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2022

Social Panorama
of Latin America and the Caribbean

Transforming education as a basis
for sustainable development

UNITED NATIONS

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This document is an offprint of chapter IV of *Social Panorama of Latin America and the Caribbean, 2022*, which may be consulted online at https://www.cepal.org/en/publications/48519-social-panorama-latin-america-and-caribbean-2022-transforming-education-basis

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CHAPTER III

Gender inequalities in educational and employment trajectories: challenges and opportunities in a protracted social crisis

Introduction

Latin America and the Caribbean has been one of the regions hit hardest by the coronavirus disease (COVID-19) pandemic, and, almost three years into the pandemic, its impact still reverberates through the societies and economies in the region. The outbreak of the pandemic occurred under complex circumstances, deepening the inequalities that have historically characterized the region, where there are high levels of informality and inadequate social protection. It also exposed the persistent structural challenges of inequality, particularly gender inequality, that hinder the equal participation of women and men in the societies and economies of Latin America and the Caribbean. The region is also grappling with a protracted social crisis that has worsened as a result of global crises in the energy, food and financial sectors, in addition to the growing challenges caused by climate change. Added to this is the care crisis, compounded by a rise in violence against women and girls during the COVID-19 pandemic. These conditions pose serious challenges to achieving gender equality, ensuring the fulfilment of women's rights, empowering women to exercise their autonomy and promoting sustainable development with equality in the countries of the region.

The pandemic-induced social and economic crisis caused an historic reversal in the economic autonomy of women in Latin America and the Caribbean. These conditions triggered sharp falls in employment and labour force participation, which had a disproportionately large impact on women, young people and workers in the informal sector earning low incomes (ECLAC, 2021a). The crisis led to an overwhelming departure of women from the labour market, which in 2020 represented an 18-year setback in their levels of labour force participation (ECLAC, 2022c). Women simultaneously absorbed the bulk of the excessive burden of unpaid domestic and care work resulting from the health measures, where their already unequal workload was three times that of men in the region prior to the pandemic (ECLAC, 2022c).

The climate of limited mobility and restricted social contact that prevailed during the health crisis gave fresh momentum to the digital transformation process and the digital economy in the region (Bidegain, Scuro and Vaca-Trigo, 2020; Bércovich and Muñoz, 2022). During the first quarter of 2020, the use of teleworking solutions increased by 324% and distance learning solutions by more than 60%. The remote provision of services, such as health services, and the use of digital government platforms to facilitate cash transfers increased (ECLAC, 2020b; Bércovich and Muñoz, 2022). Regarding the development of digital industries, the growth rate in Latin America and the Caribbean in recent years has been comparable to that observed in member countries of the Organisation for Economic Co-operation and Development (OECD), although there is still a substantial lag in the region (ECLAC, 2021c).

The rapid expansion of the digital economy is having a massive impact on the labour market and on the types of skills needed to participate in economic and social activities. The need for science, technology, engineering and mathematics (STEM) skills, and for information and communications technology (ICT) professionals in particular, is growing in all sectors and opening up new opportunities for well-paid, skilled jobs that are less routine and repetitive, often with flexible working hours and the option of teleworking. In addition to ICT professionals, new digital skills are required in all activities that are being digitalized. It is likely that many of the jobs, careers and professions of the future will require increasing levels of digital and STEM-related skills.

If affirmative steps are not taken to promote gender equality in these areas and the structural challenges of gender inequality are not addressed, such as the sexual division of labour and the unjust social organization of care, there is a risk of maintaining and even deepening this inequality in the labour market, where women are often employed in traditionally undervalued economic sectors and occupations, with lower wages and less favourable working conditions. Women are also often underrepresented in STEM fields —and particularly in ICT fields— where, despite the growing demand for labour, there is a conspicuous lack of women trained in advanced digital skills. At present, women's participation in the technological activities, careers and sectors that are now booming is low compared to men's (Bércovich and Muñoz, 2022).

As illustrated in chapter II, there has been noteworthy progress in Latin America and the Caribbean in recent decades, which has seen an increase in women's access, retention and completion rates at all education levels. Despite this outlook, challenges associated with education quality and the components of the region's social inequality matrix (ECLAC, 2016) persist, especially in terms of certain levels and types of education systems. Specifically, there are notable gender gaps in the participation of girls and young women in science, technology, engineering and mathematics. These disparities deepen as one progresses through the school system and become more acute in higher education, where gender gaps in this area become apparent.

It is, therefore, necessary to promote the equal participation of women in different spheres, especially in STEM fields, not only to address inequalities in the labour market, but also to ensure the right of all people to equal opportunities, including the right to study and work in the field of their choice. This requires equal access to different fields of study and support for conditions and affirmative measures that promote access and retention in all areas, including high-quality technical, vocational and higher education in STEM fields.

The prolonged social crisis has reaffirmed the need to move towards transformative recovery with equality and sustainability. It has challenged countries to ensure the fulfilment of Goals 4 and 5 of the 2030 Agenda for Sustainable Development (UNESCO, 2015; UNESCO/ECLAC/UNICEF, 2022) and to sustain the achievements of recent decades. In order for Latin America and the Caribbean to move towards transformative recovery with equality, various policies must be implemented, including those aimed at ensuring the inclusion of women in digital transformation processes, supporting diverse educational and employment paths, and building a more equitable and inclusive labour market that will enable decisive progress towards gender equality and women's autonomy in the region. This will also require addressing inequalities in the different spheres of men's and women's lives and in the lives of women from different territories, socioeconomic strata, places of origin and ethnic-racial backgrounds, among other measures (Bércovich and Muñoz, 2022).

A. Education trends from a gender perspective: an analysis aimed at dismantling the structural challenges of gender inequality

Latin America and the Caribbean has made significant progress at the national level in women's access to education at all levels of the education system. However, challenges remain, such as ensuring full access to STEM fields. As noted previously, gender bias against girls emerges early in this field of education and deepens as they progress through their academic careers. Gender inequality is most pronounced in higher education, where, globally, women account for 35% of learners enrolled in STEM fields. This attrition continues during higher education, the transition to the world of work and even throughout their career paths. There are multiple factors driving the progressive exclusion of girls and adolescents from subjects in this field, and the consequent low representation of women in higher education in this area, and they pertain to different dimensions.

Improving access to education for girls and women is considered one of the major achievements in education in Latin America and the Caribbean in recent decades. Such significant progress has been made that today, women register higher completion rates than men in secondary and higher education.

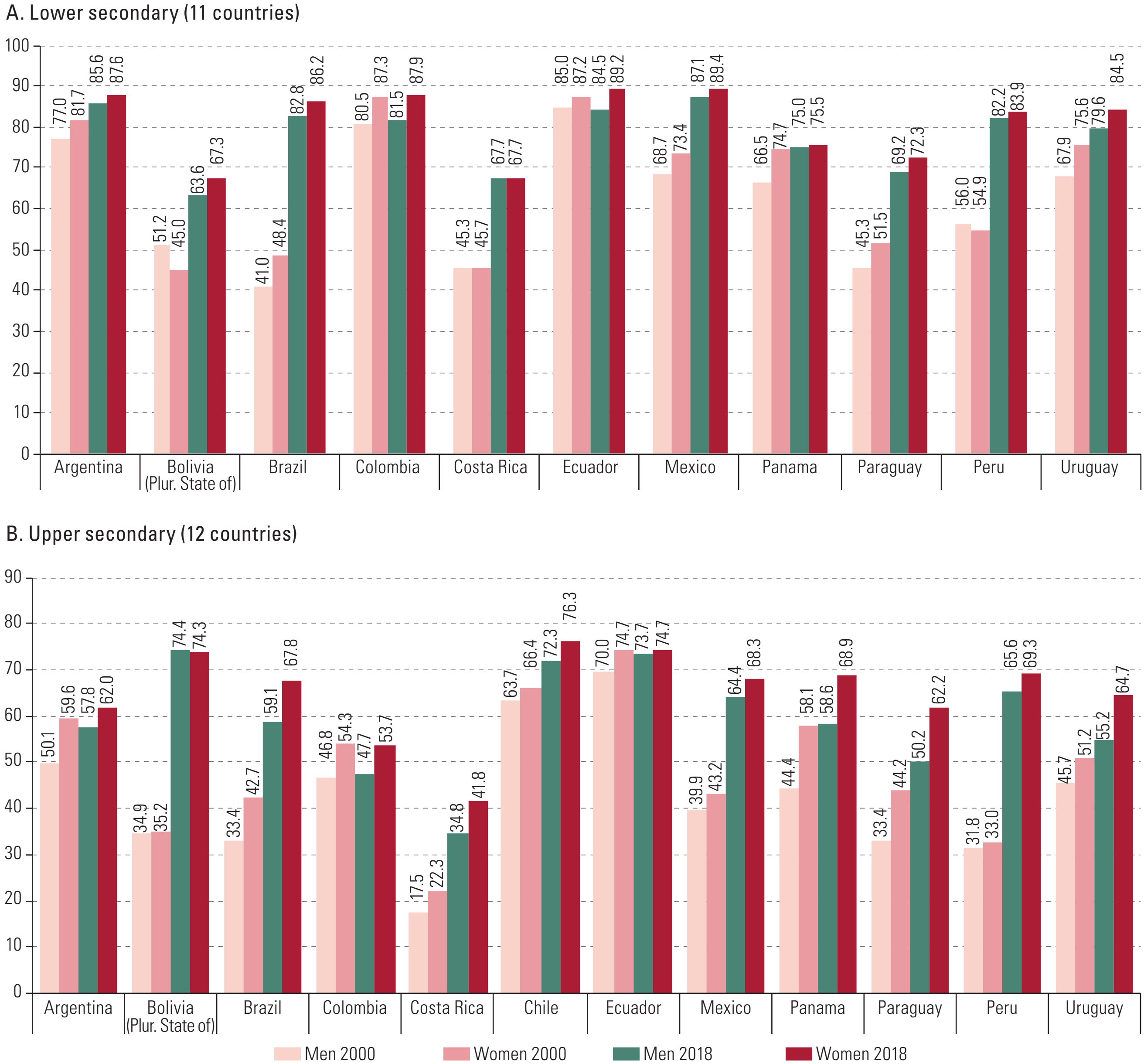
In 2019, the regional net enrolment rate for girls in primary education was 97.5%, compared to 96.9% for boys (UNESCO, 2022; ECLAC, 2022d), figures that show a high degree of access by both sexes to this level of education in the region. In secondary education and, in particular, in upper secondary education, the net enrolment rate falls in comparison to the primary level, but there has been considerable progress in recent decades.

In 2018, the net enrolment rate for girls in lower secondary education exceeded 80% in several countries in Latin America (Argentina, Brazil, Colombia, Ecuador, Mexico, Peru and Uruguay), and there were significant increases of around 20 percentage points in some countries that registered very low net enrolment rates in the early 2000s (Plurinational State of Bolivia and Costa Rica) (see figure III.1). At the upper secondary level, the enrolment rate for women also surpasses that of men, and there is a clear trend towards higher enrolment and participation.

Figure III.1

Latin America (12 countries): net enrolment rate in secondary education, by sex, 2000 and 2018

(Percentages)

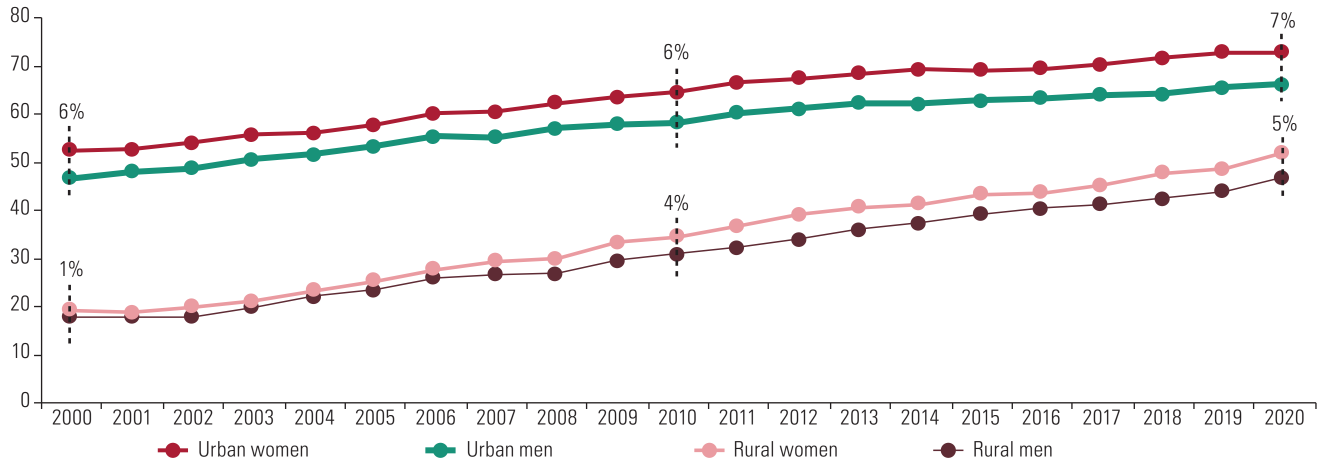


Source: International Institute for Educational Planning (IIEP), on the basis of National Institute of Statistics and Censuses, Permanent Household Survey; National Institute of Statistics, Household Survey; Brazilian Institute of Geography and Statistics (IBGE), National Household Survey (PNAD); National Administrative Department of Statistics (DANE), Continuous Household Survey; National Institute of Statistics and Censuses, Multipurpose Household Survey; Ministry of Social Development and Family, National Socioeconomic Characterization Survey (CASEN); National Institute of Statistics and Censuses, National Survey of Employment, Unemployment and Underemployment; National Institute of Statistics and Geography (INEGI), National Survey of Household Income and Expenditure; National Institute of Statistics and Census, Multipurpose Survey; General Directorate of Statistics, Surveys and Censuses, Permanent Household Survey; National Institute of Statistics and Informatics (INEI), National Household Survey; National Institute of Statistics, Continuous Household Survey.

Note: Data for Brazil are for 2001 and 2018; Colombia, 2016 and 2018; Chile, 2000 and 2017; Ecuador 2016 and 2018 and Mexico 2000 and 2016.

In terms of secondary school completion, women have more favourable indicators than men and are more likely to succeed in this area. In 2020, on average, 67.4% of women in the region aged 20-24 years had completed secondary education, compared to 60.9% of men of the same age.[1] However, despite the increase in secondary school completion rates, there is still marked segmentation between urban and rural areas, which demonstrates that territory represents a structural pillar of social and educational inequalities, in an area where inequalities are clearly present (ECLAC, 2016) (see figure III.2).

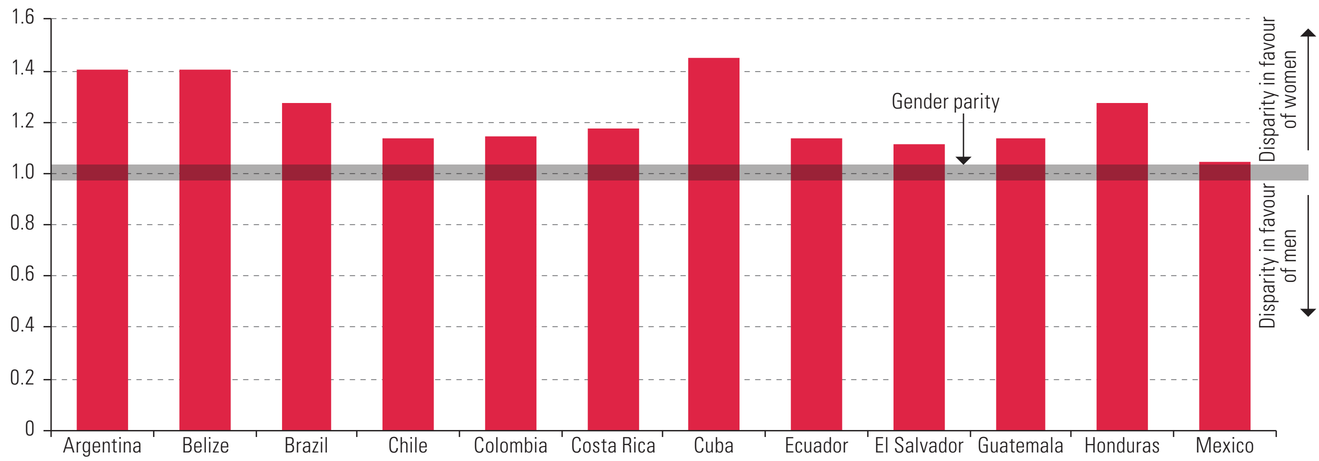
Figure III.2
Latin America and the Caribbean (18 countries):[a] percentage of 20–24-year-olds who completed secondary education, by sex and geographical area, 2000–2020
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en.
Note: The dotted lines represent the difference between urban and rural women and men.
[a] Simple averages for the following countries: Argentina, Bolivia (Plurinational State of), Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela (Bolivarian Republic of).

Overall, women's participation in higher education in Latin America and the Caribbean exceeds that of men in all countries. At this level, the gender parity index shows a positive trend in favour of women (see figure III.3).[2]

Figure III.3
Latin America and the Caribbean (12 countries): gross enrolment ratio in tertiary education, adjusted gender parity index, 2019



Source: UNESCO Institute of Statistics (UIS).
Note: Data are for 2019, except for Belize, Colombia and Cuba, where they are for 2020.

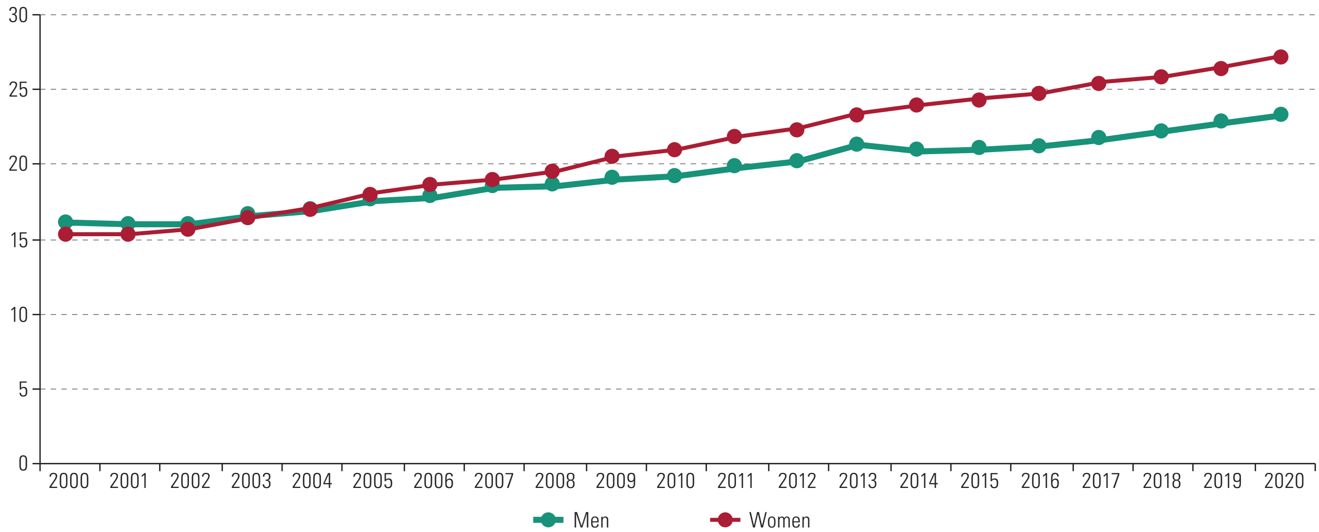
[1] On the basis of Economic Commission for Latin America and the Caribbean (ECLAC), Household Survey Data Bank (BADEHOG); CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en.
[2] The gender parity index (GPI) is the ratio of women to men for a given indicator. A GPI between 0.97 and 1.03 indicates gender parity. When the GPI is below 0.97, there is a disparity in favour of men, and when the GPI is above 1.03, the disparity favours women. See United Nations Educational, Scientific and Cultural Organization (UNESCO), "Gender parity index (GPI)" [online] https://learningportal.iiep.unesco.org/es/node/5395.

