

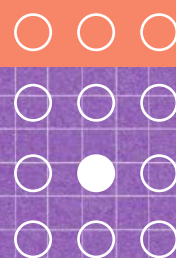
CHICAS EN TECNOLOGÍA
/ 2022

An Unequal Career

The Gender Gap in Argentina's University System



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Buenos Aires, October 2022.

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Thanks to both of them for accompanying Chicas en Tecnología in its journey to transform the data into a positive social impact and contribute to reducing the gender gap in the technological field.



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Prologue

Chicas en Tecnología seeks to generate evidence to make the gender gap in STEM disciplines visible¹, to learn about its particularities and to develop comprehensive and long-term solutions that contribute to reducing the gap. Its research team works to develop its own data based on the organization's growing outreach to young and adult women in different Latin American countries, as well as to transform public data into accessible, available and useful information for different leaders in society such as teachers, students, people dedicated to research and dissemination, journalists and the media, institutions, social organizations and the general public.

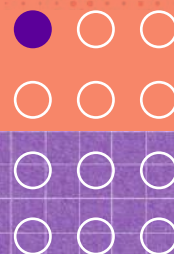
To prepare this report, Chicas en Tecnología classified more than 7,000 university degrees in Argentina, reported by the Ministry of Education, according to the definitions established by the International Standard Classification of Education (ISCED). This allows the generated statistics to be internationally comparable in order to advance the study of the gender gap and promote new analyses. With this objective in mind, the databases created by Chicas en Tecnología are open and the organization shares its research results as a way for information to circulate in society, enabling the continuous construction of knowledge surrounding the issue and encouraging decision-making and the development of policies — throughout the educational, public and private spheres — to reduce the gender gap in the technology sector.

1. An acronym for Science, Technology, Engineering, Mathematics.

1.



Introduction



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Introduction

The professional world is marked by gender inequality. In Argentina, the participation rate of women in the labor market is 50% — 20 percentage points lower than that of men (ILO 2021), their representation in Congress is 42% (WEF 2022) and their participation in management positions does not surpass 37%². The wage gap across the employed population is 26%, i.e., on average, women earn \$74 for every \$100 earned by men (INDEC 2022)³.

In part, these inequalities respond to the low participation of women in jobs, professions and roles that have higher demand and more competitive remuneration. Such is the case of the productive sectors of science and technology, which are intensive in research, development and innovation. As per recent estimates, in Argentina they represent approximately 10% of the GDP and 20% of exports, in addition to offering 60% above average salaries and accounting for half of the informal sector. Women working in these areas and having access to these competitive advantages are a minority: in 2020, their participation in the science and technology sectors was 28% (Szenkman et al. 2021) and, in the particular case of the software industry, 30% (CESSI 2020). This phenomenon is not specific to Argentina, but is replicated on a global and regional scale: globally, women represent 26% of those working in the technology sector (García-Peñalvo et al. 2022). In Mexico and Chile, these percentages amount to 35% (Lopez Bassols 2018) and in Brazil, 27% (Szenkman et al. 2021).

2. According to the International Labor Organization, ILO statistics database (ILOSTAT).

3. This difference includes causes that can be attributed to observable factors (e.g., lower number of hours worked or lower prevalence of women in higher paying hierarchical positions or in more dynamic sectors), and others that cannot be explained through these variables and are attributed to gender stereotypes or biases. For a detailed discussion of the gender gap in the region, refer to Edo et al. (2019) and, for the Argentine case, Trombetta and Cabezon (2020).

4. An acronym for Science, Technology, Engineering, Mathematics.

Jobs associated with science, technology, engineering and mathematics — usually referred to as STEM disciplines⁴ — not only offer good job opportunities at present, but also have better prospects for future development. These disciplines are at the heart of the fourth industrial revolution, characterized by the transformation of global labor markets⁵: while around 7 million jobs are expected to disappear worldwide due to the automation of tasks associated with technological integration, the trend is being reversed for STEM jobs, with a predicted increase of 2 million. Returns to these occupations are also expected to grow as the use and development of fourth-generation technologies becomes more widespread (WEF 2016, World Bank 2018).

