Knowledge economy and creative economy as tools to overcome the COVID-19 crisis in Latin America and the Caribbean: a focus on the Pacific Alliance.

One of the ten winning publications of the call for researchers, proposals for the recovery of Latin America and the Caribbean: "Trade and integration in the post-COVID 19 world: Opportunities and Challenges for Latin America and the Caribbean", from the Inter-American Development Bank.

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1. Analysis of the current situation of the knowledge economy and the creative economy. 2. Analysis of the main challenges in public policies for the knowledge economy and the creative economy. 3. Analysis of the challenges in terms of competencies and skills to improve the implementation of the knowledge and creative economy. 4. Analysis of the main ICT and Internet challenges for the knowledge economy and the creative economy. 5. Intellectual property.

Key words: *knowledge economy, creative economy, COVID-19, intellectual property, public policies, competences, skills, ICT.*

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Index

Graph Index

Motivation in the Light of the COVID-19 Crisis

Which opportunities may arise for Latin America and the Caribbean (LAC) from the global COVID-19? According to Mangabeira (2005, p. 60), moments of crisis are opportunities to generate deep and necessary changes as well as to carry out alternatives, such as the implementation of the knowledge economy. This is because the urgency of taking short-term action reduces the time lost in usually unnecessary political debates. Therefore, attention is focused on making decisions for improving the country's conditions.

Today we are experiencing an unprecedented crisis, a critical juncture that can be taken advantage of, as rarely done before in Latin American history. However, using the 2008 crisis as a precedent, Pastor Bustamante (2011) referring to the creative economy, states that "while the global market shrank 12% after a spectacular fall in the demand, the world exports of creative goods and services reached 594,000 million dollars, with an annual growth of over 14% from 2002 to 2008".

Thus, the objective of this research is to present an evaluation, its results, arguments, and recommendations to serve as reference for countries of the Pacific Alliance -Mexico, Colombia, Chile and Peru- and others in LAC. So they can identify the viability of utilizing the knowledge economy and the creative economy as tools to overcome the COVID-19 crisis. Science, technology, innovation, and creativity have been the main tools and allies to overcome other crises. In order to take advantage of these tools, it was necessary to correctly design and implement various policies, programs and actions, many of which are showcased here so that they can be used by other countries in the region.

The objective of the following research was to identify the status that knowledge economy and creative economy hold within the countries of the Pacific Alliance (PA), to make suggestions on what kind of institutional, legislative, and public policy actions could be carried out in those countries. With the purpose of promoting those economies as prospects for economic growth that help to overcome the COVID-19 pandemic, while becoming long-term policies.

Is it feasible to bet on these economies in times of difficulty? In the face of the last major global crisis in 2008 in the U.S., according to Bianchi & Labory (2010, p. 314), President Obama continued to prioritize investment in research and development (R&D), as well as in human capital development in order to help maintain and improve the competitiveness of American businesses. This was because Obama believed that new sectors would be developed, increasing jobs and opportunities to restructure obsolete businesses. In addition, it would help boost U.S. economic leadership into the new sectors that would emerge as a result of the crisis and to increase its presence in already existing sectors.

The European Union's (EU) reaction to the 2008 crisis was also to invest in R&D. Both the US and the EU cases are testimonies to the viability of betting on the knowledge economy during the current pandemic. During the 2008 crisis, the Lisbon Strategy in Europe played an important role, which, although it was not created with the purpose of facing the crisis, it served as a key factor, since it sought to increase the competitiveness of companies through innovation and research. As claimed by Bianchi & Labory (2010, p. 318) the efforts were focused on incentivizing leadership of the

EU in the knowledge economy. Its coincidence with the crisis increased the region's interest in betting on this economy.

Betting on creativity and innovation as tools to overcome crises is not something new. In history, as Acemoglu & Robinson point out, one can find sufficiently reliable evidence to support the viability of this bet. However, success depends on several factors such as institutional strength, a balance between the power of the state and that of society. Countries that do not consider those factor will have limited benefits of the knowledge and creative economy and will find it more difficult to move towards an economy of ingenuity.

While each crisis is unique, they provide important lessons for similar situations, such as the current COVID-19 pandemic crisis. Therefore, even having the 2008 crisis as a reference, as stated by Hopkins and Levy ((2012, p. 9), the knowledge economy was key to the economic recovery of the United Kingdom (UK). To achieve the recovery of this country, priority was given to promoting the specialization of industries, investments in intangible assets, information, and communication technologies (ICT), research, human capital and creative services.

The UK is an example of how the knowledge economy can go hand in hand with the creative economy. According to Engelbrechtt (2009, p. 408), for the recovery from the recession and the strengthening of the knowledge economy, the UK's vision considered the creative and cultural services - creative economy - as part of the five base sectors, along with energy and environment, health, specialized services in technology manufacturing and high-level technology services.

Korea is another example, that despite the serious crisis it faced between 1997 and 1998, it maintained and even increased its investment in innovation, education and creativity. They considered them as areas that would help them come through. Korea changed its development model, creating one that focused on strengthening small and mid-sized enterprises (SMEs), depending on big companies known as "chaebol", and in the use of ICT in public and private sectors. To do this, they developed and implemented cross-cutting policies for collaboration between different ministries (Ure, 2008).

Relevance of this Investigation for Latin America and the Caribbean.

The following research shows the result of an analysis of the current situation of the knowledge economy as well as the creative economy in the countries within the Pacific Alliance, considering the current situation and possible effects of COVID-19. Even though it is almost impossible to determine the full implications of the pandemic, this document provides information, arguments, data and examples of how the knowledge economy and the creative economy can be used as tools, so the Pacific Alliance countries overcome the crisis.

To measure the impact of the creative economy, the first chapter uses the results of the Knowledge Assessment Methodology as a reference, as well as the methodology to determine the economic contribution of copyright-based industries. These results are of great use for LAC since there is not enough recent information in the literature that provides the results presented in this chapter.

The analyses and recommendations presented from chapters two to five are based on these results and the specialized literature. These chapters address related topics because the cross-cutting work is required for the success of these economies rather than more isolated efforts. Additionally, a Big Data visualizer was designed with information on knowledge economy, creative economy and intellectual property which will be of great use to the reader: https://www.caiinno.org/mundo-post-covid-19-latam-caribe/

The second chapter is an analysis of the most important challenges that the public policies of the knowledge economy and the creative economy have faced. The different changes, legal, administrative and institutional actions are analyzed and proposed as key factors so the countries of the Pacific Alliance can optimize the conditions that would allow them to improve the implementation of the economies.

The third chapter is the analysis of the competencies and skills' challenges to improve the implementation of the knowledge economy and the creative economy. This section analyzes the changes that countries could make to provide better opportunities for people. It's highly relevant since different studies have shown fundamental skills in the job future, especially now that automation of jobs is increasing.

The fourth chapter addresses the analysis of the current challenges of the use of ICT and Internet to improve the competitiveness in the PA, regarding the knowledge economy and the creative economy. This is also relevant for the new employment conditions derived from COVID-19. This section proposes measures, policies and actions needed to improve their situation in the Alliance.

Lastly, the fifth chapter is the analysis of the intellectual property challenges that the Pacific Alliance countries encounter, which limit the benefits of the knowledge economy and creative economy implementation. This section considers various measures that are being taken and can be replicated in the Pacific Alliance countries. It creates proposals on actions and policies for their implementation.

Although the topics require a more in-depth study and analysis, as well as more detailed proposals, this research aims to provide an overview that will contribute to the academic and political debate on the viability of LAC betting on science, technology, innovation, and creativity. This research is based on many of the proposals of the Inter-American Development Bank, as well as other organizations and academics, that provide the foundation for readers from public or private sectors to use it for the design of programs, projects, instruments, or public policies that are useful to overcome the effects of COVID-19

01 Analysis of the Current Situation of the Knowledge Economy and Creative Economy.

The knowledge economy and the creative economy in the region

The term knowledge economy was coined to high-light the importance of knowledge as a key factor in economic performance, and Machlup is

considered the first in using this concept (Godin, 2008). In a knowledge-based economy, people and organizations acquire, disseminate, and use knowledge
for economic and social development.

According to Mangabeira (2005, p. 11), the knowledge economy is the accumulation of capital, technology, capabilities relevant to technology and science in the conduct of productive activity. On the other hand, creative economy is considered as the group of ac-tivities through which ideas are transformed into cul-tural and creative goods and services, whose value is or could be protected by intellectual property rights (Benavente & Grazzi, 2017, p. 9).

On authority of the UNCTAD's 2010 Creative Economy report, the creative economy generates economic growth and social development due to its potential to promote social inclusion, cultural diversity, and human development. In turn, it is related to the economic organization of the cultural sector and the to the behavior of producers, consumers and authori-ties related to this sector. However, it is not limited to the arts, since it constitutes a set of knowledge-based activities. Thus, the creative economy has the capacity to generate income related to trade and intellectual property rights (UNCTAD, 2010).

An important aspect of cultural industries, according to UNESCO, is that "they are focused on pro-moting and maintaining cultural diversity and ensuring democratic access" (UNCTAD, 2010, p. 13). Hence, creative industries allow countries to tell their own stories and project their own cultural identities, both to themselves and to the outside world. Concisely, the creative economy represents both a source of economic income and public goods that go beyond the source of monetary resources, since its benefits ex-tend to society as a whole.

The relationship between knowledge economy and creative economy is important. In the last 20 years, intellectual property has become immensely important to businesses. Nowadays, computers are increasingly common, employees are more knowledgeable, companies have begun to focus on management knowledge, and information has been stored in knowledge bases connected through networks. The result of these events was rise of knowledge economy, a phenomenon that has transformed businesses and helped emerging economies compete internationally.

Likewise, the knowledge economy and creative economy have been a source of impetus against the recent economic crises, particularly the one in 2008 (Dubina, 2012). Currently, we are facing a pandemic with a dual -health and economic- crisis that affects the entire region. This pandemic represents an opportunity to advance the implementation of both economies in LAC.

Together the creative economy and knowledge economy at its best, generate not only economic and social changes, but also structural ones. It is therefore important for LAC to develop an evolution in both knowledge economy and in the knowledge society. The more mature the knowledge economy is in conjunction with the knowledge society, the more countries can absorb knowledge, creativity, and innovation (Dubina, 2012).

Two evaluations are presented below, one for knowledge economy and the other for the creative economy. These are intended to identify the pre-pandemic situation in the studied countries, to show the pending tasks in order to know where to direct efforts in the current global pandemic. In addition, it serves as a reference because crises usually come hand in hand with a reduction in public and private investment in various sectors, so this evaluation will allow us to infer the effect of reducing budgets and having an effective reduction in government spending.

The knowledge economy assessment

The purpose of this section is to provide a summary of the performance of knowledge economy within the Pacific Alliance (PA) countries. The objective from this section on is to provide a quick visualization of the status quo of the analyzed items based on the Knowledge Assessment Methodology (KAM) (Chen, Derek, & Dahlman, 2006). An evaluation of the PA countries was created due to this methodology, as well as that of two reference countries (Argentina and the USA). Based on the results, the following chapters are analyzed.

To perform the calculation based on the KAM methodology, 59 indicators were identified from the latest available years for each country and were integrated into the following 6 pillars[1]: i. Performance; ii. Economic incentives and institutional regime; iii. Education and human resources; iv. Innovation system, and; v. Information and communications technology (information infrastructure), and; vi. Gender equality. Details on the indicators and methodology can be found in the Methodological Annex.

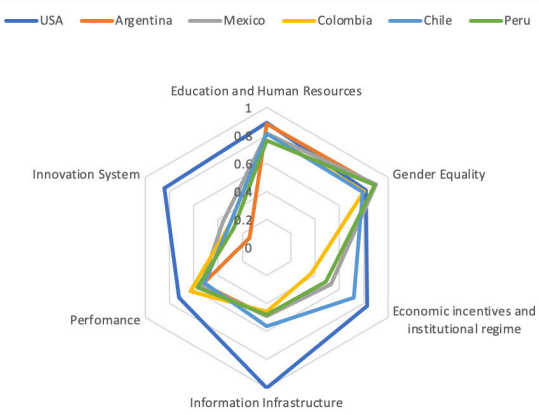
We started by collecting data from sources such as the World Bank, the World Economic Forum, the Economic Commission for Latin America and the Caribbean, the Organization for Economic Cooperation and Development and others on topics related to innovation, access to information, human resource training and the creative and cultural economy. The most recent data were sought.

Based on this, the study was delimited on the data focused and structured for Argentina, Chile, Colombia, the United States, Mexico, and Peru. Once the database was defined, the data was normalized based on the max-min criterion:

$$x' = \frac{X - X_{min}}{X_{max} - X_{min}}$$

Where the maximum value (1) is obtained by the country with the highest value for each indicator, while the minimum value (0) is obtained by the country with the lowest value for that indicator. Once the normalization is done, the values are integrated into the Big Data viewer tool Power BI for interactive consultation (a). The results are the following:

Graph 1. The knowledge economy results.



Source: Own elaboration based on various data sources.