Other educational indicators, such as the literacy rate and average years of schooling, show positive trends for women. In 2020, an estimated 27.3% of women in the region aged 25–59 years had 13 or more years of schooling, compared with 23.3% of men in the same age group. These figures represent an increase of 11.9 percentage points between 2000 and 2020 for women and 7.2 percentage points for men, resulting in a significant difference in favour of women (see figure III.4).

Figure III.4

Latin America and the Caribbean (18 countries):[a] proportion of women and men aged 25–59 years with 13 or more years of education, 2000–2020

(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), Household Survey Data Bank (BADEHOG); CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en.

[a] Simple averages for the following countries: Argentina, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Plurinational State of Bolivia and Uruguay.

While there is high participation of women at various levels of education—most notably in upper secondary and especially in higher education—gender gaps persist in STEM fields. The participation of girls and young women, the disciplines they choose, and their progress in STEM fields of education are areas in need of analysis as they reveal inequalities between women and men at all education levels.

One of the determining factors in the choice of careers in STEM fields is the unequal performance of men and women in different disciplinary areas. Regional and international standardized educational assessments enable the analysis of learning achievement in these subjects at the primary and secondary levels, with a focus on science and mathematics. Overall, the results of these assessments reveal gender gaps between women and men in these areas.

At the primary level, assessments conducted by the Latin American Laboratory for Assessment of the Quality of Education (LLECE) of the Regional Bureau for Education in Latin America and the Caribbean (OREALC) provide relevant information on the performance differences between girls and boys in primary education. In 1997, LLECE administered the First Regional Comparative and Explanatory Study (PERCE) in reading and mathematics to third- and fourth-grade primary school students. In 2006, the Second Regional Comparative and Explanatory Study (SERCE) was conducted, with coverage extended to 16 countries and to other grades and subjects. As in the first study, SERCE assessed third- and sixth-grade students in the areas of reading and mathematics and incorporated a third discipline, science, to assess sixth-grade students in eight countries. The Third Regional Comparative and Explanatory Study (TERCE) was conducted in 2013 and, similar to the Regional Comparative and Explanatory Study (ERCE) conducted in 2019, it measured learning achievement in mathematics and language in third and sixth grade and learning achievement in natural sciences only in sixth grade.

The findings of these studies highlight gender gaps in girls' and boys' performance in the skill sets assessed (reading, mathematics and science) (UNESCO, 2016a, 2016b and 2021). While the results show differences in the magnitude and persistence of gender gaps within each country and between assessments, there are some general trends that remain constant: overall, girls significantly outperform boys in reading and writing, while boys outperform girls in mathematics. With regard to science, while boys scored higher on the SERCE, the TERCE and ERCE results showed either negligible differences between the two groups or better performance by girls.

The OECD Programme for International Student Assessment (PISA) tests, which measure the academic performance of 15-year-old students regardless of their grade level, also show gender disparities in performance in STEM subjects.[3] With the exception of the Dominican Republic, in the other nine countries in Latin America and the Caribbean that participated in the 2018 tests, boys' average performance in mathematics was between 7 and 20 points higher than that of girls (OECD, 2020) (see table III.1). In science, on average, boys outperformed girls in 8 of the 10 participating countries in the region, except in Brazil and the Dominican Republic, although the differences are smaller than in mathematics.

Table III.1

Latin America and the Caribbean (10 countries): difference between average scores for women and men in mathematics and science on the Programme for International Student Assessment (PISA) tests, 2018

	Mathematics			Science		
	Average score		Score difference	Average score		Score difference
	Men	Women	Women-Men	Men	Women	Women-Men
Argentina	387	372	-15	409	399	-10
Brazil	388	379	-9	403	404	1
Chile	421	414	-7	445	442	-3
Colombia	401	381	-20	420	407	-13
Costa Rica	411	394	-17	420	411	-9
Mexico	415	403	-12	424	415	-9
Panama	357	349	-8	365	364	-1
Peru	408	392	-16	411	397	-14
Dominican Republic	324	327	3	331	340	9
Uruguay	422	414	-8	428	424	-4

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Organisation for Economic Co-operation and Development (OECD), "Girls' and boys' performance in PISA", *PISA 2018 Results (Volume II): Where All Students Can Succeed*, Paris, 2020.

Gender disparities in performance widen in the lowest income quartiles. According to the PISA indicator for socioeconomic and cultural status, educational outcomes appear to be closely correlated with learners' economic, social and cultural status (ESCS).[4] In mathematics, for example, in the lower ESCS quartile, there is a greater proportion of women than men registering scores below level 2, which is considered the threshold for satisfactory performance. In the upper ESCS quartile, performance differences in favour of men narrow overall (except in the Dominican Republic, Panama and Peru, where they widen), but the trend remains the same. In the science test, while in the lower ESCS quartile a greater proportion of women than men do not achieve the minimum threshold for performance, in the upper ESCS quartile, the trend is reversed, with a greater proportion of men falling below level 2.

3 There is no minimum or maximum score in the PISA tests: results are scaled to fit approximately normal distributions, with means around 500 score points and standard deviations around 100 score points.

4 The economic, social and cultural status (ESCS) dimension is used to gauge students' socioeconomic status. It is calculated on the basis of the financial, social and cultural resources available to students. The relevant variables are associated with students' family background: the educational level and occupation of the mother and father, and an index of household resources, which can serve as an indicator of material availability or cultural capital (having a car, having a quiet environment for homework and access to the Internet, as well as the number of books and other educational resources available at home) (OECD, 2020).

Data from the 40 countries that participated in the PISA tests show a positive correlation between women performing better in these assessments and favourable indicators of access to education, the labour market, and political participation or representation and a high score on the global gender gap index (González de San Román and de la Rica, 2010; Guiso and others, 2008, in UNESCO, 2016a).[5] However, other studies point out that even in contexts where there is a high level of gender equality, gaps are detected in STEM subjects. The concept of the gender equality paradox in science, technology, engineering and mathematics (Stoet and Geary, 2018; Muñoz, 2021) illustrates that such a disparity exists in secondary and tertiary education in countries with high levels of gender equality, while countries with low levels of gender equality have the highest proportions of women obtaining advanced degrees in technology. The authors suggest that in the first group of countries, the financial cost of forgoing a career in science, technology, engineering and mathematics is lower, and that both the difference between women's and men's academic strengths and their attitudes towards science are significant factors that contribute to the bifurcation of women's and men's academic focus during secondary school and then at university. The authors also submit that in countries where gender equality in the workplace is lower and there are more challenges to achieving a decent quality of life, STEM careers are perceived as offering good employment opportunities. Similarly, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has observed a gender equality paradox in ICT (UNESCO, 2019; Muñoz, 2021), noting the absence of a direct relationship between a country's level of gender equality and the proportion of women pursuing advanced studies in digital or ICT skills. The UNESCO (2019) study revealed that the gender equality paradox in STEM fields (Stoet and Geary, 2018) is replicated in the ICT subfield, thus concluding that the employment appeal of that field is not sufficient to nullify the paradox and alter the country-specific indicators observed by Stoet and Geary (2018).

The disparities to the disadvantage of girls that were observed in the results of the aforementioned assessments in mathematics and science are detected early and become more evident as girls progress through school. This is especially true between early and late adolescence, and the disparities deepen in the transition to higher education, where gender gaps in STEM education become more apparent. Although women dominate numerically in higher education, they account for only 35% of students worldwide enrolled in STEM fields; the lowest proportion of women is found among students enrolled in computer science, telecommunications and engineering-related fields. Globally, there is a high proportion of women abandoning STEM disciplines during their studies, the transition to the world of work or even over the course of their professional careers (UNESCO, 2019).

The literature has extensively addressed the factors that explain the progressive exclusion of girls and young women from subjects associated with science, technology, engineering and mathematics (STEM) and the consequent underrepresentation of women in STEM fields in tertiary education. Women's low participation in these areas and their disadvantages in terms of advancement and achievement cannot be attributed to a single cause. The UNESCO report (2019) reviews a number of studies and identifies a complex ecological framework that explains this issue from different angles. First, it mentions studies that conclude that self-selection bias is the main reason girls do not pursue an education in science, technology, engineering and mathematics, and that this decision is influenced by socialization processes and stereotypical ideas about gender roles and, in particular, that careers in these fields are men's territory. These stereotypes are ingrained early in life and can negatively affect girls' interest, commitment and performance in these fields, as well as their aspiration to pursue such

[5] The Gender Gap Index (GGI) is based on the World Economic Forum's *Global Gender Gap Report 2009* and considers the following: educational attainment, health-related factors, economic opportunities, components of well-being, and economic participation. A high score on the index indicates a smaller gender gap.

careers. It has also been found that women find it more difficult than men to identify with science, technology, engineering and mathematics, and that self-efficacy, linked to the assimilation of gender stereotypes or the perception of these beliefs in others, as well as the absence of supports and role models, affect women's educational outcomes in these fields (Blackburn, 2017; Sevilla and Farias, 2020).

Girls' interest and motivation in science, technology, engineering and mathematics are intricately linked to their perceived self-efficacy and performance, and are influenced by the social context, including parents' educational levels and professions, the family's socioeconomic status, the expectations of parents who hold traditional beliefs, and the influence of female peers and the media.

In the school setting, women's participation, performance and progression in STEM subjects are also linked to teachers' skills and pedagogical strategies, as well as teachers' beliefs and attitudes towards their students (UNESCO, 2019). A study in the United States found that higher student achievement in science and mathematics was associated with factors pertaining to teachers, namely, more experienced teachers who were more confident in teaching these subjects and had higher levels of professional satisfaction (Mullis and others, 2012). Teachers' perceptions of skills as a function of gender can create an uneven classroom environment and deter girls from pursuing studies in science, technology, engineering and mathematics. Conversely, effective teaching practices can cultivate a constructive learning environment that motivates and engages girls. One hypothesis that has been advanced is that as students progress through school, some of these factors could function as mechanisms that reinforce stereotypes and shape learning opportunities for boys and girls differently in the various areas of knowledge (UNESCO, 2016a). Textbooks and educational materials are another critical aspect as the depiction of male and female characters in school texts conveys explicit and implicit messages about boys' and girls' roles and abilities in science, technology, engineering and mathematics. In addition, the availability of equipment, materials and resources is a critical aspect of fostering girls' interest and supporting learning in these subjects.

Finally, the burden of unpaid domestic and care work that falls primarily to female students, especially those from low-income strata, constitutes an obstacle throughout women's lives, both in their educational and career paths. It also presents a barrier for women in the fields of science, technology, engineering and mathematics and can affect the pursuit of scientific and technological vocations, especially in adolescence, when gender roles become entrenched and gender discrimination is more pronounced. Specifically, this burden also limits the time that girls can devote to continuous learning activities, exploring cyberspace and acquiring new digital skills (Vaca-Trigo and Valenzuela, 2022).

In the region, the COVID-19 pandemic led to prolonged school closures, which affected more than 160 million young people in 2020 and had a negative impact on learning opportunities and pedagogical continuity (ECLAC/UNESCO, 2020; ECLAC, 2021b). Recent studies of household surveys conducted in 11 countries in Latin America show that the number of hours spent studying during the pandemic was significantly diminished, which adversely affected learning and the likelihood of successfully completing their education (Acevedo and others, 2021). For female students, this reduction in hours was more pronounced owing to the increase in the number of hours they spent on unpaid domestic and care work as a result of lockdowns and school closures. The study conducted in Mexico revealed that the number of hours spent on domestic activities had increased by 18% for women and only 2% for men. The pandemic exacerbated existing inequalities: before the pandemic, the time spent by girls on care work in countries such as the Plurinational State of Bolivia, Guatemala and Nicaragua was between 3 and 4 hours a day, while for boys it was less than 2.8 hours a day. In Ecuador, girls spent 3.8 hours more per week than boys on household chores (ECLAC/UNICEF, 2016; ECLAC and others, 2020). Although there is still no conclusive data in the region on the concrete effects of COVID-19 on education, analysis of the differentiated impact on women's learning and academic continuity will prove instructive.

B. Pronounced and persistent gender gaps in higher education: analysis in the field of science, technology, engineering and mathematics

In higher education, the structural challenges of gender inequality are embodied in the replication of horizontal segregation in these fields of knowledge and in the vertical segregation of academic careers. The latter can influence whether women choose these disciplines or can impose limitations on their professional growth. Androcentric biases in the generation and appropriation of knowledge engender inequality in knowledge products and create barriers to women's access, retention and promotion in scientific and technological careers and, therefore, in research, development and innovation. The small share of women graduates in science, technology, engineering and mathematics has implications for scientific and technological development. Thus, securing women's participation in the STEM professions is one way of ensuring that gender stereotypes are not carried over into knowledge generation and technological design, while enhancing equality in those areas to support sustainable development.

The field of science, technology, engineering and mathematics subsumes disciplines and fields of knowledge related to these subjects and includes emerging fields such as information and communications technologies (ICT), biotechnology, nanotechnology and interdisciplinary sciences (Muñoz, 2021). It has also been found that the skills required in this field are research, critical thinking, problem solving, creativity, communication, collaboration and that seek to project from STEM to other educational fields in a cross-cutting manner (Muñoz, 2021, p. 13).

Latin America and the Caribbean must move towards progressive structural change through the development of more knowledge-intensive sectors, particularly those that require expertise in STEM fields (CEPAL, 2020a). Advances in these fields, and the digital revolution in particular, are seen as instruments for fostering sustainable development and offer the potential to create more productive and better-paid jobs, provided that the new model of digital governance promotes inclusive digital transformation. Hence the relevance of ensuring the participation of women in professions related to science, technology, engineering and mathematics in order to bridge the gap in access to jobs in the most dynamic areas of the economy and to achieve sustainable development in line with the Montevideo Strategy for Implementation of the Regional Gender Agenda within the Sustainable Development Framework by 2030.

The International Labour Organization (ILO, 2019b) is projecting that there will be new jobs emerging from technological advances, and the World Economic Forum (2021) maintains that new occupations with higher skill levels can be expected to respond to increased technological integration. The COVID-19 pandemic has considerably expanded the digital economy through the use of cloud computing, e-commerce, electronic banking and financing mechanisms, the digital transformation of education systems, artificial intelligence (AI), automation and the use of big data.[6] Jobs in these areas require new competencies or skills (ECLAC/OEI, 2020; Martínez, Palma and Velásquez, 2020; Mateo and others, 2019; Mateo and Rucci, 2019; Mateo and Rhys, 2022; Bello, 2020), and those who are less prepared to take advantage of the new opportunities may find themselves out of work. The jobs that may be lost are in lower value-added areas and are performed mainly by women, such as customer service, administrative and accounting tasks, data entry and online production processes (ECLAC, 2021b; Vaca-Trigo and Valenzuela, 2022).

6 Cloud computing is an information technology usage model that provides on-demand access to a network comprising a set of IT services, such as applications, data storage and processing.

However, while the high proportion of women enrolled in tertiary education offers an example of overcoming access barriers, is not correlated with enrolment in science, technology, engineering and mathematics career paths (Muñoz, 2021; OEI, 2018; UNESCO, 2020b; Bello, 2020). It is therefore essential to understand the causes of the low participation of women in these professions, and particularly in science and technology, since it cannot be attributed to biological differences between men and women, but results from multiple social, cultural and economic factors. The research reveals that there are no cognitive differences between men and women in the acquisition of various skills, nor is there any physical, biological or genetic element that justifies the difference: the underrepresentation of women is induced by a complex network of social and cultural, rather than cognitive, causes (Cifuentes and Guerra, 2020; Donoso-Vázquez, Estradé and Vergés, 2022).

The underrepresentation of women in the areas of science, technology, engineering and mathematics largely stems from the structural challenges of gender inequality that have historically been a structural feature of the region, contributing to the unequal incorporation and integration of women in these areas and hindering women's full participation in them (see diagram III.1).

Diagram III.1
Structural challenges of gender inequality and their manifestations, which determine women's participation in higher education and in technical and vocational education in STEM fields

Structural challenges of gender inequality	Manifestation in the education system and environment	Manifestation in science and technology in higher education	Manifestation in technical and vocational education
Sexual division of labour and the unjust social organization of care	Overload of domestic and care tasks as an impediment to education and job placement Gender socialization: from the family to stakeholders in the education system	Limitations on the time spent learning information and communication technologies and studying science, technology, engineering and mathematics Underrepresentation in careers related to science, technology, engineering and mathematics	Segregation of careers and professions
Discriminatory and patriarchal cultural patterns and the predominance of the culture of privilege	Gender socialization Experiences with the gender-biased pedagogical model at the secondary level Discrimination against women graduates in labour market participation and transition to the world of work	Gender stereotypes in academic and scientific communities Stereotypes regarding women's lack of STEM skills Self-perception of low efficacy and poor academic performance in STEM subjects at the secondary level	Gender stereotypes in vocational choice and educational offerings Hostile educational environments for women in male-dominated settings
Concentration of power and hierarchical relations in the public sphere	Limited promotion of STEM careers to women Lack of support from family, the school and teachers Limited presence of women in managerial positions in STEM careers and academic departments Lack of support and role models	Power dynamics in the field of science Androcentrism in knowledge production and technical and scientific development STEM-related public policies that fail to take a comprehensive and systematic approach to gender equality	Male-dominated teaching and managerial positions Uneven recognition of women's and men's technical skills: unequal treatment and opportunities for equal training
Socioeconomic inequality and the persistence of poverty	Early entry into the labour market (paid and unpaid) Digital gender divide Scarcity of household assets and support	Barriers to access faced by poor households to study science, technology, engineering and mathematics, which require extra time and resources	The reproduction of disparities in labour market insertion (participation, employment, unemployment and wages, among other aspects), which perpetuates inequality and poverty among women graduates of technical and vocational education programs

Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Montevideo Strategy for Implementation of the Regional Gender Agenda within the Sustainable Development Framework by 2030* (LC/CRM.13/5), Santiago, 2017; C. Muñoz, "Políticas públicas para la igualdad de género en ciencia, tecnología, ingeniería y matemáticas (CTIM): desafíos para la autonomía económica de las mujeres y la recuperación transformadora en América Latina", *Gender Affairs series*, No. 161 (LC/TS.2021/158), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2021; A. Bello, *Women in Science, Technology, Engineering and Mathematics (STEM) in the Latin America and the Caribbean Region*, Panama City, United Nations Entity for Gender Equality and the Empowerment of Women (UN-Women), 2020; M. Sevilla and M. Farías, "Brechas de género en trayectorias STEM y educación media técnico profesional", *serie Investigación en Educación*, No. 002/220, Santiago, Alberto Hurtado University, 2020; United Nations Educational, Scientific and Cultural Organization (UNESCO), "A new generation: 25 years of efforts for gender equality in education", *Global Education Monitoring Report*, Paris, 2020.