In Argentina, information and communication technologies, science and engineering professions are among the 10 occupations that are least susceptible to automation, along with others such as those related to health and teaching (Albrieu et al. 2019). This is because the skills developed in these fields are usually complementary to technology rather than supplementary. Examples of such skills include digital competencies, innovation, critical thinking, and complex problem solving, all prominent in STEM disciplines (García-Peñalvo et al. 2022). According to IDB surveys of the private sector in Argentina, Brazil, Chile, Colombia and Mexico, STEM skills already lead the ranking in which there is a shortage of qualified personnel, followed by content and process knowledge skills (Basco et al. 2020, Basco and Lavena 2020).

The consequences of few women training and working in STEM disciplines are not limited to the impact on their individual careers. Science and technology are the fields in which solutions to the various needs and problems of society as a whole are devised. As long as women and other minority groups remain underrepresented in the disciplines that lead technological advancement, there will also be biases in the design of services and products that reach the market, as well as untapped talent, ideas and innovation potential, and unidentified problems to be solved

5. The concept of the fourth industrial revolution refers to the convergence between manufacturing production and new technological fields such as digital production, the use of sensors, nanotechnology, biotechnology and other new materials. It is also known as advanced manufacturing, industry 4.0 or fourth-generation industry (UNIDO 2019).

(García-Holgado et al. 2020, Tannenbaum et al. 2019, European Commission 2018, Hong and Page 2004). Another factor to take into account is that the skills that women bring have an economic value: in the particular case of Latin America, removing barriers to labor market access would result in a 23% rise in the production of goods and services (Ostry et al. 2018).

Although these problems are observed in labor markets, in order to understand the low presence of women in the STEM labor sphere, it is important to go back to previous instances in their paths, particularly to the training stages. In Argentina's university system, between 2010 and 2016, only 33% of women were registered as students in STEM careers. The main findings of this qualitative approach point out that women who develop an academic and professional trajectory in STEM disciplines face barriers before, during and after training in these areas, based on family and social stereotypes (Basco, Lavena and Chicas en Tecnología 2019).

In family environments, gender distinctions are manifested from early childhood in visible stereotypes, such as through games and toys. Boys play with blocks and tools to build and explore; meanwhile, girls are given dolls, make-up and brooms (Contreras et al. 2021). These socially-assigned interests to each gender leave an imprint on the perceptions that people develop about themselves and can influence the development of their skills. At the beginning of primary education, there are no differences between boys and girls with respect to their mathematical skills. However, around the age of 10, 89% of girls recognize that they are not good at this subject. In secondary education, a marked performance gap favoring boys is observed in most countries (UNESCO and FLACSO 2017, UNESCO 2019).

The sum of intrinsic factors — such as those associated with self-perception, interest and personal efficacy — and environmental factors — including family and peer context, school and, more generally, social and cultural norms — influence women's paths in STEM fields (UN Women 2020, UNESCO 2017). As they get older, they feel less “bright” and less skilled in mathematics (UNESCO and FLACSO 2017; Bian, Leslie and Cimpian 2017) and stop perceiving themselves as future scientists and technologists (OECD 2018, Microsoft 2017). This adds to the misinformation about academic and career paths in addition to the lack of visibility of professional women in technology that encourage young women to be interested and project themselves in these disciplines: 43% of young women under 17 years of age do not know any women working in technology (Contreras et al. 2021). By the time they reach university, few

will choose a degree in science, technology, engineering and mathematics.

This long process in which women get “lost” on the way to STEM careers is known as the “leaky pipeline” (Blickenstaff 2005 in Basco, Lavena, and Chicas en Tecnología 2019). As mentioned at the beginning of this section, since these disciplines are involved in the creation of solutions that are used on a daily basis, and that have a key role in the future of work and in the integration with productive activities in various fields, it is crucial to be aware of the scope of the problem. It is essential that the people who create, design and develop technology represent society and the diversity of its needs and demands.