As a summary, all the indicators that make up the KAM methodology were concentrated in 6 pillars, where the countries that make up the analysis can be distinguished by means of color variation. The graph shows as a result a notorious polarization of the United States in variables related to innovation system, information infrastructure and economic incentives and institutional regimes. However, it is necessary to highlight significant developments for Latin American countries such as the information infrastructure, economic incentives and institutional regimes in Chile, the innovation system in Mexico, education and human resources in Argentina, and gender equity in Colombia.

1 Two of the six pillars of the KAM methodology come from a more updated version identified in the literature.

The creative economy assessment

The methodology used to identify the impact of the creative economy on PA was the one developed by the World Intellectual Property Organization (WIPO), designed in the "Guide on Surveying the Economic Contribution of the Copyright-Based Industries" (WIPO, 2015). This methodology was selected because copyright is the most closely related to the creative economy, and because sufficient statistical information was available for most countries to be able to implement it, unlike others available in the specialized literature.

Information was collected from the creative and cultural industries of the PA countries, as well as from two reference countries: the United States and Argentina, for the periods from 2014 to 2020, although it was not possible to obtain data from for all calculations for all of them in that period. Based on the information collected, the methodology was adapted to measure three main indicators related to size: i. Percentage contribution to GDP and value added: ii. Contribution to employment, and; iii. Foreign trade: value and percentage of total exports and imports. Likewise, two indicators related to performance were considered: i. Contribution to GDP and employment growth, and; ii. Trade balance.

To measure the indicators, the information from each country was homogenized by classifying it according to its relationship with copyright and subclassifying it according to its creative activity. The following formula was used to calculate the contribution to the GDP, employment, exports, and national imports:

$$Cs = \frac{\mathrm{Vs} * 100}{\mathrm{Vn}}$$

The following formula was applied to measure the trade balance:

$$Trade\ balance = \mathrm{E} - \mathrm{I}$$

The following formula was used to calculate the copyright-based industries' contributions to the national growth and employment:

$$CC = \frac{\mathrm{CP} * \mathrm{TC}}{\mathrm{CT} * 100}$$

Finally, after performing the relevant calculation, it was possible to identify the economic contribution of copyright-based industries to GDP, as well as the contribution to total employment of copyright-based industries, for the period 2014 to 2020. The results are shown below, but it was not possible to obtain the results for all PA countries. For example, for the GDP it was only possible to identify sufficient statistical information for Mexico and Colombia, while for Peru and Chile there was not enough data for the period of analysis to be able to perform the calculation. The results are as follows:

Table 1. The estimated economic contribution of copyright-based industries to GDP.

Country	2006-2013*	2014	2018-2019
Argentina**	4.70% (2013)	3.47%	3.62%
Colombia	3.30% (2008)	4.25%	4.24%
Mexico	4.77% (2006)	9.22%	9.21%

Table 2. The estimated economic contribution to total employment of copyright-based industries.

Country	2006-2013*	2014	2018-2019
Argentina**			1.70%
Chile		1.39%	1.69%
Colombia	5.80% (2008)	2.01%	2.14%
Mexico	11.01% (2006)	14.67%	13.71%

* Source: Own elaboration based on data obtained from Table 1.1 Previous studies, Guide to determine the economic contribution of industries related to copyright, World Intellectual Property Organization, available at: https://www.wipo.int/edocs/pubdocs/es/copyright/893/wipo_pub_893.pdf

** For the calculation of the percentage, the annual item of "interdependent industries" was not identified in the Satellite Account of Argentina, so it was not considered in the columns 2014 and 2018-2019.

Source for the calculation 2014 and 2018-2019: In the case of Mexico, the 2014 and 2019 Economic Censuses of the National Institute of Statistics and Geography were used, available at: https://www.inegi.org.mx/programas/ce/2019/; For the other countries, were occupied the National Cultural Satellite Accounts. For Colombia, the National Administrative Department of Statistics was considered, available at: https://www.dane.gov.co/index.php/estadisticas-por-tema/cuentas-nacionales/cuentas-satelite/cuenta-satelite-de-cultura-en-colombia/cuenta-satelite-de-cultura-y-economia-naranja-cscen-2014-2018p#creaciones-funcionales; For Argentina, the National Statistics and Census Institute was considered, available at: https://www.indec.gob.ar/indec/web/Nivel4-Tema-3-9-47 ; For Chile, the Culture and Leisure Yearbooks of the Ministry of Culture, Arts and Heritage were consulted, available at: https://www.cultura.gob.cl/publicaciones/cultura-y-tiempo-libre-informe-anual-2014/

Note: In the case of Mexico, the Satellite Account was not used because the data from this source is not disaggregated to the desired level for the calculation. We sought to explore the creative industries in greater depth. The best way was by using the national Economic Censuses.

As can be seen, the importance of the creative economy in the PA countries is relevant, and it takes on special importance in the U.S., where so many cultural and creative industries that feed the world on a daily basis emerge. A similar situation can be identified in the case of employment, where in the best-case scenario there is a percentage increase, and in the worst-case scenario, stability can be seen.

Details on the indicators and methodology can be found in the Methodological Annex. The values are integrated into the Big Data viewer tool *Power BI* for interactive consultation which can be accessed from this link: https://www.caiinno.org/desempeno-economia-creativa/.

Additional problems incurred by the COVID-19 pandemic

The analysis shows a reality that could worsen as these lines are being written, since there is still no certainty as to what is and what will be the definitive impact of the pandemic on the world economy. The countries under study have already made various budget cuts on different programs. Some countries have even reduced their investment in innovation, in cultural and creative industries. Therefore, it is important to consider some of the emerging problems and challenges because of the pandemic. The following are some of the challenges identified:

Resurgence of protectionist measures

The World Bank conducted a study on export restrictions in world food markets, concluding that there is a high probability of observing protectionist measures (Espitia, Rocha, & Ruta, 2020). These types of measures have already been extended to other industrial sectors, to which their presence is expected for several months or even year.

Automation of production and short-term value chains, which in turn will increase inequity between companies that adapt to technological changes versus those that do not

The effects of the pandemic will pressure companies to automate production and value chains to increase their productivity in the short term. In some companies the change will be substantial due to the increased use of ICT, which will especially affect those who are not digital natives. In addition, as stated by the United Nations (2020), it will increase inequity, since, as mentioned by Conley, Hess and Lui (2020), ICTs will now be used intensively, so that those who are not able to adapt to this new reality could suffer a significant deterioration in their labor capacity and job opportunities.

Contraction of exports, increase in the informal sector and perhaps a great decline of SMEs

It is not yet known exactly what will happen after the pandemic, but recently the IDB (2020) reported that the value of LAC exports contracted in the first quarter of the year, when the effects of the pandemic in the region were just beginning to be noticeable in the region. The International Labor Organization (2020) identified that many people will shift to the informal sector, the number of people working in factories will be significantly reduced, and there is a possibility that seven out of ten SMEs will not survive.

Climate change

It was possible to find in different media types that during the isolation, pollution in several places was significantly reduced. However, on the authority of the United Nations (2020), this was short-lived as greenhouse gas concentrations continue to increase. This, according to the same source, will contribute to the economic, health and poverty crisis as floods and droughts will steadily increase. Furthermore, water scarcity will be a serious problem.

Increase in the gender gap

The diversity of effects in these areas because of the pandemic makes it difficult to calculate because the problem continues. Nonetheless, various sources have identified that many women are sacrificing their work due to the lack of childcare places. This goes hand in hand with other problems such as the lack of opportunities to work from home, or even the impossibility of doing so due to the null or deficient internet connection in LAC.

Increasing gap between countries

The evidence shows that usually in all the LAC countries neither the knowledge economy nor the creative economy have been a priority during times of crisis. If that happens again as a result of COVID-19, the gap between countries that generate innovation and creative content could grow. This phenomenon may occur at the sub-national level, which is also negative.

02 Analysis of the Main Challenges in Public Policies for the Knowledge Economy and the Creative Economy.

The knowledge economy and the creative economy are useful tools for the Pacific Alliance (PA) countries to address the COVID-19 pandemic crisis. However, even though the evidence in the region shows a certain degree of success in managing these economic models, Mangabeira (2019), in his most recent work, expressed that the results of knowledge economy have not been as expected due to the incorrect design and implementation of public policies on the educational-cognitive, the socio-moral and the legal-institutional fronts.

Based on the results of the evaluation of the previous chapter, as well as the challenges and recommendations identified in the literature, this section provides the reader with recommendations to take advantage of and improve the conditions of knowledge economy and creative economy. The knowledge economy was prioritized, although the evidence shows that the challenges are similar, to which it is suggested to apply the recommendations to both economies.

While no economic model is perfect, its success or failure will depend on its proper implementation. As will be seen below, although conditions have improved for both economies in the countries under study, like the public and private investments in education and innovation, the political and economic incentives in the creative and cultural industries, they are still well below the average of the countries with the best global performance. This situation could worsen because of the economic and health crisis triggered by COVID-19.

The Knowledge Assessment Methodology (KAM) was used for this analysis (Chen, Derek, & Dahlman, 2006), which does not limit its focus to Science, Technology and Innovation (STI), but rather integrates a broad and transversal work. According to the World Bank, certain characteristics strengthen the preconditions for the success of the knowledge economy.

For the success of the knowledge economy, some of the characteristics and preconditions, in the case of Finland according to the World Bank, are the following: "i. strong social cohesion and homogeneity of the population; ii. low tolerance for unequal distribution of power; iii. strong rule of law and good governance, very low corruption, and iv. a pervasive public sector, including a welfare state with universal health care and education as well as a broad research, development, and innovation (RDI) policy" (2014, p. 153). Hence, it is important to perform a correct implementation and take into account the success factors to generate the expected results. The following is an area of opportunity to implement the creative and knowledge economy in times of the COVID-19 pandemic.

The COVID-19 pandemic: A new opportunity to implement knowledge economy and creative economy in the region

The current challenges that the region is facing are the approach to other methods of economic production, of innovation, creativity, and knowledge. The current pandemic represents a great opportunity to carry out this transformation. In the classical development economics model, the strategy was to move human and productive resources to the most favored sectors, such as manufacturing centers, instead of disseminating more advanced practices. It would be ideal for the region to evolve towards a knowledge economy and a creative economy. This would not only increase their profits, but also distribute them to different geographical areas and reach a larger number of people.

New technologies have been assimilated in other countries in order to reverse the inequity and concentration of resources generated by classical development economics. Such is the case of the USA, particularly between 1994 and 2005, where technological economic centers were expanded instead of being displaced and concentrated in manufacturing cities.

That was an evolution towards a knowledge economy and an improvement in human capital capabilities, together with an economy with a greater number of economic development centers. (Pérez, 2002)

The economic and health crisis resulting from the COVID-19 pandemic represents an area of opportunity for institutions in PA countries. This is why it is important for the region to assimilate new technologies that allow for the integration of a greater degree of innovation and education within their economies and societies.

So what is previously mentioned works accordingly, legal, administrative and institutional reforms are needed to modify the terms of access to resources and production opportunities. This will help to effectively disseminate the knowledge economy and to distribute power in the labor and capital markets. As a consequence, the centers of power and decision-making for economic investments will be distributed. For this to happen, the government must act as an interlocutor between the actors involved in the innovation market, i.e., the private sector, and the actors involved in the creation of knowledge creation, such as research centers, universities, and institutions.

In this section, we will analyze the most important challenges faced by PA countries, based on the KAM methodology, i. institutional, ii. economic incentives and the public-private relationship iii. legal and iv. administrative. Lastly, this section includes suggestions to advance towards an adequate implementation of knowledge economy and creative economy in the region. (López-Bassols, Grazzi, Guillard, & Salazar, 2018).

Institutional analysis

Institutions are a fundamental pillar for coordinating different actors in the creative and knowledge economy. In turn, the government sets up the rules for the entire nation and has the ability to encourage these industries at the local, state and international levels. However, for a correct implementation it is essential for the government to be effective. The following is an institutional analysis is based on the KAM methodology indicators like the government effectiveness, political stability, civil liberties and political rights, along with the analysis of the main challenges and suggestions for public and economic policy.

State policies and government effectiveness

The evidence shows that creativity and innovation have not been state policies for LAC, which makes changing this a challenge. Other countries have done so. During the 1997 crisis, Korea implemented its version of the creative economy with elements of the knowledge economy. But perhaps its most important decision was to make it a state policy (Geun Hye, 2013, p . 10). A similar decision was taken by Finland, which, in order to achieve success in the knowledge economy, the government made education, research, technology and innovation a "national project" (Banco Mundial, 2014, p. 93).

One of the most complex challenges in the PA is to stop seeing state policies as a partisan action to which there must always be opposition, in addition to the lack of a state policy for STI or for the creative economy. Despite this, there are exceptions such as in Colombia, where the president expressed his support for the creative economy or the orange economy, as it is called in the country, so much that it was made a government priority.

An effective government that encourages the knowledge economy and creative industry is needed for a state policy to exist, so it is capable of implementing such policies. As reported on the latest data on good governance from the World Bank (2016), in the government's effectiveness indicator, Chile is ahead of the PA countries, with 79.32 percentile rank, followed by Mexico with 58.6, Colombia with 53.3 and Peru with 45.6.

