CENIA
CENTRO NACIONAL DE INTELIGENCIA ARTIFICIAL

ILIA

Latin American Artificial Intelligence Index

ILIA_2024

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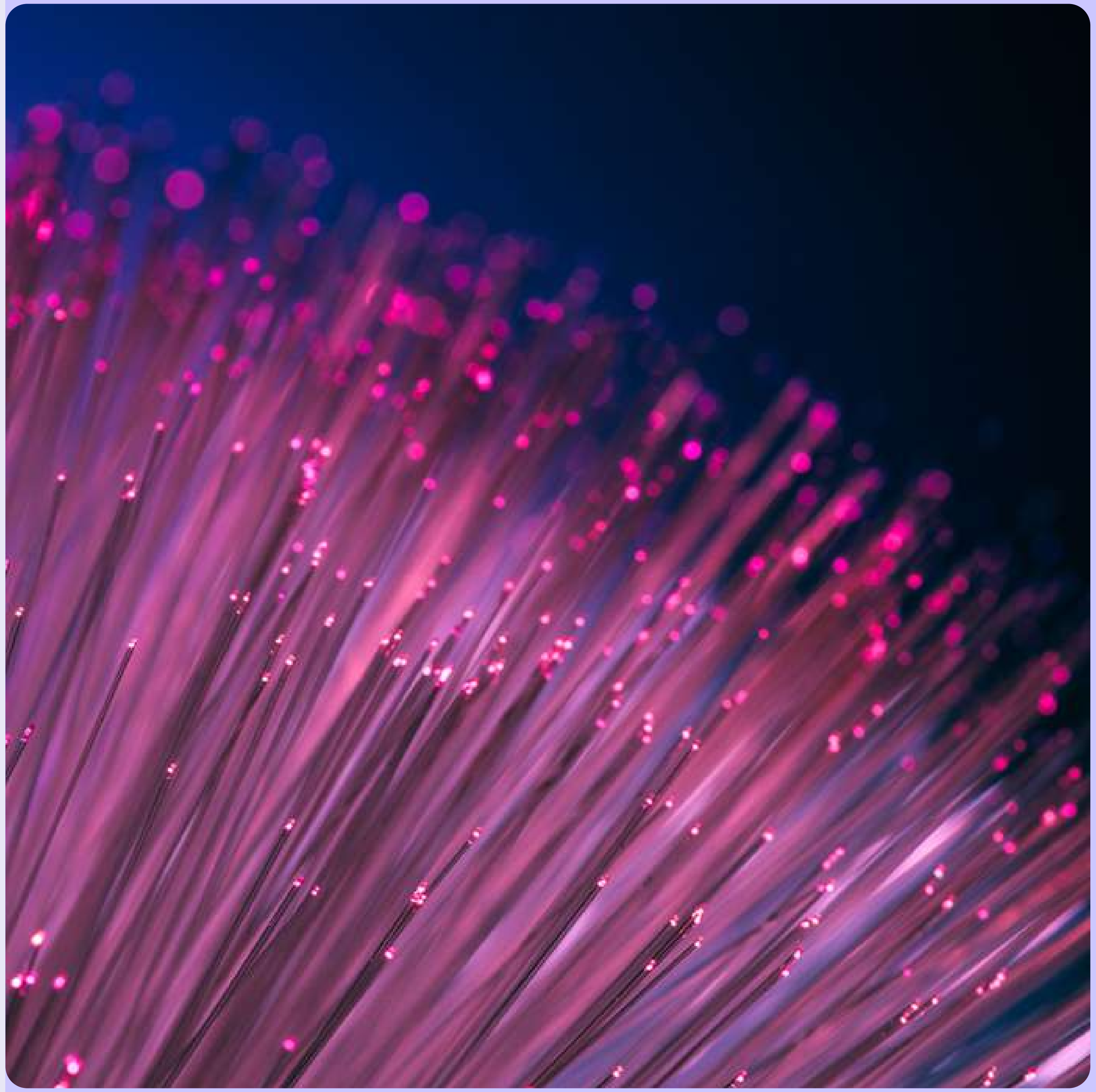
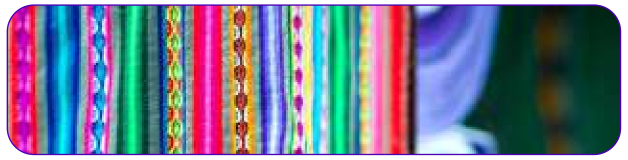
PRESENTATION



The Relevance of a Second Edition

Following its launch in August 2023, the Latin American Index of Artificial Intelligence, ILIA, has positioned itself as a benchmark for understanding the state of advance of AI in the region. However, the information contained in it is not an end in itself. The ILIA is an open access document, whose purpose is to contribute to the development of AI in the region, with an inclusive development that contributes in a broad way to the well-being of its citizens.

Identifying common opportunities, detecting gaps, and illuminating concrete actions that promote a virtuous AI advance in the region are key goals that ILIA aspires to achieve. In this area, this report has played a relevant role in initiatives such as the investment in computing infrastructure, with emphasis on AI, planned by the CAF; the creation of the Working Group for AI Ethics, initiated at the Santiago Summit; and the implementation of training programmes to increase business adoption of AI, led by the IDB, among others.



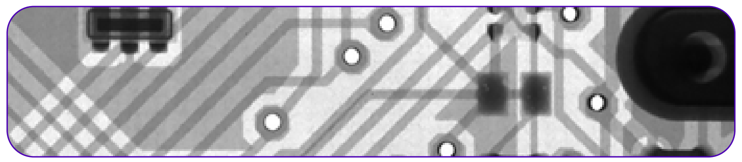
Additionally, the collaborative spirit that allowed the construction of ILIA has laid the foundation for another major regional challenge: the development of the first Great Latin Language Model. This open-ended project, led by CENIA, involves the active participation of institutions and governments throughout the region, and we expect it to materialize during the first half of 2025. This will make Latin America and the Caribbean part of this technological revolution, bringing with them the distinctive talent, idiosyncrasies and nuances of their people.

Anticipating the challenges of AI, this edition of the index puts a special focus on the transformation of the world of work. For the first time, we are dealing with a technology capable of enhancing intrinsically human skills such as creativity and reasoning. However, the data presented reveals a great opportunity to improve working conditions for workers through AI. Rather than replacing jobs, AI is emerging as a tool for enhancing human skills.

Seizing these opportunities means bridging important gaps. In this sense, one of the main conclusions of ILIA is the need to alert our leaders and authorities on the urgency of establishing national and regional agreements that promote comprehensive and coherent policies for promoting AI. These must be supported by a strong allocation of resources that reflects the relevance and urgency required to ensure healthy AI development in the region.

As in the previous edition, the call is to work collaboratively, from data collection and availability to training of advanced human talent; from the incorporation of infrastructure to the regulation of AI with local relevance. AI must be a tool at the service of Latin Americans, and it is up to each of us to make this a reality.

Álvaro Soto, CENIA Director
Rodrigo Durán, ILIA Executive Director



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The second edition of ILIA is the result of a joint work at a regional level that does not lose continuity and which, therefore, fills the National Center for Artificial Intelligence (CENIA) and the people and entities behind its construction with satisfaction. Both those who have joined efforts from the beginning to raise this report as those who have joined selflessly in this edition have done so with the motivation of building an instrument that transcends a score and points to the founding purpose of ILIA: identifying AI growth opportunities at a regional level to boost countries' economic and social growth, thus contributing to the well-being of their citizens.

We thank the Economic Commission for Latin America and the Caribbean (ECLAC) for our joint work, which has allowed us to develop rigorous and exhaustive research on the regional advance of AI and thus reach robust, reliable and trustworthy results. We highlight the role of the Division of Productive and Business Development, run by Sebastián Rovira, Alejandro Patiño, Valeria Jordan, Laura Poveda and Demetris Herakleous, who have been key players in this process. We also thank the European Union through the EU-LAC Digital Alliance.

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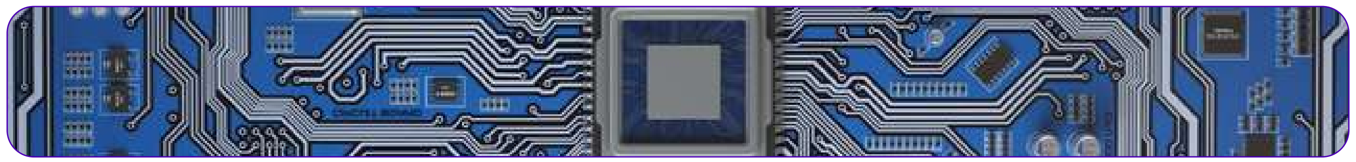

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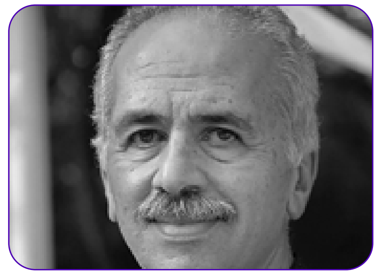

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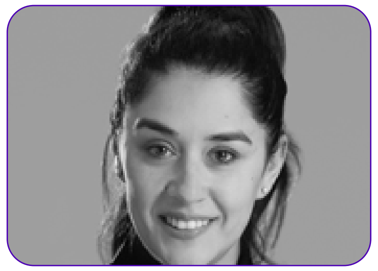

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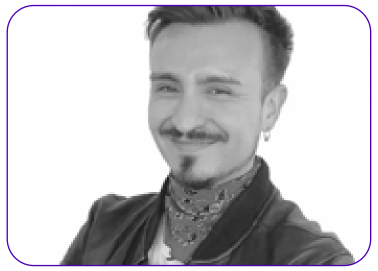

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How To Read the ILIA 2024 Report

In order to provide a comprehensive and structured view of the progress of AI in Latin America and the Caribbean, the ILIA organizes the elements and variables that affect the development of AI ecosystems around three dimensions: Enabling Factors; Research, Development and Adoption, and Governance.

This taxonomy not only allows the grouping of 76 subindicators, which served as a basis for building this index, but it also permits the document to be organized into chapters named after each dimension. These contain the conceptual and statistical descriptions of subdimensions, indicators and subindicators, which provide a more intuitive and accessible reading of results.

It should be mentioned that, in order to arrive at the scores shown, a process of normalization was applied to most of the raw data collected, except in some cases which are explained in the respective chapters.

The present edition of ILIA consists of seven chapters, some with reports and success stories on AI applications, which complement the contents of each section.

Chapter A: Latin American AI Index outlines the relevance of grouping the 19 countries into "Pioneers", "Adopters" and "Explorers", according to their level of development in relation to AI.

Chapter B: Main Findings contains the 10 most relevant conclusions of the index, which allow the formation of a viewpoint on the region's advances and gaps in AI.

Chapter C: Enabling Factors first presents the main findings associated with this dimension. Then, in the following four subsections, it includes the conceptual and statistical descriptions of each of the variables in its taxonomy.
This section also includes a case study of an AI application powered by Amazon Web Services, which demonstrates how the use of the cloud can streamline the time of professionals linked to education. The section concludes with two reports: one on the development of AI competencies in the workforce of six Latin American countries, and the other on the impact of AI on the Chilean labor market.

Chapter D: Research, Adoption, and Development follows follows a structure similar to the previous chapter, starting with the main findings and followed by the conceptual and statistical details of the dimension. This chapter also includes successful cases of AI applications. The first, from Microsoft, focuses on conserving the biodiversity of the Amazon, and the second, implemented by GobLAB at U. Adolfo Ibáñez, pertains to the public procurement system of the State.

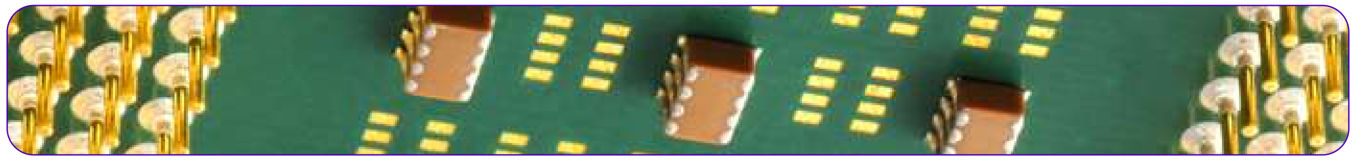
Chapter E: Governance presents the most relevant findings at the beginning and continues with an analysis of the AI strategies of each country, regulatory frameworks, and the ethical aspects that must be safeguarded regarding AI. Throughout the chapter, various analyses are presented, including one related to the progress of AI regulation in the Latin American context.
In the final part, successful cases of proper governance are included, among them, the Humboldt Cable, driven by Google and the Chilean State, aimed at materializing a central aspect of the Chilean AI strategy.

Chapter F: Country Profiles contains a snapshot of the state of AI in the 19 Latin American nations included in ILIA 2024, assigning each a classification of "Pioneer," "Adopter," or "Explorer," as applicable. Each profile includes a comparison between the final scores of 2023 and 2024, along with the presentation of the main findings and a brief analysis of each country's strengths and weaknesses. This is complemented by evaluations of talent migration flows in AI and the incorporation of AI into the 10 most important disciplines defined by the OECD.

Chapter G: Methodological Appendix contains the details about the methodology applied to collect and calculate the data included in the matrix of indicators and subindicators. It also includes the normalization formulas, the weighting applied to the dimensions, and the aggregation criteria used to address missing values. This chapter includes all the foundational documents that served as data sources to provide methodological robustness to the index.

It should be noted that, to gain a **better understanding of the findings and the statistical descriptions** included in each chapter, it is necessary to consider some general indications described below:

Graphs: Bar charts showing dimensions, subdimensions, indicators and subindicators are arranged alphabetically by country, providing a consistent order throughout the reading. This means that they are not sorted from highest to lowest according to the results, as is commonly the case. By maintaining the fixed position of each country within the chart, comparison and understanding throughout the document is facilitated.



Scores: ILIA uses a scoring system ranging from 0 to 100. Regardless of the nature of the data, it is the result of transforming each figure into a scale that allows for addition, averaging and weighting. Therefore, scores are presented in this document, not percentages.

Standardization: Scores are obtained through a standardization processes that includes methodological decisions based on the nature of the data. In some cases, countries score against the 19 countries evaluated; in others, they are shown at the global level. There are also occasions when they relate to possible theoretical values.

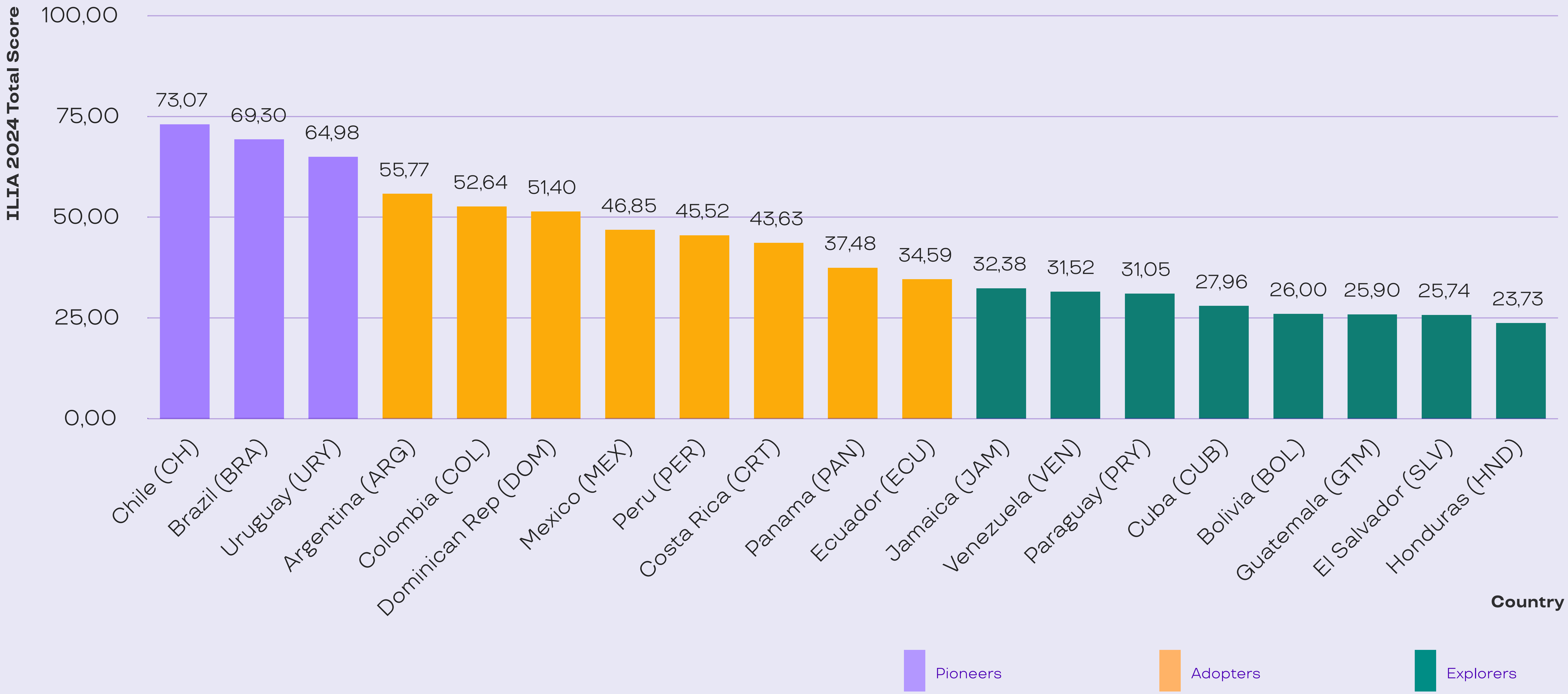
Relative weights: Not all dimensions, subdimensions, indicators and subindicators have the same influence on the final result, so relative weights have been applied to reflect the importance of each component in the context of the index. This weighting ensures that the most critical or impactful areas have a greater weight, aligning the result with the strategic objectives and priorities of the analysis.

Categorization: At the level of dimensions and subdimensions, countries were classified into three groups according to their scores divided into tertiles with respect to the total score, i.e., 100, which allows them to be categorized according to their respective performances. These groupings have no fixed limits and vary according to the nature of the data and the results obtained by the region, that is, they depend on the maximum and minimum value reached in each case.

For a more detailed and in-depth understanding of these elements, the Methodological Appendix is available.

LATIN AMERICAN AI INDEX

The ILIA taxonomy comprises dimensions, subdimensions, indicators, and subindicators, offering a structured, comprehensive view of AI ecosystems across countries in the region. This year's overall results **present individual scores** for each of the **19 Latin American and Caribbean countries**, enabling a visual comparison of their relative performance across the region .



Because of the wide geographical scope covered by this study, the index may present challenges in making a relative comparison of countries. Therefore, and in order to improve clarity and facilitate analysis, this edition of the **ILIA groups countries according to their degree of maturity** in the dimensions of **Enabling Factors**; Research, Development and Adoption **(R&D+A); and Governance.** This gives way to **three categories: Pioneers, Adopters and Explorers.**

These groups were sorted using a tercile (or thirds) categorization based on the maximum possible score, which reaches 100 points. Terciles are a statistical measure that divides a set of data into three equal parts, thus allowing the identification of groups representing approximately 33.33% of the total data.

According to the above, the countries analyzed are divided into three clear and equitable categories according to their respective scores.

Pioneers. Countries that are in the top third of the total, with the highest values, and have achieved a leading position, standing out for their efforts in several key areas: technological infrastructure, development of specialized talent, scientific productivity and innovation capacity. They are also orienting their national strategies towards the consolidation and expansion of AI in all sectors of their economy and society. The effort of the pioneers is aimed at taking their capabilities to the next level, setting new standards and models for AI adoption.

Adopters. This category groups the intermediate scores corresponding to the second third of the total range. These are nations that have begun to integrate AI into various sectors of their economy and society but are not yet in a leadership position. They are using this technology in the production sectors, services and public administrations, but only at an early stage. In the field of research, they have made significant progress in AI, although not yet at the scale of the pioneers. In terms of policies to promote AI, they are developing strategies and showing willingness to invest and collaborate with other states to strengthen their capacities for this emerging technology.

Explorers. These countries are located in the lowest third of the total range. The category refers to those in the early stages of AI probing, developing basic skills in this area. Although their use of applications based on this technology is still limited and they lack a consolidated research community, they are beginning to push preliminary public policies to encourage the development of AI. In short, they are taking their first steps towards AI integration and laying the foundations for future growth in this field.

To show how this three-component typology behaves at the level of the different dimensions, the results are presented through **quadrant scatter graphs**. These are a powerful visual tool, since they facilitate the analysis of the relationship between two variables by dividing the space into four sections-or quadrants- and using two lines representing the averages or medians of the variables on the X and Y axes.

This methodology allows not only the correlation between measured components to be observed, but also the distribution and concentration of countries in each quadrant, which allows a different perspective on the performance of nations, highlighting areas of strength and opportunities for improvement.

The above is reflected in the fact that **Quadrant I** typically represents countries with superior performance in both dimensions, which can be interpreted as a robust alignment between Enabling Factors; Research and Development; Adoption; and Governance. Those grouped in other **quadrants such as II, III or IV**, as shown in **Graph 1**, show variations in the relationship between the dimensions evaluated, reflecting specific performance contexts that require differentiated strategies.

In short, these types of diagrams not only allow the determination of general patterns and trends, but also provide a tool for identifying outliers and particular cases, providing a solid basis for comparative analysis and informed decision-making in the development and adoption of AI at regional level.

Quadrant I (top right): Represents high scores in both dimensions (X high, Y high). The points in this quadrant indicate a strong positive correlation between the two variables.

Quadrant II (top left): Reflects low values in the x-axis dimension and high values in the y-axis dimension (low X, high Y). The points in this space suggest that the variable X has a lower value, while the variable Y is higher.

Quadrant III (bottom left): Shows low scores in both dimensions (low X, low Y), which indicates a negative and low correlation.

Quadrant IV (bottom right): It displays high values on the x-axis dimension and low values on the y-axis dimension (high X, low Y). The points here show that the variable X is high, while the variable Y is low.

The **cut-off lines** dividing the quadrants represent the average of each dimension (50), which means that each table reflects deviations from these central values.

The **three graphs in this chapter** provide a detailed view of the position of the 19 countries evaluated in the index. When looking at the three cross-analyses, it is evident that the **Pioneer countries are consistently concentrated in Quadrant I**, which indicates a positive and synergistic relationship between the three measured components -Enabling Factors; Research, Development and Adoption; and Governance- and suggests a remarkable and balanced performance in all dimensions evaluated.

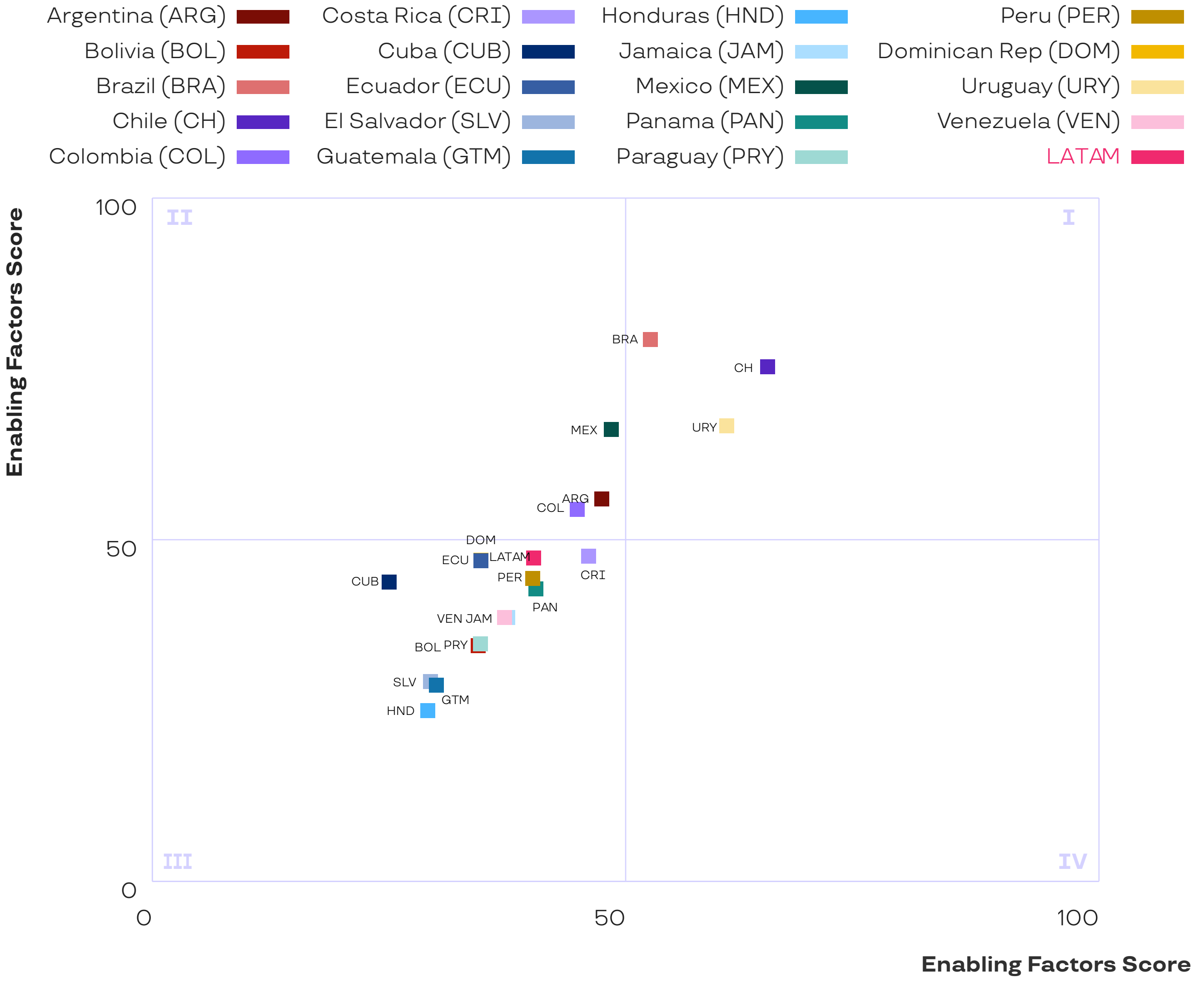
Similarly, a grouping is observed in **Quadrant III**, where countries with scores in the first tercil **(Explorers)** are mainly found, along with some of the second tercil **(Adopters)**. This distribution reflects common challenges in these nations with respect to the key factors of the index, providing a starting point for identifying areas of improvement and development opportunities in each specific context.

It should be noted that the clear differentiation between the quadrants highlights the variability in country performance and underlines the importance of the components analyzed to advance AI leadership.

All the trend lines in the three graphs correspond to a positive slope (angle up from left to right), which means that there is a direct or positive relationship between the two dimensions. The steeper the angle (i.e., closer to 45 degrees), the stronger this positive relationship.

In the quadrant scatter **Graph 1**, the relationship between the **Enabling Factors dimension (X axis)** and the **R&D+A dimension (Y axis)** is analyzed. This representation allows for the identification of performance patterns among countries according to these dimensions.

Graph 1: Enabling Factors and R&D+A



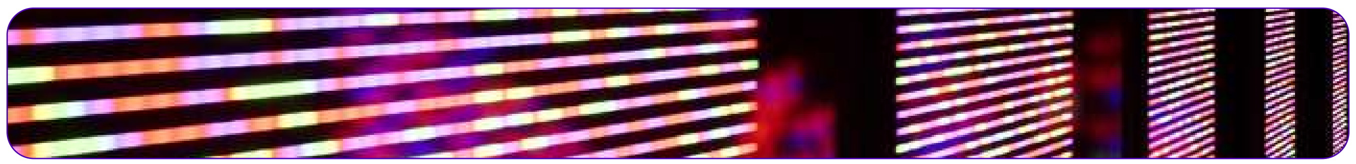
Source: 2024 ILIA

As shown in Graph 1, **Quadrant I** (high in Enabling Factors and high in R&D+A) **includes Chile, Uruguay and Brazil**, which stand out as the regional leaders. These countries show strong and balanced performance in both dimensions, suggesting that they have a supportive environment that fosters research, development and adoption of technologies. Their position indicates that they are well positioned to lead the region in terms of innovation and AI application.

Meanwhile, in **Quadrant II** (low in Enabling Factors and high in Research, Development and Adoption) are **Mexico, Argentina and Colombia**, which show good performance in R&D+A, despite having challenges in the Enabling Factors. This could indicate that while there are limitations in infrastructure or supportive policies, there is a significant push in generating knowledge around and adopting AI.

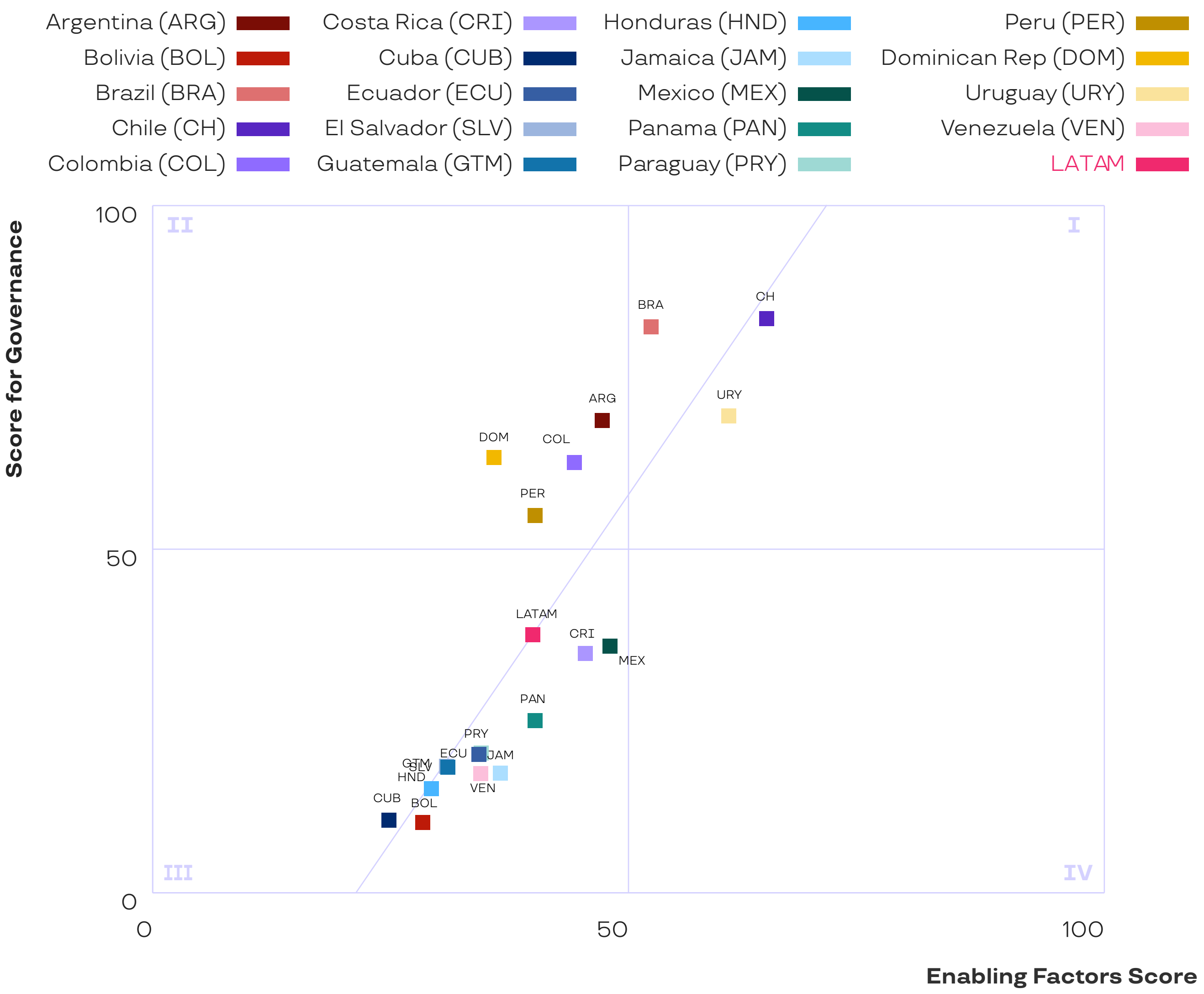
On the other hand, Q**uadrant III** (low in Enabling Factors and low in R&D+A) concentrates most of the countries, including **the Dominican Republic, Cuba, Ecuador, Peru, Costa Rica, Panama, Venezuela, Bolivia, El Salvador, Honduras and Guatemala**. Here we find, moreover, the regional average. The location in this quadrant suggests that these countries face challenges both in Enabling Factors and R&D. This may reflect structural, political or economic constraints which hinder progress in both dimensions, placing them below or near the regional average.

Finally, **Quadrant IV** (high in Enabling Factors and low in R&D) does not show any country, indicating that among those evaluated, there are no cases where favorable conditions exist in terms of the Enabling Factors dimension but with poor performance in R&D+A. This can be interpreted as an indicator that, when variables from the first dimension are present, they tend to correlate positively with the activity of the second (R&D+A).



Graph 2 analyses the relationship between the **Enabling Factors (X-axis)** and **Governance (Y-axis)** dimensions and the ranking of countries in terms of their performance in these two dimensions.

Graph 2: Enabling Factors and Governance



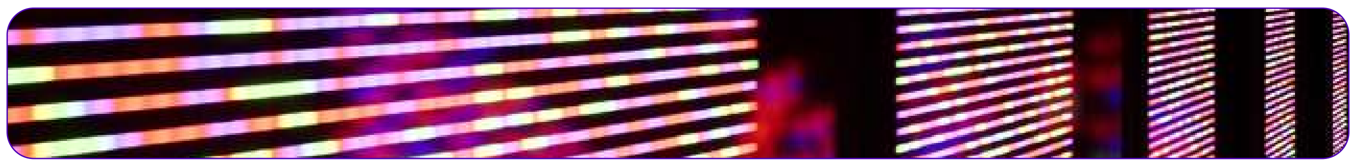
Source: 2024 ILIA

In **Quadrant I** (high in Enabling Factors and high in Governance) are the **Pioneer countries: Chile, Uruguay and Brazil again.** Its location indicates a favorable environment for both dimensions, suggesting a strong framework that supports both technological development and the regulatory and management capacity of these innovations.

In the **II Quadrant** (low in Enabling Factors and high in Governance) are **Argentina, Colombia, Dominican Republic and Peru**, nations that show good performance in the second despite facing challenges in the first. This may reflect a context where there are relatively strong regulatory frameworks and institutionality, but where infrastructure, AI skills and data availability, among others, are not as well developed. This could be limiting their full potential in the integration and development of advanced technologies.

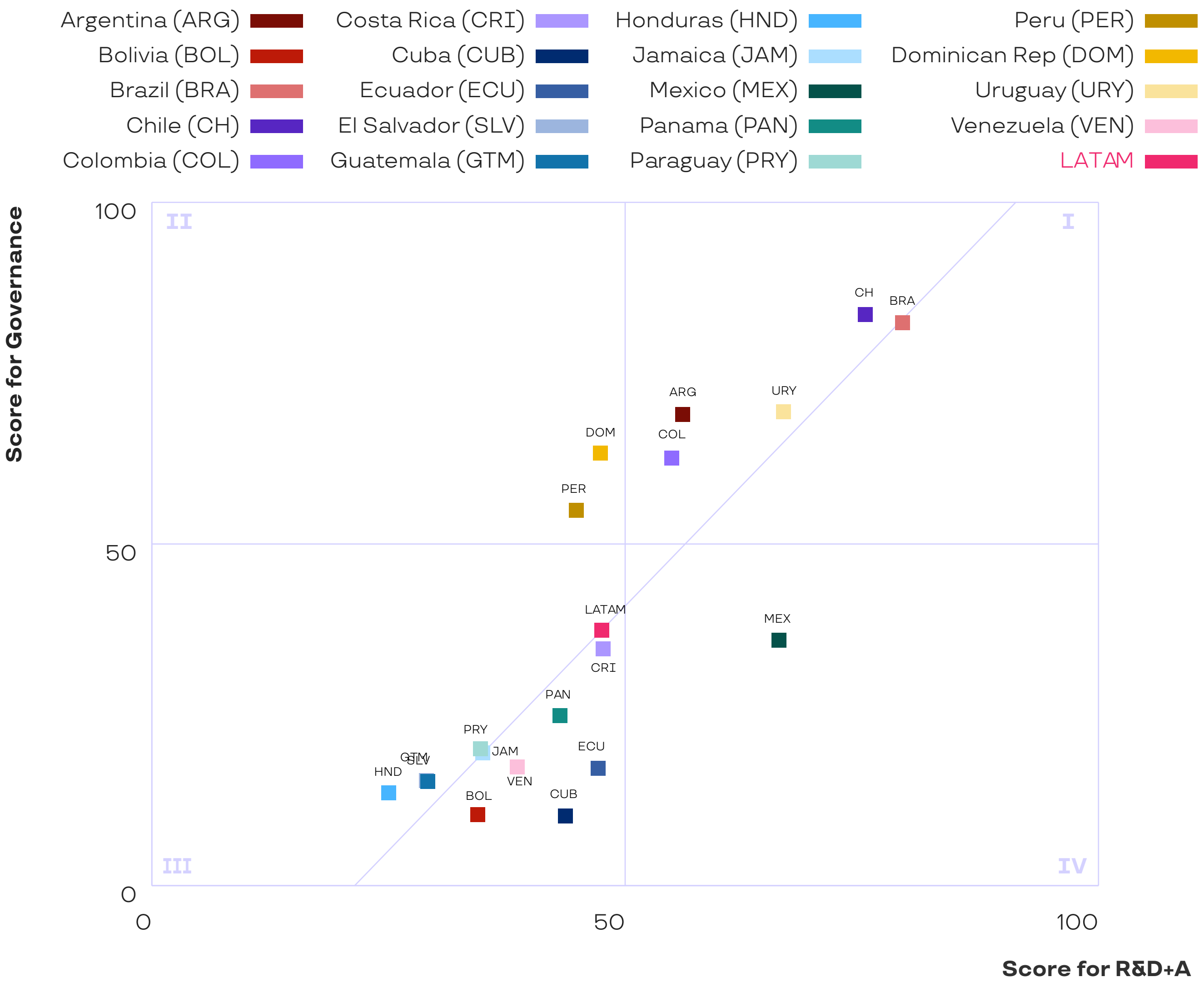
Meanwhile, **Quadrant III** (low in Enabling Factors and low in Governance) groups the rest of the countries together with the region average, indicating that both Enabling Factors and Governance are significant areas for improvement in these nations.

Finally, in **Quadrant IV** (high on Enabling Factors and low on Governance) again there is no presence of any country, which indicates that among those reviewed the phenomenon of high Enabling Factors without adequate Governance is not observed.



Considering what is shown in **Graph 3**, a relationship between the **R&D+A dimension (axis X)** and **Governance (axis Y)** can be seen.

Graph 3: R&D+A and Governance



Source: 2024 ILIA

Pioneer countries such as **Chile, Uruguay, Brazil, Argentina and Colombia** are located in **Quadrant I** (high in Research, Development and Adoption and high in Governance), which demonstrate a solid performance in both dimensions, suggesting an enabling environment for technological innovation and effective capacity to manage and regulate these initiatives. Its position reflects a robust balance that drives its regional leadership in both areas.

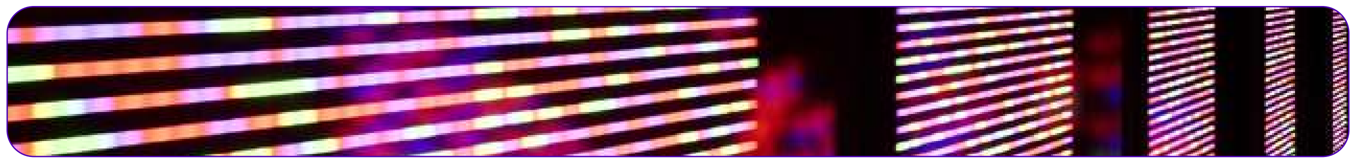
With reference to **Quadrant II** (low in R&D+A and high in Governance), it is observed that the Dominican Republic and Peru show good performance in terms of Governance but face challenges in R&D+A. This situation indicates that although there is a relatively advanced governance context, the capacity to drive research and the adoption of new technologies is limited. This translates into an opportunity to strengthen infrastructure and capacities that support technological expansion.

As seen in **Quadrant III** (low in R&D+A and low in Governance) most nations are located there, along with the region average. These are those that face significant challenges in relation to AI in both dimensions. The position in this quadrant indicates that there is a need to deploy a more comprehensive approach through effective policies and increased research and technology adoption capacities, among others, in order to improve all the variables involved in the dimensions described.

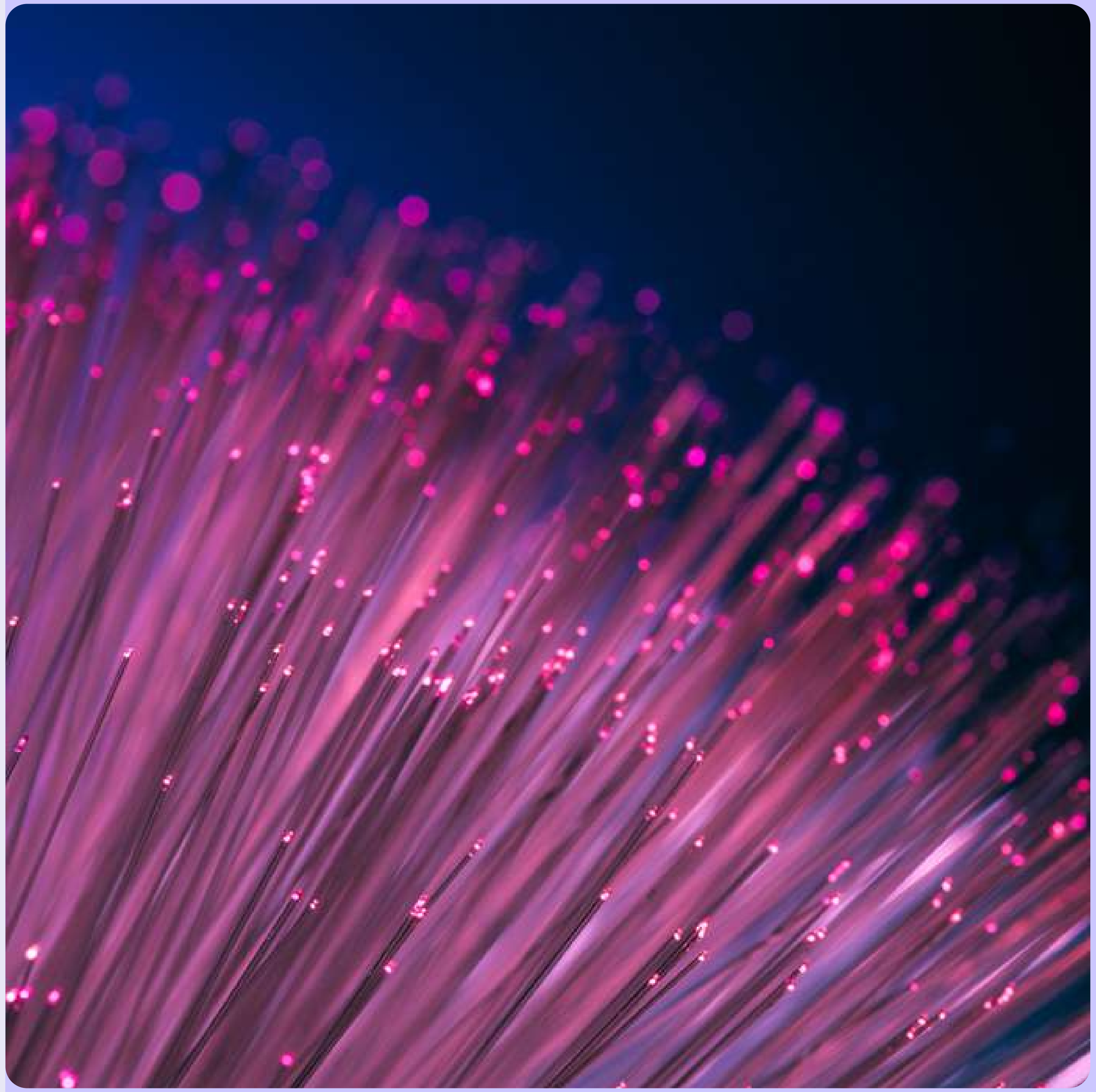
Finally, it should be mentioned that in the IV Quadrant (high in R&D+A and low in Governance), only Mexico is found, characterized by a good performance in R&D+A, but with challenges in terms of Governance.

Taking this analysis into account, it should be noted that this initial look, focused on obtaining an **overview of the countries' position in the three dimensions**, must be complemented by a detailed analysis of each sub-dimension, indicators and subindicators.

While these graphs provide a broad view on the basis of final scores, it is essential to delve into subindicators as they certainly reveal valuable details and enrich the analysis of each dimension. A more granular approach allows capturing countries' relative positions in specific areas and comparisons, in some cases with global figures, which is crucial to balance final results. This provides a more complete and accurate understanding of the challenges and opportunities facing each country in delivering a more nuanced and strategic interpretation of data.



ILIA 2024 MAIN FINDINGS



Ten are the most important findings of this report. In this edition of the index, these findings are an echo of the widening of the geographical scope of the instrument and of the new variables investigated in each dimension.

1. Talent is Scarce

The concentration of AI talent in the workforce of Latin America and the Caribbean has increased by 100% on average over the past eight years, in contrast to the fact that no country has reached the levels evidenced in countries of the Global North in the same time period, indicating that the gap between this benchmark and the region has been maintained.

2. Literacy within Reach

While the AI skill gap in engineering can be up to five times greater than in industrialized countries, literacy in the subject is not only smaller but in some countries the region shows a higher relative penetration. In this sense, promoting policies for the acquisition of AI skills and encouraging the use of smart technological tools represent an opportunity to ensure job options for the region's workforce.

3. The Challenge is not only to Train, but also to Retain

From 2019 onwards, a permanent trend of net talent flight has been detected in Latin America and the Caribbean. With the exception of Costa Rica and Uruguay, in specific years, all countries have lost more specialists than they have attracted. Consequently, along with the challenges associated with AI capacity building, the region faces the growing challenge of retaining its specialists, as in terms of migration the countries studied do not profile as talent attractors.

4. More than a Threat, an Opportunity

The incorporation of generative AI tools could accelerate the tasks performed by the 5.69 million workers in the 100 most important occupations in Chile. Depending on how the new available time is distributed, this increase in efficiency has the potential to raise Chile's GDP by 1.2 points.

5. The Importance of the Economic Matrix

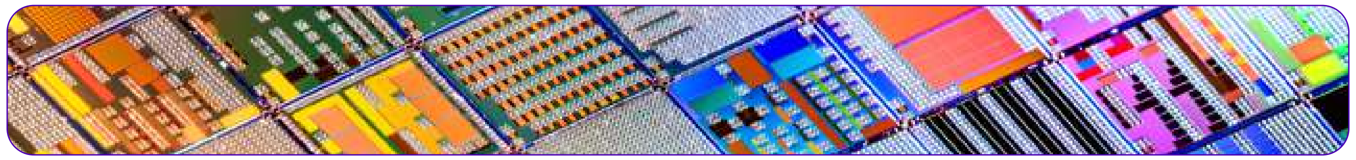
The economic characterization of each country, as well as the underlying public policies, have a direct impact on the capacity for AI adoption. While more liberal countries—such as Chile, Uruguay, and Costa Rica—exhibit better levels of entrepreneurial environment, private investment, and the emergence of startups, more industrialized and globally competitive countries —among which Mexico and Brazil are included— show better rates of patenting, high-tech workers, unicorn companies, and advanced technology manufacturing. These structural differences affect the mechanisms through which AI is integrated into the economy, its speed of adoption, and its characteristics.

6. Gender Needs Inspiration
The participation of women in AI shows robust figures in some countries, but the variability in scores across much of the region reflects that efforts to close the gender gap are insufficient and even insignificant. Understanding the best practices implemented in places that have reduced this imbalance is key to promoting gender equity and seizing the significant opportunity this presents for the development of those conditions in the region.

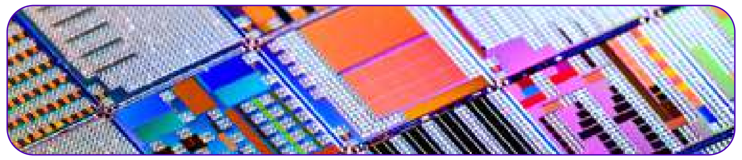
7. Multidisciplinarity is Thriving
The growing number of multidisciplinary publications associated with AI has reached an estimated level of 80% in the region. This phenomenon reflects an increasing penetration of technology-based tools to catalyze scientific and academic development in the region. Nearly 70% of the cited publications are concentrated in 10 specific disciplines, with clinical medicine being the most relevant.

8. Creativity and Legislative Interest in AI
Currently, there are 38 legislative initiatives concerning AI under discussion or already approved. The contents are diverse and range from concrete elements and specific applications of technology to broader regulatory frameworks. Thus, some projects aim to amend the Penal Code to explicitly penalize the misuse of generative AI, such as telephone scams (Chile) or violations of a person's sexual privacy (Mexico).

9. A Lot of Will, but No Sense of Urgency
Despite advances in various areas relevant to AI development, there are no organic initiatives that capture the urgent need to join the rapid progress of AI. For example, although several countries have declared national AI policies, these have not been backed by a strong commitment of resources, in line with the relevance and urgency needed to close gaps and address the significant challenge.

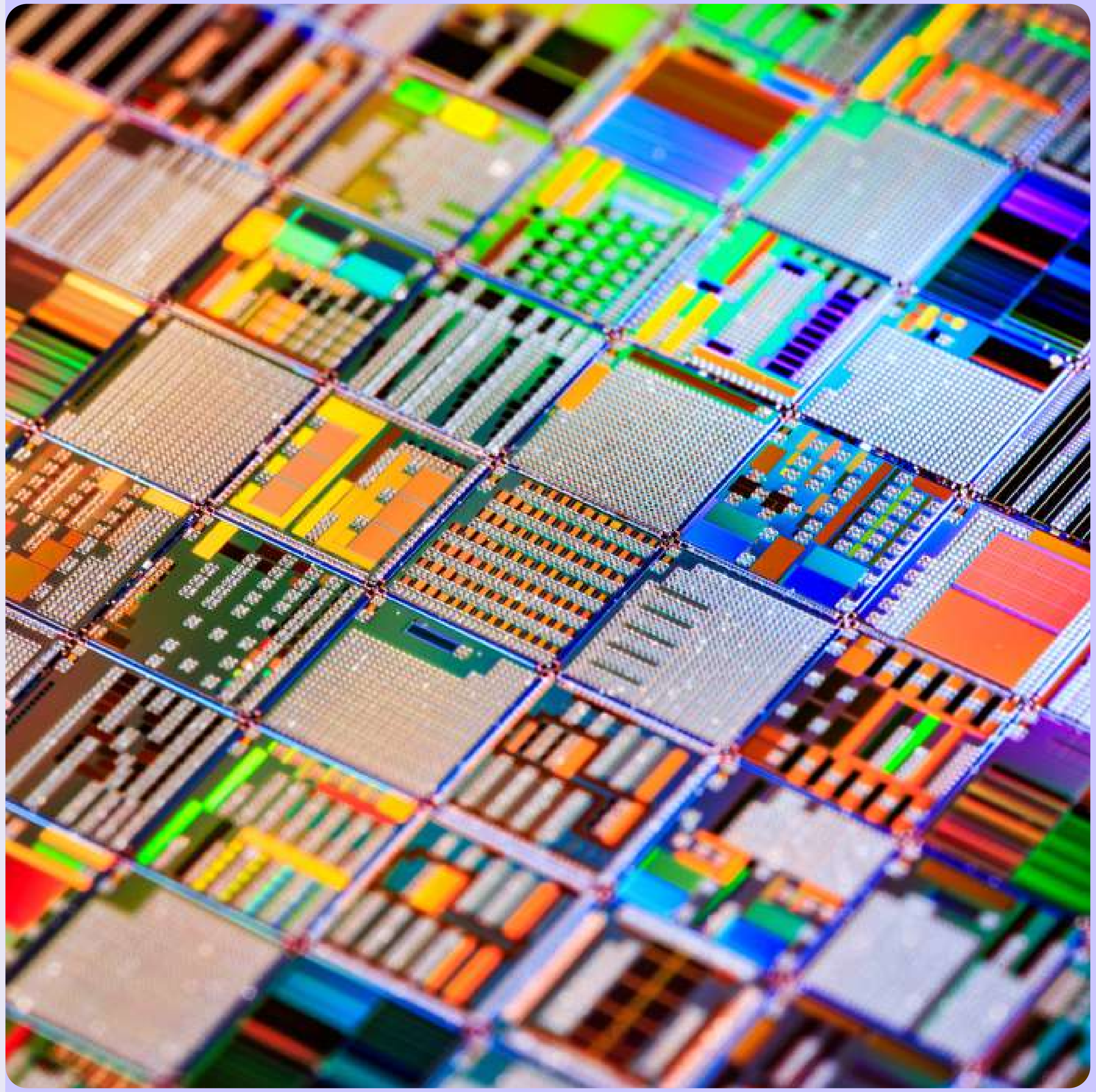


10. Neither Ponies nor Unicorns
The creation of startups within the private AI ecosystem is incipient and shows a notable concentration in a few countries, which is consistent with the volume of private investment in AI. Thus, the scarcity of unicorn companies in the region is not surprising, highlighting the need to strengthen support and funding mechanisms for scaling startups to ensure they consolidate as high-impact companies..



CHAPTER_C

ENABLING FACTORS



C.1 Main Findings

Talent Shortage
The concentration of AI talent in the workforce of Latin America and the Caribbean has increased by an average of 100% over the past eight years. However, no country has reached the levels seen in Global North countries during the same period, indicating that the gap between this benchmark and the region has persisted.

Literacy Within Reach
While the AI skills gap in engineering can be as much as five times larger compared to the Global North, in terms of literacy, it is not only smaller, but some countries in the region show a relatively higher penetration. In this sense, promoting literacy policies and encouraging the use of AI tools represent an opportunity to ensure job options for the region's workforce.

Lag in the Adoption of Technical Skills
In Latin America, the growth of specific AI skills is related to basic AI techniques, such as pattern recognition and decision trees, while globally, the leading skills are those associated with model training and Natural Language Processing (NLP). Structural shortages in software and computing in the Global South appear to have a direct impact on the region's ability to acquire specific skills in the discipline.

AI Engineering in Maturity Process
The relative penetration of AI skills in engineering occupations shows a lower level of maturity compared to the Global North. Only Brazil is above the global average, ranking 13th. The rest of the Latin American countries are ranked below 27th place.

Low Job Sophistication
The AI unique occupations indicator reveals the level of sophistication in the AI job market. While the U.S. and India show nearly 100 unique occupations, the average in Latin America and the Caribbean is 10, except for Brazil, which has 20. This indicates that AI engineering roles in the region are more generalist than those in advanced economies, with lower levels of specialization.

The Challenge is Not Only to Train but Also to Retain
Since 2019, there has been a persistent trend of net talent drain in Latin America and the Caribbean. With the exception of Costa Rica and Uruguay in specific years, all countries have lost more talent than they have attracted. Consequently, along with the challenges

associated with training AI talent, the region faces the growing challenge of retaining it, as the countries studied do not position themselves as talent attractors in migratory terms.

A Counterintuitive Gap

The patterns in the gender gap observed in AI engineering are replicated in the development of AI literacy skills and are even more pronounced. While women's participation in engineering is 27%, in literacy it is 22%. The outlook is concerning, considering these are skills that have emerged in the last two years and reveal an upward trend in the gap.

Starting with the Basics

The rapid pace of technological advancement and the opportunities it offers in terms of economic development and social impact may persuade decision-makers to seek novel mechanisms to reduce the advanced human talent gap. However, data shows that the most urgent challenge remains in the development of basic skills, such as critical thinking, computational thinking, and STEM vocations. Improving the quality of public education systems is a sine qua non condition to achieve fair and equitable access to technology.

Access Without Quality

The percentage of the population with access to a mobile network is high at the regional level, with an average of 92.96 points. However, this figure conceals significant disparities among countries, specifically regarding download speed and active broadband subscriptions. This is more evident in rural areas, where digital inclusion and access to real-time data are critical for development and innovation. Investment in enabling connectivity infrastructure must remain a priority.

If You Don't Compute, You Don't Compete

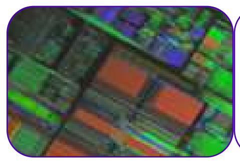
High-performance computing infrastructure capabilities are limited in Latin America, with a regional average score of only 12.32 points. Few nations stand out, and none possess sovereign capacity for the development of AI models. Most countries also show significant limitations in cloud usage, which negatively impacts their potential for technological development and AI applications.

Concrete Opportunities Ahead

Much of the region lacks the infrastructure necessary to ensure reliability, security, and efficiency in managing critical data. Only a few countries, such as Costa Rica, Panama, and Uruguay, show significant progress in this area, highlighting a gap in the region's capacity to support robust and secure digital operations. The availability of clean energy in the region, along with advancements in connectivity with the rest of the world, presents an opportunity for digital industrial development based on data centers that is not being fully utilized.

Affordable but Limited Access

Access to smartphones in Latin America is limited, indicating that in many countries these devices remain relatively expensive. This suggests that access to mobile technology, crucial for digital inclusion and leveraging AI, remains a challenge across much of the region, thereby limiting the potential for technological development and equitable access to digital tools.



Still Lagging in 3G

The implementation of 5G technology in Latin America is still in its early stages. Although some countries have made progress in deploying 5G antennas, most of the region remains behind in this critical area for technological development and advanced connectivity. This low level of 5G infrastructure could limit access to emerging technologies and the development of advanced artificial intelligence applications across much of the region.

C.2 Dimension Description

The Enabling Factors Dimension measures the progress of those conditions and technological elements that serve as the foundation for AI ecosystems to develop effectively. The variables on which this development depends are grouped into three subdimensions: Infrastructure, Data, and Human Talent.

The Infrastructure Subdimension evaluates the technological conditions that enable AI advancement from the ground up, such as connectivity, computing capacity, and access to devices like computers and smartphones.

The Data Subdimension, in turn, refers to the availability, capacity, and governance of data, an essential resource for the development of language models, among others. As in the 2023 version of the index, this dimension was constructed based on the indicators and subindicators included in the Global Data Barometer 2021 report.

The Human Talent Subdimension addresses variables that influence the development of AI skills within the population and workforce, which are crucial for AI advancement in each country.

To understand how crucial the existence of "enabling factors" for AI is, it's important to reflect on what happens when these do not evolve. Without infrastructures that store information robustly and at scale, or without machines capable of processing large amounts of data, the possibilities of training accurate and robust machine learning models are diminished. And without competent professionals or technicians to develop or leverage this technology, a country's options for innovating and growing economically are further reduced.

It is worth mentioning that the dimension of Enabling Factors has a weighting of 40% in the overall calculation of the index, defined by its relevance to the progress of AI.

As mentioned earlier, in this 2024 edition, more indicators and subindicators have been added. The latter represent the most granular level of each dimension and are responsible for providing robust and comprehensive information. The following table details the subindicators that remained from last year (in white) and those that were included in this edition (in color).

1. Although the same raw data is used, it is important to note that there are variations in the scores because this year's calculations include a greater number of countries and variations in the data normalization process

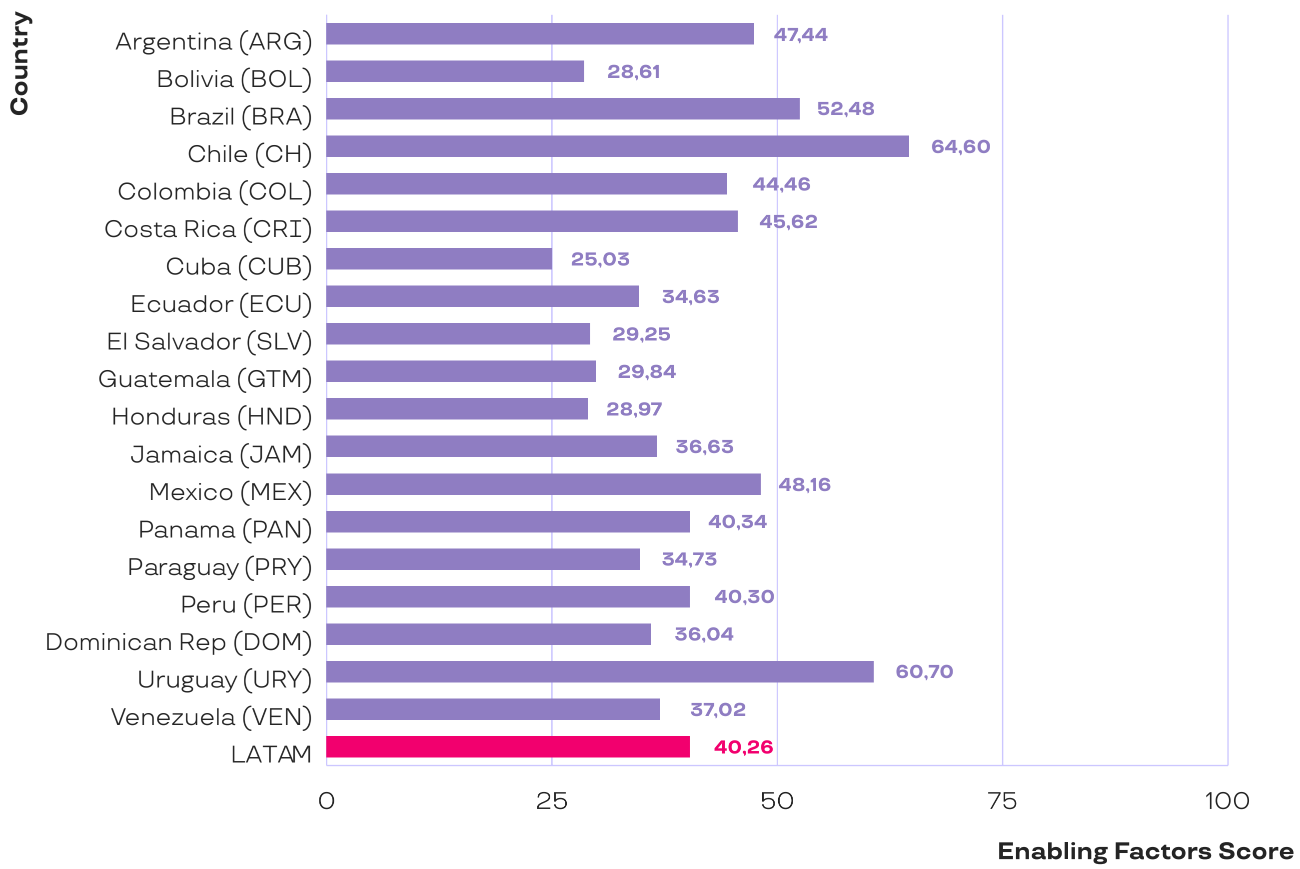
Table 1: Composition of the Enabling Factors Dimension
** New 2024 subindicators in color*

Subdimension	Indicator	Subindicator
Infrastructure	Connectivity	% of Population that Uses Internet
		Average Mobile Download Speed (Mbps)
		5G Implementation
		Mobile Network Coverage
		Households with Internet Access
		Active Mobile Broadband Subscriptions
		Fixed Broadband Subscriptions
		Average Fixed Broadband Download Speed
		Average Latency
		Basic Fixed Broadband Basket
	Computing	Cloud
		HPC Infrastructure Capacity
		Certified Data Centers
		IXP (Internet Exchange Points)
		Secure Internet Servers
	Devices	Households that Have a Computer
		Smartphone Affordability
		IPv6 Adoption
Data	Data Barometer	Availability
		Capacities
		Governance
		Usage and Impact
Human Talent	AI Literacy	Early Science Education
		Early AI Education
		English Proficiency
	Professional Training in IA	Penetration of AI Skills
		STEM Graduates
	Advanced Human Talent	Master's Programs in AI at QS-ranked Universities
		Doctoral Programs in AI at QS-ranked Universities
		Master's Programs in AI at Accredited Universities
		Doctoral Programs in AI at Accredited Universities

Source: 2024 ILIA

Graph 1 presents the results at the regional level in this dimension, highlighting **Chile and Uruguay with the highest scores** of 64.60 and 60.70 points, respectively. They are followed by Argentina, Brazil, Costa Rica, and Mexico, which exceed the regional average of 40.26 points. In contrast, the other 13 countries are situated around or below this average.

Graph 1: Scores for the Enabling Factors Dimension



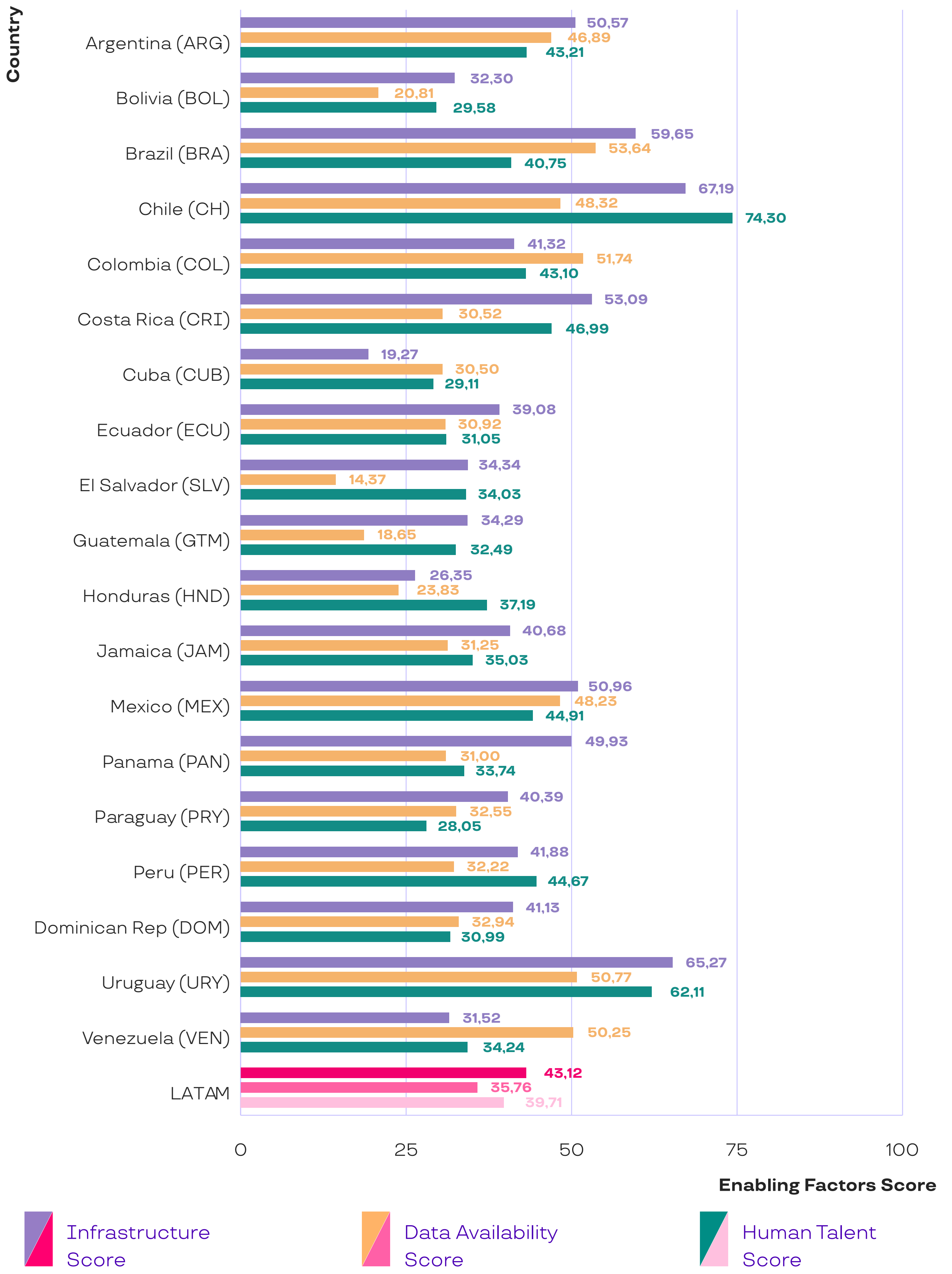
Source: ILIA 2024

The details of each subdimension are presented in **Graph 2**, which shows the total scores for this year in **Infrastructure (43.12), Data (35.76), and Human Talent (39.71)**. A deeper analysis of each of these areas provides information on the current state of the fundamental capabilities for the development of AI in Latin America and the Caribbean.

It is worth mentioning that the leading countries in this dimension —Chile and Uruguay— stand out with good results in Infrastructure and Human Talent. In contrast, countries like Bolivia, Cuba, and Venezuela face significant challenges in projecting their AI ecosystems, given their low scores in most of the sub-dimensions.

When looking only at the Infrastructure subdimension, the **leadership of Uruguay (65.27), Chile (67.19), and Brazil (59.65)** becomes evident. Meanwhile, when focusing on Data, Brazil (53.64) and Uruguay (50.77) excel. Finally, the top three countries in Human Talent are Chile (74.30), Uruguay (62.11), and Costa Rica (46.99)

Graph 2: Score for the subdimensions of Infrastructure, Data, and Human Talent



Source: 2024 ILIA

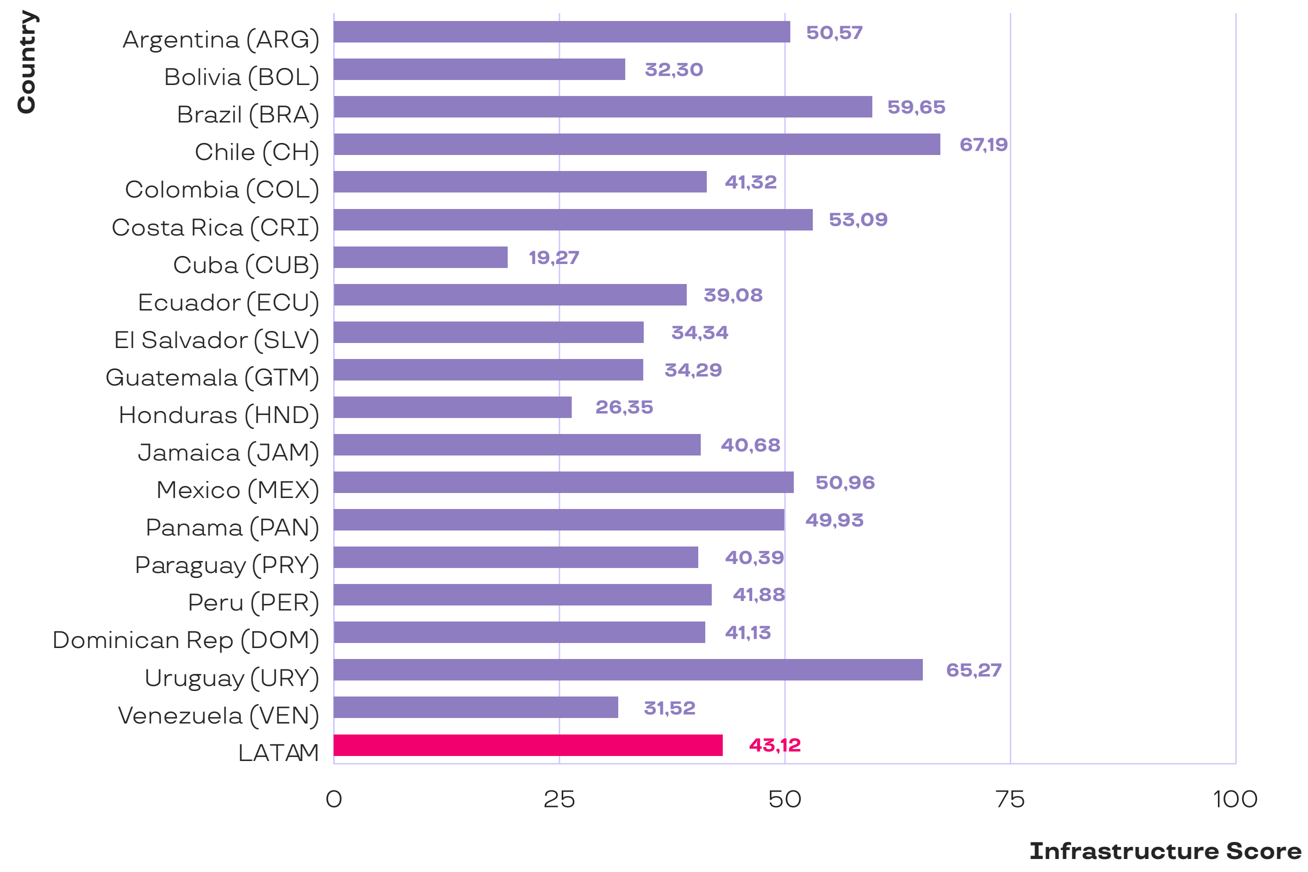
C.3 Infrastructure Subdimension

As its name indicates, this subdimension encompasses the technological support available in a country to create the conditions for AI development. A nation that has a large number of high-capacity data storage servers, access to and a cloud culture, high-performance computers, high-speed networks, application development platforms, and devices that enable good connectivity is a nation that possesses significant technological development conditions and shows growth potential in terms of AI.

This subdimension **represents 45% of the total weighting of the Enabling Factors dimension,** considering both the number of indicators and their relevance in public policy.

The sub-dimension is organized around three indicators: **Connectivity, Computing, and Devices**, all composed of variables that form the backbone of any digitalization ecosystem and, therefore, constitute a potential engine for diversifying a country's productive matrix

Graph 3: Scores for Infrastructure Subdimension



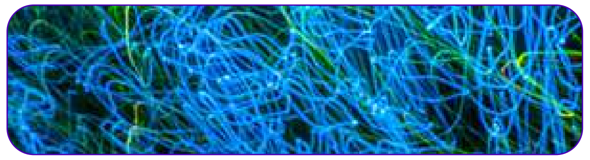
Source: ILIA 2024

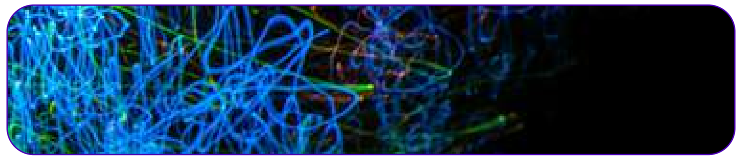
Considering the results presented in Figure 3, countries can be divided into three groups according to their different levels of infrastructure ecosystem maturity.

Countries with High Infrastructure Capacity (over 50 points): These are the countries with the best infrastructure capabilities, which provide a solid foundation for technology development and adoption. It's the case of Chile (67.19), Uruguay (65.27), Brazil (59.65), Costa Rica (53.09), Mexico (50.96), and Argentina (50.57).

Countries with Intermediate Infrastructure Capacity (between 40 and 50 points): This group includes those countries with moderate infrastructure that, while they have strengths, still face challenges in reaching the level of regional leaders. Panama (49.93), Peru (41.88), Colombia (41.32), the Dominican Republic (41.13), Jamaica (40.68), and Paraguay (40.39) are in this section.

Countries with Limited Infrastructure Capacity (less than 40 points): These are countries with limited infrastructure that need to strengthen their capabilities in this area. Among them are Ecuador (39.08), El Salvador (34.34), Guatemala (34.29), Bolivia (32.30), Venezuela (31.52), Honduras (26.35), and Cuba (19.27).





C.3.1 Connectivity

This indicator considers the **conditions of Internet access** in each country and the characteristics of the network, measuring aspects such as quality in terms of coverage, latency, speed, and penetration, both fixed and mobile.

Los subdinicadores de este indicador son:

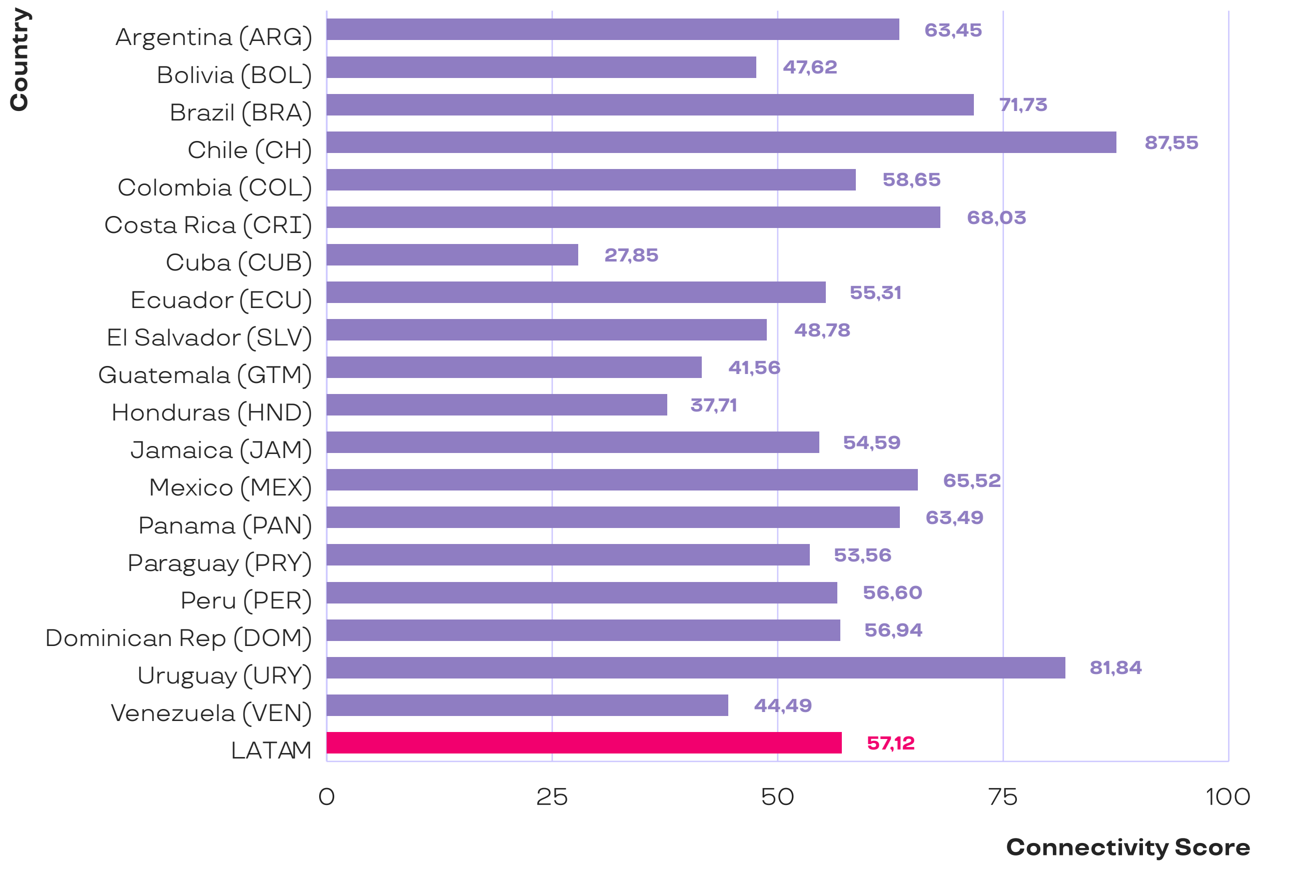
a) Percentage of the Population Using the Internet
b) Average Mobile Download Speed
c) 5G Implementation
d) Mobile Network Coverage
e) Households with Internet Access
f) Active Mobile Broadband Subscriptions
g) Fixed Broadband Subscriptions
h) Average Fixed Broadband Download Speed
i) Average Latency
j) Basic Fixed Broadband Basket

The importance of the Connectivity indicator is such that for this edition of the index, it was assigned **a significant weight in relation to the total of the Infrastructure subdimension, reaching 50%.** This is because connectivity represents a fundamental pillar to ensure the availability and access to the technologies necessary for the development of robust and efficient AI ecosystems.

By analyzing the connectivity scores in **Graph 4**, distinct levels of development of each country regarding this indicator can be identified. It shows clear differences in quality and reach.

Thus, leading in this indicator are Chile (87.55), Uruguay (81.84), and further down Brazil (71.73). The regional average is 57.12 points.

Graph 4: Score for Connectivity indicator



Source: ILIA 2024

The results of the 10 subindicators that make up the Connectivity indicator are presented below, grouped into three points for easier reading and interpretation.

a) Average Mobile Download Speed; Mobile Network Coverage; and Active Mobile Broadband Subscriptions.

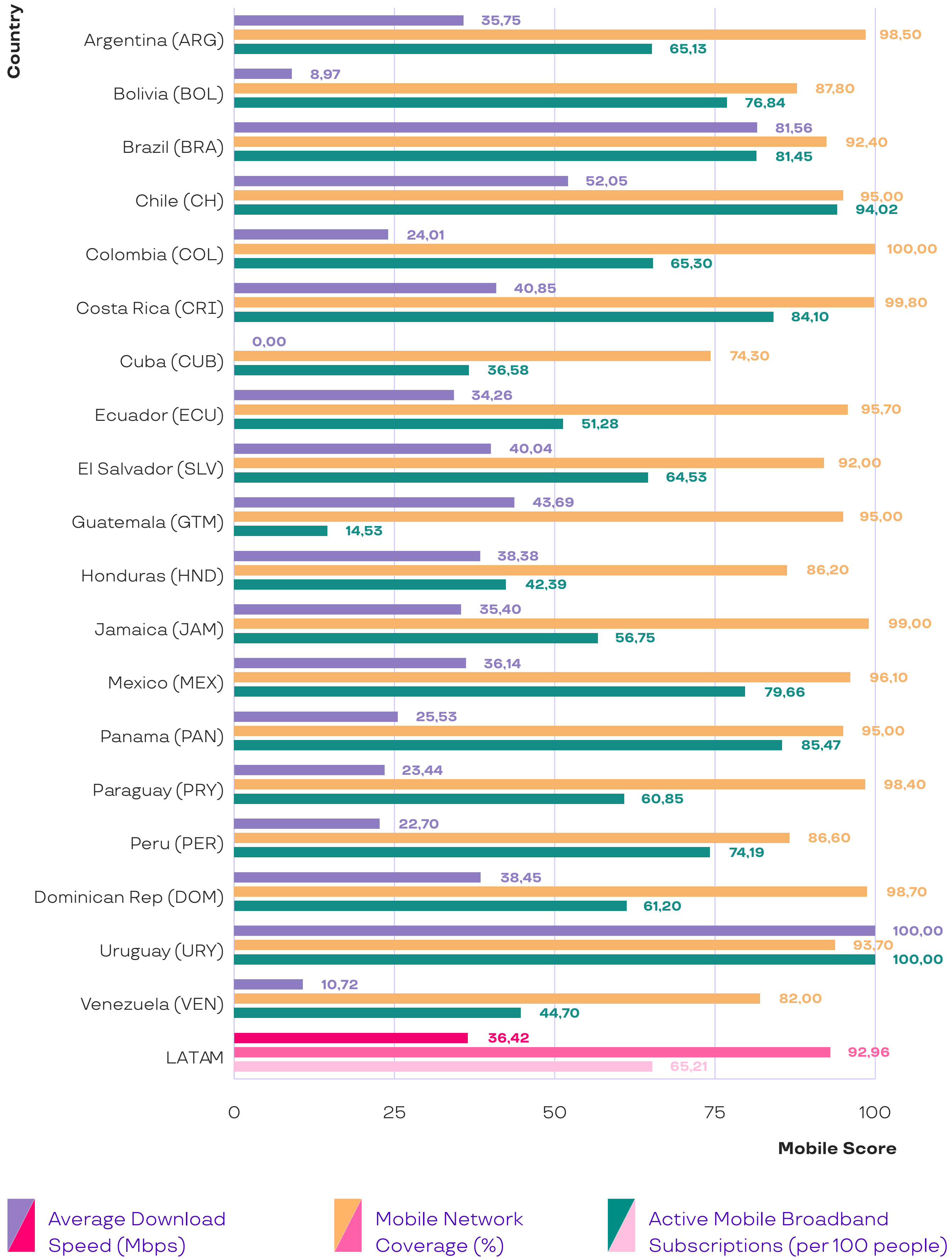
These three subindicators show, from different perspectives, the quality of the mobile connection. In the case of the **average mobile download speed** —expressed in Mbps and indicating the average amount of data a device can download in one second—, the regional average score is 36.42 points. The countries that exceed this average are: **Uruguay**, with 68.10 Mbps and the **maximum score; Brazil**, with 56.28 Mbps and **81.56 points**; and **Chile,** with 37.37 Mbps and **52.05 points**.

In contrast, the countries below the regional average in Mobile download speed are mainly concentrated in the Caribbean and Central America, with scores ranging from 8.97 (9.76 Mbps) in the case of Bolivia to 36.14 (27.17 Mbps) in the case of Mexico.

Regarding the **Mobile Network Coverage** subindicator, which refers to the percentage of a country's population that is within the reach of at least one mobile signal with 3G technology, it is observed that **the region has high scores**, with an average of 92.96 points. This suggests that most of the population has access to the Internet, regardless of whether it is through a subscription method or not.

Finally, the **Active Mobile Broadband Subscriptions** subindicator, which reflects the number of subscriptions per 100 inhabitants to a mobile Internet service —whether through phones, computers, and devices like USB/dongles— shows **quite varied scores**, with a regional average of **65.21** points. However, there are areas for improvement in countries like Guatemala, with 14.53 points (17 active subscriptions per 100 people) and Cuba, with 36.58 points (42.80 subscriptions per 100 people).

Figure 5: Score for Mobile-Related Subindicators



Source: 2024 ILIA / Data: Speedtest, ITU Datahub

b) Fixed broadband subscriptions; Average fixed broadband download speed; and Basic fixed broadband basket.

These three subindicators reflect the **quality of fixed broadband coverage.** Compared to the mobile connection subindicators, it is interesting to note that there is a significant gap between fixed and mobile connectivity. Mobile connectivity serves as a good proxy for user or consumer-level access to technology, while fixed connections enable access from a developer or promoter level. Programming an algorithm or a neural network is generally not feasible with a mobile device. These gaps are consistent with others that will be evidenced later.

First, the subindicator of **Fixed Broadband Subscriptions** is presented, indicating the number of subscriptions per 100 inhabitants to an Internet connection service through a physical cable —such as fiber optic, coaxial cable, or DSL— that offers a high data transmission speed, that is, equal to or greater than 256 kbit/s. The scores in this category for the 19 countries are quite heterogeneous, reflected in the regional average of 39.19 points. **Uruguay leads in this subindicator** with the maximum score, and countries like **Argentina, Chile, and Costa Rica stand out with more than 60 points**, representing over 21 active fixed broadband subscriptions per 100 people.

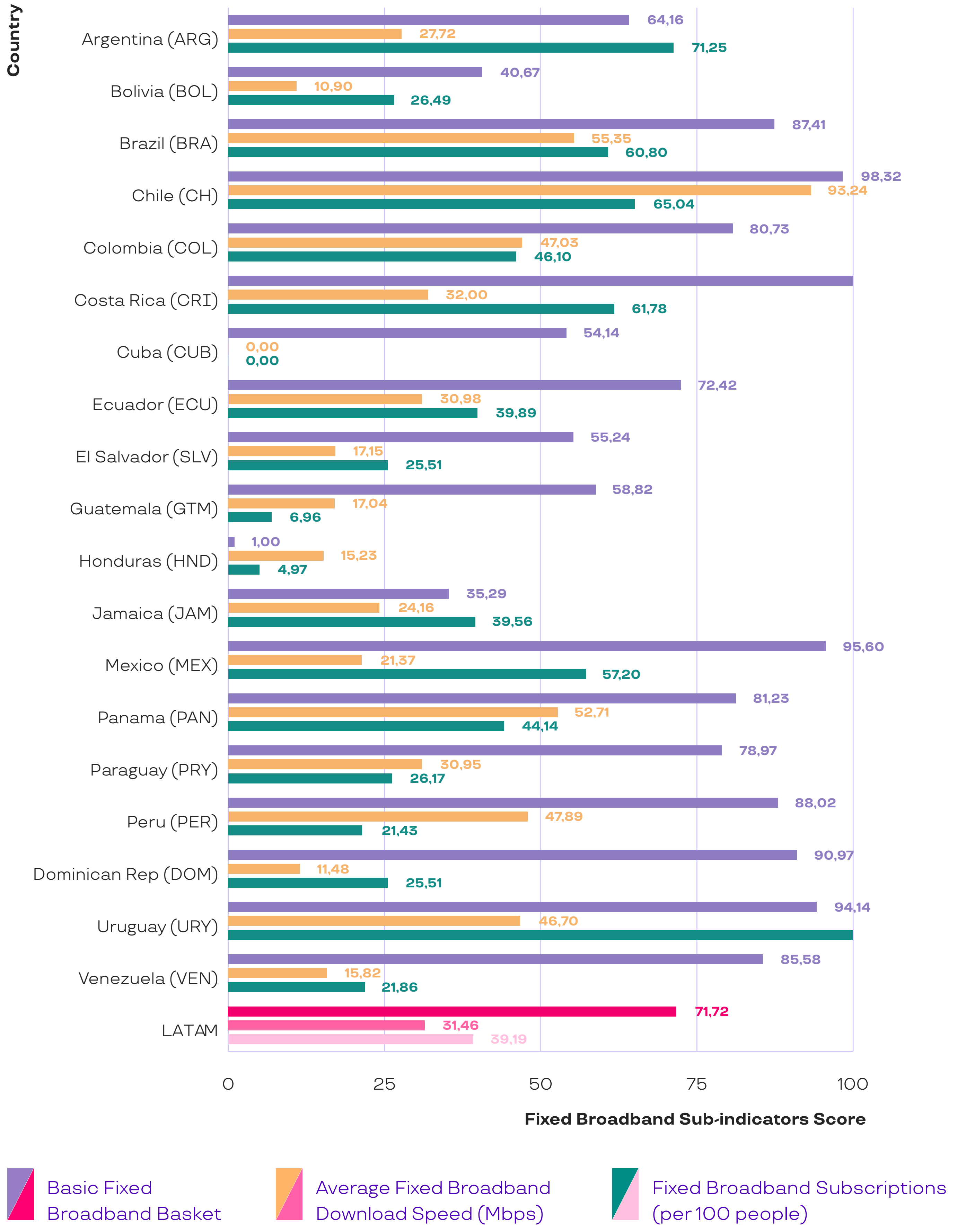
Second, the subindicator of **Average Fixed Broadband Download Speed** (Mbps) was evaluated, reflecting the investment in infrastructure made in each country and, in that sense, the quality of public policies to promote connectivity. The speed of fixed broadband is closely dependent on the amount of fiber optic or copper cables that enable it. In most countries, scores below 50 points are observed. The only ones exceeding this line are **Chile (93.24)** with a download speed of 265.12 Mbps; **Brazil (55.35)** with 158.27 Mbps; and **Panama (52.71)** with 151.14 Mbps.

Finally, the **Fixed Broadband Basic Basket** subindicator shows the population's access to the most economical plan (5 GB monthly at a high speed of 256 kbits/s), offered by the operator with the largest market share in the country. The score is based on the percentage of Gross National Income per capita for each country, representing the price of that respective basic Internet plan (it is necessary to calculate it this way due to the differences in income levels between countries).

At the regional level, the score for this subindicator reaches 71.72 points, with **Costa Rica leading**, where the basic plan represents only 1.64% of the Monthly National Income per capita, indicating its accessibility relative to the country's economy. Following this is **Chile, with 98.32 points**, equivalent to 1.83% of the Monthly National Income per capita.

The results obtained from this last subindicator show the opportunities that a consumer has to access the digital world and, also, to AI tools at the user level. The higher the score, the greater the possibilities a citizen has to enjoy the advantages of technology. Conversely, a country with a low score restricts its potential users.

Graph 6: Scores for Fixed Broadband Subindicators



Source: 2024 ILIA / Data: ITU DataHub, Speedtest, and ITU DataHub

Although some countries in Latin America have managed to maintain relatively affordable costs for fixed broadband in relation to their economies, the region faces significant challenges regarding the quality and adoption of this technology. The low average download speed in most countries not only limits the capacity to implement advanced AI applications —which depend on fast and stable Internet access— but also hinders progress in digital transformation, impacting the socioeconomic development of nations with the largest gaps.

c) Percentage of the Population Using Internet; and Households with Internet Access

These subindicators reflect Internet access among the population of each country. The **Percentage of the Population Using Internet** measures the proportion of individuals who used the Internet —whether fixed or mobile—from any location in the past three months, aiming to assess the frequency and reach of Internet use in each country.

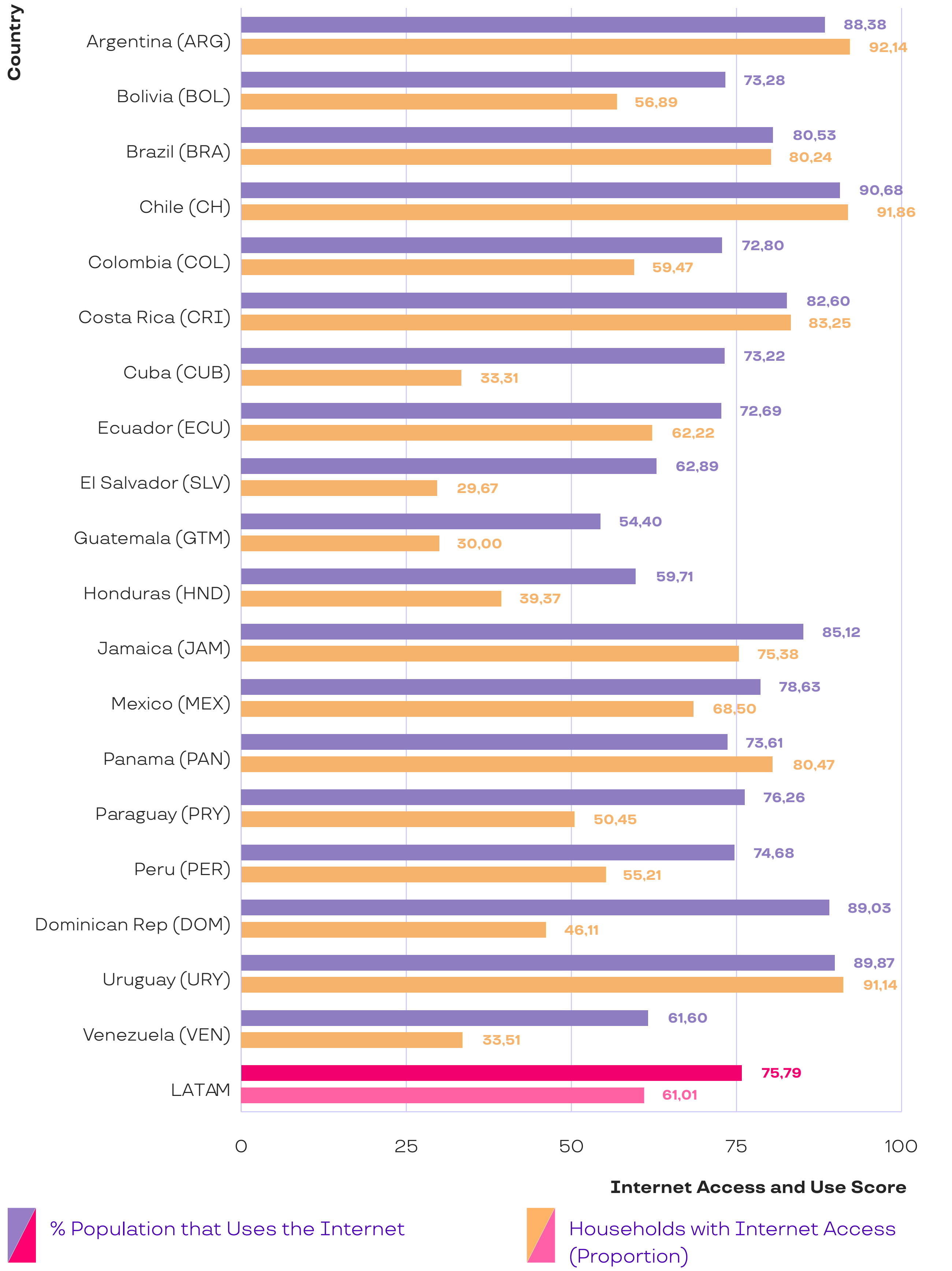
As shown in Figure 7, the regional average is 75.79 points, reflecting a good level of connectivity in the region. **Chile stands out with 90.68 points**, indicating that 90.68% of its population has been connected in the past three months. Meanwhile, **Uruguay, with 89.87 points**, reveals that 89.87% of its total population has had recent access to the Internet.

The second subindicator, **Households with Internet Access**, measures the proportion of homes with Internet connection, whether via fixed or mobile network. A household is considered to have access if at least one member has Internet and shares it with others. The regional average score for this subindicator is 61.01 points, and it is noteworthy that the countries with the least access to the network are concentrated in Central America, particularly **Guatemala and Cuba, where only 30% and 33.31% of households**, respectively, have Internet access.

In the region, there is a notable difference between the percentage of the population that uses the Internet and the access to the Internet that exists in households. Although a significant proportion of the population in several of the **19 countries actively uses the Internet** —with an average score of 75.79 points— household access is significantly lower, with an average of 61.01 points.

This element correlates with the levels of rurality in each nation, making it clear that efforts to increase last-mile coverage for home connections are relevant. It is important to note that access from home is a good proxy for connectivity for productive purposes, so increasing capabilities in this indicator reflects that countries are moving towards a quality of network coverage that not only enables access to AI as consumers but also as **developers or more sophisticated users.**

Graph 7: Score for Population that Uses Internet and Households with Internet Access Subindicators



Source: 2024 ILIA / Data: ITU DataHub

d) 5G Implementation

The ninth subindicator of Connectivity refers to the advancement of the fifth generation of mobile network technology, 5G. This frequency **improves data download speeds, supports a higher density of connected devices**, and enables the **functioning of advanced applications** such as augmented reality, virtual reality, and the Internet of Things (IoT).

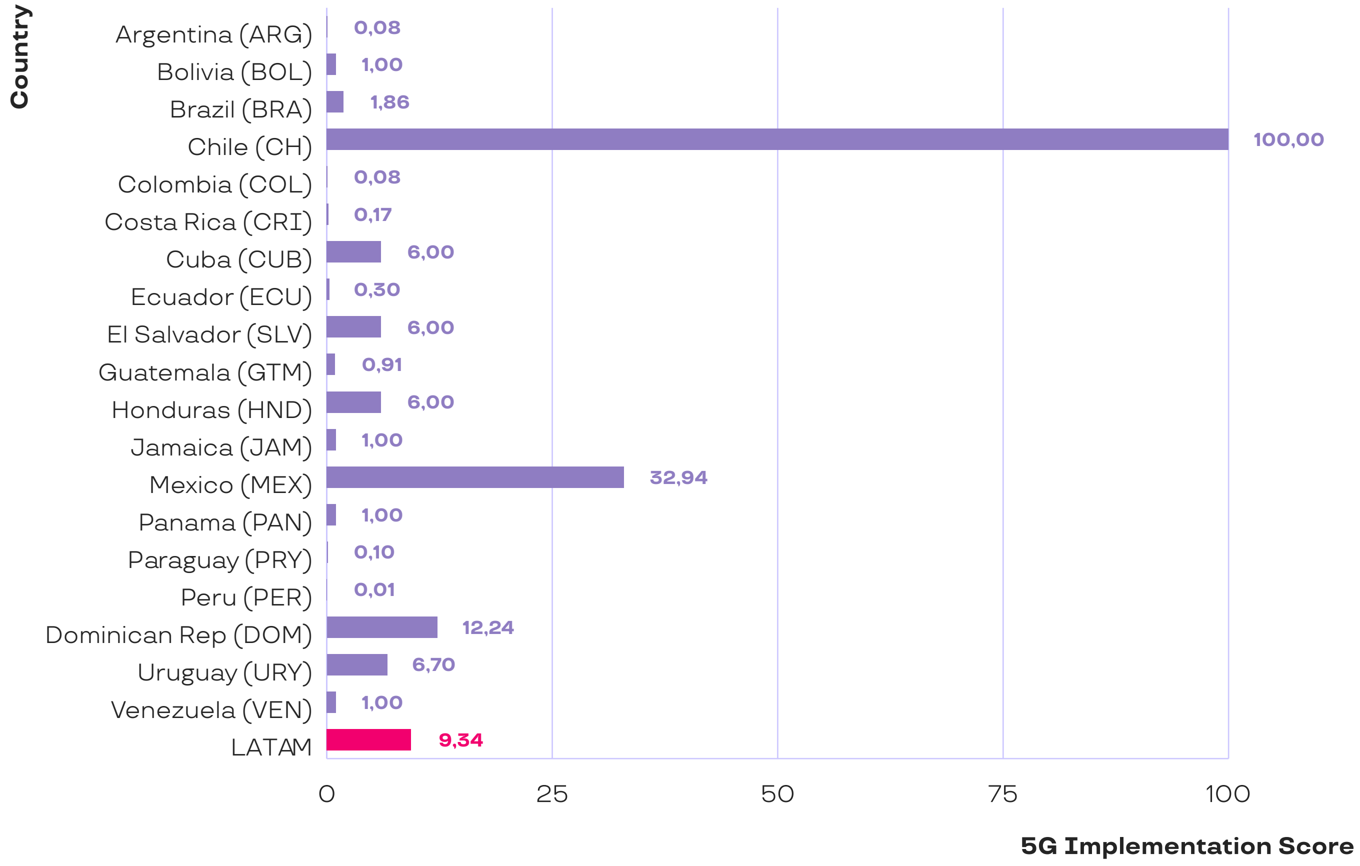
The concept of Implementation of 5G encompasses the number of launches of this technology in each country (availability of antennas —new or updated— for licensed spectrum) and pre-launches (infrastructure installed but not accessible to end consumers) to limited availability (antennas or groups of antennas that operate for specific purposes) and commercial capacity (antennas accessible to the public). All of this is measured per million inhabitants.

In the 2023 ILIA, the level of 5G advancement in each country was evaluated considering pre-launches, limited availability, and commercial capacity through a categorical variable that assigned a score discretely. However, this year, the methodology was improved by counting the number of antennas based on these three aspects and normalizing the data per capita per million inhabitants. This way, it overcomes the information limitations provided by the previous categorization and offers a more accurate view of the 5G infrastructure deployment. To obtain all this data, the 5G Map platform from Ookla was used, where the data is updated until January 2024.

The regional average score for this subindicator is 9.34, with only three countries surpassing this figure: Chile, with 100 points and a total of 64,290 antennas per million inhabitants nationwide; Mexico, with 32.94 points and its equivalent of 21,229 antennas per million inhabitants; and the Dominican Republic, with 12.24 points and 7,941 antennas per million inhabitants with 5G technology deployed across the country.

ILIA

Graph 8: Score for the 5G Implementation Subindicator



This subindicator contains data imputed using the MICE method (Multiple Imputation by Chained Equations): BOL CU SLV HND JAM PAN VEN

Source: 2024 ILIA / Data: Ookla

The scores show a significant variance that reflects the speed and effectiveness of each country's public policies in achieving greater spectrum coverage. At the same time, they have the weakness of being normalized per million inhabitants, meaning that countries with advanced 5G deployment in urban centers and with advanced commercial applications, such as Brazil, face a methodological penalty.

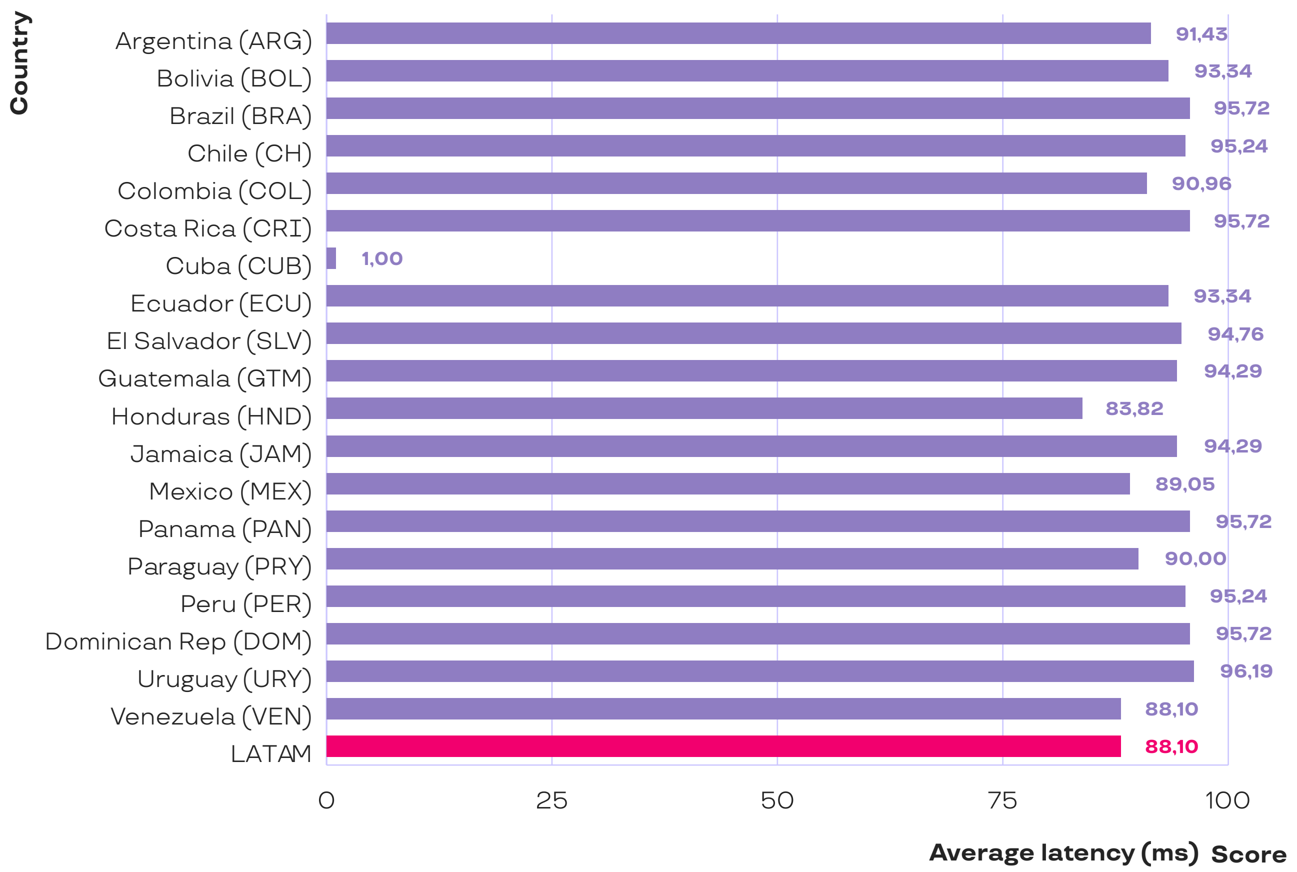
d) Average Latency

This is the last subindicator of Connectivity and indicates the average time (expressed in milliseconds) that it takes for a data packet to travel from a device to a server and then return. Lower latency indicates a faster and more responsive connection, which is a crucial factor for **enabling real-time interactions**, allowing efficient data processing, running effective IoT applications, and coordinating various AI systems. Additionally, in terms of security, low latency enables faster threat detection and improves authentication and authorization processes.

Regarding latency, Graph 9 shows that the **region achieves an average score of 88.10**, indicating that most countries have low latency, which is a positive sign for connectivity and the performance of digital infrastructure.

However, countries like Cuba need to improve significantly in this area, recording a score of only 1.00 points with a latency of 114.50 milliseconds. This is a considerably slower response time compared to the regional average.

Graph 9: Score for the Average Latency Subindicator



Source: 2024 ILIA / Data: Speedtest - Ookla

The good results displayed at the regional level for this subindicator can be misleading. When comparing the region to itself relatively, Cuba's poor performance in terms of latency significantly distorts the comparison among the rest of the countries. While it is not one of the most urgent challenges for enabling AI ecosystems, it should remain a relevant factor when planning local public policies to promote infrastructure. Moreover, the measurement is conducted in terms of each country's average and does not reflect the phenomenon in specific infrastructures.

C.3.2 Computing

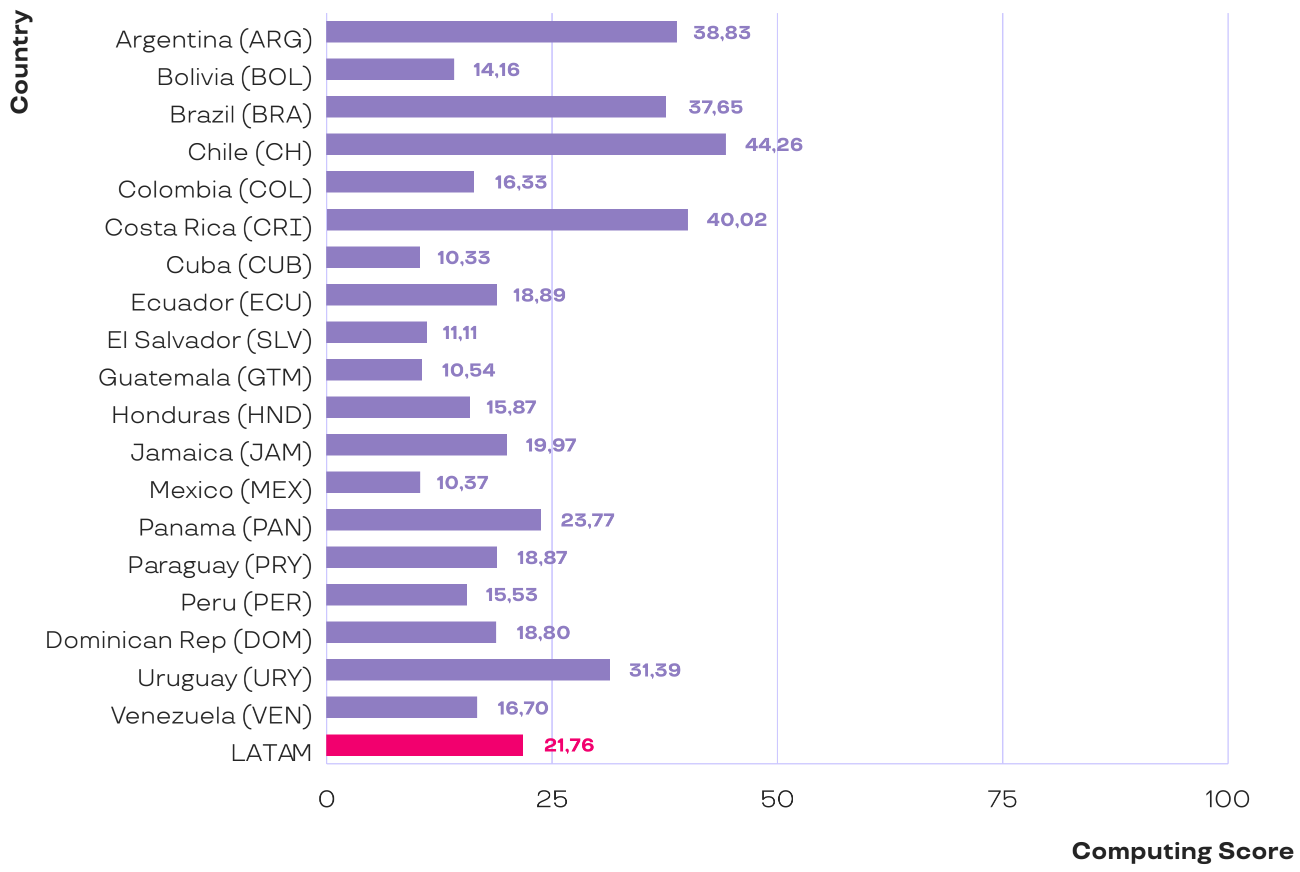
The second indicator of the Infrastructure subdimension measures the presence of those elements or conditions necessary to process large volumes of data and perform complex calculations, which are typical of cutting-edge scientific research or the development of AI applications. Each country is associated with a computing capacity, and its measurement is based on the assumption that greater capacity is linked to new developments and lower latency, which is required for advanced uses of technology.

The Computing indicator represents 2**5% of the total weight of the Infrastructure sub-dimension**, and the subindicators that comprise it are as follows

a) Cloud
b) High-Performance Computing (HPC) infrastructure capacity
c) Certified Data Centers
d) IPXs
e) Secure Internet Servers (per million Inhabitants)

Graph 10 shows a regional average score of 21.76 in **computing capacity**. Above this average are **Costa Rica (51.11), followed by Chile (45.81)** and Uruguay (41.92).

Graph 10: Score for Computing Indicator



Source: 2024 ILIA

a) Cloud

The first subindicator of computing is Cloud, consisting of a vast network of remote servers connected to the Internet that provide users with services for storage, data processing, and application delivery virtually. It is one of the **key technologies for the development of AI**, thanks to the power of these servers, which can handle large amounts of data and facilitate the complex tasks associated with Artificial Intelligence.

To measure this subindicator in each country, as was done last year, the Global Connectivity Index 2020 was used, a report by Huawei that measures the progress of 79 global economies in the implementation of infrastructure and digital capabilities, analyzing four enabling technologies —broadband, cloud, IoT, and AI through the measurement of 40 indicators. Information necessary to evaluate the four pillars on which the Cloud is based —supply, demand, experience, and potential— was extracted from this report.

According to this information, the region presents an average score of 34.37 points, with most countries exceeding this value. **Chile stands out with 42.5 points.**

A key interpretation is that, while the regional average in the adoption and development of cloud technology is moderate, there is considerable variability among countries. Some exceed this average, reflecting a higher level of advancement in investment, migration, experience, and potential in the Cloud. However, the region as a whole still faces significant challenges to maximize these opportunities and achieve more uniform development in this area.

b) High-Performance Computing (HPC) Infrastructure Capacity

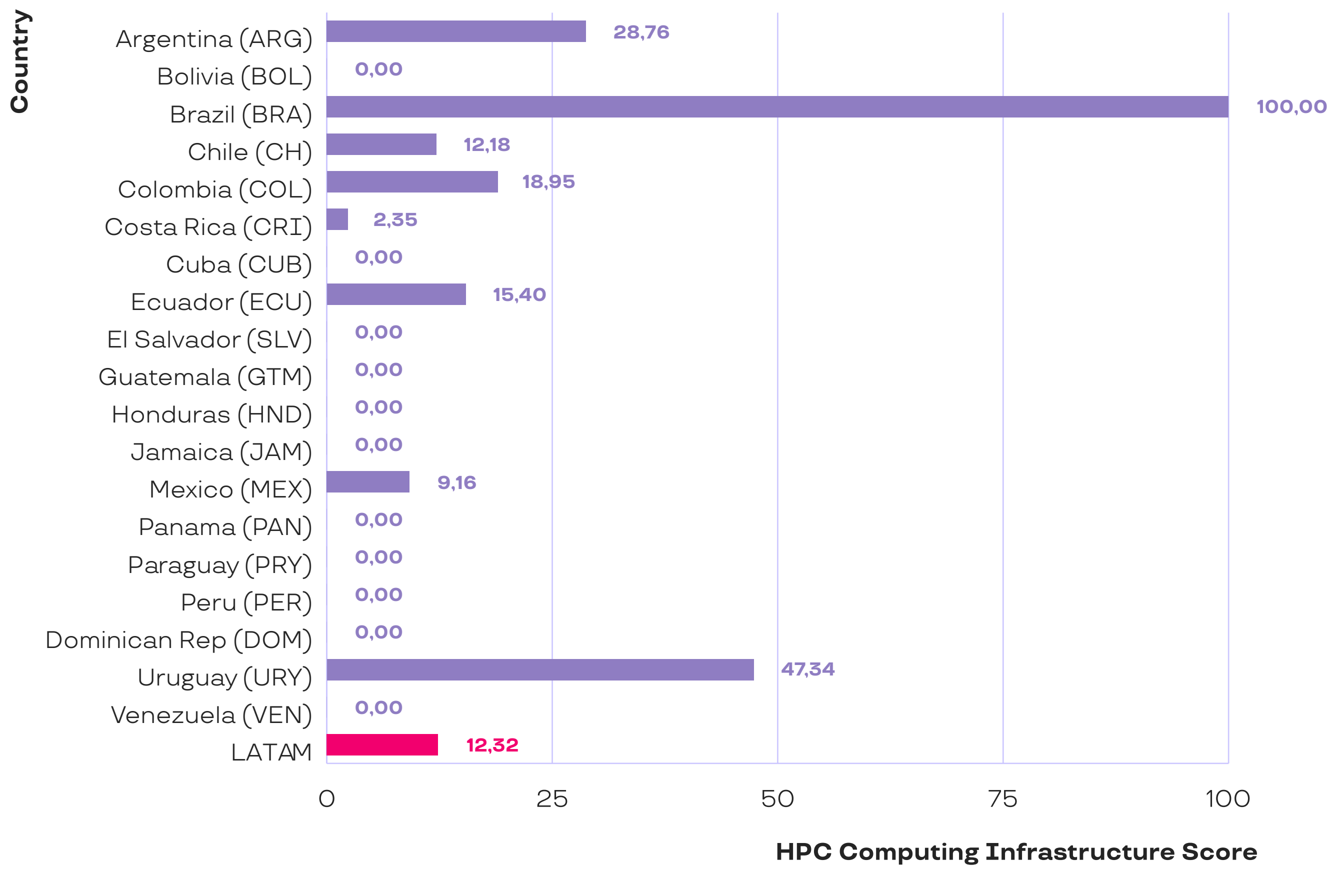
This subindicator aims to characterize the capabilities of **High Performance Computing (HPC)** in the region. Access to machines capable of processing large amounts of data and performing intensive calculations to solve complex problems in science, engineering, and business is essential for the development of AI and overall technological advancement, as its applications are transversal to any discipline.

To quantify these infrastructures and measure the computing capacity of the region, ILIA referenced the **"Report on Robust High Performance Computing Systems for Latin America and the Caribbean,"** published in June 2024 by the Advanced Computing System for Latin America and the Caribbean (SCALAC) in collaboration with RedCLARA, the latter being an international organization focused on promoting cooperation among advanced networks in Latin America as well. Mapping research centers and industrial organizations with high-performance computing infrastructures was an initiative of the HPC Observatory, which serves as a repository of reports on the existence of these machines in Latin America and the Caribbean.

The research considered all publicly available platforms belonging to **29 institutions across nine Latin American countries:** Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, and Uruguay.

The report revealed a total of 41 infrastructures that support intensive computing, meaning those with capacities ranging from 50 to 100 teraflops. This measurement adheres to the Latin American standard, with the exception of Bolivia, which has 28 theoretical teraflops but was nonetheless included in this report.

Graph 11: Score for HPC Infrastructure Capacity Subindicator



Source: 2024 ILIA / Data: SCALAC – RedCLARA

After normalizing the capacity of the clusters by population and transforming it into a score, a **regional average of 12.32** points was reached, a low score that reflects the limited computing capacity in Latin America and the Caribbean.

Brazil stands out with the maximum score of **100 points; Uruguay with 47.34; and Argentina with 28.76.** It is worth mentioning that Brazil has infrastructures that is recognized worldwide in terms of capacity.

Table 2: HPC Infrastructure Capacity by Country

Country	Institution	Manufacturer	Theoretical TFlops (GPU (FP32) + CPU)	No. HPC
Brazil	Petróleo Brasileiro S.A	EVIDEN	43008	12
		EVIDEN	14346,24	
		DELL EMC	14059,52	
		EVIDEN	9062,4	
		DELL EMC	7024,64	
		EVIDEN	5498,88	
	SiDi	NVIDIA	4229,12	
	Software Company MBZ	LENOVO	7137,28	
		LENOVO	4229,12	
	Federal University of Pará	HPE	35,875	
	Santos Dumont	EVIDEN	51122,4	
	Centro Nacional de Processamento de Alto Desempenho em São Paulo	DELL	388	
Colombia	Colombian Air Force	HPE Cray	52	11
	Colombian National Police Policía	HPE Cray	920	
	Colombian National Security	HPE Cray	1569,6	
	University of Ibague	HPE Cray	1024	
	Telco Colombia	HPE Cray	1024	
	University of Cartagena	HPE	36,6125	
	University of Los Andes, Colombia	DELL	30,2984375	
	SC3UIS	HPE	133,3748438	
		DELL Supermicro	92,6	
	BIOS	HPE	6,9	
		Inspur	178,1105	
Mexico	Autonomous University of Mexico	HPE Cray	4110,08	7
	University of Guadalajara	FUJITSU	504	

País	Institution	Manufacturer	Theoretical TFlops (GPU (FP32) + CPU)	No. HPC
	ABACUS, the Laboratory of Applied Mathematics and High-Performance Computing of the Center for Research and Advanced Studies of IPN	SGI Silicon Graphics Inc	816,6	
	National Institute of Nuclear Research s	NVIDIA	121	
	National Supercomputing Center of IPICYT	BULL ATOS	179	
	National Supercomputing Laboratory of Suerte BUAP	FUJITSU	360	
		FUJITSU		
	Autonomous University of Mexico	TYAN	100	
		DELL		
Argentina	National Weather Service	LENOVO	6133,76	5
	CCAD-UNC	Supermicro	462,825	
		Supermicro	19,04	
		Intel	83,1875	
		Supermicro	7,35	
Chile	National Supercomputing Laboratory / Universidad de Chile	Lenovo	784,2240	2
		DELL	459,2949	
Costa Rica	National Center for High Technology	DELL Supermicro	73,16	1
Ecuador	CEDIA	NVIDIA	1445,76	1
Uruguay	National Supercomputing Center	HPE	820,360313	1
		DELL		
Bolivia	Mayor University of San Simón	DELL	28	1
Total				**41**

Source: 2024 ILIA / Data: Scalac -Red Clara

The importance of countries having this type of platform lies in the fact that they are not only focused on meeting traditional scientific computing and simulation needs but also on addressing other requirements that expand future possibilities for computing, such as data analysis and AI development.

In this regard, data from the "Robust High-Performance Computing Systems for Latin America and the Caribbean Report" shows that none of the countries currently have a GPU-intensive HPC, an essential infrastructure for training and developing AI models based on transformers and neural networks. This highlights the need for public or private investment in GPU-based computing if there is an aim to advance in local sovereignty and capabilities for foundational model development.

The effort made by the Development Bank of Latin America and the Caribbean (CAF) is significant: since 2023, it has been conducting a thorough pre-investment study for the building of a network of high-performance computing centers for Artificial Intelligence in Latin America and the Caribbean, starting with Chile and the Dominican Republic. Based on this pre-feasibility study, four roadmaps will be proposed to enable these countries to develop such infrastructure.

In the same vein, a study was carried out to evaluate the profitability of an HPC investment project with an emphasis on AI, demonstrating that the project would be profitable even under a conservative scenario.

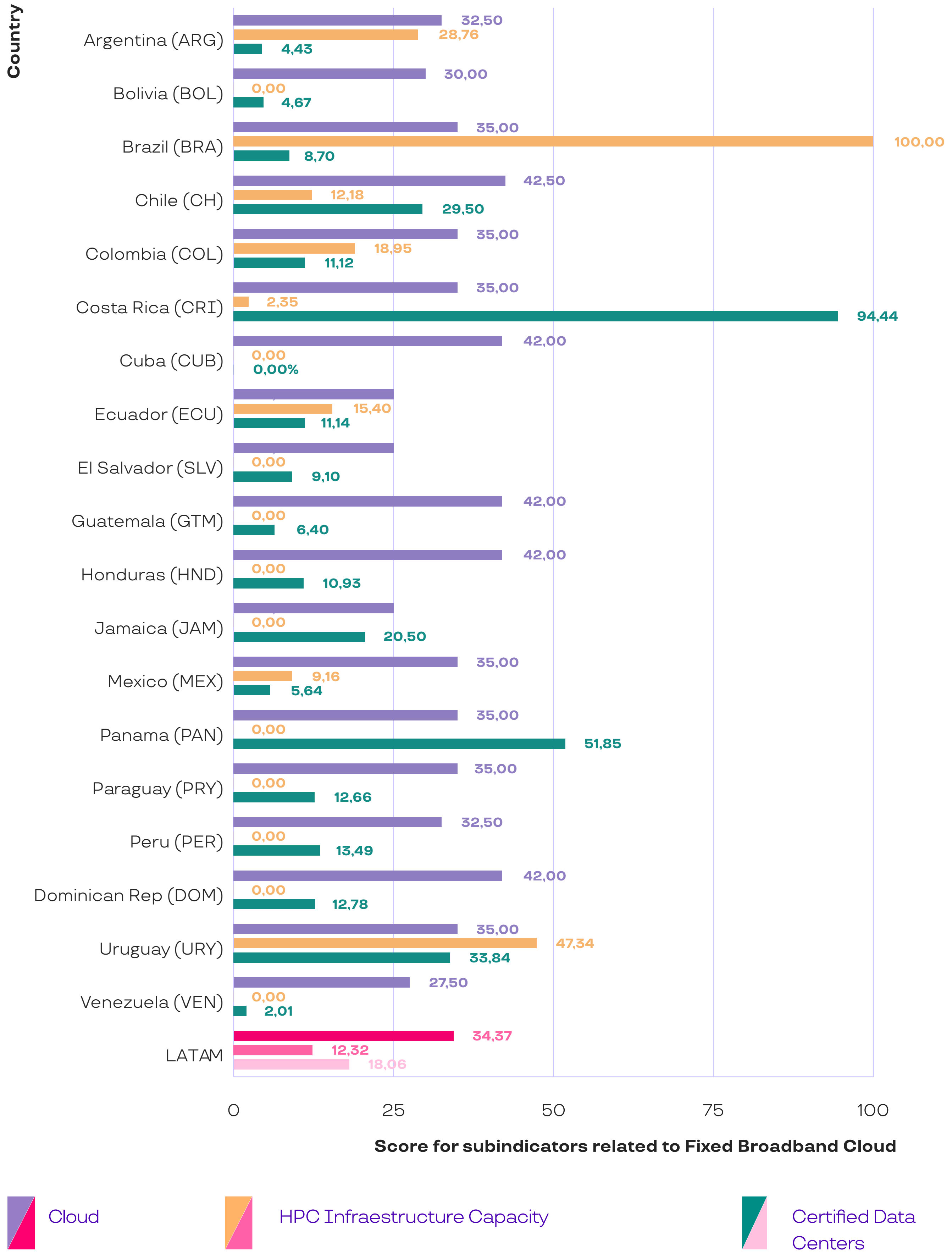
These promotion and awareness efforts point in the right direction to strengthen the local AI development ecosystem.

c) Certified Data Centers

This subindicator measures the **number of physical facilities that house a large amount of computer equipment** working together in order to store, process and distribute data. These centers have been evaluated and verified by an independent organization to meet industry standards in design, construction and operation to provide reliability, safety and efficiency.

As shown in Graph 12, the regional average for this subindicator is 18.06 points. Well above this is **Costa Rica, with 94.44** points and equivalent to 3.2 certified data centers per thousand inhabitants; **Panama, with 51.85 points** and representing 1.7 verified centers per thousand inhabitants; and **Uruguay**, with 33.84 points and 1,1 of these certified facilities per thousand inhabitants.

Graph 12: Score for Cloud/HPC Infraestructure Capacity/ Certified Data Centers Subindicators



Source: 2024 ILIA / Data: Huawei, Scalac - Clear Network and Uptime

*Cloud subindicator contains data imputed by MICE (Multiple Regression) method: CRI CU SLV GTM HND JAM PAN DOM

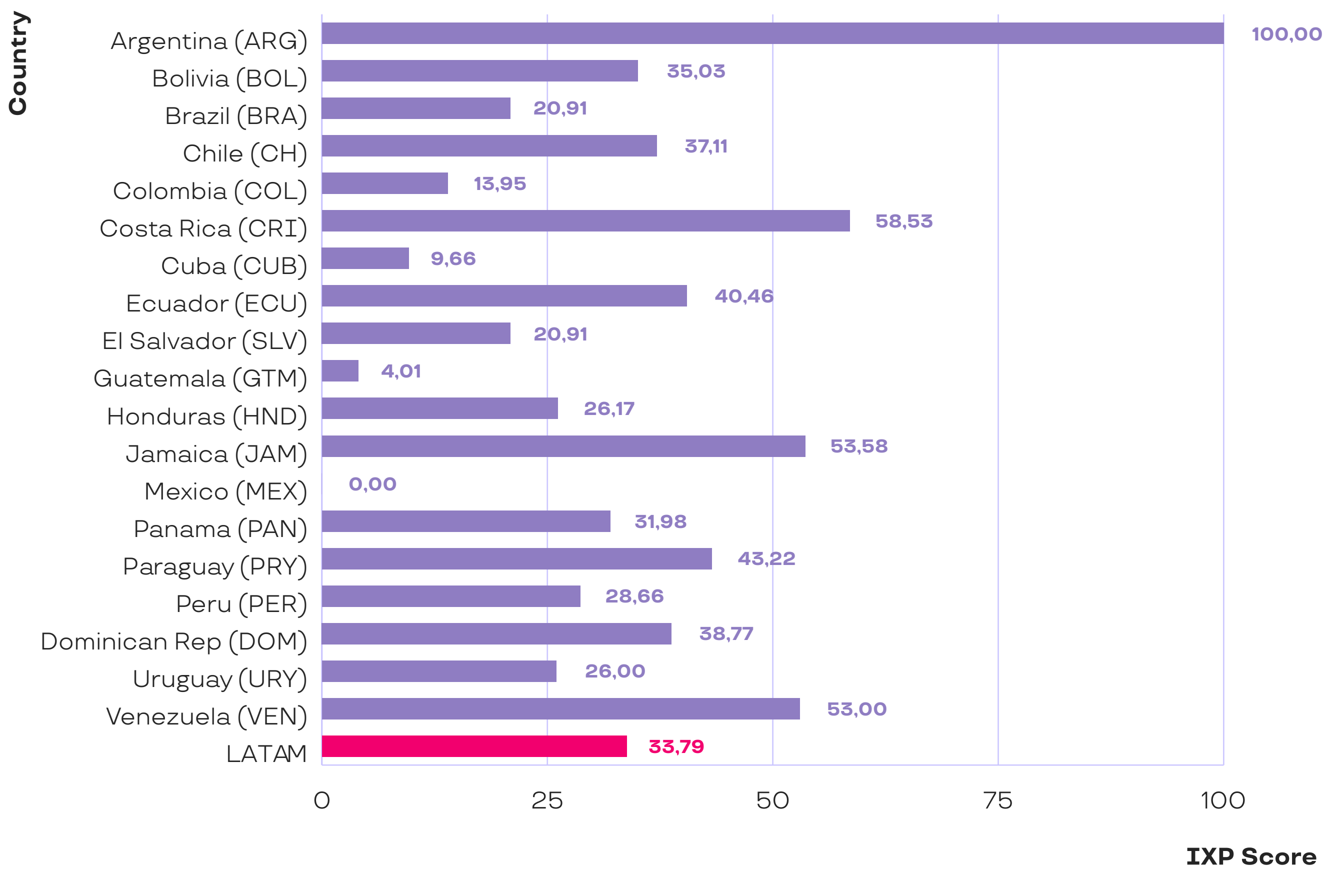
d) IXP

The IXP subindicator (Internet Exchange Point) measures the **Number of Internet Exchange Points** present in a country or the number of autonomous systems (AS) interconnected to a specific IXP. IXPs are the infrastructure where Internet service providers (ISPs) interconnect their networks to exchange Internet traffic, increasing bandwidth for their clients and thereby reducing latency.

As shown in Chart 13, **Argentina stands out with a significant lead** over other countries in this subindicator, achieving the maximum score of 100 points, equivalent to 0.63 IXPs per million inhabitants (29 Internet exchange points).

However, it is important to note that the region exhibits a notable disparity in the presence of IXPs, reflecting significant differences in digital infrastructure between countries. With a **regional average score of 33.79 points**, many countries still face substantial challenges in implementing a robust network of Internet exchange points, which can impact network traffic efficiency, increase data transmission costs, and reduce service quality.

Chart 13: IXP Subdimension Scores



*The IXP subindicator includes imputed data using the MICE (Multiple Imputation by Chained Equations) method: URY VEN

Source: 2024 ILIA / Data: Packet Clearing House

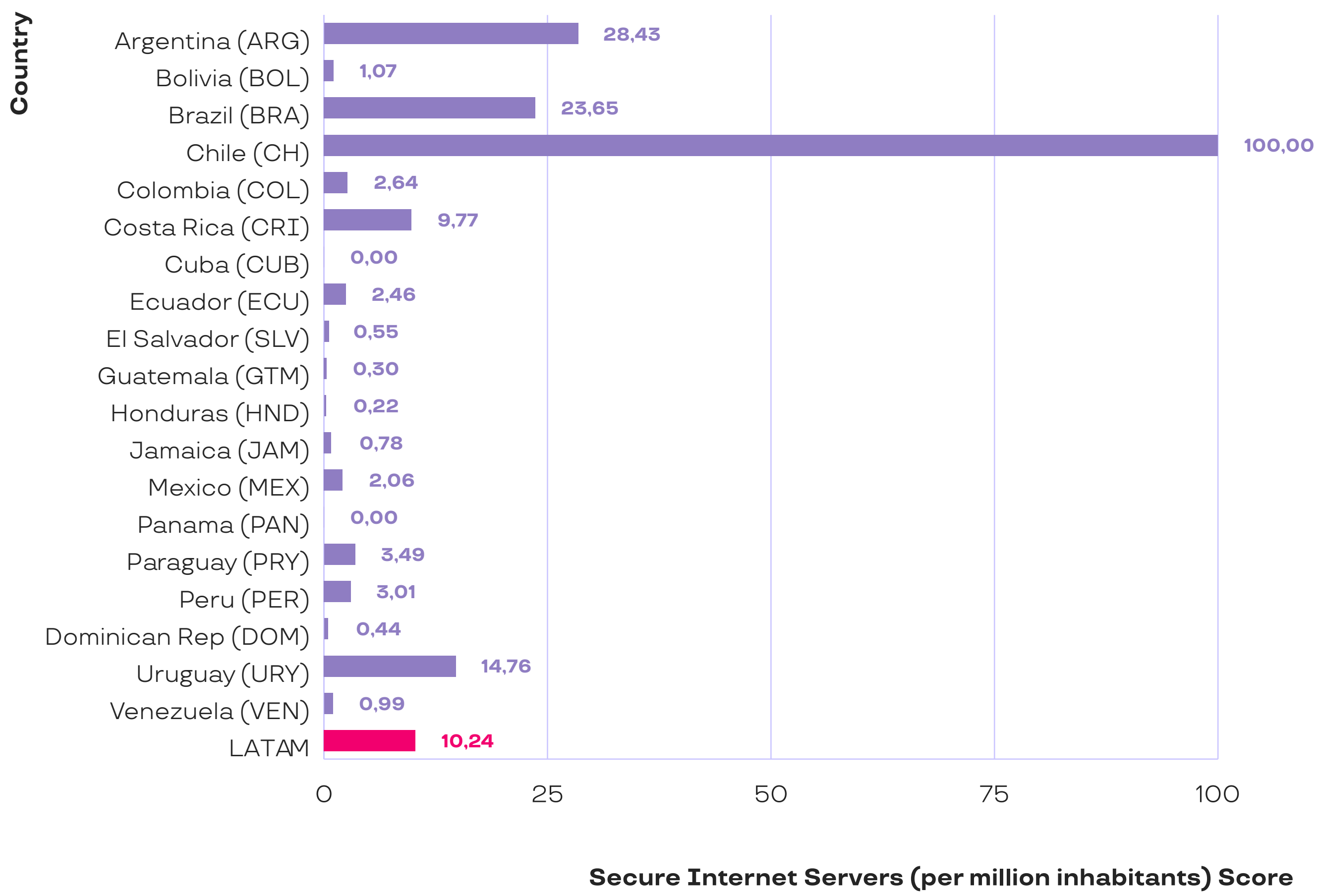
e) Secure Internet Servers

The final subindicator of the Computing indicator measures the number of secure Internet servers, which are servers that **meet the necessary security standards** to protect stored data and information, as well as to ensure user authentication, data encryption, and protection against cyberattacks.

As shown in Graph 14, **Chile leads this measurement with 100 points**, equivalent to 12,791 secure servers per million inhabitants. Argentina follows with 28.43 points (3,686 servers), and Brazil with 23.65 points (3,078 servers).

The regional average is 10.24 points, indicating a limited capacity in the region to ensure the security of critical data and information. This can increase the risk of cyberattacks and undermine confidence in the use of digital services in various countries across the region.

Chart 14: Score for Secure ecure Internet Servers Subindicator



Source: 2024 ILIA / Data: World Development Indicators

C.3.3. Devices

This is the third indicator within the Infrastructure subdimension, reflecting the level of access to and adoption of technological infrastructure at the individual and household levels.

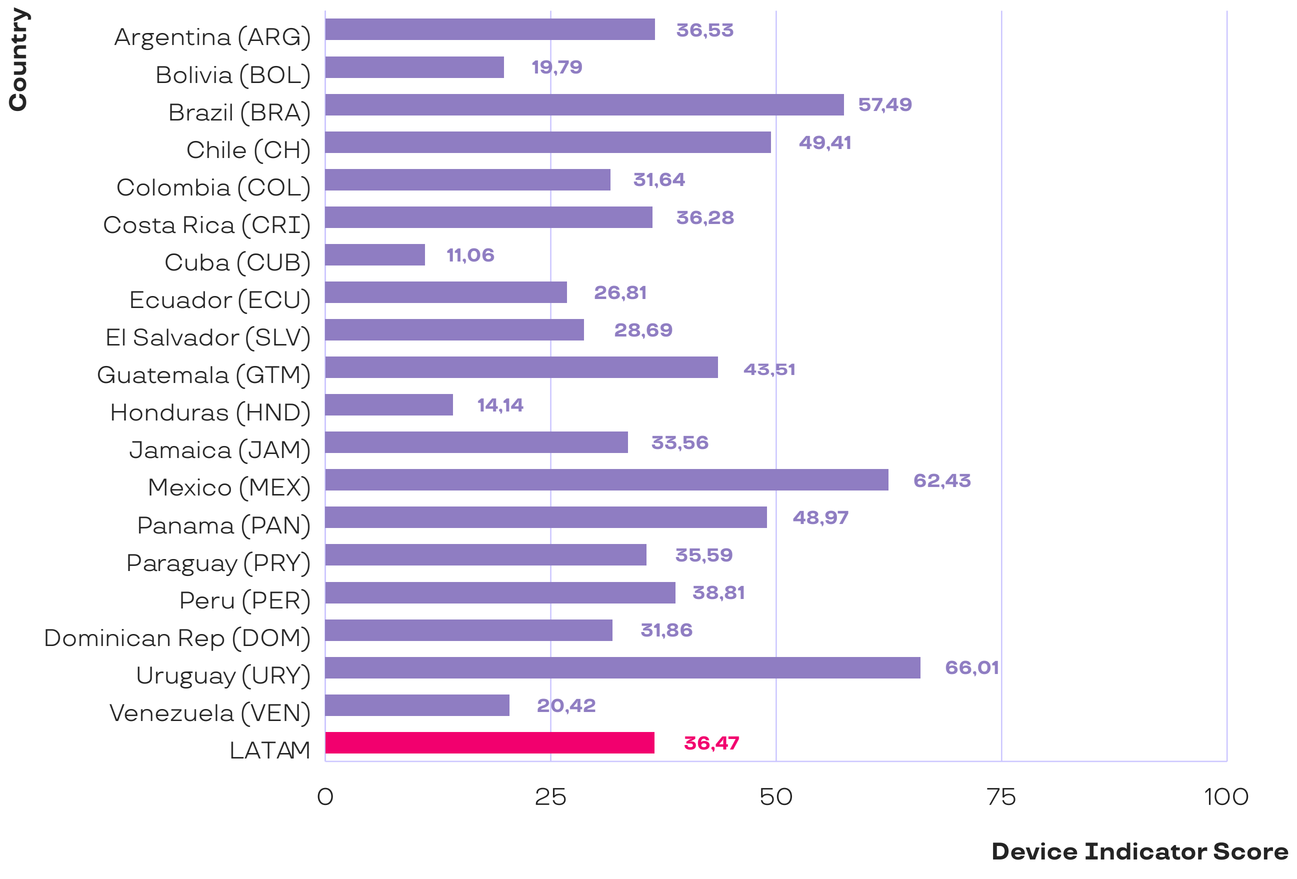
This indicator represents **25% of the total weight of the Infrastructure dimension** and is composed of three subindicators:

a) Households with a computer
b) Smartphone affordability
c) IPv6 adoption

Together, these three aspects provide insight into the availability, accessibility, and adoption of technologies that are key to Internet connectivity and access in the region, thus contributing to socioeconomic development and digital inclusion.

As shown in **Graph 15**, at the regional level, this indicator reaches a score of 36.47, with **Uruguay standing out with 66.01 points, followed by Mexico with 62.43, and Brazil with 57.49.**

Chart 15: Score for Devices Indicator



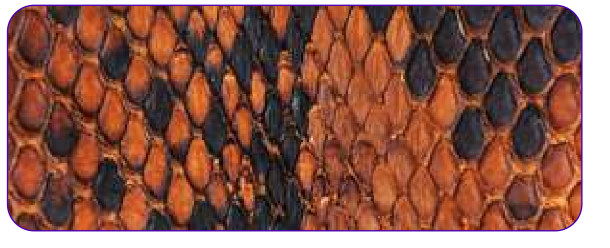
Source: 2024 ILIA

a) Households with a Computer

This subindicator reflects the proportion of households that own a computer, whether it be a desktop, laptop, tablet, or similar device. Its importance lies in assessing access to essential digital tools for education, work, and communication. This year, a new data source was integrated (ITU's DataHub), allowing access to more updated and accurate information.

As shown in **Graph16**, at the regional level, the subindicator reaches an average of 29.25 points, with **Uruguay leading at 68.70 points** (69.52% of households with a computer), followed by **Argentina with 61.54 points** (62.62% of households with a computer), and **Chile with 58.98 points** (60.15% of households with a computer).

In contrast, several countries in the Caribbean fall below the regional average, highlighting significant challenges in expanding computer access in households in that subregion.



b) Smartphone Affordability

Economic access to smartphones is a key element for digital inclusion, as it drives open innovation, facilitates skill development, promotes widespread technology adoption, and enables solutions to address social challenges.

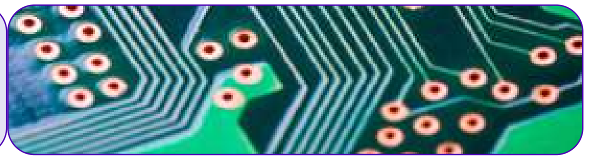
Smartphone affordability in each country is assessed based on the price of the most economical device available in the market, adjusted by Purchasing Power Parity (PPP). This parameter is determined by comparing purchasing power between countries and using a representative basket of goods and services as a reference. Data for this subindicator is obtained through the International Comparison Program and the World Bank's Alliance for Affordable Internet.

This subindicator is equivalent to the Basic Broadband Basket under the Connectivity indicator, and its score reflects the population's opportunity to access a smart device considering the economic context of each country.

Panama leads in this subindicator with 100 points, as its market allows the acquisition of up to 665.33 smartphones with a PPP of $33,266.48, based on a price of $50 USD for the most economical device. **Chile follows with 57.7 points, Mexico with 55.93, and Brazil with 43.34.** The two leaders in smartphone affordability share less restrictive tariff policies, which may correlate with greater availability of these devices, given that most are imported.

Additionally, both Mexico and Brazil play key roles in the industrial supply chains for producing these devices, especially Mexico. In this sense, their participation in this value chain may create positive externalities that enhance local price competitiveness.

For other countries, the chart shows that most remain below 50 points, with a regional average of 32.68 points, underscoring the need to improve smartphone accessibility across much of the region.

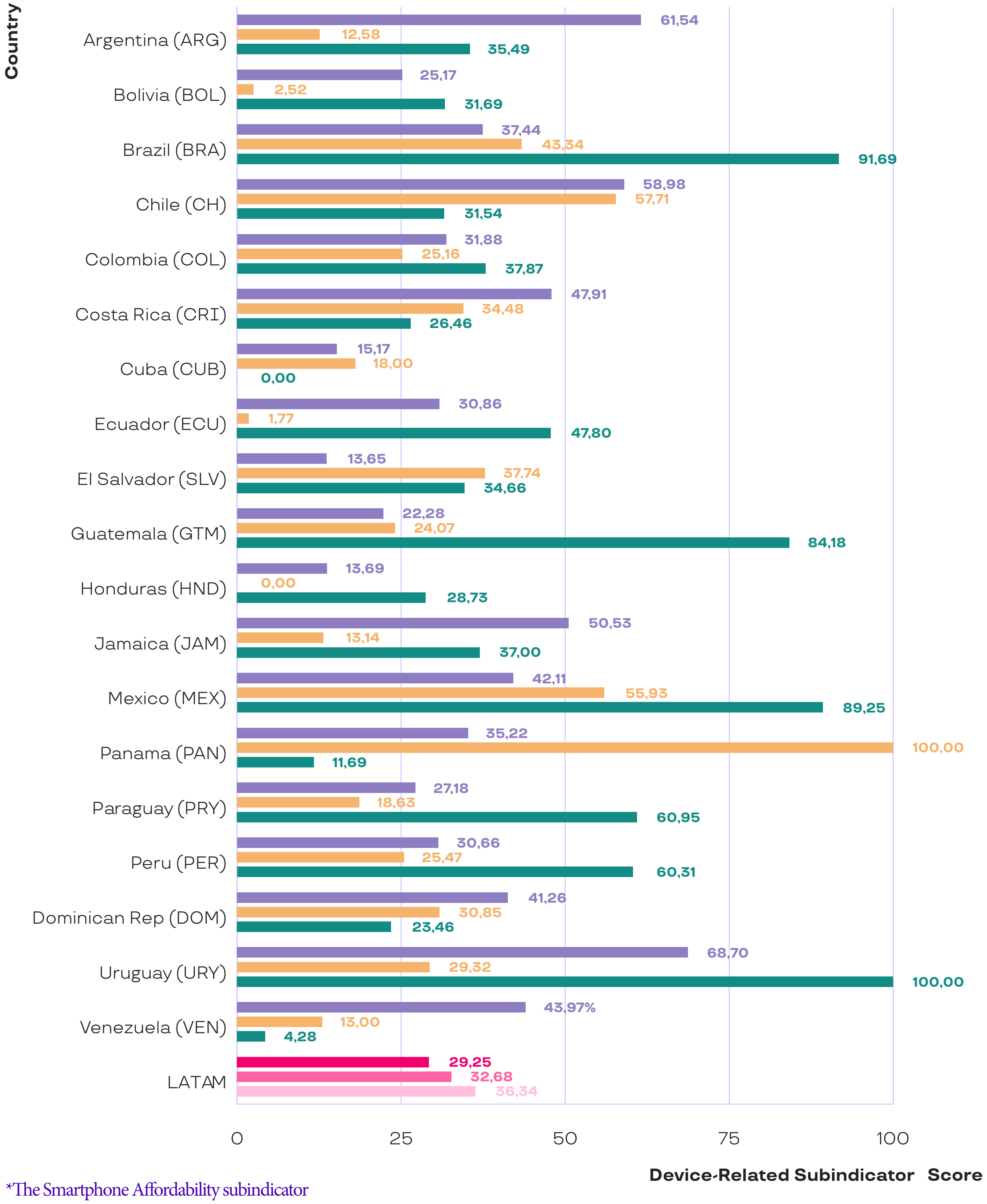


c) IPv6 Adoption

The adoption of IPv6 —the sixth version of the Internet Protocol (IP)— provides an almost infinite number of IP addresses, facilitating smoother internet traffic. This adoption is essential for establishing a more robust network infrastructure, which is necessary for the efficient development and deployment of AI applications in an increasingly interconnected world. As the successor to IPv4, IPv6 addresses the growing demand for IP addresses due to the increase in connected devices, ensuring greater scalability, connectivity, efficiency, and security for such applications, fostering their growth and adoption across multiple industries and sectors. This subindicator, based on data from LACNIC Stats, reflects the estimated percentage of users using IPv6 in each country in the region, as well as the percentage of websites and routable prefixes available with this protocol, enabling an assessment of countries' capacity to sustain future Internet growth and ensure long-term network and service interoperability.

At the regional level, an average score of 36.34 is observed, with marked variability among countries. **Uruguay leads** with 100 points and a **54.05% IPv6 adoption rate,** followed by **Chile and Mexico with scores of 91.69 and 89.25**, respectively. Countries with adoption rates below 50% (equivalent to scores below 85) may face medium-term challenges in positioning themselves as economies capable of hosting AI development industries and in providing more sophisticated solutions to the general population, which will require adherence to international protocol standards.

Chart 16: Score for Device-Related Subindicator



Households whith a Computer | Smartphone Affordability | IPv6 Adoption

*The Smartphone Affordability subindicator includes data imputed using the MICE (Multiple Imputation by Chained Equations) method: CUB VEN

*The IPv6 Adoption subindicator includes data imputed using the MICE method: JAM

Source: 2024 ILIA / Data: ITU DataHub, World Bank, A4AI, and LACNIC Stats

REPORT

5G Bidding in Chile: The Strategy Behind the Initiative's Success

Chile's score is clearly outstanding and unusual compared to other countries in terms of 5G network deployment. Consequently, an analysis of the factors contributing to the success of its public initiative is included so that other countries in the region may consider these when strengthening public policies aimed at enhancing their capabilities.

Motivations for the Auction

LThe allocation of electromagnetic spectrum for mobile services is a critical component of modern telecommunications infrastructure (9). In Chile, recognizing that 5G offered high download speeds and lower latency —thus enabling the development of new applications in the Internet of Things (IoT), automation, and augmented reality (Cave, 2018)—, the implementation of 5G technology was seen as a natural boost for the telecommunications sector in 2020, with the potential to drive digital transformations incorporating new technologies and process automation. Given this scenario, it was essential to design a process for allocating 5G spectrum in an efficient, competitive, and transparent manner to also generate a multiplier effect on the economy (Rao & Prasad, 2018).

For a company to compete on equal footing, it needs low, mid, and high bands. Thus, a simultaneous auction was designed for four spectrum bands, each through a separate bid. The first three were held at the national level, while the fourth, the 2600 MHz band —with significantly more blocks than interested companies— was launched at the municipal level (Chile's most local administrative unit) on an exploratory basis.

While this last band did not have use cases or mass equipment, it promised to be valuable for high-capacity data-speed use cases (for example, operating ROVs in the salmon farming industry or heavy machinery in mining), always considering limited areas due to its high implementation cost. For the first three bands, a first-price package auction was designed, assigning spectrum in the 700 MHz, AWS (1700 and 2100 MHz), and 3.5 GHz bands. This took place in February 2021. The process involved four incumbents and a potential new entrant, raising more than five times the total revenue obtained in previous assignment processes combined, reaching USD$453 million.

It is worth mentioning that there were those who opposed competition in spectrum allocation, such as the regulated entity, which won six lawsuits against incumbents to be able to bid for the benefit of the country. However, three years after the auction, the widespread infrastructure and population coverage proved to be a success.

Before the 5G auction, spectrum allocation in Chile was carried out through what is colloquially known as a "beauty contest," an administrative process that assigned spectrum based on a company's technical project to develop infrastructure and provide mobile services. Specifically, companies submitted their proposals, which received scores based on criteria such as geographic coverage, service quality, and the timeline for network deployment.

According to the law, in technical bidding tie situations, the spectrum was assigned in a second stage through a sealed-bid auction. While this stage could encourage competition for the spectrum, in practice it did not occur, as they offered as many blocks as there were bidders.

In short, the "beauty contests" were not fully competitive and lacked transparency (Prat & Valle, 2001), which is why an innovative approach was taken, respecting the regulatory limitations in Chile.

In 2018, prior to the 5G spectrum auction in Chile, the Supreme Court had raised concerns about spectrum concentration and decided that the Undersecretariat of Telecommunications (Subtel) should clarify a maximum ownership policy for this public-use resource. In this way, Subtel proposed spectrum limits for different bandwidths, dividing them into low bands (below 1 GHz), mid-low bands (between 1 and 3 GHz), and mid-high bands (between 3 and 6 GHz).

The idea behind this was that, given the varying properties of the bandwidths, to enable a company to be competitive they should have different spectrums that could complement each other. For example, low bands have great coverage but high latency, while mid-high bandwidths offer high speed and low latency but low coverage.

Subtel's proposal, ratified by the Supreme Court, emphasized that the Chilean mobile market should have space for four serious competitors and that the spectrum policy should recognize this, as should the auction. Specifically, the spectrum limits set by the Supreme Court equate to 32% for the low bands and 30% for both mid-low and mid-high bands, allowing for four operators.

The Design of the 5G Auction: The Combinatorial Auction

The entire 5G allocation process included the 700 MHz, AWS, and 3.5 GHz bands. For each of these, a separate first-price auction was held. In each of the lower bands (700 MHz and AWS), a single block was auctioned (20 MHz and 30 MHz, respectively). The 3.5 GHz band, the most sought after for full 5G or standalone applications, was divided into 15 blocks of 10 MHz each, with 10 located in the lower part of the band (3400 MHz – 3500 MHz) and the other five in the upper part (3600 MHz – 3650 MHz).

The 3.5 GHz spectrum was assigned through a first-price combinatorial auction, conducted simultaneously to allow companies to bid on different packages and express complementarities between various macro bands. The decision was made to carry out the tasks sequentially to keep the process simple for participants (Crampton).

Considering that the lower bands are necessary for coverage, the second decision was to auction the 700 MHz block first, followed by AWS, and finally the blocks of 3.5 GHz, allowing participants to bid on higher bands with knowledge of the allocations in the lower bands. This approach could also induce greater competition and higher revenues as more information became available to participants.

