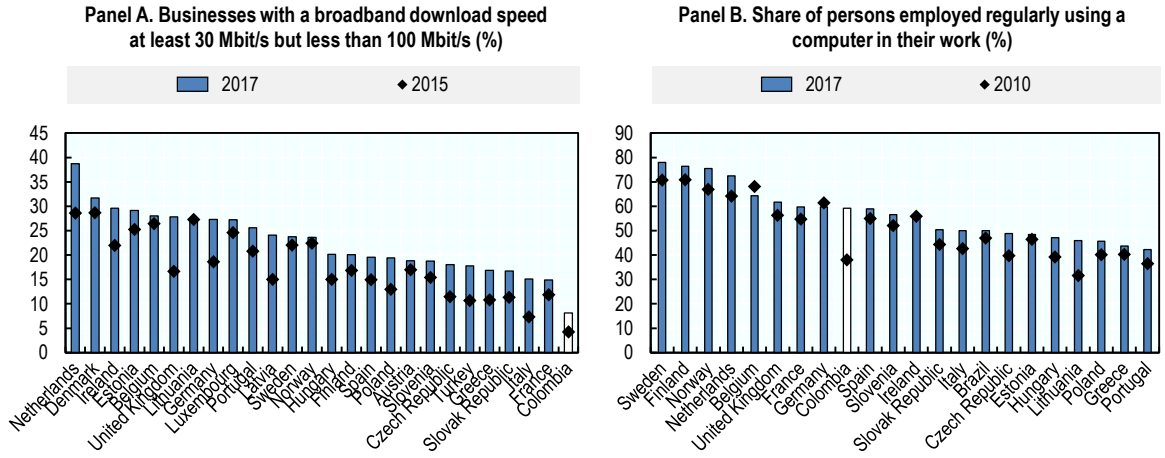
Building on an analysis of the inter-relations between key policy domains and different levels of government, the Review assesses the coherence of policies across these domains and of the synergies across government ministries, levels and institutions in Colombia.

Source: See www.oecd.org/going-digital/ for more information about the integrated policy framework and Going Digital project.

Firms in Colombia are starting to use digital technologies for businesses

More firms in Colombia are using the internet for business (ECLAC, 2016[19]). The share of businesses with high-speed broadband internet connections doubled in 2015-17. Nevertheless, this share is still low compared to other countries. It is roughly 8% in Colombia, while the same figure is 15% in Italy and 39% in the Netherlands (Figure 3.8).

Figure 3.8. The connection speed and use of computers for businesses have increased



Note: Business enterprises refer to firms with ten or more employees.
Source: Authors' elaboration based on OECD Broadband Statistics, 2018,http://www.oecd.org/sti/broadband/broadband-statistics.

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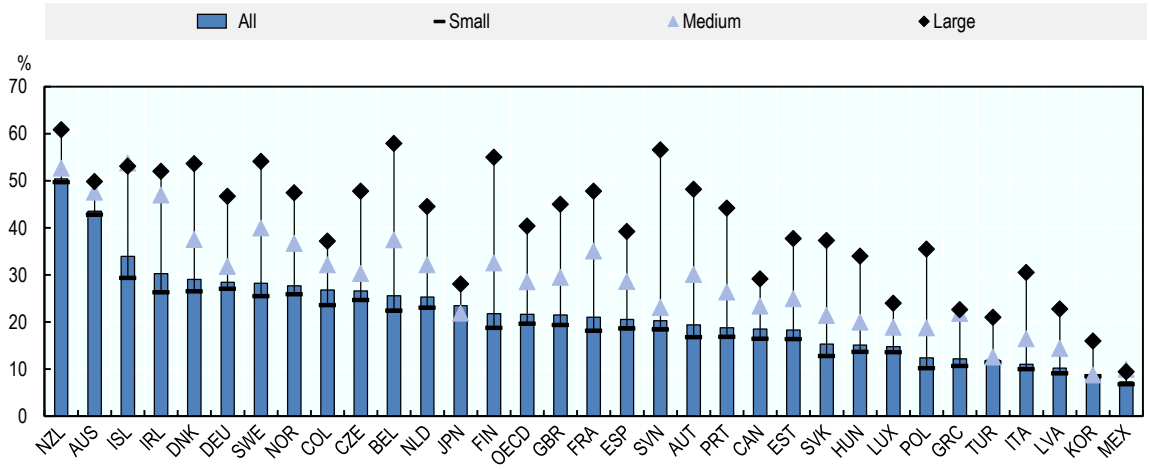
E-commerce is widespread in Colombia. Firms are adopting digital technologies to transform B2B (business to business) and B2C (business to consumers) interactions. In 2015, 23% of small firms, 32% of medium and 38% of large enterprises were engaged in e-commerce activities. These figures are above the OECD average of 22% and above that of other countries in the region, such as Mexico, where only 7% of SMEs carry out e-commerce (Figure 3.9). Additionally, according to the OECD, World Bank and Facebook survey on the future of digital technology in business, in Colombia 29% of digitally active firms report that they use digital platforms to export. According to the survey, 73% of respondent firms are using digital platforms to sell, primarily to national customers, and 85% are using them in advertising. Digital technologies transform production, organisation and decision-making processes and contribute to increased productivity. There are several implications, covering different sectors and activities (OECD, 2017[3]). In Colombia, digital technologies are primarily used to increase market access, and their impact on new forms of business organisation is yet to be explored; only 26% of firms report that digital tools are used to manage internal business processes and only 29% accept digital payment (Figure 3.10).