Weak standard national policy

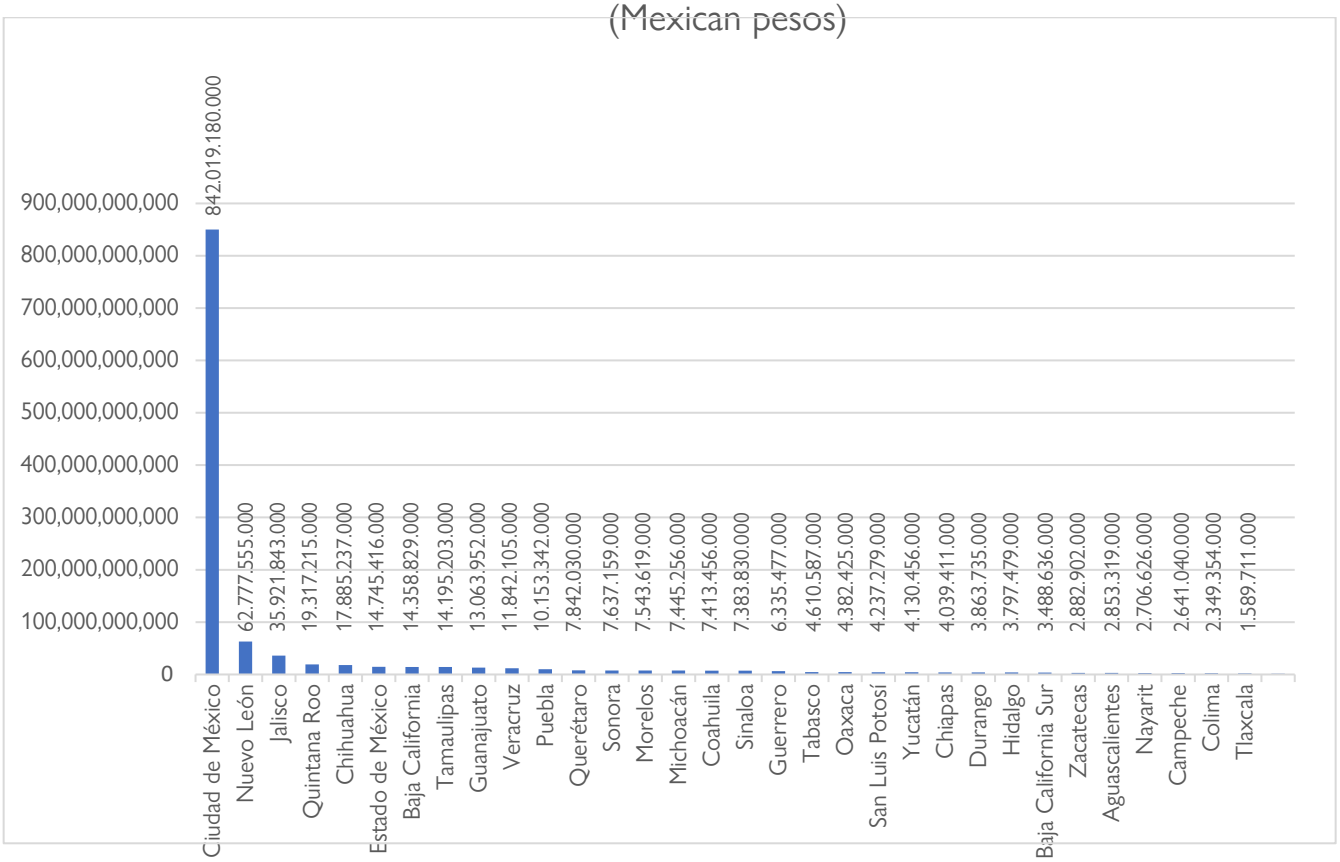
The lack of homologation of standards of subnational efforts, which follow different paths is another challenge detected in the PA. According to Bianchi & Labory (2010, p. 314), one of the measures that helped the U.S. emerge from the 2008 crisis was to maintain an industrial policy framework at the federal and state level that went hand in hand with various instruments, all aimed at ensuring competition, compliance with industrial policies and development. This minimum standard implemented by the government was key to prevent some states and industries from losing competitiveness and becoming isolated.

Political stability vs. subnational disparities

Avoiding centralization to promote efforts at the subnational level while preserving state cohesion when creating the proliferation of creative and knowledge industries across the country, is an institutional challenge. That is, to achieve a good implementation of these industries at the institutional level, it is necessary to understand the difference between cohesion and centralization. Centralization, on one hand, prevents the diffusion of the benefits of the creative and knowledge industries, while cohesion maintains coherence within the country and diffuses the benefits of these industries.

An example of centralization and poor implementation of the knowledge economy, according to Geissmanna and Zhang (2018), is China's transition to this economy from 2000 to 2012. This transition was key for China to withstand the 2008 crisis but had as a negative effect the disparity in the regional concentration of development. It is possible to identify a similar situation in the PA, where the capitals and some cities are far above others, without a spread of benefits. Inequity in the distribution of benefits raises questions about the viability of knowledge and creative economies. As a reference, the following graph shows the total gross production of all cultural and creative industries in Mexico at the subnational level in the 2019 census year.

Graph 2. Total gross production in the 2019 census year (Mexican pesos)



Source: Creative and Cultural Industries Database, CAIINNO, available at: https://www.caiinno.org/industrias-creativas/

The graph shows that Mexico City concentrates almost all of the gross production of the creative industries, while other cities are far below this production.

For the creative and knowledge economy to institutionally prosper, it is essential for the PA to improve political stability and global freedom. Based on the political stability indicator of the World Bank (2016), which also includes a section on the absence of violence or terrorism, Chile is in the lead with 60.4 percentile rank while Colombia is the country with the lowest rank of 16.1. Moreover, Peru has a position of 38.09 and Mexico with 23.8. Without a doubt, political stability represents a challenge for the PA to promote knowledge economy and creative economy.

According to Freedom House's Global Freedom Scores[1] (2020), which include Political Rights and Civil Liberties, Mexico is classified as partially free, with an overall score[2] of 62 out of a total of 100 points. For the Political Rights score[3], Mexico obtained a score of 27 out of 40 total points, while in Civil Liberties it had a score of 35 out of 60 points. Likewise, Colombia is also classified as partially free, with an overall score of 66/100, above Mexico, a score of 29/40 for Political Rights and 37/60 for Civil Liberties.

Chile and Peru received better scores for this indicator. Chile is the leading PA country with a score of 90/100 and a free country category. In Political Rights, it obtained a score of 38/40 and in Civil Liberties a total of 52/60 points. Meanwhile, Peru scored 72/100 points with a free country category. In Political Rights, Peru obtained a total of 30/40 and in Civil Liberties a total of 42 out of 60 points. This means that, according to this Global Freedom Scores, the PA has a great challenge moving towards a democracy that lays foundations in political rights and civil liberties in order to evolve into other industries that create greater equity. Without this, it will be difficult to lay the institutional foundations for a creative and knowledge industry and to successfully implement these industries.

Analysis of the economic incentives and the public-private relationship

The automation of production and value chains in the short term will increase the inequity between companies that adapt to technological change and those that do not. It is important for governments to forge a critical path to win during COVID-19 times. This section analyzes different economic and public policy challenges for the government to support SMEs and MSMEs, which in turn will be able to adapt to a creative and knowledge industry. It also examines the macroeconomic challenges and proposals for the government to link the innovation and financial markets with existing research networks (Álvarez, 2020).

Automation is advancing rapidly

Automation will increase by the pandemic profoundly affecting people in the region. As mentioned by Conley, Hess & Lui (2020), those who are not able to adapt to the new reality that requires more digital skills, could suffer a significant deterioration in their labor capacity and job opportunities. According to the MIT Technology Review it is estimated that by 2030 automation will make between 400,000,000 - 800,000,000 jobs disappear around the world (Winick, 2018).

A recently published study by Banco de México (2018) assessed the automation risk of the employed population. The results showed that two-thirds of the country's employed population works in occupations classified with a high risk of automation for the period from 2005 to 2017. Using the same methodology, it calculated that the percentage of jobs that are at risk of being automated in Mexico both for those related

1 The Freedom House's Global Freedom Scores considers access to political rights and civil liberties in a total of 210 countries worldwide, such as the right to vote, freedom of speech and equality before the law. For more information: https://freedomhouse.org/countries/freedom-world/scores

2 The Freedom Status of a territory at a global level depends on its aggregate Political Rights score, on a scale of 0-40, and its aggregate Civil Liberties score, on a scale of 0-60. The total Political Rights and Civil Liberties scores are equally weighted. More on the Freedom House's Methodology at: https://freedomhouse.org/reports/freedom-world/freedom-world-research-methodology

3 According to the Freedom House's Methodology, the highest obtainable score for Political Right is 40 (4 points for each of the 10 questions). The total score that can be obtained for Civil Liberties is 60 (4 points for each of the 15 questions).

to the knowledge economy and the creative economy and compared with the rest that do not belong to those groups. Data from the first quarter of 2017 to the first quarter of 2020 were considered, and Big Data analysis processes are applied.

As a result, for the creative economy, it was found that the risk for creative and cultural industries is 0.10 percent, while for those that are not, it is 63.62 percent. For the knowledge economy, it was found that professional, scientific and technical services have an average risk of 1.28 percent, while the rest is 62.45 percent, as can be seen in the following table containing the information by region:

Table 3. Comparison of jobs at risk of being automated in Mexico.

Mesoregions	Average number of jobs at risk in non-professional, scientific and technical services.	Average number of jobs at risk in professional, scientific, and technical services
West Central (Aguascalientes, Colima, Guanajuato, Jalisco, Michoacan, Nayarit, San Luis Potosí, and Zacatecas)	61.44%	1.28%
Center of the country (Mexico City, Hidalgo, Mexico, Morelos, Puebla, Queretaro and Tlaxcala)	62.76%	1.44%
Northeast (Coahuila, Durango, Nuevo Leon and Tamaulipas)	65.71%	1.26%
Noroeste (Baja California, Baja California Sur, Chihuahua, Sinaloa y Sonora)	63.20%	1.34%
South (Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz and Yucatan)	61.08%	1.11%
Total	**62.45%**	**1.28%**

Source: Own elaboration based on Banco de México, La automatización en México desde una perspectiva regional, 2018, available at: https://www.banxico.org.mx/publicaciones-y-prensa/reportes-sobre-las-economias-regionales/recuadros/%-7BE3665296-DCDE-78FD-54CB-0420E1CD9A36%7D.pdf

Public-Private Partnership (PPP)

Based on the UN (2020) the digitalization caused by the effects of the pandemic will increase inequality, which will cause, according to Hess & Lui (2020), a significant deterioration in the labor capacity and job opportunities of those who are not able to adapt. Therefore, it will be key for governments and companies to carry out training activities. Ideally, these should be *ad hoc* programs, based on the educational level and age groups of those who are already working, as well as by type of sector or industry.

One of the solutions to strengthen the knowledge economy's ecosystem is to create institutional networks between educational centers, universities and research centers to meet local needs, but also to link them to the business sector of innovation and thus establishing a knowledge market. In LAC there is still a sepa-

ration between the institutions in charge of generating knowledge and the companies dedicated to innovation (Álvarez, 2020).

In addition, the government is recommended to invest in fiber optics and encourage the linkage of the innovation market in conjunction with research networks. The National Research and Education Networks (RINE for its acronym in Spanish Redes de Investigación Nacional y Educación; from now on a will be used) have played a fundamental role in the increase of services offered beyond connectivity such as free software, digital libraries and cloud services. In sum, the generation of RINEs and the investment in fiber optics are fundamental for the increase of the knowledge economy and the provision of services related to this market (Álvarez, 2020).

Structure of the market economy

Both legal and administrative barriers are a major challenge for more people to access new types of credit that allow them to invest in intangible assets. This needs to change, argued by Bianchi and Labory (2010, p. 325), "Industrial development results from the capacity of entrepreneurs to organise production, to organise the division of labour, which tends no longer to be organised in « filières » but rather in overlapping networks, where key resources are no longer tangible assets but rather intangible assets". If the market economy is not restructured, the effects of the knowledge and creative economy will be limited, and many of the efforts made will not have the expected results.

Growth model

Preventing the creative and knowledge industries from widening the gap in the distribution of income and profits is a challenge for their correct implementation. As an example, Brazil and India reacted differently on how to continue betting on the knowledge economy in the face of the 2008 crisis. As claimed by Pateo, Botelho, Balestro and Túmulo (2020, p. 9), while Brazil reduced its investments, India only paused and then continued, which helped India in 2016 to overtake Brazil's GDP. However, the disparity between GDP and social development as well as income distribution in India widened.

Another problem that the pandemic is evidencing, is the economic stagnation and inequality in PA, which according to Mangabeira (2019), has happened in several countries where they tried to implement the knowledge economy. Hence, one of the main challenges is to prevent a few companies from the concentration of most of the innovations. If so, the disparity between GDP and social development like it happened in India, will be present in the PA. Moreover, due to the economic crisis, these effects could remain for a long time and deepen social, institutional, political stability and violence problems.