Seeking to contribute to this thought, this report dives into a stage in the trajectory of women in which the “leak” is significant: their ticket to university. By randomly selecting 100 students from the Argentine university system, about 40 will be male and 60, female. The initial advantage in favor of women is quickly diluted when looking at the STEM universe. Out of the 40 men, 13 choose a STEM career and 3 of them study programming. Among women, the picture is completely different: only 7 of the 60 opt for a STEM career, and it takes 150 students to come across a woman studying programming. According to the data collected, women represent only 35% of those studying STEM and 17% of those studying programming.

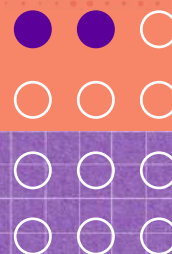
This report provides a descriptive, gender-sensitive analysis of Argentine university statistics. Section 2 details the approach and methodology implemented in the processing of the statistics provided by the National Ministry of Education. In Section 3, the evolution of university studies in Argentina and the careers chosen by women are discussed in great detail. Section 4 is focused on the specific analysis of STEM careers to understand how they evolve in relation to the rest of the university offerings, the participation of women in these disciplines and in which fields of study they have a greater presence. Section 5 focuses on programming careers.

The study of the causes leading to gender gaps in the Argentine university system is beyond the scope of this report. However, to promote the generation of evidence on the gender gap in STEM disciplines, and to encourage collaborative and interdisciplinary work, the section on final thoughts includes some questions that may contribute to the development of future research.

2.



Approach and methods



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Approach and Methods

This paper analyzes, from a gender perspective, statistics from the Department of University Information, which is part of the Department of University Policies of the Ministry of Education. The data was provided by this Ministry in response to the requests for access to public information (regulated by Law No. 27,275) that Chicas en Tecnología had been making since 2018. The database used to prepare this report presents the number of enrollments, re-enrollments, students and graduates registered by each university institution in the country in each of the degrees recognized by the Ministry of Education. The variables are disaggregated by binary gender⁶ (female or male), by degree level (post-secondary, undergraduate or postgraduate⁷) and by type of institution (public or private). Definitions of these fields can be found in the Glossary attached to this publication.

To analyze the careers grouped by disciplinary fields and identify those belonging to a STEM discipline, the 7,785 university degrees reported by the Department of University Information were classified according to the definitions established by the International Standard Classification of Education (ISCED). The ISCED has the explicit objective of enabling the compilation of internationally comparable educational statistics. The methodology defines criteria for categorizing education and training fields at the secondary and tertiary levels in any country into 11 broad fields and 29 specific fields, as shown in Figure 1 (UNESCO 2014, 2015).

6. The data provided by the Ministry of Education and used to prepare this report are classified by binary gender. Chicas en Tecnología believes that official statistics should contemplate all gender identities — and not be limited to a binarism-centered perspective — in order to represent diversities, note their demands and needs, and take them into account when preparing public policies.

7. In this report we include post-secondary degrees as part of the undergraduate category because for the purposes of this analysis, no significant differences were detected between the two levels. In any case, the databases that can be downloaded together with the document allow us to analyze these levels separately.

Careers in the broad fields 05 (Natural sciences, mathematics and statistics), 06 (Information and communication technologies) and 07 (Engineering, industry and construction) are those defined as STEM careers according to much of the specialized literature in their study, although other definitions also include some fields belonging to health, agriculture and related fields (UN Women 2020, López-Bassols et al. 2018).

Figure 1. Broad fields, specific fields and STEM fields of the International Standard Classification of Education (ISCED).