Figure 3.9. Colombia firms are engaging in e-commerce activities, 2017

As a percentage of enterprises in each employment size class



Note: Only enterprises with ten or more employees are considered. Small firms have 10-49 employees, medium-sized firms have 50-249 employees and large firms have 250 or more employees.
Source: Authors' elaboration based on OECD ICT Access and Usage by Businesses (database), http://oe.cd/bus Database, 2018.

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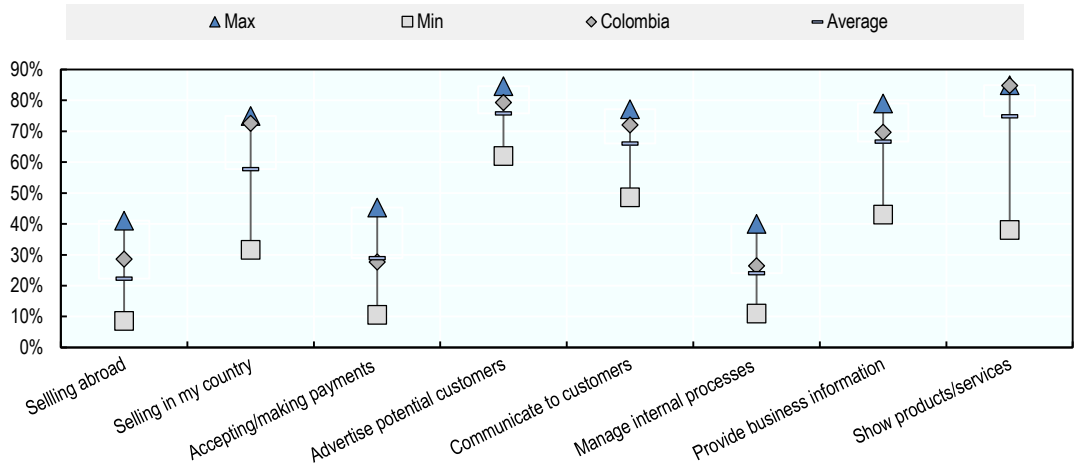
Figure 3.10. What are firms in Colombia using the internet for?



Note: Max, Min and Average are calculated from developed and emerging economies in 42 countries, where the reference population are SMEs with a Facebook account.
Source: Authors' elaboration based on OECD, World Bank and Facebook – The Future of Business Survey, 2018.

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More and better measurement is essential to develop policies and to increase firms' awareness of the potential benefits and risks of Industry 4.0 and the use of digital technologies for business. Some countries are already modifying their official industrial statistics to better capture the readiness of their production systems to embrace digital

transformation. In the United States, the Annual Capital Expenditures Survey (ACES), launched for the first time in 1996, has gradually incorporated specific questions related to digitalisation in business. ACES covers all domestic non-farm businesses and details investments by type and industry. The Census Bureau eliminated the use of paper forms with the 2016 ACES (US Census Bureau, 2019[20]). In the absence of fully comparable official statistical information, pilot firm-level surveys can also be useful to kick-start awareness and to spot new trends. These pilot surveys, if well structured, can then be scaled up to better inform official industrial statistics. In Brazil, for example, the National Confederation of Industry (CNI) has carried out a major research project to understand Industry 4.0 and to map its current and potential use in Brazilian industry (Box 3.3).

In 2017, the National Business Association of Colombia (ANDI) carried out a survey of its members on digital transformation to better understand the reality of digital technologies in national businesses. This opinion survey revealed that the main barriers firms face in the adoption of digital strategies are related to the lack of managerial digital culture (74%), the lack of awareness of potential benefits (62%), and budget constraints (56%) (ANDI, 2017[24]). In 2017, the MinTIC carried out for the first "Great ICT Survey" (*Gran Encuesta TIC*). The survey aimed at companies and individuals and its objective is to articulate historically dispersed statistical efforts in diverse surveys.