The impressive results regarding the widespread 5G infrastructure in Chile, as shown to date in the ILIA, are based on the fact that the minimum project requirements for competing for national spectrum had very high obligations for coverage and bandwidth. Regarding the former, it was required to develop mobile networks that covered 90% of the population of all of Chile within a maximum of two years, ensuring territorial equity. This was the first time simultaneous deployment was mandated in each region, requiring that every regional and provincial capital in Chile had 5G.

Additionally, coverage was also required in several important industrial hubs and all public hospitals, among others. Furthermore, collaboration was established with mayors across Chile to include 366 locations with low or no connectivity, making 5G in the 700 MHz band an obligation for these areas as well.

Given the connectivity issues experienced during the pandemic, it was required, for the first time, that a bidding process included acceptable minimum service levels, defined as minimum upload and download speeds for each band, according to their specific characteristics.

It is important to understand the particular context in which this process took place to comprehend some auction design choices. Chilean legislation stipulates that spectrum allocation must occur in a single administrative act, which, due to certain interpretations, ruled out the possibility of implementing multi-round mechanisms (such as the Clock or Simultaneous Ascending Auctions) that can take several days or even weeks (Kuś, 2020; Bernheim & Whinston, 1986; Milgrom, 2004).

The first-price package auction allows companies to express valuations for different numbers of blocks. Under relatively demanding conditions, the first-price combinatorial auction is also efficient (Milgrom, 2004).

The first-price package auction is also easy and quick to implement, enabling the rapid launch of 5G technology (Milgrom, 2019). These two auctions consolidated four firms with spectrum in the low and mid-low bands, while five companies participated in the 3.5 GHz auction, three of which had spectrum in that band prior to the auction.

Learnings

The 5G spectrum auction in Chile represents a significant shift in how a scarce and valuable resource —broadband spectrum— has been allocated. A first-price package auction was designed and implemented for two segments of the 3.5 GHz spectrum band. This new format provides a transparent way to allocate spectrum and generated over USD 450 million in revenue, six times more than the total revenue from all previous auctions in the country.

Transitioning from a "beauty contest" to an auction procedure required a careful consideration of the recent market evolution and the political and legal context in which the allocation occurred.

The allocation process took place amid a major crisis, where citizens distrusted political actors and institutions. While some incumbents questioned the shift to an auction, the new process and its results have been widely praised by the media, policymakers, and politicians alike. Chilean society, for its part, has never questioned the auction process, unlike many other public concessions. Although the legal framework under which the 5G auction was conducted was the same as that of previous awarding processes —such as the "beauty contest"—, the outcome was radically different, as it included spectrum caps and upper limits for each company. By being combinatorial, it could ensure competitiveness and transparency.

It is crucial to emphasize that the 5G auction imposed robust obligations on the winning companies, marking the first time in Chile's history that minimum service levels were required. At the same time, it was designed to promote competition for blocks among participants, preventing agreements or guaranteed awards. More details and learnings from the bidding process can be found in Escobar et al. (2023).

C.4. Data Subdimension

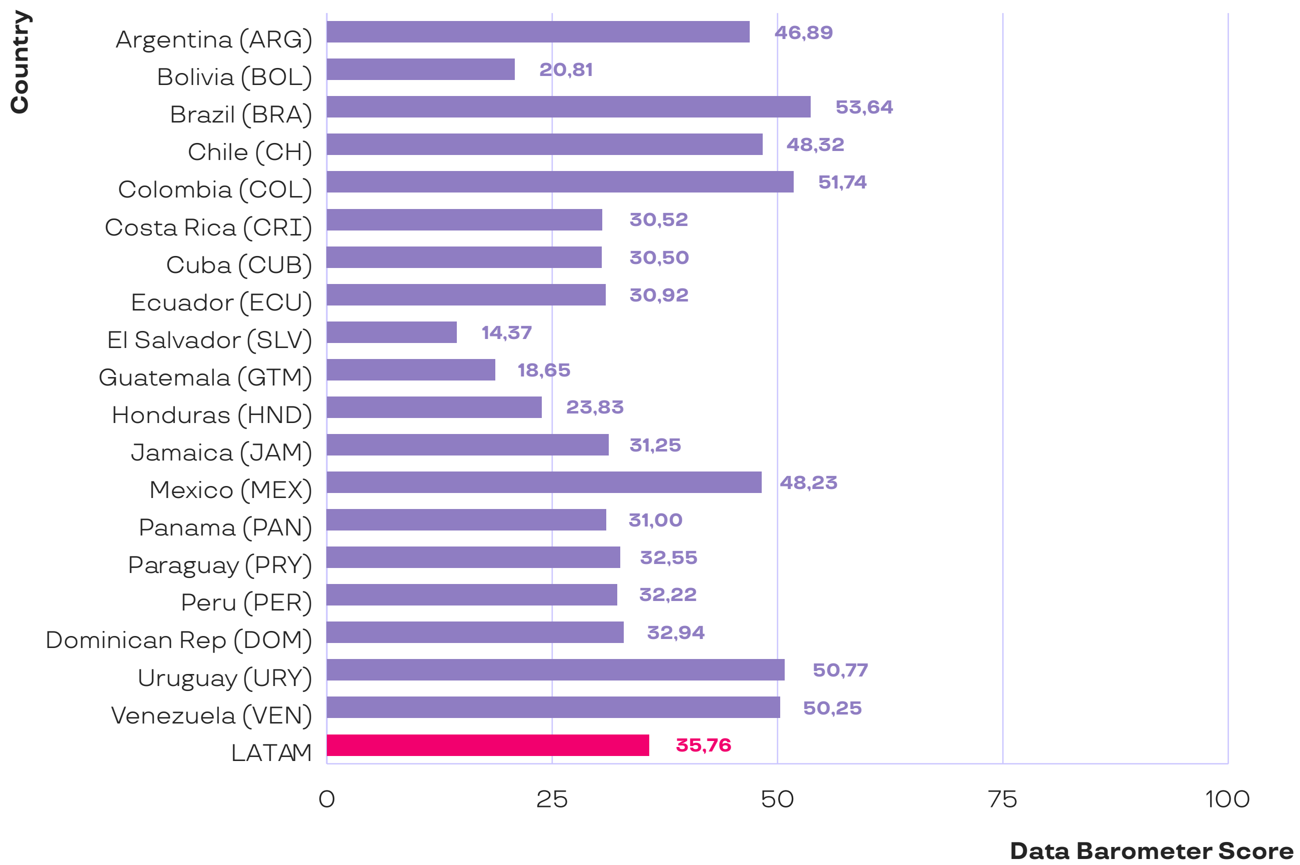
The availability and access to open and reliable data, along with the safeguarding of personal data protection, are crucial aspects for the development of AI. Without open and quality data, there is no raw material to feed algorithms that train accurate and robust learning models.

This subdimension comprises **a single indicator, the Data Barometer**, which addresses aspects such as data availability, the capacity to download and use this data, its reliability, and the projected impact it has on critical areas in each country. Effective data management is closely related to the potential for generating a healthy AI ecosystem.

This subdimension represents **25% of the total weight** of the Enabling Factors dimension.

It is important to note that, as with the entire edition of this index, the incorporation of new countries, adjustments in the normalization process, the allocation of scores and their weighting influence the final results, even if the raw data remains unchanged.

Graph 17: Scores for the Data Subdimension



Source: 2024 ILIA

Considering the results presented in **Graph 17**, countries can be divided into three groups that reflect different levels of data ecosystem maturity:

Countries with Advanced Data Ecosystems (more than 45 points): This group includes countries that possess high data availability, management capabilities, and a robust governance framework. The countries in this category are: Argentina (46.89), Brazil (53.64), Chile (48.32), Colombia (51.74), Mexico (48.23), Uruguay (50.77) and Venezuela (50.25).

Countries with Developing Data Ecosystems (between 30 and 45 points): These countries have resources and processes for data management and governance, but they face limitations and lack an environment conducive to AI development. The countries in this group include: Costa Rica (30.52), Cuba (30.50), Ecuador (30.92), Jamaica (31.25), Panama (31.00), Paraguay (32.55), Peru (32.22) and Dominican Republic (32.94).

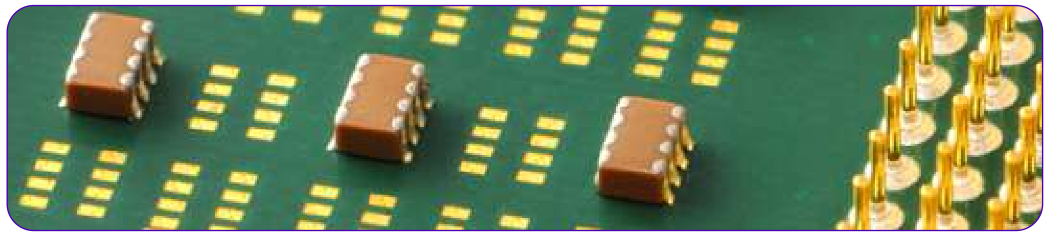
Countries with Emerging Data Ecosystems (less than 30 points): This group consists of countries that face significant barriers in data availability and have limitations in the necessary infrastructure for data use and governance frameworks. The countries in this category are: Bolivia (20.81), El Salvador (14.37), Guatemala (18.65) and Honduras (23.83).

C.4.1 Data Barometer

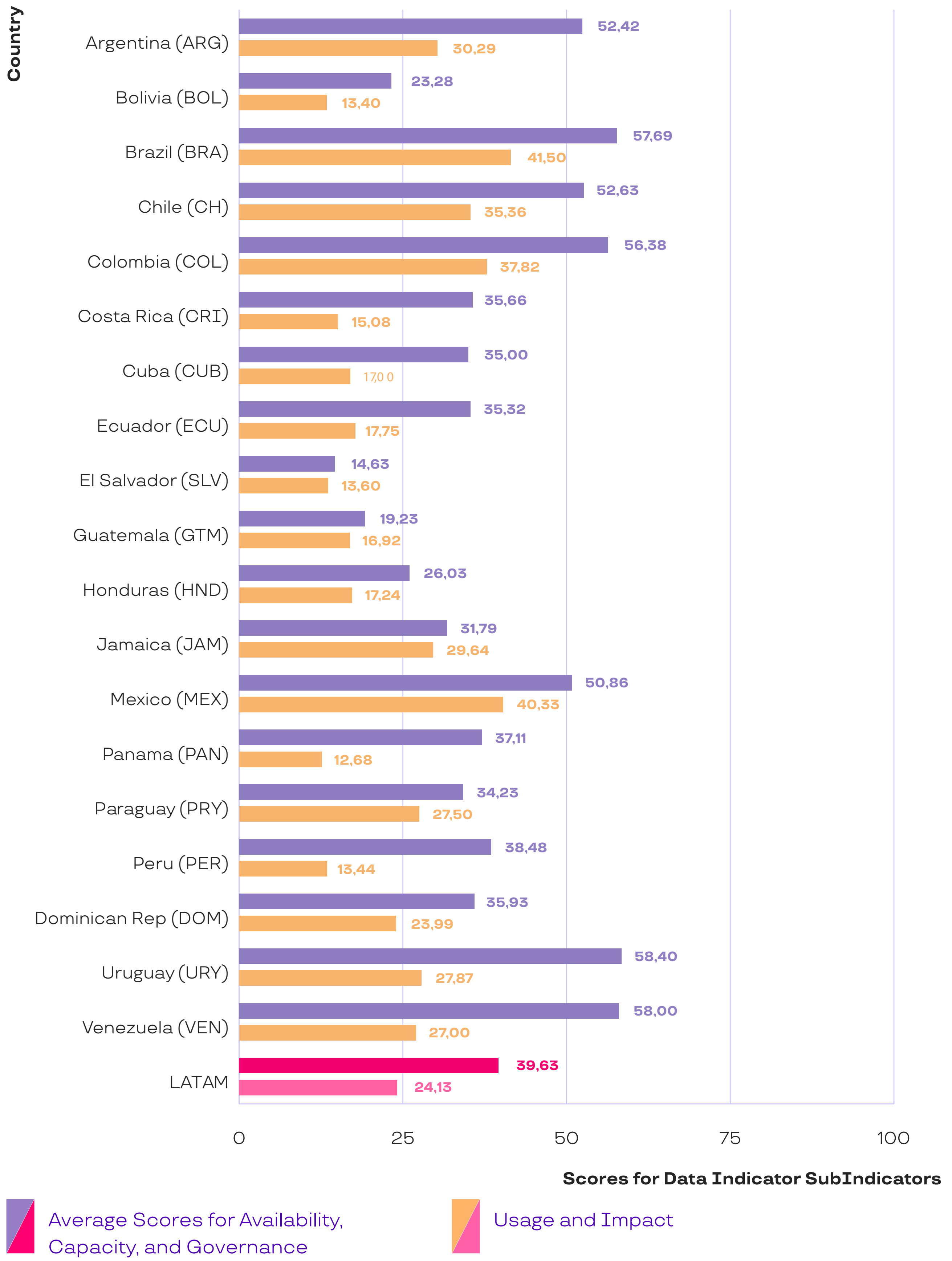
The **Data Barometer** is the only associated indicator, and its data are based on the report produced by the Global Data Barometer, an international collaborative project that collects information on the state of open data in each country. This parameter operates under the assumption that data are essential for governmental decision-making in areas such as climate action, public health, public finance, and procurement, among others. The subindicators that comprise it are:

a) Availability
b) Capacity
c) Governance
d) Usage and Impact

It is important to note that to obtain the score for this indicator, the Data Barometer was used again. This report was a source in the ILIA 2023, as its update will not be available until the first quarter of 2025.



Graph 18: Score for Data Indicator Subindicators
Average Scores for Availability, Capacity, and Governance



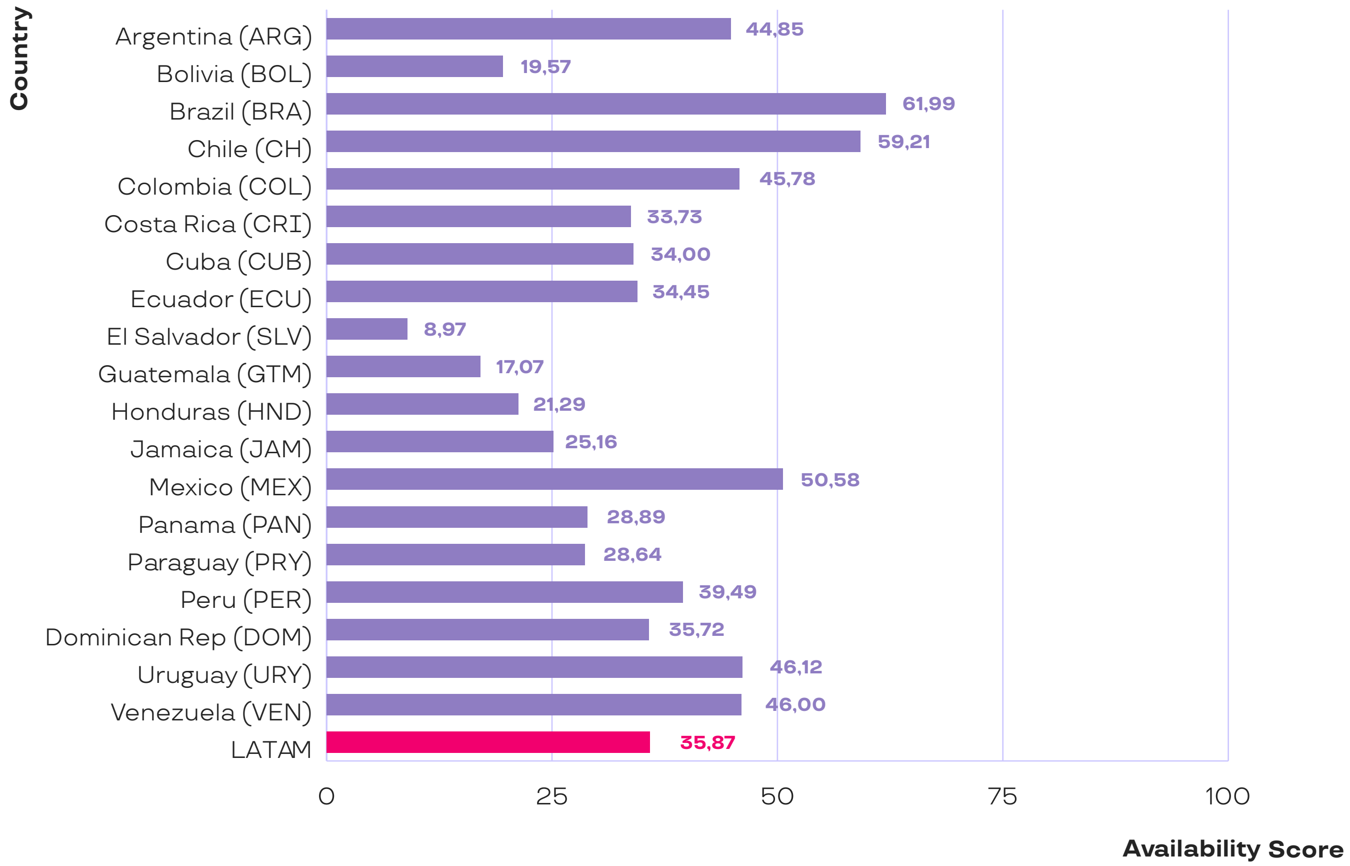
Source: 2024 ILIA / Data: Global Barometer's

ILIA

a) Availability

This subindicator focuses on the availability of clear and easily processed public data for open use. In **Graph 19**, it can be observed that data is presented in a quite heterogeneous manner. With a regional average of 35.87, countries like **Brazil (61.99), Chile (59.21), and Mexico (50.58)** stand out. Others, located in the Caribbean basin, **fall below 30 points.**

Graph 19: Scores for Data Availability Subdimension



*The Availability subindicator includes imputed data using the MICE method (Multiple Imputation by Chained Equations): CUB VEN.

Source: 2024 ILIA/ Data: Global Barometer's

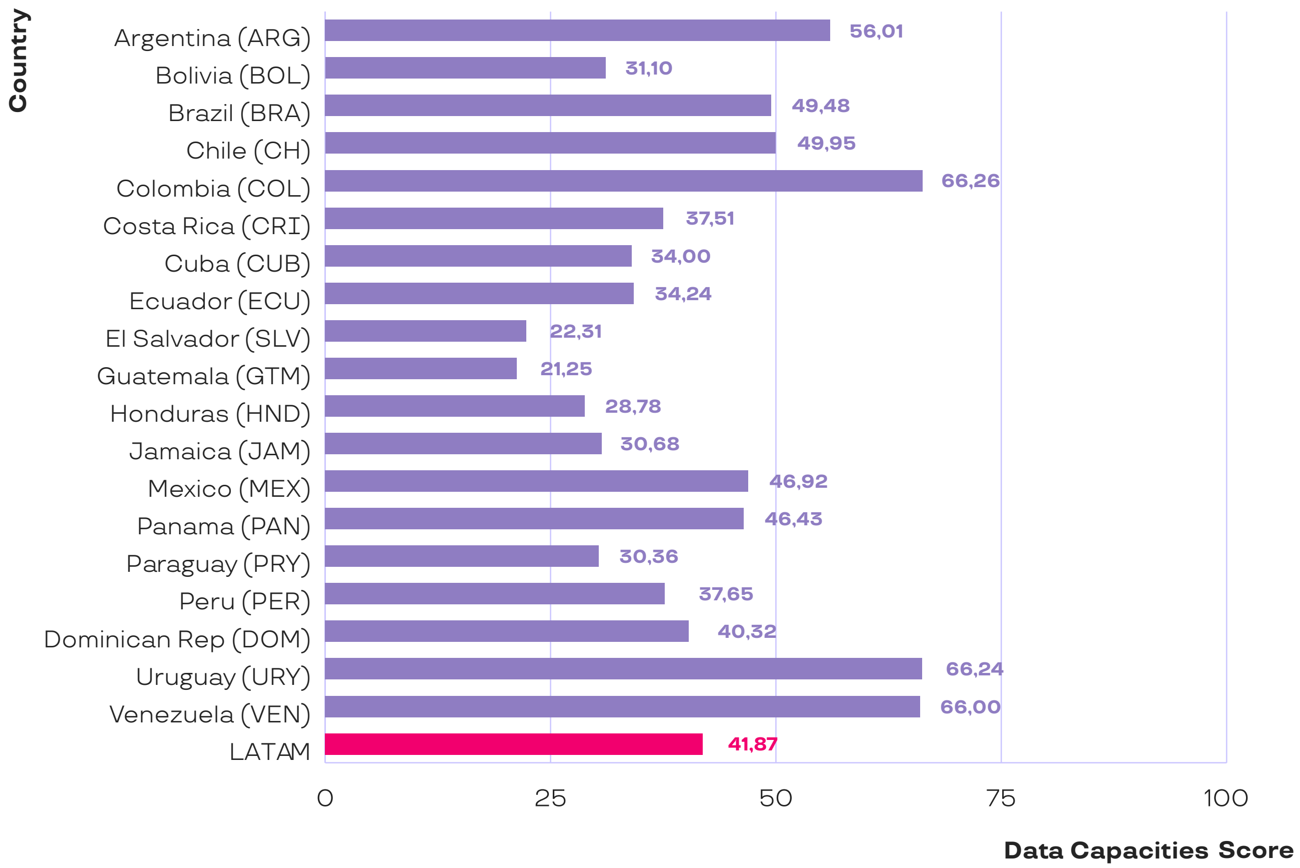
The disparity in this subindicator reflects the limitations that exist for equitable access to technological growth opportunities and the benefits that AI can provide, thus underscoring the need to promote policies that encourage more democratic access to data across the region.

b) Capacities

This measurement refers to how countries effectively collect, download, process, use, and share data. To achieve optimal capacities, it is essential to have resources such as connectivity, professional skills, and institutions that provide them.

In **Graph 20**, it can be seen that several countries are above the regional average of 41.87 points. Although countries like Colombia (66.26), Uruguay (66.24), and Venezuela (66) stand out, it is notable that about 50% of the total region is below this average, revealing a significant gap in the capacity to leverage the potential of data in Latin America and the Caribbean as a whole.

Graph 20: Score for Data Capacities Subdimension



*The Availability subindicator includes imputed data using the MICE method (Multiple Imputation by Chained Equations): CUB VEN

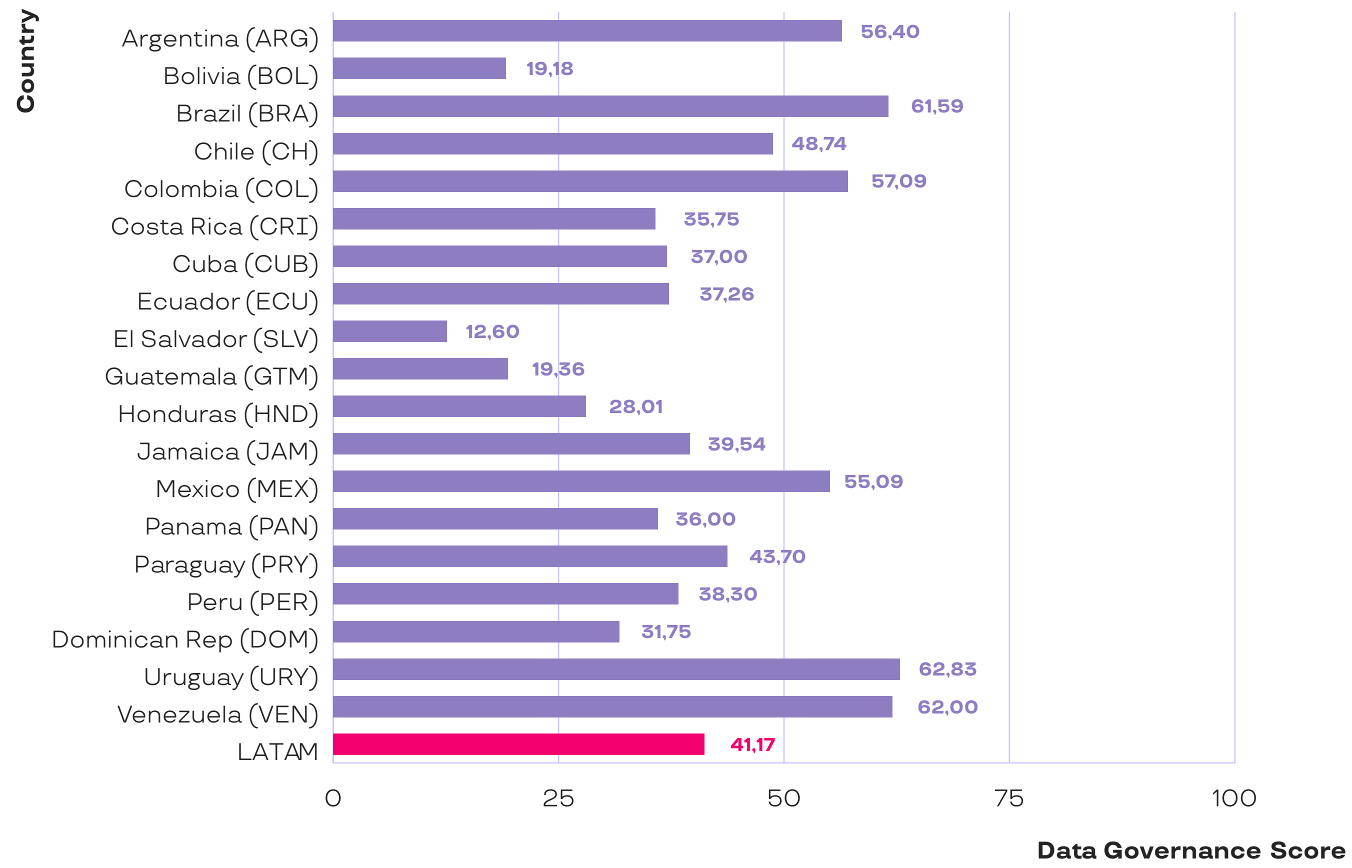
Source: 2024 ILIA / Data: Global Barometer's

c) Governance

This involves the implementation of rules, processes, and structures aimed at ensuring the right to information, access to reliable, complete, and transparent data, and the protection of personal data.

Graph 21 shows a regional average of 41.17 points, but with quite different scores among the countries: three nations are above 60 points (Uruguay, Venezuela, and Brazil), while 11 fall below this average. This leads to the interpretation that data governance in Latin America is unequal and exhibits a moderate development of regulatory frameworks and rights related to data protection and sharing.

Graph 21: Score for Data Governance Subdimension



*The Availability subindicator includes imputed data using the MICE method (Multiple Imputation by Chained Equations): CUB VEN

Source: 2024 ILIA / Data: Global Barometer's

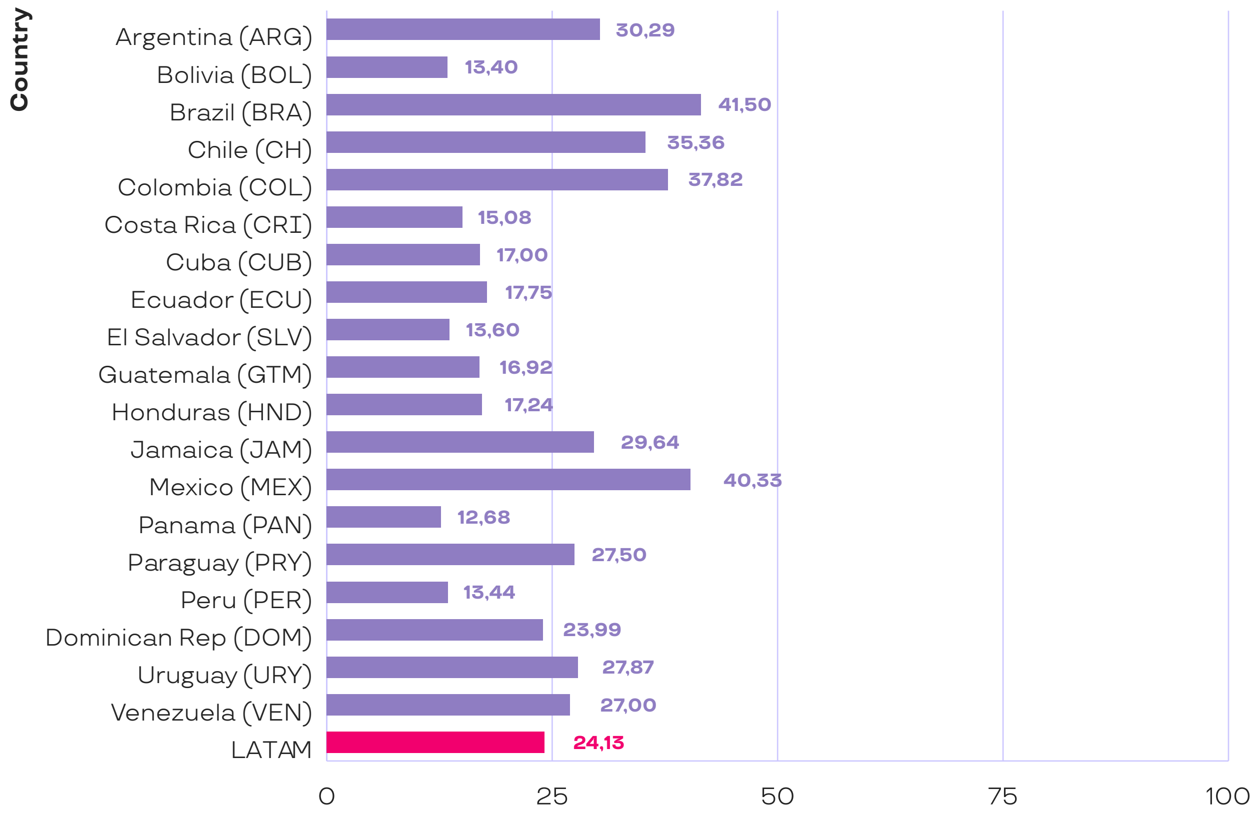
d) Use and Impact

This subindicator explores representative use cases of data, identifying which sectors or groups within the population are interested in utilizing data within a country.

Graph 22 shows that, similar to the other three subindicators, the results remain unequal, with a regional average of 24.13 points. The Caribbean region concentrates the countries with the lowest scores (ranging from 23.99 points to 13.40), while Brazil (41.50), Mexico (40.33), and Colombia (37.82) exceed the average.

This evidence suggests that the ability to leverage data to drive economic and social development varies considerably and could exacerbate the gaps between countries in terms of innovation and technological advancement.

Graph 22: Data Barometer - Use and Impact



*The Availability subindicator includes imputed data using the MICE method (Multiple Imputation by Chained Equations): CUB VEN

Source: 2024 ILIA / Data: Global Barometer's

C.5 Human Talent Subdimension

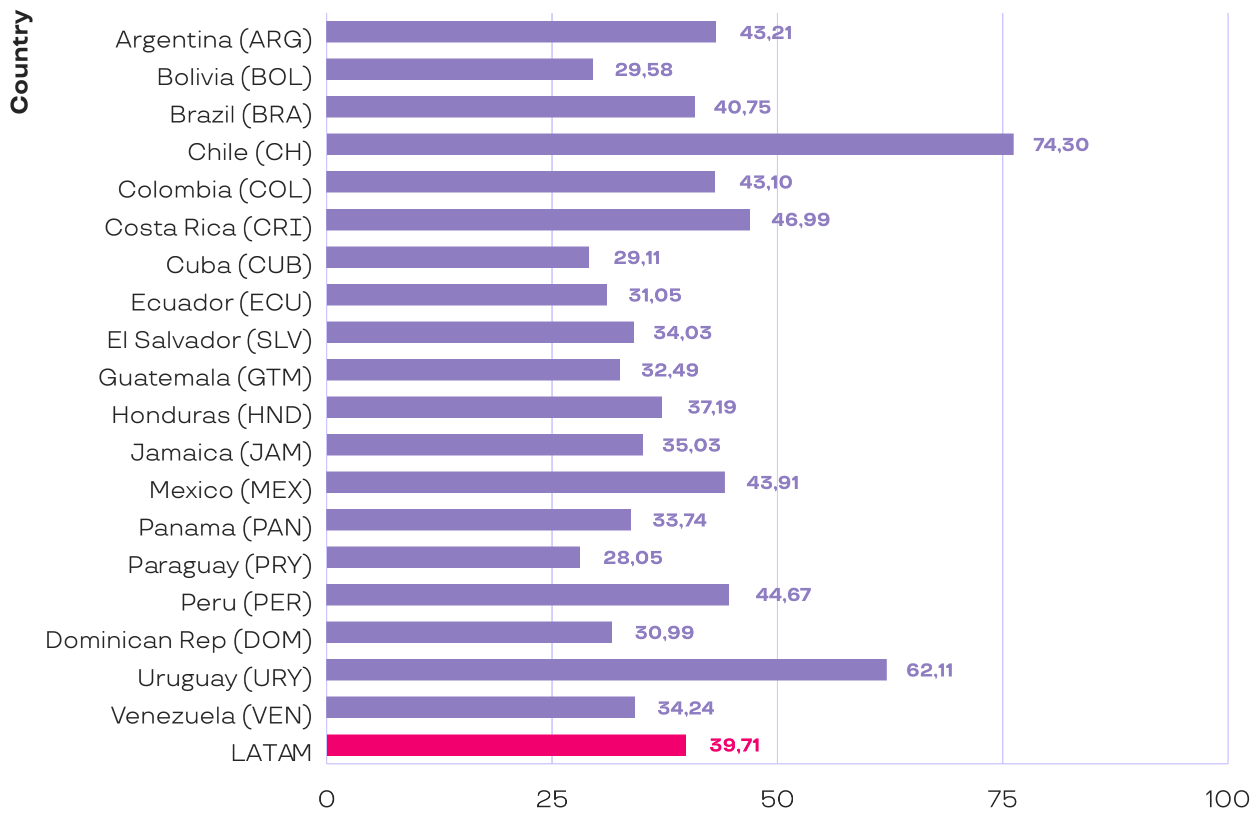
Human Talent is the driving force behind innovation and technological development. Having skilled professionals in AI is the starting point to enhance the adoption and utilization of this technology, which has the potential to positively impact the economies of countries through improvements in productivity and the individuals' quality of life.

For a nation to possess the talent capable of designing, developing, and implementing AI-based solutions, it is essential to have public policies and programs aimed in that direction, both in primary education and in continuous training. To cover all the elements that influence a country's AI capabilities, this subdimension includes three indicators: **AI Literacy, Professional Training, and Advanced Human Talent.**

Considering the fundamental importance of generating Human Talent, this dimension has been assigned a **weighting of 30% of the score for the Enabling Factors Dimension.**

As shown in **Graph 23,** the Human Talent subdimension has a regional average of 39.71 points, with **Chile (74.30) and Uruguay (62.11) leading** as the only countries surpassing the 60-point barrier. The incorporation of new indicators with greater coverage and specificity smooths out the differences seen in the first version.

Graph 23: Score for Human Talent Subdimension



Source: 2024 ILIA

Countries with high preparedness in human talent (more than 60 points): This group includes those showing the highest scores, indicating a strong capacity for training and availability of specialized human talent in AI. This includes Chile (74.30) and Uruguay (62.11).

Countries with moderate preparedness in human talent (between 40 and 60 points): These have intermediate development in this area, with solid capabilities but still room for improvement, such as Costa Rica (46.99), Peru (44.67), Mexico (43.91), Argentina (43.21), Colombia (43.10), and Brazil (40.75).

Countries in development of human talent (less than 40 points): This category includes countries facing significant challenges in training and retaining specialized talent, including Honduras (37.19), Jamaica (35.03), Venezuela (34.24), El Salvador (34.03), Panama (33.74), Guatemala (32.49), Ecuador (31.05), Dominican Republic (30.99), Bolivia (29.58), Cuba (29.11), and Paraguay (28.05).

C.5.1 AI Literacy

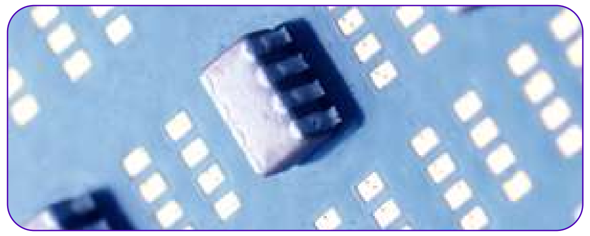
As an indicator, AI Literacy examines the presence of content related to **AI or computer science in each country's school curriculum,** formal public initiatives for education in AI, and the English proficiency of its population. Literacy, in this context, is considered as an enabler for the development of vocations linked to AI in the realm of professional development.

These three subindicators provide an approximate perspective on the elements deemed necessary to have a population capable of developing and handling tools for computational thinking, programming, and AI at early stages.

It is important to note that this is not the same concept included in the "AI in the Labor Market Report for Latin America," which addresses AI literacy as the acquisition of knowledge and skills to use AI tools, especially generative ones.

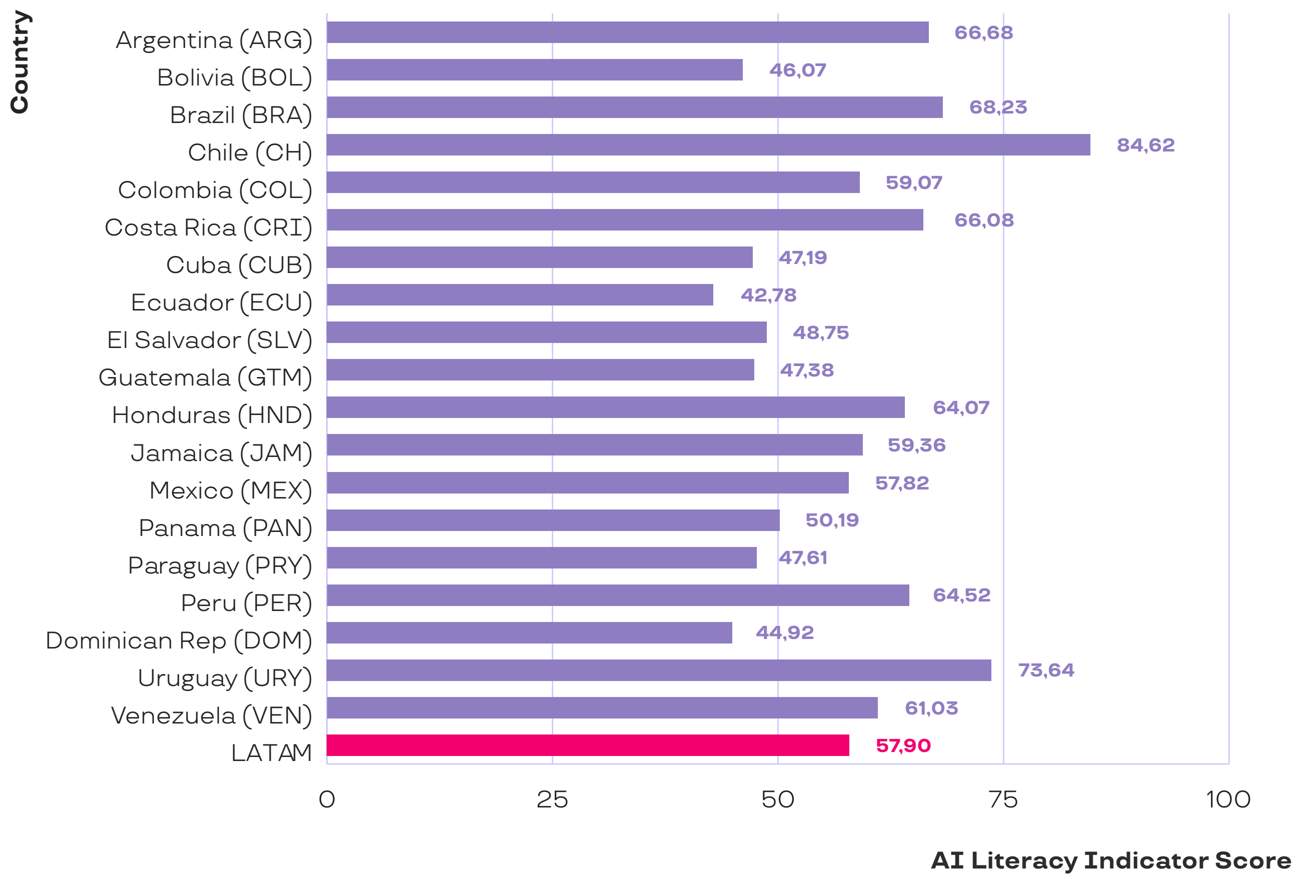
This indicator represents **40% of the total weight of the Human Talent subdimension** and is composed of these three subindicators:

a) Education in science
b) Early education in AI
c) English proficiency



In **Graph 24,** the assessment of skills and knowledge in mathematics and sciences of secondary school or second cycle students is observed, according to performance in comparable standardized tests in the region. The regional score is an average of 57.9 points across 19 countries.

Graph 24: AI Literacy Indicator Score



Source: 2024 ILIA

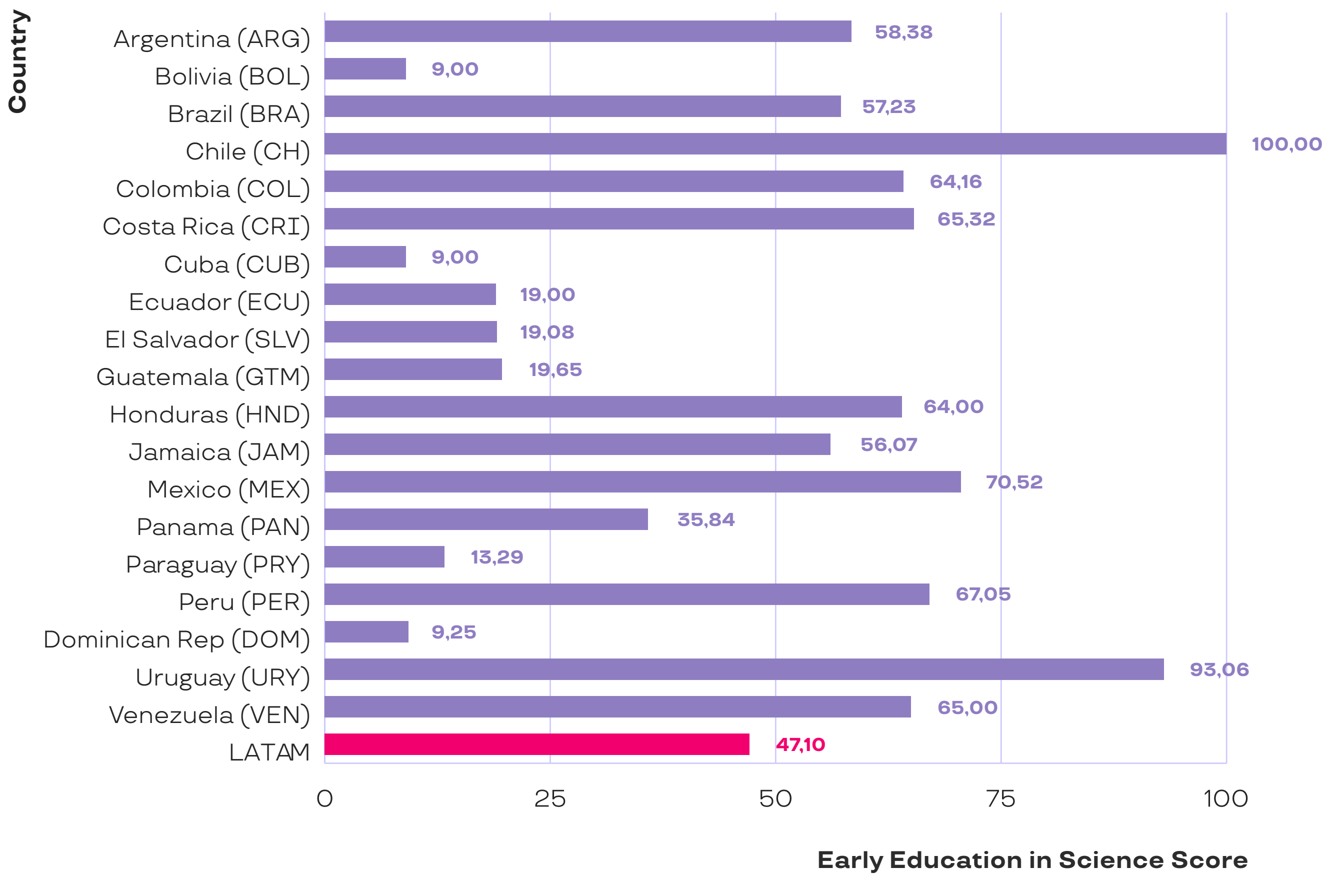
The results for this indicator reveal that disparities in AI literacy in the region stem from structural differences in educational systems. Although all countries incorporate content related to information technologies, only Brazil and Chile have made significant progress in integrating these themes into the mandatory curriculum.

a) Early Education in Science

This subindicator gathers information on the skills and knowledge in mathematics and sciences of students in the second cycle of secondary education (15 years old), measured by the PISA test (Programme for International Student Assessment, coordinated by the OECD). This measurement provides an approximation of each country's level of knowledge necessary for the development of early vocations associated with AI, such as computational thinking and programming skills.

Graph 25 shows a high heterogeneity in scores across the 19 countries, with a regional average of 47.10 points and nine countries falling below this level. The countries leading the measurement are Chile with the highest score, Uruguay with 93.06 points, and Mexico with 70.52 points.

Graph 25: Scores for the Early Education in Science Subdimension



*The subindicator contains data imputed using the MICE method (Multiple Imputation by Chained Equations): BOL CUB ECU HND VEN

Source: 2024 ILIA / Data: OECD

b) Early Education in AI

This refers to the inclusion of content related to **Information and Communication Technologies (ICT)**, or more broadly, **AI-related content, in the secondary education curriculum guidelines**. The score for this subindicator was calculated based on a categorization from 1 to 5, without making any value judgment regarding the quality of the content or the ability to teach it in the classroom. Only the existence of projects that included these topics in the curriculum was assessed.

Table 3 reveals that only two countries, **Chile and Brazil, achieve the maximum score (100),** reflecting the implementation of AI topics in the curriculum guidelines. Meanwhile, **most other countries score around 75 points,** indicating that they do have some level of integration of ICT-related subjects that are mandatory in their school programs.

Categories	Score
1= No proposal	0 points
2= ICT proposal	25 points
3= AI proposal	50 points
4= ICT implemented (technology, information and computing)	75 points
5= AI implemented	100 points

Table 3: Scores for the Early Education in AI Subindicator

Country	AR	BOL	BRA	CH	COL	CRI	CUB	ECU	SLV	GTM
Category	4	4	5	5	4	4	4	4	4	4
Score	75	75	100	100	75	75	75	75	75	75

Country	HON	JAM	MX	PAN	PRY	PER	DOM	URY	VEN	LATAM Average
Category	4	4	4	4	4	4	4	4	4	
Score	75	75	75	75	75	75	75	75	75	77,63

Source: 2024 ILIA / Data: OECD

c) English Proficiency

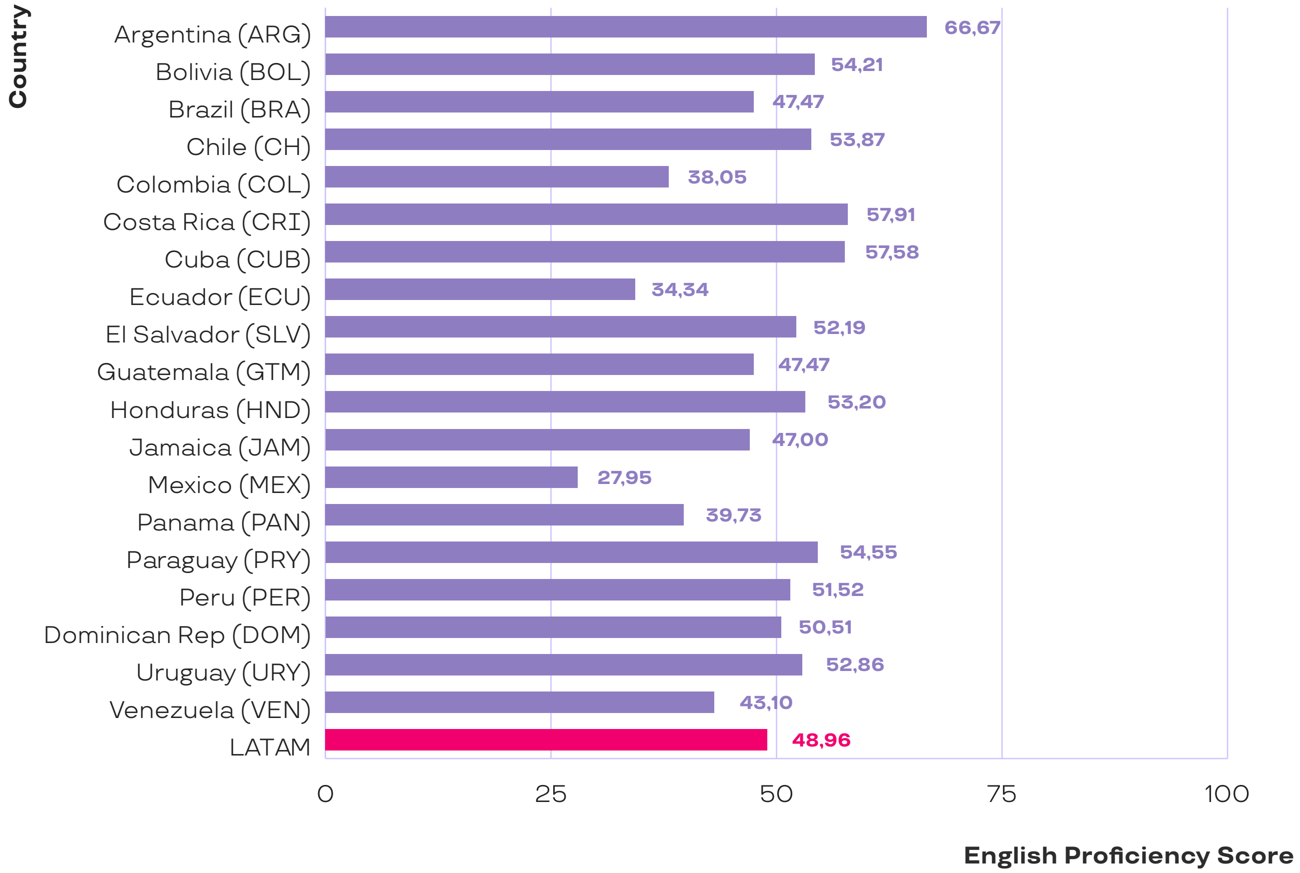
Considering the degree to which a country's inhabitants are proficient in English is important to measure, as it is the standard language for programming.

Graph 26 shows the scores for each country in terms of its citizens' skills in reading and listening comprehension in this language.

It is worth noting that self-assessment tests called EF Standard English Test (EF SET) are available online and are voluntary. Each country's results on these tests are scored according to the levels of the Common European Framework of Reference (CEFR: C2, C1, B2, B1, A2, A1, pre-A1) as well as an EF EPI score (ranging from 1 to 800). Both scores are entered into the English Proficiency Index A Ranking, which provides the raw number for this subindicator.

The data shows that most of the countries studied are above the regional average score of 48.96 points, while only six countries fall below this figure.

Graph 26: Score for the English Proficiency SubIndicator



Source: 2024 ILIA / Data: English Proficiency Index A Ranking

In terms of English proficiency, only Argentina stands out above the average, with the rest of the countries scoring around the mean. These findings suggest that public and private efforts should remain focused on improving educational systems to develop basic skills that enable the workforce to leverage the technological revolution.

*The subindicator contains data imputed using the MICE (Multiple Imputation by Chained Equations) method: JAM

C.5.2 Professional Training in AI

This indicator measures the AI skills that workers possess during their professional careers, considering the availability of skills present in the workforce and the number of graduates in STEM disciplines **(Science, Technology, Engineering, and Mathematics).**

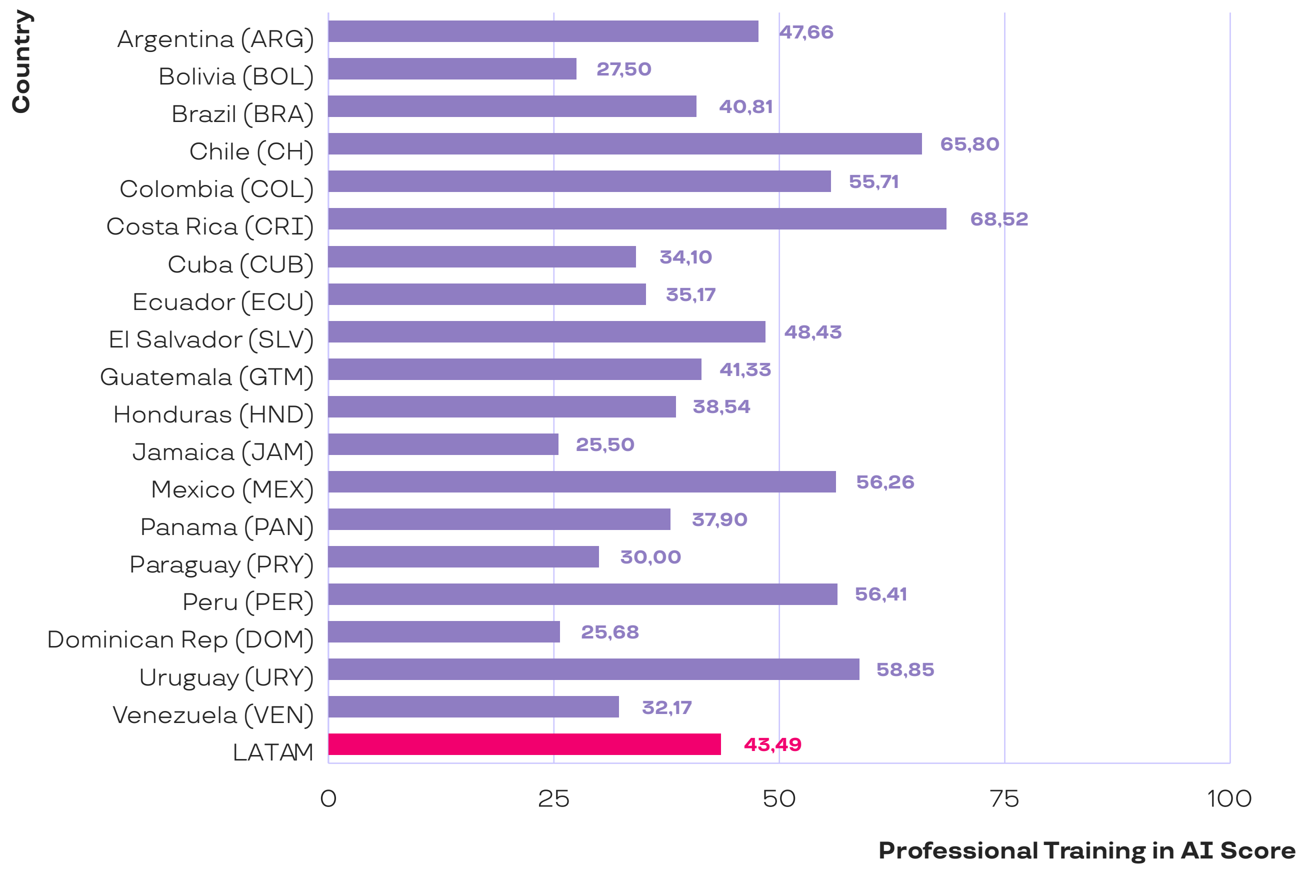
The conclusions of this indicator are complemented by findings from the regional workforce analysis conducted in collaboration with LinkedIn. Although the data from this platform does not cover enough countries to constitute subindicators, it appropriately reflects the regional context, which is why it is analyzed separately.

This indicator represents **30% of the total weight** of the Human Talent subdimension and consists of two subindicators:

a) AI Skills Penetration
b) STEM Graduates

In **Graph 27**, the varying scores obtained by each country for this indicator can be seen. With a regional reference score of **43.49**, three countries are shown to lead: Costa Rica (68.52), Chile (65.80), and Uruguay (58.85).

Graph 27: Score for Professional Training in AI Indicator



Source: 2024 ILIA

a) AI Skills Penetration

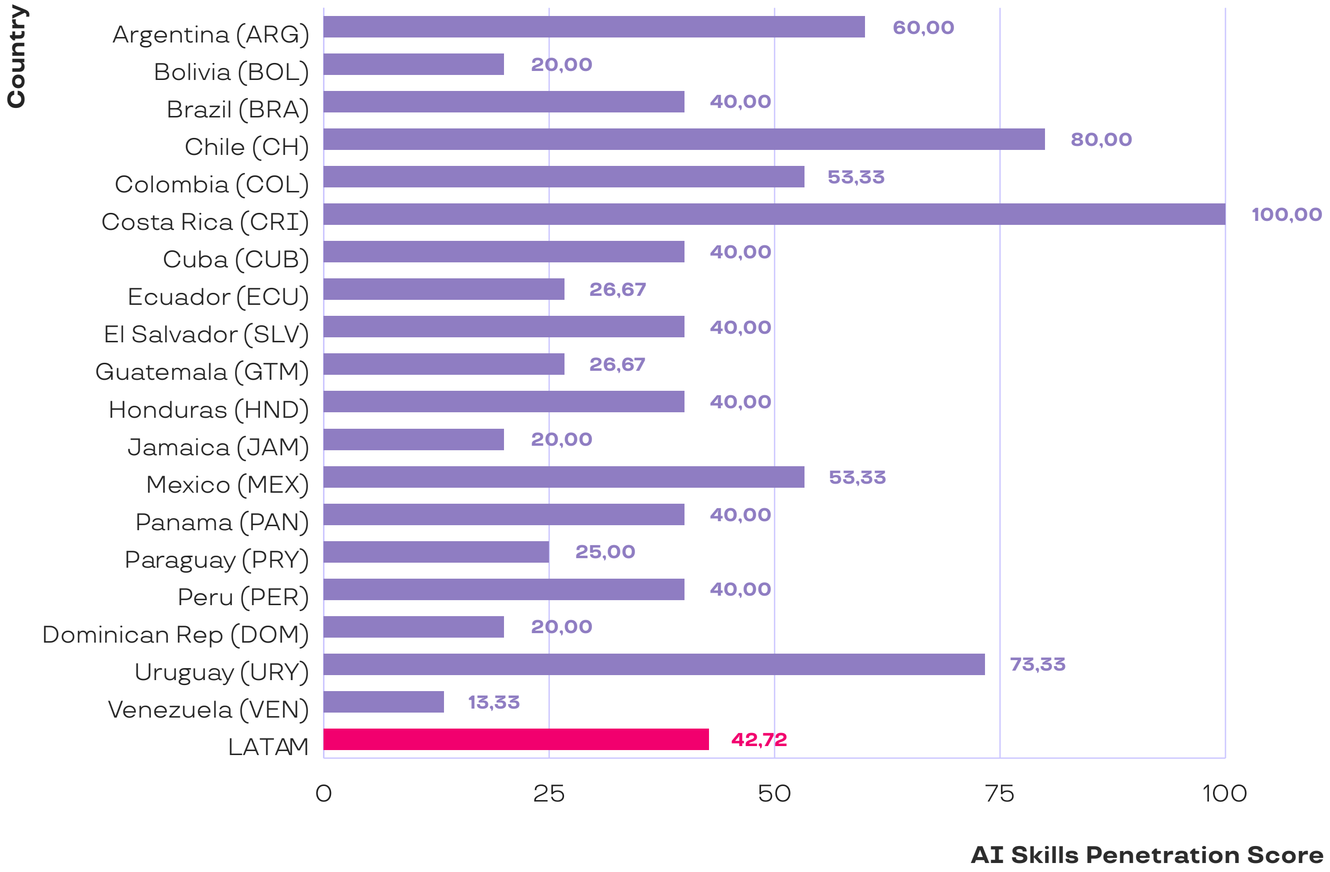
This subindicator specifically measures the relative penetration of AI-related competencies within the workforce, indicating how widespread AI skills are among the working population.

To keep up-to-date measurements of AI adoption in the labor market, regional data was obtained from private information sources, in this case, LinkedIn. This allowed for an understanding of how key AI-related technological skills are currently being incorporated by the workforce in countries across the region.

For the integration of AI into productive processes to be beneficial for countries, the workforce must acquire specific AI-related skills.

The data presented in Graph 28 shows that the leading countries in the region are **Costa Rica, with the highest score; Chile, with 80 points; and Uruguay, with 73.33**. Additionally, with a regional average of **42.72 points**, nearly 70% of the countries in the study are below this score.

Graph 28: Score for the AI Skills Penetration SubIndicator



*The subindicator contains data imputed using the MICE (Multiple Imputation by Chained Equations) method: CUB SLV HND PRY

Source: 2024 ILIA / Data: LinkedIn

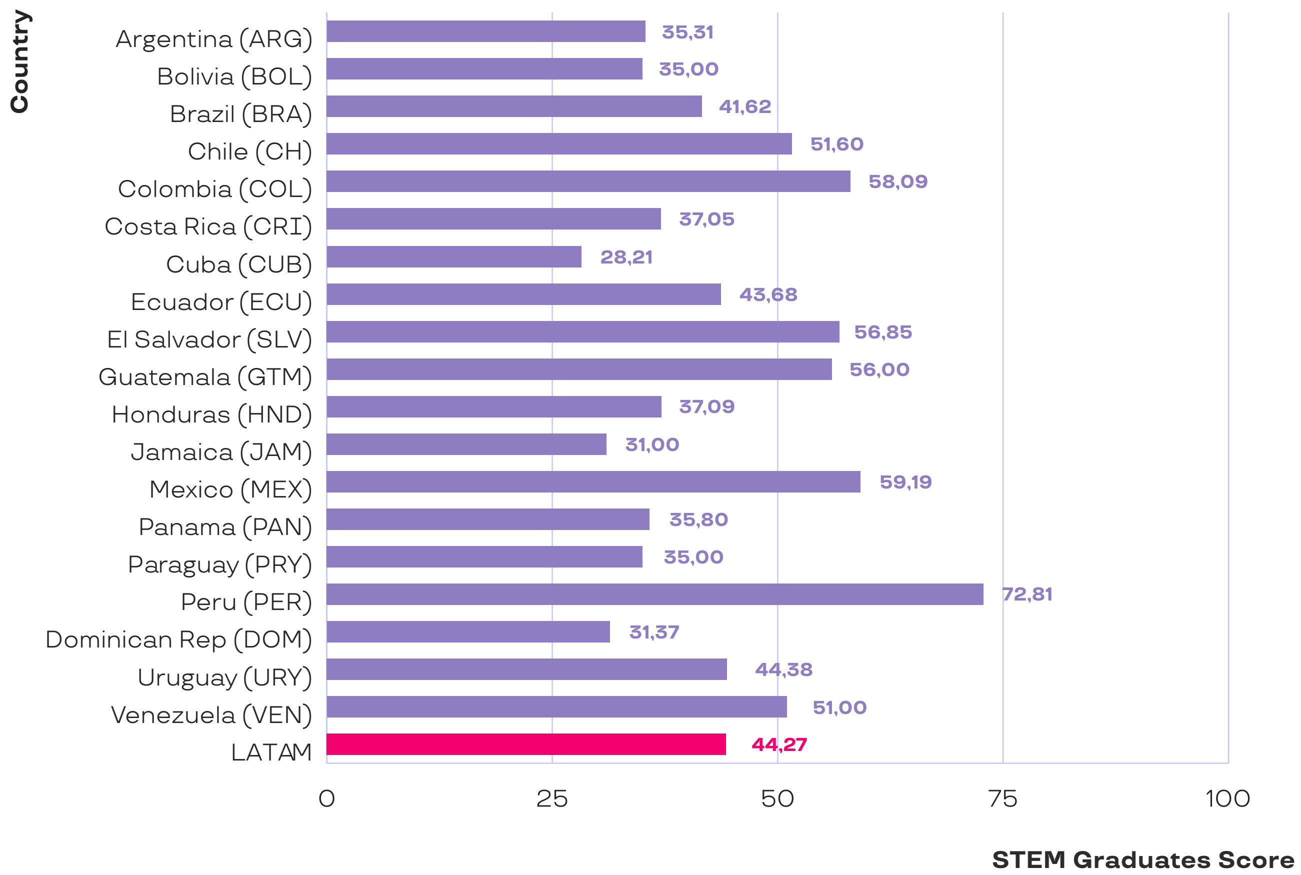
Graph 28 shows that **only six nations exceed the regional average**, which corresponds to a relative AI skills penetration of 0.1% of the population. This figure is, in itself, low compared to the global average (0.32%), highlighting the region's structural lag in developing skills in this area.

b) STEM Graduates

This refers to the percentage of individuals who successfully completed a higher education program (bachelor's degree) in a field related to Science, Technology, Engineering, or Mathematics (STEM) relative to the total number of graduates in the country. Based on this measurement, the region scored 44.27.

In this subindicator, **Peru stands out with 72.81 points**, placing it 20 points above the regional average. This figure represents a STEM graduation rate of 29.64%. This high rate may be attributed to the strength of Peru's higher education system in engineering and sciences, while other countries like Brazil, Uruguay, or Chile have a more significant relative share of non-STEM fields.

Chart 29: Score for the STEM Graduates SubIndicator



*The subindicator contains data imputed using the MICE (Multiple Imputation by Chained Equations) method: BOL GTM JAM PRY VEN

Source: 2024 ILIA / Data: UNESCO-UISUIS

C.5.3 Advanced Human Talent

The final indicator in this subdimension is Advanced Human Talent, which considers each country's capacity to develop AI-related skills and competencies in professionals through postgraduate programs with an AI emphasis.

This indicator assesses the maturity of higher education systems in training highly qualified professionals in fields associated with both knowledge generation and the application of models in more complex contexts. In this regard, considering the Latin American and Caribbean context, doctoral programs reflect the capacity to train specialists with an academic focus, while master's programs are more industry and profession oriented.

This indicator represents **30% of the total weight of the Human Talent subdimension** and is composed of four subindicators:

a) Master's Programs in AI (QS Ranking)
b) Doctoral Programs in AI (QS Ranking)
c) Master's Programs in AI at Accredited Universities
d) Doctoral Programs in AI at Accredited Universities

The QS Ranking indicators aim to show the presence of highly competitive training programs within a global framework, while the evaluation of programs at accredited universities indicates the strength of the discipline from the perspective of local quality standards in each country.

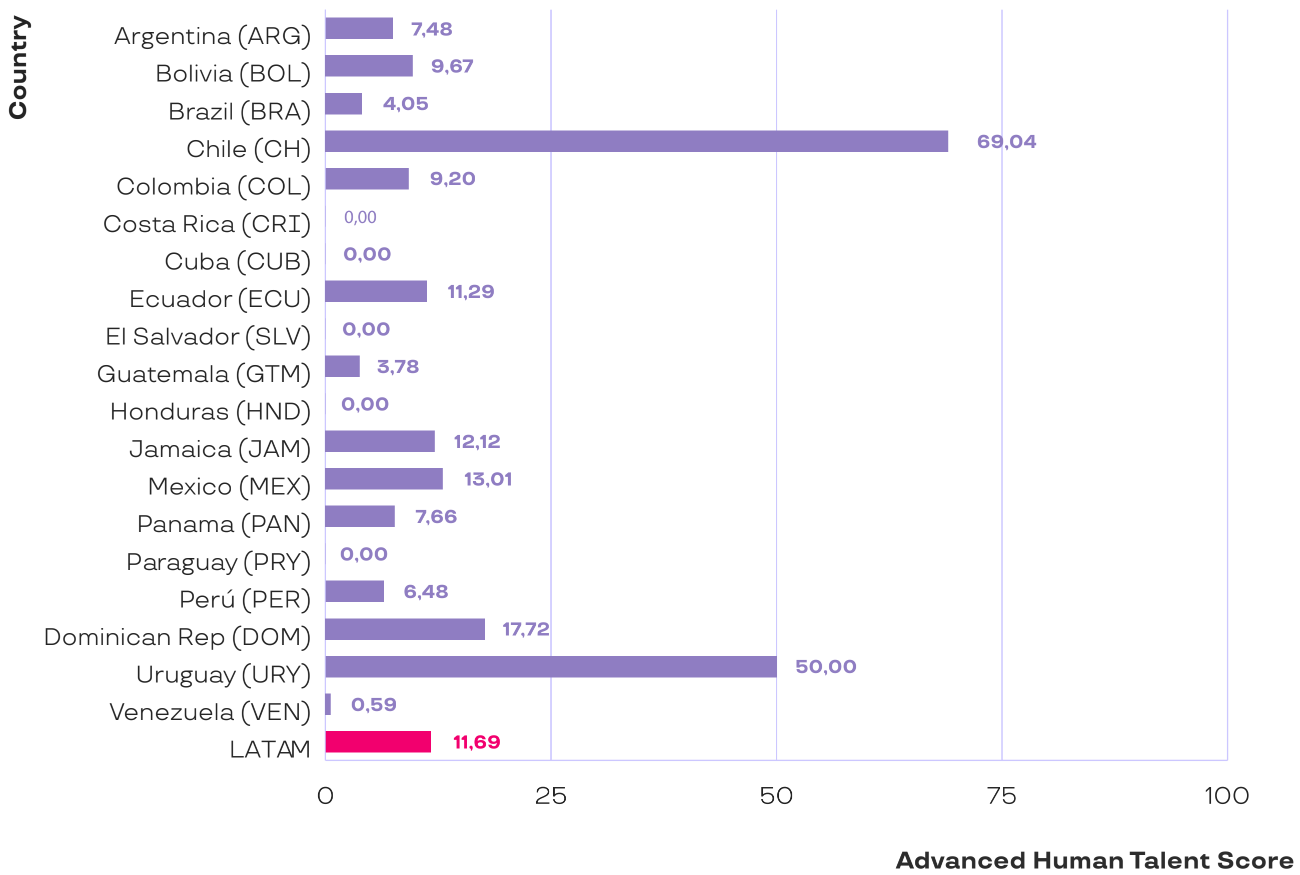
Graph 30 shows the total score achieved by the region in this indicator, with a regional score of 11.69 points. **Chile stands out with 69.04 points**, and **Uruguay with 50**. The rest of the region does not exceed 20 points, which aligns with the gaps observed compared to the global average in AI skills penetration and the generally low levels of AI literacy.

a)Master's Programs in AI at Universities in the QS Ranking

Graph 31 shows the score for the subindicator master's Programs in AI at Universities in the QS Ranking, referring to the top 1,000 universities ranked in the QS World University Rankings.

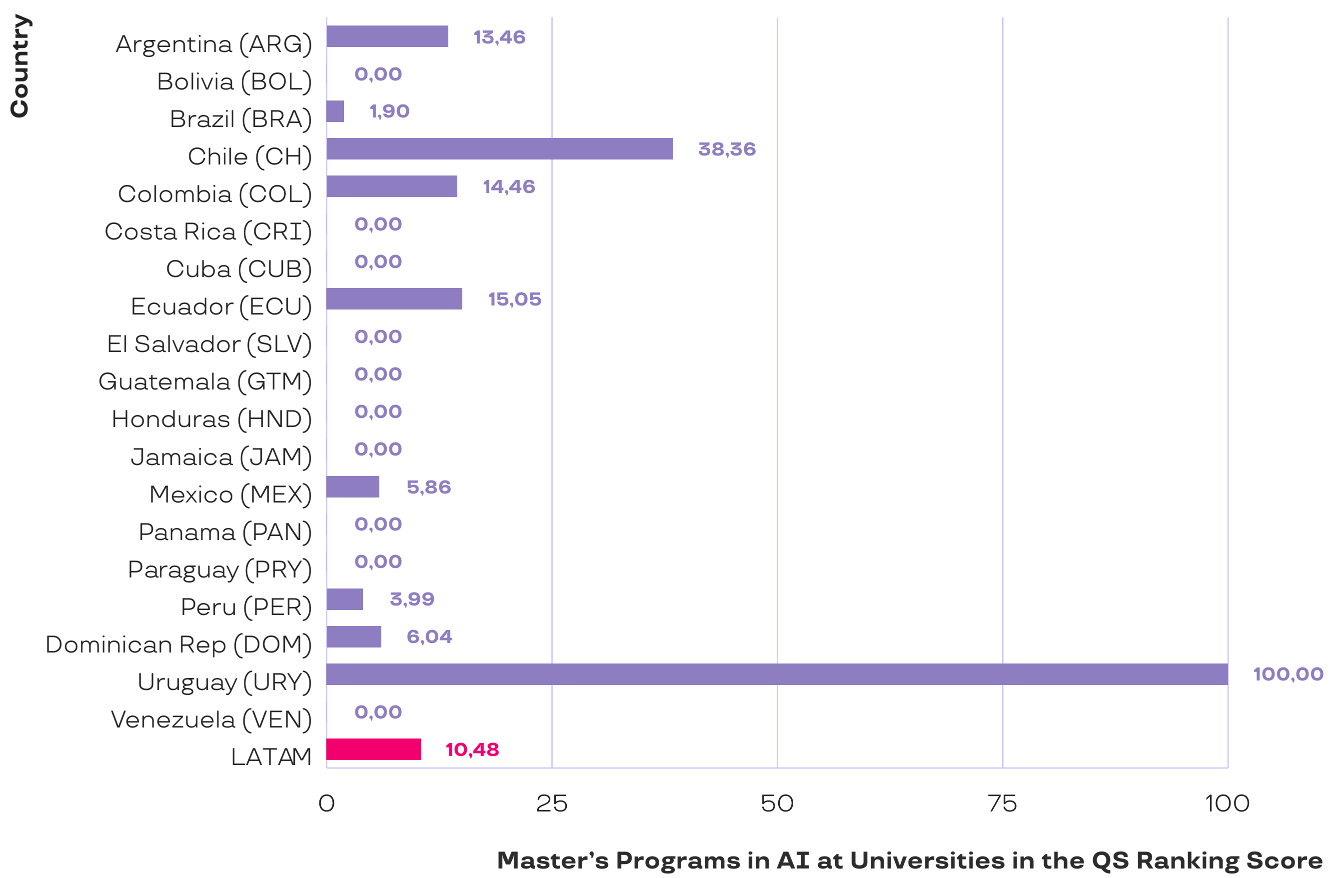
This subindicator indicates that **only nine countries have master's programs in AI** of international excellence, but access to these programs is strongly limited by their low quantity and coverage. The regional average score is 10.48 points, with **Uruguay standing out with 100 points** (equivalent to five master's programs) and **Chile with 38.36 points** (11 master's programs). It is worth noting that Colombia and Mexico also have a significant number of such programs at universities included in the ranking (11 each). However, the data is normalized by population, which creates a difference in the scores obtained. This implies that although the number of programs is high, their relative impact is lower compared to Uruguay and Chile.

Graph 30: Score for the Advanced Human Talent Indicator



Source: 2024 ILIA

Graph 31: Score for the subindicator Master's Programs in AI at Universities in the QS Ranking



Source: 2024 ILIA / Data: CENIA

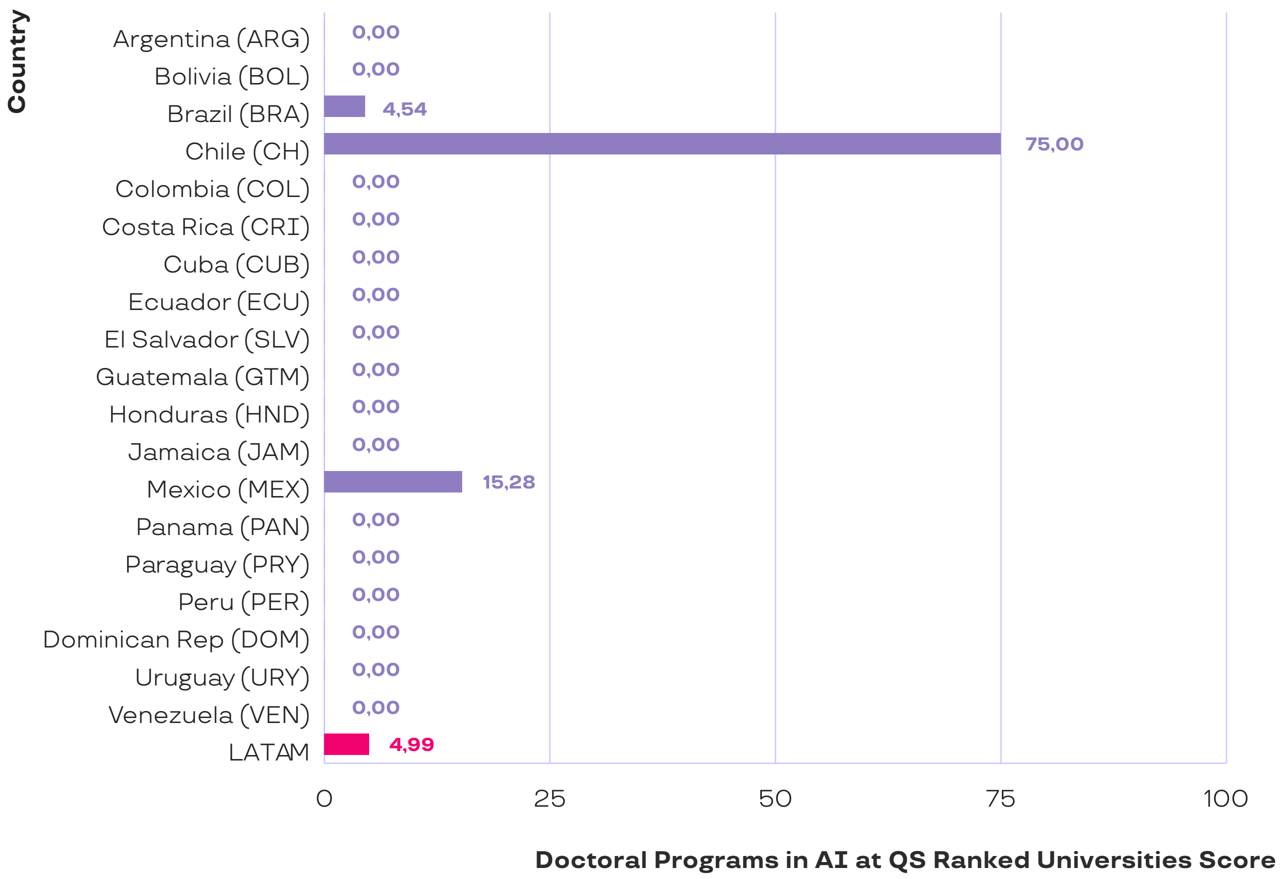
b) Doctoral Programs in AI at Universities in the QS Ranking

This subindicator refers to the production of doctoral programs in AI that are within the top 1,000 universities ranked in the QS World University Rankings.

The score achieved by the region is 4.99 points because **only three countries have doctoral programs in AI** at QS-ranked universities. These countries are **Chile, Mexico, and Brazil.** While Chile shows a score of 75 points (equivalent to three doctoral programs), Mexico demonstrates 15.28 points (four programs). Meanwhile, Brazil exhibits 4.54 points, equivalent to two doctoral programs.

The fact that only three countries have internationally competitive programs for doctoral training reinforces the hypothesis of the need to strengthen the factors that could enable more robust development in this area: appropriate computing capacity and the identification of mechanisms to promote AI research at the local level.

Graph 32: Score for the subindicator Doctoral Programs in AI at Universities in the QS Ranking



Source: 2024 ILIA / Data: CENIA

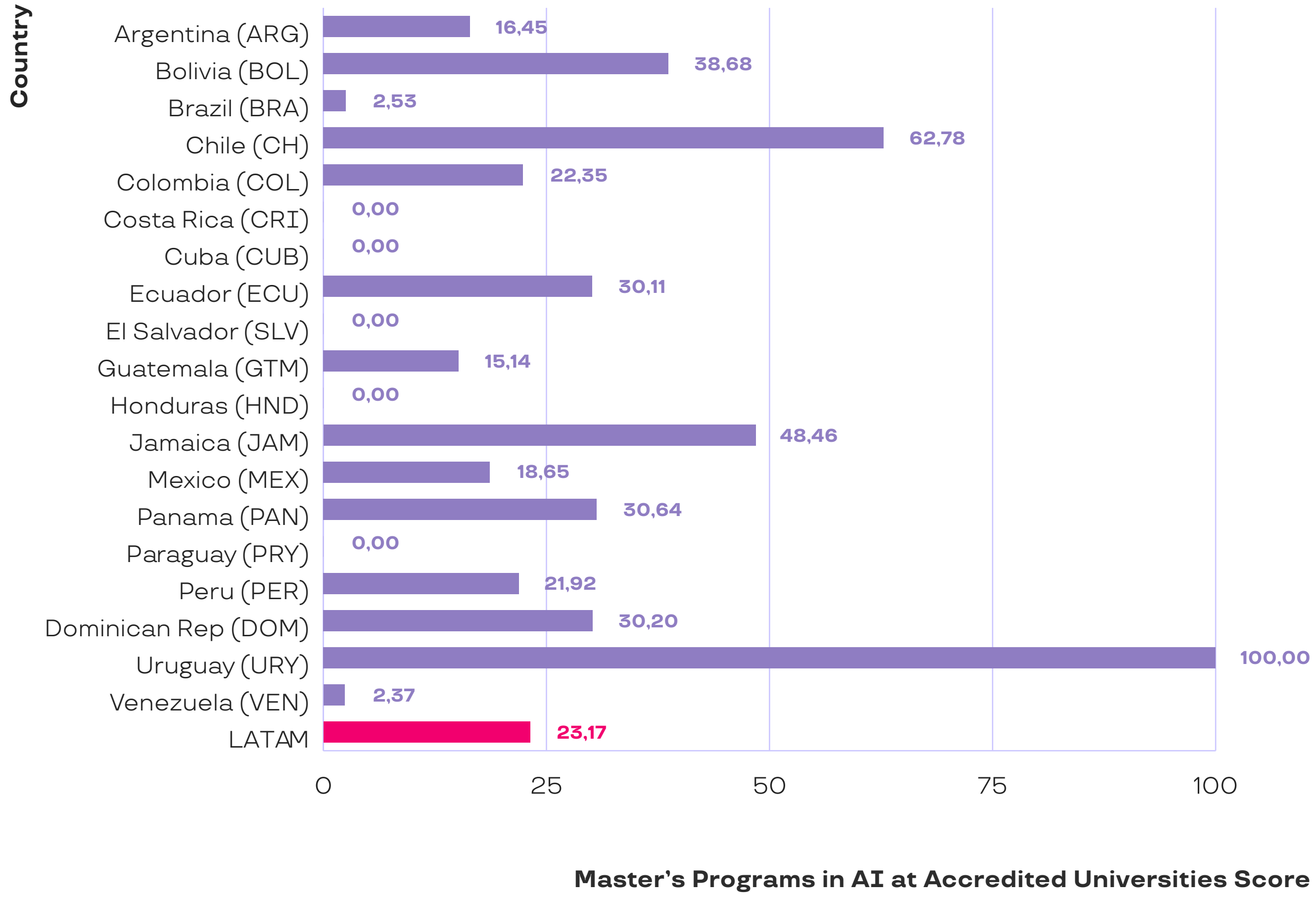
c) Master's Programs in AI at Accredited Universities

This subindicator provides insight into the number of master's programs in AI offered by each university with a certain degree of accreditation according to the relevant agency in each of the 19 countries. This subindicator aims to offer a perspective on the relative maturity of the supply of this type of postgraduate program, using accredited universities in each country as a cutoff criterion.

The countries leading this measurement are **Uruguay, with 100 points, and Chile, with 62.78 points.** It is worth mentioning that five other countries in the region are above the average score, while the rest are below it.

Unlike the subindicator associated with the QS ranking, this one shows that 14 countries have master's programs at accredited universities, indicating a certain level of maturity for the training of advanced human talent at the regional level.

Graph 33: Score for the subindicator Master's Programs in AI at Accredited Universities



Source: 2024 ILIA / Data: CENIA

d) Doctoral Programs in AI at Accredited Universities

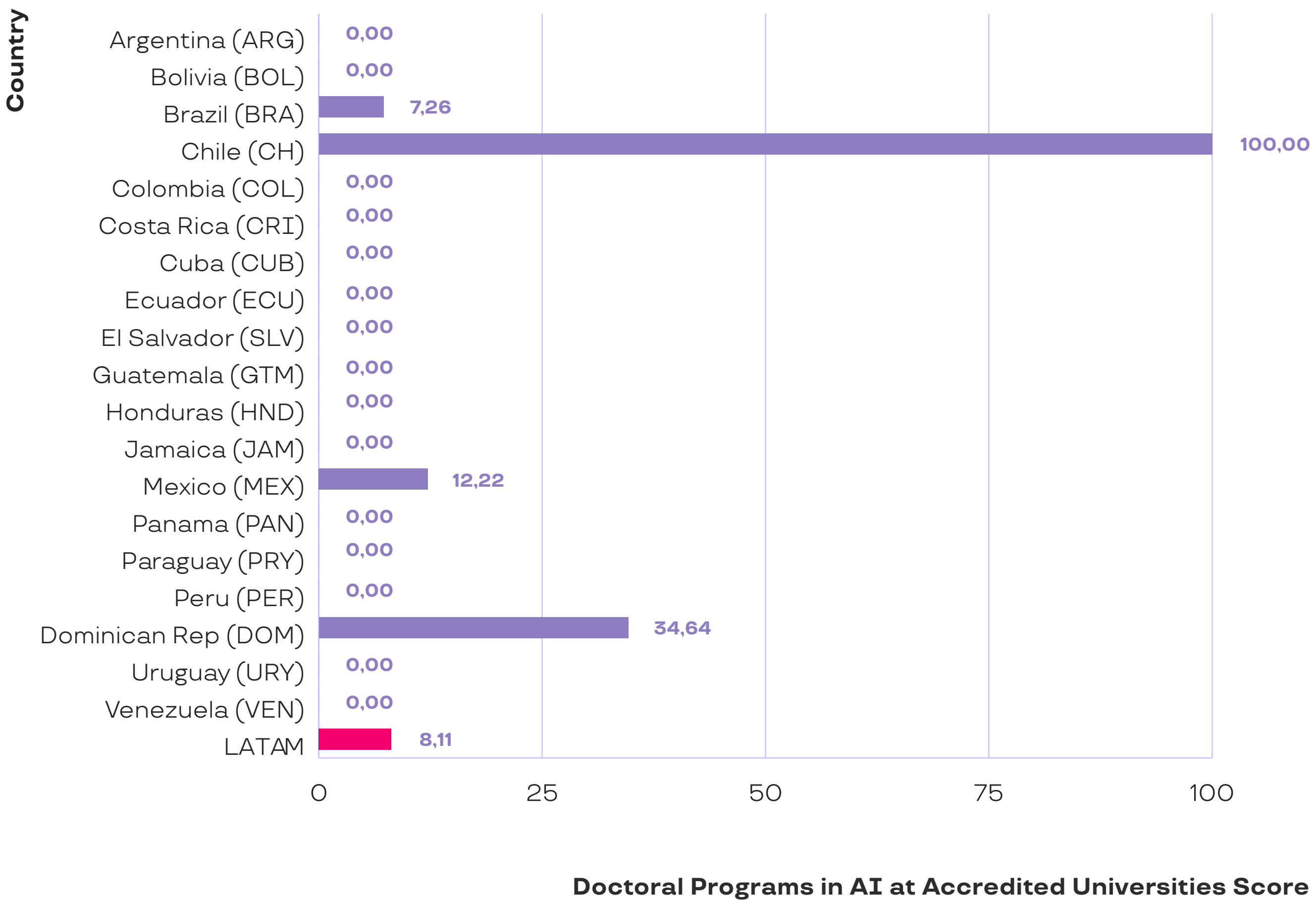
This subindicator shows the number of doctoral programs in AI offered by each of the universities in the 19 countries that are accredited according to their relevant agency.

The region scores 8.11, with **Chile leading with the maximum score** and four doctoral programs. Following Chile is the **Dominican Republic with 34.64 points** and one program. Mexico also has four doctoral programs at accredited institutions but, due to normalization by population, achieves 12.22 points. Finally, Brazil also has four programs, with a score of 7.26.

It is worth mentioning that the remaining countries appear without scores as they do not have an offering of doctoral programs in AI at this particular type of institution.

link

Graph 34: Score for the subindicator Doctoral Programs in AI at Accredited Universities



Source: 2024 ILIA / Data: CENIA

The Value of the Cloud

Plu, the AI Assistant That Promises to Change Education in Brazilian Schools

· As a unique and unprecedented service, one of brazil's largest educational companies, somos educação, offers ai tools for teachers and students through its plurall platform.

· This is plu, the intelligent assistant developed in collaboration with amazon web services (aws) to assist teachers with lesson plans that optimize their time.

· It will be implemented as a pilot project and will be the first of several that will use AWS's generative AI tools to reach over 7,000 schools in Brazil.

On average, a teacher spends two hours daily preparing a class. This routine could change for many educators in Brazil with just requesting an intelligent AI assistant to generate a detailed plan for a 50-minute lesson. This is Plurall AI or Plu, the generative AI assistant created by one of Brazil's leading educational companies, **SOMOS Educação**, in collaboration with Amazon Web Services (AWS). Its goal is to help teachers and students plan lessons more quickly, accurately, and effectively.

At Bett Brazil 2024, the country's most important local educational fair, the company chose to present the pilot of this virtual assistant, capable of delivering a complete script for a teacher's class in just seconds. Not only that, but it also provides illustrations, suggested activities for students, and even personalized questions for students who need to take exams with lower levels of demand.

SOMOS Educação aims to revolutionize basic education in Brazil by bringing the intelligent assistant Plu to over 5,000 schools by 2025. The main goal of the technology is to enable teachers to spend their working hours on more personalized interactions with their students. According to the OECD's International Teaching and Learning Survey (TALIS) 2018 and McKinsey's 2020 report, 67% of teachers' time is dedicated to activities outside the classroom, such as lesson preparation. McKinsey estimates that between 20% and 40% of these activities can be optimized with technology, which could provide professionals with up to 12 additional days of productivity per year for every 5% of optimization. "We believe this technology can be incredibly useful in freeing them from time-consuming tasks. If we consider a conservative goal of 10% optimization, it could mean nearly 24 additional days a year that teachers could dedicate to supporting students, improving lessons, or taking care of their own well-being. These metrics may vary over time and may have other impacts to measure," says Rafael Augusto Teixeira, senior IT manager at SOMOS Educação.

"Generative AI is one of the most transformative technologies of our generation. It addresses some of humanity's most challenging problems, enhancing human performance and maximizing productivity. (...) In the field of education, AI has a significant impact by offering various advantages that can transform the way we learn and teach," says Cleber Morais, AWS's director of enterprise sales for Latin America.

Successful Outcomes

For nearly a century, **SOMOS Educação,** a leader in primary and secondary education in Brazil, has provided comprehensive services to schools, including educational tools and online learning. Its digital platform, Plurall, serves over 7 million students and 120,000 teachers in 7,000 schools since 2014, providing digital books, activities, assessments, and other online tools to that community.

Aware that AI is here to stay and has great potential to transform the school environment, SOMOS Educação approached the AWS team in June 2023 with the purpose of launching a GenAI-based solution that will impact the educational market. "After collaborative work between the teams at AWS and SOMOS Educação, the virtual assistant for teachers was selected as a project to invest in, as it could have scalable adoption," says Morais.

Thus, within its digital platform Plurall, the educational company integrated this chatbot based on generative AI to offer advanced and personalized solutions. "Plu uses our extensive content database to generate responses and meet user requests, such as creating complete lesson plans, summarizing texts, providing activity lists, illustrative images, unique questions, complete exams, interdisciplinary lessons, bilingual content, and adjusting the complexity level of certain topics," explains Teixeira.

The intelligent assistant Plu is available for both teachers and students. For students, it can analyze content, ask questions, request summaries, additional activities, as well as establish study plans and many other applications. Meanwhile, for teachers —through the Adaptive Teaching tool— it can recommend new content and skills for students to work on. By July 2024, 3,400 students from various schools had been testing the assistant.

"Not only have school owners and administrators highlighted the results of the platform so far, but also the teachers and coordinators themselves. The reception has been so positive that we have created a waiting list for the pilot. Teachers with decades of experience have commented that the tool offers new perspectives and improves lesson preparation or summaries for the board," says Teixeira.

AWS Generative AI

To create the intelligent assistant Plu, SOMOS Educação used Amazon Bedrock, a cloud services platform offered by Amazon Web Services (AWS) that facilitates the creation, training, and deployment of AI models that can be adapted to a variety of specific tasks for developers and businesses. By using prompts —tools to guide and customize responses— the developers adjusted the behavior of these pre-trained models according to the specific needs of the educational context. This contributed to improve the chat applications used by teachers and students, ensuring more accurate and relevant responses to educational requirements.

Among the AWS tools used in the development of Plu, notable mentions include CloudFront for content caching in the front-end application and RDS for managing users and school data. Other tools used include Amazon EKS (Elastic Kubernetes Service), which facilitates the management and execution of cloud applications to ensure that the intelligent assistant operates efficiently and without interruptions; Amazon S3 (Simple Storage Service), which provides secure and scalable cloud storage to quickly store all necessary information and make it accessible when needed; Amazon OpenSearch Service, which allows the rapid and precise searching and analysis of large volumes of data, ensuring that teachers can quickly obtain the information they need; and Amazon SQS, which enables the sending and receiving of messages between different parts of the system, ensuring smooth communication within the chatbot. Lastly, there is Amazon SNS, which facilitates the efficient distribution of notifications and coordination of the service.

The AWS executive for Latin America indicated that the company worked with Accenture when designing the architecture of the GenAI model for the virtual assistant, as well as in the development, implementation, and training of SOMOS Educação teams. "AWS offers companies more than just a simple chatbot, a tool, or an LLM: we enable multiple capabilities, such as applications with integrated generative AI, tools for creating customized generative AI applications, and efficient infrastructure that scales. All with safeguards and security controls so that companies can operate with confidence. In the near future, all applications will feature generative AI to make them more useful, personal, and engaging," says Morais. One of the strengths of SOMOS Educação's intelligent assistant is the vast educational content database the company possesses, one of the largest in the world by volume, which supports the assistant. To manage it, they received guidance from AWS Brazil and used the RAG (Retrieve, Augment, Generate) approach, a method upon which AI relies —specifically in language models or text generation— to improve the quality and relevance of the responses generated by AI to teachers and students, improving overall systems like this chatbot.

"We believe that SOMOS's vast knowledge base, powered by AI, can generate rapid changes in the learning process, not only in Brazil but worldwide. This technology can be easily adapted to other languages and content bases, thanks to the power of AI," says Teixeira.

New Tools

Currently, the implementation of generative AI through this virtual assistant is the spearhead of SOMOS Educação in its educational offering. In fact, it has established a long-term roadmap to implement generative AI across the entire platform, as explained by Bruno Brusco, director of the digital area responsible for the entire operation of the Plurall platform.

In the first phase, they will focus on improving teachers' productivity through the use of AI. In the second, they will provide specific support to both teachers and students by creating adaptive learning pathways that students can use for personalized tasks or in learning games and challenges sent by tutors. In the third phase, they plan to use the data generated by AI for two key objectives: generating predictions of students' academic performance and providing insights that help administrators make informed decisions. The latter involves offering detailed information on areas for improvement, identified educational trends, and strategic recommendations to enhance student performance and efficiency in educational management.

We have the best educational content in Brazil, which, combined with our strong investment in technology, positions us as leaders in AI initiatives for large-scale education," assures Brusco.

AI in the Labor Market in Latin America

Anywhere in the world, the development of AI depends on the availability of three enabling factors: data, infrastructure, and human talent. The dissemination of AI and its advancement are shaping up to be a dynamic field, in which the ways to conceive and measure adoption and its deployment in the labor market must be continuously updated.

It is natural that usual administrative tools, such as national employment surveys, are methodologically outdated in the face of the whirlwind brought about by this technological revolution. For this reason, it becomes necessary to turn to private information sources, as was done in this case with LinkedIn.

In the previous version of the ILIA, the data provided by this social network revealed a structural deficit in the relative presence of digital and disruptive skills across 20 industries in the region. This deficit is widespread in the countries of Latin America and the Caribbean, with exceptions in certain industries and countries. Therefore, the way to measure the phenomenon at the labor market level for the 2024 version of the ILIA was updated, working with data on the development of skills and competencies in AI in the labor market, which respond to a new international classification.

To understand how the main technological competencies related to AI are currently being incorporated by the workforce in the countries of the region, LinkedIn selected a sample of six countries where 40% of the total workforce had their profiles registered on that network. These countries are Argentina, Brazil, Chile, Costa Rica, Mexico, and Uruguay. This served to ensure the representativeness of the data and the rigor of the conclusions drawn in this report, considering an aggregate of Latin America and the Caribbean. Given the relative importance in terms of population, workforce, and contribution to the regional GDP of these six nations, the data was sufficiently complete to outline regional conclusions.

The data provided by LinkedIn came from users who have added AI competencies to their profiles and/or hold a representative occupation in the field of AI. Through these criteria, a segment of the workforce known as "AI talent" is established, which is classified according to its concentration based on the number of registered users in each country[2].

Analyzing the concentration of AI-related talent by country and the relative penetration of AI competencies provides a metric that constitutes a Continuoustion of the regional analysis initiated in ILIA 2023. This analysis accounts for the prevalence of AI competencies, whether through different occupations or the frequency with which users employ them in their jobs. It is an indicator that ultimately measures the intensity of AI competencies within a given "entity" (country, productive sector, gender).

Secondly, the development of AI competencies is explored, including the recently introduced conceptual distinction by LinkedIn that refers to the development of AI skills, differentiating between AI engineering skills and AI literacy skills. While the former are aimed at building tools with this new technology, the latter are used to apply them. This is followed by a description of the development of AI skills in the workforce between 2015 and 2023, according to countries and productive sectors.

In a third part of this analysis, recent trends in AI talent migration are revealed. This measurement takes available data at a global level, allowing for an understanding of Latin America's position in the global context of AI advancement.

This chapter concludes with a gender perspective evaluation of AI development in the labor market. It is worth noting that although the sample of selected Latin American countries for this edition of the ILIA is considerably smaller than the previous ones, it offers greater accuracy when constructing segmented information by country. This allows for a more detailed examination of the labor markets and provides, in a pioneering manner for the region, data that differentiate between men and women, addressing the existing gender gap in the acquisition and supply of AI-related talent. This is a central approach for the understanding of the disparities that characterize the deployment of this technology in the workforce, but it also sheds light on the opportunities that exist to narrow this gap.

2. The AI talent concentration indicator can be influenced by the adoption of the social network by the workforce of a given country. For more detail, see the sampling criteria in the methodological framework.

3. The current availability of data on AI literacy skills is still limited, focusing the analysis on AI engineering skills

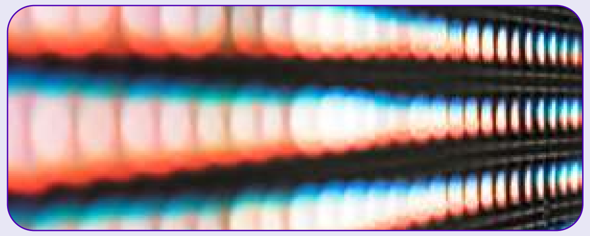
Concentration of AI Talent in the Workforce

The development of AI talent plays a crucial role in the growth and innovation of an increasing number of productive sectors, where workforce members with AI competencies are redefining the demands of companies and the structure of the labor market globally. Without appropriate and available human talent, it is impossible to operate and generate private and public value from the AI revolution, let alone develop innovative solutions based on this technology.

As the dissemination of applications and technologies related to AI continues to advance rapidly, there is also an emerging demand for competencies related to the effective use of these technologies. In this sense, a metric was built based on LinkedIn users who add AI competencies to their profiles and/or hold occupations in AI. This concept encompasses those workforce members who engage in typical AI occupations, such as engineers and data scientists (classified as "Engineering Skills"), but also includes professionals who certify their ability to use AI in their daily tasks and, therefore, possess AI literacy competencies. The following section of this section details the differences and scopes of these skill categories.

The subsequent analysis not only displays the structural lag in the relative penetration of AI skills in Latin America and the Caribbean but also highlights the significant gender differences in this area. Counts of AI talent are used to calculate talent concentration metrics: for example, to calculate the concentration of AI talent, counts of AI talent at the country level are compared to the count of LinkedIn users in the respective countries.

To measure the concentration of AI talent in countries in Latin America and the Caribbean, AI talent counts at the country level are used against LinkedIn membership counts in the respective countries. The concentration of AI talent in Latin America is then presented by country and year **(see Graph 1).**



4. A limitation to consider in this metric is that concentration metrics may be influenced by LinkedIn's coverage in these countries. Additionally, there may be biases in the current data for the Bolivarian Republic of Venezuela due to currently active trade sanctions.

Graph 1: Concentration of AI Talent in Latin America, Average by Country (2024)

Source: Prepared by us based on LinkedIn data.

The development of AI talent in the countries of the region is marked by disparities that have persisted over time. While most countries for which data is available have increased their concentration of AI talent from 2016 to 2024, there are others that have stagnated **(see Graph 2).**

Graph 2: Evolution of AI Talent Concentration by Country (2016-2024)

Source: Own elaboration based on LinkedIn data. Data available for skills in AI engineering.

Taking the average available for AI skills in 2024 as a reference, Costa Rica stands out compared to the other countries for having the highest concentration of AI talent in the region (0.18%). It is followed by the Southern Cone countries: Chile (0.15%), Uruguay (0.14%), Argentina (0.12%), Brazil (0.09%), and Mexico (0.11%). Regarding the countries with the lowest concentration levels, such as Bolivia (0.06%), or those showing slow growth like the Dominican Republic (from 0.03% in 2016 to 0.06% in 2024), their stagnation is concerning. The regional landscape contrasts with the accelerated increase in "AI talent" concentration in Argentina, for example, which doubled from 0.06% in 2016 to 0.12% in 2024. Meanwhile, in Costa Rica, the concentration of AI engineering talent tripled from 0.06% in 2016 to 0.18% in 2024, the highest level in the region.

However, despite the rapid growth rate in AI talent concentration in several countries in the region, the levels recorded by Latin America in this indicator currently do not even reach a quarter of the levels in the countries that lead this indicator globally (see Table 1). The concentration of AI talent in the highlighted Latin American countries, despite having also doubled, does not match the level that the countries that lead this indicator globally had in 2016. These are nations belonging to the global north, characterized by significant industrial and technological productive development.

Table 1: Countries with the Highest AI Talent Concentration by Country and Year

Country	Concentration of AI Engineering Talent	
	2016 Average	2024 Average
Israel	0,49 %	1,13%
Singapore	0,30 %	0,91%
South Korea	0,53 %	0,81%
Luxembourg	0,35 %	0,77%
Finland	0,40 %	0,72%

Source: Own elaboration based on LinkedIn data. Data available for skills in AI engineering.

The following analyzes the concentration of AI talent in the "Technology, Information, and Media" sector by country, as this is the productive sector where AI finds its greatest development. It is observed that the "Technology, Information, and Media" sector presents the highest levels of AI talent concentration in the region across the board. Costa Rica, Uruguay, and Chile stand out both in terms of the growth experienced and the level of AI talent concentration they report.

Graph 3: Concentration of AI Talent in the "Technology, Information, and Media" Sector by Country (2016-2023)

Source: Own elaboration based on LinkedIn data. Data available for skills in AI engineering.

In **Graph 3**, it can be observed that in the case of Latin America and the Caribbean, the concentration of AI talent for professionals with skills in AI engineering has tripled in the "Technology, Information, and Media" sector. However, the country with the highest level in this indicator in the region, Uruguay, which reaches 1.53%, is still far behind the global leaders. This translates to AI engineering talent in the countries of the region being in last place in Table 3.

Table 2: Concentration of AI Talent in the Technology, Information, and Media Sector by Country (2023)

Country	AI Engineering Talent	AI Literacy Talent
Israel	5,23%	0,0246%
Luxembourg	4,69%	0,000%*
Singapore	4,23%	0,0211%
Uruguay	1,53%	0,0249%
Costa Rica	1,37%	0,0022%
Chile	1,16%	0,0045%
Argentina	0,91%	0,0103%
Brazil	0,86%	0,0047%
Mexico	0,82%	0,0103%

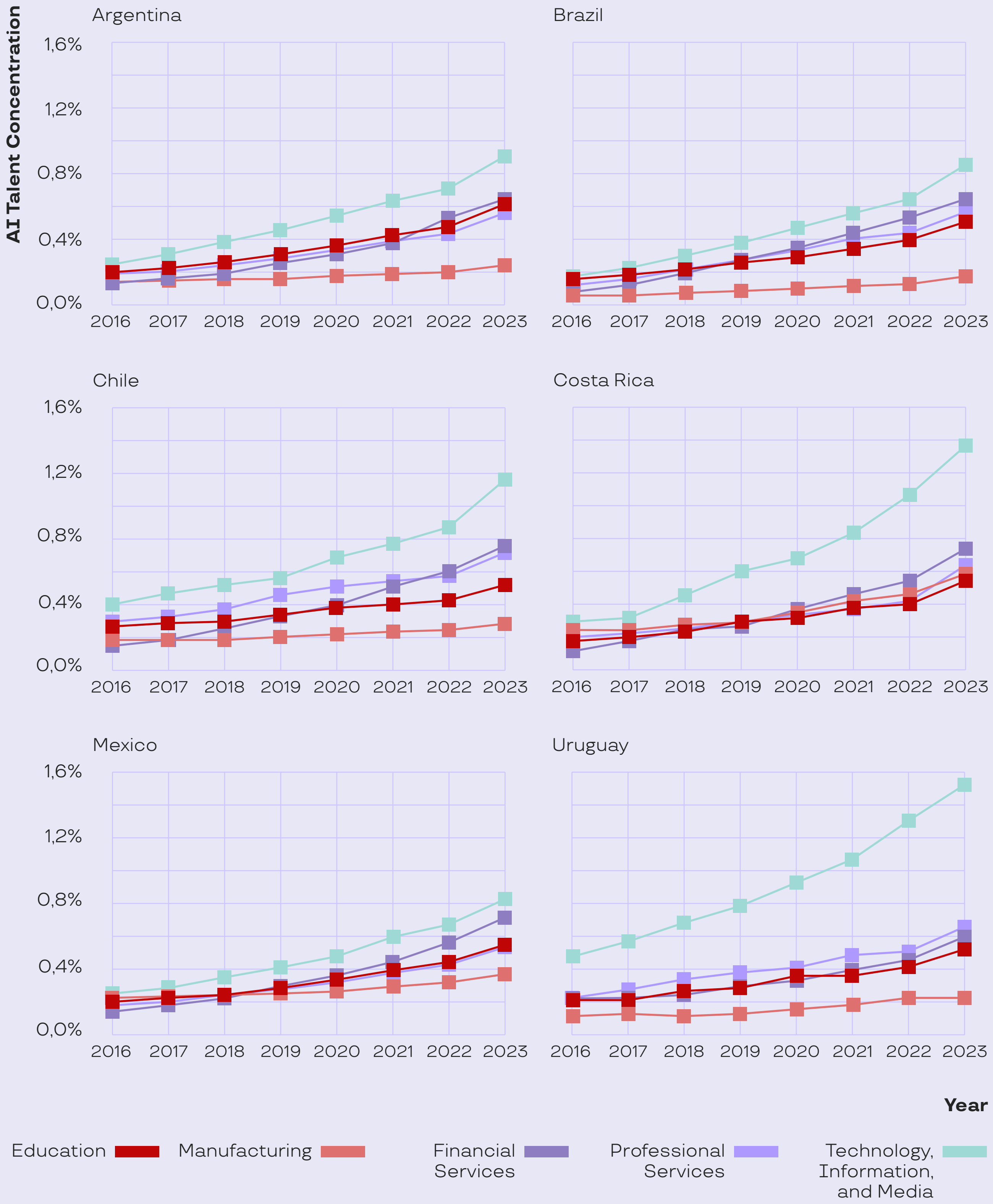
Source: Own elaboration based on LinkedIn data.

In terms of AI literacy skills, Latin American countries are not as far behind the leaders in AI engineering. In this indicator, Uruguay stands out with levels comparable to Israel. This reflects that AI literacy remains a global challenge and, therefore, represents an opportunity for countries in the region in terms of developing and promoting relatively scarce skills.

Having established the landscape of countries leading this indicator globally, the following analyzes Latin America. Available data for the region show a notable expansion in the concentration of AI engineering talent since 2016. However, this does not imply that Latin America's position in the global context has changed.

The following presents a comparison among the countries in the sample regarding the development of AI human capital by productive sectors, highlighting existing regional disparities in this area **(see Graph 4).**

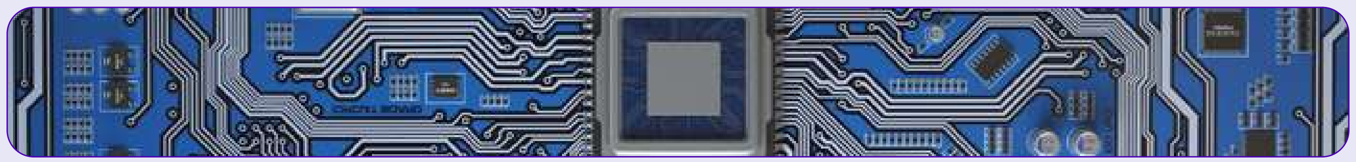
Graph 4: Concentration of AI Talent by Productive Sector, by Country (2016-2023)



Source: Own elaboration based on LinkedIn data. Data available for AI engineering skills.

A sector experiencing considerable growth in talent concentration is financial services. While in Brazil this sector had a 0.08% concentration of AI engineering talent, by 2023 it reached 0.65%. In Chile, the concentration expanded from 0.15% to 0.76% during this period, moving from the second-to-last position among productive sectors to the second-highest concentration of AI talent in the country.

The speed at which AI talent concentration has increased in some sectors contrasts with the relative stagnation of the manufacturing sector, which has comparatively low levels and moderate growth over the analyzed period. Despite this, Brazil tripled its AI talent concentration in this sector between 2016 and 2023, reaching 0.17%. Meanwhile, Mexico went from 0.23% to 0.28%. Costa Rica stands out as an exception, reaching 0.59% in 2024. Regionally, the manufacturing sector ranks last in 2023, the latest year with available data. While in countries like Uruguay it has held the last position since measurements began in 2016, in countries like Costa Rica and Mexico it has been displaced to the bottom, with a slower growth rate compared to more dynamic sectors, such as professional services.



Development of AI Skills in the Workforce in Latin America

AI skills have gained increasing relevance for the workforce in various countries. LinkedIn data allows us to examine the growth these skills have experienced in recent years, using the year-over-year growth measure to identify labor market trends in the AI field **(see Table 3).**

Table 3: Top AI Skills with Highest Year-over-Year Growth Globally (YoY, 2023)

Ranking	AI Competencies	
	AI Engineering	Ai Literacy
1	Generative AI	GPT-4
2	Large Language Models (LLM)	ChatGPT
3	Generative Neural Networks	Prompt Engineering
4	Transformer Models	Google Bard
5	Model Training	GitHub Copilot
6	Responsible AI	Midjourney
7	Image Generation	Stable Diffusion
8	Hyperparameter Tuning	GPT-3
9	Hyperparameter Optimization	DALL-E
10	Time Series Forecasting	Generative Art

Source: Own elaboration based on LinkedIn data

In 2023, globally, within AI engineering competencies, the fastest-growing was Generative AI, followed by Language Models and Generative Neural Networks. Meanwhile, in terms of AI literacy competencies, the fastest-developing skills are GPT-4, ChatGPT, and Prompt Engineering.

LinkedIn data shows that it is AI engineering competencies that demonstrate the fastest growth during 2023 **(see Table 4).**

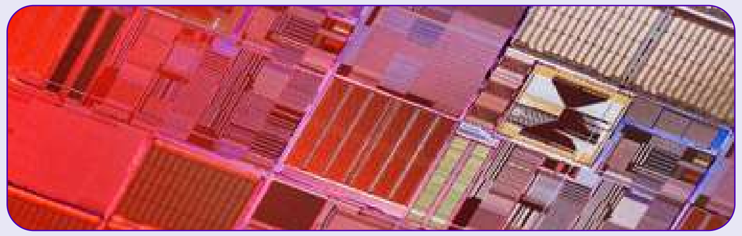


Table 4: AI Engineering Competencies with Highest Year-over-Year Growth (YoY) by Country (2023)

Ranking	País								
	Argentina	Brasil	Chile	Costa Rica	México	Uruguay	EE.UU	India	Israel
1	Sentiment Analysis	Speech Recognition	Pattern Recognition	Artificial Intelligence (AI)	Pattern Recognition	Artificial Intelligence (AI)	Large Language Models (LLM)	Large Language Models (LLM)	3D Reconstruction
2	Artificial Intelligence (AI)	Sentiment Analysis	Unsupervised Learning	Pattern Recognition	Unsupervised Learning	Scikit-Learn	Model Training	Model Training	Pattern Recognition
3	Pattern Recognition	Artificial Intelligence (AI)	Statistical Inference	Predictive Modeling	Artificial Intelligence (AI)	Keras	Time Series Forecasting	Time Series Forecasting	Chatbots
4	Decision Trees	Unsupervised Learning	Artificial Intelligence (AI)	Neural Networks	Statistical Inference	Deep Learning	Chatbots	Pattern Recognition	Artificial Intelligence (AI)
5	Convolutional Neural Networks (CNN)	Decision Trees	Decision Trees	Deep Learning	Decision Trees		Artificial Intelligence (AI)	Feature Selection Chatbots	Applied Machine Learning
6	Unsupervised Learning	Pattern Recognition	Neural Networks		Convolutional Neural Networks (CNN)		Generative Adversarial Networks (GANs)	Speech Recognition	Predictive Modeling
7	Algorithm Analysis	Machine Learning Algorithms	Supervised Learning		Supervised Learning		Statistical Inference	Generative Adversarial Networks (GANs)	Unsupervised Learning
8	Artificial Neural Networks	Classification	Convolutional Neural Networks (CNN)		Reinforcement Learning		Pattern Recognition	Unsupervised learning	Generative Adversarial Networks (GANs)
9	Supervised Learning	Statistical Inference	Predictive Modeling		Algorithm Analysis		Algorithm Development	Random Forest	Algorithm Development
10	Neural Networks	Supervised Learning	Natural Language Processing (NLP)		Classification		Chatbot Development		Supervised Learning

Source: Own elaboration based on LinkedIn data. Due to sampling reasons, only engineering competencies in AI are included.

The YoY metric in **Table 4** indicates the increase experienced by AI competencies compared to the same period of the previous year.

In Latin America and the Caribbean, the competencies with the most growth are skills more closely associated with the machine learning and deep learning revolution (e.g., "Pattern Recognition" or "Decision Trees" appear in the top 5), driven in the Global North following the emergence of Convolutional Neural Networks (CNNs) in AlexNet and the Transformer architecture. Meanwhile, in countries that generally lead AI development indicators —such as the U.S., Israel, or India the top-growing AI competencies include Large Language Models (LLM), Model Training, Time Series Forecasting, and ChatBots. Likewise, more traditional skills like Decision Trees or Random Forest do not appear in the top YoY growth for advanced economies, reflecting a certain maturity where these competencies no longer grow in supply.

As a notable example, the skill with the global greater growth was LLM, which also appears in the top 5 for Global North countries. In Latin America and the Caribbean, no country shows significant growth in that skill in 2023. The same trend is observable with Model Training, which ranks second for India and the U.S., fifth globally, and is completely absent in the region. This lag can be explained by the region's structural deficiencies in computing and software. To date, there is no large language model developed in Latin America and the Caribbean, so specific competencies like model training or NLP do not have significant demand. This lag is due to the lack of appropriate computing capacity for developing this technology.

In this regard, the information about Latin America indicates the diversity of fields in which AI competencies are developed globally and reflects the lag affecting Latin American countries in this area. The competencies in Global North countries are closely related to the revolution we are experiencing with language models and their exponential growth, indicating that Latin America and the Caribbean are followers in talent development and skill acquisition in this field.

On the other hand, skill development appears relatively varied when comparing different countries in the region. The example of Uruguay is notable, as the fastest-growing skills stand out from the norm and refer to very specific applications of the technology. Among the countries in the sample, only Chile shows Natural Language Processing (NLP) as a ranked skill. Interestingly, there is a similarity in skill development patterns between Mexico and Chile, contrasting with those seen in Brazil and Argentina.

Relative Penetration of AI Competencies

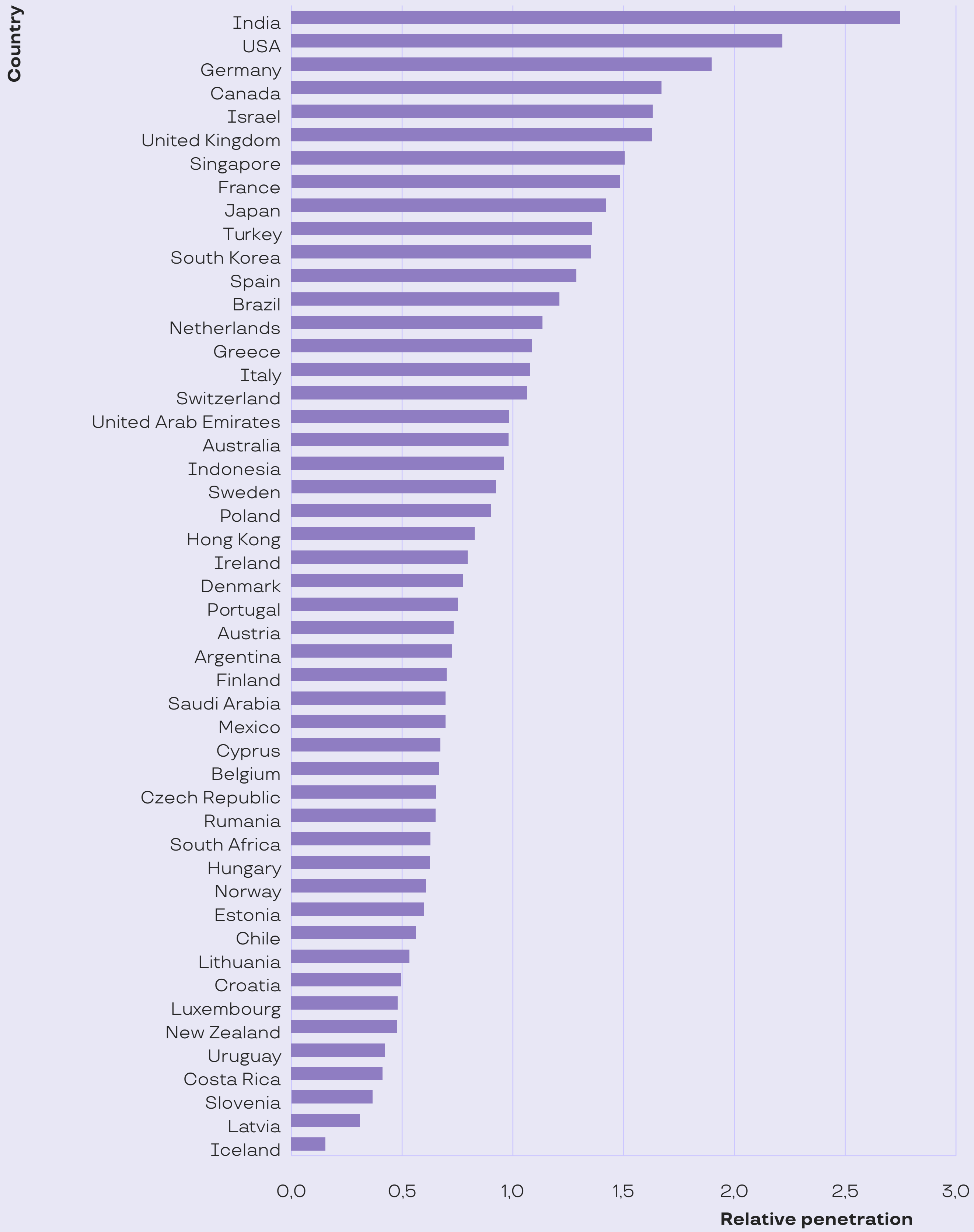
The prevalence of AI engineering competencies in each country is compared through the AI competency penetration index. This metric indicates the intensity with which the workforce utilizes AI competencies in their jobs.

To illustrate this metric, the top 50 competencies for the occupation of "engineer" can be considered, calculated based on the weighted frequency with which they appear in LinkedIn user profiles. If four of the competencies held by engineers belong to the group of **AI engineering competencies**, this measure indicates that the penetration of those skills is estimated at 8% among engineers (since four competencies out of the total 50 correspond to AI competencies). The higher the penetration, the greater the use of existing AI in that field.

The relative penetration rate of AI competencies is a measure for comparison between countries, aggregating the penetration of each AI competency across occupations in a specific country, divided by the global average penetration of AI competencies.

To position a country's AI competency penetration relative to other countries, the global average is used as a reference point. If the relative penetration measure for a country is less than 1, it means it is below the global benchmark, and it is above this benchmark if it is greater than 1. Below is the penetration of engineering competencies in AI compared to the global average, controlling occupations **(see Graph 5)** and aggregating the entire period between 2015 and 2023.

Graph 5: Relative Penetration of Engineering Competencies in AI (2015-2023)



Source: Own elaboration based on LinkedIn data.

ILIA

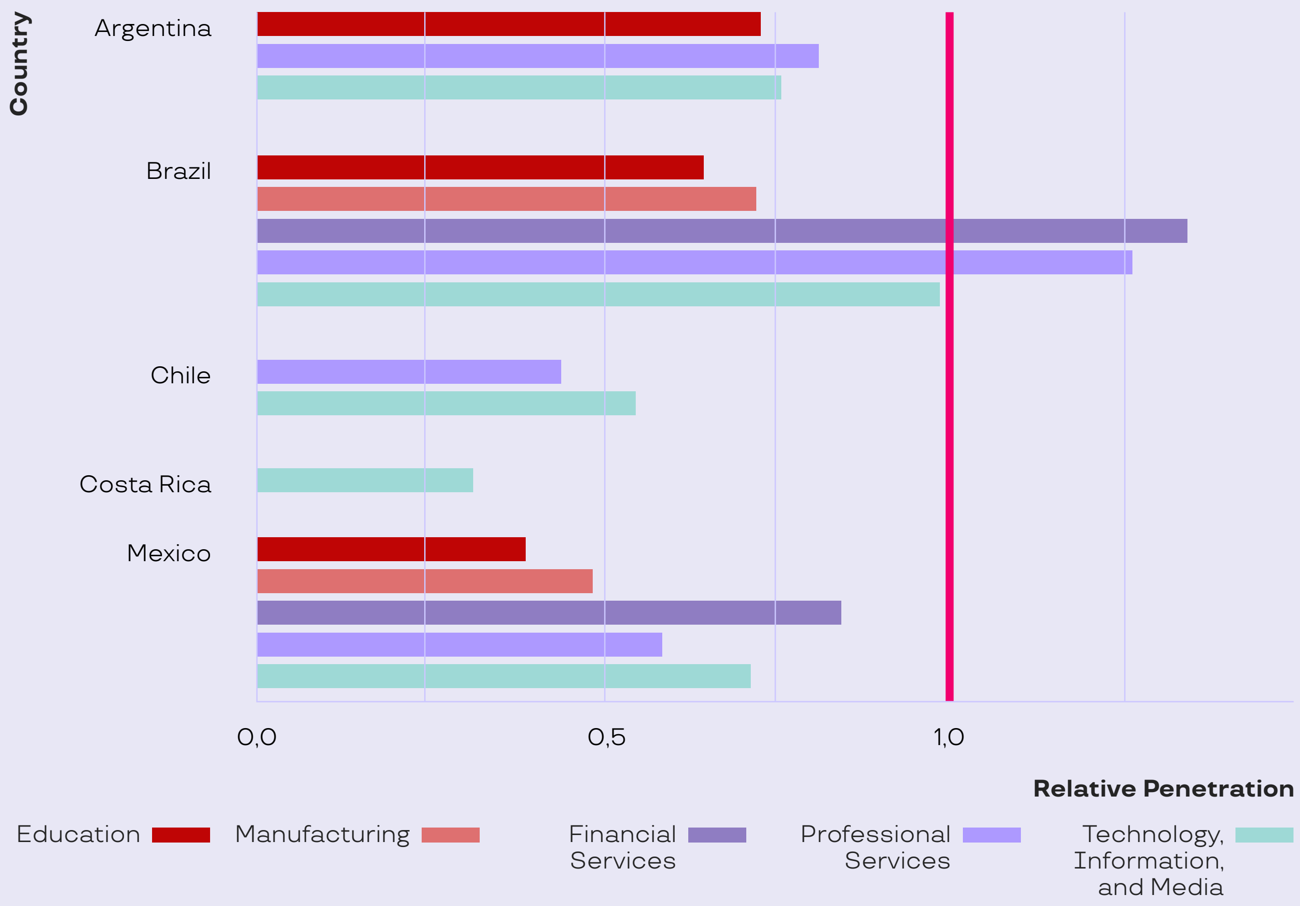
The top positions occupied by India and the USA have a frequency of these skills more than twice the global average, followed by developed countries from the Global North, such as Germany and Canada. All countries in the region are below the global average, except for Brazil. Among Latin American countries, it is observed that Mexico has a relative penetration of 0.695, while Chile (0.561), Uruguay (0.421), and Costa Rica (0.411) are among the 10 countries in the sample with the lowest levels of AI competency penetration in their workforce.

It is noteworthy that the ranking is not led by the world's largest economy (the USA) but by India. The country from the Asian subcontinent has distinguished itself in recent years by demonstrating productive development, reflecting an emphasis on innovation and technology, which indicates that there are opportunities for countries in the region through well-focused public policies.

The position of the countries that make up the sample for Latin America among the 49 countries analyzed globally reflects the low penetration of AI competencies in the region. Only Brazil (1.21) has a penetration of competencies higher than the global average for the same set of occupations. Regarding Latin America and the Caribbean, it also shows the best performance in this indicator: it ranks 13th, while the rest of the countries in Latin America are positioned below 27th place.

The relative penetration of AI competencies by country is also observed across various productive sectors. In the case of the "Technology, Information, and Media" sector, the sample included 39 countries, including five Latin American ones **(see Graph 6).**

Graph 6: Relative Penetration of AI Competencies by Productive Sector (2015-2023)



Source: Own elaboration based on LinkedIn data. The table only includes AI engineering competencies.

When observing the relative penetration of AI competencies by productive sector, it is noted that there is a lack of data for all productive sectors of the analyzed countries. Brazil has two productive sectors with levels above the global average in terms of the relative penetration of AI competencies. Meanwhile, the rest of the sectors in the countries included in the sample are below the global average for this indicator.

"Technology, Information, and Media" is the only sector that allows a comparison among all the countries in the region due to data availability. In Brazil, the score is 0.986, which means that the average penetration of AI competencies in that country is marginally lower than the global average for the same set of occupations in that productive sector. Similarly, Argentina, Mexico, Costa Rica, and Chile also have a penetration of AI competencies in that productive sector below the global average.

The AI competencies added by LinkedIn users to their profiles can be applied in multiple occupations, but there are some occupations where knowledge of AI is essential: these are jobs such as "Machine Learning" engineers, AI specialists, or data scientists, among others. These are referred to as unique occupations.

The number of unique AI occupations for each productive sector is a key indicator for understanding the development of AI in the labor markets of the countries. The number of unique AI occupations helps to understand the level of sophistication in terms of Artificial Intelligence for each specific economic sector: the more unique occupations exist in an industry, the more mature that industry is perceived in terms of AI. To illustrate this, the case of the "Technology, Information, and Media" sector at a global level is addressed below **(see Table 5).**

Table 5: Relative Penetration of AI Competencies and Number of Unique AI Occupations by Country, "Technology, Information, and Media" Sector, by country (2015-2023)

Country	Relative penetration of AI competencies	Number of unique occupations with AI
India	2,44148	94
U.S.	2,21256	93
Israel	1,45671	28
Canada	1,44612	40
Germany	1,44409	39
South Korea	1,23955	15
Turkey	1,23687	19
United Kingdom	1,22916	44
Japan	1,19983	21
Singapore	1,18712	22
France	1,13497	20
Spain	1,00889	21
Brazil	0,98607	20
Hong Kong SAR	0,9465	9
Australia	0,93475	14
United Arab Emirates	0,87517	10
Denmark	0,87214	9
Belgium	0,85303	7
Poland	0,84084	12
Sweden	0,82911	14
Netherlands	0,82566	14
Ireland	0,8056	9
Norway	0,80427	9
Greece	0,80348	9
Switzerland	0,7796	14
Argentina	0,75596	8
Italy	0,72875	15
Czech Republic	0,72861	8
Mexico	0,71404	10
South Africa	0,67701	6
Finland	0,67182	10
Romania	0,64755	9
Hungary	0,62829	7
Portugal	0,61789	9
Indonesia	0,6144	11
Chile	0,54644	8
Austria	0,52318	8
New Zealand	0,38458	5
Costa Rica	0,31277	5

Source: Prepared by the author based on LinkedIn data. The table only includes competencies in AI engineering.

During the measurement period (2015-2023), Brazil has 20 unique occupations with AI competencies, even surpassing countries with a higher relative penetration, such as South Korea and Turkey.

When analyzing this metric in "Manufacturing and Financial Services," the available data for Latin American countries is scarce. The countries that do have unique AI occupations are limited to Mexico and Brazil, which possess an economic sophistication above the regional average, with significant weight in regional GDP and a substantial population.

In terms of relative penetration, Brazil ranks first in the region by far, demonstrating a position within the top third of countries globally regarding AI competencies, while also showing a significant number of unique occupations with AI competencies across various productive sectors, at a level comparable to Germany in the financial services sector.

Globally, India and the U.S. are leaders in relative penetration of AI competencies, highlighting their position in this area in recent years. The scale and level of penetration, as well as the number of unique occupations with AI competencies, far exceed those of the countries that follow them in the ranking.

Talent Migration

The progress of the AI workforce in Latin America is reflected in the indicators of relative presence and skill penetration observed earlier. However, this must be analyzed considering the significant phenomenon of attracting human capital with AI competencies from the Global North.

AI and migration are topics of increasing interest, given the globalized nature of this technological diffusion process and the worldwide demand for specialized labor in this field. Since 2019, it has been possible to analyze migration phenomena of the workforce through LinkedIn data, using the locations declared by users. For this analysis, the relative migration of AI talent at a global level is taken into account.

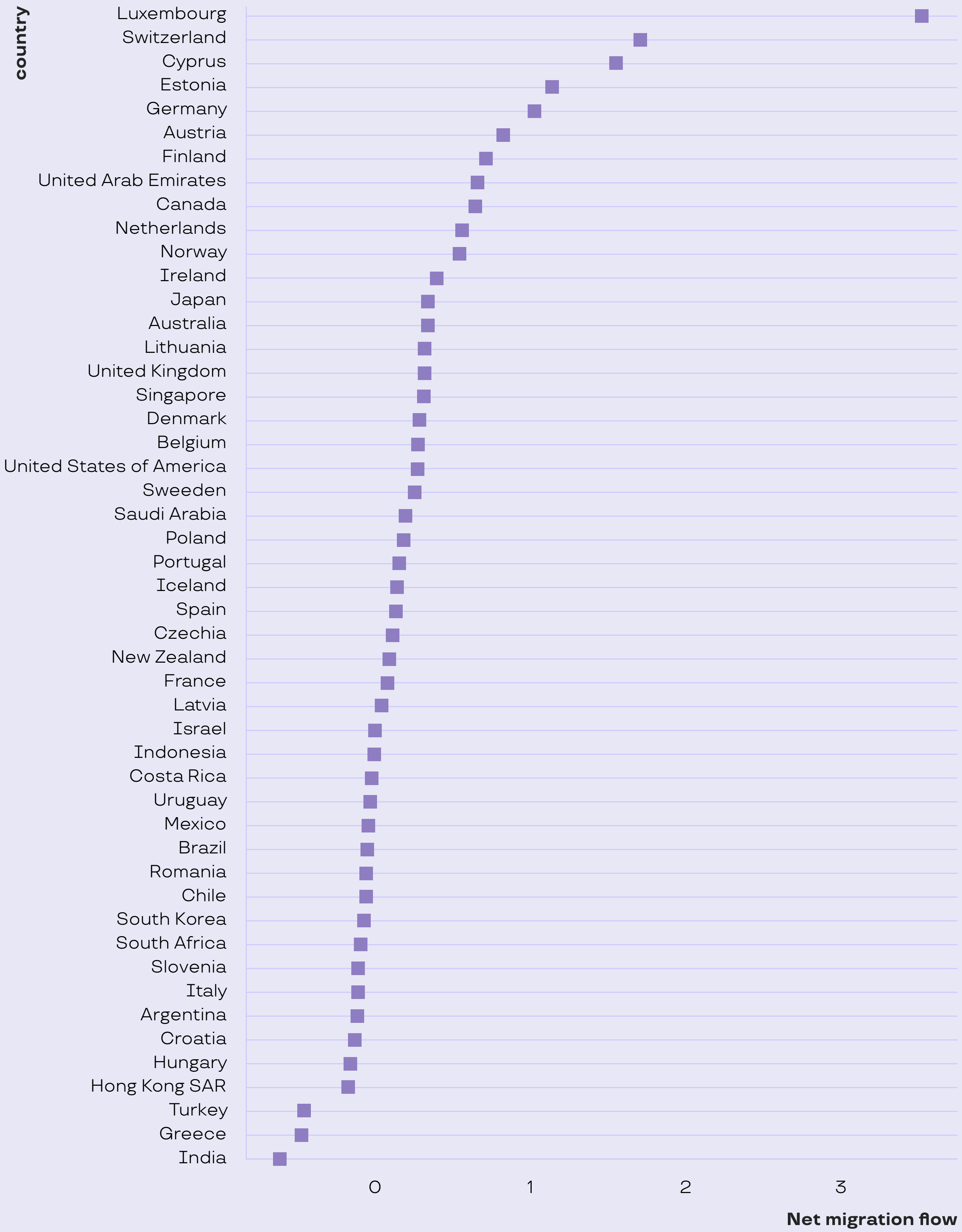
To calculate migration rates, the locations indicated in users' profiles on the network since 2019 are followed. For example, when a LinkedIn member updates its location from San José de Mariquina in Chile to San Francisco in the U.S., this counts as a migration. To compare migration flows between countries fairly, the migration flows are normalized for the country of interest, considering the volume of its labor market.

The data provides information on the AI talent gained or lost at the country level due to migration trends **(see Graph 7)**. Values above 0 indicate a positive net flow, meaning that the nation attracts more talent than it loses, while a negative net flow is below 0 and reflects that it loses more talent than it attracts.

5. The migration data comes from the "Digital Data for Development" partnership of the World Bank Group and LinkedIn (see Zhu et al. 2018).

6. For example, if "Country A" is the country of interest, all absolute net flows to and from "Country A" —regardless of the countries of origin and destination— are normalized based on LinkedIn membership in "Country A" at the end of each year and multiplied by 10,000. Therefore, this metric indicates the relative migration of talent to and from all countries to "Country A."

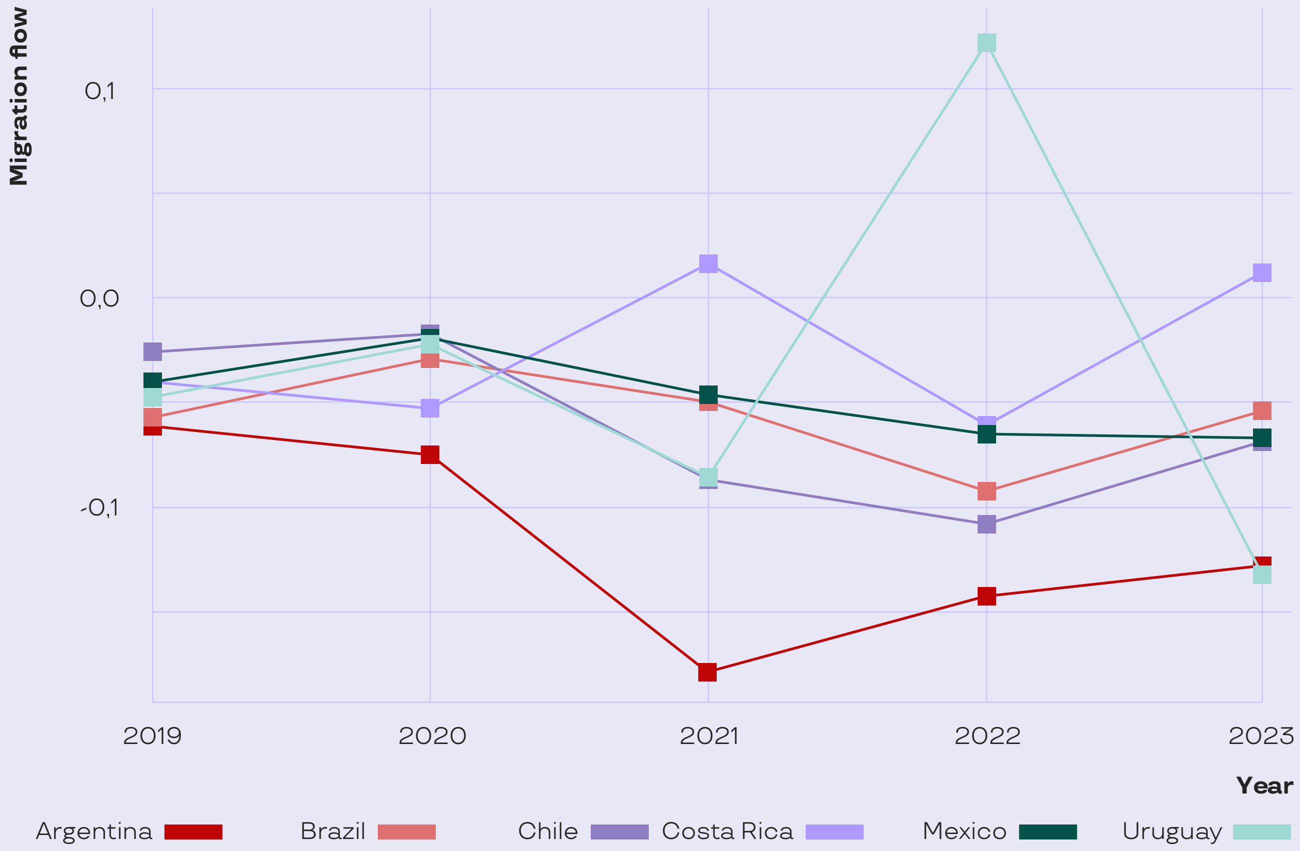
Graph 7: Talent Migration in AI (average net flow, 2019-2023)



Source: Prepared by the author based on LinkedIn data.

The average talent migration flow in AI over the past five years for Latin American countries is negative, placing them in the group of those whose AI engineering talent tends to emigrate. The countries in the region that make up the sample (AR, BR, CL, CR, MX, UR) record negative net flows (entries minus exits) **(see Graph 8)**.

Graph 8: Talent Migration in AI in Latin America (net flow, 2019-2023)



Source: Prepared by the author based on LinkedIn data.

JAlong with the challenges associated with training AI talent, the countries in the region increasingly face the challenge of retention, as they do not position themselves as attractors of AI talent in migration terms. It is observed that for all Latin American countries in the LinkedIn sample, the negative migration flow has increased by at least double, except for Brazil, which has remained stable over the past five years.

In 2023, Argentina shows a negative trend and registers a net flow of AI talents of -0.13, reflecting a slight improvement compared to the last two years. Uruguay had a similar flow but experienced a significant decline between 2022 and 2023, which was the only year with a positive flow. Brazil has the least variation in its migration flow in the region, with a persistent negative flow. In 2023, the country recorded a flow of AI talents of -0.07.

Costa Rica, on the other hand, is the only country in the region that showed a positive flow of AI talents, at 0.01 for every 10,000 users of the social network. This has been the case since this indicator was first measured in 2019. In the case of Chile, the year 2023 recorded a flow of AI talents of -0.07 per 10,000 users of the social network, similar to Mexico.

The data indicates that the countries with the highest negative net flow in 2023 were Turkey (-0.395), Israel (-0.573), and India (-0.758). This is noteworthy, as these are three contexts where the markets have dissimilar levels of development, raising questions about the push factors for AI talent in these countries. On the other hand, those with the highest positive net flow of AI talent are Luxembourg (3.674), Switzerland (1.602), and the United Arab Emirates (1.479). It seems that having a highly sophisticated ecosystem with relative skill penetration does not guarantee talent retention, as shown by the cases of Israel or India.

The causes structuring these processes are complex and cannot be reduced to a single factor, as they involve opportunity structures, the rate of training AI professionals, living conditions, and the migration regimes of the countries. Based on the available data, the analysis of the net migration flow reveals that the mobility of AI talents has a clear directionality, with poles situated in the Global North concentrating the attraction of specialized talents in this area.

The Gender Gap in the AI Workforce

In the previous version of the ILIA, the existence of a gender gap in the artificial intelligence research ecosystem was already noted. To understand the development of AI, it is crucial to analyze the underrepresentation of women within the talent composition in this sector, a challenge addressed below.

Globally, in 2023, the representation of women in "AI Engineering" talent reached 26.84%, having recorded an increase of two percentage points since 2016 **(see Table 6).**

Table 6: Distribution of AI Competencies Globally by Gender (2016-2023)

Año	Competencias en Ingeniería en IA		Alfabetización en IA	
	Femenino	Masculino	Femenino	Masculino
2016	24,90%	75,10%		sin datos
2017	24,89%	75,11%		sin datos
2018	24,81%	75,19%		sin datos
2019	24,91%	75,09%		sin datos
2020	25,33%	74,67%		sin datos
2021	25,94%	74,06%		sin datos
2022	26,36%	73,64%		76,47%
2023	26,84%	73,16%		77,58%

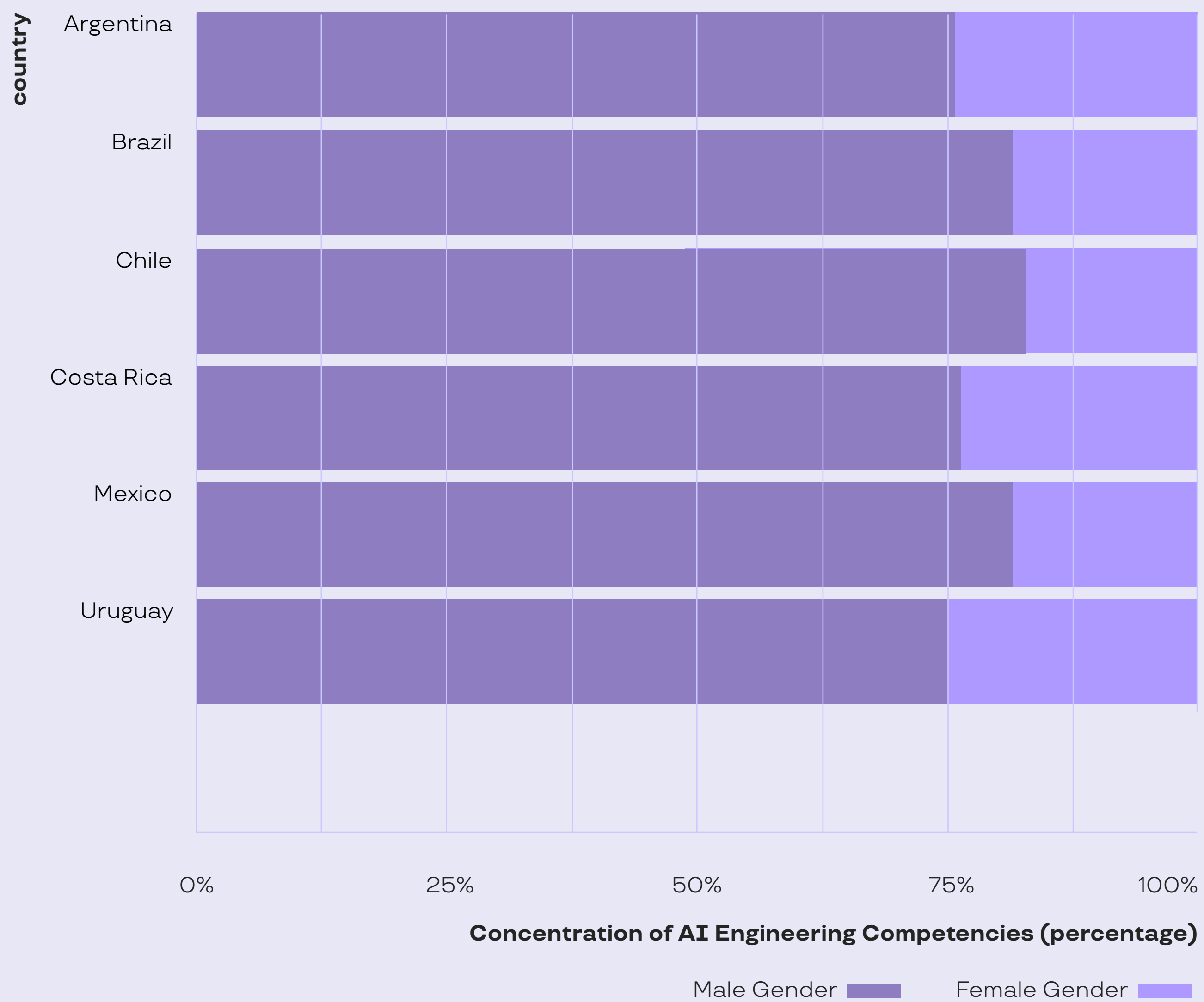
Source: Prepared by the author based on LinkedIn data. Countries with more than 100,000 users and >=67% gender gap coverage are included.

7. The LinkedIn sample considers those countries where more than two-thirds of the workforce indicates their gender.

When analyzing this trend by productive sector, sectoral variations are observed; however, they still highlight the magnitude of the gender gap. In the professional services sector, for example, globally, female representation has also grown from 24.1% in 2016 to 26.4% in 2023.

Current data on female underrepresentation in the context of Latin America is reviewed below. When examining the distribution of engineering talent in AI by gender in the region, the overrepresentation of men becomes evident **(see Graph 9).**

Graph 9: Concentration of AI Engineering Competencies by Gender (2023)

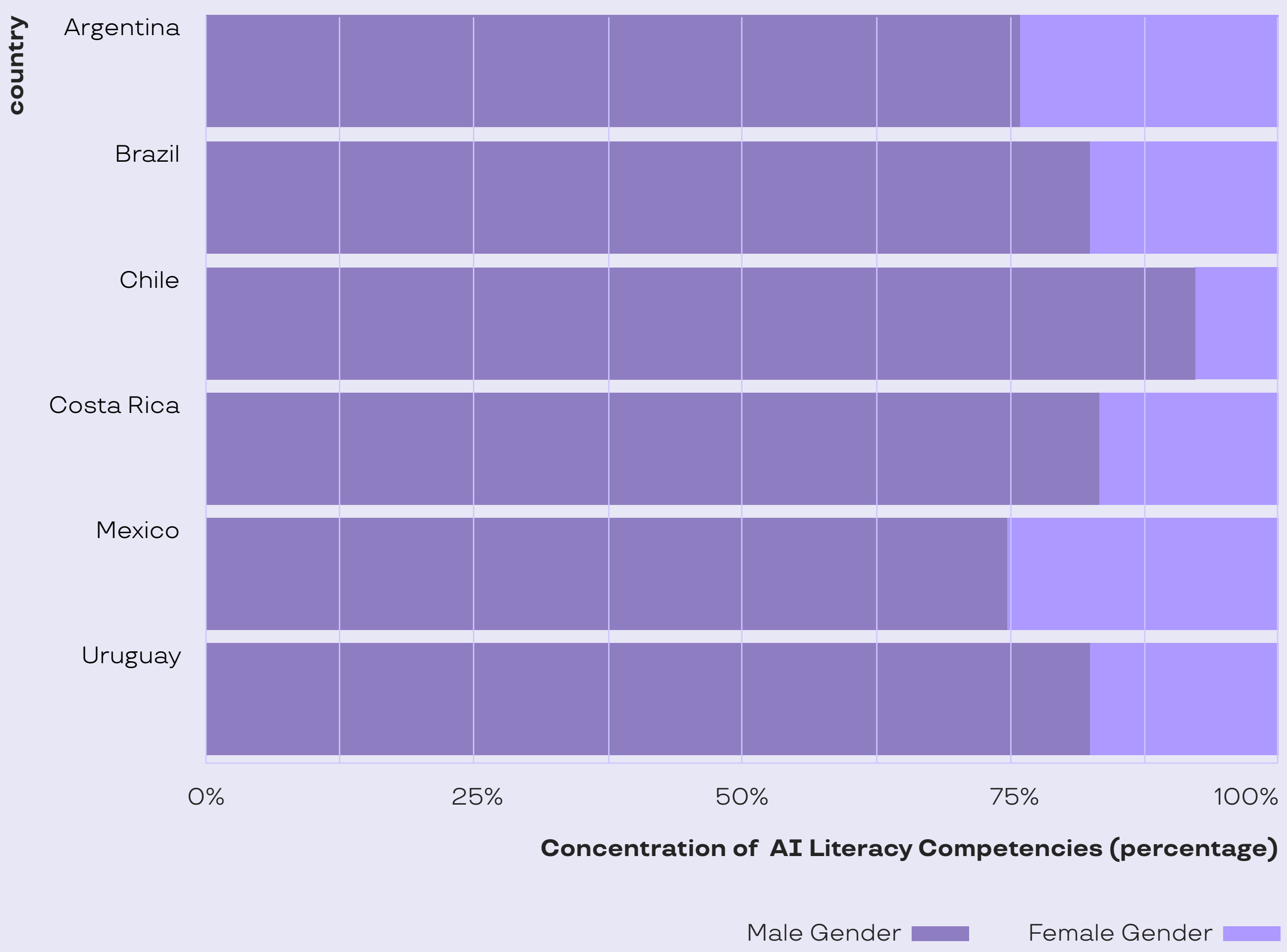


Source: Prepared by the author based on LinkedIn data.

The percentage of female representation within AI talent in 2023 varies from 17.18% in Chile, the lowest level in the region, to Uruguay, which has the highest percentage at 24.97%. The graph shows that despite the slight variations in female representation in Latin America, the presence of AI engineering competencies among women is disproportionately low in the countries of the region.

The data from the selected Latin American countries also allows for observing how the representation of AI talent by gender is distributed at the level of AI literacy competencies **(see Graph 10).**

Graph 10: Distribution of AI Talent by Gender: AI Literacy Competencies (2023)



Source: Prepared by the author based on LinkedIn data.

The Graph presents data from 2023 and reveals notable disparities in female representation regarding AI talent, observed through AI literacy competencies, which are even more pronounced than in engineering competencies.

The percentage of female representation within AI talent with engineering competencies in AI in Chile is 7.6%, the lowest level among the Latin American countries in the sample. Meanwhile, Uruguay ranks first in terms of the percentage of AI talent with engineering competencies, reaching 17.65% in literacy competencies. At the same time, Mexico appears as the Latin American country with the highest female representation in this indicator, reaching 25.19%.

The current female underrepresentation characterizing the distribution of AI talent in the labor markets of the analyzed countries raises questions that have led to discussions on public policy aimed at closing the gender gap in this area. Specifically, there are plans to generate sectoral strategies and measures so that the potential of this segment of the population can also be expressed in AI talent.

Key AI Competencies

For the incorporation of AI into productive processes to be beneficial for countries, it is necessary for the workforce to acquire specific competencies associated with AI. The following chapter outlines the deployment of this process, with its varying intensities and the asymmetries between regions of the globe that characterize it. AI engineering competencies refer to the construction of AI tools and encompass a diverse range of techniques and models in machine learning and AI.

Below are the AI engineering competencies that users from a selection of LinkedIn countries added most frequently during the period from 2015 to 2023 **(see Table 7).**

Table 7: AI Engineering Competencies by Country (2015-2023)

Ranking	Country						Global
	Argentina	Brazil	Chile	Costa Rica	Mexico	Uruguay	
1	Artificial Intelligence (AI)	Artificial Intelligence (AI)	Artificial Intelligence (AI)	Artificial Intelligence (AI)	Artificial Intelligence (AI)	Artificial Intelligence (AI)	Machine Learning
2	Machine Learning	Machine Learning	Machine Learning	Machine Learning	Machine Learning	Machine Learning	Artificial Intelligence (AI)
3	Deep Learning	Deep Learning	Deep Learning	Generative AI	Deep Learning	Deep Learning	Deep Learning
4	Generative AI	Generative AI	Generative AI	Deep Learning	Generative AI	Generative AI	Natural Language Processing (NLP)
5	Image Processing	Natural Language Processing (NLP)	Predictive Modeling	Natural Language Processing (NLP)	Natural Language Processing (NLP)	TensorFlow	Computer Vision
6	Scikit-Learn	Computer Vision	Natural Language Processing (NLP)	Predictive Modeling	Image Processing	Scikit-Learn	TensorFlow
7	Natural Language Processing (NLP)	Chatbots	Neural Networks	Large Language Models (LLM)	Computer Vision	Natural Language Processing (NLP)	Image Processing
8	TensorFlow	Scikit-Learn	Machine Learning Algorithms	Microsoft Azure Machine Learning	TensorFlow	PyTorch	PyTorch
9	Supervised Learning	TensorFlow	Supervised Learning	Image Processing	Scikit-Learn	Computer Vision	Scikit-Learn
10	Computer Vision	Machine Learning Algorithms	TensorFlow	Scikit-Learn	Predictive Modeling	Keras	Predictive Modeling

Source: Prepared by the author based on LinkedIn data.

Table 7 shows that during the period from 2015 to 2023, the most commonly added AI engineering competencies by LinkedIn users globally are related to learning models, specifically, Machine Learning, AI Learning, and Deep Learning. This reflects the rise these models have experienced recently as they appear as "AI Competencies" in the workforce of the countries.

When looking at the **AI engineering competencies** most frequently added by LinkedIn users in Latin American countries during the period from 2015 to 2023, the users included "Artificial Intelligence," "Machine Learning," and "Deep Learning." These global trends should be analyzed considering the explosive growth of generative AI experienced globally since 2022.

