

1 Innovation and higher education ecosystems in Latin America

Opportunity-driven entrepreneurship is gaining traction in selected countries in Latin America (Argentina, Brazil, Chile, Colombia, Mexico and Uruguay). While the innovation system is characterised by low levels of public and private investment in research and development and limited university-business linkages, recent efforts from selected universities are sustaining the nascent entrepreneurial ecosystem and are putting knowledge transfer back on the education agenda. The OECD, the Inter-American Development Bank (IADB) and Banco Santander have joined forces to analyse eleven universities' contribution to innovation and entrepreneurship in selected countries. This study builds on previous work on the topic.

Rationale for this review: Universities as drivers of innovation in their ecosystems

Over the past four decades, universities' role in their communities has changed. The traditional roles of research and teaching are increasingly complemented by the transfer of knowledge, technology to external stakeholders, support for entrepreneurs and the broader community. Universities are increasingly assuming roles of innovators that contribute to regional and national growth. This changing role is due to many factors. Megatrends such as globalisation and technological advancement have altered the way universities teach and conduct research, compelling institutions to compete at the international level, adapt their curriculum and their research to respond to these societal challenges and prepare students for a changing labour market.

In addition, pressures on budgets and economic downturns have led to increased scrutiny of public funding allocated to higher education, putting pressure on institutions (especially public ones) to prove their role in a knowledge-based society. Many of the world's leading higher education institutions (HEIs) are located in economically thriving cities and regions: the geographical proximity between prestigious HEIs and agglomerations of businesses is considered a driver of innovation, productivity and economic growth. The new knowledge generated by these leading research institutions plays an important role in attracting innovative business in regions and is expected to increase university-industry co-operation in the given region. Companies can benefit from the knowledge spill-overs generated by research conducted in local HEIs, especially as knowledge spill-overs are favoured by the geographical proximity of actors.

Universities across the globe have become more “entrepreneurial”, adapting teaching and research activities but also increasingly engaging with external partners to transfer knowledge and support entrepreneurs. Etzkowitz defines the entrepreneurial university as one that carries out activities beyond teaching and research, to fulfil its third mission (Etzkowitz, 2013^[1]). Gibb, Haskins and Robertson (2013^[2]) further argue that entrepreneurial universities are dedicated to “creating public value via a process of open engagement, mutual learning, discovery and exchange with all stakeholders in society – local, national and international”. Concretely, third mission activities may refer to continuous education or lifelong learning, innovation, knowledge and technology transfer, social engagement (volunteer work, cultural programmes) and entrepreneurship programmes.

Over the past four decades, entrepreneurial universities have started to engage more with their ecosystem and some universities have turned into key drivers of economic development in their region. They support a new generation of entrepreneurs, by teaching entrepreneurial skills and providing incubation facilities and producing research that has an impact. The University of Stanford in the Silicon Valley or Massachusetts Institute of Technology, United States, are good examples of entrepreneurial university, producing talent, training a new generation of entrepreneurs and liaising with local technological companies to produce pioneering research and technology (Jaffe, 1989^[3]).

More recently, the COVID-19 pandemic has also highlighted the capacity of universities to play a fundamental role in providing knowledge-based solutions as well as scientific and technological innovation in their respective ecosystems. For example, many HEIs have mobilised scientific and medical resources to address the health emergency, contributing to research but also to the production of medical equipment (respirators, masks, hand sanitisers). Universities can continue this work and support their regions leading innovative research, offering digital and entrepreneurial skills in their ecosystems. In the post-COVID era, opportunities open up to build on this engagement and strengthen HEIs' role in supporting regional development, such as by leading innovative research and contributing to the development of digital and entrepreneurial skills in their ecosystem.

Within this context, the review analyses entrepreneurship education and knowledge exchange practices in a selected sample of universities and identifies common patterns and lessons learned that could be useful to other universities in the region and across the globe. It takes stock of the best practices and challenges

identified during the fact-finding process of the review. It also benefits from pre-existing work on entrepreneurial ecosystems from the Ecosystem Dynamics Initiative (GED) and the Inter-American Development Bank (IADB), each with their own specific methodological approach (see Box 1.5).

The review aims to understand how universities interact with different actors in entrepreneurial ecosystems and how these HEIs can promote economic growth and prosperity within their ecosystems and support the nascent entrepreneurial and start-up landscape in Latin America. Furthermore, as underscored in the previous section, the region is adapting to global transformations that will shape the way we live, study or work. Understanding the role of universities within this context is important, especially as these institutions are a pillar of democratisation in the region and now have a fundamental role to play in a time where social and digital divides are increasing. The report provides some suggestions and international benchmarks to enhance the role of HEIs as drivers of innovation and sustainability in all territories. The review covers 11 universities in six countries in the Latin American region (Argentina, Brazil, Chile, Colombia, Mexico and Uruguay).

The conceptual framework used to understand HEIs new role

OECD work on entrepreneurial and innovative universities

The OECD has been analysing the role of entrepreneurial universities in regional development for almost two decades. To support higher education systems and institutions in their changing role, the European Commission (EC) and the OECD developed the higher education innovation framework and programme HEInnovate in 2011. This guiding framework includes an online self-assessment tool, which helps HEIs to develop their institutional strategy and related actions to embrace the entrepreneurial and innovation agenda (see Box 1.1 for more information).