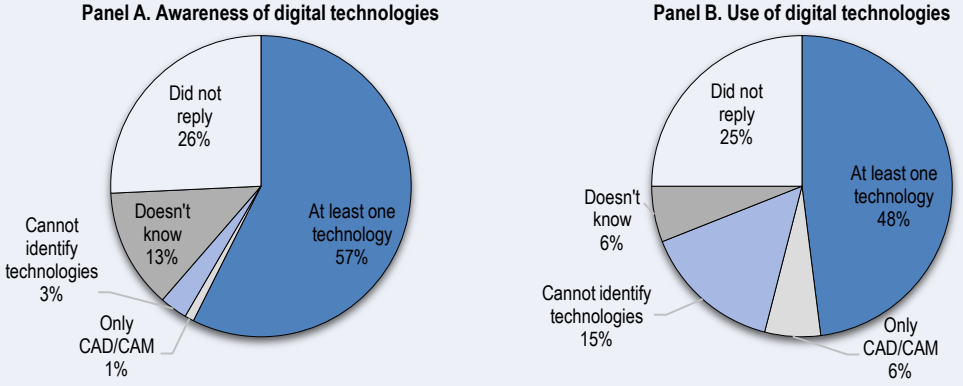
Box 3.3. Measuring the use of digital technologies in firms: The experience of Brazil

The Brazilian National Confederation of Industry (CNI) was founded in 1938.

In 2016, the CNI embarked in an ambitious project to map digital technologies and to understand their use and development by Brazilian firms. This was a business opinion survey to identify not only the investment intentions of Brazilian industry, but also the main drivers and obstacles faced by companies in carrying out their investment plans. Data was collected in the period 24 January-19 March 2018. It covered national companies whose main economic activity was classified as manufacturing or mining and quarrying industry, according to IBGE's National Classification of Economic Activities (CNAE 2.0). The final sample contained 632 randomised and representative firms. Digital technologies were classified according their potential disruptive impact and business functions. Five business functions in which digital technologies have an impact were defined: supplier relations, product development, production management, customer relations, and business management. The potential impact was classified according to four generational types of digital technologies: first generation (rigid production); second generation (lean production); third generation (integrated production); and fourth generation (integrated, connected, and smart production).

Almost 60% of all respondents said they were aware of the importance of these technologies for industrial competitiveness. Awareness was higher among large enterprises (68%) than in SMEs (43%). The survey also revealed that fewer than 50% of manufacturing firms were using digital technologies in their production processes (Figure 3.11). Within manufacturing, the highest share of firms using these technologies was in electronics and electrical equipment (61%), while there was less use in textile and apparel (29%).

Figure 3.11. Less than half of Brazilian manufacturing firms are adopting digital technologies



Source: Joao Emilio Goncalves, Executive Manager, Industrial policy unit, CNI, Brazil. "Industry 4.0 in Brazil. Opportunities and Challenges". Presentation during the 10th plenary meeting of the OECD Initiative on GVC and Production Transformation, Paris, 27 June 2018 (CNI, 2018[21]; CNI, DIRET and IEL, 2018[22]; CNI, 2016[23]).

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In addition, in 2017, the MinTIC, in co-operation with the Bogotá Chamber of Commerce (CCB), carried out the first survey on the adoption of digital technologies in the country. The survey covered 17 sectors and all 33 administrative departments (MINTIC, 2017[25]). This new initiative monitors the state of digitalisation of productive processes of Colombian companies taking into account the size of companies, the economic sector and the region. The survey indicates a limited adoption of all digital technologies in SMEs and micro-enterprises (Table 3.2). Among large firms, 49% were using Cloud computing in their business activities, in line with the OECD average (OECD, 2017[26]). They are followed by 23% of SMEs and only 13.6% of micro-enterprises. In other advanced technologies, SMEs and micro-enterprises have not yet reaped the benefits of the technological transition. For example, only 2.4 % and 1.2% of SMEs and 0.6% and 0.7% of micro-enterprises have adopted Artificial Intelligence (AI) and Robotics. The lag of SMEs in Colombia, as in other OECD countries, is linked to a lack of investment in complementary assets, such as R&D, human resources, organisational changes and process innovation (see Chapter 1 and OECD, 2017[15]). Furthermore, in Colombia, large regional disparities slow the adoption of these technologies. For example, most firms using digital technologies are located in the most industrialised regions of Bogotá, Antioquia and Atlántico (MINTIC, 2017[25]).