On the other hand, and also within the AI competencies that the workforce has developed recently, are generative AI competencies, referring to the skills that workers have to use and integrate generative AI tools into their tasks. The development of these competencies leads to the concept of AI literacy competencies, which are summarized in detail according to their relevance in recent times and for the countries in the region in **Table 8.**

Table 8: AI Literacy Competencies by Country (2015-2023)

Ranking	Country								
	Argentina	Brazil	Chile	Costa Rica	Mexico	Uruguay	U.S.A	Israel	India
1	ChatGPT	ChatGPT	ChatGPT	ChatGPT	ChatGPT	ChatGPT	ChatGPT	ChatGPT	ChatGPT
2	Prompt Engineering	Prompt Engineering	Prompt Engineering	Prompt Engineering	Prompt Engineering	Prompt Engineering	Prompt Engineering	Prompt Engineering	Prompt Engineering
3	GPT-4	Midjourney	GPT-4	GPT-4	GPT-4	GPT-4	GPT-4	GPT-4	GPT-4
4	Midjourney	GPT-4	Midjourney	GPT-3	GPT-3	GPT-3	GPT-3	Stable Diffusion	GPT-3
5	GPT-3	GPT-3	GitHub Copilot	GitHub Copilot	Midjourney	Midjourney	Stable Diffusion	Midjourney	Stable Diffusion
6	Stable Diffusion	Stable Diffusion	GPT-3	Midjourney	Stable Diffusion	DALL-E	Midjourney	GPT-3	Google Bard
7	DALL-E	GitHub Copilot	DALL-E	Stable Diffusion	DALL-E	Stable Diffusion	DALL-E	DALL-E	Midjourney
8	Google Bard	DALL-E	Generative Art		Google Bard		Generative art	Generative art	GitHub Copilot
9	GitHub Copilot	Google Bard	Stable Diffusion		GitHub Copilot		GitHub Copilot	GitHub Copilot	DALL-E
10	Generative Art	Generative Art	Google Bard		Generative Art		Google Bard	Google Bard	Generative Art

Source: Prepared by the author based on LinkedIn data.

Table 8 presents the AI literacy competencies added most frequently by LinkedIn users between 2015 and 2023 in the selected Latin American countries. Some of these were added after 2021, reflecting the sector's dynamism and the massive emergence of ChatGPT in 2022.

The top entries in the table highlight AI competencies such as Prompt Engineering, Chatbot Management, and Image Generation from text descriptions. These are skills that have gained relevance differently, according to each type of profession and productive sector.

It is noteworthy that among the generative AI competencies most frequently added by the workforce during the specified period are Chat GPT, Prompt Engineering, and Midjourney, which will likely determine the speed with which AI impacts the productivity and competitiveness of local economies. This is because there is a close relationship between the level of adoption of AI tools and the economic advantages of a country.

Economic Impact of AI on the Workforce: An Analytical Framework

Analytical Framework

Las revoluciones tecnológicas, como la que Technological revolutions, like the one we are currently experiencing, bring transformations that are challenging to measure in economic, social, and cultural terms. Imagine for a moment that it's 1999, right before the dot-com crash, and we need to think about the companies that will be the major players from 2010 onward. Google, Amazon, Meta, or Alibaba probably wouldn't have even crossed our minds.

Data-driven business models were not easily conceivable, and their impact on how we create value, human relationships, consumption, and democracy itself was the stuff of science fiction. Imagining the impact of revolutions at their onset is a challenging alchemy to manage, as it depends on countless factors and, above all, on human innovation and creativity.

Despite all this, by the end of the last century, we could already envision that internet-based businesses would impact the economy. The rise of dot-coms and the success of several of them allowed us to project, at least, increased demand for software developers, system administrators, or microcomponents for personal computers, among others. With a certain margin of error, the technology of that time offered us the ability to estimate the economic impact of the transformation we were experiencing.

After two decades, our ability to estimate this impact has improved partially. In part, because betting on which company will be the most valuable in 2034 remains an exercise in futurology. Generative AI is only beginning to penetrate the economy, and though still in very early stages, it allows us to estimate economic impact with the information we currently have.

The phrase "impact of a technological revolution" may bring to mind an element present in all prior processes, from the Industrial Revolution until today: automation and the replacement of the workforce. The collective imagination rightly associates technological change with an impact on employment, whether through the need for new skills and competencies or the loss of jobs due to the incorporation of automation into production processes.

For the first time, we are facing a technology that mimics human abilities that, until now, we considered inherent to our species, such as creativity, learning, reflection, and reasoning. In this way, machines appear to have the potential to replace not only manual workers performing repetitive operations along a production line, but also those engaged in intellectual and creative tasks, from general managers to writers or copywriters. The potential of language models in this regard is staggering.

However, this is a shortsighted and somewhat superficial view of how human work actually functions. Work is often analyzed by occupation or position, overlooking the fact that each role within an organization is made up of a series of interdependent tasks. These tasks provide a much more granular unit of analysis, which is potentially easier to evaluate when considering the impact of generative AI for two reasons: first, it allows us to differentiate the importance of each task within a role, and second, it enables us to accurately estimate the specific impact that generative AI has on that particular function.

Methodology

The methodology for making this estimate was developed with Workhelix—a company founded by academics Erik Brynjolfsson and Andrew McAfee, authors of the bestseller Race Against the Machine— and is based on the impact estimation proposed in the paper "GPTs are GPTs". This approach suggests analyzing AI's influence in a granular way, task by task. Following this line of reasoning, we can consider a simplified example of a supply intermediary for restaurants, who has four tasks over a 42-hour workweek: i) talking with clients, ii) quoting and negotiating supplies, iii) preparing business proposals, and iv) preparing reports for their supervisor. It's reasonable to think that most of their workweek —let's say 50%— is dedicated to interacting with clients, that is, 21 hours. Quoting, negotiating, and preparing proposals, which are important but less so, each occupy 20%. Finally, reports take 10%, equivalent to 4.2 hours.

Conceptually, the previous example establishes the analytical framework for calculating economic impact and well-being. Weekly or monthly hours are matched with a monetary amount associated with each worker's income. If the same intermediary in the previous example had a salary of $840, each hour of work would have a value of $5. If the incorporation of generative AI has an impact, it will result from the number of hours saved by using the application multiplied by the worker's hourly rate.

To assess each task's exposure to technology, the following question is posed:

Can generative AI reduce the time spent on this task by half without sacrificing quality?

The answer to this question is provided by a panel of experts and estimates made with the support of LLMs (Large Language Models), which compare the development of available generative AI and the nature of the tasks involved. Depending on the answer, the task can be classified into one of the following three categories:

a. No, generative AI does not reduce the time spent by half. And if it does, it comes at the cost of quality.
b. Yes, generative AI reduces the time spent on this task by half without sacrificing quality.
c. Yes, generative AI reduces the time spent on this task by half without sacrificing quality, but additional software tools are necessary to achieve this.

By combining these approaches —on one hand, the relative importance of each task and its estimated monetary value, and on the other, each task's exposure to generative AI—, we have a conceptual framework that offers an estimation of this technology's impact on the economy through the labor market. This initial exploration of generative AI's potential in the labor market opens a long-term and collaborative agenda that enables us to address the challenges and seize the opportunities of this new technology.

Application in Chile and results

The National Center for Artificial Intelligence (CENIA), along with Sofofa Capital Humano's Future of Work program, the National Training and Employment Service (SENCE), and the Ministry of Labor in Chile, prepared the data to supply the model outlined in the methodology. By using public information sources, the 100 occupations employing the most people in Chile were identified. Detailed descriptions of them were made, along with the tasks they entail. This data enabled Workhelix to make estimates based on the methodology explained above.

The results of this occupational research allowed for an estimation of generative AI's impact on 5,690,000 workers in Chile, equivalent to 62% of the country's workforce. Each occupation was described according to the previously mentioned criteria, and the average annual salary was calculated based on available statistical information.

8. Eloundou, Tyna, Sam Manning, Pamela Mishkin, and Daniel Rock. "GPTs are GPTs: Labor market impact potential of LLMs." Science 384, no. 6702 (2024): 1306-1308

The total amount of the valuation of the workers time dedicated to activities that could be accelerated by generative AI is 1.2 percentage points of annual GDP. The impact that this acceleration would have on the economy depends on how that time is effectively used. At the same time, the occupations with the greatest potential to increase their value using generative AI are:

- Public administration professionals, with 84% of identified tasks capable of being accelerated using generative AI.
- Software developers, with 82% of tasks.
- Systems analysts, with 80% of tasks.
- Medical secretaries, with 76% of tasks.
- Pension advisors and lawyers, with 72% of tasks.
- Accountants; auditors; marketing advisors and professionals; teachers in primary, secondary, and higher education; and research assistants, with 71% of identified tasks capable of improvement using generative AI.

Of this group, it is worth noting the concrete effect that it could have on teaching work. According to the study, the incorporation of generative AI, especially in the non-teaching work of teachers —namely, lesson preparation and teaching materials— could mean a direct impact of USD$258 million per year for more than 210,000 professionals in this field and across various levels. On the other hand, the potential of generative AI to create public value through its impact on the quality of state services, freeing public administration professionals from certain tasks, far exceeds the estimated financial impact.

Unlike other revolutions, this one shows a significant impact on relatively well-paid jobs that require a higher level of education. However, it is important to note that AI would impact certain tasks within jobs but not the entire job, which opens up the possibility of redesigning the functions of certain occupations.

From the data obtained, it can be observed that there are occupations where the use of technology does not seem to have a significant impact. Notable on this list are bus operators (2% of tasks are augmentable), cleaning assistants, physiotherapists, and chiropractors (6% of tasks), painters and builders (18% of tasks), and packers (19% of tasks). The nature of these occupations means that the potential impact of generative AI is marginal, and therefore, the opportunity to improve their working conditions at present, given the state of the art, is limited.

The Chilean economy has experienced a decade of stagnation in productivity. Generative AI is unlikely to solve structural problems, but the evidence is robust in showing its potential to move the needle in the right direction. Transforming this potential into a concrete opportunity to improve the quality of life for millions of workers depends not only on the curiosity and interest of individuals but also on the ability of the state and companies to develop spaces for AI literacy that break down prejudices about technology while also providing concrete tools to harness its potential.

RESEARCH, DEVELOPMENT AND ADOPTION

D.1 Main Findings

Maturing Ecosystems
Beyond differences in magnitude, all countries have at least two consistent AI researchers. In addition, 11 of the 19 countries included in the index have university-based or private AI research centers. In addition, there is an increase in the average number of publications compared to the previous year. These aspects speak of a certain maturity in the local ecosystems.

A Research Gap
Differences persist in terms of the number and impact of publications in AI, as well as in the relative size of the ecosystem between the countries that lead in scores and the rest of the region. The presence of competitive mechanisms for public funding of scientific activity seems to have a significant impact on productivity and quality indicators.

Where are the Latinoooos?
The presence of authors from Latin America and the Caribbean in the main conferences of the discipline is almost nonexistent. In the eight most important conferences of the discipline (ACL, CVPR, NeurIPS, EMNLP, ICCV, AAAI, ICLR and ICML) 0.23% of the publications were generated in the region (39) and only 0.11% of the participants in the main tracks are local authors.

Shortcuts to Bridge the Gender Gap
The participation of women in AI research shows robust figures in some countries, but the variability in scores reflects that in much of the region these efforts are insufficient or even negligible. Understanding best practices in places that have reduced the gap is key to promoting partnerships and the impact of institutional and national policies.

The Importance of the Economic Matrix
The economic characterization of each country, as well as the underlying public policies, have a direct impact on the capacity for AI adoption. While more liberal countries -such as Chile, Uruguay and Costa Rica- show better levels of entrepreneurial environment, private investment and startup emergence, more industrialized and globally competitive countries -including Mexico and Brazil- exhibit better rates of patenting, high-tech workers, unicorn companies and high-tech manufacturing. These structural differences affect the mechanisms through which AI is integrated into the economy, its speed of adoption and its characteristics.

An Expanding Community
The open source AI community continues to grow dynamically. Panama leads in production, surpassing Uruguay over last year, and followed by Costa Rica and the Dominican Republic.

In terms of ratings, the Charrúa open source community is significantly more appreciated, probably driven by a long-standing ecosystem

New Academic Collaboration Partners
The relative importance of collaborations with LATAM, USA and Europe goes from 82.27% to 72.65%, a drop of 10 percentage points. Academic collaborations with China and India grew by 387% and 635%, respectively. This change is congruent with the pattern of greater diversity in the destinations to which researchers from the region go for graduate studies, which results in the creation of collaboration networks and joint work.

The Multidisciplinary Revolution of AI
The OECD discipline that stands out among all for its frequency of AI-related publications is clinical medicine, which peaked in 2021 due to the pandemic, but remained the most relevant until 2023. The growth of the AI-related discipline of economics and business also stands out, reflecting an increase in the use of this technology in the field of entrepreneurship and innovation.

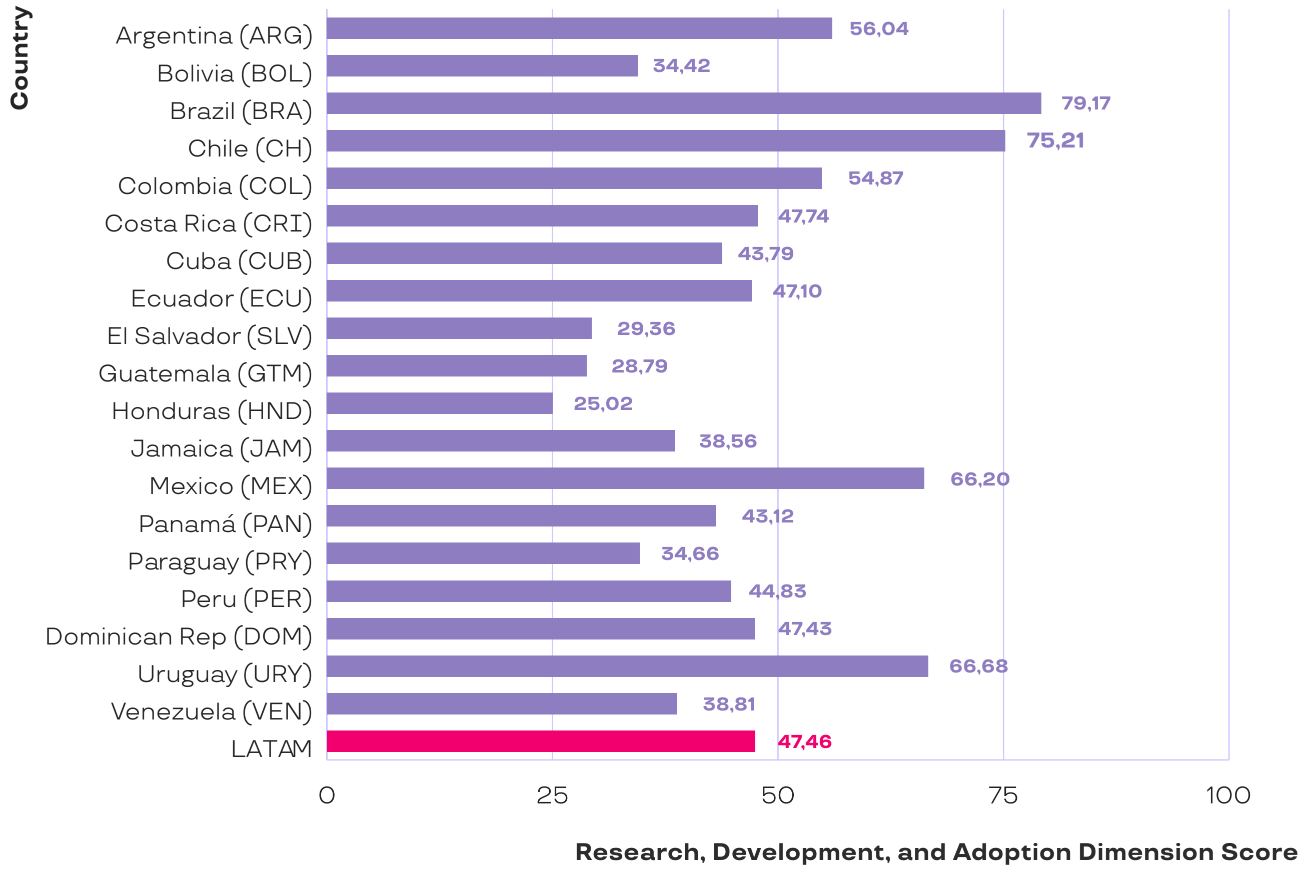
Table 1: Composition of the Research, Development and Adoption Dimension
**New subindicators 2024 in color*

Subdimension	Indicator	Subindicator
Research	Research	AI Publications
		Active AI research
		Productivity of AI Researchers
		Impact of AI Research
		Presence of AI Research centers
		Proportion of Female Authors in AI
		Consistent AI Research
		Participation in Main Tracks of A+ Conferences
		Participation in Side Events of A+ Conferences
Innovation And Development (R&D+A)	Innovation	Number of Private Investments
		Estimated Total Value of Private Investment
		AI Companies
		Unicorn Companies
		Research and Development Expenditure as a Share of GDP
		Application Development
		Entrepreneurial Environment
	Development	Open Source productivity
		Open Source Quality
		Number of Patents
Adoption	Industry	Workers in the High-Tech Sector
		Medium and High-Tech Manufacturing
		Share of Medium- and High-Tech Manufacturing Value-Added in total Value-Added (in percent)
	Government	Digital Government

Source: ILIA 2024

As shown in **Graph 1,** regional performance in **Research, Development and Adoption** averages **47.46 points**, with countries such as **Brazil (79.17), Chile (75.21), Uruguay (66.68) and Mexico (66.20)** standing out. Whether due to insufficient investment in this area or to the lack of incentives, the rest of the countries show low scores, making it clear that there are ample opportunities for improvement in this area.

Graph 1: Score for the Research, Development, and Adoption Dimension



Source: ILIA 2024

Based on the data presented in **Graph 1,** it is possible to segment the countries into three categories, according to their degree of evolution in the generation of new knowledge and its practical application.

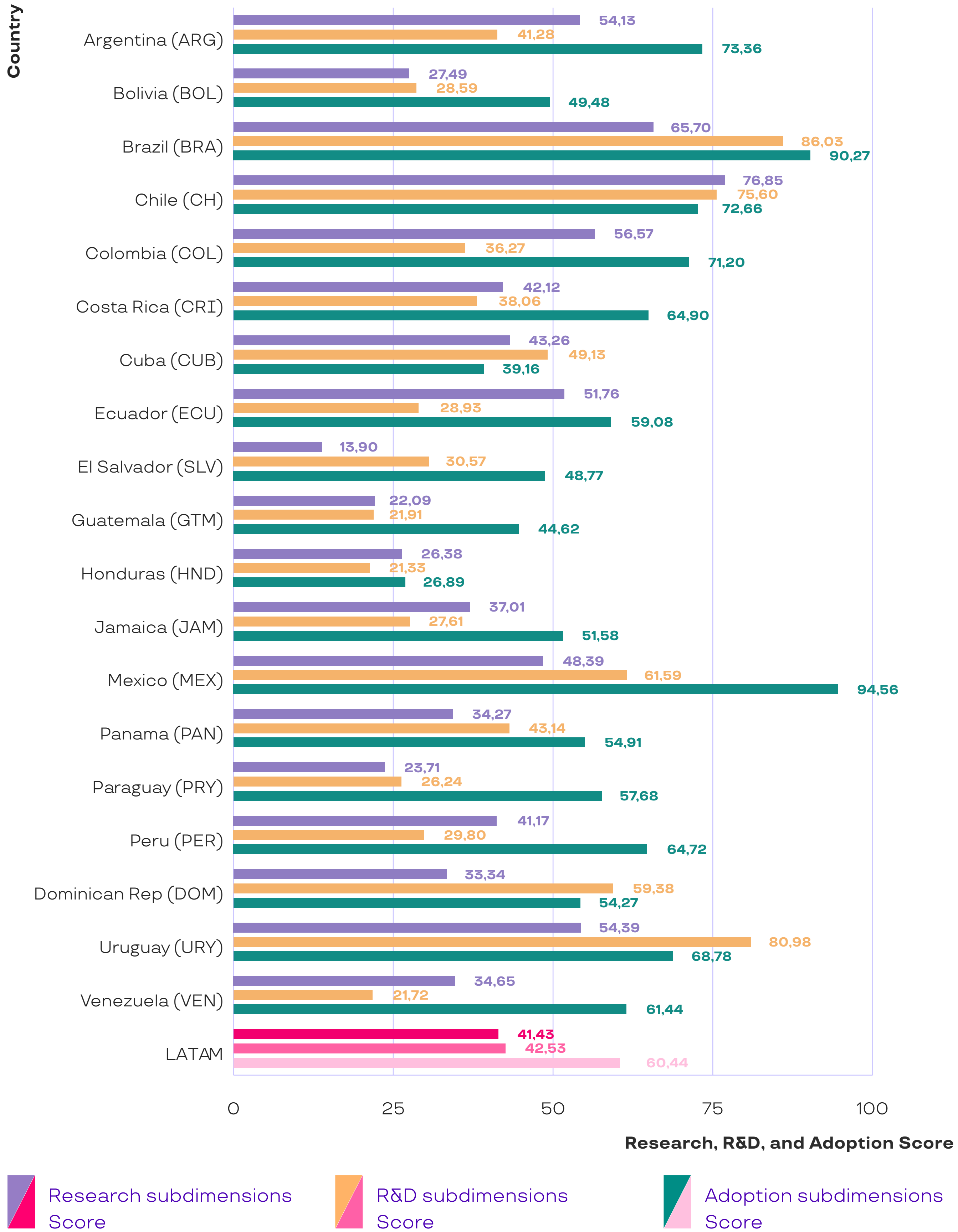
Countries with high R&D+A performance (over 60 points): Those that have achieved advanced capacity in research, development and integration of AI technologies. This group includes Brazil (79.17), Chile (75.21), Uruguay (66.68) and Mexico (66.20).

Countries with medium performance in R&D+A (between 35 and 60 points): These are those that show moderate development, with solid capabilities, but still with room for improvement in these aspects. These include Argentina (56.06), Colombia (54.87), Costa Rica (47.74), Ecuador (47.10), Dominican Republic (47.43), Peru (44.83), Cuba (43.79), Panama (43.12), Venezuela (38.81), Jamaica (38.56) and Paraguay (34.66).

Countries with low R&D+A performance (up to 35 points): Within this group are those that are in the initial stages in the areas of research, development and adoption of AI, as is the case of Bolivia (34.42), El Salvador (29.36), Guatemala (28.79) and Honduras (25.02).

Graph 2 shows that the **Adoption subdimension** presents a **regional average of 60.44 points,** while the Research and R&D subdimensions show regional averages of 41.43 and 42.53 points, respectively. Despite these results, there are outstanding scenarios in terms of productivity and research impact in certain countries included in this measurement, highlighting the existence of interesting investment opportunities in these specific areas.

Graph 2: Score for Research, R&D, and Adoption subdimensions



Source: ILIA 2024

D.3. Research Subdimension

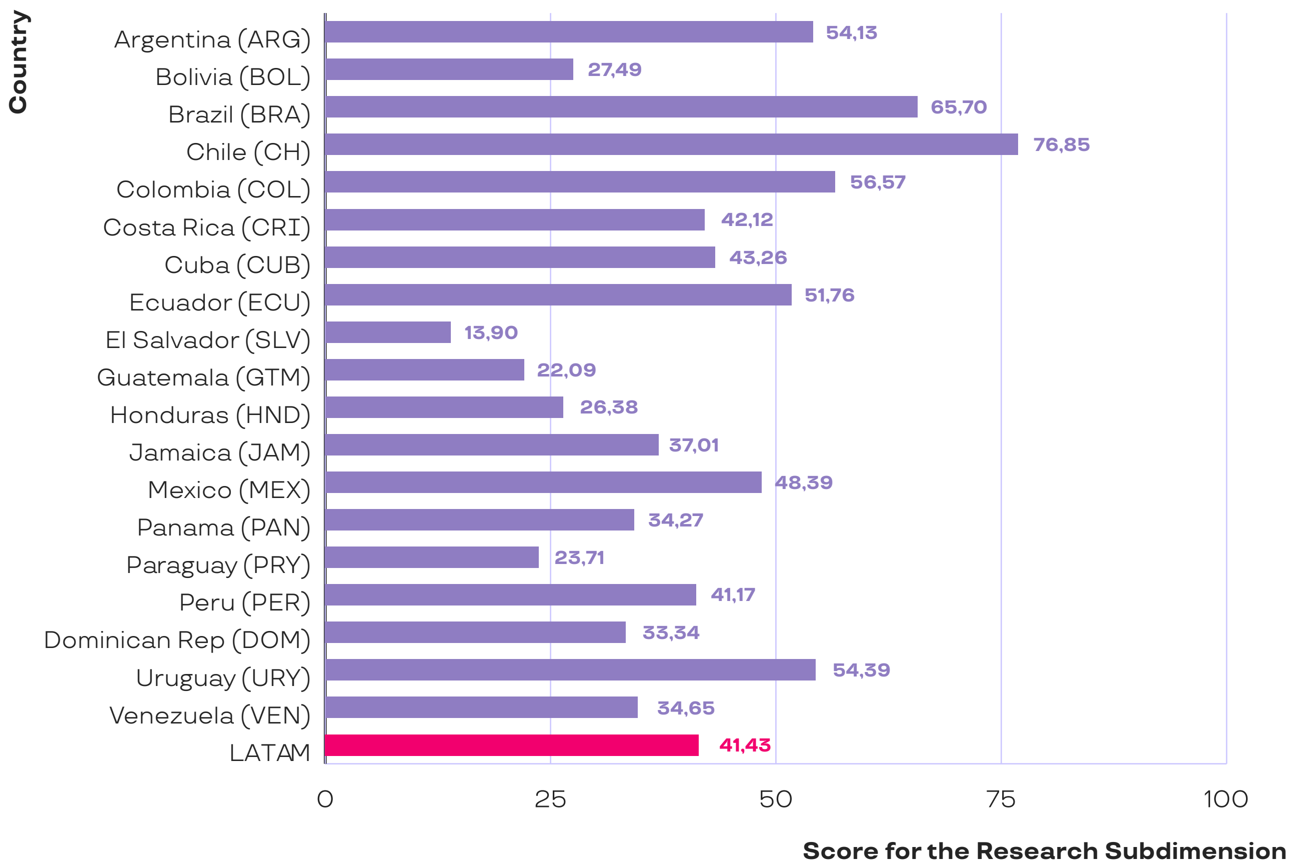
Research is the engine that drives innovation. Without a solid research base, it is not possible to build a strong AI ecosystem that is permanently transforming knowledge into innovative products and solutions.

As shown in **Table 1,** this subdimension has only one indicator, also called **Research.** However, in this version of the index, this subdimension was expanded with **new subindicators** that allow a more granular assessment of the progress of AI research and a more detailed measurement of the maturity of scientific activity.

This subdimension represents **40% of the total weighting of the R&D+A dimension.**

From Graph 3 it´s possible to infer that **Research presents a diverse regional panorama,** in which only some countries manage to consolidate more robust and specialized academic environments. This year, the region averages 41.43 points, with Chile being the leading country with 76.86 points and reflecting significant maturity in this field. It is followed by **Brazil,** with a score of **65.7; Colombia with 56.57 and Uruguay with 54.39.**

Graph 3: Score for the Research Subdimension



Source: ILIA 2024

Considering these results, countries can be divided into three groups to distinguish different levels of research capacity.

Countries Leading in AI Research (over 60 points): These nations demonstrate robust development in this field, with well-established ecosystems fostering innovation, knowledge creation, and specialized talent. Chile (76.85) and Brazil (65.70) exemplify this.

Countries Developing AI Research (40-60 points): These nations are solidifying their research capabilities and making significant strides, though they have not yet reached leadership levels. Uruguay (54.39), Colombia (56.57), Argentina (54.13), Ecuador (51.76), Mexico (48.39), Cuba (43.26), Costa Rica (42.12), and Peru (41.17) fall into this category.

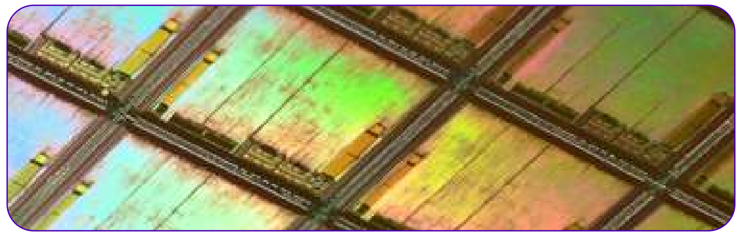
Countries Initiating AI Research (below 40 points): These nations face significant challenges in developing their AI ecosystems and require greater support to strengthen their academic and innovation capacities. Jamaica (37.01), Venezuela (34.65), Panama (34.27), Dominican Republic (33.34), Paraguay (23.71), Guatemala (22.09), Honduras (26.38), Bolivia (27.49), and El Salvador (13.90) are in this category.

D.3.1 Research

With the same name as the subdimension, this indicator, in turn, is composed of seven subindicators that allow for a more detailed evaluation of this important area:

a) Publications in IA
b) Active AI research
c) Productivity of AI researchers
d) Impact of AI research
e) Presence of AI research centers
f) Proportion of female authors in IA
g) Consistent AI research
h) Participation in main tracks conferences A+
i) Participation in A+ conference side events

It should be noted that the new subindicators enrich the analysis of the field of research. Such is the case of the **Proportion of female authors in IA**, which is key to address aspects related to gender equity in academic production. Meanwhile, **the Research consistent in IA**, reflects more precisely the research activity, classifying professionals according to the frequency with which they publish their articles. The latter is defined in order to better understand the level of specialization of male and female scientists and the continuity of their research activity in the academic field.



The last two subindicators added to this subdimension are related to participation in international conferences, both in the **main track (main event)** and in **side events (parallel events)**. These provide specific elements to evaluate the visibility and presence of LATAM researchers in the global AI community. This participation reflects the degree of integration of the region in the most advanced debates and developments in the sector, as well as its capacity to contribute to emerging trends at a global level.

a) Publications and Active Research in AI

Two Research subindicators are presented in this area: **AI Publications**, which analyzes the average number of publications in AI during the last five years, and **AI Active Research,** which measures the average number of active authors in AI also in the last five years; both per capita.

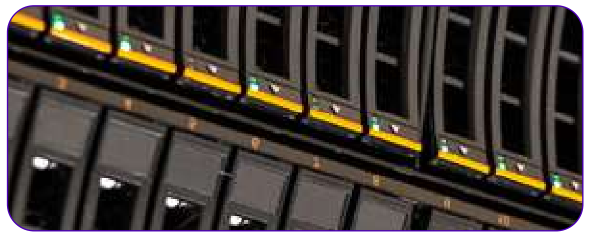
For its calculation, the methodology used was the same as that used for the previous version of the index: the complete database of OpenAlex, a platform that integrates portals, conferences, journals and repositories of academic publications, was accessed.

Given that most authors do not declare their country of residence, but only the institution with which they are affiliated at the time of publishing their paper, the indicators for this subdimension were based on cross-referencing the institution with the respective country. This approach ensured the accuracy and consistency of the data collected, providing a solid basis for assessing productivity (number of papers by these authors) and the impact of AI research (number of citations of these papers) in different countries.

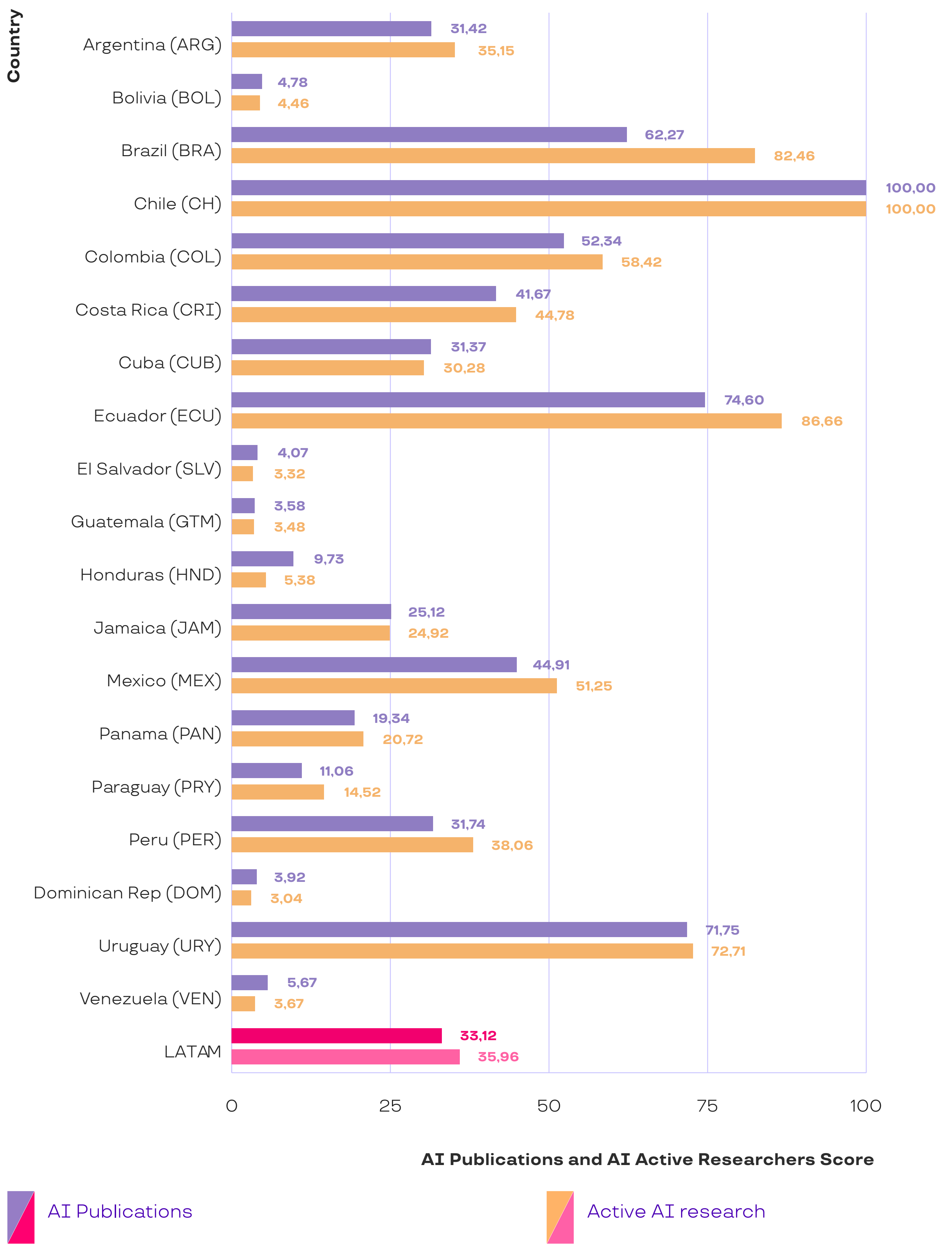
As shown in Graph 4, **Chile leads in these subindicators with 100 points, followed by Ecuador, which in this edition surpassed Uruguay**, thus consolidating the same top 3 as in 2023. Other countries also stand out with a performance in publications above the regional average (33.12 points). In this group are Brazil, Colombia and Mexico, with scores of 62.27, 52.34 and 44.91, respectively.

This year, **Chile** not only consolidates its position as **leader in terms of number of Publications in AI** and **number of active researchers**, but its score is well above the regional average of 33.12 points in publications and 35.96 points in active researchers.

It is worth noting that **these averages have experienced a significant drop compared to the 2023 measurement**, which showed values of 46.01 and 52.02 points respectively. This decrease is largely due to the incorporation -in this edition- of new countries with AI research ecosystems still in the initial stages, which has led to greater dispersion and a drop in regional averages.



Graph 4: Score for AI Publications and AI Active Researchers subindicators



Source: ILIA 2024 / Data: CENIA

b) Productivity of AI Researchers and Impact of AI Research

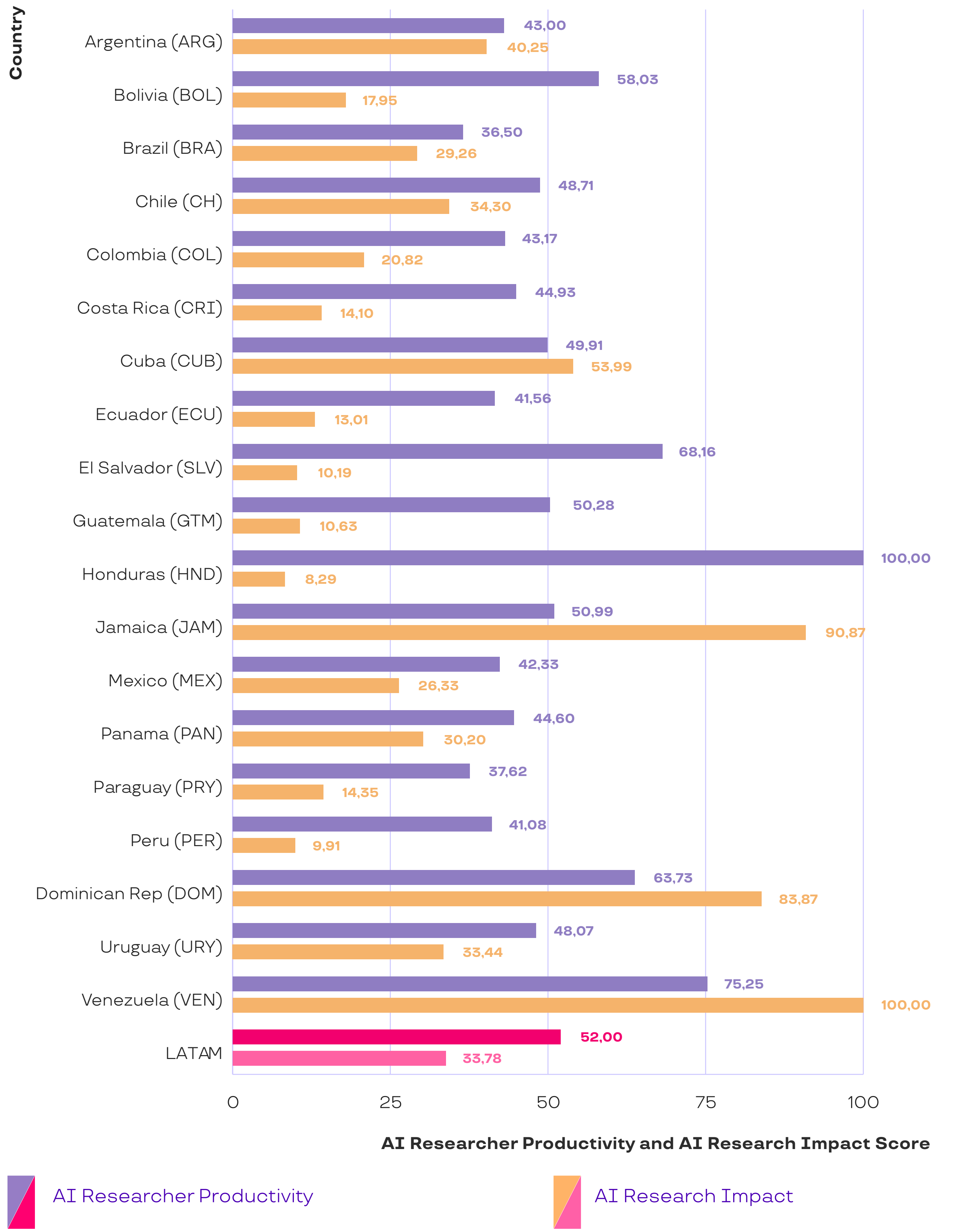
Two other subindicators of the Research indicator that are measured in each country are the **Productivity of AI researchers** and the **Impact of AI research**. While the former measures the annual average number of publications per author in the last five years - in order to assess the intensity of publication in the field of AI in that period - the latter refers to the annual average number of citations of research papers in the total number of publications and conferences in this field in the last five years. These measurements reflect the impact of each paper on other scientific articles.

As **Graph 5 shows**, both items present diverse behaviors and highlight significant disparities between countries. A notable case is **Honduras,** which achieves the maximum score of **100 points in productivity**, but a low research impact with only 8.29 points. This contrast suggests that, although the research ecosystem in Honduras generates a high number of publications in relation to its population, they achieve limited relevance and dissemination in the academic and scientific sphere. This result opens the door to the debate on the incentive policies for scientific production applied in the different countries of the region.

It is important to note that **some countries show a decrease in their score compared to 2023,** despite having improved in absolute terms. A relevant case is Argentina which, although it increased its productivity in gross numbers, experienced a drop in its score. This phenomenon can be attributed to several factors, such as the methodological adjustment that takes into account the incorporation of new countries with less developed research, the strong impact of the COVID-19 pandemic on research work worldwide, and the drop in scientific production due to financial restrictions of public instruments.

It is worth mentioning that the improvement in productivity must be accompanied by a proportional increase in the quality and impact of the publications to be reflected in a higher score.

Graph 5: Score for AI Researcher Productivity and AI Research Impact subindicators



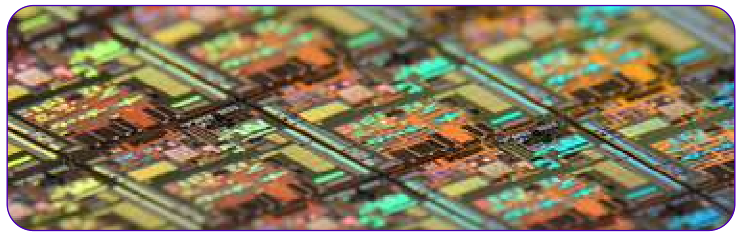
Source: ILIA 2024 / Data: CENIA

c) Presence of AI Research Centers

Identifying and characterizing the R&D centers dedicated to the study and development of AI in Latin America and the Caribbean allows us to understand the level of sophistication and maturity of the regional ecosystem in this strategic area. These centers not only drive their lines of work in research and innovation, but also facilitate the training of specialized talent and promote collaboration between sectors. Their presence is a key indicator of the region's potential to position itself competitively in the global AI landscape.

To determine whether or not a country has such centers, and to differentiate them from other types of institutions, collaborative projects or research groups, the **definition of "AI Research Centers"** was constructed **on the basis of five exclusionary criteria:**

1. Existence of established governance
2. Validity of bylaws or equivalent
3. Inclusion of the "AI" concept within the three pillars that define the center at the research level.
4. Stable financing of some kind
5. At least three years of seniority

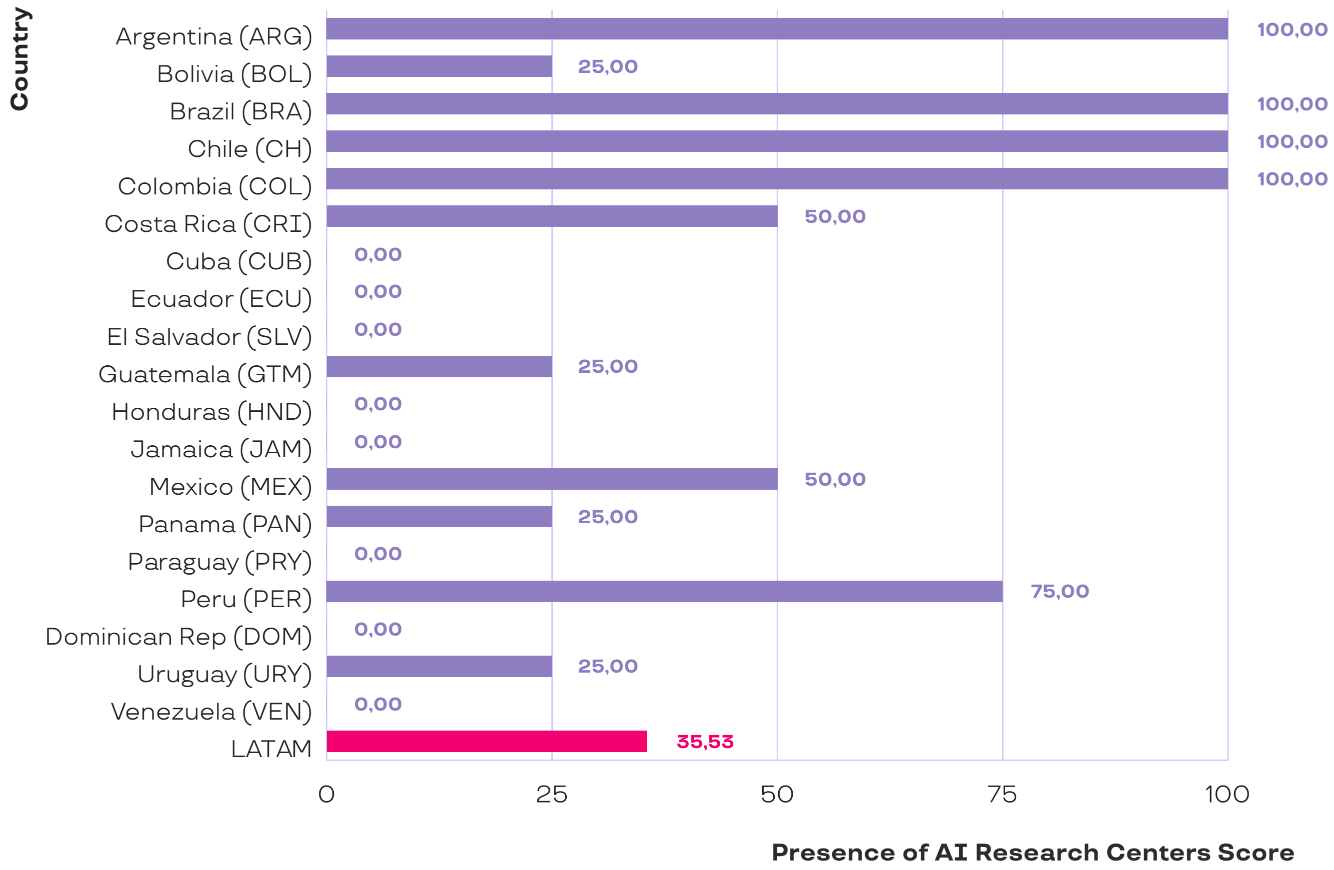


For the classification process, the following categories were used according to the number of centers that each country has:

1: No AI center = 0 points
2: Has an AI center = 25 points
3: Has two AI centers = 50 points
4: Has three AI centers = 75 points
5: Has more than three AI centers = 100 points

According to the information gathered, **five countries already have more than two AI research centers:** Argentina, Brazil, Chile, Mexico and Peru. This is in contrast to the results for 2023, when three countries were identified as having this level of institutional presence in the field of AI.

Graph 6: Score for Presence of AI Research Centers Subindicator



Source: ILIA 2024 / Data: CENIA

It is important to note that, although several entities that are working on AI-related issues at different levels were identified, they did not meet all the criteria necessary to be included in this category.

The following is the final list of the institutions that do meet the aforementioned requirements:

Table 2: AI Research Centers in Latin America and the Caribbean

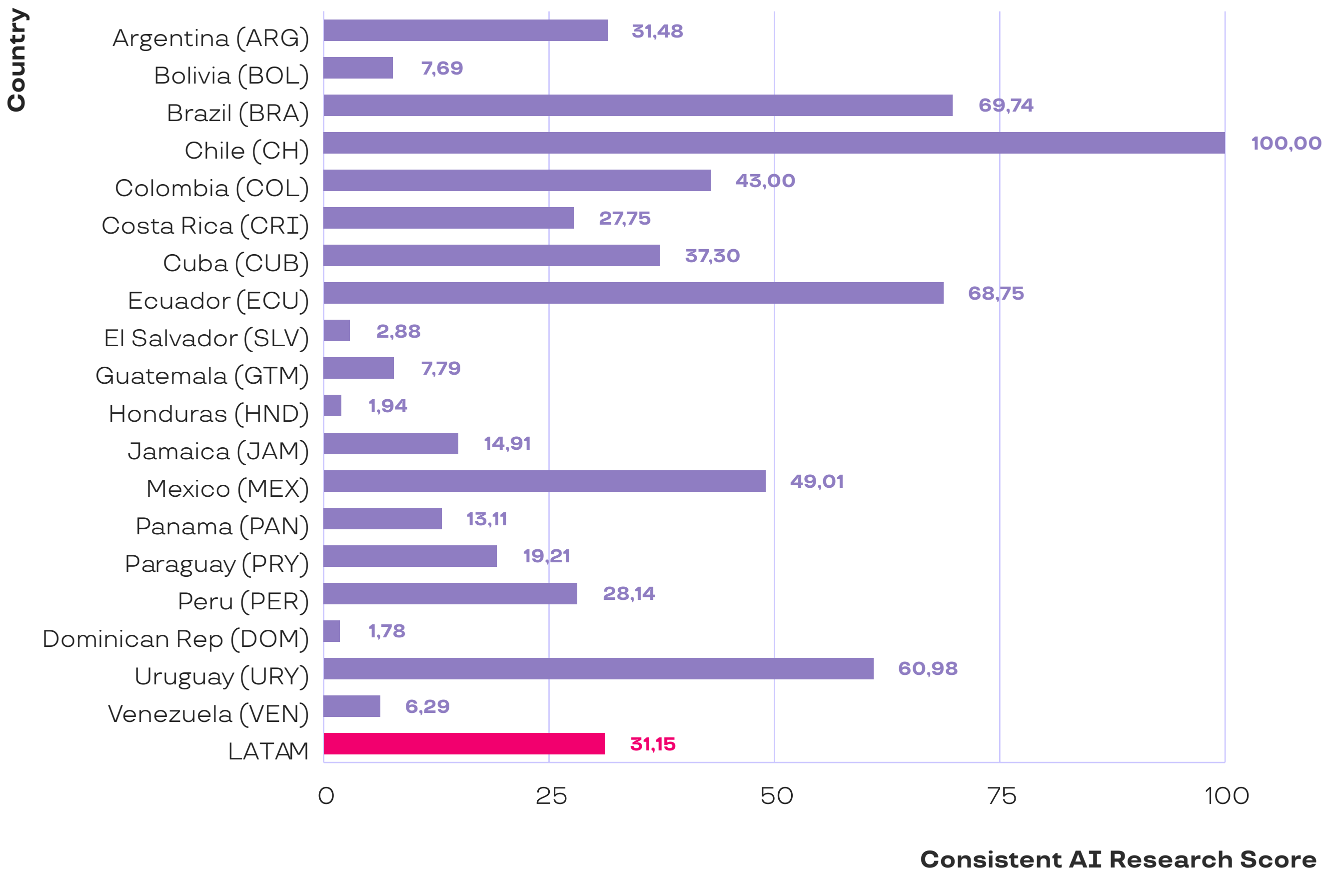
Country	AI Research Center	Website
Argentina	Center for Artificial Intelligence and Health for Latin America and the Caribbean (CLIAS)	https://clias.iecs.org.ar/
	LIFIA Center, University of La Plata, Argentina	https://lifia.info.unlp.edu.ar/lifia/
	Argentine Center of Engineers (CAI)	https://cai.org.ar/quienes-somos/mision-y-objetivos/
	IALAB UBA (Law School of the University of Buenos Aires)	https://ialab.com.ar/
	Institute of Computer Science and Engineering (ICIC) CONICET-UNS	https://icic.conicet.gov.ar/
	Laboratory of AI and Robotics (LINAR), University of San Andrés	https://udesa.edu.ar/linar
Brazil	AI Center (C4AI)	https://c4ai.inova.usp.br/
	Artificial Intelligence Recreating Environments (IARA)	https://bv.fapesp.br/pt/auxilios/111390/iara-inteligencia-artificial-recriando-ambientes/ https://iara.science/
	Brazilian Institute of Data Science (BIOS)	https://www.bi0s.unicamp.br/
	Center of Excellence in Artificial Intelligence Research for Industry	https://bv.fapesp.br/en/auxilios/111046/center-of-excellence-in-applied-research-in-artificial-intelligence-for-industry/
	Center for Applied Research in Artificial Intelligence for the Evolution of Industries to Standard 4.0	https://bv.fapesp.br/en/auxilios/110902/center-for-applied-research-in-artificial-intelligence-for-the-evolution-of-industries-to-standard-4/
	Innovation Center on Artificial Intelligence for Health (CIIA-Health)	https://ciia-saude.dcc.ufmg.br/home/
	Artificial Intelligence Reference Center (CEREIA)	https://bv.fapesp.br/pt/auxilios/109947/cereia-centro-de-referencia-em-inteligencia-artificial/
Bolivia	Institute for Computational Intelligence	https://www.upb.edu/investigacion/centros-de-investigacion/ingenierias-y-arquitectura-fia/instituto-de-inteligencia-computacional
Colombia	AudacIA	https://audacia.ai/
	Center for Research and Formation in Artificial Intelligence (CinfonIA)	https://uniandes.edu.co/es/noticias/ingenieria/nuevo-centro-de-inteligencia-artificial-en-uniandes
	Research and Technological Development Center of ICESI University, focused on Data Science and Artificial Intelligence	https://www.icesi.edu.co/unicesi/todas-las-noticias/7271-conoce-el-centro-de-investigacion-y-desarrollo-tecnologico-de-la-icesi-enfocado-en-la-ciencia-de-datos-y-la-inteligencia-artificial
	Antioch Science and Technology Center	https://cta.org.co/
Chile	National Center for Artificial Intelligence (CENIA)	https://www.cenia.cl/
	Institute for Data and Artificial Intelligence (ID&IA)	https://uchile.cl/noticias/181354/un-instituto-de-datos-e-inteligencia-artificial-para-chile
	The Artificial Intelligence and Society Core [AI+SIC].	https://ia-sic.org/
	Millennium Nucleus Futures of Artificial Intelligence Research (FAIR)	https://www.nucleofair.org/
	iHEALTH - Millennium Institute for Engineering and Artificial Intelligence in Healthcare	https://i-health.cl/
Costa Rica	National Advanced Computing Collaboratory (CNCA) of the National High Technology Center (Cenat).	https://www.cenat.ac.cr/es/
	PARMA Group, Technological Institute of Costa Rica	https://www.tec.ac.cr/grupo-parma
Cuba	International Research Institute for Artificial Intelligence Research	https://mincyt.gob.ve/china-cuba-inauguran-instituto-internacional-investigaciones-inteligencia-artificial/
Guatemala	Generative Artificial Intelligence Lab, Galileo University	https://www.galileo.edu/page/ia-aplicada-educacion/#gptprofesores
Mexico	Institute for Research in Artificial Intelligence (IIIA), Veracruzana University	https://www.uv.mx/iiia/
	National Institute of Astrophysics, Optics and Electronics (INAOE)	https://www.inaoep.mx/
	Center for Research and Advanced Studies (Cinvestav)	https://www.cinvestav.mx/
	Center for Complexity Sciences C3 of the UNAM	https://www.c3.unam.mx/progacademicos.html
	IA Center	https://www.ia.center/es/
Peru	Artificial Intelligence Group PUCP - IA-PUCP	http://ia.inf.pucp.edu.pe/
	Artificial Intelligence and Robotics Laboratory, National University of Engineering of Lima	https://www.fiis.uni.edu.pe/laboratorios
	Scientific Computing Research Group - UTEC	https://utec.edu.pe/grupo-de-investigacion-en-computacion-cientifica
Panama	National Institute for ICT Research (INDICATIC)	https://indicatic.org.pa/
Uruguay	Interdisciplinary Center for Data Science and Machine Learning (CICADA)	https://cicada.uy/

Source: ILIA 2024

d) Consisting IA Research

For this edition of the index we considered evaluating the level of specialization of AI research in each country through the new subindicator that measures the presence of **consistent researchers in AI topics**. These are those who have published in AI journals or participated in conferences on a regular basis in this discipline in the last five years. This information was extracted from the OpenAlex database, considering AI publications in the 19 countries covered by the ILIA.

Graph 7: Score for Consistent AI Research Subindicator



Source: ILIA 2024 / Data: CENIA-OPENALEX

At the regional level, a group of leading countries stands out in this subindicator, with **Chile with the highest score,** followed by **Brazil (69.74), Ecuador (68.75)** and **Uruguay (60.98)**. By significantly exceeding the regional average (31.15), these countries not only show a concentration of specialized AI talent, but also reflect the gap with other countries in the region and their ability to sustain a stable, high-level research community

Table 3: Proportion of consistent male and female authors over the total number of authorships in the last five years

Country	Nº Total number of authors in IA	Nº of Consistent Authors on AI	Rate of Consistent Authors
Argentina	914	157	17,18%
Bolivia	31	10	30%
Brazil	10.138	1.649	16,27%
Chile	1.115	214	19,19%
Colombia	1.729	245	14,17%
Costa Rica	133	16	12,03%
Cuba	193	46	23,83%
Ecuador	896	137	15,29%
El Salvador	12	2	16,66%
Guatemala	36	15	41,66%
Honduras	32	2	6,25%
Jamaica	40	5	12,5%
Mexico	3.740	688	18,39%
Panama	53	6	11,32%
Paraguay	57	14	24,56%
Peru	743	106	14,20%
Dominican Rep	20	2	10%
Uruguay	141	23	16,31%
Venezuela	60	20	33,33%
Total/Average	**20.083**	**3.357**	**18,59%**

The percentage of **consistent researchers** in IA with respect to the total number of those who have published in the discipline in the period of analysis is 18.59%, which is equivalent to **3,357 unique researchers.** This shows a frequency and regularity of publication in the area during 2023 that allows us to argue that they are consistent in IA. Of this universe, **70% is in Brazil** (1,649, or 49.1%) and **Mexico** (688, 20.5% of the unique authors) and the remaining 30% in the other 17 countries.

According to **Table 3**, all the countries of Latin America and the Caribbean have at least two researchers who meet the consistency criterion. None -except Honduras- shows a rate of consistent researchers below 10%. However, these **are low recurrence rates in the region**, which highlights the challenge of generating longer careers that extend the years of research to strengthen this fundamental aspect in the advancement of AI in LAC countries.

e) Proportion of female authors in IA

In order to incorporate the gender perspective in the measurement of academic productivity, and thus underscore the importance of promoting the participation of women in the field of AI, this subindicator was added this year.

Promoting gender equity in an area historically dominated by male presence not only contributes to equal opportunities, but also enriches scientific development with a generation of higher quality science and technology. In addition, it inspires future generations of female researchers in order to promote a positive cycle of **inclusion, diversity and progress in science and technology.**

The objective of this subindicator is to measure the gender gap by country in AI and to make visible the tools that have had an impact on the reduction or deceleration of scientific production by female authors. To this end, the **number of female authors publishing on AI** was counted and then the proportion of the total number of male and female researchers was estimated over the last five years.

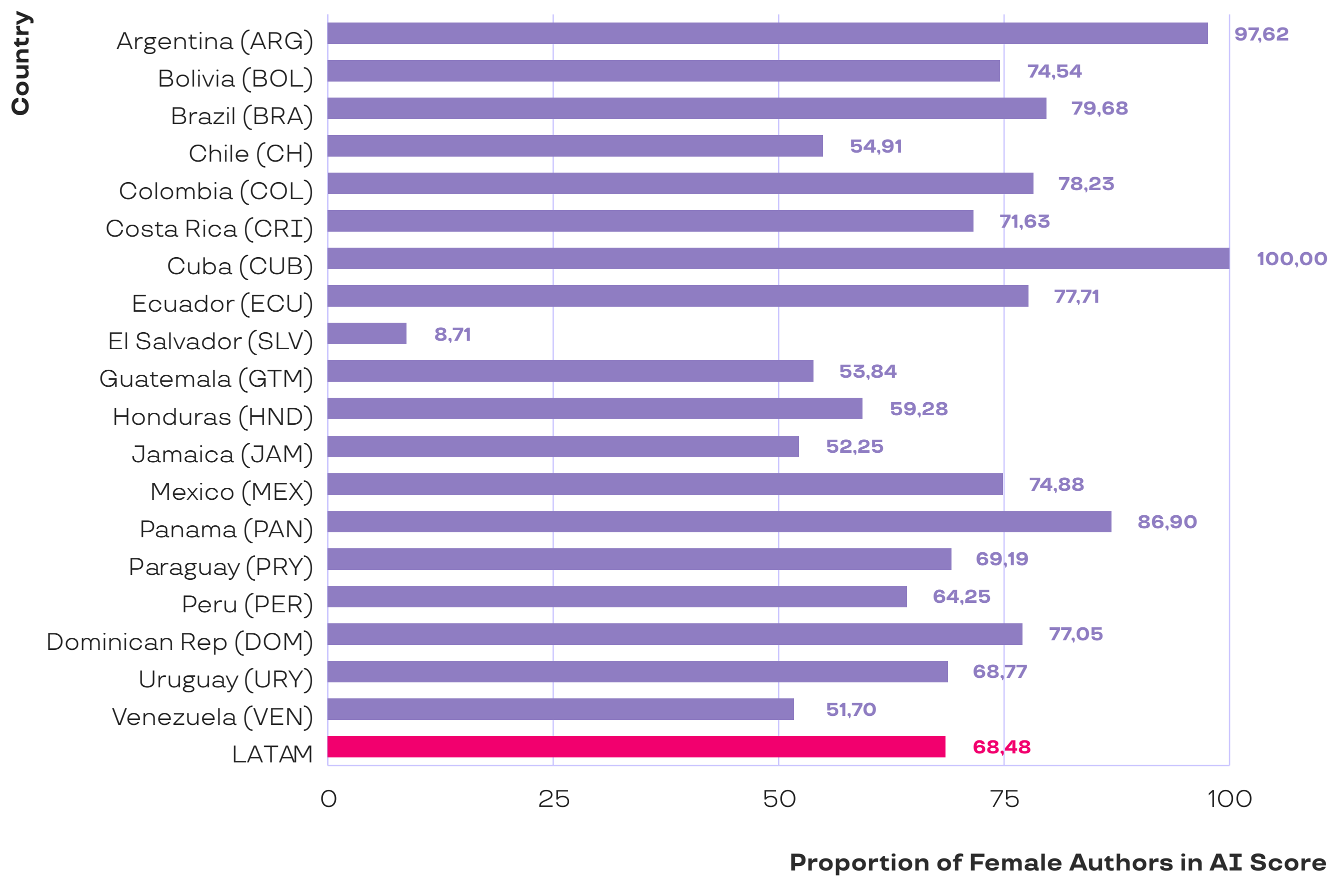
For this item, as indicated in Graph 8, the region achieves an average score of 70.19 points. It is interesting to consider this information in light of the fact that **the score reflects the presence rate of women in diverse research ecosystems** relative to the number of individuals engaged in AI.

Cuba stands out, leading with 100 points, corresponding to 26.42% female presence in a research ecosystem comprising 193 individuals. **Following closely is Argentina, with 97.72 points**, representing 24.84% of female authors within a total of 914 individuals. **In third place is Panama, with 92.28 points**, reflecting 22.64% female representation among a total of 53 people engaged in AI research.

On the other hand, El Salvador records the lowest score in the region at 13.59 points, corresponding to 8.33%, which equates to just one female researcher within a small community of only 12 individuals working in AI. This highlights the need for greater efforts to enhance female participation in this field. These contrasts underscore the existing disparities in gender equity within AI research in Latin America.

Chile's score is striking - which is almost 14 points below the average- with 57.38 points concerning a 14.17% participation of women in a research ecosystem composed of 1,115 people. Despite extensive public policies to promote access and reduce gaps (such as the INES Gender Program- and the maturity of the Chilean ecosystem in other elements of research) there is a relevant challenge in increasing the relative participation of women in the discipline. This challenge can also be linked to the indicators of female participation in the labor market, where Chile shows the lowest rates in the region in penetration of engineering skills and AI literacy.

Graph 8: Score for the Proportion of Female Authors in AI Subindicator



Source: ILIA 2024 / Data: CENIA-OpenAlex

ILIA

Table 4 presents a detailed analysis of female participation and absolute figures in the research ecosystems of the 19 evaluated countries. This breakdown not only allows for an examination of the scores that comprise the index but also highlights how Latin America and the Caribbean are significantly below the expected 50% of women in AI research across all the countries considered in this index.

Table 4: Percentage of female IA authors (2010-2023)

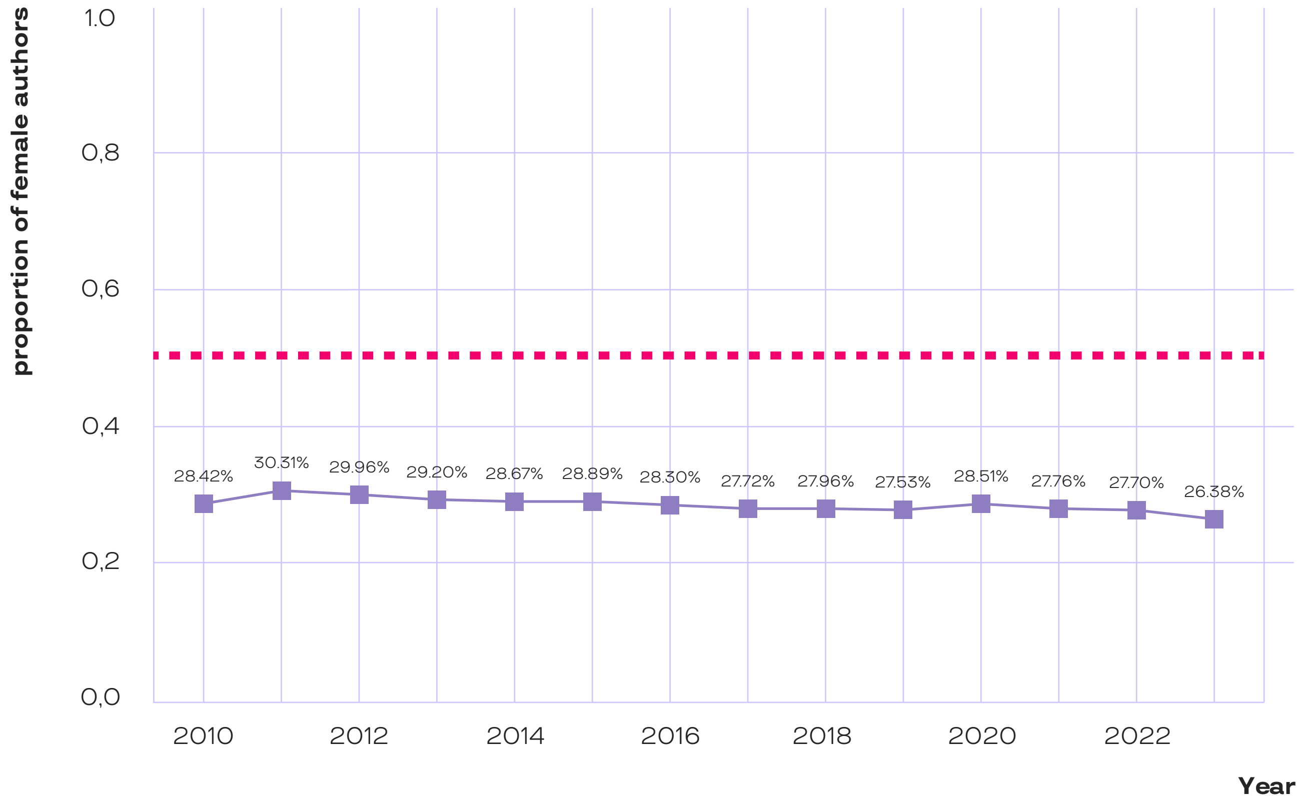
Country	Nº Total number of Authors in IA	Nº of Consistent Authors on AI	of Consistent Authors on AI
Argentina	914	227	24,84%
Bolivia	31	6	19,35%
Brazil	10.138	2.068	20,40%
Chile	1.115	158	14,17%
Colombia	1.729	346	20,01%
Costa Rica	133	24	18,05%
Cuba	193	51	26,42%
Ecuador	896	178	19,87%
El Salvador	12	1	8,33%
Guatemala	36	5	13,89%
Honduras	32	5	15,63%
Jamaica	40	6	15,00%
Mexico	3.740	716	19,14%
Panama	53	12	22,64%
Paraguay	57	11	19,30%
Peru	743	126	16,96%
Dominican Republic	20	4	20,00%
Uruguay	141	25	17,73%
Venezuela	60	8	13,33%
Total/Average	**20.083**	**3.977**	**19,80%**

Source: ILIA 2024 / Data: CENIA

Finally, it is relevant to broaden the perspective and analyze the **persistent low representation of women in AI research** in the region, especially in the authorship of scientific articles. **Graph 9** illustrates this trend, showing how from 2010 to 2023, the percentage of female participation has remained practically unchanged and below the optimal equity reflected by the red line of 50%.

This stagnation is evidence that, despite technological advances and growing interest in inclusion, the average number of women in AI research is still not reaching satisfactory levels. The graph reflects the average percentage for all countries evaluated, highlighting the urgent need for strategies that promote greater gender equity in this field.

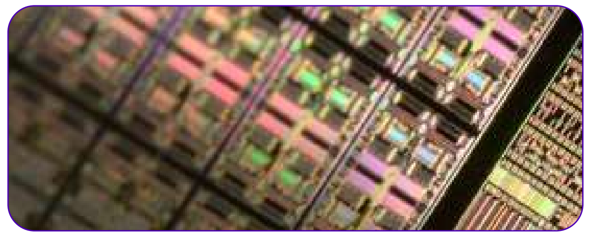
Figure 9: Representation of women in AI research 2010-2022



Countries included: Brazil, Mexico, Colombia, Chile, Argentina, Ecuador, Peru, Cuba, Uruguay, Costa Rica, Venezuela, Panama, Paraguay, Jamaica, Bolivia, Guatemala, Honduras, Dominican Republic, El Salvador

Expected level 50%

Source: ILIA 2024 / OpenAlex Data



f) Participation in main conference track A+ (index of excellence)

Unlike other academic disciplines, computer science and AI consider participation in conferences as **venues for publishing** the most relevant **scientific advances**. Similar to journals, these can be ranked according to their relevance based on the impact index (H5 Index).[1]

Conferences feature rigorous scientific review committees to assess study results, making the presence of researchers in the main tracks a strong indicator of the quality of research conducted in each country.

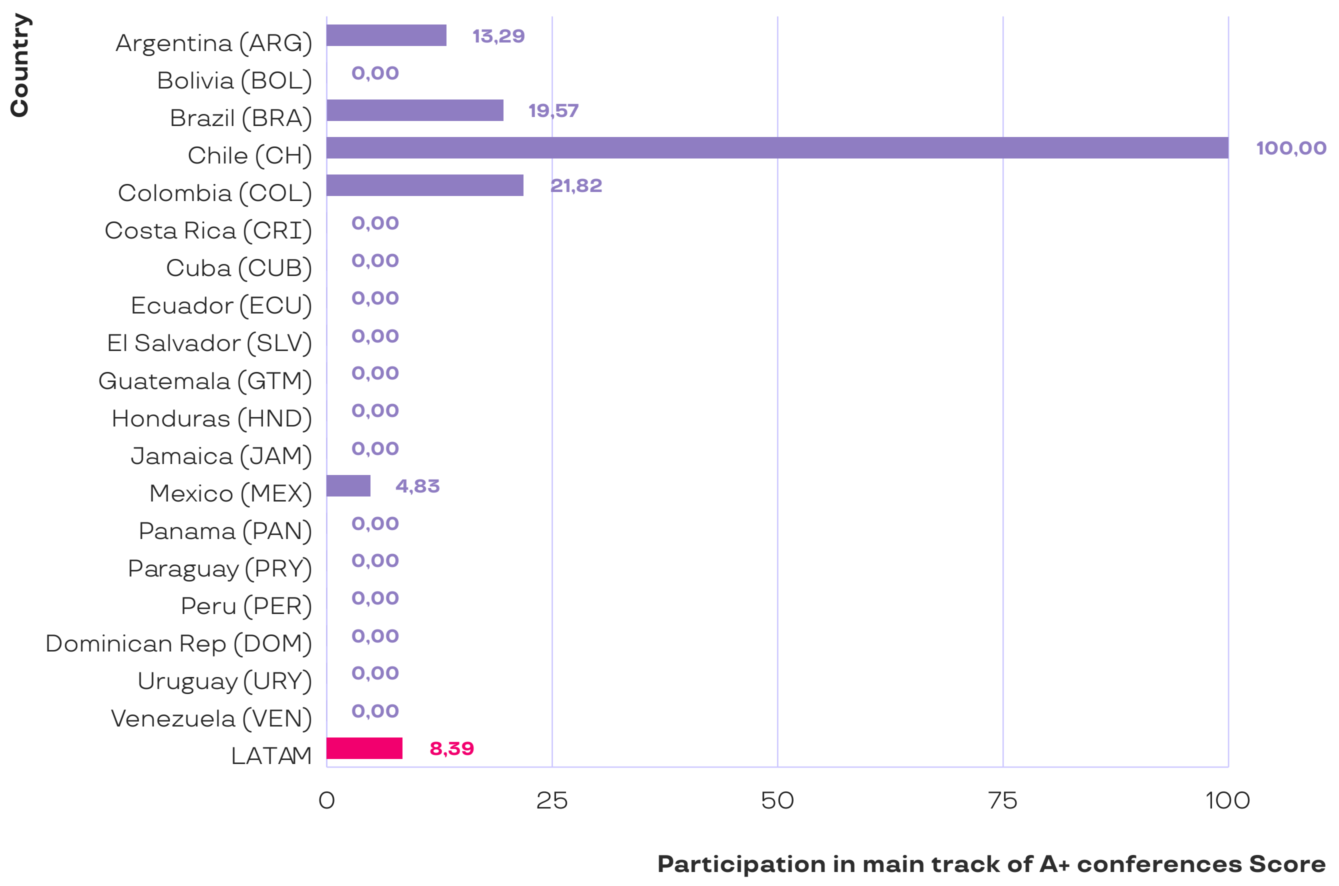
It should be noted that the conferences considered in the count are within the top 100 of Google Scholar based on the H5 Index: ACL, CVPR, NeurIPS, EMNLP, ICCV, AAAI, ICLR and ICML.

In terms of participation in the main tracks of international AI conferences, **Chile leads regional involvement with the highest score,** followed—by a considerable margin—by **Colombia, scoring 21.82, and Brazil with 19.57.** Argentina also shows notable participation, scoring 13.29, surpassing the regional average of 8.39.

In contrast, the rest of the countries register low or no participation, indicating the need for a greater effort to increase their presence in these key forums for the development of AI in the region.

1. The H5 Index is a bibliometric indicator used to measure the visibility and impact of a journal or periodic scientific event (conference), it is calculated taking into account the last 5 full years of publications of a journal, based on the calculation of the H index.

Graph 10: Score for Participation in main track of A+ conferences Subindicator



Source: ILIA 2024 / Data: CENIA

It should be noted that the average for the region indicates that the participation of researchers in conferences is very low, given that the above scores correspond to a total of 39 publications -most of them concentrated in the NeurIPS and AAAI conferences- and 83 authors.

g) Participation in side events of conferences A+ (subindicator from the excellence index)

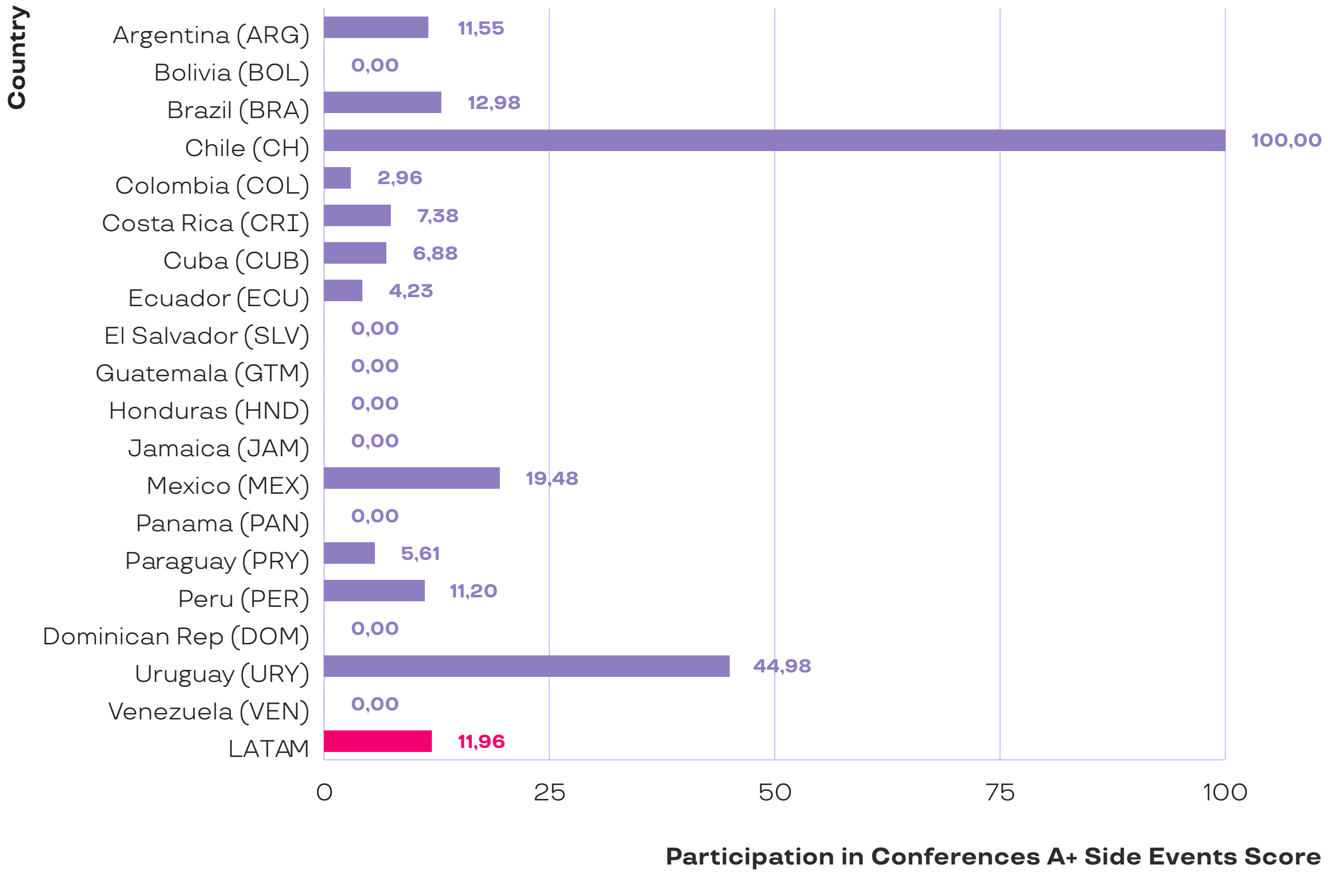
g) Participation in side events of conferences A+ (subindicator from the excellence index) While the primary indicator of scientific research quality is participation in the main conference track, many of them also offer side events with rigorous, though slightly less selective, admission processes. Notably, **Latin American authors are more prevalent in these side spaces than main tracks,** which include forums like findings expositions and workshops. A key example is the LatinX workshop, dedicated to showcasing regional research and now established as a regular side event at major AI conferences.

The analysis of this subindicator first reveals a significant presence of Latin America and the Caribbean compared to the main tracks. Eleven countries report some level of participation, with 83 publications and 267 authors. However, notable regional disparity is evident, **with Chile standing out at the top score of 100.** This high score reflects strong attendance at these complementary events, which are essential for networking and fostering collaborative development.

Uruguay also shows an outstanding performance with a score of **44.98,** indicating a considerable participation. **Mexico (19.48)** and **Brazil (12.98)** also exceed the regional average of 11.96, while **Argentina** and **Peru** are close to the average, with **11.55** and **11.20** points, respectively.

It is worth mentioning that several countries in the region did not register participation.

Graph 11: Score for Participation in Conferences A+ Side Events Subindicator



Source: ILIA 2024 / Data: CENIA

Being part of these spaces is the international standard of excellence for scientific and academic development in AI disciplines. The fact that academics from the region are present in the main tracks is the result of the **strengthening of local research ecosystems** and the internationalization of scientific work in each country. Both elements must be taken into account to fully understand how to strengthen the ecosystem of scientific production.

Report

Characterization of Research and Academic Collaboration in Latin America and the Caribbean

In the 2023 edition, academic collaboration between Latin American countries and 13 geographic areas was reported in five-year intervals. In the 2024 edition, seven countries were added, and the analysis was concentrated on two six-year periods.

Table 1 demonstrates that collaborations have grown at least twice as fast in all regions from one period to the next, with notable shifts in the distribution of the relative importance of collaboration areas.

Notably, collaborations with non-traditional regions (Canada, USA, Latin America, and Europe) are increasing at twice the average rate, indicating a trend of heightened internationalization and diversification within the Latin American and Caribbean AI community.

Table 1: Academic collaboration in Latin America and the Caribbean

2012-2017			2018-2023			
Zone	Nº of collaborations	%	Zone	Nº of collaborations	%	change
Europa	5.436	57.03%	Europa	12.084	50.67%	-7
USA	1.517	15.91%	USA	3.143	13.18%	-2,5
LATAM	889	9.33%	LATAM	2.099	8.80%	-0,5
Canada	415	4.35%	Canada	1.014	4.25%	1,5
Asia	307	3.22%	Asia	1.000	4.19%	0,97
China	262	2.75%	China	961	4.03%	-0,32
Oceanía	225	2.36%	Oceanía	761	3.19%	0,67
Turkey	17	0.18%	Turkey	591	2.48%	1,5
Middle East	118	1.24%	Middle East	519	2.18%	0,94
India	93	0.98%	India	380	1.59%	0,72
Africa	83	0.87%	Africa	176	0.74%	0,32
Russia	40	0.42%	Russia	87	0.36%	0,18
Others	130	1.36%	Others	1.035	4,34%	2,98
Total	9.532		Total	23.850		

Source: ILIA 2024 / Data: CENIA

The comparison shows, first of all, a **very relevant increase in academic production,** from 9,532 in the period 2012-2017 to 23,850 between 2018-2023.

The growth of collaborations is more heterogeneously distributed in the second period of analysis, which translates into a relative drop in the proportional importance of European, U.S. and Latin American countries in the composition of the total panorama of scientific links.

Europe increased from 5,434 collaborations to 12,084, an increase of 220% over the period. However, at the same time, it fell from 57% of the total to 50%, being the most relevant relative and gross drop in participation of the entire sample. Meanwhile, the USA shows an increase from 1,517 to 3,143 collaborations, nearly 200%, but also falls in terms of relative importance by 2.5 percentage points, reaching 13.18% of the total.

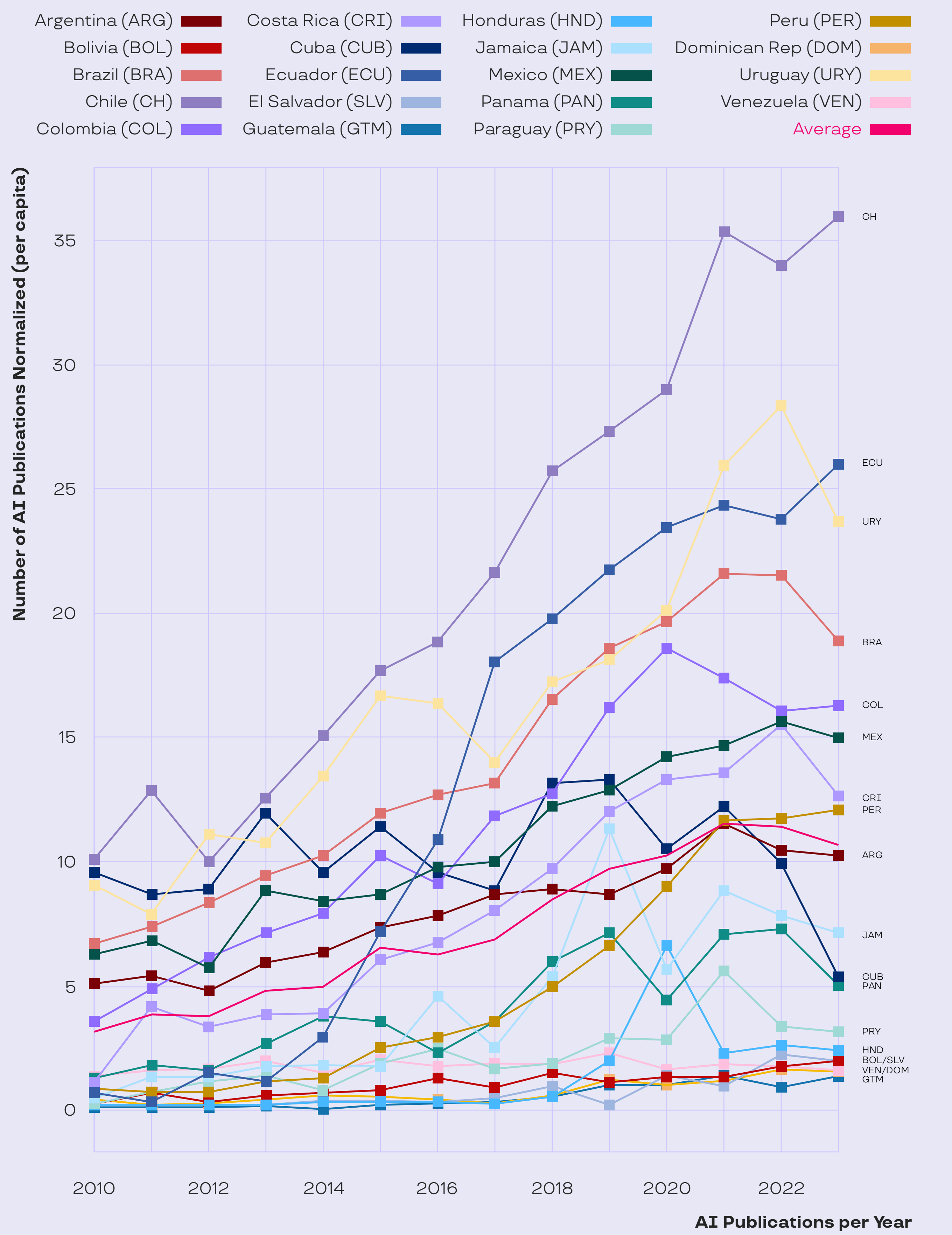
Finally, collaborations within LATAM—specifically, among authors affiliated with Latin American and Caribbean institutions—have increased by 233%, rising from 889 to 2,099 across the two six-year periods. Despite this growth, the relative importance of intraregional collaborations has decreased by 0.5 percentage points.

The areas representing more than 1% of collaborations increased from 5 to 7, with the most significant changes in the number of collaborations with China, which grew by 387%, and India, which increased by 635%.

Beyond the fact that the increases can be attributed to a low comparison base, they reinforce the idea of the internationalization of scientific and academic collaboration within the Latin American ecosystem. The relative importance of the top three regions drops from 82.27% to 72.65%, a decrease of 10 percentage points. This aligns with changes in the talent migration matrix, following the same pattern of increased diversity in the destinations to which academics from the region go for graduate studies, resulting in the creation of collaboration networks and subsequent joint work.

In terms of aggregate publications, **Graph 1** shows the number of annual publications per country normalized by number of inhabitants, from 2010 to 2023.

Graph 1: AI Publications from 2010 to 2023 by Country (Normalized by Population)



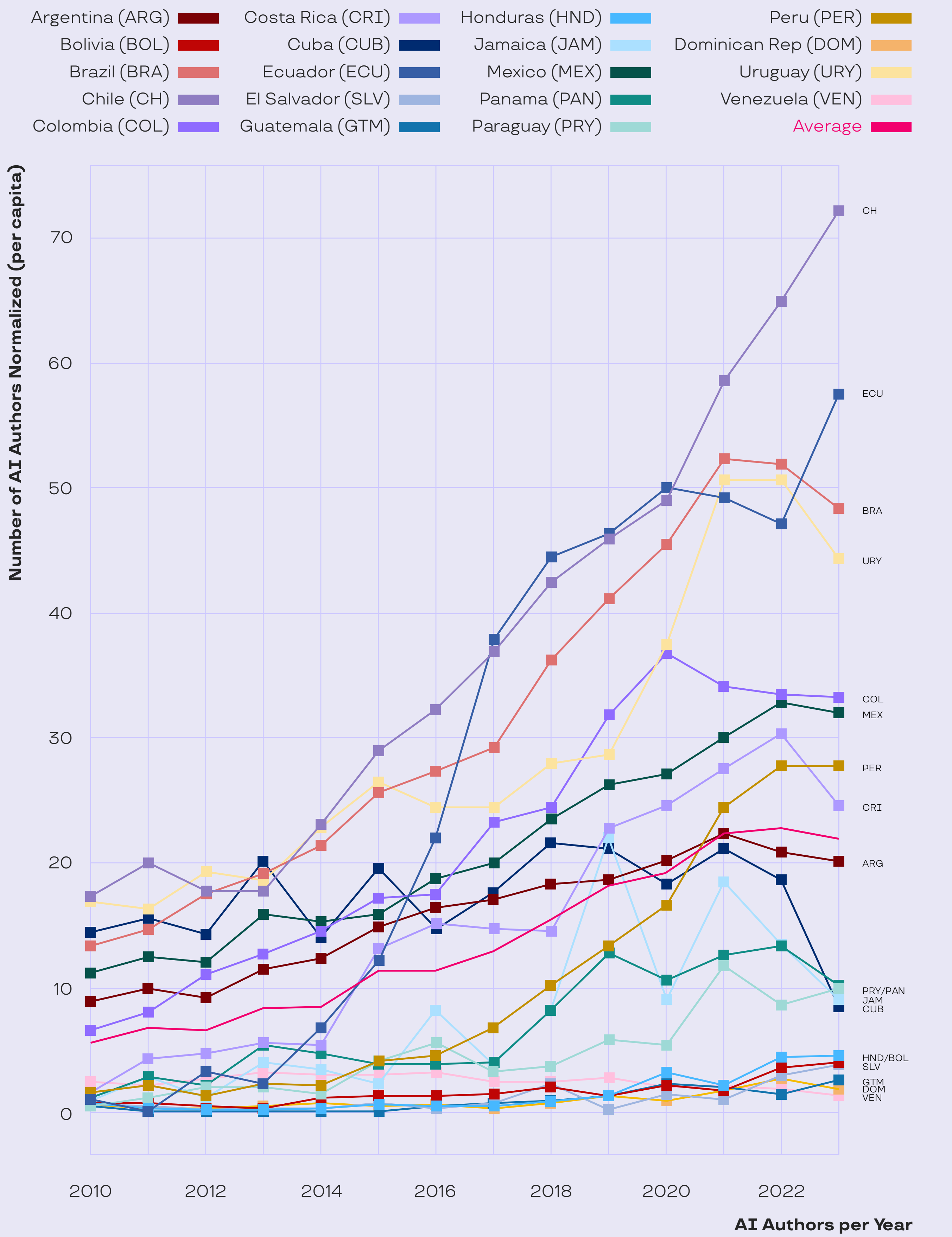
Source: ILIA 2024 / Data: CENIA

The first thing that stands out from this graph is that until the year 2021 there is a continuous growth in academic production associated with AI, both among pioneer and adopter countries. The graph also reveals that the drop in academic output for all countries shown in ILIA 2023 is associated with a lag in scientific output as a consequence of the pandemic or, eventually, the existence of a bottleneck in conferences and specialized journals that reduced the number of publications (a transitory phenomenon for most countries).

It should be noted that Chile, Colombia and Ecuador show a recovery that approaches or exceeds pre-pandemic levels, while Brazil, Uruguay and Costa Rica maintain a lagging trend. Meanwhile, eight countries are above the average number of publications in the region (11): Chile (35), Ecuador (25), Uruguay (23), Brazil (17), Colombia (15), Mexico (14), Costa Rica and Peru (11). On the other hand, there is a group of eight countries that do not exceed five publications per year in the discipline, a fact that should be taken into account when analyzing the research capacities of these ecosystems.

In **Graph 2** the number of authors in the discipline is analyzed by year. To facilitate comparisons between countries, the number of authors per country was normalized for each year, as was done in the previous version.

Graph 2: Authors in IA by year



Source: ILIA 2024 / Data: CENIA

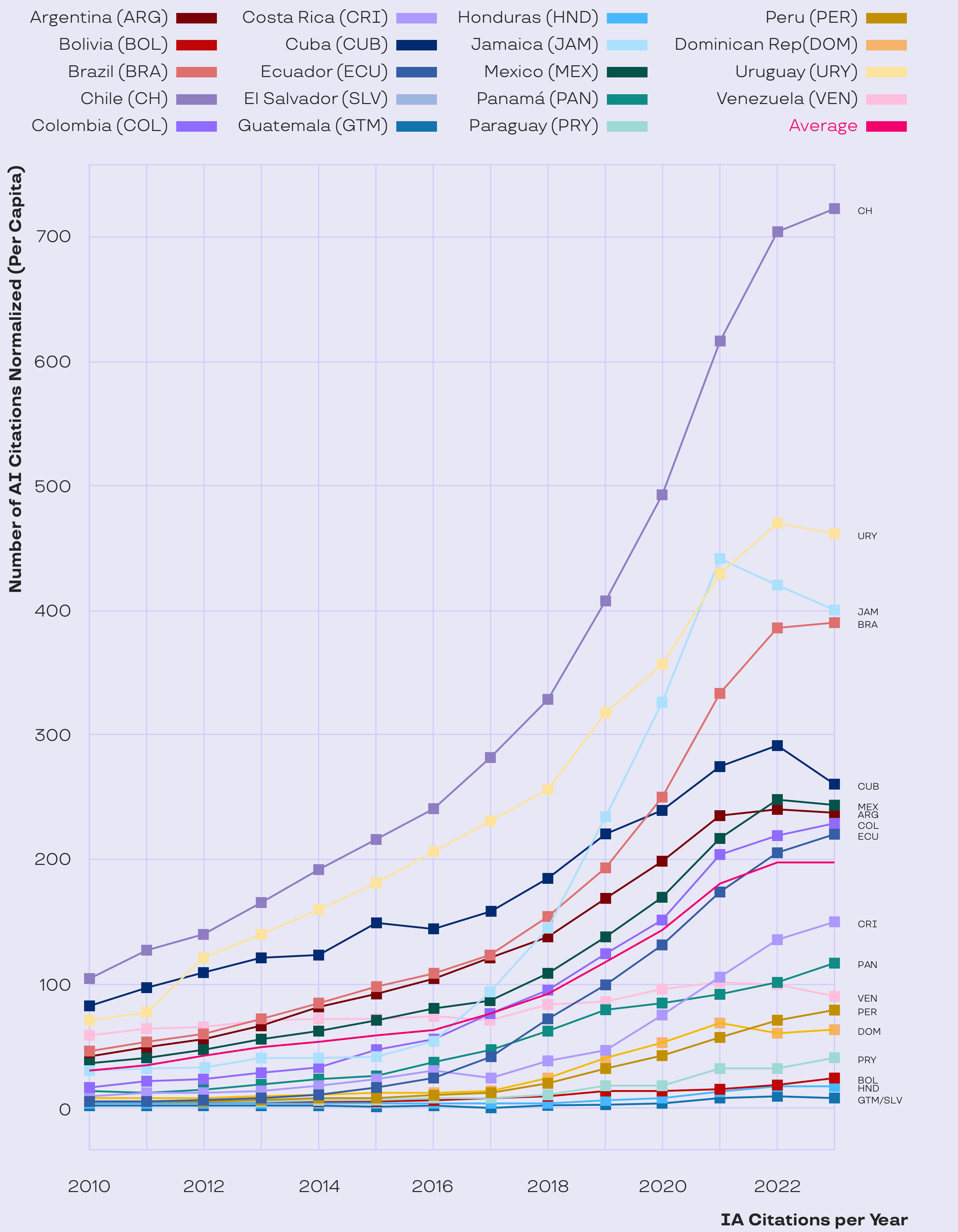
Comparing trends in the number of authors and the volume of publications helps to understand the factors influencing academic productivity in recent years. There has been a steady increase in both male and female authors in Chile and Ecuador, which has contributed to maintaining a high volume of publications.

On the other hand, Brazil and Uruguay have shown a sustained decline since 2021, which has seemingly impacted the total number of publications. Meanwhile, Mexico and Colombia have demonstrated greater resilience, with no significant changes in the volume of authors that make up their ecosystem.
This graph illustrates the disparities in the growth of the number of authors among different countries, evident in both leading research and development nations and those with lower position in the ILIA, yet experiencing rapid advancements in research. For instance, Chile has 70 authors per million inhabitants, while Ecuador has 55. Brazil and Uruguay have 48 and 45 authors per million inhabitants, respectively.

The rest of the countries in the region show a trend over time that aligns with the pattern evidenced in the first graph, reflecting a very close correlation between authors and publications.

Finally, the academic output of countries in the region is examined through the analysis of the number of citations in scientific journals and their participation in conferences or equivalent activities. **Graph 3** shows the annual number of citations per country, normalized by population, from 2012 to 2023.

Graph 3: Impact of scientific production in AI by year

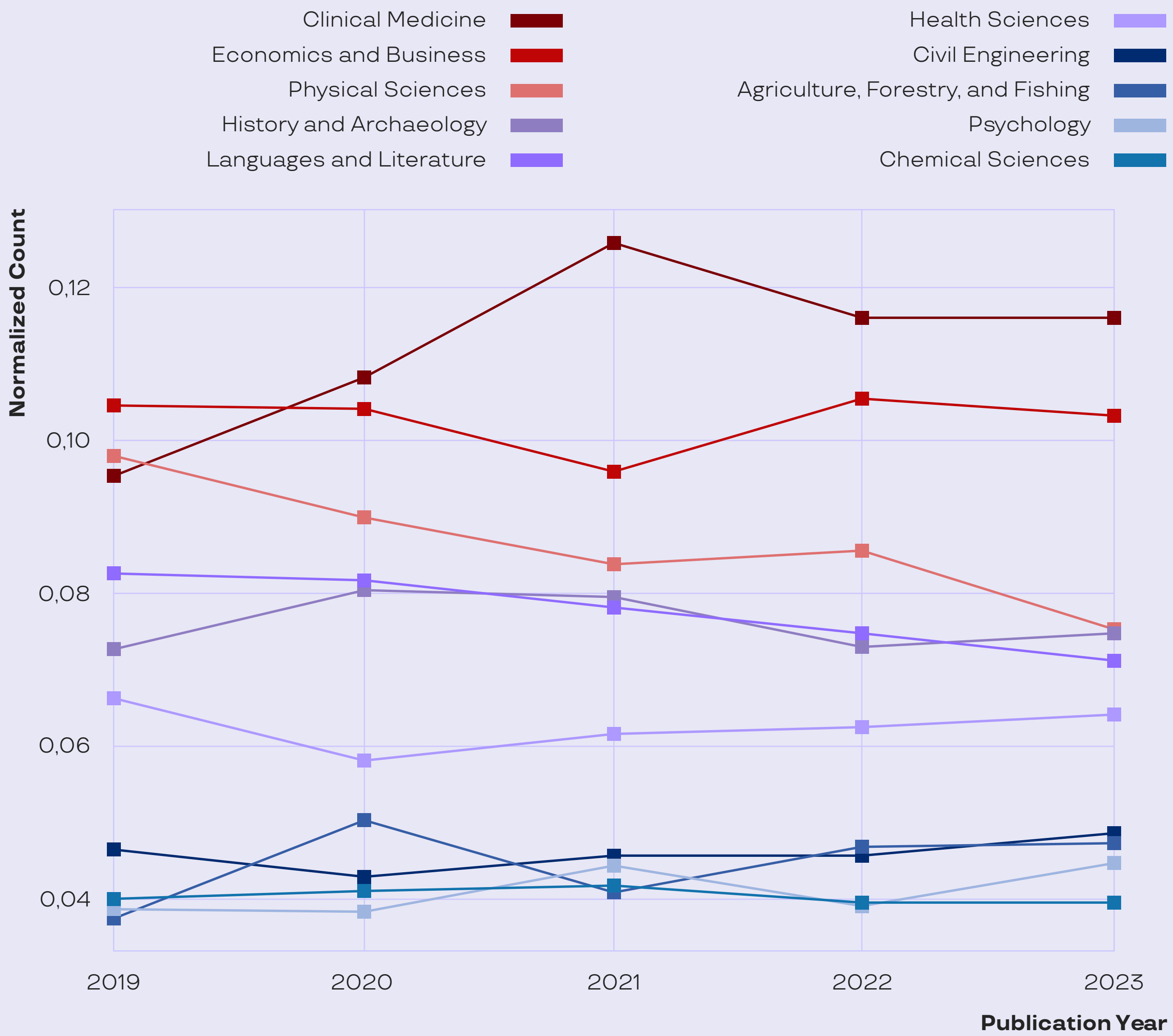


Source: ILIA 2024 / Data: CENIA

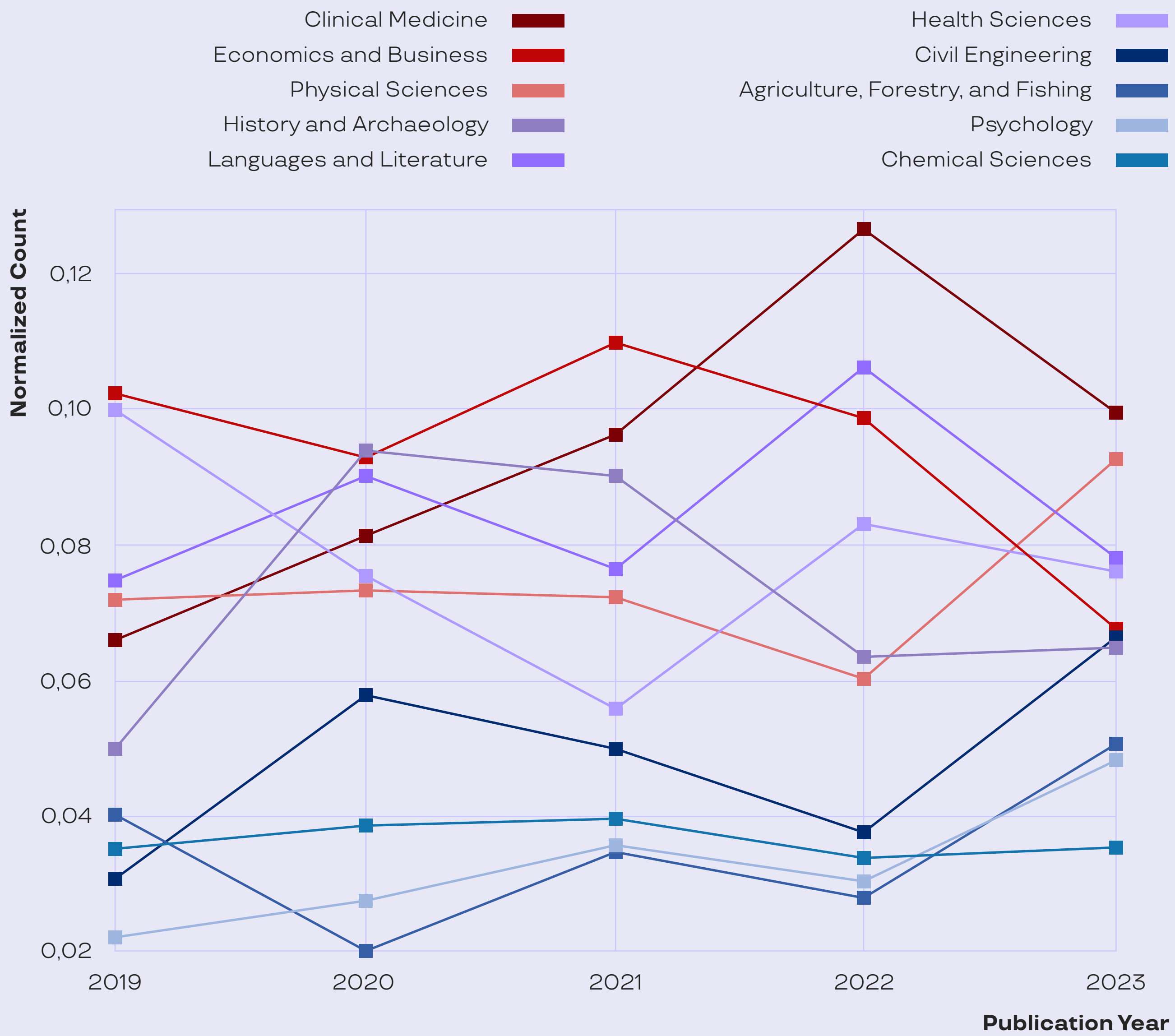
When analyzing the impact based on citations, we see that the leading countries are Chile and Uruguay, with 700 and 420 citations respectively. From 2018 onwards, Jamaica and Brazil show very accelerated growth, homologizing the slope of the curve of the two leaders. Both nations are in third and fourth place with approximately 410 appointments. Between 200 and 300 annual citations we find the second group of countries, made up of Cuba, Mexico, Argentina, Ecuador and Colombia. The rest of the countries register less than 150 citations per year.

In summary, Uruguay and Chile demonstrate clear leadership in academic production, supported by robust university ecosystems that enable long-term academic initiatives. Simultaneously, the working conditions stemming from this structure encourage scientists to remain in academia as knowledge producers, a trend that is less evident in other countries in the region. Additionally, the structure of incentives and competitive funding in these countries may be related to this phenomenon.

Graph 4. Number of publications in the Top 10 of OECD disciplines in the Americas



Graph 5: Number of publications in the Top 10 of OECD disciplines in the Caribbean



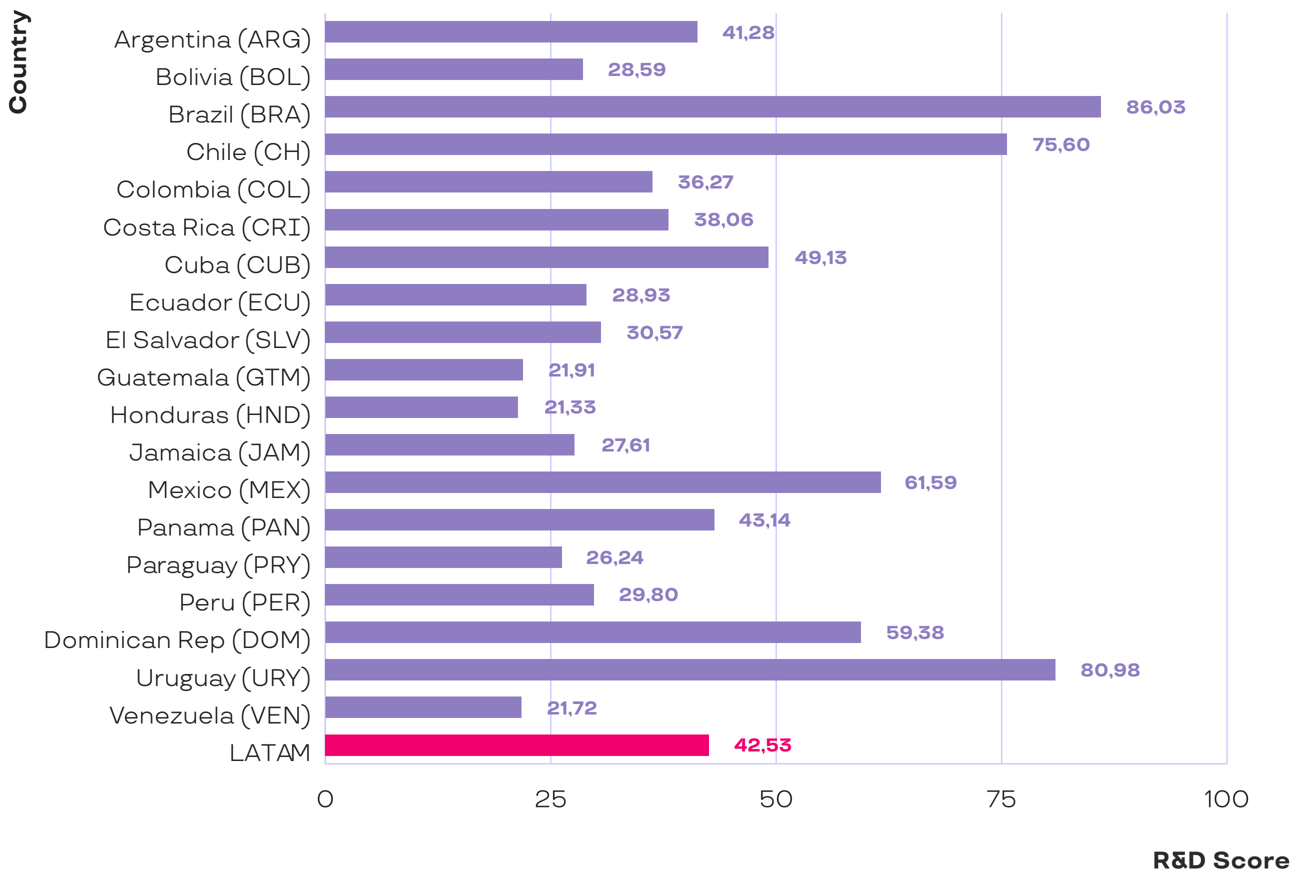
D.4. Innovation and Development Subdimension

Focused on assessing the dynamism and creative capacity of countries in the field of AI through two indicators such as Innovation and Development, this subdimension collects fundamental information to understand how countries are contributing to the development of open technologies, contributing quality in collaborative platforms and generating patents to protect intellectual property.

In this index edition, the subdimension represents **30% of the total weighting** of the R&D+A dimension.

Graph 12 shows the region's performance in this subdimension, with an average of 42.53 points. Brazil leads with 86.03 points and Uruguay with 80.98 points. They are followed by Chile (75.6) and, further down, Mexico (61.59).

Graph 12: Score for Innovation and Development Subdimension



Source: ILIA 2024 / Data: CENIA

Countries with high performance in Innovation and Development (above 75 points): These are the ones that stand out for their high scores, indicating a strong focus on innovation and development, as is the case of Brazil (86.03), Uruguay (80.98) and Chile (75.60).

Countries with moderate performance in Innovation and Development (35 to 75 points): These countries moderately exceed the regional average, although they still have room for improvement. Among them are Mexico (61.59), Dominican Republic (59.38), Cuba (49.13), Panama (43.14), Argentina (41.28), Costa Rica (38.06) and Colombia (36.27).

Countries with low performance in Innovation and Development (up to 35 points): These are those that, due to their lower scores, face significant challenges in this area. This is the case of El Salvador (30.57), Peru (29.80), Ecuador (28.93), Bolivia (28.59), Jamaica (27.61), Paraguay (26.24), Guatemala (21.91), Venezuela (21.72) and Honduras (21.33).
The results of the indicators of this subdimension are presented below, together with those of their respective subindicators

D.4.1 Innovation

This indicator shows the capacity of each of the 19 countries to generate **new ideas, technologies and products based on AI**, and turn them into solutions and services that generate economic and social value.

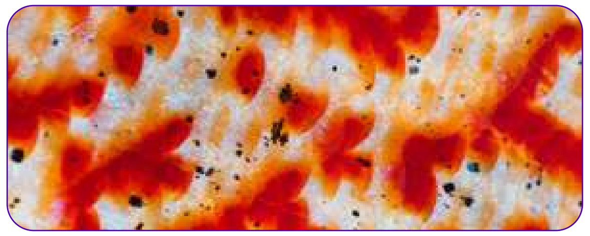
In ILIA 2023, the focus for assessing this indicator was on inward investments in AI, that means, all capital flowing into AI-related companies or projects. This made it possible to analyze the vitality of the innovative and entrepreneurial ecosystem and, in the process, to find out how attractive the AI sector is to investors.

This year, four new subindicators were added to evaluate the scalability of initiatives and each country's commitment to R&D for AI-driven products and services.

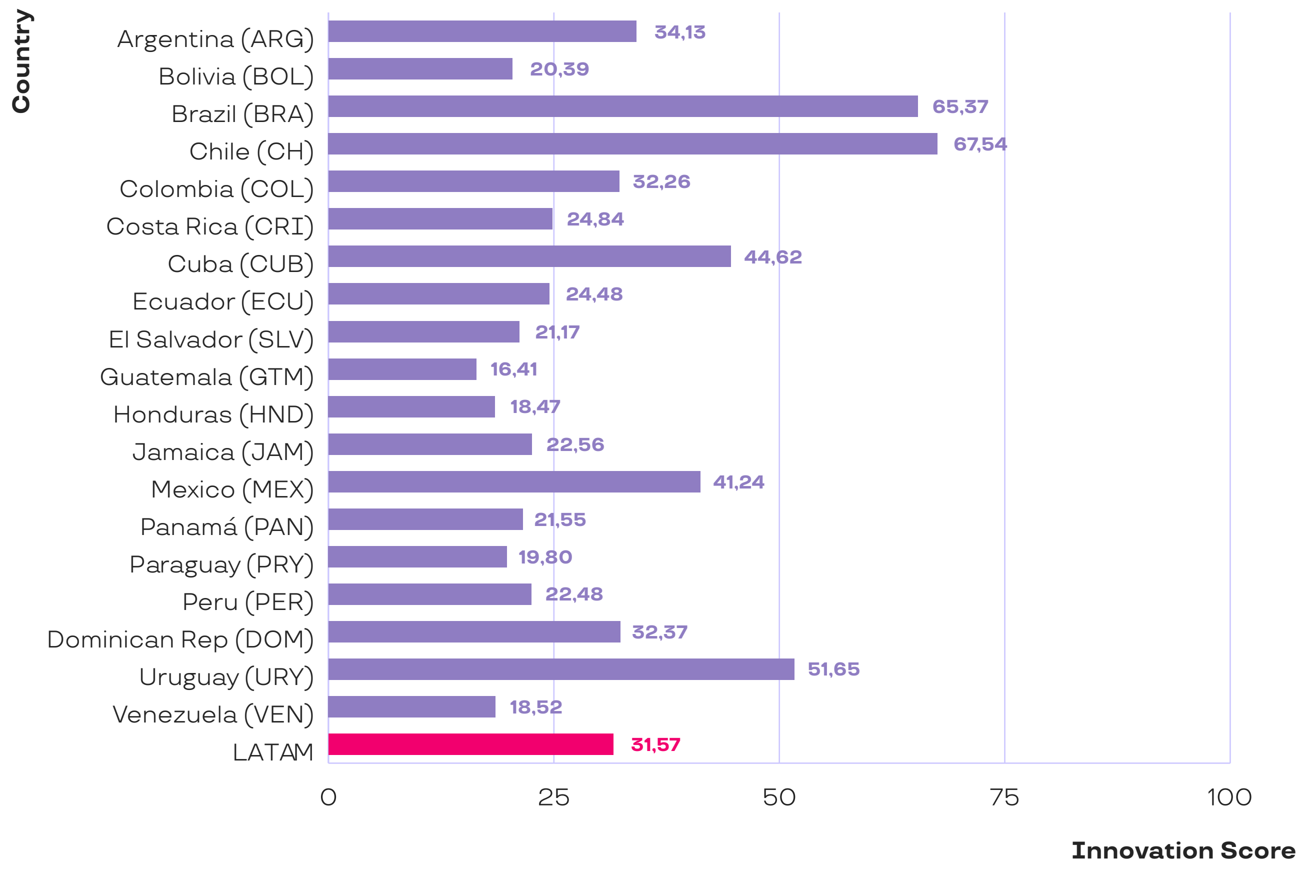
There are seven subindicators that determine the state of innovation:

1. Number of private investments
2. Estimated total value of private investment
3. AI companies
4. Unicorn companies
5. Expenditure on research and development as a proportion of GDP
6. Application development
7. Entrepreneurial environment

As shown in **Graph 13**, the regional average for this indicator is 31.57 points, with seven countries managing to exceed this score. **Chile has 67.54 points and Brazil 65.37, with Uruguay at 51.65 points.**



Graph 13: Score for Innovation Indicator



Source: ILIA 2024

a) Number of Inbound Investments and Estimated Value of the Inbound Investment

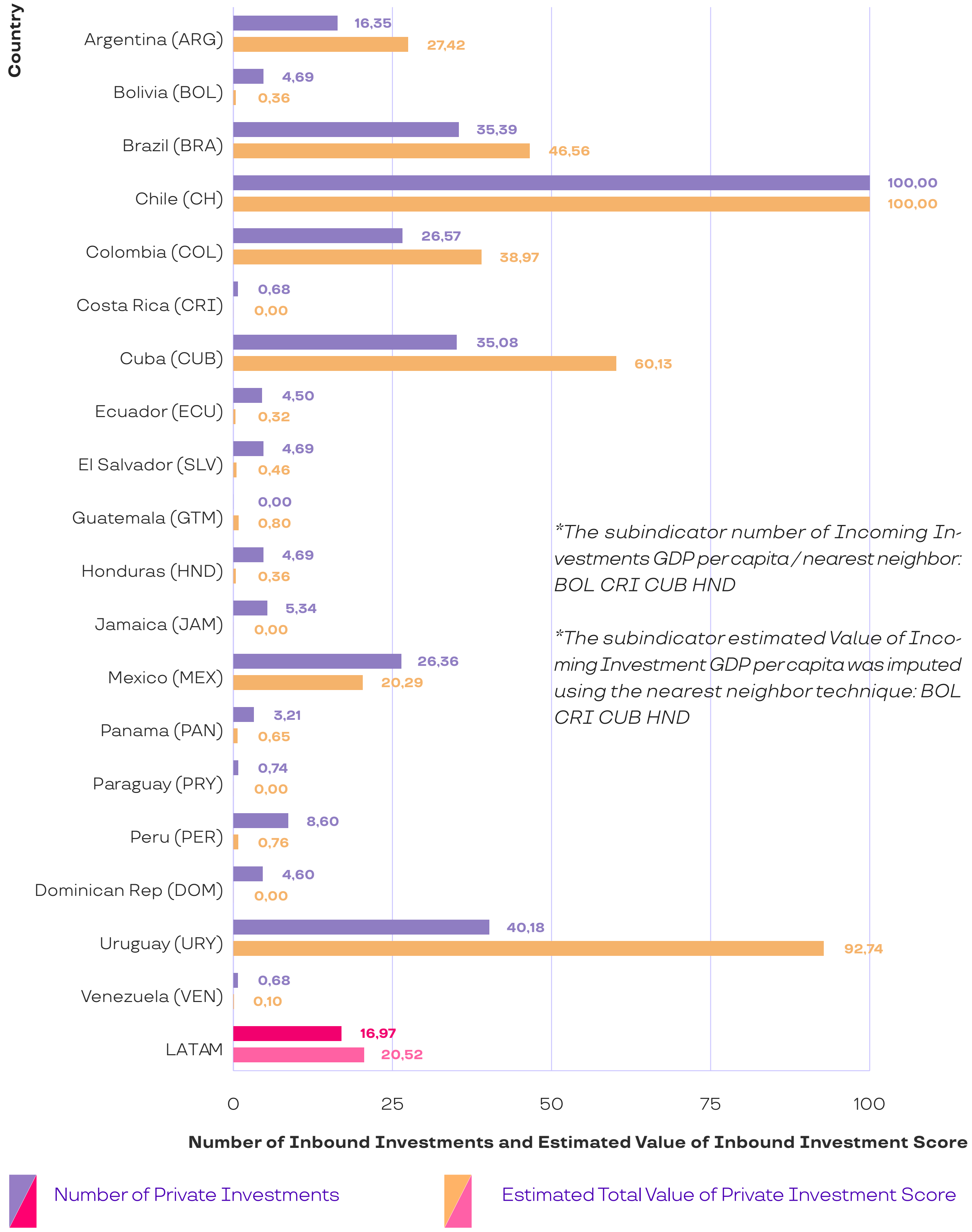
The **Number of inbound investments in AI** contemplates the placement of money in AI-related companies, considering venture capital rounds, private equity rounds and mergers and acquisitions (M&A) transactions with target companies in the indicated country during the last decade. **Estimated value of inward investment** refers to the total amount of capital projected to be invested by private players in this technology sector during a specific period.

This year, four new subindicators were introduced to evaluate how scalable initiatives are and to assess each country's dedication to AI-driven research and the development of commercial products and services.

This data has limitations, as the CAT metrics only capture a specific type of AI investment activity and not all those associated with it, such as the purchase of consulting services or SaaS. Meanwhile, the AI inbound investment subindicator does not include amounts invested within the same country, but it is considered a good proxy to measure the dynamism and diversity of private AI projects, as well as the economic value of these projects in relation to the local context.

Figure 14 shows that the disparities in investment between countries with respect to the previous version of the index are maintained. **Chile and Uruguay once again stand out** as those with the greatest maturity in this subindicator. While Chile scores 100 points, both in the number of operations and in their total value, Uruguay scores high in the total value of investments, i.e. available resources, with 92.74 points; but not in the number of operations (40.18 points), although it is double the regional average (20.52) in this last subindicator.

Graph 14: Score for Number of Inbound Investments and Estimated Value of Inbound Investment Subindicators



Source: ILIA 2024 / Data: Country Activity Tracker, Crunchbase

b) AI companies

Taking Crunchbase data, this subindicator refers to the number of **startups and other** privately held **AI companies** that are not publicly traded and are based in a given country.

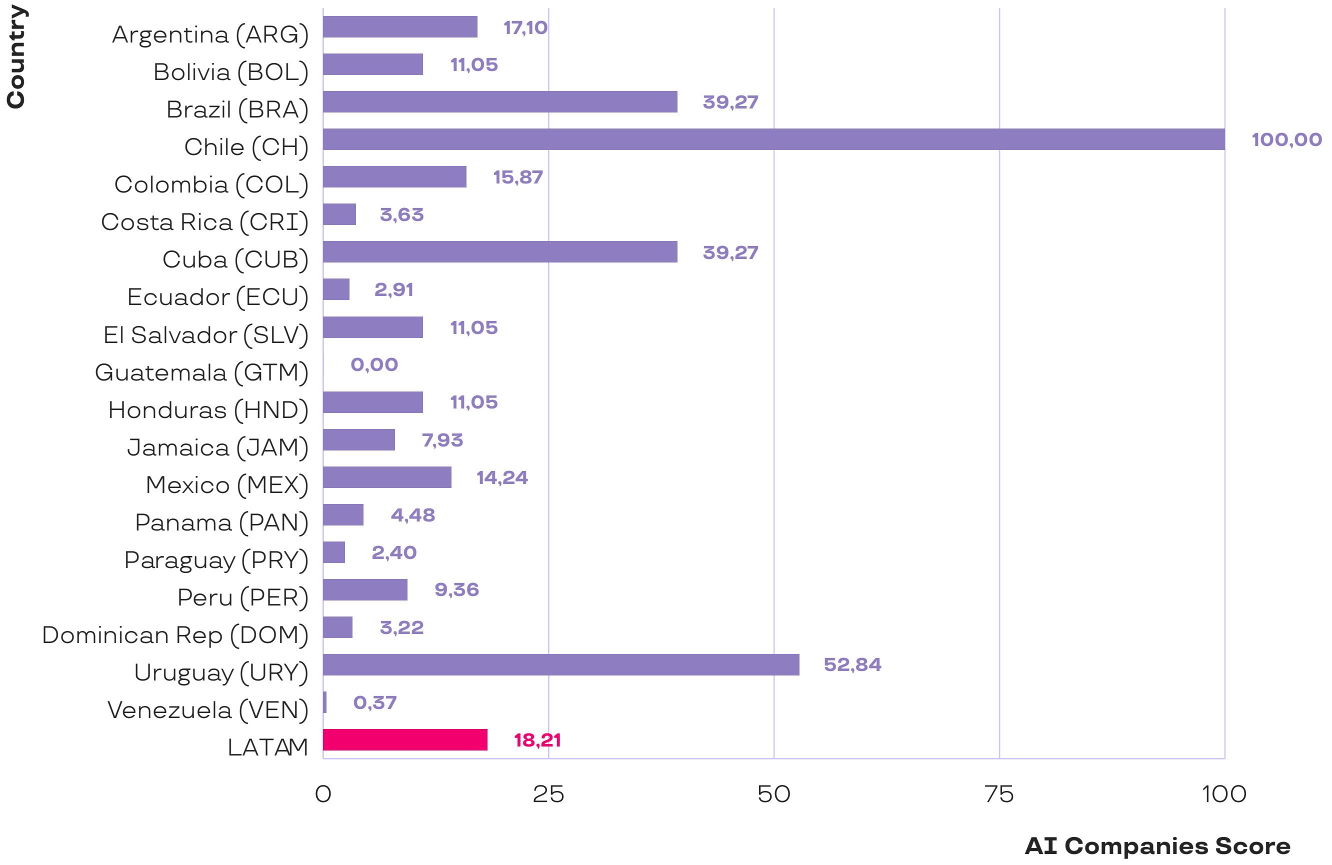
According to **Figure 15,** the private AI ecosystem in Latin America and the Caribbean is incipient and highly concentrated in a few countries.

With a regional score of 18.21, most countries lag behind in the creation and development of this type of enterprise, which is congruent with the volume of private investment in AI.

Two countries lead in terms of the existence of this type of company: **Chile with 100 points and Uruguay**, below, **with 52.84**. Brazil (39.27) and Argentina (17.10) show some degree of maturity in the consolidation of this type of companies, but in the region there is evidence of a structural delay in the capacity to promote innovation and technological entrepreneurship in the commercial and industrial sectors.

All of the above underscores the need to strengthen the environments that favor the creation of AI companies in Latin America in order to boost economic growth and competitiveness in the technological field.

Graph 15: Score for AI companies Subindicator



**The subindicator contains data imputed using the GDP per Capita / nearest neighbor method: BOL CUB HND*

Source: ILIA 2024 / Data: Emerging Technology Observatory

c) Unicorn companies

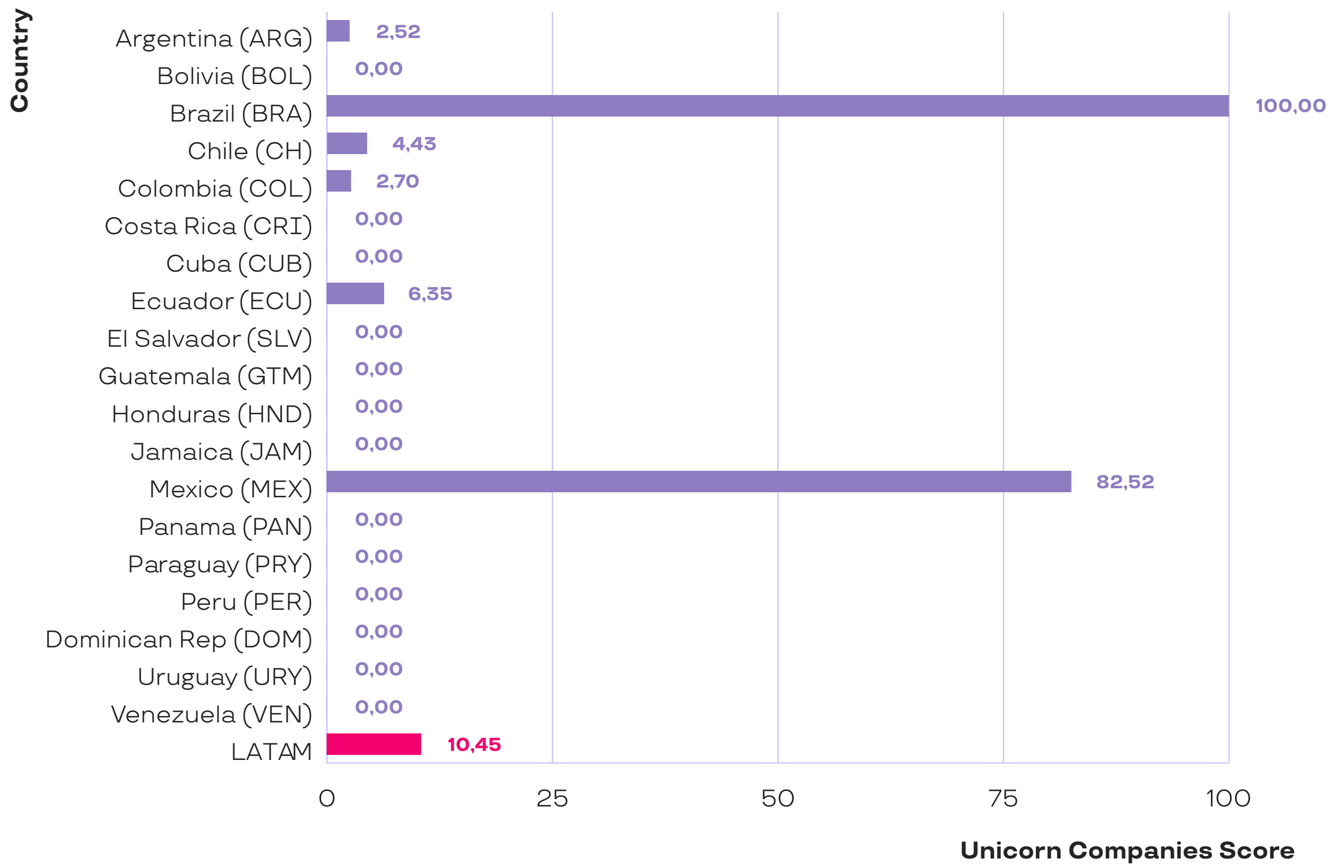
This subindicator measures the number of unicorn companies or startups (with a valuation or share price above USD 1 billion), as they reflect the capacity of an ecosystem to transform scientific research into commercial value through innovation.

The presence of **unicorn companies** in the region is **extremely limited**, demonstrating a lack of mature entrepreneurial ecosystems in most Latin American and Caribbean countries. In this context, the absence of these types of companies highlights the challenge of attracting large investments, fostering innovation and creating an environment that drives the growth of new businesses on a large scale.

As shown in **Figure 16**, only **Brazil (100) and Mexico (82.52)** have scores that allow them to be categorized as participants in this type of ecosystem. And although Ecuador (6.35), Chile (4.43), Colombia (2.70) and Argentina (2.52) show a certain maturity on the Latin American horizon, the rest of the countries are far from these scores, as they do not have unicorn companies.

This situation highlights the need to **strengthen support and financing mechanisms** for scaling up startups, with the aim of consolidating them as unicorn companies. This includes the strengthening of support networks for the expansion of these companies in international markets and the development of high-level investment funds to facilitate their growth.

Graph 16: Score for Unicorn companies Subindicator



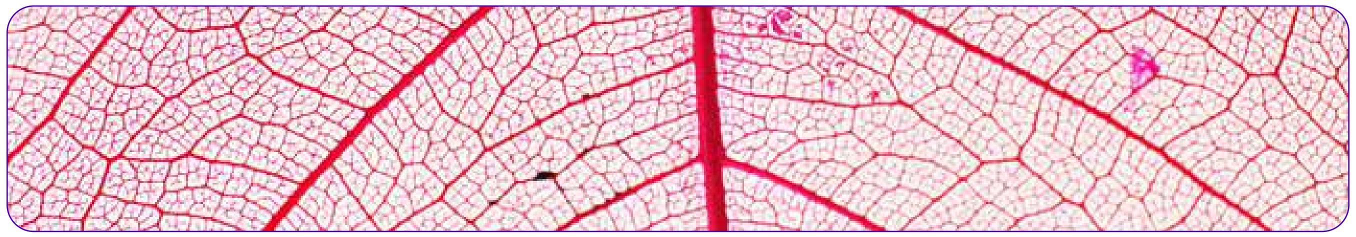
Source: ILIA 2024 / Data: Global Unicorn Club

Table 3 shows the unicorns that have emerged in the region, highlighting the city of Sao Paulo, Brazil, which has become a successful ecosystem for scaling startups. This case can offer clues about the actions and public policies needed to foster this type of companies.

Table 3: Unicorn companies in ILIA 2024 countries

"Global Unicorn Club: Private Companies Valued at $1B+ (as of March 20th, 2024)"

Company	Valuation ($B)	Date Joined	Country	City	Industry	Select Investors
Uala	$2,45	13/8/2021	Argentina	Buenos Aires	Financial Services	Soros Fund Management, Ribbit Capital, Monashees+
QuintoAndar	$5,10	9/9/2019	Brazil	Campinas	Financial Services	Kaszek Ventures, General Atlantic, SoftBank Group
C6 Bank	$5,05	2/12/2020	Brazil	São Paulo	Financial Services	Credit Suisse
Creditas	$4,80	18/12/2020	Brazil	São Paulo	Financial Services	Kaszek Ventures, Amadeus Capital Partners, Quona Capital
Nuvemshop	$3,10	17/8/2021	Brazil	São Paulo	Consumer & Retail	Kaszek Ventures, Qualcomm Ventures, Accel
Wildlife Studios	$3,00	5/12/2019	Brazil	São Paulo	Media & Entertainment	Benchmark, Bessemer Venture Partners
Unico	$2,60	3/8/2021	Brazil	São Paulo	Enterprise Tech	Big Bets, General Atlantic, SOFTBANK Latin America Ventures
CloudWalk	$2,15	8/9/2021	Brazil	São Paulo	Financial Services	Plug and Play Ventures, Valor Capital Group, DST Global
Loggi	$2,00	5/6/2019	Brazil	São Paulo	Industrials	Qualcomm Ventures, SoftBank Group. Monashees+
Dock	$1,50	12/5/2022	Brazil	São Paulo	Financial Services	Viking Global Investors, Riverwood Capital, Lightrock
Olist	$1,50	15/12/2021	Brazil	Curitiba	Consumer & Retail	Redpoint e.ventures, Valor Capital Group, SoftBank Latin America Fund
Loft	$1,46	3/1/2020	Brazil	São Paulo	Financial Services	Monashees+, Andreessen Horowitz, QED Investors
Neon	$1,38	14/2/2022	Brazil	São Paulo	Financial Services	Propel Venture Partners, Monashees+, BBVA
QI Tech	$1,00	31/10/2023	Brazil	São Paulo	Financial Services	General Atlantic
CargoX	$1,00	21/10/2021	Brazil	São Paulo	Industrials	Valor Capital Group, Lightrock, Softbank Group
MadeiraMadeira	$1,00	7/1/2021	Brazil	Paraná	Consumer & Retail	Flybridge Capital Partners, SoftBank Group, Monashees+
EBANX	$1,00	16/10/2019	Brazil	Curitiba	Financial Services	FTV Capital, Endeavor
Movile	$1,00	12/7/2018	Brazil	São Paulo	Consumer & Retail	Innova Capital - FIP, 3G Capital Management, Prosus Ventures
NotCo	$1,50	26/7/2021	Chile	Santiago	Consumer & Retail	Kaszek Ventures, SOSV, Tiger Global Management
Betterfly	$1,00	11/2/2022	Chile	Santiago	Enterprise Tech	QED Investors, DST Global, Endeavor
Rappi	$5,25	31/8/2018	Colombia	Bogotá	Consumer & Retail	DST Global, Andreessen Horowitz, Sequoia Capital, Redpoint e.ventures
LifeMiles	$1,15	13/7/2015	Colombia	Bogotá	Consumer & Retail	Advent International
Habi	$1,00	11/5/2022	Colombia	Bogotá	Financial Services	Homebrew, Inspired Capital, Tiger Global Management
Kushki	$1,50	7/6/2022	Ecuador	Quito	Financial Services	Clocktower Technology Ventures, DILA Capital, Kaszek Ventures
Kavak	$8,70	1/10/2020	México	Lerma de Villada	Industrials	DST Global, SoftBank Group, Mountain Nazca
Bitso	$2,20	5/5/2021	México	Mexico City	Financial Services	Pantera Capital, QED Investors, Coinbase Ventures
Clip	$2,00	10/6/2021	México	Mexico City	Financial Services	Alta Ventures Mexico, General Atlantic, SoftBank Group
Konfio	$1,30	29/9/2021	México	Mexico City	Financial Services	Kaszek Ventures, QED Investors, International Finance Corporation
stori	$1,20	15/7/2022	México	Juarez	Financial Services	Vision Plus Capital, Source Code Capital, Lightspeed Venture Partners
Merama	$1,20	9/12/2021	México	Mexico City	Consumer & Retail	SoftBank Latin America Fund, Advent International, Balderton Capital
Nowports	$1,10	24/5/2022	México	Monterrey	Industrials	Monashees+, Foundation Capital, Base10 Partners
Clara	$1,00	6/12/2021	México	Mexico City	Financial Services	DST Global, General Catalyst, Monashees+



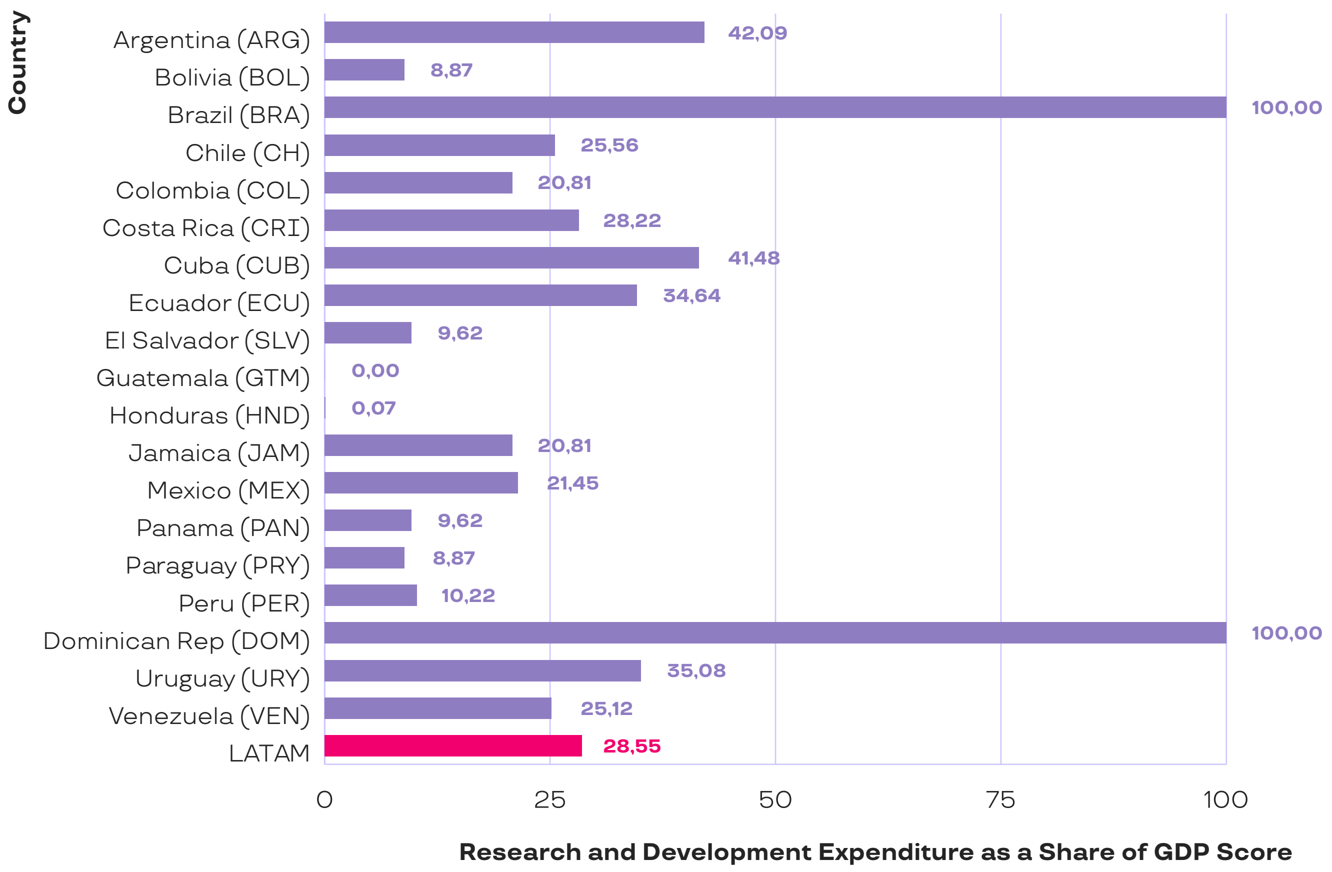
d) R&D expenditures as a proportion of GDP

This subindicator was added to the Innovation indicator for this version in order to obtain a proxy for the impact of R&D investment in AI on a country's economic growth. It is the amount of R&D expenditures divided by the total output of the economy (Gross Domestic Product).

In Figure 17 it is possible to see how most of the countries are below 50 points, **14 of them even below the average score in the region** (28.55). These countries are between 0 and 17.15 points.

The country that leads this variable is **Brazil with 100** points, with 1.17% R&D expenditure as a proportion of its GDP. Costa Rica, meanwhile, has 53.70 points, with 0.37% R&D expenditure as a proportion of its GDP.

Graph 17: Score for Research and Development Expenditure as a Proportion of GDP Subindicator



**The subindicator contains data imputed using the GDP per capita / Nearest neighbor method: JAM DOM*

Source: ILIA 2024 / Data: Cepal

e) Application development

The Development of AI-based applications is a subindicator that measures the level of technological innovation in a country, as it reflects the capacity to transform advances in **AI into practical solutions.** These can solve complex problems, improve processes and create new products and services, generating economic and social value.

To measure this subindicator, data was taken from the GSMA's Mobile Connectivity Index - which measures the performance of 173 countries in relation to the key factors that facilitate mobile Internet adoption - and the number of locally developed applications per person was analyzed.

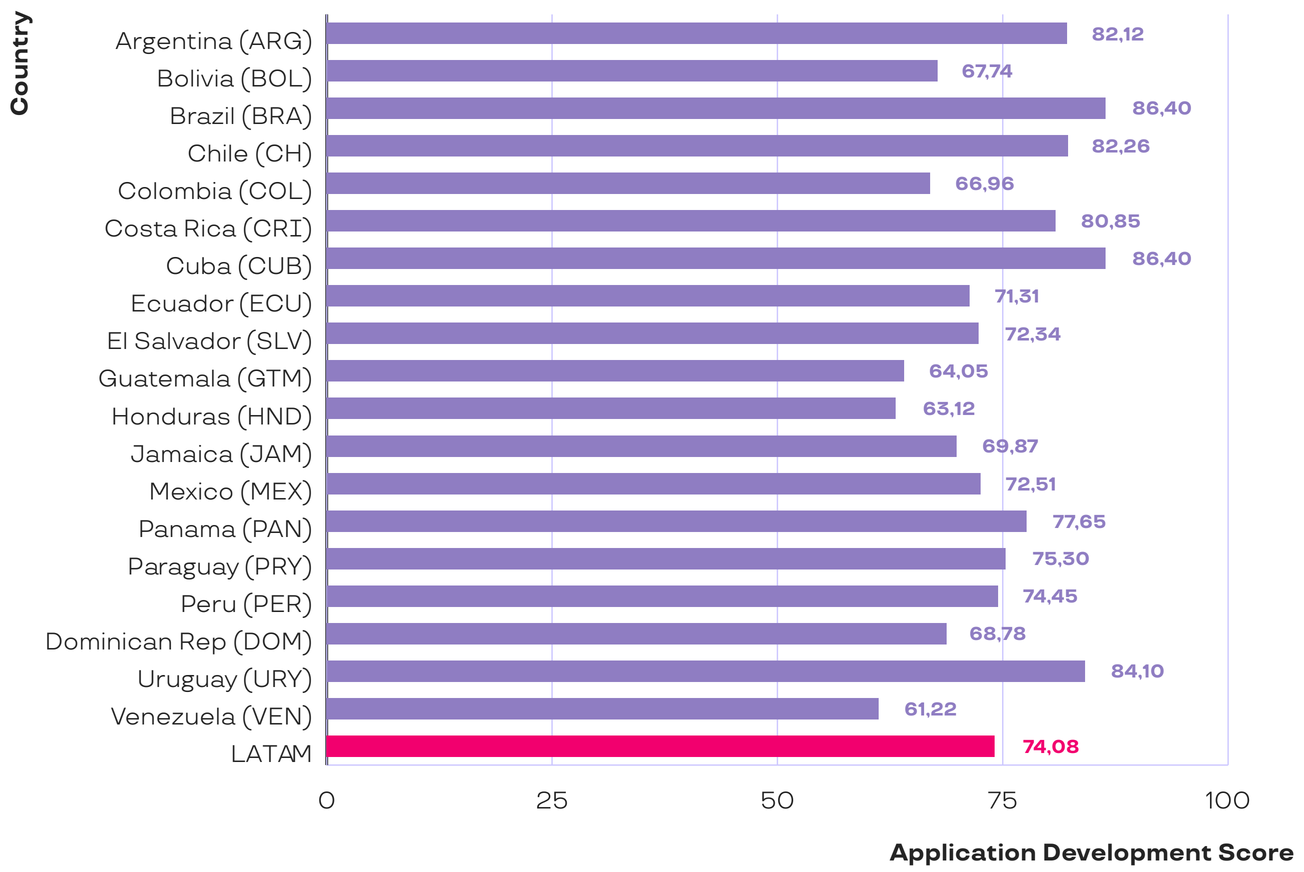
According to **Figure 18**, the regional average score is 74.08 points, with **Brazil standing out** in this subindicator with 86.40 points. Immediately behind are **Uruguay with 84.10; Chile, with 82.26;** and **Argentina, with 82.12.**

The results for this subindicator show that the local development of applications in Latin America and the Caribbean shows a positive performance, with nations scoring over 60 points, suggesting a dynamic and growing ecosystem, as well as a process of digital transformation in the region.

Unlike the previous subindicators, which showed a wide dispersion in terms of the progress of the countries considered, this one shows a more uniform level of development. This reveals a significant opportunity for joint work and regional scaling of potential applications emerging in the coming years in the region.

Brazil, Chile, Uruguay and Argentina probably stand out because they are taking advantage of their technological capabilities to foster innovation and meet local needs.

Graph 18: Score for Application Development Subindicator



** The subindicator contains data imputed using the GDP per capita / Nearest neighbor method: JAM DOM*

Source: ILIA 2024 / Data: Mobile Connectivity Index

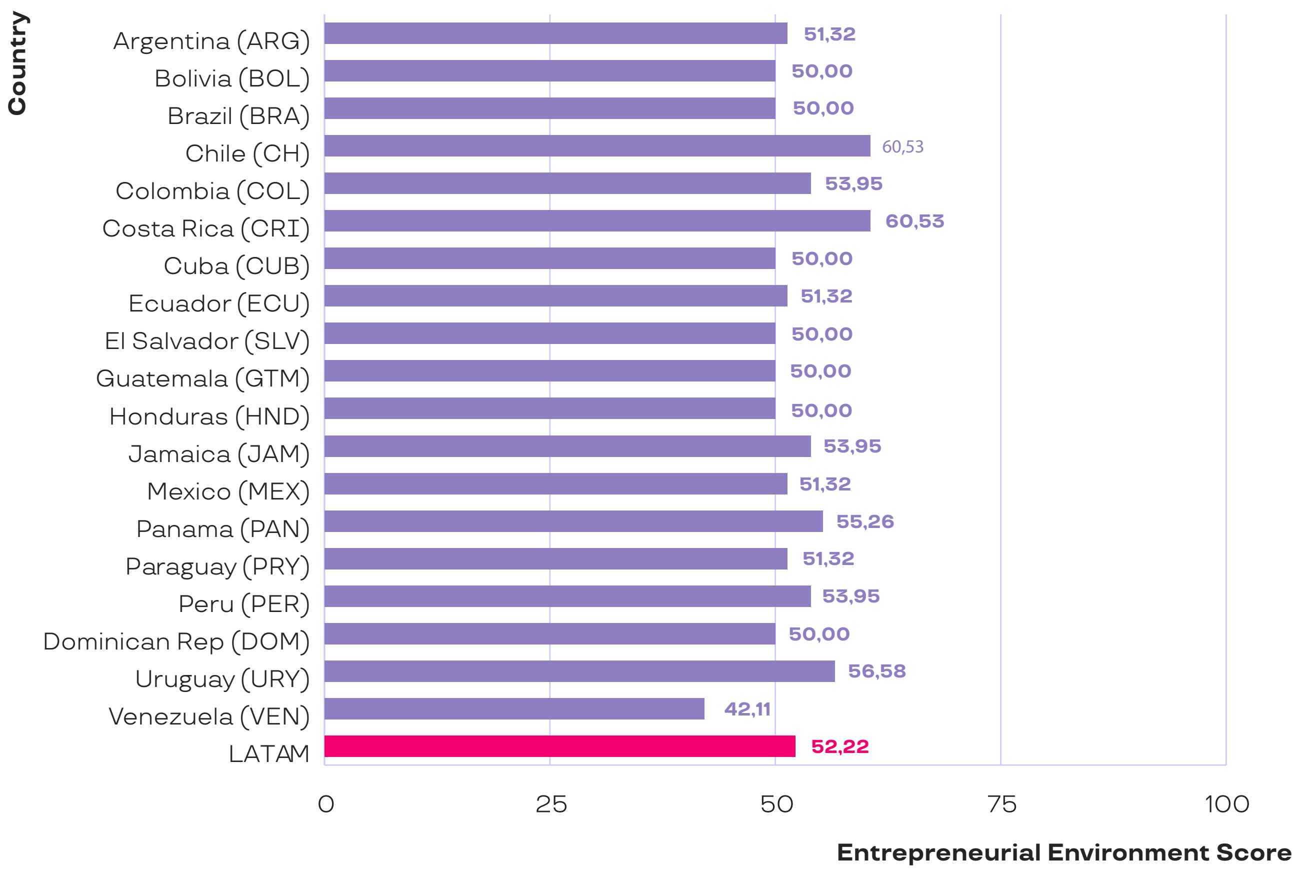
f) Entrepreneurial environment

Analyzing the appropriateness of the conditions that favor entrepreneurship and innovation is an essential factor for the development of applied AI-based solutions, as they are the ones that **generate economic opportunities** and address global challenges.

To measure the **Entrepreneurial Environment** subindicator, data were extracted from the Global Entrepreneurship Monitor (GEM), an annual assessment of entrepreneurial activity in various countries, which reflects the result of a composite index that evaluates a series of factors that influence business take-off: access to financing, government policies, attitudes towards entrepreneurship and the perception of opportunities to start a business.

According to **Figure 19**, the environment for entrepreneurs in Latin America presents significant challenges to foster innovation and the development of AI. With a regional score of 52.22 points, there is a high degree of homogeneity in the conditions for entrepreneurship, with **only a few countries, such as Chile and Uruguay, standing out** with more favorable environments.

Graph 19: Score for Entrepreneurial Environment Subindicator



**The subindicator contains data imputed using the GDP per Capita / nearest neighbor method: BOL CRI CUB SLV HON JAM PRY PER DOM*

Source: ILIA 2024 / Data: Global Report

D.4.2. Development

The second indicator within the Research and Development subdimension is Development, which evaluates the capacity of countries to innovate technologically and generate AI-based products, processes or services that add value, solve problems or satisfy needs more efficiently.

This indicator is composed of three subindicators that allow the generation and use of knowledge in the field of AI in an effective and sustainable manner:

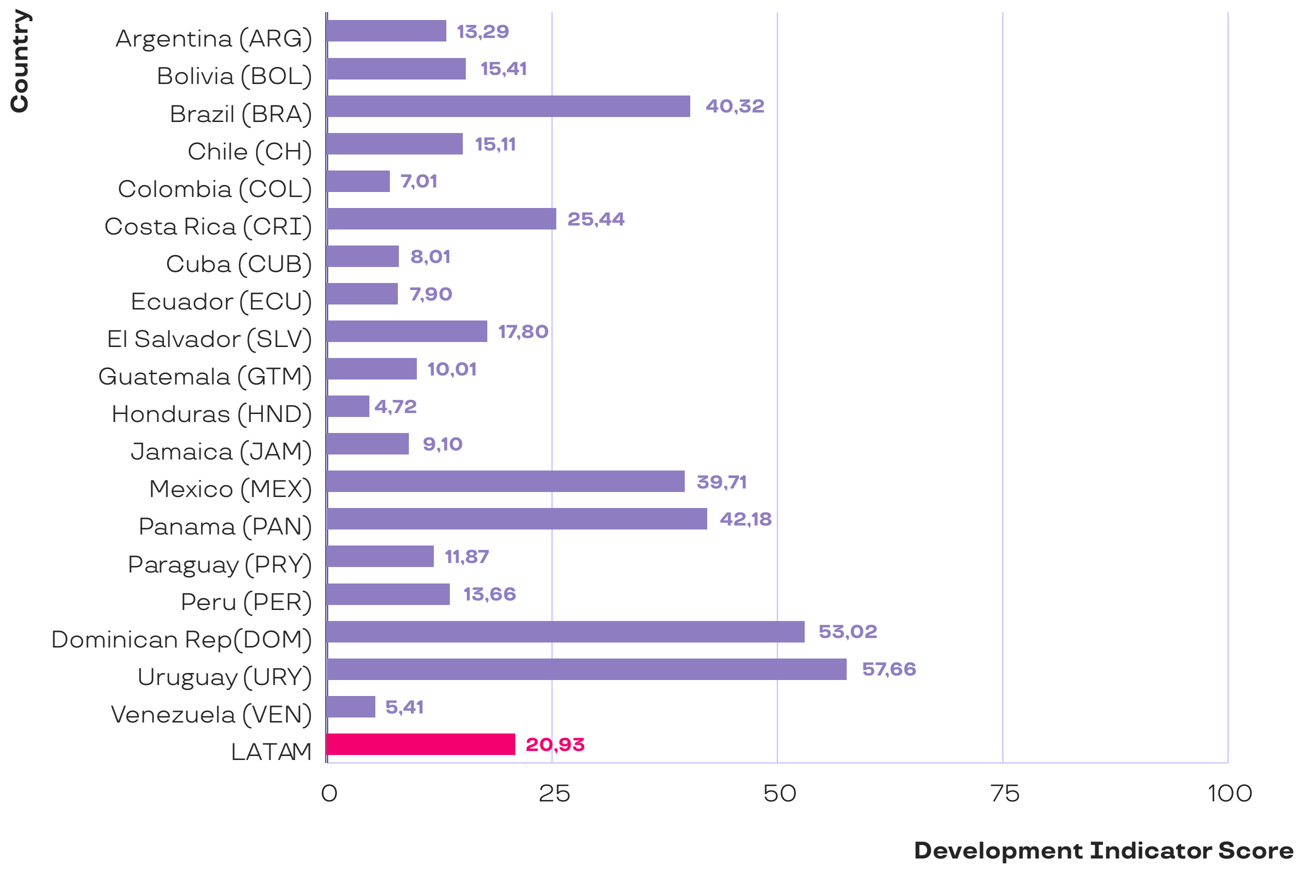
a) Open source productivity
b) Open source quality
c) Number of patents

Within the Innovation and Development subdimension, this indicator has an assigned weight corresponding to 50% of the total.