Box 1.1. About the HEInnovate guiding framework

HEInnovate is a guiding framework for HEIs wishing to develop their entrepreneurial and innovative potential. The framework, developed by the EC in collaboration with the OECD includes a self-assessment tool, which helps HEIs assess their entrepreneurial and innovative agenda. The interactive tool facilitates discussion within an institution on how to drive forward the entrepreneurial and innovative agenda. Through the continued use of the tool, HEIs can monitor their progress against actions taken, gain inspiration from material available on the HEInnovate webpage and be part of a community of practice. HEInnovate covers eight broad areas, which include statements for self-assessment:

- Leadership and Governance.
- Organisational Capacity, People and Incentives.
- Entrepreneurial Teaching and Learning.
- Preparing and Supporting Entrepreneurs.
- Digital Transformation and Capabilities.
- Knowledge Exchange and Collaboration.
- The Internationalised Institution.
- Measuring Impact.

Source: EC/OECD (2022^[4]), *HEInnovate*, <https://heinnovate.eu/en>, accessed in May 2022

Initial work was followed by country reviews, which examine the implementation of the entrepreneurial and innovation agenda at the country level, by taking into account both the national policy framework and institutional practices. Between 2013 and 2021, 13 country reviews have been undertaken in OECD and European Union member countries.

Box 1.2. Lessons learned from the HEInnovate country reviews

Between 2013 and 2021, the OECD and EC undertook 13 country reviews in Austria, Bulgaria, Croatia, Hungary, Greece, Ireland, Italy, Lithuania, the Netherlands, Poland, Romania, Slovenia and Sweden. These reviews demonstrate that there is no shortage of examples of HEIs driving the entrepreneurship and innovation agenda in their institution and within their regions. In many instances, these practices are at the global forefront of what it means to be an entrepreneurial university. Entrepreneurship education has expanded beyond business and engineering schools and is adopted by different types of universities and faculties, generating innovations in teaching, research activities and the way in which HEIs connect with their stakeholders. Yet the country reviews also found that these entrepreneurial practices are granular, dispersed and under-recognised. The HEInnovate country reports demonstrated that HEIs require effective strategies to collaborate with external stakeholders, which can only be driven by effective governance and institutional settings that favour these arrangements (such as the creation of a technology transfer office, a staff position with a remit to promote innovation, etc.). However, often, institutions lacked the right incentives to reward teachers and researchers engaging in activities with external partners and adequate funding to sustain knowledge transfer activities. At the system level, policies, legislation and funding schemes to support this agenda were still at preliminary stages, with countries like the Netherlands or Sweden leading the way. Further research also illustrated the lack of a national evaluation or accreditation system that would consider the entrepreneurship or knowledge transfer agenda, evidencing a lack of policy support.

Source: Adapted from (OECD, 2022^[5]), « Advancing the entrepreneurial university: Lessons learned from 13 HEInnovate country reviews », *OECD SME and Entrepreneurship Papers*, n° 32, Éditions OCDE, Paris, <https://doi.org/10.1787/d0ef651f-en>.

The HEInnovate framework served as a basis to develop the analysis as it offers a comprehensive understanding of universities' entrepreneurial and innovative agenda and the implementation of this agenda. The present study in particular focuses on two dimensions of the HEInnovate guiding framework: entrepreneurship education and knowledge transfer (Box 1.1). It also looks at incentives and organisational structures put in place to support these activities.

In addition, this review of innovative and entrepreneurial universities in Latin America is the first of a series of regional reports on the theme of the Geography of Higher Education being conducted by the OECD.¹ The reports are part of a policy dialogue that aims to understand better the role of universities in their local ecosystems, and how these can be drivers of growth for their regions. Knowledge transfer needs physical proximity, thus the relevance of the role universities play in supporting regional economies. It will also address a key driver for innovation in higher education policy: the need for policy complementarities or synergies to address a policy that has always turned a blind eye to space. Education policies are often regulated at a national level with disregard for the specific needs of local authorities, even in countries where regional authorities are involved in education policy (such as in Spain or some Latin American countries, especially in federal states). Links between policies are often missed too, as policies are developed in silos. To support innovation, higher education policy needs to be done in co-ordination with other policies such as regional development policies, encouraging foreign direct investment (FDI), or industrial policy (Box 1.3).

Box 1.3. Defining policy complementarities

As noted in HEInnovate reviews, universities that succeed in pushing forward their innovation agenda rely on a solid policy framework. For example, in the Netherlands, higher education policies are designed in co-ordination with other policy areas such as innovation, regional development and attracting FDI.

The concept of policy complementarity refers to the mutually reinforcing impact of different actions on a given policy outcome. Policies can be complementary because they support the achievement of a given target from different angles. For example, production development policy, innovation policy and trade policy all support the competitiveness of national or regional industry. Alternatively, a policy in one domain can reinforce the impact of another policy. Policy makers should take into account these policy complementarities when they design and implement policy reforms to avoid poor performance of policies and optimise the use of scarce resources.

Policy synergies are also relevant to higher education policy. For instance, a country that invests in the development of higher education should also be concerned with policies, which create job opportunities for individuals holding a degree, to avoid skills mismatch, or brain drain (qualified workers migrating abroad). In addition, higher education policy should be linked to regional innovation policies. HEIs can act as innovation powerhouses for their regions. Depending on the level of development of their region, HEIs can promote the diffusion of innovation, by creating “competence centres” or “digital hubs”, for example, or collaborating with regional firms to enhance their innovation capacity, through industrial PhD programmes or other forms of joint research activities. In the same vein, through their teaching and learning activities, HEIs can generate human capital to promote sustainable and inclusive development.

The IADB and Santander-sponsored Ecosystem Dynamics Initiative (GED) work on entrepreneurial ecosystems

The study benefits from the IADB’s and Banco Santander exhaustive work on entrepreneurial ecosystems in Bogotá (Colombia), Buenos Aires (Argentina), Mexico City (Mexico), Montevideo (Uruguay), Santiago de Chile (Chile) and São Paulo (Brazil).