Table 3.2. Share of firms adopting digital technologies, by size class, Colombia, 2017

	All firms	Large	SMEs	Micro
Cloud computing	19.1	48.8	22.9	13.6
Internet of the things	9	14.8	9.3	8.2
Robotics	1.5	11.1	1.2	0.6
3D printing	2.2	4.8	2.1	2.1
Big data analytics	3.2	16.8	4	1.3
Artificial Intelligence	1.8	9.7	2.4	0.7
Blockchain	1.6	5.9	1.6	1.1

Note; Size class classifications in Colombia are defined according to the parameters contained in Law 905 of 2004. This involves three different indicators with three different thresholds: the monthly salaries in force (SMMLV), the total assets and the number of employees.
Source: Digital survey Ministry of Information and Communication Technologies (MINTIC) and Bogotá Chamber of Commerce (CCB), 2017, https://www.mintic.gov.co/portal/604/articles-61929_recurso_4.pdf.

Policies for production development in Colombia need to take into account Industry 4.0

Colombia has advanced in digital connectivity, although much needs to be done to raise the country to the level of more advanced economies. Some policies have led to Industry 4.0 giving more impetus to business development and competitiveness. Some of these targeted policies have fostered access to the use of digital technologies by firms, particularly small and medium enterprises. The programme Micro and SMEs Live Digital (*MiPyme Vive Digital*), managed by MinTIC and Findeter, mobilised USD 25 million in 2014-18 to increase access and use of digital infrastructure by micro-enterprises and SMEs (OECD, 2018[27]).

The Production Development Policy (PDP) (see Chapter 2 of this report), has objectives to 2025, but it does not include a focus on Industry 4.0 and the use of digital technologies to transform existing businesses and create new ones. This contrasts with several economies in Latin America and other regions of the world. In these countries and regions, governments and businesses are collaborating to define production transformation strategies that take advantage of the potential of digital technologies. All have different approaches but they all identify targeted and substantial resources to help existing firms in the transition to Industry 4.0. They also finance research and start-up development to enhance competitiveness.

The governance of these emerging initiatives to benefit from Industry 4.0 is specific to each country and region. Two key features are present in all approaches. There are cross-ministerial committees in which the agencies in charge of digitalisation or the ministries for ICT participate. As well, there are specific public-private committees where the government, the business community (both existing industries and large firms, and small firms and entrepreneurs) and academia and research institutions meet to define priorities and funding needs and responsibilities (Table 3.3).

Table 3.3. Several countries are taking steps to reap the benefits of Industry 4.0

		National level				Regional level		
		China	Germany	Sweden	Thailand	Emilia Romagna, Italy	Basque Country, Spain	Shenzhen, China
Strategy		Made in China 2025	Industrie 4.0	Produktion 2030	Thailand 4.0	Industria 4.0	Industrialisation Plan 2020	Shenzhen Action Plan 2025
Time horizon		2015-25	2010-20	2013-30	2016-21	2014-20	2014-20	2015-25
Public budget		USD 10 billion	USD 250 million	USD 50 million (2013-17)	USD 286 million	USD 2 billion	USD 1.5 billion	N/A
Governance		Cross-ministerial, multi-level	Cross-ministerial, multi-level & participatory	Cross-ministerial, multi-level & participatory	Cross-ministerial, multi-level & participatory	Cross-ministerial, multi-level & participatory	Cross-ministerial, cluster of companies and STI actors	Cross-departmental
Prioritisation	Technologies	Automation & robotics, new materials, renewable energies	IoT, automation & robotics	Nine enabling technologies	Infrastructure, enterprise development, robotics, biotech	Digitalisation, automation, energy efficiency, green technologies	Biosciences, Advanced manufacturing, energy production and efficiency	Digital equipment, robotics and new materials, green manufacturing, biotech
	Industries	Aerospace transport equipment, biopharma and advanced medical products	Machinery, electronic, mechanical engineering	Agro-food, construction mechatronics, health industry, creative industry	Automotive electronics, health, tourism, food and agriculture, aviation, chemistry,	Agro-food, construction, creative industries, health, motor vehicles	Agro-food, creative industries, health	Electronics, motor vehicles, aerospace, engineering equipment,

Note: IoT: Internet of things; n/a: not applicable.
Source: Updates and expands (OECD/UN, 2018[28]), *Production Transformation Policy Review of Chile: Reaping the Benefits of New Frontiers*, http://dx.doi.org/10.1787/9789264288379-en.