As shown in **Graph 20**, progress in the adoption of AI to develop innovative solutions in the region is limited, with a regional average of 20.93 points. **However, Uruguay (57.66), the Dominican Republic (53.02) and Panama (42.18) stand out** among the other nations, mainly because of their high score in open source productivity, probably due to the high talent of their developer community.

They are followed **by Brazil (40.32) and Mexico (with 39.71)**, which raise the average of this indicator due to the strength they show in the generation of patents, that is, the capacity they have to take research to the level of concrete solutions at both the public and private levels.

Graph 20: Score for Development Indicator



Source: ILIA 2024

The following sections detail the results for each of the Development subindicators.

a) Open source productivity and quality

Open source software is fundamental for the development and expansion of AI technology, as it promotes access and democratization, transparency and reliability, as well as acceleration of innovation processes.

While **Open Source Productivity** allows analyzing the capacity of a community or country to generate high quality and relevant open source code, **Open Source Quality** refers to the excellence, sophistication, innovation or scalability of the open **source** code.

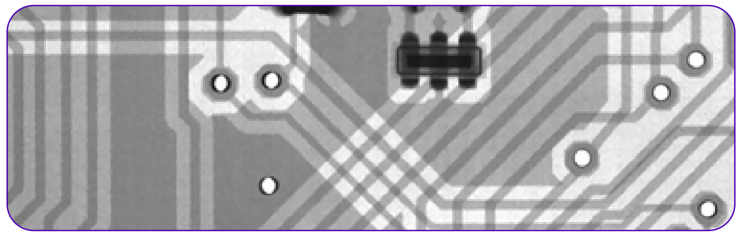
To measure open source productivity, we used data provided by GitHub on the relative measure of software development activity in relation to the number of people contributing to it compared to the total population. That is, the number of contributions to open source projects within the technology community, reflecting the commitment to collaboration and accessibility in AI.

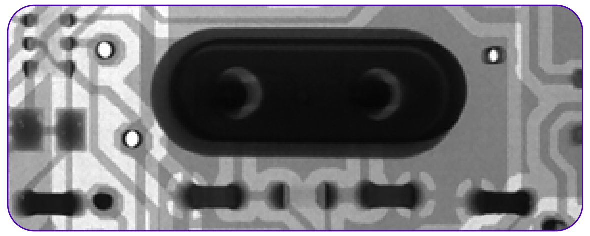
To evaluate the quality of the open source code, the average number of stars received by a package in a repository on the collaborative development platform GitHub was taken into account, which made it possible to measure its impact within the developer community. In both cases, as in the first version, the tags of the data packages were used to classify whether they are AI or traditional software development.

Evaluating the digital ecosystem based on the productivity and quality of open source contributions allows us to understand the degree of collaboration of the AI technical development ecosystem.

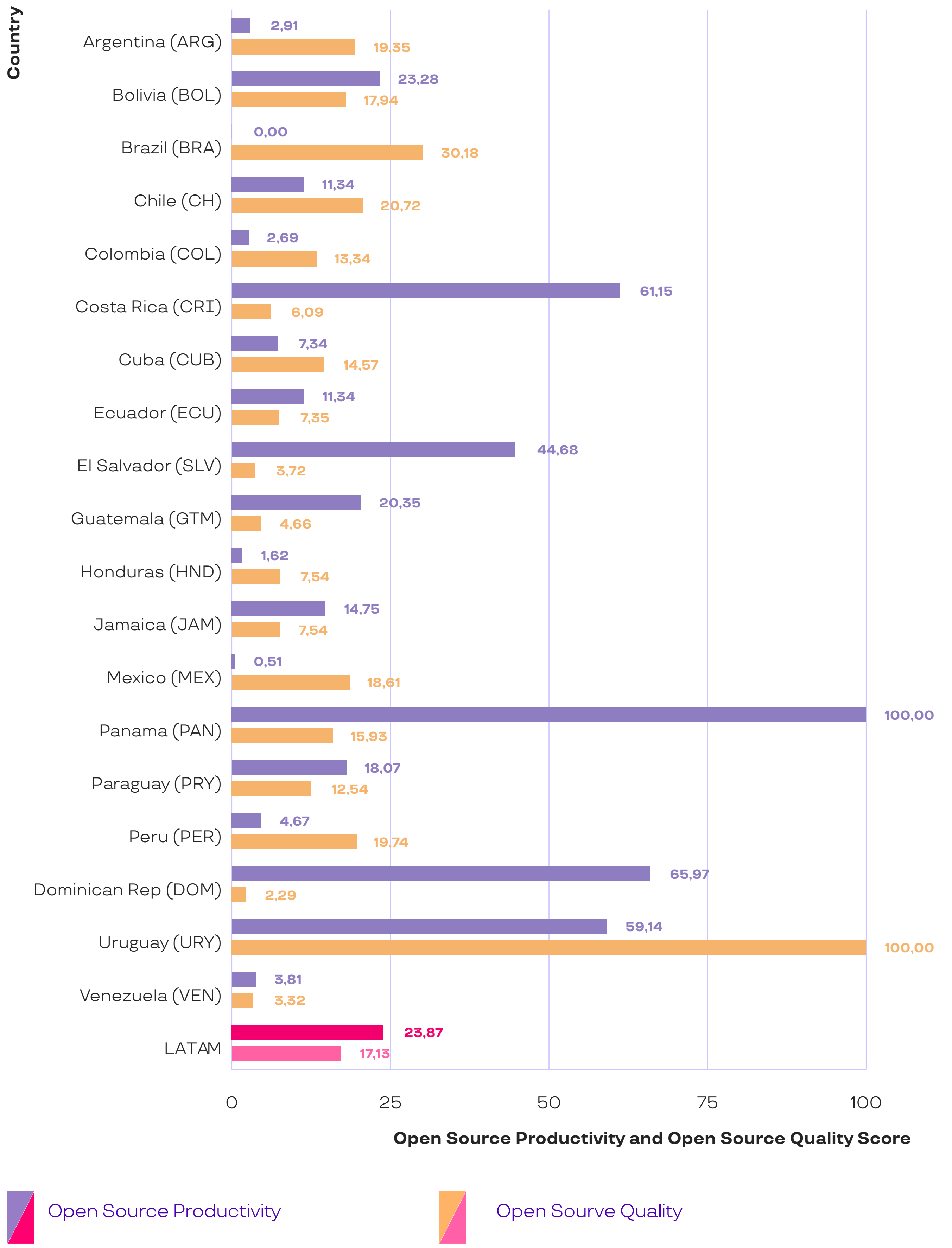
As shown in **Graph 21, Panama leads the** open source **productivity subdimension** with 100 points, representing a ratio of 77.5 between commits and contributors. It is followed by the Dominican Republic and Costa Rica, with 66.97 and 61.15 points respectively (representing values of 130.77 and 55.79 for the commits/contributors ratio). This subindicator is the one that shows the best relative results in the Caribbean Basin in the entire ILIA, which is indicative of relevant development opportunities in the region.

In terms of open source quality, **Uruguay** stands out **with the highest score (100)**, corresponding to an average of **92.82** stars out of 6,126 stars in 66 repositories. Then comes Brazil **with 30.18 points**, representing an average of 28.01 corresponding to 88,113 stars in 3,146 repositories. Finally, Chile is in third place **with 20.72** points, which in terms of raw data represents an average of 19.23 stars corresponding to 2,634 stars in 137 repositories.





Graph 21: Score for Open Source Productivity and Quality Scores Subindicators



Source: ILIA 2024 / Data: GitHub

b) Number of patents

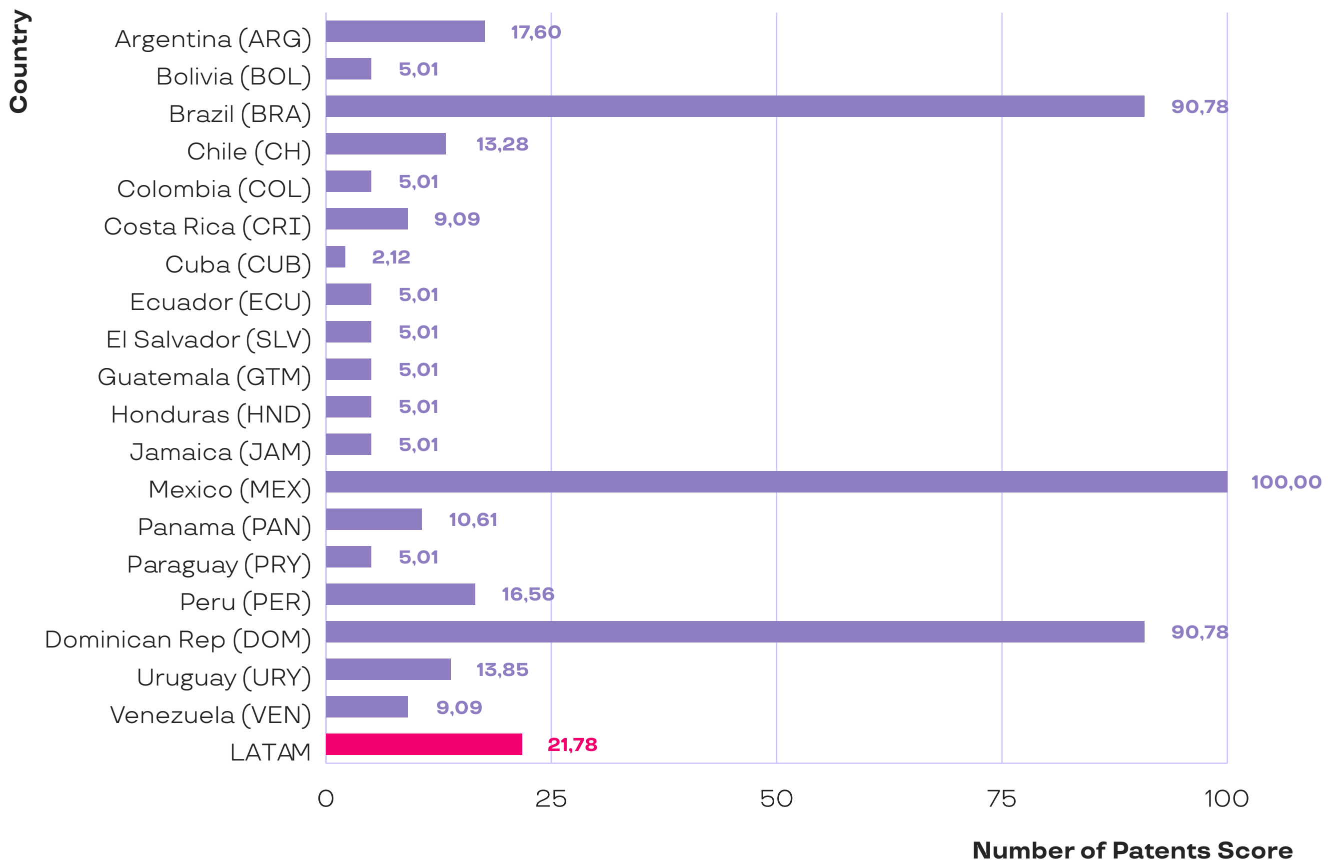
The capacity of countries to generate and protect intellectual property in AI is evidence of the level of progress in the development of new technologies in the region.

An ecosystem with high patent production activity is closely related to a high capacity to transform scientific and academic innovations into concrete solutions associated with public problems in the private sector. Therefore, it reflects a robust collaboration environment between academia, industry and government.

To evaluate the subindicator of **Number of patents,** the number of AI-related patents filed for the first time in the patent office of the indicated country was calculated.

Over the course of the last year, the picture is quite similar to the 2023 measurement, with two countries strongly leading in this aspect: **Mexico with 100 points** (equivalent to 4.22 AI patents per million inhabitants) and **Brazil with 90.78 points** (**3.84** AI patents per million inhabitants). The rest of the data show a discouraging picture of a region with low productivity in this area, which could be explained by low investment in R&D, lack of incentives and policies for the protection of intellectual property. Limited technology transfer and the scarcity of venture capital also contribute to an uncompetitive AI patent ecosystem in the region.

Graph 22: Score for Number of patents Subindicator



*The subindicator contains data imputed by GDP per capita/nearest neighbor method. BOL ECU SLV SLV GTM HND JAM PRY DOM VEN

Source: ILIA 2024 / Data: Emerging Technology Observatory

The Value of Research

Guacamaya´s Flight: The Project in which Microsoft and Research Converged on AI

The Universidad de los Andes, the Humboldt Institute and the SINCHI Institute in Colombia, together with Microsoft, created an AI platform that processes satellite data from bioacoustic and camera trap recordings.

The objective of the project is to monitor deforestation and biodiversity in the Amazon.

It is an innovative and powerful tool that will provide key information to protect an ecosystem crucial to planetary climate stability.

With 7 million km2 and its presence in nine countries, the Amazon is the world's largest tropical forest, home to 1% of the planet's biodiversity and responsible for delivering humidity and rainfall to South America, which helps stabilize the global climate. However, due to activities such as illegal mining, agricultural expansion, overfishing, hunting and deforestation, this unique ecosystem is in serious danger.

According to the Living Amazon 2022 Report (WWF), 18% of Amazon forests have been completely lost and an additional 17% are degraded, figures that promise to continue to worsen and bring consequences for biodiversity, the global climate and people. Especially on the 47 million people who live in the Amazon region and depend on it for their livelihoods.

To help address these threats, **Guacamaya, AI for the Amazon**, an initiative supported by **Microsoft's AI for Good,** was launched in 2022 to promote the use of Artificial Intelligence to address social and environmental challenges. The platform used AI to make available to science and government, accurate and timely data on the phenomena that are negatively impacting this unique ecosystem on the planet. "Guacamaya was born as a result of an exploration by Microsoft and the Universidad de los Andes in Colombia. The latter, through its Center for Research and Training in Artificial Intelligence, CinfonIA, analyzed how AI could be used to address environmental challenges, including deforestation in the Amazon. To begin this analysis, one of the key tools was the training of an AI model, which should prioritize data quality. For this we looked for collaborators with validated and high quality data and that is how we partnered with the Humboldt Institute and the Amazonian Institute for Scientific Research, SINCHI", explains CinfonIA researcher Andrés Hernández Celis.

According to the researcher, the Amazon was chosen as the focus because it is a crucial region for the world's biodiversity, especially in Colombia, which is the most biodiverse country per square kilometer. "The Amazon rainforest influences weather patterns and provides water to regions such as Bogotá and the páramos. However, deforestation has reached a critical point and threatens to completely desertify this natural ecosystem, which explains why it is urgent to take action by making AI available for this purpose," says Hernández.

Thus, it was decided to promote systematic monitoring and data delivery with AI in real time -or in less time- capable of generating the necessary alerts to take action before the situation becomes irreversible.

AI with environmental impact

Guacamaya is fed by three sources of data on the Colombian Amazon: bioacoustic recordings, camera trap images, and satellite data on vegetation cover. While the first are provided by the Humboldt Institute -the main scientific organization on biodiversity in Colombia and the one with the largest biodiversity repository in the region-, the second are a contribution of the Faculty of Sciences of the Universidad de los Andes. The third ones, meanwhile, are provided by the SINCHI Institute and the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM).

Microsoft's Director of Corporate, External and Legal Affairs for the South Andean region, Andrés Rengifo, explains that by integrating aerial, acoustic and camera trap data from the area, a 360° perspective of the region is achieved and thus delivers a much richer and more accurate understanding of the environment. "Generative AI offers valuable benefits for deciphering data and optimizing processes, and Guacamaya demonstrated this by connecting all the scientific information, which has traditionally been isolated in universities or research institutes on this platform," he explains.

The institutions linked to science contributed more than 100,000 files, data with which CinfonIA and Microsoft trained the algorithms capable of capturing, through sounds and images, the presence or absence of certain species. In this way, they could have useful information about the state of biodiversity in this sector of the Amazon.

"AI is trained and refined with the continuous use of data, but the algorithms used already had a solid base from other similar analyses, which allowed their adaptation to the Amazon ecosystem. The success of this project lies in the synergy created between various entities. Each institution contributes its experience and resources, creating a multiplier effect that results in innovative and effective solutions to complex problems such as climate change and biodiversity conservation," says Rengifo. The technology company powers Guacamaya with algorithms and computational capacity, essential for running intensive models that facilitate scientific research and human resources. "We have robust computational capacity on our Azure platform. Our cloud is the foundation for running these systems and where the information is stored, allowing us to gain new insights and develop approaches to better understand this data. We contribute with models, tools, computational capacity and a highly specialized team, dedicated to addressing social and human challenges through technology," explains the Microsoft executive.

Revolutionary methodology

The introduction of AI to the study of the Amazon ecosystem completely changed the way of obtaining information from this global biological reserve.

In order to have one of the most important repositories of natural sounds in South America over 25 years - with 25,000 audios of more than 1,300 species - the biologists of the Humboldt Institute captured these sounds with recorders of limited capacity, which they placed and removed from the jungle to hand them over to experts in recognition of vocalizations at times. These experts spent months listening to the recordings and identifying species.

But the arrival of Guacamaya revolutionized this field and after a year and a half of work, the first results are evident. Today, AI algorithms are not only able to identify bird sounds with 80% reliability and five times the amount of data analyzed during the same time, but they are also capable of detecting threats such as illegal logging and machinery. "In the bioacoustics area, a model was employed in collaboration with Microsoft Speech Lab. This, in order to convert sounds into spectrograms, which are visual representations of sound," explains CinfonIA researcher Andrés Hernández. These spectrograms are used together with natural text (name of the species of interest, for example) to identify bird sounds, insects or specific frequencies, he explains.

The processing of camera trap images is also enjoying the benefits of the initiative. "Before, a scientist manually reviewed more than 100,000 images and now Guacamaya does it automatically, performing monitoring 10 times faster and saving 90% of the time. The algorithms filter the useful ones and identify specific animals, facilitating efficient analysis and the detection of rare or invasive species," explains Rengifo.

Currently, pre-trained models from the Guacamaya project are now available on Pytorch Wildlife, an open source platform from Microsoft for biodiversity that fosters collaboration among developers in the field. "Pytorch Wildlife delivered us a collaborative deep learning framework for conservation, including different types of neural networks that address project-specific tasks. An example of this is the segmentation and detection of animals in camera trap images, using Microsoft's Megadetector," explains researcher Andrés Hernández.

Another substantive contribution of Guacamaya is its ability to interpret satellite images of the Amazon forest in real time. According to official data from Colombia's Institute of Hydrology, Meteorology and Environmental Studies, IDEAM, the Colombian Amazon lost more than 40,000 hectares between 2021 and 2022. "Guacamaya uses high-resolution imagery to monitor forest loss, which streamlines reporting on forest cover and allows informed decisions for conservation to be made in near real-time. This marks a difference with traditional reports, which had a delay of up to 18 months in Colombia," says Andrés Rengifo.

Open Source

CinfonIA researcher Andrés Hernández points out that the biggest technical challenge in training the algorithms has been data management. "For example, it is crucial to have detailed camera trap images to accurately identify species. This is difficult due to variations in the images and the uneven distribution of species in the database. Some species are common and over-represented, while rare species appear less than 100 times. This unevenness presents a considerable challenge, as it is necessary to handle an unbalanced distribution in the data."

This explains why the megadata that each pillar - camera traps, sounds and naturalistic cover - have been trained through proprietary or predetermined models, with the bioacoustic and camera trap algorithms being the most advanced. "In the satellite imagery one, we are fine-tuning the temporal consistency, which will allow us to produce reliable results at different times and avoid instability at the edges of forest cover maps. This will improve the accuracy of reforested hectare measurements. The main objective of our model is to extend current research by integrating the three pillars of the project into a platform to analyze the relationship between biodiversity loss: animal migration patterns and deforestation in different regions," Hernández explains.

To achieve this scalability, Guacamaya was designed as an open platform for scientific collaboration and in this new phase, after its official launch at the end of 2023, it seeks to consolidate the data in the Azure platform and invite more international institutions to participate in the monitoring of the Amazon. "This project was thus designed to allow other members of the scientific community and countries such as Peru, Ecuador, Bolivia, Brazil, Paraguay, Venezuela, Suriname, Guyana and French Guiana, to join and contribute. Open collaboration is essential to address challenges such as climate change and to have a global and more comprehensive view of what is happening in this ecosystem," says Microsoft executive Andrés Rengifo.

It becomes vital, then, to add data from various sources to continue improving the algorithms and generate deeper and more accurate analysis of the Amazon. To this end, the source code of the models and the platform are available to any research center or scientist interested in contributing to the protection of this place. "At Microsoft we believe that technology is a crucial tool to address challenges such as climate change. We have received support from scientists and the Colombian government, who have contributed data and shown enthusiasm to see how the platform operates and to see the potential of technological collaboration in biodiversity conservation," says the Microsoft executive.

The Guacamaya team continues to work on improving the algorithms and hopes to have functional models in each of the categories to present the progress of this initiative at COP16 in Cali, Colombia. "This initiative is not just the responsibility of one country or a group of people, but is a joint effort involving the entire Amazon region and beyond. Our goal is to expand this tool to institutions and organizations in other countries working in the Amazon to join the Guacamaya project. The Amazon is not only a natural treasure, but also the lungs of the planet that regulates the global climate. Protecting this invaluable ecosystem is a shared responsibility that transcends borders and requires a joint effort by all Amazonian countries and the international community," concludes the CinfonIA researcher.

D.5. Adoption Subdimension

The extent to which organizations or individuals are using AI in their processes, operations or products and the existence of an enabling environment for its development - including talent training, adequate infrastructure and the necessary regulatory framework to ensure ethical and safe implementation - reveals the degree of adoption this technology has reached in each country.

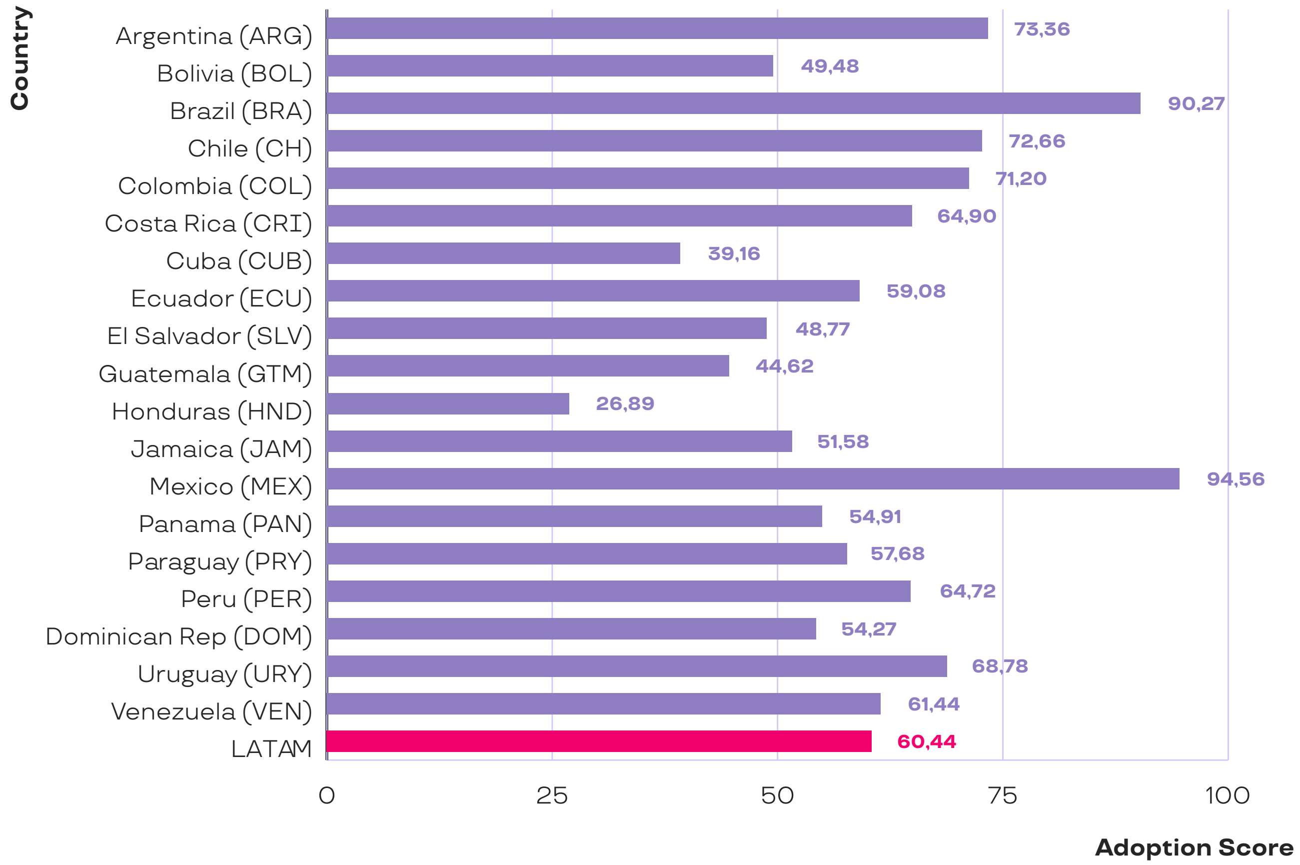
Evaluating the progress of the integration of this technology facilitates the identification of trends in the use of AI, the development of public policies and investment strategies, and the analysis of the maturity of industries or companies.

To calculate these aspects, the **Adoption** sub-dimension - which represents 30% of the total weighting of the R&D dimension - considers two essential indicators: **Industry,** which measures the integration of AI technologies in this sector, and **Government**, which analyzes the progress of digital transformation in the public sector.

It is worth mentioning that the sub-dimension was strengthened with four new subindicators that could provide a broader view of the capacities of national ecosystems to incorporate AI.

Graph 23 shows that the regional score is 60.44, with **Mexico as the leader with 94.56 points** and Brazil close behind with 90.27 points. Below are Argentina and Chile with above-average scores of 73.36 and 72.66, respectively.

Graph 23: Score for Adoption Subdimension



Source: ILIA 2024

Countries with high AI adoption (above 70 points): These are the ones with the highest scores, indicating an advanced and robust environment in the adoption of AI technologies. This is the case of Mexico (94.56), Brazil (90.27), Argentina (73.36), Chile (72.66) and Colombia (71.20).

Countries with moderate adoption of AI (50 to 70 points): To this group correspond those that show a moderate level of adoption, with scores close to the regional average. These include Uruguay (68.78), Costa Rica (64.90), Peru (64.72), Venezuela (61.44), Ecuador (59.08), Paraguay (57.68), Panama (54.91), Dominican Republic (54.27) and Jamaica (51.58).

Countries with low adoption of AI (less than 50 points): These are those with the lowest scores, which pose a challenging scenario in the incorporation of AI. These include Bolivia (49.48), El Salvador (48.77), Guatemala (44.62), Cuba (39.16) and Honduras (26.89).

D.5.1. Industry

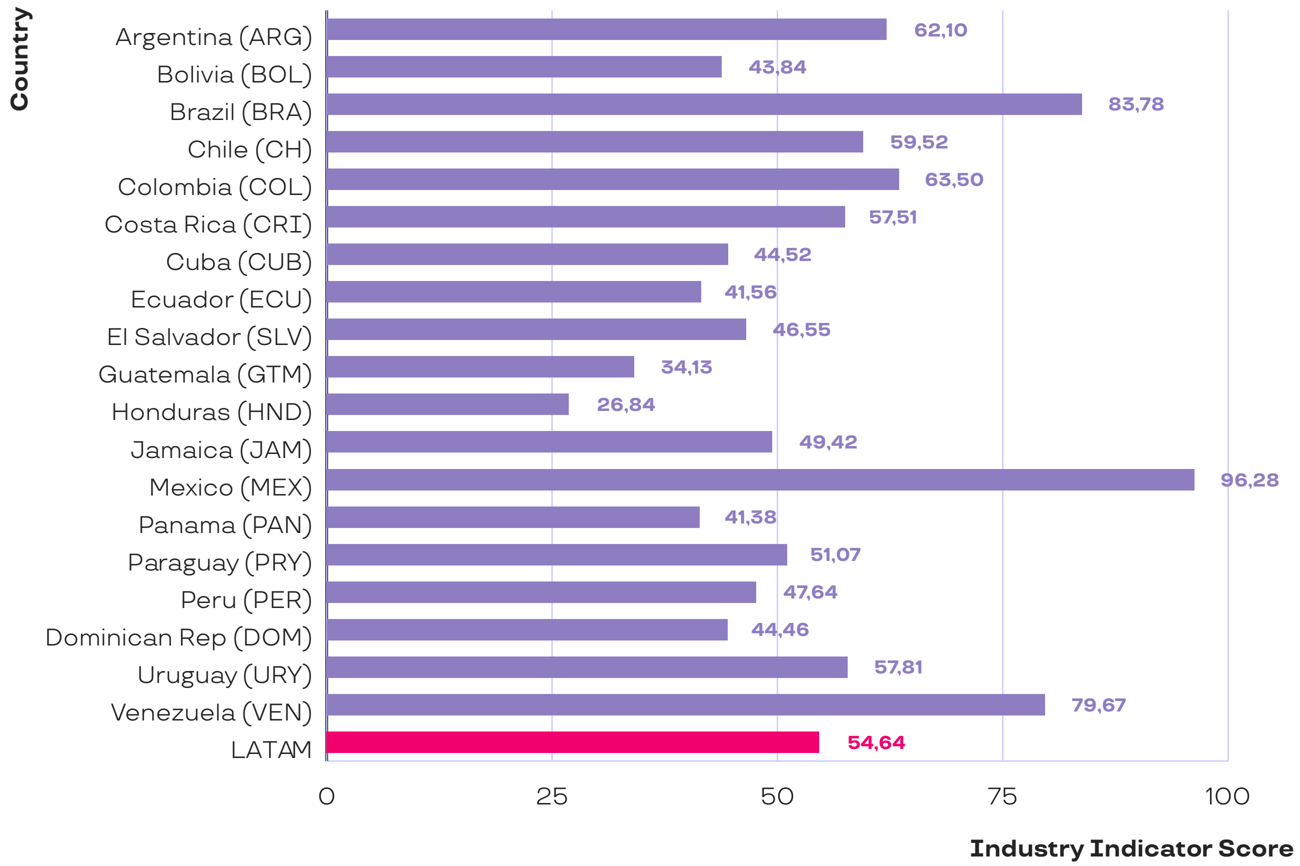
The adoption of AI in economic activities dedicated to the transformation of raw materials into finished products or the generation of goods and services measures the degree of integration of these technologies through different factors. These make it possible to evaluate not only the level of sophistication of the industrial sector, but also the preparation of human talent and the availability of the necessary infrastructure to maintain competitiveness in the market.

For this indicator, which represents **60% of the total weighting of the Adoption subdimension**, three subindicators were defined to calculate the level of AI incorporation:

a) Workers in high-tech sectors
b) Medium and high technology manufacturing
c) Share of medium- and high-tech manufacturing value-added

Graph 24 shows an intermediate regional progress in the adoption of AI by the industrial sector, with a score of 54.64. **Mexico and Brazil stand out with 96.28 and 83.78 points,** respectively, followed by Colombia (63.50), Argentina (62.10) and Chile (59.52).

Graph 24: Score for Industry indicator



Source: ILIA 2024

Here we see that, at a regional level, companies have begun to experiment with AI, implementing solutions in specific areas that are most likely related to task automation and data analysis. However, despite the advances, there are still challenges that prevent a faster and more widespread adoption, which may be associated with the initial investment required, the lack of specialized talent, the need to adapt processes and concerns about data security.

a) Workers in the high technology sector

Those employees in manufacturing industries that do not belong to the sectors traditionally classified as low-tech -such as food, beverages, tobacco, textiles and apparel- are the ones that define this subindicator of **Workers in the high-tech sector.**

The description -extracted from Socio-Economic Database for Latin America and the Caribbean, a website that includes statistics on poverty and other distributive and social variables for 25 countries in Latin America and the Caribbean- is obtained by exclusion. It is important to note that not all industries that apply advanced techniques or use high technology are grouped in this category, due to the limited information provided by household surveys.

This subindicator correlates with the sophistication of the local labor market and, in that sense, provides an approximation of the capacity to incorporate AI in productive processes,

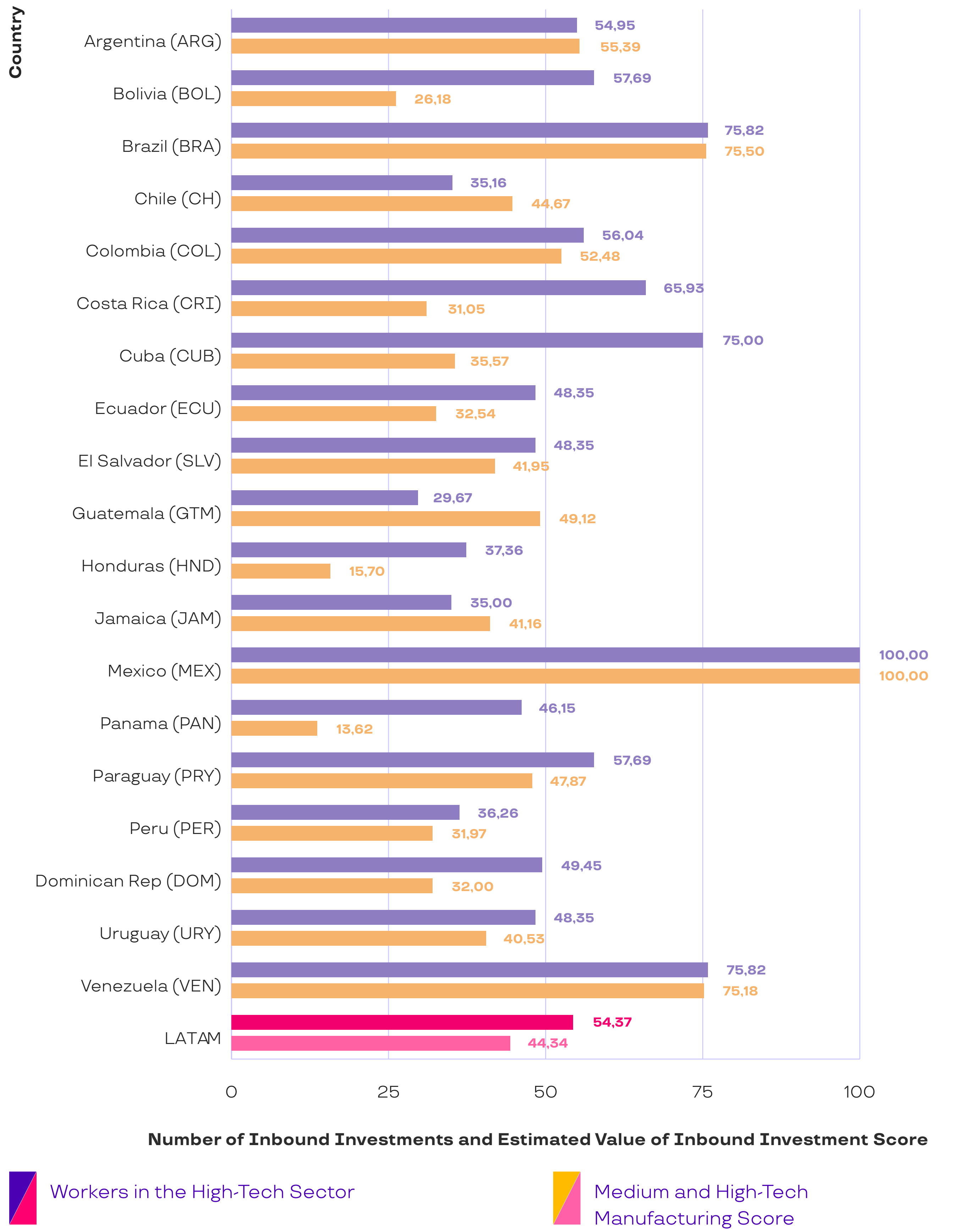
Graph 25 shows that countries such as **Mexico and Brazil lead the measurement, with 100 and 75.82 points** respectively, giving the region an average of 54.37 points, a score above which most of the countries under study are located. The countries of the Caribbean Basin are the ones with scores below this, reaching 29.67 points.

The number of workers in high-tech sectors in Latin America is unevenly distributed, with an average regional score of 54.37. Countries such as Mexico and Brazil lead in this area, suggesting greater development in advanced industries within their economies. The concentration of manufacturing and industrial industry in these two countries has a clear impact on the proportion of workers in high-tech areas. However, the disparity is evident, as the Caribbean Basin countries are significantly below average, indicating a lower participation in high-tech sectors.

The case of **Chile** is striking, as it is almost **20 points below the average**. This difference could be related to the policy of trade liberalization which, although it has favored growth in sectors such as mining and services, has reduced the relative importance of industry and manufacturing. Trade liberalization may have encouraged the importation of technology and finished products, reducing the need for a robust industrial base in the country. This, in turn, impacts the number of jobs linked to advanced technological sectors.

This variability reflects differences in the region's ability to drive industrial innovation and adopt advanced technologies, which could influence its global competitiveness and technology-based economic growth.

Graph 25: Score for Workers in High-Tech and Medium and High-tech Manufacturing Sectors subindicators



Source: ILIA 2024 / Data: CEPAL

**The subindicator Workers in the high technology sector contains data imputed by MICE (Multiple Regression) method: CUB JAM*

**The Medium and High Technology Manufacturing subindicator contains data imputed by MICE (Multiple Regression) method: DOM*

b) Medium and high technology manufacturing

This subindicator reflects the level of industrial sophistication of the local value chain by showing the share of value added of the Medium-High and High Technology (MHT) industry in the total manufacturing value added (MVA hereafter). Specifically, the subindicator is the ratio between MHT and MVA. The higher the value, the more intensive medium and high technology is in the value generation process, and therefore, the **economy shows a higher degree of sophistication.**

As with the indicator of high-tech workers, this measure makes it possible to **compare the relative maturity of** countries' **economies and value chains in terms** of the incorporation of technologies.

The share of medium- and high-tech industries in total manufacturing value added in Latin America is generally low, with an average regional score of 44.34. Although countries such as Mexico and Brazil stand out with a higher contribution from these industries, most countries in the region are below this threshold, indicating a low level of development in advanced technology sectors. This suggests that much of the **region relies on lower technological value industries** in greater proportion, which may limit their ability to incorporate digitalization and AI in their production processes.

Thus, the significant disparity between the best and worst positioned countries reflects profound differences in the productive matrix of each country. It is notable that, unlike other indicators, there is no clear correlation between GDP per capita and the value of the indicator of participation in advanced technological industries, suggesting that structural factors - such as the composition of industry, investment in research and development, and the capacity to attract high-value technological industries - play a more decisive role than the simple level of a country's wealth.

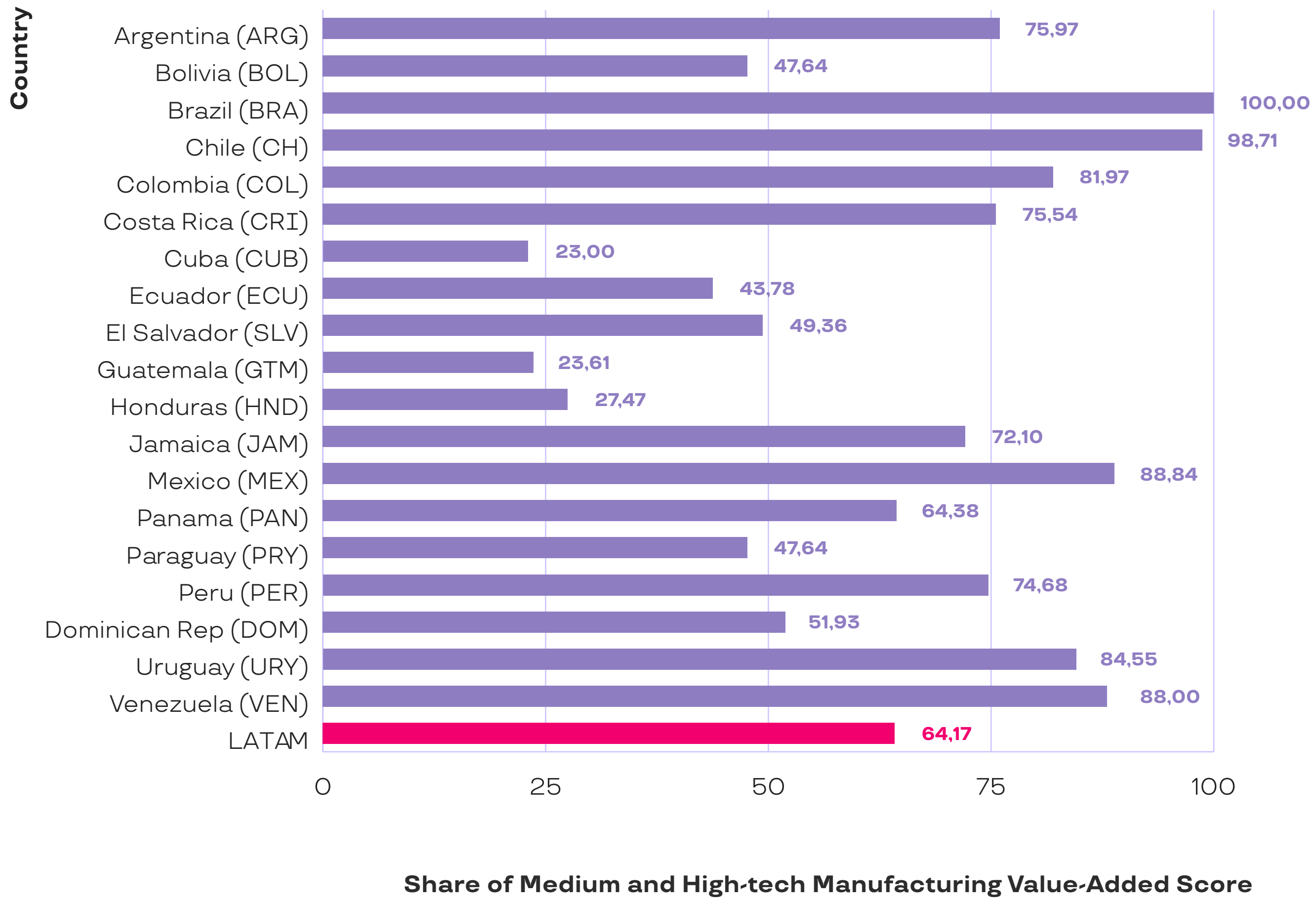
c) Share of medium- and high-tech manufacturing value-added

Medium- and high-tech manufacturing capacity in Latin America is uneven, with an average regional score of **64.17 points.**

While some countries such as Brazil, Chile and Mexico stand out with high levels of technological production, reflecting a greater capacity to innovate and develop strategic sectors for AI, others, especially in the Caribbean, lag behind with significantly lower or even zero scores.

This disparity in advanced technology production capacity suggests that, although some countries are better positioned to take advantage of the opportunities offered by AI, much of the region faces constraints that may hold back their competitiveness and growth in a global economy increasingly driven by technological innovation.

Gráfico 26: Score for Share of Medium and High-tech Manufacturing Value-Added Subindicator



**The subindicator contains data imputed using the MICE method (Multiple Imputation by Chained Equations): CUB VEN*

Source: ILIA 2024 / Data: World Intellectual Property Organization

D.5.2 Governance

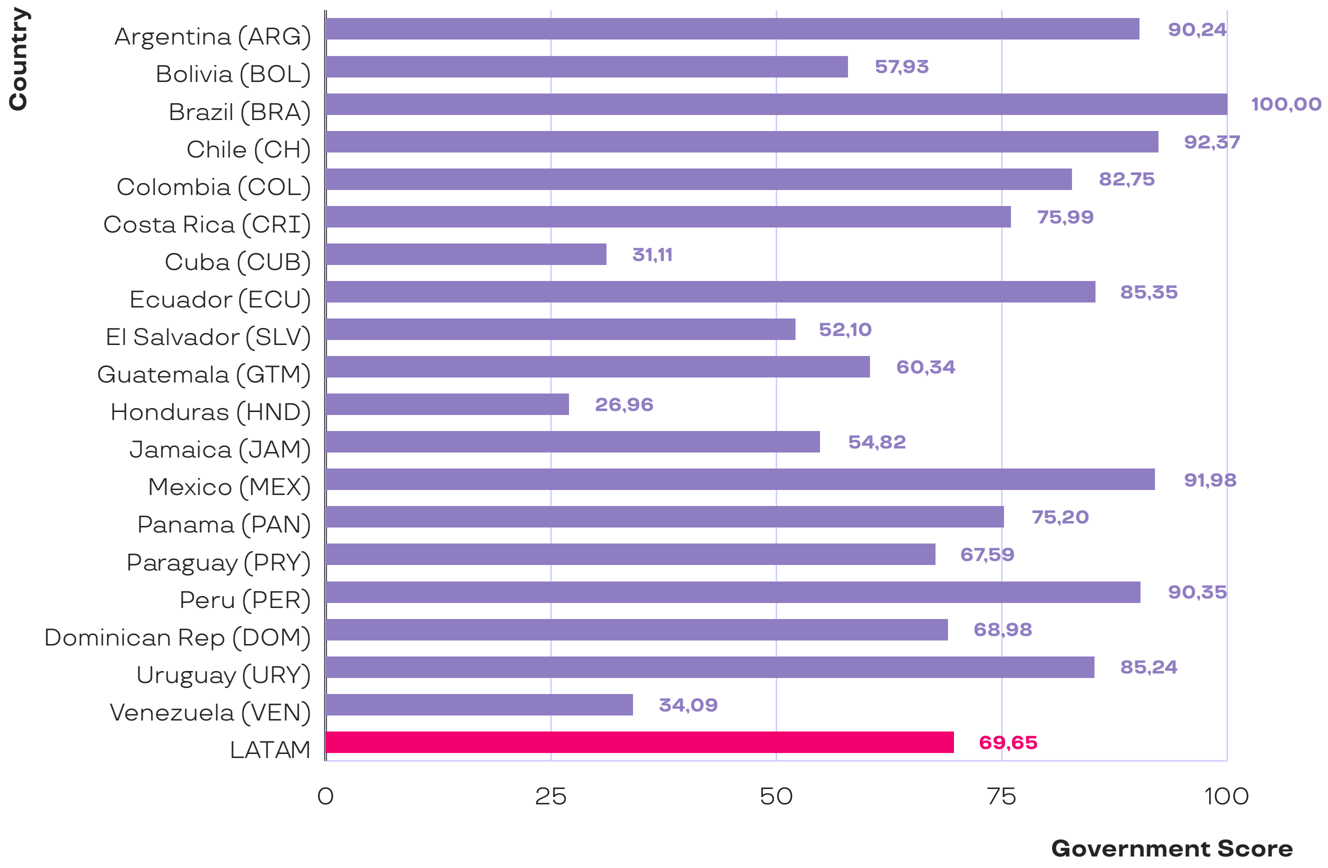
This indicator is composed of a subindicator, **Digital Government,** which aims to evaluate the progress of digital transformation in a government and which, in turn, is aligned with the State's modernization strategies.

According to the Economic Commission for Latin America and the Caribbean, ECLAC, IA strategies seek to build more transparent, effective and democratic public administrations, contributing to the Sustainable Development Goals. The Organization of American States emphasizes that e-government, through the use of ICTs in the public sector, increases efficiency, transparency and citizen participation.

It should be noted that the digitization of the State is a necessary - but not sufficient - condition for the incorporation of AI in the processes of public attention and management. In this sense, clarity regarding the relative position of the countries in terms of Digital Government allows for the identification of common lessons and challenges, in addition to properly describing the potential adoption scenario in the region.

Among the three indicators that make up the Adoption subdimension, the Governance indicator represents 40% of the total weighting.

Graph 27: Score for Governance Indicator



Source: ILIA 2024 / Data: Online Services Index (OSI)

a) Digital Government

For this subindicator, data from the Online Services Index (OSI) was used for the digital government subindicator based on the results of the United Nations Digital Government survey[2] .

The analysis of this subindicator shows a regional average of 69.65 points, which reflects a fairly homologous level of progress in the digitization of public services among the countries of the region.

As shown in **Figure 27,** three countries stand out for their outstanding performance: **Brazil, with the highest score**, leads the region as a benchmark in the implementation of digital technologies in the public sector. **It is followed by Chile, with 92.37 points,** and Mexico, with 91.98 points, both demonstrating a strong commitment to modernizing their public administrations. These results underscore the importance of a strategic and effective adoption of digital tools to improve efficiency, transparency and accessibility in government services.

Coincidentally, countries with higher levels of connectivity and infrastructure tend to score higher, while those lagging behind have weaker performance. Enabling infrastructure, from fiber optic connectivity and transmission speed to access to devices, are elements that precede the ability of states to digitize. The use of digitized public services necessarily requires the existence of a digitally literate citizenry with the means to access them.

2. Department of Economic and Social Affairs. E-Government Survey 2022-The Future of Digital Government. (2022). United Nations.

Ethical Algorithms: A Private Project Promoting Fair and Transparent AI in the Public Sector

· "Algoritmos Éticos, Responsables y Transparentes" is a multi-stakeholder initiative, led by the GobLab of the Adolfo Ibáñez University that promotes the responsible development and implementation of AI in Chile, especially in the public sector.

· The project, a pioneer in Latin America, has developed replicable tools for developed replicable instruments to increase transparency increase transparency and avoid discrimination in the provision of public services that incorporate AI, in addition to services that incorporate AI, in addition to ensure the protection of citizens' personal data.

Artificial Intelligence uses algorithms, which are sets of rules and processes designed to enable machines to learn from the data they are given, make increasingly accurate classifications and predictions in less time, and make decisions on their own, without human intervention. This ability to process information quickly allows AI to improve processes, optimize solutions and accelerate innovation in areas such as paperwork management, customer service and security, among others.

For the same reason, to date, several countries have adopted AI to expedite the services they provide to citizens and organizations, for example, those related to the management of waiting lists in some public hospitals, virtual assistants for citizen consultations, school admissions system allocation or facial recognition cameras for public safety, among others. But who ensures that these AI systems, which are created by people, do not have gender, racial, ethnic or social biases that lead to possible discrimination? How do these systems ensure the protection of citizens' personal data?

Projecting answers to these questions with concrete solutions was the initial vision of GobLab UAI, the public innovation laboratory of the School of Government of the Universidad Adolfo Ibáñez (UAI) with its project "Ethical, Responsible and Transparent Algorithms", presented in Chile in 2020.

Years before the realization of this initiative -and coinciding with the launch of fAIr LAC, an initiative of the Inter-American Development Bank (IDB) to promote the ethical use of AI in Latin America and the Caribbean-, the director of GobLab UAI and leader of the project, María Paz Hermosilla, had begun to manage conversations with the international financial institution's innovation laboratory, the IDB Lab. The objective was to obtain financial support to develop this project that had the transformation of AI public procurement as its center and starting point. "We found it interesting that the project would focus on public procurement (ChileCompra). We identified there an opportunity to foster public-private collaboration, raise awareness and train capacities in ethical AI and develop concrete tools to ensure a positive impact on society," explains BID Lab lead specialist Carolina Carrasco."

Thus, after ChileCompra formally joined the project in 2020, new collaborators were added: the Digital Government Secretariat, the Ministry of Science, and Magical, a startup business accelerator. "Subsequently, Fonasa, the Public Criminal Defender's Office, the Council for Transparency, the Social Security Institute, the Civil Service and the Superintendence of Social Security joined the project," says Hermosilla.

Four years after its launch, the initiative, a pioneer in Latin America, has produced a series of innovative instruments that can be replicated in the countries of the region, including five published tools, 13 pilots for the implementation of automated systems with ethical standards in public institutions and more than 1,200 participants in training and dissemination activities.

Protection of the public

A key milestone of the **Ethical, Responsible and Transparent Algorithms** project is the creation of standardized bidding guidelines and a directive with recommendations for government procurement of data science and artificial intelligence services. Developed by ChileCompra in the framework of the UAI GobLab initiative, they are the first published by a public procurement governing body in the region: a pioneering measure in Latin America. The bases and the directive establish, for the first time, rigorous requirements for transparency, fairness and data protection in order to help public services to tender, for example, predictive models, benefit allocation algorithms or user personalization systems, thereby mitigating any bias and opacity. "That not only improves efficiency in government procurement, but also strengthens citizen confidence in public management and fosters equal opportunities for suppliers and contractors," says Hermosilla.

The analyst of the Studies and Business Intelligence Division of ChileCompra, David Escobar, explains that the entity is responsible for establishing purchasing policies and guidelines, issuing bases and recommendations that ensure the protection of citizen information and transparency. "In the case of Ethical Algorithms, it seeks that purchases (with AI) consider the review of possible biases to avoid negatively affecting citizens, ensuring that public resources are allocated fairly and without discrimination," he says.

To support the project design stage, the UAI, together with the Secretariat of Digital Government, prepared the guide "Ethical Formulation of Data Science Projects", which provides tools for public officials to identify and address the legal and ethical challenges in artificial intelligence systems. Kareen Schramm, coordinator of Policies and Studies of the Digital Government Secretariat, points out:

Data is a strategic asset for public management, making it possible to streamline the delivery of goods and services and anticipate users' needs with tools such as artificial intelligence. One example is the Instituto de Previsión Social, which makes benefit payments directly through data integration, eliminating the need for people to apply. The development of concrete tools, such as those in this project, helps institutions to meet minimum standards, ensuring transparency and mitigating bias in the algorithms.

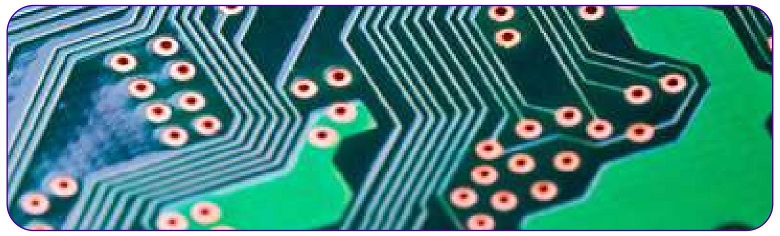
Inverters and tools

Thinking of large investors and technology companies that supply the State, key players in this ecosystem, the project developed together with the Ministry of Science, Technology, Knowledge and Innovation the experimental methodology fAIr Venture whose objective is to evaluate the ethical risks and social effects in AI technology investments. Alondra Arellano, cabinet advisor on Artificial Intelligence at the Ministry, highlights:

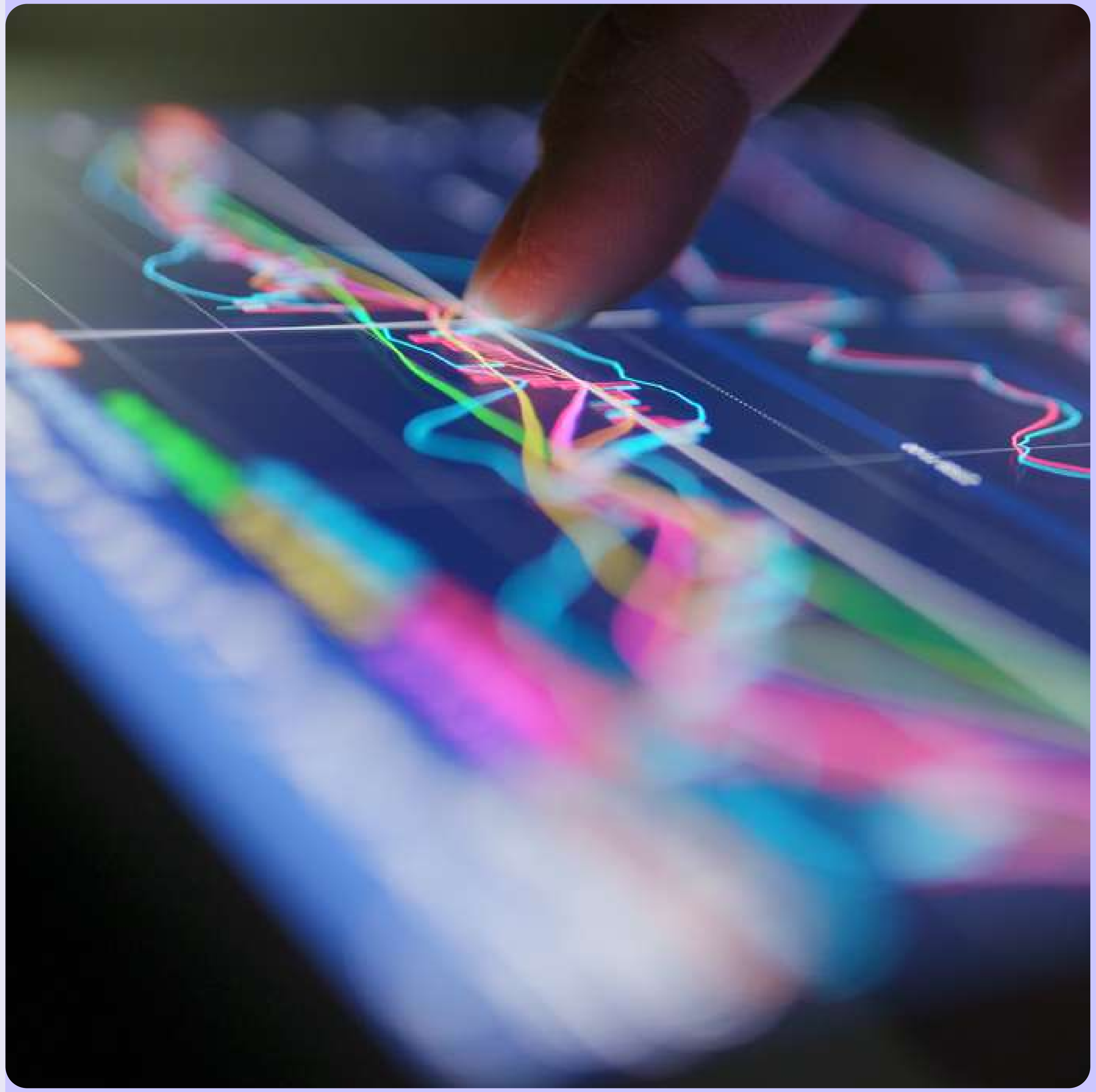
Our role as a public service is to ensure that the algorithms are equitable, that they do not reproduce biases, that they do not discriminate arbitrarily, and that they do not violate people's fundamental rights. And this is also important for the private world, because they are the main suppliers of these technologies to the public system.

The second phase of the Ethical Algorithms project, launched in July 2023 with funding from the National Agency for Research and Development (ANID), will run until 2025. In this framework, the GobLab team has already launched two new open source tools that are in the piloting phase: an "Algorithmic Transparency Token" and a "Bias and Statistical Fairness Measurement" that will allow public services to audit, in some way, their internal or acquired AI projects, thus anticipating upcoming regulations on the subject. "Specific tools will be used to evaluate the algorithms under development, allowing institutions to determine their transparency and detect possible biases that require adjustments. These tools will be applied in several pilots, ensuring that the algorithms comply with a minimum regulatory framework," says Schramm.

Although the IDB is no longer a formal part of this second stage, Carolina Carrasco indicates that they will continue to support it from fAIr LAC, as they are convinced that encouraging this type of collaborative work can accelerate social impact, improve the quality of life and promote economic growth in the region. "Algoritmos Éticos de la UAI is a tremendous reference. They have already demonstrated a clear path with tools that are applicable in any geography. With fAIr LAC we are now looking at how to make the adoption of these tools in other countries in the region."



GOVERNANCE



E.1 Main Findings

Drifting Countries
Twelve countries fail to have a systematic, comprehensive and updated AI strategy, either because of political changes or because they still have not started the process to create one. The absence of an official roadmap to boost AI is an indicator of the lack of urgency to join the racing progress of this technology.

Well-oriented Strategies
All countries that have a strategy in place count with, at least, six out of the seven critical elements established in the principles. Furthermore, they are equipped with similar structures and most of them incorporate evaluation and coordination mechanisms to comply with the objectives stated.

Opportunities for Collective Building
Only one out of 19 countries developed robust, clear and auditable processes for citizen participation in the construction and validation of their strategy. This issue deserves analysis, considering that the creation and update of national processes and strategies represents an opportunity to increase participation and legitimacy standards.

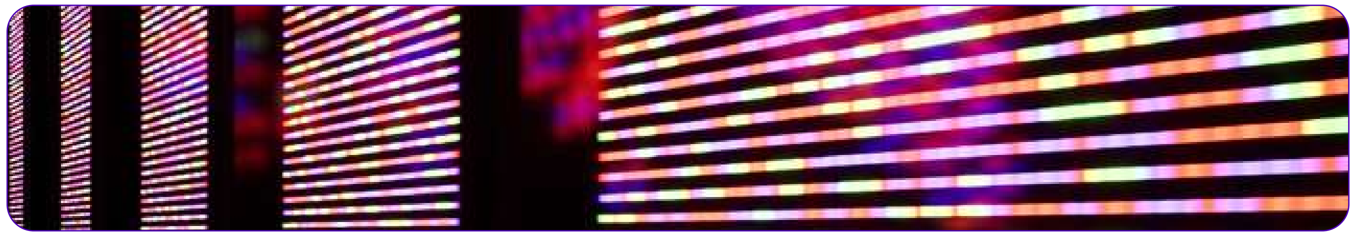
Legislative Creativity
Currently, there are 38 legal initiatives in discussion or approved regarding AI, related to diverse contents, addressing from concrete elements to specific technology applications and wide regulatory frameworks. Some of the proposals look to modify the Criminal Code to explicitly sanction the inappropriate use of generative AI, such as in cases of phone scams (Chile) or in case of violations of people's sexual privacy (Mexico).

Developing News
It is not easy to identify a common regional position with respect to proper AI governance in global discussion spaces, and it is impossible to infer one only from what has been established in draft laws and official strategies. Despite the existence of common challenges, opportunities, synergies and potential spaces to develop a position, there is still no regional announcement or proposal in the matter.

Solid, Safe and Explainable Environments
According to data obtained from the Global Index on Responsible AI, countries with mature ecosystems in the region show similar maturity levels in relation to European and Asian nations. This maturity is reflected in topics of transparency and explainability, accountability, and the promotion of "no harm" principles.

Let's Go Green

Data shows that practically all countries in the region offer favorable conditions for access to green and renewable energies. Factors such as regulatory frameworks, accessibility and prices could transform the region into a source of carbon neutral energy for the rest of the world, although this still requires more awareness and promotion efforts.



E.2 Dimension Description

Governance is the last dimension comprised by ILIA and it has raised the **global attention of public policymakers** at a local and multilateral level. Faced with the need to create certainty with regards to a revolutionary technology, these agents have proposed diverse mechanisms and approaches to **stablish common limitations, frameworks and standards** that allow participation in this transformative process.

Global governance with respect to AI is still a matter in development. The need to establish it involves both technical elements related to standards and **regulations of precision, cybersecurity, statistical equality and bias elimination,** and existential elements such as the survival of the human species in dystopic scenarios, fighting against autonomous and conscious evil machines.

The astounding technological advances made in the last five years have put control mechanisms that governments use to manage potentially negative effects of technology in the center of the debate. Contrary to other historical processes, such as the definition of norms for atomic developments and regulations for intellectual property and patenting, multilateral governance institutions lack effective tools to address this discussion with complete accuracy.

This is a technology that has been rapidly mastered by the private sector in the Western world, with growing investments that have launched striking advances in the last years. However, this has also led to a loss of democratic control over these advances and, more importantly, it has diminished the ability of public policymakers to understand the phenomena they are witnessing.

Beyond these issues, a common element in technological revolution processes like this one is that their development generally starts in the global North. In this sense, Latin America is trailing behind in terms of enabling factors and maturity of research, development and adoption ecosystems.

Consequently, and also because of the global geopolitical structure, the voice and understanding of the economic, social and cultural context of the region is barely represented in the spaces that currently lead governance discussions. Additionally, it is currently impossible to assert that there is a Latin American and Caribbean "position" regarding this challenge, as shown in this chapter. Diversity of approaches is an element that adds complexity to participating in the above-mentioned spaces.

Considering that the goal of the **Governance** dimension is to characterize the state of the region in this matter, the methodological framework proposed suggests that regulations are not the only element needed, there is also a necessity for promotion actions, shared visions, and participation of the civil society in decision-making on technology and other related elements.

The present chapter addresses three subdimensions to structure the results: **Vision and Institutionality, International Linkage** and **Regulation**.

The **Vision and Institutionality** subdimension makes an exhaustive revision of AI strategies and policies for each of the 19 countries of the region, considering aspects such as their content and follow-up mechanisms. In contrast with the previous edition of this Index, in this opportunity the reach of countries' active strategies is analyzed with greater detail, and coherence and consistency with internationally recognized and necessary principles is identified. The work made in the preparation of this subdimension is based on the principles defined by the Economic Commission for Latin America and the Caribbean (ECLAC), which actively participated in the formulation of the analysis and conclusions.

Next, the **International Linkage** subdimension is grounded on the participation of countries in relevant instances for the establishment of global governance and their impact in these spaces. Considering the private character of most of these advances, participation in the ISO guidelines definition process is emphasized as a space for the definition of standards in this matter, as well as the adherence to international agreements or treaties outside Latin America and the Caribbean.

Finally, the **Regulation** subdimension widens its evaluation reach in comparison with the first version of ILIA, including a revision of draft law and active law projects in each of the 19 countries, together with a critical analysis of the regulatory approach behind their processes. Taking into account the nature of this technology, this edition of the Index makes a deeper regulatory analysis concerning cyber security, and adds a new subindicator named **Ethics and Sustainability**, which integrates information from the Global Index on Responsible AI (GIRAI) and the Network Readiness Index (NRI) to characterize the situation of countries in social and environmental justice areas, ethics and respect of human rights.

Considering the relative importance of the ILIA dimensions for the purpose of describing AI ecosystem maturity in each country, this dimension has a **weigh of 25% of the total score** of the Index.

Table 1 details the taxonomy of the dimension, including the new subindicators in this edition.

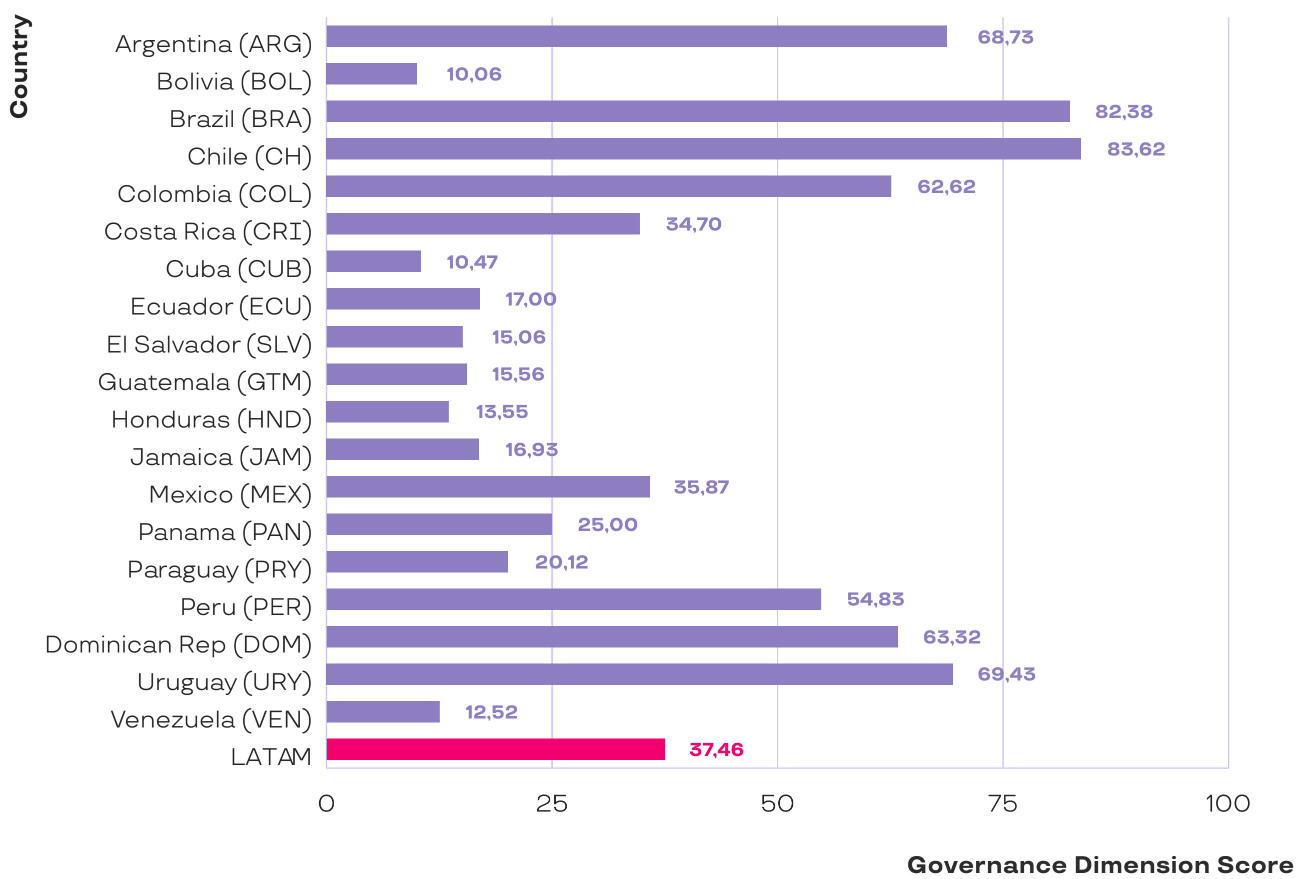
Table 1: Governance Dimension Composition
* 2024 new subindicators are colored

Subdimension	Indicator	Subindicator
Vision and Institutionality	AI Strategy	Existence of AI Strategy
		Responsible Institution for Execution
		Evaluation Mechanisms Availability
		Interinstitutional Coordination Mechanisms
		AI Ethics and Governance
		AI Infrastructure and Technology
		Capabilities Development
		Data
		Digital Governance
		Industry and Entrepreneurship
		R&D
		Regional and International Cooperation
	Society's Involvement	Citizen Participation
		Multistakeholder Methodology
	Institutionality	Institution Presence
International Linkage	Standard Definition Participation	Participation in ISO
	International Organisms Participation	Participation in International Committees
Regulation	AI Regulations	Risk Mitigation
	Cybersecurity	Cybersecurity Index
	Ethics and Sustainability	Data Protection and Privacy (Civil and Political Rights Data Protection and Privacy, GIRAI)
		Safety, Accuracy and Reliability (Technical Standards Safety, Accuracy and Reliability, GIRAI)
		Sustainability

Source: ILIA 2024

As shown in Figure 1, the leaders in this dimension are **Chile (83.62), Brazil (82.38)** and **Uruguay (69.43)**, with only seven countries above the regional average of 37.46 points.

Figure 1: Score for Governance Dimension



Source: ILIA 2024

Considerando los resultados del Gráfico 1, las naciones se pueden dividir en tres grupos, de acuerdo a la madurez de ecosistemas de Governance.

Countries with Advanced Governance (over 60 points): These count with more inclusive, better structured decision making processes and policies effectively and efficiently implemented are in this group. This is the case of Chile (83.62), Brazil (82.38), Uruguay (69.43), Argentina (68.73), Dominican Republic (63.32) and Colombia (62.62).

Countries with Intermediate Governance (between 20 and 60 points): These show a moderate level of development. Although they have established structures and processes, there are still areas that require improvement to reach higher standards. Among them are Peru (54.83), Mexico (35.87), Costa Rica (34.7), Panama (25.0) and Paraguay (20.12).

Countries with Basic Governance (less than 20 points): Nations with base level management, minimal infrastructure and significative areas to be improved. In this group are Ecuador (17.0), Guatemala (15.56), El Salvador (15.06), Honduras (13.55), Venezuela (12.52), Cuba (10.47) and Bolivia (10.06).

E.3 Vision and Institutionality Subdimension

This subdimension is comprised by three indicators: AI Strategy, Society's Involvement and Institutionality.

Policy instruments, such as a**gendas and sectorial strategies** are crucial to **promote innovation, foster economic growth** and establishing ethical standards for technologies like AI. Without structured policies, countries risk getting behind in this Fourth Industrial Revolution, failing to take advantage of AI's transformative potential to improve public services, governance and economic, productive and sustainable development.

Nations that have implemented specific strategies and well-designed policies are already ripping the initial benefits of AI. Beyond the United States and China, which lead the AI race with massive funding and extensive policies, several other nations are reaching significative advances. For example, despite having a late start in the design and implementation of AI policies, India is at the forefront of talent gathering for this technology thanks to its ambitious capacity development program. Also, South Korea has been prominently positioned as a developer of innovative AI solutions through its comprehensive national strategy and collaborative efforts made in commercial research programs.

These are only two examples of nations that have taken advantage of their AI structural plans to advance their positions in the global AI landscape. It is expected that, in average, countries with advanced AI technology double the benefits of countries with similar economic development levels which are behind in AI development.

At present, and as shown in Figure 2, only **seven countries** from Latin America and the Caribbean count with an official **national AI strategy: Colombia, Brazil, Chile, Peru, Argentina, Uruguay and Dominican Republic.**

In this edition of the Index, the **Vision and Institutionality subdimension represents 50% of the total weight of the Governance dimension,** due to the importance of the elements it analyses.

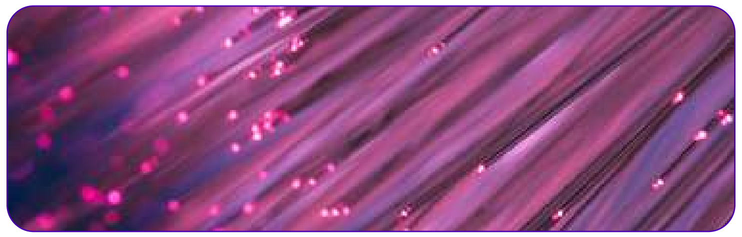
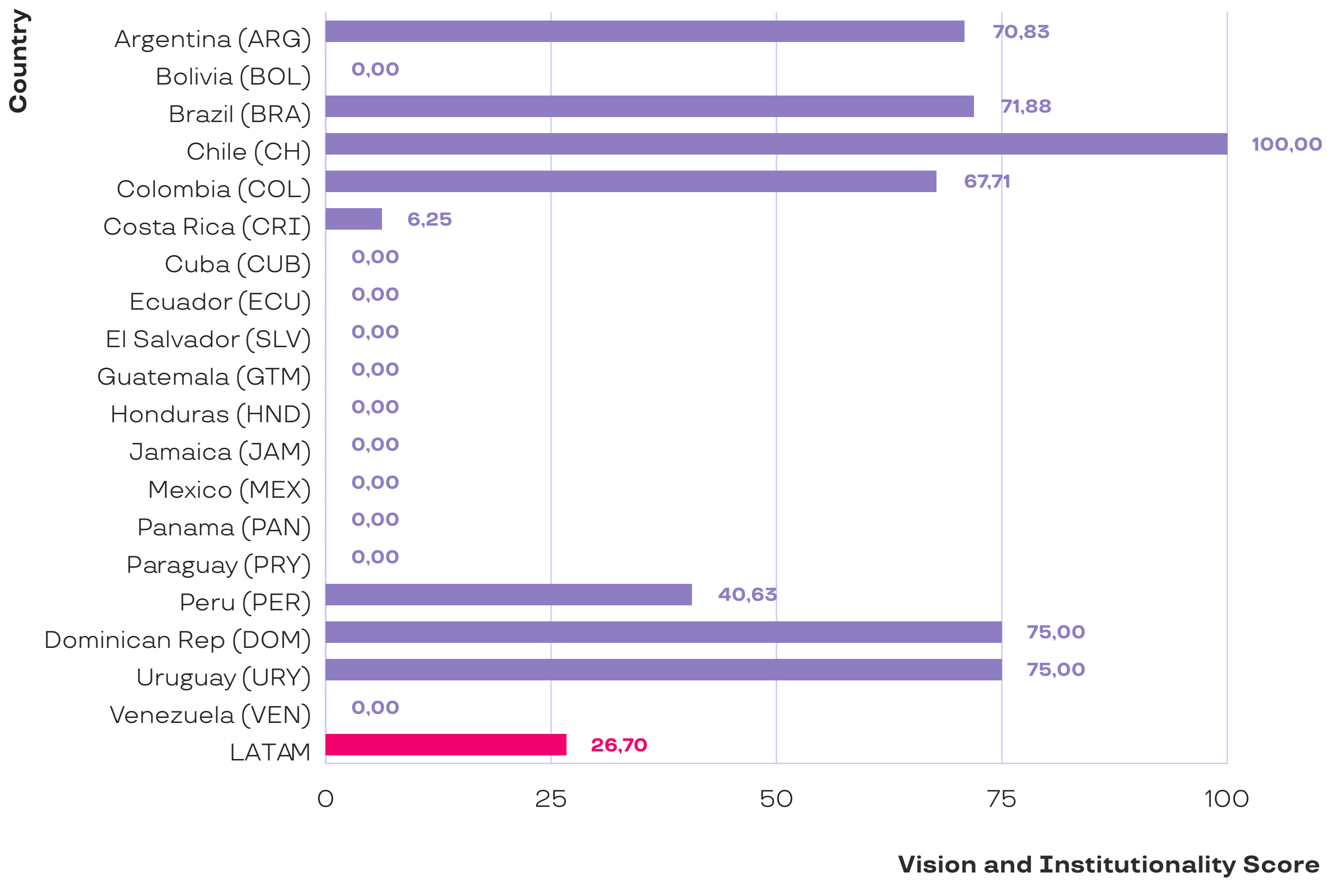


Figure 2: Score for Vision and Institutionality Subdimension



Source: ILIA 2024

Considering the results shown in **Figure 2**, countries can be divided into two groups according to their maturity levels in this dimension.

Countries with a Robust or in Progress Vision and Institutionality: This is the case of Chile (100.0), Uruguay (75.0), Dominican Republic (75.0), Brazil (71.88), Argentina (70.83), Colombia (67.71), Peru (40.63) and Costa Rica (6.25).

Countries with an Absent Vision and Institutionality: Mexico, Paraguay, Panama, Guatemala, Jamaica, Honduras, Bolivia, El Salvador, Ecuador, Cuba and Venezuela.

E.3.1 AI Strategy

The **AI Strategy** indicator measures the presence and validity of an AI strategy or policy backed by a public institution, and whose role is to define a roadmap to promote investment, research, talent development and regulatory and ethical frameworks aiming to facilitate AI's sustainable growth and strengthen countries competitivity in the matter.

This indicator is composed by the following subindicators:

a) Existence AI Strategy
b) Responsible Institution for Execution
c) Evaluation Mechanisms Availability
d) Interinstitutional Coordination Mechanisms
e) AI Ethics and Governance
f) AI Infrastructure and Technology
g) Capabilities Development
h) Digital Governance
i) Industry and Entrepreneurship
j) R&D
k) Regional and International Cooperation

To measure a country's advances regarding its current AI strategy, **binary indicators where defined to determine the presence or absence of the aspects above in their AI strategy,** as shown in Table 3.

Table 3: AI Strategy Indicators Categorization

Subdimension	Categories	Score
Existence of AI Strategy	1: There is an AI strategy 0: There is no AI strategy	0= 0 1= 100
Responsible Institution for Execution	1: There is an institution responsible for its implementation 0: There is none	0= 0 1= 100
Evaluation MechanismsAvailability	1: There are evaluation mechanisms for the strategy 0: there are none	0= 0 1= 100
Interinstitutional Coordination	1: There are interinstitutional coordination mechanisms for the strategy 0: There are none	0= 0 1= 100
AI Ethics and Governance	1: The strategy includes AI ethics and governance aspects 0: The strategy does not include AI ethics and governance aspects	0= 0 1= 100
AI Infrastructure and Technology	1: The strategy includes AI infrastructure and technology aspects 0: The strategy does not include AI infrastructure and technology aspects	0= 0 1= 100
Capabilities Development	1: The strategy includes capabilities development 0: The strategy does not include capabilities development	0= 0 1= 100
Data	1: The strategy includes data 0: the strategy does not include data	0= 0 1= 100
Digital Governance	1: The strategy includes digital governance 0: the strategy does not include digital governance	0= 0 1= 100
Industry and Entrepreneurship	1: The strategy includes industry and entrepreneurship terms 0: The strategy does not include industry and entrepreneurship terms	0= 0 1= 100
R&D	1: The strategy includes R&D terms 0: The strategy does not include R&D terms	0= 0 1= 100
Regional and International Cooperation	1: The strategy incorporates regional and international cooperation 0: The strategy does not incorporate regional and international cooperation	0= 0 1= 100

Table 4: 0 / 1 Dichotomies (see methodological appendix for details) 1= 100

	ARG	BOL	BRA	CHI	COL	CRI	CUB	ECUS	LV	GTM	HON	JAMM	EX	PANP	RY	PER	DOMU	RY	VEN
Presence of an AI Strategy	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
Presence of an Institution Responsible for its Implementation	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	100	100	0
Evaluation Mechanisms	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	100	0	0
Interinstitutional Coordination Mechanisms	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	100	0	0
AI Ethics and Governance	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	0	0
AI Infrastructure and Technology	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
Capabilities Development	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
Data	100	0	100	100	0	0	0	0	0	0	0	0	0	0	0	100	100	100	0
Digital Governance	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
Industry and Entrepreneurship	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
R&D	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
Regional and International Cooperation	100	0	100	100	100	0	0	0	0	0	0	0	0	0	0	100	100	100	0
AVERAGE	**91**	**0**	**100**	**100**	**91**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**75**	**100**	**75**	**0**
FREQUENCY	**11**	**0**	**12**	**12**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**12**	**9**	**0**

Source: ILIA 2024

E.3.1.1. AI Strategies in Latin America and the Caribbean

There are only seven countries in Latin America and the Caribbean that currently have official national AI strategies: Colombia, Brazil, Chile, Peru, Argentina, Uruguay1 and the Dominican Republic. This is a low average compared to the global context, where nearly 30% of countries have such instruments. The pace of technological progress and the strong implications of the lag in the promotion, implementation and regulation of this technology urge more nations in the region to adopt comprehensive policies in this area.

a) Colombia

In 2019, Colombia presented to the CONPES (National Council for Economic and Social Policy) the document entitled **National Policy for Digital Transformation and Artificial Intelligence**, which describes a comprehensive strategy to improve the country's social and economic value through digital technologies. The policy aims to improve digital services, promote digital transformation and take advantage of opportunities associated with the Fourth Industrial Revolution (4IR). Its key objectives include overcoming barriers to technology adoption, fostering digital innovation and strengthening human capital for 4IR integration.

The policy establishes 14 principles, emphasizing evidence-based regulations, the development of local and global talent, the ethical use of AI, a robust data infrastructure and monitoring the impact of AI on the labor market. Meanwhile, strategic actions include improving electronic payment systems, updating regulations for emerging technologies, facilitating the deployment of 5G, creating R&D spaces, promoting the mobility of AI experts, and developing training programs for senior managers.

The investment required by the policy over five years is approximately 121,619 million pesos (around 30 million USD) and involves a collaborative effort among government entities to ensure a comprehensive digital transformation.

To monitor progress and ensure alignment with policy objectives, follow-up measures have been established, with periodic reports from all entities involved, consolidated by the National Planning Department (DNP).

b) Brazil

The **Brazilian AI Strategy (EBIA)** presented in 2021 is the cornerstone of Brazil's AI development efforts, implemented by the Ministry of Science, Technology and Innovations.

Engaging 48 institutions and more than 1,000 participants, EBIA aims **to refine policies, establish governance frameworks and create monitoring mechanisms**, as well as to facilitate the cross-border exchange of AI tools.

In addition, it seeks to connect Brazil to the global network of public policies, fostering business creation, scientific research and evidence-based management.

The strategy promotes transparency and cooperation in data governance, obtaining social and economic benefits. It also considers the standardization of terminology, international guidelines and manuals to improve Brazil's AI diplomacy, with coherent public policies that foster innovation, trust and accountability.

EBIA sets 74 goals with specific allocations to various entities, covering training (15% or 11 goals), international collaboration, data governance, ethics (42% or 31 goals), and productivity, public administration and research improvement.

As for ethical considerations, they focus on data regulation and addressing biases.
The Ministry coordinates actions, invites contributions from various sectors and publishes progress reports to ensure alignment with the objectives, strengthening interdepartmental cooperation and positioning Brazil as a leader in ethical AI development.

c) Peru

In 2021, under the initiative of the Government and the Digital Transformation Secretary of the Presidency of the Council of Ministers, a group of experts developed the preliminary draft of Peru's National AI Strategy.

In order to take advantage of the benefits of AI and address its current state, the strategy positions the country as a leader in AI defining **six strategic areas: i) Talent Training and Recruitment; ii) Economic Model; iii) Technological Infrastructure; iv) Data; v) Ethics; and vi) Collaboration.**

Key initiatives include establishing a National Innovation and AI Center, integrating AI into the value chain, improving local infrastructure for AI research, promoting open data, the ethical use of AI, and fostering collaboration.

The strategy details 14 objectives and 75 subobjectives, with Talent Training and Recruitment and Economic Model each accounting for 28.57% of the objectives, Technology Infrastructure and Data accounting for 14.29% each, and Ethics and Collaboration accounting for 7.14% each.

d) Chile

In 2021, the Ministry of Science, Knowledge, Technology and Innovation introduced **Chile's National Artificial Intelligence Policy,** establishing a plan projected to 2031 to be a pioneer in AI applications worldwide and lead the Latin American and Caribbean region in the matter.

The policy, which involved more than 1,300 participants in specialized workshops and 5,300 people in nationwide dialogues, compiled diverse ideas and concerns. Structured around areas such as "Enabling Factors," "Development and Adoption," and "Social and Legal Nuances," it focused on **talent development, technology infrastructure, data issues, productivity enhancement, R&D promotion,** addressing **climate change, ethics, labor market** implications, **e-commerce, intellectual property, and cybersecurity.**

In 2024, the Chilean government updated the policy to include "Governance and Ethics", aiming to promote AI skills in schools, integrate AI into vocational training, increase the number of experts in the discipline, improve high-performance computing infrastructure, and improve public data agendas.

The updated policy also aims to increase AI productivity, boost research to OECD levels, foster academia-industry collaboration, create regulatory certainty, promote the ethical use of technology, and ensure international cooperation and standards, while addressing climate change, gender equality, inclusion, and responsible use of AI for children.

The Ministry of Science, Knowledge, Technology and Innovation oversees the strategy's implementation.

e) Uruguay[LP1]

Uruguay's **Roadmap for Data Science and Machine Learning** dates back to 2019, and although it is not officially recognized as a national agenda, it serves as a strategic plan to boost the country's economic development and productivity through advanced technological integration.

Leaded by the National System for Productive Transformation and Competitiveness, this initiative prioritizes several key areas: **improving STEM education** at the secondary level to build a strong workforce, **improving tertiary education** to produce highly skilled graduates, and **attracting** global **talent** while

LP1. Uruguay's 2019 'Roadmap for Data Science and Machine Learning,' although not officially recognized as a national agenda, serves as a strategic plan to boost the country's economic development and productivity through advanced technological integration.

benefitting from the expertise of the Uruguayan diaspora.

The roadmap stresses the importance of promoting research, development and innovation (R&D+I), ensuring access to comprehensive databases and addressing the ethical implications of data science applications. It also advocates strong international partnerships to facilitate knowledge sharing and align with global trends.

By incorporating Data Science and Machine Learning in the public and private sectors, Uruguay seeks to improve its competitive advantage, increase productivity and drive sustainable social and economic growth.

f) Argentina

The **National Artificial Intelligence Plan** (PNIA), developed by the Ministry of Science, Technology and Productive Innovation (MINCYT) of Argentina in 2019, establishes a comprehensive AI strategy with 75 specific goals distributed in 10 categories: Talent (8 goals); Data and Public-Private Partnership (5 goals); Supercomputing Infrastructure (3 goals); R&D+I (10 goals); Implementation in the Public Sector (9 goals); Implementation in the Private Sector (7 goals); Impact on the Workplace (9 goals), Ethics and Regulation (7 goals); International Linkage (5 goals); Innovation Lab (9 goals); and Communication and Awareness (3 goals).

Each of the above details their vision, responsible organizations and contributions to the SDGs, supported by a diagnostic phase that identifies opportunities, challenges, specific targets and implementation steps.

A key strength of the PNIA is its multi-stakeholder approach, which **engages government, industry, academia and international partners** to **foster innovation** and ensure that AI technologies maximize benefits and minimize harms.

The plan emphasizes improving STEM and tertiary education to build a talent pool, attracting global talent and engaging the diaspora. It has a strong focus on R&D to acquire a competitive advantage by ensuring accessibility to databases, addressing ethical implications and promoting international partnerships for knowledge sharing.

The strategic priorities of this plan include developing a regulatory framework, improving AI infrastructure and focusing on ethical AI.

g) Dominican Republic

The Dominican Republic's 2024 National Artificial Intelligence Strategy (ENIA) aims to position the country as a regional leader in AI, integrating it into the Fourth Industrial Revolution and fostering a knowledge-based economy, while aligning it with ethical principles and the protection of human rights. Headed by a High Level Committee of key representatives from 20 state institutions, led by the Ministry of the Presidency, and coordinated by the Government Office of Information and Communication Technologies (OGTIC) and the Innovation and Digital Development Cabinet, the strategy ensures high-level political commitment and broad stakeholder participation. Key government ministries and agencies, including the Senate, the Chamber of Deputies and the Supreme Court, collaborate to implement the strategy, fostering a unified approach to harnessing AI for national progress.

The ENIA is structured around four main pillars: Smart Government, Data Center, Regional Scale and Talent and Innovation Center (#YosoyfuturoRD), and has an Action Plan comprising 50 initiatives distributed among these pillars.

The strategy emphasizes the role of the state as an entrepreneurial investor, with the goal of investing 1% of GDP in R&D by 2030, supported by the Innovation Support Fund (FAI). To monitor and control progress, the OGTIC will hold quarterly meetings and regular evaluations to evaluate the implementation of the strategy, ensuring flexibility to adapt to changing circumstances and technological advances. This dynamic approach aims to ensure efficient implementation and optimization of resources to achieve the established objectives, with specific indicators and timelines until 2030 to ensure accountability and clear milestones throughout the implementation period.

Table 4 shows the **details of the official IA strategies** in force in the seven countries of the region, including the name of the document, the year of its entry into force and the public institution in charge of its design and promotion. It also shows an outline of the elements (subindicators) present or absent in each of the AI policies, leading to the calculation of the indicator score (Figure 2).

Table 4: AI Strategies in Latin America and the Caribbean

		Validity Period		Institution [b]	The strategy includes		
Country	Document	Issue	Expiration [a]	Design and Political Support	Evaluation Mechanisms	Institutional Coordination Mechanisms	Assigned Budget
ARG	National Artificial Intelligence Plan	2019		Nation's Presidency	●		
BRA	Brazilian AI Strategy	2021		Ministry of Science, Technology, Innovation and Communications	●	●	
CHI	National Artificial Intelligence Policy	0		Ministry of Science, Technology, Knowledge and Communications	●		
COL	National Policy for Digital Transformation and Artificial Intelligence	2019	2030	National Planning Department. Ministry of Information and Communication Technologies. Presidency Administrative Department.	●	●	●
PER	National AI Strategy National Artificial	2021		Secretary of Government and Digital Transformation			
DOM	Intelligence Strategy	2023	2031	Government Office of Information and Communication Technologies. Office of Innovation and Digital Development. National Presidency.	●	●	
URY	Roadmap for Data Science and Machine Learning	2019	2030	Ministry of Industry, Energy and Mining			

	The strategy includes objectives on									
Country	AI Ethics and Governance	Infraestruct. y Tecnología de la IA	AI Technology and Infrastructure	Capabilities Development	Data	Digital Governance	Industry and Entrepreneur ship	R&D	Regional and International Cooperation	Legal efforts to mitigate AI risks
ARG	●	●	●	●	●	●	●	●	●	●
BRA	●	●	●	●	●	●	●	●	●	●
CHI	●	●	●	●	●	●	●	●	●	●
COL	●	●	●	●		●	●	●	●	●
PER	●	●	●	●	●	●	●	●	●	
DOM	●	●	●	●	●	●	●	●	●	
URY		●	●	●	●	●	●	●	●	●

Source: ILIA 2024- ECLAC

a: Although Colombia's strategy does not include specific objectives on the subject of data protection, it is worth noting that the country has multiple initiatives and policies on this subject, such as the Personal Data Protection Law (L.1581 of 2012) and laws 1273 of 2009, 1266 of 2008, 1712 of 2014 and 1928 of 2018.

b: Regarding the institutions in charge of implementation, Argentina, Brazil and Colombia assign different entities depending on the objective of the strategy. For the rest of the countries there is no clarity in this regard.

c: Although Colombia's strategy does not include specific objectives on the subject of data protection, it is worth noting that the country has multiple initiatives and policies on this subject, such as the aforementioned Law 1581 (2012) and Laws 1273 of 2009, 1266 of 2008, 1712 of 2014 and 1928 of 2018.

Humboldt Cable: A Joint Effort Between Google and the Chilean State for Latin American Connectivity

· The Humboldt Cable is the first submarine fiber optic route, which will link Chile with Australia to enable faster, more stable and lower cost connectivity between South America, Oceania and Asia Pacific.

· The joint initiative between Google and the State of Chile seeks to boost the digital economy of Chile and all of Latin America, as well as to connect them with key global markets.

Fiber optic cables are the backbone of Internet's operation by transmitting millions of data at high speed, with increased bandwidth capacity and low latency. This means minimal delay in data transmission, and thus, greater ease of use for critical real-time applications, ranging from online gaming to remote monitoring of industrial processes, surveillance systems, financial transmissions or telemedicine.

A better technological infrastructure is now the cornerstone for the development of advanced technologies such as AI, cloud computing and services such as 5G and the Internet of Things (IoT), all of which are essential for the digital and economic transformation of countries due to their significant impact on industrial, digital and scientific productivity. In this context, the construction of the Humboldt submarine route, of more than 12,000 kilometers long and promoted by Google and the State of Chile through the state-owned company Desarrollo País, is considered a true revolution in local connectivity. The project will provide direct connectivity between South America and Asia Pacific, which will result in lower latency (increased speed in data transport), providing greater autonomy and resilience to Latin American telecommunications and consolidating Chile as a digital hub or technology center.

This public-private initiative is an example of innovative and efficient governance, involving the participation of multiple stakeholders who showed a long-term vision and the strategic ability to find in Google the ally that allowed them to make this critical infrastructure for the country a reality.

"Chile's governance of the project has been fundamental to highlight its value and attract the interest of a number of stakeholders to be a part of it. In this joint project between Google and Desarrollo País, the strategic and long-term objectives of both companies were aligned. For Desarrollo País, the deployment of this new digital infrastructure allows Chile to position itself in the technology market as a hub for the development of data centers and new technological solutions, thus enabling it to fulfill the country's vision of being the first in the region to be directly connected to Asia and Oceania. We chose Google as a strategic partner because of its extensive experience in the deployment of submarine cables worldwide, which gives us guarantees of a serious execution with a world-class company," explains Patricio Rey, general manager of Desarrollo País, the state-owned company responsible for managing long-term infrastructure in Chile.

The ambition of establishing a direct link between South America and Asia through a submarine fiber optic cable emerged in 2016, during Michelle Bachelet's second term in office, with a project that initially looked towards China. In 2018, during the second government of Sebastián Piñera, the Chilean Undersecretary of Telecommunications (Subtel) together with the support of the Development Bank of Latin America and the Caribbean (CAF), tendered studies on technical, legal, financial and economic aspects, defining Valparaíso-Sidney as the optimal route. In 2021, the project was taken on by Desarrollo País, which launched in the following year an international call for bids to seek strategic partners in the construction of the cable. It was then that Google joined the project, showing a strong interest in collaborating with the State of Chile and sealing this public-private partnership in 2023, during the government of Gabriel Boric.

"This cable consolidates Chile's position as the center of digital activity in South America, opening opportunities for new industries, jobs and better working and living conditions for thousands of people. There was no connectivity of this type from south to south; therefore, we are also advancing from a geopolitical perspective, which is very important. And that should fill us with pride," said the President of the Republic of Chile, Gabriel Boric, during the launch of the initiative in January 2024.

Holistic infrastructure

Fiber optic cables connect continents and markets, driving the unstoppable boom of digital technologies, which in 2021 recorded an increase of US$34 billion in the annual value of exports in six Latin American economies (0.8% of total GDP), according to Google's Digital Sprinters (2022) report. This value could quadruple and reach US$140 billion by 2030.

The Humboldt Cable will generate an unprecedented exchange of technology across the South Pacific, opening new doors for connections between South America and Asia's main technology centers in Hong Kong, Tokyo and Singapore.

This connection will be part of Google's comprehensive infrastructure in Chile, which already includes a data center in Quilicura (2015), the Curie submarine cable (2020) connecting Chile, the United States and Panama, and the inauguration of a cloud region in Santiago (2021), the second in Latin America after Brazil. "Chile has followed a significative policy of attracting investment and capacity building in digital matters, in addition to its high availability of renewable energy. That is why Google has invested heavily in this country and established its only data center in Latin America and the southern hemisphere in Quilicura. We have taken advantage of Chile's economic and political stability, in addition to its wide network of commercial agreements, since this center provides services to the entire region", says the manager of Government Relations and Public Policy of Google Chile, Nicolás Schubert.

Additionally, Patricio Rey highlights as a key aspect of this public-private initiative the advantage given by Google's great experience in digital infrastructure, "which makes the State's investment more efficient and generates important economies of scale".

Although the benefits for Chile will be unquestionable, the Humboldt Cable aims to empower all of South America. "The connection from the Valparaíso region benefits the Southern Cone and the region in general, with the possibility of using open cables for other companies. This facilitates new connections between data centers in Chile and Asia, providing expansion opportunities for telecommunications and technology companies. Today Chile's submarine communications are mainly with the United States; with this new connection they open up to Australia and Asia", explains Cristian Ramos, Director of Infrastructure Development at Google.

Technology hub and AI

All of the above, says Schubert, will improve users' internet browsing and usage experience and will be fundamental for real-time applications. "These advances will boost Chile's digital development and highlight it as a benchmark in the region," says Schubert, referring specifically to the development of technologies such as AI and cloud computing.

The issue is not a minor one. The 2023 Global

Interconnection Index predicts that 85% of global enterprises will expand multicloud access across multiple regions by 2025. Meanwhile, data traffic between Asia Pacific and South America is forecast to grow by an annual average of 28% over the next 20 years.

This explains the Chilean government's commitment to take advantage of the Humboldt Cable to promote Valparaíso as an emerging hub in South America. "Google's commitment to Chile demonstrates the confidence that our country generates in international investors in the world of technology, which is extremely important to consolidate the country as a digital hub," says Patricio Rey.

Moreover, the advantages that Chile possesses in renewable energy access could promote the installation of data centers and push the development of cloud capabilities and digital services that will benefit large companies as well as SMEs, startups and emerging sectors. "Developers and creators will know they can count on a better experience. This effect was seen with investments in cloud services. New infrastructures enable the creation of new services; not only direct benefits are obtained, but you also create an ecosystem. We saw this when Curie came into effect, which brought a significant economic benefit to the country as a whole, a multiplier effect, because it allowed many other businesses and industries to become more efficient," says Cristian Ramos.

Increased access to cloud computing will invigorate technologies such as IoT (Internet of Things) monitoring, which is already having an impact on companies of national interest such as Codelco. The state-owned copper mining company in Chile increased its production by 4% after implementing integrated operations centers and IoT technologies.

Scientific research will also benefit from the cloud. "The acceleration of data transfer will also have an impact on the astronomical observation center located in northern Chile, which generates a large data volume that needs to be transmitted to universities and research centers. Previously, it followed traditional routes through the northern hemisphere and then crossed the Pacific. But now, with a direct route, we expect a significant improvement in the speed and cost of connections, which will benefit science as well," says Schubert.

Economic impact is another benefit measured. According to Analysys Mason, Google's submarine cables in Latin America and the Caribbean, across five countries, will generate a cumulative GDP increase of US$178 billion between 2017 and 2027, with the creation of approximately 740,000 additional jobs by 2027. This represents an annual GDP increase of 1.08%. "As an example, the Curie cable has increased Chile's international outbound capacity (increased data traffic to and from other countries) by 30%. Between 2020 and 2027, the Curie cable is expected to bring US$19.2 billion and create 67,000 jobs in the region," says Google's Director of Infrastructure Development.

High-level engineering

According to Cable Map 2024, since 2018 Google has invested in 29 submarine fiber optic cable projects, five of which connect Latin America: Monet (to Brazil and the United States), Tannat (to Argentina with Uruguay and Brazil), Curie (to Chile, Panama and the United States), Junior (Rio de Janeiro with Praia Grande) and Firmina (United States with Brazil, Uruguay and Argentina). These are very expensive, high-level engineering works, including simulations, drilling, fabrication and installation on the seabed.

Humboldt, meanwhile, is in full development. "This year we will focus on obtaining permits to survey the seabed, which is essential to map the cable route. We have already completed a preliminary study using underwater mapping and now we need to confirm the route with a detailed survey. In parallel, we will begin construction of the cable, a long and complex process that involves the complete fabrication of the cable and the installation of repeaters. Once the route has been adjusted and the permits have been obtained, we will proceed with the installation of the cable on the seabed, guaranteeing a useful life of about 25 years," says Ramos.

The Curie cable landing in Valparaiso occurred in April 2019. "The cable reached the coast and was covered with sand and anchored on land to prevent gravity from pulling it into the sea. The construction of the cable was previously done in a factory and then deposited on the seabed using specialized boats", advances Ramos.

This infrastructure would be installed in 2025 and be operational by 2026. "This will be further enhanced by Google's Pacific Connect initiative, connecting French Polynesia, Fiji, Guam, the Mariana Islands, Japan, Hawaii and the United States, which will strengthen networks resilience and link Pacific islands with continents. The more connection nodes, the more resilient the networks are, as they allow traffic to find alternative routes in the event of outages," concludes Google's Director of Infrastructure Development, Cristian Ramos.

E.3.2 Society's Involvement

A central element concerning the legitimacy and sustainability of AI policies is the degree of involvement that society has on its conception and development. To measure this, a desk review of documents associated with current AI policies and strategies in Latin America and the Caribbean was carried out, with the objective of detecting evidence concerning citizen participation mechanisms that were involved in the development process and non-state participants that were formally involved in its conception.

There are two subindicators that determine the degree of community participation in the conception of an official strategy to devise an AI development route.

a) Citizen Participation
b) Multistakeholder Methodology

The Citizen Participation subindicator assesses the degree of importance and incorporation of the most direct citizen participation mechanisms during the policy design process. Out of the countries that have a strategy in force, five **report having citizen participation mechanisms in place** in their public documents: **Argentina, Brazil, Colombia, Dominican Republic, and Uruguay.** Their results or applications are not disclosed, however.

It is important to point out that countries such as Peru have not published the existence of participation mechanisms during the conception process, regardless of including them in the work plan as part of the process. A score was given to Costa Rica despite not having a current published strategy; this is because it is currently on the process of formulating a strategy and citizen participation mechanisms have been established for its development.

Chile stands out for this subindicator, as there were three citizen participation mechanisms in place. At first, there was a call for participation through Regional Ministerial Secretaries of five regions for a preliminary public consultation, and, at the same time, the publishing of a manual on how third parties could join in this process. After the incorporation of elements of these processes, the final draft was digitally published for public consultation, and the anonymized results were published for the public to examine.

On the other hand, the **Multistakeholder Methodology** subindicator indicates the level of formal participation of other parties outside of government during the conception process. "Formal participation" refers to the regular and periodic **formal incorporation** of different parties that represent a group or a collective -outside of the government- during the process of normative conception. These refers to the industry, academic community, civil society (specifically activists) and general public that is not part of any organization.

All of the seven countries analyzed that have strategies in place incorporated at least one of these aspects. Both Colombia and Peru formally involved the academia through scientific associations or heads of university groups. Brazil included the private industrial sector, which participated regularly in the design of the policy. Moreover, Argentina, Uruguay and Dominican Republic regularly included two parties in the design of the policy, while **Chile involved formal representatives of the academic community, the private sector, the civil society and the general public** in the Advisory Committee on AI, which was established by ministerial decreet to guide the creation process of the national strategy of AI. For this reason, this country obtained the highest score in the subindicator.

The **Society's Involvement** indicator **weighs 25%** of the Vision and Institutionality subdimension.

Table 5: Categorization Description and Score for Society's Involvement Subindicator

Subdimension	Categories	Score
Citizen Participation	1. No participation	0 points
	2. Informal participation (e.g. e-mails)	25 points
	3. There was a mechanism present, but its results are not published	50 points
	4. There was a mechanism present and its results are published	75 points
	5. There was more than one mechanism present	100 points
Multistakeholder Methodology	1. Government only	0 points
	2. Government +1	25 points
	3. Government +2	50 points
	4. Government +3	75 points
	5. Government, academia, industry, organized civil society, general public	100 points

Tabla 6: Score for Society Engagement

	ARG	BOL	BRA	CHI	COL	CRI	CUB	ECU	SLV	GTM
Citizen Participation	50	0	50	100	50	50	0	0	0	0
Multistakeholder Methodology	50	0	25	100	25	0	0	0	0	0
Average	**50,00**	**0,00**	**37,50**	**100,00**	**37,50**	**25,00**	**0,00**	**0,00**	**0,00**	**0,00**

	HON	JAM	MX	PAN	PRY	PER	DOM	URY	VEN
Citizen Participation	0	0	0	0	0	0	50	50	0
Multistakeholder Methodology	0	0	0	0	0	25	50	50	0
Average	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**12,50**	**50,00**	**50,00**	**0,00**

RAM Methodology: A “GPS” for Ethical and Responsible AI Implementation

· To know how prepared each country is to ethically and responsibly implement AI, UNESCO developed an instrument called Readiness Assessment Methodology (RAM).

· In Latin America, 14 countries are implementing it, while Chile stands out as a global model for being the first to complete it.

One aspect where there is agreement concerning AI is the need for its adequate regulation to maximize its benefits and mitigate risks.

In 2017, Canada launched the first national AI strategy in the world, according to the 2023 AI Index Report of the Human-Centered Artificial Intelligence Institute of the Standford University. Since then, 62 strategies have been presented globally, 14 are in development and 127 countries have at least one law related to AI.

However, only after the 41th Conference of the United Nations Educational, Scientific and Cultural Organizations (UNESCO), carried out on November 2021, the world had the first regulatory framework for AI ethical development.

The fast use of this technology and its impact on society had become a priority for the United Nations organism, which had already approved in its 2019 plenary session the creation of a global normative on this topic. Thus, at the beginning of 2021, UNESCO carried out a multidisciplinary consultation with global experts to establish the principles and guidelines for the development and responsible use of AI. These principles are written in "Recommendations on the Ethics of Artificial Intelligence", a norm that was approved by 193 UNESCO member states in the 41th Conference. Economist Natalia González, the expert coordinator of the UNESCO Ethics of Artificial Intelligence for Latin America and the Caribbean initiative, points that, "this is the first global instrument that has been accepted and implemented by such a number of countries".

The organization created the initiative mentioned as a guide to help governments, companies and organizations to be better prepared to face, mitigate and solve the unwanted effects of AI. This guide covers 11 aspects of political action, including ethical governance, data policy, education, health, and research, among others. This encourages, among other things, AI literacy, the empowerment of ethical research on education and electronic learning, and the promotion of interdisciplinary research through investment and sectorial collaboration that acts in accordance with Human Rights.

For the implementation of the "Recommendations on the Ethics of Artificial Intelligence", UNESCO developed the instrument named Readiness Assessment Methodology (RAM) with the objective of evaluating through surveys and other participation instruments how prepared a country is for the ethical implementation of AI using five dimensions: legal/regulatory, social/cultural, economic, scientific/educational and technological/infrastructural.

Practical Methodology

This tool helps countries to evaluate if their AI laws and policies are adequate and aligned with the principles of the UNESCO Ethical Recommendations, guaranteeing a positive development of AI that respects the fundamental rights of people.

The implementation of the RAM considers the creation of national teams, hiring of local advisors, organization of events and workshops with the participation of both public and private actors, in addition to academics and social organizations.

Public sector actors use the RAM survey to evaluate the state of AI in the five dimensions mentioned before. The results guide the institutional and regulatory changes that need to be implemented. This information is complemented with data from the private and civic sector gathered from workshops and interdisciplinary discussion panels. Finally, the results of the RAM are published in the "AI Readiness Assessment Report" which puts forward recommendations on policies to bridge governance gaps and guarantee a responsible AI ecosystem, aligned with UNESCO Recommendations.

On a global scale, 50 countries are working with this methodology, 14 of which are from Latin America. Chile was the first nation in the world to finish the implementation of RAM and publish its final report. It is expected that in the following months, the results from Uruguay, Dominican Republic and Cuba are published, while others are still in progress. "UNESCO has put Chile and Uruguay as global examples due to their advancement and leadership on this topic", says the expert of this international organism.

Chile's case

The process of implementation of RAM in Chile consisted of four phases and was completed in less than a year. It was carried out by the Chilean consultant Foresight, hired by UNESCO, and it had the direct collaboration of the Chilean Ministry of Science, Technology, Knowledge and Innovation. This was implemented to update the National AI Policy of the country (2021), presented on last May, including all recommendations from the instrument. "The evaluation of the RAM process in Chile coincides with the publishing of the 2023 Latin American AI Index and the update of the National AI Policy. This left Chile in a good position to identify how we are doing and start conversations in areas where there wasn't one", explains José Guridi, cofounder of Foresight, the consultancy company in charge of applying the RAM in Chile.

In the first phase, an interministerial commission was created to diagnose the state of AI in the country through the use of the RAM survey. Workshops were carried out in six regions with 300 participants from diverse sectors to gather opinions on the opportunities and challenges of AI. Then, it concluded with a roadmap revised by ministerial counterparts and an evaluation report with recommendations. "The UNESCO RAM recommendations were very useful to focus the efforts put during the update of the National AI Policy in Chile (PNIA), allowing us to advance in cultural and social impacts, establishing ethical principles and promoting responsibility and transparency in the development and use of AI", said the Chilean minister of Science, Technology, Knowledge and Innovation, Aisén Etcheverry.

In addition to its contribution to the PNIA, the elements identified in this instrument were gathered in a bill presented to the Chilean Congress in May 2024, "that promotes human-centered AI and seeks to protect health, security, fundamental rights and consumers, in addition to proposing both self-regulation and risk-based regulation, classifying AI systems according to their threat level, following the ethical principles aligned with the UNESCO Recommendations on the Ethics of Artificial Intelligence ", says the minister.

The advisor indicated that one of the aspects that stood out in Chile's case was that the implementation of the RAM was participative, which enriches the result, as it considers the emotional environment around AI. "In Chile, we observed that, in general, there is an optimistic view on artificial intelligence. It is seen as a technology with great potential that must be taken advantage of", explains Gurudi.

The fianl report of RAM recommends Chile to prioritize data protection and cybersecurity laws, to create AI strategies at the municipal level, to evaluate the impact of AI in culture and the environment, to attract investment in technological infrastructure and to mitigate the impact on the workforce with retraining. It also proposes an adaptative governance through the creation of a specialised organ that supervises the implementation of AI policies and it make sures its alignment with current legislation and proposes regulatory improvements.

The document is already published and will be part of the AI Ethics Observatory of UNESCO, a platform which will shared good global practices. Meanwhile, the organism of UN will work with countries that have completed the process of RAM to adjust and update methodologies. "The future dynamic will involve the periodic revision and adaptation of strategies due to the rapid technological advancement", says Natalia González of UNESCO.

E.3.3 Institutionality

The third and last subdimension indicator is **Institutionality**, which consists of the **Presence of Institutionality** subindicator. This adds elements that are included in the previously mentioned AI Strategy indicator and shows the degree of complexity and public interaction of the management and tracking of AI strategies.

Out of the seven countries with strategies in place, the only one that does not have a formal institutionality for its follow up is Peru, although its strategy establishes specific objectives to manage and even determine it, which is a positive starting point for the allocation of responsibilities on this matter. On their part, Argentina, Brazil, Colombia and Dominican Republic define the main institutionality of AI Strategies in a specific ministry, with a clear and regulated mandate for its implementation. **Chile and Uruguay have the maximum score**, as they not only delegate following up to a specific public organism, but also define **institutional coordination spaces** in the framework of the strategy.

The **Institutionality indicator weighs 25%** of the Vision and Institutionality subdimension.

Table 5: Score for Institutionality

1. Non-existent = 0 points
2. Exists outside of the State = 25 points
3. Exists in a ministry = 50 points
4. Exists as an independent organism = 75 points
5. Exists and involves more than one institution = 100 points

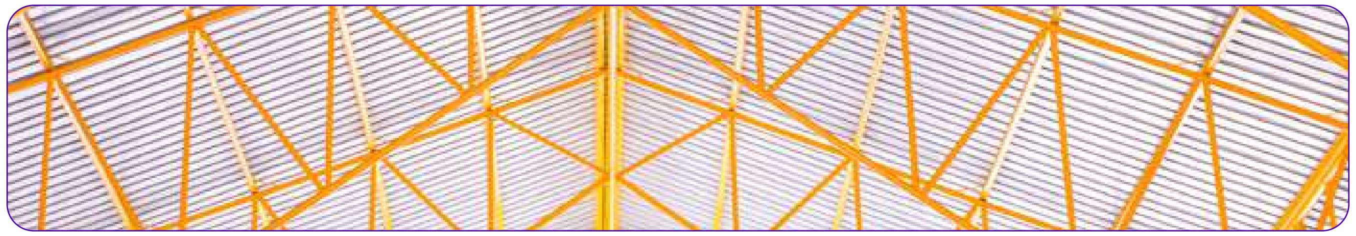
Country	AR	BOL	BRA	CH	COL	CRI	CUB	ECU	SLV	GTM
Presence of an Institution	50	0	50	100	50	0	0	0	0	0

Country	HON	JAM	MX	PAN	PRY	PER	DOM	URY	VEN
Presence of an I nstitution	0	0	0	0	0	0	50	100	0

The establishing of formal mechanisms of inter-institutional coordination, be that at the level of ministry or executing organisms, could favor the timely accomplishment of AI strategies objectives. As stated before, most policies in place address topics that go beyond the specific scope of just one ministry or public repartition, so the accomplishment of their vision will depend on the organizational capacity of the organism in charge. The existence of formal spaces to bring this coordination and follow up forward, either through periodic discussion panels or interministerial committees, speeds conversations and promotes the coordination and transparency of efforts. This in addition to allowing an on-time tracking of the processes.

Concerning institutionality, there are many areas to improve. Except for Peru, all strategies count with evaluation mechanisms. However, only three countries include institutional coordination mechanisms and only one has a designated budget.

There is a wide range of topics covered, as many of them are also addressed in other policy instruments, such as national agendas for digital transformation. From the thematic point of view, it is important to find a balance between the development and implementation of AI and the protection of citizens through regulation.



OBIA: the Brazilian AI Observatory Debut

· As a response to the impact of AI to the productive, educational and commercial ecosystems, and also to guarantee the transparency and responsibility in its use, Brazil developed its National Strategy of AI in 2021, recently updated.

· The Brazilian Observatory of AI plays a key role in its implementation. compiling AI data in Brazil with emphasis on industry, government, health and education. This way, it will provide updated information for diverse parties, including decision makers.

Natural Language Processing (NPL) is the branch of AI that allows computers to understand and translate texts and audio into multiple languages, facilitating global communication. However, there is a lack of tools and specific data for this system training in Brazilian Portuguese dialogue, a language that is spoken by more than 200 million of people. The Center of AI (C4AI/USP) of Sao Paulo University looks to address this issue and it has more than 100 researchers working in diverse, innovative projects with AI, such as the processing of Portuguese language and native languages which in Brazil add to more than 150.

The C4A/USP is one of 11 Research Centers in Applied Engineering and Investigation Centers (CPE/CPA) in AI founded by the Sao Paulo Research Foundation (FAPESP). These centers are promoted by the Brazilian government to strengthen this technology in diverse strategic areas of the country. and its data and research will feed into the new Brazilian Observatory of AI (OBIA).

OBIA is founded as a public, open access repository with the objective of gathering and providing information about the advances of this technology in the country, while also being connected to other international observatories. "Its main purpose is to observe the development, impact and implementation of AI in Brazil, in a qualitative as well as quantitative way. We aim to be an information repository for decision makers, the industry and other stakeholders", says Tuca-Luiz Reali Costa, manager of OBIA.

Launched in 2022 per mandate of the Ministry of Science, Technology and Innovation (MCTI) to the Brazilian Network Information Center (NIC.br), the OBIA was one of the priorities defined by the National Brazilian Strategy of AI, approved in 2021 and updated in 2024. From the beginning, the policy looked to promote technological entrepreneurship and innovation in the country through 9 dimensions, one of which is AI Governance, in which OBIA is the top priority.

Since then, a multidisciplinary team has worked on its creation and development, opening its website last March and preparing its launch for September 2024.

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Part of the driving group has been actively integrated by professionals from NIC.br and the Regional Center for Studies on the Development of the Information Society (Cetic.br), with the support of the Center for Management and Strategic Studies (CGEE), the State System of Data Analysis Foundation (SEADE), the Center for Artificial Intelligence (C4AI/USP), among others. "The International Telecommunication Union (ITU), UNESCO, IRCAI (International Research Center on AI) and the OECD have also been relevant in aligning the Observatory's efforts with global best practices," comments Reali Costa.

The 11 AI centers which will support OBIA cover strategic areas such as industry, health, cities, agriculture and cybersecurity, among others. These centers were selected in two public calls launched between 2021 and 2023 by FAPESP together with the Brazilian Ministry of Science (MCTI-MC) and the Brazilian Internet Steering Committee (CGI.br). The exception was the C4IA/USP, the first of its kind to be integrated into the observatory, but which emerged in partnership with IBM.

Four vital areas

The establishment of the Brazilian AI Observatory (OBIA) was a complex process that posed several challenges, such as keeping up with the speed and scope of advances in the field, integrating multiple perspectives and methodologies, and establishing better coordination among the data producers that feed the observatory.

One of OBIA's strategic advancements was the definition of indicators across four key dimensions to analyze artificial intelligence in Brazil. "At Cetic.br we have been handling many indicators on the adoption of digital technologies in Brazil for 20 years and, for the observatory, we have been grouping them into four segments: government, health, education and various economic sectors. We will also add academic training, knowledge production and patents," says Alexandre Barbosa, head of the Regional Center for Studies on the Development of the Information Society (Cetic.br), linked to NIC.br.

To monitor this work, a multi-sector governance committee is being created to address current and future indicator needs. "OBIA will draw on indicators from a variety of sources, such as biannual surveys and automatically updated databases. Although the periodicity will vary, in-depth and updated analysis is guaranteed to maintain the observatory's relevance and accuracy," explains Luiz Reali Costa.

The repository will include documents on AI, not only from Brazil, but also from other countries such as the national AI strategies of Chile, Germany, Japan and others, which will be classified according to a taxonomy to facilitate data retrieval and cross-referencing, according to Barbosa.

Challenges

Brazil stands out as one of the regional leaders in AI, according to the latest 2023 Latin American Artificial Intelligence Index, due to a series of strengths in infrastructure, human capital, data availability and governance in this field, standing out also for its extensive digitization of public services and for being the only Latin American country among the 20 nations with the highest volume of academic publications in AI.

However, it has pending tasks in the area: to further improve AI infrastructure, especially in remote and rural areas; to expand the use of this technology to various economic sectors; and to increase the annual training of PhDs in the area, which today is four times less than in the U.S. "We expect rapid progress with the support of the AI centers promoted by the Ministry of Science and Technology," says the head of Cetic.br.

To this end, these 11 centers already add up public and private investments totaling 240 million reals until 2030, according to the document Artificial Intelligence: Mapping Intelligence Centers in Brazil: initiatives, actions and projects (Panorama Setorial da Internet. No. 1, April, 2024).

OBIA is also working to address some of these challenges, since the information it provides can be crucial for decision-making. To this end, it is currently working on launching a data visualization portal, integrating more AI centers - both public and private - into the platform, and disseminating the first results to provide an updated and concrete overview of the state of AI in Brazil in various areas.

"Our ultimate goal is for OBIA to become a reference, a cooperative and multidisciplinary initiative that provides reliable and complete knowledge to inform society and guide policies, strategies and actions for the promotion of the development and responsible use of AI in Brazil," says OBIA's manager, Luiz Alexandre Reali Costa.

E.4 International Linkage Subdimension

It is relevant to evaluate the relative importance of countries in the international discussion on AI regulation and their adherence to global governance mechanisms. AI is a transboundary technology, so local regulatory efforts should consider the elements of public discussion in international forums and coordination bodies. This is what this subdimension seeks to measure: the incidence of each country in these international spaces, given how relevant it is that the concerns and development context prevailing in Latin America and the Caribbean are considered in the decision-making process of global and multilateral governance.

The International Linkage subdimension is composed of **two indicators**. One of them is **Participation in the definition of standards,** which is composed of the **subindicator Participation in ISO**, which measures whether the country is an observer member or a participant in the Ibero-American Data Protection Network, whose objective is to guarantee the protection of personal data in the region, promoting cooperation and the exchange of experiences among its members.

Currently, the mechanisms and metrics of security and statistical fairness with which the quality and potential risk of algorithms are evaluated emanate from academia and have been transformed into industry standards through the International Standard Organization (ISO).

Participation in ISO by countries in the region is relatively marginal. Fifteen countries are absent from this standard. While Argentina, Mexico and Peru are observer members, Brazil is the only country in the region that participates with full rights. In addition, Brazil will host the G20 summit in November 2024, during which world powers will discuss, among other topics, technology governance. This event only confirms Brazil's relevance in geopolitical matters and its capacity to orchestrate regional coordination in this area.

The second indicator is P**articipation in international organizations,** comprised by the subindicator **Participation in international committees,** which evaluates whether the country is incorporated into various international treaties such as the OECD Principles on AI, the Santiago Declaration, the Ibero-American Data Protection Network (RIPD), the Open Government Partnership and the Global Partnership on Artificial Intelligence.

To estimate the degree of adherence to global governance standards, a survey was made of the treaties or committees in force on the subject outside the region. In this regard, all countries subscribe to at least one international treaty on the subject, which is UNESCO's ethical recommendation for AI. In this sense, it is promising to see that the international alignment is quite homogeneous in the region, which could enable closer coordination of countries to express common positions in the spaces in which they participate.

The International Linkage subdimension represents **20%** of the total weight of the Governance dimension.

Table 7: Categorization and Score for International Linkage Subindicator

Subindicators	Categories	Score
Participation in ISO	0: Does not participate. 1: Observer Member 2: Participating Member	0 points 25 points 50 points 75 points 100 points
Participation in international Committees	0: No membership in treaties or committees 1: Incorporated into a treaty or committee 2: Incorporated into two or more treaties or committees	0 points 25 points 50 points 75 points 100 points

Tabla 8: Puntaje subindicadores Participación en ISO y Participación en comités internacionales

Country	ARG	BOL	BRA	CHI	COL	CRI	CUB	ECU	SLV	GTM
Participation in the Definition of Standards - Participation in ISO	50	0	100	0	0	0	0	0	0	0
Participation in International Organizations - Participation in International Committees	100	50	100	100	100	100	50	100	100	100
Average	75,0	25,0	100,0	50,0	50,0	50,0	25,0	50,0	50,0	50,0

Country	HON	JAM	MEX	PAN	PRY	PER	DOM	URY	VEN
Participation in the Definition of Standards - Participation in ISO	0	0	50	0	0	50	0	0	0
Participation in International Organizations - Participation in International Committees	100	100	100	100	100	100	100	100	50
Average	50,0	50,0	75,0	50,0	50,0	75,0	50,0	50,0	25,0

Source: ILIA 2024

It is worth mentioning that remarkable efforts have been made to promote common positions among the countries of the region through international forums. In October 2023, the First Ministerial and High Authorities Summit on the Ethics of Artificial Intelligence in Latin America and the Caribbean was held in Santiago, Chile, co-organized by the Ministry of Science, Technology, Knowledge and Innovation of Chile, UNESCO and CAF. The Santiago Declaration established a Working Group with a view to the constitution of an Intergovernmental Council on AI for the region, which should be strengthened after the Second Summit to be held in Montevideo, under the auspices of AGESIC.

Along the same lines, the efforts of the Organization of American States (OAS) to consolidate the Network of Centers of Excellence for Transformative Technologies through COMCYT have made it possible to disseminate the work of academic institutions and bring them closer to decision makers from a collaborative perspective.

Mention should also be made of the seventh meeting of Ministers and High Authorities of Science and Technology, in November 2024, a space in which the actions described above can be consolidated. The Economic Commission for Latin America and the Caribbean (ECLAC) coordinates the Working Group on AI, within the framework of the Digital Agenda for Latin America and the Caribbean (eLAC-2024). The objective of the WG is to serve as a space for technical debate on conceptual and methodological aspects related to the design of IA policies in the region, with a view to the organization's Ministerial Conference this year.

It is likely that there are other multilateral efforts that are not indicated in the previous paragraph. If so, they consolidate the panorama of a disjointed mosaic of initiatives and efforts that point in the same direction, but do not operate in a coordinated manner. The relevance of the positions of Latin America and the Caribbean in the discussion of international governance of IA requires a clearer and more coherent articulation of the different efforts that have been carried out, achieving the joining of forces around common ideas and concerns.

E.5 Regulation Subdimension

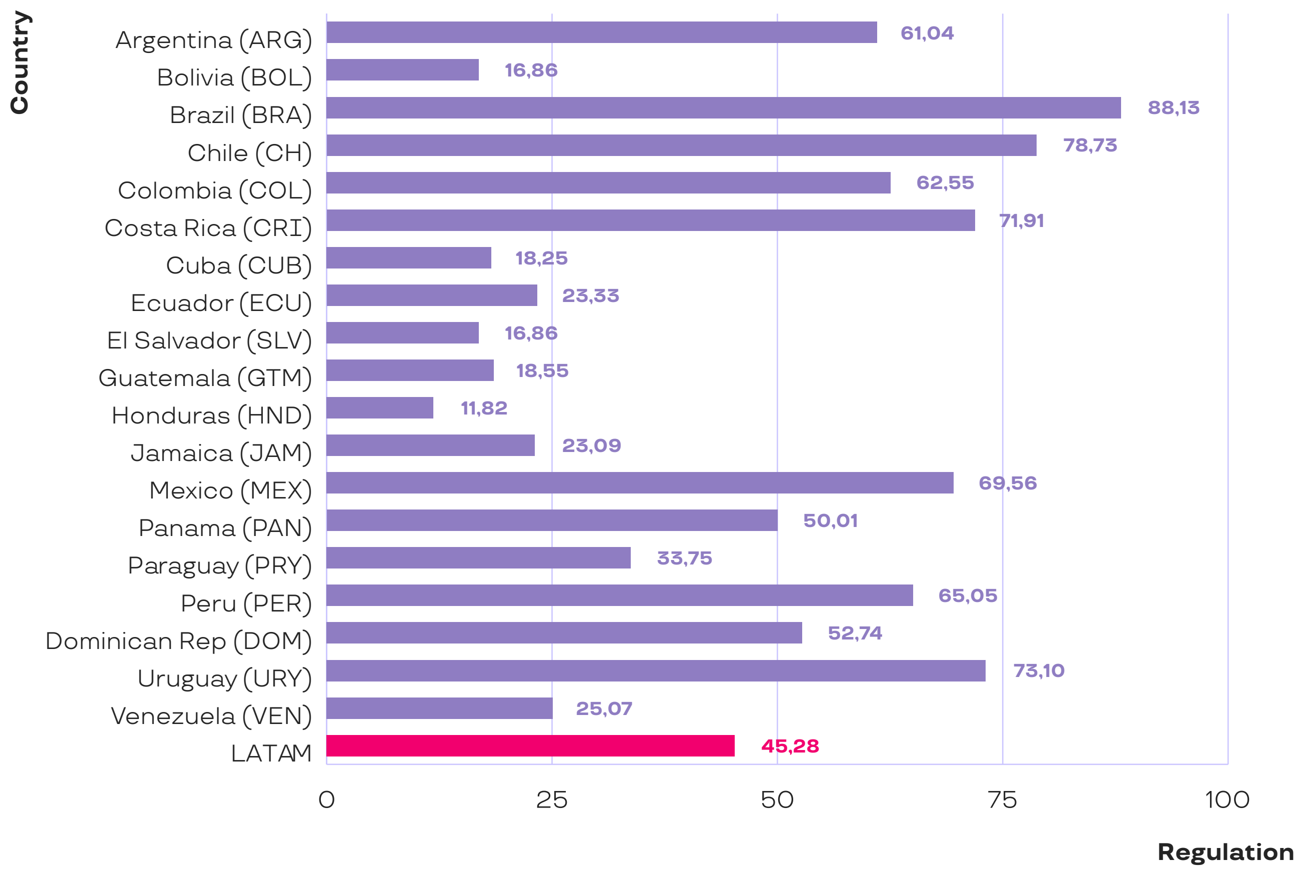
This subdimension measures the maturity of regulatory systems that go beyond the concrete actions of the executive branch and international organizations. It is assessed in order to provide a more complete understanding of the formal mechanisms through which limits to AI are sought to avoid negative impacts, promote legitimacy and human rights, and sustainability.

This subdimension is composed of three indicators: **AI Regulation, Cybersecurity,** and **Ethics and Sustainability.**

The Regulation subdimension represents **30%** of the total weight of the Governance dimension.

As shown in Figure 3, **Brazil and Chile lead this subdimension with 88.13 and 78.73 points respectively,** almost 40 points above the average for the region, which reaches a score of 45.28 points.

Figure 3: Score for Regulation Subdimension



Source: ILIA 2024

Countries with Advanced Regulation (above 60 points): These nations have the highest scores, indicating a robust and consolidated environment in terms of regulation. In this group are Brazil (88.13), Chile (78.73), Uruguay (73.10), Costa Rica (71.91), Mexico (69.56), Peru (65.05), Colombia (62.55) and Argentina (61.04).

Countries with Moderate Regulation (30 to 60 points): These present a moderate level of regulation, with scores that reflect a regulatory development close to the regional average. These include the Dominican Republic (52.74), Panama (50.01) and Paraguay (33.75).

Countries with incipient regulation (less than 30 points): This group reached low scores, indicating a challenging regulatory environment and the need for significant improvements. These include Venezuela (25.07), Ecuador (23.33), Jamaica (23.09), Guatemala (18.55), Cuba (18.25), Bolivia (16.86), El Salvador (16.86) and Honduras (11.82).

In addition to the strategies themselves, countries have initiatives that complement standards for promotion and regulation. It is worth noting that Argentina is developing comprehensive legal frameworks for AI that emphasize ethical standards and regulatory oversight. Brazil, meanwhile, is expanding its technology landscape with the Brazilian AI Law and initiatives aimed at digital transformation. Chile, on the other hand, aims to be a world leader in AI by 2031, employing policies and regulatory sandbox initiatives to foster innovation. Colombia is one nation that is enhancing its AI ecosystem with innovation centers and innovative public hubs, and Uruguay is leveraging AI development in its public sector, focusing on data science and machine learning to improve productivity and economic growth.

E.5.1 AI Regulation

This indicator is composed only of the **Risk Mitigation** subindicator, which identifies the presence of explicit mechanisms in the legislative initiative for the implementation of strategies and measures to reduce the probability of adverse events occurring with the use of AI or to minimize their impact if they occur.

To evaluate this subindicator, the following procedure is used: if there is more than one legislative initiative, the one sponsored by the Executive Branch is considered, and if there is none with such sponsorship, the one in the most advanced legislative process is considered.

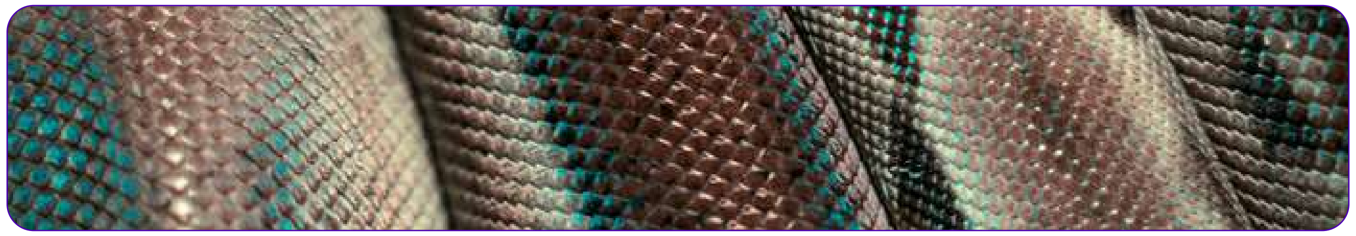
The **Regulation** indicator **represents 20% of the total weight** of the Regulation sub-dimension.

There are currently 38 legal initiatives under discussion or approved in the area of AI. The contents are diverse and range from concrete elements or specific applications of the technology to broad regulatory frameworks. For example, there are initiatives that seek to amend the Penal Code to explicitly punish the use of generative AI in the case of telephone scams (Chile) or for the purpose of violating a person's sexual privacy (Mexico). Only Peru and El Salvador have laws that directly address the issue, approved and in force since 2023.

As **Table 7** shows, nine of the 19 Latin American and Caribbean countries evaluated in ILIA 2024 have some risk mitigation mechanism included in the legal initiative under discussion. It is interesting to note that six of the seven countries that have an AI strategy in place coincide in the incorporation of risk mitigation through the law.

Table 7: Score for Risk Mitigation Subdimension

Countries	Categories	Score
Argentina	6	100
Bolivia	0	0
Brazil	2	100
Chile	6	100
Colombia	6	100
Costa Rica	3	100
Cuba	0	0
Ecuador	0	0
El Salvador	1	0
Guatemala	0	0
Honduras	0	0
Jamaica	0	0
Mexico	4	100
Panama	1	100
Paraguay	1	0
Peru	1	100
Dominican Republic	1	0
Uruguay	2	100
Venezuela	3	0
Latam	**Total: 37**	**Average: 47,37**



Report

Analysis and Recommendations on Artificial Intelligence Legislation and Regulation in Latin America and the Caribbean

To fully understand the state of the art of legislative and regulatory discussion in the region, Foresight developed a detailed study of AI laws and bills in the Latin American and Caribbean (LAC) region, which reveals a dispersion of proposals promoted by various actors such as the legislature, the executive, civil society and the private sector.

This study presents an evaluation framework based on the predominant approaches in the global discussion and the influence of these conceptual frameworks in the formulation of proposals for legal discussion. It also characterizes the state of the multilateral discussion in the global spaces with the greatest progress on the subject.

Subsequently, a general characterization of the state of the legislative debate in the region is made, identifying four findings that describe the current situation considering the social, cultural and economic context of Latin America and the Caribbean. In view of this analysis, recommendations that aim to achieve a national and regional governance that is coherent and promotes a fair and equitable adoption of AI at the service of people are offered.

State of the Debate

The regulation of AI is at a crucial juncture, marked by the coexistence of harmonization efforts and persistent regulatory fragmentation. Despite the valuable contributions of organizations such as the OECD, UNESCO and the UN, which have established fundamental principles for responsible AI, differences in national legislation generate uncertainty and inequalities.

International forums such as the Hiroshima Process and the AI Safety Summit have highlighted the urgency of addressing AI risks and opportunities, leading to initiatives such as the Bletchley Declaration and the Santiago Declaration. However, the influence of large economies and the diversity of national contexts make it difficult to create a uniform global regulatory framework.

It is essential to strengthen international cooperation to overcome these challenges. Developing countries, such as those in Latin America and the Caribbean, must actively participate in these debates and adapt regulations to their realities, taking advantage of the opportunities offered by international organizations to strengthen their capacities. The complexities of regulatory fragmentation could be exacerbated in the context of Latin America and the Caribbean, where there are few spaces for academic or commercial collaboration in AI compared to other parts of the world. This fragmentation could further hinder associative processes and thus delay a harmonious and fair adoption and deployment of the technology, deepening the gaps that already exist.

At the global level, three bodies have made the most successful progress in establishing comprehensive governance: UNESCO, OECD and the UN. In November 2021, the Recommendations on the Ethics of AI was approved. UNESCO has provided a fundamental tool for ethical and trustworthy AI. Its recommendations provide clear guidelines for governments, businesses and civil society, ensuring that AI is developed in an inclusive manner, respectful of diversity. To guide countries in the implementation of the recommendation, the application of a tool known as RAM, which shows the concrete challenges of ecosystems to move in the proposed direction, was proposed.

The OECD adopted the OECD Principles in 2019 and they have served as a recognized standard for policy formulation. To support the application of these principles, a network of experts was formed to collaborate with countries from a multistakeholder composition. This network proposed the creation of a framework for the classification of AI systems, linking technical characteristics of the tools with public policy impacts, in order to guide decision-making in the field. The UN created an advisory body to address this challenge in October 2023, which generated a recommendation to host international AI governance at the UN, with 7 concrete functions.

Approaches from Leading Global Countries

China has taken a proactive approach to AI regulation, prioritizing state control and alignment with social values. Through specific laws and national strategies, the country seeks to regulate content moderation, protect personal data and ensure responsible use of algorithms. Stringent rules on recommendation algorithms, deepfakes and generative AI force service providers to align their operations with national goals. In addition, China encourages public-private collaboration and constant policy evaluation, ensuring that AI is developed in a safe and beneficial way for society.

The United States has adopted a balanced approach to regulating AI, seeking to promote innovation while protecting citizens' rights. Through a combination of incentives for research and development, and adapting existing regulations at the federal and state levels, the country seeks to foster a dynamic and safe AI ecosystem. This strategy avoids overly rigid regulation that may inhibit innovation, but at the same time ensures that AI developments are conducted in a responsible and ethical manner.

Finally, the EU has taken a proactive, risk-based approach to regulating AI. The AI Act, which is binding and extraterritorial in scope, classifies AI systems according to their level of risk, imposing stricter requirements on those that may cause significant harm. This approach, grounded on the precautionary principle, seeks to prevent risks before they occur and to ensure that AI is developed in a safe and ethical manner. The track record in other digital or scientific matters such as data protection means that the EU has a solid and competent multilateral institutionality in this area, capable of following up on the commitments of the Law and articulating actors for the fulfillment of regulatory objectives. As presented below, the European regulatory framework is the main influence for Latin American and Caribbean democracies. Except for El Salvador, which is inspired by the North American model, the rest of the countries lean towards some degree of similarity with the EU.

Main Findings of the Analysis of Projects and Laws in Latin America and the Caribbean

The proliferation of legislative proposals on AI in various countries is evidence of a growing interest in regulating this technology. However, this diversity of initiatives, driven by different actors, has generated a lack of coordination that results in a multiplicity of projects (38), often overlapping and with disparate technical bases.

While some projects demonstrate a thorough prior analysis, others lack a solid rationale and diverge in terms of definitions and key approaches. Despite this fragmented panorama, it is estimated that only those proposals that are more aligned with international trends and have greater political backing will be able to advance in the respective legislative processes.

The proliferation of legislative initiatives on AI has generated a number of challenges. One is the tendency to confuse AI-specific regulation with other areas of law, such as data protection and intellectual property. This confusion can lead to overlapping functions between different bodies and a lack of clarity in terms of competencies and procedures. In addition, the creation of new regulatory institutions requires a careful assessment of their need and the resources required for their operation: it is necessary to consider the need to train officials and to take advantage of existing structures to the extent possible. It is essential to ensure that these new entities work in coordination with existing agencies and that their functions are clearly defined. In this sense, there is a lack of strategic analysis when legislating. Regulating AI is a complex challenge that requires a multidimensional approach. While the ethical principles and risks associated with this technology are central issues in the global debate, it is essential to also consider the political, economic and social implications of the different regulatory options. Fortunately, in several countries, draft laws are framed within a plan defined in national AI policies. It is precisely in such cases that the bills are better supported and legislators have reviewed international experiences and global best practices.

Latin American and Caribbean nations should avoid simply adopting the regulatory models of other regions, such as the European Union. Instead, they should develop their own regulatory frameworks that fit their needs and priorities. This implies an in-depth analysis of international experiences, as well as a reflection on the role that AI can play in the development of each country. This perspective is neither frequent nor widespread when reviewing the projects under discussion, and should be a source of concern. The institutional maturity for multi-stakeholder work that results in establishing indicators or benchmarks that the EU has is a key element for its approach, and is absent in virtually all countries in the region. Therefore, by proposing such a framework without the institutional framework, legislative initiatives generate a trap of expectations that will probably end up being a dead letter. This is why it is essential to understand not only the discussion scenario, but also the specific context of the region in order to approach technology. Avoiding the establishment of "colonialist" regulatory frameworks goes beyond positions of political activism and has concrete repercussions on the real economy and the possibility of development in the countries.

In this sense, attention should be paid to the historical consequences of establishing limits to innovation processes. The following is not intended to inhibit the construction of robust regulatory frameworks, but to complement them with a reflection that is not present in the review of the projects under discussion. It is necessary to understand that the implementation of regulations on AI systems will have consequences in the form of externalities that can be addressed if they are evaluated in a timely manner.

In the absence of unified global governance for AI, countries are forced to adopt existing regulatory models. However, even in faithfully following a model such as the EU's, regulatory disjunctions with other jurisdictions will inevitably arise, generating fragmentation costs. It seems inevitable that out of this fragmented system a litigious system will emerge.

The evolutionary nature of any regulatory system implies that its limits and scope are specified through jurisprudence. Ultimately, the qualification of a system as 'high risk' or the failure to comply with specific requirements will be the subject of administrative or judicial decisions. The increasing complexity of systems and the aggressive practices of large companies are creating an increasingly polarized market. The proliferation of litigation makes the operation significantly more expensive, benefiting the larger players and disadvantaging the smaller ones.

In addition, establishing limits restricts local possibilities of approaching the R&D frontier. Greater internal regulation narrows the margin of space for R&D in the countries of the region and the importation of developments that may serve a country's needs. The relevant question is not whether or not to regulate, but the timing of regulation: in the context of Latin America and the Caribbean, is it better to establish a strong regulatory framework for AI from the outset, or to allow freer development and adapt as problems arise?

Having analyzed the governance ecosystem described in this Index, it is clear that LATAM countries do not have the capacity or budget to create an institutional framework equivalent to that of the European Union to ensure effective and clear compliance with the law, nor do they have the influence to influence future complementary or amending regulations.

However, the establishment of early regulations also entails benefits beyond the obvious ones set out in the projects analyzed. The first is that developing countries incorporate certain regulations in exchange for benefits that allow them to open their economies to global markets, such as tariff reductions, among others.

But that is not happening in the current scenario. Most countries are adopting the EU risk system, internalizing the costs of importing the legal regulation of a leading economy, only this time unilaterally or without a concrete diplomatic or commercial benefit in return. It is relevant to keep in mind that large companies, with the potential to generate the most damage, will have to comply mandatorily with EU standards, voluntarily with US guidelines and increasingly with international technical standards. In addition, the requirements set by the EU must be met extraterritorially by all vendors marketing or commissioning AI systems or marketing general-purpose AI models in the EU, regardless of their location. By complying with these regulatory frameworks, AI system providers already meet a standard of principles and risk management. This implies that LAC countries can benefit from taking certain actions by the most relevant providers as compliant, without having to establish them as domestic law. Considering the above, the benefit of establishing the same or similar legal frameworks within LAC countries should be thoroughly studied. In particular, what would be the additional delta in terms of security considering the above points, and whether it is worth it compared to the costs and difficulties of implementing this system.

Suggested elements to consider in the regulatory discussion.

DEFINE APPROACHES ALIGNED WITH DEVELOPMENT STRATEGIES

LAC countries should continue to develop national AI strategies or policies, embedded in a broader development strategy, and make a decision as to what and how to regulate that aligns with them.

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We should be neither too pessimistic nor too optimistic. We do not expect massive unemployment or an automatic acceleration of growth. In the coming years, AI will not replace humans, nor will it be the solution to all the challenges of our time. We should neither overestimate the impact in the very short term, nor underestimate in the long term. LAC nations should prioritize their own challenges such as improving productivity, equity and education. Therefore, although it will be influenced by global trends and standards, the region should seek its own path of AI governance.

DETERMINE PRIORITIES

Each country has its own priorities with respect to priority values, social goods or individual rights. It may choose to prioritize the processing of regulations that address these more urgent definitions.

Many countries have opted to establish new criminal offenses for cases of serious infringements of the legal rights that are considered most relevant. Thus, there are bills in the region to punish the misuse of AI in crimes of fraud, identity theft, new criminal offenses for violation of sexual privacy through AI, and also to establish its misuse as an aggravating circumstance in the commission of other crimes.

Another possibility is to establish exceptional and well-defined cases of unacceptable risk from a European perspective. The restricted and absolute nature of this category makes the measure much simpler and more cost-effective than the more general compliance obligations established for high-risk systems.

In this point, differences aside, the formula followed by China can be taken as a reference, in the sense that only once its strategy was defined did it focus on enacting specific laws to regulate the prohibition or control by the State of the elements it considers most relevant.

REVIEW CURRENT SYSTEM

Another recommendation is to review existing regulations and prioritize appropriate amendments to existing laws to better address the challenges of AI. Both substantive and procedural rules should be reviewed to ensure the protection of fundamental rights and effective redress for damages that may be caused by technologies that use AI systems. In line with the U.S. system, it is to map the regulatory bodies in each country, with their functions and powers, to see whether they already have powers to address new AI-related challenges or whether issues have arisen that they have deemed to be outside their scope of competence.

In addition, it is recommended to conduct a case study of new challenges related to IA, reviewing with these agencies and/or the national comptroller's office or other relevant agency whether the existing agencies already have the authority to address them.

We recommend that countries work with international organizations that offer support in the review of their legal systems. We highlight the work carried out by UNESCO through its UNESCO Readiness Assessment Methodology, mentioned above.

HARMONIZATION

As noted in previous chapters, there is global consensus on the basic principles that should govern the governance of IA and also on the need for harmonization. Along these lines, it is recommended that preference be given to the incorporation of those elements on which there is international consensus.

Thus, once the decision to legislate on a given matter has been made, we recommend following the definitions and categories established by international organizations in instruments that are widely adhered to, rather than following our own definitions that generate greater fragmentation.

TO TAKE ADVANTAGE OF INTERNATIONAL OBSERVATION AND COOPERATION

Along with what and how to regulate, it is important to determine when is the best time to move forward with AI legislation in LAC countries. Observing the international discussion, and especially the implementation of laws in other countries, is a good way to analyze this. To this end, we recommend first of all to promote the technical operability of multilateral spaces, such as the Working Group approved in the Santiago declaration, with the support of CAF and UNESCO.

Continuously review the information to be published by the new bodies created by the EU AI law and the European Commission regarding the implementation and enforcement of the law. It will be especially relevant to analyze emerging issues as the implementation schedule is met.
We suggest carrying out a survey of all the international cooperation measures that currently exist and a strategy to take advantage of these opportunities in the countries of the region. In particular, review the work of CAF, IDB, UNESCO and OECD.

In particular, this alternative should be studied with UNESCO and the OECD, with respect to their public policy recommendations, for example, by carrying out ethical impact studies and supervision mechanisms at UNESCO. This would allow the countries of the region to have the same source of information and avoid duplication of efforts, working together with international organizations on definitions and conclusions and maximizing their use.

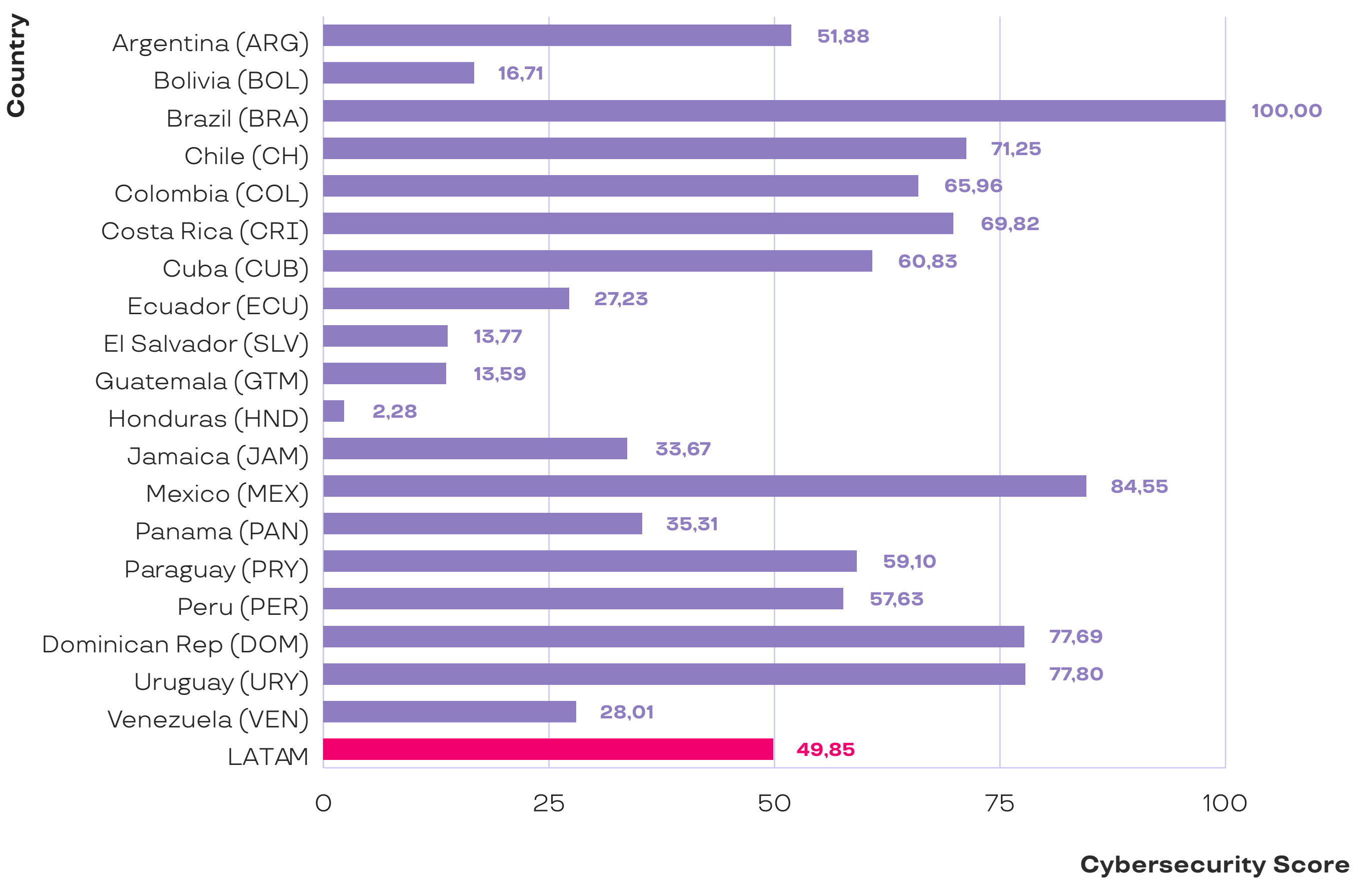
E.5.2 Cybersecurity

The increase in digital connectivity and services, driven by digital transformation and accelerated by the pandemic, has reinforced the importance of robust cybersecurity frameworks. Because of the nature of digital AI technology, governance in this area is momentous and impacts dissimilar phenomena, from public trust in the technology to the ability of private companies and states to implement and adopt AI-based solutions.

Given the above, this edition of ILIA includes the **Cybersecurity i**ndicator, whose only subindicator is the **Cybersecurity Index**, which seeks to show the level of maturity of countries in this area based on public data from the ITU, which publishes the global cybersecurity index. This measurement evaluates the level of cybersecurity commitments assumed by each country, reflected in legal, technical, organizational, capacity building and cooperative measures.

The **Cybersecurity** indicator **has a weight of 30% of the total of the** Regulation **subdimension.**

Figure 4: Score for Cybersecurity Index Subindicator



Source: ILIA 2024 / Data: ITU

Figure 4 shows a high variability in the scores, reflecting the high heterogeneity in this area at the regional level. The average score for the region is 49.85, with a maximum for **Brazil, which scores 100 points.** This is followed by **Mexico, with an exceptional relative score of 84.55 points**. Once again, the incorporation of these two countries in global manufacturing value chains seems to have an impact on their relevance for the formulation of public policies, this time in the area of cybersecurity.

E.5.3 Ethics and Sustainability

As discussed in the analytical section, an important part of regulation is aimed at establishing regulatory frameworks that guarantee fair access to ethical AI. This global interest is also manifested in local and global multilateral spaces, such as the Santiago Summit on AI Ethics, the UNESCO ethical recommendation or the OECD principles.

At the same time, an element that has not attracted sufficient attention and that it is essential to raise awareness of is the energy consumption of the computing infrastructure that supports the technology. Concepts such as "the cloud" and the immateriality of software models tend to obscure the fact that all training and inference processes are computed in data centers that exist physically, and are intensive in electricity and water consumption.

The dizzying advance of AI has been accompanied by an unprecedented demand for specific components such as GPUs, which are even more power-hungry than traditional computing units (CPUs). While the industry is making significant efforts to optimize energy consumption, both at the component level and in terms of data center structure and architecture, the fact is that the increase in demand is such that the energy demand will grow at unprecedented rates for the industry.

The **Ethics and Sustainability** indicator evaluates countries in both aspects and is composed of **three new subindicators:**

a) Data protection and privacy
b) Safety, accuracy and reliability
c) Sustainability

The first two come from the **Global Index for Responsible AI (GIRAI)**, a unique human rights-based measurement that showcases data, trends, scores and rankings from 138 countries around the world and addresses the phenomenon of ethics. The third, meanwhile, comes from the **Network Readiness Index,** particularly that document's indicator on accessibility to clean energy, to showcase a country's ability to provide sustainable AI.

It is worth mentioning that the **Ethics and Sustainability** indicator **has a 50% weighting** within the Regulation subdimension.