The quantitative analysis from the GED and IADB’s entrepreneurial ecosystems assesses the role of HEIs in their surrounding communities, taking into account the characteristics of the different ecosystems. It focuses on the role universities play in supporting research, innovation development and the creation of cutting-edge start-ups. Usually, the innovative edge of start-ups relies on the high content of science and technology in the solutions they bring to the market. For that reason, the process of scouting, incubation, acceleration, investment and exit of this type of start-up requires the confluence of different types of specialised institutions providing specific services and inputs at each stage of this process (hence the importance of knowledge-based institutions such as universities).

The Santander-sponsored Ecosystem Dynamics Initiative (GED) has developed a methodology and metrics to understand the social dynamics of economic ecosystems. GED defines economic ecosystems as a community of actors and individuals who interact with each other and with their environment in a delimited region, which is determined by its social and dynamics, in which resources are exchanged with the function and/or purpose of creating economic value (Tedesco, 2022^[6]). In this definition, actors in an ecosystem are united by a common goal. It draws its inspiration from the Complex Systems Theory that studies the dynamics of economic ecosystems such as other forms of complex systems (traffic, epidemics) where the relations between actors are not always sequentially arranged and/or straight-forward (Turner,

Klimek and Hanel, 2018^[7]; Farmer, 2012^[8]). The OECD uses an analogue definition, which emphasises the connections of the actors in the ecosystem (Box 1.4).

Box 1.4. Definition of entrepreneurial ecosystems

A key concept for understanding regional entrepreneurial ecosystems is that they are networks and places at the same time. These places host interactions among actors that influence each other. Within regional entrepreneurial ecosystems, the connections (and connectors) within the network are as important as the parts that make up the network. The more connectors in a network (and the more connections they have), the more information and resources flow throughout the network. A healthy regional entrepreneurial ecosystem will find many ways to create and nurture connectors and especially “super-connectors”, which proactively connect the connectors. Effective entrepreneurial ecosystems “connect the connectors” and reward participants for stewardship, not ownership.

Four elements that sustain entrepreneurial ecosystems are:

1. They grow from the bottom up.
2. They are inclusive of different types of businesses and support entities located in a given place.
3. They are one or more rallying points for the community.
4. They are sustainable over the long term.

Source: Adapted from OECD/EU (2018^[9]), *Supporting Entrepreneurship and Innovation in Higher Education in The Netherlands*, <https://doi.org/10.1787/9789264292048-en>.

Over 2019-22, GED has analysed more than 5 200 links between 2 500 actors in 12 different economic ecosystems from Latin America and Europe.² This review includes Santander GED’s analysis of the entrepreneurial economic ecosystems of Bogotá, Buenos Aires, Mexico City, Montevideo, Santiago de Chile and São Paulo, with a focus on the role and positioning of the universities. The ecosystem analysis presented in Part II of this review is presented in the form of a visual diagram the universities’ role in the ecosystem, depending on connections these establish with other actors.

In addition, the review also builds on part of the IADB’s work (Goñi Pacchioni and Gonzales, 2022^[10]) on innovation-driven economic ecosystems in Colombia, and the role that universities and other actors provide to cater for the needs of local start-ups. The analysis is also included in Chapter 4 (in graph form) and details how universities help different types of start-ups (innovation-driven, traditional opportunity-driven, social-environmental impact and necessity-driven) at different stages of development (ideation and start-up, acceleration and scale-up, as well as general business-oriented services and financing services) (Box 1.5).

Box 1.5. Methodology used for the ecosystem network analysis

GED’s methodology

This review includes Santander GED’s analysis of the entrepreneurial economic ecosystems of Bogotá, Buenos Aires, Mexico City, Montevideo, Santiago de Chile and São Paulo, with a focus on the role and positioning of the universities (see Part II). Data collection for each ecosystem was conducted by firstly identifying as many actors as possible through desk research, which were in turn invited to attend a workshop on strengthening innovation-driven entrepreneurial economic ecosystems and fill out an

online survey regarding their social dynamics with other actors. The workshops and surveys were designed based on lean research principles with four goals in mind:

1. Gather quantitative and qualitative data concerning the relationships between actors.
2. Gather statistical data directly related to the results of collaborations between actors, regardless of the success of the outcomes, the nature of the agreements or other characteristics corresponding to the social capital of each city.
3. Help actors define their ecosystem's purpose, which is a fundamental component for complex systems as described by (Meadows, 2008^[11])
4. Inform the participants of the theoretical method to study economic ecosystems as well as important lessons learned for the strengthening and development of their own ecosystems.

At the core of the research instrument, participants were asked to mention up to 25 of their most relevant collaborations with other actors in the last 3 years and provide additional information concerning their nature and outcome.

IADB's methodological approach

Part II of this review features the IADB analysis of the Colombian ecosystems to understand the role, centrality and specific services provided by a subset of universities (ICESI University and Pontificia Universidad Javeriana [hereinafter Javeriana University], Bogotá and Cali Campuses).

For this analysis, the authors conducted in-depth interviews with a selection of actors in each ecosystem. These interviews explored in detail the business model of each actor, their specific interactions with the ecosystem, their opinion of the ecosystem's development and their perception of what opportunities exist for public interventions to further dynamise their ecosystems. Among the universities selected for this report, ICESI was the only institution interviewed.