It is true that modifying the growth model is difficult with or without crisis, so the challenge is to design and implement it to generate positive changes in the long term and that these are cross-cutting for integral growth. As a reference, as stated by the World Bank (2014, p. 47), although the development of the knowledge economy in Finland was greatly affected by the 2008 crisis, the country took this as an opportunity to make adjustments in order to integrate those vulnerable population sectors, and for example, promote entrepreneurship and industrial renewal activities.

Relationship with the financial sector

A global challenge that is also for PA is to attract and maintain the participation of the financial sector in activities related to the knowledge and creative economy, especially its investment in intangible assets. For Engelbrechtt (2009, p. 408), part of the knowledge-intensive services sector that created "dark" financial instruments have also some responsibility for the 2008 crisis. Therefore, it is extremely important to carefully

design and operate the financial services, especially those that provide loans without a vigilant filter.

In conclusion, the analysis of economic incentives and the relationship with the public and private sector, found that the strengthening of the knowledge generation networks and their interlocution with the innovation market are a key challenge to face the global pandemic crisis, and the automation of the pre-COVID-19 economy. Also, a correct implementation of the creative and knowledge industries is recommended based on being mindful of social gaps and the expansion of distribution centers. Finally, careful design and operation of financial markets is recommended for the creative and knowledge economy to be successful in LAC.

Legal analysis

In a weak rule of law, both the knowledge and creative economies will find it more difficult to be successful. In this sense, according to Rose-Ackerman (2005, p. 17) democracy and economic success tend to be linked. The rule of law is a necessary piece for a good democracy, so its weakness has a negative effect on any economic model that is to be implemented. Which is why this issue should be of interest to scientists and creatives. The following is a more in-depth analysis of the rule of law and corruption indicators, included in the KAM methodology diagnosis, together with the challenges in the regulatory framework for the creative and knowledge industries to progress successfully in the region.

Improving the regulatory framework and combating corruption

An important and persistent challenge in PA is the design of cross-cutting policies, actions and regulations. Specifically with respect to the regulatory framework, the current challenges can be seen in two ways: i. the generation of regulations that are related, aligned in terms of their objectives and that help to meet the objectives of the knowledge and creative economy policies, and; ii. the design of an *ad hoc* framework that works to address the most urgent challenges caused by the pandemic, with measures aligned with the objectives of the previous point.

To address regulatory problems in the region and generally strengthen the legal framework for the knowledge economy and creative economy to prosper, it is essential to strengthen the rule of law and absence of corruption. Regarding the rule of law, the PA countries are different. According to the World Bank (2016), in the rule of law indicator[1], Chile has the highest percentile with 85.1, followed by Colombia with 43.8, Peru with 34.1 and Mexico with 31.7. This is striking not only because of the disparity between PA members, but also because the regulatory framework should be respected so that the implementation of a new economic model in the region does not cause damage to society, generate inequalities or parallel economies that weakens institutions instead of strengthening them.

Likewise, according to the *World Justice Project* (WJP) *Rule of Law Index*, only Chile (position 26) has greater adherence to the rule of law, while the other three countries are far from the top positions, with Colombia in 77th place, Peru in 80th place, and Mexico in 104th place (2020, p. 18). Both indices show Chile in the lead with a large discrepancy between the rest.

The challenges in the PA are not only in strengthening the rule of law, but also challenges persist in combating corruption. In the World Bank's global corruption control ranking (2016), Mexico has a percentile rank of 25.9, the lowest in the PA. In contrast, Chile is the best positioned with 82.6. Colombia and Peru have percentile ranks of 44.7 and 43.2 respectively.

1 The World Bank's Rule of Law indicator (2016) considers the trust and adherence to the rules of society, particularly the quality of the contract enforcement, property rights, the police, as well as the likelihood of crime and violence. The indicator is in percentile ranks where the highest is 100 and the lowest is 0. For more information please go to the following link: https://databank.bancomundial.org/Governance-Indicators/id/2abb48da

The rule of law, the fight against corruption and transparency are key elements for improving accountability and for the creative and knowledge industries to flourish. Work in the areas of information technology, e-procurement, data analytics and biometrics are transforming the ability of governments to manage resources effectively (World Bank 2018). These tools could pave the way towards better resource management and lay the groundwork towards a proper implementation of both industries in LAC, particularly in the PA.

Administrative analysis

A major challenge for the PA governments in mitigating the effects of the pandemic is the lack of prior assessment. There is usually no mention of measures arising from previous crisis experiences or lessons from other countries. In some cases, such as Mexico, a recent decision was made to reduce budgets in key areas of the knowledge and creative economy.

The lack of studies and assessments to help make decisions is a relevant issue, since the effects of the pandemic do not and will not affect everyone equally. A recent study carried out by the International Monetary Fund (2020), identified that the impacts have been and will be more negative for: i. women, especially those who had to reduce their mobility to take care of their children, harming their professional careers, and ii. young people (18-24 years old), who could suffer from intergenerational inequity. For this reason, the administrative and cross-cutting diagnosis, which takes into account the most vulnerable groups to the effects of COVID-19, is tangential to the successful implementation of the creative and knowledge industries. The main administrative challenges are described below.

Short-term policies and lack of accounting and regulation: The importance of civil society integration

One of the most persistent challenges in LAC is the lack of public policies that persist beyond one government administration. Within the PA, few cases were also identified, but a remarkable one is that of the Colombian cinema, specifically the legislation that supported its long-term vision, starting with Law 397 of 1997, the prelude to Law 814 of 2003, both of which were reinforced by Law 1556 of 2012. The results are there for all to see.

To face short-term challenges and generate a creative and knowledge industry that maintains political power shifts, citizens must be considered so that long-term changes endure, social oversight is strengthened, and governmental accounting and regulation is improved. According to the latest available data from the World Bank's (2016) global regulatory quality ranking, Chile is at the forefront in comparison to other PA countries with a 89.9 percentile rank. Meanwhile, Mexico (64.4), Peru (69.7) and Colombia (67.3) have very close percentile ranks and higher than the average of the countries within the World Bank's worldwide ranking. In the voice and accounting indicator, Chile is better positioned with 77.8 percentile ranks, followed by Peru with 55.2, Colombia with 49.8 and Mexico in last place with a total of 43.8 (World Bank, 2016).

These data show, with the exception of Chile, fundamental challenges in strengthening institutional accountability. In addition, it is very important to strengthen organized civil society to avoid short-term policies. A persistent challenge in the region has been the lack of placement, as a priority issue on the public agenda, the development of trust and collaboration. Both are key to the implementation and success of the knowledge and creative economy, as well as to democratic integrity. Their impact is long-term and their positioning in society takes years.

As stated by Latino-barómetro (2015), LAC is the most distrustful region in the world; even worse, in the interpersonal trust indicator, only 17 percent of Latin Americans say that it is possible to trust a third party. Without trust and collaboration, it will be difficult to create teams that contribute their knowledge and experience to design innovations, which is why this challenge becomes relevant in the future of the PA.

All things considered, a fundamental change in the region and a victory in the face of the health and economic crisis represented by the COVID-19 pandemic will only be achieved with a long-term vision in the implementation of this industry in the region. For this, it is important to integrate civil society; through its integration, the pressure on institutions for greater accountability and regulation will also be strengthened. For this, the trust and collaboration of society must be strengthened to generate a participatory democracy and a profitable economy in the long term.

Policy suggestions and possibilities for scaling up

Return to the knowledge economy as a state policy. It is recommended that, if there is a desire to invest in innovation and creativity, support should come from the highest levels of government. Support should not be seen as an action of a political party, but rather all political actors should support this initiative for the benefit it can give to the entire population.

Analyze the growth model. It is necessary to redesign the economic growth model to move towards socially inclusive economic growth, especially for the PA countries where this gap is present. It is necessary to design and implement knowledge and creative economy policies that seek to break down barriers that exclude or marginalize governments, companies, and individuals.

Another recommendation is that a part of the design or redesign of the PA countries' model should address their own and other countries' previous experiences, to avoid falling or maintaining the economic stagnation and inequality that the pandemic is causing.

Tackling automation. It is necessary to design a cross-cutting policy to identify how the knowledge and creative economies can support other labor areas at greater risk of automation. Also, for the integration into the industries that make up these economies, it is ideal to develop schemes to increase and improve working conditions.

Reducing disparities at the subnational level: decentralization, but with cohesion. It is necessary to prevent public policies from allowing the existence and maintenance of gaps at the subnational level. No state or sector should be left out, for which it is ideal to create projects and policies that seek the growth and development of all regions. For this purpose, the installed capacities and potential of the States or municipalities should be identified in order to know where to direct efforts. The participation of the private sector is key, as it helps to trigger and take advantage of the efforts of the public sector.

Take special measures for COVID-19. Solutions need to be designed based on assessments. Although there is no timestamp for the end of the pandemic, there are recent studies based on national data and international experiences. The IDB recently published a study on several LAC countries, including Mexico from the PA, presenting information on health, social issues, macro-fiscal context, productive sector, among others (Anglade et al. 2020, p. 59).

Another recommendation is to identify how to address proposals based on previous assessments and analyses, such as those recently published by the IDB, which highlight opportunities for intervention for LAC in science and technology: "i. additional and long-term

financing of local scientific capacity; ii. open science and regional collaboration; iii. proactive science and technology; iv. science and data, and; v. Science-based institutions (Angelelli, et.al, 2020, p. 4). This publication also provides suggestions for productive development and SMEs, as well as for business innovation and start-ups.

A further recommendation is to develop strategies for the rapid shift to the use of digital platforms. Adapting to this transition should not be the exclusive task of governments, but also of companies, SMEs and citizens. The options offered by digital platforms are diverse; therefore, it is advisable to initiate strategies for adapting to the new reality, such as those proposed by Madariaga et al. (2020, p. 20), to identify, create, and/or prepare for new job opportunities in the digital environment.

Increase social capital. It is recommended to follow Finland's example who used its strengths in collaboration, supported by its education and research system to overcome the 2008 crisis. These were fundamental to achieve a knowledge economy since, due to its size and scarcity of available resources, according to the World Bank (2014, p. 94), they helped to achieve consensus, collaborative preparation, and commitment of those involved. Then, as observed, the culture of trust and collaboration are key in at least two ways: i. to make working teams, and ii. to reach agreements.
Generating trust and confidence is also necessary, as argued by Mangabeira (1998, p. 44), so that people actively participate in at least two areas: i. governments, and ii. private sector. This could be through the creation of honorary positions in which workers, citizens, etc., share their points of view with the aim of improving the governments or companies' performance, and keep them focused on a common benefit, which would create a sense of community. It is ideal to design *ad hoc* policies and programs for the digital era that is taking hold due to the pandemic.

Maintain a national standard policy. It is recommended that countries design and implement cross-cutting policies to support both companies and states so that they can improve their competitiveness and avoid lags. It is ideal to design a minimum standard in various sectors according to their specific characteristics. This would help to define a direction to follow, reduce the risk of efforts being isolated and wasting scarce time and resources in a crisis. This must go hand in hand with *ad hoc* diagnostics. Today, artificial intelligence and Big Data can be key tools in this regard.

Develop a policy with a long-term perspective. New economic and social development policies should be based on innovation and creativity with a long-term perspective. The change must be made by the government, companies, entrepreneurs and people involved in the knowledge and creative economy, seeking to start economic and social development. It is time for make all population sectors have access and benefit from it.

Another recommendation is the design of *ad hoc* policies, because as Benavente & Grazzi (2017) suggest, although policies from other countries can be taken up, it is important that they are designed specific to each country according to its characteristics and conditions. Replicating without doing so may create false expectations and lead to limited results.

Finally, it is also recommended to pay attention to what other countries have experienced, as well as studies that have evaluated how public policies focused on science, technology, innovation and creativity can be implemented in the PA countries. On this respect, Navarro, Benavente & Crespi (2016, p. 78) have already studied and proposed a series of recommendations that would make it possible to achieve success through various dimensions, or cross-cutting actions in which the public and private sectors should participate.

Consolidate institution networks dedicated to the innovation industry knowledge. En la región de América Latina y el Caribe aún existe In the LAC region there is still a division between the institutions in charge of constructing knowledge and the companies dedicated to innovation. It is recommended to invest in fiber optics and strengthening the link between national research networks and the innovation market. The creation and consolidation of National Research and Education Networks (NREN) are vital for the establishment of the knowledge economy in the region since they are excellent mediators between higher education, SMEs dedicated to innovation and the innovation market (Álvarez, 2020).

Work with the financial sector. One recommendation, which was part of the solution for the 2008 crisis and will possibly be for the new pandemic crisis, is the restructuring of the financial sector to work along with the knowledge and creative economy. De la Cruz et al. al. (2020, p. 169) argue that the Public Development Banks can be a key allies to improve access to financing, offering resources for productive investments, in addition to improving the conditions that encourage and make private investment viable through options such as public guarantee funds and Public-Private Partnership (PPP) financing schemes, which at the same time support sub-sectors such as MSMEs.