Figure 5 shows that **Brazil and Chile lead the indicator, with 76.27 and 74.7 points** respectively, while the regional average is 41.71. Brazil stands out for its relative strength in the safety, reliability and accuracy subindicator, while Chile shows stable figures above the regional average in all three subindicators. The countries with lower levels of development in the rest of the indicators of the above dimensions, meanwhile, reflect a position that lags behind the average, which probably has a relevant degree of correlation with ecosystems that lack enabling factors or are immature in terms of research and development. In this sense, they probably do not have the capacity to offer robust security or privacy standards.

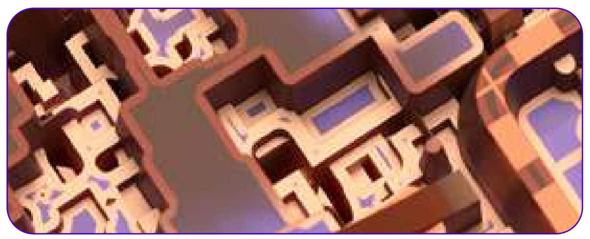
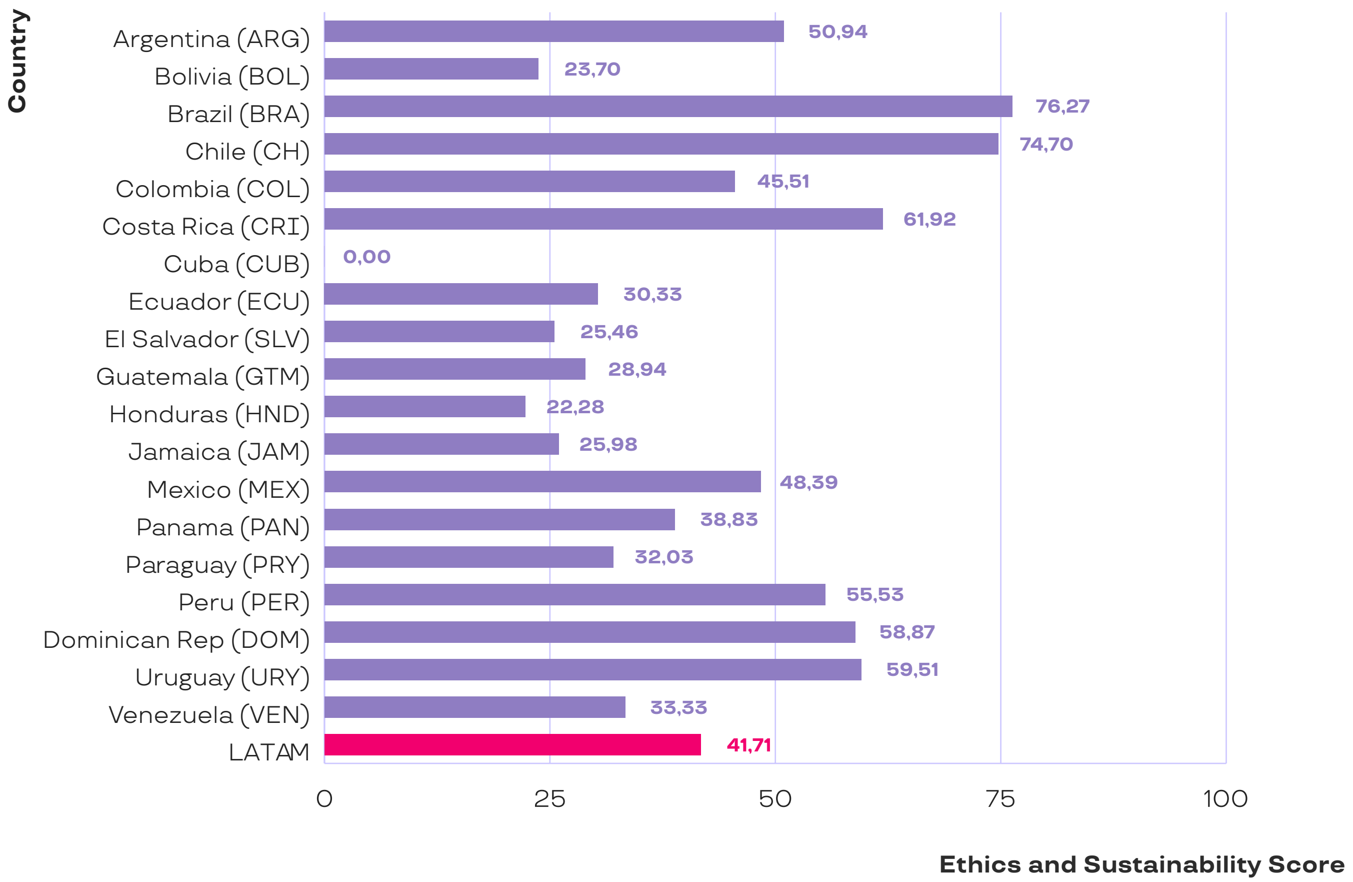


Figure 5: Score for Ethics and Sustainability Indicator



Source: ILIA 2024

a) Data protection and privacy

The Global Index for Responsible IA (GIRAI) is the result of a series of consultations with a wide range of stakeholders from around the world, especially from Africa, Asia, Latin America and the Caribbean. During these consultations, participants were invited to commit to the scope and structure of the GIRAI, which included not only the conceptual basis and rationale for the index, but also the areas of measurement, including the three pillars, three dimensions and thematic areas.

In this way, participants were invited to comment on suggested areas of measurement and their interpretation, as well as approaches to data collection, analysis and reporting. Special attention was given to the relevance of each thematic area in the different countries, as well as to the local prioritization of the different human rights groups and the possible availability of data in the country.

The GIRAI is composed of three dimensions rooted in human rights and democratic principles, namely:

· **Responsible AI Governance,** which measures the degree to which countries' governance regimes maintain effective and rights-respecting practices in responsible AI.

· **Human Rights and AI,** which assesses the extent to which countries are taking steps to protect, promote and respect key human rights implicated in AI.

· **Responsible AI Capabilities,** which analyzes the extent to which the key state capabilities needed to advance responsible AI exist, are met, and are being promoted.

One of the virtues of this instrument is the holistic vision it proposes for assessing the maturity of countries in each dimension, by incorporating and measuring governmental or state conceptual frameworks, concrete governmental or state actions, and the role played by non-governmental actors. This independent evaluation of the three elements (pillars in the GIRAI taxonomy) allows for a deeper understanding of the ecosystems and more clearly identifies areas for improvement.

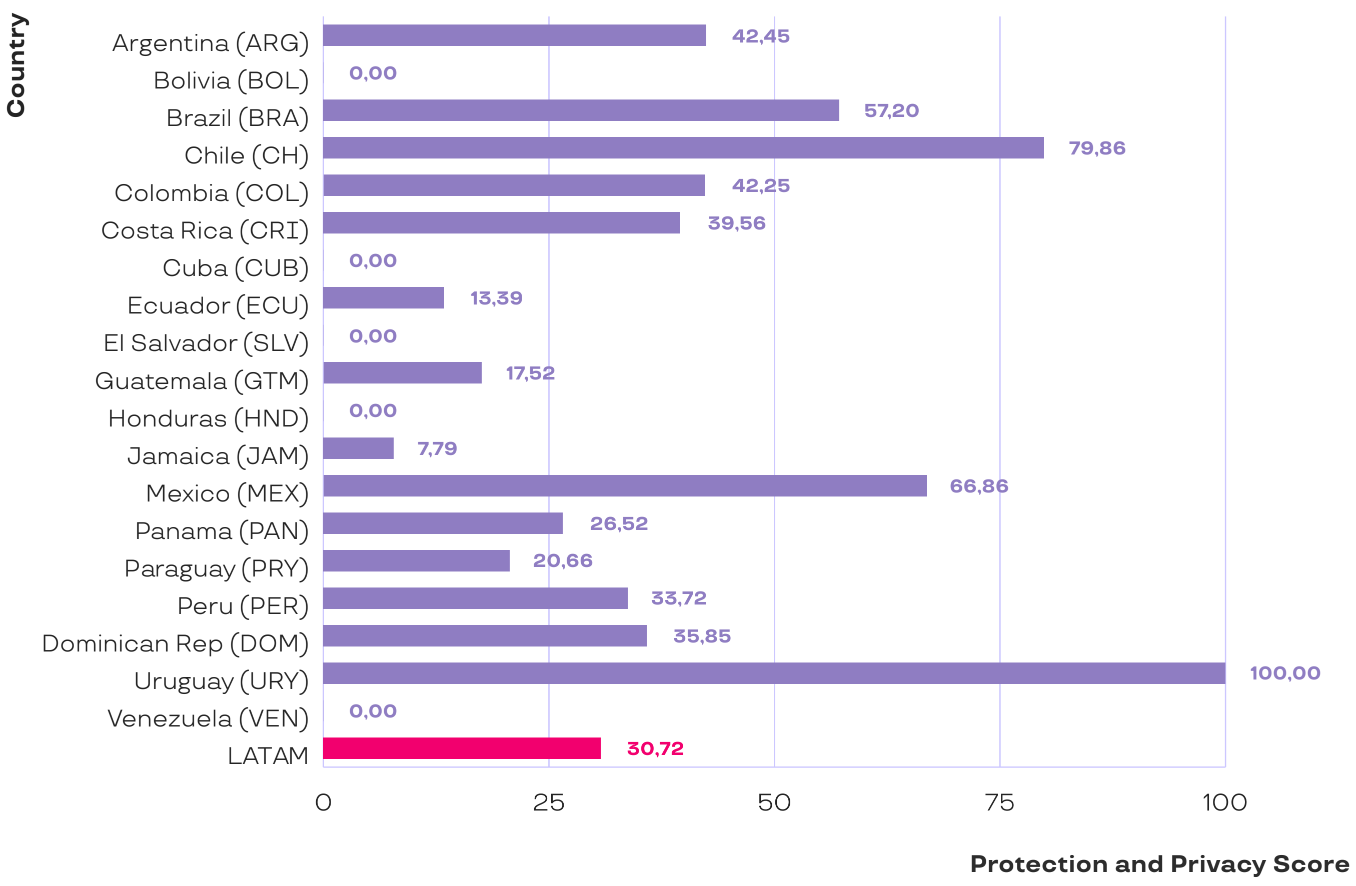
For the construction of the Data Protection and Privacy subindicator, the index score pertaining to the homonymous thematic area of the second dimension of HR & IA was used, while for the **Security, Accuracy and Reliability** subindicator, the figure pertaining to the homonymous thematic area of the first dimension of Responsible Governance was used.

This subindicator was selected because international normative frameworks on AI have highlighted the importance of the relationship between the right to privacy and data protection. The OECD AI principles require all actors to ensure data protection measures, and the UNESCO recommendation calls for the lawful processing of personal data. In addition, UNESCO's definitions of personal data protection and privacy set out a list of 10 principles on this issue. Data protection laws have thus become the cornerstone of responsible AI.

Despite the above, state-of-the-art AI solutions often rely on the processing of sensitive personal information, which increases the potential for privacy rights violations. From recommendation engines to phone assistants, all collect and analyze large data sets during training and also in real time. Data protection considerations in relation to AI include ensuring that the channeling of personal data operates lawfully, installing security measures to safeguard it, and monitoring and auditing its use to ensure legitimate and lawful uses, and providing users with transparent and clear information.

As shown in Figure 6, Uruguay leads regionally and globally, with 100 points in the ILIA and almost 85 in the GIRAI. Chile also performs adequately, with almost 80 points in the ILIA and a similar standard to that of the OECD countries in the GIRAI. Brazil and Mexico show a significantly above average performance, but reveal the absence of a harmonious and robust ecosystem as seen in Uruguay or Chile. The difference in performance seems to be related to the maturity of non-governmental organizations dedicated to personal data issues in Uruguay and Chile, compared to the other nations. The rest of the countries in the region are around the regional average, equivalent to 30 points in GIRAI.

Figure 6: Score for Data Protection and Privacy Subindicator



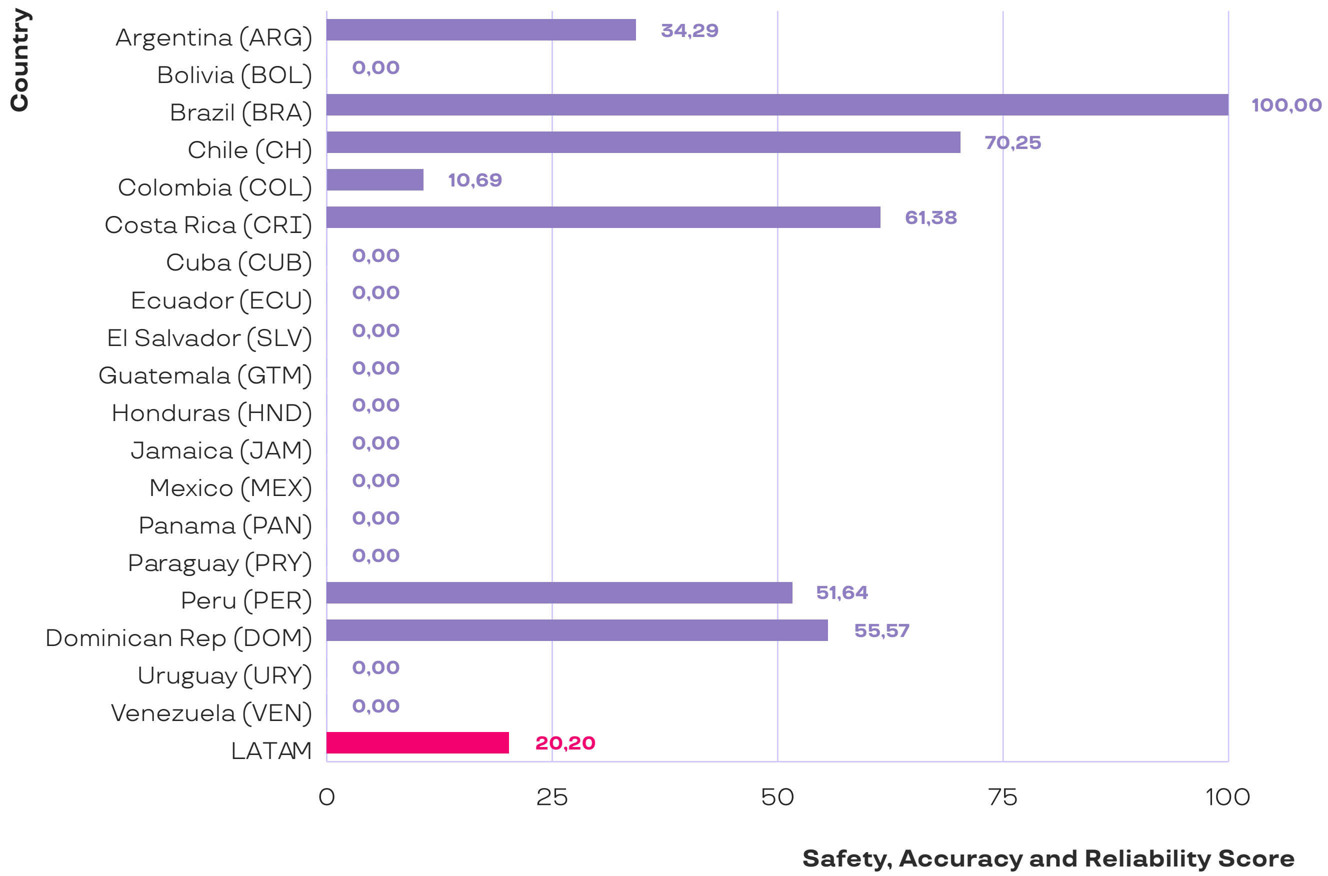
Source: ILIA 2024 / Data: GIRAI

b) Safety, Accuracy and Reliability

The emergence of AI-based technologies in various facets of life raises new questions about the safety of these tools and whether the decisions and outcomes of these machines can be trusted. Global movements have driven initiatives to improve AI safety, primarily emphasizing the importance of constraining standards regarding the accuracy and reliability of AI systems as a way to mitigate harm and reduce risks to individuals, communities and societies seeking to harness the power of AI.

The Safety, Accuracy and Reliability subindicator measures the steps countries have taken to improve AI safety by integrating the principles of accuracy and reliability in the design, development, use and deployment of technologies.

Figure 7: Score for Safety, Accuracy and Reliability Subindicator



Source: ILIA 2024 / Data: GIRAI

As shown in Figure 7, the subindicator is led by **Brazil, with 100 points in ILIA equivalent to 46.29 in GIRAI.** Chile and Costa Rica, meanwhile, have a relatively similar performance, with more than 40 points above the regional average (20.2) and scores of 70.25 and 61.38 points, respectively.

Apart from the above, it can be seen that in this area, the region is more backward than in terms of data and privacy, both because of the novelty of the technology and because of the probable difficulty of reporting or making transparent processes that are probably advancing in the academic spaces of the countries.

c) Sustainability

The Network Readiness Index (NRI) stands out as a key metric for assessing digital trends and understanding the evolution of online trust in this interconnected era. The NRI aims to identify and analyze key trends, determine the driving forces behind the evolution of media, information and communication technologies and their social implications, and provide practical recommendations for policy development.

The **Sustainability** subindicator is constructed from NRI data, specifically the "Clean and Affordable Energy" subindicator, which addresses the situation of countries to supply an IA that tends to minimize or eliminate its carbon footprint. This, through consumption for the operation of data centers, or by the consumption generated by the end user in any device, whether it is a company, state or citizen.

As shown in Figure 8, there is a very balanced performance among the countries of the region in this area, with an average of 74.22 points. **The case of Venezuela stands out, with 100 points in the ILIA**, driven by **significant subsidies to electricity tariffs** from the public sector at the time of measurement. Colombia, Costa Rica and Panama, meanwhile, also exhibit robust scores. Likewise, countries that are intensive in the use of NCRE, such as Chile, are closer to the average.

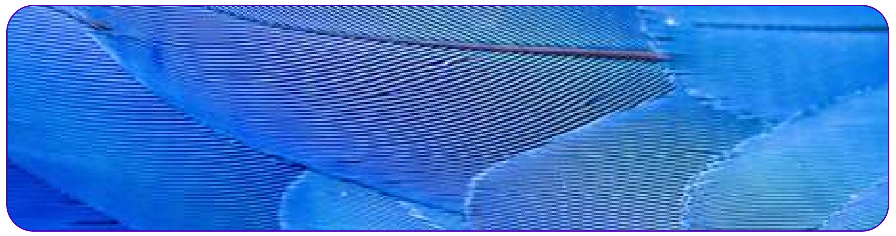
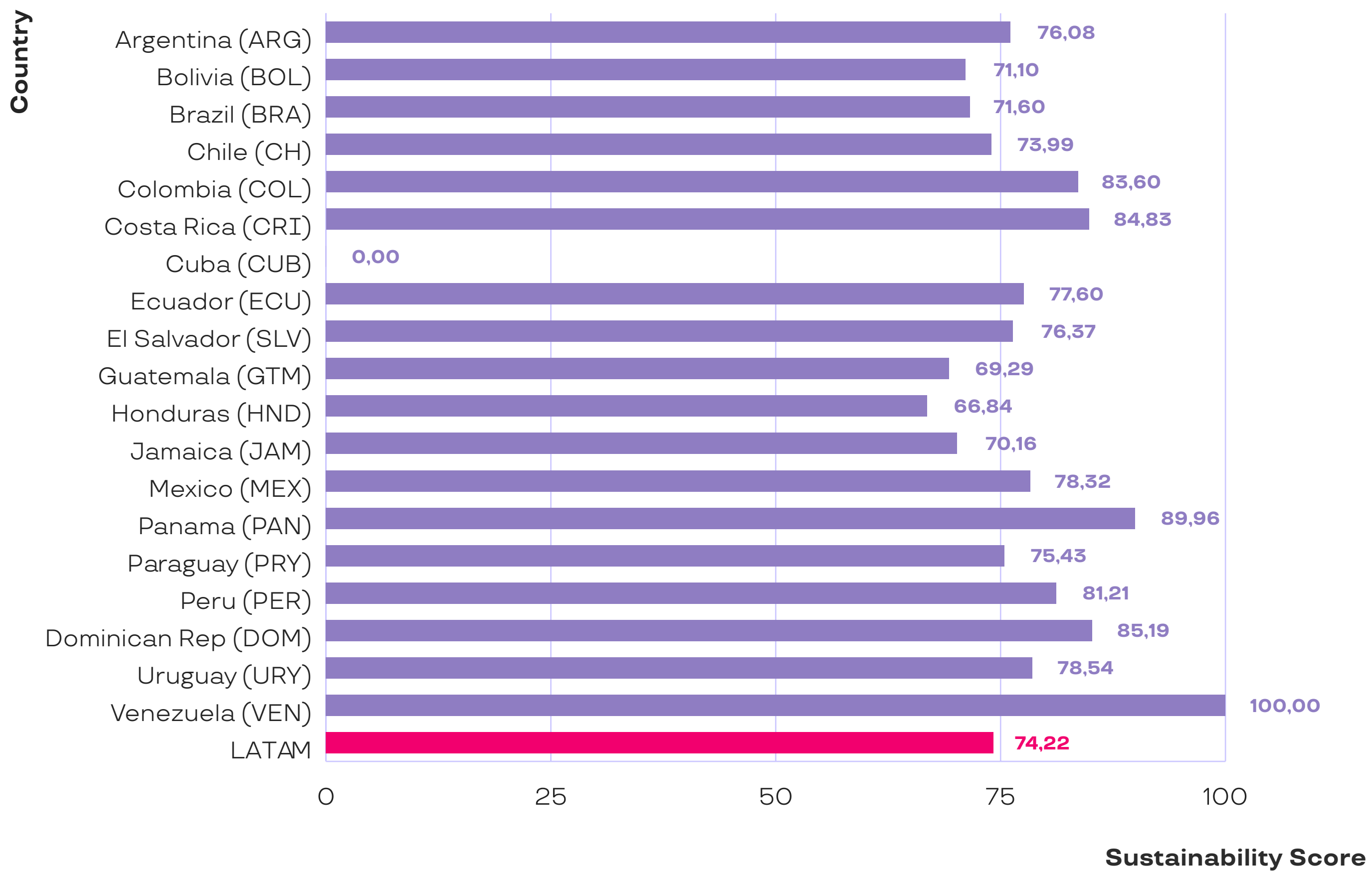


Figure 8: Score for Sustainability Subindicator



Source: ILIA 2024 / Data: Network Readiness Index 2023

As mentioned above, it is important to promote reflection on the environmental impact of the models, particularly their energy consumption. There is certainty that the demand for this technology will continue to grow in the medium term, so taking advantage of the local advantages of Latin America and the Caribbean to promote the use of clean energies in the computer and data storage industry, for example, could be a reasonable way to increase the competitiveness and sophistication of the economies.

CHAPTER_F

COUNTRY FILES

ARGENTINA

General Description
Population to 2023: **45.773.000**
2023 GDP per capita: **USD 13.730,50**
% of GDP Allocated to R&D: **0,53%**
Human Development Index (HDI): **0,849**

Category: **Adopter**

Score: **55,77**

Position: **4**

	2023	2024
ILIA Total Score	**54,76**	**55,77 •**
Position in Index	4	4
Infrastructure Score	59,29	50,57
Data Score	46,89	46,89
Human Talent Score	36,31	43,21
Enabling Factors Score	47,50	47,44
Enabling Factors Position	3	5
Research Score	59,50	54,13
Innovation and Development Score	10,06	41,28
Adoption Score	53,96	73,36
Research, Development and Adoption Score	41,18	56,04
R&D+A Position	5	5
Vision and Institutionality Score	76,79	70,83
International Linkage Score	67,86	75,00
Regulation Score	50,00	61,04
Governance Score	75,60	68,73
Governance Position	3	4

General Overview

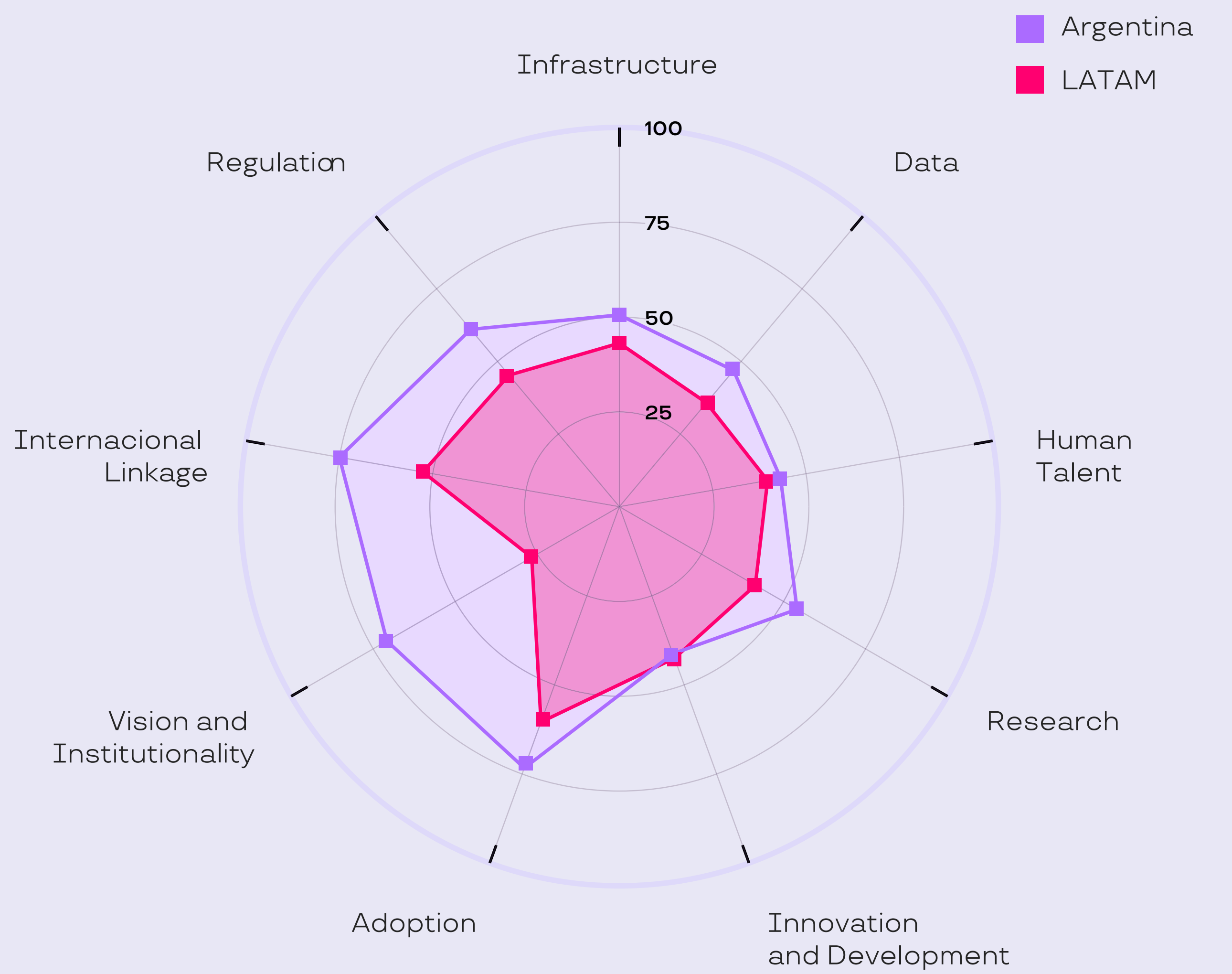
Argentina shows a similar performance with respect to the previous edition of the ILIA, with a relative position within the region that places it in fourth position with 55.77 points in the index, which positions it as an Adopter.

The score for the Infrastructure subdimensión is lower than in the year 2023. In the case of Human Talent, a subdimension in which indicators associated with education and professional training were incorporated, shows a moderate improvement.

On the other hand, the R&D dimension presents better results in this 2024 edition, specifically, in the Innovation and Development subdimension (up 31 points) and the Adoption sub-dimension (up 20 points), placing it above the average for the region.

In terms of Governance, it stands out as one of the countries that has been able to consistently sustain the policies proposed in the proposed strategy in a government of different political sign. In the regulatory area, the score of 6.04 shows a relative decline in the region due to the incorporation of new subindicators, among which AI Regulation stands out.

Graph 1: Argentina and LATAM Subdimensions



General Overview

In terms of Infrastructure, Argentina is above the regional average, but with a mixed situation when looking at the scores at a granular level. In terms of Connectivity, the almost universal coverage of mobile networks and a very high level of households with Internet access contrast with an average mobile download slightly below the regional average and an expansion close to zero in the implementation of 5G, similar to the rest of the region but at the lower end of those adopting countries.

As for Computing, it has a Cloud subindicator of similar level to the region, while Certified Data Centers do not represent even a quarter of the regional average, reflecting a weakness in this aspect. On the other hand, it is three times the average in subindicators such as IXP with 100 points (with 29 Internet Exchange Points) and in one of the new subindicators incorporated, Secure Internet Servers, it is above the regional average (28.43).

In terms of Devices, the level of Smartphones Affordability is notoriously below the region, mainly due to the relative price due to the weakness of the local currency, which could eventually be a transitory phenomenon. In this scenario, however, it stands out the Homes with computer (62.54 points).

In terms of Data, the country outperforms the average in all subdimensions, standing out in Capabilities and Governance, registering 15 points above the average respectively.

In the area of Human Talent, its strengths are in AI Literacy and Professional Training in AI, the latter with a variable such as Penetration of AI Skills in the workforce with 60 points, which places the country in this aspect immediately after the **Pioneers.** The upward trend in this subdimension is mainly due to the fact that in terms of Advanced Human Talent, in the development of graduate programs in AI shows an improvement compared to 2023, however it is below the regional average.

Regarding the Research subdimension, Argentina occupies a predominant position in the region, with a Number of Active AI Researchers and AI Publications, but with relevant impact levels, presence of AI research centers and presence of female AI authors.

Argentina's regional leadership position in Vision and Institutionality is due to the scores obtained in the AI Strategy indicator, which shows that it has a developed national AI plan and variables that reflect robustness in its implementation (100 points in almost all of them). The country also participates in international organizations such as ISO and international committees.

In Regulation, it is positioned above the LATAM score, registering 42.45 points in Data Protection and 34.29 points in Safety, Accuracy and Reliability Regulation. In Sustainability, its performance slightly exceeds the regional score.

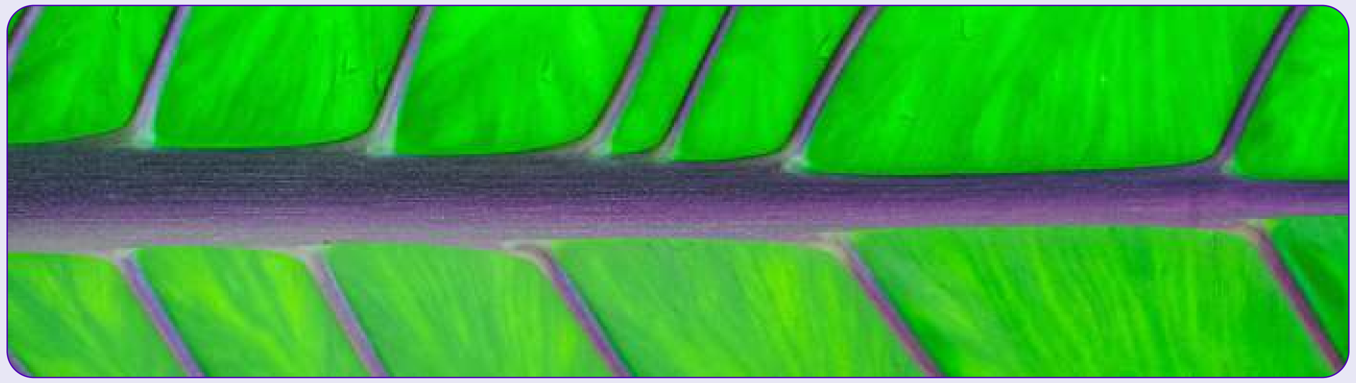
Immigration and Talent Drain in AI

The analysis of Advanced Human Talent migration is limited to researchers who have published at least once or who have participated in a conference recognized in an international academic portal or repository. For this analysis, publications and their respective authors from 1990 to the present are considered. The author is linked to the institution with which is affiliated in the publication to a particular country. Tracking the author involves considering the location of the institutions to which they are affiliated so that it can be detected if there is a drain or entry of advanced human talent. For this purpose, two graphs are shown that indicate in their columns the proportion of authors coming or going to each country in the respective year.

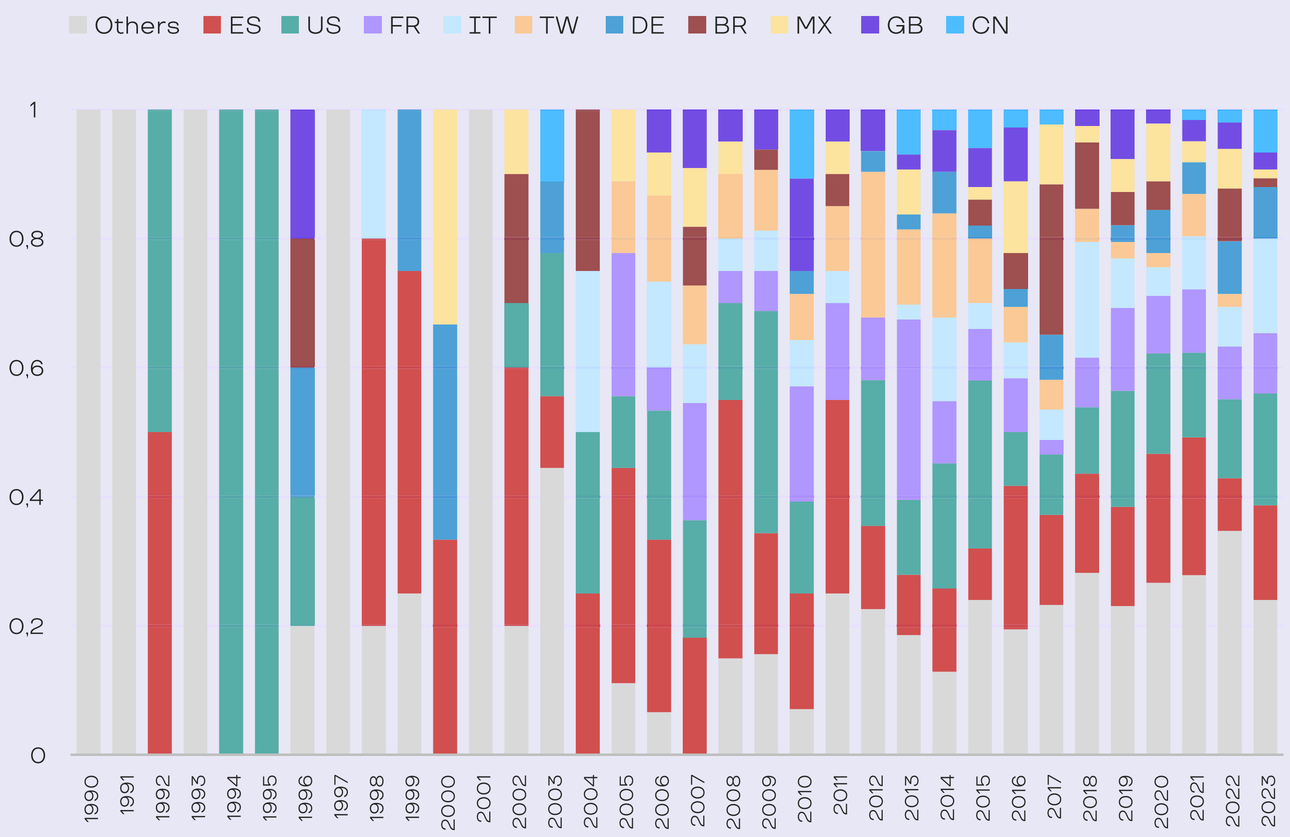
The migration flows of talent in Argentina, as shown in Graph 2 and Graph 3, show a pattern consistent with that observed in 2023, when the inflows and outflows of authors in IA are similar. It is worth mentioning that there is a clear trend towards internationalization, that is an increase in the number of destinations where Argentine authors go to conduct research, which intensifies over time. This reflects the openness of the Argentine academic community towards a greater diversity of countries in terms of collaboration.

It is important to note that Spain and the United States continue to be the primary origin and destination for authors, a trend that is probably due to linguistic affinities. Since 2006, countries such as Great Britain, Taiwan and Italy have gained importance, being frequent destinations and origins of authors publishing in Argentina. The lack of relevance of countries in the region in terms of immigration of talent is striking, with only Brazil and Mexico among the top 10.

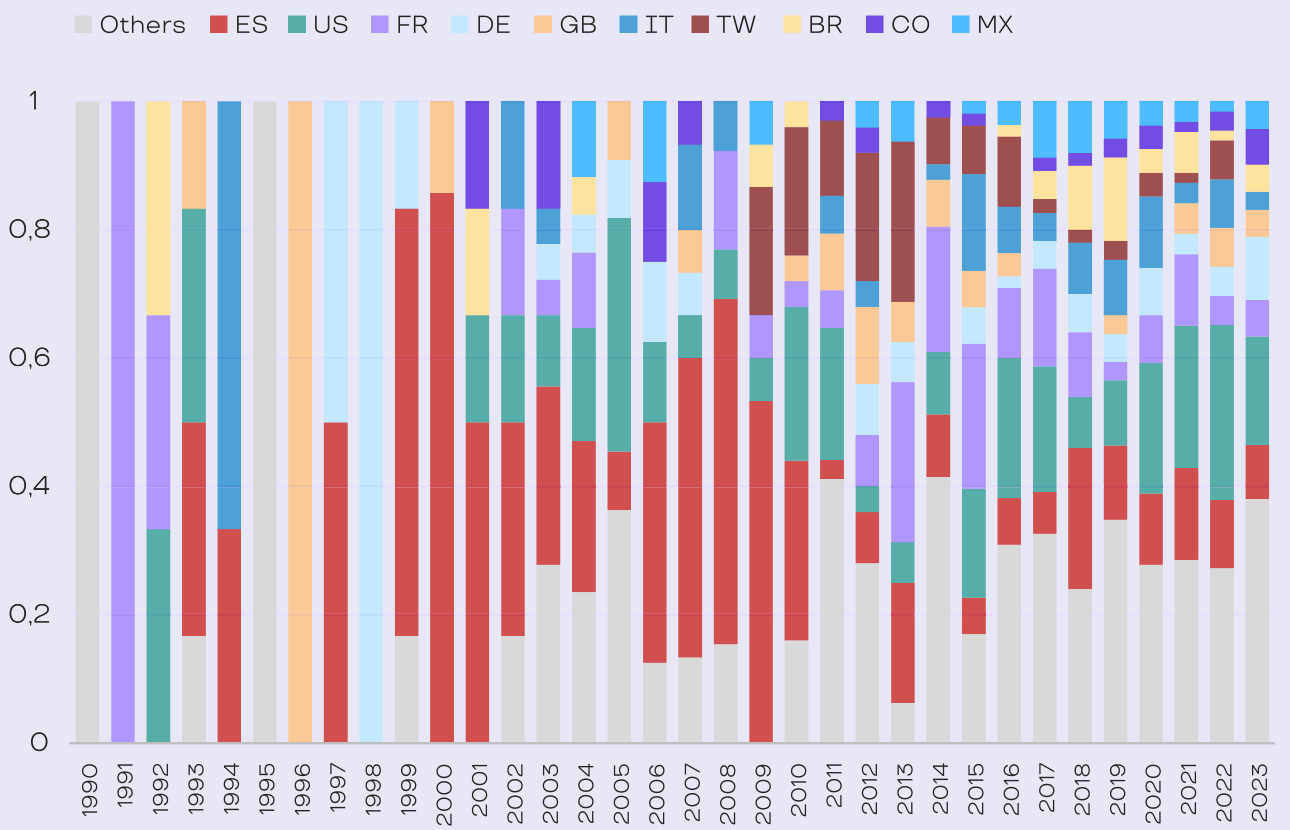
In terms of migration patterns, both in the arrival and departure of authors, there is a remarkable symmetry. Most of those who publish in Argentina come from the same countries to which Argentine authors have previously emigrated. This cycle of exchange tends to repeat itself at intervals of approximately four years, suggesting a sustained relationship between Argentina and these countries over time.



Graph 2: Where do Authors who Publish in Argentina Come From?



Graph 3: Where Do Authors Who Published in Argentina Go?

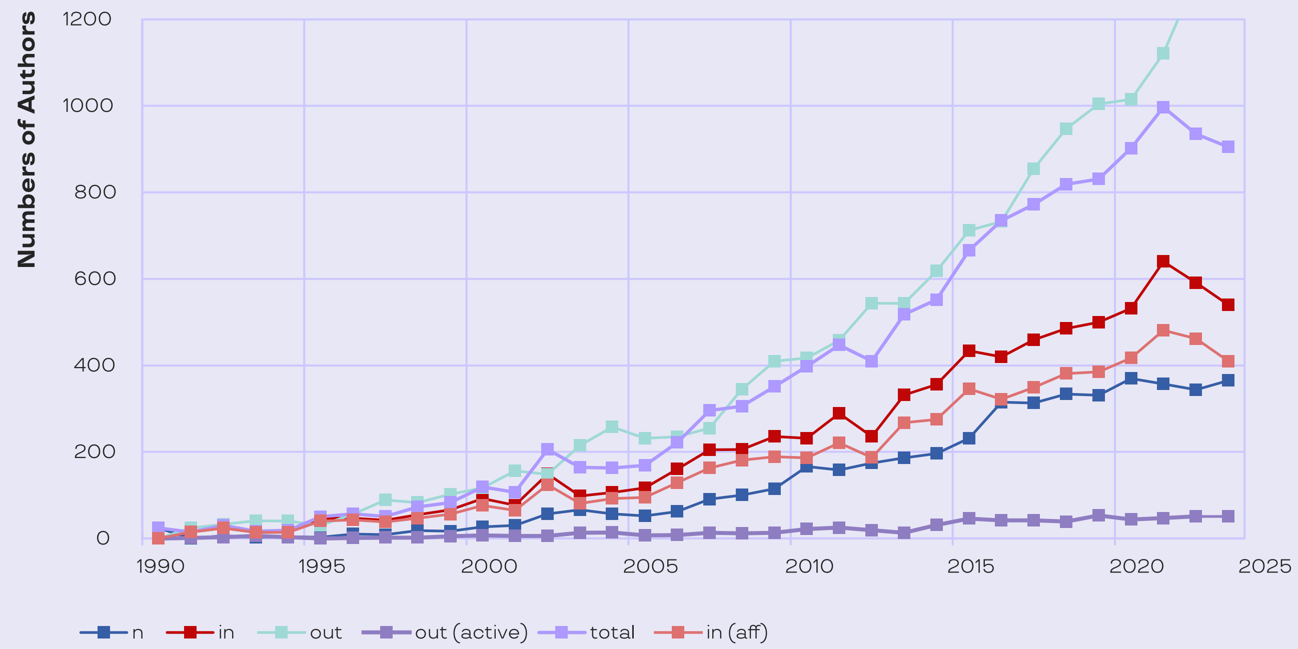


Talent Drain

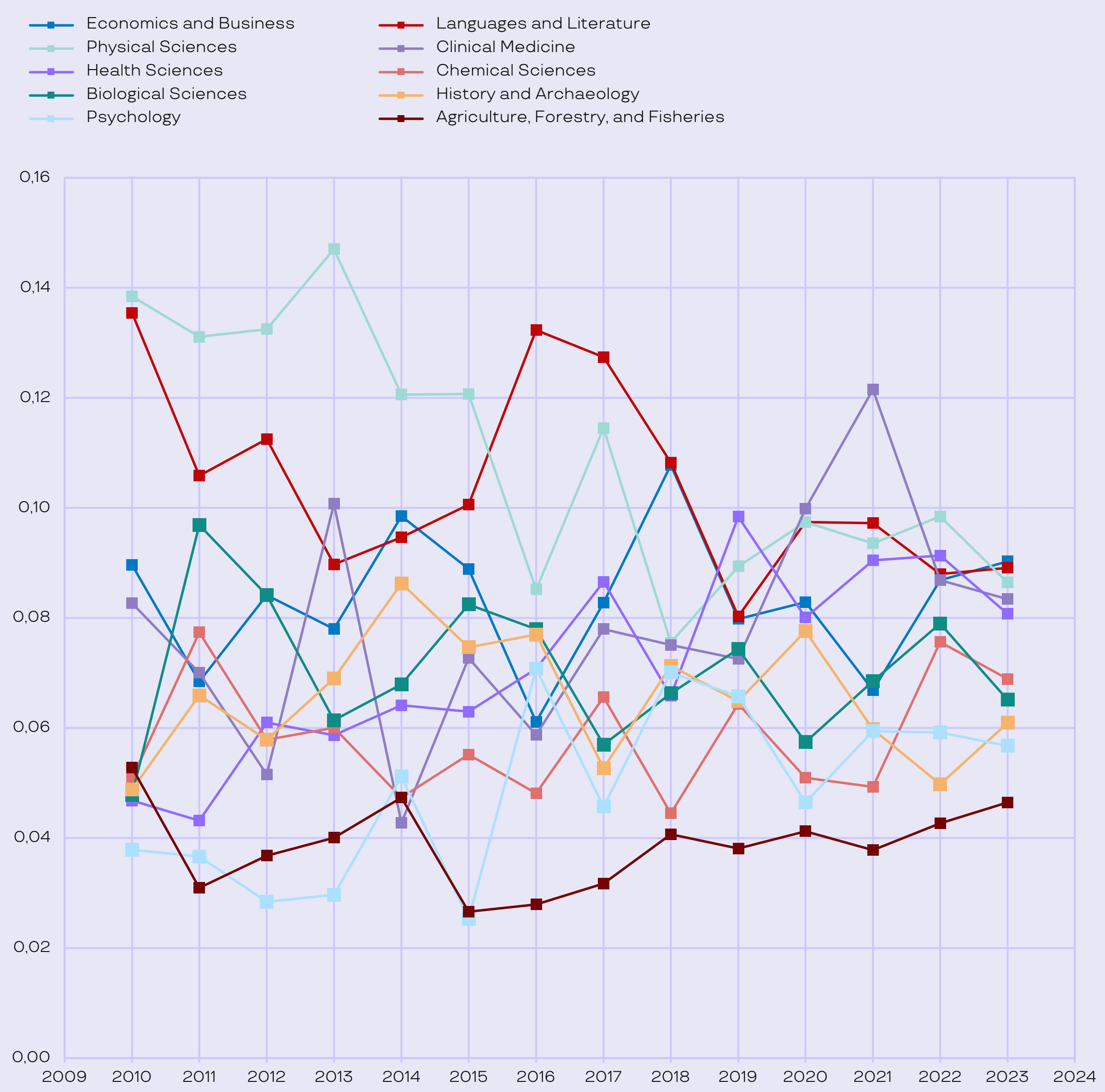
Regarding to the overall composition according to the categories of authors observed in 2023, there are no relevant changes.

Multidisciplinarity continues to be relevant, as evidenced by the green line, which is complemented by authors publishing for the first time. As in the region, the increase in the slope is probably explained by a significant number of works under review, which increases the number of authors who are not present in the system. The number of authors who continue to publish outside the system remains relatively even, indicating a balance in the brain drain, while the green line reflecting the number of authors in the year under analysis shows that the system has returned to pre-pandemic levels after the fall of the last two years.

Graph 4: Talent Drain



Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Argentina



Graph 5 shows the composition of multidisciplinary AI research according to OECD disciplines. For this purpose, all publications per year that use AI tools or techniques are analyzed and then grouped by the OECD discipline to which they belong. It should be noted that computer science was excluded for this analysis.

In the case of Argentina, the ten most relevant disciplines (detailed in Figure 5) collectively account for approximately 85% of AI usage. Notably, publications in Physical Sciences have experienced a decline in the use of AI tools, dropping from representing 15% of the total to nearly 9%, according to OECD classification. The same phenomenon is seen with Languages and Literature, which has had a more consistent downward trend after the peak reported in 2015 and a share close to 8% in 2023.

Meanwhile, those that exhibit growth are Psychology and Health Sciences, showing a growth in the period from 4% to 6-7%. It is also worth noting the notable increase in Clinical Medicine publications in 2021, reaching 12% of the total, which can be explained by the expansion of research in Medicine and the growing use of AI Technologies in that period.

Dimension	Subdimension	Indicator	Argentina	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	63,45	57,12	7
		Computation	38,83	21,76	3
		Devices	36,53	36,47	8
	Infrastructure Score		50,57	43,12	6
	Data	Data Barometer	46,89	35,76	7
	Data Score		46,89	35,76	7
	Human Talent	AI Literacy	66,68	57,90	4
		Professional Training in AI	47,66	43,49	8
		Advanced Human Talent	7,48	11,69	10
	Human Talent Score		43,21	39,71	6
	ENABLING FACTORS TOTAL SCORE		47,44	40,26	5
Research, Development and Adoption (R&D+A)	Research	Research	54,13	41,43	5
	Research Score		54,13	41,43	5
	I+D	Innovation	34,13	31,57	6
		Development	13,29	20,93	11
	R&D Score		41,28	42,53	8
	Adoption	Industry	62,1	54,29	5
		Government	90,24	69,65	5
	Adoption Score		73,36	60,44	3
	R&D+A TOTAL SCORE			47,46	5
Governance	Vision and Institutionality	AI Strategy	91,67	33,33	4
		Society's Involvement	50	19,08	2
		Institutionality	50	21,05	3
	Vision and Institutionality Score		70,83	26,70	5
	International Linkage	Standard Definition Participation	50	13,16	2
		International Organizations Participation	100	92,11	1
	International Linkage Score		75	52,63	2
	Regulation	Regulation on AI	100	47,37	1
		Cybersecurity	51,88	49,85	11
		Ethics and Sustainability	50,94	41,71	7
	Regulation Score		61,04	45,28	8
	GOVERNANCE TOTAL SCORE		68,73	37,46	4
ILIA 2024 TOTAL SCORE			55,77	42,08	4

BOLIVIA

General Description
Population to 2023: **12.388.000**
2023 GDP per capita: **USD 3.701,00**
% of GDP Allocated to R&D: **0,16%**
Human Development Index (HDI): **0,698**

Category: **Explorer**

Score : **26,00**

Position: **16**

	2023	2024
ILIA Total Score	**15,1**	**26,00 •**
Position in Index	12	16↑
Infrastructure Score	33,35	32,3
Data Score	20,81	20,81
Human Talent Score	11,81	29,58
Enabling Factors Score	21,99	28,61
Enabling Factors Position	12	18
Research Score	42,3	27,49
Innovation and Development Score	17,77	28,59
Adoption Score	9,87	49,48
Research, Development and Adoption Score	23,31	34,42
R&D+A Position	11	16
Vision and Institutionality Score	0,00	0,00
International Linkage Score	0,00	25
Regulation Score	0,00	16,86
Governance Score	0,00	10,06
Governance Position	10	19

General Overview

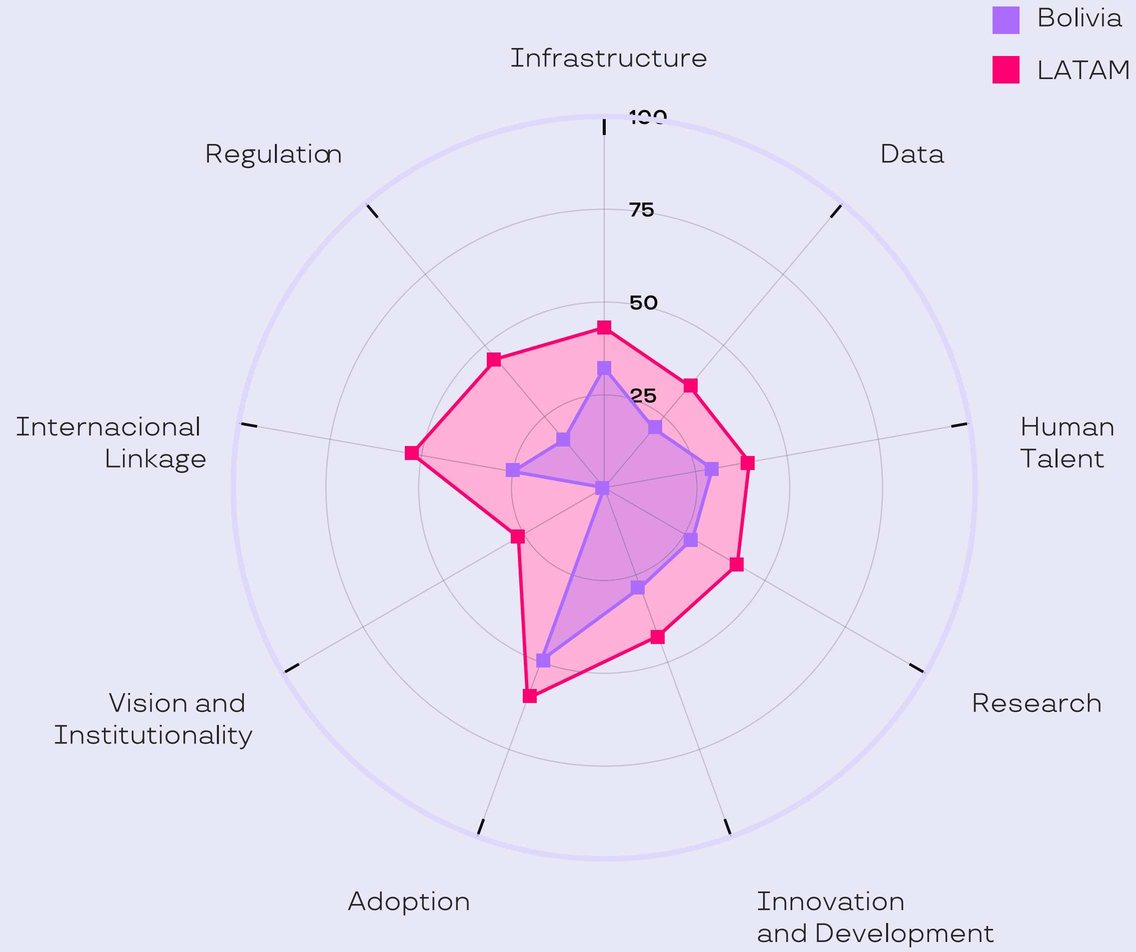
In 2023, the indicators with the largest gaps in Bolivia were Governance, Adoption in R&D+A and Human Talent in Enabling Factors, which progressed in the ILIA 2024 and, likewise, its total score, which went from 15, 10 to 26 points in this edition. Despite this, Bolivia's relative position within the region dropped four places compared to last year, ranking 16th.

Although the subdimensions such as Infrastructure and Data show results equivalent to those of 2023, the Human Talent sub-dimension shows a significant advance of more than 17 points, supported by the incorporation of new variables within the Professional Training in IA indicator (STEM Graduates) and the AI Literacy indicator (inclusion of ICT-related content in the secondary school curriculum).

The Research, Development and Adoption (R&D+A) dimension meanwhile experiences a discrete increase in its score, mainly due to the Adoption subdimension, which rises 40 points, determined by the result obtained by the incorporation of AI in the industrial sector and variables related to the digital transformation of the State, which prepares the public apparatus to add technologies such as these to its care and management processes. Despite the above, the Research sub-dimension drops 15 points...

In terms of Governance, Bolivia lacks a national AI strategy or policy; however, unlike what it showed in 2023, in the last year it has shown greater participation in international multilateral bodies in which ethical aspects of AI are defined (up 25 points). Also in the regulatory field, its score rises to 16.68, reflecting the incorporation of sectoral regulations on cybersecurity, ethics and sustainability.

Graph 1: Bolivia and LATAM Subdimensions



Bolivia

General Overview

In infrastructure (32.30 points), Bolivia is 12 points below the regional average. In connectivity (47.62 points), it is 10 points below the regional average. A total of 73% of the population uses the Internet, two percentage points below the regional average. The proportion of Households with Internet Access (56.89) is five points below the regional level.

Download speeds are well below the regional average, both for mobile and fixed broadband. While fixed broadband subscriptions are below the regional average, active fixed broadband subscriptions reach 76.84 per 100 people, ten points higher than the regional indicator. The basic fixed broadband basket represents 40.67% of GNI per capita, below the average by more than 30 points.

In terms of Computing (14.16 points), Bolivia is below the regional average, which is explained by its Cloud score (30 points), which is four points lower than the average; also, by its lack of High Performance Computing (HPC) infrastructure and the scarce existence of certified data centers (4.67 points), which shows a gap of 14 points with respect to the region in this indicator. In this indicator, only the IXP score stands out, which is slightly above average (35.03 points).

In terms of Devices (19.79 points), the country is more than 15 points below the regional average. While the level of Households with a Computer is slightly lower than the regional average, smartphone affordability is significantly below the average (2.52 points). The level of IPv6 Adoption (31.69 points) is five points lower than the regional average.

In the area of Data (20.81 points), Bolivia is below the regional average, with a gap of more than 10 points in all subindicators.

In terms of Human Talent (29.58 points), the Andean country is below average with a gap of 10 points. In terms of AI Literacy (46.06 points), the level of Early Education in Science is notoriously low (9 points), while Early Education in AI is slightly below the average for the region. In the area of training of professionals in AI (27.50 points), the country registers a gap of almost twenty points with respect to the average. Regarding Advanced Human Talent (9.67 points), it registers a lower level than the regional average, without AI PhD programs, but standing out above the region in Master's Programs in AI at Accredited Universities (38.68 points). In terms of Research, Development and Adoption (34.42 points), Bolivia has thirteen points lower levels of innovation (22.48 points).

In Research, the country shows a score of 27.49, 15 points less than last year and again below the regional average, which may be associated with the low levels of AI Publications and Active Researchers in this discipline (4.78 and 4.46 respectively), the low impact of the publications generated and also the Consistent Research score (7.69), referring to publication in journals and participation in conferences periodically in the last five years. Notwithstanding the above, the country presents more outstanding results in Productivity of researchers, which reaches 58 points (six more than the regional average score) and a Proportion of female researchers in IA (74.54 points), which is seven points higher than the LATAM average.

In terms of Innovation (20.39 points), Bolivia is characterized by low levels of investment, with an estimated Total value of Private Investment in the sector of 0.36 points (a gap of 20 points with respect to the region) and R&D Expenditure as a Proportion of GDP of 8.87 points, 20 points lower than the LATAM average.

Likewise, the development of AI Companies is seven points below the average, with 11.5, and their Entrepreneurial Environment score (52.22 points) is slightly below the average for the region.

In terms of Application Development, the country is below the regional average.

In terms of AI Development (15.41 points), Bolivia registers similar levels to the average in terms of Open Source Productivity and Open Source Quality but is significantly below the regional average in the number of AI Patents.

In terms of AI Adoption by the industrial sector, the score for this indicator is 10 points below the regional average, with a gap of almost 20 points in the area of Medium and High-Tech Manufacturing in LATAM score and almost 17 points below the average for the subindicator of Share of Medium and High-Tech Manufacturing Value Added in Total Value Added (47.64%).

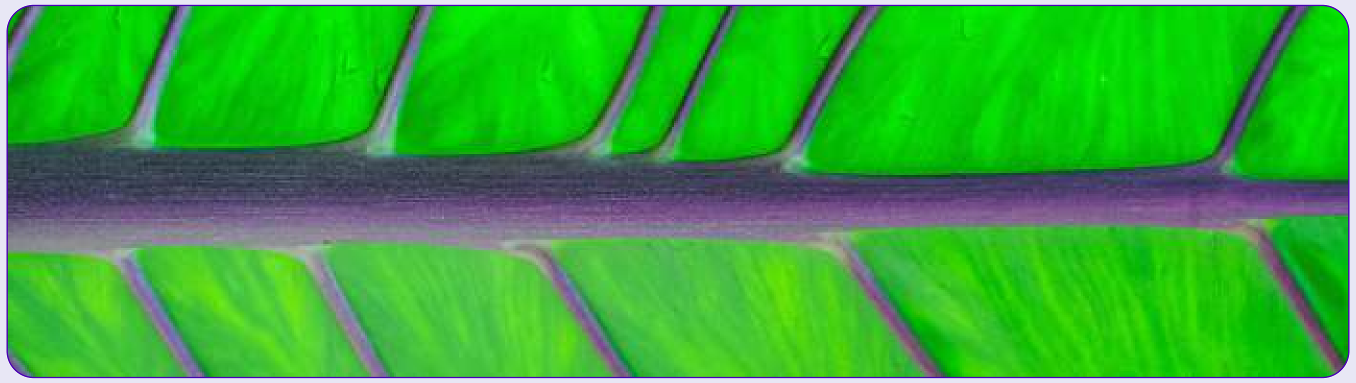
At the Digital Government level, there is the challenge of closing the 12-point gap in this area (57.93 points). Given that Bolivia does not have an AI Strategy, nor an institution specifically dedicated to this issue, nor mechanisms to generate citizen or stakeholder participation in policy development, its Governance score is 10.06 (37.46 LATAM).

In terms of international AI Governance (25.00), Bolivia is below average, with average levels of International Organizations Participation and no participation in AI standard-setting bodies such as ISO. In the regulatory area, the country's development is below average, as it has not made progress in risk mitigation regulation and has a low level in Cybersecurity (16.49 points). While it does not register activity in data protection or in security, accuracy and reliability, it stands out for its regulation on sustainability (71.10 points), which is close to the regional average.

Immigration and Talent Drain in AI

As observed in the 2023 study, the data for the 2024 edition of the index show that Latin American and Caribbean countries continue to be the main countries of origin and destination for authors publishing in Bolivia. It is relevant to note that in the last decade Spain was the recurring destination for Bolivian authors, but has been replaced by France at the European level, which now leads as one of the main destinations for academic migration.

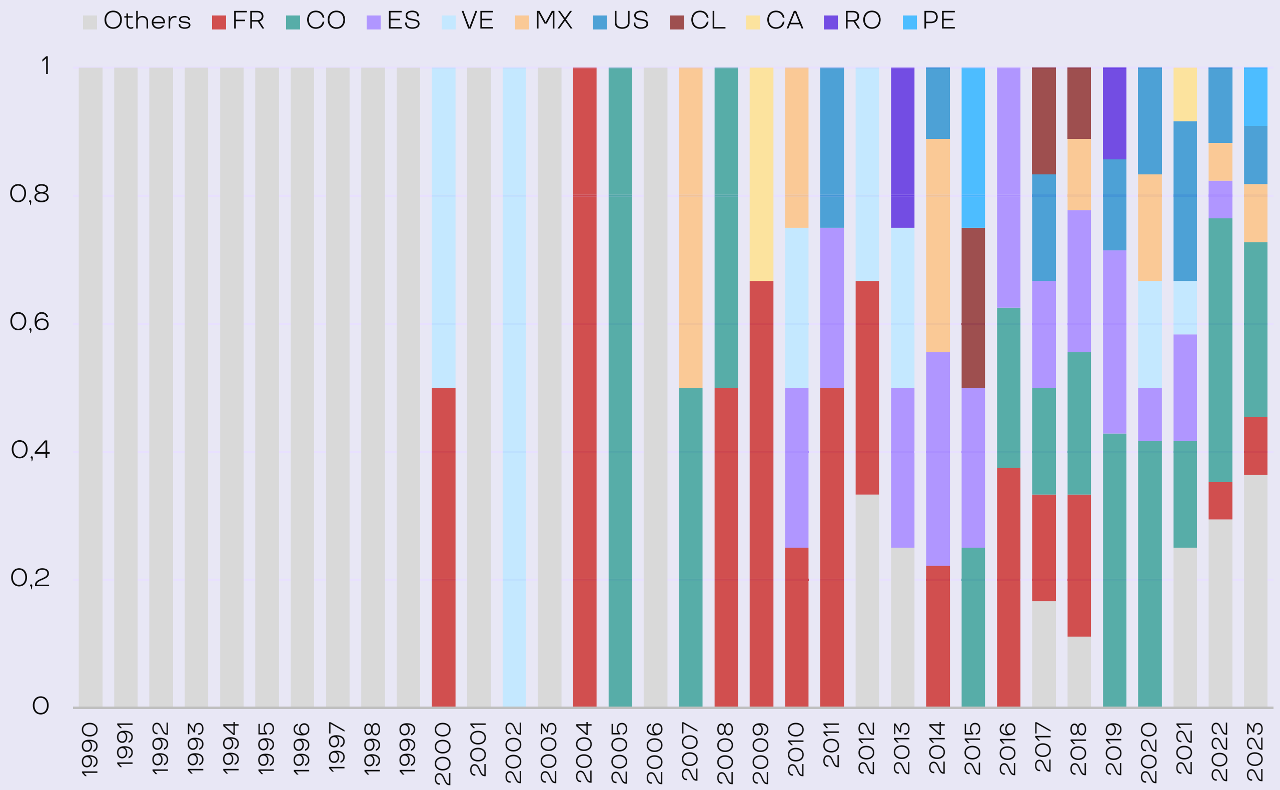
As shown in Graph 2 and Graph 3, it is possible to observe the absence of China in migration patterns to and from Bolivia, compared to its growing global influence in other countries. In contrast, less traditional destinations such as Romania and Saudi Arabia have emerged, although with less impact on migration flows.



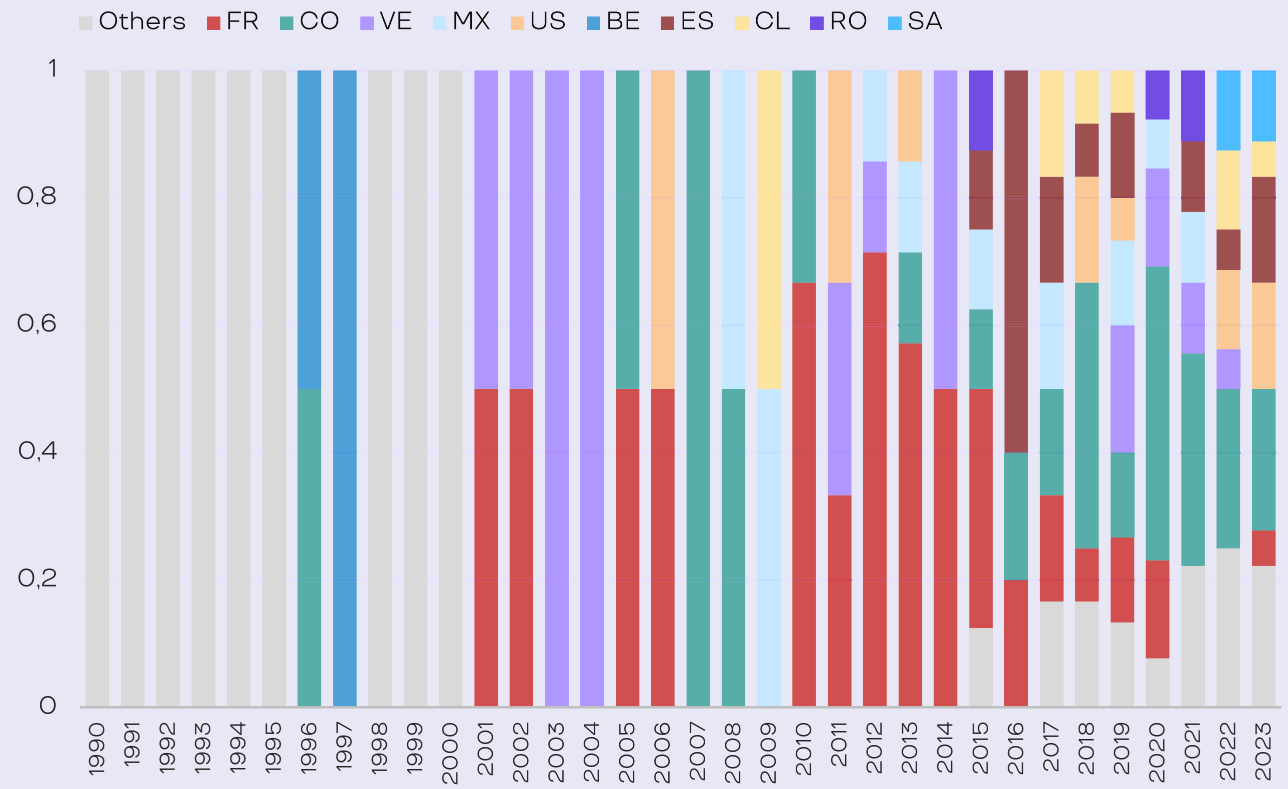
In addition to the above, it is interesting to note that collaboration between researchers from different Latin American countries in IA publications continues to be essential for the Bolivian academic community. Countries such as Colombia, Venezuela and Mexico are relevant destinations and origins for both incoming and outgoing authors. This reinforcement of intraregional collaborations underlines the importance of academic networks in Latin America.

The migration patterns observed between the arrival and departure of authors show a strong symmetry, suggesting that most of the authors migrating to Bolivia come from the same countries to which Bolivian authors have previously emigrated. However, there is a notable difference: while the number of authors migrating to Spain has decreased, those arriving from Spain are even fewer. This indicates a shift in the preferences of the Bolivian academic community to other destinations.

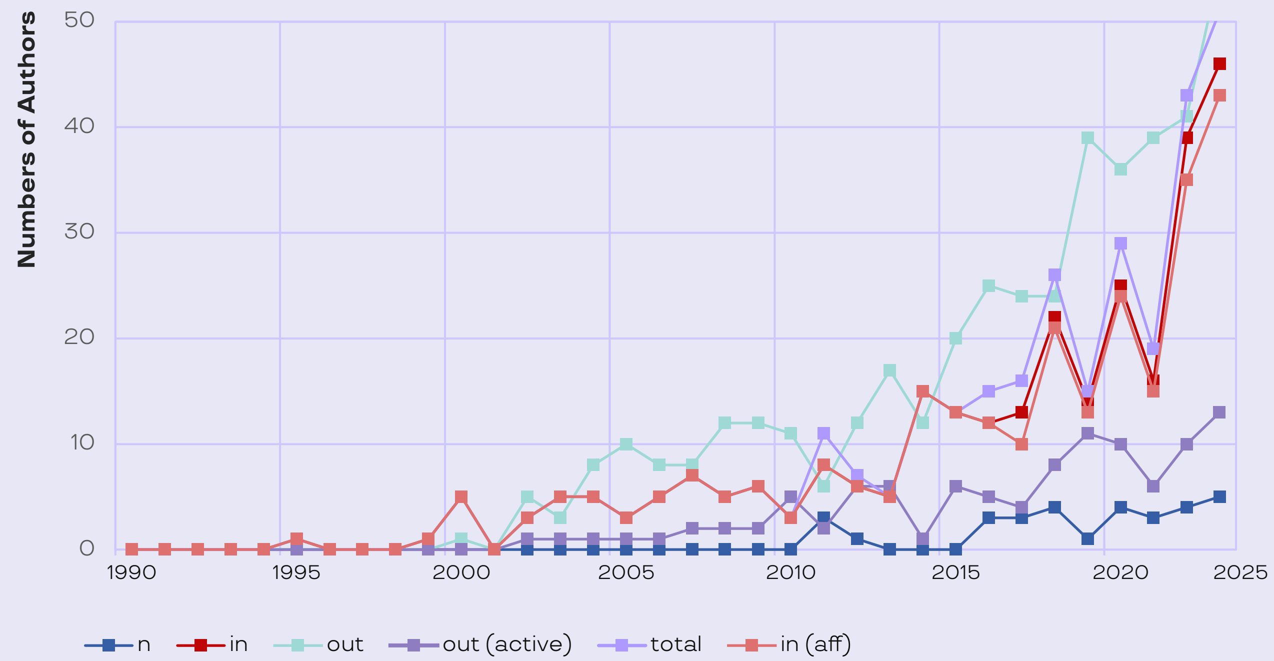
Graph 2: Where Do Authors Who Publish in Bolivia Come From?



Graph 3: Where Do Authors Who Published in Bolivia Go?

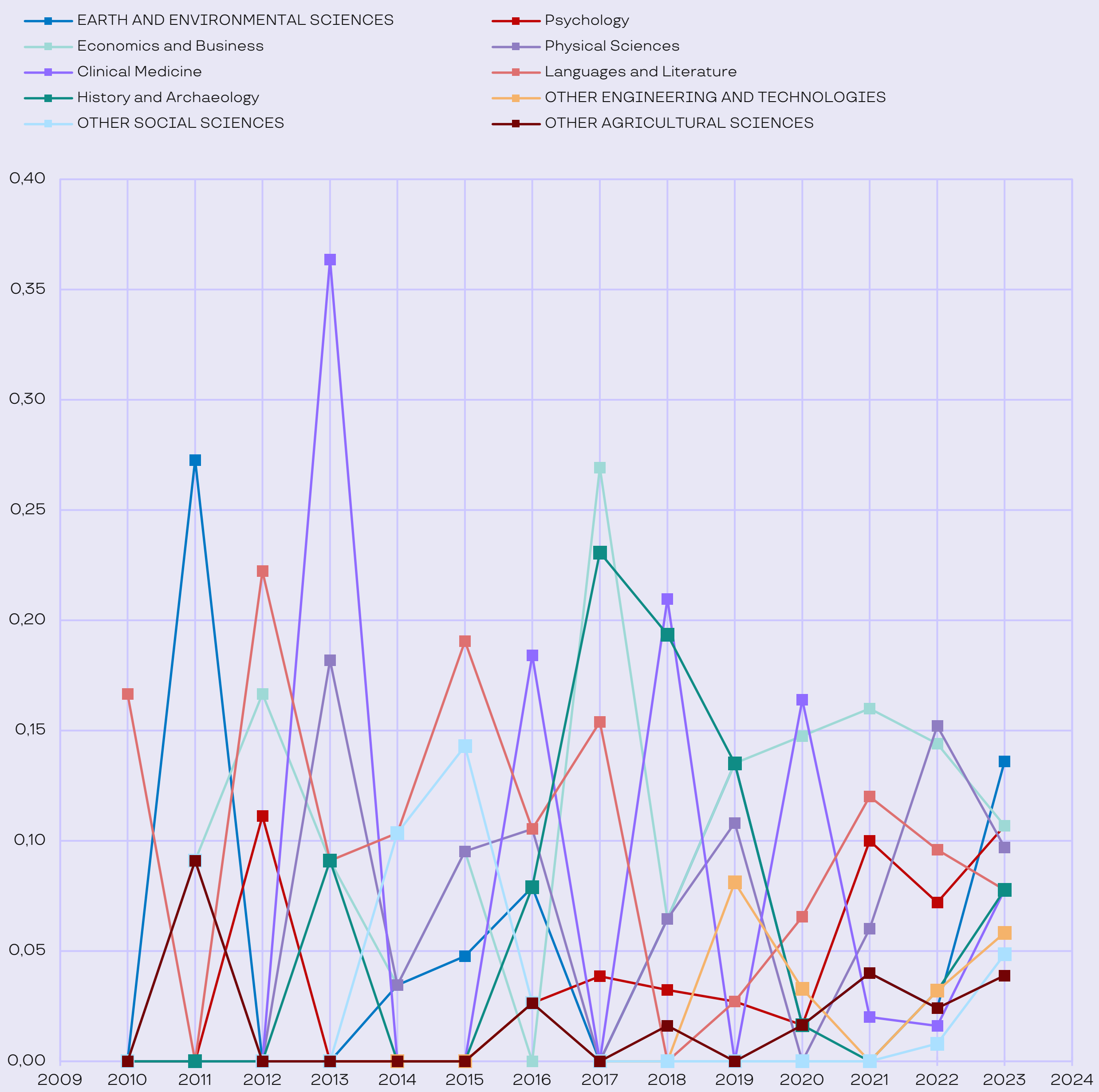


Graph 4: Talent Drain



Graph 4 shows the phenomenon of incoming and outgoing talent, following the timeline of the previous year. An anomalous phenomenon can be seen in relation to the rest of the region in the sense that all groups show a significant increase. Particularly surprising is the fact that from 2013 onwards the number of authors from Bolivia publishing outside the country exceeds the total publishing within. This is the main local challenge.

Graph 5: Number of Publications in the Top 10 OECD Disciplines in Bolivia



Because the volume of publications is relatively low in Bolivia, the conclusions of the analysis of the composition of multidisciplinary research may not be statistically significant. However, it is possible to appreciate a concentration of disciplines, all being relatively relevant in the range between 4% and 15%. There is no relevant leadership for any of them, and the increase in local productivity has the impact of the previous phenomenon, which indicates a non-concentrated use in a particular discipline. prevalence in combination with AI, representing 14% of the total OECD concepts, followed by physical sciences and economics and business.

Dimension	Subdimension	Indicator	Bolivia	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	47,62	57,12	15
		Computation	14,16	21,76	15
		Devices	19,79	36,47	17
	Infrastructure Score		32,30	43,12	16
	Data	Data Barometer	20,81	35,76	17
	Data Score		20,81	35,76	17
	Human Talent	AI Literacy	46,07	57,9	17
		Professional Training in AI	27,5	43,49	17
		Advanced Human Talent	9,67	11,69	7
	Human Talent Score		29,58	39,71	17
	ENABLING FACTORS TOTAL SCORE		28,61	40,26	18
Research, Development and Adoption (R&D+A)	Research	Research	27,49	41,43	15
	Research Score		27,49	41,43	15
	I+D	Innovation	20,39	31,57	15
		Development	15,41	20,93	8
	R&D Score		28,59	42,53	14
	Adoption	Industry	43,84	54,29	15
		Government	57,93	69,65	14
	Adoption Score		49,48	60,44	15
	R&D+A TOTAL SCORE		34,42	47,46	16
Governance	Vision and Institutionality	AI Strategy	0	33,33	8
		Society's Involvement	0	19,08	9
		Institutionality	0	21,05	7
	Vision and Institutionality Score		0	26,7	9
	International Linkage	Standard Definition Participation	0	13,16	5
		International Organizations Participation	50	92,11	17
	International Linkage Score		25	52,63	17
	Regulation	Regulation on AI	0	47,37	10
		Cybersecurity	16,71	49,85	16
		Ethics and Sustainability	23,7	41,71	17
	Regulation Score		16,86	45,28	17
	GOVERNANCE TOTAL SCORE		10,06	37,46	19
ILIA 2024 TOTAL SCORE			26	42,08	16

BRAZIL

General Description
Population to 2023: **216.422.000**
2023 GDP per capita: **USD 10.043,60**
% of GDP Allocated to R&D: **1,17%**
Human Development Index (HDI): : **0,76**

Category: Pioneer

Score: **69,30**

Position: **2**

	2023	2024
ILIA Total Score	**65,31**	**69,30**
Position in Index	2	2
Infrastructure Score	62,32	59,65
Data Score	53,64	53,64
Human Talent Score	64,99	40,75
Enabling Factors Score	60,32	52,48
Enabling Factors Position	2	3
Research Score	77,7	65,7
Innovation and Development Score	27,19	86,03
Adoption Score	37,23	90,27
Research, Development and Adoption Score	47,37	79,15
R&D+A Position	3	1
Vision and Institutionality Score	64,68	71,88
International Linkage Score	100	100
Regulation Score	100	88,13
Governance Score	88,29	82,38
Governance Position	1	2

General Overview

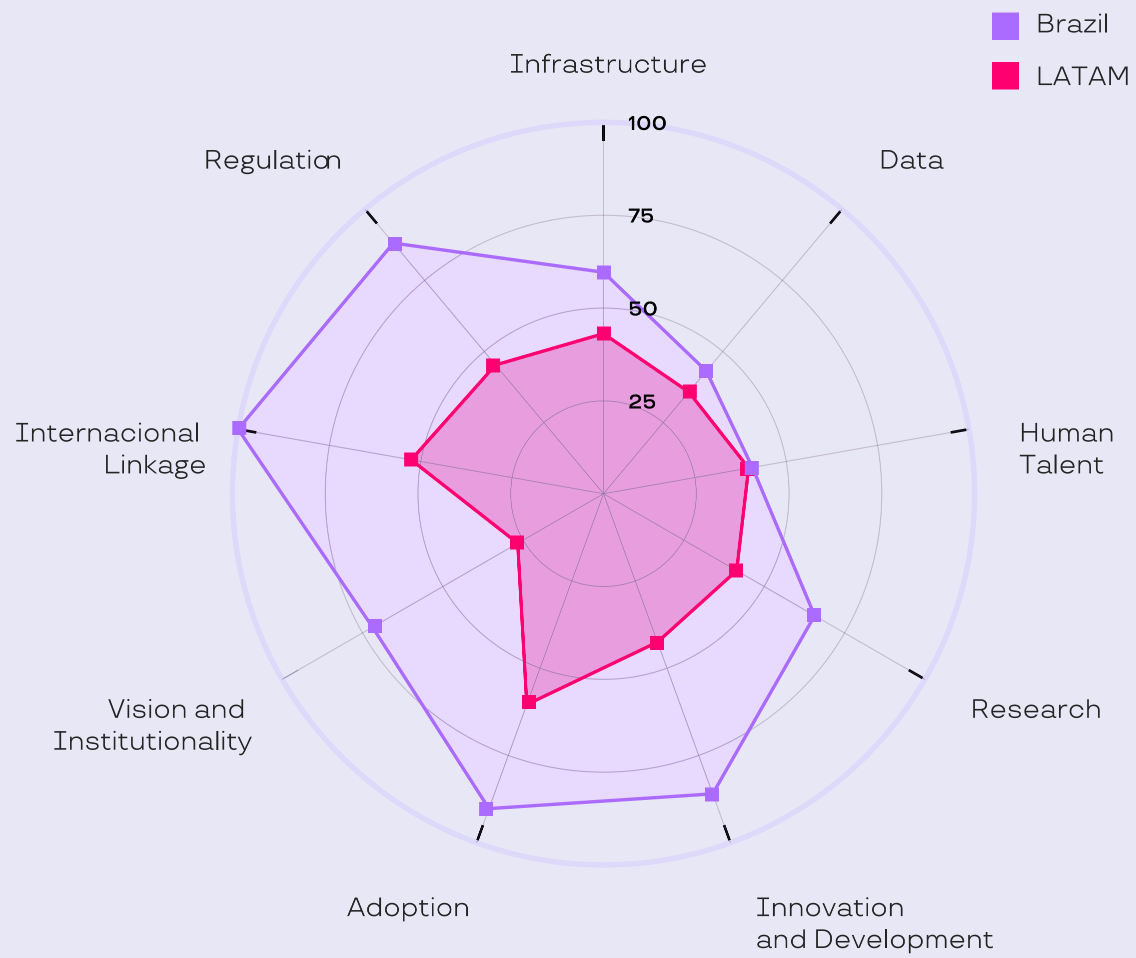
Although Brazil's total score increases slightly, its relative performance within the region is quite similar to that of the previous version of the ILIA, occupying the same position 2 as in the previous edition of the index.

As for the Enabling Factors, a drop in the total score is observed, derived from that experienced by the subdimension of Infrastructure, but above all, that of Human Talent, which drops 25 points with respect to 2023. It should be noted that this decrease is explained by methodological factors, particularly the incorporation of subindicators that reflect, with greater precision, the phenomena observed in the Advanced Human Talent indicator.

The R&D+A dimension, on the other hand, shows the greatest increases in relation to the previous edition. Despite the 12-point drop in the Research subdimension, the R&D subdimension increased by 60 points and the Adoption subdimension by 53 points, leaving the country in first place in the region's average in this area.

In Governance, the presence of an IA Strategy or national policy is maintained, while the incorporation and verification of subscription to international agreements explain the maximum score in the international subdimension. In the regulatory area, the score of 88.13 shows a decrease relative to the previous year, due to the incorporation of new elements to measure in the subdimension.

Graph 1: Brazil and LATAM Subdimensions



Brazil

General findings

In Infrastructure (59.65 points), Brazil is 12 points above the regional average. In Connectivity (71.73 points), it registers 13 points above the average. A total of 80.53% of the population uses the Internet, five points above the average, while the proportion of Households with Internet Access (80.24 points) is 20 points above the regional level. In terms of download speed, the High Speed in Mobile Networks (81.56 Mbps) and in fixed broadband (55.24 Mbps), which is above average, stand out. However, it is well below the regional average in the Implementation of 5G.

Fixed broadband subscriptions per 100 people are double the regional average with a score of 60.80, while mobile Broadband Subscriptions reach 81.45 per 100 people, exceeding the regional average by 15 points. On the other hand, the Basic Fixed Broadband Basket represents 87.41% of GNI per capita, exceeding the regional average by more than 15 points.

In terms of Computing (37.65 points), one of the subindicators that stands out as one of the country's main strengths is High Performance Computing, HPC Infrastructure Capacity, with almost 10 times the regional average. As for Cloud, Brazil has a score of 35.00 points, similar to the regional average. However, that of Certified Data Centers (8.70 points) is below the regional average, which is also the case with IXP (37.11). Regarding Secure Internet Servers per million inhabitants, this surpasses the average score with 23.65 points.

In the subdimension of Devices (57.49 points), Brazil has a score more than 15 points above the regional average. While it registers a level of Households with a computer and Smartphone Affordability around 10 points above the average, it stands out in the high level of IPv6 Adoption (91.69 points, 60 more than the regional average).

In the subdimension of Human Talent (40.39 points), the South American giant is slightly above average, due to the score exhibited by the AI Literacy indicator (68.23 points), which includes Early Education in Science (57.23 points) and Early Education in AI. However, in the Professional Training in AI, AI Skills Penetration and STEM Graduates in the country are below the regional average. Low scores are also observed in Advanced Human Talent, where there is not a significant number of graduate programs in AI.

The impact of standardization for Brazil's score is very high in this indicator, leaving it with 4.05 points. Regardless of this, Brazil registers the levels in terms of advanced human talent, due to the low presence of Master's Programs (6 in QS and 8 in accredited) and PhDs (2 in QS and 4 in accredited) in AI, being behind Chile, Argentina or Colombia.

In terms of Research, Development and Adoption, Brazil evidences a pioneering AI ecosystem, exceeding the average by more than 30 points (79.17), standing out in Presence of AI research centers (100 points), and in subindicators of AI Publications, Active Research, and Consistent Research, which exceed the regional average. Also showing good results is the one that measures the gender gap in AI research, with a score of 79.67. However, it should be noted that the country faces challenges in Productivity and Impact of Research and presence in Side Events and Main Tracks (19.57 points), where although Brazil is among those with the highest gross presence in these spaces, when corrected by volume of researchers, it shows a less favorable performance.

R&D is an aspect in which it shows a good relative performance, with more than twice the regional score (86.03 points) and with indicators such as Unicorn Companies and R&D Expenditure As a Share of GDP with maximum scores. These elements make it the leader in this area and the country that grew the most between 2023 and 2024 in terms of score. Others, such as Private Investment in AI and Estimated Value of Private Investment, meanwhile exceed the regional average. The challenge lies, however, in strengthening the Entrepreneurial Environment (50.00 points), which is slightly below the regional average.

In terms of Development (40.20 points), although it registers levels twice as high as the average, it stands out with the maximum in Number of Patents in AI (90.79 points), driven by a strong presence of manufacturing industry, just like Peru.

Something that is evident in Brazil is its strength in the technology sector, reflecting a good degree of AI Adoption (90.27 points). A good score is observed in the Industry indicator (83.78), with subindicators such as Workers in the High-Tech Sector and Medium and High-Tech Manufacturing exceeding the regional average. As for the Digital Government indicator, it reaches high levels with 100 points.

In the Governance dimension, Brazil registers a high level (82.38 points). The country has a completed IA Strategy (100 points) that includes everything from an institutional framework to evaluation mechanisms, covering the different issues that have been measured by this Index. In addition, and although it is not included in this analysis, the action plan proposed for the implementation of the strategy is the most robust in the region.

In terms of Society´s Involvement (37.50 points), it registers a score above average, but with the challenge of expanding the presence of participation mechanisms and methodologies that involve all stakeholders of the AI ecosystem. This is in addition to an institution specifically dedicated to AI, which requires development in all areas covered by the Index.

In terms of international AI governance (100 points), Brazil participates actively in international organizations, along with AI standard-setting bodies such as ISO, achieving the highest score in the region. In the regulatory area (88.13 points), the country has a high development in all areas and, among them, Risk Mitigation (100 points), with more than 50 points above the region. Also in the regulatory development in Cybersecurity, it presents the highest level in the region. The area of Ethics and Sustainability is 57 points above the region in Data Protection and Privacy and stands out in the area of Security, Accuracy and Reliability with the highest score, with more than 80 points above the average. However, in the area of Sustainability (71.60 points) it faces the challenge of working in this area, as it is slightly below the regional average, showing the need to face the challenges that arise in this area.

Immigration and Talent Drain in AI

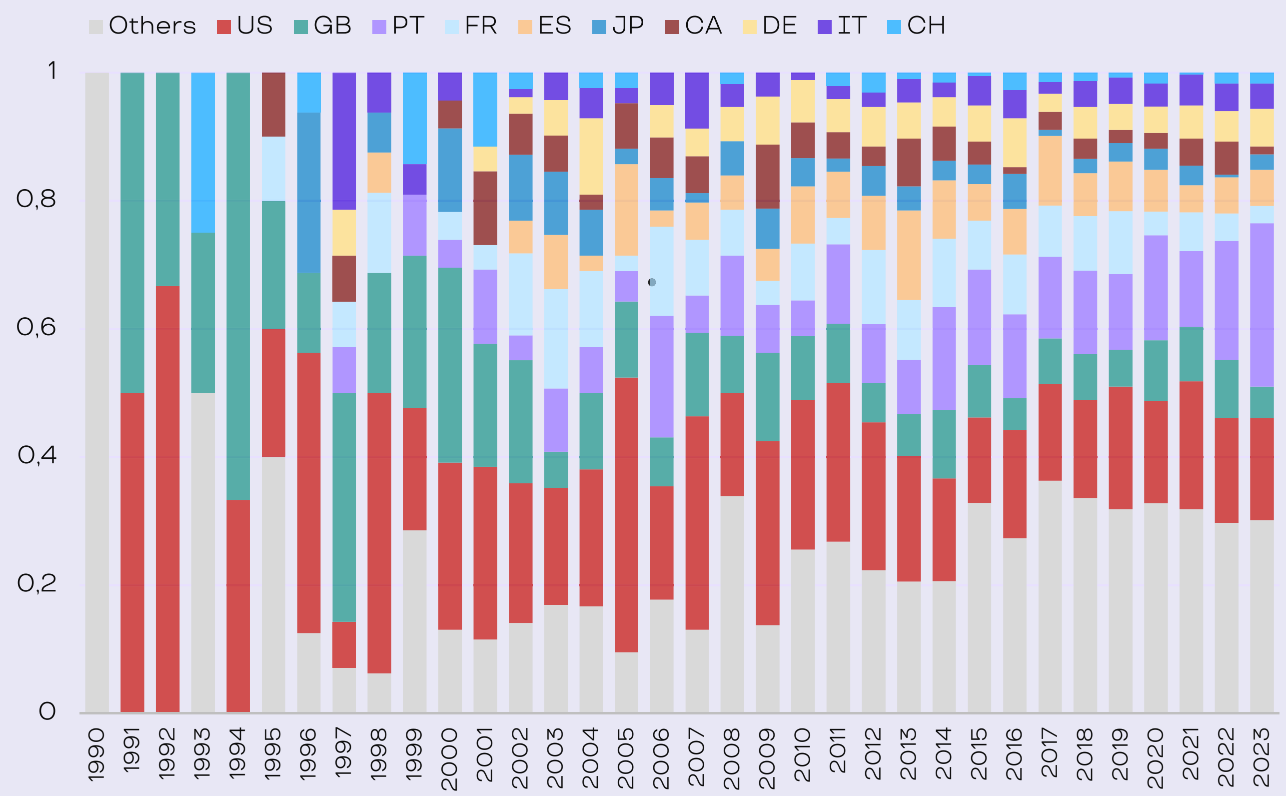
The analysis of talent migration shows that the trends observed in 2023 continue. The exchange with the United States remains significant, probably due to the establishment of long-term international collaborations. The United Kingdom also plays a relevant role in this flow, but with a clear decrease in relative importance, and Portugal, driven by language affinity, has significantly increased its relevance as a source of authors, especially in the last decade. It is worth noting that the volume of authors coming from Portugal far exceeds the number of those going to that country, which positions Brazil as a net attractor of talent.

At the European level, Spain shows a lower proportion compared to the rest of the region, being less relevant than the United Kingdom or Portugal. However, the flows of authors from Canada, Germany, Italy and Chile are relatively lower, indicating a lower participation of these countries in Brazilian academic production in the area of AI.

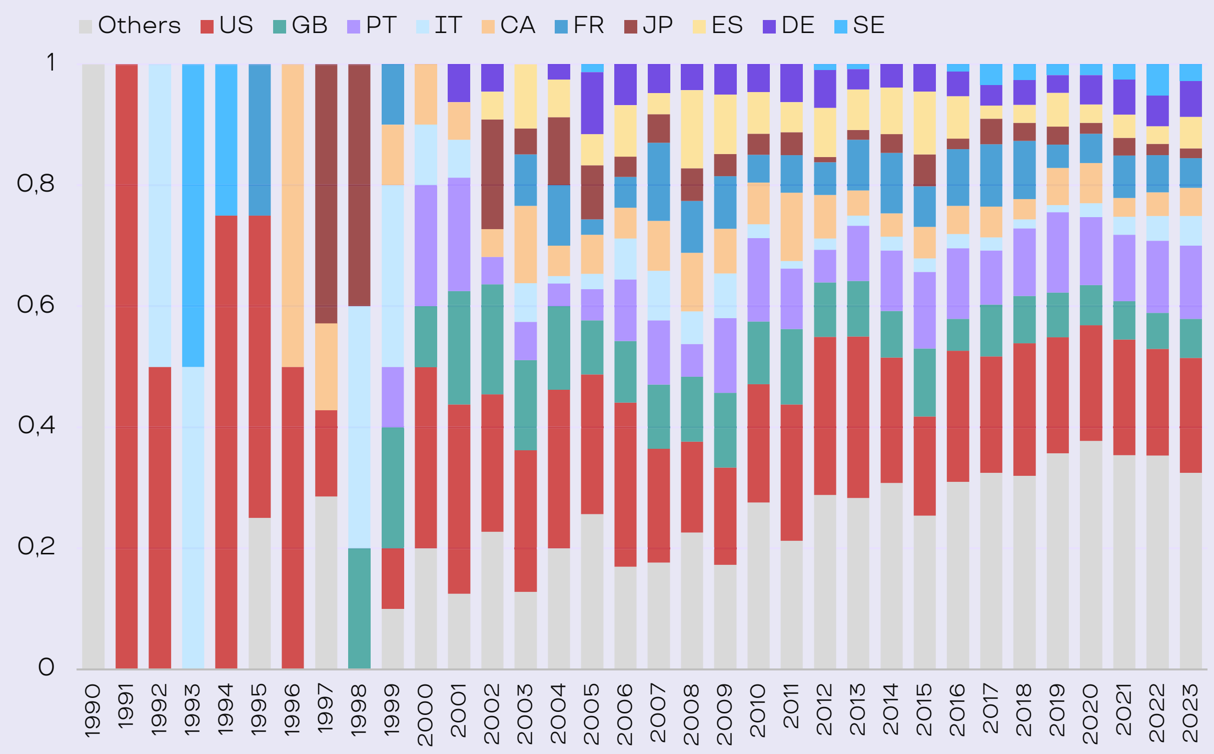
A striking aspect given the global growth of China in scientific research, is the absence of this power as the origin or destination of authors publishing in Brazil, which follows the trend of 2023.

In terms of migration patterns, it is observed that the inflows and outflows of authors present a notorious symmetry: most of the authors arriving in Brazil come from the same countries to which Brazilians have previously migrated. This cycle of academic exchange seems to repeat itself in periods of approximately four years, consolidating collaborative relationships between countries that already have a history of academic interaction in the area.

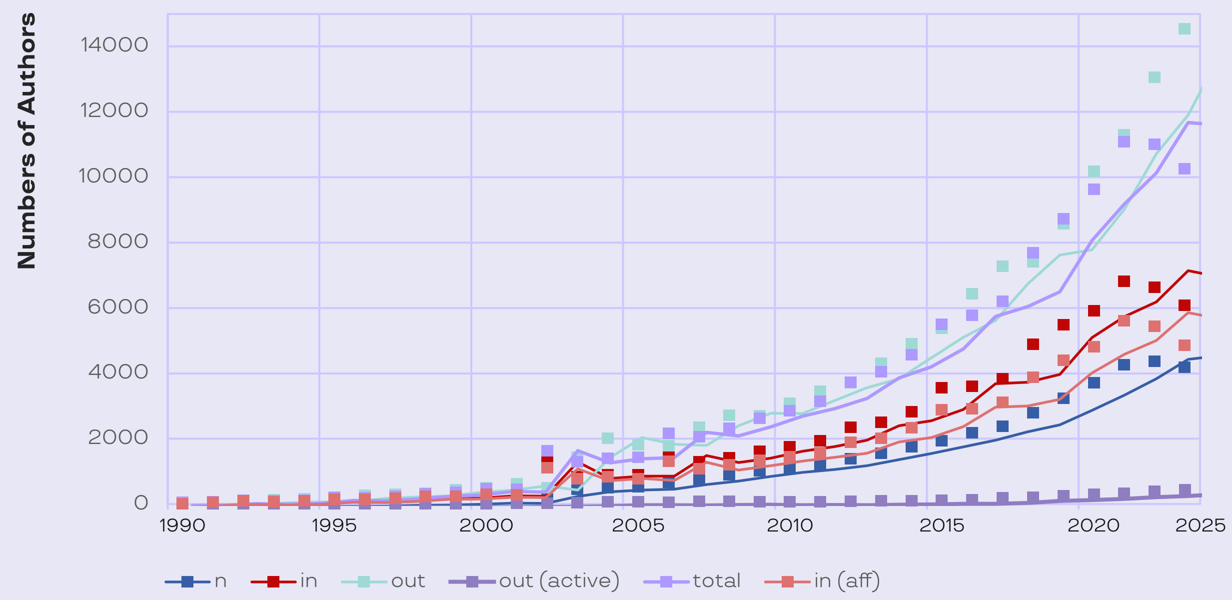
Graph 2: Where Do Authors Who Publish in Brazil Come From?



Graph 3: Where Do Authors Who Published in Brazil Go?

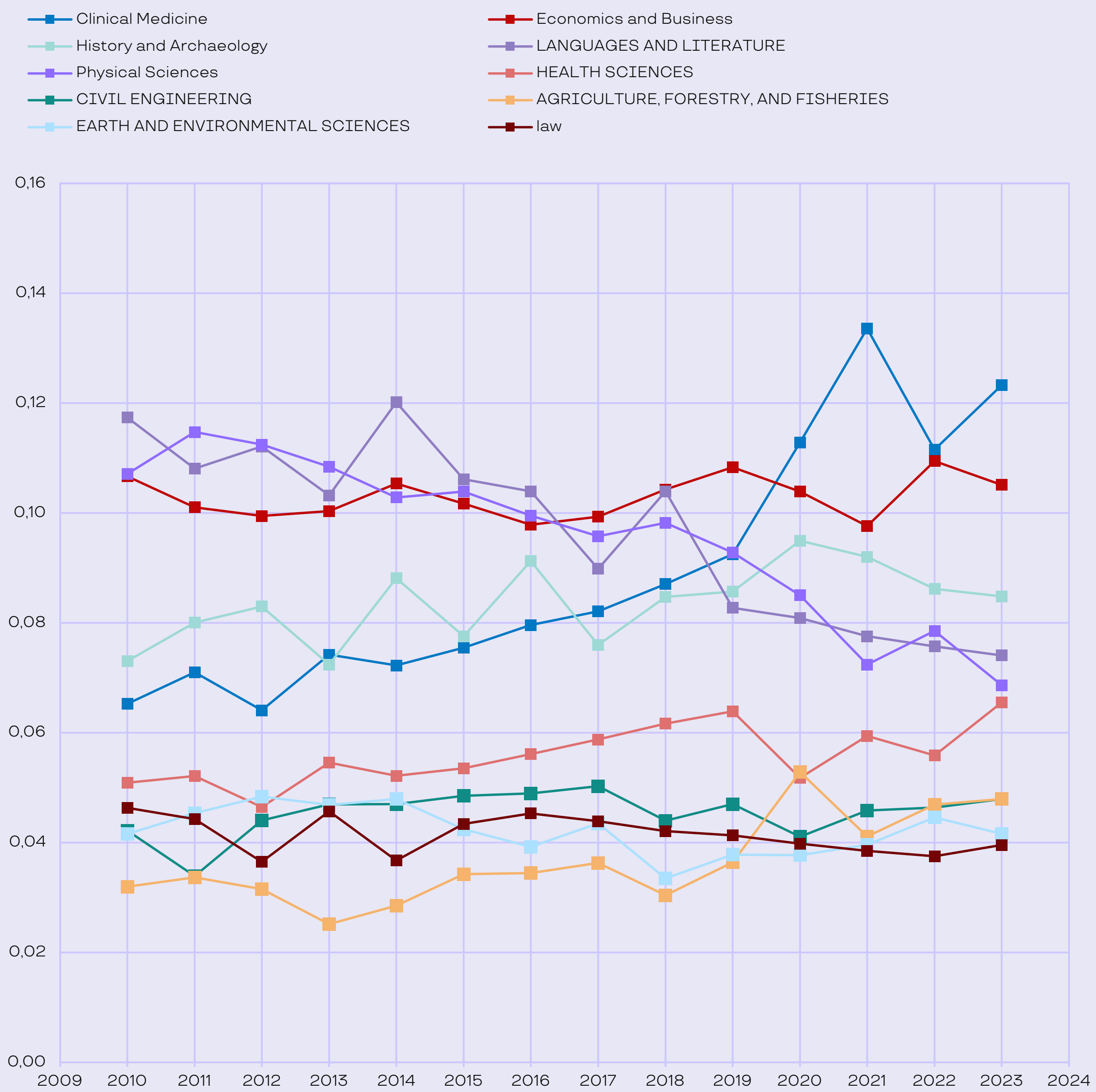


Graph 4: Talent Drain



Graph 4 shows a smoothing of the fall in productivity and incorporation of authors as a result of the pandemic, although unlike other countries such as Argentina, there is no evidence of reaching the pre-pandemic level in the line of active authors in the country (n, blue). Another anomalous phenomenon is the growth, albeit marginal but persistent, in the volume of authors publishing outside Brazil (out active, red). The total number of authors (10,000 app), between new (6,000 app), active and consistent (4,000 app) shows a drop in the last two years, in line with the consistent growth of those who have published only once in the field. This can be explained by the analysis of the composition of multidisciplinary research, which is explored in Graph 5.

Graph 5: Number of Publications in the Top 10 OECD Disciplines in Brazil



As shown in Graph 5, Clinical Medicine in Brazil has experienced sustained growth since 2010, consolidating its position as one of the main OECD disciplines using AI. Its peak was reached in 2021, probably driven by the COVID-19 pandemic and representing 13% of total publications.

Although there was a slight decline in 2022, in 2023 Clinical Medicine again stood out as the most frequent discipline linked to AI, concentrating 12% of the publications. Economics and Business, which reached 11%, has maintained a consistent relative importance over the last 15 years. On the other hand, both Languages and Literature and Physical Sciences show a significant and permanent decrease in relative importance in the period under analysis, going from 12% to about 7%. Probably, as in Chile or Argentina, this drop is due to the fact that other disciplines (such as Health) have increased their importance more rapidly, so it does not reflect a loss of relative interest, but rather the extent of a plateau.

Dimension	Subdimension	Indicator	Brazil	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	71,73	57,12	3
		Computation	37,65	21,76	4
		Devices	57,49	36,47	3
	Infrastructure Score		59,65	43,12	3
	Data	Data Barometer	53,64	35,76	1
	Data Score		53,64	35,76	1
	Human Talent	AI Literacy	68,23	57,9	3
		Professional Training in AI	40,81	43,49	10
		Advanced Human Talent	4,05	11,69	12
	Human Talent Score		40,75	39,71	8
	ENABLING FACTORS TOTAL SCORE		52,48	40,26	3
Research, Development and Adoption (R&D+A)	Research	Research	65,7	41,43	2
	Research Score		65,7	41,43	2
	I+D	Innovation	65,37	31,57	2
		Development	40,32	20,93	4
	R&D Score		86,03	42,53	1
	Adoption	Industry	83,78	54,29	2
		Government	100	69,65	1
	Adoption Score		90,27	60,44	2
	R&D+A TOTAL SCORE		79,17	47,46	1
Governance	Vision and Institutionality	AI Strategy	100	33,33	1
		Society's Involvement	37,5	19,08	5
		Institutionality	50	21,05	4
	Vision and Institutionality Score		71,88	26,7	4
	International Linkage	Standard Definition Participation	100	13,16	1
		International Organizations Participation	100	92,11	2
	International Linkage Score		100	52,63	1
	Regulation	Regulation on AI	100	47,37	2
		Cybersecurity	100	49,85	1
		Ethics and Sustainability	76,27	41,71	1
	Regulation Score		88,13	45,28	1
	GOVERNANCE TOTAL SCORE		82,38	37,46	2
ILIA 2024 TOTAL SCORE			69,3	42,08	2

CHILE

General Description
Population to 2023: **19.629.000**
2023 GDP per capita: **17.093,20 USD**
% of GDP Allocated to R&D: **0,34%**
Human Development Index (HDI): **0,860**

Category: **Pioneer**

Score: **73,07**

Position: **1**

	2023	2024
ILIA Total Score	**72,67**	**73,07 •**
Position in Index	1	1
Infrastructure Score	71,32	67,19
Data Score	48,32	48,32
Human Talent Score	71,49	74,3
Enabling Factors Score	63,71	64,6
Enabling Factors Position	1	1
Research Score	97,34	76,85
Innovation and Development Score	41,93	75,6
Adoption Score	84,11	72,66
Research, Development and Adoption Score	74,46	75,21
R&D+A Position	2	2
Vision and Institutionality Score	89,48	100
International Linkage Score	75	50
Regulation Score	75	78,73
Governance Score	79,83	83,62
Governance Position	2	1

General Overview

Chile shows a similar performance to the previous version of the ILIA, rising from 72.67 to 73.07 points. This increase has allowed the position in the index to remain in first place. However, the individual areas show a mixed performance.

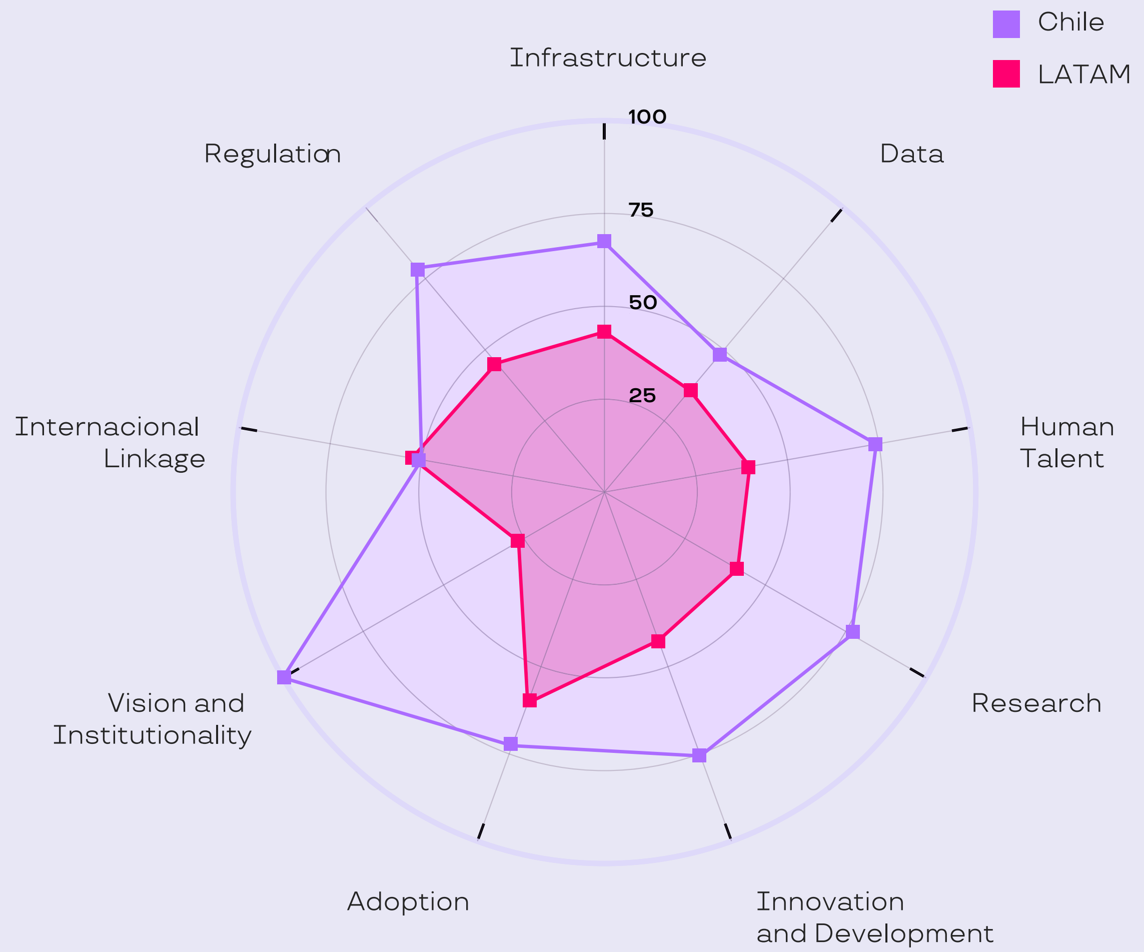
The Enabling Factors dimension increases slightly from 63.71 to 64.60, consolidating its position in first place in both editions of the index. Research, Development and Adoption shows a moderate increase, with a score of 74.46 in 2023 and 75.21 in 2024. Despite this increase, the position in this category remains in second place.

With regard to Governance, there was a significant improvement in the score, from 79.83 to 83.62, allowing the country to move up from second to first place in this dimension.

The Innovation and Development dimension experiences a significant increase from **41.93 to 75.60.** However, the Adoption subdimension shows a drop in score from 84.11 in 2023 to 72.66 in 2024, indicating challenges in AI implementation at the practical level.

Finally, in the dimension of Governance, **Vision and Institutionality** it reaches the **maximum score in 2024 with 100 points** which, compared to **89.48 in 2023**, consolidates a clear strategic framework for the development of AI. Meanwhile, the International Linkage score decreases considerably for Chile, dropping from 75 to 50 points. In Regulation, an improvement is observed, rising from 75.00 to 78.73, which reinforces the regulatory environment necessary for the advancement of AI.

Graph 1: Chile and LATAM Subdimensions



General findings

In Infrastructure (67.19 points), Chile is more than 24 points above the regional average, with the Connectivity indicator standing out with more than 30 points above the average score (87.55). Within this category, subindicators such as Population that Uses AI (90.68%), with 15 points above the average; proportion of Households With Internet Access (91.86 points), with 30 points above the regional level; Average Mobile Download Speed (52.05 Mbps) and in Average Fixed Broadband Download Speed (93.24 Mbps), with levels highly above the average; and 5G Implementation (100), one of the most relevant elements to explain the gap with other countries and whose public policy proposal was included as a success case in this year's analysis.

Fixed Broadband Subscriptions per 100 people reach 65.04, well above the average, while mobile broadband subscriptions reach 94.02 per 100 people. On the other hand, the Basic Fixed Broadband Basket represents 98.43% of GNI per capita, exceeding the average of the region by more than 25 points.

In terms of Devices (49.41 points), the country is more than 12 points above the regional average. While the level of Households With a Computer (58.98 points) is 30 points above the average, Smartphone Affordability is 25 points above the average. However, the level of IPv6 Adoption (31.54 points) is five points below the regional average.

In terms of Computing (44.26 points), Chile has a Cloud score (42.5 points) almost 10 points above the regional average, but relatively weak when compared to the rest of the indicators of the dimension. It is worth mentioning that the country has a scarce HPC Infrastructure Capacity, probably the weakest element of the measurement but on the other hand it reaches 29.50 points in Certified Data Center, exceeding the average by more than 10 points. As for IXP, this subindicator exceeds the regional average, registering 37.11 points, and in Secure Internet Servers per million inhabitants it shows the maximum score.

The pioneering character of Chile's AI ecosystem is evident in the high level of Human Talent (74.30 points), above the regional average by almost 35 points. In AI Literacy (84.62 points), the country leads the region, with a top score in Early Education in Science and Early Education in AI, driven by good relative results in international standardized tests (PISA). And although it exceeds the average by five points in English Proficiency (53.87 points), it evidences a challenge in this subindicator. In the AI Professional Training (65.80 points) area, the Andean country has AI Skills Penetration levels four times above average (80 points), and has a high level of STEM Graduates when compared to the regional level.

In terms of Advanced Human Talent (69.67 points), this country has the highest levels in the region, with graduate programs in IA, including a significant number of internationally competitive master's and PhD programs (included in the QS ranking) and in relation to the volume of the country.

In the area of Research, Development and Adoption (75.21 points), the country shows a robust ecosystem, with a distance of more than 30 points from the regional average and with multiple variables that have a maximum score.

In Research (76.85 points), for example, Chile exceeds the regional average by more than 30 points, showing a maximum score in the subindicators of AI Publications, Active Researchers and Consistent AI Research. However, in the area of Proportion of Female Researchers in AI (54.91 points), Chile is below the average, showing a gap that, despite various instruments to promote female participation in STEM, is among the highest in the region.

A striking element is that while the subindicators of Productivity per Author and Impact of AI Research are close to the average for the region, Participation in Main Tracks and Side Events reaches maximum scores. This reflects that the local academic community is highly competitive at the global level, standing out in publications and conferences of international excellence. In addition to this, the leadership in AI Publications and active and Consistent Researchers denote that Chile's ecosystem is the most mature in the region in terms of AI.

The fact that Chile achieves the highest score in terms of private investment and the creation of AI Companies has an impact on the score achieved by the Innovation indicator (67.64 points) at the regional level. This is in spite of the six points below the average in the Unicorn Companies subindicator (4.43 points) and the fact that Research and Development Expenditure as a Proportion of GDP (25.56 points) is slightly below the regional average, which is a pending challenge for all development and research disciplines in the country. Application Development (82.26 points) and Entrepreneurial Environment (60.53 points) reflect a certain dynamism in the entrepreneurship and startup ecosystem.

In terms of Development (15.11 points), it registers levels four points below the average. This is explained by low levels of Open Source Productivity (11.34 points) and Open Source Quality which, although it exceeds the regional average by three points (20.72 points), shows room for improvement and growth. In turn, the country has a low level in Number of Patents (13.28 points), eight points below the regional average. Probably this indicator, together with the Enabling Factors Computation, reflect the country's most pressing pending challenges if it wants to maintain regional leadership in the medium term.

In terms of AI Adoption, the country is above average in the Industry indicator. This is because, although it does not have a high level of Workers in the High-Tech Sector and in Medium and High-Tech Manufacturing -whose scores are similar to the regional average- in the subindicator of Share of Medium and High-Tech Manufacturing Value-Added in total Value-Added it reaches almost the maximum with 98.71%, 34 percentage points above the average. In reference to the adoption of high technologies by the State, the Digital Government subindicator shows a very high score (92.37 points), with more than twenty points above the region. Within the region, Chile is a country with a very high level of IA Governance (83.62 points). This is because it has an IA Strategy (100 points), ranging from an institutional framework responsible for carrying it forward, to evaluation mechanisms and other variables responsible for keeping the strategy in force. In terms of social involvement (100 points), there are participation mechanisms and methodologies that involve stakeholders. In addition, there is an institution specifically dedicated to IA.

Regarding International Linkage (50 points), although the Andean country participates actively in international organizations, it does not participate in AI standards definition bodies such as ISO.

Finally, in regulatory terms, Chile shows a score of 78.73. This is 30 points higher than the regional average, which is due to advanced development in the various areas considered by the index. These include Risk Mitigation (100 points), which registers more than 50 points above the region, and regulatory development in Cybersecurity (71.27 points), which also represents high levels. Meanwhile, the elements that the Ethics and Sustainability indicator, records a score slightly below the regional average (73.99 points), thus evidencing the need to address the challenges that arise in this area.

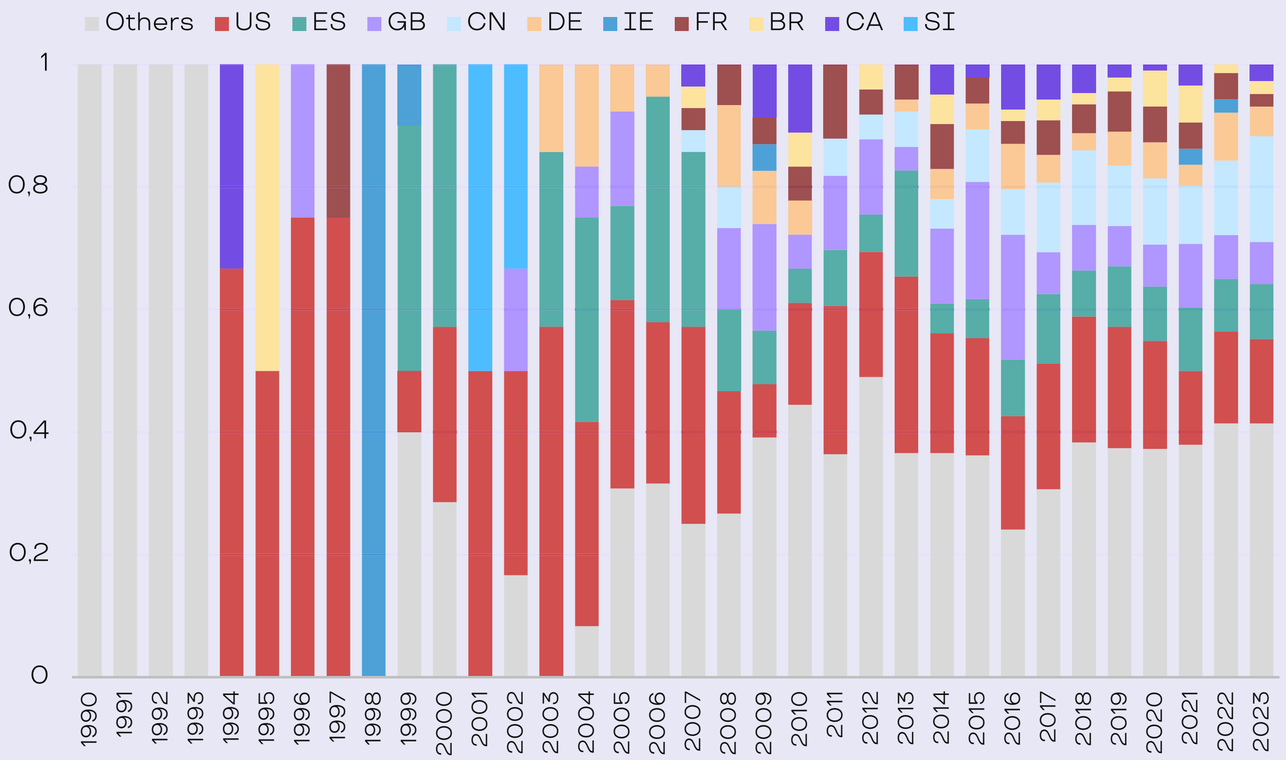
Immigration and Talent Drain in AI

The analysis of the migration of human talent in Chile reveals a continuity in the trends observed in the previous year of study. This flow of talent stands out in both incoming and outgoing authors, although with a peculiarity: while the proportion of authors arriving from Spain is greater than that of those leaving for that country, the opposite occurs with the United States, where more Chilean authors emigrate than arrive from there.

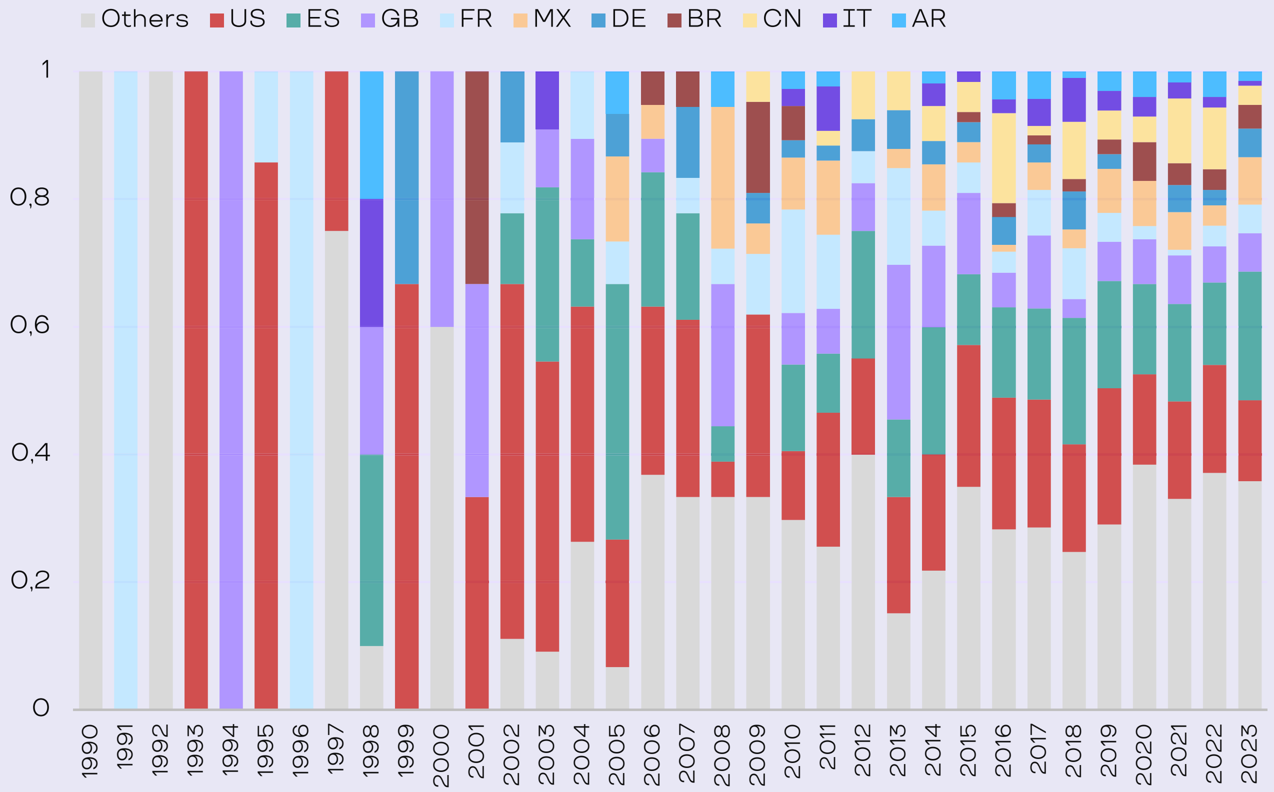
According to the graphs, it can be seen that most of the authors who emigrate return to the country, with symmetrical patterns in time periods of two to three years, except for the cases mentioned above and China, a nation to which there is evidence of a constant and accelerated growth of migration, as well as a relevant retention of advanced human capital there. In 2023, about 17% of the authors who emigrated did so to that destination, while only 5% of those who returned or entered were from China.

Another element to consider is the relatively low relevance of the countries of the region in the inflows and outflows of talent. Only Brazil appears in the top 10 of outflows, while Argentina and Mexico also figure with some importance in the top 10 of countries from which AI authors arrive, which is consistent with the growing maturity of the ecosystem and the consequent opening of opportunities for research at the local level compared to other countries in the region.

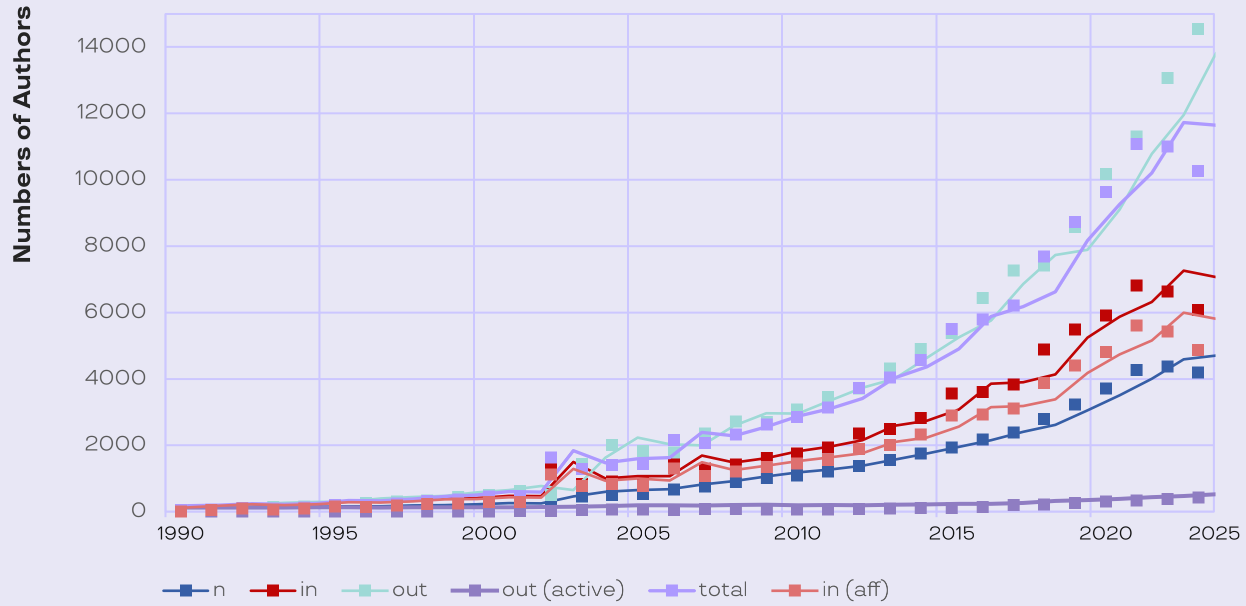
Graph 2: Where Do Authors Who Publish in Chile Come From?



Graph 3: Where Do Authors Who Published in Chile Go?

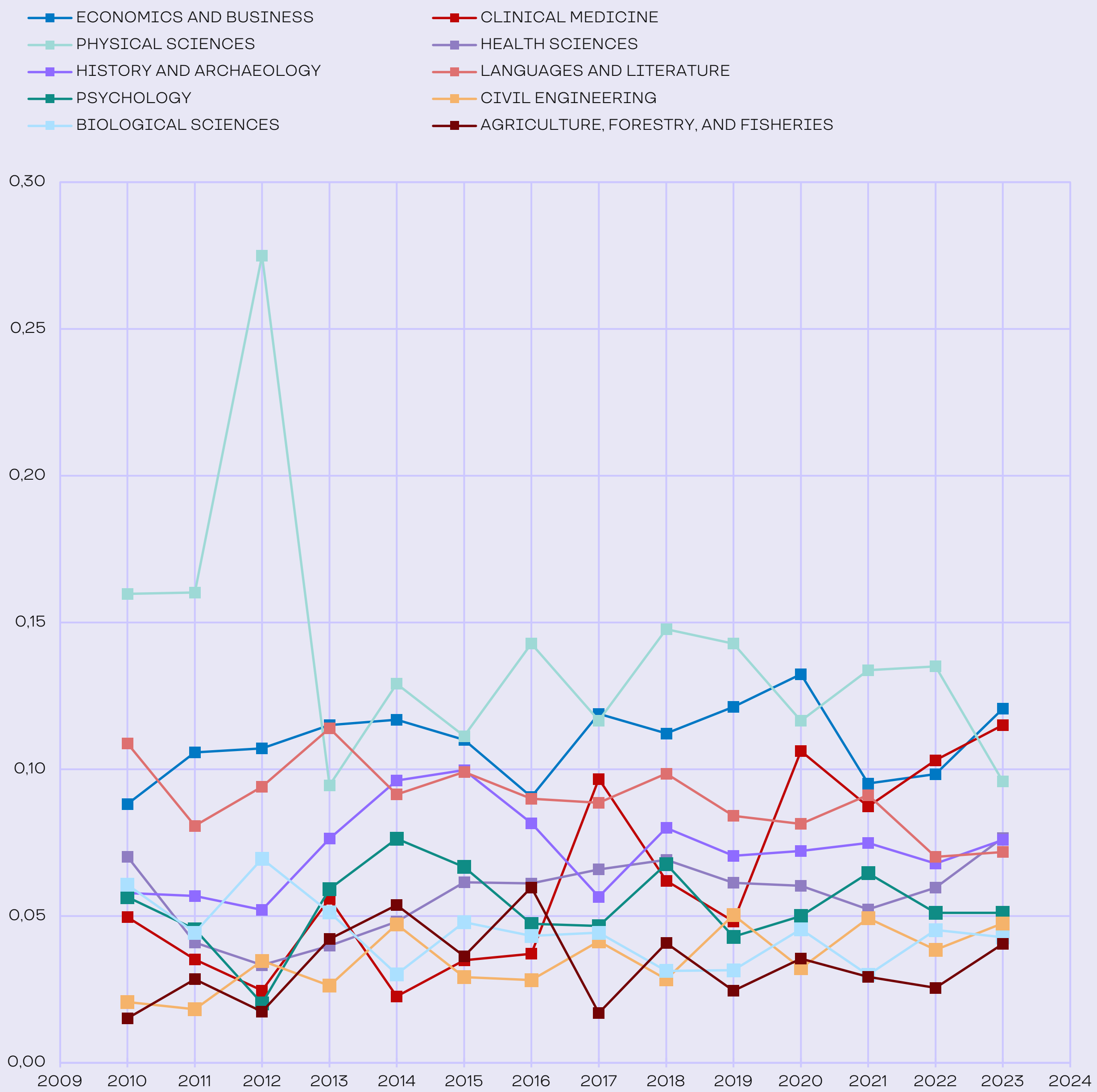


Graph 4: Talent Drain



When analyzing the phenomenon of brain drain in detail (Graph 4), the first thing that can be observed is a change in the downward trend evidenced in 2022, as a result of the pandemic. The total number of authors in the country publishing in 2023 (1402) is close to the number of authors who published only once in IA (1456) more than in other countries in the region, which reflects a strengthening of the academic community. This strengthening is not only among those who publish consistently (n, blue line), but also among those who publish permanently outside the country (red, out active). In addition, the growth of the local community is consistent and exceeds the pre-pandemic volume.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Chile



In the case of Chile, **Graph 5** shows a peak in the Physical Sciences in 2012, referring to the relative use of AI for research. In contrast, Clinical Medicine has shown a steady and remarkable growth in its linkage with AI since 2014, reaching 11.5% of publications in 2023, which positioned it as one of the most dynamic areas. This growth has been surpassed only by the field of Economics and Business, which has maintained a stable leadership and cu-rrently represents 12% of publications, reflecting a growing interest in the integration of AI in economic analysis and decision making.

Both cases show clear trends in the evolution of scientific disciplines in Chile, with a change in the priority areas for applied research in the context of AI.

Dimension	Subdimension	Indicator	Chile	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	87,55	57,12	1
		Computation	44,26	21,76	1
		Devices	49,41	36,47	4
	Infrastructure Score		67,19	43,12	1
	Data	Data Barometer	48,32	35,76	5
	Data Score		48,32	35,76	5
	Human Talent	AI Literacy	84,62	57,9	1
		Professional Training in AI	65,8	43,49	2
		Advanced Human Talent	69,04	11,69	1
	Human Talent Score		74,3	39,71	1
	ENABLING FACTORS TOTAL SCORE		64,6	40,26	1
Research, Development and Adoption (R&D+A)	Research	Research	76,85	41,43	1
	Research Score		76,85	41,43	1
	I+D	Innovation	67,54	31,57	1
		Development	15,11	20,93	9
	R&D Score		75,6	42,53	3
	Adoption	Industry	59,52	54,29	6
		Government	92,37	69,65	2
	Adoption Score		72,66	60,44	4
	R&D+A TOTAL SCORE		75,21	47,46	2
Governance	Vision and Institutionality	AI Strategy	100	33,33	2
		Society's Involvement	100	19,08	1
		Institutionality	100	21,05	1
	Vision and Institutionality Score		100	26,7	1
	International Linkage	Standard Definition Participation	0	13,16	6
		International Organizations Participation	100	92,11	3
	International Linkage Score		50	52,63	5
	Regulation	Regulation on AI	100	47,37	3
		Cybersecurity	71,25	49,85	5
		Ethics and Sustainability	74,7	41,71	2
	Regulation Score		78,73	45,28	2
	GOVERNANCE TOTAL SCORE		83,62	37,46	1
ILIA 2024 TOTAL SCORE			73,07	42,08	1

COLOMBIA

General Description
Population to 2023: **52.085.000**
2023 GDP per capita: **USD 6.979,70**
% of GDP Allocated to R&D: **0,29%**
Human Development Index (HDI): **0,758**

Category: **Adopter**

Score: **52,64**

Position: **5●**

	2023	2024
ILIA Total Score	**47,62**	**52,64 ●**
Position in Index	6	5↑
Infrastructure Score	55,45	41,32
Data Score	51,74	51,74
Human Talent Score	46,66	43,1
Enabling Factors Score	51,28	44,46
Enabling Factors Position	4	7
Research Score	60,06	56,57
Innovation and Development Score	14	36,27
Adoption Score	31,06	71,2
Research, Development and Adoption Score	35,04	54,87
R&D+A Position	7	6
Vision and Institutionality Score	44,64	67,71
International Linkage Score	75	50
Regulation Score	100	62,55
Governance Score	73,21	62,62
Governance Position	4	6

General Overview

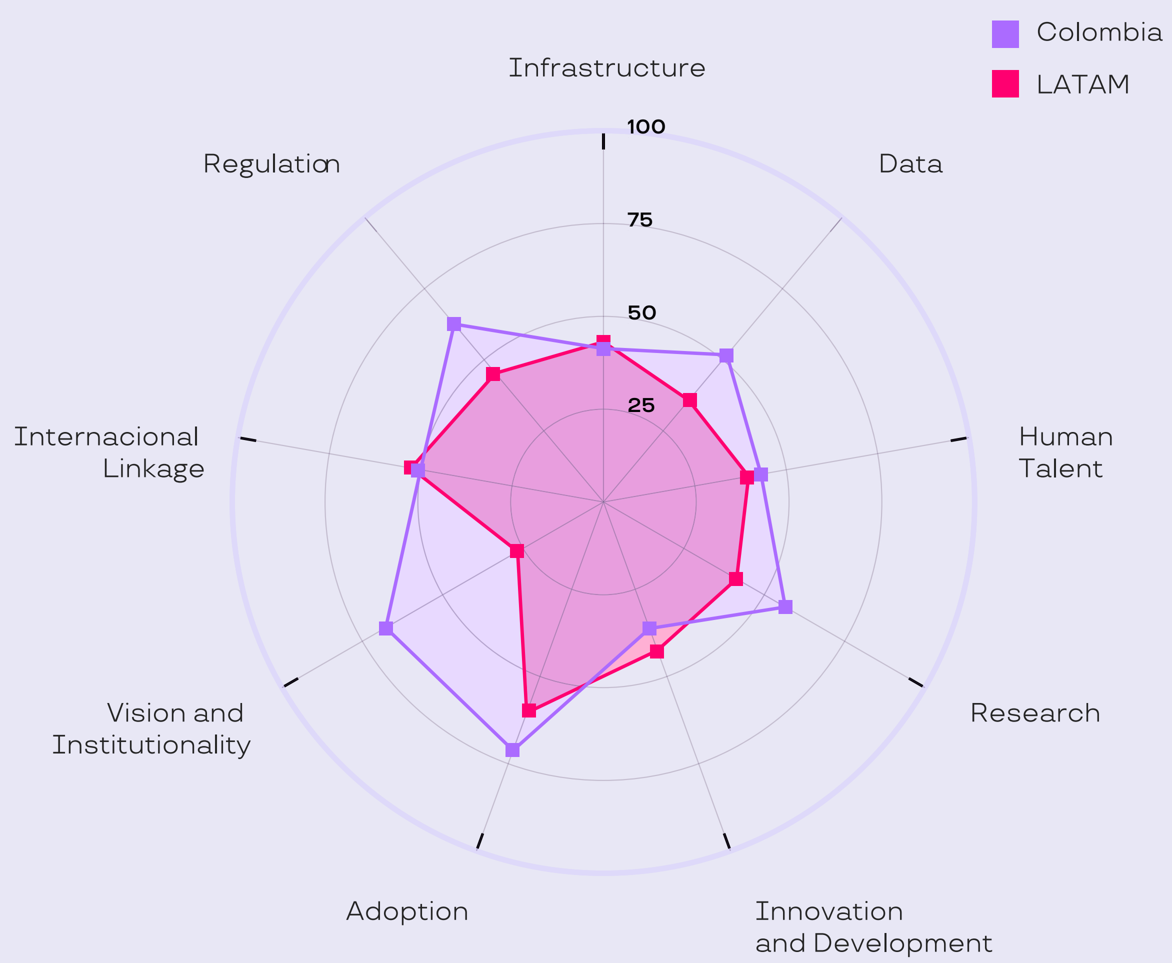
Colombia outperforms compared to 2023 in the ILIA. Its overall score increases moderately, moving up one place in relative position within the region and reaching fifth place.

The Infrastructure subdimension registers a drop of six points in the ILIA 2024 compared to last year's report. The Data subdimension does not vary, but is above the regional average, while the Human Talent subdimension shows a slight drop.

Meanwhile, the R&D+A dimension presented the greatest increases in relation to the previous edition, specifically in the R&D subdimension (up 22 points) and the Adoption subdimension (up 40 points), remaining above the regional average.

In terms of Governance, the presence of a national strategy is maintained, while in the incorporation and verification of subscription to international agreements there is a decrease with respect to the last measurement, registering 50 points in the subdimension of International Linkage. Regarding Regulation, the score of 62.55 shows a decrease throughout the region due to the incorporation of new indicators.

Graph 1: Colombia and LATAM Subdimensions



General Findings

In terms of infrastructure, Colombia is slightly below the regional average. It has a high level of Active Mobile Broadband Subscriptions -which however is on average 12 Mbps slower than the regional average- and progress in 5G coverage is close to zero. It has a very high mobile network coverage (100 points) and a Basic Fixed Broadband Basket subindicator that represents 80.73% of GNI per capita.

In terms of Computing (16.33 points), it registers a lower level than the regional average, close to countries such as Chile, and a subindicator such as Cloud that registers a similar score to the region and slightly above the average in terms of HPC Infrastructure Capacity. It presents the challenge of developing certified data centers, IXP and Secure Internet Servers, which have low scores in this country.

The Devices indicator has a lower score than the average, with a slightly higher than average number of Households With Computers and IPv6 Adoption. Colombia faces the challenge of facilitating the Smartphones Affordability, a key enabler for the massive use of AI solutions on a daily basis.

In the area of Human Talent, the country shows potential for improvement in the area of AI Literacy: while Early Science Education is below average, the nation evidences strengths in English Proficiency. In Professional Training in AI, Colombia stands out for its levels of AI Skill Penetration and high level of STEM Graduates. In terms of Advanced Human Talent, it is below the regional average, because although it has accredited AI master's programs and AI master's programs in QS-ranked universities, it lacks doctoral programs in AI with these characteristics.

In Research, Development and Adoption (54.87 points), Colombia exceeds the regional average, standing out in the area of Research, with subindicators such as Publications in AI that exceed the regional average by 20 points (52.34 points) and with a fairly robust ecosystem of researchers specialized in AI, aspects such as the Proportion of Female Researchers who are authors in AI (68.23 points) is 10 points higher than the regional average, and Participation in Main Tracks of relevant conferences in the field of AI is 13 points above the regional average but with a relatively lower volume than in other countries. The challenges for this country are in terms of Productivity and Impact in AI Research.

The same is true in the area of R&D. In innovation, the country stands out in terms of private investment in this area, while spending on Research and Revelopment as a Proportion of GDP (20.81 points) is below the regional average, as are AI Companies. And although it has Unicorn Companies (2.70 points), it is almost eight points below the average. In terms of Application Development, it shows a score of 66.96, eight points below the average.

Colombia has high levels in the area of Governance, among which Vision and Institutionality subdimension (67.71 points) stands out with more than 30 points more than the regional average. Within it the IA Strategy indicator is heterogeneous, because while several areas of this subdimension have the maximum score, the strategy Data subindicator is at zero. Despite this, the country has mechanisms for civil Society's Involvement, which, however, can still be further developed.

It is worth mentioning that while Colombia has a specialized institution in charge of projecting national IA policy, as far as international governance is concerned, it does not participate in standard-setting bodies such as ISO but engages fully in international committees.

In Regulation, it is positioned above average, registering maximum scores in Risk Mitigation and 65.69 in Cybersecurity, 15 points above average. And although the score is high in Ethics and Sustainability, it does present challenges with respect to the development of Security, Accuracy and Reliability (10.69 points), which is 10 points below average.

Immigration and Talent Drain in AI

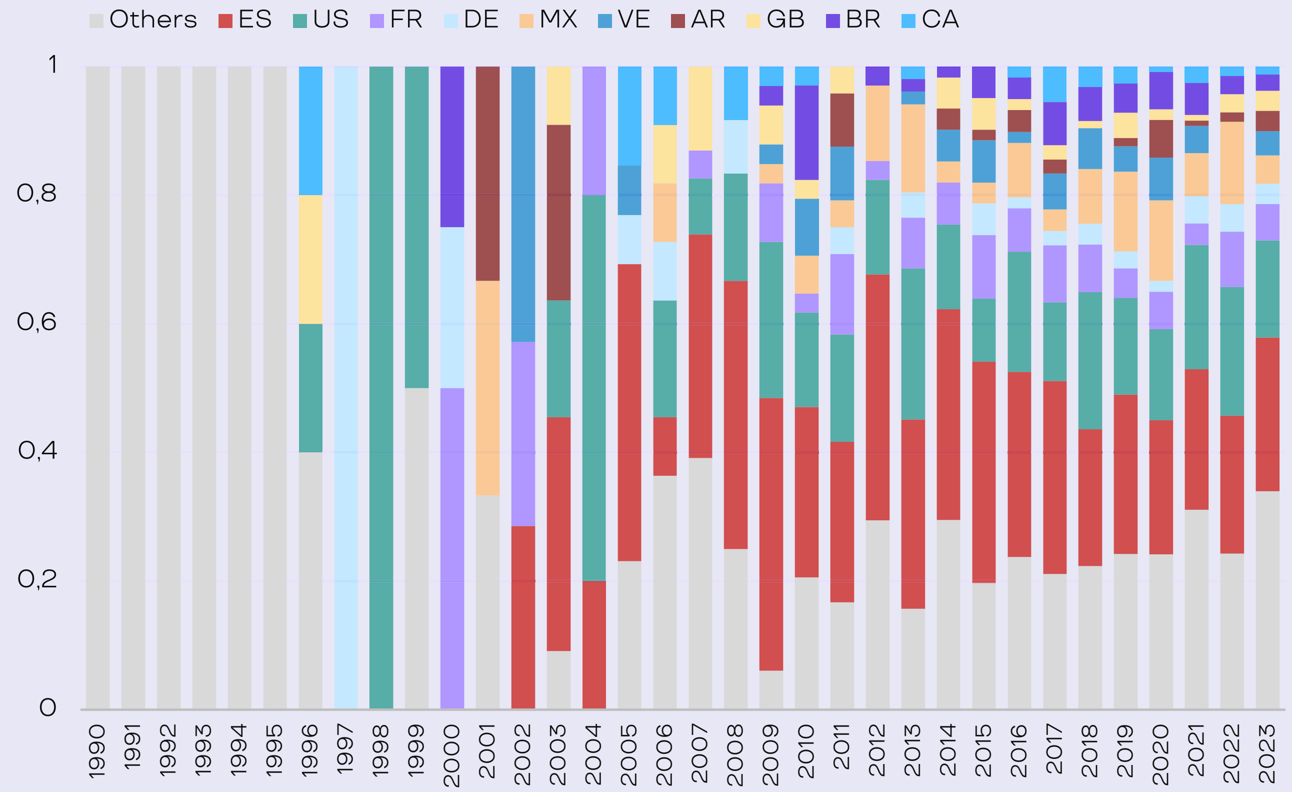
As in 2023, Spain continues to stand out as both the main destination and origin of authors publishing in Colombia, which is probably explained by the linguistic and cultural affinities between the two countries. The United States occupies second place in importance, although it should be noted that the relevance of these two countries has gradually decreased over time, giving way to a greater participation of European countries such as Mexico, Germany and France.

One aspect that is striking is the low relevance that China continues to have as an origin or destination for authors publishing in Colombia, which contrasts with the growing prominence of the Asian giant in other countries in the region.

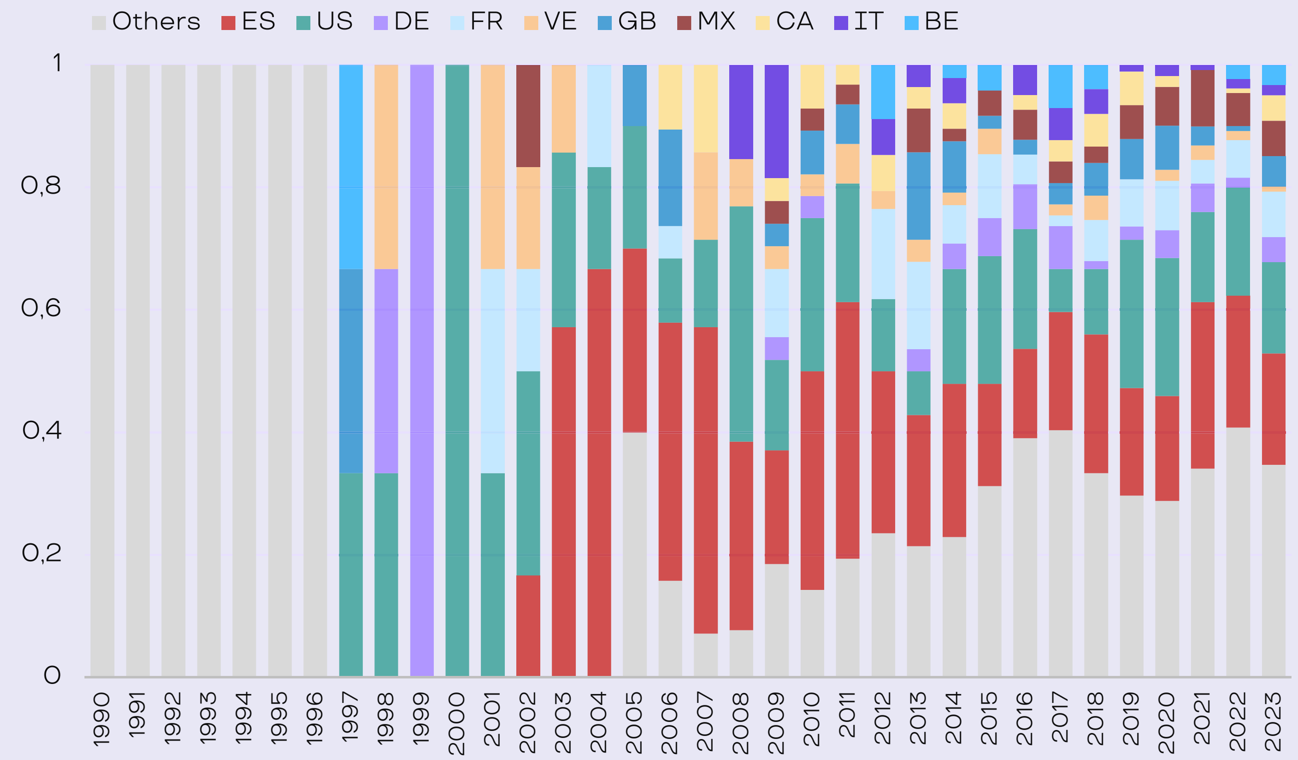
On the other hand, collaboration within Latin America continues to be crucial for Colombia with Mexico and Venezuela as prominent countries in both incoming and outgoing authors. This strengthening of intraregional ties reinforces the importance of academic collaborations within the continent.

The patterns of inflows and outflows show a clear symmetry indicating that the authors who publish in Colombia come, for the most part, from the same countries to which Colombian authors have previously emigrated. This cycle of academic exchange is similar to the pattern observed at the regional level.

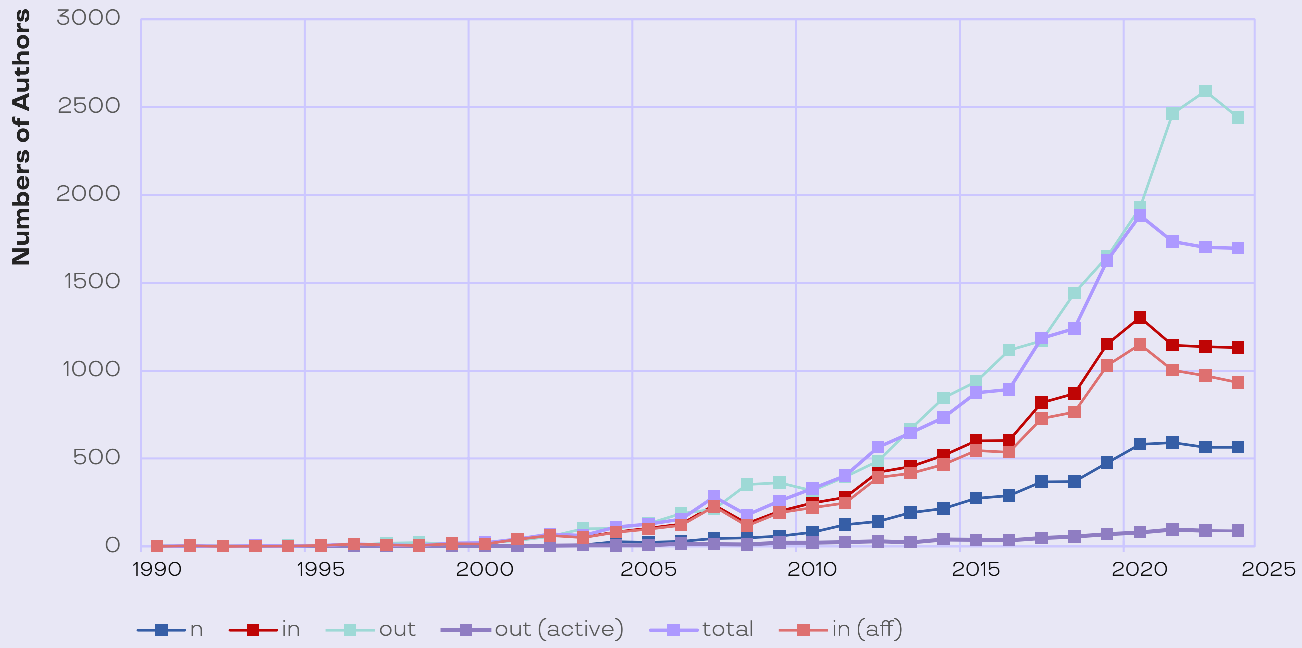
Graph 2: Where do Authors who Publish in Colombia Come From?



Graph 3: Where Do Authors Who Published in Colombia Go?



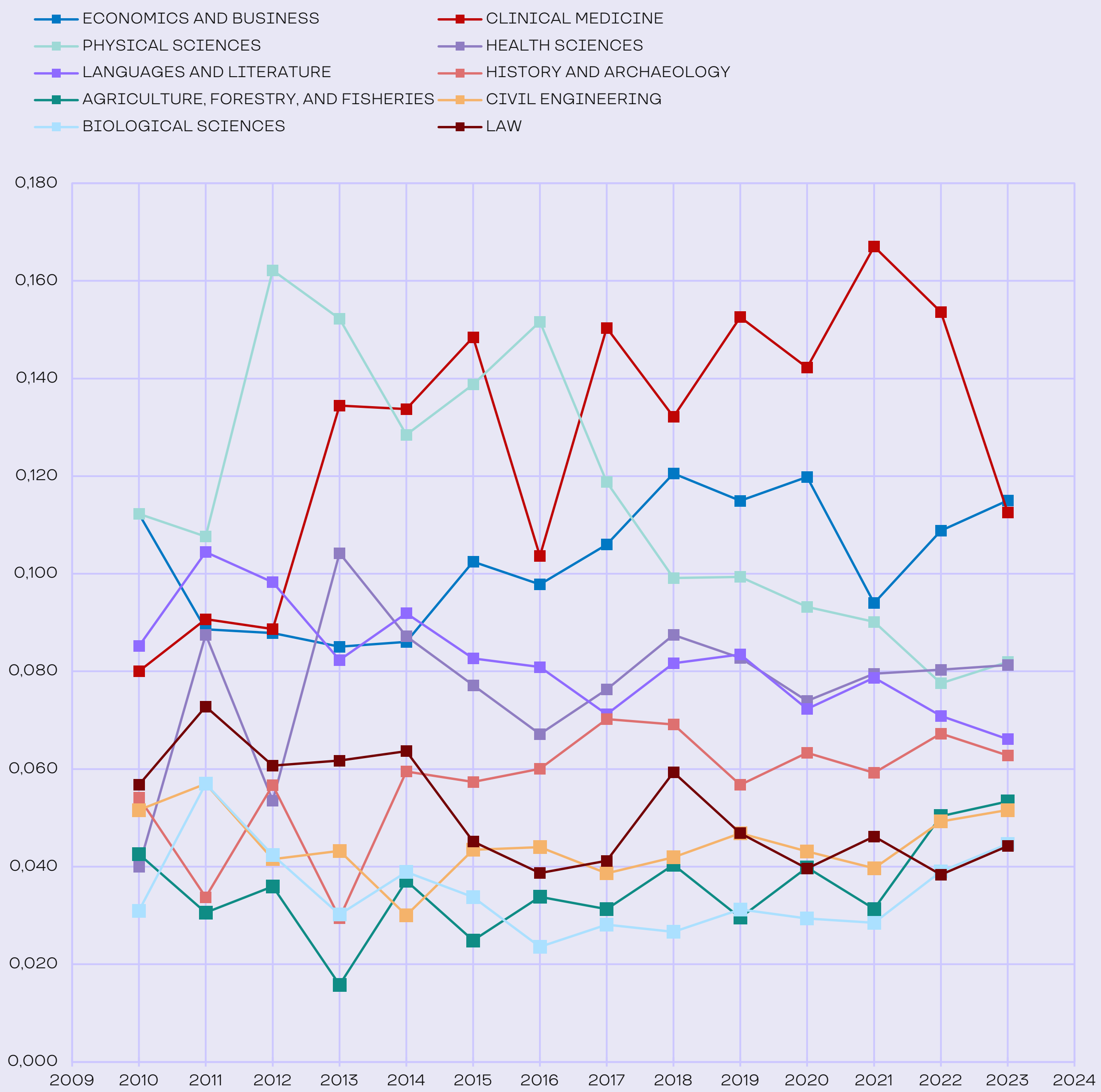
Graph 4: Talent Drain



Graph 4 shows a stabilization after the fall evidenced as a result of the pandemic, although the levels of entry of new researchers (brown and orange) have not yet recovered the dynamism they had prior to COVID 19.