Many factors influence the choice of field of study and career path of women in the region. In addition to the performance disparities between women and men in secondary education, other factors specifically linked to higher education have been noted: educational environments that are hostile to efforts to include women; gender stereotypes; the image portrayed by teachers and in study materials, laboratories and educational practices; the influence of the family environment and peers; barriers to entry into employment for graduates of secondary education; limited implementation at the secondary level of projects aimed at strengthening vocational pursuits associated with information and communications technologies; low self-efficacy and the digital gender divide, both in terms of the digital skills acquired and barriers to accessing devices and meaningful connectivity (Bércovich and Muñoz, 2022; Muñoz, 2021; Sevilla and Farías, 2020) (see box III.1).

Box III.1
Meaningful connectivity and gaps in access in Latin America and the Caribbean

The concept behind the term "meaningful connectivity," which was coined by the Alliance for Affordable Internet (A4AI), is based on four dimensions: daily Internet use; availability of an appropriate device; sufficient data and a reliable connection; and adequate speed to meet demand.

In the region, there are disparities in all four dimensions. With respect to the digital divide in terms of access to technology, inequality is observed in access to high-speed broadband connections and appropriate devices. In terms of connectivity, between 2017 and 2018, 63% of men in the region had access to the Internet compared to 57% of women (Agüero, Bustelo and Viollaz, 2020). However, the regional average masks significant differences between countries. Overall, these gaps favour men by a margin of 1 percentage point (in Uruguay) to 15 percentage points (Vaca-Trigo and Valenzuela, 2022). The gap is more acute among women with a low level of education living in rural areas, who make up the most poorly connected group (IICA/IDB/Microsoft, 2020). With respect to the availability of devices, although access is generally higher in the region than in Africa, the Arab States and Asia and the Pacific, the Gallup Global Survey results (IICA and others, 2020) show that there are differences among countries, and that in the 23 countries analysed in Latin America and the Caribbean, there is a gap in favour of men in terms of mobile phone ownership. While 83% of men and 80% of women had access to and used a mobile phone between 2017 and 2018 (Agüero, Bustelo and Viollaz, 2020), access to the Internet via these devices was limited in terms of usability and connectivity when compared to tablets or computers. Microdata from the AfterAccess survey conducted in six countries in the region in 2017 and 2018 indicate that access to computers is more widespread among men (54%) than among women (45%). The gender gap is, therefore, also linked to the quality of the devices available to many women.

In addition to the gaps in basic access to the Internet and mobile devices, the low quality of Internet service affects the entire region. Data collected by ECLAC/CAF (2020) show that the region lags behind the world average and the most advanced countries in broadband connection speed. According to ECLAC (2020a), in 67% of the countries in the region, download speeds could not handle simultaneous data-intensive activities. The gap was also evident in the types of subscriptions available to users —namely, prepaid plans or post-paid subscriptions— which indicated that a small share of the population enjoyed reliable Internet service, while the majority of the population grappled with unstable access and lower-quality mobile connectivity (Becerra, 2021). A study conducted by A4AI in Colombia, Ghana and Indonesia found that most women experience suboptimal Internet connectivity as access conditions do not meet the minimum thresholds for effective connectivity (A4AI, 2020; Vaca-Trigo and Valenzuela, 2022).

Against this backdrop, during the sixtieth meeting of the Presiding Officers of the Regional Conference on Women in Latin America and the Caribbean, organized by ECLAC in coordination with UN-Women, the high-level authorities of machineries for the advancement of women in Latin America and the Caribbean agreed to promote a Regional Alliance for the Digitalization of Women in Latin America and the Caribbean, under the leadership of Chile in its capacity as Chair of the Presiding Officers of the Regional Conference, and with support from ECLAC, in coordination with UN-Women and other agencies, funds and programmes within the United Nations system. This partnership aims to promote the full participation of women in the digital economy and to reduce gender gaps in terms of women's and girls' access to information and communications technologies, as well as in the use of these technologies and skills development in this area.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of A. Agüero, M. Bustelo and M. Viollaz, "¿Desigualdades en el mundo digital?: brechas de género en el uso de las TIC", *Technical Note*, No. 01879, Washington, D.C., Inter-American Development Bank (IDB), 2020; I. Vaca-Trigo and M. Valenzuela, "Digitalización de las mujeres en América Latina y el Caribe: acción urgente para una recuperación transformadora y con igualdad", *Project Documents* (LC/TS.2022/79), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2022; Alliance for Affordable Internet (A4AI), "Meaningful connectivity: a new target to raise the bar for internet access", Washington, D.C., 2020; Inter-American Institute for Cooperation on Agriculture/Inter-American Development Bank/Microsoft (IICA/IDB/Microsoft), *Rural Connectivity in Latin America and the Caribbean: A Bridge for Sustainable Development in a Time of Pandemic*, San Jose, 2020; *Habilidades digitales en la ruralidad: un imperativo para reducir brechas en América Latina y el Caribe*, San Jose, 2021; Inter-American Institute for Cooperation on Agriculture (IICA) and others, *Digital Rural Gender Divide in Latin America and the Caribbean*, San Jose, 2020; AfterAccess [online] https://afteraccess.net/about-afteraccess; Economic Commission for Latin America and the Caribbean/Development Bank of Latin America (ECLAC/CAF), *Las oportunidades de la digitalización en América Latina frente al COVID-19*, Santiago, 2020; Economic Commission for Latin America and the Caribbean (ECLAC), "Universalizing access to digital technologies to address the consequences of COVID-19", *COVID-19 Special Report*, No. 7, Santiago, 2020; M. Becerra, "Accesos TIC 2000-2020 en Argentina: ¿20 años no es nada? Conectividad y brechas en telecomunicaciones, internet y tv paga en el siglo XXI", Buenos Aires, 2021 [online] https://martinbecerra.wordpress.com/2021/06/16/accesos-tic-2000-2020-en-argentina-20-anos-no-es-nada/.

The feminist perspective of science offers arguments for analysing the paltry participation of women in the field of science, technology, engineering and mathematics, delivering a sharp rebuke of scientific objectivity and distancing as a situated product or social construct fraught with gender biases (Harding, 1996 and 2012; Haraway, 2014). Through a feminist lens, the critique challenges an approach to women's participation in the field of science and technology focused solely on the woman's perspective, given that the very structure of the scientific fields is constitutively exclusionary to women. Androcentric biases in knowledge production, as well as in knowledge products, explain the exclusion of women and are producers of inequality (Muñoz, 2021, p. 15). This perspective raises doubts about the knowledge production process as well as who sets the priorities, who participates in the process and for whom such scientific knowledge is produced.

From a feminist viewpoint, one notable aspect of the production, dissemination and recognition of knowledge is the concept of epistemic violence (Fricker, 2017). In the context of gender bias, this form of violence is a way of exercising symbolic power by making women invisible, dispossessing them of the opportunity to be represented in scientific production and denying their capacity for agency or influence in the definition of topics and issues to be researched, such as in scientific development itself. Epistemic objectification and disqualification, the division of intellectual labour and the creation of totalizing and stereotyped representations (Radi, 2019), for example, the androcentric ethos whereby knowledge produced by women does not carry the same value as that produced by men, are a reflection of the power hierarchies in science and represent barriers women face when entering, pursuing and persevering in scientific careers (Bello, 2020; Muñoz, 2021; ECLAC, 2017).

One example of the findings of applied research is technological development. Technology can be viewed as a set of sociotechnical products whose development is awash in gender biases. Artificial intelligence, robotics and management processes based on large volumes of data (big data) are classic examples. The underrepresentation of women in designing artificial intelligence applications and the persistence of gender biases in artificial intelligence datasets, algorithms and training mechanisms, reinforce gender stereotypes that stigmatize women and drive them from these fields (UNESCO, 2019 and 2020a; Vaca-Trigo and Valenzuela, 2022). From the standpoint of scientific and technological neutrality, gender biases permeate robotics algorithms, programs and designs as they are created by experts who may be susceptible to the biases present in a patriarchal society.

Two sources of bias in artificial intelligence can be identified: the characteristics of the models and the characteristics of the data. Model bias stems from biases held by the design and programming specialists. A typical example is the assignment of gender roles in robotics (military robots are generally male and relational or caregiving robots, female). However, the data used to train algorithms are susceptible to societal gender biases and are thus influenced by the underlying definitions and applications that imbue them with stereotypical concepts. Consequently, machines are trained to observe biased data and perpetuate the bias (Colett, Neff and Gouvea, 2022; UNESCO, 2020b; UNESCO/EQUALS Skills Coalition, 2019). From a scientific perspective, women's participation in scientific development engenders excellence and improves the quality of STEM products by including diverse perspectives, reducing bias and promoting more robust knowledge and solutions.

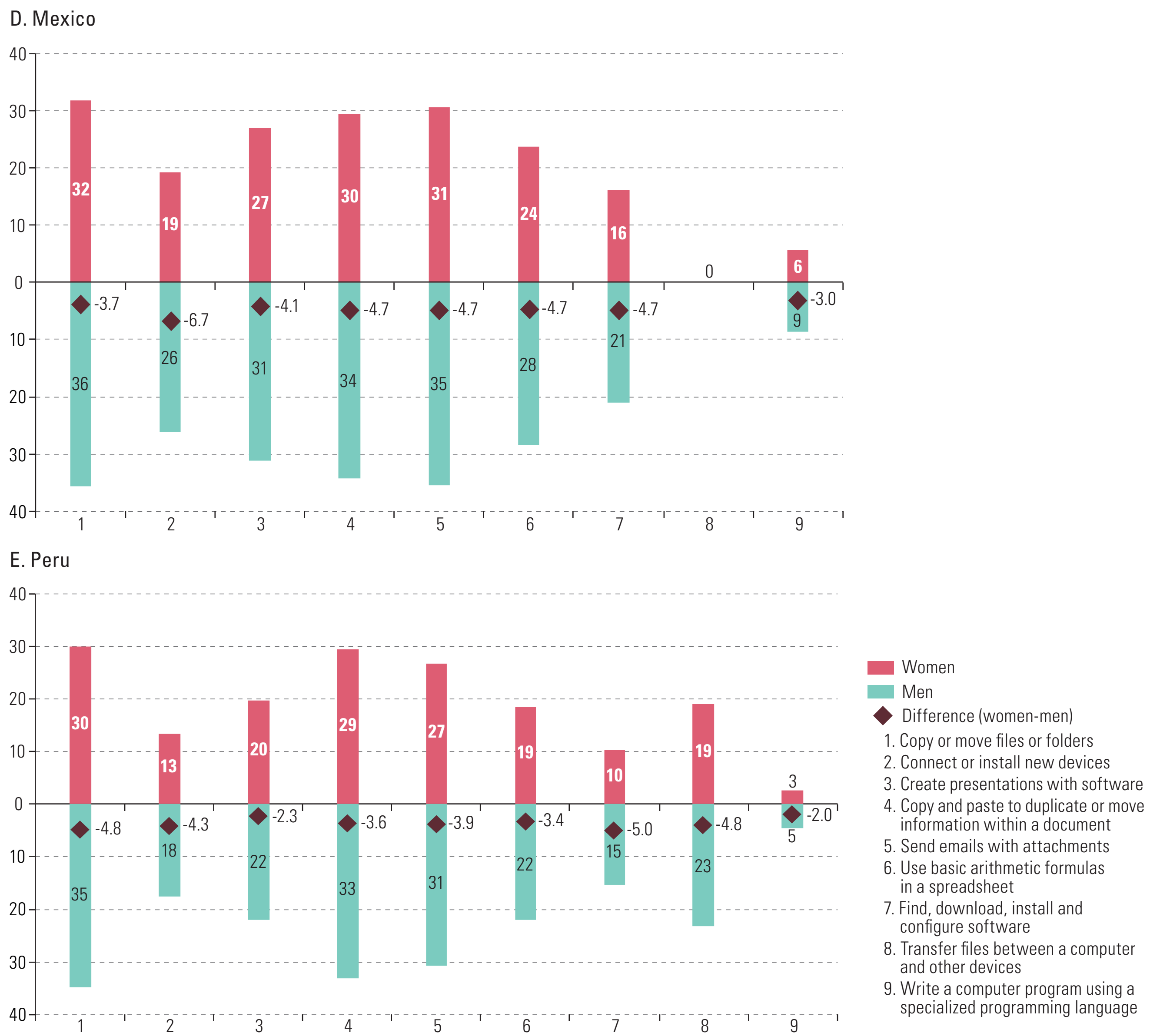
Finally, digital skills represent a significant barrier to women's access to STEM fields. The acquisition of these skills, understood as the set of technical, cognitive and social skills needed to perform tasks in digital environments, must be carefully studied from a gender perspective (Bércovich and Muñoz, 2022). In the region, digital gaps of different types and scope (Bércovich and Muñoz, 2022; Castaño and others, 2009) function as a determining factor of the opportunities available to women (Bércovich and Muñoz, 2022; Castaño and others, 2009; Vaca-Trigo and Valenzuela, 2022). Gaps in access to technology and the skills needed to use it, as well as gaps related to the specialized use and design of the most advanced ICT services, have been widening as technologies become more sophisticated and expensive (UNESCO/EQUALS Skills Coalition, 2019; Vaca-Trigo and Valenzuela, 2022). The structural challenges of gender inequality influence women's access to digital skills, as well as their use and appropriation across all dimensions, and have a greater impact on women in the lowest quintiles, especially in rural areas.

In line with Goal 4 on inclusive, equitable and quality education, and particularly target 4.4 on promoting the relevant skills to access decent work, UNESCO gathers data on eight digital skills (Bércovich and Muñoz, 2022). In countries where such data are available, less than half the population possesses digital skills and, for the most complex activities (such as programming, configuring software or devices, or using formulas on spreadsheets), the share of people claiming proficiency is very low (less than 9%), and there is a wider gender gap that is reinforced by women's low self-perception of academic proficiency in science and mathematics (Muñoz, 2019).

This situation perpetuates discriminatory patterns and inhibits holistic development, as technological skills are a means of accessing other social assets, such as access to STEM careers. These, in turn, grant access to jobs associated with the digital economy and frontier technologies, as well as to the development of exponential technologies, given that such access stimulates and enhances innovation and enables the attainment of higher levels of development (ECLAC, 2020a, 2020b and 2021d). Ensuring equal access to STEM careers for girls and women is a human rights imperative and paves the way for women's economic empowerment, while contributing to a country's scientific and sustainability prospects. However, such development must be framed in terms of technologies that are socially relevant, safe and sustainable, both environmentally and in terms of their role in eliminating gender inequalities, as outlined in the Montevideo Strategy. Otherwise, the digital skills gaps that currently leave women in Latin America and the Caribbean trailing their male counterparts will persist (see figure III.5).

In all countries except Cuba, the data show that women's reported skill levels are lower than men's. This gap is especially noticeable in Brazil, although it is also significant in Mexico and Peru. Colombia shows some measure of equity, while in Cuba, women are in a better position. In all cases, the proportion of people with complex skills, particularly in writing a computer programme using a specialized programming language, is very low for both men and women, and does not exceed 6% in any country.

Figure III.5
Latin America and the Caribbean (5 countries): proportion of people possessing digital skills, by skill type and sex, 2019
(Percentages)



Source: UNESCO Institute of Statistics (UIS).
Note: In category 1, data for Mexico and Peru are for 2018. In category 9, data for Peru are also for that year.

1. Horizontal segregation in higher education in science, technology, engineering and mathematics

Gender gaps in science, technology, engineering and mathematics begin to appear in secondary education and widen when choosing fields of study at the tertiary level. While the majority of the student body is female, there is a clear pattern of gender segregation by discipline. Overall, women are concentrated in education, health, social sciences, arts and humanities, with a limited presence in engineering and technology, which adds to already pronounced horizontal segregation.

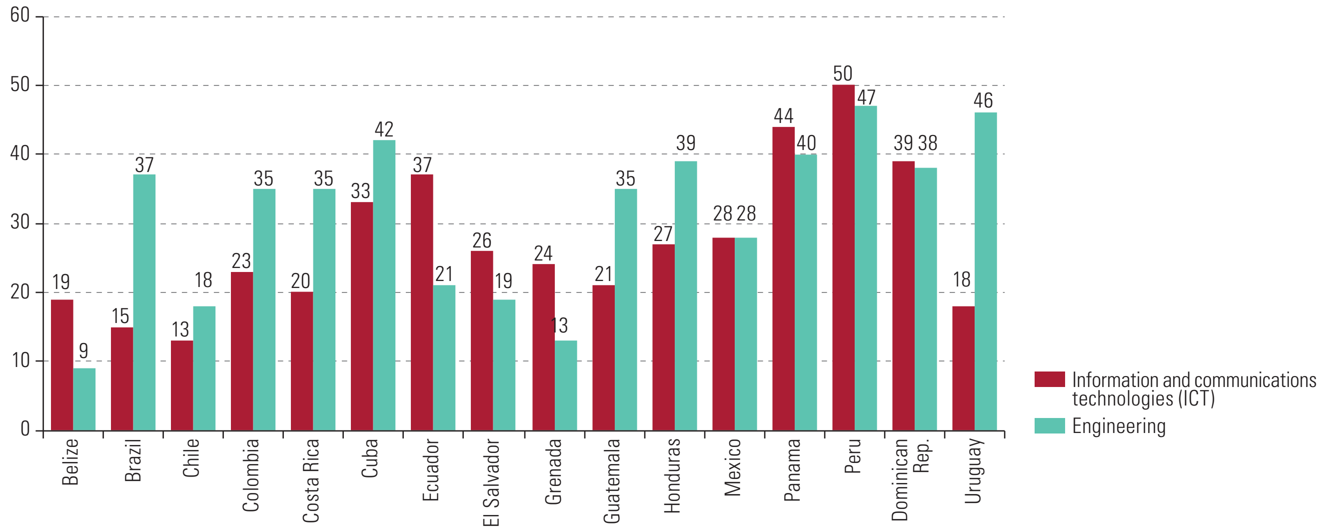
In Latin America and the Caribbean, less than 30% of all tertiary education graduates are in STEM careers. In this regard, the underrepresentation of women in careers in these fields is a major problem, and only four countries have a female graduation rate above 40% in these areas: Argentina, Belize, Panama and Uruguay (ECLAC, 2019a).

Within STEM fields, in ICT and engineering, industry and construction, which have traditionally been considered male domains, women's participation is notably low. According to data compiled by UNESCO, with some exceptions, such as Peru and Panama, women make up less than 40% of graduates in the ICT sector, and there are several countries where this share is lower, such as Chile (12.7%), Brazil (14.6%) and Uruguay (17.7%) (UNESCO, 2022; Bello, 2020; Muñoz, 2021) (see figure III.6).

Figure III.6

Latin America and the Caribbean (16 countries): share of women in total tertiary education graduates in engineering and information and communications technologies (ICT)

(Percentages)



Source: United Nations Educational, Scientific and Cultural Organization (UNESCO), "A new generation: 25 years of efforts for gender equality in education", *Global Education Monitoring Report*, Paris, 2020.

Note: Latest available data; percentage of female graduates in tertiary education according to UNESCO Institute for Statistics classifications: information and communications technologies, and engineering, manufacturing and construction.