In Colombia, the PDP has a Technical Committee to co-ordinate strategy. However, the Ministry of ICT has not been part of it, and this has limited the capacity to embrace fully digitalisation. Expanding governance to include key public and private actors in charge of digitalisation could help to identify priority gaps and lines of actions. It could also mobilise joint financing and define appropriate tools to speed the transition to Industry 4.0. This would help broaden the current focus of the PDP. It now focuses on existing firms and their adoption of new technology. It could concentrate on more innovative aspects, to unlock some of the potential benefits of digitalisation. There are unprecedented opportunities to transform businesses and therefore cities, communication and ultimately societies.

To bring about a major transformation through Industry 4.0 in Colombia, the emphasis needs to be both on adopting new technology and on research and development agenda. This will require the participation of key stakeholders from the public and the private sector such as in the case of the Basque Countries in Spain or in the *Industrie 4.0* in Germany where the governments lead the agendas and gather all the relevant stakeholders, such as companies, business and worker associations. In this way, existing businesses will be strengthened and new businesses, products and services will be created (Table 3.4).

Table 3.4. A key challenge for Colombia is to shift from technology adoption to creation

	Short term: Adopting digital technologies	Medium and long term: Innovating through digital technologies
Objectives	Improving quality of and access to internet infrastructure Fast-tracking technology adoption in businesses (processes, products, services and organisation) Favouring start-up development and enabling experimentation	Developing new products and services based on digital technologies
Lines of action	Public-private partnerships for infrastructure development. Financing and fiscal incentives for firms to facilitate digital transformation Services to raise awareness and transform mind-sets to facilitate technology adoption Updates in public procedures and training for public officials to manage digital programmes for firms Targeted short-term training for entrepreneurs and workers to facilitate technology adoption	Public-private partnerships for strengthening the science and technology infrastructure Public financing for digital research and development through a mission-oriented research fund Public-private financing for disruptive innovation Public investment in innovative training of high skilled scientists, engineers and innovators
Beneficiaries	Start-ups, existing firms, employees	Start-ups, existing firms, research and technology centres, networks of innovators

Source: Authors' elaboration based on the High Level Consensus Building Event co-organised by the OECD Development Centre, DNP, ANDI and CPC in Bogotá, Colombia in October 2018.

Conclusions

Colombia has advanced in digital connectivity, but the country is still not at the level of OECD countries. Colombia needs to make its industries and services more competitive and productive. A smarter use of digital technologies would help in this push. Cities can be active players in this field. Medellín, has announced in 2019 the creation of an Industry 4.0 technology centre with an initial investment of USD 6 million up to 2022.

More needs to be done to improve the coverage and quality of digital connectivity. Low broadband connection speed can hamper firms working in digitally connected and global platforms and chains. This, in turn, slows productivity and the competitiveness of Colombia's businesses. The country can also improve start-up development by providing incentives in business areas connected to digital technologies. A reform of regulations on university-to-business spin-offs would make it easier to pass on to business the research developed by universities. Despite infrastructure limitations, digital technologies have opened up unprecedented opportunities for Colombia. In the realm of start-up creation, the country has transformed its image in less than a decade. Medellin, once globally renowned for crime, now attracts global investors and is among the world's most dynamic start-up hubs.

Fast-tracking digitalisation in firms and creating new opportunities for digital innovation is necessary to unlock the potential of Industry 4.0. This means that national and regional governance and financing polices for production development need to be reformed. The Ministry of ICT and agencies in charge of digitalisation should sit on the committees in charge of defining strategies, policies and financing for production development. Public-private consultation bodies should include not only established and big businesses but also small firms and entrepreneurs. The latter need an early opportunity to explain their views and needs.

In addition, Colombia should try to identify potential areas in which the country could be an innovator and creator of knowledge-based solutions, as well as a user. Achieving this transformation requires time, but also public and private investments at levels that match needs. Micro and SMEs Live Digital *(Mi Pyme Digital*) is one of the main programmes to help adopt digital technologies in businesses in Colombia, particularly in micro and small firms. It spent USD 25 million of public funds in 2014-18. By contrast, in Spain, the 5G Digital Agenda will invest USD 300 million in 2018-20. The objective is to harness all the opportunities offered by 5G connection by 2020. This means supporting the adoption of standards, identifying practical-use cases, experimenting with technology and developing the relevant ecosystems (EU, 2018[29]). In Colombia, what is needed is an increase in investment to enable current and future firms to operate and compete in an Industry 4.0 landscape. This also requires broadening the production development agenda and including a pillar linked to science, research and innovation. This has been a missing link in the previous efforts to sustain production development in the country.

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