The number of consistent researchers in the discipline is maintained (blue) in relation to the previous measurement at around 500 authors, while there is a slowdown in the volume of authors who use AI as a tool for other disciplines (green). It should be noted that the Colombian academic community that consistently publishes outside the country continues to be small and without significant growth, which indicates the strengthening of the local ecosystem.

Graph 5: Number of Publications in the Top 10 OECD Disciplines in Colombia



Graph 5 illustrates the steady growth in the use of AI in conjunction with Clinical Medicine. In 2021, it reached a peak of more than 17% relevance compared to other OECD concepts, reflecting the impact of AI in the advancement of medical research and the development of applied health technologies. However, in 2022 and 2023, there is a decrease in the relative importance of Clinical Medicine, although it still remains the second most relevant discipline in 2023, sharing the place with Economics and Business, which has also experienced a significant increase in its relationship with AI.

On the other hand, Physical Sciences and Languages and Literature show the most relevant drops in terms of relative AI usage, going from about 10% (Physical Sciences peaked at 17% in 2013) to 8% and 6% respectively.

Dimension	Subdimension	Indicator	Colombia	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	58,65	57,12	8
		Computation	16,33	21,76	12
		Devices	31,64	36,47	13
	Infrastructure Score		41,32	43,12	9
	Data	Data Barometer	51,74	35,76	2
	Data Score		51,74	35,76	2
	Human Talent	AI Literacy	59,07	57,9	10
		Professional Training in AI	55,71	43,49	6
		Advanced Human Talent	9,2	11,69	8
	Human Talent Score		43,1	39,71	7
	ENABLING FACTORS TOTAL SCORE		44,46	40,26	7
Research, Development and Adoption (R&D+A)	Research	Research	56,57	41,43	3
	Research Score		56,57	41,43	3
	I+D	Innovation	32,26	31,57	8
		Development	7,01	20,93	17
	R&D Score		36,27	42,53	10
	Adoption	Industry	63,5	54,29	4
		Government	82,75	69,65	8
	Adoption Score		71,2	60,44	5
	R&D+A TOTAL SCORE		54,87	47,46	6
Governance	Vision and Institutionality	AI Strategy	91,67	33,33	5
		Society's Involvement	37,5	19,08	6
		Institutionality	50	21,05	5
	Vision and Institutionality Score		67,71	26,7	6
	International Linkage	Standard Definition Participation	0	13,16	7
		International Organizations Participation	100	92,11	4
	International Linkage Score		50	52,63	6
	Regulation	Regulation on AI	100	47,37	4
		Cybersecurity	65,96	49,85	7
		Ethics and Sustainability	45,51	41,71	9
	Regulation Score		62,55	45,28	7
	GOVERNANCE TOTAL SCORE		62,62	37,46	6
ILIA 2024 TOTAL SCORE			52,64	42,08	5

COSTA RICA

General Description
Population to 2023: **5.212.000**
2023 GDP per capita: **USD 16.595,40**
% of GDP Allocated to R&D: **0,37%**
Human Development Index (HDI): **0,806**

Category: Adopter

Score: 43,63

Position: 9●

	2023	2024
ILIA Total Score	**33,41**	**43,63 ●**
Position in Index	8	9↑
Infrastructure Score	53,73	53,09
Data Score	30,52	30,52
Human Talent Score	30,87	46,99
Enabling Factors Score	38,37	45,62
Enabling Factors Position	8	6
Research Score	53,99	42,12
Innovation and Development Score	14,36	38,06
Adoption Score	42,28	64,9
Research, Development and Adoption Score	36,88	47,74
R&D+A Position	6	7
Vision and Institutionality Score	0	6,25
International Linkage Score	75	50
Regulation Score	50	71,91
Governance Score	41,67	34,7
Governance Position	7	9

General Overview

Although Costa Rica increased its overall score significantly this year (43.63), the relative position within the region is one place lower than last year, reaching ninth place.

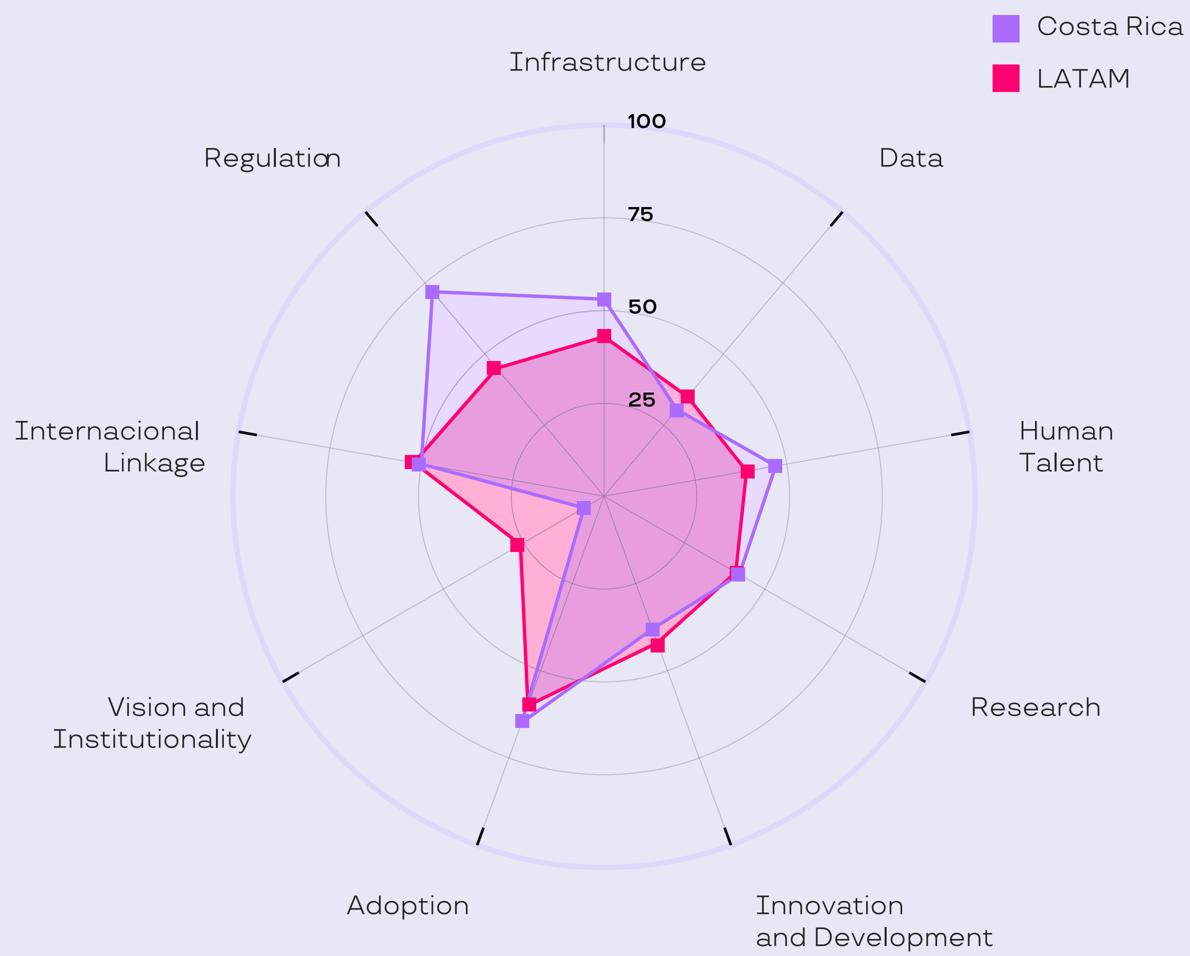
In the subdimensions of Infrastructure and Data, the result is similar to that recorded in the ILIA 2023, while in the Human Talent subdimension, a slight decrease is observed due to the incorporation of indicators associated with STEM degrees and the detection of ICT elements in the school curriculum. Despite this, it is above the regional average in the Enabling Factors dimension.

In the R&D+A dimension, higher scores are observed with respect to the previous edition, specifically in the R&D subdimension (up 26 points) and the Adoption subdimension (up 22 points). Meanwhile, in the Research subdimension, there is a notable drop of 11 points with respect to the 2023 results.

In the area of Governance, the absence of a national strategy or policy is maintained, but shows a moderate increase due to the Society's Involvement to articulate one. In the area of International Linkage, the lack of participation in the standards definition at the international level explains the decrease of 25 points in the subdimension.

In Regulation, meanwhile, the score of 71.91 is above the regional average.

Graph 1: Costa Rica and LATAM Subdimensions



General Findings

In Infrastructure (53.09 points), Costa Rica is above the regional average by five points. In terms of connectivity, it registers very high levels of Mobile Network Coverage (99.80 points), but almost no 5G Implementation. Regarding other outstanding subindicators, there are Households With Internet Access with a high score (83.25 points) and Active Mobile Broadband Subscriptions (84.10) over Fixed Broadband Subscriptions (61.78). In both cases, it exceeds the regional average by 20 points. In terms of Average Mobile Download Speed, the country exceeds the regional average and the Basic Fixed Broadband Basket represents 100% of GNI per capita, surpassing the region by almost 19 points.

In terms of Computing (40.02), the country has twice the score of the region. While its Cloud score (35.00 points) is slightly above average, its HPC Infrastructure Capacity is significantly below average. In turn, the presence oCcertified Data Centers (94.44) stands out together with the high IXP subindicator (58.53). And in terms of Secure Internet Servers, the country faces the challenge of closing the gap with respect to the region.

In terms of Devices (36.28 points), Costa Rica is on a par with the regional average: while the level of Households With a Computer is double that of the region, Smartphone Affordability is slightly above the average (34.48 points). It is worth noting that IPv6 Adoption faces the challenge of closing the 10-point gap with the regional average.

Data (30.52 points) is a subdimension in which the country registers five points below the regional average, maintaining that distance specifically in the subindicators of Data Availability, Data Capabilities and Data Governance and widening to 10 points below in the Use and Impact of AI (15.08).

In the Human Talent subdimension (46.99 points), this nation stands out in Early Education in Science, while Early Education in AI is slightly below the LATAM average. The subindicator English Proficiency (57.91 points) is almost 10 points above the regional average.

It should be noted that the Advanced Human Talent indicator has no score, as it lacks certified or accredited programs, and faces the important challenge of making visible master's and PhDl programs in IA with a presence in international academic rankings or in locally accredited institutions.

In the indicator of Professional Training of AI the Central American country registers the highest score in AI Skills Penetration, while in STEM Graduates it is slightly above average.

The Innovation area (24.84 points) shows levels below the regional average. This situation is due to an almost null number of private investments, the non-existence of Unicorn Companies and a score that is very low with respect to the average of companies in IA (3.63 points). However, Research and Development Expenditure as a Proportion of GDP (28.22 points) is similar to the average, and both in the area of Application Development (80.85 points) and Entrepreneurial Environment (60.54 points), it exceeds the LATAM average.

AI Development (25.55) is an indicator in which the country is five points above the regional average, which is due to a very high Open Source Productivity (62.15 points). This good result is not affected by the scores for Open Source Quality (6.09) and Number of Patents (9.09 points), which are notoriously below the regional average.

In terms of Adoption, the IA Industry score (57.47) is slightly above the regional average but shows a significant gap of 13 points below the LATAM score in the Medium and High-Tech Manufacturing subindicator (31.05 points), which reflects a manufacturing sector that is not very technology-intensive. At the Government level (75.99), the country exceeds the average by six points.

The country registers a level slightly below the regional average in terms of IA Governance (34.70 points), in which the absence of an IA Srategy and an institutional framework to oversee it persists. In the Society's Involvement, meanwhile Costa Rica scores 25 above the regional average, due to the presence of instances of citizen participation but without details of mechanism or results reported in an auditable manner. In terms of International Linkage in IA (50), the country is very close to the average for the region, standing out for its International Organizations Participation subindicator. However, there is no participation in the definition of AI standards.

In Regulation, this nation stands out for having an above-average development in all the regulatory areas measured in the index: it reaches the maximum score in Risk Mitigation of the regulatory framework and far exceeds the regional average in Cybersecurity (69.82). In the Ethics and Sustainability indicator (61.92 points), Safety, Accuracy and Reliability (61.38 points) stands out with more than 40 points above the regional average.

Immigration and Talent Drain in AI

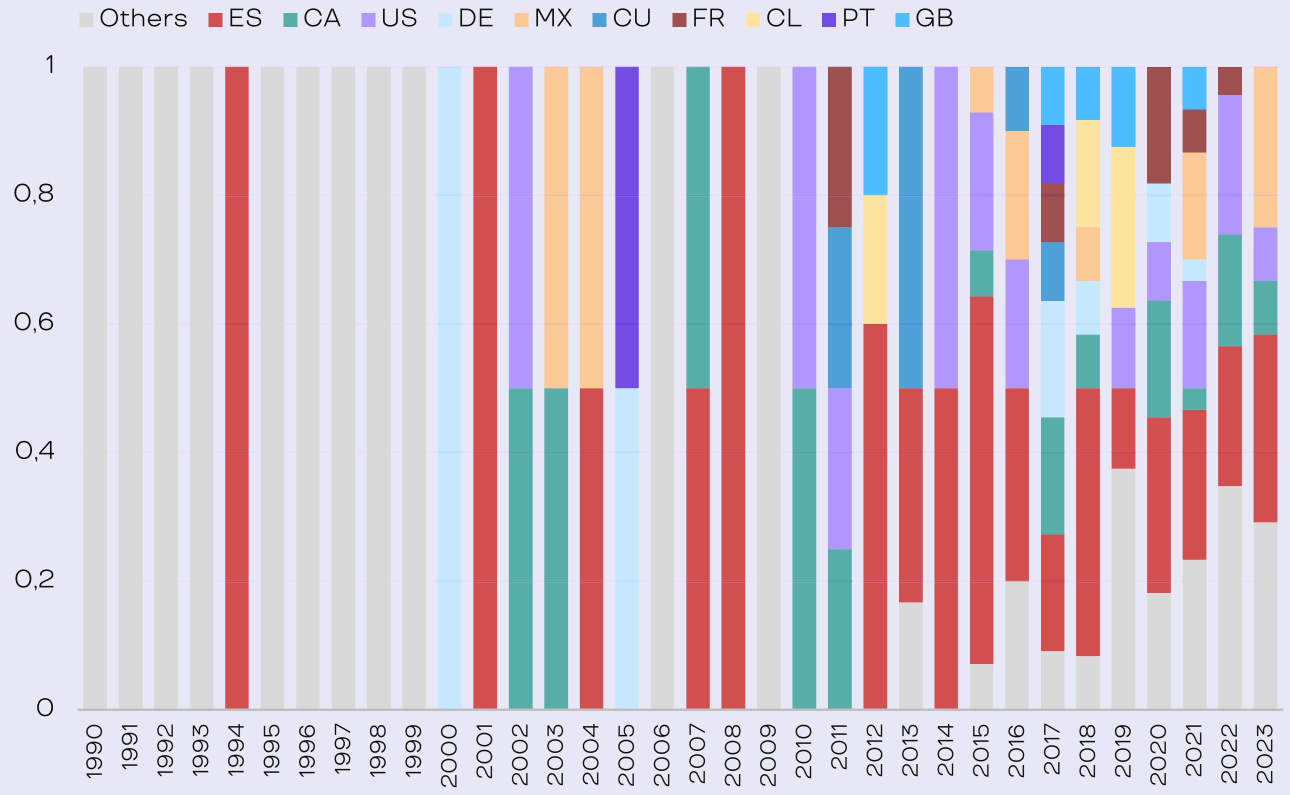
As for the origin and destination of authors publishing in Costa Rica, outside the region, Spain and Canada stand out as the main countries of origin and destination, even surpassing the United States in terms of importance. This pattern suggests a strong academic relationship with Europe and North America, especially Spain, which continues to be a key destination for academic mobility.

Within Latin America, regional collaboration is also significant. Mexico is the most recurrent destination for both authors coming to Costa Rica and those migrating from the country, consolidating themselves as key academic partners in the region.

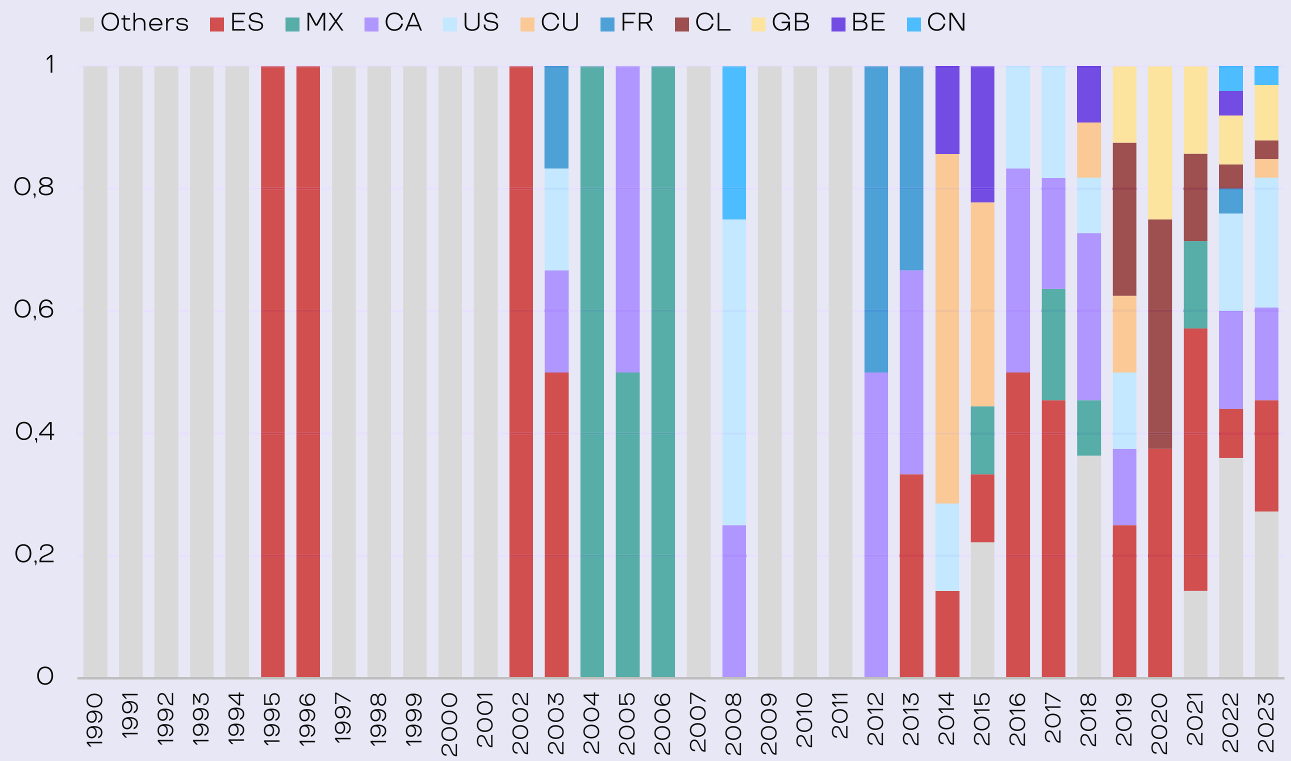
Unlike what has been observed in other countries in the region, the importance of Spain has not diminished over time; on the contrary, it remains a preferred destination for Costa Rican authors. On the other hand, several Latin American countries have seen a decrease in their relevance as destinations for academic migration from Costa Rica. It is also interesting to note that China appears only as a destination of departure for Costa Rican authors, but in smaller proportions, and does not show symmetry in the entry, so it is probably a destination where authors continue to work.

In terms of migration patterns, there is symmetry between inflows and outflows, suggesting that authors publishing in Costa Rica come, for the most part, from the same countries to which Costa Rican authors emigrate. However, there is one significant exception: the number of authors arriving from Spain is considerably higher than those emigrating to that country, underscoring the continued importance of Spain as a center of academic collaboration for Costa Rica.

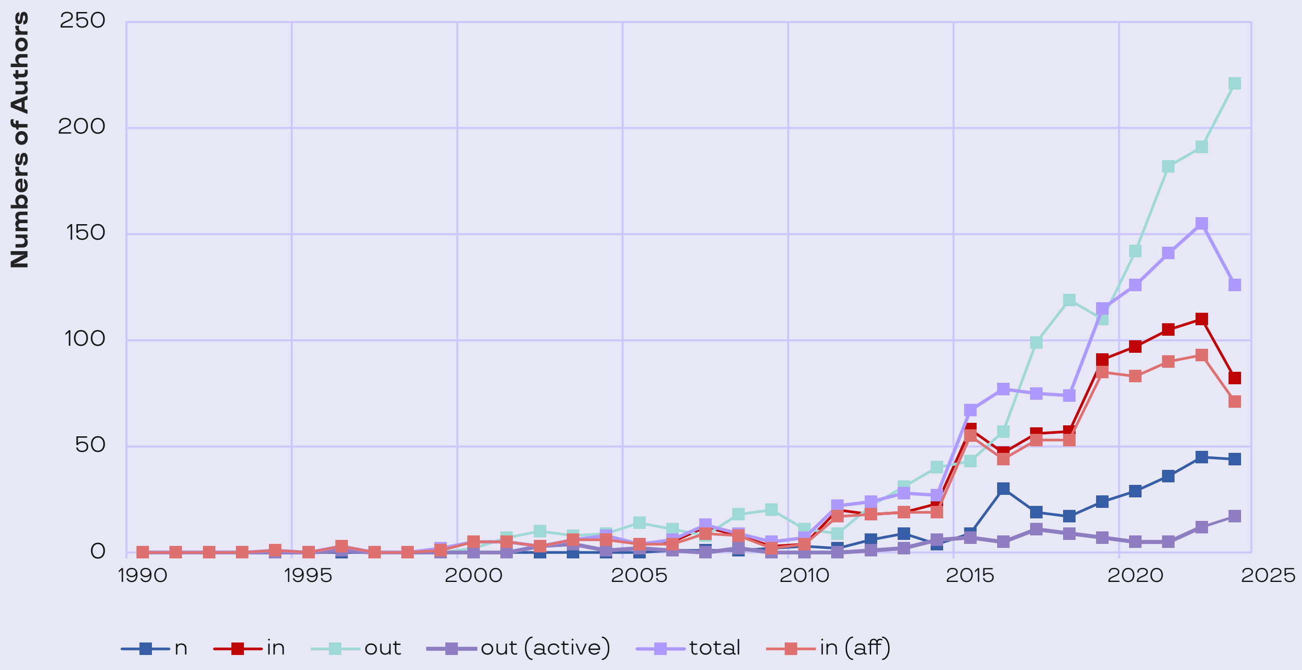
Graph 2: Where do Authors who Publish in Costa Rica Come From?



Graph 3: Where Do Authors Who Published in Costa Rica Go?



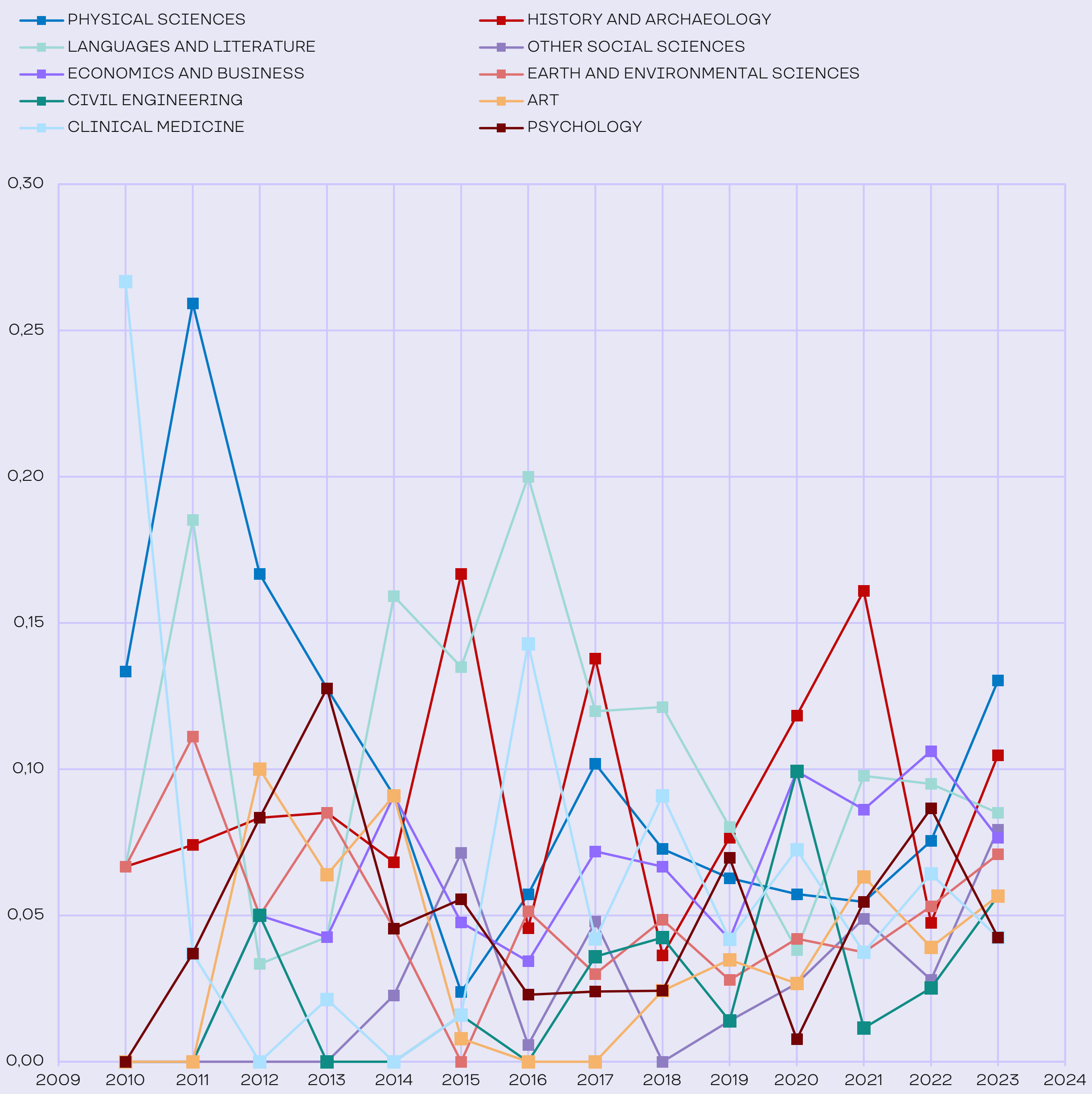
Graph 4: Talent Drain



When reviewing the composition of the academic community in AI in Costa Rica and its inflows and outflows in Graph 4, it can be seen that COVID19 did not have such a relevant impact on the inflow and outflow of authors as in other countries in the region. The number of consistent authors in the discipline maintains a growth (blue) from 2016 to date, reaching almost 50 authors, mainly pushed by new authors, being less relevant the relevance of the arrival from other countries than in the rest of the region. On the other hand, the volume of those who use AI as a tool for another discipline increases faster (green) than the rest of the categories.

Costa Rica

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Costa Rica



In **Graph 5**, for the case of Costa Rica, it should be noted that the number of publications is relatively low, so that the variance from one year to another is high in the period of analysis. However, the evolution of the use of AI in conjunction with various OECD disciplines is observed, where the relevance of these has remained relatively shared over time and with relative variations within the same discipline decreasing over time.

In 2023, Physical Sciences becomes the most frequently used discipline in combination with AI with 13% relevance of the OECD concept, followed by History and Archaeology with 11%.

Dimension	Subdimension	Indicator	Costa Rica	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	68,03	57,12	4
		Computation	40,02	21,76	2
		Devices	36,28	36,47	9
	Infrastructure Score		53,09	43,12	4
	Data	Data Barometer	30,52	35,76	14
	Data Score		30,52	35,76	14
	Human Talent	AI Literacy	66,08	57,9	5
		Professional Training in AI	68,52	43,49	1
		Advanced Human Talent	0	11,69	15
	Human Talent Score		46,99	39,71	3
	ENABLING FACTORS TOTAL SCORE		45,62	40,26	6
Research, Development and Adoption (R&D+A)	Research	Research	42,12	41,43	9
	Research Score		42,12	41,43	9
	I+D	Innovation	24,84	31,57	9
		Development	25,44	20,93	6
	R&D Score		38,06	42,53	9
	Adoption	Industry	57,51	54,29	8
		Government	75,99	69,65	9
	Adoption Score		64,9	60,44	7
	R&D+A TOTAL SCORE		47,74	47,46	7
Governance	Vision and Institutionality	AI Strategy	0	33,33	9
		Society's Involvement	25	19,08	7
		Institutionality	0	21,05	8
	Vision and Institutionality Score		6,25	26,7	8
	International Linkage	Standard Definition Participation	0	13,16	8
		International Organizations Participation	100	92,11	5
	International Linkage Score		50	52,63	7
	Regulation	Regulation on AI	100	47,37	5
		Cybersecurity	69,82	49,85	6
		Ethics and Sustainability	61,92	41,71	3
	Regulation Score		71,91	45,28	4
	GOVERNANCE TOTAL SCORE		34,7	37,46	9
ILIA 2024 TOTAL SCORE			43,63	42,08	9

CUBA

General Description
Population to 2023: **11.194.000**
2023 GDP per capita: **USD 9.499,60**
% of GDP Allocated to R&D: **0,52%**
Human Development Index (HDI) 2022: **0,764**

Category: **Explorer**

Score: **27,96**

Position: **15**

	2023	2024
ILIA Total Score	**s/d**	**27,96**
Position in Index	s/d	15
Infrastructure Score	s/d	19,27
Data Score	s/d	30,5
Human Talent Score	s/d	29,11
Enabling Factors Score	s/d	25,03
Enabling Factors Position	s/d	19
Research Score	s/d	43,26
Innovation and Development Score	s/d	49,13
Adoption Score	s/d	39,16
Research, Development and Adoption Score	s/d	43,79
R&D+A Position	s/d	11
Vision and Institutionality Score	s/d	0
International Linkage Score	s/d	25
Regulation Score	s/d	18,25
Governance Score	s/d	10,47
Governance Position	s/d	18

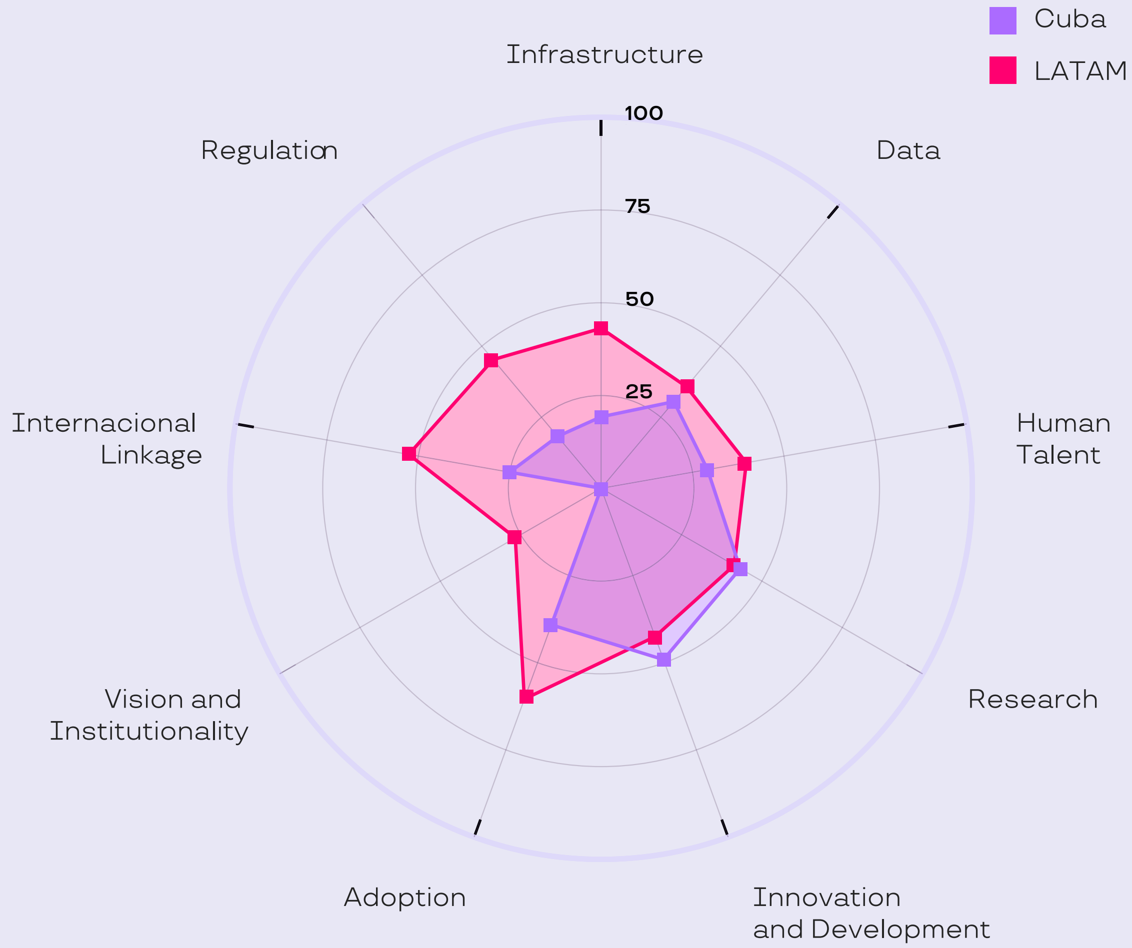
General Overview

Cuba is among the countries newly included in the ILIA for 2024, with an overall score of 27.96 points—20 points below the regional average—ranking it 15th.

In Enabling Factors, Cuba's score is over 15 points lower than the regional average, standing at 25.03 points. The Research, Development and Adoption (R&D+A) dimension sees Cuba just four points below the regional average, positioned 11th in the region with a score of 43.79.

In Governance, the lack of a national AI strategy or policy results in a zero for this area. However, Cuba earns 25 points in the International Linkages subdimension, reflecting its participation and verification in international agreements. In the regulatory domain, a score of 10.47 places it significantly below the regional average

Graph 1: Cuba and LATAM Subdimensions



General Findings

In Infrastructure (19.27 points), the Caribbean Basin country is notoriously below the regional average, with 20 points less, and Connectivity (27.85) is an indicator that shows 30 points less than the LATAM average. Among its subindicators, Population that Uses Internet reaches 73.22 points but Fixed Broadband Subscriptions has no score. The item Households With Internet Access is half less than the regional average, while Mobile Network Coverage (74.30 points) is 20 points below. In terms of Basic Fixed Broadband Basket, it represents 6.79% of the country's GNI per capita, which gives it 54.14 points in the ILIA, 17.5 points below the average.

In terms of Computing (10.33), Cuba shows half the score compared to the regional average, which is explained by the absence of HPC Infrastructure Capacity and Certified Data Centers, and because IXPs reaches a third of the regional score. In the area of Secure Internet Servers, it registers a score of zero, which highlights the challenge of strengthening the area of Computing in general.

In terms of Devices (11.06 points), the nation reaches around a third of the regional average, with the subindicators Households with Computer (15.17 points) and Smartphones Affordability (18 points) reflecting around half of the average for the region. For its part, the level of IPv6 Adoption is nil, contrasting with the average of 36.34.
In the area of Data (30.50), which is five points below the regional level, it is important to mention that the four subindicators that were measured for data were imputed through the MICE method.

In Human Talent, Cuba's total of 29.11 is 10 points below the regional average. For Professional Training in AI, the country registers a level that is seven points lower than the average. Additionally, in Advanced Human Talent, the nation is significantly behind the region with a total of 0.00, reflecting the absence of graduate programs in AI.

In terms of Innovation and Development (I&D), Cuba stands out above the regional average with 49.23 points, which may be due to the large number of subindicators imputed for the innovation indicator, which were imputed through the GDP per capita/nearest neighbor method. The Caribbean Basin country exhibits low performance in the AI Development indicator, with a score of 8.01 points, which is less than half of the regional average. This is primarily due to its low score in Open Source Productivity (7.34 points) and slightly lower open source quality, both of which contribute to this shortfall. Furthermore, the country has a notably low Number of AI Patents, scoring just 2.12 points, which is ten times below the regional average.

Regarding AI Adoption in Industry and Government, this country scores 39.16, placing it 20 points below the average. This deficiency is evident in areas such as Medium and High-Tech Manufacturing. A substantial gap is also observed at the government level, where Cuba achieves a score of 31.11, significantly lagging behind the regional average for Digital Government, which is over 30 points higher.

In terms of AI Governance, Cuba registers a low level of 10.47 points, reflecting the absence of a national AI strategy, a dedicated institution for its implementation and interinstitutional evaluation and coordination mechanisms. The Society's involvement indicator is also limited, with a lack of citizen participation and a stakeholder methodology. For International Linkages in AI, Cuba scores 25 points, which is below the average, indicating lower participation in international organizations compared to other regional countries.

In the regulatory arena, while the country's development is below the regional average, it shows significant progress in Cybersecurity with a score of 60.83 points. However, there is currently no activity related to Risk Mitigation or the Ethics and Sustainability indicators in AI.

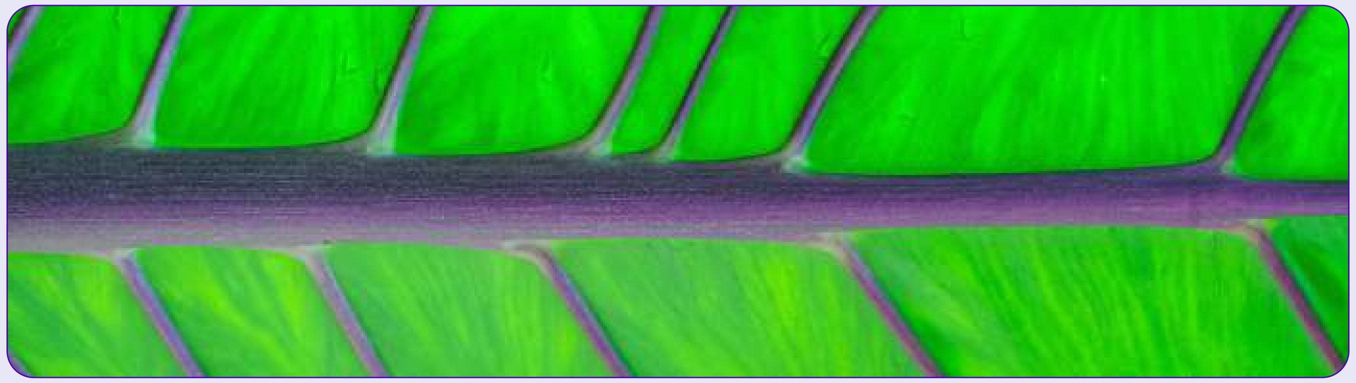
Immigration and Talent Drain in AI

As a new addition to this edition of the index, Cuba lacks a prior comparative study regarding the migration of academic talent. Data illustrated in Graphs 2 and 3 highlight Spain and Mexico as the primary countries of origin and destination for authors publishing in Cuba, even surpassing the United States in significance. This trend solidifies these nations as key players in the mobility of talent on the island.

Within Latin America, Brazil and Mexico emerge as prominent hubs for Cuban authors, reinforcing the vital role of regional networks in knowledge exchange and academic mobility in Cuba.

Notably, Spain's significance has declined less sharply in Cuba compared to other regional countries. However, in 2022 and 2023, it notably did not emerge as a primary origin for those publishing in Cuba, indicating a shift in recent academic mobility patterns. Conversely, China has increased its role in recent years, serving as both an origin and destination for Cuban authors, thereby enhancing its growing influence in the global academic arena.

The patterns of incoming and outgoing migration exhibit remarkable symmetry, suggesting that the majority of authors arriving in Cuba hail from the same countries to which Cuban scholars emigrate. This cycle of academic exchange reflects a dynamic similar to that observed in other regional nations, where sustained collaborations with specific countries persist over time



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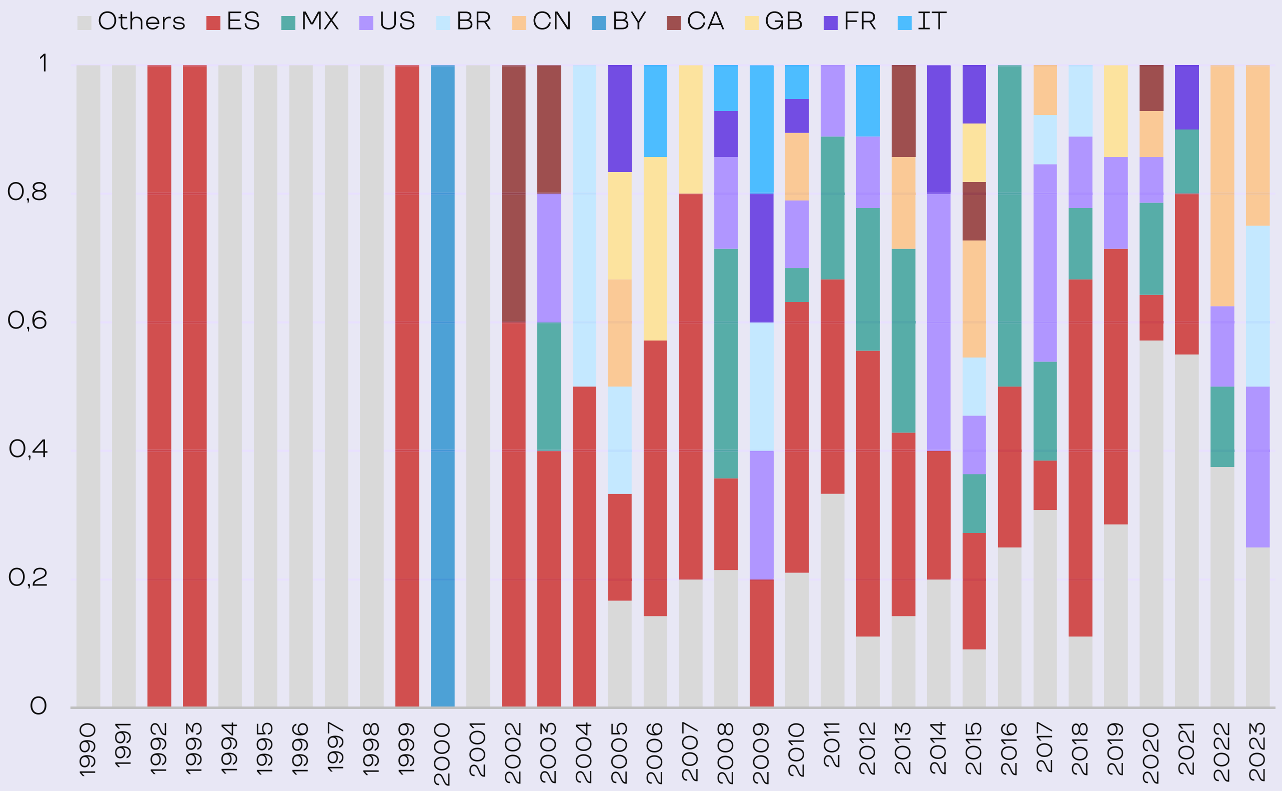

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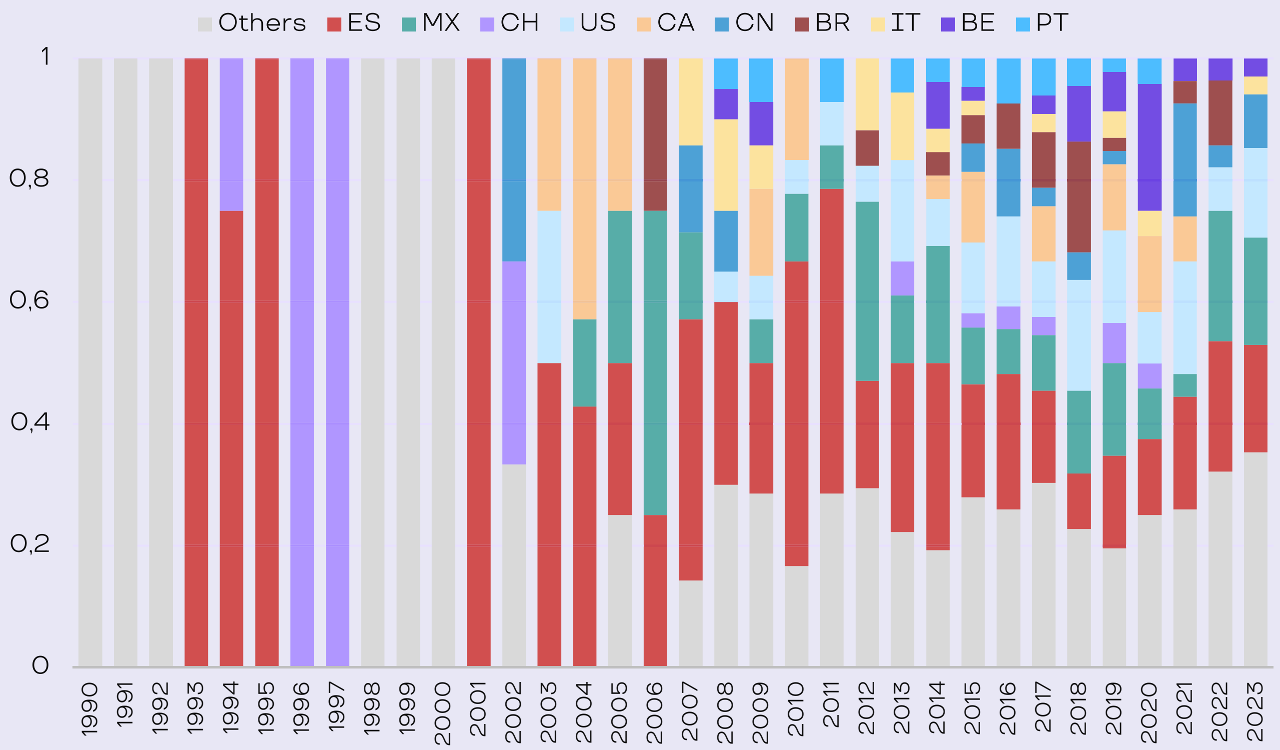
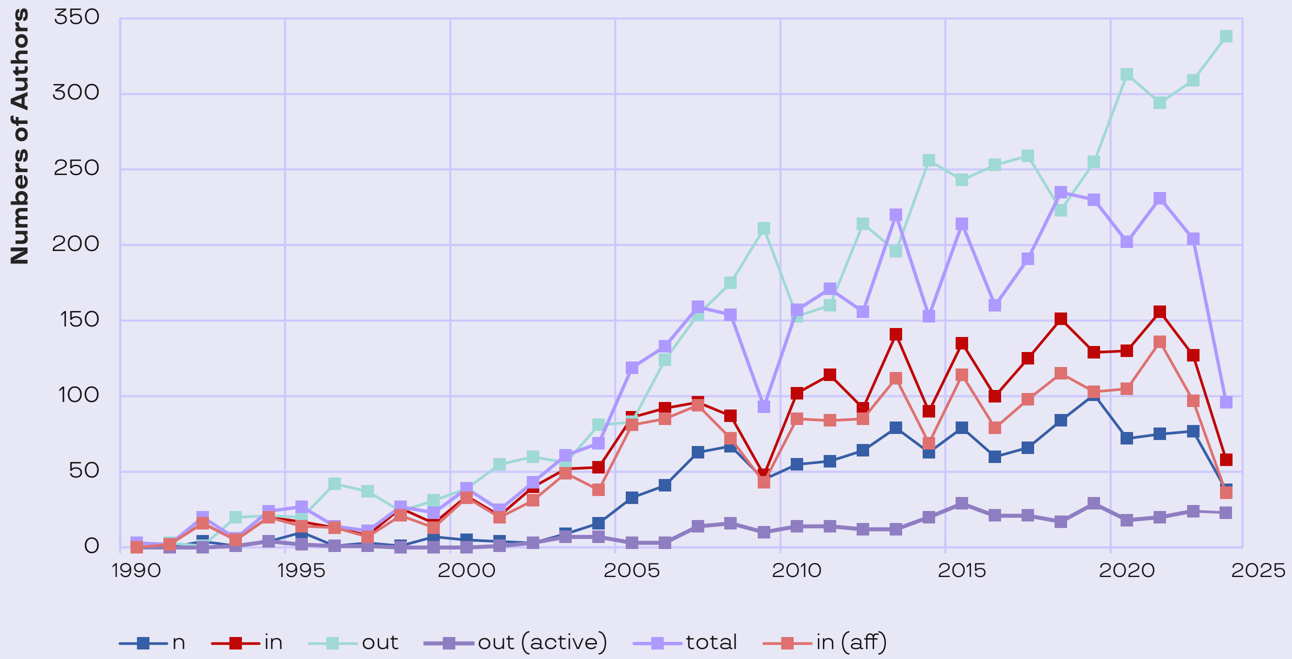
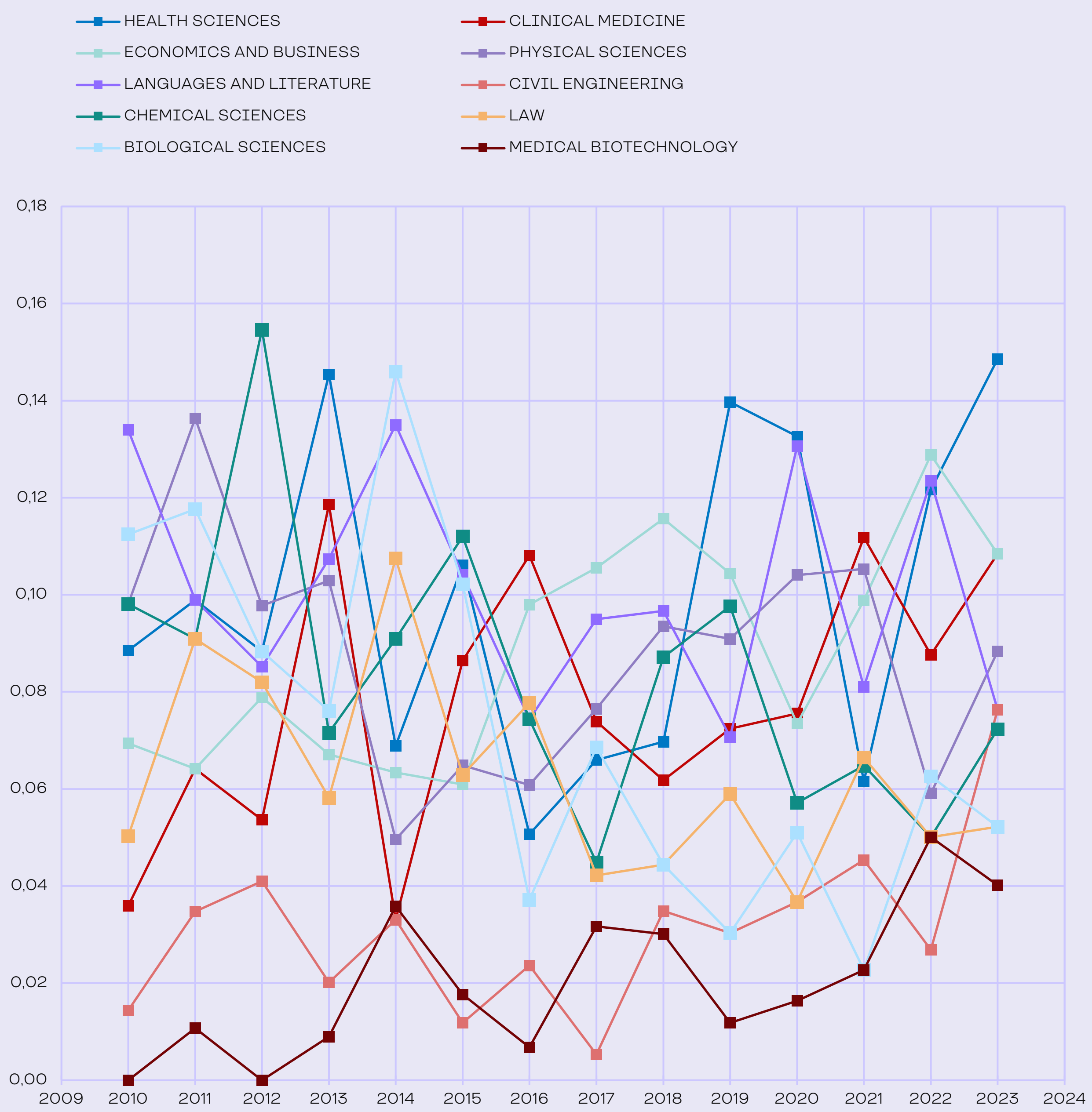


Graph 4: Talent Drain



Graph 4 illustrates a significant talent drain in Cuba from 1990 to 2023. Notably, the number of authors publishing in the field of AI remains limited, as evidenced by the blue line (n), which indicates an average of just 108 authors over the 23-year period examined. Since 2006, there has been an observable rise in the number of authors who previously published in Cuba but have since ceased doing so in the current year, reflecting a discontinuity in AI publication output (out, green line). This trend suggests a lack of consistency in scholarly contributions over time. Conversely, the stable pattern of authors who, after publishing at least once in the two years prior to this study, choose to publish in countries other than Cuba (out active, red line) is noteworthy. This indicator has remained steady over time, without significant fluctuations in the number of authors opting for this migration of their research.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Cuba



As depicted in Graph 5, the distribution of the top 10 OECD disciplines in Cuba from 2010 to 2023 reveals important trends; however, it is essential to note that the sample size is insufficient to achieve statistical significance. Collectively, these disciplines account for approximately 72% of the nation's scientific publications, with the remaining 28% spanning an additional 23 OECD categories. Among these, Health Sciences emerges prominently, averaging around 10% of total publications. This figure fluctuates over time, dipping to 6% in 2021 before rebounding to 15% in 2023, a trend likely influenced by specific health challenges, including the COVID-19 pandemic, which stimulated scientific output during those years. Another significant area of focus for Cuban authors is Language and Literature, which also comprises an average of 10% of publications, peaking in 2014 and 2020. This highlights Cuba's robust cultural and intellectual heritage, wherein research in these fields has consistently maintained a vital role

Dimension	Subdimension	Indicator	Cuba	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	27,85	57,12	19
		Computation	10,33	21,76	19
		Devices	11,06	36,47	19
	Infrastructure Score		19,27	43,12	19
	Data	Data Barometer	30,5	35,76	15
	Data Score		30,5	35,76	15
	Human Talent	AI Literacy	47,19	57,9	16
		Professional Training in AI	34,1	43,49	14
		Advanced Human Talent	0	11,69	16
	Human Talent Score		29,11	39,71	18
	ENABLING FACTORS TOTAL SCORE		25,03	40,26	19
Research, Development and Adoption (R&D+A)	Research	Research	43,26	41,43	8
	Research Score		43,26	41,43	8
	I+D	Innovation	44,62	31,57	4
		Development	8,01	20,93	15
	R&D Score		49,13	42,53	6
	Adoption	Industry	44,52	54,29	13
		Government	31,11	69,65	18
	Adoption Score		39,16	60,44	18
	R&D+A TOTAL SCORE		43,79	47,46	11
Governance	Vision and Institutionality	AI Strategy	0	33,33	10
		Society's Involvement	0	19,08	10
		Institutionality	0	21,05	9
	Vision and Institutionality Score		0	26,7	10
	International Linkage	Standard Definition Participation	0	13,16	9
		International Organizations Participation	50	92,11	18
	International Linkage Score		25	52,63	18
	Regulation	Regulation on AI	0	47,37	11
		Cybersecurity	60,83	49,85	8
		Ethics and Sustainability	0	41,71	19
	Regulation Score		18,25	45,28	16
	GOVERNANCE TOTAL SCORE		10,47	37,46	18
ILIA 2024 TOTAL SCORE			27,96	42,08	15

ECUADOR

General Description
Population to 2023: **18.190.000**
2023 GDP per capita: **USD 6.533,4**
% of GDP Allocated to R&D: **0,44%**
Human Development Index (HDI) 2022: **0,765**

Category: Adopter

Score: 34,59●

Position: 11

	2023	2024
ILIA Total Score	**22,17**	**34,59●**
Position in Index	10	11↑
Infrastructure Score	37,95	39,08
Data Score	30,92	30,92
Human Talent Score	22,71	31,05
Enabling Factors Score	30,53	34.63
Enabling Factors Position	10	14
Research Score	56,26	51,76
Innovation and Development Score	10,18	28,93
Adoption Score	16,49	59,08
Research, Development and Adoption Score	27,65	47,1
R&D+A Position	9	9
Vision and Institutionality Score	0	0
International Linkage Score	0	50
Regulation Score	25	23,33
Governance Score	8,33	17
Governance Position	9	12

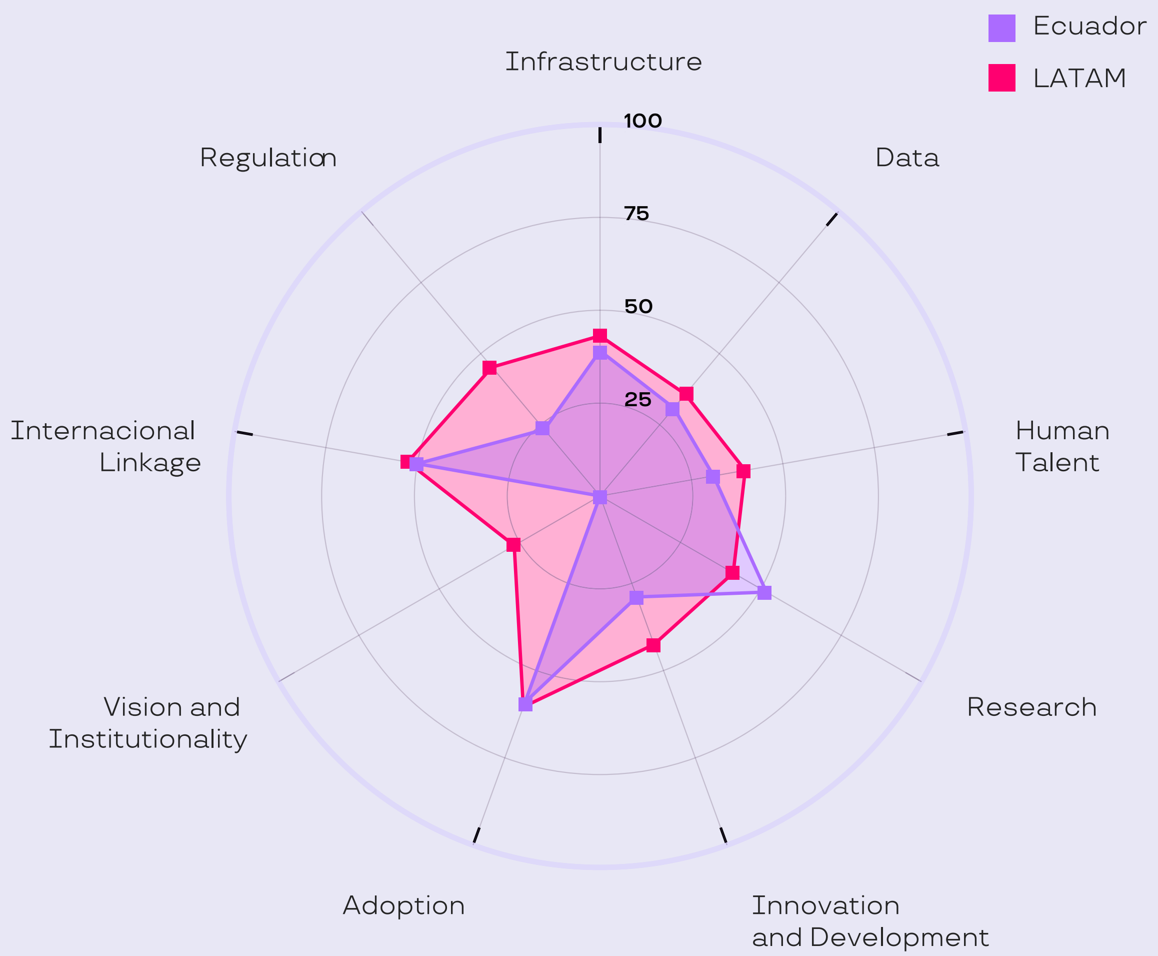
General Overview

EEcuador's performance aligns with the findings of the 2023 ILIA. Although the country has improved its overall score by more than 10 points, its ranking in the region has fallen by one position to 11th. It is important to note that the previous evaluation included 12 countries, while this edition expands the scope to 19 nations, suggesting that Ecuador's relative standing has improved in context with this broader geographic inclusion.

The Enabling Factors dimension remains consistent with last year's results, while the Human Talent subdimension exhibits slight progress, attributed to the inclusion of subindicators related to STEM graduates. Conversely, the Research, Development and Adoption (R&D+A) dimension shows the most significant gains compared to the prior edition, particularly in the Innovation and Development (I&D) subdimension, which has risen by 20 points. For its part, AI Adoptionhas increased by 35 points. Despite these advancements, it still lags behind the regional average.

In Governance, the lack of a national strategy or policy persists. However, the incorporation and verification of international agreements contribute to a 50-point increase in the International Linkages subdimension. In the regulatory context, a score of 23.3 indicates a relative decline within the region, influenced by the addition of new indicators.

Graph 1: Ecuador and LATAM Subdimensions



General Findings

In the Infrastructure subdimension, Ecuador aligns closely with the regional average, a trend also observed in the Connectivity indicator, where the country achieves a score of 55.31 points, near the Latin America and Caribbean (LAC) average. However, several subindicators reflect lower performance relative to the region: For instance, 5G Implementation stands at a mere 0.30 points, indicating the deployment of only five antennas using this technology within the country, and similarly, Mobile Broadband Subscriptions exhibit relatively low penetration with a score of 51.28 points. The remaining subindicators in this category are approximately at the regional average.

In the realm of Computing, Ecuador demonstrates notable capabilities, with a HPC Infrastructure Capacity of 15.40 points, surpassing the regional average, alongside a commendable score of 40.46 points for the number of available Internet Exchange Points (IXPs). However, there are shortcomings in the areas of secure Internet servers and cloud utilization.

Regarding the Devices indicator, the Smartphones Affordability is relatively low, with a score of 1.77, which may hinder the population's ability to fully benefit from advancements in artificial intelligence.

In the domain of Human Talent, the country's strengths are highlighted by a significant proportion of STEM Graduates, achieving a score of 43.68. Additionally, Ecuador offers graduate programs in AI, with subindicators for Master's programs in accredited and QS-ranked universities exceeding the regional average. In contrast, AI PhD programs remain absent, reflected by a score of zero.

Ecuador's ecosystem development is particularly evident in the Research, Development and Adoption (R&D+A) dimension. Within the Research subdimension, it ranks as a regional leader, achieving scores of 74.60 for the number of AI Publications and 86.66 for the number of active researchers, both significantly higher than the regional average by 40 and 50 points, respectively. Furthermore, Ecuador boasts a 19.87% representation of Female Authors in AI Research, translating to 77.71 points. However, there are currently no AI research centers that meet the established institutional criteria, presenting a short-term opportunity for growth. The strength in Basic Research contrasts sharply with challenges in Innovation and Development (I&D), where six out of seven subindicators fall below the regional average, particularly in investment performance. Similarly, the Development indicator reflects a lag, with subindicators ranging from 10 to 15 points below the average for the Latin America and Caribbean (LAC) region.

In the Adoption subdimension, the Industry indicator reveals insufficient performance, especially regarding the Proportion of Added Value generated by medium and high technology sectors. These findings underscore the urgent need for enhancing private sector engagement and investment in AI adoption. Conversely, in public sector technological adoption, the Digital Government subindicator reflects a strong performance with a score of 85.35, exceeding the regional average by 16 points.

In terms of Governance, the absence of a national AI strategy limits a comprehensive analysis of the country's vision and institutional framework. Furthermore, regulatory proposals lack effective risk mitigation mechanisms, a notable anomaly in the region, while scores in Cybersecurity, data protection, and technical standards fall short of the regional benchmarks.

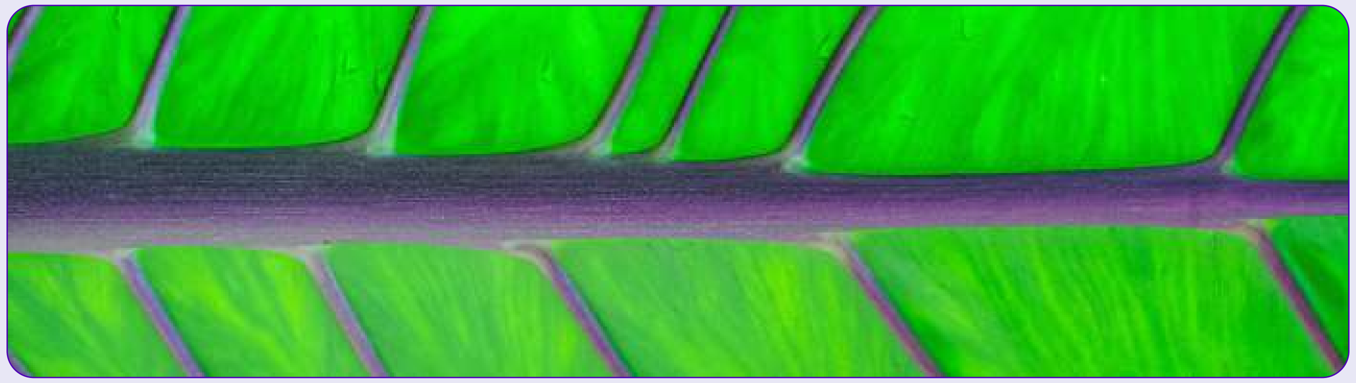
Immigration and talent drain in AI

Recently, there has been a significant change in the origin and destination of authors publishing in Ecuador, as can be seen in Graph 2 and 3. Mexico has gained considerable importance displacing Spain, which was previously one of the preferred destinations and origins for Ecuadorian authors. This change reflects a growing academic relationship between Ecuador and Mexico, consolidating it as one of the main partners in the mobility of talent.

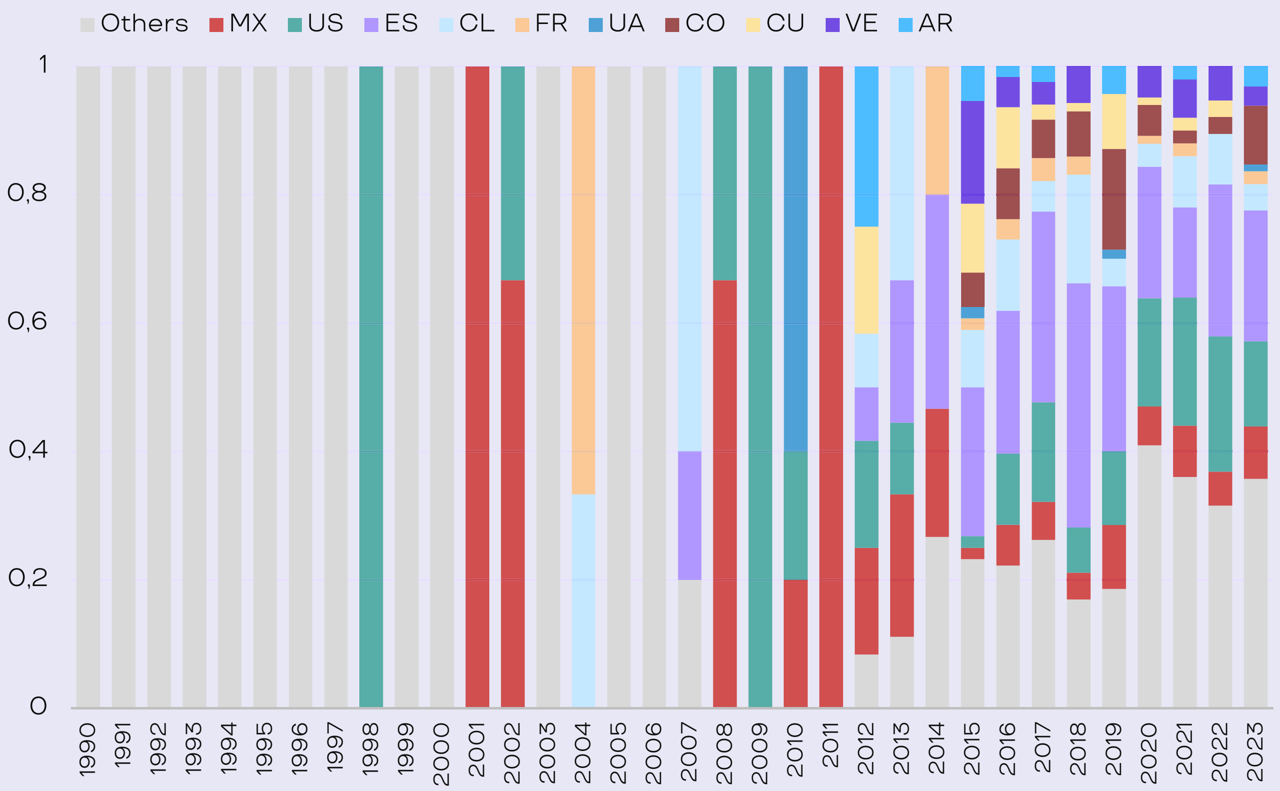
Likewise, the growing influence of the United States can be noted, both as a destination and source country for authors publishing in Ecuador. This suggests a strengthening of academic ties with the country of the North, a pattern that is also seen in other nations of the region.

In addition, other countries such as France and Ukraine have begun to appear more frequently as relevant destinations and origins, showing a diversification in Ecuador's international collaborations.

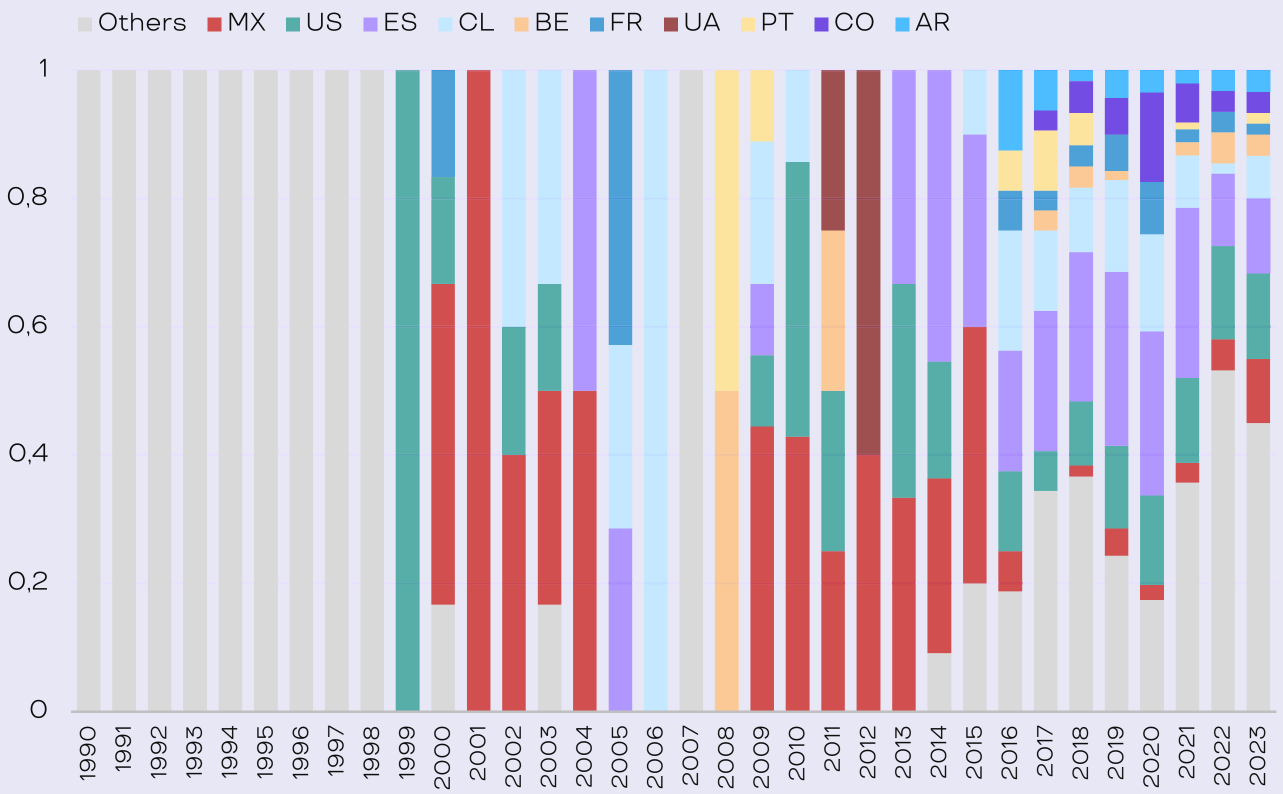
In terms of migration patterns, there is symmetry between inflows and outflows, especially in the case of Spain, which indicates that most of the authors entering Ecuador come from countries to which Ecuadorian authors have previously emigrated. This reciprocity in talent flows suggests stability in collaborative relationships with certain countries over time.



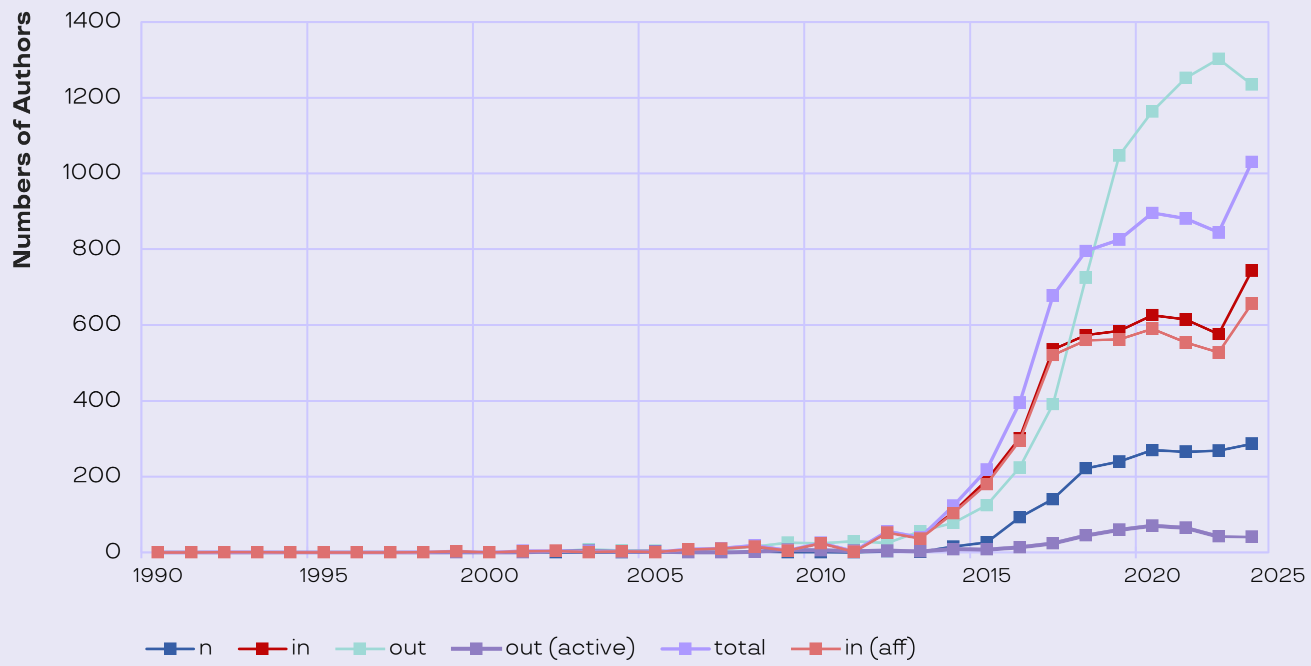
Graph 2: Where do Authors who Publish in Ecuador Come From?



Graph 3: Where Do Authors Who Published in Ecuador Go?



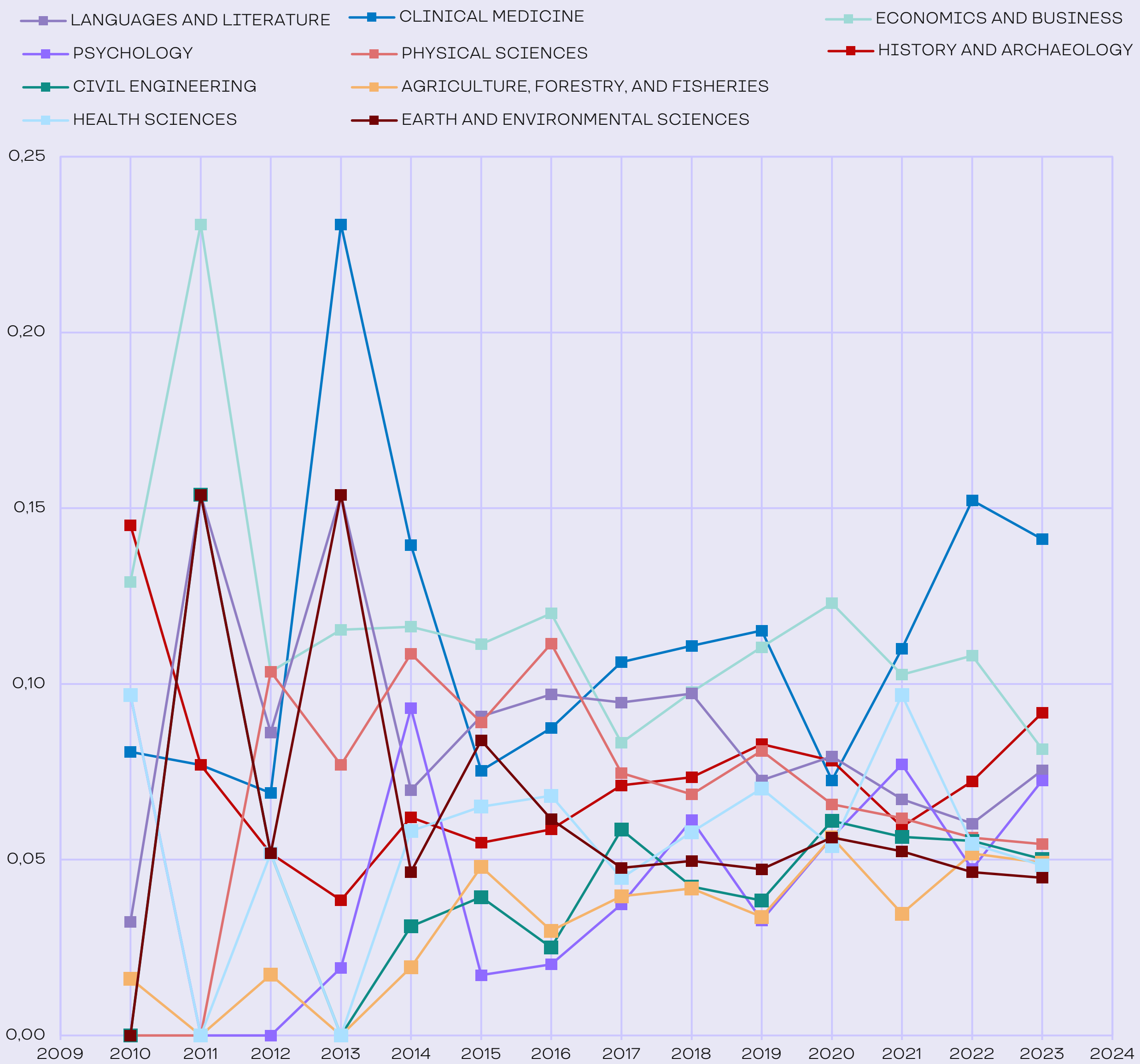
Graph 4: Talent Drain



Graph 4 reveals a significant trend of talent drain in Ecuador from 1990 to 2023. Initially, it highlights the limited presence of authors in AI from 1990 to around 2015, as indicated by the blue line (n). During this period, the average number of authors is approximately two per year, suggesting a statistically insignificant sample size. However, since 2015, there has been a gradual uptick in the number of authors. Notably, there is an increase in the number of individuals who had previously published in Ecuador but have not continued doing so in the current year, as shown by the green line (out). This trend reflects challenges in sustaining a consistent output of AI publications within the country.

On the other hand, there has also been a rise in the number of authors whose last publication was not from Ecuador but who are now contributing to the national landscape (brown line). This trend may indicate a potential dynamic of returning researchers or new authors motivated to engage in the local development of AI. Overall, these data portray a landscape of growth alongside significant challenges in establishing a robust and continuous foundation for AI publications in Ecuador.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Ecuador



Graph 5 shows the distribution of the top 10 OECD disciplines in Ecuador between 2010 and 2023. On average, these account for 70% of scientific publications, while the remaining 30% corresponds to the other 23 OECD disciplines. Clinical Medicine stands out with an average of 10% during the study period, reaching its highest point in 2013 with 23% and indicating that it regains its importance between 2021 and 2023 and maintains a constant production. This focus on Clinical Medicine is due to the strengthening of the Ecuadorian health system and the increase in research linked to medical care, which has been especially relevant after the COVID-19 pandemic.

Another outstanding discipline is Economics and Business, with an average of 12%, which has remained stable since 2010 to date. This reflects the growing interest in the areas of economic and business development, aligned with economic growth policies and the need to generate studies that promote the sustainable development of the country.

Language and Literature has also gained relevance, with an average of 9%, its highest point being in 2011. This area stands out for the strong interest in cultural and linguistic research, which highlights the key role that cultural heritage and identity play in Ecuadorian academia.

Dimension	Subdimension	Indicator	Ecuador	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	55,31	57,12	11
		Computation	18,89	21,76	8
		Devices	26,81	36,47	15
	Infrastructure Score		39,08	43,12	13
	Data	Data Barometer	30,92	35,76	13
	Data Score		30,92	35,76	13
	Human Talent	AI Literacy	42,78	57,9	19
		Professional Training in AI	35,17	43,49	13
		Advanced Human Talent	11,29	11,69	6
	Human Talent Score		31,05	39,71	15
	ENABLING FACTORS TOTAL SCORE		34,63	40,26	14
Research, Development and Adoption (R&D+A)	Research	Research	51,76	41,43	6
	Research Score		51,76	41,43	6
	I+D	Innovation	24,48	31,57	10
		Development	7,9	20,93	16
	R&D Score		28,93	42,53	13
	Adoption	Industry	41,56	54,29	16
		Government	85,35	69,65	6
	Adoption Score		59,08	60,44	10
	R&D+A TOTAL SCORE		47,1	47,46	9
Governance	Vision and Institutionality	AI Strategy	0	33,33	11
		Society's Involvement	0	19,08	11
		Institutionality	0	21,05	10
	Vision and Institutionality Score		0	26,7	11
	International Linkage	Standard Definition Participation	0	13,16	10
		International Organizations Participation	100	92,11	6
	International Linkage Score		50	52,63	8
	Regulation	Regulation on AI	0	47,37	12
		Cybersecurity	27,23	49,85	15
		Ethics and Sustainability	30,33	41,71	13
	Regulation Score		23,33	45,28	13
	GOVERNANCE TOTAL SCORE		17	37,46	12
ILIA 2024 TOTAL SCORE			34,59	42,08	11

EL SALVADOR

General Description:
Population to 2023: **6.364.000**
2023 GDP per capita: **USD 5.344,20**
% of GDP Allocated to R&D: **0,17%**
Human Development Index (HDI) 2022: **0,674**

Category: **Explorer**

Score : **25,74**

Position: **18**

	2023	2024
ILIA Total Score	**s/d**	**25,74**
Position in Index	s/d	18
Infrastructure Score	s/d	34,34
Data Score	s/d	14,37
Human Talent Score	s/d	34,03
Enabling Factors Score	s/d	29,25
Enabling Factors Position	s/d	16
Research Score	s/d	13,9
Innovation and Development Score	s/d	30,57
Adoption Score	s/d	48,77
Research, Development and Adoption Score	s/d	29,36
R&D+A Position	s/d	17
Vision and Institutionality Score	s/d	0
International Linkage Score	s/d	50
Regulation Score	s/d	16,86
Governance Score	s/d	15,06
Governance Position	s/d	15

General Overview

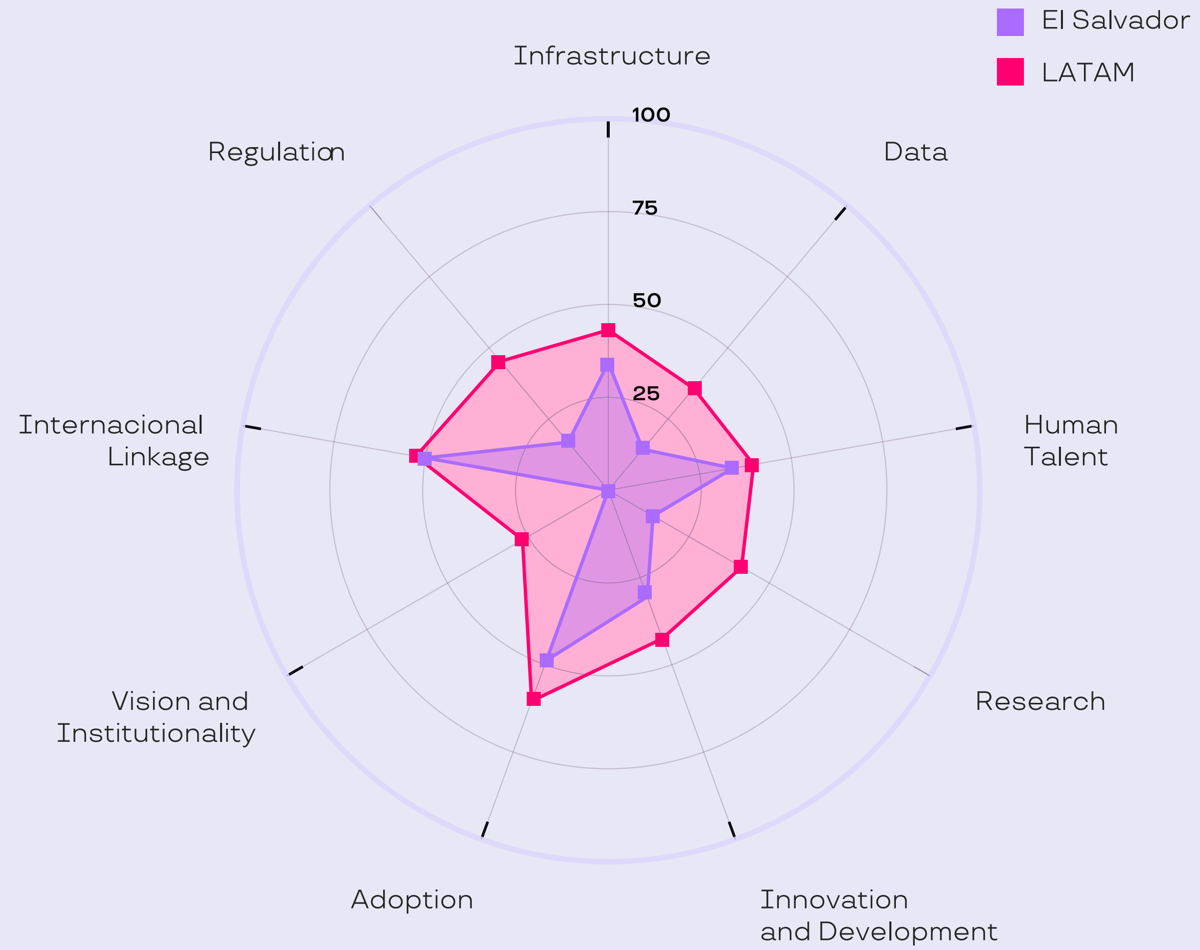
El Salvador has joined the ILIA for the first time, achieving an overall score of 25.74 points, which is relatively low compared to its regional counterparts, placing it in 18th position.

As for the the Enabling Factors dimension, the country registers 29.25 points, falling 11 points below the regional average, primarily due to low performance in the Computing and Advanced Human Talent subindicators

Similarly, in the Research, Development and Adoption (R&D+A) dimension, the score obtained is quite similar (29.36) to that of the Enabling Factors dimension, with about 20 points below the regional average. This is due to the low scores in the Research (13.90 points) and Adoption (48.77 points) subdimensions, all of which are far from the regional average.

Regarding Governance, the lack of a national strategy or policy is reflected in a zero score for this indicator. However, the country achieved 50 points in the International Linkages subdimension, highlighting its engagement with international agreements. In the regulatory landscape, the score of 16.86 suggests the presence of initial regulatory frameworks, with the Ethics and Sustainability indicator being the most significant.

Graph 1: El Salvador and LATAM Subdimensions



General Findings

In Infrastructure (34.34 points), El Salvador is below the regional average by almost 10 points, a similar situation is observed in the Connectivity indicator (48.78 points), where subindicators such as Population that Uses Internet (62.8 points) and Proportion of Households with Internet Access (29.67 points) are below the LATAM average. Mobile Network Coverage is similar to the regional average (92 points), while Mobile Download Speed (40.04) is above the regional average and Fixed Band Download Speed (17.15) is 14 points above the average. For its part, the Basic Fixed Broadband Basket shows 55.24 points, which represents 6.68% of GNI per capita.

In the realm of Computing, El Salvador's performance is below the regional average, with a score of 11.11 points. This shortfall is attributed to the absence of High-Performance Computing Infrastructure and a Certified Data Centers subindicator that is only half the average score (9.10). Additionally, the Internet Exchange Points (IXP) score is 20.91, which is 13 points below the regional benchmark, while the count of Secure Internet Servers is nearly negligible. Regarding Devices, El Salvador registers 28.69 points, indicating a significant gap compared to the regional average. This discrepancy is primarily due to the low score in Households with a Computer (13.65 points). However, the Smartphones Affordability is relatively strong, exceeding the average by five points (37.74). The country's IPv6 Adoption also remains slightly below the regional mean.

In the Data category, El Salvador's score of 14.37 is considerably below the average, with specific weaknesses in Availability (8.97), Capabilities (22.31), Governance (12.60), and Use and Impact (13.60). This underscores a pressing need for development in these areas. When examining Human Talent, the country scores 34.03, which is slightly under the regional average. It performs better in AI Literacy with a score of 48.75, exceeding the average by eight points. However, it faces challenges in Early Science Education, where it scores only 19.08, 20 points below the average. El Salvador does excel in the number of STEM Graduates, achieving a score of 56.85. Nevertheless, in Advanced Human Talent, it records a score of 0.00, reflecting the absence of graduate programs in AI at accredited institutions and those recognized by QS rankings.

In terms of Research, El Salvador's score of 13.90 is low relative to the regional average. The country's performance in AI Publications (4.07 points) is nearly 10 points below average, as is its number of Active Researchers (3.32 points). Additionally, El Salvador faces challenges in establishing AI Research Centers and has a low Proportion of Female Authors in AI (8.71 points). Despite these issues, the productivity of male and female researchers (38.19) exceeds the regional average by 12 points.

El Salvador's R&D score of 30.57 places it 12 points below the regional average. The Innovation indicator, at 21.17 points, is half the average score, with subindicators such as the Estimated Total Value of Private Investment in AI being nearly negligible (0.46 points) and the Number of Private Investments (4.69) at only a quarter of the regional average, with no Unicorn Companies present. A significant aspect of this gap is seen in Expenditure on Research and Development as a Proportion of GDP (9.62 points), which is markedly below the regional average. For AI Development, El Salvador scores 17.80, falling two points short of the regional average. This is influenced by a high Open Source Productivity score (44.68), which contrasts with a low Open Source Quality score.

Regarding Adoption, the country's AI Industry score is slightly below the regional average (46.55), while its Digital Government adoption (52.10 points) reveals a gap of twelve points compared to the region.

El Salvador exhibits a low level of AI Governance, accounting for less than half of the regional average at 15.06 points. This situation primarily stems from the absence of a comprehensive AI strategy and mechanisms for civil society engagement, alongside a lack of institutional support related to AI.
In the subdimension of International Linkage in AI, which scores 50, the country surpasses the average despite not participating in the establishment of AI standards. However, it maintains a strong presence in international organizations.

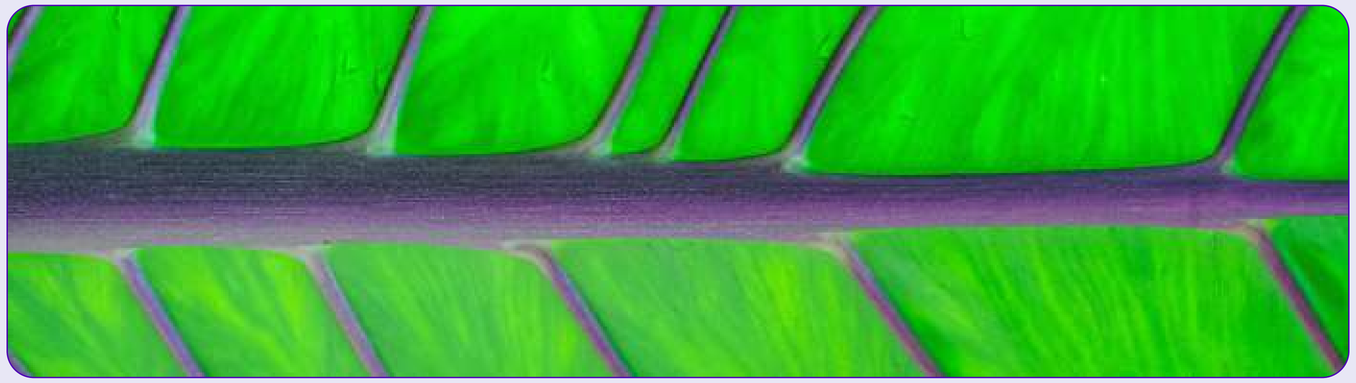
Regarding Regulation, El Salvador faces significant challenges, having made limited advancements in this domain. The country reports a score of zero in several regulatory aspects, lacking activity in Risk Mitigation, Data Protection, Security, and Accuracy and Reliability. In terms of Cybersecurity, it achieves only 13.77 points, falling 36 points below the average. Nevertheless, it does have a sustainability regulation that slightly exceeds the regional average.

Immigration and Talent Drain in AI

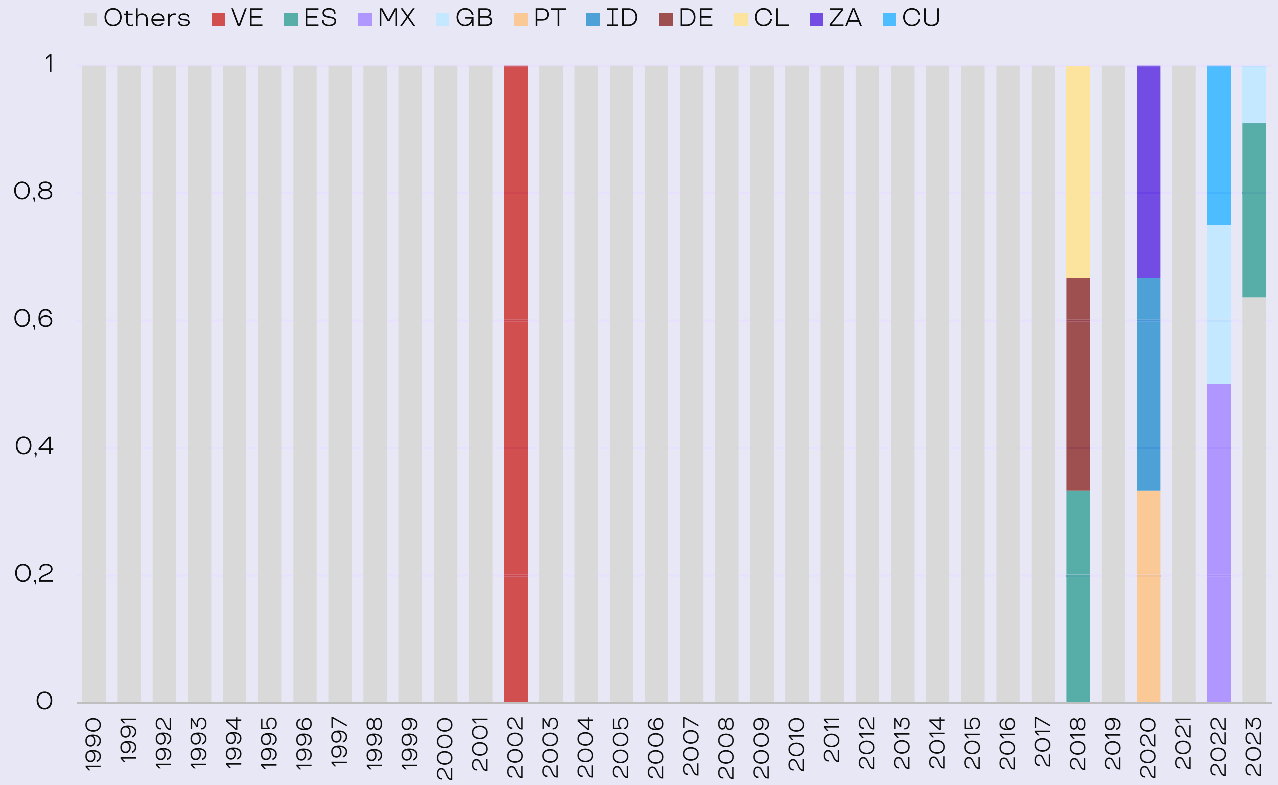
The recent inclusion of El Salvador the ILIA edition, makes it impossible to conduct a previous comparative analysis for the country. Nevertheless, the data indicates that academic mobility in the field of AI remains relatively uncommon in El Salvador. Despite this, it is noted that authors publishing in the country primarily hail from Venezuela, Spain, and Mexico.

Regarding the destinations chosen by these authors, the United States, Venezuela, and Malaysia emerge as prominent choices. Notably, there is a significant disparity between the countries of origin and those of destination. Unlike in many other nations, El Salvador does not exhibit a strong symmetry between the inflows and outflows of authors. This observation suggests that individuals select different countries to migrate to compared to those from which they arrive in El Salvador.

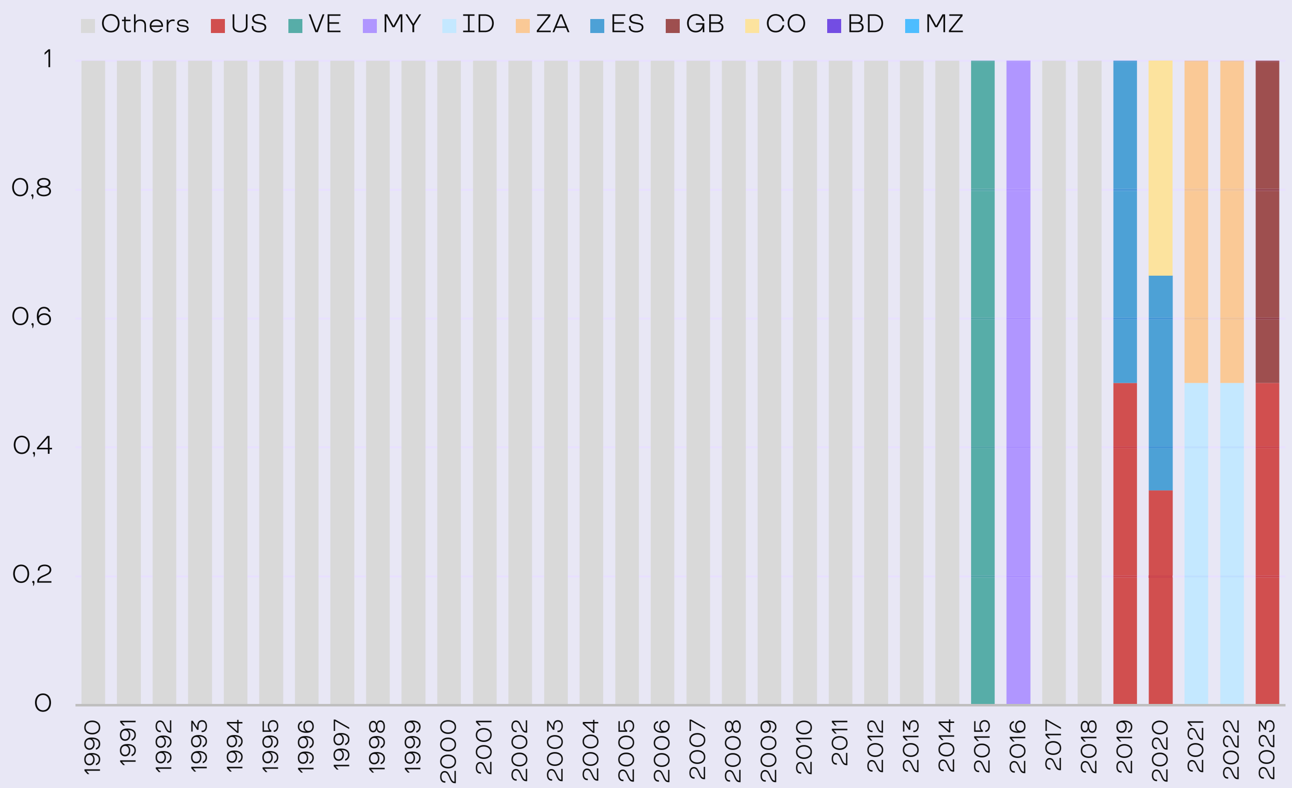
This distinctive pattern underscores a unique aspect of academic mobility in El Salvador, where the countries of origin and destination do not align, contrasting with trends observed in other countries across the region.



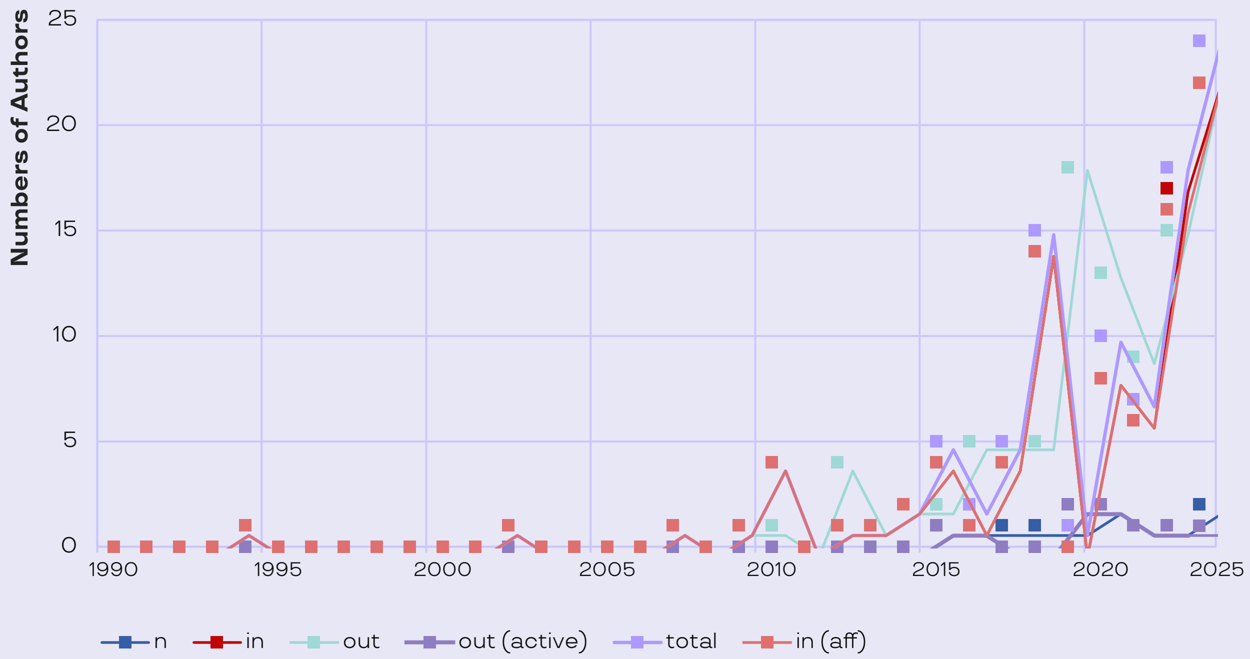
Graph 2: Where do Authors who Publish in El Salvador Come From?



Graph 3: Where Do Authors Who Published in El Salvador Go?



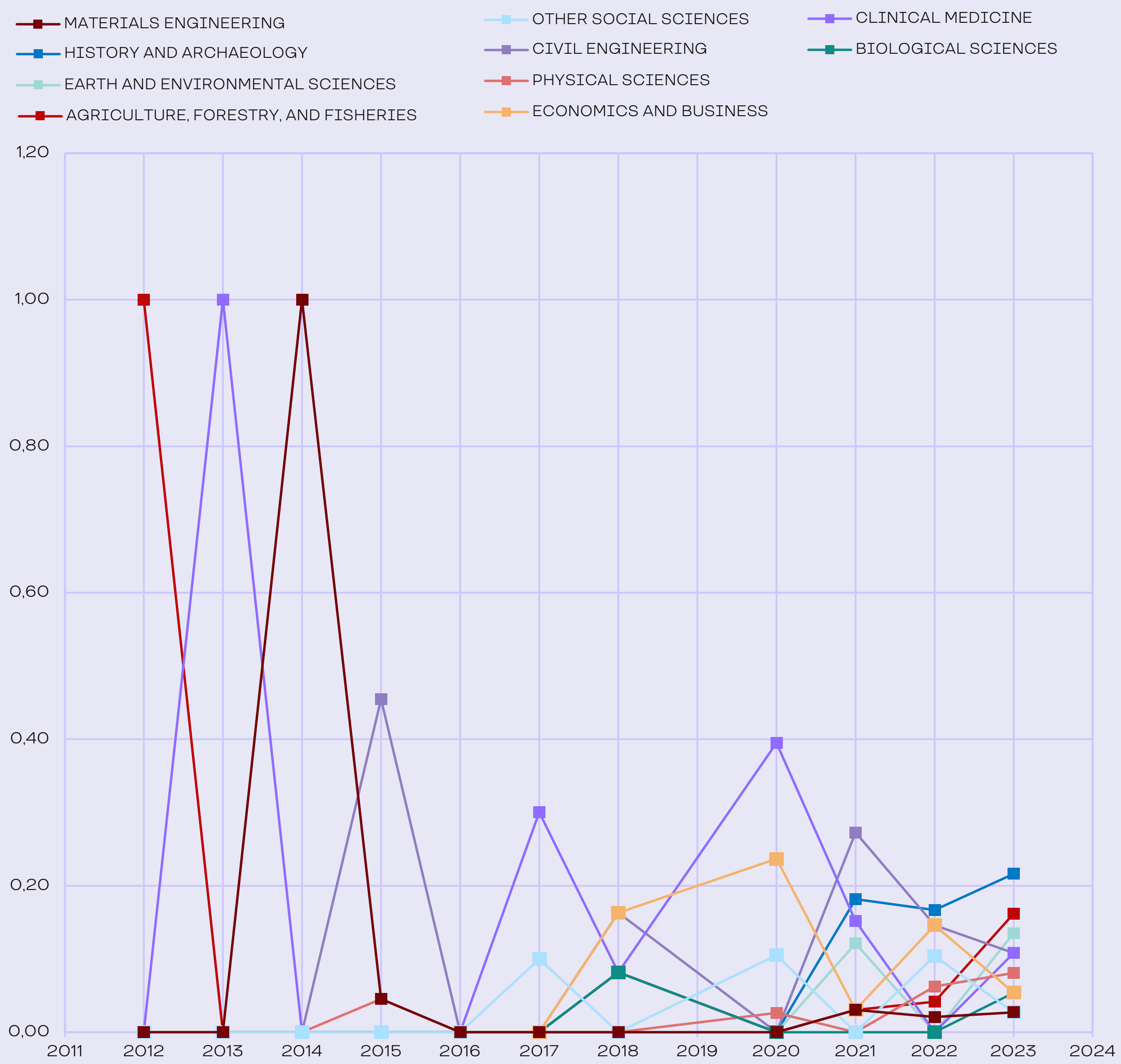
Graph 4: Talent Drain



Graph 4 depicts a significant talent drain in El Salvador from 1990 to 2023. A notable aspect is the limited number of authors publishing in the field of AI, indicated by the blue line (n), which shows an average of merely 0.3 authors over the 23-year period. This figure suggests that, on average, there is less than one author per year, a statistically negligible number. Beginning in 2018, an uptick in AI authorship is observed. However, despite this positive trend, the increase does not yield a statistically significant sample. Another interesting pattern during this period is the similar trajectories of the various curves. Notably, the rise of authors whose most recent publication in AI was not in El Salvador, but who have begun to contribute locally again (aff, brown line), indicates a potential return or renewed commitment to local scholarship.

Conversely, there is a growing number of authors who published at least once in El Salvador in prior years but are currently inactive (out, green line). This trend reflects a lack of consistency in scientific output. While there are signs of growth in AI research within El Salvador, significant challenges persist regarding the maintenance of continuity and the establishment of a robust community of authors.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Costa Rica



Graph 5 illustrates the distribution of the top 10 OECD disciplines in El Salvador from 2012 to 2023. The analysis begins in 2012 due to a lack of earlier data for these fields, and it is crucial to note that the sample size is not sufficient for statistical significance. On average, these disciplines represent 71% of scientific publications, while the remaining 29% corresponds to the other 23 OECD categories.

A notable trend in El Salvador is that, in 2012, the discipline of Agriculture, Forestry, and Fisheries accounted for 100% of publications related to artificial intelligence, and in 2013, Clinical Medicine also reached this mark. These fields have consistently maintained their prominence among Salvadoran authors.

The significance of Agriculture, Forestry, and Fisheries can be attributed to the importance of these sectors within the national economy, with a strong emphasis on innovation to enhance agricultural productivity and sustainability. Meanwhile, Clinical Medicine has gained traction due to the increasing focus on improving health services and medical training, which in turn fosters scientific output in this area

Dimension	Subdimension	Indicator	El Salvador	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	48,78	57,12	14
		Computation	11,11	21,76	16
		Devices	28,69	36,47	14
	Infrastructure Score		34,34	43,12	14
	Data	Data Barometer	14,37	35,76	19
	Data Score		14,37	35,76	19
	Human Talent	AI Literacy	48,75	57,9	13
		Professional Training in AI	48,43	43,49	7
		Advanced Human Talent	0	11,69	17
	Human Talent Score		34,03	39,71	12
	ENABLING FACTORS TOTAL SCORE		29,25	40,26	16
Research, Development and Adoption (R&D+A)	Research	Research	13,9	41,43	19
	Research Score		13,9	41,43	19
	I+D	Innovation	21,17	31,57	14
		Development	17,8	20,93	7
	R&D Score		30,57	42,53	11
	Adoption	Industry	46,55	54,29	12
		Government	52,1	69,65	16
	Adoption Score		48,77	60,44	16
	R&D+A TOTAL SCORE		29,36	47,46	17
Governance	Vision and Institutionality	AI Strategy	0	33,33	12
		Society's Involvement	0	19,08	12
		Institutionality	0	21,05	11
	Vision and Institutionality Score		0	26,7	12
	International Linkage	Standard Definition Participation	0	13,16	11
		International Organizations Participation	100	92,11	7
	International Linkage Score		50	52,63	9
	Regulation	Regulation on AI	0	47,37	13
		Cybersecurity	13,77	49,85	17
		Ethics and Sustainability	25,46	41,71	16
	Regulation Score		16,86	45,28	18
	GOVERNANCE TOTAL SCORE		15,06	37,46	15
ILIA 2024 TOTAL SCORE			25,74	42,08	18

GUATEMALA

General Description
Population to 2023: **18.092.000**
2023 GDP per capita: **USD 5.797,50**
% of GDP Allocated to R&D: **0,06%**
Human Development Index (HDI): **0,629**

Category: Explorer

Score : 25,90

Position: 17

	2023	2024
ILIA Total Score	**s/d**	**25,9**
Position in Index	s/d	17
Infrastructure Score	s/d	34,29
Data Score	s/d	18,65
Human Talent Score	s/d	32,49
Enabling Factors Score	s/d	29,84
Enabling Factors Position	s/d	15
Research Score	s/d	22,09
Innovation and Development Score	s/d	21,91
Adoption Score	s/d	44,62
Research, Development and Adoption Score	s/d	28,79
R&D+A Position	s/d	18
Vision and Institutionality Score	s/d	0
International Linkage Score	s/d	50
Regulation Score	s/d	18,55
Governance Score	s/d	15,56
Governance Position	s/d	14

General Overview

Guatemala has been included for the first time in the ILIA 2024 assessment. With a score of 25.9 points shows a low performance in terms of its relative position in the region, reaching seventeenth place in the ranking.

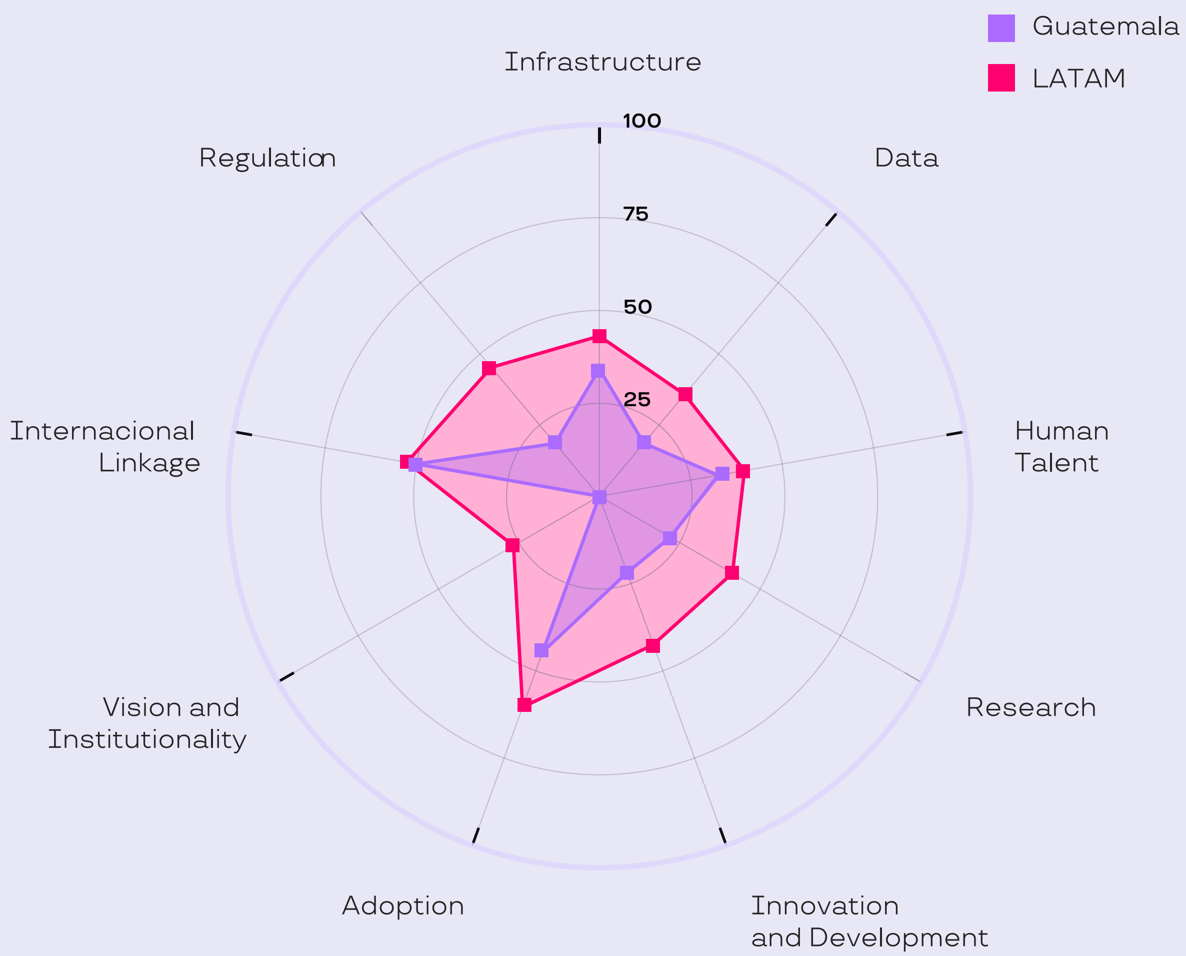
In Enabling Factors, the country has a score of 29.84 points, eleven points below the regional average, as a result of its deficient scores in both Computing and Advanced Human Talent.

As for the Research, Development and Adoption (R&D+A) dimension, it is the second to last lowest in the region, with the largest drop in the Innovation and Development (I&D) score (21.91 points), while the Adoption subdimension scores 44.62 points, behind the regional average.

In terms of Governance, the absence of a national strategy or policy leads to a score of zero in this sub-dimension, while the incorporation and verification of subscription to international agreements explains the score of 50 in the International subdimension.

In the regulatory area, the score of 18.55 shows a scarce regulatory deployment in this area, placing it in fifteenth place at the regional level.

Graph 1: Guatemala and LATAM Subdimensions



General Findings

In Infrastructure (34.29 points), Guatemala is almost 10 points below the regional average. In Connectivity (41.56 points), it is almost 14 points below the average. The country has 54% of the Population That Uses Internet, twenty points below the regional average, and half the regional average in the proportion of Households with Internet Access (30.00 points). Mobile Network Coverage is 95 points, three points higher than the regional average, while the Implementation of 5G registers almost zero score. The country stands out for having a Mobile Download Speed higher than the regional average, but an Average Download Speed in Fixed Band of 17.04 points, 14 points below the regional average. On the other hand, the Basic Fixed Broadband Basket scored 58.82, which represents 6.26% of GNI per capita.

In terms of Computing, Guatemala is well below the regional average (10.54 points). The country shows potential in terms of its Cloud score (42.00 points), which is ten points higher than the average. On the other hand, Guatemala does not have HPC Infrastructures Capacity and achieves a regional score in Certified Data Centers of 6.40, a third of the regional average. In terms of IXPs, it has a rather poor score compared to the rest of the region (4.01 points) and a level close to zero in Secure Internet Servers.

Regarding Devices (43.51 points), the Central American country has a higher score than the region, which is explained by the very high score for IPv6 Adoption (84.18), exceeding the regional average by more than double. Meanwhile, the level of Homes with Computer and Smartphones Accessibility are below the regional average.

In the area of Data (18.65 points), Guatemala registers scores well below the regional average, both in Availability (17.07 points), Capabilities (21.25 points), Governance (19.36 points) and Use and Impact (16.92), evidencing the challenges that arise to reduce the gaps in these areas. In Human Talent (32.49 points), the country is below the regional average. In AI Professional Training (41.33), it registers a score close to the regional average, with AI Skills Penetration (26.67) six points below the average and an outstanding level of STEM Graduates, since with 56.85 points it exceeds the regional average by almost twenty points. Meanwhile, in Advanced Human Talent (3.78 points) presents low levels, given that with the exception of master's programs in AI in accredited universities with a low level, the region does not have graduate programs in AI in accredited universities, nor does it have programs in universities that are in the QS ranking.

In Research, Development and Adoption (R&D+A) dimension (28.79 points), Guatemala has a gap of almost 20 points below the average. In the area of Research (22.90 points), the Central American country scores eleven points below the regional average. In the area of IA Publications (3.58 points), the country is almost 30 points below the regional average, as it is in its Active Researchers (3.32 points). At the same time, it has low levels of consistent AI researchers, with research productivity close to the average (50.28 points) and with a low level of impact. The country does not have AI Research Centers, and its Proportion of Female authors in AI is ten points below the average for the region (53.84 points).

Concerning Innovation and Development field (I&D) Guatemala is more than 20 points below the regional average. In terms of Innovation (16.41 points), the country's gap with respect to the average is even greater, registering zero scores in Private Investment, AI Companies and Unicorn Companies. The area for Application Development (64.05 points) is 10 points below the regional average, while the Entrepreneurial Environment (50.00 points) is slightly below the regional average.

Guatemala has a low level of IA Governance, representing less than half the regional average (15.56 points). The causes for this are found in the lack of an IA strategy and a non-existent Institutionality in the matter. Added to this is the lack of civil Society´s Involvement mechanisms. In terms of International Lankage (50 points), the country is above the regional average, without participating in the Standards Definition in IA but with full presence in its Participation in International Organizations.

In the area of Regulation (18.55 points), the country has relevant challenges to face in this area. It has a zero score in various regulatory matters, with no activity in the areas of Risk Mitigation, Data Protection and Security, Accuracy and Reliability. In Cybersecurity (13.59 points) it is 36 points below the average. In the AI Ethics and Sustainability Regulation, there is no development in the areas of Security, Accuracy and Reliability, and it is below the regional average in Data Protection and Privacy. In the AI Sustainability Regulation (69.29 points) it is five points below the regional average.

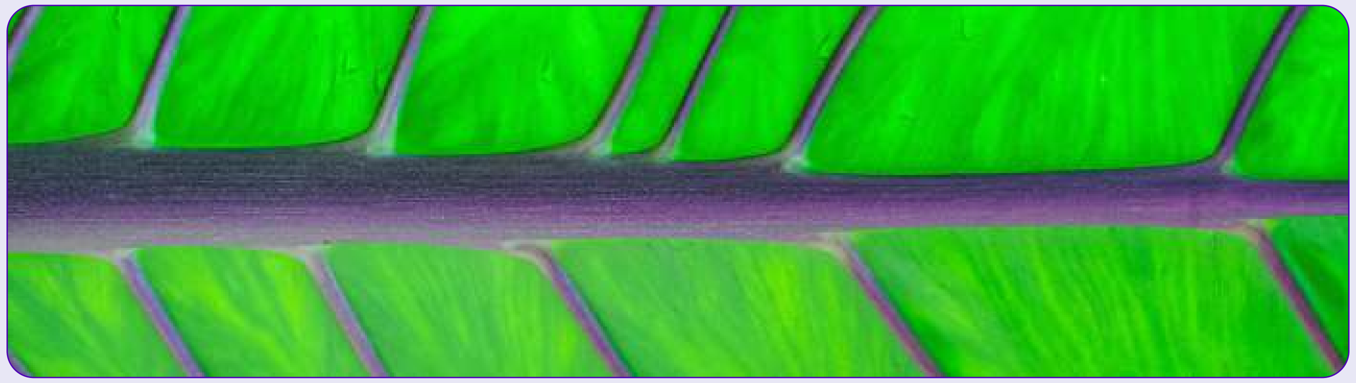
Immigration and Talent Drain in AI

In this updated version of the ILIA, Guatemala's analysis has been incorporated, marking the absence of prior comparative studies on academic talent migration within this context.

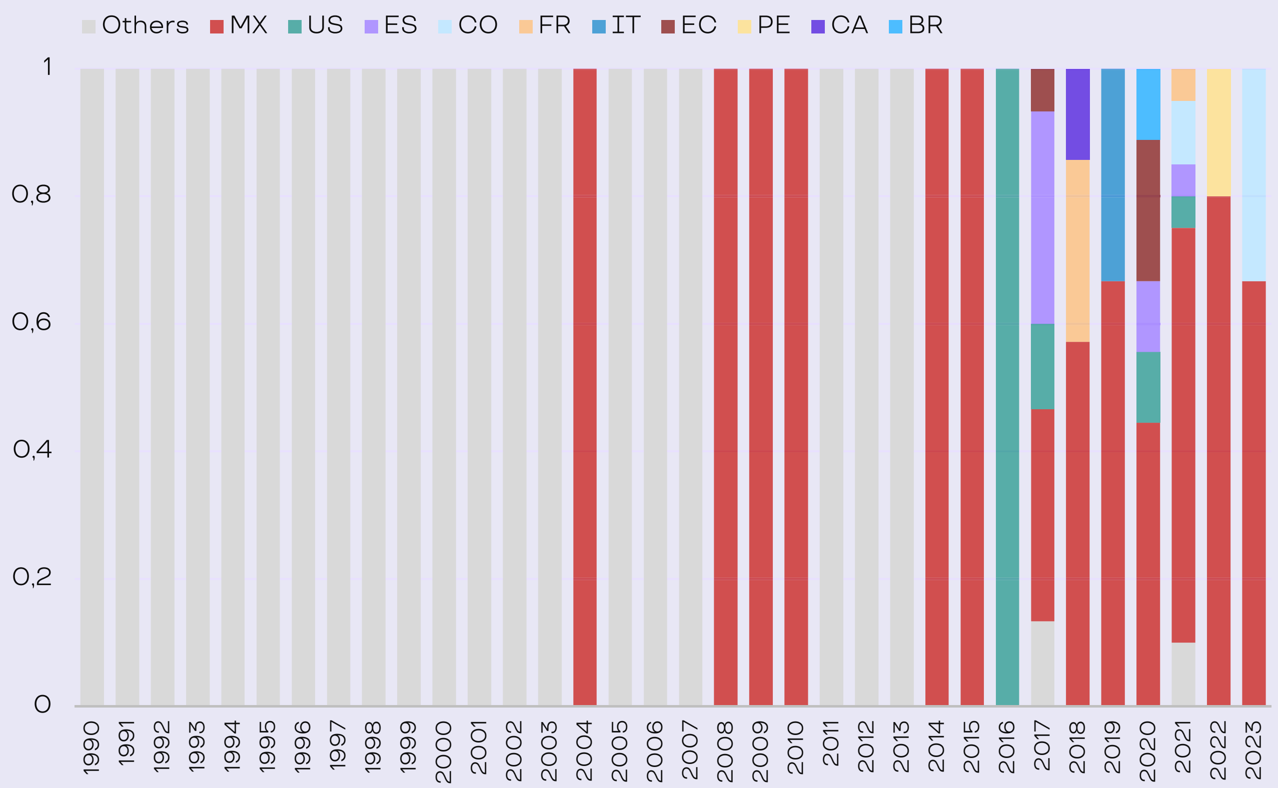
The data presented in Graph 2 and 3 indicate that academic mobility is not prevalent in Guatemala, as evidenced by a limited volume of author inflows and outflows. Notably, Mexico emerges as a significant origin and destination, likely due to linguistic similarities and geographic proximity.

Alongside Mexico, the United States and Spain are also pivotal players in academic migration flows involving Guatemala, highlighting the importance of academic relationships with these nations. Importantly, unlike trends observed in other countries within the region, China does not rank among the top ten destinations or sources for authors publishing in Guatemala.

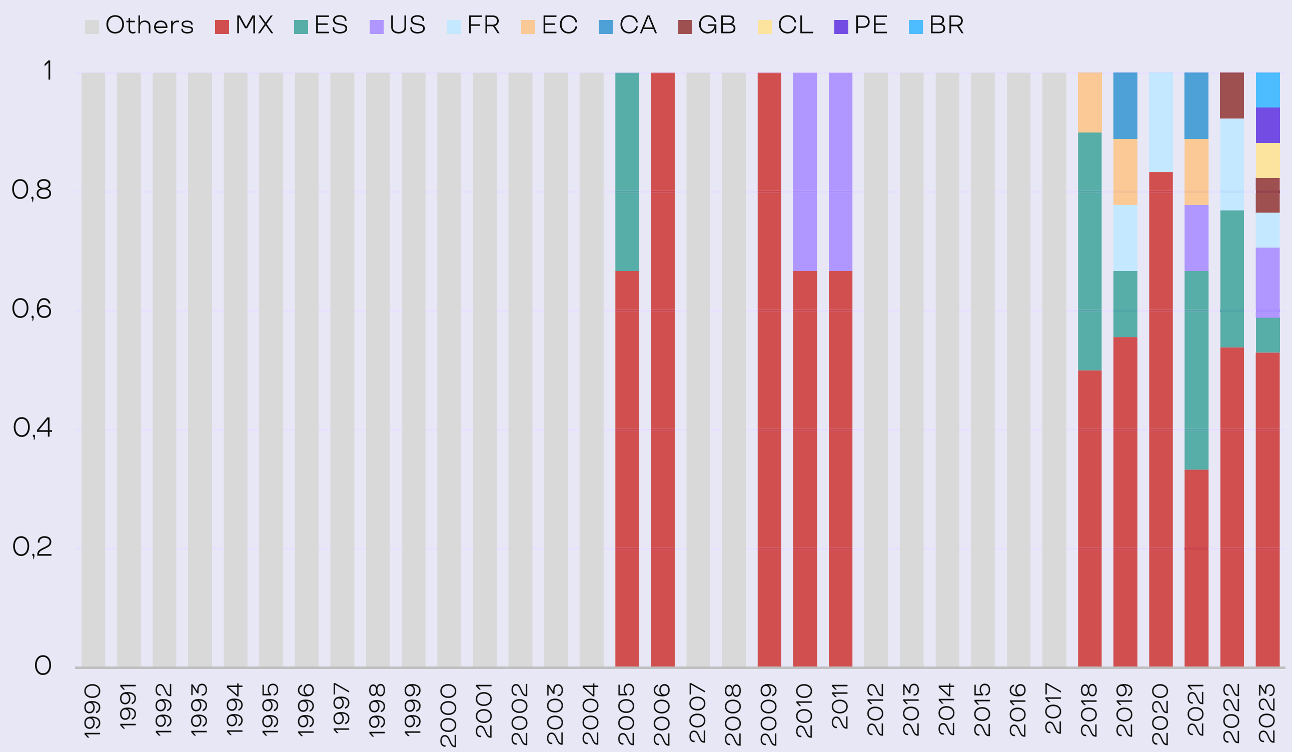
The migration patterns in this country reveal a striking symmetry between the influx and outflux of authors. This suggests that those migrating to Guatemala predominantly hail from the same countries that Guatemalan authors previously left for academic pursuits. Such a cycle of scholarly exchange aligns with regional trends, where academic collaborations between specific nations tend to remain stable over time.



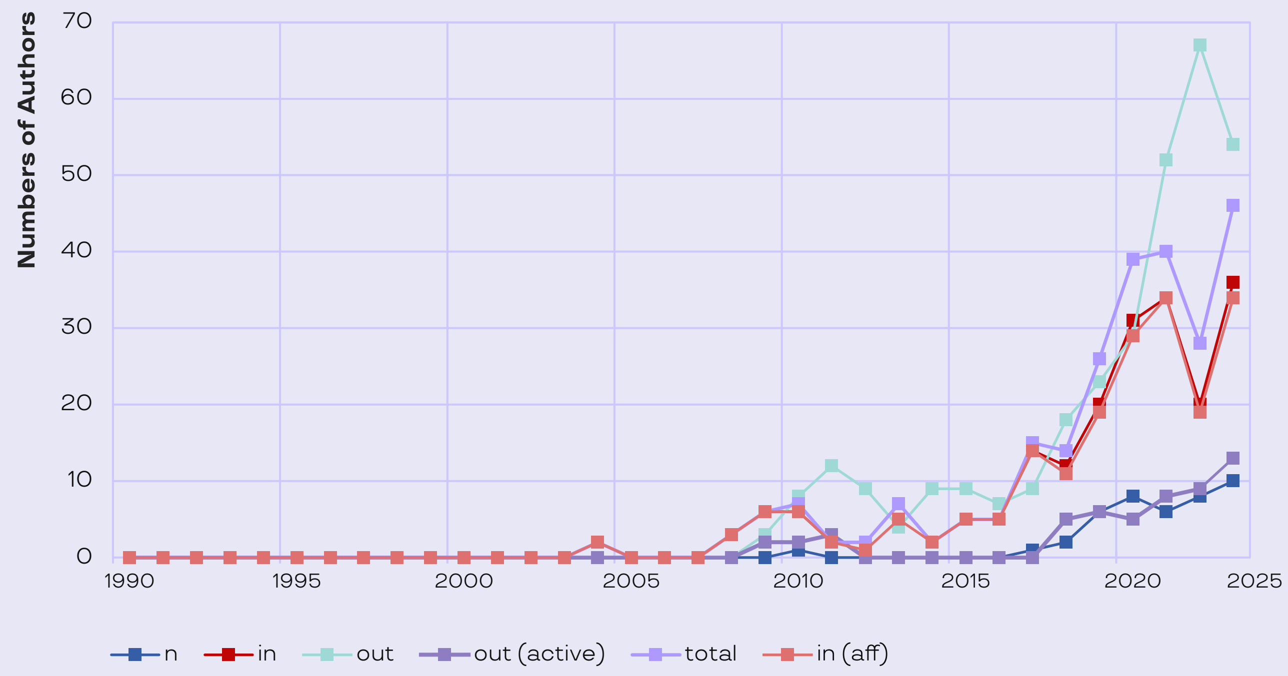
Graph 2: Where do Authors who Publish in Guatemala Come From?



Graph 3: Where Do Authors Who Published in Guatemala Go?



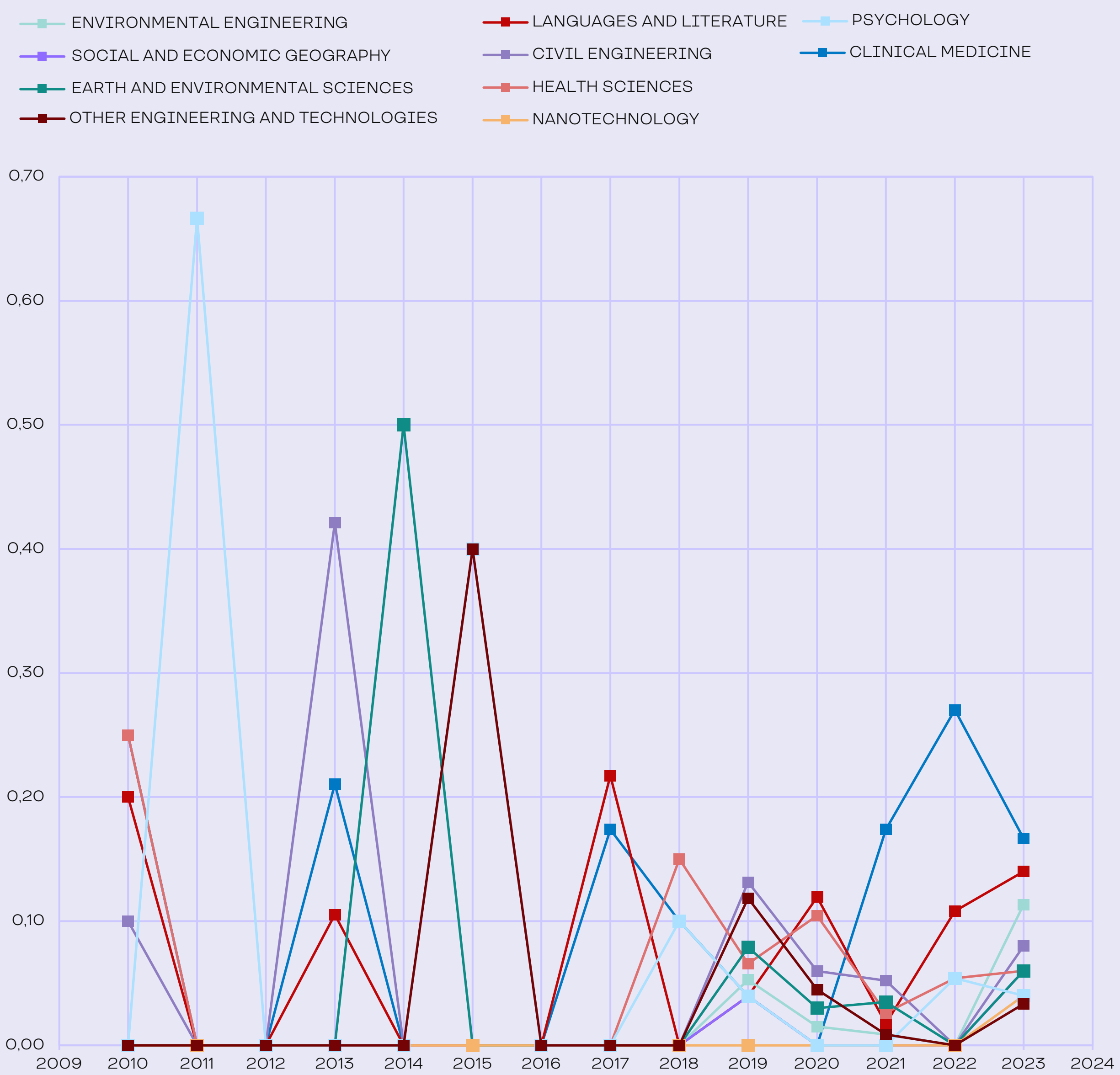
Graph 4: Talent Drain



As Graph 4 shows there was phenomenon of talent drain in Guatemala during the period from 2005 to 2023, since no data are recorded for the previous years. The first aspect to highlight is the low number of AI authors publishing in the country, as reflected by the blue line (n). This trend is relatively recent compared to the rest of the region, and the average shows that only two authors per year publish in AI during the period studied. Although the sample is small, there is an increase in the number of authors whose last publication in AI was not in Guatemala, but who are currently publishing in the country (brown line). This increase suggests a possible renewed interest or attraction of authors to the local scientific environment.

In contrast, the number of authors who had published in Guatemala in previous years, but who are not doing so in the current year, shows a slight drop in 2023, as indicated by the green line. This decline, although moderate, could indicate a reduction in the continuity of publications, which underscores the need to strengthen the constancy of scientific productivity in the country. Despite progress, these patterns reflect both emerging advancements and challenges in consolidating a stable community of AI researchers in Guatemala.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Guatemala



Graph 5 shows the distribution of the top 10 OECD disciplines in Guatemala between 2010 and 2023. It should be noted that the sample is not large enough to be statistically significant. On average, these disciplines account for 49% of scientific publications, while the remaining 51% correspond to the other 23 OECD disciplines. Clinical Medicine stands out with an average of 10% during the period analyzed, reaching its highest point in 2022. This recent increase may be related to the growing investment in the health sector and the efforts to improve medical care in the country, which has encouraged the production of research in this field.

On the other hand, Psychology had a remarkable 67% of the publications in 2010, marking a significant peak compared to other disciplines. This outstanding participation reflects Guatemala's interest in understanding and addressing mental health and social welfare issues, areas that have gained relevance in the country's scientific research due to the socioeconomic and cultural challenges faced by the population.

Dimension	Subdimension	Indicator	Guatemala	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	41,56	57,12	17
		Computation	10,54	21,76	17
		Devices	43,51	36,47	6
	Infrastructure Score		34,29	43,12	15
	Data	Data Barometer	18,65	35,76	18
	Data Score		18,65	35,76	18
	Human Talent	AI Literacy	47,38	57,9	15
		Professional Training in AI	41,33	43,49	9
		Advanced Human Talent	3,78	11,69	13
	Human Talent Score		32,49	39,71	14
	ENABLING FACTORS TOTAL SCORE		29,84	40,26	15
Research, Development and Adoption (R&D+A)	Research	Research	22,09	41,43	18
	Research Score		22,09	41,43	18
	I+D	Innovation	16,41	31,57	19
		Development	10,01	20,93	13
	R&D Score		21,91	42,53	17
	Adoption	Industry	34,13	54,29	18
		Government	60,34	69,65	13
	Adoption Score		44,62	60,44	17
	R&D+A TOTAL SCORE		28,79	47,46	18
Governance	Vision and Institutionality	AI Strategy	0	33,33	13
		Society's Involvement	0	19,08	13
		Institutionality	0	21,05	12
	Vision and Institutionality Score		0	26,7	13
	International Linkage	Standard Definition Participation	0	13,16	12
		International Organizations Participation	100	92,11	8
	International Linkage Score		50	52,63	10
	Regulation	Regulation on AI	0	47,37	14
		Cybersecurity	13,59	49,85	18
		Ethics and Sustainability	28,94	41,71	14
	Regulation Score		18,55	45,28	15
	GOVERNANCE TOTAL SCORE		15,56	37,46	14
ILIA 2024 TOTAL SCORE			25,9	42,08	17

HONDURAS

Descripción general
Population to 2023: **10.593.000**
2023 GDP per capita: **USD 3.247,20**
% of GDP Allocated to R&D: **0,06%**
Human Development Index (HDI) 2022: **0,624**

Category: Explorer

Score: 23,73

Position: 19

	2023	2024
ILIA Total Score	**s/d**	**23,73**
Position in Index	s/d	19↑
Infrastructure Score	s/d	26,35
Data Score	s/d	23,83
Human Talent Score	s/d	37,19
Enabling Factors Score	s/d	28,97
Enabling Factors Position	s/d	17
Research Score	s/d	26,38
Innovation and Development Score	s/d	21,33
Adoption Score	s/d	26,89
Research, Development and Adoption Score	s/d	25,02
R&D+A Position	s/d	19
Vision and Institutionality Score	s/d	0
International Linkage Score	s/d	50
Regulation Score	s/d	11,82
Governance Score	s/d	13,55
Governance Position	s/d	16

Honduras

General Overview

Honduras joins the ILIA 2024 for the first time, showing a lower performance in relation to the countries in the region, with a score of 23.73, reaching the last place in the ranking, i.e. nineteenth place.

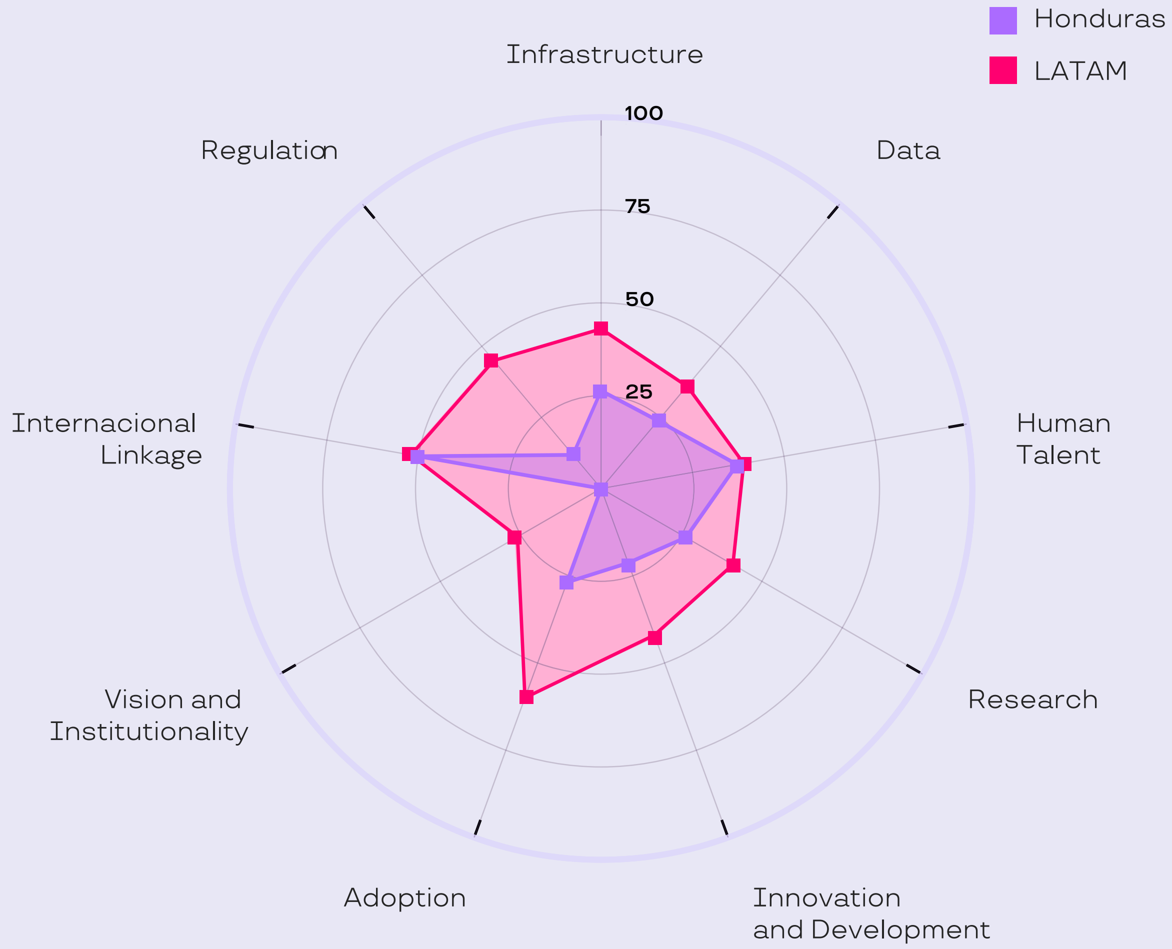
In the Enabling Factors it has a score of 28.97 points, twelve points below the regional average, which is due to its low scores in the areas of Computer Science and Advanced Human Talent.

The Research, Development and Adoption (R&D+A) dimension presents the greatest deficit in the region, reaching a score of 25.03, 20 points below the regional average. In the R&D subdimension it presents 26.38 points, while adoption reaches 26.89 points.

In terms of Governance, the absence of a national strategy or policy leads to a score of zero, while participation in multilateral Bbodies associated with the verification of subscription to international agreements explains the 50 points obtained in the International Lankage subdimension.

In the Regulatory area, it manages to obtain a score of 11.82.

Graph 1: Honduras and LATAM Subdimensions



General Findings

In Infrastructure (26.35 points), Honduras is twelve points below the regional average. In Connectivity (37.71 points), it is twenty points below the average. In the Central American country, 59% of the Population that Uses Internet, with a score of 59 points, a gap of 25 points below the regional average. The Proportion of Homes with Internet Access reaches 39.37 points, more than twenty-two points below the regional average. On the other hand, Mobile Network Coverage is below the regional average, reaching 86%, while the 5G Implementation registers 6 points, 3 points below the regional average. The country has a very low level of Fixed Broadband Subscriptions (4.97 per 100 people), with a Fixed Broadband Download Speed that is half the regional average. As for Mobile Broadband Subscription, it has 42.39 per 100 people, which nevertheless represents more than twenty points less than the regional average.

In terms of Computing (15.87 points), Honduras is below the regional average. The country has a Cloud score (42.00 points) 10 points above the average. Honduras does not have HPC infrastructures, and is eight points below the regional average score in Certified Data Centers. It has a low score in IXPs (26.17 points), six points below the average, and a level close to zero in Secure Internet Servers.

In terms of Devices (14.14 points), the Central American country presents greater challenges. The level of Homes with Computer registers 13.69 points, less than half the average, while the Smartphones Affordability is nil. In turn, the level of IPv6 Adoption (28.73 points) is eight points lower than the average for the region.

In the area of Data (23.83 points), Honduras registers half the average score in the region, with a gap that is expressed in all aspects measured by the Index in this area.

In Human Talent, the nation is slightly below the regional average. In AI Literacy, it stands 20 points above the regional average, with high scores in Early Science Education (64.00 points), a score similar to the regional average in Early AI Education and English Proficiency (53.20) four points above the average.

In Training of AI Professionals (38.54) the country registers a low regional average, with a gap of about six points below the average in terms of the level of STEM Graduates. In the area of Advanced Human Talent (0.00 points), Honduras has no graduate programs in AI in accredited universities or universities that are in the QS ranking.

In Research, Development and Adoption (R&D+A) (25.02 points), Honduras is well below the regional average, with a gap of more than 20 points in several areas measured by the Index. On the other hand, it stands out in the area of Research (26.38 points), where it exceeds the average. While the score in IA Publications represents one third of the average and has very low levels of presence of Active Researchers in IA, it has the total score in research productivity. Concerning Consistent Researchers in IA has very low levels of and a reduced level of impact. It is worth mentioning that Guatemala does not have AI Research Centers, and its Proportion of Women Authors in AI is 9 points lower than the average for the region (59.28 points).

In R&D (21.33 points), the Central American country is more than twenty points below the regional average. In the area of Innovation (18.47 points), the country's gap with respect to the average is even greater, registering scores close to zero in the Estimated Total Value of Private Investment and in Research and Development Expenditure as a Proportion of GDP. The country also has AI Companies scores six points below the average and no Unicorn Companies. For its part, the area for Application Development (63.12 points) is ten points below the regional average.

In terms of AI Development in Honduras, it registers levels four times lower than the regional average, with very low scores in Open Source Productivity and levels ten points below the average in Open Source Quality (7.54 points). In the area of Adoption, the gap of the Central American country with respect to the region is very wide, with twenty points less in the area of Industry. The Share of Medium and High-Tech Manufacturing Value-Added in Total Value-Added is 27.47 points, almost forty points below the average.

Regarding AI Adoption at the Public Sector level, Honduras registers forty points below the average in Digital Government.

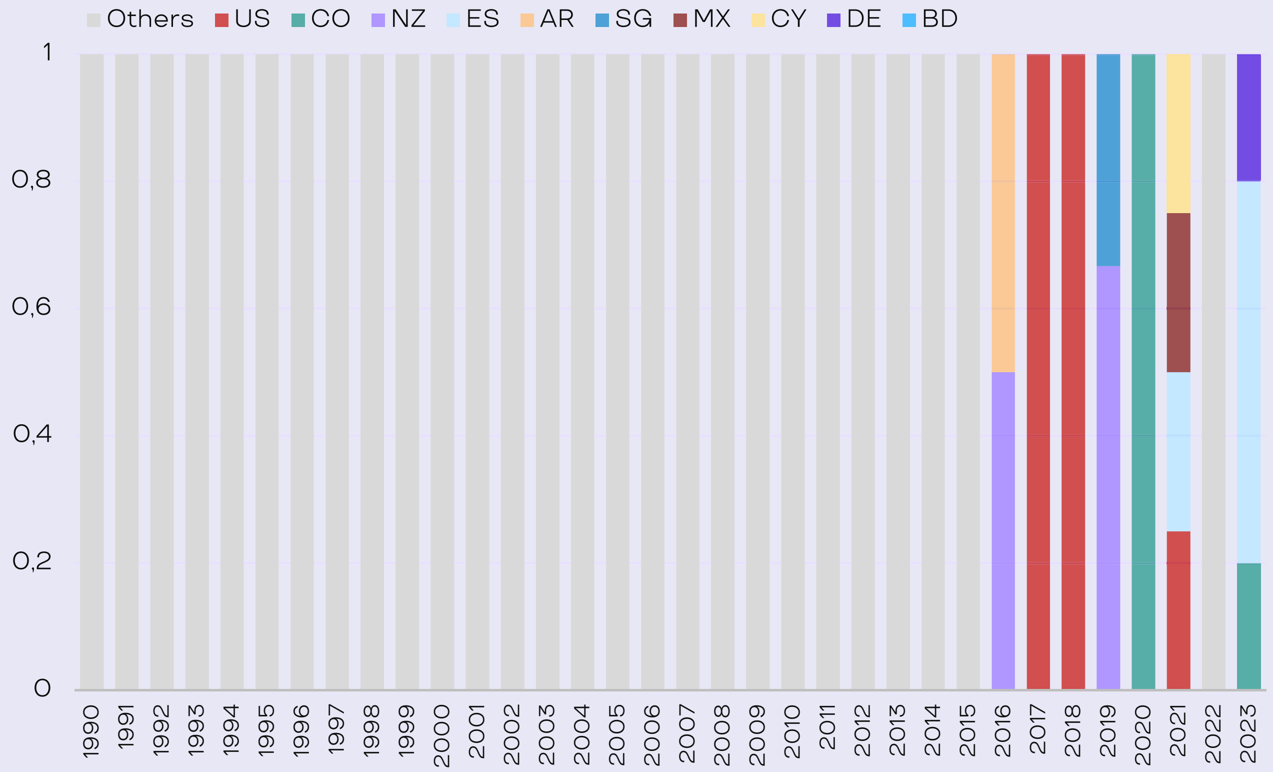
Honduras has a low level of IA Governance (13.55 points), which represents about one third of the regional average. The country does not have an IA strategy, and does not have an institution focused on this issue. Added to this is the lack of Society's Involvement Mechanisms. On the other hand, International Governance in IA (50 points), the country is similar to the regional average and besides does not participate in the definition of standards in IA, but maintains its full participation in the matter at the level of international organizations.
The Regulation subdimension (11.82 points) has one of the lowest scores in the region. Honduras' pending challenges in regulatory matters are related to Risk Mitigation (0.00 points), Cybersecurity (2.28 points), Data Protection (0.00 points) and Security, Accuracy and Reliability (0.00 points). The only area in which it has made progress is the development made in Sustainability (66.84 points), 8 points below the regional average

Immigration and Talent Drain in AI

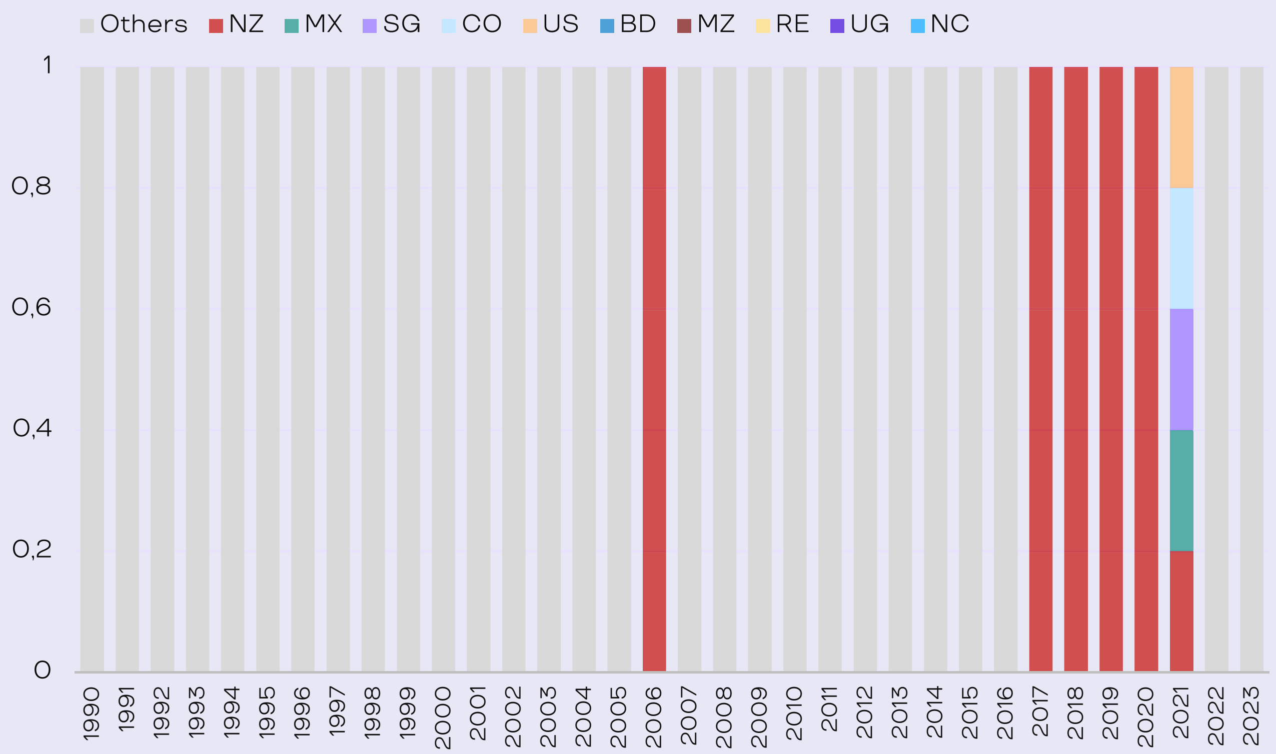
In this new version of the ILIA, the analysis of the country Honduras has been included, which implies that there is no previous comparative study on the migration of academic talent in this context. The data reveal that academic mobility in Honduras is a relatively recent phenomenon and not constant over time, with a limited volume of inflows and outflows of authors
.
In terms of the origin of authors publishing in Honduras, there is an interesting variety of countries. The United States, Colombia and New Zealand stand out as the main origins of authors, suggesting emerging connections with different regions of the world. On the other hand, the destinations preferred by Honduran authors are quite varied, with New Zealand, Mexico and Singapore as the most prominent destinations, reflecting a diversification in the international academic relations of Honduras.