Data gathered by the Ibero-American Network of Higher Education Indicators (INDICES Network) initiative of the Organisation of Ibero-American States for Education, Science and Culture (OEI) on Latin American countries reflect the same trend. In the fields of education or health, over 70% of students enrolled in education and 60% enrolled in the arts are women. Yet, in the fields of ICT and in engineering, industry and construction, women's participation is very low: less than 18% in the former and around 31% in the latter (Lugo and Ithurburu, 2019). Regional averages conceal significant differences between countries, since these values are more noticeable in some, such as in Chile, where only 11.21% of students in the fields of technologies and communications are women; in Brazil, where this proportion is 13.62%; in Uruguay, where the percentage rises to 15.8%, and in Argentina, where women represent 16.84% of students in these fields. Although participation is higher in engineering, with some exceptions, the proportion of women does not exceed one third of enrolment (see table III.2).

The responses to the pandemic have triggered transformations in the various forms of communication, education, work and consumption, and offer an excellent opportunity to enhance the links between education and employment in the STEM fields as this is one of the sectors that has seen the most development during the pandemic. However, as has been established, this is the field in which women are most underrepresented, and gender biases in technological development impose limits on innovation and its appropriation (ECLAC, 2021a). It is therefore necessary to design and implement public policies aimed at promoting gender-sensitive transformation of the technologies themselves and dismantling the structural challenges of inequality.

Table III.2
Latin America (10 countries): women's share of enrolment in higher education, by field of knowledge, 2019
(Percentages)

	Argentina	Brazil	Chile	Colombia	Cuba	Honduras	Mexico	Panama	Paraguay	Uruguay	Latin America
Education	73.7	72.2	80.3	60.6	78.9	70.7	73.9	74.8	56.0	75.4	72.7
Health and well-being	75.2	71.1	75.8	67.7	67.3	73.8	67.7	76.4	--	76.3	71.6
Social sciences, journalism and information	86.4	66.8	62.8	70.9	69.9	70.7	66.7	68.4	--	67.3	66.5
Arts and humanities	62.3	53.4	52.1	46.9	67.2	59.6	55.9	59.5	58.1	67.3	60.4
Business administration and law	57.5	54.8	54.7	59.5	70.5	60.4	54.6	66.6	56.4	62.2	55.8
Services	53.0	60.7	49.0	50.3	39.3	48.1	49.2	54.9	--	38.1	53.4
Natural sciences, mathematics and statistics	62.2	48.2	45.6	53.7	59.9	49.7	49.4	60.8	--	58.1	52.5
Agriculture, forestry, fisheries and veterinary medicine	50.1	50.3	53.1	46.7	51.9	29.0	41.4	43.7	56.4	50.5	47.7
Engineering, industry and construction	33.8	33.5	20.2	32.2	41.1	35.9	29.3	38.4	44.5	40.8	30.8
Information and communications technologies	16.8	13.6	11.2	20.8	31.9	28.4	23.7	29.5	38.6	15.8	18.0

Source: Organization of Ibero-American States for Education, Science and Culture (OEI), "Las brechas de género en la producción científica iberoamericana", *Papeles del Observatorio*, No. 09, Buenos Aires, 2018.

Note: Values are shaded according to women's participation in each of the fields: green corresponds to participation above 50%, yellow to participation between 35% and 50%, and red to participation below 35%.

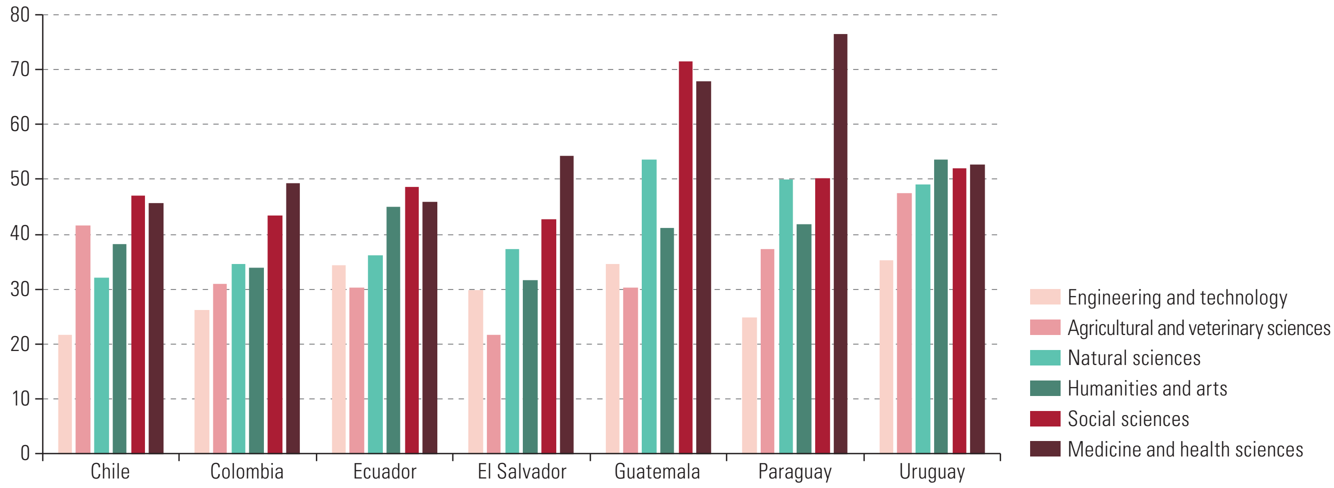
2. Academic profession and vertical segregation in the field of science, technology, engineering and mathematics

The gender inequalities observed in the field of education continue throughout academic careers, where gender gaps exist in several areas. Evidence of this includes the low participation of women in research and development (R&D), the presence of gender biases in scientific culture and in science and technology content itself, women's lower scientific output (e.g. publication of academic research and patenting), and their lower representation in leadership positions.

Although women make up the majority of higher education faculties, they tend to spend more time teaching than researching and are less likely to hold senior or leadership positions (university rectors and deans). They are also underrepresented at the highest levels of research careers (Bello, 2020). This differentiation is even greater in STEM careers. Women's representation decreases as they advance through academia; thus, the gender gap widens as they ascend the career ladder (Bello, 2020).

To understand vertical segmentation and the scenario women face in academia, it is necessary to analyse women's participation in R&D activities. Overall, in one third of the countries in the region there is a certain measure of gender parity, as women's share of the total number of researchers is between 48% and 53% (UNESCO, 2022); the average for the region is 45.7% (Ministry of Science and Innovation, 2021). However, in the area of research development, segregation in the field of R&D is pronounced. On average, women in Latin America are overrepresented in the fields of medicine and health sciences, social sciences, humanities and the arts, but make up only slightly more than 25% of researchers in engineering and technology (UNESCO, 2022) (see figure III.7). While this trend was observed across the region, there are significant differences among countries.

Figure III.7
Latin America (7 countries): women's participation in research and development (R&D) activities, by field of study
(Percentages)



Source: UNESCO Institute for Statistics (UIS), on the basis of official data from the countries.
Note: The years considered are: Chile, 2016; Colombia, 2017; Ecuador, 2014; El Salvador, 2018; Guatemala, 2018; Paraguay, 2018; and Uruguay, 2018.

This situation is even more acute if only those working in R&D full time are considered (Bércovich and Muñoz, 2022). Patriarchal cultural patterns arise in science based on male hierarchies that reproduce their own biases and contribute to the hierarchical organization of the processes of producing and validating scientific knowledge. It is essential to analyse how knowledge is created, who creates it and for whom, and how these biases are translated into employment and research in science, technology, engineering and mathematics. Therefore, it is not only important to examine the quantitative participation of women in science, but also how gender bias impacts access, selection and promotion in scientific careers in science and technology (Castaño and Webster, 2014; Bello, 2020), in the very processes of validation of knowledge through the peer community, and in scientific culture itself.

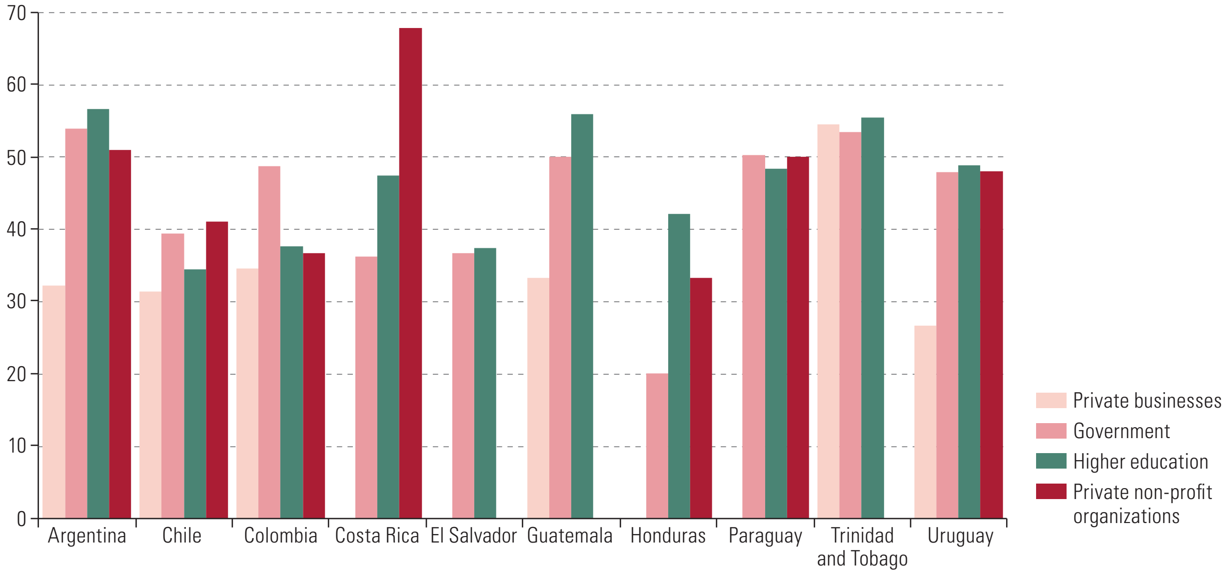
Deeper analysis by sector of occupation reveals additional, specific gender gaps. A review of gender segregation by sector of occupation (higher education, government and private companies), reveals that women are woefully underrepresented as researchers in R&D, where salaries tend to be higher, particularly in the fields of engineering and ICT. Gender biases are also observed in companies' recruitment, promotion and compensation processes (Bello, 2020). In all cases, gender parity is highest in public R&D centres and universities (Bello, 2020; Albornoz and others, 2018) (see figure III.8).

One indicator of academic career progression is the possession of a doctoral degree (corresponding to ISCED level 8).[7] There is a significant gap between men and women as they progress through post-graduate education. The proportion of female researchers of the total number of researchers (full-time equivalent) at ISCED level 8 is low in most countries reporting this indicator: Colombia, 36.4%; El Salvador, 23.4%; Guatemala, 39.1%; Paraguay, 39.8%, and Uruguay, 46%.[8] In Argentina and Trinidad and Tobago, women are in the majority at 54.4 9% and 53.6%, respectively (UNESCO, 2022) (see figure III.9).

7 The International Standard Classification of Education (ISCED) is part of the United Nations' international family of economic and social classifications and allows internationally comparable data to be collected and analysed in a uniform manner. It represents a benchmark classification that allows educational programs and their respective certifications to be organized by education level and field of study. ISCED level 6 corresponds to degree programs in tertiary education or equivalent; ISCED level 7 corresponds to master's or specialization programs or the equivalent; and ISCED level 8 corresponds to doctoral programs or the equivalent.

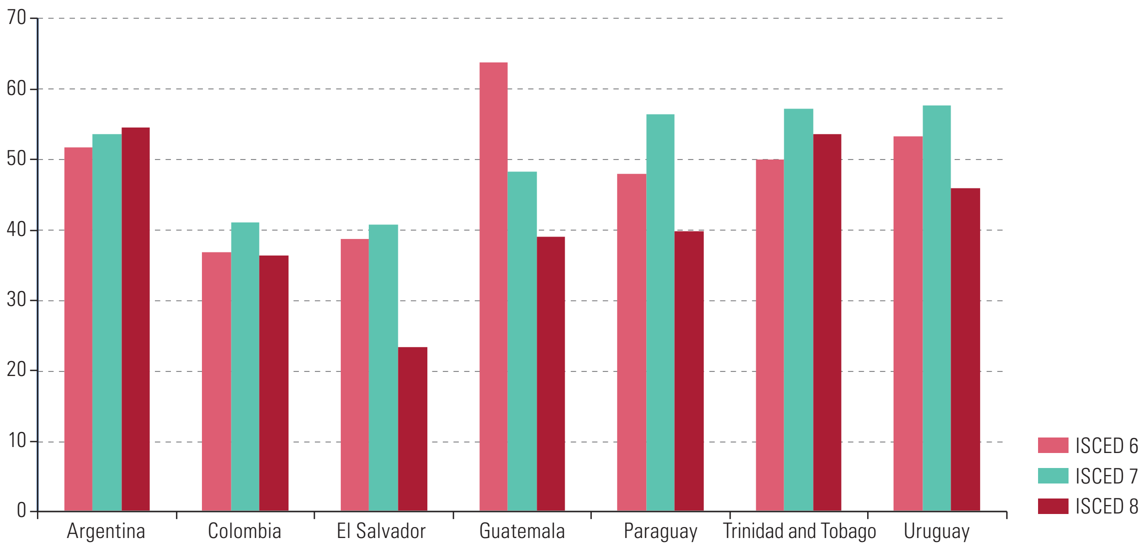
8 The full-time equivalent (FTE) for R&D personnel is the ratio of the hours worked in R&D during a calendar year to the total hours a person typically works in a year. Someone who normally spends 30% of their time on R&D and the rest on other activities is considered to be 0.3 FTE. For more information on this unit of measurement, see United Nations Educational, Scientific and Cultural Organisation (UNESCO), "Full-time equivalent (FTE) of R&D personnel" [online] http://uis.unesco.org/en/glossary-term/full-time-equivalent-fte-rd-personnel.

Figure III.8
Latin America and the Caribbean (10 countries): participation (full-time equivalent) of women in research and development (R&D) activities, by hiring sector
(Percentages)



Source: UNESCO Institute for Statistics (UIS), on the basis of official data from the countries.
Note: The years considered are: Argentina, 2017; Chile, 2017; Colombia, 2017; Costa Rica, 2018; El Salvador, 2018; Guatemala, 2018; Honduras, 2017; Paraguay, 2018; Trinidad and Tobago, 2018; Uruguay, 2018.

Figure III.9
Latin America and the Caribbean (7 countries): women researchers at levels 6, 7 and 8 of the International Standard Classification of Education (ISCED)
(Percentages)



Source: UNESCO Institute for Statistics (UIS), on the basis of official data from the countries.
Note: The years considered are: Argentina, 2018; Colombia, 2017; El Salvador, 2018; Guatemala, 2018; Paraguay, 2018; Trinidad and Tobago, 2018; Uruguay, 2018.

In some countries, the gaps between men and women are widening in the fields of science, technology, engineering and mathematics. The most notable cases are El Salvador and Colombia, where there is a difference of 20 and 14 percentage points, respectively, between the two groups at the doctoral level. There are also significant gaps in Chile and Ecuador.

Another indicator of progress in scientific career advancement is based on scientific output. Globally, women publish fewer papers than men and are less likely to be the first or last authors of an article;[9] moreover, publications written by women are cited less often (Bello, 2020). While women in Latin America have moved toward parity in authorship of scientific publications, the scenario conceals striking differences between countries and disciplines (IEO, 2018). Women's participation in publishing is lowest in the physical and chemical sciences and in engineering, at 38% and 30% respectively. Between 2011 and 2015, the women's share of the total number of authors of scientific articles was 38% in Chile, 39% in Colombia and 38% in Mexico; Brazil, meanwhile, was the country with the highest percentage of female authors (49% of the total) (López-Bassols and others, 2018).

The COVID-19 pandemic may have had a major impact on this situation. According to a study conducted by the University of Siena (Squazzoni and others, 2021) on a corpus of 2,329 journals published by the academic publisher Elsevier, the first wave of the pandemic created unanticipated research opportunities as a collective response from the academic community. The production of scholarly articles increased dramatically, especially in the health fields, driven by changes in the editorial management of many scientific journals, but with an imbalance in favour of men. The study concluded that this situation may have created inequalities in academic careers, particularly for young women. One plausible explanation for this is the increased demand for care activities that are primarily undertaken by women. It is thought that this may have an impact on their academic career development. This has also been confirmed in research into the impact of COVID-19 on higher education in Latin America (Marquina and others, 2022).

Another gap in women's participation in science and technology —particularly in STEM fields— arises as a result of barriers to obtaining significant funding; it is also evident in the underrepresentation of women at prestigious universities. Women are also at a disadvantage in the composition of faculty among tenured university professors, which puts them at an even greater disadvantage in terms of high-impact scientific publications (ECLAC, 2019a). Similarly, globally, women receive smaller grants than men and find it more difficult to raise venture capital for science and technology start-ups (World Economic Forum, 2021; Bello, 2020).

There is also a significant gender gap in terms of technology transfer. Data from the World Intellectual Property Organization (WIPO) on women's participation in patenting activities indicate that patents with at least one woman inventor on the team, on average, represent less than 30% of the total in countries in Latin America and the Caribbean (López-Bassols and others, 2018) (see figure III.10); internationally, the rate of women inventors is around 17% (Bello, 2020).

Reducing the segregation of women in science and technology requires policies and regulatory frameworks that actively promote gender equality in science and technology by mainstreaming gender in research activities and promoting gender parity in the allocation of positions in national science and technology systems. Undoubtedly, the lower participation of women in STEM careers is linked to pedagogical processes in basic education, where gender stereotypes and other structural challenges of inequality are propagated; therefore, policies must address all dimensions of this complex issue.

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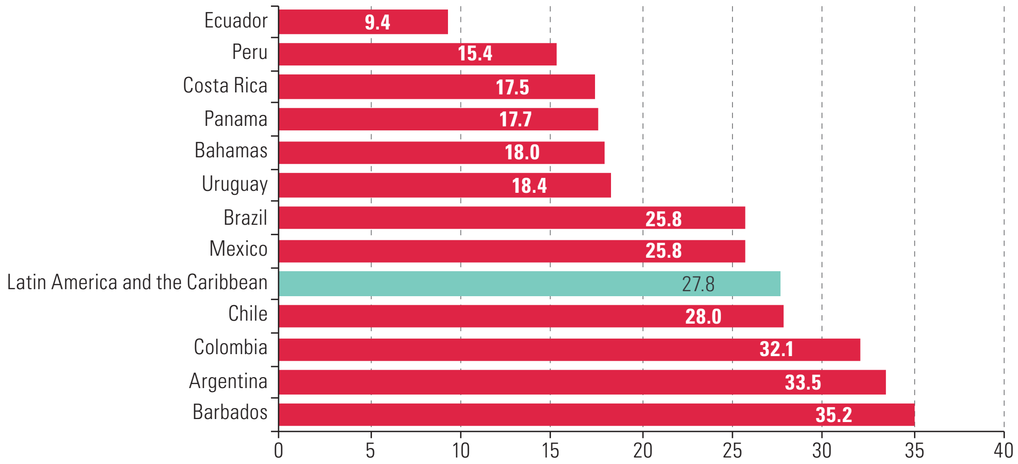
[9] In research articles in STEM fields, authors' names are ordered according to the scope of their contribution. The first author is usually the one who proposed the idea and was most involved in the research and writing of the paper, while the last author is the one who coordinates or supervises the project. Identifying someone as the first or the last author denotes the relevance of his or her participation in the knowledge production process.