Another recommendation aimed mainly at private banks is to support and work with open innovation. Rojas (2017) affirms that collaborating between companies is a good option to take advantage of what each one has or offers, for example, by sharing certain data with others so that they can use it in their business. The regulation of personal data is something to be very careful with. Another recommendation is to create a network of expert investors to provide advice to companies in early stages, especially those seeking credit, since private banks will have more certainty, and companies will receive better support to face the pandemic.

Create a good regulatory framework. A framework legislation that establishes a relationship with other laws such as those on the economy, public-private partnerships, or social development, to cite a few examples, is crucial. For this, state policy should leave aside the political perspective, since different political parties must work together to make this happen. Countries such as Brazil and Spain have legislated to create instruments such as the Cultural Emergency Law or measures to support the cultural sector and taxation to deal with the pandemic (Gobierno de España, 2020).

Others proposals made by Madariaga et al. (2020, p. 21), consist of: "i. changes in existing regulations so that they are dynamic processes that adapt to the new work modalities, guaranteeing protection for all workers regardless of their qualifications in order to reduce informality; ii. promotion of accessible and easy-to-access risk coverage schemes for platform workers; iii. promotion of savings for independent workers; iv. development of learning-labor trajectories; v. greater coordination and collaboration in the support actions promoted by the different platforms; and vi. greater coordination and collaboration of the platforms with social services".

03 Analysis of the Challenges in Terms of Competencies and Skills to Improve the Implementation of the Knowledge and Creative Economy.

This section focuses on analyzing the *status quo* of the capacities and abilities of Human Resourses to promote interest, knowledge and higher education in the areas of science and technology (S&T), innovation and creativity in the region, and specifically in the Pacific Alliance (PA). This section also includes an analysis of skills and the labor market in innovation by gender.

In particular, and due to the COVID-19 pandemic, an analysis will be included to evaluate and propose public policies to help PA member countries strengthen innovation capabilities in SMEs in the region. SMEs have been severely affected by the pandemic and, while it is true that data is not yet available, it is important to analyze and propose means for their post-pandemic recovery. This is with the goal that SMEs emerge stronger post-COVID-19, with greater training in innovation to adapt to the pandemic, generate jobs and strengthen the creative and knowledge economy.

Analysis of skills and human resources

The following is an analysis of the educational levels and skills of Human Resources according to the Knowledge Assessment Methodology (KAM), developed by the World Bank, as well as including other complementary indicators.

Strengthening SME competencies and increasing academic exchanges in STEM: Strategies to deal with COVID-19

The PA, founded in April 2011, seeks the free movement of goods, services, capital and people. This economic association has been successful in its objectives. One of them is the current Student and Academic Mobility Program among the four member countries. This has generated an exchange of knowledge, where in turn, visas between member countries have been eliminated to generate a greater number of student exchanges, which has been in effect since November 1, 2012. However, challenges still remain within the Program to strengthen the areas of science and technology (S&T) (Alianza del Pacífico, 2020).

As an example, one of the challenges still in place is the incorporation of the areas of innovation, science and technology in academic exchanges. According to the report of the Pacific Alliance Strategic Observatory (2018) on the Student and Academic Mobility Program, there are more scholarship holders in the areas of engineering (59% men and 41% women), followed by business and international relations (39% men and 61% women). In contrast, only 7% of scholarship holders belong to areas related to innovation, science and technology. (Observatorio Estratégico de la Alianza del Pacífico, 2018).

An area of opportunity for SMEs to better face the COVID-19 pandemic is in the area of innovation and S&T training. The PA has four instruments to promote entrepreneurship and innovation: I. the Technical Innovation Group (TIG), an organization that coordinates with the Inter-American Development Bank (IDB) to finance the steps to follow, II. *InnovAP,* a network of innovation agencies in the PA, III. *AngelsAP*, the alliance's network of business angels, and IV. *AcelerAP*, a network of incubators. (Innovación Chile, 2017)

Among the most recent actions of this trade bloc is the promotion of *e-Ruedas de Negocios*, where the bloc's promotional entities organized three virtual business rounds with buyers from Asia, Oceania and the Middle East. The results were 12-month business projections for US$98.6 million, the participation of 276 exporters from the four countries of the trade bloc, and immediate agreements. (Alianza del Pacífico , 2020).

What is missing? PA governmental actions have been successful in articulating counterparts for better collaboration and greater results. Moreover, technical groups and incubation, investment and financing networks have been developed. Nevertheless, SMEs do not yet have the internal capabilities and competencies

to create innovation in the region. In other words, the government has worked to generate networks, but not to train SMEs. In this regard, it is proposed to work on the transfer of capabilities and competencies in innovation, science and technology among PA members, in order to strengthen the region's SMEs in the event of crises.

Research and Development

One of the main areas of opportunity in terms of competencies and skills to promote knowledge in research and development (R&D). On average, PA countries invest only 0.26% of GDP in this sector, with Chile investing the most with 0.36% of GDP. Meanwhile, Peru invests the least in R&D with a meager 0.13%. Likewise, the number of researchers per million people, scientific and technical articles, patent and trademark applications in each PA country are below the average, not only for OECD countries, but also for Latin American countries. (Banco Mundial, 2020).

In addition, R&D collaboration between universities and industry could be strengthened in PA countries, particularly for Peru. According to the results of the Executive Opinion Survey, conducted for the World Economic Forum's Global Competitiveness Report (2018), on the perception of collaboration between universities and industry by executives in their countries, evidences that the PA countries and those in Latin America and the Caribbean (LAC) are generally lagging behind compared to other developed countries and below the OECD average. However, Chile, Colombia and Mexico are above the world average, though Peru does not reach it.

Regarding gender gaps in R&D in LAC and PA countries; López-Bassols, Grazzi, Guillard, and Salazar (2018) state that the gender gap in science, technology and innovation in LAC has been reduced in recent years, however, there are still challenges such as the glass ceiling, the fact that few women reach hierarchical positions, and that the presence of women researchers in science, technology, engineering and mathematics (STEM) areas has increased but at a slow pace. (Unesco Institute for Statistics, 2019). For instance, in Mexico of the 1,481 patents granted to Mexican inventors in 2016, women as sole inventors are just 20, in 126 patents they appear in collaboration with at least one man, for the rest of the patents granted (1,335), only male inventors are listed. (Santamaría Hernández & Castro del Ángel, Mujeres inventoras patentando en México ¿cómo vamos?, 2018).

Labor force and incorporation of women

The knowledge economy needs to take advantage of technological and digital tools even more in the face of the current crisis caused by the pandemic. In terms of digital skills of the labor force, such as those related to computer use, basic coding, and e-reading, with the exception of Chile, PA countries are below the global median according to the Executive Opinion Survey, conducted for the World Economic Forum's Global Competitiveness Report. (Foro Económico Mundial, 2018).

Another area of opportunity for the labor force is the incorporation of women. While an average of 80% of men between the ages of 15 and 64 participate in the labor force in OECD countries and 82% in Latin America, there are 64% of women of the same age in the OECD and 58% in Latin America. The same gaps are present in PA: in Peru, the difference between the percentage of men and women participating in the labor force is 15 percentage points, 20 points in Chile, 22 points in Colombia, and up to 34 points in Mexico. It is worth mentioning that, in Mexico, only 48% of women between 15 and 64 years of age participate in the labor force. As a result, Mexico is in last place with respect to the rest of the PA countries (World Bank, 2020). Similarly, there are gaps between the percentage of men and women participating in the labor force

with higher education, but to a lesser extent (World Bank, 2020). This confirms the results of other studies that indicate that gender gaps are smaller in the knowledge economy than in the economy in general and that jobs and conditions tend to be better in the knowledge economy (Walby, 2011).

Higher education and gender

In order to foster high-level human capital, it is essential to promote higher education among the population. High-level education coverage varies greatly among PA countries. Such is the case of Chile, which has a gross enrollment rate in tertiary education of almost 89%. This percentage is well above the average 51% for the Latin American region, and even higher than the OECD average of 74%. Peru and Colombia have higher gross enrollment rates than the regional average, reaching 71% and 55%, respectively. Mexico, however, has low coverage, with a gross enrollment rate of only 40%.

Public expenditure investment in education as a percentage of GDP in Chile is 5.4%, which is higher than the LAC average of 4.5% and 5% for OECD countries, whereas Colombia is at the LAC median with 4.5%. Peru and Mexico are below this average, with 3.7% and 3% of GDP invested in education, respectively. (Banco Mundial, 2020).

Regarding gender gaps in higher education; similar to global patterns, since the first decade of the 21st century the gender gap in LAC has not only been closed but in some cases, it has been reversed (Bertocchi & Bozzano, 2019; Creighton & Park, 2010). In the case of the PA countries, the gender parity ratio is slightly in favor of women; this data indicates that there are more women enrolled in higher education than men. (Banco Mundial, 2020).

Notwithstanding the increase in the number of women in higher education, horizontal gender gaps persist in the area of knowledge; there is a generalized underrepresentation of women, particularly for degrees in science, technology, engineering and mathematics (STEM) (Gerber & Cheung, 2008; Carvalhaes & Ribeiro, 2019; Walby, 2011). Examples of the aforementioned are the significant gaps between men and women in relation to the study of STEM majors: by 2017, the percentage of women graduates in STEM majors was 6.8% in Chile, 14.4% in Colombia, 14.5% in Mexico, and 24.4% in Peru. (Banco Mundial, 2020).

This horizontal stratification is built from an early age caused by the internalization of gender roles; this plays a fundamental role in women's occupational preferences and self-perceptions of skills. For instance, girls and teenagers who participated in the 2012 and 2015 PISA tests tended to report much lower levels of confidence compared to men, affecting their performance in mathematics (OECD, 2015); this is fundamental when choosing a profession, as students tend to prefer careers related to skills in which they perceive to have an advantage on (Stoet & Geary, 2018). Moreover, due to the profitability of STEM-linked careers, as women are not involved in these careers, the economic gap between women and men increases. (Gerber & Cheung, 2008).

At an institutional level, the educational system does not sufficiently promote the development of skills and capabilities, as well as deeper thematic analysis. Therefore, it is necessary to design a strategy to evaluate, restructure or correct both effective and efficient policies. It is key to place the student at the center and not the political interest, which is transitory. Thus, it is important to include unions in the negotiations in order to bring about a peaceful transition to the evaluation of education by results. In sum, it is recommended to develop better ways to evaluate the results and performance of students, teachers, and institutions.

Areas of opportunity in the short term to adapt to the COVID-19 pandemic

In the short term, it is not possible to make a large investment in optical fiber, broadband access and infrastructure that will generate the means to train students in the region in times of pandemic. Yet, it is possible to train people with what is already available at the individual level: televisions and radio. This is a short-term recommendation since in the medium-term it will be necessary to invest in infrastructure and broadband that will lead the region to train its Human Resources to generate a knowledge economy in the region.

Policy suggestions and possibilities for scaling up

Strengthen educational exchange within the PA. The Pacific Alliance currently has an educational exchange program within the region. It is important to strengthen this program, especially in the areas of innovation and S&T.

Training SMEs in innovation, science, and technology in the PA. The Pacific Alliance is aimed at the exchange of goods and services and the free movement of people. This has also allowed the sharing of best practices among countries to generate a greater number of SMEs in the region. However, in order to better address the economic crisis caused by COVID-19, it is essential to train them in the areas of innovation and S&T.

Increase investment in education. It is necessary to maintain or increase public spending on education in the PA countries in order to increase both the coverage and quality of education, which is fundamental to the knowledge economy. While Chile is above regional and OECD averages, Colombia and especially Peru and Mexico need to consider allocating more public spending to this area.

Expand higher education coverage. It is important to expand higher education, particularly in Colombia and Mexico, countries that are lagging behind compared to Chile. Additionally, it is necessary to expand higher education with a focus on STEM areas, particularly for women, in an equitable manner in all PA countries.

Evaluating Higher Education with results. Public policies are recommended to lead the region to develop better ways of evaluating the results and performance of students, teachers, and institutions. A restructuring of both human and economic capital is also recommended, aiming to standardize the performance level of schools regardless of the origin of the students or the location of the schools.

Increase investment and incentives in research. Investment in research in PA countries is less than 1%. It is important to increase investment in research, because of the economic and social return it generates for the countries, and to develop and encourage scientific production. It is advisable to create policies that incorporate women into research work.

Incorporate more women in STEM areas. A recommendation is to pay attention to the suggestions that have emerged from diagnoses for the LAC region such as the one prepared by López-Bassols, Grazzi, Guillard, and Salazar (2018), in which they propose the creation of mechanism groups that facilitate the coordination and exchange of information on gender issues in the region, plus, to identify the barriers for more women to get involved in STEM areas (López-Bassols, Grazzi, Guillard, & Salazar, 2018). This could go hand in hand with ad hoc workshops to train women inventors, and the trend of online classes could be exploited to reach women with limited access to these courses.

Strengthen research collaboration between universities and industry. The linkage between universities and industry in PA countries is not as developed as in other advanced countries, such as some OECD member countries.