Source: Tedesco, M. and T. Serrano (2019^[12]), "Roles, values, and social dynamics: A new model to describe and understand economic ecosystems", MIT D-Lab, Massachusetts Institute of Technology, Cambridge. Hoffeecker, E., K. Leith and K. Wilson (2015^[13]), "The lean research framework: Principles for human-centred field research", MIT D-Lab, Massachusetts Institute of Technology, Cambridge. Goñi Pacchioni, E. and S. Reyes (2022^[14]), "¿Cómo mapear y medir ecosistemas de emprendimiento? Metodología y aplicación para el ecosistema de emprendimiento innovador de Lima", Nota Técnica, Banco Interamericano de Desarrollo; Goñi Pacchioni, E. and A. Gonzales, (Meadows, 2008^[11]) (2022^[15]), "Ecosistemas innovadores de emprendimiento en América Latina", Banco Interamericano de Desarrollo.

The methodology to select the case study universities

A selection of universities from Argentina, Brazil, Chile, Colombia, Mexico and Uruguay is studied in this review. The team co-ordinating the study has selected the institutions based on the following criteria:

- The type of entrepreneurial ecosystems in which universities operate, drawing on IADB and Santander analysis of different ecosystems in the region, and how different actors interact in these ecosystems.
- The type of universities: In order to have a varied sample, these institutions were selected taking into consideration their size, geographical location and curriculum. The universities' entrepreneurial trajectory was also considered: selected institutions had already been developing their entrepreneurial agenda for some time.

As a starting point, 22 universities participated in the initial stages of the review process. The OECD surveyed these universities to gain an understanding of the institutions' entrepreneurial and innovative activities. The survey also enquired about governance, funding and institutional arrangements that

universities put in place to support the development of such activities. The survey was addressed to the university leadership.

A workshop was also conducted with these 22 universities to introduce the HEInnovate self-assessment tool and enable the universities to get acquainted with this new digital tool. It was created by the EC and used by universities throughout the world that wish to self-assess their capabilities for entrepreneurship and innovation. The self-assessment tool is useful for universities wishing to prioritise and plan actions for the entrepreneurship and innovation agenda. HEInnovate also identifies areas of strengths and weaknesses, and opens up debate and discussion on the innovative and entrepreneurial nature of each HEI.

After this exercise, 11 universities volunteered to participate in the process as case studies within this review. As noted in Table 1.1, the sample includes universities of different sizes, with some large public universities such as the University of São Paulo, and others more specialised but equally big such as the Tecnológico de Monterrey or the Technological University of Uruguay. The sample also includes Siglo 21 Business University (hereafter Siglo 21) in Argentina and ICESI University in Colombia, which are more business-oriented. With the exception of two universities in Colombia that have one campus (ICESI, National University of Colombia at Manizales or UNAL Manizales), all other universities are multi-campus, with campuses located in different cities within a given country(or regions) which multiplies the impact of universities in different places. Chapter 3 of this review offers in-depth analysis of the kinds of organisational capacity universities are putting in place to support knowledge transfer in a multi-campus setting.

Table 1.1. The selection of 11 case studies

Country	University	General characteristics
Argentina	Siglo 21 Business University (Siglo 21)	Private university, 67 000 students, 4 campuses in Cordoba, 200 research teams, 45 graduate and 30 post-graduate programmes.
Brazil	University of São Paulo (USP)	Public university, 90 000 students, 335 undergraduate and 264 graduate programmes, 42 schools, 4 incubators and 1 technology park. Campuses in seven municipalities in the state of São Paulo.
Brazil	Federal University of São Carlos (UFSCar)	Public university, 20 000 students, 20 disciplines related to the areas of innovation and entrepreneurship. Four campuses in the state of São Paulo.
Chile	Adolfo Ibáñez University (UAI)	Private university, 7 661 students enrolled in 12 undergraduate degree programmes and 3 365 graduate students enrolled in 50 master's and 7 PhD programmes. Three campuses in Chile and an additional site in Lima, Peru.
Chile	Pontifical Catholic University of Chile (PUC)	Private university, 5 campuses, 18 faculties. The university focuses on innovation, digitalisation and service to the community.
Colombia	Pontifical Xavierian University (Javeriana)	Private university, 22 516 students, 2 campuses in Bogotá and Cali, 2 000 professors.
Colombia	National University of Colombia at Manizales (UNAL)	Public university with 9 campuses, 58 000 students (11 440 on Manizales Campus), 953 research groups.
Colombia	ICESI University	Private university created by the business community. Started as a business school, but now includes programmes in health social science, medium-sized university with 7 000 students.
Mexico	Tecnológico de Monterrey (TEC de Monterrey)	Private non-profit university, 26 campuses throughout the country, 92 645 students, 11 entrepreneurship and innovation parks.
Mexico	Universidad Anáhuac México (Anahuac University)	Private university with two campuses in the state of Mexico, with five faculties and eight other campuses throughout the country.
Uruguay	Technological University of Uruguay (UTEC)	Public university with a technological profile. There are campuses or "regional technological institutes" located across the 4 main regions of the country and 8 000 students. Careers in engineering, arts and applied sciences.

The fact-finding process

The COVID-19 pandemic limited travel possibilities so the review team was not able to visit the participating institutions. The fact-finding process was conducted virtually, through 22 online bilateral interviews (or 2 interviews with each institution on the topics addressed in the review). The interviews focused on entrepreneurship education and how these practices enabled HEIs to interact with their ecosystems.³

The interviews focused on the following topics:

- Entrepreneurial curricular and extracurricular teaching and learning activities.
- Entrepreneurship promotion within the existing innovation and entrepreneurship ecosystem.
- Current challenges and future opportunities for the university in terms of further entrepreneurship and innovation development.