Broad field	Specific field
00 Generic programs and certifications	001 Basic programs and certifications
	002 Literacy and numeracy
	003 Personal skills and development
01 Education	011 Education
02 Arts and Humanities	021 Arts
	022 Humanities (except languages)
	023 Languages
03 Social sciences, journalism and information	031 Social and behavioral sciences
	032 Journalism and information
04 Business administration and law	041 Business education and administration
	042 Law
05 Natural sciences, mathematics and statistics	051 Biological and related sciences
	052 Environment
	053 Physical sciences
	054 Mathematics and statistics
06 Information and communication technologies	061 Information and communication technologies (ICTs)

07 Engineering, industry and construction	071 Engineering and related professions
	072 Industry and production
	073 Architecture and construction*
	0732 Construction and civil engineering
08 Agriculture, forestry, fishing and veterinary medicine	081 Agriculture
	082 Forestry
	083 Fisheries
	084 Veterinary medicine
09 Health and social services	091 Health
	092 Welfare
10 Services	101 Personal services
	102 Occupational health and hygiene services
	103 Security services
	104 Transportation services

References: STEM fields are identified with a gray background.

*The specific field “073 Architecture and construction” excludes careers corresponding to the detailed field, “0732 Construction and civil engineering,” which is reported separately as it is of interest for this analysis.

Source: Personal research using data from UNESCO 2014 and UNO 2021.

The ISCED criterion consists of categorizing careers according to the predominant thematic content of their curricula, i.e., the “factual, practical and theoretical knowledge imparted during the program and recognized through the respective certification” (UNESCO 2013). Many careers are interdisciplinary or have diffuse thematic scopes, which makes it difficult to classify them in a single field. However, ISCED manuals establish disambiguation criteria for most cases

through definitions and examples. Among them, they indicate that professorships and teacher training programs should be classified in the field “01 Education,” even if they are oriented to a specific subject of specialization such as history, mathematics, or technology, and they make explicit which engineering degrees should be classified in fields other than “071 Engineering and related professions,” such as genetic engineering. They also specify the recommended codes to be used in cases where the predominant subject field cannot be established, in those where different disciplines have equal weight, or in cases that are not covered.

A second categorization exercise carried out was to identify all programming careers. There is no official taxonomy or agreed methodology to unanimously establish what these degrees are. On the contrary, the boundary becomes more blurred as the use of different programming languages become more widespread as a cross-cutting competency in different fields of study. But even if the learning of programming notions is expanding, having studied a subject with this content does not suffice to be considered a programmer. The technological ecosystem is broad, diverse and complex, and the ability to program appears in various disciplines with different levels of depth and specialization⁸.

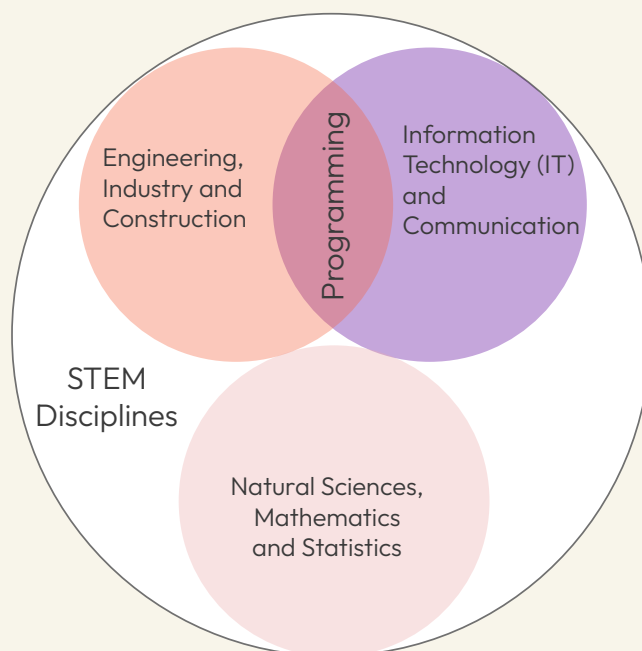
Taking into account the difficulty of representing these nuances with the available data and the state-of-the-art methodologies, this research focuses on careers whose main objective is to train programming professionals. For this purpose, the classification developed by Chicas en Tecnología and Medallia for the work, [Female Programmers](#), is taken up again. According to these criteria, all careers in systems, informatics, software, computing, programming, development and information and communication technologies (ICTs) are included, regardless of whether they are doctorates, master’s degrees, engineering degrees, bachelor’s degrees, technical degrees, specializations or degrees in analysis. Likewise, due to the thematic affinity, data science degrees are added to this classification. Thus, the categorization of programming degrees used in this report encompasses a subset of STEM degrees from ISCED fields “06 Information and communication technologies” and “07 Engineering, industry and construction” that could not otherwise be analyzed together.