Promote the incorporation of women into the labor market. In public policies, the incorporation of women into the labor market is discussed in a comprehensive manner, meaning that it goes beyond the actions that women can initiate individually. The incorporation of women into the labor market necessarily implies an institutional approach and involves both genders for the correct resolution and implementation of solutions. Therefore, it is a priority to integrate women, especially those with advanced educational levels, through policies focused on the needs of women and families; such as flexible working hours and teleworking. In other words, an institutional approach must be addressed and the family must be included as a unit of action. This should address needs, obligations and rights as a whole.

04 Analysis of the main ICT and Internet challenges for the knowledge economy and the creative economy.

While the digital transformation of the economy was an important and emerging issue before the pandemic for both Latin American countries (Prats Cabrera & Puig Gabarró, 2017) and Pacific Alliance countries (PA; Observatorio Estratégico de la Alianza del Pacífico, 2017), the crisis originated by COVID-19 has emphasized the urgency of the development of information and communication technologies (ICTs) and their embracement by individuals, households and businesses for economic, educational and health reasons. Similarly, to promote the knowledge and creative economy, productivity and long-term recovery of the economy, investment in and expansion of ICT infrastructure, with the aim of increasing its accessibility and affordability, is essential.

In 2016 was the establishment of the PA Digital Agenda (SGAD for its acronym in Spanish), which focused on four cross-cutting areas: digital economy, digital connectivity, digital government and digital ecosystem, as well as on promoting a further digital integration among the countries of this region (Alianza del Pacífico, 2015a). In this sense, the measures implemented by the SGAD have focused on the installation of infrastructure that, through partnerships between the public and private sectors, allow access to a universal internet service through new Internet Exchange Points (IXPs) within Latin America, fiber optic connectivity and the transition to Internet Protocol version 6 (IPv6), to increase the speed of internet service and reduce the cost of infrastructure. Moreover, priority has been given to the promotion of Regional Digital Markets, fomenting e-commerce and encouraging digital and technological entrepreneurship (Observatorio Estratégico de la Alianza del Pacífico, 2017).

Furthermore, other commitments such as cooperation for the digital literacy of users within the region, as well as the protection of user rights and access to quality services and transparency of the service and rates provided have been included (Alianza del Pacífico, 2015b). Additionally, there is a need to set up a committee specialized in initiatives to increase connectivity in the region, in order to coordinate the implementation of these measures in a timely manner (Observatorio Estratégico de la Alianza del Pacífico, 2017).

Finally, in the face of the contingency caused by COVID-19, the corresponding organizations of the PA countries have implemented measures to favor user connectivity, such as increased fixed and mobile connection speeds (Subsecretaría de Telecomunicaciones de Chile, 2020), access to free SMS services (Colombia, 2020), free access to official content on COVID-19 (Instituto Federal de Telecomunicaciones, 2020b), and low-cost plans for internet access (Instituto Federal de Telecomunicaciones, 2020a).

ICT analysis

The use of the Internet, computers, and cell phones

The current pandemic challenges have highlighted the existing widespread access to the Internet and technologies lag in Latin America. While 83% of the OECD population are internet users, in Latin America it is estimated that only 65.9% are (Banco Mundial, 2020). Of the PA countries, Peru is below 60%, and Colombia is at the average with 65.3%, meanwhile Mexico also exceeds with a 70.1% and Chile is well above the regional average with an 82.3%. In terms of gender gaps, in Peru, Chile and Mexico, the proportion of men using the internet is between three and five percentage points higher than the proportion of women using it; in Colombia, however, the difference is one percentage point, but in favor of women (ITU, 2017).

There is a limited access to a computer and the Internet in the PA countries' households, except for Chile. In general terms, more than half of the populations in Mexico, Colombia and Peru do not have a computer at home. In Mexico 45.4% of households have a computer, in Colombia 44.3% and in Peru 32.9%; in Chile, this figure rises to 60%, although it

is still well below the average of households in developed countries where 82% of have access to a computer (UIT, 2017).

Even though more households have access to the Internet; this is due to the fact that the Internet is accessed through devices other than computers, such as cell phones. In Chile 87.5% of households have internet access, in Mexico 50.9% and in Colombia 50%; however, in Peru only 28.2% of households have internet access. In comparison, 82.9% of households in developed countries have access to the internet; in other words, only Chile exceeds this figure, while the other PA countries are lagging behind (UIT, 2017). It should be kept in mind that there are significant gaps between urban and rural areas in terms of home internet access, particularly for Mexico and Colombia; while the difference between both areas is 27 percentage points on average, in these two countries, the gap is greater than 35 percentage points (ECLAC, 2018).

Data from the Pew Research Center (2018) indicate that on average 85.3% of the population in the PA countries has a cell phone, ranging from 75% in Mexico to 93% in Chile, although only 61.3% have a smartphone, ranging from 56% in Mexico to 77% in Chile. This is below the U.S., where 94% of people own a cell phone and 86% own a smartphone. More than 47% of internet and smartphone users use the internet to get news at least once a day in the PA countries, compared to 66% in the U.S. Yet the use of the internet and smartphones to access social networks is high in the PA countries; more than 80% of users in the PA countries use it for this purpose, which is even higher than the U.S. figure of 74%.

ICT infrastructure and emerging technologies

There are several global indexes on ICT use and infrastructure that are suitable to compare and identify areas of opportunity. The indices demonstrate that Chile is the leader in this area, not only among the PA countries, but in all of LAC, followed by Colombia and/or Mexico, and lastly Peru. For example, the ITU ICT Development Index, which analyzes the digital divide, the development, and the potential development of the ICT, locates Chile in position 56 out of 176 countries, the highest of Latin American countries, while Colombia is in position 84, Mexico 87 and Peru 96 (UIT, 2017). The Digital Ecosystem Development Index of the Development Bank of Latin America, which considers infrastructure, connectivity, competition, and regulation of the ICT sector, as well as its use by individuals and businesses, also reveals that Chile is the leader among Latin American countries with an advanced digital ecosystem. According to this index, Colombia also has an advanced digital ecosystem, while Mexico has an intermediate digital ecosystem and Peru limited (CAF, 2017).

Other indices highlight the need for the PA countries to prepare for the establishment of emerging and future technologies. The Portulans Institute's 2017 Network Readiness Index (NRI) measures the application, use and impact of ICTs on development in 121 countries, considering future technologies. While Chile is ranked 42nd in the world, again being the highest in Latin America, Mexico is ranked 57th, Colombia 69th and Peru 77th (Dutta & Lanvin, 2019). Despite of these rankings, for the sub-theme of future technologies, the rankings of all the PA countries fall more than 20 places (Dutta & Lanvin, 2019), which suggest that they need to invest both in infrastructure and in the adoption of emerging technology by individuals and companies.

Similarly, the 2019 Global Connectivity Index (GCI) analyzes the penetration and use of new technologies in countries such as broadband, cloud services, the internet of things (IoT) and artificial intelligence. According to its data, Chile is above the world average for broadband coverage and use of the internet of things, at the average for the use of cloud services and slightly below average for artificial intelligence. Nonetheless,

Colombia, Mexico and Peru are below the world average for all four technologies, showing higher broadband gaps (Huawei Technologies, 2019).

Broadband access

The upgrade of the broadband infrastructure is essential to improve the use, harnessing, and efficiency of ICTs due to its speed and service reliability. Although mobile and fixed broadband penetration was similar in 2010 (ECLAC, 2018), due to the ease of expanding this type of infrastructure compared to fixed broadband wired infrastructure, the development of mobile broadband has been increased in Latin America and in other developing countries. As presented by the World Economic Forum (2018) in Chile 69 out of every 100 people have a mobile broadband subscription, in Peru 62, Mexico 58.8 and Colombia 45.5 people.

Fixed broadband subscriptions are about four times less in Chile, Mexico and Peru, with 16, 12.7 and 11.8 subscribers per 100 people, respectively. In Peru, there are nine times fewer fixed broadband subscribers than mobile broadband: only 6.7 people out of every 100. To put it into perspective, there are more mobile broadband subscriptions than people in developed countries; in the US, there are 120 subscriptions for every 100 people. There are 32.4 people out of every 100 Americans who have fixed broadband, which is twice the availability for people in Chile and almost five times - that of - Peru (World Economic Forum, 2018).

Affordability is an important factor in broadband access. While some users prefer the flexibility of pay-as-you-go for mobile services rather than taking out a monthly subscription for mobile or fixed broadband services (Minges, 2015), the low number of mobile and fixed broadband subscriptions suggests that they are not affordable for a significant part of the population (OECD, 2020). In this regard, an IDB report notes that, in Latin America, a fixed broadband subscription of an medium speed costs on average 10% of the monthly income of the 40% of the population with the lowest income; this compares with 3% of the monthly salary of the same population in OECD countries (Prats Cabrera & Puig Gabarró, 2017).

Similarly, broadband quality is poor in LAC, although there has been progress. According to ECLAC (2018), while the average effective fixed broadband connection speed is approximately 16 Mbps, in Latin America the average is less than 6 Mbps. Only Chile, Mexico and Peru are above that average, Colombia is slightly below average. In terms of mobile broadband quality, while the top 10 countries have more than 50% of their connections above 15Mbps, the two best Latin American countries, Chile being one of them, only have 15% of their connections above this speed, Mexico has 6% of its connections above this speed, Peru just over 4% and Colombia only 2%.

An improved broadband and ICT infrastructure would have positive impacts on economic growth as well as foreign direct investment (FDI). ITU (2019) concludes that by increasing fixed broadband penetration in Latin America by 10%, the GDP per capita will increase by 1.6%. Similarly, in the case of mobile broadband, a 10% increase in its penetration will result in an estimated 1.7% increase in GDP per capita. Furthermore, the same report states that a 10% reduction in the cost of broadband will expand fixed broadband use by 3% and mobile broadband use by 0.9% in the region (ITU, 2019). Like authors such as Latif et al. (2018), Ketteni, Kottaridi, and Mamuneas (2015) and Suh and Boggs (2011) affirm, the level of development of ICT infrastructure has an important relationship with FDI, such that investing in ICT access and quality could attract more FDI, and in the same way, the attracted FDI could be invested to improve them.

ICTs and SMEs

De acuerdo con el Centro de Comercio InternacioAs reported by the International Trade Center (2020), small and medium-sized enterprises (SMEs) are the most vulnerable and have been the most impacted by the pandemic, hence, the ICTs are a fundamental aspect of coping with it. In addition to promoting their competitiveness, productivity and innovation, ICTs can facilitate the rapid expansion of SMEs, as well as give them access to local, national, regional, and international markets, minimizing entry costs, depending on the goods or services they offer (Beylis, Fattal-Jaef, Sinha, Morris, & Sebastian, 2020). In the context of the pandemic, they facilitate e-commerce, telework and remote management (IDB, 2020).

While digital technologies are increasingly present in different sectors in LAC, and even technology start-up ecosystems are being developed in Mexico City, Buenos Aires, and São Paulo (OECD, 2020), compared to other regions, businesses in LAC are lagging behind in the ICT appropriation (OECD/IDB, 2016). The availability and use of basic services, from access to electricity to having an email, vary across the PA countries. But according to data from the International Trade Centre (Centro de Comercio Internacional, 2019 Mexico is rated well below the other countries in terms of adequate access to electricity for SMEs, as well as the use of websites and emails.

Up-to-date data are limited on the significant use of ICTs by companies in LAC. Anyhow, according to the INTAL study conducted in Argentina, Chile, Brazil, Mexico and Colombia, most companies with export and service potential make use of technology such as cloud computing, digital platforms, and mobile services (Basco, De Azevedo, Harraca, & Kersner, 2020), while SMEs tend to be the furthest behind in the adoption of ICTs and new technologies (Gallego & Gutiérrez, 2015; OCDE/BID, 2016).

Improving access, affordability, and reliability of broadband and ICT service in Latin America will lead to leveraging other technologies. These could be cloud services helpful for individuals and businesses, even more so in the face of the pandemic, since data storage, databases, applications, and software can be accessed remotely. Furthermore, services are often flexible, since they are purchased on demand and by capacity, which allows SMEs to expand or reduce computer services according to the evolution of their needs without requiring large capital investments (OECD/BID, 2016).

Policy suggestions and possibilities for scaling up

Expand broadband coverage, affordability, and quality. The ICT infrastructure depends on the connectivity and speed enabled by the Internet. It is essential to improve the penetration and quality of both mobile and fixed broadband to increase the use of computers and internet in homes until the adoption of new technologies in companies. Through subsidies, tax incentives, and public-private partnerships, among other strategies, the focus should not be only on increasing coverage, but also the quality and service provisioning, as the PA and LAC countries face challenges. in these three areas.

Promote access to computers and Internet from home. Although cell phone use is increasingly widespread in LAC and PA countries, access to the Internet and computers at home is low compared to developed countries, except for Chile. Increasing the coverage and affordability of both equipment and the Internet is fundamental to developing knowledge economy and creative economy. Dealing with the social distancing measures, business closures and growing unemployment, it is even more important that people can access the internet via computer from their homes, not only for labor productivity, but also for educational and health issues.

Improve ICT infrastructure to take advantage of and invest in emerging and future technologies. The PA countries' areas of opportunity are in the implementation of emerging and future technologies. Colombia, Mexico, and Peru are lagging behind in the use of cloud services, the internet of things and artificial intelligence. Access to and widespread use of these technologies would facilitate the advancement and development of the knowledge and creative economy.