It is important to note that migration patterns in Honduras are not symmetrical; that is, the countries of origin of authors who publish in the country do not coincide with the destinations to which Honduran authors migrate. In addition, in the years 2022 and 2023 no data are recorded on where authors who publish in Honduras migrate to, suggesting a discontinuity in outflows or a phenomenon still in development.

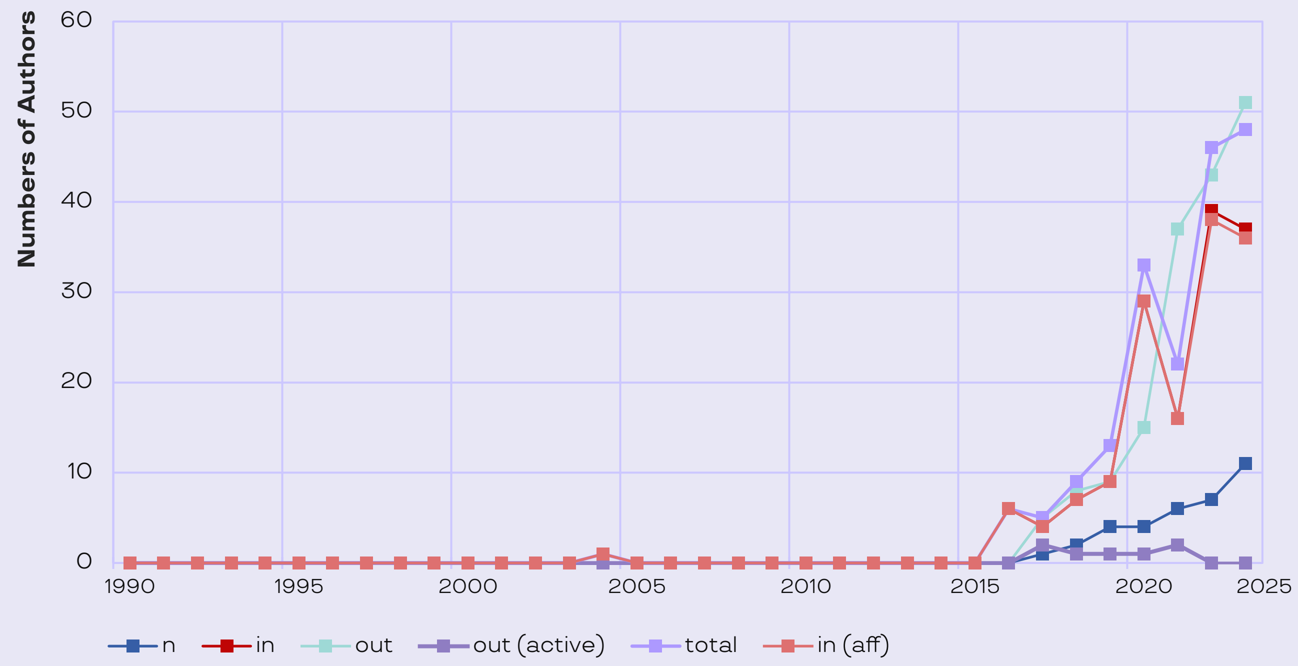
Graph 2: Where do Authors who Publish in Honduras Come From?



Graph 3: Where Do Authors Who Published in Honduras Go?



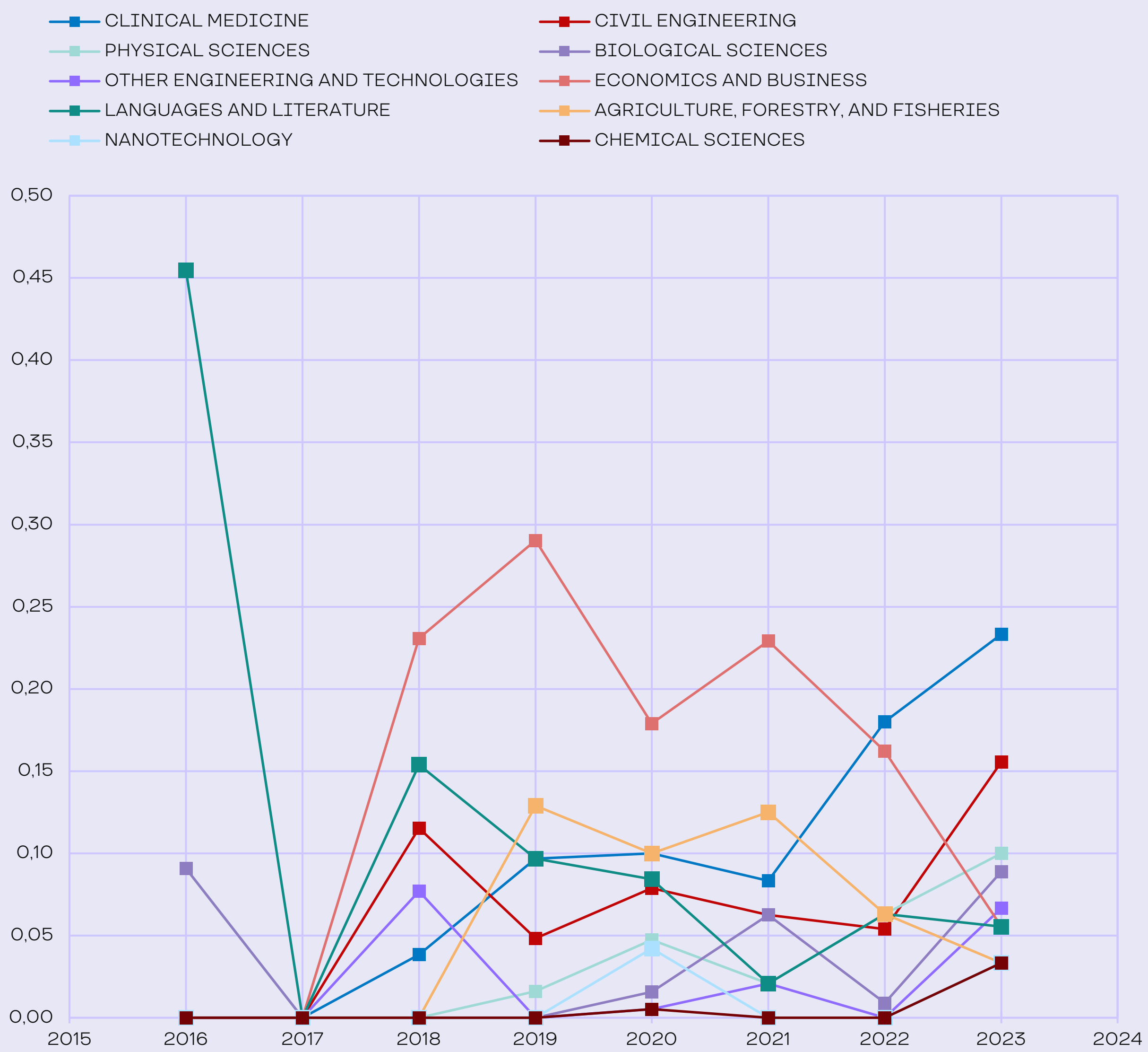
Graph 4: Talent Drain



As shown in Graph 4, there was a trend of talent drain in Honduras over the period from 1990 to 2023. It is worth noting that no authors are registered until 2004, which highlights the limited number of authors in AI publishing in the country, represented by the blue line (n). This data underlines a late start in scientific production in AI compared to other countries.

The orange (in) and brown (in aff) curves show similar behavior, indicating that the average number of authors who did not publish in previous years in the country, but do so in the current year, is comparable to the number of authors whose last publication was in another country, but who have decided to publish in Honduras at the present time. This phenomenon suggests a dynamic in which some authors are returning or joining the country's publication environment, which could indicate a growing interest in contributing to the local environment. Furthermore, it can be seen that the number of authors who published at least once in previous years in Honduras, but who are publishing in another country in the current year, is quite low. This behavior reflects that, although there is some migration of talent, it is not significant in numerical terms, which could be an indicator of the overall low activity in the field of AI in Honduras. However, the stability of this indicator suggests a margin to encourage greater constancy in national scientific production.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Honduras



Graph 5 shows the distribution of the top 10 OECD disciplines in Honduras between 2016 and 2023. It is important to mention that the sample is not large enough to be statistically significant. On average, these disciplines account for 58% of scientific publications, while the remaining 42% corresponds to the other 23 OECD disciplines. Economics and Business stands out with an average of 14% participation in publications during the period studied, reaching its highest point in 2019 with 29% of scientific publications in this area. This growth can be attributed to the growing need to research and analyze topics related to economic and business development in Honduras, especially in the face of the search for solutions for sustainable growth and the improvement of the country's socioeconomic conditions.

On the other hand, Language and Literature occupies an average of 12% of the publications, reaching 45% in 2016. This remarkable participation reflects the interest in preserving and promoting the cultural and linguistic heritage of Honduras, as well as the importance of research in the humanities, which has played a key role in strengthening cultural identity and education in the country.

Dimension	Subdimension	Indicator	Honduras	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	37,71	57,12	18
		Computation	15,87	21,76	13
		Devices	14,14	36,47	18
	Infrastructure Score		26,35	43,12	18
	Data	Data Barometer	23,83	35,76	16
	Data Score		23,83	35,76	16
	Human Talent	AI Literacy	64,07	57,9	7
		Professional Training in AI	38,54	43,49	11
		Advanced Human Talent	0	11,69	18
	Human Talent Score		37,19	39,71	9
	ENABLING FACTORS TOTAL SCORE		28,97	40,26	17
Research, Development and Adoption (R&D+A)	Research	Research	26,38	41,43	16
	Research Score		26,38	41,43	16
	I+D	Innovation	18,47	31,57	18
		Development	4,72	20,93	19
	R&D Score		21,33	42,53	19
	Adoption	Industry	26,84	54,29	19
		Government	26,96	69,65	19
	Adoption Score		26,89	60,44	19
	R&D+A TOTAL SCORE		25,02	47,46	19
Governance	Vision and Institutionality	AI Strategy	0	33,33	14
		Society's Involvement	0	19,08	14
		Institutionality	0	21,05	13
	Vision and Institutionality Score		0	26,7	14
	International Linkage	Standard Definition Participation	0	13,16	13
		International Organizations Participation	100	92,11	9
	International Linkage Score		50	52,63	11
	Regulation	Regulation on AI	0	47,37	15
		Cybersecurity	2,28	49,85	19
		Ethics and Sustainability	22,28	41,71	18
	Regulation Score		11,82	45,28	19
	GOVERNANCE TOTAL SCORE		13,55	37,46	16
ILIA 2024 TOTAL SCORE			23,73	42,08	19

JAMAICA

General Description
Population to 2023: **2.825.000**
2023 GDP per capita: **USD 6.874,20**
% of GDP Allocated to R&D: **N/A**
Human Development Index (HDI) 2022: **0,706**

Category: **Explorer**

Score : **32,38**

Position: **12**

	2023	2024
ILIA Total Score	**s/d**	**32,38**
Position in Index	s/d	12
Infrastructure Score	s/d	40,68
Data Score	s/d	31,25
Human Talent Score	s/d	35,03
Enabling Factors Score	s/d	36,63
Enabling Factors Position	s/d	11
Research Score	s/d	37,01
Innovation and Development Score	s/d	27,61
Adoption Score	s/d	51,58
Research, Development and Adoption Score	s/d	38,56
R&D+A Position	s/d	14
Vision and Institutionality Score	s/d	0
International Linkage Score	s/d	50
Regulation Score	s/d	23,09
Governance Score	s/d	16,93
Governance Position	s/d	13

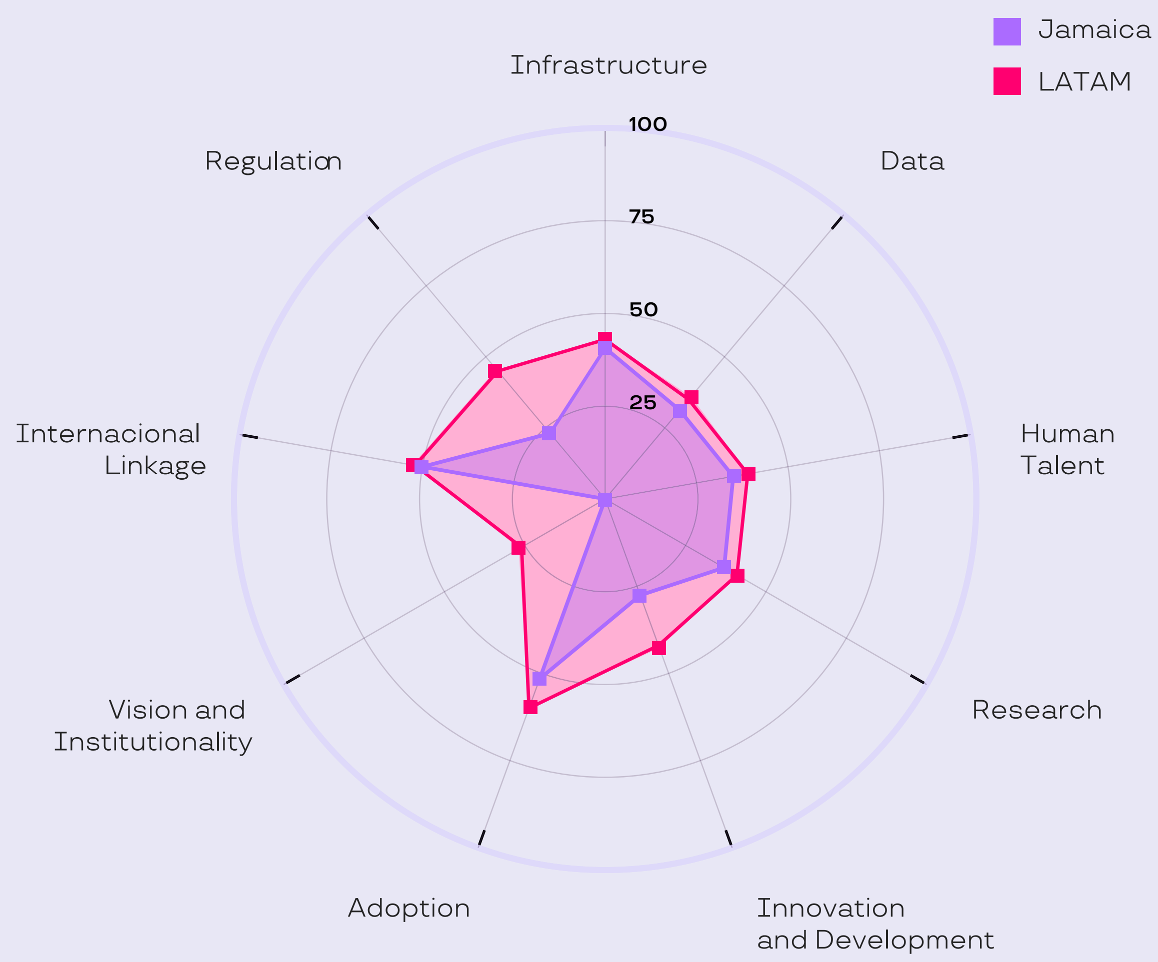
General Overview

Jamaica was included in ILIA 2024 for the first time, achieving a score of 32.38, which reflects a relatively weak performance compared to much of the region, placing it twelfth overall.

In the Enabling Factors dimension, the country records a score of 36.63, nearly four points below the regional average. Within the Research, Development and Adoption (R&D+A) dimension, Jamaica ranks fourteenth among regional nations with a score of 38.56, indicating a deficit of almost 10 points relative to the average.

In Governance, the lack of a national strategy or policy accounts for a zero in the vision and institutional framework subdimension. However, the country has achieved a score of 50 in the International Linkage subdimension due to its participation in and verification of international agreements.
In the Regulatory area, initial progress in Cybersecurity and Ethics and Sustainability contributes to a score of 23 in the subdimension. That positions Jamaica thirteenth within the Governance category.

Graph 1: Jamaica and LATAM Subdimensions



General Findings

In Infrastructure (40.68 points), Jamaica is 3 points below the regional average. In the Connectivity indicator (54.59 points), it registers a score 3 points below the average. A high percentage of the Population Uses Internet (85.12 points), while the proportion of Households with Internet Access reaches 75.38 points, almost 15 points above the average. The country stands out for having a Mobile Network Coverage of 99.00 points. However, Mobile Download Speed remains slightly below the regional average, while Fixed Broadband Download Speed (24.16 points) is seven points below the regional average. Fixed Broadband Subscriptions are at a similar level to the regional average, while Active Mobile Broadband Subscriptions reach 56.75, almost ten points below the regional indicator. The Basic Fixed Broadband Basket represents 35.29 points, or 8.91% of GNI per capita, below the average by more than 35 points.

In terms of Computing (19.97 points), Jamaica is slightly below the regional average and does not have HPC Infrastructure. However, it scores 20.50 points in Certified Data Centers, two points above average, and stands out for its score in IXPs (53.58 points), twenty points above average.

In terms of devices (33.56), the country is 3 points below the regional average.

While the level of Households That Have a Computer is significantly higher than in the region, the Smartphones Affordability (13.14) is significantly below the average. The level of IPv6 Adoption (37.00 points) is similar to the regional average.

In the area of Data (31.25 points), Jamaica faces the challenge of developing the many areas in which it is below the regional average, such as Availability, Capabilities and Governance. In the item Use and Impact of data (29.64 points), the island stands out with more than five points above the average.

In Human Talent (35.03 points), the nation is four points below the average. In terms of AI Literacy (59.06 points), the Early Science Education score (56.07 points) stands out, almost ten points above the average, and levels of Early AI Education are similar to the average. In the Professional Training in AI (25 points), the AI Skills Penetration subindicator represents a central challenge, being almost 20 points below the average. The level of STEM Graduates (31.00 points) is also lower than the regional average, registering a gap of 14 points.

In terms of Advanced Human Talent (12.12 points), the island registers a slightly above average level. Although it does not have PhD programs in AI in accredited universities and QS-ranked universities, it stands out for its Master's programs in AI in Accredited Universities subindicator (48.46 points).

In Research, Development and Adoption (38.56 points), is almost 10 points below the regivon. In research (37.01 points). The country outperforms the average despite a lower number of AI Publications and fewer Active Researchers than the region. The island does not have research centers. However, it stands out with a very high level of Research Impact (90.97), exceeding the average by almost sixty points. The country has a slightly lower level of productivity than the region (50.99 points) and zero levels of Mine Track and Side Event. The gender gap in research is evidenced by the low Proportion of Female Researchers in AI (14.91 points), less than half the regional level.

In terms of innovation (22.56 points), this island is characterized by minimal levels of investment, with the lowest value in total Estimated Private Investment in the sector. It also has a low score in AI Companies (7.93 points), 10 points below the average. The country is below the regional average in Application Development.

In terms of AI Development (9.10 points), Jamaica's low levels are due to low Productivity and Quality in Open Source compared to the region.

In terms of Adoption, ranks below the region in terms of Medium and High-Tech Manufacturing. It stands out, however, in terms of the share of Medium and High-Tech Manufacturing Value-Added in total Value-Added (72.10%), 8% points above the average. And in terms of Digital Governance, there is a challenge to close the twelve-point gap in this area (54.82 points), with an average score that is 15 points below the average. The country has a slightly below average level of AI Governance (35.87 points) due to an absence of IA Strategy and the lack of Society's Involvement mechanisms or methodologies that involve stakeholders. In the Regulation sundimension, the country has the highest level in Risk Mitigation regulation and reaches a high level in Cybersecurity (84.55 points). In the area of Ethics and sustainability, it does not register progress in terms of Security, Accuracy and Reliability, while it is well above the regional average in Data Protection and Privacy.

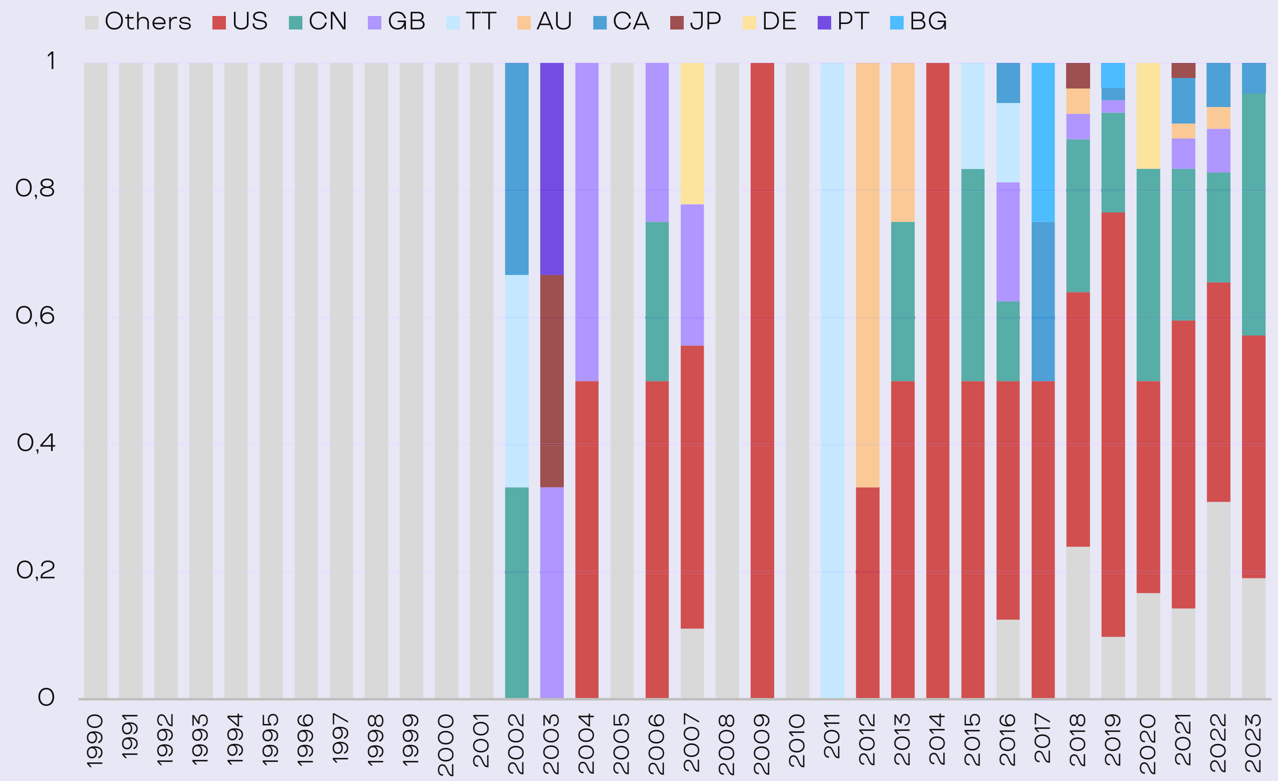
Immigration and Talent Drain in AI

In this latest edition of the ILIA, the analysis of Jamaica has been incorporated for the first time, indicating a lack of prior comparative studies on the migration of academic talent in this context. The data reveal that academic mobility in Jamaica is a relatively recent phenomenon, characterized by fluctuations over time and a limited volume of inflows and outflows of authors. This suggests that academic migration in the country remains in an emerging stage.

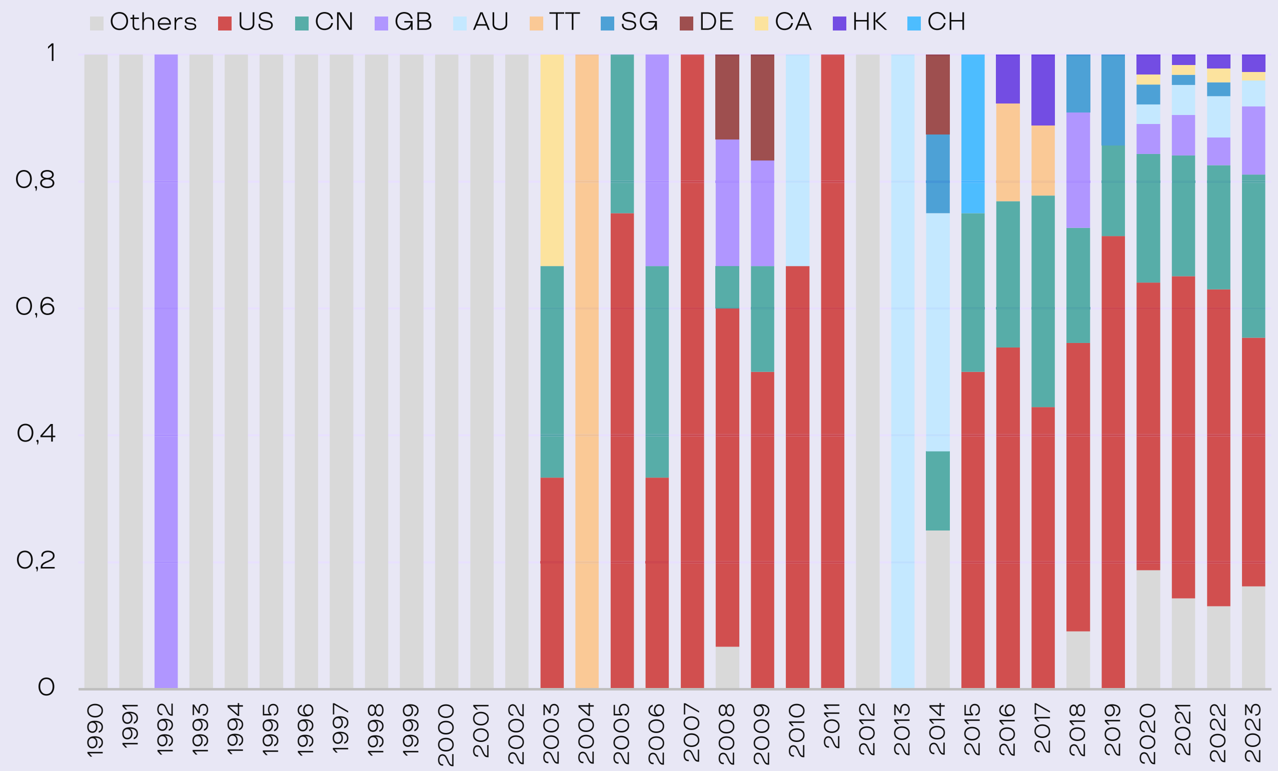
Regarding the origin and destination of authors publishing in Jamaica, the United States emerges as the primary source, followed by China and Great Britain. This reflects Jamaica's robust international ties with these academic leaders. Such migration patterns imply that Jamaica maintains substantial relationships with countries beyond the region, particularly with key global players like the United States and China. Notably, a significant distinction compared to other nations in the region is that Spain does not appear among the top ten countries of origin or destination for authors publishing in Jamaica. This observation highlights a unique dynamic of international collaboration, contrasting with most Latin American and Caribbean countries, where Spain typically serves as a vital academic partner.

The identified migration patterns exhibit symmetry, indicating that most authors migrating to Jamaica originate from the same countries to which Jamaican authors travel. This phenomenon suggests that academic exchange relationships are consistent and bidirectional, reinforcing the connections established between Jamaica and its major international collaborators.

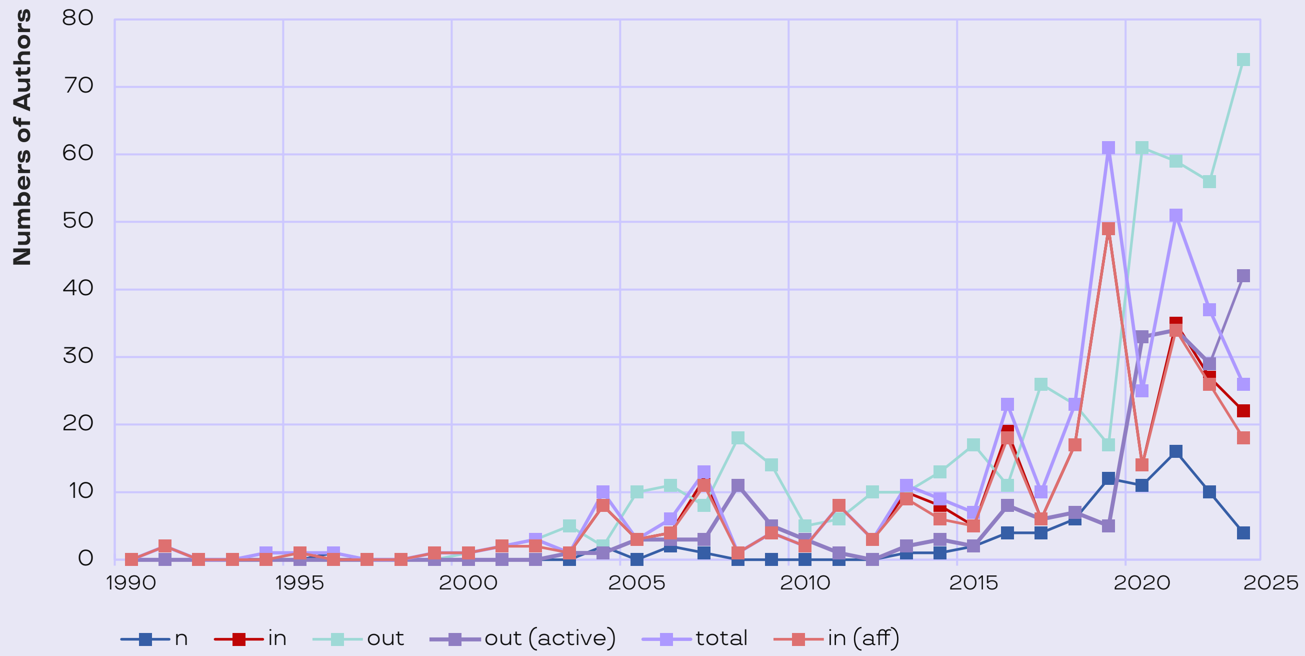
Graph 2: Where do Authors who Publish in Jamaica Come From?



Graph 3: Where Do Authors Who Published in Jamaica Go?

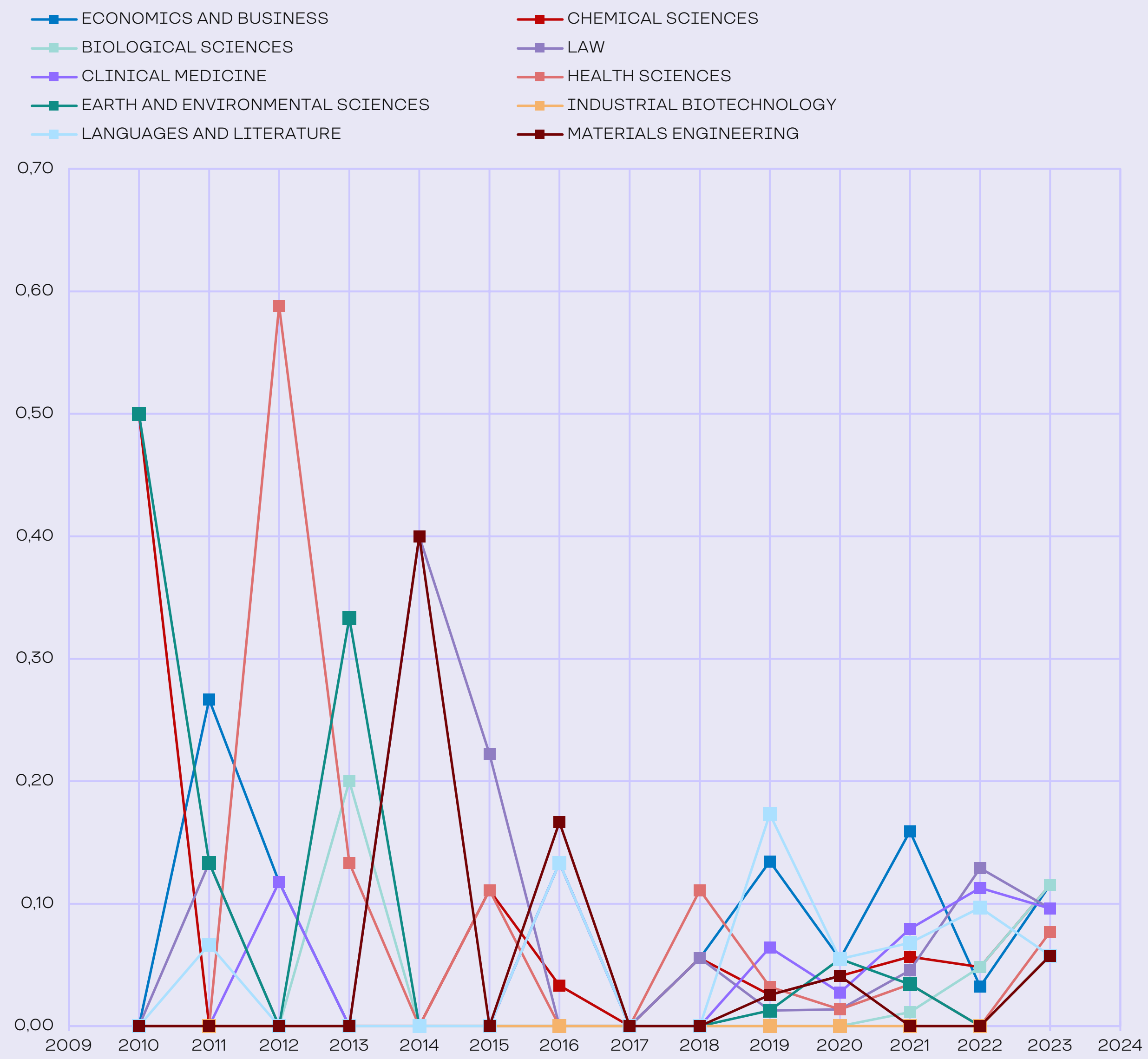


Graph 4: Talent Drain



Graph 4 evidences a phenomenon of talent drain in Jamaica during the period between 1990 and 2023. First, it highlights the low number of artificial intelligence (AI) authors publishing in the country, represented by the blue line (n), with an average of only 2 authors per year over the twenty-three years studied. Since 2017, there has been an increase in the number of authors who had previously published in Jamaica but who in the current year cease to do so, indicating a lack of continuity in the production of publications on AI (out, green line). This behavior suggests a failure to maintain consistency in publications, which limits the sustained development of the AI field in the country. Another relevant phenomenon is the number of AI authors who, after having published in Jamaica in previous years, now publish in other countries (out active, red line). This pattern does not favor the strengthening of national scientific production, as it reflects a migration of talent that could be hindering the growth of AI research in Jamaica.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Jamaica



Graph Figure 5 shows the distribution of the top 10 OECD disciplines in Jamaica between 2010 and 2023. It should be noted that the sample is not large enough to be statistically significant. On average, these disciplines account for 55% of scientific publications, while the remaining 45% is accounted for by the other 23 OECD disciplines. Economics and Business stands out with an average of 8% in the period studied, reaching its highest share in 2011. This prominence reflects the interest in economic development and applied research that supports key sectors of the Jamaican economy, especially in the areas of tourism, trade and finance, which are fundamental for the country's sustainable economic growth.

On the other hand, Health Sciences also averages 8%, with its highest point in 2012, when it accounted for 59% of AI publications. This suggests a focus on research in public health and medicine, key areas for health system strengthening in Jamaica, driven in part by the need to address the health challenges facing the country.

Dimension	Subdimension	Indicator	Jamaica	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	54,59	57,12	12
		Computation	19,97	21,76	7
		Devices	33,56	36,47	11
	Infrastructure Score		40,68	43,12	11
	Data	Data Barometer	31,25	35,76	11
	Data Score		31,25	35,76	11
	Human Talent	AI Literacy	59,36	57,9	9
		Professional Training in AI	25,5	43,49	19
		Advanced Human Talent	12,12	11,69	5
	Human Talent Score		35,03	39,71	10
	ENABLING FACTORS TOTAL SCORE		36,63	40,26	11
Research, Development and Adoption (R&D+A)	Research	Research	37,01	41,43	11
	Research Score		37,01	41,43	11
	I+D	Innovation	22,56	31,57	11
		Development	9,1	20,93	14
	R&D Score		27,61	42,53	15
	Adoption	Industry	49,42	54,29	10
		Government	54,82	69,65	15
	Adoption Score		51,58	60,44	14
	R&D+A TOTAL SCORE		38,56	47,46	14
Governance	Vision and Institutionality	AI Strategy	0	33,33	15
		Society's Involvement	0	19,08	15
		Institutionality	0	21,05	14
	Vision and Institutionality Score		0	26,7	15
	International Linkage	Standard Definition Participation	0	13,16	14
		International Organizations Participation	100	92,11	10
	International Linkage Score		50	52,63	12
	Regulation	Regulation on AI	0	47,37	16
		Cybersecurity	33,67	49,85	13
		Ethics and Sustainability	25,98	41,71	15
	Regulation Score		23,09	45,28	14
	GOVERNANCE TOTAL SCORE		16,93	37,46	13
ILIA 2024 TOTAL SCORE			32,38	42,08	12

ILIA

MEXICO

General Description
Population to 2023: **128.455.000**
2023 GDP per capita: **USD 13.926,10**
% of GDP Allocated to R&D: **0,30%**
Human Development Index (HDI) 2022: **0,781**

Category: Adopter

Score: 51,40

Position: 6

	2023	2024
ILIA Total Score	**48,55**	**51,40 •**
Position in Index	5	6↑
Infrastructure Score	50,82	50,96
Data Score	48,23	48,23
Human Talent Score	51,39	43,91
Enabling Factors Score	50,15	48,16
Enabling Factors Position	5	4
Research Score	71,42	48,39
Innovation and Development Score	18,34	61,59
Adoption Score	43,98	94,56
Research, Development and Adoption Score	44,58	66,2
R&D+A Position	4	4
Vision and Institutionality Score	2,78	0
International Linkage Score	100	75
Regulation Score	50	69,56
Governance Score	50,93	35,87
Governance Position	6	8

Mexico

ILIA

General Overview

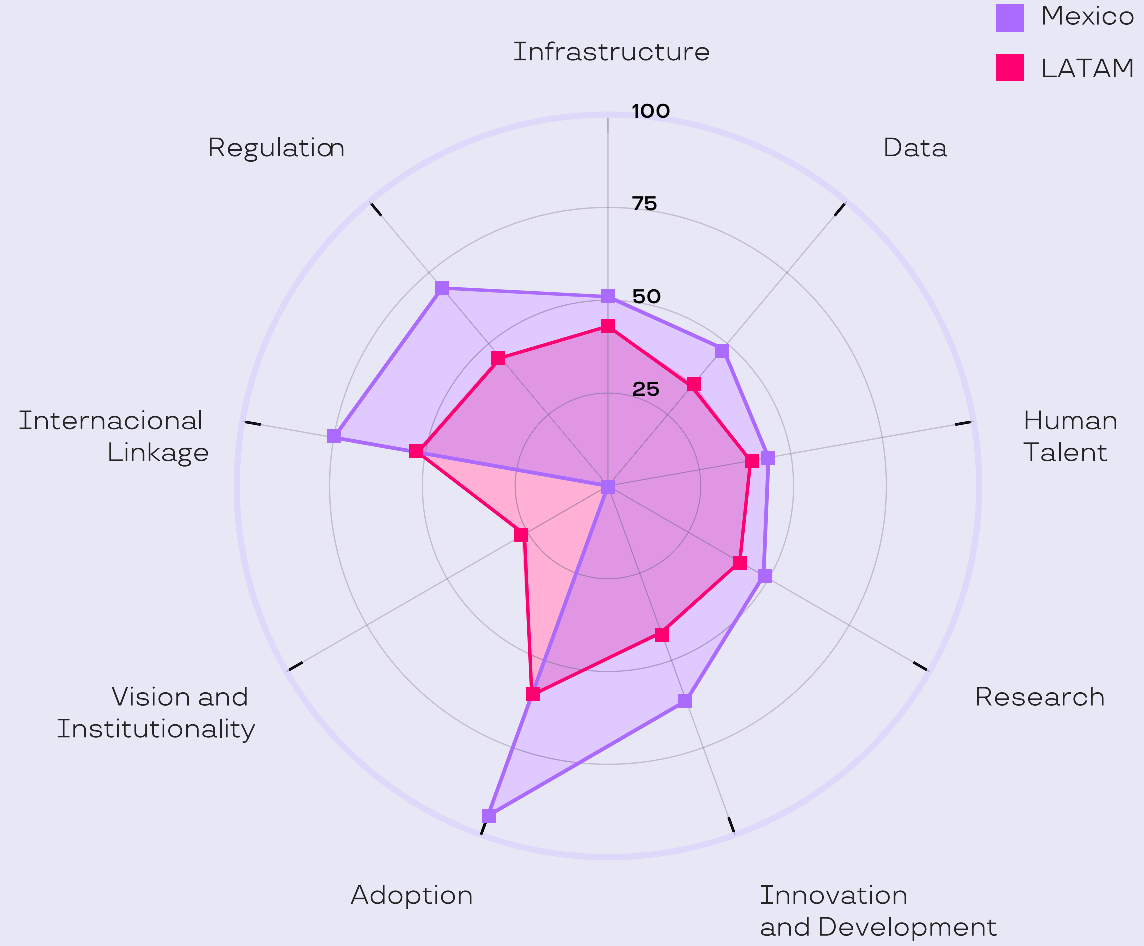
Mexico shows a lower performance than in the previous version of the ILIA. Although its overall score increases, it drops in relative position within the region by one place, reaching sixth place.

The evaluation in the subdimensions of Infrastructure and Data is analogous to that of the year 2023, while in the sub-dimension of Human Talent there is a slight decrease. Meanwhile, the R&D+A dimension shows the largest increases in relation to the previous edition, specifically in the R&D subdimension (up 43 points) and the Adoption subdimension (up 50 points). With this, it continues to be above the average for the region.

In the Governance dimension, the absence of a national strategy or policy is maintained, while the incorporation of International Organizations Participation indicator for the International Linkage subdimension explains the decrease of 25 points.

In the Regulation subdimension a rise of almost 20 points is evaluated associated with data protection regulations. With this, it is below the regional average, occupying eighth place in the subdimension.

Graph 1: Mexico and LATAM Subdimensions



General Findings

In Infrastructure (50.96 points), Mexico is seven points above the regional average. The Connectivity indicator (65.52) shows that 78.63% of the Population Uses the Internet, three points above the regional average and above average levels in the proportion of Households With Internet Access (68.50 points). Regarding Implementation 5G subindicator, it shows a low score with 32.94 points but well above the regional average. And while the Average Mobile Download Speed is similar to that of the region, the Fixed Broadband Download Speed is 10 Mpbs lower than the LATAM average (21.27 Mbps). Mobile Network Coverage is 96 points (four points above the regional average) and Active Mobile Network Subscription is also significantly higher than the regional average. The Basic Fixed Broadband Basket represents 95.60% of GNI per capita, 10 points above the average.

In the area of Computing, Mexico does not reach half the average score. In Cloud, it outperforms the region's average, but registers lower levels in HPC Infrastructure Capacity, in addition to low scores in Certified Data Centers (5.64 points) and Secure Internet Servers (2.06 points). Regarding IXP the country shows a minimum score.

In Devices (62.43 points), this nation far exceeds the average with a number of Households That Have a Computer (41.11 points) that is 13 points above the average and with a Smartphones Affordability subindicator that exceeds the regional average by 20 points. The level of IPv 6 Adoption stands out, which at 89.25 is one of the highest in the region.

In the Data subdimension, Mexico outperforms the regional average, standing out in Availability and Use and Impact.

In terms of Human Talent (43.91 points) the country exceeds the regional average by four points, with the AI Literacy indicator 17 points above the regional average and the Early Education in Science subindicator 23 points above the average. At a lower level is English Proficiency, with 27.95 points. As for the Professional Training in AI indicator, Mexico registers levels of AI Skills Penetration (53.33 points) that is eight points above the average, highlighting the subindicator of STEM Graduates (59.19 points), with 15 points above the LATAM average. Advanced Human Talent (13.01 points) is an indicator that in Mexico is slightly above the regional average, standing out in its AI PhD programs with accreditation and QS ranking in the region. Meanwhile, the master's programs in AI are below the average in both aspects. In the Research, Development and Adoption dimension (66.22 points), this country shows its potential by being almost 20 points above the regional average. It is worth mentioning that in the Research indicator (48.39 points) it is slightly above the regional average, with researchers specialized in the subject and a Proportion of Female Authors in IA that is 10 points higher than the regional average. It should be noted that the country faces the challenge of strengthening the Productivity and Impact of AI Research, aspects that are below the average. In terms of Participation in Main Tracks (4.38), the score is half the average but stands out in terms of Side Events Participation (19.48 points).

In the area of Innovation (41.24 points), the country has a high Number of Private Investments and a significant number of Unicorn Companies. At the same time, it registers scores below the regional average in AI Companies and in the Expenditure on Research and Development as a Proportion of GDP subindicator. It is also slightly below average in Application Development and Entrepreneurial Environment.

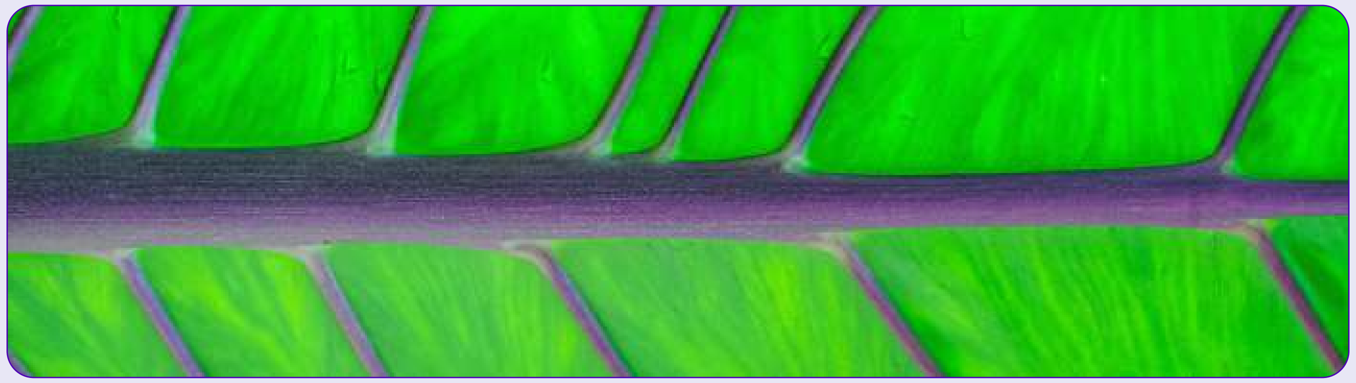
In terms of AI Development (39.71), Mexico is about 20 points above the regional average. And although it has a score close to zero for Open Source Productivity, the country slightly exceeds the regional average in Open Source Quality. In Number of Patents, meanwhile, it obtains the maximum score.

Adoption is a subdimension in which it has the most robust profile at the regional level. In the Industry indicator, it shows a maximum score in the variables of Workers in the High-Tech Sector and Medium and High-Tech Manufacturin, with the level of Share of Medium and High-Tech Manufacturing Value-Added in total Value-Added also being high (88.84%), representing 24 points more than the regional average. At the government level, the degree of AI adoption in Mexico registers a great progress with a subindicator of Digital Government showing 88.84 points.

Governance is a dimension in which this nation shows a low score (25), which responds to the fact that it does not have an IA Strategy, nor mechanisms for civil Society's Involvement, nor an institution specifically dedicated to this matter.

As for the country's International Linkage, its score reached 75, showing Participation in the definition of international standards in IA and presence in committees of international organizations with the highest score.

In the regulatory area (69.56 points), Mexico registers more than 20 points above the regional average, reaching the maximum score in Risk Mitigation and 84.55 points in Cybersecurity which places it 35 points above the average in this aspect. It stands out in the area of Data Protection (66.86 points), with more than 35 points above the average, while in Sustainability (78.32) it surpasses the region by four points above the regional average. It is worth mentioning that the nation's challenges in this dimension are in creating a regulatory framework in the area of Security, Accuracy and Reliability (0 points).



Immigration and Talent Drain in AI

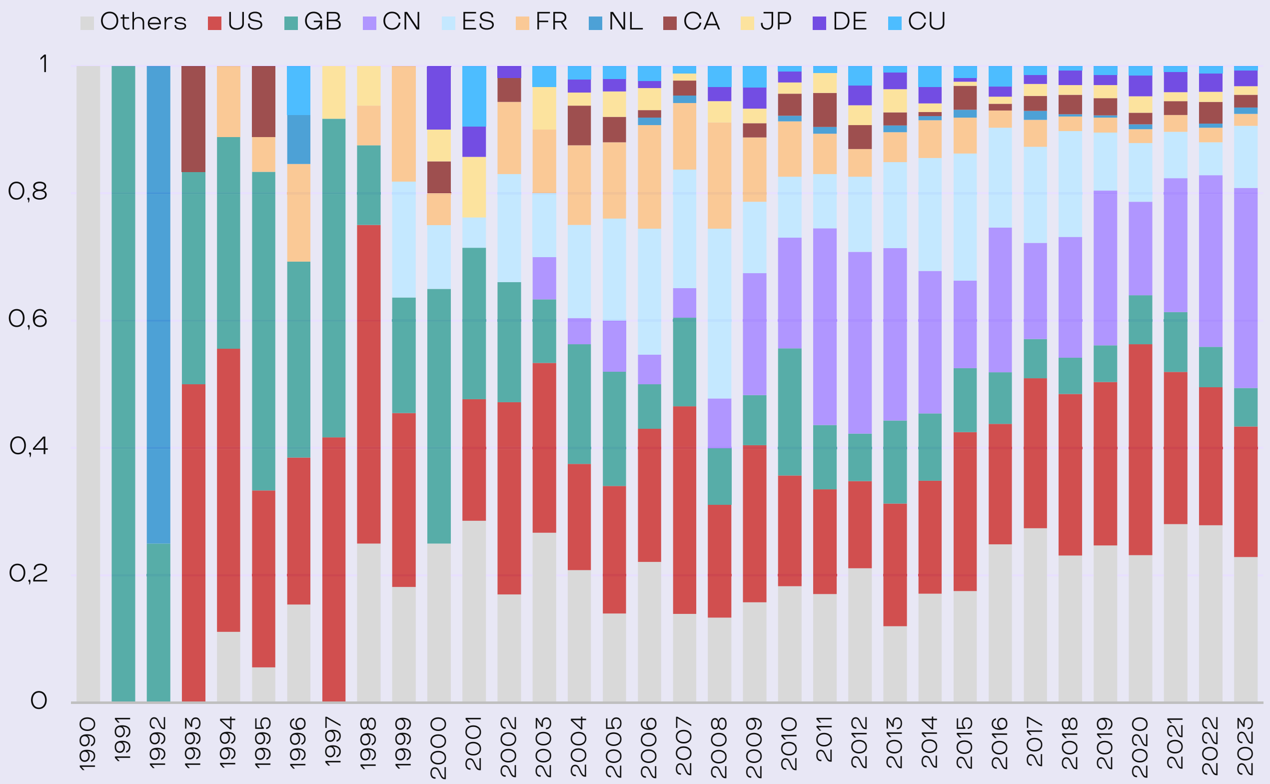
As observed in the 2023 migration study, the United States has maintained its importance as a source and destination country for authors publishing in Mexico from 1993 to 2023. This leadership is probably due to geographical proximity and affinities of scientific collaboration. Great Britain has also maintained a constant relevance over time, standing out as another key country for author migration, which could be linked to language and cultural affinities.

An interesting case is that of China, which since 2003 has gained relevance and, in 2023, is positioned as one of the most important countries both as a destination and origin of authors publishing in Mexico, in line with the sustained growth of China in the field of AI research globally.

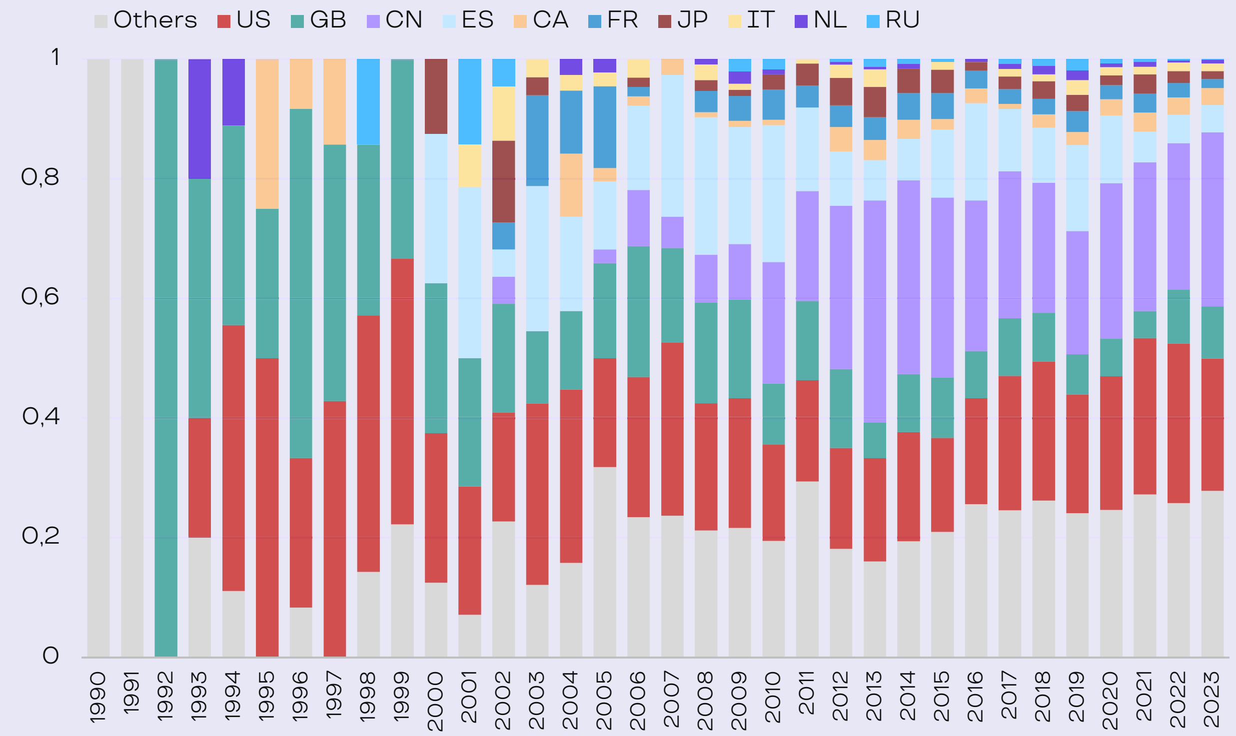
On the other hand, there has been a progressive decrease in the participation of European countries such as France, Spain and Germany, which used to have a more significant presence in academic migration flows to and from Mexico.

Migration patterns show a remarkable symmetry between the arrival and departure of authors, suggesting that most authors publishing in Mexico come from countries to which Mexican authors have previously migrated. This cycle of academic exchange is similar to that observed in other countries in the region, which reinforces already established collaborative relationships.

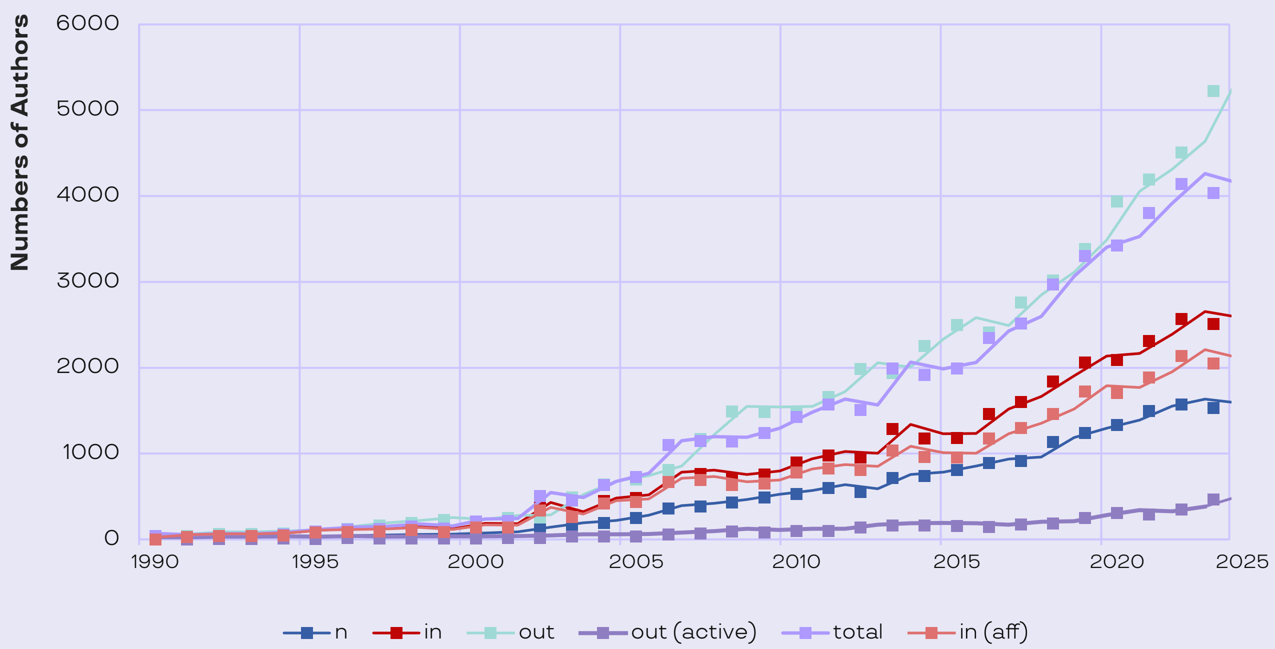
Graph 2: Where do Authors who Publish in Mexico Come From?



Graph 3: Where Do Authors Who Published in Mexico Go?

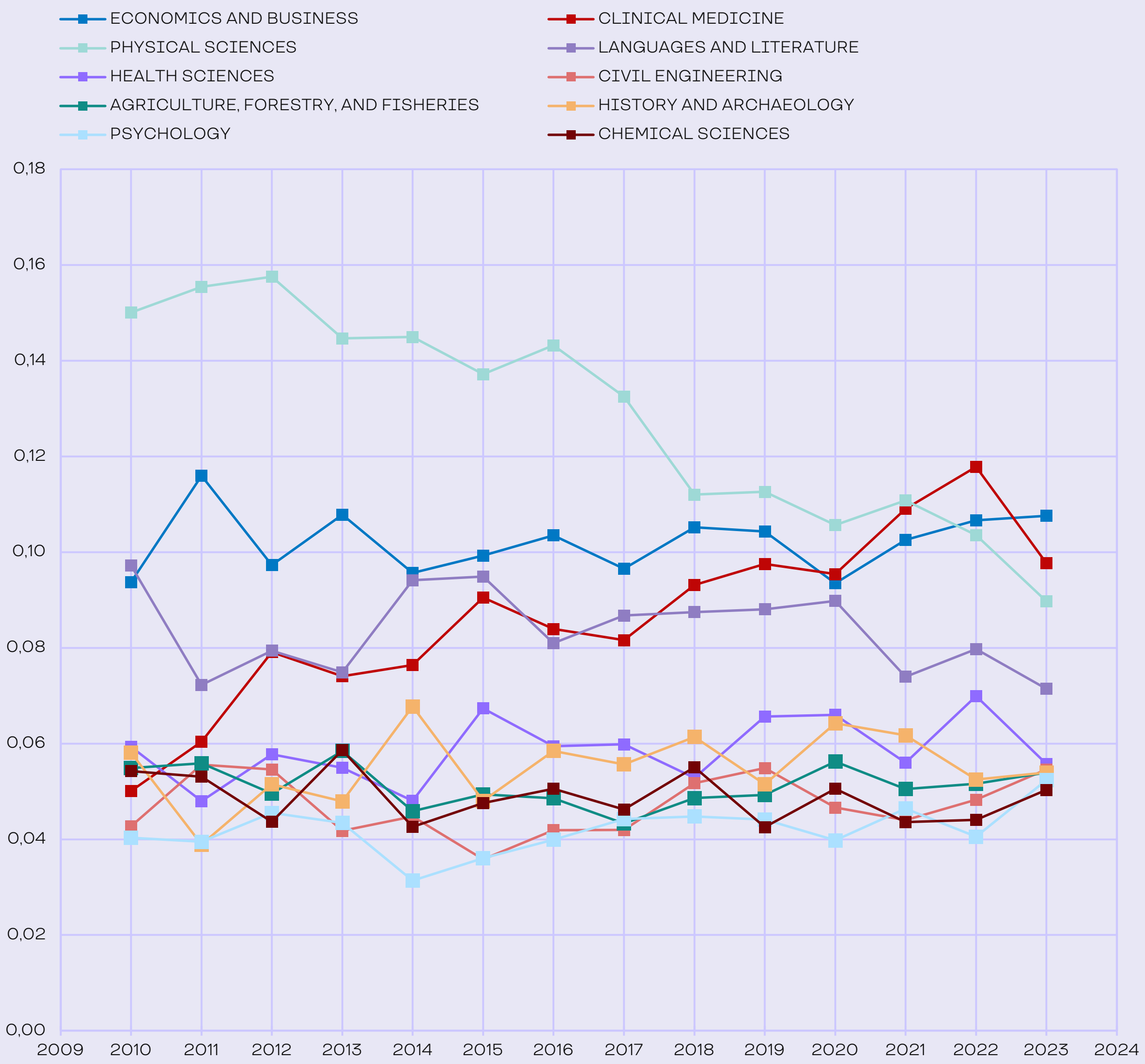


Graph 4: Talent Drain



Unlike other countries in the region, the impact of the pandemic on the number of authors that make up the ecosystem is not so relevant, while there is a significant acceleration in the outflow of authors who leave the country and publish consistently in other regions (red). The number of consistent authors in IA (blue) shows a growth in the decade, mainly driven by new academics entering the system (orange). As in the rest of the region, the multidisciplinary collaboration reflected in the green line shows a more pronounced growth than the rest of the groups.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Mexico



Graph 5 reveals that in the case of Mexico the Physical Sciences have experienced a significant decrease in their relative relevance using AI, from 16% to 9% in 2023. This decline may be associated with a more relevant growth in the use of technology in research in other disciplines, a phenomenon consistent with the composition of the ecosystem shown in Graph 4.

In contrast, Clinical Medicine shows a remarkable increase, probably driven by the COVID-19 pandemic in 2020, which accelerated the integration of AI technologies in medical research. In 2023, Clinical Medicine was positioned as the second most relevant discipline, representing 10% of OECD concepts and only surpassed by Economics and Business, which reached 11%.

The growth of the latter discipline from 2020 onwards can be interpreted as a reflection of the boom in technological innovation and the emergence of new AI-based business models in Mexico, underscoring the growing importance of AI as a driver of change in the country's economic sector.
These data indicate a trend towards greater adoption of AI in strategic areas, positioning Mexico as a key player in the region in the application of AI in economics and medicine.

Dimension	Subdimension	Indicator	Mexico	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	65,52	57,12	5
		Computation	10,37	21,76	18
		Devices	62,43	36,47	2
	Infrastructure Score		50,96	43,12	5
	Data	Data Barometer	48,23	35,76	6
	Data Score		48,23	35,76	6
	Human Talent	AI Literacy	57,82	57,9	11
		Professional Training in AI	56,26	43,49	5
		Advanced Human Talent	13,01	11,69	4
	Human Talent Score		43,91	39,71	5
	ENABLING FACTORS TOTAL SCORE		48,16	40,26	4
Research, Development and Adoption (R&D+A)	Research	Research	48,39	41,43	7
	Research Score		48,39	41,43	7
	I+D	Innovation	41,24	31,57	5
		Development	39,71	20,93	5
	R&D Score		61,59	42,53	4
	Adoption	Industry	96,28	54,29	1
		Government	91,98	69,65	3
	Adoption Score		94,56	60,44	1
	R&D+A TOTAL SCORE		66,2	47,46	4
Governance	Vision and Institutionality	AI Strategy	0	33,33	16
		Society's Involvement	0	19,08	16
		Institutionality	0	21,05	15
	Vision and Institutionality Score		0	26,7	16
	International Linkage	Standard Definition Participation	50	13,16	3
		International Organizations Participation	100	92,11	11
	International Linkage Score		75	52,63	3
	Regulation	Regulation on AI	100	47,37	6
		Cybersecurity	84,55	49,85	2
		Ethics and Sustainability	48,39	41,71	8
	Regulation Score		69,56	45,28	5
	GOVERNANCE TOTAL SCORE		35,87	37,46	8
ILIA 2024 TOTAL SCORE			51,4	42,08	6

PANAMA

General Description:
General Description: **4.468.000**
2023 GDP per capita: **USD 18.661,80**
% of GDP Allocated to R&D: **0,17%**
Human Development Index (HDI) 2022: **0,820**

Category: Adopter

Score : **37,48**

Position: **10**

	2023	2024
ILIA Total Score	**24,66**	**37,48●**
Position in Index	9	10
Infrastructure Score	47,45	49,93
Data Score	31	31
Human Talent Score	16,12	33,74
Enabling Factors Score	31,52	40,34
Enabling Factors Position	9	8
Research Score	40,2	34,27
Innovation and Development Score	23,61	43,14
Adoption Score	38,59	54,91
Research, Development and Adoption Score	34,13	43,12
R&D+A Position	8	12
Vision and Institutionality Score	0	0
International Linkage Score	0	50
Regulation Score	25	50,01
Governance Score	8,33	25
Governance Position	9	10

Panama

ILIA

General Overview

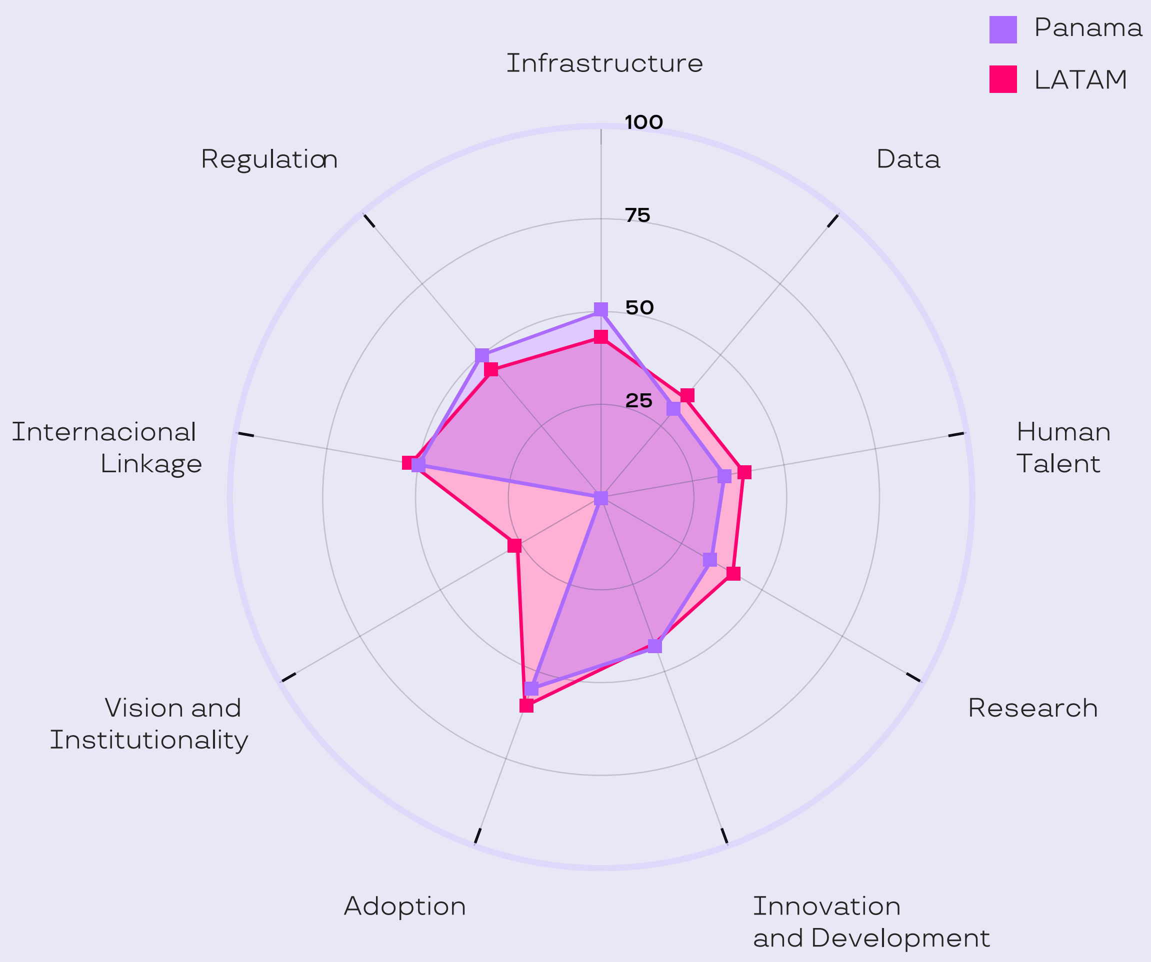
Panama shows superior performance compared to the index launched in 2023. Its overall score increased significantly with 13 points, but despite this, it dropped one place to tenth.

The evaluation of the Infrastructure and Data subdimensions shows no notable differences compared to 2023, whereas Human Talent exhibits a significant increase due to the incorporation of indicators linked to STEM Degrees and Early Education in AI, which includes ICT elements in the school curriculum.

The Research, Development, and Adoption (R&D+A) dimension shows the largest increases compared to the ILIA previous edition, specifically in the Innovation and Development (I&D) subdimension (up 20 points) and the Adoption (up 17 points). Notably, the Research recorded a six-point drop from last year's results, indicating it remains below the regional average.

In Governance, there is an absence of a national strategy or policy persists, while the International Linkage subdimension shows a significant increase due to the incorporation and verification of subscriptions to international agreements (up 50 points). In the regulatory area, the 50-point score reflects a notable increase from 2023, although it remains below the regional average

Graph 1: Panama Rica and LATAM Subdimensions



General findings

In Infrastructure (49.93 points), Panama is six points below the regional average. The Connectivity indicator shows levels above the average, with subindicators such as Percentage of the Population that Uses Internet (73.61), slightly below the regional average, and the proportion of Households with Internet Access (80.47 points) above the average by 20 points. Meanwhile, the implementation of 5G is very low (1.00 points), while mobile network coverage reaches 95%, exceeding the regional average by three points. The country has an Average Broadband Download Speed significantly above the regional average, while in terms of Mobile Download Speed (11 Mbps) it is below the average.

Other subindicators, such as Fixed broadband, register active subscription levels of 21.43 per 100 people, five points above the regional average, while Active Mobile Broadband Subscriptions reach 85.476 per 100 people, 20 points above the average. The Basic Fixed Broadband Basket represents 81.23% of GNI per capita, 10 points above the average.

In terms of Computing, Panama is slightly above the LATAM average, highlighting the subindicator of Certified Data Center (51.85 points), more than double the regional average. However, in HPC Infrastructure Capacity, it does not register a score and has the lowest score in Secure Internet Servers. For its part, IXP shows a slightly below-average score.

In terms of Devices (48.97 points), the Central American country stands out with a number of Households that have a computer (35.22 points), six points above the region, and achieves the highest score in Affordability to smartphones, mainly due to its status as a port with open access to technology markets. However, the level of IPv6 Adoption (11.69) is less than a third of the regional average.

In the area of Data (31.00 points), Panama's scores are below the regional average. The gap with the region is particularly evident in the Use and Impact subindicator (12.68 points), which is 12 points below the regional average. However, it stands out in the area of Capabilities (46.43 points), registering five points above the average.

The Human Talent subdimension (33.74) exceeds the regional average by five points, but lags behind in the AI Literacy indicator (35.84) compared to the average: Early Education in Science presents 12 points less and English Proficiency, nine points less.

In the area of Professional Training in AI, the Central American country registers levels below the region, showing 40 points in Penetration of AI Skills subindicator (two points below the average) and in STEM Graduates 7 points below the average.

Panama's Advanced Human Talent indicator (7.66 points) registers a level below the regional average by not having AI PhD programs or AI master's degree programs in QS Ranking. Despite this, it outperforms the region by seven points in the Master's Programs in AI at Accredited Universities subindicator (30.64).

In the Research, Development and Adoption (R&D+A) dimension (43.2 points), the country is below the regional average. In Research, it has a slightly higher average than the region, while in the Innovation indicator (21.55 points) it is notoriously below the regional average. The latter is due to a low number of private investments, with a total estimated value close to zero, combined with a low number of AI Companies (4.48 points) and the absence of Unicorn Companies. A low level of R&D Expenditure as a Proportion of GDP subindicator

(9.62 points) - representing one third of the average - would explain the situation. However, the Central American country stands out in Application Development and Entrepreneurial Environment, with three points above the regional average.

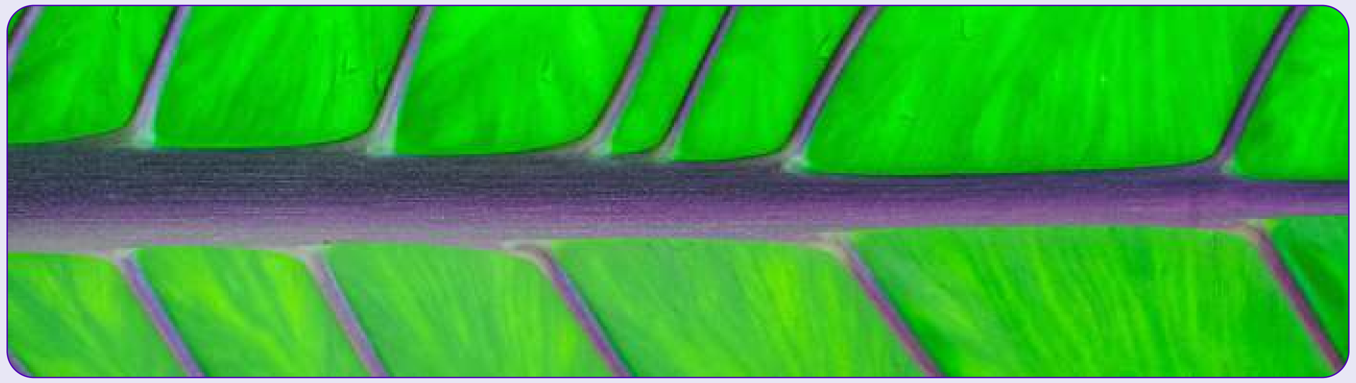
In terms of AI Development (42.18), Panama stands out with 20 points above the regional average, achieving the highest score in Open SourcePProductivity, while in Open Source Quality it remains slightly below the average. In the area of Number of patents, the score is below the regional average.

The Adoption subdimension, on the other hand, registers in this nation a lower score than the region (54.91 points), showing levels similar to the average in the Share of Medium and High-Tech Manufacturing Value-Added in total Value-Added. However, it ranks well below the average in Medium and High-Tech Manufacturing, and eight points below the average in Medium and High-Tech Workers (46.15 points). In terms of AI Adoption at the government level, it registers progress in Digital Government (75 points), exceeding the average by six points.

The country has a low level of AI Governance (25 points), which is primarily due to the fact that Panama does not have an AI strategy or mechanisms for civil society involvement to promote it. Nor does it have an institution specifically dedicated to this issue.

Regarding the subdimension of International Linkage in IA (50), the country is close to the regional average, without participating in the definition of international standards in IA. However, in the Presence in Committees of International Organizations subindicator, it reaches the maximum score.

In the regulatory area, Panama registers an above-average development, with a maximum score in AI Risk Mitigation but with a Cybersecurity indicator that is almost 15 points below the regional average. In turn, it faces the challenge of developing the area of Data Protection, which is below the LATAM average while it does not register activity in the area of Security, Accuracy and Reliability. It stands out in the area of Sustainability (89.86 points), surpassing the region by more than 15 points.



Panama

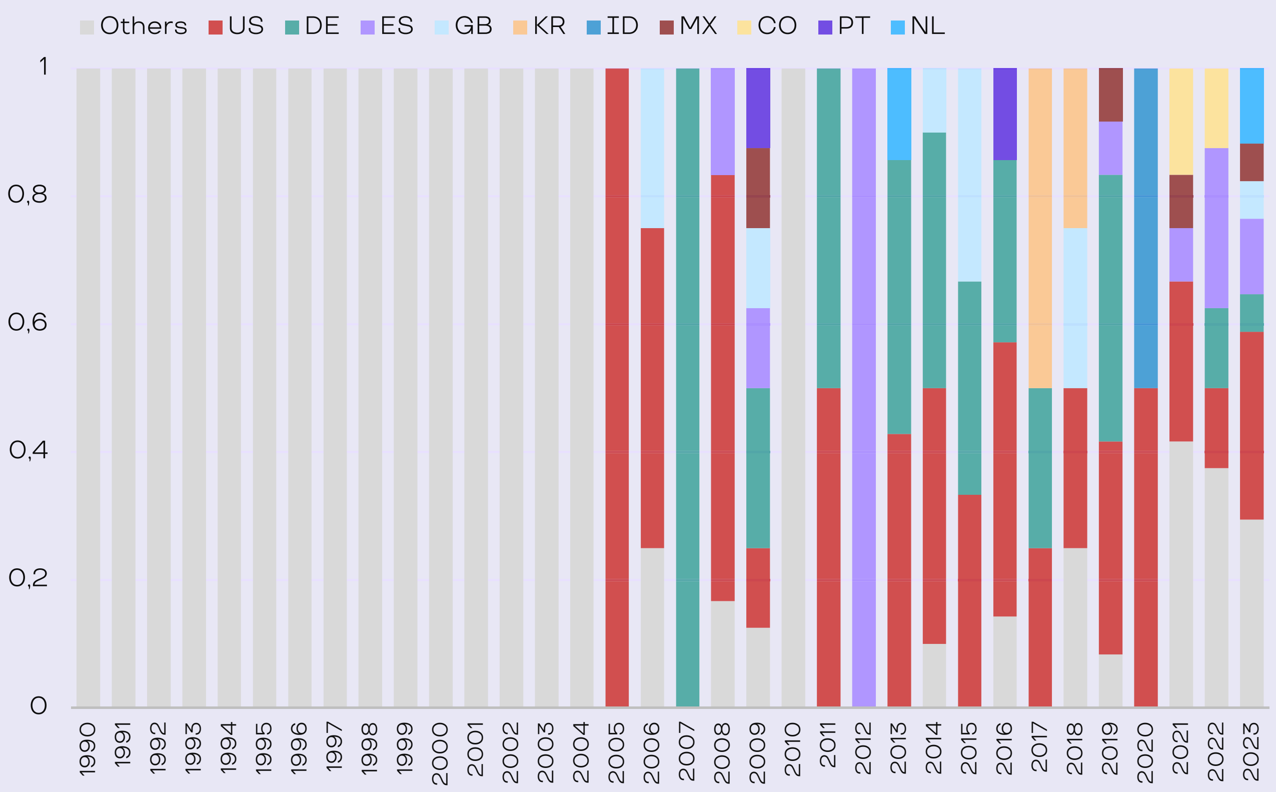
Immigration and Talent Drain in AI

Academic mobility in Panama is not a widespread phenomenon, though there are distinct patterns in the origin and destination of authors publishing within the country. Since 2005, the United States has emerged as the primary contributor and recipient of migrating authors, consistently maintaining this position through 2023. This prominence likely stems from academic opportunities and geographic proximity, facilitating collaboration and researcher exchange.

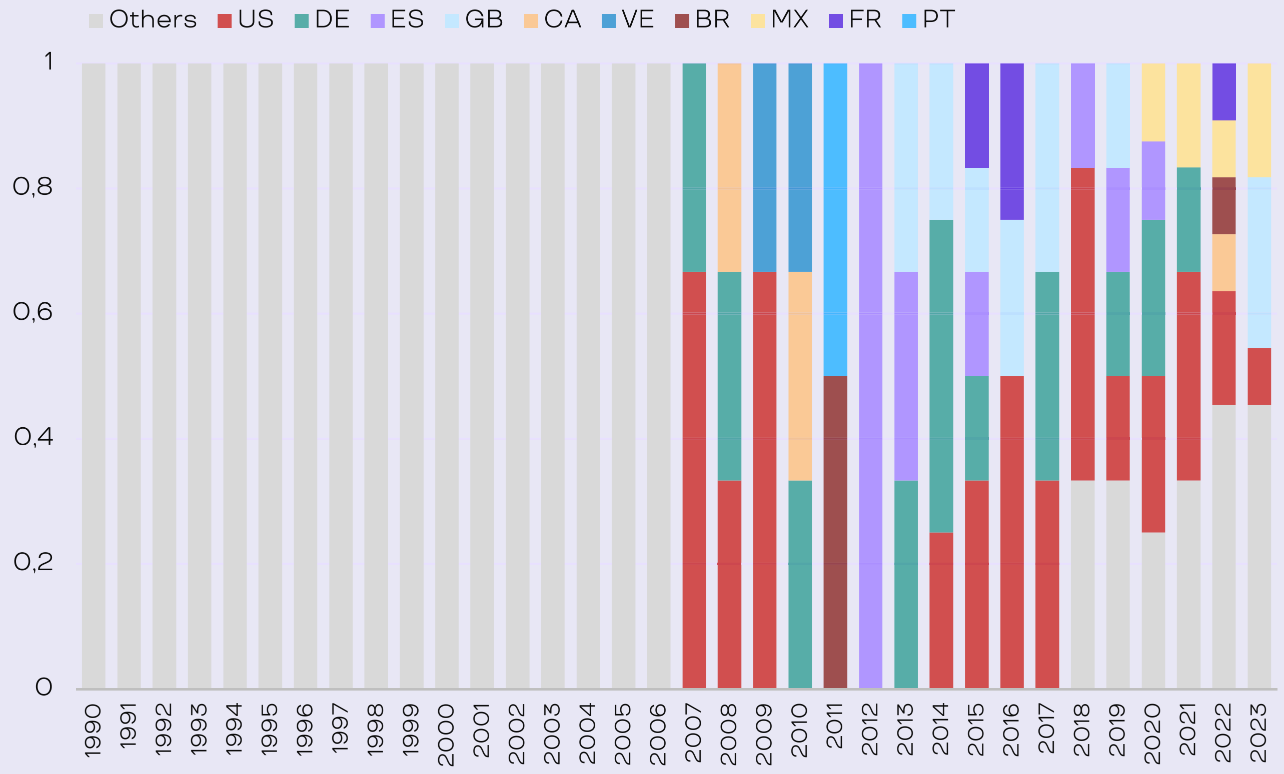
Beyond the United States, Spain holds a significant place, likely due to linguistic and cultural affinities. Among European countries, Germany and the United Kingdom have shown increased involvement as destinations and sources for Panamanian authors. This trend suggests a growing interest in collaboration with European institutions, which offer expanded opportunities for specialization and development.

Regarding migration patterns, there is a trend of returning researchers who previously migrated. This cycle of migration and return indicates that academic mobility in Panama is largely motivated by the pursuit of training and specialization opportunities abroad, followed by reintegration into the national academic system

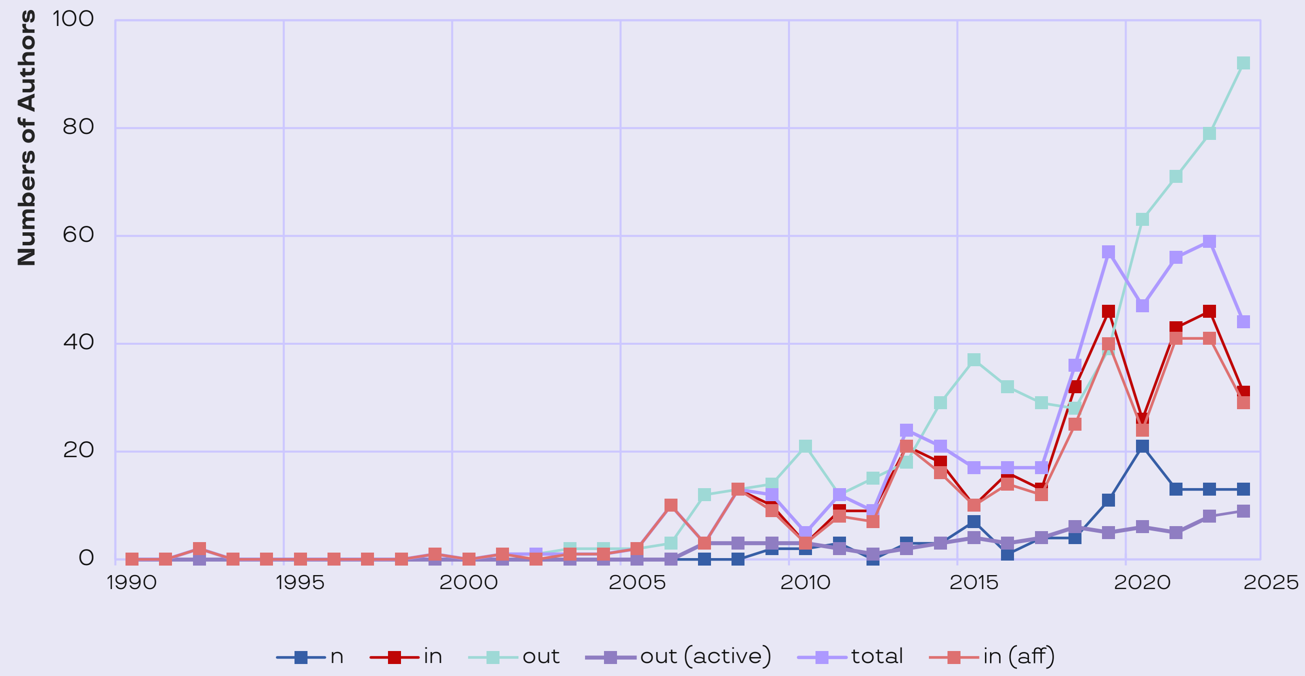
Graph 2: Where do Authors who Publish in Costa Rica Come From?



Graph 3: Where Do Authors Who Published in Panama Go?

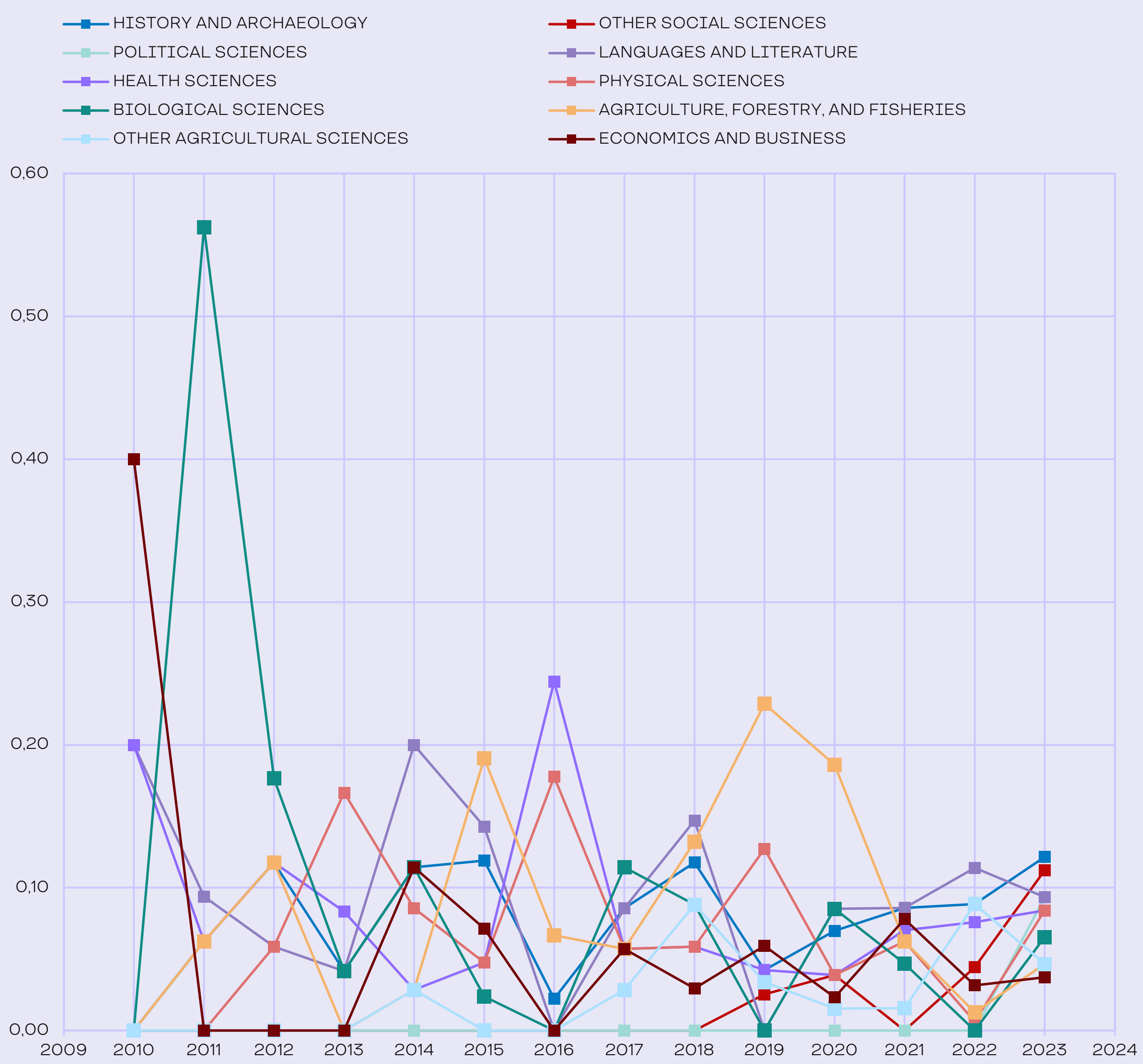


Graph 4: Talent Drain



The community of AI authors in Panama remains in its early stages, making it difficult to derive conclusive insights from the graphs as a global trend. However, some patterns are apparent: since 2020, there has been a slowdown in the growth of consistent authors (blue), alongside an increase in authors who have left Panama to publish elsewhere (red). Both the entry of new authors into the system and the return of those who had left the country for training (orange and brown lines) show a declining trend over the past five years, resembling the levels observed in 2017. As in other parts of the region, the number of authors using AI as a tool for other disciplines is the largest, nearly four times the number of consistent authors in 2023

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Panama



Graph 5 shows notable variability in the significance of OECD disciplines in relation to AI in Panama, mainly due to the limited volume of aggregate publications. Over time, the Biological Sciences have achieved remarkable prominence, comprising 56% of AI-related publications in 2011, indicating a strong focus on AI integration within biotechnology and natural sciences. However, by 2023, a more balanced distribution across disciplines is observed, signaling a shift in the dynamics of AI application. Noteworthy among these disciplines are History and Archaeology, representing 12%, and other social sciences, with 11%. This evolution reflects an expanded adoption of AI in fields traditionally less associated with technology, such as the humanities and social sciences, suggesting a multidisciplinary approach. Panama appears to be broadening AI applications across diverse knowledge domains, which may signify an effort to foster technological innovation while supporting the preservation and study of the country's cultural and social heritage.

Dimension	Subdimension	Indicator	Panama	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	63,49	57,12	6
		Computation	23,77	21,76	6
		Devices	48,97	36,47	5
	Infrastructure Score		49,93	43,12	7
	Data	Data Barometer	31	35,76	12
	Data Score		31	35,76	12
	Human Talent	AI Literacy	50,19	57,9	12
		Professional Training in AI	37,9	43,49	12
		Advanced Human Talent	7,66	11,69	9
	Human Talent Score		33,74	39,71	13
	ENABLING FACTORS TOTAL SCORE		40,34	40,26	8
Research, Development and Adoption (R&D+A)	Research	Research	34,27	41,43	13
	Research Score		34,27	41,43	13
	I+D	Innovation	21,55	31,57	13
		Development	42,18	20,93	3
	R&D Score		43,14	42,53	7
	Adoption	Industry	41,38	54,29	17
		Government	75,2	69,65	10
	Adoption Score		54,91	60,44	12
	R&D+A TOTAL SCORE		43,12	47,46	12
Governance	Vision and Institutionality	AI Strategy	0	33,33	17
		Society's Involvement	0	19,08	17
		Institutionality	0	21,05	16
	Vision and Institutionality Score		0	26,7	17
	International Linkage	Standard Definition Participation	0	13,16	15
		International Organizations Participation	100	92,11	12
	International Linkage Score		50	52,63	13
	Regulation	Regulation on AI	100	47,37	7
		Cybersecurity	35,31	49,85	12
		Ethics and Sustainability	38,83	41,71	10
	Regulation Score		50,01	45,28	10
	GOVERNANCE TOTAL SCORE		25	37,46	10
ILIA 2024 TOTAL SCORE			37,48	42,08	10

PARAGUAY

General Description:
Population to 2023: **6.861.000**
2023 GDP per capita: **USD 6.260,50**
% of GDP Allocated to R&D: **0,16%**
Human Development Index (HDI) 2022: **0,731**

Category: Explorer

Score: 31,05

Position: 14

	2023	2024
ILIA Total Score	**18,82**	**31,05●**
Position in Index	11	14↑
Infrastructure Score	32,86	40,39
Data Score	32,55	32,55
Human Talent Score	7,65	28,05
Enabling Factors Score	24,35	34,73
Enabling Factors Position	11	13
Research Score	35,53	23,71
Innovation and Development Score	25,9	26,24
Adoption Score	9,93	57,68
Research, Development and Adoption Score	23,79	34,66
R&D+A Position	10	15
Vision and Institutionality Score	0	0
International Linkage Score	0	50
Regulation Score	25	33,75
Governance Score	8,33	20,12
Governance Position	9	11

General Overview

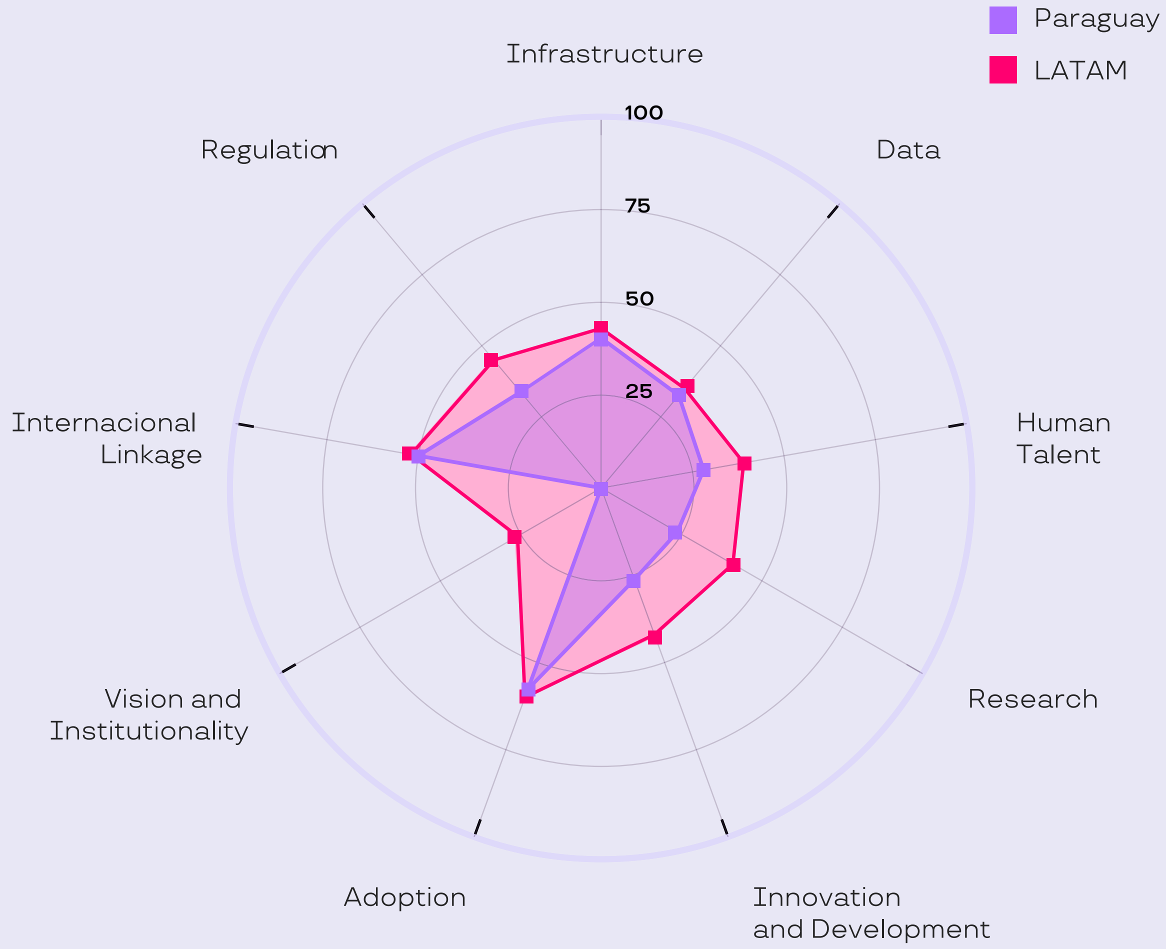
Paraguay shows a lower performance than the previous version of the ILIA with a score of 31.05 points. Although its overall score increased significantly, its relative position within the region is three places lower than last year, ranking fourteenth.

The Enabling Factors dimension has a higher score this year compared to the 2023 version, with a score of 34.73 points, 6 points below the regional average. Meanwhile, the Research, Development and Adoption (R&D+A) dimension shows an increase in relation to the previous edition, specifically in the Adoption sub-dimension (up 48 points) while research shows a significant decrease. This means that it continues to be below the average for the region.

In terms of Governance, the absence of a national strategy or policy is maintained, while the incorporation and verification of subscription to international agreements allows an increase of 50 points in the international subdimension.

In the regulatory area, the score of 33.75 represents an increase with respect to 2023, below the regional average after the incorporation of new indicators.

Graph 1: Paraguay and LATAM Subdimensions



General Findings

Paraguay is three points below the regional average in Infrastructure (40.39 points). In the area of Connectivity, it registers below average levels, with challenges in several areas. While it has a very high mobile network coverage (98.4 points), it does not have 5G implementation. Although 76% of the Population That Uses Internet, slightly above the regional average, the proportion of Households with Internet Access is 10 points lower than the average. This situation is related to low levels of Active Fixed Broadband Subscription, while mobile broadband subscription reaches 60.85 per 100 people, five points below the regional average. While the Average Broadband Download Speed is 30.95 points, similar to the regional average, Mobile Download Speed is significantly slower than in the region. Finally, the Basic Fixed Broadband Basket represents 78.97 points, seven points above the regional average.

In terms of Computing, Paraguay registers similar levels to the region in terms of Cloud and stands out in IXPs (43.22), registering ten points above the average. On the other hand, it is below the regional level in terms of Certified Data Centers and Secure Internet Servers. It does not have HPC Infrastructures Capacity. In terms of devices (35.59 points), the country is slightly below the average. While the level of Households That Have a Computer is slightly lower than the regional average, Smartphone Affordability (18.63) is 13 points below the average. The high level of IPv6 Adoption stands out, with 60.95 points, double the regional average.
In the area of Data (32.55 points), Paraguay's scores are below average in the areas of Availability and Capabilities, while they exceed the regional average in data Governance and in the area of Use and Impact.

In Human Talent (28.05 points) the country is eleven points below the regional average. The South American country has a score of 47.621 in AI Literacy, which, however, is due to the contribution of its high level of English Proficiency compared to the average. On the other hand, it faces an important challenge in the remaining elements that make up the AI Literacy subdimension: in Early Education in Science (13.29 points) it is more than 30 points below the regional average. In turn, its level of Early AI Education (75 points) is slightly below the average.

Professional Training in AI is a second aspect in which Paraguay faces challenges, ranking about 10 points below the regional average in both AI Skills Penetration and STEM Graduates. As for Advanced Human Talent (0.00 points), it registers the lowest level in the region, as it does not have AI graduate programs in accredited universities and with presence in the QS ranking.

In the area of Research, Development and Adoption, Paraguay (34.66 points) is almost thirteen points below the regional average. In Research, the country achieves one-third of the regional average in terms of publications in AI and has less than half the number of Active Researchers in this field. Additionally, it exhibits low levels of research impact in AI. Furthermore, there are no research centers focused on AI within the country. However, it does stand out slightly above the regional average in the proportion of female researchers in AI.
In terms of Innovation (19.80 points), Paraguay registers a low score, reaching less than half the average. With a score close to zero for the Number of Private Investments and the lowest score for the total Estimated Value of Private Investment in the country, it is characterized by very low levels of AI companies and no Unicorn companies. The country is also notoriously below the region in terms of its low Innovation and Development Spending as a Proportion of GDP (8.87). However, the country stands out for registering scores similar to the regional average in the Development of Applications and Entrepreneurial Environment subindicators.
In terms of AI Development (11.87), the country is below the regional average. It is five points below the average in terms of Open Source Productivity and Open Source Quality.

In terms of adoption, although Paraguay has above-average levels of Workers in the High-Tech Sector (57.69 points), its below-average levels of AI Adoption in Industry are due to a Share of Medium and High-Tech Manufacturing Value-Added in Total Value-Added of 47.64%, 16 points below the regional average. In turn, the country is slightly below the regional average for AI Adoption in Government.

The country has a low level of AI Governance (20.12 points). Paraguay does not have an AI strategy, lacks mechanisms for civil society involvement and has not implemented an institution dedicated to this issue. In terms of international AI governance (50.00), the South American country is slightly below average, with no participation in AI standard-setting bodies such as ISO, but with a maximum score in international organizations.
Finally in the Regulation subdimension, the country has levels of development that vary by area. While it records zero progress in Risk Mitigation, it outperforms the region by ten points in Cybersecurity (59.10). In terms of Ethics and Sustainability, the country faces the challenge of creating regulations on Security, Accuracy and Reliability, and of continuing to develop in the areas of Data Protection and Sustainability.

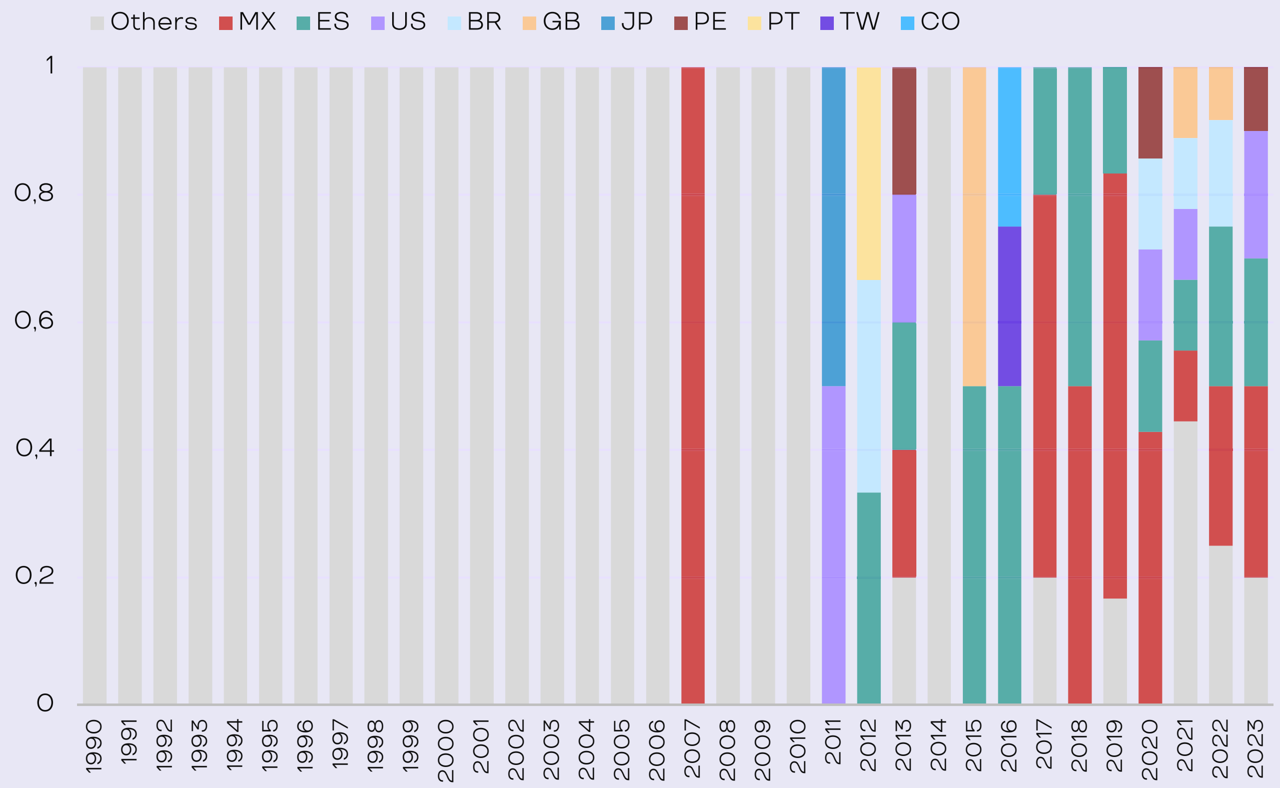
Immigration and Talent Drain in AI

As noted in the 2023 study, academic migration in Paraguay is based on a relatively small sample, which limits the possibility of a more in-depth longitudinal analysis of the situation in the country. However, despite this limitation, the data evidence the continued importance of Spain as one of the main countries of both origin and destination for authors publishing in Paraguay. This trend is probably due to the linguistic and cultural affinities that facilitate academic exchange between the two countries.

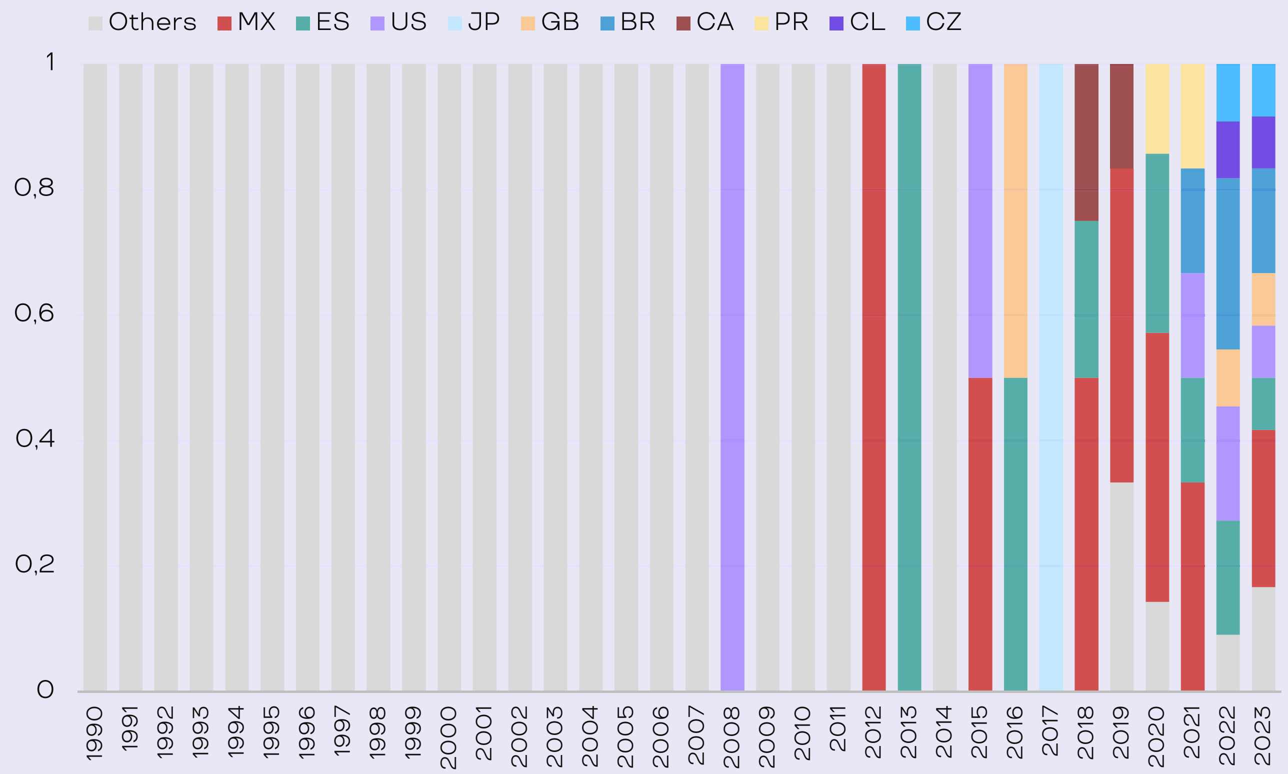
In addition to Spain, Mexico and the United States also stand out in academic migration flows, reinforcing the relevance of these countries in Paraguay's international collaborations. The exchange with Mexico and the United States underscores the growing importance of Latin America and North America in the training and development of Paraguayan academic talent.

Migration patterns show a remarkable symmetry between inflows and outflows, suggesting that authors migrating to Paraguay come, for the most part, from the same countries to which Paraguayan authors have previously emigrated. This cycle of academic exchange is consistent with the pattern observed in other countries in the region, where collaborative relationships with certain countries tend to be stable and reciprocal over time.

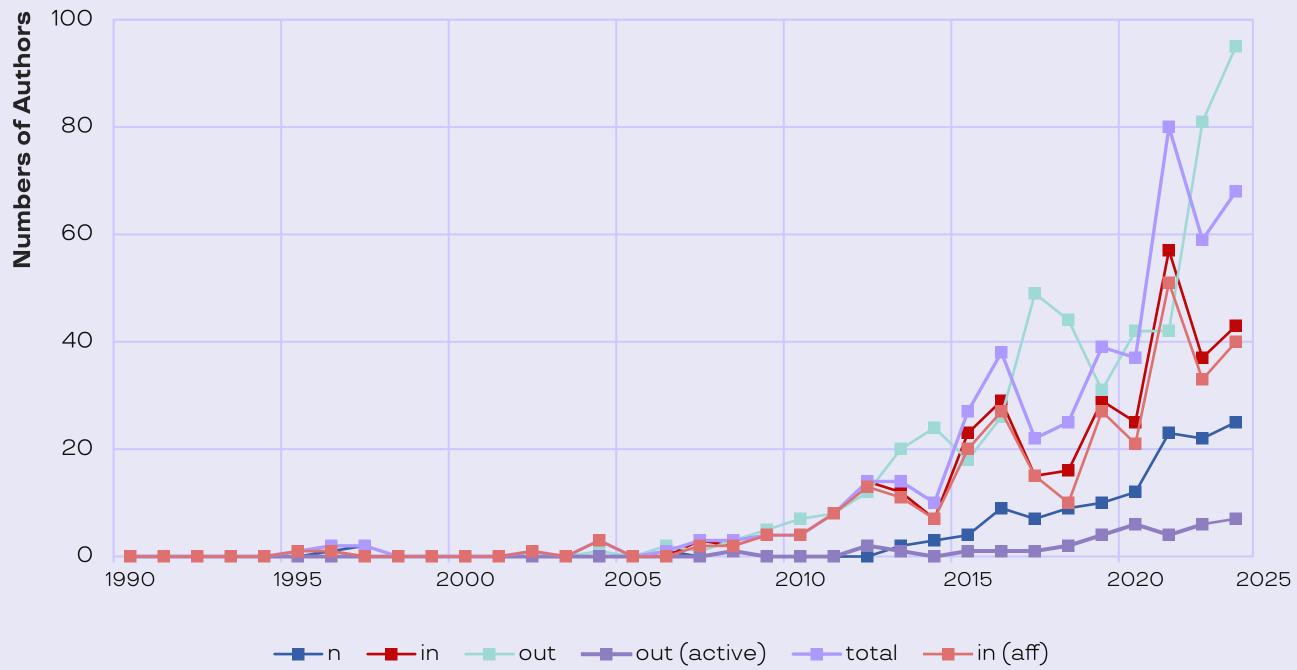
Graph 2: Where do Authors who Publish in Paraguay Come From?



Graph 3: Where Do Authors Who Published in Paraguay Go?



Graph 4: Talent Drain

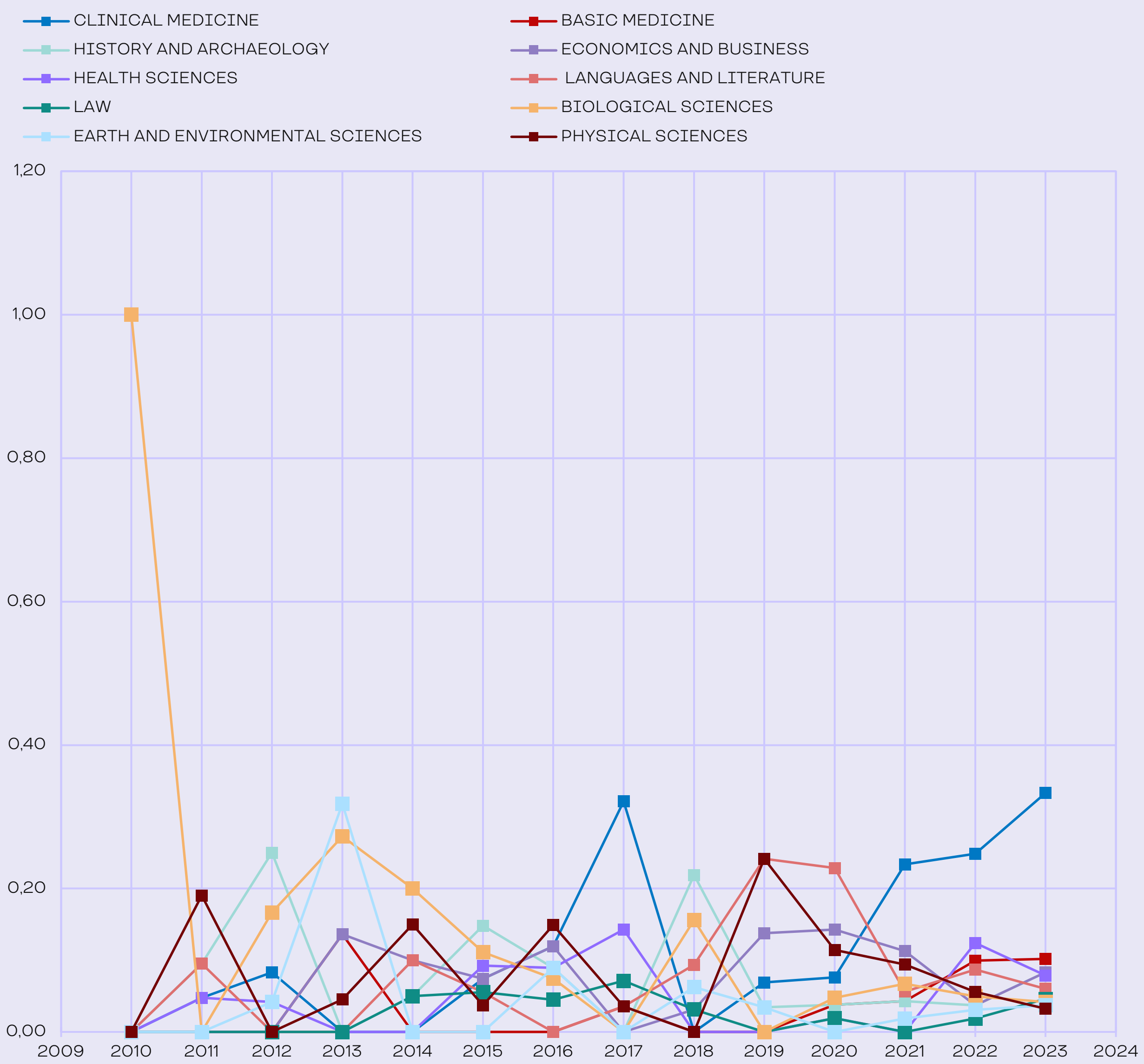


Graph 4 reveals a phenomenon of talent drain in Paraguay during the period between 1990 and 2023. A first noteworthy aspect is the limited number of artificial intelligence (AI) authors publishing in the country, with a low sample represented by the blue line (n), which averages only 4 authors per year over the twenty-three years of the study.

In addition, it is observed that between 1995 and 1997 a small number of authors appeared, although over time this activity was lost, and it is not until approximately 2009 that a resurgence in production is seen again. As of 2017, there is an increase in the number of authors who previously published in Paraguay but in the current year no longer do so (green line), suggesting a lack of continuity in the production of AI publications in the country.

This behavior highlights the challenge of maintaining a constant level of scientific productivity in AI in Paraguay, where, despite some temporary increases in activity, a stable and continuous base of authors has not been achieved. These indicators reflect the need to strengthen the mechanisms for the retention and development of AI talent in order to promote sustained growth in the national scientific field.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Paraguay



Graph 5 shows the distribution of the top 10 OECD disciplines in Paraguay between 2010 and 2023. It is important to mention that the sample is not large enough to be statistically significant. On average, these disciplines account for 72% of scientific publications, while the remaining 28% correspond to the other twenty-three OECD disciplines.

Biological Sciences stands out with an average participation of 16%, although it varies over time: in 2010 it accounted for 100% of publications in IA, but then dropped to 27% in 2013. This variability may be due to the interest in research on biodiversity and natural resources, priority areas in Paraguay due to its rich biodiversity and the need for studies that support the conservation and sustainable use of these resources.

On the other hand, Clinical Medicine has gained relevance with an average of 11% in the period studied, reaching its highest participation in 2023 with 33%. This growth reflects the growing interest in improving medical care in the country, boosting scientific production in health to respond to the demands of a developing health system.

Dimension	Subdimension	Indicator	Paraguay	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	53,56	57,12	13
		Computation	18,87	21,76	9
		Devices	35,59	36,47	10
	Infrastructure Score		40,39	43,12	12
	Data	Data Barometer	32,55	35,76	9
	Data Score		32,55	35,76	9
	Human Talent	AI Literacy	47,61	57,9	14
		Professional Training in AI	30	43,49	16
		Advanced Human Talent	0	11,69	19
	Human Talent Score		28,05	39,71	19
	ENABLING FACTORS TOTAL SCORE		34,73	40,26	13
Research, Development and Adoption (R&D+A)	Research	Research	23,71	41,43	17
	Research Score		23,71	41,43	17
	I+D	Innovation	19,8	31,57	16
		Development	11,87	20,93	12
	R&D Score		26,24	42,53	16
	Adoption	Industry	51,07	54,29	9
		Government	67,59	69,65	12
	Adoption Score		57,68	60,44	11
	R&D+A TOTAL SCORE		34,66	47,46	15
Governance	Vision and Institutionality	AI Strategy	0	33,33	18
		Society's Involvement	0	19,08	18
		Institutionality	0	21,05	17
	Vision and Institutionality Score		0	26,7	18
	International Linkage	Standard Definition Participation	0	13,16	16
		International Organizations Participation	100	92,11	13
	International Linkage Score		50	52,63	14
	Regulation	Regulation on AI	0	47,37	17
		Cybersecurity	59,1	49,85	9
		Ethics and Sustainability	32,03	41,71	12
	Regulation Score		33,75	45,28	11
	GOVERNANCE TOTAL SCORE		20,12	37,46	11
ILIA 2024 TOTAL SCORE			31,05	42,08	14

PERU

General Description
Population to 2023: **34.352.000**
2023 GDP per capita: **USD 7.789,90**
% of GDP Allocated to R&D: **0,17%**
Human Development Index (HDI) 2022: **0,762**

Category: **Adopter**

Score: **45,52**

Position: **8**

	2023	2024
ILIA Total Score	**45,55**	**45,52 •**
Position in Index	7	8↑
Infrastructure Score	51,45	41,88
Data Score	32,22	32,22
Human Talent Score	31,5	44,67
Enabling Factors Score	38,39	40,3
Enabling Factors Position	7	9
Research Score	32,51	41,17
Innovation and Development Score	9,78	29,8
Adoption Score	22,24	64,72
Research, Development and Adoption Score	21,51	44,83
R&D+A Position	12	10
Vision and Institutionality Score	70,23	40,63
International Linkage Score	25	75
Regulation Score	100	65,05
Governance Score	65,08	54,83
Governance Position	5	7

General Overview

Although Peru's total score in the ILIA 2024 shows a marginally lower performance compared to the 2023 index, the country drops in relative position within the region and ranks eighth.

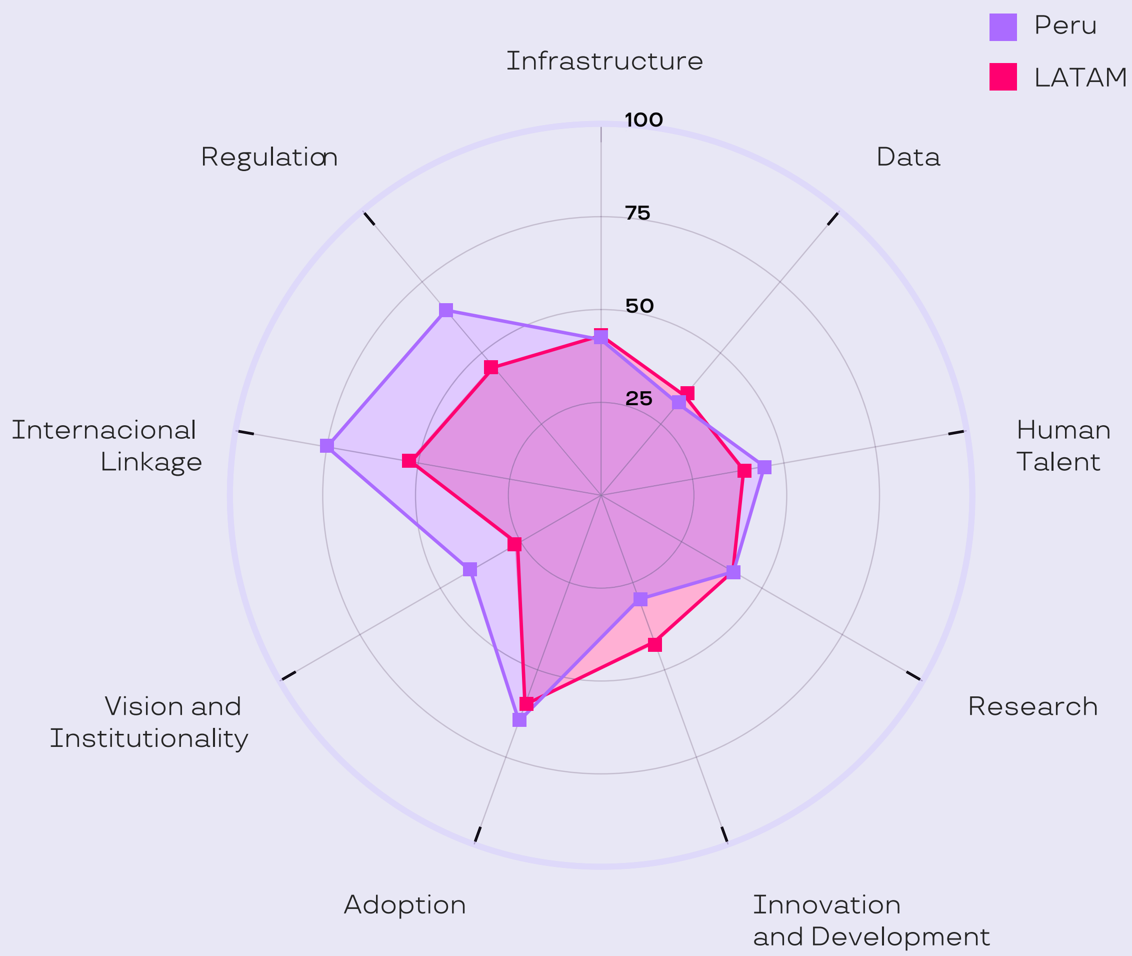
The Infrastructure subdimension reveals a result that shows a lower score (41.88) compared to that of 2023, while Data depicts no changes. Meanwhile, in Human Talent, a significant improvement is evidenced by the incorporation of subindicators associated with AI literacy —such as the one that detects ICT elements in the school curriculum— and with the Professional Training in AI indicator, which counts people who have successfully completed a Bachelor's degree in STEM.

The Research, Development and Adoption (R&D+A) dimension presents higher scores than in the previous edition, specifically in the Innovation and Development (I&D) subdimension (up 20 points) and in Adoption (up 22 points). Despite this, it is still below the regional average.

In the area of Governance, although the national IA strategy or policy remains in force, there is a drop in the current score of the dimension. This is due to the incorporation of new indicators and subindicators. In the area of International Linkage, the incorporation and verification of the subscription to international agreements and their measurement explains the notable increase of 50 points in the subdimension.

As for the Regulation area, the score of 65.05 shows a relative decrease in the region due to the incorporation of new indicators.

Graph 1: Costa Rica and LATAM Subdimensions



General Findings

In Infrastructure, Peru is slightly below the regional average (43,12), with Connectivity being an indicator that registers below average levels too, and 5G Implementation almost nil. The country faces the challenge of expanding the proportion of Households With Internet Access, although it stands out in Active Mobile Broadband Subscriptions, whose figure is above the regional average. For its part, Fixed Broadband Subscription levels are well below the LATAM average, as is the speed of this network. Likewise, the Basic Fixed Broadband Basket represents 88.02% of GNI per capita, which is almost 19 points higher than the regional average. All of the above show a complex and uncompetitive level of connectivity with ample room for growth and deepening.

In terms of Computing, Peru is slightly below the regional average. It does not have HPC Infrastructure Capacity, is below average in Certified Data Centers, and scores slightly above zero in Secure Internet Servers. It also has a slightly above-average score in IXPs.

Regarding Devices (38.81 points), the country is slightly above the regional average. While the level of households with a computer is similar to that of the region, the Smartphones Affordability is below average (25.47 points). However, in IPv6 Adoption shows 60.31 points, which is double the regional average

In the area of Data, Peru's scores are within the regional average (35,76), standing out in terms of Availability but there is a need for development regarding Use and Impact, an aspect in which it is notably below the regional average.

Concerning Human Talent, it exceeds the regional average by five points (39,71), standing out in Early Science Education (67.05 points), with AI Literacy levels (64,52) similar to the regional average, and English Proficiency slightly above average. Also, in Professional Training in, the Andean country doubles the level of the region in STEM Graduates (71,81 points), which is likely the indicator in which it stands out the most.

As for Advanced Human Talent (6.48 points), it registers a lower level than average with no PhD programs in AI but with master's programs in AI at both accredited and QS-ranked universities.

The Innovation indicator (22.48 points) is significantly below the regional average, a situation that can be explained by the low level of the subindicator for Expenditure on Research and Development as a Proportion of GDP (10.22 points) and that of total Private investment in AI, which is almost nil, in addition to there being no record of Unicorn Companies. However, in terms of Application Development and the Entrepreneurial Environment, it is within the regional average.

In terms of AI Development (13.66), Peru is almost seven points behind the regional average, with a marked gap in the average in terms of Open Source Productivity (4.67 points) but with a slightly above average Open Source Quality subindicator (19,74 points), which highlights its potential in this area.

In terms of Adoption, although the AI Industry score is slightly above average, this nation shows a deficit at the granular level of this indicator, i.e., in Workers in the High-Tech sector and in Medium and High-Tech Manufacturing. However, in terms of Digital Government it presents a very high score (90.35), 30 more than the LATAM average.

The IA Governance dimension (54.83 points) has a higher score than the average; however, there are undeveloped areas, specifically regarding IA Strategy: this indicator does not show an institution in charge of executing it or interinstitutional evaluation and coordination mechanisms.

Concerning the Society's Involvement indicator, it reaches a score of 12.50, below the average for the region, which is explained by the lack of instances of citizen participation and a stakeholder methodology for participation that needs to be expanded. An additional issue is the lack of an institution specifically dedicated to this matter.

In terms of International Linkages (75 points), Peru is above average, standing out for its participation in AI standards definition bodies such as ISO, in addition to the subscription and ratification of at least two international AI global governance committees.

In the Regulation subdimension, the country shows above-average development, and in the Risk Mitigation subindicator, it achieves the maximum score. Additionally, it slightly exceeds the regional average in the Cybersecurity indicator and shows progress in Ethics and Sustainability (55.53 points), with Security, Accuracy, and Reliability standing out.

Immigration and Talent Drain in AI

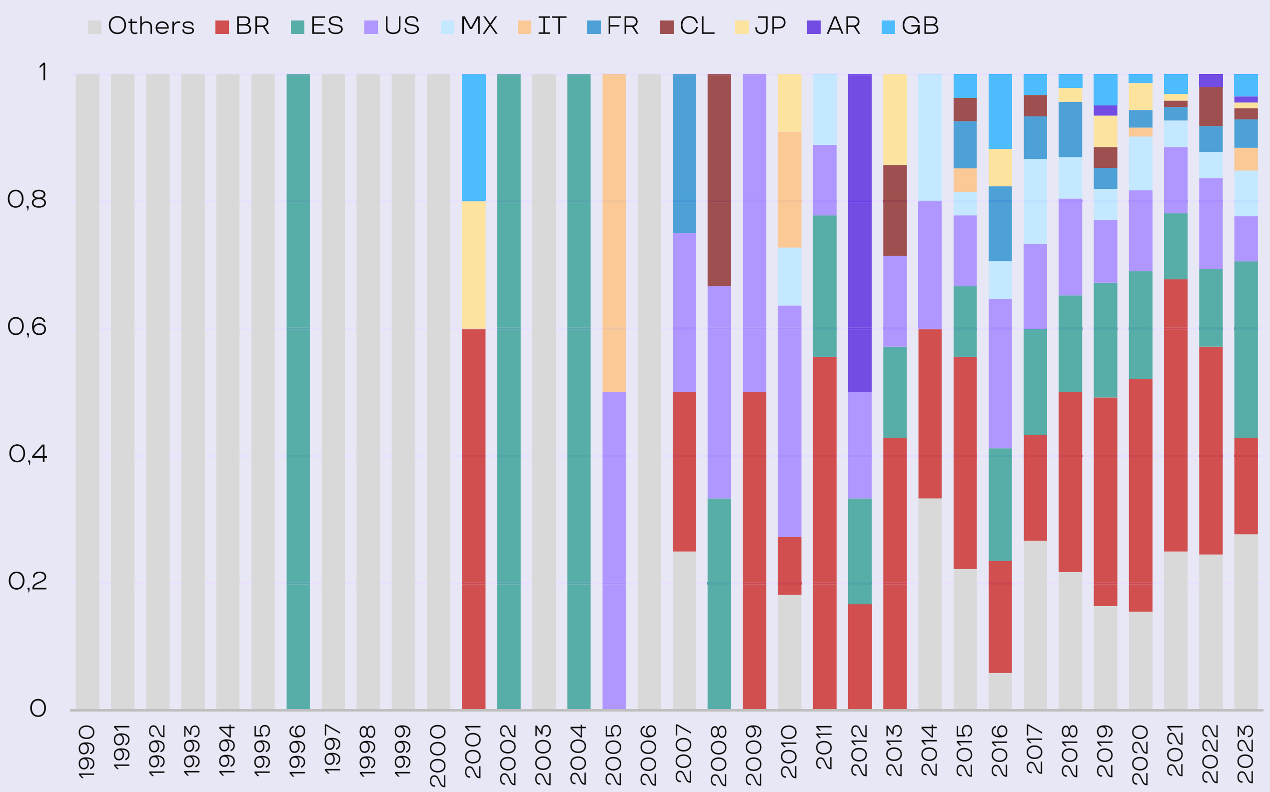
As in the 2023 study, the importance of Spain and the United States continues to be predominant in both the origin and destination of the authors. Brazil also stands out as a key player in migration flows, being a relevant country for both arrivals and departures, underlining the strong academic collaboration between Brazil and the rest of the countries.

Active collaboration within Latin America, where countries such as Mexico, Chile and Argentina play a crucial role as destinations and origins of authors publishing in the country. This dynamic reinforces the importance of regional academic networks and the constant exchange of talent within the region.

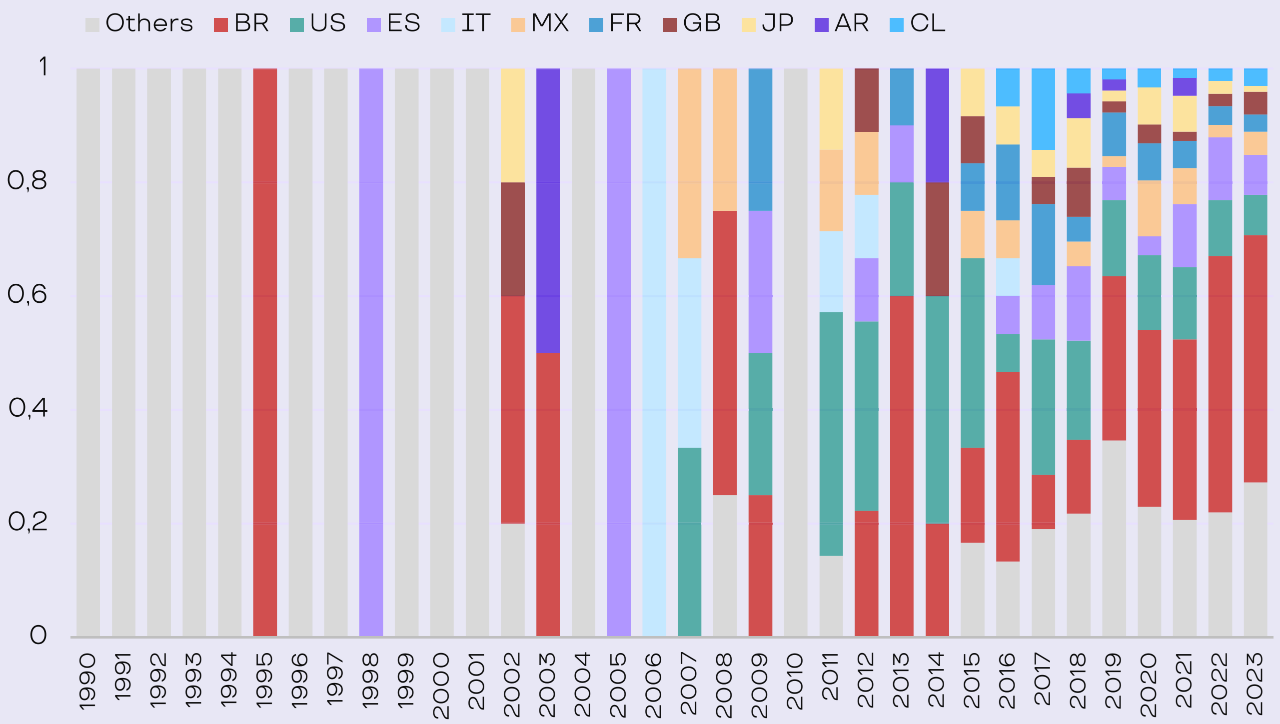
It is important to mention that, unlike in other parts of the region, the importance of Spain has not diminished significantly, which highlights the continuity of academic relations with that country. On the other hand, the absence of collaboration with China, a country that has grown in relevance in terms of attracting talent in other countries, but does not seem to have a significant impact on the academic migration flows observed here.

Migration patterns show a notable asymmetry between inflows and outflows, particularly in the case of Brazil and the United States, countries that seem to retain the talent that migrates there.

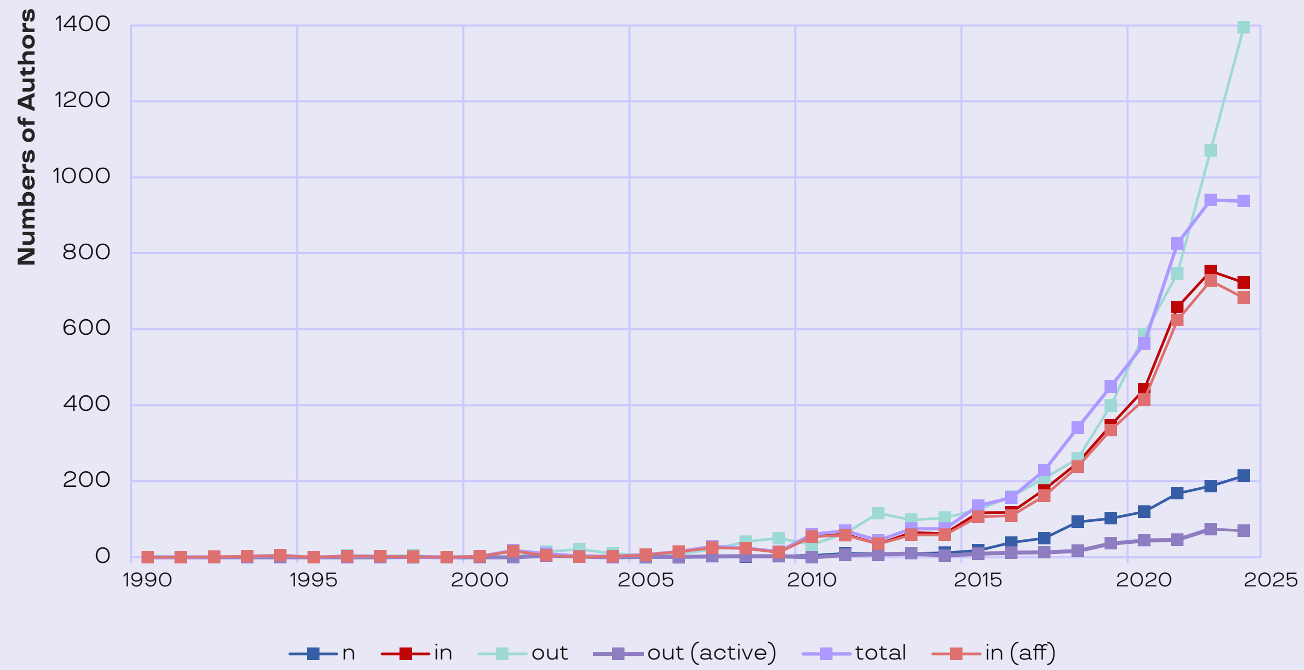
Graph 2: Where do Authors who Publish in Peru Come From?



Graph 3: Where Do Authors Who Published in Peru Go?

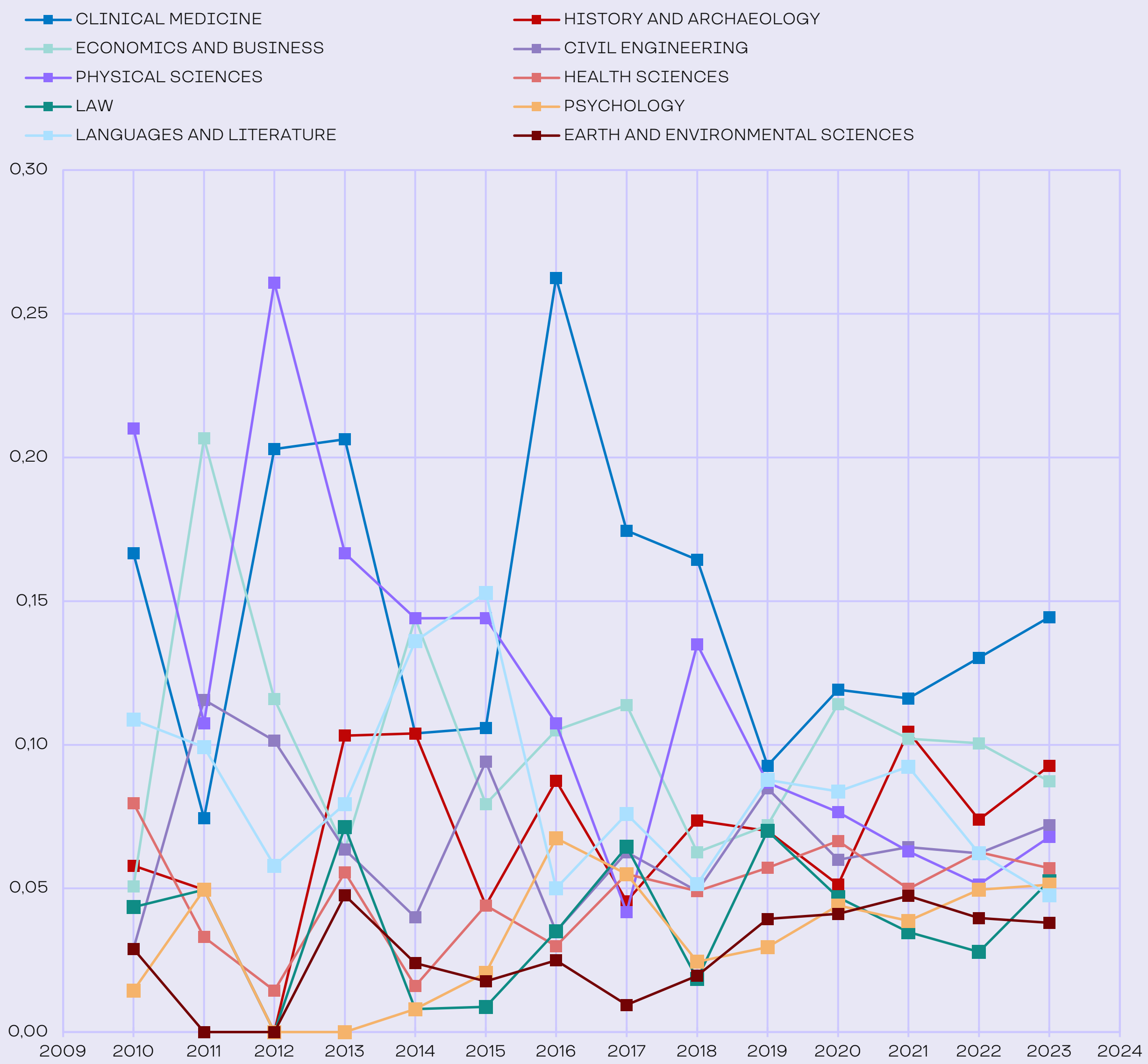


Graph 4: Talent Drain



The composition of Peru's AI academic community in terms of origin and application shows some anomalous characteristics at the regional level. Notably, it was only in 2021 that a decoupling was observed between the total volume of authors (purple) and those who use AI as a tool in a single publication before discontinuing its use (green). From that year onward, the community of authors shows a plateau, while the latter increases at a faster rate than in other countries in the region with a similar level of maturity, at a rate of approximately 25% per year. Meanwhile, the number of authors who consistently publish within Peru is growing faster than those who publish outside the country. Both elements indicate a growing maturity of the local knowledge production system.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Peru



In Peru, as shown in Graph 5, Clinical Medicine, categorized by the OECD, reached a peak in 2016, representing 26% in terms of relevance. Although this area experienced a considerable decline, it grew again in AI applications, reaching 14% in 2023. From 2019 onward, the volume of publications using AI achieved a level that allows statistically significant conclusions to be drawn; before this, the low volume resulted in high variance across most disciplines. Particularly notable is the relative importance of publications in history and archaeology over the last four years, with an average of 9% since 2020. In contrast, the relevance of the physical sciences has declined, dropping from 25% in 2013 to just 5% a decade later.

Dimension	Subdimension	Indicator	Peru	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	56,6	57,12	10
		Computation	15,53	21,76	14
		Devices	38,81	36,47	7
	Infrastructure Score		41,88	43,12	8
	Data	Data Barometer	32,22	35,76	10
	Data Score		32,22	35,76	10
	Human Talent	AI Literacy	64,52	57,9	6
		Professional Training in AI	56,41	43,49	4
		Advanced Human Talent	6,48	11,69	11
	Human Talent Score		44,67	39,71	4
	ENABLING FACTORS TOTAL SCORE		40,3	40,26	9
Research, Development and Adoption (R&D+A)	Research	Research	41,17	41,43	10
	Research Score		41,17	41,43	10
	I+D	Innovation	22,48	31,57	12
		Development	13,66	20,93	10
	R&D Score		29,8	42,53	12
	Adoption	Industry	47,64	54,29	11
		Government	90,35	69,65	4
	Adoption Score		64,72	60,44	8
	R&D+A TOTAL SCORE		44,83	47,46	10
Governance	Vision and Institutionality	AI Strategy	75	33,33	6
		Society's Involvement	12,5	19,08	8
		Institutionality	0	21,05	18
	Vision and Institutionality Score		40,63	26,7	7
	International Linkage	Standard Definition Participation	50	13,16	4
		International Organizations Participation	100	92,11	14
	International Linkage Score		75	52,63	4
	Regulation	Regulation on AI	100	47,37	8
		Cybersecurity	57,63	49,85	10
		Ethics and Sustainability	55,53	41,71	6
	Regulation Score		65,05	45,28	6
	GOVERNANCE TOTAL SCORE		54,83	37,46	7
ILIA 2024 TOTAL SCORE			45,52	42,08	8

DOMINICAN REPUBLIC

General Description
Population to 2023: **11.332.000**
2023 GDP per capita: **USD 10.716,00**
% of GDP Allocated to R&D: **N/A**
Human Development Index (HDI) 2022: **0,766**

Category: Adopter

Score: 46,85

Position: 7

	2023	2024
ILIA Total Score	**s/d**	**46,85**
Position in Index	s/d	7
Infrastructure Score	s/d	41,13
Data Score	s/d	32,94
Human Talent Score	s/d	30,99
Enabling Factors Score	s/d	36,04
Enabling Factors Position	s/d	12
Research Score	s/d	33,34
Innovation and Development Score	s/d	59,38
Adoption Score	s/d	54,27
Research, Development and Adoption Score	s/d	47,43
R&D+A Position	s/d	8
Vision and Institutionality Score	s/d	75
International Linkage Score	s/d	50
Regulation Score	s/d	52,74
Governance Score	s/d	63,32
Governance Position	s/d	5

General Overview

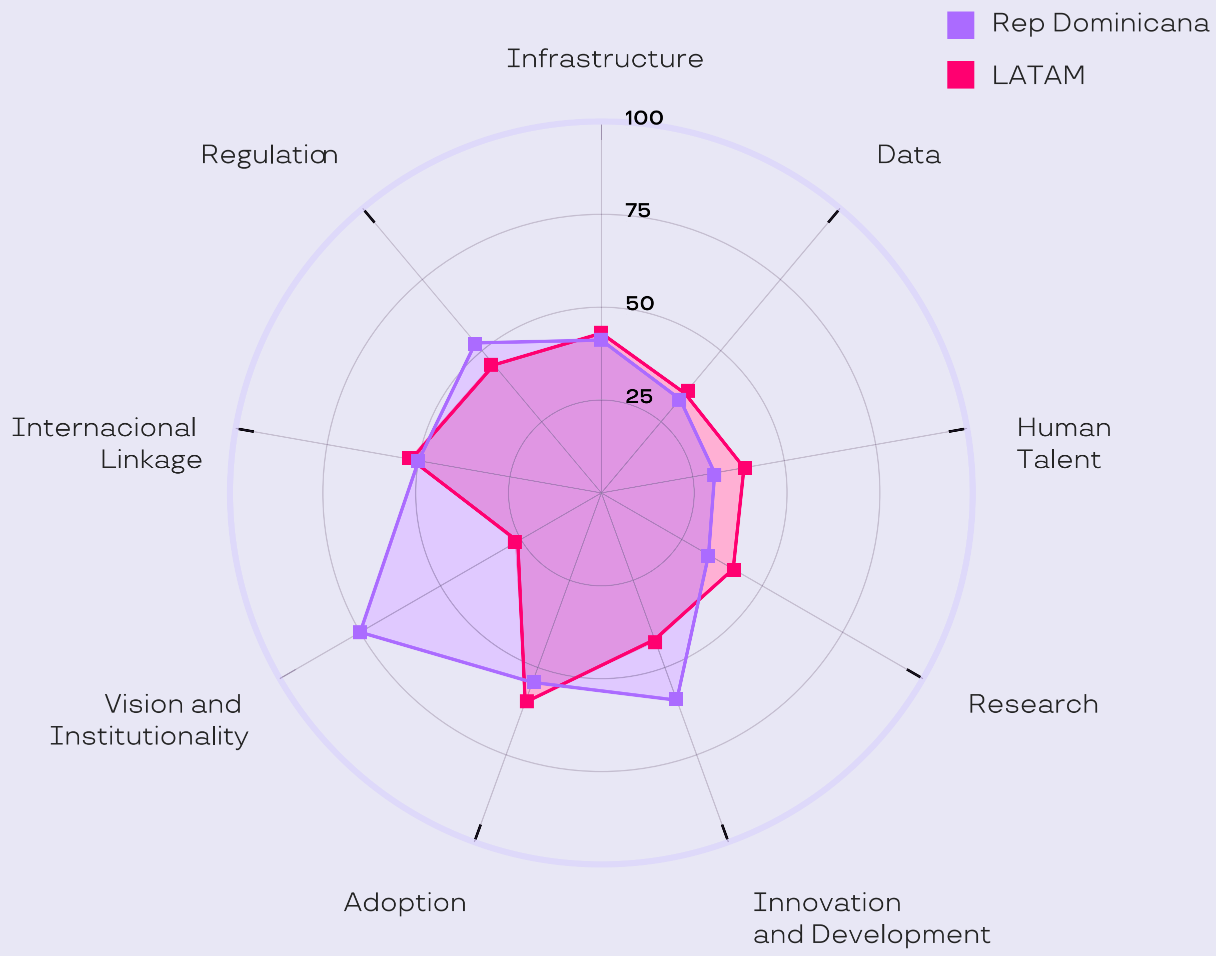
The Dominican Republic joined ILIA 2024, registering a medium-high performance, with 46.85 points, reaching seventh place at the regional level, in the adopter category.

The Enabling Factors place it below the regional average. In the subdimensions of Infrastructure and data, it is below the regional average with a moderate distance, while in the subdimension of Human Talent it is nine points below the average. Here, the most important deficit is found in Professional Training.

The Research, Development and Adoption dimension is practically at the regional average (47.45 points), which is mainly explained by the medium-high score in the I&D subdimension (59.38 points), while the Research and Adoption subdimensions are below the regional average.

n Governance, the presence of a national strategy enhances the overall score, while the incorporation and verification of international agreements contribute to the 50 points in the International sub-dimension. In the Regulatory area, the score of 52.74 reflects the existing regulatory framework, although the absence of risk mitigation regulations is noted. Nevertheless, it surpasses the national average by seven points.

Graph 1: Dominican Republic and LATAM Subdimensions



Dominican Republic

ILIA

General Findings

In terms of IA Infrastructure, the 41.13 points recorded by the Dominican Republic place it slightly below the regional average. In terms of Connectivity, the percentage of the Population that Uses Internet (89%) is above average. At the same time, it shows a download speed slightly above average, and a more advanced Implementation of 5G than in the rest of the region. However, it faces the challenge of increasing the Proportion of Households With Internet Access and the expansion of Fixed Broadband Subscriptions, which is below average, as is the speed of the latter. The Basic Fixed Broadband Basket represents 2.66% of GNI per capita, 90.97 points, which is almost 30 points higher than the region.

In terms of Computing, the Dominican Republic is slightly below the regional average. While its Cloud score (42.00 points) is eight points above the regional average, it does not have HPC Infrastructures Capacity, is below average in Certified Data Centers and scores slightly above zero in Secure Internet Servers. It has a slightly above-average score in IXPs.

In terms of Devices (31.86 points), the country registers five points below the average. The level of Households That Have a Computer is 41.26 points (above the regional average), with Smartphone Affordability slightly below average and a level of IPv6 Adoption of 23.46 points, ten points below the region.

In the area of data, the Dominican Republic is below the regional average. Its data Governance score (31.75 points) is ten points below the regional average. On the other hand, but in terms of Availability, Capabilities and Use and Impact, the country reaches levels comparable to the regional average.

In terms of Human Talent (30.99 points), the country is above average in terms of AI Literacy, but has a significant deficit in Early Science Education (9.25 points). In terms of AI Professional Training, the country presents a significant gap with respect to the region, with lower levels of STEM Graduates. Regarding Advanced Human Talent (17.72 points), it registers a higher score than average, in which AI master's and PhD programs in accredited universities stand out, contrasting, however, with no development of PhD programs in AI in QS-ranked universities. The Dominican Republic registers a high level in terms of IA Governance, given that it has a completed IA Strategy and a top score in each of the areas measured in the index. In terms of societal engagement, it scored 50, above the average for the region in terms of both citizen participation and stakeholder methodology.