The second round of bilateral interviews focused on the topic of knowledge exchange and collaboration practices that the universities are developing and implementing to support economic growth in their territories.⁴ The interviews centred on incentives, strategies for knowledge transfer, channels for innovation diffusion, to account for the nature of the exchanges between the universities and their external partners and the strategies, and means that each institution is putting in place to support knowledge transfer. The interviewees were asked to report on:

- Institutional approaches to knowledge exchange (how knowledge exchange is engrained in strategic documents, the university's mission, what form it takes and its allocated budget).
- Incentives for knowledge exchange and collaboration (funding, incentives for staff to engage in such activities, evaluation of such activities).
- The university's place in the ecosystem (main partners, form of engagement, underlying challenges and barriers to collaboration).

Framework conditions in the Latin American region: Education, economy and innovation trends

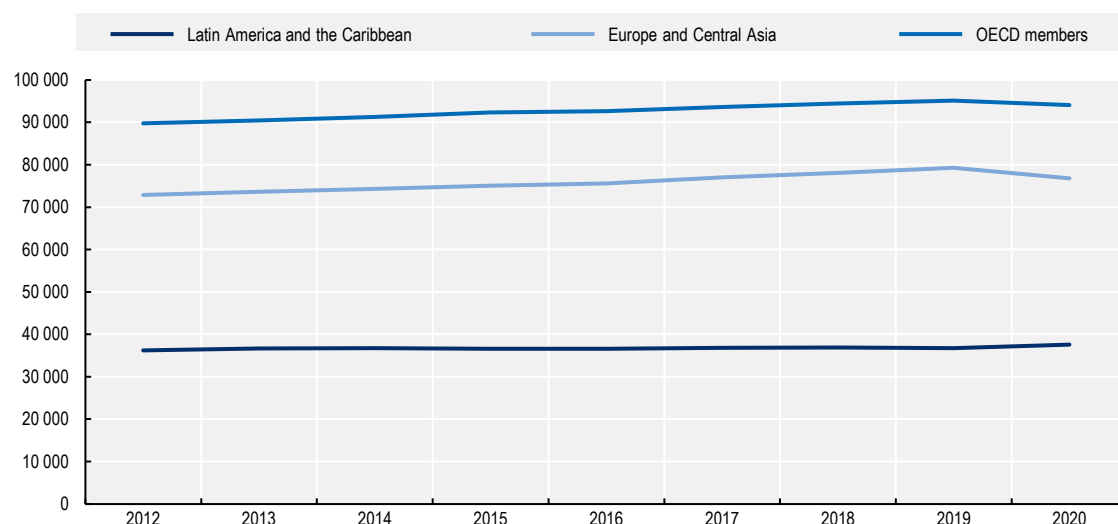
On average, the performance of a given university in terms of entrepreneurship and innovation reflects the framework conditions of its own ecosystem. Innovative regions are also home to entrepreneurial HEIs. In other words, it is difficult to separate HEI contributions from regional innovation; vice-versa, it is hard to understand if a given university performs particularly well due to its location. For this reason, it is important to provide some information about the socio-economic context in which universities operate. Because this study is implemented at the subcontinental scale, the next section illustrates the main economic trends in Latin America, including the impact of COVID-19, which affected the implementation of this study.

A moderated innovation system that affects the economy and universities' ability to transfer knowledge

Since 2014, the Latin American region has exhibited a drop in gross domestic product (GDP) growth rates, with the highest average increase recorded in 2017 at 1.24% (with some disparities, Central American countries performing better) (see Figure 1.3). Labour productivity remains low compared to other regions and has stagnated over the past 20 years and the region is stuck in a productivity trap (Figure 1.1). Other indicators such as per capita GDP, GDP per hour worked or multifactor productivity also show that the region is lagging in terms of competitiveness and productivity⁵ (Vesga, 2015^[16]).

Figure 1.1. The region exhibits low productivity rates compared to other regions

GDP per person employed, constant 2017 Purchasing power parity (PPP) USD

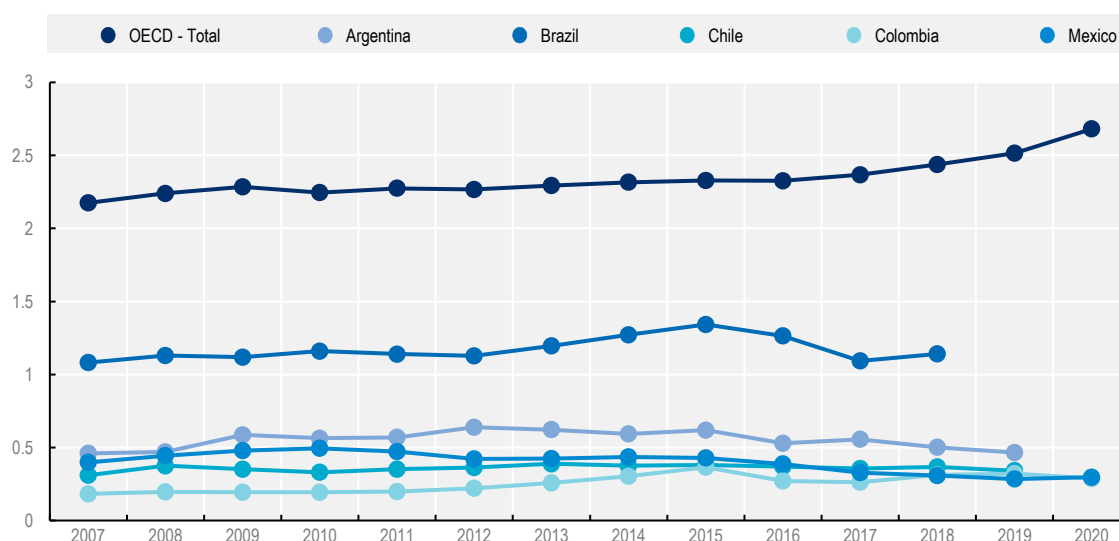


Source: Author's elaboration based on World Bank (2022^[17]), *World Bank Open Data*, <https://data.worldbank.org/indicator>.