8. The expansion of the demand for skills related to programming and the technological ecosystem in recent years has also been manifested through the proliferation of non-formal training, but these courses are not part of the university system, which is why they are not included in the analysis.

Figure 2.

Relationship between the ISCED classification of STEM careers and the programming careers used.

Source: Personal research



It is worth mentioning some final considerations related to data limitations. For 2010, the databases provided by the Ministry of Education do not have the classification by gender for 13% of the enrollments reported. Therefore, the 2010 records are excluded from the segments that illustrate the evolution of the absolute levels of students and enrollments, and are considered in the analysis of participation by gender in the total. For 2018 and 2019, the same is true for 0.7% and 0.6% of the data, respectively, so the level of students that can be observed in the absolute numbers graphs slightly underestimate the total number. In all these cases, data that was reported without gender disaggregation is excluded from the analysis.

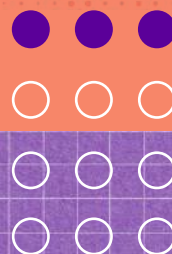
The two databases that are part of this research work — the consolidated and standardized university statistics provided by the Department of University Information, and the unpublished classifier of Argentine degrees in ISCED and programming fields developed by Chicas en Tecnología — are published in open format at the following link.

The dissemination of the curated data seeks to broaden the access and use of public information to promote an evidence-based debate on the gender gap in STEM disciplines. It is also an invitation to the scientific, academic and interested community to take an active role in the process of co-creating definitions and standardizations of methodologies that are still emerging. The classifiers are living bases in continuous revision that can be collectively improved.

3.



Overview of university careers



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3.1 Evolution of the number of students at the university level

University studies are expanding. The Argentine university system went from having 1.9 million post-secondary, undergraduate, postgraduate students in 2011 to 2.3 million in 2019. This 20% increase in 8 years represents an annual growth rate of 2.3%. To put this into context, during that same period, the Argentine population as a whole grew 10%. One of the most representative population segments of the university student body, the population aged 20 to 24, grew by only 5%⁹. This means that the number of people with access to university education grew not only in absolute terms, but also in relation to the population. In other words, a higher percentage of young people in Argentina attend university.

Women are the majority in the university system and their participation is ever-growing. In 2011, 1.1 million women were enrolled as students, 33% more than male students. In 2019, the number of female students rose to 1.4 million, a 23% growth, or 2.7% per year. For males, the proportional increase was smaller: the number of males enrolled grew by 16% overall, equivalent to 1.9% per year.

The ratio went from 3.1 male students for every 4 female students at university to 2.8 males for every 4 females. The absolute variations by gender can be seen in Figure 3, while the participation rates can be seen more clearly in Figure 4.

9. The difference in the population growth rates among the different age groups responds to the demographic stage that the society in question is going through. Argentina is going through the “demographic bonus,” a transition to an older population structure in which there is a temporary decrease in the participation of people who are not of working age (Gagnolati et al. 2014).