Figure III.10
Latin America and the Caribbean (12 countries): patents with at least one female inventor on the team, 2007–2016
(Percentages)



Source: World Intellectual Property Organization (WIPO).
Note: The figure only includes countries that filed more than 40 patents under the Patent Cooperation Treaty during the period 2007–2016.

C. Technical and vocational education and women's insertion in the labour market: focus on the STEM sectors

While there has been an increase in the number of female students in higher technical education and vocational training, this is not evident in STEM fields or at the secondary level of technical education. Barriers to access to traditionally male-dominated careers are linked to sociocultural factors that date back to the origins of vocational technical education and its association with the sexual division of labour and the unjust social organization of care in the context of industrial development. Gender stereotypes that are reproduced in the design and format of academic offerings, in the pedagogical model, in curricular content, and in teaching and learning methods and resources in technical and vocational education, particularly in STEM subjects, deepen segregation. Inequalities linked to gaps in the labour market insertion and promotion of women graduates of technical and vocational education are other factors affecting working conditions in the STEM sectors.

The teaching and learning processes involved in technical and vocational education are intricately linked to the world of work and the acquisition of professional skills related to socio-productive issues. Prompted by the pandemic, technological advances and automation have increased the demand for skills in science, technology, engineering and mathematics. In recent times, technical and vocational education and training systems, which are closely related to practical issues and real-life problems, have witnessed an increase in competency-based training, particularly in science, technology, engineering and mathematics, to facilitate employability and make the world of work more dynamic and empowering. The field of science, technology, engineering and mathematics is usually associated with traditional academic education, rather than with technical and vocational education. However, designing technical and vocational education programmes linked to technology and engineering is seen as being conducive to fostering labour market insertion and advancement through higher education, which enable the deepening of skills and competences and promote greater specialization among the professionals working in these areas (Sevilla, 2021).

Data from a number of studies (Wolniak and Engberg, 2019, cited in Sevilla, 2021) indicate that professions in science, technology, engineering and mathematics offer a higher return in the labour market, regardless of students' socioeconomic background. Therefore, technical and vocational education at various levels, but especially in these areas, has the potential to galvanize the employment and educational trajectories of women in the region, especially those belonging to the lowest income quintiles. Viewed though this lens, technical and vocational education is a critical component in achieving structural change in the development model as it speaks directly to people's capabilities and has transformative potential that can drive women's economic autonomy at the nexus of education and work. However, technical and vocational education programmes are highly segregated by gender, and there are several curricular, organizational and cultural elements that prevent the potential of such education from being harnessed to propel girls and young women in these areas (Sevilla, 2021).

The studies that have been carried out on women's participation in science, technology, engineering and mathematics address general or university education and have not specifically considered technical and vocational education, where gender differences tend to be more evident because of the heightened dominance of women or men in the associated areas of study. A report recently published by UNESCO warns of the need for in-depth research on the factors that hinder and facilitate women's participation and performance in areas of technical and vocational education related to science, technology, engineering and mathematics (Sevilla, 2021).

In the region, technical and vocational education is generally offered at various levels corresponding to the following UNESCO ISCED categories: secondary education (depending on the country, ISCED 2 and 3); post-secondary non-tertiary education (ISCED 4); tertiary education (ISCED 5, short cycle, and ISCED 6, degree programme); and vocational education or training.

Women's participation at each of these levels is uneven. At the secondary level, their participation is low, especially in the industrial sector and in careers associated with science, technology, engineering and mathematics. In technical higher education and vocational training, however, this trend is reversed in overall enrolment, but gender gaps persist with respect to the types of careers that are traditionally male dominated.

The wide gender gaps at the secondary level of technical and vocational education —which vary by career, but on average indicate that only 30 of every 100 students are female— may be caused by individual characteristics linked to social identity, the construction of self-identity by adolescents and gender representation in this age group, which influences vocational choices (ECLAC, 2021a). This also speaks to the very origin of technical and vocational education, which, at the social level, instilled gender stereotypes in vocational choice and educational offerings (Sepúlveda, 2017).[10]

Although some countries show evidence of gender parity in enrolment in technical and vocational education, the figures belie a considerable degree of heterogeneity within the educational offerings, as there are sectors that are seen as female-dominated professional niches, which are primarily associated with occupational fields in which remuneration is low or job prospects are limited compared to occupations in the areas of science, technology, engineering and mathematics.

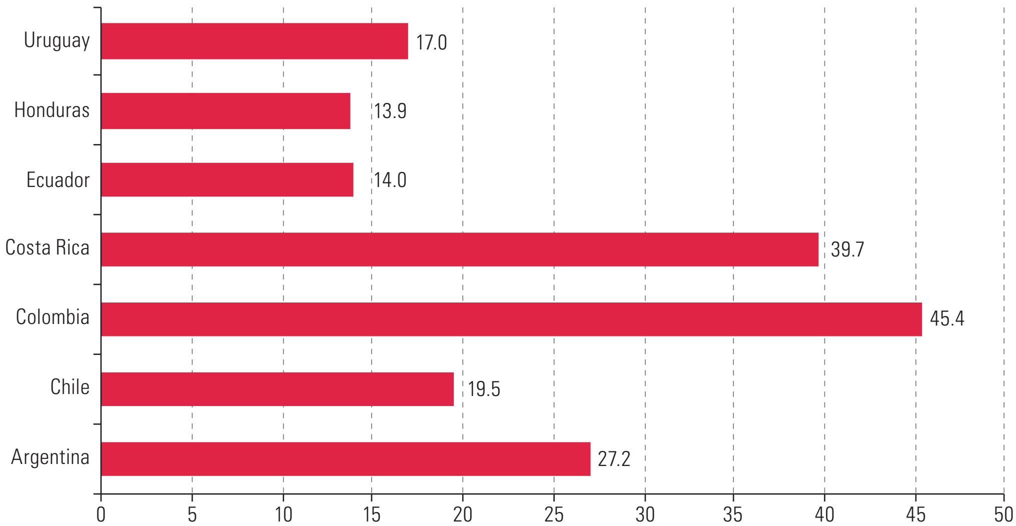
In recent years, there has been an increase in policies and initiatives developed by ministries of Education or other public or private bodies to include gender mainstreaming in technical and vocational education among the lines of action established in national

[10] See Sepúlveda (2017) for more details of the historical context, the evolution of technical and vocational education in Latin America and the Caribbean and the origin of gender inequalities in this academic area.

gender equality plans and mainstreaming policy. However, no specific STEM-related initiatives have been in technical and vocational education. Rather, initiatives associated with these areas aim to foster scientific and technological vocations and promote a progressive increase in women's participation in these fields, mainly in tertiary education.

Despite these efforts, the proportion of women in technical and vocational education in the region reveals marked gender segregation. Men are concentrated in programmes in the engineering, manufacturing and construction sectors, while women are concentrated in programmes related to business, education and health care (Sevilla, 2021). For example, as figure III.11 shows, the average rate of women's participation in secondary-level technical and vocational education in the industry, production and technology sectors does not exceed 30%.

Figure III.11
Latin America (7 countries): share of women in total enrolment in secondary technical and vocational education in the areas of industry, production and technology, selected years
(Percentages)



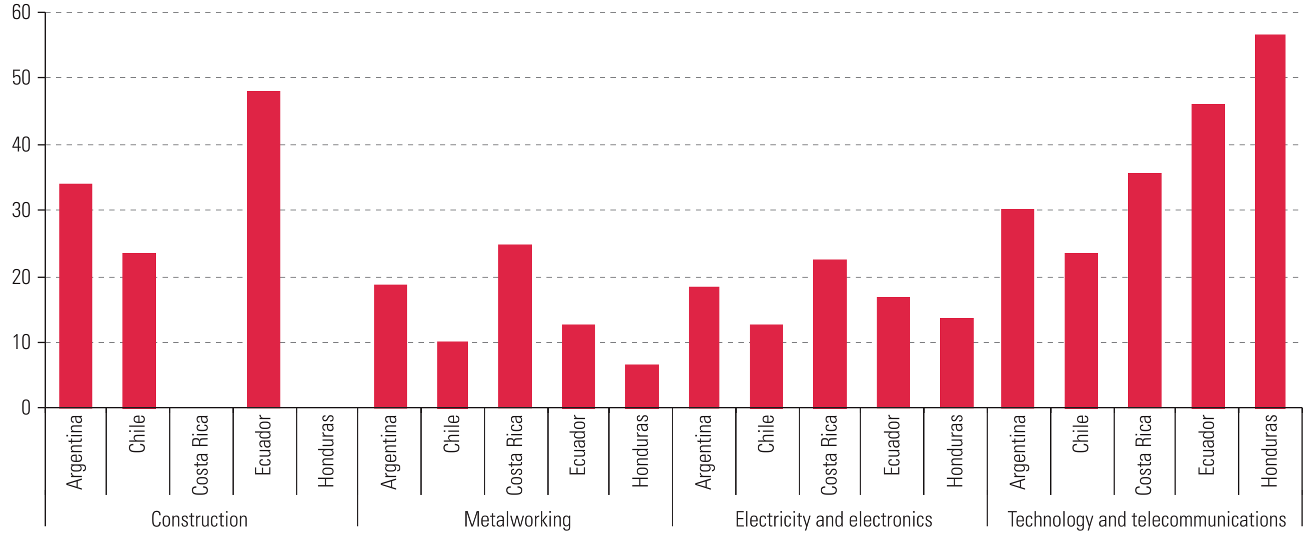
Source: M. Sevilla, "La educación técnico-profesional y su potencial para mejorar la trayectoria educativa y laboral de las mujeres en las áreas de ciencia, tecnología, ingeniería y matemáticas: una revisión regional", *Gender Affairs series*, No. 160 (LC/TS.2021/155), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2021; National Institute of Technological Education (INET); Ministry of Education of Chile; National Administrative Department of Statistics (DANE); Ministry of Science, Innovation, Technology and Telecommunications (MICITT); S. García, "Trayectorias de mujeres: educación técnico-profesional y trabajo en el Ecuador", *Gender Affairs series*, No. 156 (LC/TS.2019/28), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2019; L. Rivero, "Educación técnico profesional en Uruguay: aproximación de análisis de aspectos clave bajo una mirada con enfoque de género", *Informe de consultoría*, Montevideo, Economic Commission for Latin America and the Caribbean/National Women's Institute/Professional Technical Education Council (ECLAC/INMUJERES/CETP), 2019, unpublished.

Note: The years considered are: Argentina, 2021; Chile, 2019; Colombia, 2019; Costa Rica, 2020; Ecuador, 2017; Honduras, 2017 and Uruguay, 2018.

In Argentina, Chile, Ecuador, Honduras and Uruguay, women's participation in secondary-level programmes associated with industry, production and technology is low, while in Colombia and Costa Rica, higher levels are observed, with the caveat that enrolment in programmes in the industrial sector only represents around 20% of total enrolment.

Regarding total enrolment in selected sectors related to science, technology, engineering and mathematics, the share of women does not exceed 30% in the metalworking sector and in the electricity and electronics sector in any of the countries (see figure III.12). According to Sevilla (2021), the high percentage of female participation in Ecuador's construction sector could be influenced by the fact that the curricula are focused on less male-dominated tasks, such as providing support for the administrative management of construction sites and projects.

Figure III.12
Latin America and the Caribbean (5 countries): share of women enrolled in selected sectors related to the field of science, technology, engineering and mathematics
(Percentages)



Source: M. Sevilla, "La educación técnico-profesional y su potencial para mejorar la trayectoria educativa y laboral de las mujeres en las áreas de ciencia, tecnología, ingeniería y matemáticas: una revisión regional", *Gender Affairs series*, No. 160 (LC/TS.2021/155), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2021; National Institute of Technological Education (INET); National Administrative Department of Statistics (DANE); Ministry of Science, Innovation, Technology and Telecommunications (MICITT); S. García, "Trayectorias de mujeres: educación técnico-profesional y trabajo en el Ecuador", *Gender Affairs series*, No. 156 (LC/TS.2019/28), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2019.

Note: The years considered are: Argentina, 2021; Chile, 2019; Costa Rica, 2020; Ecuador, 2017 and Honduras, 2017.

Gender disparities are apparent within countries depending on the regional distribution of technical and vocational education options in general, and in areas related to science, technology, engineering and mathematics in particular. In Argentina, for example, while almost 20% of the student body in the metalworking sector is made up of women, in some regions of the country this share is less than 10% (INET, 2021). Thus, it is necessary to strengthen States' commitment to promoting public policies aimed at incentivizing the closure of these gender gaps and the promotion of women in various sectors of the labour market, such as in science, technology, engineering and mathematics, in line with subnational needs and disparities.

The STEM-focused academic offerings in technical and vocational education are highly segregated by gender in terms of curricular aspects as well as organizational and cultural aspects (Sevilla, 2021), which reveal persistent barriers that function as structural challenges of unequal opportunities for women (see diagram III.1). From this standpoint, it is possible to analyse the factors that produce the barriers and obstacles that affect the educational trajectory of girls and women in technical and vocational education at the regional level, particularly in the areas of science, technology, engineering and mathematics.

Since their inception, academic offerings in technical and vocational education have been segmented based on the sexual division of labour and the unjust social organization of care, from the advent of industrialization. Technical and vocational education was, therefore, designed to prepare men for work and women for arts and crafts associated with manual labour and household chores (Sepúlveda, 2017). Based on this premise, the burden of domestic and care work and the gender socialization ingrained by the family and actors in the education system can be identified as structural challenges of gender inequality in technical and vocational education and function as barriers in women's education in technical and vocational education and in the career paths of women graduates of these programmes.

Patriarchal cultural patterns affect women's career choices in technical and vocational education and lead to their underrepresentation in science, technology, engineering and mathematics. This is largely due to stereotypes associated with differences in men's and women's bodies in terms of the physical strength required for professions in STEM-related sectors (particularly in the industrial sectors related to construction and metalworking). The main factors associated with women's underrepresentation are sociocultural and individual: the former stem from the impact of sociocultural elements regarding women's likelihood of success in their professional performance in the face of stereotypes that correlate the feminine with kindness and sensitivity and suggest that these characteristics are incompatible with occupational fields traditionally dominated by men (such as science, technology, engineering and mathematics). Individual factors refer to biological, psychological, sociocultural and contextual aspects that influence the choice of careers in these fields (Sevilla, 2021).

Linguistic and extra-linguistic practices (cultural codes) that are typically used in the field of technical and vocational education also function as a barrier. Three aspects of this dynamic are particularly noteworthy. First, the terms "women" or "gender" are practically absent from the curricula content. Second, educational offerings in technical and vocational education are communicated and promoted through visual language that associates images of men with careers that are traditionally considered masculine (those linked to the sexual division of labour of the past century), while female iconography is used to promote offerings related to subject areas that are viewed as women's exclusive domain (for example, fashion design). Lastly, the names of technical and vocational education qualifications are expressed in masculine form, for example, in Spanish, the term for technician is "*técnico*" (Bloj, 2017).

The inexorable persistence of gender stereotypes in vocational choices and educational offerings in technical and vocational education reinforces segregation. Female students' scientific and technological career aspirations are influenced by representations of gender associated with mothers and fathers in terms of activities that women cannot perform or would perform poorly (Buquet and Moreno, 2017). Several regional studies show that these gender representations and stereotypes in family structures influence individual female students' decisions to enter and remain in technical and vocational education careers in science, technology, engineering and mathematics. Studies also show that there are, on average, 2 women per 20 men enrolled in technical and vocational education at the secondary level, and that the gap is even wider at the non-university tertiary level (Sevilla, 2021).

Other studies reveal that female students who did opt for technical and vocational careers, despite all the barriers, attribute their decision to the following factors: motivation or encouragement from male relatives (fathers, uncles, brothers or boyfriends); the family's encouragement or mandate to participate in the family's productive activity, or to continue or inherit it; the expectation of early entry into the labour market; the distinguished careers of women who are viewed as role models or early signs of excellence in subjects associated with science, technology, engineering and mathematics (García, 2019).

Despite regional progress in women's access to and participation in technical and vocational education, potent discriminatory sociocultural patterns that reproduce gender inequality remain. This is evidenced by educational environments that are hostile to women in male-dominated spheres, such as discrimination against women graduates of technical and vocational education on entry into the labour market and in career transitions.

Educational models in technical and vocational education respond to gender diversity in terms of school format, the organization of time, spaces and groupings, as well as in their connection to care work performed by women. Discrimination linked to the gender stereotypes of men's physical strength and women's weakness are reflected in institutional culture and teaching and learning resources (school equipment and infrastructure), as well as in hostile or harassing classroom environments (particularly in male-dominated careers where women are underrepresented by a ratio of 2:20) that promote dropout or create a situation in which women must earn the respect of their male peers (Buquet and Moreno, 2017).

The organization of professional internships, a vital component of the educational model of technical and vocational education, also presents barriers. The scarcity of women in internships appears to be related to the scarcity of women in managerial positions or in scientific and technological positions in the fields that offer internships, where gender stereotypes and segmentation of the tasks assigned to female interns are observed, as well as resistance from companies to host female interns (García, 2019).

These training opportunities reinforce the structural challenges of gender inequality associated with the concentration of power and hierarchical relationships in male-dominated public and private spheres, and the unequal valuation of women's and men's technical capacities, since, despite equal training, treatment and opportunities are unequal. This dynamic is replicated in technical and vocational education institutions through male-dominated teaching and management roles. The regulatory frameworks operating at each level reinforce this structural challenge since the regulations governing access to posts and promotions (in teaching and managerial positions) require a technical degree and, therefore, generate a feedback loop in the technical specialties whereby the majority of students and teachers are men, which hinders effort to close the gender gap in these positions (Muñoz, 2019; Bloj, 2017).

Lastly, discrimination against women graduates of technical and vocational education in labour market entry and progression, the propagation of gaps on entry into the labour market (participation, occupation, unemployment and wages, among others), and the coordination with domestic work and care tasks, which affect both working and non-working women, constitute another structural challenge of gender inequality in technical and vocational education, as they perpetuate inequality and poverty among female graduates (Muñoz, 2019).

Since the 1990s, regional programmes aimed at increasing women's participation in technical and vocational education were launched with the objective of promoting economic autonomy and increasing employment opportunities. Examples of these were the regional programmes promoted by the Inter-American Centre for Knowledge Development in Vocational Training (CINTERFOR), namely, the Regional Programme for the Promotion of Women's Participation in Technical and Vocational Training, 1991 and the Regional Programme to Strengthen Technical and Vocational Training of Low Income Women in Latin America (FORMUJER), 1998, which included, among other elements, a scholarship for vocational training for women living in poverty. Following an evaluation of these experiences, it was recommended that the gender perspective should be more deeply embedded in training programmes for trainers and instructors in this area of knowledge in the region. The expectation was that this recommendation would have a positive impact on training processes in technical and vocational education institutions in terms of diversity in the pedagogical materials and methodologies.

It is worth highlighting experiences with this initiative in several countries in the region, where gender policies and programmes have been launched in technical and vocational education, generally as a component of national equality plans (see section E). Various initiatives have been promoted to reduce gender gaps and eradicate stereotypes in this area: the Ministry of Education of Ecuador prepared a *Guide for mainstreaming the gender perspective in the operational management of technical education in Ecuador*; the National Institute of Technological Education (INET) of Argentina prepared an *Orientation Guide for the design of professionalizing practices with a gender perspective*, and carries out follow-up studies of students and graduates of technical and vocational education, including a National Survey of Student Trajectories (ENTrE); in Chile, studies have also been carried out on the educational and employment trajectories of students in technical and vocational secondary education.