The Latin American region, on average, suffers from a lack of public and private investment in research and development (R&D), which hinders innovation-driven growth. Gross domestic expenditure in R&D in the region grew from a little over 0.5% of GDP in the early 2000s to 0.75% in 2015 before declining again in the past years. This trend contrasts starkly with OECD countries, whose R&D intensity stood on average over 2.3% of their GDP in the past decade and increased over the last years (World Bank, 2022^[17]; OECD, 2016^[18]) (Figure 1.2). In addition, R&D intensity varies within the region: Argentina and Brazil are leading the way compared to other countries such as Colombia and Mexico (Figure 1.2).

Figure 1.2. Research and development intensity in selected countries

Gross domestic expenditure on R&D as a percentage of GDP



Note: Gross domestic expenditure on R&D (GERD), totals all expenditure on inputs used in performing R&D, in a given territory.

Source: Author's elaboration extracted from the OECD, 2022^[18], Science, Technology and Innovation Scoreboard accessed in May 2022

The number of researchers employed per thousand inhabitants stands below the OECD countries' median in almost all the countries in the region (OECD/EC, 2022^[19]). Higher education expenditure in R&D financed by industry is below OECD countries' median expenditure with the exception of Colombia, in which the industry's contribution to the higher education expenditure in R&D represents 5% of total expenditure (OECD/EC, 2022^[19]). As in many other developing countries, the countries of the region are limited by the limited involvement of the industry in research and innovation, with low levels of investments and many firms without a dedicated R&D department (especially small- and medium-sized enterprises [SMEs]). There is also a reduced number of people and institutions dedicated to activities of R&D or innovation.

The research funding system for public and private HEIs, usually under the care of national governments has also diminished its institutional grant allocations in support of joint university-business collaboration. The economic vulnerability of the region has dried out financial resources entailing a decrease in the offer of research grants, which hindered the ability of HEIs to collaborate with external stakeholders to develop research.

These obstacles are also found at the local level, where regions are affected by the low engagement of the private sector, although the most prosperous regions have a more developed innovation system whereby HEIs and firms are more involved in R&D. For instance, technology transfer and innovation activities are very developed in regions such as the state of São Paulo in Brazil or the state of Mexico in Mexico, where universities such as the State University of Campinas (Unicamp) or the University of São Paulo (USP) in Brazil, or the National Autonomous University of Mexico (UNAM) find firms to collaborate with (Serra, Rolim and Bastos, 2018^[20]).

In sum, the underdevelopment of the innovation system is an important factor to consider as universities do not operate in an isolated manner. The absorption capacity of firms and the state support for R&D affects the ability of universities to collaborate and transfer knowledge (Serra, Rolim and Bastos, 2018^[20]). The absorption capacity of firms is unequal, with prosperous regions benefitting from and contributing to more mature innovation systems but overall university-business collaboration in Latin America is lower than in other regions.

Promoting start-ups and entrepreneurship to counter-balance the negative economic outlook

Since the early 2010s, a specific type of opportunity-driven entrepreneurship has started to gain traction in several LAC countries.⁶ Start-ups started emerging and growing in several countries in the region, changing the innovation landscape by bringing in new products and services to the market, competing with established firms or offering innovative solutions (OECD, 2016^[18]). Investable innovative start-ups or start-ups whose value proposition can potentially generate high returns to investments have started to attract an increasing amount of public support as well as more private venture investments in several countries of the region.

Following investment trends of more developed markets and a pioneering pilot public programme established in 2010 to accelerate technology-based start-ups in Chile (Start-up Chile), Argentina, Brazil, Colombia, Mexico, Peru and Uruguay have created similar programmes to support start-ups. Entrepreneurship and SMEs have been a policy focus in LAC over the past decade. Start-up Chile is the first public accelerator established in the region for technology-based entrepreneurs and has this year a portfolio of more than 2 200 start-ups from all over the world and over 5 000 alumni from 85 countries (CORFO, 2022^[21]). It has programmes to help start-ups scale up from very early stages (pre-acceleration programmes) to programmes for start-ups with a functional product or service, or start-ups seeking to enter new markets. Start-up Chile counts over 200 mentors and connects entrepreneurs to a large network of venture capital funds, local and global business angels, investors as well as governmental and industry partners. Start-up Chile is attached to Chile's established innovation agency Production Development

Corporation (*Corporación de Fomento de la Producción de Chile*, CORFO) in charge of the country's economic development agenda since 1939. Both CORFO and Start-up Chile have important connections with universities in the country.

Colombia followed in the footsteps of Chile and created INNPulsa in 2012, an agency attached to the Ministry of Commerce, Industry and Tourism in charge of entrepreneurship and innovation promotion. INNPulsa is the culmination of public policies to support entrepreneurship which began in the early 2000s with the first fund dedicated to financing student entrepreneurial ventures in universities and technical institutes (*Fondo Emprender*) (Vesga, 2015^[16]). The agency connects entrepreneurs and SMEs to existing accelerator incubators, firms and investors all over the country. INNPulsa also offers programmes for entrepreneurs or firms looking to scale up their innovative ventures (but does not offer incubation programmes for early-stage ventures). It offers targeted programmes such as ALDEA for ventures in creative and cultural industries (INNPulsa Colombia, 2022^[22]). The agency has created a culture of entrepreneurship and innovation in the country and has connected several entrepreneurs to key actors in cities and regions such as universities, chambers of commerce, incubators and policy-makers. It has anchored high-impact entrepreneurship and firm-based innovation as a fundamental lever to entrepreneurship policy. It promotes entrepreneurship in regions and regularly organises events throughout the country to connect and galvanise actors in different regions and cities (Vesga, 2015^[16]).