Encourage competition in the telecommunications sector to improve the quality and costs of services for users.

Promote technological training for SMEs. To induce innovation, increase productivity and overcome times of crisis such as the current one, it is essential to adopt and use ICTs. Technical assistance programs should be offered, and incentives should be provided for SMEs to take advantage of technology.

Adoption of ICT skills. Regardless of the policies and programs that governments may implement, it is ideal for SMEs to seek training for the implementation to the best of their ability of the various options offered by the market. A wide variety of formal courses or free videos can be found on the Internet, explaining how to use from basic to complex programs.

Development of new ICT-based businesses. This can be done in two ways: i. The public sector should look for ways to support the development of businesses that use ICTs as a basic tool, and; ii. Private banks should provide better credit options for the development of these businesses, and SMEs should seek to take advantage of them, especially those that have been developed by SMEs or local entrepreneurs because otherwise the possibility of survival is significantly reduced.

05

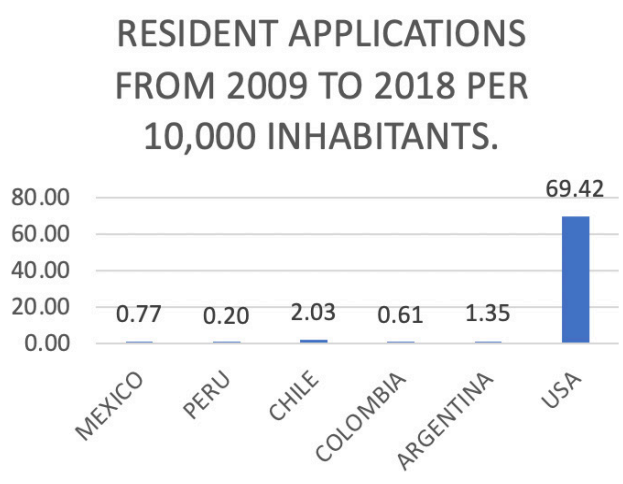
Intellectual property.

Intellectual property is one of the elements which neither the knowledge nor the creative economy could possibly exist without. Despite its relevance, the results of the assessment made in the first chapter show that between the PA countries and the reference country (USA) there is a very wide gap. So much so that, for example, all the patent applications from the PA countries in 2018 could be combined and still be far behind the USA. This chapter displays some challenges and suggestions based on the results of the first chapter, on what is established in the literature and prioritizing those that urgently need to be addressed considering the current and future effects of COVID-19.

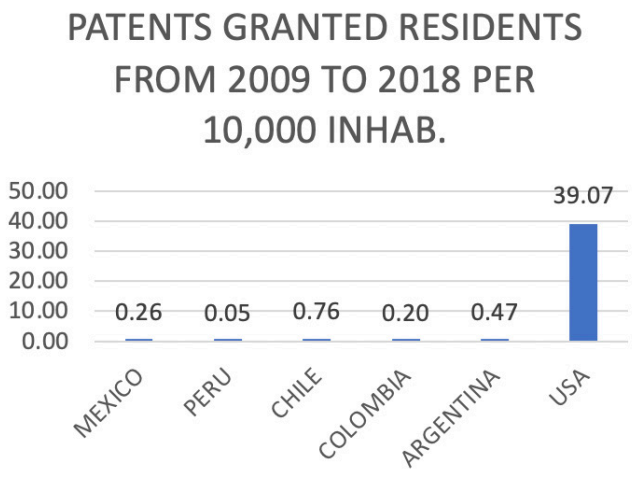
The results showing the gap between the U.S. and the PA countries are similar to those identified in the Innovation Index published by the World Intellectual Property Organization (WIPO). The positions that the PA countries occupied in the Index for the years 2015 (p. 20) and 2020 (p. 32) were, respectively: i. Colombia, 67th and 68th; ii. Chile, 42 and 54; iii. Mexico 57 and 55, and; iv. Peru, 71 and 76.

Notwithstanding, statistical information shows that there is a wide gap between the reference country, the USA, and the PA countries and Argentina in the accumulated amount of invention patents, both in applications and those granted, from 2009 to 2018, as can be seen in the following graphs. Patents are fundamental in both economies as they serve as a reference to evaluate their results, like measuring the impact of investments in indicators such as higher education, research and development, or public and private investment.

Graph 3. Invention patent applications in 2018 per 10,000 inhabitants.



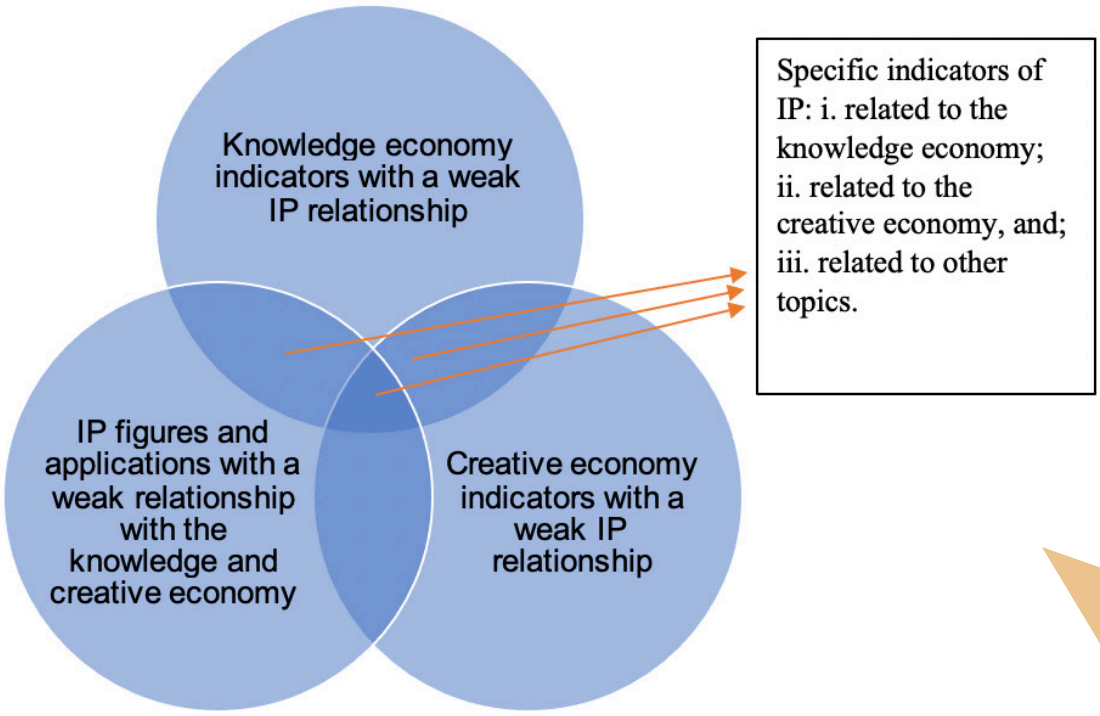
Graph 4. Invention patents granted in 2018 per 10,000 inhabitants.



Source of graphs: Own elaboration based on "Statistical Country Profiles", Intellectual Property Organization, available at: https://www.wipo.int/ipstats/es/statistics/country_profile/

Conversely, the degree of presence of intellectual property in both knowledge and creative economies depends on the impact it has within these economies. As can be seen in the KAM methodology used to evaluate the knowledge economy. There are specific indicators that have a direct impact on its results, such as the number of invention patent applications. But there are others with no correlation or with an indirect link, such as investment in research and development, since this investment sometimes results in patents. On the other hand, there are also intellectual property figures that have almost no relationship with these economies, such as plant varieties.

Image 1. Relationship between intellectual property indicators.



Source: Own elaboration.

Intellectual property analysis

Online services

At the time of writing, almost all the intellectual property offices in the PA countries are now offering all their services online. COVID-19 led to the suspension of many legal procedures and deadlines, especially for those procedures that could only be carried out in face-to-face or physically. This produced challenges in at least two ways: i. For users who could not carry out formalities, and ii. For workers who could not carry out activities from home due to lack of adequate measures, protocols, and equipment (hardware and software).

Not all procedures and formalities to protect intellectual property can be carried out online in all PA offices. Likewise, not all courts focused on intellectual property trials offer an online service. This situation poses at least two additional challenges: i. It delays procedures and trials which causes other problems, and ii. It creates an excessive workload for public officials who are unable to work. The following table shows which offices allow registration through an ad hoc portal for such purposes, as well as the link where it can be accessed:

Chart 1. Offices with an online registration service.

Country	Office name	Online	Website
Chile	Departamento de Derechos Intelectuales	Yes	http://crin.propiedadintelectual.gob.cl/
	Instituto Nacional de Propiedad Industrial	Yes	https://www.inapi.cl/tramites/tramites-digitales
Colombia	Dirección Nacional de Derechos de Autor	Yes	https://www.registroenlinea.gov.co/portal.htm
	Superintendencia de Industria y Comercio Ministerio de Industria, Comercio y Turismo	Yes	http://sipi.sic.gov.co/sipi/Extra/Default.aspx?sid=637382888972813303
Mexico	Instituto Nacional del Derecho de Autor	No*	https://www.indautor.gob.mx/
	Instituto Mexicano de la Propiedad Industrial	Yes	https://eservicios.impi.gob.mx/seimpi/
Peru	Instituto Nacional de Defensa de la Competencia y de la Protección de la Propiedad Intelectual (propiedad industrial y derechos de autor)	Yes	https://www.indecopi.gob.pe/servicios-en-linea

Source: Own elaboration based on information available from the offices cited in the table, last revision October 14, 2020.
*According to the latest revision of The National Copyright Institute on October 14, 2020, allows certain registration procedures, but it is through an email ad not through and *ad hoc* platform.

Lack of regulation on the Internet

All PA countries face the challenge of the lack of *ad hoc* regulation to sanction those who violate intellectual property rights on the Internet. This takes on special relevance due to the increase in online commercial activities because of the pandemic. As stated in Forbes (Hernández Armenta, 2020), in Mexico as of September of this year, 5 out of 10 companies doubled their growth on the Internet, and 2 out of 10 registered increases of 300 percent in the online business.

The 301 report, which publishes the intellectual property weaknesses of several countries, has indicated that this is the most important challenge for the four PA (Office of the United States Trade Representative, 2020). The lack of regulation to protect online intellectual property rights affects areas like: i. Online piracy, and; ii. Lack of clarity on the responsibility of internet service providers. Although there are already certain forecasts arising from recent trade agreements such as the T-MEC and the Trans-Pacific Economic Cooperation Agreement, the regulation problem has not yet been fully addressed.

Little or no education on protection and the upholding of the intellectual property rights

Nowadays, piracy and using intellectual property without the owner's authorization on the Internet is easier than ever before. This situation could increase in the same proportion as the number of people on the Internet increases due to the pandemic. According to the European Union Intellectual Property Office, more than 83 billion Euros per year in the period from 2013 to 2017, as well as 671 thousand jobs (2020, p. 5).

Although it is possible to identify various activities in the PA countries to explain how to protect intellectual property, few have focused on the promotion of upholding the intellectual property rights. With the current pandemic situation, no *ad hoc* public policies were identified in any of the intellectual property offices of the PA countries as of October 16, 2020, to promote the upholding of these rights.

What has been argued above directly affects the capacity and possibility of monetization of intellectual property, especially because: i. There is a perception that access, especially to culture, should be free; ii. It reduces the possibilities of recovering the investment, and iii. The perception of a weak rule of law may inhibit protecting or receiving investment (Aresty, 2012), among other effects. This situation may become especially critical with the pandemic since many right holders, especially creative ones, will only be able to market their products or services on the Internet.

Monetization of intellectual property

This challenge is neither exclusive nor caused by the pandemic, however, it may now be much more complex since many of the ways in which many patent holders, copyright holders or other figures used to market their products or services have ceased to exist or have changed completely. In the literature it is possible to identify several useful documents on how to make a living from the creative and cultural industries, like those of WIPO (s/f), but, these documents, guides or manuals were designed for a world without COVID-19.

Intellectual property as support for industrial policies

Bianchi & Labory (2010, p. 315) state that to emerge from the 2008 crisis, the U.S. maintained a strict degree of consistency of the industrial policy framework at the federal and state levels and used it to ensure competition and trade policies and industrial development. Among these, intellectual property rights. In the PA countries, no industry framework was identified that aligned the federation and states on how to leverage intellectual property during the pandemic.

Ad hoc measures during the pandemic

According to the COVID-19 IP Policy Tracker (OMPI, 2020), two of the four PA countries have created intellectual property policies as a response to the pandemic, shown in the following table. The focus of this research is not to evaluate the policies, however, it is possibly necessary for them to design ad hoc policies, especially for the case of invention patents, although, it would be ideal if others were established considering the previous challenge.

Chart 2. Intellectual property policies related to COVID-19 in the PA countries.