These policies must be strengthened and expanded, and information systems on the educational and employment trajectories of students and graduates must be implemented to eliminate gender segregation in the workplace and promote women's entry into high-productivity sectors, while reinforcing technical and vocational education strategies, particularly through proposals that address the areas of science, technology, engineering and mathematics. Given that technical and vocational education is a key area for launching women into the world of work in these sectors and can enhance economic autonomy, it is essential to mainstream the gender perspective into training systems in this type of education to enhance academic and employment trajectories in traditionally male-dominated domains and to overcome the gaps in access to jobs and promotions in the areas of science, technology, engineering and mathematics, as well as in the dynamic sectors of the economy.

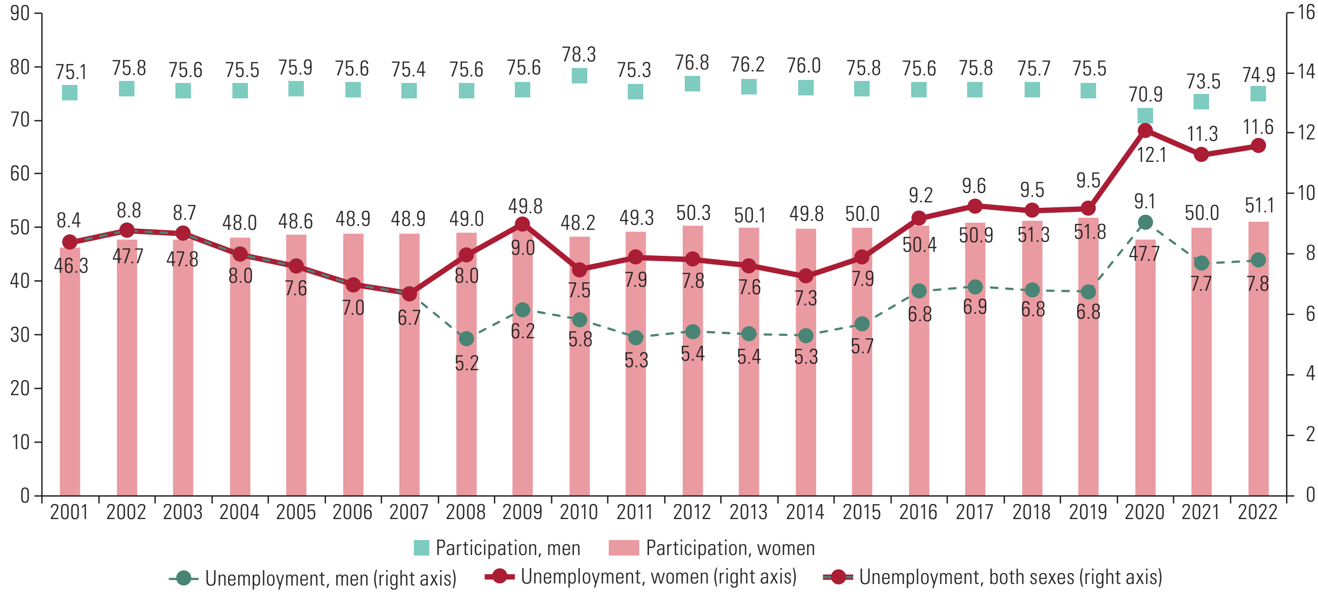
D. Women's labour market insertion and career paths: progress in access to education does not translate into equal employment conditions

Gender inequalities that originate in primary and secondary education influence the choice of fields of study at the tertiary level, as well as women's subsequent labour market insertion and career path. This process is illustrated by marked occupational gender segregation, where women are often concentrated in sectors associated with more precarious working conditions and low wages, as well as in sectors related to care, such as health and teaching. The pandemic's impact on the labour market and women's overwhelming exit from paid employment brought to light the structural challenges of gender inequality and, in particular, the sexual division of labour and the unjust social organization of care, which fall disproportionately on women. The areas of science, technology, engineering and mathematics, and technology in particular, offer an excellent opportunity to achieve sustainable development and gender equality on the path towards transformative recovery with equality, as outlined in the Montevideo Strategy for the Implementation of the Regional Gender Agenda within the Sustainable Development Framework 2030. However, it is imperative that public policy responses address the structural challenges of gender inequality.

The gender gaps that begin to emerge in primary and secondary education are clearly manifested in the choice of fields of study at the tertiary level and, later on, in women's labour market insertion and trajectories. The persistence of the structural challenges of gender inequality are a key factor in the evolution of these trajectories, and their effects were already evident before the pandemic in the overrepresentation of women in informal jobs and in sectors characterized by lower productivity, in wage gaps and, in general, in the lower participation of women in the labour market.

The pandemic and its impact interrupted the slow progress made in the labour market in recent decades. In 2019, the labour market participation rate for women in Latin America was 51.8%, compared with 75.5% for men, and the unemployment rate for women was 9.5%, 2.7 percentage points higher than that of men (6.8%) (see figure III.13). The pandemic triggered a sharp exit by women from the labour market: in 2020, the female participation rate fell to 47.7%, representing an 18-year setback in women's labour participation. While this figure is projected to reach 51.1% in 2022, this still means that one in two women does not fully participate in the labour market, which represents a major obstacle to progress towards economic autonomy (ECLAC, 2022c and 2022e).

Figure III.13
Latin America and the Caribbean (24 countries):[a] trend in labour market participation and unemployment, by sex, 2001–2022
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), *Economic Survey of Latin America and the Caribbean, 2022* (LC/PUB.2022/9-P), Santiago, 2022; on the basis of official country figures.
Note: Projections for 2022 are included using data from the *Economic Survey of Latin America and the Caribbean*, 2022.
[a] Argentina, Bahamas, Barbados, Belize, Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Plurinational State of Bolivia, Trinidad and Tobago and Uruguay. The figures for 2019 do not include the Bolivarian Republic of Venezuela.

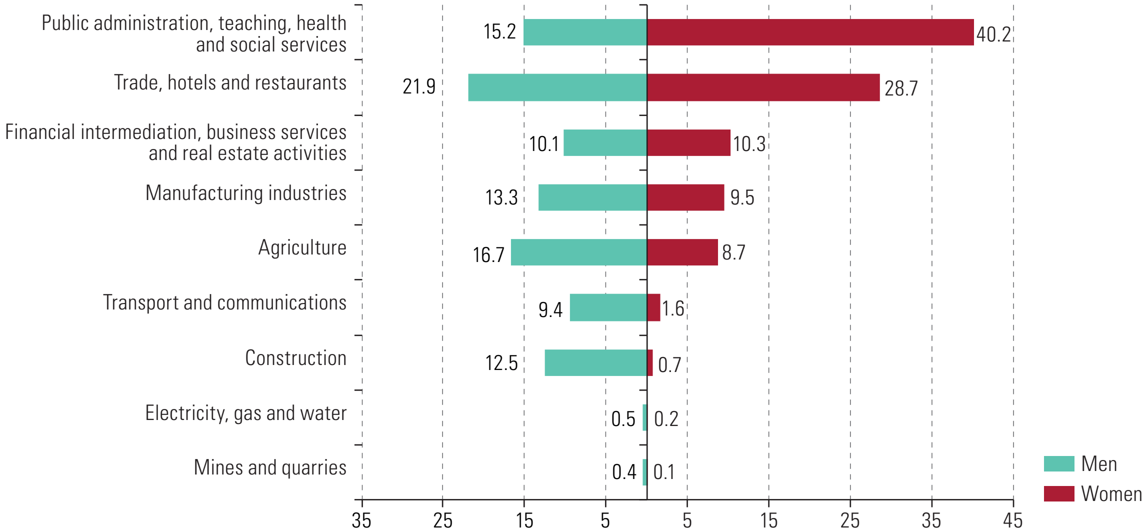
Women's mass exodus from the labour market is associated with two phenomena in particular: marked occupational gender segregation, as several of the productive sectors most affected by the pandemic have been precisely those in which women are heavily overrepresented, and the overload of unpaid domestic and care work, which falls disproportionately on women and was exacerbated by lockdowns, the closure of educational establishments and other measures aimed at coping with the health crisis.

Occupational segregation in the region reveals a high concentration of women in trade sectors and care-related sectors (education, health, social assistance and domestic employment) (Vaca-Trigo, 2019) (see figure III.14). These sectors are associated with a high incidence of part-time work and relatively low wages (Vaca-Trigo, 2019).

The pandemic had a major impact on tourism, trade, manufacturing and domestic services as these sectors suffered the greatest losses in terms of production volume and employment (Bidegain, Scuro and Vaca Trigo, 2020). Moreover, these sectors account for about 56.9% of women's employment and 40.6% of men's employment in Latin America, and 54.3% of women's employment and 38.7% of men's employment in the Caribbean (ECLAC, 2021b). In the largely female-dominated sectors of health and education, workers had to contend with intensified working hours, new demands and high exposure to contagion.

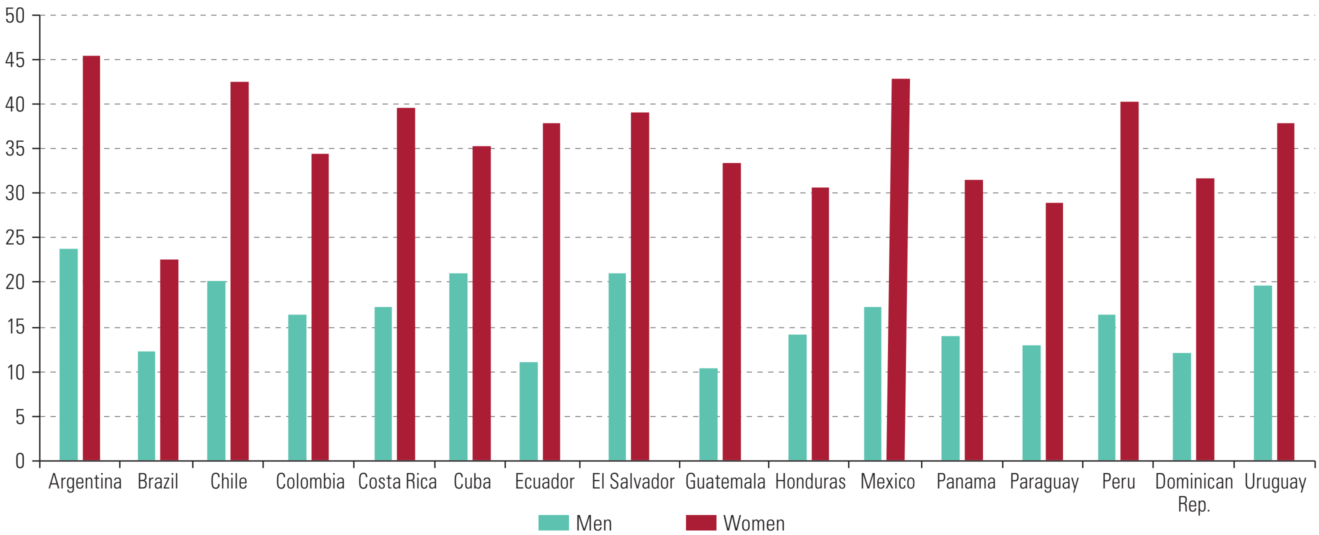
At the same time, during the pandemic, women faced an overwhelming increase in their workload, to the detriment of their physical and mental health, their work assignments, their personal spaces and their overall autonomy (ECLAC, 2021b). This situation is closely tied to the sexual division of labour and the unfair social organization of care, which represents one of the most persistent structural challenges of gender inequality in the region and leads women to assume a greater burden of work and responsibility in this area. The systemic role of unpaid care work is invisible and takes a heavy toll on women's autonomy, especially their economic autonomy. Data from time-use surveys in the region provide a very clear picture of this situation. Every week, women in the region spend double or triple the time spent by men on unpaid domestic and care work (see figure III.15).

Figure III.14
Latin America and the Caribbean (10 countries):[a] distribution of the employed population by sector of economic activity, by sex, around 2021
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Household Survey Data Bank (BADEHOG).
[a] Weighted average of the following countries: Argentina, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, Panama, Peru, Paraguay and Uruguay

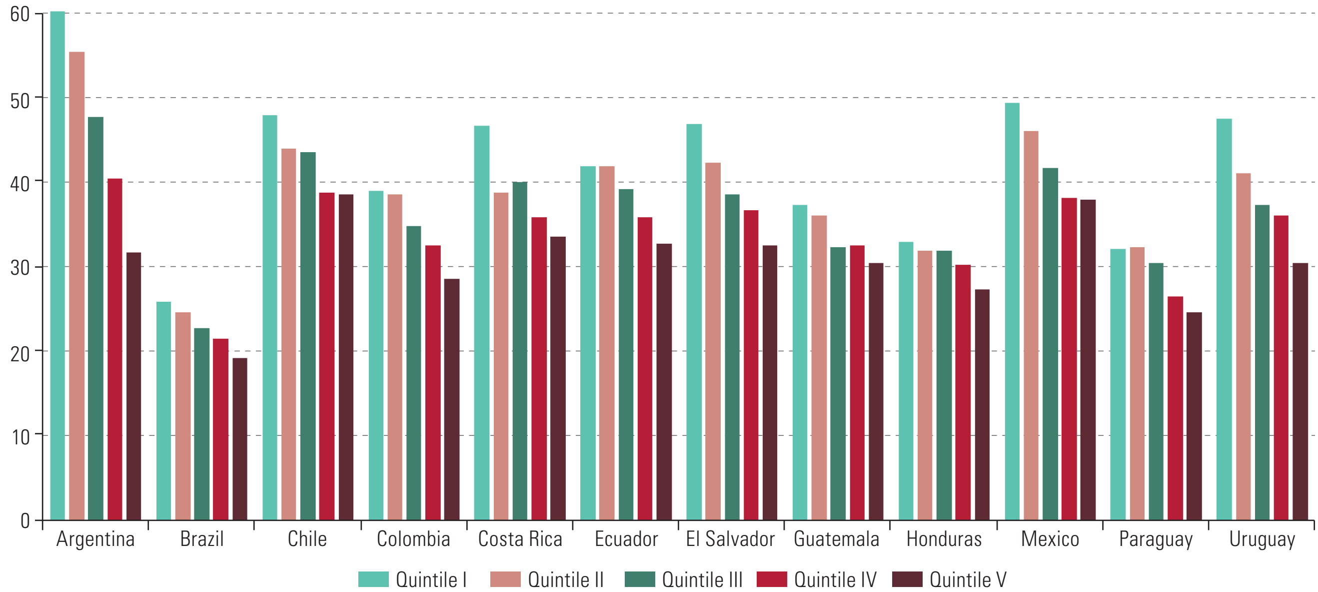
Figure III.15
Latin America (16 countries): average time per week spent on unpaid work by the population aged 15 and over, by sex and country
(Number of hours)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en.
Note: The years considered are: Argentina, 2013; Brazil, 2019; Chile, 2015; Colombia, 2017; Costa Rica, 2017; Cuba, 2016; the Dominican Republic, 2016; Ecuador, 2012; El Salvador, 2017; Guatemala, 2019; Honduras, 2009; Mexico, 2019; Panama, 2011; Paraguay, 2016; Peru, 2010 and Uruguay, 2013.

In addition to patriarchal cultural patterns, socioeconomic stratification in the region and the lack of quality public services leaves lower-income households more vulnerable to this situation as they find it more difficult to organize care and are unable to buy goods and services on the market that would help reduce the burden of domestic and care work. On average, women in the top quintile spend up to 40% of their working hours on domestic chores, and the early assignment of these tasks to girls widens the gaps by making it more difficult for them to access education and better jobs (see figure III.16) (ECLAC, 2019a).

Figure III.16
Latin America and the Caribbean (12 countries): average time weekly spent by women on unpaid work, by quintile
(Number of hours)

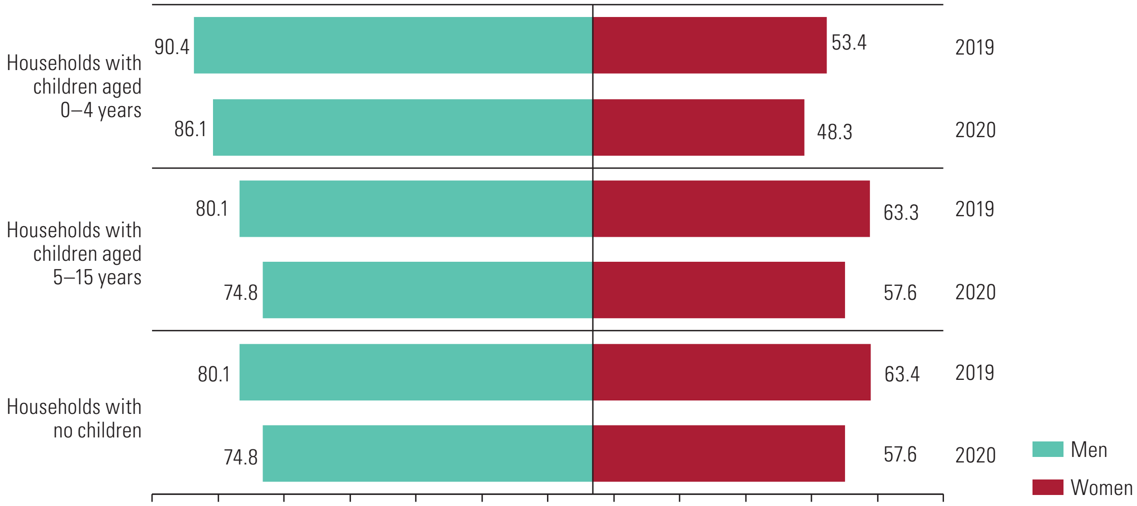


Source: Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en.
Note: The years considered are: Argentina, 2013; Brazil, 2019; Chile, 2015; Colombia, 2017; Costa Rica, 2017; Ecuador, 2012; El Salvador, 2017; Guatemala, 2019; Honduras, 2009; Mexico, 2019; Paraguay, 2016 and Uruguay, 2013.

The COVID 19 pandemic highlighted the centrality of domestic and care work, which increased for both men and women. It also demonstrated the unsustainability of the current social organization of care as women had to assume the lion's share of care work in households. A study by the Americas and the Caribbean Regional Office of the United Nations Entity for Gender Equality and the Empowerment of Women (UN-Women, 2021) conducted in Chile, Colombia and Mexico in the second half of 2020 found that a higher percentage of women than men were performing a larger share of teaching and training for children, with an average gender gap of 12.3 percentage points in the three countries. In addition, time spent feeding, cleaning and playing with children increased more among women than men, with a difference of 8.4 percentage points (UN-Women, 2021; ECLAC, 2022c).

The closure of education and care facilities had a greater impact on women and households with children aged 0–4 years, where the employment rate fell by 11.8%. Women aged 20-59 in these households had the lowest employment rates before the pandemic (53.4%) (see figure III.17).