Mexico has also started supporting entrepreneurship through the establishment of the National Institute of the Entrepreneur (INADEM) in 2013, attached to the government's Secretariat of Economy. It offers programmes to connect entrepreneurs and SMEs to the private sector and public institutions. Linked to this institute, the government has created a National Entrepreneurship Fund, which funds entrepreneurial ventures. The fund has created a new digital platform where entrepreneurs and SMEs can access a wide variety of government-funded support programmes (incubation, acceleration activities and entrepreneurial mind-set courses) (Fondo Nacional Emprendedor, 2022^[23]).

Brazil supports its entrepreneurs and SMEs through public agencies that offers SMEs courses in entrepreneurship education, webinars and training. In 2013, the government also created the Brazilian Company of Research and Industrial Innovation (EMBRAPII), a public organisation to strengthen Brazil's innovation capacity. The Ministry of Science, Technology, Innovation and Communications and the Ministry of Education fund this public body. It aims to connect technical research institutions with the industry through established innovation centres (EMBRAPII units and hubs) located within universities and research institutes (EMBRAPII, 2022^[24]).

In a similar way, Uruguay created in 2007 the National Research and Innovation Agency (ANII), a public body whose mandate is to promote research and innovation by funding research projects, national and international scholarships and entrepreneurship programmes. It has a specific programme for innovative entrepreneurs with courses and organises annual public calls to tender to help innovative entrepreneurs scale up their ventures. The National Development Agency of Uruguay also accompanies entrepreneurs and SMEs throughout the country. It has delocalised offices that function as one-stop-shops to attend to the needs of entrepreneurs and SMEs (respectively Venture Support Institutions and Centres for SMEs).

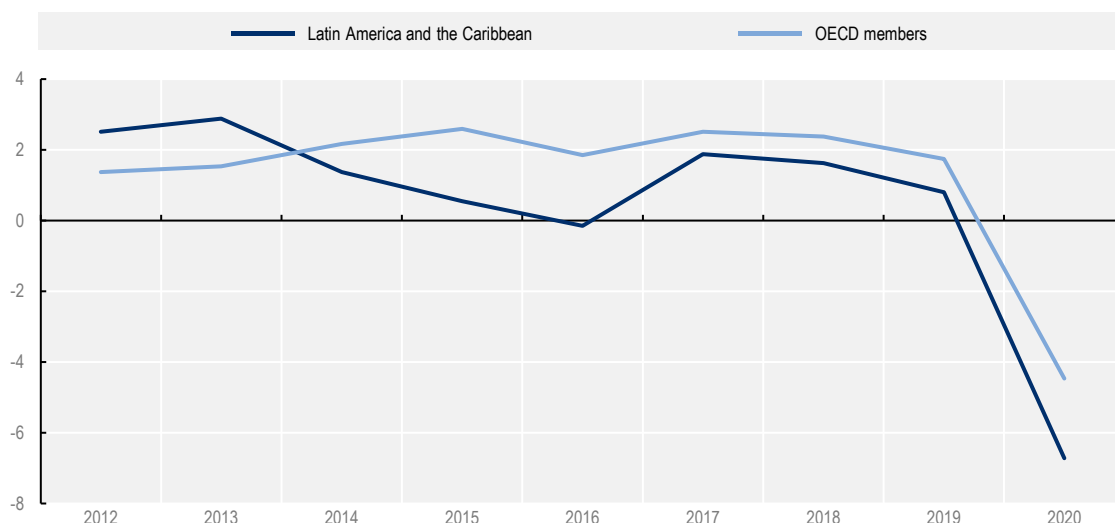
This new landscape has contributed to the emergence of a boom in technology-driven businesses and innovative start-ups thriving on digital technologies. Examples include digital lender Nubank in Brazil, fin-tech Ualá, e-commerce leader Aleph Solutions and *Mercado Libre in Argentina*, used-car platform Kavak in Mexico and Chilean food producer Notco. Such a boom is accompanied by venture capital growth in the region, mainly from foreign investment funds.

As detailed in Chapter 3, universities are collaborating with these institutions that support entrepreneurial development. As reported by universities during the interview process, many start-ups and unicorns⁷ are born within a university incubator or were created by alumni.

The COVID-19 pandemic has exacerbated social divides and increased the productivity trap

The region was the hardest hit by the pandemic with a GDP drop of 7% in 2020 and 6% in 2021 compared to OECD countries (-4.7% in 2020 and -5.3% in 2021) (Figure 1.3) (OECD et al., 2021^[25]). Recovery is expected to be slow, particularly for economies in the region that depend on services and the tourism sector, which suffered from mobility and health restrictions (such as the Caribbean region). Disruptions in global value chains and a drop in imported inputs for industry (originating from China) have greatly impacted the region's manufacturing industry and the automobile industry in particular.

Figure 1.3. Annual GDP percentage growth in and OECD countries, 2012-20



Source: Author's elaboration based on World Bank (2022^[17]), *World Bank Open Data*, <https://data.worldbank.org/indicator>.

The COVID-19 socio-economic crisis exacerbated social challenges, which lingered against the backdrop of stagnating growth. While there was a growing share of the population considering themselves part of a new “middle class”, at the start of the pandemic, the region was facing increasing inequalities and informalities.