International Lankage indicator (50 points) has a slightly lower score than the regional average. Participation in international organizations contrasts with the lack of participation in standard-setting bodies, such as participation in ISO.

In the Regulatory area, the country registers above-average developments in Cybersecurity (77.69 points). Relevant advances are also observed in Ethics and Sustainability (58.87 points), in which security, accuracy and reliability stand out. However, there is no regulatory progress in Risk Mitigation.

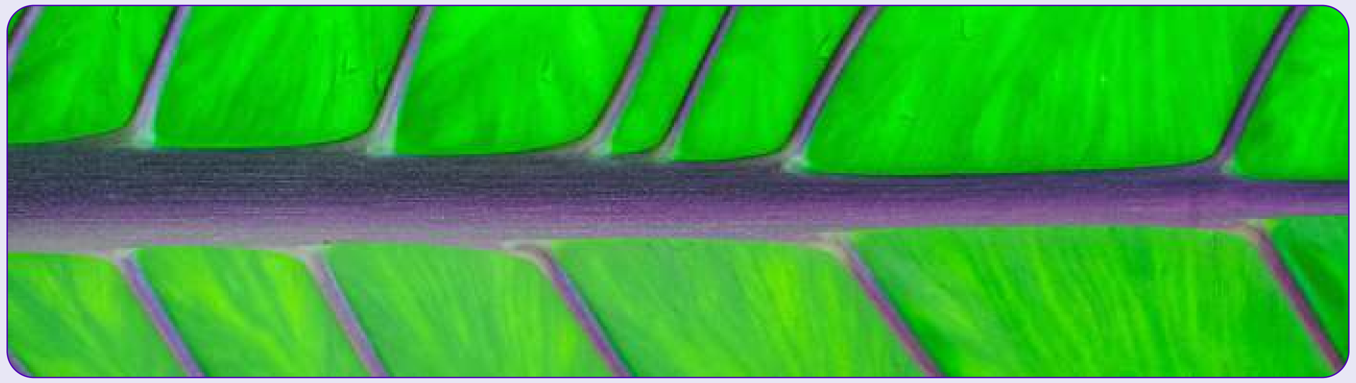
Immigration and Talent Drain in AI

Although the sample size is small, which limits the possibility of a more comprehensive descriptive analysis, the available data provide a clear picture of academic mobility trends.

The importance of the United States as the main country of origin and destination for authors publishing in the Dominican Republic stands out, followed by Chile and Argentina, probably due to the linguistic and cultural affinities that facilitate academic exchange between these countries. The presence of these destinations highlights the relevance of relations with Latin America and the United States in the flow of academic talent.

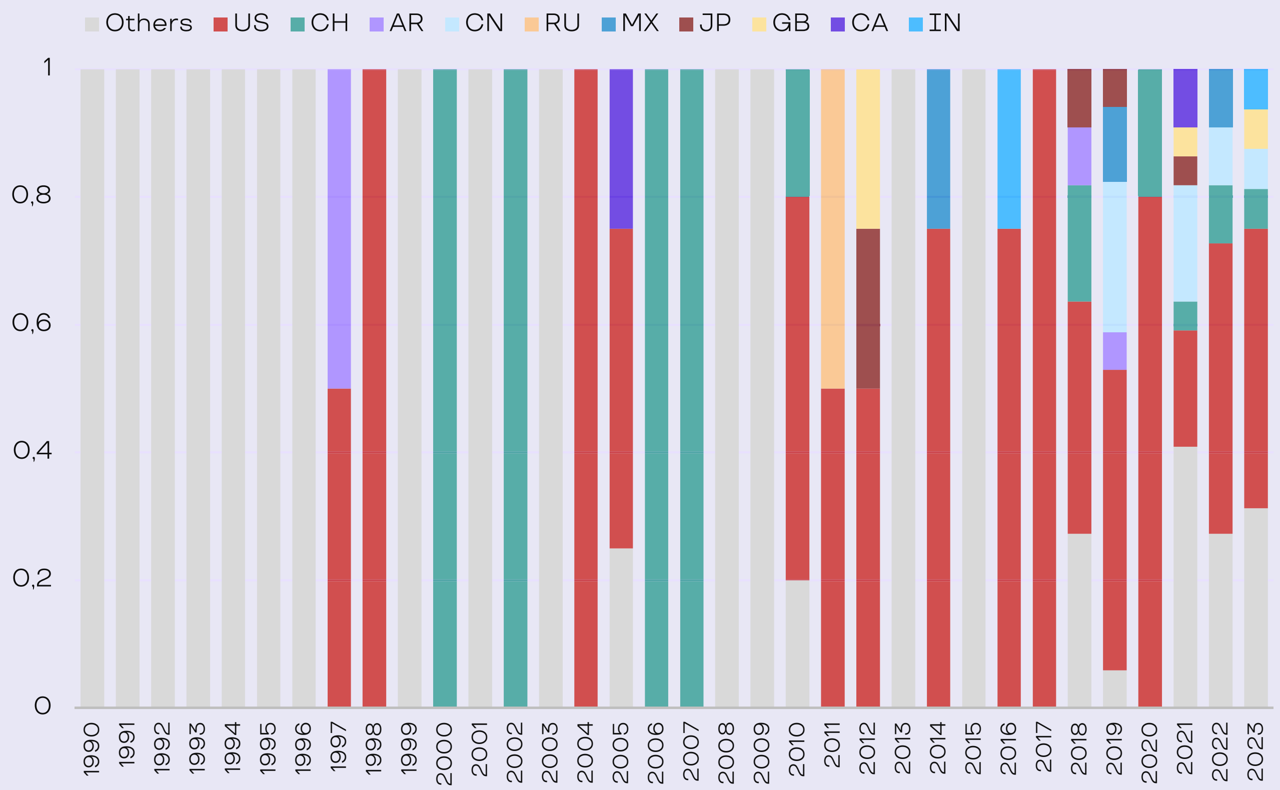
An interesting phenomenon that emerges in the case of the Dominican Republic, unlike most countries in the region, is the growing relevance of India as a country of destination and origin of authors. Over time, India has gained prominence in academic migration, consolidating itself as an important actor for both arrivals and departures, suggesting a strengthening of academic relations with Asia.

The observed migration patterns show a symmetry between the arrival and departure of authors, suggesting that most of the authors migrating to the Dominican Republic come from the same countries to which Dominican authors have previously emigrated. This cycle of exchange is consistent with what is observed at the regional level, where academic collaborations with certain countries tend to be reciprocal and stable over time.

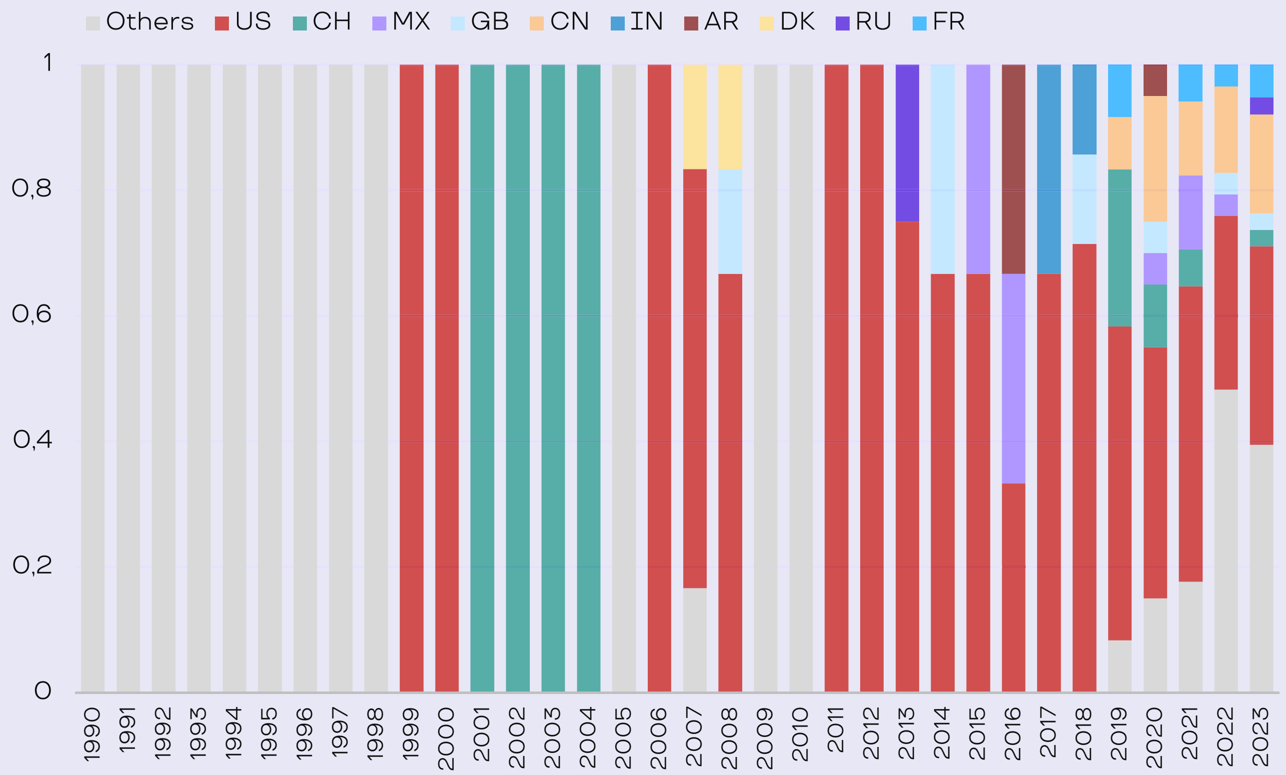


Dominican Republic

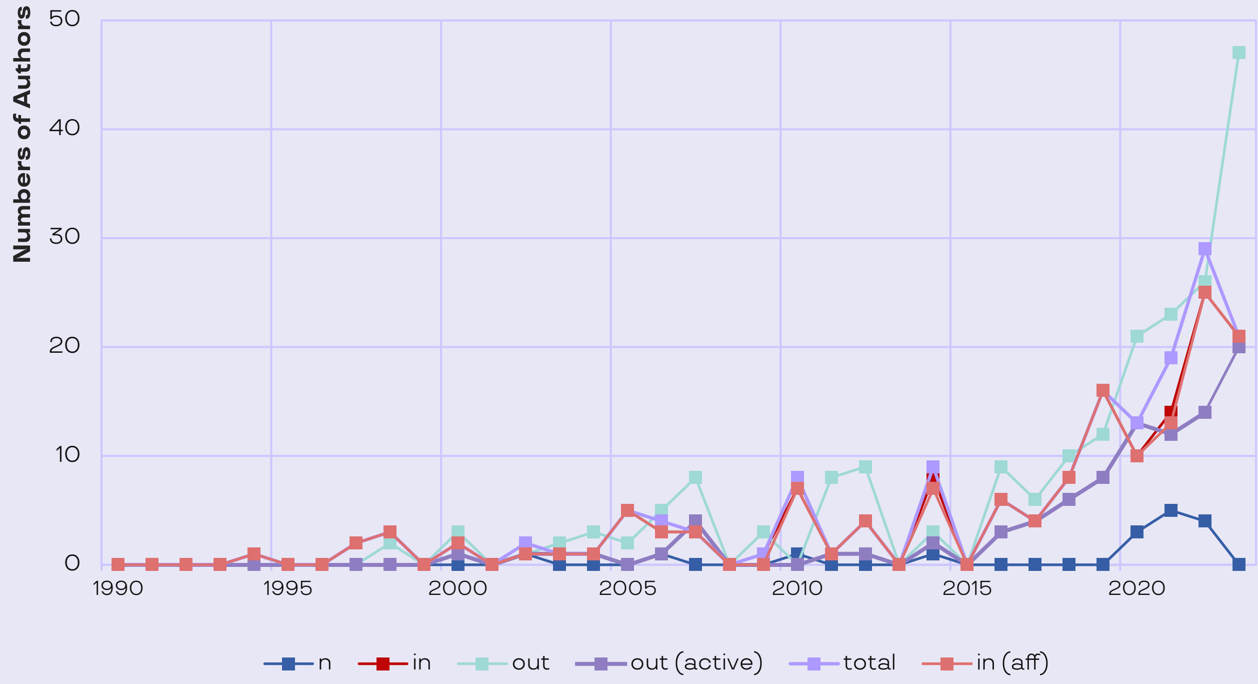
Graph 2: Where do Authors who Publish in Dominican Republic Come From?



Graph 3: Where Do Authors Who Published in Dominican Republic Go?

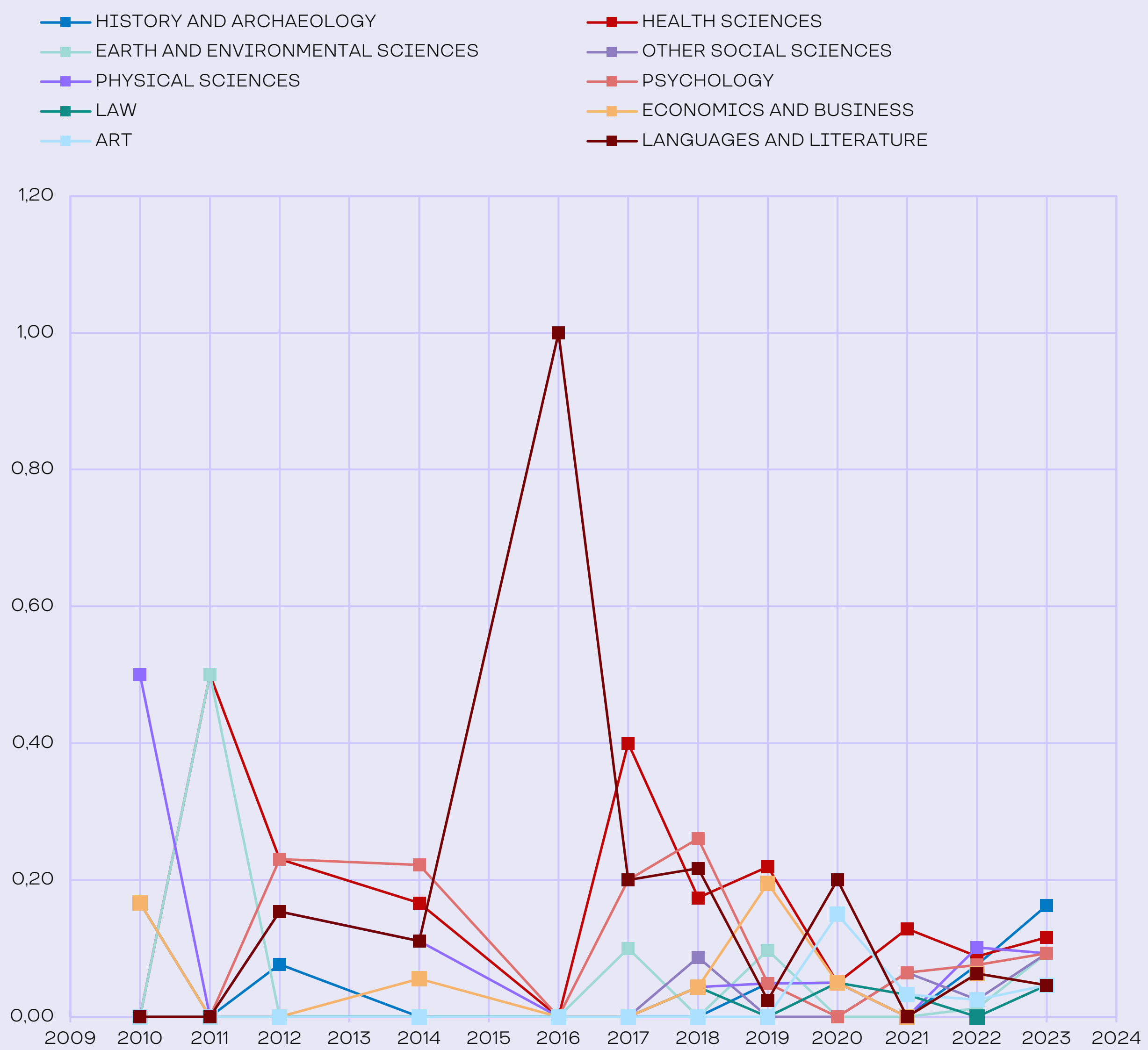


Graph 4: Talent Drain



The data on the composition of the Dominican Republic's author ecosystem show a significant fragility. There is no evidence of the existence of a community that publishes consistently, which, although it begins to appear in 2019, disappears in 2023. At the same time, the number of Dominican authors publishing in institutions outside the country grows much faster (red line) reaching about 20 authors in 2023. Likewise, those who use AI as a research tool for a single publication (green) exhibit the most relevant and accelerated growth throughout the series. In this sense, the most relevant challenge lies in the generation of local conditions that allow the retention and insertion of researchers in local institutions.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Dominican Republic



In the case of the Dominican Republic, Graph 5 reveals that the volume of publications is low, which hinders a thorough analysis of the system's composition. Although there was a peak in languages and literature in 2016, this was due to the fact that there were only three publications in AI that year, all within that field. Starting in 2018, a higher volume of publications can be observed, but there is no clear trend indicating the dominance of one discipline over another, as reflected in the fluctuations in the relative importance of each discipline from year to year.

Dimension	Subdimension	Indicator	Dominican Republic	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	56,94	57,12	9
		Computation	18,8	21,76	10
		Devices	31,86	36,47	12
	Infrastructure Score		41,13	43,12	10
	Data	Data Barometer	32,94	35,76	8
	Data Score		32,94	35,76	8
	Human Talent	AI Literacy	44,92	57,9	18
		Professional Training in AI	25,68	43,49	18
		Advanced Human Talent	17,72	11,69	3
	Human Talent Score		30,99	39,71	16
	ENABLING FACTORS TOTAL SCORE		36,04	40,26	12
Research, Development and Adoption (R&D+A)	Research	Research	33,34	41,43	14
	Research Score		33,34	41,43	14
	I+D	Innovation	32,37	31,57	7
		Development	53,02	20,93	2
	R&D Score		59,38	42,53	5
	Adoption	Industry	44,46	54,29	14
		Government	68,98	69,65	11
	Adoption Score		54,27	60,44	13
	R&D+A TOTAL SCORE		47,43	47,46	8
Governance	Vision and Institutionality	AI Strategy	100	33,33	3
		Society's Involvement	50	19,08	3
		Institutionality	50	21,05	6
	Vision and Institutionality Score		75	26,7	2
	International Linkage	Standard Definition Participation	0	13,16	17
		International Organizations Participation	100	92,11	15
	International Linkage Score		50	52,63	15
	Regulation	Regulation on AI	0	47,37	18
		Cybersecurity	77,69	49,85	4
		Ethics and Sustainability	58,87	41,71	5
	Regulation Score		52,74	45,28	9
	GOVERNANCE TOTAL SCORE		63,32	37,46	5
ILIA 2024 TOTAL SCORE			46,85	42,08	7

URUGUAY

General Description:
Population to 2023: **3.423.000**
PIB per cápita al 2023: **USD 22.564,50**
% of GDP Allocated to R&D: **0,45%**
Human Development Index (HDI) 2022: **0,830**

Category: Pioneer

Score: 64,98

Position: 3

	2023	2024
ILIA Total Score	**54,99**	**64,98 •**
Position in Index	3	3
Infrastructure Score	58,59	65,27
Data Score	50,77	50,77
Human Talent Score	52,1	62,11
Enabling Factors Score	53,82	60,7
Enabling Factors Position	3	2
Research Score	74,82	54,39
Innovation and Development Score	83,6	80,98
Adoption Score	69,43	68,78
Research, Development and Adoption Score	75,95	66,68
R&D+A Position	1	3
Vision and Institutionality Score	55,56	75
International Linkage Score	0	50
Regulation Score	50	73,1
Governance Score	35,19	69,43
Governance Position	8	3

General Overview

Uruguay shows a similar performance to the previous version of the ILIA. Its overall score increases significantly, maintaining its relative position within the region, occupying third place.

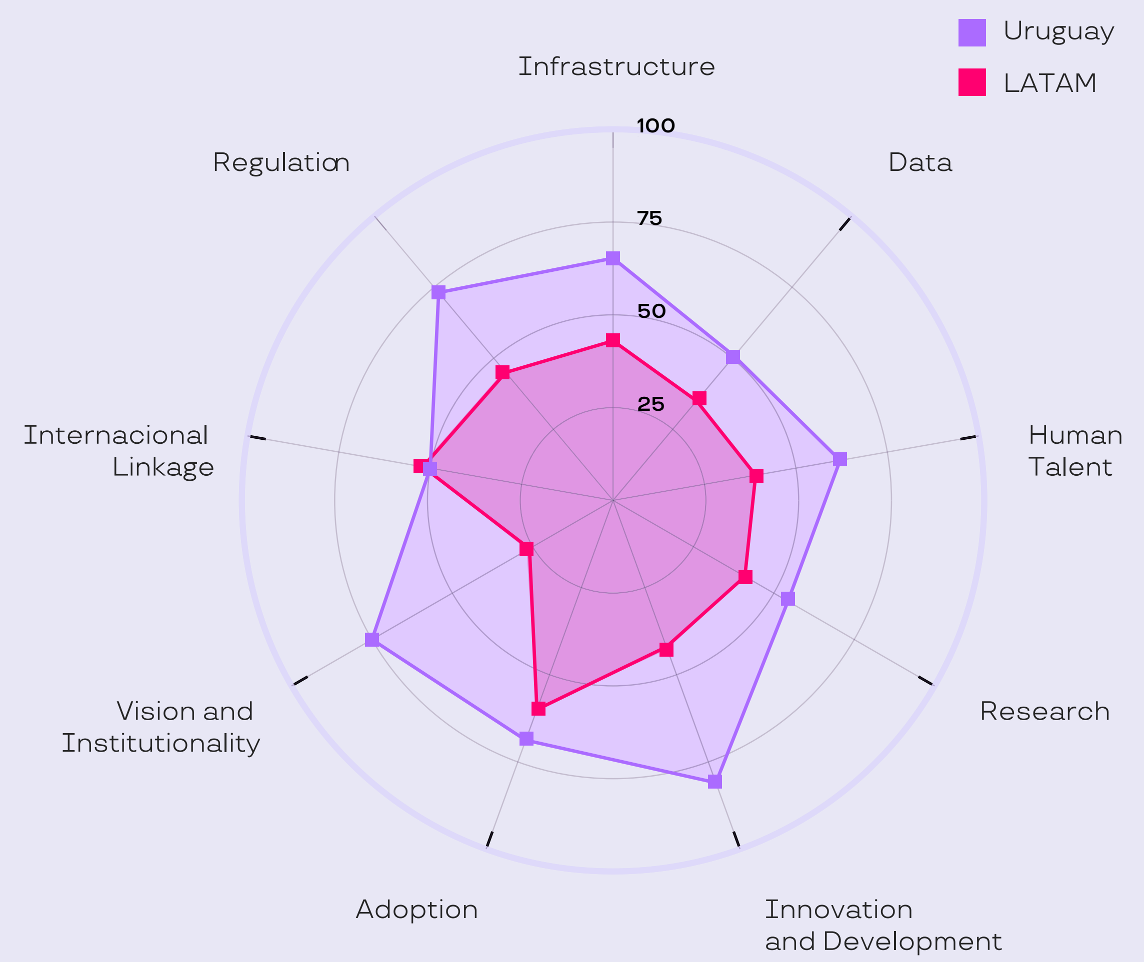
The evaluation in the Infrastructure subdimensions is higher than in 2023, while the Data is maintained and in the Human Talent there is evidence of a significant improvement from the incorporation of indicators associated with STEM Degrees and the detection of ICT elements in the school curriculum, in addition to the improved data capture regarding the Advanced Human Talent ecosystem.

The Research, Development and Adoption (R&D&+A) dimension shows the greatest decrease in relation to the previous edition, specifically in the Research subdimension (down 20 points). Despite this, it remains above the average for the region and even improves its relative position to second place.

In Governance, the presence of a national strategy or policy is maintained, while the incorporation and verification of subscription to international agreements contributes to the 50-point increase in the international subdimension.

At laugh, In the regulatory area, the score of 73.10 shows a relative increase in the region due to the incorporation of new indicators to the index.

Graph 1: Uruguay and LATAM Subdimensions



Uruguay

General Findings

In the area of Infrastructure, Uruguay is above the regional average, with 65 points. In terms of connectivity, the country has a high level of Internet use among the population (89.87%). It also has high levels of these subindicators: Average Mobile Download Speed, Active Mobile Broadband Subscriptions and Fixed Broadband Subscriptions (with 100 points respectively, the highest in the region). On the other hand, it has a lower than average level of 5G implementation, with 6.70 points.

In terms of Computing, the country aligns closely with the regional average in Cloud services and scores four times higher than the region in High-Performance Computing Infrastructure Capacity (47.34 points). It also demonstrates strength in Secure Internet Servers, although there is potential for growth in the development of Internet Exchange Points (IXPs), as it currently falls below the regional average in this area.

The country leads the region in Devices, achieving a score of 68.70 points for Households That Have a Computer and boasting the highest score in IPv6 Adoption. However, it lags slightly behind the regional average in Smartphone Accessibility, with a score of 29.32 points. In terms of Data, Uruguay has an Availability score of 46.12, ten points above the average, while in Capabilities, with 66.24 points, it is 15 points ahead of the region, with its biggest advantage over the region in Data Governance (62.83 points).

In the area of Human Talent, the country stands out in terms of AI literacy, specifically in Early Science Education (93.06 points), a vocational training in which the Penetration of AI Skills (73.33 points) is almost four times the regional average. It also has a higher than average level of STEM Graduates, with 44.38 points. In the Advanced Human Talent, while it achieves maximum scores in globally competitive and accredited academic programs, it only does so up to the master's degree, scoring zero at the PhD level.

The pioneering character of the AI ecosystem in Uruguay is strongly expressed in the Research, Development and Adoption (R&d+A) dimension. In terms of AI Publications, the country occupies a regional leadership position, with high levels of Active and Consistent AI Researchers, with a level of Female AI authors similar to the average. AI Research Productivity is slightly below average (48.07 points), while AI Research Impact (33.44 points) is at the same level as the region.

In terms of Innovation, the country leads the region, with above-average levels of private investment, with an estimated total value of 90.72 points. Although the country has three times the average number of AI Companies, it does not have Unicorn cCompanies. There are economic activities where AI finds applications in the market, but without innovation at that level. The country has high levels of Productivity and Quality of Open Source, but is seven points below the Number of Patents at the regional level.

The indicators of Adoption by Industry show a slight lag with respect to the region in Medium and High-Tech Manufacturing and in Workers in the High-Tech Sector. However, in the score for the indicator of the Proportion of Value-Added generated by medium and high technology, the country exceeds the average by 20 points (84.55 points).

In terms of Vision and Institutionality, the absence of coordination mechanisms between institutions and evaluation mechanisms persists in relation to the previous year, while the institutional framework continues to stand out in terms of a national AI strategy. For its part, the Society's Involvement indicator scores 50, well above average, but with room for further development in terms of citizen and stakeholder participation. As for the International Lankage subdimension, there is still a lack of participation in instances such as ISO, but there are opportunities to make progress on this point.

In regulation, the maximum result for Risk Mitigation contrasts with the zero score for Safety, Accuracy and Reliability, which is 20 points below the regional average.

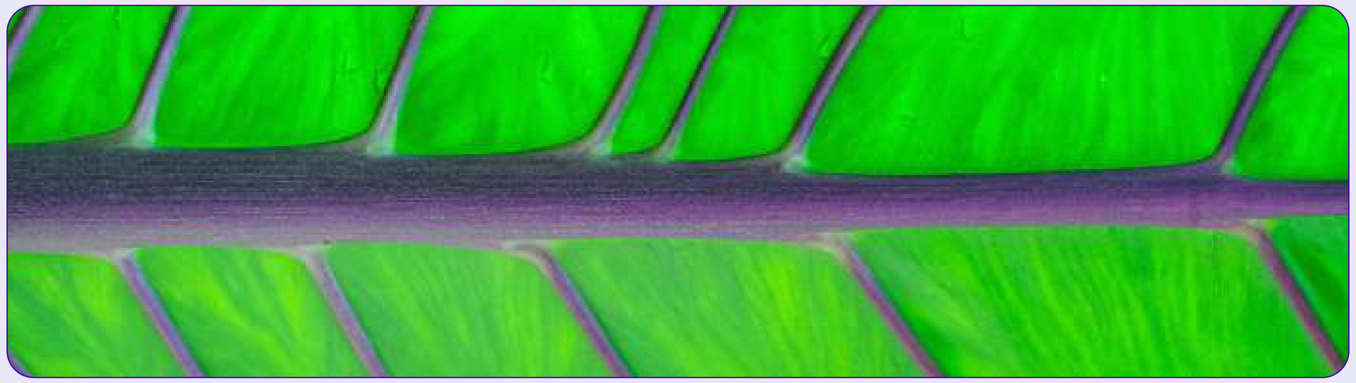
Immigration and Talent Drain in AI

Compared to the 2023 analysis, there is a change in the origin and destination of authors publishing in Uruguay. The United States has come to occupy a relevant position, leading both as origin and destination of authors publishing in the country. Spain, which previously had a more prominent role, is now in second place.

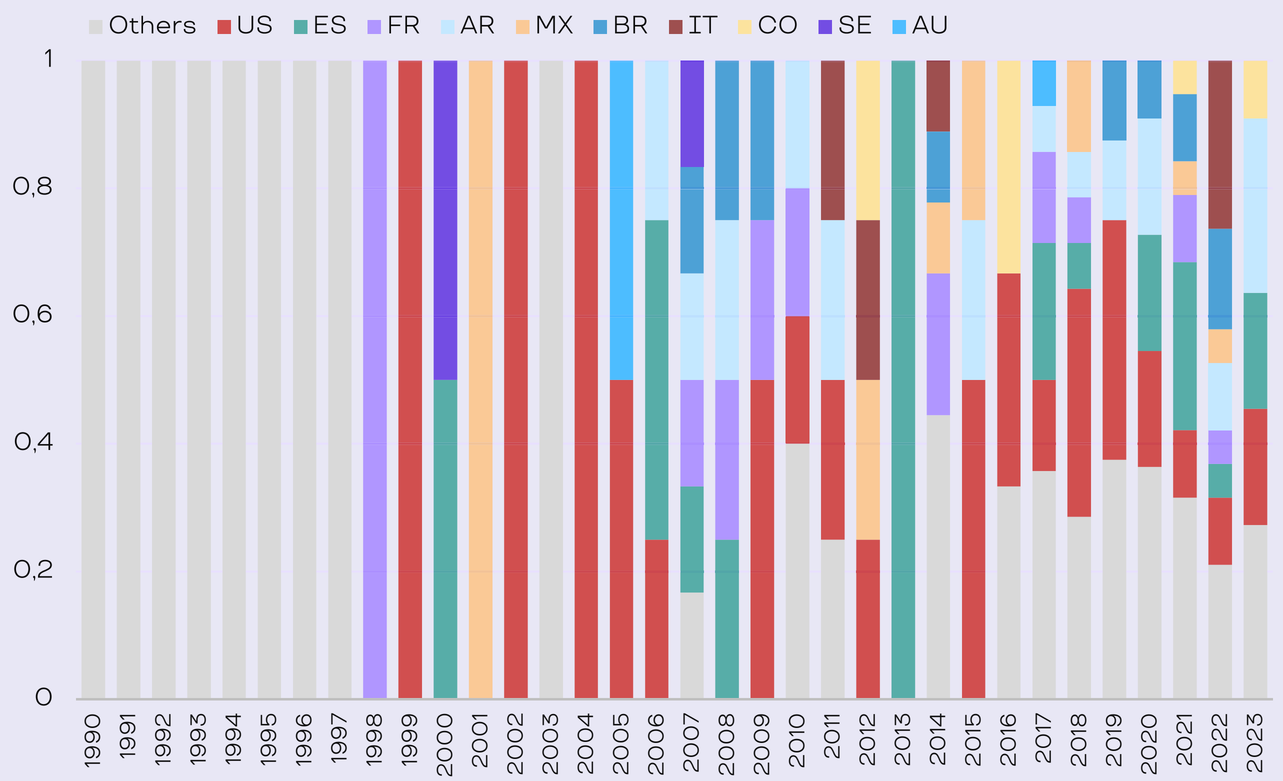
The growing presence of Latin American countries in the landscape of migration of academic talent to and from Uruguay is also notable. Argentina is the most important, even more so than the USA and Spain, followed by Mexico and Brazil, which emerge as key collaborators. Brazil stands out as an important destination for authors publishing in Uruguay. This reinforces the strengthening of regional ties and academic integration in Latin America.

It is possible to observe a decrease in the relevance of European countries in comparison with previous years, which previously had a greater representation, have ceded space to the Latin American nations mentioned above. This change reflects a shift in collaborations towards the regional level.

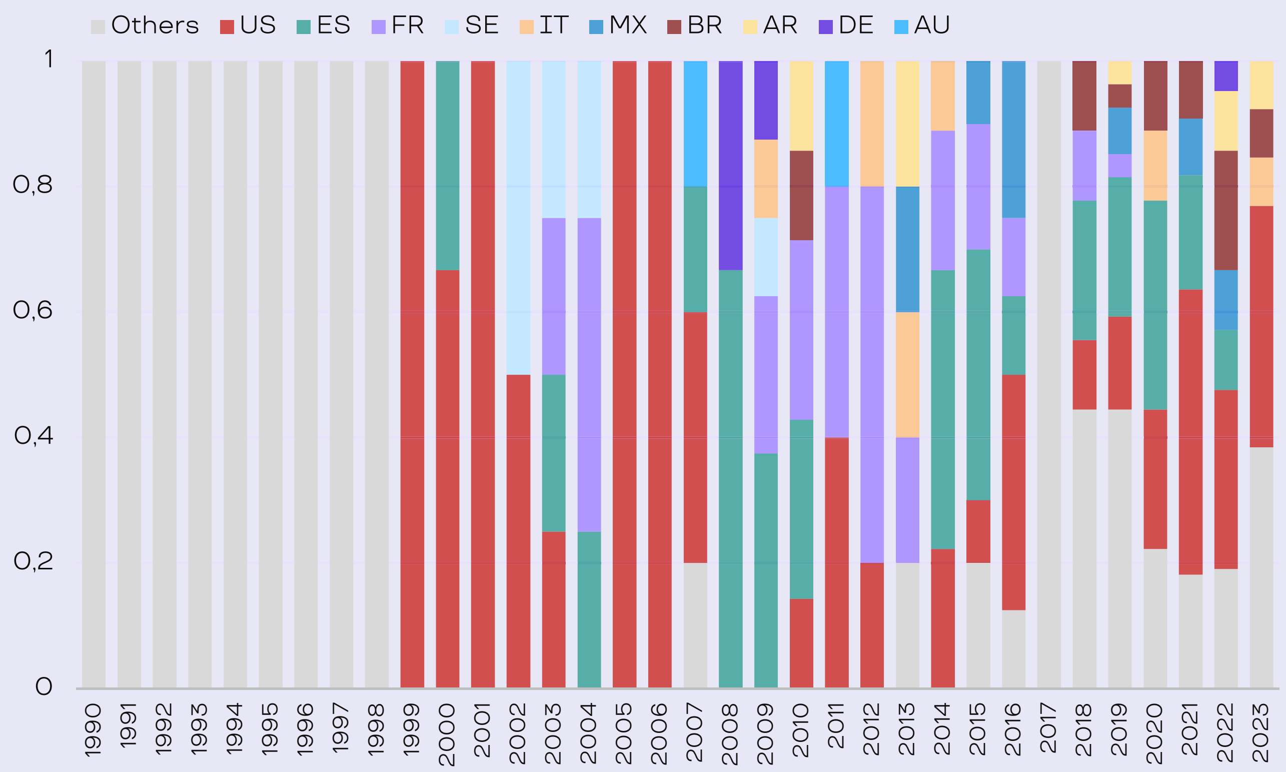
In terms of migration patterns, inflows and outflows show a similar trend, suggesting that most authors entering Uruguay come from countries to which Uruguayan authors have previously migrated. Spain and Chile are the notable exceptions to this trend, as Uruguayan authors do not seem to return to these countries as frequently as others.



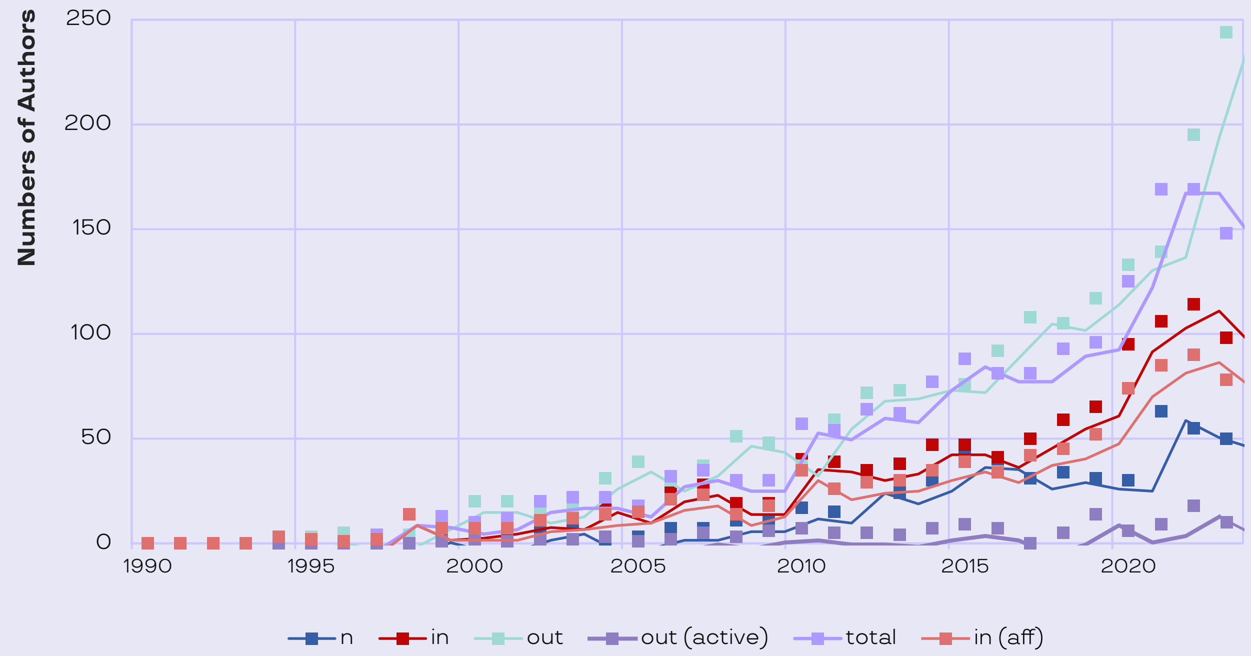
Graph 2: Where do Authors who Publish in Uruguay Come From?



Graph 3: Where Do Authors Who Published in Uruguay Go?

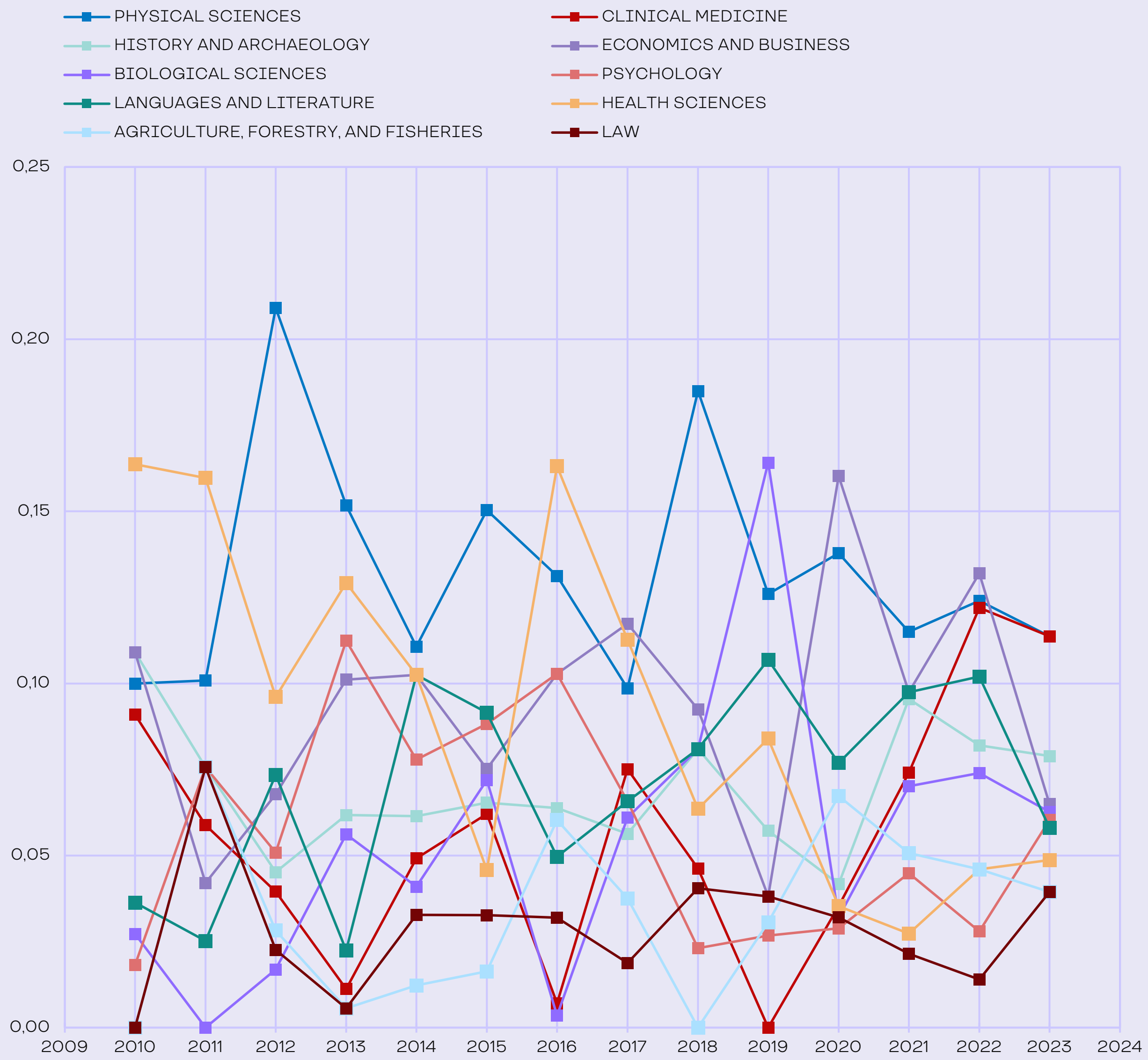


Graph 4: Talent Drain



The growth in the total number of authors has not been able to resume its dynamism after the pandemic. Between 2019 and 2021 there was a growth in both the number of new authors (orange) and those returning after having published outside (brown) and a significant drop in the same period in the number of those who consistently publish outside (red). These combined phenomena accelerated the total number of authors as well as the specific group of AI consistent authors (blue), but from 2022 onwards there is a decline, partly explained by the significant increase in the number of authors who stop using AI tools in their next publications (green).

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Uruguay



As for Uruguay, the distribution of the 10 OECD concepts exhibits a high variance in the relative importance of publications with AI in the last decade as a result of the low overall volume of publications. Despite this, it is possible to appreciate the relevance of physical sciences throughout the series, and the significant growth of clinical medicine from 2017 onwards. In 2023 they each account for 13% of AI publications. On the other hand, History and Archaeology has maintained a consistent relevance over time, at around 9%, a phenomenon that contrasts with Biological Sciences or Economics and Business, whose relative importance in publications varies almost 12 points between 2017 and 2018.

Dimension	Subdimension	Indicator	Uruguay	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	81,84	57,12	2
		Computation	31,39	21,76	5
		Devices	66,01	36,47	1
	Infrastructure Score		65,27	43,12	2
	Data	Data Barometer	50,77	35,76	3
	Data Score		50,77	35,76	3
	Human Talent	AI Literacy	73,64	57,9	2
		Professional Training in AI	58,85	43,49	3
		Advanced Human Talent	50	11,69	2
	Human Talent Score		62,11	39,71	2
	ENABLING FACTORS TOTAL SCORE		60,7	40,26	2
Research, Development and Adoption (R&D+A)	Research	Research	54,39	41,43	4
	Research Score		54,39	41,43	4
	I+D	Innovation	51,65	31,57	3
		Development	57,66	20,93	1
	R&D Score		80,98	42,53	2
	Adoption	Industry	57,81	54,29	7
		Government	85,24	69,65	7
	Adoption Score		68,78	60,44	6
	R&D+A TOTAL SCORE		66,68	47,46	3
Governance	Vision and Institutionality	AI Strategy	75	33,33	7
		Society's Involvement	50	19,08	4
		Institutionality	100	21,05	2
	Vision and Institutionality Score		75	26,7	3
	International Linkage	Standard Definition Participation	0	13,16	18
		International Organizations Participation	100	92,11	16
	International Linkage Score		50	52,63	16
	Regulation	Regulation on AI	100	47,37	9
		Cybersecurity	77,8	49,85	3
		Ethics and Sustainability	59,51	41,71	4
	Regulation Score		73,1	45,28	3
	GOVERNANCE TOTAL SCORE		69,43	37,46	3
ILIA 2024 TOTAL SCORE			64,98	42,08	3

VENEZUELA

General Description
Population to 2023: **28.838.000**
2023 GDP per capita: **15.975,7 USD**
% of GDP Allocated to R&D: **0,34 %**
Human Development Index (HDI) 2022: **0,699**

Category: Explorer

Score 31,52

Position: 13

	2023	2024
ILIA Total Score	**s/d**	**31,52**
Position in Index	s/d	13
Infrastructure Score	s/d	31,52
Data Score	s/d	50,25
Human Talent Score	s/d	34,24
Enabling Factors Score	s/d	37,02
Enabling Factors Position	s/d	10
Research Score	s/d	34,65
Innovation and Development Score	s/d	21,72
Adoption Score	s/d	61,44
Research, Development and Adoption Score	s/d	38,81
R&D+A Position	s/d	13
Vision and Institutionality Score	s/d	0
International Linkage Score	s/d	25
Regulation Score	s/d	25,07
Governance Score	s/d	12,52
Governance Position	s/d	17

General Overview

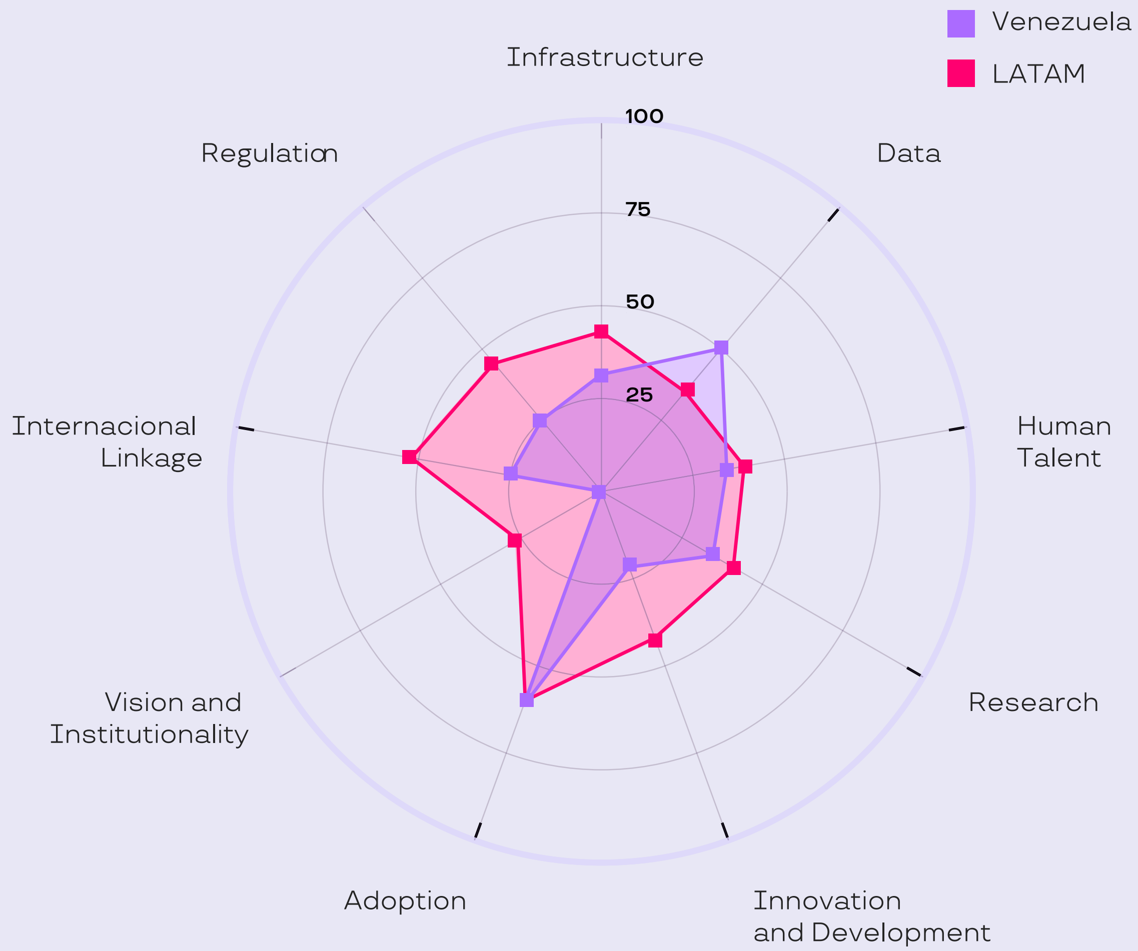
Venezuela joins ILIA 2024 for the first time and does so with an overall score of 31.52, which places the country in 13th place among the countries in the region.

In Enabling Factors it presents 12 points below the regional average, and the evaluation in the subdimensions of Infrastructure and Human Talent is below the regional average, while in the subdimension of data it shows an evaluation 15 points higher than the regional average.

The Research, Development and Adoption (R&D+A) dimension presents levels below the national average in the research subdimension (34.65 points) and in Innovation and Development (I&D), 21.72 points. In the Adoption subdimension, it is slightly above the regional average. It is below the regional average in this dimension.

In terms of Governance, the absence of a national strategy and/or policy in this area partly explains its position at the regional level. In turn, it registers low levels in the incorporation and verification of subscription to international agreements, which explains its 25 points in the international subdimension.
In the regulatory area, the score of 25.07 places it among the countries with the lowest levels in the region.

Graph 1: Venezuela and LATAM Subdimensions



General Findings

In Infrastructure (31.52 points), Venezuela is below the regional average, constituting a major challenge for the development of the AI ecosystem in the country. In terms of Connectivity, most of the indicators show a deficit with respect to the average. Population That Uses Internet (61.00 points) is almost 15% points below the regional average, while download speed is significantly lower than the regional average.

In terms of Computing, Venezuela is below average. It stands out for the IXPs (53.00 points), which exceed the regional score. Meanwhile, all the remaining indicators are below average, with no High Performance Computing Infrastructure Capacity and a score close to zero in Certified Data Centers. Furthermore, Internet Server Security has lower results.

Venezuela registers a significant deficit according to the type of devices. While the level of Households That Have a Computer registers 43.97 points (above the regional average), it has levels almost three times lower than the average in Smartphone Affordability and a very low level of IPv6 Adoption.

In the area of Data, Venezuela is above the regional average. Its Use and Impact score (27.00 points) is slightly above average, but in the area of Capabilities and Governance it registers levels comparable to pioneering countries in the region.

In terms of Human Talent, Venezuela is above average in terms of AI Literacy, with a strong presence in Early Education in Science and 75.00 points in Early Education in AI, slightly below the regional average. The deficit with respect to the region is practically absolute in Advanced Human Talent, with no presence of PhD programs in AI.

The country's conditions are not very conducive to Research, as it lacks AI Research Centers and has a low number of AI Publications compared to the regional average. Along with this, there is a low number of Active Researchers in the subject, but with a maximum impact score. In addition, the country's score for Participation in Mine Tracks and Sides Events is zero. Notwithstanding the above, AI research in Venezuela is characterized by its effectiveness, reaching the maximum score in Impact.

Venezuela's AI Governance deficit is largely due to the fact that it does not have an AI strategy in any of the areas analyzed in this index. In turn, this is linked to not having any type of participation mechanism or methodology with stakeholders, registering a zero score in the Society's Involvement indicator. The country also does not have an institution dedicated to this issue.

Concerning Standards Definition Participation and International Organizations Participation indicators, linked with de International Lankage subdimension, Venezuela shows low results. In the area of Regulation, the country stands out with the highest score in Sustainability. It has also made progress in regulatory matters in Cybersecurity, although it is below the regional average.

Venezuela needs to address its outstanding need for a specific regulatory framework for AI, as well as tackle ethical issues such as data protection and the technical standards of Security, Accuracy, and Reliability.

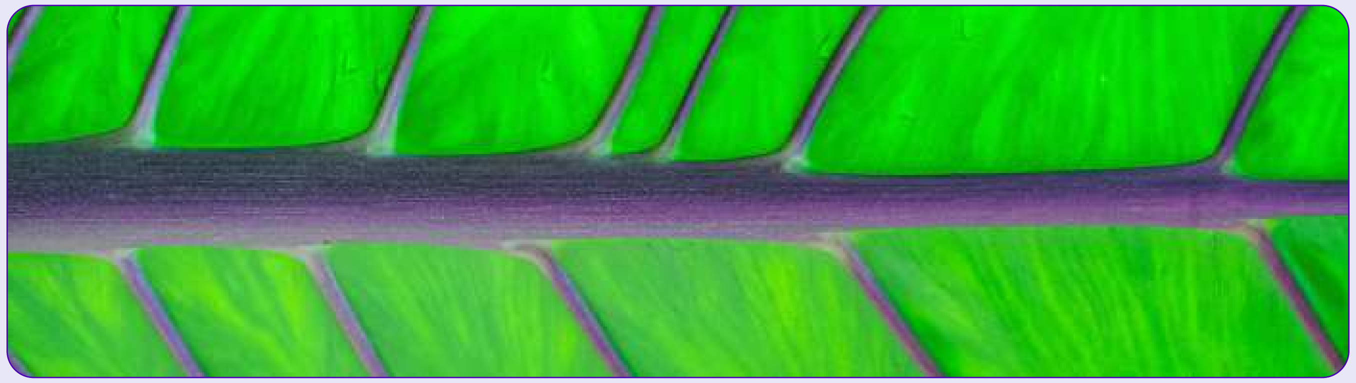
Immigration and Talent Drain in AI

In the current ILIA edition, the analysis of the migration of academic talent in Venezuela has been included for the first time, which implies that there is no previous comparative study for this country. Despite this, the available data reveal that Spain, the United States and Germany are the main countries of origin and destination for authors publishing in Venezuela. These nations play a crucial role in the exchange of academic talent, highlighting the importance of connections with Europe and North America.

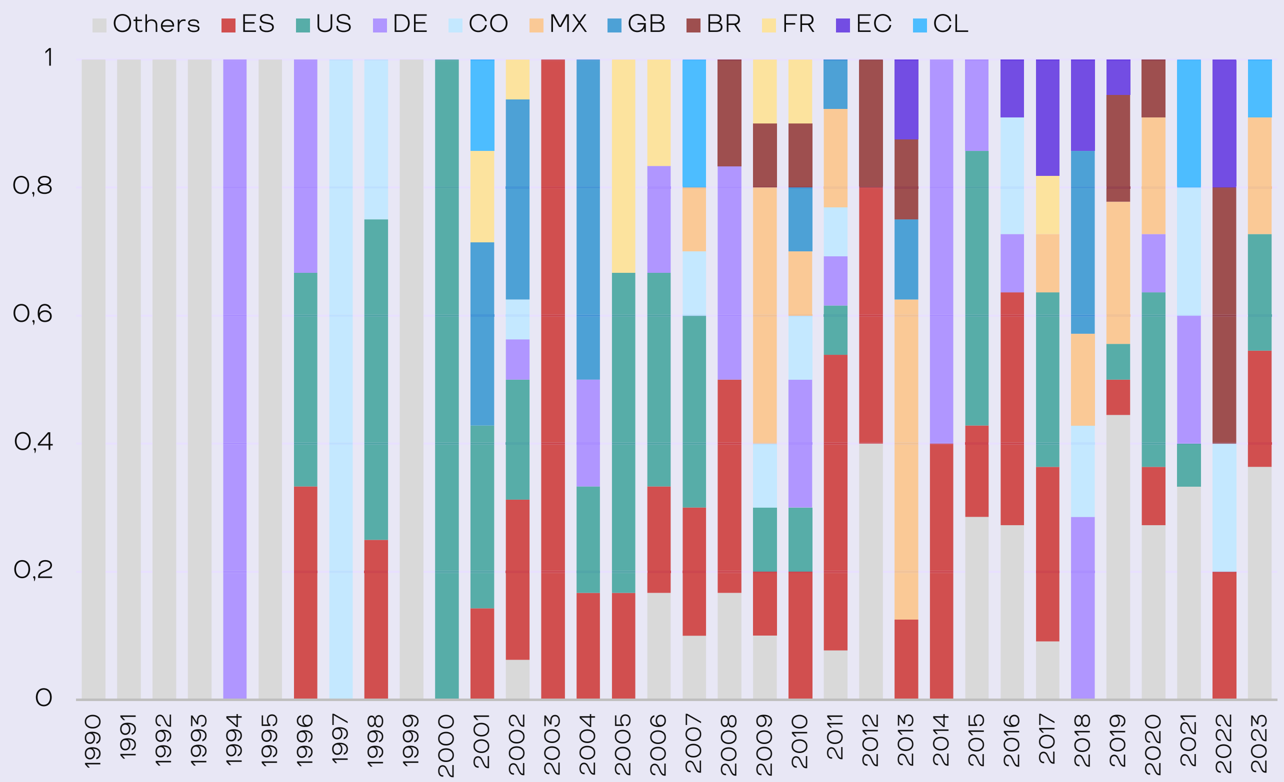
In addition to these key destinations, collaboration within Latin America is also highly relevant for Venezuela. Countries such as Colombia, Mexico, Brazil, Ecuador and Chile appear as important players in the inflows and outflows of authors. This reinforces the idea that academic networks within the region play a fundamental role in the mobility of Venezuelan talent, both in terms of training and collaborative research.

It is interesting to note that, unlike other nations in the region, China is neither a destination nor a relevant origin for authors publishing in Venezuela, which contrasts with its growing presence in other Latin American countries. This could reflect a structure of academic collaboration more oriented towards the West and towards neighboring countries in the region.

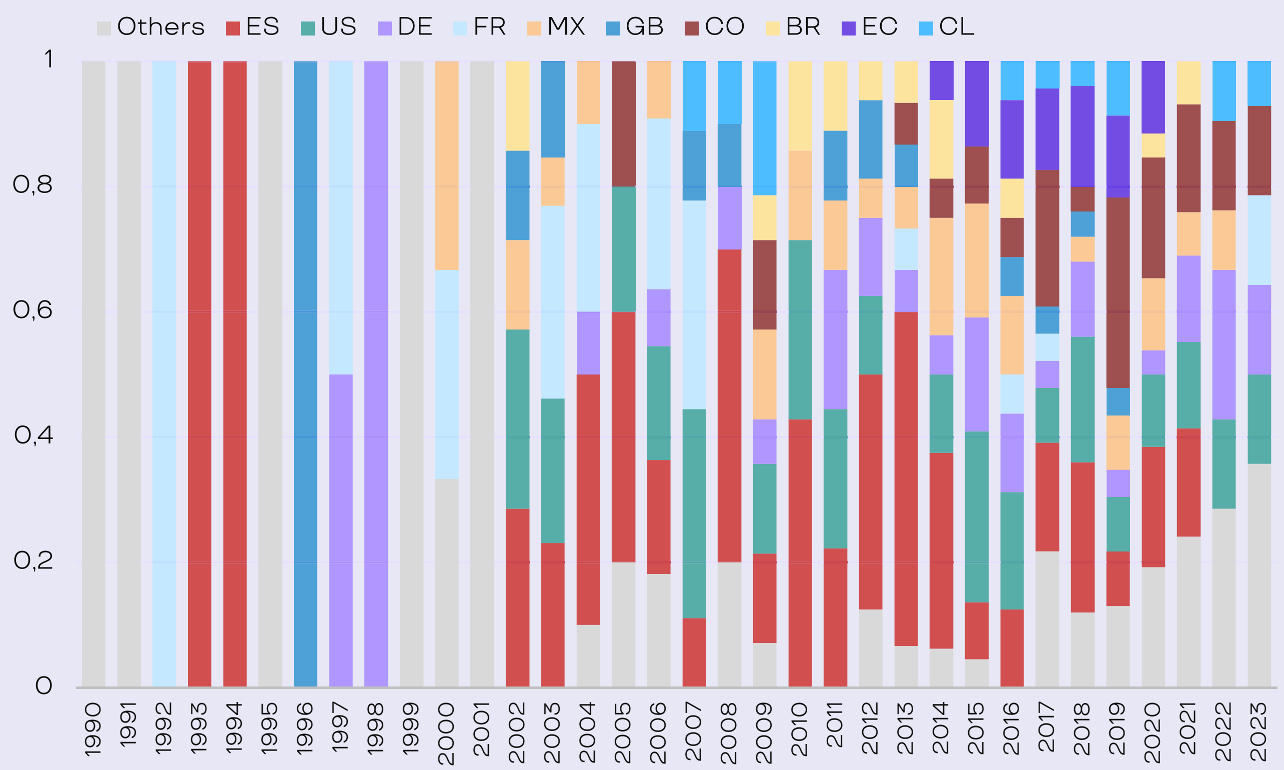
In terms of migration patterns, there is a notable symmetry between inflows and outflows, indicating that most of the authors migrating to Venezuela come from the same countries to which Venezuelan authors have previously emigrated. This cycle of reciprocity in academic mobility is consistent with the pattern observed at the regional level, where collaborations with certain countries tend to be sustained and stable over time.



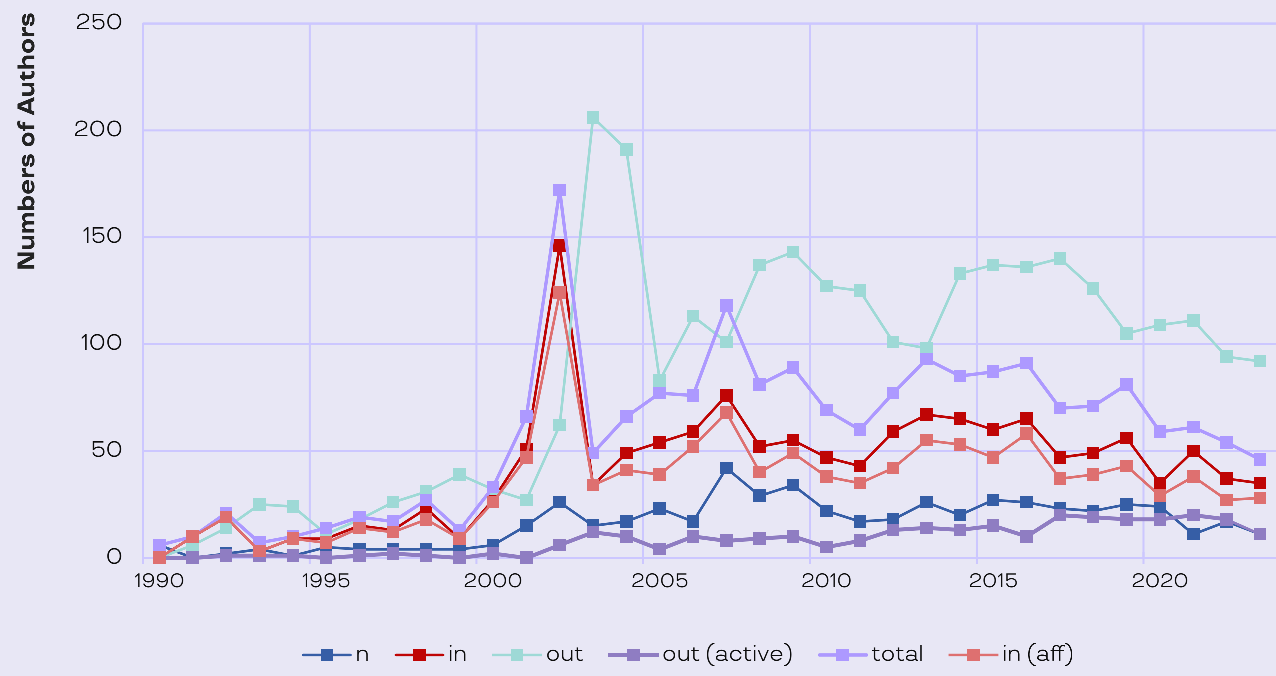
Graph 2: Where do Authors who Publish in Venezuela Come From?



Graph 3: Where Do Authors Who Published in Venezuela Go?



Graph 4: Talent Drain



As evidence, Graph 4 depicts the talent drain in Venezuela during the period from 1990 to 2023. One of the first aspects to highlight is the progressive decrease in the number of artificial intelligence (AI) authors publishing in the country, a trend that suggests a drop in research activity, possibly influenced by the political situation facing Venezuela.

The number of AI authors who published in Venezuela in previous years but are no longer doing so is remarkable, with a marked outflow of researchers between 2003 and 2012 (green line), which evidences a loss of continuity in scientific production. This phenomenon seems to indicate a significant migration of talent, which affects the capacity for sustained development in AI within the country.

On the other hand, there is no significant increase in the number of authors whose last publication was outside Venezuela and who are now publishing again in the country (brown line). This suggests a decline in the return of researchers, which limits the possibilities of a rebound in local AI production. Taken together, these data reflect a considerable challenge in retaining and attracting AI talent in Venezuela.

Graph 5: Number of Publications in the Top 10 of OECD Disciplines in Venezuela

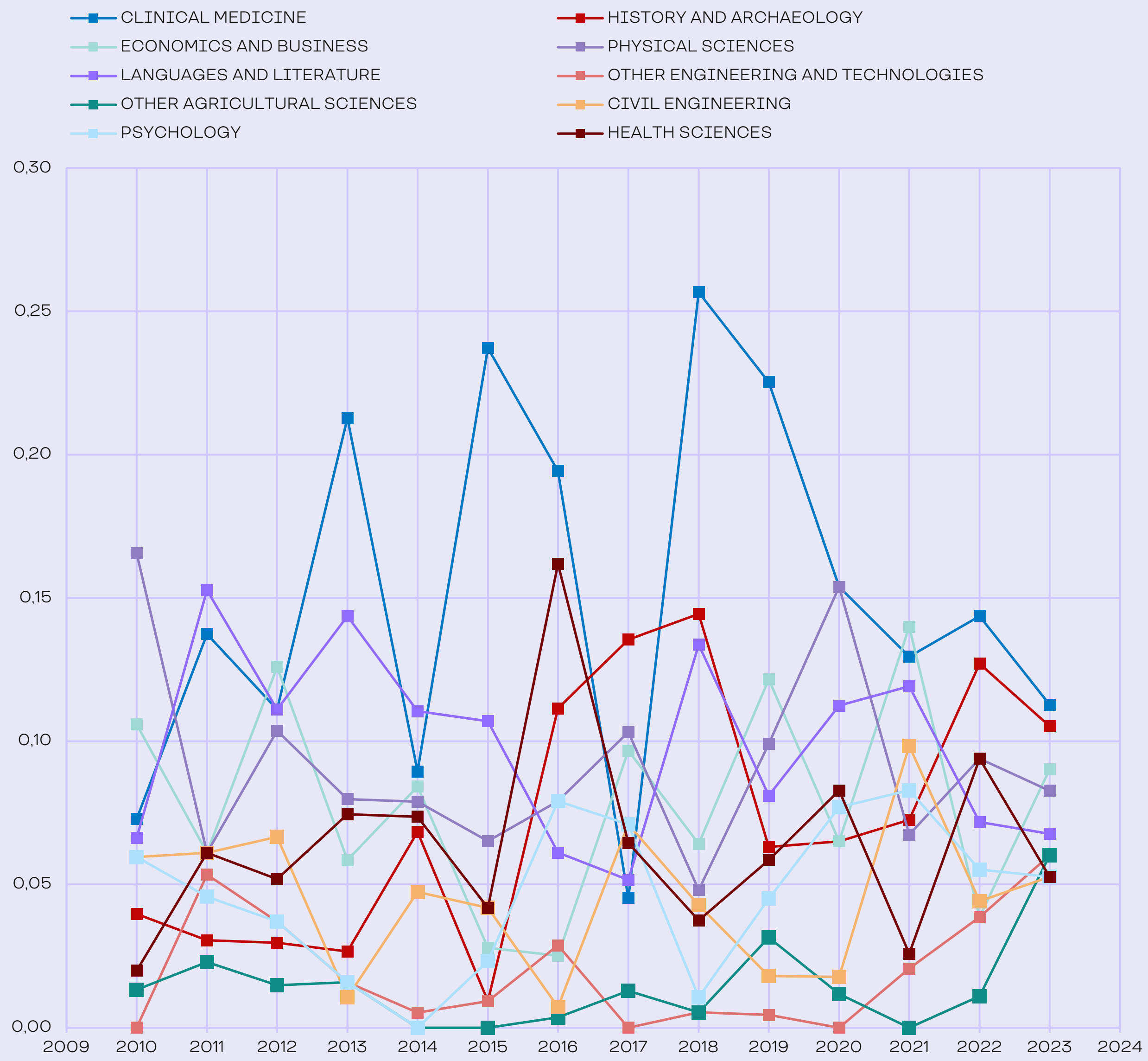


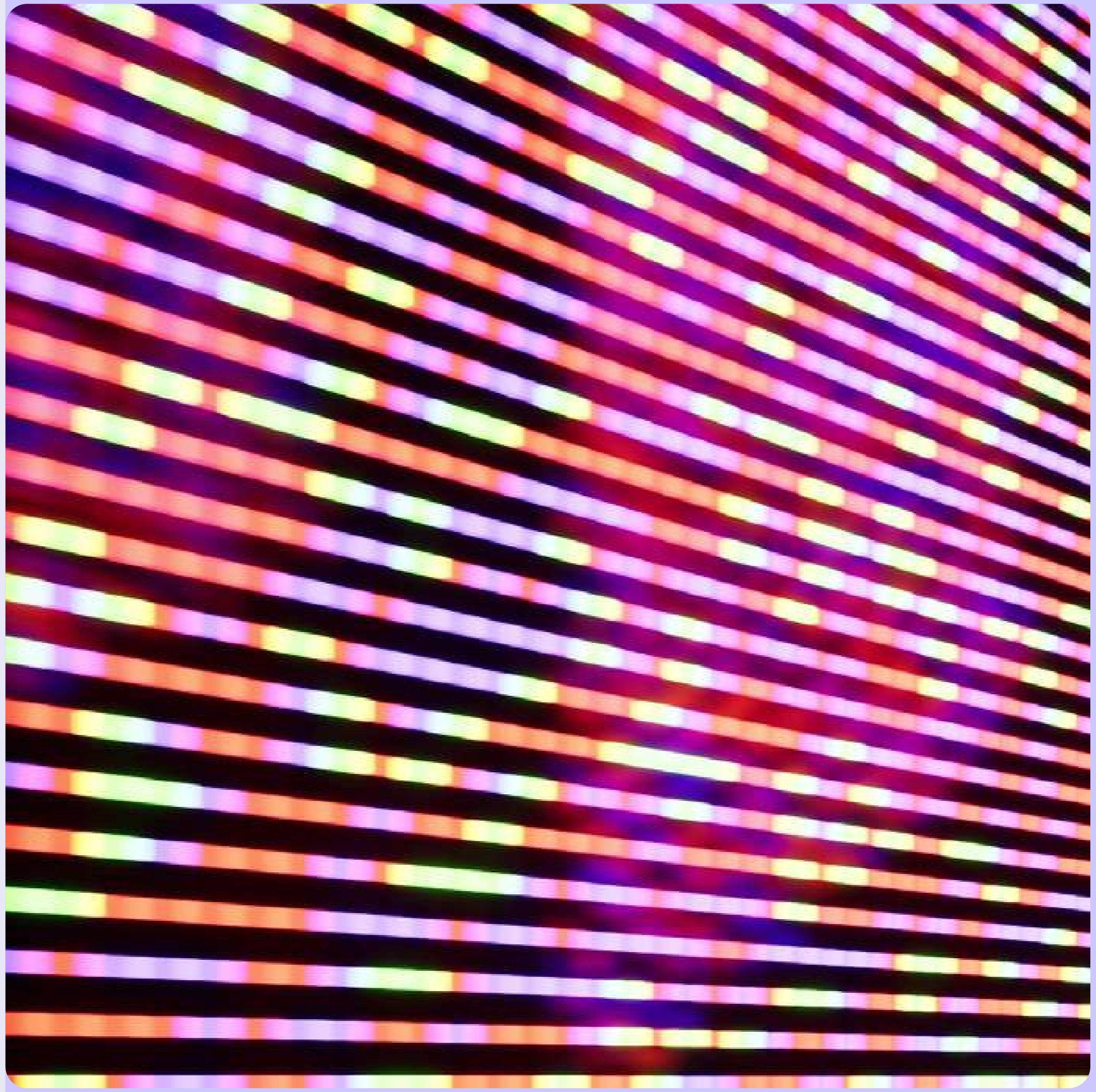
Figure 5 shows the distribution of the top 10 OECD disciplines in Venezuela between 2010 and 2023. It is important to note that the sample is not large enough to be statistically significant. On average, these disciplines account for 68% of scientific publications, while the remaining 32% correspond to the other OECD disciplines.

Clinical Medicine stands out with an average participation of 15%, although its proportion has varied over time, decreasing to 5% in 2017 and reaching 26% in 2018. This significant increase may be related to the interest in researching solutions for the healthcare system, given the country's health situation, which has boosted scientific production in medical topics.

On the other hand, Language and Literature has an average of 10% participation, reaching its highest level in 2018 with 13% of the total number of publications. This interest reflects the relevance of research in language and culture, which has been fundamental to preserve and promote cultural identity in Venezuela in a context of great social challenges.

Dimension	Subdimension	Indicator	Venezuela	LATAM average	Position
Enabling Factors	Infrastructure	Connectivity	44,49	57,12	16
		Computation	16,7	21,76	11
		Devices	20,42	36,47	16
	Infrastructure Score		31,52	43,12	17
	Data	Data Barometer	50,25	35,76	4
	Data Score		50,25	35,76	4
	Human Talent	AI Literacy	61,03	57,9	8
		Professional Training in AI	32,17	43,49	15
		Advanced Human Talent	0,59	11,69	14
	Human Talent Score		34,24	39,71	11
	ENABLING FACTORS TOTAL SCORE		37,02	40,26	10
Research, Development and Adoption (R&D+A)	Research	Research	34,65	41,43	12
	Research Score		34,65	41,43	12
	I+D	Innovation	18,52	31,57	17
		Development	5,41	20,93	18
	R&D Score		21,72	42,53	18
	Adoption	Industry	79,67	54,29	3
		Government	34,09	69,65	17
	Adoption Score		61,44	60,44	9
	R&D+A TOTAL SCORE		38,81	47,46	13
Governance	Vision and Institutionality	AI Strategy	0	33,33	19
		Society's Involvement	0	19,08	19
		Institutionality	0	21,05	19
	Vision and Institutionality Score		0	26,7	19
	International Linkage	Standard Definition Participation	0	13,16	19
		International Organizations Participation	50	92,11	19
	International Linkage Score		25	52,63	19
	Regulation	Regulation on AI	0	47,37	19
		Cybersecurity	28,01	49,85	14
		Ethics and Sustainability	33,33	41,71	11
	Regulation Score		25,07	45,28	12
	GOVERNANCE TOTAL SCORE		12,52	37,46	17
ILIA 2024 TOTAL SCORE			31,52	42,08	13

METHODOLOGICAL APPENDIX



This appendix offers a detailed overview of the ILIA 2024 methodology for each subindicator. It includes a description of all subindicators, specifying the measurement procedures and rigorous criteria applied for data selection. Additionally, it outlines methods used for data aggregation, imputation of missing values, indicator weighting, and the comprehensive analytical approach undertaken to ensure the accuracy and validity of the results.

The first section outlines the data collection strategy, detailing the methodologies and tools employed to ensure comprehensive coverage and high-quality data. Moreover, it includes a hyperlink for direct access to the detailed indicator results for each country, enabling a more nuanced understanding of the data foundations.

Following this, the subindicators and the specific methodology underlying their construction are outlined, using open and publicly accessible data sources. This section explains the techniques for data processing and normalization, as well as the criteria applied for information validation and verification. In addition, it addresses the challenges and limitations encountered during the construction of ILIA 2024, including inconsistent data availability, variations in source quality, and methodological constraints faced throughout the process.

Finally, the construction of indicators and subindicators not derived from public or comparable sources is comprehensively detailed, emphasizing the alternative methodologies and adjustments applied. This includes the systematic integration of primary data and informant insights, with precise documentation of the collection and processing protocols used to ensure the robustness and reliability of the ILIA 2024 results.

To review the detailed indicators for each country, **access this link.**

G.1 G.1 Data Collection Strategy

The data collection strategy primarily relied on publicly accessible sources across the 19 countries examined. Each subindicator's origin is thoroughly documented in the **Table 1: Conceptual Framework for ILIA 2024 Subindicators and Methodology**, organized by the dimension they support.

Ensuring data comparability across countries was central to maintaining the study's validity. Consequently, data were excluded when publicly available information covered only a subset of countries. Similarly, where some nations offered more recent or higher-quality data than those available from international sources, the study prioritized the latter to sustain a consistent and reliable comparative foundation.

Each index dimension is structured using **granular-level subindicators**, categorized into quantitative and qualitative types, with distinct approaches applied to each.. Qualitative subindicators were methodically classified into categories outlined in Table 1, which provides a clear analytical framework. Conversely, quantitative subindicators were collected in their raw form, without additional processing, to preserve data integrity. Following this, we carried out normalization and weighting processes, which are explained in the sections that follow in this appendix.

G.2 Data Imputation Method

The goal for data imputation concerning missing values is estimating these gaps, ensuring that models include all observations, specifically all countries involved in the analysis. It is essential to clarify that missing values should not be interpreted as zeros; rather, they signify the unavailability of information pertaining to the respective indicator.

The current ILIA 2024 employed two methodologies for data imputation:

1.Multiple Imputation by Chained Equations (MICE): This sophisticated approach leverages multiple regression equations applied iteratively to estimate missing values. The MICE method utilizes the available variables within the dataset as predictors in a regression model, adapting to the characteristics of each variable.

2. Nearest Neighbor Methodology

This method was utilized in instances where the data volume was insufficient for the MICE approach. To identify the nearest neighbor, the country with the smallest difference in GDP per capita compared to the country with missing data was selected, considering both higher and lower GDP per capita values. This strategy involves substituting the missing value with the corresponding data from the country exhibiting the most similar GDP per capita and available data for that specific subindicator.

Specific variables were chosen for the imputation of ILIA data based on the dimension requiring restoration. This targeted selection ensured that the imputations were appropriate to the particular analytical context of each investigated dimension

The number of iterations determined to achieve convergence was evaluated by the stability of the estimates across iterations

Figure 1: Implementation of MICE Imputation in Python using the statsmodels library

```
# Import the necessary library for MICE
Vfrom statsmodels.imputation.mice import MICEData

def perform_mice_imputation(df, columns, n_imputations=5):

    # Perform MICE imputation on selected columns of a table in Pandas library
    DataFrame format.

    # Initialize MICE data only on the specified columns
    imp = MICEData(df[columns])

     # Perform multiple imputations
    for i in range(n_imputations):
     imp.update_all()

    # Return a copy of the imputed data
    imputed_data = imp.data.copy()
    return imputed_data
```

The code presented in Figure 1 implements the Multiple Imputation by Chained Equations (MICE) technique in Python, utilizing the statsmodels library. The perform_mice_imputation function accepts a DataFrame from the pandas library, a list of columns designated for data imputation, and the number of iterations for the imputation process.

The function begins by importing the necessary components from the statsmodels module and initializing the MICEData object with the specified columns of the DataFrame. It then executes multiple imputations, updating all fields at each iteration to yield robust estimates of the missing values. Ultimately, the function returns a copy of the DataFrame containing the imputed values, ensuring that the original dataset remains intact. This methodology is particularly effective for addressing incomplete data in complex statistical analyses, enhancing both the completeness and utility of datasets.

Table 1 displays the Missing Data Imputation column, indicating which subindicators and countries underwent the data imputation process, along with the methodologies employed.

Tabla 1: Metodología de Datos ILIA 2024

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infrastructure	Connectivity	% Population using the Internet	Proportion of individuals who used the Internet -from fixed or mobile networks- from any location in the last three months. The objective is to measure how actively each country uses the Internet.	Not applicable	Continuous	Secondary	ITU DataHub: https://datahub.itu.int/	2020: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY 2017: VEN	Without imputation	Not applicable	0	100	Possible	Possible
	Infrastructure	Connectivity	Average mobile download speed (Mbps)	It is expressed as Mbps (megabits per second) and refers to the average amount of data that a device can download in one second, i.e. the speed at which a cell phone downloads data from the Internet.	Not applicable	Continuous	Secondary	Speedtest: https://www.speedtest.net/global-index	march 2023-march2024: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	Without imputation	Not applicable	4,010	68,100	Cash (Cuba)	Cash (Uruguay)
	Infrastructure	Connectivity	5G implementation	It addresses various aspects of 5G technology deployment, including the number of launches, pre-launches, limited availability and commercial capacity. The "number of launches" refers to the installation of new or upgraded antennas for spectrum that has been tendered, while "pre-launches" involves the installation of hardware necessary for 5G operation, but not yet available to end consumers. "Limited 5G availability" corresponds to announcements about antennas operating for specific uses, and "commercial capacity" relates to antennas available to the general public.	Not applicable	Continuous	Primary	Ookla	2024: ARG BRA BOL CH COL ECU GTM MEX PRY PER DOM URY	MICE Imputation Method (Multiple Imputation by Chained Equations)	Per million inhabitants	80,71937 10	64290,66 30802	Cash (Peru)	Cash (Chile)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infrastructure	Connectivity	Coverage of mobile networks (%) (minimum 3G)	Percentage of the population with at least 3G mobile coverage and to measure the number of people who can access the network from where they live. Mobile network coverage is essential for the effective implementation of AI: it facilitates access to real-time data, the interconnection of devices and the development of mobile applications (democratizes access to technology and AI).	Not applicable	Continuous	Secondary	ITU DataHub: https:// datahub.itu.int/	2021: DOM BOL 2022: VEN URY PER PRY PAN MEX JAM HND GTM SLV ECU CUB CRI COL CH BRA ARG	No imputation	Not applicable	0	100	Possible	Possible
	Infrastructure	Connectivity	Households with Internet access (proportion)	Refers to the proportion of households with Internet access at home. Access can be through a fixed or mobile network. If a household member has a cell phone with an Internet connection and makes it available to all members, then the household should be considered to have Internet access.	Not applicable	Continuous	Secondary	ITU DataHub: https:// datahub.itu.int/	2017: VEN 2021: BOL CH DOM GM HND JAM PAN SLV 2022: ARG BRA COL CRI MEX PER PRY URY 2020: CUB 2023: ECU	No imputation	Not applicable	0	100	Possible	Possible
	Infrastructure	Connectivity	Active mobile broadband subscriptions (p/c 100 persons)	It is the sum of active mobile broadband subscriptions through cell phones and computers (USB/ dongles) that allow access to the Internet.	Not applicable	Continuous	Secondary	ITU DataHub: https:// datahub.itu.int/	2021: ARG BOL 2022: BRA CH COL CRI CUB DOM ECU HND JAM MEX PAN PER PRY SLV URY VEN GTM	No imputation	Not applicable	0	117	Possible	Cash (Uruguay)
	Infrastructure	Connectivity	Fixed broadband subscriptions (p/c 100 persons)	Indicates the number of subscriptions, per 100 inhabitants, to an Internet connection service through a physical cable, such as fiber optic, coaxial cable or DS, and which offers a high data transmission speed, i.e., equal to or greater than 256 kbit/s.	Not applicable	Continuous	Secondary	ITU DataHub: https:// datahub.itu.int/	2022: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Not applicable	2,89	33,5	Cash (Cuba)	Cash (Uruguay)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infrastructure	Connectivity	Fixed broadband average download speed (Mbps)	It measures the average download speeds from fixed Internet connections, performed by Ookla in its Speedtest.	Not applicable	Continuous	Secondary	Speedtest: https://www.speedtest.net/global-index	march 2023 - march 2024: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Not applicable	2,92	284,130	Cash (Cuba)	Cash (Singapore)
	Infrastructure	Connectivity	Average latency (ms)	It indicates the average time (milliseconds) it takes for a data packet to travel from a device to a server and vice versa. Lower latency time means faster and more responsive connection and data transmission so efficient, enabling real-time interactions (online gaming), effective use of applications such as IoT and coordination between AI systems. Moreover, in terms of security, it facilitates rapid threat detection, improving authentication and authorization of access to personal data.	Not applicable	Continuous	Secondary	Speedtest: https://www.speedtest.net/global-index	May2024: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Not applicable	10,5	114,5	Cash (Singapore)	Cash (Cuba)
	Infrastructure	Connectivity	Basic fixed broadband basket (% of GNI per capita)	The "basic basket" is considered to be an Internet plan of 256 kbits/s with a data limit of 5 GB per month and from the operator with the largest market share in the country. The result of this subindicator indicates the percentage of each country's Gross National Income per capita that the price of the respective basic Internet plan represents. This is due to the difference in income levels between one country and another.	Not applicable	Continuous	Secondary	ITU DataHub: https://datahub.itu.int/	2016: VEN 2020: CUB 2022: ARG BOL BRA CH COL CRI DOM ECU GTM HND JAM MEX PAN PER PRY SLV URY	No imputation	Not applicable	1,64113	12,7559	Cash (Costa Rica)	Cash (Honduras)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infrastructure	Computation	Cloud	It consists of a huge network of remote servers connected to the Internet that provide its users with virtual storage, data processing and application delivery services. Data hosted in the cloud can be processed by powerful servers that facilitate complex tasks associated with AI. To measure this subindicator in each country, the Global Connectivity Index 2020 - carried out by Huawei - was used again, which gives a score based on the sum of ratings in four items: investment in this technology, migration to it, experience and potential.	Not applicable	Continuous	Secondary	Huawei: https://www.huawei.com/minisite/gci/en/country-profile-cl.html	2020: ARG BRA CH COL MEX BOL ECU PRY PER URY VEN	Imputation Method: MICE (Multiple Regression) CRI CU SLV GTM HND JAM PAN DOM	Not applicable	0	120	Possible	Possible
	Infrastructure	Computation	HPC infrastructure capacity	It measures how developed in terms of capacity High Computing Performance (HPC) is in each of the countries. The concept refers to the use of a set of high-performance computers or Central Processing Units (CPUs) working in parallel to perform highly intensive sequential computations to solve complex, large-scale problems in areas such as science, engineering and business. Thanks to their power, high-performance computers are capable of analyzing large amounts of data in a short time - such as those generated by scientific experiments or simulations - and of solving complex problems thanks to high computational power.	Not applicable	Continuous	Primary	Scalac-Clear Network	June 2024: ARG BOL BRA CHI COL CRI ECU MEX URY	No imputation	Per capita	0,0022601	0,5037329	Cash (Bolivia)	Cash (Brazil)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infrastructure	Computa-tion	Certified data centers	Refers to data centers that have been evaluated and certified by an indepen-dent organization to meet industry standards for design, construction and operation to provide reliability, security and efficiency. These awards represent third-party validation of data center designs, constructed facilities, operational plans and overall efficiency. Their awards include: M&O Seal of Approval, Tiered Certification of Design Documents, Tiered Certifica-tion of Constructed Facilities, and Tier Certification of Operational Sustaina-bility.	Not applicable	Continuous	Secondary	Uptime: https://uptimeinstitute.com/uptime-ins-titute-awards/list	2024: ARG BRA BOL COL CRI CUB DOM ECU GTM JAM MEX PAN PRY PER SLV URY VEN CH HND	No imputation	Per capita	0	0,0034534	Cash (Cuba)	Cash (Costa Rica)
	Infrastructure	Computa-tion	IXPs	It counts the number of Internet exchange points in a country or the number of autonomous networks (AS) that are interconnected to a specific Internet exchange point (IXP).IXPs (Internet Exchange Point) are the pla-ces where Internet Service Providers (ISPs) interconnect their networks to exchange Internet traffic and create more Internet bandwidth for their customers and thus decrease latency for them.	Not applicable	Continuous	Secondary	Packet Clearing House :https://www.pch.net/ixp/dir#!mt-filter-s=%7B%22re-g%22%3A%-5B%22drop-down%22%-2C%22%22%-2C%22Latin%20America%22%-5D%7D	May 2024: ARG BRA BOL COL CRI CUB DOM ECU GTM JAM MEX PAN PRY PER SLV CH HND	Imputation Method: MICE (Regresión Múltiple) URY VEN	Per capita	0,0000311	0,0006335	Cash (Mexico)	Cash (Argen-tina)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infrastructure	Computation	Secure Internet servers (millions of inhabitants)	Number of Internet servers (computer equipment that stores and provides information through the network) that comply with security standards to protect data and stored information, such as user authentication, data encryption and protection against cyber attacks.this subindicator allows measuring and concluding the level of security of a country's Internet infrastructure.	Not applicable	Continuous	Secondary	World Development Indicators: https://data.worldbank.org/indicator/IT.NET.SECR.P6?view=chart	2024: ARG BRA BOL COL CRI CUB DOM ECU GTM JAM MEX PAN PRY PER SLV URY VEN CH HND	No imputation	Not applicable	69	12.791	Cash (Cuba)	Cash (Chile)
	Infrastructure	Devices	Households that have a computer	Refers to the proportion of households that have a computer, whether it is a desktop, laptop, tablet or similar handheld computer.	Not applicable	Continuous	Secondary	ITU DataHub: https://datahub.itu.int/data	2017: CH VEN GTM 2019: HND PAN 2020: CUB SLV 2021: DOM JAM BOL 2022: ARG BRA COL CRI MEX PRY PER URY 2023: ECU	No imputation	Not applicable	3,3	99,7	Cash (Mozambique)	Cash (Turkey)
	Infrastructure	Devices	Smartphone Affordability	Calculates the price of the cheapest smartphone on the market but with respect to PPP (Purchasing Power Parity which is calculated by considering the price of a basket of goods and services representative of each country and compared to the price with the others of each country to obtain the exchange rate, which reflects the relative purchasing power of the currencies). It promotes inclusiveness, fosters open innovation, facilitates skills development, drives widespread adoption and enables the development of solutions that address social challenges.	Not applicable	Continuous	Secondary	World Bank: https://datos.bancomundial.org/indicator/NY.GDP.PCAP.PP.CD ; https://a4ai.org/research/device-pricing-2022/; A4AI: https://a4ai.org/research/device-pricing-2022/	Download March 2024 / Data availability 2022: ARG BOL BRA CH COL CRI DOM ECU GTM HND JAM MEX PAN PER PRY SLV URY	Imputation Method: MICE (Multiple Regression)CUB VEN	Not applicable	99,71	665,33	Cash (Honduras)	Cash (Panama)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Infraestructura	Dispositivos	Adopción IPv6	IPv6 amplía las funciones de Internet para habilitar nuevos tipos de aplicaciones, incluidas las aplicaciones móviles y de punto a punto. MIde el porcentaje estimado de usuarios de IPv6 en cada uno de los países de LAC.	Not applicable	Continuous	Secondary	LACNIC Stats: http://stats.labs.lacnic.net https://www.google.com/intl/en/ipv6/statistics.html#tab=per-country-ipv6-adoption http://stats.labs.lacnic.net/IPv6/opendata/ipv6-report-access.json	2024: CUB DOM CRI SLV GTM HND MEX PAN ARG BOL BRA CHL COL ECU PRY PER URY VEN	Imputation Method: MICE (Multiple Regression)	Per capita	69	12.791	Cash (Cuba)	Cash (Chile)
	Data	Data Barometer	Availability	It is the availability of publicly available data for any user to access and use. Data availability is fundamental to the development of healthy AI systems. This data can be about climate, land, health, public finance, and public procurement, all data that is a valuable resource for research, innovation, and citizen engagement.	Not applicable	Continuous	Secondary	Global Barometer's: https://globaldatabarometer.org/open-data/	2021: ARG BRA BOL CH COL CRI DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY	Imputation Method: MICE (Multiple Regression)CUB VEN	Not applicable	0	100	Possible	Possible
	Data	Data Barometer	Capabilities	It addresses the ability of countries to effectively collect, download, process, use and share data, all important aspects of availability.	Not applicable	Continuous	Secondary	Global Barometer's: https://globaldatabarometer.org/open-data/	2021: ARG BRA BOL CH COL CRI DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY	Imputation Method: MICE (Multiple Regression)CUB VEN	Not applicable	0	100	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Data	Data Barometer	Governance	Development and implementation of rules, processes and structures to ensure that data is reliable, trustworthy and complete. Measures the presence of indicators such as the existence of regulatory regimes for data protection, right to information and right to data, emerging frameworks for data sharing.	Not applicable	Continuous	Secondary	Global Barometer's: https://globaldatabarometer.org/open-data/	2021: ARG BRA BOL CH COL CRI DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY	Imputation Method: MICE (Multiple Regression)CUB VEN	Not applicable	0	100	Possible	Possible
	Data	Data Barometer	Use and impact	Explore representative use cases in order to gain a comparative understanding of data usage and impact.	Not applicable	Continuous	Secondary	Global Barometer's: https://globaldatabarometer.org/open-data/	2021: ARG BRA BOL CH COL CRI DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY	Imputation Method: MICE (Multiple Regression)CUB VEN	Not applicable	0	100	Possible	Possible
	Human Talent	AI Literacy	Early science education	Refers to the mathematics and science skills and knowledge of students in upper secondary education (15 years old) as measured by the PISA test (Program for International Student Assessment, which is coordinated by the OECD). Mathematics and science represent the early knowledge necessary for educational development in AI.	Not applicable	Continuous	Secondary	OECD: https://www.oecd.org/pisa/OECD_2022_PISA_Results_Comparing%20countries%E2%80%99%20and%20economies%E2%80%99%20performance%20in%20mathematics.pdf	2022: CH URY MEX PER CRI COL COL BRA ARG JAM PAN SLV GTM PRY DOM	Imputation Method: MICE (Multiple Regression) BOL CUB CUB ECU HND VEN	Not applicable	341,5	428	Cash (Cambodia)	Cash (Chile)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Human Talent	AI Literacy	Early AI education	Presence of content associated with Information and Communication Technologies (ICT) or content associated with AI in the curricular bases or curricular guidelines for secondary education in each country. ICT concepts: (information technologies, computational thinking, computing, informatics) AI concepts: (AI, generative AI, robotics, big data, computer vision).	1.Does not have 2 ICT proposal 3 Proposal IA 4.Has implemented ICT 5.Has implemented AI	Categorical	Secondary	SITEAL: https://siteal.iiep.unesco.org/politicas?pais=1&eje=2	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	No imputation	Not applicable	1	5	Possible	Possible
	Human Talent	AI Literacy	English proficiency	What is measured in this subindicator are people's reading and listening comprehension skills. There are self-tests called EF Standard English Test (EF SET), available online and voluntary. The results in each country are given a score according to the levels of the Common European Framework of Reference, CEFR, C2, C1, B2, B1, A2, A1, pRE A1) - and also an EF EPI score (from 1 to 800) and that goes into the English Proficiency Index A Ranking, which is what gives the number for this indicator.	Not applicable	Continuous	Secondary	English Proficiency Index A Ranking: https://www.ef.com/wwen/epi/	2022: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND MEX PAN PRY PER SLV URY VEN	Imputation Method: MICE (Multiple Regression)JAM	Not applicable	364	661	Cash (Laos)	Cash (Netherlands)
	Human Talent	Professional training in AI	AI skills penetration	Measures the development of AI skills and competencies in the labor market environment.	Not applicable	Continuous	Primary	Linkedin	2024: ARG BOL BRA CH COL CRI ECU GTM JAM MEX PAN PER DOM VEN	Imputation Method: MICE (Multiple Regression) CUB SLV HND PRY	Not applicable	0,03	0,18	Cash (The bahamas)	Cash (Costa Rica)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Enabling Factors	Human Talent	Professional training in AI	STEM graduates	Refers to the percentage of graduates (both sexes) who have successfully completed a higher education program (bachelor's degree) in a field related to science, technology, engineering or mathematics.	Not applicable	Continuous	Secondary	UNESCO-UIS: http://data.uis.unesco.org/index.aspx?-queryid=163#	2017: PER 2019: HND 2020: ECU BRA SLV 2021: ARG PAN CRI MEX CUB COL DOM URY 2022: CH	Imputation Method: MICE (Multiple Regression) BOWL GTM JAM PRY VEN	Not applicable	1,29	40,23	Cash (Marshall Islands)	Cash (Malaysia)
	Human Talent	Advanced Human Talent	AI master's degree programs at QS Ranked Universities	Refers to the existence of AI master's degree programs that are among the top 1000 universities ranked in the QS World University Rankings.	Not applicable	Continuous	Secondary	National AI Center (CENIA)	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	No imputation	Per capita	0	0,001461	Possible	Cash (Uruguay)
	Human Talent	Advanced Human Talent	PhD programs in AI at QS-ranked universities	Refers to the production of PhD programs in AI that are within the top 1000 universities ranked in the QS World University Rankings.	Not applicable	Continuous	Secondary	National AI Center (CENIA)	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	No imputation	Per capita	0	0,0002038	Possible	Cash (Chile)
	Human Talent	Advanced Human Talent	Master's degree programs at accredited IA universities	This is the number of AI master's degree programs offered by each of the universities with a certain degree of accreditation according to the relevant body in each of the 19 countries.	Not applicable	Continuous	Secondary	National AI Center (CENIA)	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	No imputation	Per capita	0	0,0014607	Possible	Cash (Uruguay)
	Human Talent	Advanced Human Talent	PhD programs at accredited IA universities	This is the number of AI doctoral programs offered by each of the universities in the 19 countries that are accredited according to their relevant accrediting body.	Not applicable	Continuous	Secondary	National AI Center (CENIA)	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	No imputation	Per capita	0	0,0002547	Possible	Cash (Chile)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	Research	Research	Publications in IA	This subindicator reflects the total number of publications or papers in AI, considering exclusively the set of researchers in the OpenAlex database who have published in this area during the last five years.	Not applicable	Continuous	Secondary	OpenAlex / National AI Center (CENIA)	Average last 5 years 2019-2023: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Per million inhabitants	0	32410,2376	Possible	Cash (Chile)
	Research	Research	Active AI researchers	This subindicator measures the total number of authors who have published in the field of AI during the last five years.	Not applicable	Continuous	Secondary	OpenAlex / National AI Center (CENIA)	Average last 5 years 2019-2023: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Per million inhabitants	0	56812,16123	Possible	Cash (Chile)
	Research	Research	Productivity of AI researchers	This subindicator represents the ratio between the total number of publications in IA and the total number of authors who have contributed in this field during the last five years.	Not applicable	Continuous	Secondary	OpenAlex / National AI Center (CENIA)	Average last 5 years 2019-2023: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Not applicable	0	1,184	Possible	Cash (Honduras)
	Research	Research	Impact of AI research	This subindicator reflects the ratio between the total number of citations received and the total number of publications in IA during the last five years.	Not applicable	Continuous	Secondary	OpenAlex / National AI Center (CENIA)	Average last 5 years 2019-2023: ARG BRA BOL CH COL CRI CUB DOM ECU GTM HND JAM MEX PAN PRY PER SLV URY VEN	No imputation	Not applicable	0	52,965	Possible	Cash (Venezuela)

ILIA

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	Research	Research	Presence of AI research centers	Measures the number of active AI research centers in the country with at least three years of existence. Both independent centers and those affiliated to universities are included, as long as they have established statutes, a clear governance structure, permanent funding and AI is one of their main research focuses (at least one of three). In addition, it is required that their publications are in indexed journals or that they participate in A+ conferences.	1: No AI center 2:Has an AI center 3: It has two AI centers 4: It has three AI centers 5: Has more than three AI centers	Categorical	Primary	National AI Center (CENIA)	2024:ARG BOL BRA CH COL CRI CUB DOM ECU GTM MEX PAN PRY PER SLV URY	No imputation	Not applicable	1	5	Possible	Possible
	Research	Research	Proportion of female authors in IA	The objective of this indicator is to measure the gender gap in the field of AI by country. To do this, Cenia has counted the proportion of female authors who have published papers on AI in relation to the total number of authors. This indicator seeks to make visible the tools and strategies that have had an impact on reducing or slowing down the gender gap in scientific production. The metric is expressed as the ratio between the number of female authors in IA and the total number of authors in this field.	Not applicable	Continuous	Secondary	OpenAlex / National AI Center (CENIA)	Average last 5 years 2019-2023:PAN PER VEN ARG BOL GTM MEX PRY URY CH COL HND Average from 2020 to 2023 :SLV	No imputation	Not applicable	0	25,52	Possible	Cash (Cuba)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	Research	Research	Consistent AI researchers	This indicator includes authors who have published regularly in journals specialized in AI or in relevant conferences in the area during the last five years. The information has been extracted from the OpenAlex database, considering AI publications corresponding to the 19 countries included in the ILIA.	Not applicable	Continuous	Secondary	OpenAlex / National AI Center (CENIA)	Average last 5 years 2019-2023: URY CRI PAN PRY JAM GTM HND DOM SLV 2024: BRA MEX COL CH ARG ECU PER CUB VEN BOL	No imputation	Per million inhabitants	0	10922,28064	Possible	Cash (Chile)
	Research	Research	Participation in main conference tracks A+ (Index of Excellence)	The subindicator reflects the participation in the maintrack in any of the top 100 conferences of the discipline according to google scholar during the year 2023: IEEE, ACL, CVPR, NEURIPS, EMNLP, ICCV, AAAI, ICLR and ICML. The count is done per publication, if more than one author of the same nationality or affiliation participated in the publication, it is counted only once.	Not applicable	Continuous	Primary	OpenAlex / National AI Center (CENIA)	2023: ARG BRA COL CH MEX PER PRY URY ECU CUB CRI	No imputation	Per capita	0	0,0009679	Possible	Cash (Chile)
	Research	Research	Participation in A+ conference side events (subindicator from the Index of Excellence)	The subindicator reflects the participation in the attached events (LatinxAI, Workshps, findings, tutorials) in any of the top 100 conferences of the discipline according to google scholar during the year 2023: IEEE, ACL, CVPR, NEURIPS, EMNLP, ICCV, AAAI, ICLR and ICML. The count is done per publication, if more than one author of the same nationality or affiliation participated in the publication, it is counted only once.	Not applicable	Continuous	Primary	OpenAlex / National AI Center (CENIA)	2023: ARG BRA COL CH MEX PER PRY URY ECU CUB CRI	No imputation	Per capita	0	0,0025981	Possible	Cash (Chile)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	I+D	Development	Open source productivity	This subindicator measures the relative activity of software development, considering the number of commits in relation to the number of people involved in development, compared to the total population.	Not applicable	Continuous	Primary	GITHUB	2023: BRA ARG MEX COL CH DOM CRI URY ECU VEN GTM PRY BOL SLV CUB PER PAN JAM HND	No imputation	Per capita	0,00013	0,01742	Cash (Brazil)	Cash (Panama)
	I+D	Development	Open source quality	This subindicator refers to the average number of stars a repository has received on GitHub, the collaborative development platform, reflecting its quality or impact on the community.	Not applicable	Continuous	Primary	GITHUB	2023: BRA ARG MEX COL CH DOM CRI URY ECU VEN GTM PRY BOL SLV CUB PER PAN JAM HND	No imputation	Per capita	0,00013	0,01742	Cash (Brazil)	Cash (Panama)
	I+D	Development	Number of patents	This indicator measures the number of AI-related patents filed for the first time in the patent office of the indicated country. CAT includes only AI patents, identified using a method developed by CSET and 1790 Analytics, which uses keywords and patent classification codes from databases such as 1790 and The Lens. These patents are linked to AI techniques (such as machine learning), applications (such as speech processing) and industries (such as transportation).	Not applicable	Secondary	Secondary	Emerging Technology Observatory: https://eto.tech/resources/	may 2024: ARG BRA CH COL MEX CRI PAN URY PER CUB	Imputation method: GDP per capita/ nearest neighbor BOL ECU SLV GTM HND JAM PRY DOM VEN	Per capita	0	0,00421936	Possible	Cash (Mexico)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	I+D	Innovation	Number of private investments	This subindicator quantifies investment activities in private companies in the country indicated, focusing on venture capital rounds, private equity and mergers and acquisitions (M&A) transactions carried out during the last decade. Investments that do not involve equity contributions, such as debt financing, grants and crowdfunding, are excluded. In addition, the analysis is limited to private companies, i.e., not listed on stock exchanges, leaving out large technology companies and companies already established in the public markets.	Not applicable	Continuous	Secondary	Cruchbase: https://eto.tech/tool-docs/at/#company-and-investment-data	June 2024: ARG BRA CH COL MEX ECU PAN PRY PER URY DOM GTM JAM VEN SLV	Imputation Method: GDP Per Capita / nearest neighbor BOWL CRI CUB HND	Per capita	0,0000553	0,0122774	Cash (Guatemala)	Cash (Chile)
	I+D	Innovation	Estimated total value of private investment	The value of equity investment transactions is often kept confidential. CAT's "disclosed value" metrics only consider investments with publicly announced dollar amounts, while the "estimated value" metrics include all investments, assigning an estimated dollar value to those without disclosed amounts. This estimated value is calculated using the average value of similar investments in the Crunchbase database, considering the same investment stage, country of destination and year. Thus, the total value of inbound investments includes both disclosed and estimated values for transactions without public values.	Not applicable	Continuous	Secondary	Crunchbase: https://eto.tech/tool-docs/at/#company-and-investment-data	June 2024: ARG BRA CH COL MEX ECU PAN PRY PER URY DOM GTM JAM VEN SLV	Imputation Method: GDP Per capita / nearest neighbor BOWL CRI CUB HND	Per capita	0	0,0343359	Possible	Cash (Chile)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	I+D	Innovation	AI companies	"AI companies" are startups and other privately held (non-listed) AI companies based in a specific country, according to data from Crunchbase and Refinitiv. These companies are identified by analyzing their descriptions using SQL search techniques to find terms related to AI techniques and applications, such as "machine learning," "neural network," "computer vision," and "autonomous vehicles," among others. Included are general terms such as "AI," as well as terms that suggest specific AI activities, such as "optimize," "personalize," and "robotics." The data used comes from sources such as company websites, regulatory filings, and input from registered users, providing a broad and up-to-date view of these companies' AI activities and approaches.	Not applicable	Continuous	Secondary	Emerging Technology Observatory: :https://cat.eto.tech/?expanded=Summary-metrics&dataset=Investment&countries=&countryGroups=Latin+America+and+the+Caribbean	may 2024: ARG DOM PAN ECU PRY SLV PER GTM BRA CH COL CRI JAM URY MEX VEN	Imputation Method: GDP Per capita / nearest neighbor BOL CUB HND	Per capita	0,0000553	0,0038208	Cash (Guatemala)	Cash (Chile)
	I+D	Innovation	Unicorn companies	Number of unicorn companies, i.e. private startups valued at more than US$1 billion. These companies are key drivers of innovation, attracting talent, investing significantly in research and development, and strengthening the entrepreneurial ecosystem. In addition, they bring knowledge to their respective industries, generate employment and promote the internationalization of the AI sector, contributing to the global growth and competitiveness of the industry.	Not applicable	Continuous	Secondary	CB Insights: https://www.cbinsights.com/research-unicorn-companies	2024: MEX COL BRA BRA ARG ECU	No imputation	Per million inhabitants	0	866,0390431	Possible	Cash (Brazil)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	I+D	Innovation	Expenditure on research and develo-pment as a proportion of GDP	Research and development (R&D) expenditure as a share of Gross Domestic Product (GDP) measures R&D investment relative to a country's total economy, calculated as the amount of R&D expenditure divided by GDP. This subindicator is integrated into the Innovation indicator to estimate the impact of R&D investment in IA on a country's economic growth, providing a proxy for assessing how these investments contribute to national economic and technological development.	Not applicable	Continuous	Secondary	CEPAL: Link https://statistics.cepal.org/portal/databank/index.html?lang=es&indicator_id=3915&area_id=1559&members=	2009: BOL 2014: ECU VEN 2018: CRI 2019: CH HND 2020: CUB SLV ARG MEX PER URY BRA COL 2021: GTM PAN PRY	Imputation Method: GDP Per capita / nearest neighbor JAM DOM	Not applicable	0,05867	1,17	Cash (Guatemala)	Cash (Brazil)
	I+D	Innovation	Application development	This subindicator is evaluated through the number of locally developed apps per person, which indicates the activity and dynamism of the technological development ecosystem in the region. According to data from platforms such as Appfigures, which monitor the creation and performance of mobile apps, this subindicator also allows us to analyze how a country's population contributes to the development of apps, its adoption of emerging technologies, and the integration of AI into technological products accessible to global users.	Not applicable	Continuous	Secondary	https://www.mobileconnectivityindex.com/index.html / https://www.mobileconnectivityindex.com/index.html#year=2022&dataSet=indicator	2023: ARG BOL BRA CH MEX COL CRI SLV GTM ECU PER PRY URY JAM HND VEN PAN DOM	Imputation Method: GDP Per capita / nearest neighbor CUB	Not applicable	0	100	Possible	Possible
	I+D	Innovation	Entrepreneurial environment	Measures how conducive the environment is to the entrepreneurs, an essential necessity for the development of AI because it allows to boost the innovation, create economic opportunities and address global challenges.	Not applicable	Continuous	Secondary	Global Report:https://gemconsortium.org/reports/latest-global-report	2022/2023: ARG BRA CH COL ECU GTM MEX PAN URY VE	Imputation Method: GDP Per capita / nearest neighbor BOL CRI CUB SLV HON JAM PRY PER DOM	Not applicable	0	7,6	Possible	Cash (United Arab Emirates)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	Adoption	Industry	Workers in the high-tech sector	Employees in high-tech manufacturing industries are defined as those working in sectors that do not belong to industries traditionally classified as low-tech, such as food, beverages, tobacco, textiles and apparel. This classification is obtained by exclusion and assumes that the rest of the manufacturing industry corresponds to high technology, although this does not necessarily imply the use of advanced techniques or state-of-the-art equipment. The definition is based on available information, since household surveys do not provide sufficient detail on production techniques or the type of capital equipment used, thus limiting a more precise classification of industries.	Not applicable	Continuous	Secondary	Socio-Economic Database for Latin America and the Caribbean:https://www.cedlas.econo.unlp.edu.ar/wp/estadisticas/sedlac/estadisticas/#1496165509975-36a05fb8-428b	Industry high tech: 2006: VEN 2013: CRI 2014: GTM 2019: HND 2021: COL 2022: ARG BRA CH DOM ECU SVL MEX PER URY promedio industry low tech y high tech: 2021: BOL PRY	MICE Imputation Method (Multiple Imputation by Chained Equations) CUB JAM	Not applicable	0	9,1	Possible	Cash (Mexico)
	Adoption	Industry	Medium and high technology manufacturing	This indicator refers to the industrial production of goods that require medium and high complexity technological processes, such as machinery, electronic equipment, vehicles, chemicals and pharmaceuticals, which require high investment in research and development. It measures the contribution of the medium-high and high-tech manufacturing sector to the total value added of manufacturing in an economy, expressed as a percentage. This indicator reflects the capacity of a country or region to generate value through the production of advanced and technologically complex goods, reflecting the level of sophistication, innovation and competitiveness of its industrial sector. A higher percentage indicates an economy more oriented towards innovation and knowledge, with a greater capacity to compete in global markets with products of high added value and technological complexity.	Not applicable	Continuous	Secondary	CEPAL: https://statistics.cepal.org/portal/databank/index.html?lang=es&indicator_id=3918&area_id=1564&members=212%2C78852%2C29170%2C29171%2C29172%2C29173%2C29174%2C29175%2C29176%2C29177%2C29178%2C29179%2C29181%2C29182%2C29183%2C29184%2C29185%2C29186%2C29187%2C74391&context=sdg	2020: ARG CH MEX COL ECU CUB GTM HND URY PER BOL JAM BRA PAN PRY CRI SLV VEN	MICE Imputation Method (Multiple Imputation by Chained Equations) DOM	Not applicable	0	45,6	Possible	Cash (Mexico)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Research, Development and Adoption	Adoption	Industry	Share of medium- and high-tech manufacturing value added in total value added (percentages)	This indicator measures the contribution of the medium- and high-tech manufacturing sector to total manufacturing value added in an economy, expressed as a percentage. It reflects a country's capacity to generate value through the production of more technologically complex goods. It is a key metric for assessing the degree of integration of advanced technology into a country's economic structure. A higher percentage indicates a greater capacity to compete in global markets with innovative and technologically advanced products.	Not applicable	Continuous	Secondary	World Intellectual Property Organization (WIPO) (2023). Global Innovation Index 2023: Innovation in the face of uncertainty. Geneva: WIPO. https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2023-en-main-report-global-innovation-index-2023-16th-edition.pdf	2023: ARG BRA CH COL CRI CUB DOM ECU SLV GTM JAM MEX PAN PRY PER URY BOL	MICE Imputation Method (Multiple Imputation by Chained Equations) CUB VEN	Not applicable	10,3	33,6	Cash (Angola)	Efecitvo (Brazil)
	Adoption	Government	Digital Government	Digital Government refers to the integration of information and communication technologies (ICT) in public administration with the aim of modernizing the State, making administrations more transparent, efficient and accessible. This digital transformation seeks to improve interaction between government and citizens, encourage citizen participation and accelerate the achievement of the Sustainable Development Goals. By adopting these technologies, governments not only optimize their internal processes, but also promote greater transparency and more inclusive access to public services, thus strengthening democracy and public trust.	Not applicable	Continuous	Secondary	https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2022	2022: ARG BRA CH COL CRI CUB DOM ECU SLV GTM HND JAM MEX PAN PRY PER VEN URY BOL	Without imputation	Not applicable	0	0,8964	Possible	Cash (Brazil)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Vision and Institutionality	AI Strategy	Existence of the strategy	This indicator measures the presence of an AI strategy or policy in place in the country, supported by a public institution. Having a national AI policy is essential to guide the development and adoption of AI technologies in a coordinated and strategic manner. The existence of these policies not only establishes a regulatory and ethical framework, but also boosts investment, research and the training of talent in the area, facilitating the sustainable growth of the sector and strengthening the country's competitiveness in the global AI arena.	0: No AI strategy 1: AI strategy exists	Categorical	Secondary	OECD: https://oecd.ai/en/dashboards/overview; TMG: https://www.tmgtelecom.com/wp-content/uploads/2020/07/TMG-Informe-de-Desarrollo-de-Pol%C3%ADticas-de-IA.pdf	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	Existence of an institution in charge of execution	Measures whether the IA Strategy has an institution in charge of its execution, such as a Ministry of Science and/or Technology or equivalent.	1: It has an institution in charge of execution 0: No	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	It has evaluation mechanisms	This refers to the fact that the country has some method of monitoring compliance with the goals. This can range from quantitative methods (numerical indicators) to something more qualitative such as a body dedicated to the evaluation of progress in the strategy.	1: It has evaluation mechanisms. 0: No	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	It has inter-institutional coordination mechanisms	A coordination mechanism can be a dedicated body or a detailed action plan with clearly defined responsibilities and areas of action for specific objectives.	1. It has inter-institutional coordination mechanisms in place. 0. No	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Vision and Institutionality	AI Strategy	AI ethics and governance	AI ethics and governance involves the establishment of comprehensive frameworks and policies that ensure transparency, accountability, inclusiveness, and protection in the use and development of AI. This includes accountability and transparency in algorithms, protection of personal data, elimination of discriminatory bias, promotion of environmental sustainability, implementation of regulated environments for AI testing, oversight of dedicated bodies, creation of specific legal frameworks, protection of employment from automation, and strengthening cybersecurity with AI-based solutions.	0: There is no AI ethics and governance in the country's AI strategy. 1:There are AI ethics and governance aspects to the strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	AI infrastructure and technology	AI Infrastructure and Technology encompasses the development and strengthening of the technical components essential for the implementation and efficient operation of AI systems. This includes the creation of specialized hardware and access to supercomputing resources, ensuring a robust Internet infrastructure, establishing data centers capable of handling large volumes of information, standardizing AI interoperability and security, developing scalable cloud solutions, and encouraging the development of AI software and models through support policies and incentives.	0: There are no AI infrastructure and technology aspects in the country's AI strategy. 1: There are AI infrastructure and technology aspects of the country's AI strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Vision and Institutionality	AI Strategy	Capacity building	Capacity Development focuses on the education and training needed to prepare society and the workforce to interact and thrive in an AI-driven environment. This includes developing bachelor's and master's degree programs in AI and related fields, integrating AI literacy into primary and secondary education curricula, and offering training and retraining programs for the existing workforce. These initiatives seek to foster a skilled workforce, an informed society, and facilitate continued adaptation to emerging AI technologies.	0: There is no capacity building in the country's IA strategy. 1: There is capacity building in the country's AI strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	Data	Data encompasses the creation and management of infrastructures and policies necessary for the access, use and quality of data in AI development. This includes the establishment of data hubs that provide centralized platforms for secure and anonymized information sharing, the implementation of policies that promote the availability of open data in machine-readable formats to foster transparency and innovation, and the standardization of data quality and format to ensure interoperability across different sectors and AI applications.	0: No data presence in the country's AI strategy 1: There is a data presence within the country's AI strategy	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Vision and Institutionality	AI Strategy	Digital Government	Digital Government involves the modernization of public services and government administration through the use of advanced technologies, especially AI. This includes migrating to cloud solutions compatible with various devices and operating systems, developing smart city initiatives, implementing platforms for citizen participation, simplifying procurement processes through AI systems, training public officials in the use of AI tools, improving public services with advanced technologies, and promoting accountability, transparency and anti-corruption through verifiable and secure technologies.	0: There is no presence of digital governance within the IA strategy. 1: There is presence of digital governance within the IA strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	Industry and entrepreneurship	Industry and Entrepreneurship encompasses initiatives and policies aimed at integrating and fostering the use of AI in various industrial and business sectors. This includes facilitating the adoption of smart factory technologies, creating AI clusters that promote collaboration between companies and academic institutions, providing funding for AI startups, developing programs for SMEs to adopt AI solutions, fostering collaboration between the public and private sector, establishing accelerators and incubators for AI startups, providing training programs for employees of SMEs and startups, and enhancing sectoral focus by applying AI in areas such as agriculture, finance, and healthcare.	0: There are no industry and entrepreneurship terms within the country's IA strategy. 1: Industry and entrepreneurship terms exist within the AI strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Vision and Institutionality	AI Strategy	I+D	R&D (Research and Development) encompasses initiatives and policies aimed at promoting innovation and advancement in the field of AI. This includes fostering the development of innovative AI applications through competitions and grants, funding and supporting doctoral research in AI, directing funds toward research into new technologies and ethical considerations, building centers of excellence for AI research, supporting the creation of AI models that process local languages, and formulating policies that promote collaboration between academia, companies and research centers to transform research results into marketable ideas.	0: There are no R&D terms within the country's AI strategy. 1: There are R&D terms in the country's AI strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Vision and Institutionality	AI Strategy	Regional and international cooperation	Regional and international cooperation focuses on promoting collaboration and knowledge sharing between different regions and countries to advance the development and implementation of AI. This includes facilitating data sharing to improve the accuracy and cultural relevance of AI models and establishing regional forums and bodies to coordinate AI policies, standards and practices. These initiatives seek to foster collaboration and mutual understanding, ensuring that the benefits of AI are shared globally and tailored to specific regional contexts.	0: There is no regional and international cooperation in the country's IA strategy. 1: There is regional and international cooperation in the country's IA strategy.	Categorical	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Vision and Institutionality	Involvement of society	Citizen participation	This subindicator measures whether there was citizen participation in the creation of the IA policy, whether through informal participation, unpublished mechanisms, published mechanisms or more than one mechanism, with mechanisms being understood as: citizen demands, social networks, emails or instruments created by the state.	1. Non-participation 2. Informal participation (e.g. mails) 3. There was a mechanism, but the results are not published. 4. There was a mechanism and the results are published 5. There was more than one mechanism	Categorical	Primary	CENIA / IA strategy by country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	1	5	Possible	Possible
	International	Participation in the definition of standards	Participation in ISO	This subindicator measures whether the country is an observer member or participant in the Ibero-American data protection network.	0: Does notparticipate. 1: Observer Member 2: Participating Member	Categorical	Primary	Ibero-American Network: https://www.redipd.org/es/la-red/entidades-acreditadas	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	Without imputation	Not applicable	0	2	Possible	Possible
	International	Participation in international organizations	Participation in international committees	Measures whether the country is incorporated in different international treaties such as: OECD Principles on AI, Santiago Declaration, Ibero-American Data Protection Network (RIPD), Open Government Partnership and Global Partnership on Artificial Intelligence.	0: No membership in treaties or committees 1: Incorporated into a treaty or committee 2: Incorporated into two or more treaties or committees	Categorical	Primary	OCDE: https://oecd.ai/en/ai-principles ; https://minciencia.gob.cl/uploads/filer_public/40/2a/402a35a0-1222-4dab-b090-5c81bbf34237/declaracion_de_santiago.pdf ; https://www.redipd.org/es/la-red/entidades-acreditadas ; https://www.opengovpartnership.org/our-members/ ; https://gpai.ai/community/	2024: ARG BOL BRA CH COL CRI CUB ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	Without imputation	Not applicable	0	2	Possible	Possible

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Regulation	Regulation on AI	Risk mitigation	This subindicator assesses whether the country has an AI legislative initiative that includes risk mitigation measures. Factors considered include: the adoption of hard law approaches, the development of international standards and international law, and the fostering of controlled environments for regulatory experimentation. These elements reflect the country's commitment to creating a robust and adaptable regulatory framework that promotes safe and ethical AI development.	0: There is no risk mitigation in the country's IA Legislative Initiative 1: There is risk mitigation in the country's IA legislative initiative.	Categorica	Primary	ECLAC / AI Strategy per country	2024: ARG BRA CH COL PER DOM URY	Without imputation	Not applicable	0	1	Possible	Possible
	Regulation	Cybersecurity	Cybersecurity Index	The ITU (International Telecommunication Union) Global Cybersecurity Index (GCI) is a tool that measures the level of countries' commitment to cybersecurity. It evaluates national efforts across five pillars: legal, technical, organizational, capacity building and cooperation measures. This index provides a clear view of each country's progress in implementing strategies and practices to strengthen its cybersecurity.	Not applicable	Continuous	Secondary	Global Cyber Security https://www.itu.int/epublications/publication/globalcybersecurity-index-2020/en/).	2020: ARG BRA CH COL CRI CUB DOM ECU SLV GTM HND JAM MEX PAN PRY PER VEN URY BOL	Without imputation	Not applicable	0	96,6	Possible	Cash (Brazil)

Levels of analysis				Operationalization			Search for information			Allocation of missing data	Standardization				
Dimension	Subdimension	Indicator	Subindicator	Conceptual Description	Categorization and/or aggregation criteria	Type of Variable	Type of source	Source	Year	Imputation technique	Per capita, million inhabitants or GDP	Minimum value	Maximum value	Minimum rate	Maximum rate
Governance	Regulation	Ethics and Sustaina-bility	Sustainability	Sustainability in the context of AI development refers to the adoption of practices that minimize environmental impact and promote the efficient use of resources, particularly energy. Given that energy consumption in AI can vary significantly depending on the type of application, algorithms and efficiency of computing systems, it is crucial to implement approaches that optimize energy efficiency. Sustainability seeks to ensure that the development and expansion of AI does not compromise the availability of clean, reliable and affordable energy for future generations, ensuring a balance between technological innovation and environmental responsibility.	Not applicable	Conti-nuous	Secondary	Network Readiness Index https://download.networkreadinessindex.org/reports/nri_2023.pdf	ARG BOL BRA CH COL CRI ECU SLV GTM HND JAM MEX PAN PRY PER DOM URY VEN	Without imputation	Not applicable	0	100	Possible	Cash (Venezuela)

G.3 Normalization

The data normalization process employed in constructing this index was essential for adjusting and standardizing the values of various indicators to a common scale, thereby enabling direct comparisons. This step is particularly crucial because the original raw data are characterized by differing units, ranges, or magnitudes. By normalizing the data, values are transformed to a uniform scale (e.g., from 0 to 1, or in the index case from 0 to 100), which facilitates data aggregation and analysis, ensuring that all indicators contribute appropriately to the final index without any one indicator dominating due to scale differences.

Two distinct normalization methods were applied for this index:

a) Normalization by Gross Domestic Product (GDP) or Population: This approach enhances the reflection of relative realities and enables more equitable and meaningful comparisons across different contexts being measured.

Normalization by GDP: This method adjusts indicators that are inherently influenced by economic or financial factors, allowing for the comparison of countries' relative performance irrespective of their economic size. For example, normalizing research expenditures enables an assessment of the proportion of each country's wealth invested in this area, rather than comparing absolute values that would favor more developed economies.

Normalization by Population: This adjustment was made for data influenced by population size, such as the number of researchers, as well as master's and doctoral programs. This approach allows for indicators to be expressed in per capita terms, thus more accurately reflecting the relative situation of each country.

b) Normalization to a scale of 1 to 100 for calculating ILIA scores Consistent with 2023, a transformation process was applied to the observed raw values of each subindicator. This process involved adjusting the original values to a uniform scale from 0 to 100. This methodology aligns with the standards established by Oxford, which emphasizes data normalization as a critical step in index construction. By adapting the values to a common scale, potential distortions arising from differences in measurement units, ranges, or magnitudes are minimized.

Two types of minima and maxima were established for the feasible and observed effective subindicators. The feasible minima and maxima primarily pertain to categorical subindicators, while the observed effectives apply to continuous subindicators. When the minimum and maximum feasible values for a specific subindicator were known, these values were utilized; otherwise, the actual observed values were employed. For further details, please refer to Table 1.

G.3.1 Normalization Formulas

The normalization formula utilized to derive an index on a scale from 1 to 100 is specifically designed to standardize the values of subindicators.

Min-Max Normalization Formulas Multiplied by 100

$$x' = \left(\frac{x - min(x)}{max(x) - min(x)} \right) x100$$

Caption:
x: Original value to be normalized
x': Normalized value adjusted to a range of 0 to 100
min (x): Minimum value of the data set
max (x): Maximum value of the data set

This methodology ensures that the normalized values are distributed proportionally across the entire range, facilitating easy interpretation and comparison within the context of the index. Lower values indicate poorer relative performance, while higher values signify superior performance based on the observed data.

Normalization formula for the line equation

$$x' = 100 + \left(\frac{(1-100)}{(max(x) - min(x))} \right) x \, (x - min\,(x))$$

Caption:
x: Original value to be normalized
x': Normalized value adjusted to a range of 0 to 100
min (x): Minimum value of the data set
max (x): Maximum value of the data set

For indicators that exhibit an inversely proportional relationship with the desired outcome—where a higher numerical value signifies a less favorable condition—a different approach is necessary. These indicators require specialized treatment in score assignment, as their interpretation diverges from that of conventional indicators where higher values denote better performance.

In such instances, an inverse normalization process is applied to adjust the values, accurately reflecting their negative impact on the index. For example, subindicators like average latency and the cost of a basic fixed broadband basket illustrate scenarios in which increased values indicate a decline in service quality or accessibility, contrasting with directly proportional indicators that reflect improvements with higher values.

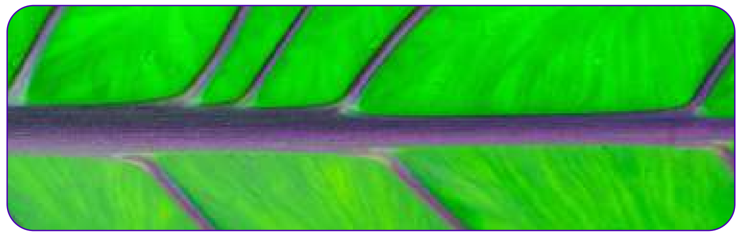


Table 2: Score Calculation Examples

	Example Enabling Factors	Example R&D+A	Example Governance
STEP 1 Collection of information Raw data according to source.	**5G implementation** Argentina: 6 Bolivia: 1 Brazil: 276	**Proportion of female authors** Colombia: 19.97 Costa Rica: 18.28 Cuba: 25.52	**Existence of strategy** Categories: 0: no AI strategy 1: AI strategy exists Paraguay: 0 Peru: 1 Dominican Rep.: 1
STEP 2 Normalization by population or Gross Domestic Product	Argentina: 131.0790647 Bolivia: 80.7193710 Brazil: 1275.2838893	Not applicable	Not applicable
STEP 3 Normalization for score calculation	* Min. Cash (Peru): 80.7193710 * Max. Cash (Chile): 64290,6630802 Argentina: 0.08 points Bolivia: 1.00 points Brazil : 1.86 points	* Min. possible : 0 * Max. Cash (Cuba): 25,52 Colombia: 78.23 points Costa Rica: 71.63 points Cuba: 100 points	0 = 0 points 1 = 100 points Paraguay: 0 points Peru: 100 points Dominican Republic: 100 points

Source: ILIA 2024

G.4 Subindicators

Several subindicators feature data collection methodologies with unique characteristics that warrant emphasis for a comprehensive understanding of their integration into the overall index. These subindicators possess specific traits regarding data collection, processing, and normalization, which may impact their contribution to the final index result.

In the upcoming sections, we'll outline a detailed overview of these methodological nuances, encompassing aspects such as the data sources utilized, the normalization criteria applied, and any specific adjustments made to ensure that the subindicators accurately and fairly reflect the realities they aim to measure. This is crucial for maintaining that each subindicator, along with its respective methodologies, is integrated consistently and equitably into the ILIA construction.

G.4.1 OpenAlex Database

OpenAlex is a free and heterogeneous bibliographic database that includes a wide variety of items such as scientific articles, authors, institutions, and concepts (Priem, J. et al., 2022). Unlike traditional bibliographic databases such as Scopus and Web of Science (WOS), Openalex is not limited to published and indexed scientific articles; it also incorporates unpublished articles or articles under review, known as pre-prints.v

This database is the successor to the Microsoft Academic Graph (MAG), a heterogeneous multidisciplinary graph that was active until 2021. Since January 3, 2022, the OurResearch team (https://ourresearch.org/, accessed July 31, 2023) has continued to develop Openalex with the same paradigm as MAG; with free access, continuous updates, and full accessibility through an API that allows immediate downloads from the original data source (https://openalex.org/about, accessed July 31, 2023).

To date, OpenAlex stores approximately 240 million scientific articles, almost 2.7 times more than the Scopus and WOS databases. Additionally, it handles diverse entities such as articles, authors, sources, institutions, concepts, publishers and funders, resulting in hundreds of millions of entities and billions of connections between them, occupying approximately 300 GB of disk space.
The paragraph is mostly clear, but it can be refined for better flow and clarity. Here's a revised version:

Downloading and Local Population of the Database

Due to limitations in the OpenAlex API that hinder complex queries —such as identifying the number of scientific articles by a specific author that discuss "Artificial Intelligence" and have a score exceeding 20% —researchers Felipe Urrutia and Andres Carvallo opted to download and locally populate the original database. The responsible team followed the procedures outlined in the OpenAlex documentation to download all relevant data and populate it as an entity-relationship model in PostgreSQL.

Extraction date: May 3, 2024
Population date: June 16, 2024
Range of years of articles: 1987 to 2024
Total number of scientific articles: 249 million
Size in memory: fullprod 1106 GB (tobebackedup_size 9145 kB, junk_size 1106 GB)
Number of entities and relationships: 6 entities, 11 relationships, plus 19 other tables

G.4.2 AI Scientific Article Identification Strategy

Each scientific article in OpenAlex is associated with a set of concepts (see table works_concepts = (work_id, concept_id, score)). For example, the article by Omer Levy and Yoav Goldberg (2014), titled "Neural Word Embedding as Implicit Matrix Factorization," includes the concepts "Word Embedding" and "Artificial Intelligence," among others.

OpenAlex utilizes an end-to-end neural model that labels concepts based on those present in the title, abstract, and other metadata of the scientific article. Consequently, for each concept, the classifier assigns a score indicating the likelihood that the concept is present in the article. For instance, in the article by Omer Levy and Yoav Goldberg (2014), the concept "Word Embedding" has a score of 66.9%, while "Artificial Intelligence" has a score of 45.2%. In contrast, the concept "Paleontology" has a score of 0%.

As demonstrated in the previous example, even though "Paleontology" has a score of zero, it remains connected to the scientific article. Moreover, among articles labeled with the concept of "Artificial Intelligence," a significant percentage also have concepts labeled with a null score. For example, see the article at https://api.openalex.org/works/W4205543764 (accessed July 31, 2023).

Firstly, in preparing the first version of the indexes, the technical team decided to use only scientific articles labeled with the concept of "Artificial Intelligence" to create the indexes

of scientific production in this field. However, because some articles with the AI label have low or even null scores, the team established a minimum score to identify those scientific articles that are genuinely related to AI.

To address this issue, the following steps were carried out:

1. A random sample of 476 scientific articles labeled with the AI concept was selected.

2. Each article in the sample was manually reviewed to determine whether it should be classified as AI-related. This manual labeling process involved evaluating the entire sample to decide if an article should be included or excluded as an AI article.

3. A minimum score was determined to identify the scientific articles labeled with the AI concept that are genuinely related to AI. A one-level decision tree was fitted using the expert-labeled data to classify the articles based on their scores, resulting in an optimal minimum score of 20%.

Thus, for the remainder of the methodology, all articles labeled with the concept of Artificial Intelligence and having a relevance score equal to or higher than 20% are considered AI-related scientific articles. This classification ensures that only studies with a significant connection to the topic are included, establishing a threshold that filters out articles with minimal AI-related content.

G.4.3 AI Scientific Production Measurement

SQL queries were designed to create three indexes for measuring scientific production in AI. The indexes considered are as follows:

1. Number of AI scientific articles
2. Number of authors with scientific articles on AI
3. Number of citations of AI scientific articles

Each index is disaggregated by country and year. OpenAlex explicitly stores the publication year of each scientific article (publication_year). However, the country of a scientific article is not always clear, especially when authors from different nationalities are involved. The nationality of an author can also be ambiguous, as an author may have affiliations with institutions in multiple countries.

To address this ambiguity, the following procedure is established to relate scientific articles to countries:

1. Each scientific article (work_id) is authored by a set of authors (author_id).
2. Each author is associated with a specific institution (institution_id) when writing a scientific article.
3. Each institution has a designated country (country_code).
4. By default, each scientific article will have a set of countries associated with it based on the authors' affiliations. The countries assigned to a scientific article will be those where at least one author has an affiliation.
5. Therefore, for the assignment of scientific articles to countries, it is sufficient to have at least one author affiliated with an institution in the relevant country, regardless of the total number of authors.

F.4.4 Structured Query Language Queries

Q1: This query extracts and groups the number of scientific papers by country and year of publication. It focuses on papers associated with the AI concept (identified by concept_id) that have a score greater than or equal to 0.2. The data are grouped by country code and year of publication, providing a count of the total number of papers per year for each country.

```
\copy (SELECT t.country_code, t.publication_year, COUNT(*) count_by_year FROM (SELECT distinct c.work_id, c.publication_year, i.country_code FROM (SELECT b.work_id, b.publication_year, wa.institution_id FROM (SELECT a.work_id, w.publication_year FROM openalex.works w JOIN (SELECT doi, work_id FROM openalex.works_ids WHERE work_id IN (SELECT work_id FROM openalex.works_concepts WHERE score >= 0.2 AND concept_id = 'https://openalex.org/C154945302')) a ON w.doi = a.doi) b JOIN openalex.works_authorships wa ON wa.work_id = b.work_id ) c JOIN openalex.institutions i ON c.institution_id = i.id) t GROUP BY (t.publication_year, t.country_code)) TO 'q1.csv' WITH CSV HEADER;
```

Q2. Similar to the previous query, but instead of counting papers, it sums the citations received by published papers. It focuses on papers related to the AI concept and calculates the total citations received by year and country, providing insight into the impact of these papers.

```
\copy(SELECT t.country_code, t.counting_year, SUM(t.cited_by_count) cited_by_count FROM (SELECT distinct c.work_id, i.country_code, c.counting_year, c.cited_by_count FROM (SELECT b.work_id, wa.institution_id, b.counting_year, b.cited_by_count FROM (SELECT wi.doi, wi.work_id, r.counting_year, r.cited_by_count FROM (SELECT o.referenced_work_id work_id, m.publication_year counting_year, COUNT(*) cited_by_count FROM (SELECT wrw.work_id, wrw.referenced_work_id, mi.doi work_doi FROM openalex.works_referenced_works wrw JOIN openalex.works_ids mi ON mi.work_id = wrw.work_id WHERE wrw.referenced_work_id IN (SELECT work_id FROM openalex.works_concepts WHERE score >= 0.2 AND concept_id = 'https://openalex.org/C154945302')) o JOIN openalex.works m ON m.doi = o.work_doi GROUP BY (o.referenced_work_id, m.publication_year)) r JOIN openalex.works_ids wi ON wi.work_id = r.work_id) b JOIN openalex.works_authorships wa ON wa.work_id = b.work_id) c JOIN openalex.institutions i ON c.institution_id = i.id) t GROUP BY (t.country_code, t.counting_year)) TO 'q2.csv' WITH CSV HEADER;
```

Q3. This query also groups papers by country and year of publication, but focuses on the relationship between authors and institutions. It extracts the number of papers by author, institution and country, providing a count of publications by country and year for specific authors associated with the AI concept.

```
\copy (SELECT t.country_code, t.publication_year, COUNT(*) count_by_year FROM (SELECT distinct c.author_id, c.publication_year, i.country_code FROM (SELECT distinct wa.author_id, wa.institution_id, b.publication_year FROM (SELECT a.work_id, w.publication_year FROM openalex.works w JOIN (SELECT doi, work_id FROM openalex.works_ids WHERE work_id IN (SELECT work_id FROM openalex.works_concepts WHERE score >= 0.2 AND concept_id = 'https://openalex.org/C154945302')) a ON w.doi = a.doi) b JOIN openalex.works_authorships wa ON wa.work_id = b.work_id) c JOIN openalex.institutions i ON c.institution_id = i.id) t GROUP BY (t.publication_year, t.country_code)) TO 'q3.csv' WITH CSV HEADER;
```

Q4. Identifies and lists publication sources (such as journals or conferences) that include papers related to the AI concept.

```
\copy (SELECT DISTINCT s.id, s.display_name FROM (SELECT source_id FROM openalex.works_locations WHERE work_id IN (SELECT work_id FROM openalex.works_concepts WHERE score >= 0.2 AND concept_id = 'https://openalex.org/C154945302')) wl JOIN openalex.sources s ON s.id = wl.source_id) TO 'q4.csv' WITH CSV HEADER;
```

Q5. Extracts data on international collaboration, showing papers that have co-authors from different countries in the area of AI.

```
\copy (SELECT DISTINCT w1.work_id, w.publication_year AS publication_year, i1.country_code AS country1, i2.country_code AS country2 FROM openalex.works_authorships w1 JOIN openalex.works_authorships w2 ON w1.work_id = w2.work_id AND w1.institution_id < w2.institution_id JOIN openalex.institutions i1 ON w1.institution_id = i1.id JOIN openalex.institutions i2 ON w2.institution_id = i2.id JOIN openalex.works_ids wid ON w1.work_id = wid.work_id JOIN openalex.works w ON wid.doi = w.doi WHERE i1.country_code < i2.country_code AND w1.work_id IN (SELECT work_id FROM openalex.works_concepts WHERE score >= 0.2 AND concept_id = 'https://openalex.org/C154945302')) TO 'q5.csv' WITH CSV HEADER;
```

Q6. This query focuses on extracting the number of works by concept and year of publication, sorted by year and number of works.

```
\copy (SELECT w.publication_year, c.display_name, COUNT(w.doi) as number_of_works FROM openalex.works w JOIN openalex.works_ids wi ON w.doi = wi.doi JOIN openalex.works_concepts wc ON wi.work_id = wc.work_id JOIN openalex.concepts c ON wc.concept_id = c.id WHERE c.level = 0 GROUP BY w.publication_year, c.display_name ORDER BY w.publication_year, number_of_works DESC) TO 'q6.csv' WITH CSV HEADER;
```

Q7. Similar to some previous queries, but breaks down the number of works by year, country, and specific concept.

```
\copy (SELECT w.publication_year, i.country_code, wc.concept_id,COUNT(*) as count FROM (SELECT wc.work_id FROM openalex.works_concepts wc JOIN openalex.concepts c ON wc.concept_id = c.id WHERE c.id = 'https://openalex.org/C154945302' AND wc.score >= 0.2) ai_works JOIN openalex.works_concepts wc ON ai_works.work_id = wc.work_id JOIN openalex.concepts c ON wc.concept_id = c.id JOIN openalex.works_ids wi ON ai_works.work_id = wi.work_id JOIN openalex.works w ON w.doi = wi.doi JOIN openalex.works_authorships wa ON wa.work_id = ai_works.work_id JOIN openalex.institutions i ON wa.institution_id = i.id WHERE c.level = 0 GROUP BY w.publication_year, i.country_code, wc.concept_id) TO 'q7.csv' WITH CSV HEADER;
```

Q8. Disaggregated version. Extends the Q7 query by including an additional level of conceptual hierarchy, allowing you to further disaggregate the data to see how jobs related to a specific concept relate to their ancestor concepts in different countries and over time.

```
\copy (SELECT w.publication_year, i.country_code, wc.concept_id, COUNT(*) as count FROM (SELECT wc.work_id, concept_id FROM openalex.works_concepts wc JOIN openalex.concepts c ON wc.concept_id = c.id WHERE c.id = 'https://openalex.org/C154945302' AND wc.score >= 0.2) ai_works JOIN openalex.concepts_ancestors ca ON ca.concept_id = ai_works.concept_id AND ca.ancestor_id = 'https://openalex.org/C41008148' JOIN openalex.works_concepts wc ON ai_works.work_id = wc.work_id JOIN openalex.concepts c ON wc.concept_id = c.id JOIN openalex.works_ids wi ON ai_works.work_id = wi.work_id JOIN openalex.works w ON w.doi = wi.doi JOIN openalex.works_authorships wa ON wa.work_id = ai_works.work_id JOIN openalex.institutions i ON wa.institution_id = i.id WHERE c.level in (0, 1) GROUP BY w.publication_year, i.country_code, wc.concept_id) TO 'q7_desagregada.csv' WITH CSV HEADER;
```

As shown in Table 3, the country code, used in the OpenAlex database, represents the location of the author's institution and corresponds to the two-letter ISO country code.

Table 3. Country Code used for the OpenAlex Database

Country Code	Name
BR	Brazil
MX	Mexico
CO	Colombia
CL	Chile
AR	Argentina
EC	Ecuador
PE	Peru
CU	Cuba
UY	Uruguay
CR	Costa Rica
VE	Venezuela
PA	Panama
PY	Paraguay
JM	Jamaica
BO	Bolivia
GT	Guatemala
HN	Honduras
DO	Dominican Republic
SV	El Salvador

Measuring Trends in AI Concepts

As in ILIA 2023, a set of concepts related to artificial intelligence (AI) has been identified. For each of these concepts, the number of scientific articles labeled with that concept was calculated, with results broken down by country and year of publication. The selection process for these AI concepts involves the following steps:

1. Include all level 1 concepts in OpenAlex that have AI as their ancestor (Artificial Intelligence: link, accessed July 1, 2023).

2. Include concepts in OpenAlex that correspond to subcategories of the "Artificial Intelligence" category in Wikipedia (link to the category). The selected concepts are listed in Table AM.5.

3 .Include concepts in OpenAlex that correspond to subcategories of the "Applications of Artificial Intelligence" category in Wikipedia (link to category). The complete list is also available in Table AM.5.

The team decided to expand the set of selected concepts beyond those with AI as a direct ancestor in OpenAlex, including key concepts like "Natural Language Processing" (NLP) and "Computer Vision" (CV), which, rather than being descendants of AI, are classified as descendants of Computer Science (CS), making them siblings of AI rather than children. This unintuitive hierarchy occurs not only in OpenAlex but also in other ontologies or Fields of Study (FOS), such as those in Arxiv and MAG. To overcome this limitation and enrich the set of concepts, the team relied on Wikipedia's extensive category network, specifically subcategories of "Artificial Intelligence" and "Applications of Artificial Intelligence," where relevant concepts like CV and NLP are located.

Regarding the concept trend graph for the LATAM region, the region of interest was defined with the following countries: Brazil, Chile, Mexico, Uruguay, Colombia, and Argentina. The regional graph is constructed from a linear combination of the individual country graphs, where the weights or coefficients used in this combination are derived from the normalized per capita index version of each country. This approach allows for a balanced and proportional representation of each country's impact on the regional trend of AI concepts.

G.4.5 The Excellence Indicator Construction

The analysis focuses on the ten most relevant conferences in AI, selected according to the Google Scholar H5 Index. These conferences include the IEEE/CVF Conference on Computer Vision and Pattern Recognition, Neural Information Processing Systems (NeurIPS), and the International Conference on Learning Representations (ICLR), among others.

Data Collection

Data collection was primarily conducted by scraping the web platforms of each conference using the BeautifulSoup Python library. Since most conferences do not provide an API for access, this technique allowed us to extract key information, such as the paper's title, the authors, and whether the paper was presented in the main track or in side events. In cases where data was only available in PDF files, such as at the AAAI conference, additional libraries like pdfminersix and PyMuPDF were used for text extraction.

The paragraph you provided is largely well-written, but I suggest a few minor grammatical adjustments for clarity and flow. Here's a revised version:

Authors' Identification

To identify the geographical origin of the authors, we used OpenAlex, an open-access bibliographic catalog that stores information on scientific articles, authors, institutions, and their relationships. By utilizing the OpenAlex API, we aimed to match the titles of the collected works to determine the existence of the articles and verify the authors' affiliations with Latin American and Caribbean institutions. Data extraction and storage were managed using the Python requests and pandas libraries, with results saved in JSON, XLSX, and CSV formats for further analysis.

Initial results in Table 4 indicated that not all papers were present in OpenAlex due to title-matching issues or because some papers were simply not stored in the repository. To resolve this, we conducted manual searches on the internet for missing papers or explored their presence in other academic repositories such as OpenReview and arXiv, which also offer access APIs.

Table 4. Identification Results in OpenAlex

Conference	Total Papers	Main Track Papers en OpenAlex	Difference
IEEE	1041	1004	37
ACL	1255	1244	11
CVPR	2353	2299	54
NeurIPS	3540	2549	991
EMNLP	1048	1038	10
ICCV	2156	2103	53
AAAI	1803	1613	190
ICLR	1584	1131	453
ICML	1865	1414	451

For articles not found in OpenAlex, additional searches were performed manually or checked in other repositories such as OpenReview and arXiv, which also have APIs for accessing their data. Although these platforms do not offer the same detailed affiliation structure as OpenAlex, they complemented the identification of missing authors.

Counting authors

For the counting of papers and authors (Table 5), participation in the main tracks and side events of the conferences was divided. The main tracks are mainly composed of formally published academic articles, while the side events include project presentations, workshops, research in progress, and other more informal formats where the participation of Latin American authors also stands out.

As shown in Table 5, an author was counted if he or she did research for an institution within a given country. For example, if an author worked on a paper in NeurIPS under a Chilean institution, he/she was counted for Chile. If the same author participated in another publication in the same conference also for Chile, he/she was only counted once in the main track, but if he/she also participated in a side event, he/she was counted again under that category.

Table 5: Author Participation by Country in Main Tracks

Conference	ARG	BRA	COL	CHI	MEX	PER	Nº papers
IEEE	1	12	7	0	0	0	7
ACL	4	2	0	0	6	0	4
CVPR	0	5	0	2	0	0	3
NeurIPS	0	10	1	6	0	0	13
EMNLP	0	0	0	7	0	0	3
ICCV	0	7	0	0	0	0	1
AAAI	0	5	3	1	0	0	6
ICLR	0	0	0	0	0	0	0
ICML	1	0	0	3	0	0	2

Side events

Participation in the side events showed a higher representation of Latin American authors compared to the main tracks. The LatinX in AI initiative stands out, which is presented in several of the conferences and concentrates a significant amount of scientific production from the region.

Considerations and conclusions

It is important to carry out meticulous work to ensure the accuracy of the results, due to the large amount of data and the complexities in the disambiguation of entities in OpenAlex. Manual reviews complemented the automatic process to cover possible omissions, recognizing that some institutions or authors might not be fully represented in the available databases. Manual review is essential to detect errors and ensure the correct inclusion of participants in the indicator of excellence.

Although OpenAlex is regularly updated, it continues to face challenges in keeping up with the dynamic reality of the academic world. One critical example is that, to date, CENIA is not registered in OpenAlex, underscoring the need for careful manual scrutiny to ensure the correct inclusion of institutions and their researchers. This challenge applies to any other institution or individual that may not be fully represented in the available databases.

G.5 Weighting

ILIA 2024 incorporates weightings in its construction. This is an important component of index creation, as it determines the relative influence of each sub-dimension, indicator, or subindicator on the final result.

Specifically, the Budget Allocation methodology was used, in which experts in specific topics, defined by a set of indicators, distribute a "budget" of one hundred points among the indicators, guided by their experience and subjective judgment regarding the relative importance of each. This process was conducted internally within the research team, alongside consultations with external experts to gather input from a diverse range of knowledge and experience in AI development, as well as representatives of the various countries included in the study. This method is essential to ensure that the weighting system reflects the priorities and contexts of the different evaluated countries in a balanced and fair manner.

In the context of the Enabling Factors dimension, the weighting reflects the importance of different areas such as Infrastructure, Data, and Human Talent. For example, as shown in Table 6, within Infrastructure, connectivity is considered fundamental and is therefore assigned 50% of the total weighting of the sub-dimension, while computation and devices each receive 25%. Additionally, Infrastructure accounts for 45% of the total Enabling Factors weighting, highlighting its critical role in developing the necessary environment for the adoption of AI technologies. Human Talent and Data are also weighted at 30% and 25%, respectively, within this dimension.

In the Research, Development and Adoption (R&D+A) dimension, the weighting of the subindicators is distributed in such a way that Research leads, with a weighting of 40%, due to its importance in the generation of knowledge and technological progress. The Innovation and Development (I&D) subdimension contributes 30% to R&D+A, balancing the emphasis on the creation of new ideas and their transformation into practical products and services. Adoption, on the other hand, weighted at 30%, divides its weight between Industry (60%) and Government (40%), recognizing the crucial role of both the private and public sectors in the effective AI implementation.

For the Governance dimension, the weighting is distributed among three sub-dimensions: Vision and Institutionality, International and Regulation. Vision and Institutionality, which includes AI Strategy, Societal Involvement and Institutionality, has a 50% weighting, underscoring the need for clear direction and a robust institutional framework. The International subdimension has a weighting of 20%, reflecting the importance of global collaboration. Finally, Regulation, weighted at 30%, addresses critical aspects such as AI regulation, Cybersecurity, and Ethics and Sustainability. The combination of these weightings, with Governance representing 25% of the total weight in ILIA, highlights the importance of a regulatory and strategic framework that facilitates and controls the AI use.

Table 6: ILIA 2024 Weightings' Construction

Dimension	Subdimension	Indicator	Weighting
Enabling Factors (EF)	Infrastructure	Connectivity	50%
		Computation	25%
		Devices	25%
	Infrastructure Weighting in EF		**45%**
	Data	Data Barometer	
	Data Weighting in EF		**25%**
	Human Talent	AI Literacy	40%
		Professional Training in AI	30%
		Advanced Human Talent	30%
	Human Talent Weighting in EF		**30%**
	EF Total Weighting in ILIA		**40%**
Research, development and adoption	Research	Research	100%
	Research Weighting in R&D+A		**40%**
	I&D	Innovation	50%
		Development	50%
	I&D in R&D+A		**30%**
	Adoption	Industry	60%
		Government	40%
	Adoption Weighting in R&D+A		**30%**
	R&D+A Total Weighting in ILIA		**35%**
Governance	Vision and Institutionality	AI Strategy	50%
		Society's Involvement	25%
		Institutionality	25%
	Vision and Institutionality Weighting in Governance		**50%**
	International Linkage	Standards Definition Participation	50%
		Standards Definition Participation	50%
	International Linkage Weighting in Governance		**20%**
	Regulation	Regulation	20%
		Cybersecurity	30%
		Ethics and Sustainability	50%
	Ethics and Sustainability		**30%**
	Governance Total Weighting in ILIA		**25%**

G.6 Methodological Challenges for Future Editions

One of the main challenges of this index relates to the collection of primary information. Conducting this process across the 19 countries of Latin America presents several significant methodological challenges, particularly when attempting to capture accurate and representative data in relevant areas, such as the adoption of AI technologies in industry.

A key challenge lies in the diversity of socioeconomic, political, and cultural contexts that characterize each country in the region. This diversity implies that data collection methodologies must be sufficiently flexible and adaptable to accurately reflect local realities without sacrificing comparative consistency across countries.

The complexity of designing reliable and effective questionnaires for data collection represents another important challenge. For a survey to meet these criteria, it is crucial not only to formulate clear and relevant questions but also to ensure they reach the right participants and achieve a sufficient response rate. This is especially critical in the industrial sector, where detailed information on the state of AI adoption is needed. Therefore, developing strategies to encourage business participation, as well as involving local organizations and networks, is essential to facilitate and support data collection at the national level. Strengthening the capacity to collect primary data in the region is vital for obtaining a finer and more detailed view of the actual state of AI adoption in Latin America. Currently, many metrics on technology adoption rely on secondary data that may not capture the particularities of each country or sector. Taking a strategic and coordinated approach to primary data collection can provide a deeper and more accurate understanding of the AI landscape in Latin America, especially in the industrial and education sectors, where granular and contextual information is essential to assess progress and identify opportunities for improvement.

ILIA