Figure III.17
Latin America (13 countries):[a] employment rate and change in employment rate of the population aged 20–59 years in households with and without children aged 0–15 years, by sex, 2019 and 2020
(Percentages)



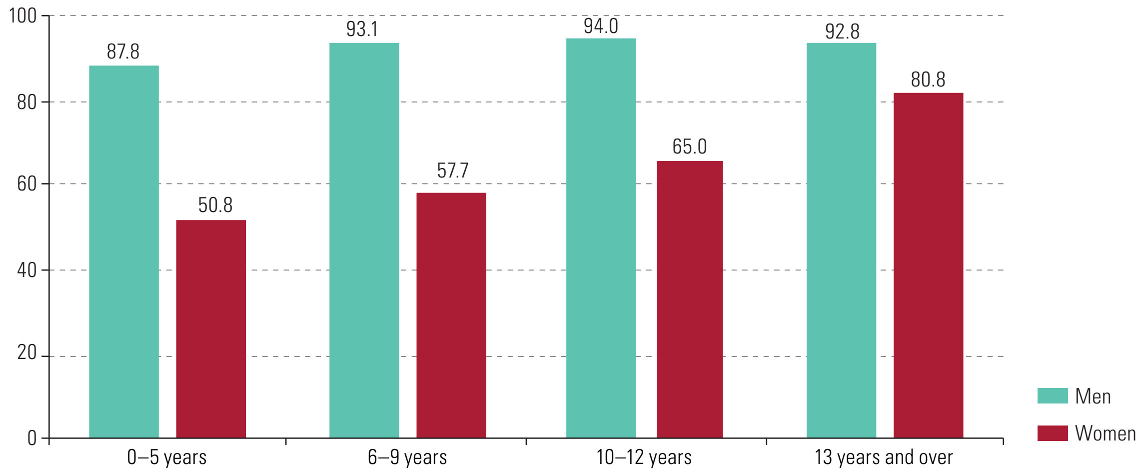
Source: Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en
[a] Argentina, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Mexico, Paraguay, Peru, the Plurinational State of Bolivia and Uruguay.

Education has a major impact on women's entry into the labour market in environments characterized by pronounced occupational gender segregation and segmentation. There is a gap of 37 percentage points in labour force participation between men and women with 5 years of education or less, but this gap narrows to 12 points for men and women with over 13 years of education (see figure III.18). Moreover, the gap between those with more years of education has diminished over time, from 15.3 percentage points in 2000 to a low of 11.5 percentage points in 2019, which coincides with women's higher levels of academic achievement. While educational attainment attracts higher incomes, it is not sufficient to ensure equality. In all cases, and when combined with other factors, gender proves to be a crosscutting factor in inequality, which deepens in an intersectional context. In all population groups, men's income is consistently higher than women's, and disaggregation of income distribution by sex and ethnic-racial status reveals that Indigenous women earn almost 40% less than their peers of African descent when they have both completed 13 or more years of education, and more than 50% less than non-Indigenous women or women of African descent with the same educational level (see figure III.19) (ECLAC, 2019a).

In this context, digital technologies will affect employment and produce profound transformations in many activities based on the growing cognitive capabilities of robots and machines (ECLAC, 2018; ECLAC, 2019b). New technologies, therefore, threaten employment prospects in manufacturing sectors and service activities, where the majority of women are employed. This scenario could lead to a widening of gender gaps in labour market insertion and working conditions in general (ECLAC, 2019b).

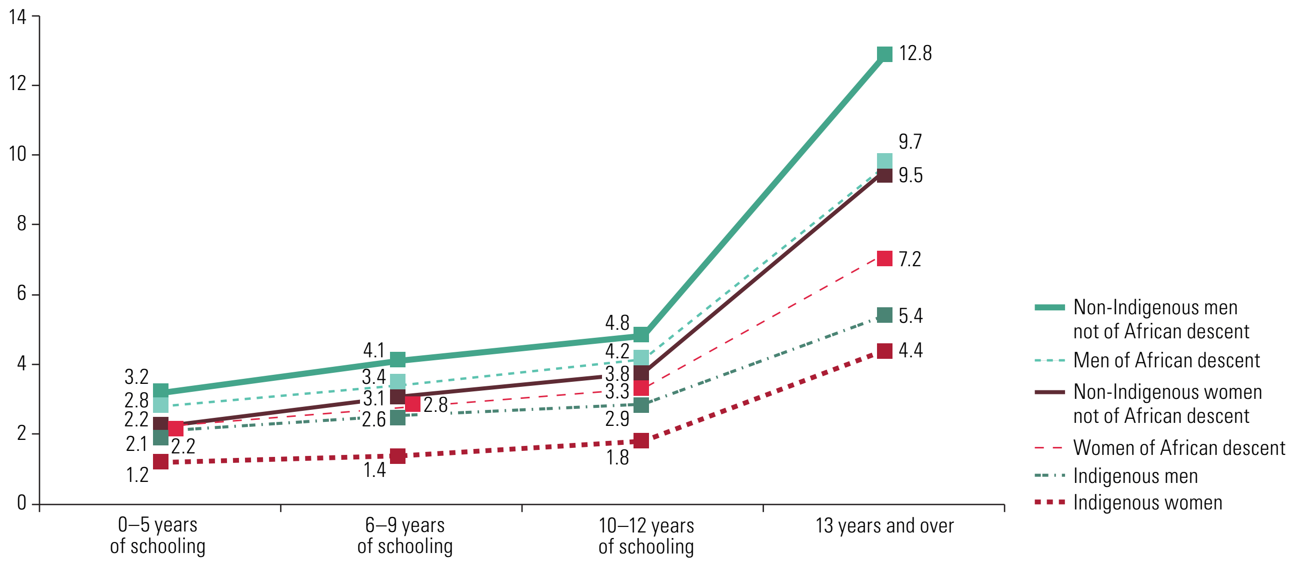
The digital transformation requires that workers acquire more skills and different capabilities to gain access to new occupations. In the various sectors, professionals with skills in science, technology (particularly ICT), engineering and mathematics are needed. These fields are linked to the occupations or professions of the future (ECLAC, 2022a), and the absence of people with the necessary skills is one of the main constraints hindering expansion (Bércovich and Muñoz, 2022). The low proportion of women trained in science, technology, engineering and mathematics, as well as the lack of digital skills, are the main obstacles to harnessing the potential of the digital economy and taking advantage of opportunities to enter the most dynamic sectors, which could translate into access to new and better jobs resulting from the transformation, diversification and creation of new economic activities (Vaca-Trigo and Valenzuela, 2022).

Figure III.18
Latin America and the Caribbean (18 countries):[a] labour participation rate of the population aged 25–59 years, by sex and years of education, around 2020
(Percentages)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/index.html?lang=en
[a] Argentina, the Bolivarian Republic of Venezuela, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, the Plurinational State of Bolivia and Uruguay.

Figure III.19
Latin America and the Caribbean (6 countries):[a] hourly income of the employed population aged 15 years or older, by sex, education level and ethnicity or race, around 2020
(International dollars)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Household Survey Data Bank (BADEHOG); World Bank, "PPP conversion factor, GDP (LCU per international $)" [online] https://data.worldbank.org/indicator/PA.NUS.PPP.
Note: The calculations were made using the World Bank indicator, PPP conversion factor
[a] Weighted averages for the following countries: Brazil, Colombia, Ecuador, Panama, Peru and Uruguay. The data for Panama are for 2019.

Men currently occupy most of the management and communications jobs in ICT and in science, technology, engineering and mathematics, while women are more likely to work in routine occupations that are vulnerable to the threat posed by automation (Bustelo and others, 2022; Bércovich and Muñoz, 2022). It is worth noting that people working in science, technology, engineering and mathematics earn two thirds more than those employed in other fields (Bello, 2020).

The structural challenges of gender inequality limit women's ability to integrate into and remain in occupations in science, technology, engineering, and mathematics. Gender stereotypes produce educational environments that are hostile to women, which is manifested in their educational trajectories as well as in the transition to the initial stages of their careers and throughout advancement to higher-level positions (ECLAC, 2019a; López-Bassols and others, 2018). In countries such as Chile and Mexico, women's participation in occupations linked to science, technology, engineering and mathematics does not exceed 40%, including in health, where women are overrepresented (López-Bassols and others, 2018). Several gender gaps are clearly visible in women's employment in science and technology-related industries (including R&D-intensive industries as well as the ICT sector). In 2018, in Chile and Colombia, women held less than one third of jobs in these industries (López-Bassols and others, 2018). Globally, women occupy less than 25% of all jobs in the digital sector and in developing countries, men are 2.7 times more likely than women to work in the digital sector (Bércovich and Muñoz, 2022). Moreover, only 6% of software and mobile application designers are women (ITU, 2016).

Not only do women face obstacles in accessing jobs in STEM fields, but when they do gain access, there are significant differences in the level at which they are employed compared to men. In Mexico, women's representation in high- and mid-level positions in ICT occupations is similar to that of men (around 40% or 45% of the total), while in science and engineering, they hold only 17% of high-level positions and 6% of mid-level positions (López-Bassols and others, 2018).11 In the digital sector, women are less likely to occupy high-level positions and usually work in administrative or less skilled roles (Bércovich and Muñoz, 2022). When women do manage to participate in these sectors, they face significant wage gaps relative to men, which are even larger than the average gap for the rest of the workforce (UNESCO, 2019; UNESCO/EQUALS Skills Coalition, 2019). In Chile, the wage gap is even more pronounced in occupations in science, technology, engineering and mathematics, as men's average salaries are approximately 50% higher than women's; if all occupations are considered as a whole, the difference is 46% (López-Bassols and others, 2018).

Furthermore, women are absent or underrepresented in the design processes of the technologies that are shaping our future way of life, which is a key component given the multiplier effect of these resources. Women's absence or underrepresentation in designing digital technologies, in addition to representing considerable under-utilization of talent and potential for greater diversity (Bércovich and Muñoz, 2022), carries the risk of perpetuating gender biases considering the impact of digital processes on everyday life (particularly artificial intelligence, such as database use and operation)

E. Educational and employment measures to make progress towards women's economic autonomy

Public policy responses in Latin America and the Caribbean demonstrate increased recognition of the need to promote women's participation in educational and employment opportunities related to science, technology, engineering and mathematics. This recognition has been reflected in two complementary areas in particular: the promotion of this field in gender equality plans in several countries in the region and the development of plans specifically focused on the intersection between gender and science, technology, engineering and mathematics, as has been done in Chile, Costa Rica and Argentina. These policies highlight a number of key issues, such as the digital gender divide and the key role of the education sector in fostering vocations in science, technology, engineering and mathematics. They are also a crucial step in advancing at the national level the priorities in the field that have been identified in international policy frameworks, such as the 2030 Agenda for Sustainable Development and the Beijing Platform for Action.

[11] While high-level occupations require knowledge and skills that are acquired in tertiary education (ISCED level 6 and above), mid-level jobs involve technical tasks that do not necessarily require more than short-cycle tertiary education (ISCED level 5).

In order to make progress towards women's economic autonomy and promote their entry into the dynamic sectors of the economy, it is imperative to address the obstacles and biases that exist in the areas of education and paid work in light of the structural challenges of gender inequality that shape women's educational and employment trajectories.[12] The public sector can play a key role in regulating the new forms of work brought about by technological change and in promoting multisectoral policies that enable these issues to be addressed in an integrated manner from a gender perspective.

In this vein, progress has been made both regionally and internationally in establishing agreements, regulatory frameworks and science and technology policies that aim to reduce gender gaps and biases in the production of scientific and technological knowledge.

At the international level, gender issues and their intersection with science, technology, engineering and mathematics have been addressed in several arenas, with some of the most important initial milestones occurring in 1995 at the United Nations Fourth World Conference on Women. At that time, a working group on gender was formed within the United Nations Conference on Science and Technology for Development, which produced a report on the subject and proposed recommendations that were incorporated into the Fourth Conference and the Beijing Declaration and Platform for Action. At this conference, strategic objective B.3 to "improve women's access to vocational training, science and technology, and continuing education" was established. Similarly, measures and initiatives aimed at implementing the Beijing Declaration and Platform for Action included promoting girls' education at the national level in science, mathematics, new technologies, including information technologies, and technical subjects, and promoting women's entry into high-growth, high-wage jobs (action item 82.i) (United Nations, 1995).

According to a review conducted by the United Nations, at the 25-year mark following the Beijing Platform for Action, 60% of States reported taking action to solve the underrepresentation of girls and women in STEM fields, such as developing digital skills programmes and initiatives aimed at promoting access to training opportunities and counteracting stereotypes, among other actions (United Nations, 2019, cited in Muñoz, 2021).

Another important milestone in this area was reached in 2015 with the adoption of the 2030 Agenda for Sustainable Development, in which Goal 4 on inclusive, equitable and quality education proposes targets 4.3 and 4.4, which respectively state: "by 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university" and "by 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship." Target 4.5 further emphasizes the intent to eliminate gender disparities in education and ensure equal access to all levels of education and vocational training. Complementing these targets, the targets under Goal 5, aimed specifically at achieving gender equality, highlight the need to recognize and respect the value of unpaid domestic and care work by expanding the provision of public services and promoting co-responsibility (target 5.4), and the importance of ensuring women's full and effective participation at all levels of decision-making in political, economic and public life (United Nations, 2015). Subsequently, in 2017, the Committee on the Elimination of Discrimination against Women issued general recommendation No. 36 (2017) on the right of girls and women to education. This recommendation merits particular attention because it expands on Goal 4 and offers concrete recommendations pertaining to the field of science, technology, engineering and mathematics, including the following: increase women's

[12] ECLAC has identified eight dynamic sectors of the economy in which investment is needed to advance the three pillars of sustainable development: sustainable mobility, digital transformation, the health-care manufacturing industry, the care economy, renewable energy, the bioeconomy, the circular economy and sustainable tourism (ECLAC, 2020b).

and girls' participation in STEM programmes, at all levels of education, by providing scholarships and other incentives, for example, by adopting affirmative measures;[13] adapting the options and content of the educational offerings, particularly at the higher levels, to increase their participation in scientific, technical and managerial disciplines and facilitate access to male-dominated professions and jobs;[14] and recognize the importance of promoting education in ICT and science as necessary tools to enable women and girls to contribute fully to all spheres of public life (Committee on the Elimination of Discrimination against Women, 2017; Muñoz, 2021).[15]

From a regional perspective, it is important to highlight how gender and science, technology, engineering and mathematics are addressed in the Regional Gender Agenda, and in particular the Brasilia Consensus (2010) and the Santo Domingo Consensus (2013), the Montevideo Strategy (2016) and, more recently, the Santiago Commitment (2020). The Santo Domingo Consensus discusses the link between gender and science, technology, engineering and mathematics in greater depth, albeit with greater emphasis on the technological sphere (Muñoz, 2021). This set of agreements establishes as a priority that public policies in countries in Latin America and the Caribbean should aim to cultivate the vocational interest of girls, young women and women in science, technology, engineering and mathematics; adopt affirmative measures to promote women's access to and retention in these fields; foster equal participation and the elimination of sexism and gender stereotypes in the education system and in teachers' perceptions of girls' and boys' performance in these fields; promote gender mainstreaming and confront the issue of women's employment in science, technology, engineering and mathematics (see table III.3).

Table III.3

Recommendations on gender and science, technology, engineering and mathematics in the Regional Gender Agenda

Access: Cultivate vocational interest	• Promote women's access to science, technology and innovation, fostering interest among girls and young women (Brasilia Consensus, 2010). • Develop a new technological, scientific and digital culture geared towards girls and women that brings them closer to new technologies: promote and strengthen scientific and technological vocations (Santo Domingo Consensus, 2013).
Access and retention: Affirmative measures	• Adopt public policies that include affirmative measures to promote the reduction of barriers to access and enhance understanding of the use of information and communication technologies (Santo Domingo Consensus, 2013). • Promote the inclusion of women and girls from diverse backgrounds, origins and environments in vocational training in science, technology, engineering and mathematics (Santo Domingo Consensus, 2013). • Foster equal participation (Montevideo Strategy, 2016). • Promote public policies that include affirmative measures to enable girls and young women to participate, remain and complete their education in the areas of science, engineering, mathematics and technology (Santiago Commitment, 2020).
Mainstreaming	Science and technology • Include the gender perspective as a cross-cutting pillar of public policies in information and communications technologies, ensuring full access to and use of these technologies by women and girls (Santo Domingo Consensus, 2013). • Design programmes specifically aimed at closing gender gaps in access, use and skills in science, technology and innovation (Montevideo Strategy, 2016). Education • Provide timely information from the educational system on science and technology training opportunities (Santo Domingo Consensus, 2013) • Adopt legislative and educational measures to eradicate sexist, stereotypical, discriminatory and racist content in media, software and electronic games (Santo Domingo Consensus, 2013).
Employment in science, technology, engineering and mathematics	• Encourage women's labour participation in the fields of science, technology, engineering and mathematics, eliminating occupational segregation and ensuring decent work and wage equality, in particular in emerging sectors, including the digital economy (Santiago Commitment, 2020)

Source: C. Muñoz, "Políticas públicas para la igualdad de género en ciencia, tecnología, ingeniería y matemáticas (CTIM): desafíos para la autonomía económica de las mujeres y la recuperación transformadora en América Latina", *Gender Affairs series*, No. 161 (LC/TS.2021/158), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), 2021; Economic Commission for Latin America and the Caribbean (ECLAC), 40 years of the Regional Gender Agenda (LC/G.2682/Rev.1), Santiago, 2017; *Montevideo Strategy for Implementation of the Regional Gender Agenda within the Sustainable Development Framework by 2030* (LC/CRM.13/5), Santiago, 2017; *Santiago Commitment*, Santiago, 2020.

13 See paragraph 63.d of Committee on the Elimination of Discrimination against Women (2017).

14 See paragraph 81.b of Committee on the Elimination of Discrimination against Women (2017).

15 See paragraphs 81.d and 81.f of Committee on the Elimination of Discrimination against Women (2017).

1. Public policies at the national level: equality plans and specific policies at the intersection of gender and science and technology

There has been growing recognition in the region of the need to promote women's participation in the areas of science, technology, engineering and mathematics. This recognition has been reflected in some areas of public policy, most notably in the inclusion of science, technology, engineering and mathematics in gender equality plans and in the development of specific policies at the intersection of gender and science, technology, engineering and mathematics. These policies have been implemented relatively recently and are evident in three countries in the region (Argentina, Chile and Costa Rica). This section illustrates some relevant aspects of each of these spheres of action.

(a) Equality plans

Equality plans are instruments used in most countries in Latin America and the Caribbean and driven by the machineries for the advancement of women, which aim to guide the action of the State and plan and carry out joint work between the different sectors, thus enhancing the institutionalization and mainstreaming of gender (ECLAC, 2017). In this way, equality plans are technical and political instruments that are intended to open up avenues for institutionalizing gender by identifying priority areas in this field to demonstrate the State's commitment to gender equality and establish a pillar around which other policies should function (Muñoz, 2021).