As in many other emerging markets, at the outbreak of the pandemic, the region suffered declines in employment, with more than 20 million people leaving the workforce, and a sharp decline in the employment rate which reached a historic minimum value (falling from 57, 4% in 2019 to 51,7% in 2020) (ILO, 2021^[26]). The poverty rate reached an average of 33% in the LAC region, its highest level over the past 20 years (OECD, 2021^[27]). In addition, high rates of informality (on average 45%) left most workers without access to social protection measures.⁸ During periods of confinement, informal workers were not protected against job loss. People earning a lower-middle income decreased by 7 million and those with a middle income decreased by 13 million (OECD et al., 2021^[25]).

Inequalities were further accentuated as access to education was challenged by the pandemic, drawing a clear line between those with access to digital technologies and those left behind (see Box 1.6).

Box 1.6. The digital divide in the LAC region

At odds with these trends, the region has made progress in adapting to digitalisation. The digital uptake in the region has steadily increased. The population with Internet access doubled between 2010 and 2018, reaching almost 70% of the total population in 2018. Mobile broadband penetration reached 65% in 2017. Yet penetration of fixed broadband remains low (12%), less than half of the OECD country average (30%). Furthermore, broadband access remains challenging in rural remote regions, as networks are located in large, high-population density areas. The Internet usage gap between the wealthiest and the poorest is estimated at 40 percentage points and the gap between urban and rural households is 25 percentage points

Source: OECD/EU (2021^[28]), *Supporting Entrepreneurship and Innovation in Higher Education in Slovenia*, <https://www.oecd.org/cfe/smes/HEInnovate-Slovenia.pdf>.

University closures also amplified existing inequalities in access to primary and secondary education, with more than 40 weeks of university lost between March 2020 and October 2021, one of the highest across the globe (UNESCO, 2022^[29]). Students with no resources to connect to or follow online courses were at a disadvantage compared to students who had the means to follow courses remotely (around 15% of students from a disadvantaged socio-economic background did not have Internet access at home compared to the 2% average in OECD countries). Inequalities also have a strong territorial dimension. In countries like Colombia and Mexico, universities act as Internet providers for more than 20% of rural students who do not have Internet access in their homes but can use it in universities (OECD, 2020^[30]).

Universities were also challenged by the lack of digital skills of students and teachers and connectivity issues. Many HEIs were forced to reorganise their activities, teaching has been moved online in a very short timeframe and a strong link between basic and applied research has emerged due to the pressing need to respond to the health crisis. The transition to online teaching has widened the divide between universities with experience in online education and those with little to no experience in such processes, which had difficulties in adopting an effective technological platform to continue teaching activities, although a 2020 survey shows that most universities in the region had a suitable digital platform to continue their teaching online. The survey also shows that teachers were not prepared and some had little experience in online teaching, which directly affected the way in which they could interact with students and evaluate student knowledge in a virtual setting. Many students in the region had difficulties accessing computers or had connectivity issues: the survey shows that more than half of students had limited access to the Internet at home (58%).

The exacerbation of the social inequalities and the challenges faced by the education system is challenging the efforts led by the government and HEIs to democratise access to education over the past decades and expand education to reduce inequalities and not just benefit an elite (Pitton and Britez, 2009^[31]). The degree to which universities are equipped to adapt to these megatrends will also define their involvement in the region. Within such a context, this report also looks at how the pandemic has affected universities' activities and how can universities support their ecosystems in the current challenging context.

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Notes

¹ To promote a stronger connection between higher education leaders, policymakers and firms, the OECD launched the Entrepreneurship Education, Collaboration and Engagement (EECOLE) network in June 2021. EECOLE and its partners will build on the findings of the HEInnovate reviews, to deepen understanding in key network areas. In particular, it will develop a full work programme on the geography of higher education to explore more in-depth the connection between universities and their communities.

² The term “actor” refers to all the organisations or organization initiatives that exist for the benefit of the economic ecosystem to which the actor belongs (Tedesco and Serrano, 2019^[12])

³ For these encounters, which took place between June and September 2021, each of the 11 universities studied were represented by their project contact point representatives from top management (vice-rectors, deans, directors), professors of entrepreneurship as well as staff co-ordinating incubation or acceleration initiatives. The interviews were conducted by the OECD-IADB team as well as an expert in entrepreneurship education.

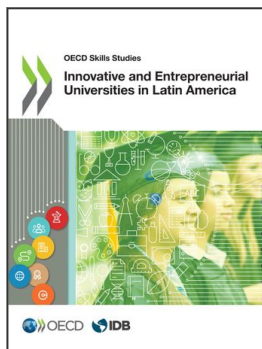
⁴ The interviews took place between February and March 2022. The 11 universities were again represented by the top management as well as contact points in research departments, innovation agencies and technology transfer offices. To prepare the interviews, the OECD-IADB circulated a questionnaire on knowledge exchange practices for university representatives to answer. On the basis of each institution's answers to the questionnaire, follow-up questions were asked during the bilateral interviews.

⁵ Multifactor productivity is calculated by dividing the output by the number of combined inputs used to produce that output.

⁶ As opposed to necessity-driven entrepreneurship, which is the prevalent form of entrepreneurship in LAC (Global Entrepreneurship Research Association (GERA), 2018^[33])

⁷ Unicorn is a start-up valued over 1 billion USD

⁸ Informality rates vary across the region. The share of informal workers in Chile and Uruguay represents less than 20% of the total workforce whereas in Colombia more than half of the workers are informal (OECD et al., 2021^[25]).



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