Chile	Colombia	Mexico	Peru
On March 17, 2020, the Chilean parliament passed a resolution requesting the Chilean government to declare that there was a justification for compulsory licensing of vaccines, drugs, diagnostics, supplies and other technologies for the prevention and treatment of COVID-19. On April 6, 2020, ABBVIE voluntarily requested the cancellation of six of its patents related to the drugs Norvir (ritonavir) and Kaletra (ritonavir / lopinavir).	Issued on March 25 the Decree 476 of 2020 declares a public health interest in drugs, medical devices, vaccines and other health technologies that are used for the diagnosis, prevention and treatment of COVID-19 and establishes the framework of the State of Emergency, under which the SIC is fully capable of providing information that will allow determining whether the products or procedures that are of interest and have patent protection in Colombia, as well as technological searches in other patent documents, which may be useful when manufacturing the products required in this emergency.	Mexico has not currently issued any compulsory licenses, enabled the use of the government use or made changes to the existing legislation in response to the COVID-19 pandemic.	Peru has not currently issued any compulsory licenses, enabled the use of the government use or made changes to the existing legislation in response to the COVID-19 pandemic.

Source: Own elaboration with information from the World Intellectual Property Organization, extracted from the IP Policy Tracker relative to COVID-19, available at: https://www.wipo.int/covid19-policy-tracker/#/covid19-policy-tracker/access, date of consultation October 21, 2020.

39

Policy suggestions and possibilities for scaling up

Online services. It is necessary that all services and procedures can be carried out online to avoid contagion. To this end, the generation or modification of regulations that can eliminate possible barriers is recommended. This is seen in two ways: I. So that users or their managers can carry out their procedures in a simple and secure manner, and; II. So that public servants can perform acts through digital media with legal validity from home.

It is suggested to make an evaluation to find out if the design and functions of the web sites can be improved or made more user-friendly. Likewise, it is important to provide public servants with the necessary hardware and software to be able to perform their functions outside the office. All of this also applies to the courts in charge of trials in this area.

Create and Internet regulation. It is suggested to pay special attention to this issue, given the increase in commercial activity on the Internet as a result of the pandemic. It is ideal to start from a study that allows knowledge of what administrative, legal, and procedural changes are necessary to provide legal security. It is advisable, especially for legislators, to learn about the experiences of other countries. In light of this, WIPO (2019) has prepared certain documents with the help of experts that serve as a source of information.

Legal knowledge must go hand in hand with a strong awareness campaign for users and professionals in the field. Big companies should be the first to adopt and use new regulations in order to encourage SMEs and entrepreneurs to use them. In addition, good training of public officials and judges is essential before implementing any measure.

Education and promotion of respect for intellectual property. The design and implementation of a campaign on respect for intellectual property rights are proposed. One option to reach more people is to add content to the basic education courses that are given on television or digital media due to the pandemic. It could be added within the subject related to civic and ethical education, where the topic of respect for the creations of others is addressed.

It is also recommended that campaigns be designed and implemented for adults, ideally in collaboration with the holders of intellectual property rights, to inform the population that unauthorized or improper use and piracy affects the inventors or creators of the products or services consumed by the population.

Intellectual property as a support for industrial policies. Ideally, policies should be designed with a country-wide normative range to: I. Avoid a reduction of creations, inventions or registrations; II. Maintain or promote the development of certain technological areas that are a priority to confront the effects of the pandemic, or; III. Use intellectual property as a tool to promote competition and the industrial development of countries. Those points are relevant because innovation and creativity are currently the guiding principles that help the world deal with COVID-19 and its consequences.

Finally, in order to be able to use intellectual property in industrial or public policies, it is essential to increase the generation of statistical information. Serving as an input for both the public and private sectors. For this research, a Big Data viewer was designed containing statistical information on industrial property from PA countries, Argentina and the USA (available at https://www.caiinno.org/estadistica-pi-alianza-del-pacifico/).

Intellectual property monetization. It is recommended to design and use of documents that address the current situation due to the pandemic. As a reference, the IDB recently published a Basic Guide of

elements to consider when starting a business in the creative economy keeping in mind the COVID-19 effects (Santamaría Hernández, 2020). The government should help by providing clear rules on new channels and forms of marketing. It is essential that it quickly reacts to provide legal certainty while maintaining a balance of not hindering or creating a barrier.

On the private sector and entrepreneur perspective, they should take advantage of available resources, as well as promote the creation of new ways to monetize intellectual property. Although there is pressure to obtain resources, this should not lead to unethical businesses or actions or to the violation of the intellectual property rights of other owners.

Lastly, both public and private sectors should seek new ways to collaborate with each other in every area even if they seem distant. For example, in the case of creative invention patents, where the invention solves a technical problem faced by the cultural and creative industries, such as the one shown in the table.

***Ad hoc* measures for the pandemic.** It is important to identify whether the regulatory framework provides legal certainty to the holders of intellectual property rights, in the case of compulsory licenses for invention patents, or on the contrary, the creation of reforms or the taking of legal measures to eliminate risks or barriers that endanger those rights would be necessary.

There is also a need for the private sector to make changes or take important steps. As an example, private banks could consider investing or lending on intangible assets, and even take them as collateral instead of tangible assets. For this to happen, regulatory changes may be necessary, so public-private collaboration is key.

Image 2. Invention patent.

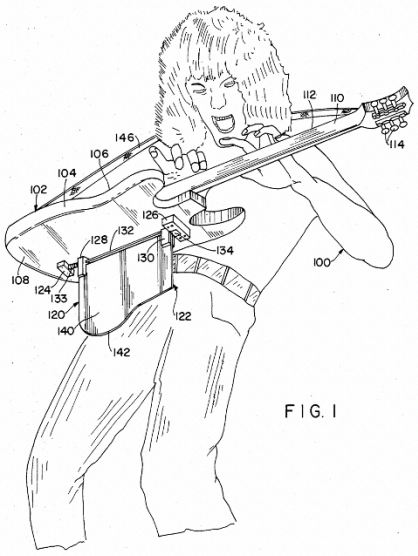


Image source: Invention patent US4656917, Musical instrument stand, HALEN EDWARD L VAN, available at: https://patentscope.wipo.int/search/es/detail.jsf?docId=US37633734

Methodological Annex. Methodology to Measure the Economic Contribution of the Copyright-based industries

For this research, the methodology known as Knowledge Assessment Methodology, KAM, designed by the World Bank for the making of this interactive data bank, was used as a starting point. The methodology was designed to evaluate the countries' knowledge economy performance. It also allows us to identify the sectors and areas where public policymakers could focus their attention and investments.

The research started collecting data from the countries' official sources, as well as from international organizations such as the World Bank, the World Economic Forum, the Economic Commission for Latin America and the Caribbean, the Organization for Economic Cooperation and Development, and other sources used in the literature by various experts.

To generate the calculation with the KAM methodology, 59 indicators were identified from the last available years for each country (see table below), and they were classified into 6 pillars which are[1]: i) Performance; ii) Economic Incentives and Institutional Regime; iii) Education and Human Resources; iv) Innovation System; v) Information and Communication Technology (Information Infrastructure), and vi) Gender Equality.

Pilar	Indicator
Education and Human Resources	Extent of staff training
	Digital abilities within the population
	Ease to find qualified employees
	Internal labor mobility
	Life expectancy at birth, years
	8th grade achievement in mathematics
	8th grade achievement in science
	Average years of schooling
	Quality of professional development
	Primary Pupil-teacher ratio, pupils per teacher
	Trust in professional management
	Graduate skills
	Adult literacy rate (% age 15 and above)
Gender Equality	Seats in Parliament held by women (as % of the total)
	Gender development Index
	Females in labor force (% of total labor force)
	Females Literacy Rate (% of females ages 15 and above)
Economic Incentives and Institutional Regime	Tariff & non-tariff barriers
	Regulatory Quality: Efficient and effective governments
	State and state bodies debt
	Government Effectiveness
	Political stability
	Rule of law
	Exports of goods and services as % of GDP
	Average Gross capital formation as % of GDP
	Intensity of local competition
	Intellectual property is well protected
	Press freedom
	Control of corruption
	Adequate regulations & supervision of the financial institutions
	Soundness of banks
	Voice and accountability

1 Two of the six pillars of the KAM methodology come from a more updated version identified in the literature

Information and Communication Technology (Information Infrastructure)	Computers per 1,000 people
	Subscriptions to fiber optic Internet / 100 inhabitants
	Subscriptions to fixed broadband Internet / 100 inhabitants
	E-government
	Internet users % of population
	Main Telephone Lines per 1,000 people
	Subscriptions to fixed mobile broadband / 100 inhabitants
	Safe Internet servers
	Safe Internet servers (per 1 million inhabitants)
	Mobile telephony
Performance	Composite ICRG risk rating
	Human Development Index
	Poverty index
	GDP per capita (International Current PPP)
	Average unemployment rate, % of total labor force
	Average Annual GDP growth (%)
Innovation System	Administrative burden for start-ups
	Scientific and techical journal articles
	Availability of venture capital
	Manufacturing exports
	FDI inflow
	Total expenditure for R&D as percentage of GDP
	Manufacturing. Trade as % of GDP
	Royalty and license fees payments
	Patent applications granted by the USPTO, per million population
	Royalty and license fees receipts in US$ millions
	Patent applications

According to the previous information, the study was delimited with the data from Argentina, Chile, Colombia, the United States of America, Mexico, and Peru. Once the database was defined then the data was normalized based on the max-min criterion:

$$x' = \frac{X - X_{min}}{X_{max} - X_{min}}$$

Where:
X'= Normalized observation
X= Observation in the data set
Xmin = Minimum value of the set of observations in the indicator
Xmax - Xmin = The difference between the maximum and minimum values of the set of observations in the indicator X.

Where the maximum value (1) is obtained by the country with the highest value for each indicator, while the minimum value (0) is obtained by the country with the lowest value for that indicator. Once the normalization was done, the data values were integrated into a Big Data viewer known as *Power BI* for interactive query (https://www.caiinno.org/kam/).

Methodology to Measure the Economic Contribution of the Copyright-based Industries

The methodology developed by the World Intellectual Property Organization (WIPO) in its document "Guide on Surveying the Economic Contribution of the Copyright-Based Industries" was used as a basis. This methodology was designed to provide an assessment of the performance of the copyright-based industries, to which for example, can be identified their contribution to the national GDP. It is also useful as a reference to identify in which sectors intervention proposals can be made.

The years considered for the application of the methodology vary depending on the country since the information available for each substantially varies between years and countries. The reference period for the current study covered from 2014 to 2019:

Country	GDP and Value Added	Employment	Foreign Trade
Argentina	2014-2019	2016 - 2019	2014 - 2019
Chile	N/A	2014 - 2018	2014 - 2018
Colombia	2014 - 2018	2014 - 2019	2014 - 2019
United States	2014 - 2017	2014 - 2017	2014 - 2017
Mexico	2014 - 2018	2014 - 2018	2014 - 2018

Note: In the case of Chile there was no data found on production and value added during the study period.

Based on the collected information, the methodology was adapted to measure three main indicators relative to size:

1. Contribution of the copyright industries as a percentage of GDP and GVA
2. Contribution of the copyright industries to employment and the compensation of employees
3. Foreign trade: value of and shares in overall exports and imports.

And two performance-related indicators:

1. Contribution to GDP and employment growth.
2. Trade balance.

To measure these indicators, the information for each country was classified according to their relationship with copyright and subclassifying them according to their creative activity.

1. Core copyright industries:
   a) Press and literature.
   b) Music, theatrical productions, operas.
   c) Motion picture and video.
   d) Radio and television.
   e) Photography.
   f) Software, databases and computer games.
   g) Visual and graphic arts.
   h) Advertising services.
   i) Copyright collecting management societies.

2. Interdependent copyright industries:
   a) Creative economy manufacturing activities.
   b) Photographic and cinematographic instruments manufacture.
   c) Musical instruments manufacture.
   d) Others.

3. Partially dependent industries:
   a) Museums.
   b) Architecture.
   c) Crafts.
   d) Textiles.

4. Non-dedicated Support Industries:
   a) General wholesale and retail.

The following formula was used to calculate the contribution to the GDP, employment, exports and national imports:

$$Cs = \frac{\mathrm{Vs} * 100}{\mathrm{Vn}}$$

Where:
Cs= Contribution to the GDP/ Employment/ Imports/ Exports
Vs= Creative sector production / Number of employees in the creative sector / Imports to the creative sector / Exports of the creative sector
Vn= National GDP / Economically active population / National imports/ National exports

The following formula was applied to measure the trade balance:

$$Trade\ balance = \mathrm{E} - \mathrm{I}$$

Where:
E = Exports
I = Imports

Lastly, the following formula was used to calculate the copyright-based industries' contributions to the national growth and employment:

$$CG = \frac{\mathrm{CP} * \mathrm{GR}}{\mathrm{RG} * 100}$$

Where:
CG= Contribution to the national economic growth / Contribution to the national employment growth
CP= Percentage of contribution to the creative sector GDP / Percentage of contribution to the creative sector employment
GR= Creative sector gross output growth rate / Creative sector employment growth rate
RG= National GDP growth rate / National employment growth rate

Once the results were gathered, the data was integrated into a Big Data viewer known as *Power BI* for interactive query (https://www.caiinno.org/desempeno-economia-creativa/).

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