In recent years, several countries in Latin America and the Caribbean have renewed, approved and implemented equality plans that place greater emphasis on gender equality and in the field of science, technology, engineering and mathematics. The equality plans developed in Argentina, Chile, Costa Rica, the Dominican Republic, Mexico, Peru and Mexico are particularly noteworthy. The following are some key aspects of these equality plans in science, technology, engineering and mathematics:

- Argentina. The Plan Nacional de Igualdad en la Diversidad 2021-2023 identifies two aspects to science, technology and innovation that should be improved: the participation of women and LGBTI+ persons in the national scientific and technological system, and the digital gender divide, which results from gender-based disparities in access to and use of ICT. Therefore, the strategic objective to contribute to reducing this digital and technological divide has been proposed to ensure equal conditions and opportunities.
- Chile. The Cuarto Plan Nacional de Igualdad entre Mujeres y Hombres 2018-2030 acknowledges the progress made in science and technology represented by the updating of the institutional gender policy of the National Commission for Scientific and Technological Research (CONICYT), which establishes three lines of work: promoting and reinforcing gender equality in the development of scientific and technological activity; enhancing the visibility of scientific and technological development in the country from the perspective of gender equality and establishing a culture of gender equity and diversity in the management of CONICYT's human and financial resources.
- Costa Rica. The Política Nacional para la Igualdad Efectiva entre Mujeres y Hombres en Costa Rica 2018-2030 recognizes the development of the recently updated Plan Nacional de Ciencia, Tecnología e Innovación (2022-2027), which includes gender equity and equality as one of the guiding principles that delineate the parameters for activities aimed at meeting its objectives. This stems from

the recognition that statistics show significant gaps in the presence of women in scientific and technological careers, as well as employment gaps in terms of recruitment, appointment to managerial positions and salaries. The Policy reflects an awareness of women's participation in scientific and technological fields and in innovation as being of vital importance to disseminate the positive contributions of these fields and reach the critical mass needed in the country. To this end, there is a clear need to foster vocations in science, technology, engineering and mathematics in the aerospace sector and to update university curricula and promote vocations in electronic, electrical, mechanical and electromechanical engineering, materials engineering, computer engineering and computer sciences, and civil engineering and industrial design, to match the supply and demand of the skills and competences needed in the aerospace sector. It also affirms that there is a need to close the gender gaps in these areas. The goal is to increase the number of STEM graduates through public intervention aimed at closing the gender gap in science, technology, engineering and mathematics. It also aims to promote women's participation in research, development and innovation processes by providing incentives to support R&D projects led by women.

- Mexico. The National Programme for Equality between Women and Men (PROIGUALDAD) 2020-2024 highlights the promotion of women's economic autonomy to close historical inequality gaps as a priority objective. Priority strategies and specific actions have been established for this purpose, some of which are related to the fields of science, technology, engineering and mathematics. These include the need to promote actions that encourage the retention and promotion of women in the energy, technology, engineering, communications and transportation sectors, to facilitate women's entry into the labour market, against a backdrop of equality, non-discrimination, and decent and dignified work.

- Peru. The National Gender Equality Policy (PNIG), approved in 2019 under the Ministry of Women and Vulnerable Populations, identifies the problem of inequality in access to and control and use of ICTs and highlights the existence of a digital divide in their use as well as the persistence of structural gender inequalities impeding their access and utilization. In order to address this problem, the Policy establishes priority objective 4, which points to the need to increase women's participation in male-dominated careers and to make progress towards guaranteeing equal access, retention and completion in different areas of the education system for women and men (Ministry of Women and Vulnerable Populations, 2019; cited in Muñoz, 2021).

- The Dominican Republic. The National Gender Equality and Equity Plan 2020-2030 (PLANEG III) reflects recognition of the problem of women's underrepresentation in ICT-related fields, including careers in science, technology, engineering and mathematics, as well as in labour market insertion as a result of the absence of public policies in the education system and universities aimed at driving actions that promote the inclusion and integration of Dominican women in these careers. The Plan outlines commitments geared towards incorporating gender equality into the new policy to encourage more women to pursue careers in science and technology and increase their labour participation in the area of science and technology. Incorporating the gender equality perspective into the design, implementation and evaluation of plans, programmes and projects subsumed under the public policies targeting digital transformation, science and technology has been established as a priority to ensure the development of concrete objectives, actions and goals that can generate socially appropriate and safe technologies to eliminate gender inequalities in access to and use of ICTs.

(b) Policies focused specifically on gender, science and technology: Argentina, Chile and Costa Rica

In recent years, Argentina, Chile and Costa Rica have developed specific policies on gender and science and technology with an intersectoral focus (Muñoz, 2021). It is worth noting that in these countries, the multisectoral and intersectoral participation of different ministries and agencies contributes to the development of these policies. Although this is a recent practice, strengthening efforts in this area can prove promising.

In this regard, there are institutional forerunners in Costa Rica —the National Institute for Women (INAMU) and the National Policy on Gender Equality and Equity (PIEG) 2007-2017)— which laid the foundation for the formulation of the National Policy for Effective Equality between Women and Men in Costa Rica 2018–2030, in accordance with the agreements concluded under the Montevideo Strategy.[16] The Policy states that effort should be made to ensure that more women have access to ICTs and the skills required to use them and work with open data in order to perform educational, employment, political and productive activities in all regions and areas. Moreover, emphasis is placed on ensuring that more women have access to both public and private technical, technological and scientific education and to cutting-edge research for sustainable development (Muñoz, 2021).

Against this backdrop, the National Policy for Equality between Women and Men in Training, Employment and the Enjoyment of the Products of Science, Technology, Telecommunications and Innovation 2018-2027 was approved in 2018. This initiative, promoted by the Ministry of Science, Innovation, Technology and Telecommunications (MICITT), aims to promote equal participation of women and men in terms of attracting them to the different fields of science, technology and innovation and their retention, training, skills development, quality employment and research therein, so that all can benefit from scientific and technological progress (MICITT, 2018, p. 19).

The main intervention areas outlined in this Policy are: attracting women to science, technology and innovation; training and retaining women in careers in science, technology and innovation; promoting women's research and employment in science, technology and innovation; fostering social ownership of science with a gender perspective (through support for scientific and technological projects and research shaped by this perspective), and creating a monitoring and evaluation system coordinated by the bodies established to enable implementation of the Policy.

In the case of Chile, there is a strong precedent of gender mainstreaming in science, technology, engineering and mathematics. In addition to the above-mentioned Fourth National Plan for Equality between Women and Men 2018-2030, there are two specific plans in the education sector: the Education Plan for Equality between Men and Women and the Action Plan for Gender Equity and Equality in Technical Vocational Training and the Inclusion of Other Socially Vulnerable Groups. Three lines of action of the work plan for gender-equitable education are being implemented through the Inclusion and Participation Unit under the Ministry of Education:

(i) Quality without bias: a technical advisory council on gender and education, a working group for gender equity in technical and vocational secondary education, teacher training to eliminate gender bias and stereotypes in classroom practices and a system of gender indicators for Chile's higher education institutions.

16 The segregation observed in careers at different education levels is among the challenges mentioned in the Policy. In technical colleges, there are 94.2 women for every 100 men, and these are mainly concentrated in the service areas, where there are 156 women for every 100 men. At the university level, in 2015 most of the women graduates were in areas such as education, health sciences and social sciences, while there was a lower percentage of women than men in areas such as basic sciences or engineering. In addition, of the total number of graduates in traditionally male-dominated careers, only 30.9% are women.

(ii) More opportunities: the STEM Women programme and scholarship for women pursuing scientific and technological vocations, support for secondary school students by female students in science, technology, engineering and mathematics careers to familiarize them with scientific and technological subjects, the UNESCO STEM and Gender Advancement (SAGA) project to survey gender indicators and coordinate networks that promote girls' and women's entry into the areas of science, technology, engineering and mathematics in the education system.

(iii) Non-violence: the eradication of gender-based violence in all its forms in kindergarten, secondary school and higher education, the signature of a commitment to gender equity in the governing bodies of higher education institutions (universities, professional institutes and technical training centres), a technical assistance plan for higher education institutions, and examination of strategies to combat discrimination, harassment and sexual abuse.

In this vein, the National Policy on Gender Equality in Science, Technology, Knowledge and Innovation was approved in 2021, and its action plan "50/50 by 2030" was also developed to establish that year as an inflection point and create true equality between men and women in the science, technology, knowledge and innovation.

A report published by the Ministry of Science, Technology, Knowledge and Innovation (2021) in 2020 noted lower participation of women as they progressed through higher education degree levels (from undergraduate to PhD), especially in the areas of science, technology, engineering and mathematics; in careers related to science and engineering, only 28% of those enrolled were women. According to the Asociación Chilena de Empresas de Tecnologías de Información (ACTI), female participation in ICT-related fields stands at only 5%.

The following four objectives are outlined in the afore-mentioned Policy: (i) inclusive, protected childhood experiences, empowered with future-ready skills; (ii) inclusive, transformative and accountable science, technology, knowledge and innovation systems;[17] (iii) a State committed to data, tools and policies to achieve gender equality in science, technology, knowledge and innovation; and (iv) science, technology, knowledge and innovation to address the impacts of the gender gap. The action plan calls for the creation of a scientific research programme for the youngest children, a budget to develop plans to close gender gaps in research in universities through a competitive fund and a leadership programme for women in academia.

In addition, initiatives such as the Plan+ Mujeres en Telecomunicaciones (involving local telecommunications companies) have been implemented to promote women's participation in the sector and to make progress towards closing the digital gender divide (in collaboration with the Ministry of Women and Gender Equity). The Regional Alliance for the Digitalization of Women in Latin America and the Caribbean has been launched, led by Chile in the framework of the Sixtieth Meeting of the Presiding Officers of the Regional Conference on Women in Latin America and the Caribbean. This Alliance aims to narrow gender gaps in access to and use of information and communications technologies and the acquisition of ICT skills to promote full participation by women in the digital economy.

In Argentina, the Ministry for Women, Genders and Diversity was created in 2019 and has a National Plan for Equality in Diversity 2021–2023 that seeks to transform the structural foundations of inequality to reduce gender gaps. In the field of education, the strategic goal is to help reduce gender gaps and segregation in the access, retention and promotion of women and LGBTI+ persons in their academic careers, governed by the principle of equality in diversity.

[17] According to Muñoz (2021), women's participation in research competitions for projects and grants (CONICYT) has risen to around 40%; in addition, approximately 45% of national PhD grants are awarded to women. However, gaps have been noted in the projects awarded by the National Fund for Scientific and Technological Development (FONDECYT): according to historical figures gathered between 2001 and 2015, 73% of project leaders were men, and 27% were women.

In 2020, the National Programme for Gender Equality in Science, Technology and Innovation was developed under the Ministry of Science, Technology and Innovation, in collaboration with the National Scientific and Technical Research Council (CONICET) under the Gender and Diversity pillar, the Ministry for Women, Genders and Diversity and a committee of experts and inter- and intra-institutional coordination panels. Among its objectives, the Programme seeks to guarantee the equal participation of women and LGBTI+ persons at all levels and in all areas of the scientific and technological system, and to amplify the gender perspective in research.

The following five actions are proposed in the Programme : (i) mainstream the gender perspective in policy instruments (e.g. prepare recommendations for assessing gender policy in science and technology agencies); (ii) produce gender-aware skills reports in the areas of science and technology; (iii) organize discussions to address the topic of science from a gender perspective and carry out awareness-raising activities for stakeholders in the management of science to be incorporated into science, technology and innovation policy instruments; (iv) promote actions for prevention, care and training related to gender violence, for example, mandatory training through the enactment of the Ley Micaela in 2018, the development of a guide to create work teams, and the design of a survey of actions and the organizational structures to implement them in the National Science, Technology and Innovation System (SNCTI) and (v) foster coordination with cross-cutting policies through participation in a national cabinet for the mainstreaming of gender policies (created by Decree No. 680/2020), the commitments outlined in the national plans to combat violence and ensure equality in diversity, and the development of guidelines for incorporating the gender perspective and diversity into university systems, among other actions.

In sum, the cases of Argentina, Chile and Costa Rica demonstrate considerable progress on specific policies associated with gender, science and technology.

F. Towards gender equality: a comprehensive approach to ensure opportunities and rights in science, technology, engineering and mathematics

It is important to move towards economic recovery that promotes women's participation in sectors that boost the economy, eliminating barriers to entry, guaranteeing labour rights and ensuring that the skills needed for the jobs of the future are acquired equally throughout the education system. Comprehensive, multidimensional and gender-sensitive public policies are needed that synergistically address the structural challenges of gender inequality.

The COVID-19 pandemic rattled the economies of Latin America and the Caribbean and paralyzed domestic productive activities, exacerbating the rising precariousness and, in some cases, the elimination of jobs. The sluggish progress on labour issues that had been made in recent decades was disrupted, and women were left in an even worse position than prior to the pandemic. These conditions triggered a social crisis and widened pre-existing gaps in the equal participation by men and women in the labour market and in unpaid care work.

Consequently, there is a pressing need in Latin America and the Caribbean to move towards progressive structural change by developing more knowledge-intensive sectors, particularly in science, technology, engineering and mathematics, while at the same time reducing the inequality gaps that have characterized the region. Progress in these fields and, in particular, the digital transformation, has been identified as a preferred instrument for fostering sustainable development as it offers new opportunities to mitigate the effects of the current crisis and overcome the long-term consequences by enabling the creation of more productive and better-paid jobs and the development of high-value production chains (ECLAC, 2020b).

Education will play a key role in tackling this challenge. Not only is the right to education a key element of sustainable development and a fundamental condition for full participation in economic, political and social life, in the context of technological change, education is one of the main strategies for responding to the potential negative effects of digitalization processes, particularly job automation (ECLAC, 2018). However, progress in women's access to education does not translate into equality owing to the persistence of the structural challenges of inequality evidenced by occupational segregation, the underrepresentation of women in sectors —such as those related to science, technology, engineering and mathematics— that drive the economy, wage gaps and, in general, lower labour market participation.

One of the most significant gaps in education, which influences entry into the labour market, is the underrepresentation of women in careers in STEM, where their entry and retention rates are lower. Indeed, while there are noteworthy achievements at the national level in terms of women's access to all levels of education systems, challenges remain in ensuring their full access to science, technology, engineering and mathematics, at university and in technical and vocational education. These gender gaps in participation and progress in these areas emerge early in women's academic careers, widen at the secondary level and compromise career choices and, consequently, employment trajectories and economic autonomy. The underrepresentation of women in science, technology, engineering and mathematics is most pronounced in ICT-related fields, in engineering, and in industry and construction. Gender gaps are also discernible in women's low participation in R&D, scientific output, publication of academic research, patenting and representation in academic leadership positions.

In line with the commitments of the Regional Gender Agenda, it is essential to ensure women's participation in science, technology, engineering and mathematics in order to bridge the gap in access to jobs in dynamic sectors of the economy, which would contribute to the sustainable development of the region and to gender equality. To achieve this, the structural challenges of gender inequality must be dismantled on multiple fronts, taking the following five aspects into account:

(i) Promoting gender equality in science, technology, engineering and mathematics requires comprehensive public policies that combine various strategies. To address gender inequalities in academic and career paths in the field of science, technology, engineering and mathematics, it is necessary to advocate for comprehensive, multidimensional and gender-sensitive public policies that do not focus solely on interventions in the education sector, but that enable the structural challenges of gender inequality to be addressed synergistically. In this vein, it is necessary to combine affirmative measures with legislative reform and actions that promote the equality of opportunity, as well as with gender mainstreaming processes in sectors associated with science, technology, engineering and mathematics. It is also important to strengthen the connections between policies and employment in these fields and to create spaces for intersectoral work and coordination to promote gender mainstreaming in science and technology policies as well as in the approach to science, technology, engineering and mathematics in gender policies. Likewise, promoting girls' and young women's vocational aspirations in science, technology, engineering and mathematics from the earliest stages requires sustained effort and the establishment of public policies that ensure inclusion from basic education onwards. Skills training from an early age is critical; therefore, it is essential that regional governments strengthen gender equality plans through intersectoral actions that include measures in which the gender perspective is embedded in education, science and technology policies in line with the provisions of Goals 4 and 5. These actions are necessary to achieve equality and, as ECLAC states, this transformation must be accompanied by a fiscal covenant aimed at ensuring inclusion and equality that is sustainable and guarantees women's autonomy (ECLAC, 2021e).

(ii) The inclusion of technical and vocational education to promote participation in science, technology, engineering and mathematics offers significant potential to expand opportunities in these areas, especially for low-income women. Technical and vocational education is not often found in training programs in STEM fields and skills, nor in efforts to address gender inequalities (Muñoz, 2021). However, such training has considerable potential and represents an excellent opportunity to boost the employment and educational trajectories of the poorest women in the region, particularly in areas related to science, technology, engineering and mathematics. Yet, patriarchal cultural patterns that are manifested in problems such as teenage pregnancy, early marriage and the reproduction of the sexual division of labour hinder scientific and technological vocations and access to and retention in careers in this area.

(iii) Gender stereotypes in various aspects of the education sector must be eliminated to eradicate patriarchal cultural patterns, especially those related to science, technology, engineering and mathematics. The institutional culture and teaching and learning resources (equipment, study materials and school infrastructure) reveal forms of discrimination linked to gender stereotypes. Thus, it is important to review various aspects of education, such as linguistic and extra-linguistic practices. As cultural codes that are used specifically in the field of technical and vocational education, but not only in this area, they reinforce the barriers that hinder the entry and retention of women in careers related to science, technology, engineering and mathematics. It is also necessary to design strategies to address the gender representations of mothers and fathers regarding the activities that women can and cannot perform (Buquet and Moreno, 2017), as these representations can compromise men's and women's scientific and technological vocations and reinforce stereotypes. Furthermore, communication policy is a critical factor in guaranteeing women's access to and retention in careers in science, technology, engineering and mathematics. It is, therefore, essential to pay close attention to the visual language that communicates and promotes academic offerings in these areas, which —habitually and pointedly in the case of technical and vocational education— echoes the sexual division of labour of the past century. Lastly, it is necessary to identify hostile or harassing classroom environments, particularly in male-dominated careers where there is clear underrepresentation of women, and to design concrete policies in response to prevent women from dropping out of careers in science, technology, engineering and mathematics.

(iv) New education modalities offer an opportunity to leave no one behind, but they must be designed and implemented with a gender perspective, paying particular attention to the digital divide. The pandemic underscored the need to review and transform conventional educational practices, as it highlighted the transformative potential of new forms of teaching for education in general, and for higher education and technical and vocational education in particular. The implementation of hybrid pedagogical formats combining face-to-face and virtual sessions, new forms of teaching that include digital technologies and innovative educational resources, among other measures, represent an opportunity to leave no one behind. However, it will not be possible to take full advantage of this trend without considering the structural obstacles that must be addressed from a gender perspective. To this end, it is crucial to reduce the gender gap in digital skills, as well as to ensure effective connectivity, especially for low-income women in the region. In this vein, ECLAC has proposed that countries in Latin America and the Caribbean implement a basic digital basket that includes monthly connection plans, a laptop, a smartphone and a tablet (ECLAC, 2020a). In this way, the region can move towards universal access to digital goods and services and prioritize women who head households lacking connectivity and whose income does not allow them to afford Internet access and the necessary devices. Moreover, given that access to technology alone does not directly lead to more economic and social opportunities, it is also important that the basic digital basket encourages the use of digital skills and facilitates the acquisition of an adequate level of skills in this area (ECLAC, 2020b). The basic digital basket is a proposal for effective connectivity in the future development of intergovernmental agreements.

(v) Moving towards social co-responsibility for care and comprehensive care systems is a fundamental condition for dismantling the sexual division of labour and the unjust social organization of care. As discussed earlier, the overload of domestic and unpaid care work is one of the barriers obstructing women's academic and career paths in the areas of science, technology, engineering and mathematics. Surmounting this obstacle requires the promotion of social co-responsibility for care among all individuals and institutional actors, who must implement comprehensive policies in this area, as well as the reduction of the burden on households and a shift towards systems that establish care as a fundamental right. Furthermore, it requires investment in strengthening the care economy as a central element in moving towards transformative recovery with equality. The approach to care must transcend the notion of care as purely an expense and adopt the mindset that care represents an investment that builds present and future capacities and creates employment, particularly for women.

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