3. Overview of university careers

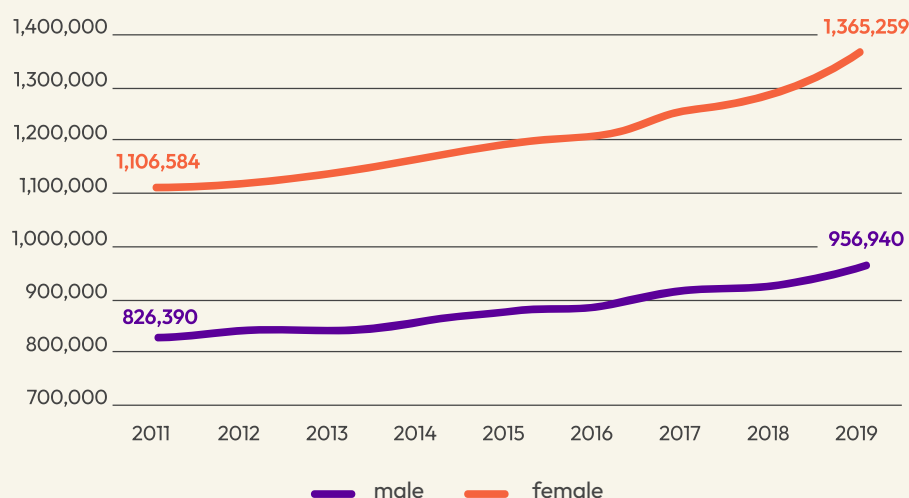


Figure 3. Evolution of the number of female and male students from 2011 to 2019.

3.2 Evolution of the number of university enrollments

The number of women enrolled in university rose by 42%. The number of enrollments is an indicator that reflects trend changes faster than the number of students, because it does not accumulate enrollment lags from previous years¹⁰. Therefore, it allows us to see the growing participation of women in universities in a more marked way. While the number of female enrollments increased 42% between 2011 and 2019, for males, this growth was 29%. The annual growth rates were 4.5% for females and 3.2% for males. The gap in favor of women seems to be accelerating: moving from 1.25 women for every enrolled man, to 1.45. Thus, women's part in total enrollment in 2019 was 59%.

10. This is because for a given year, the number of enrollments refers to the number of people who enrolled in university that year, which — in all cases except for equivalency changes — are first-year students. On the other hand, the indicator of number of students includes those who are in the first to the last year of each course, making it a more structural indicator than the first.

Figure 4. Evolution of the number of female and male enrollments from 2011 to 2019

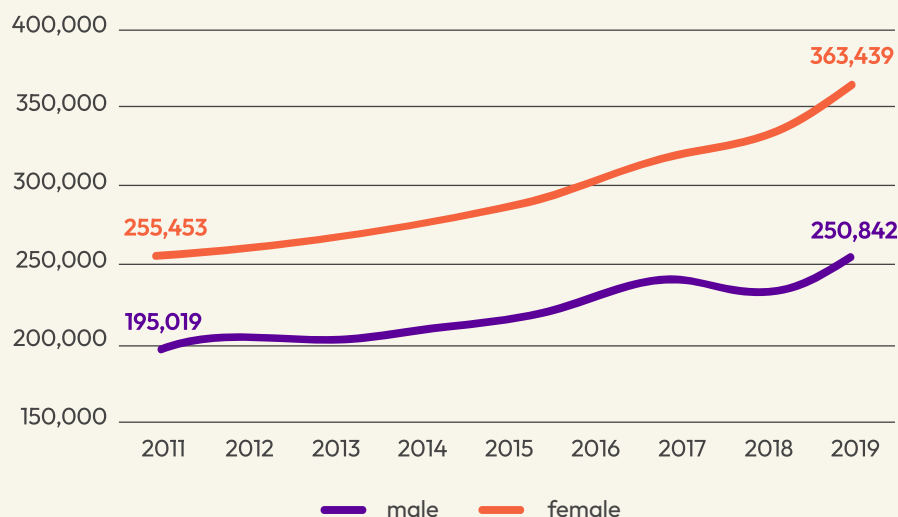


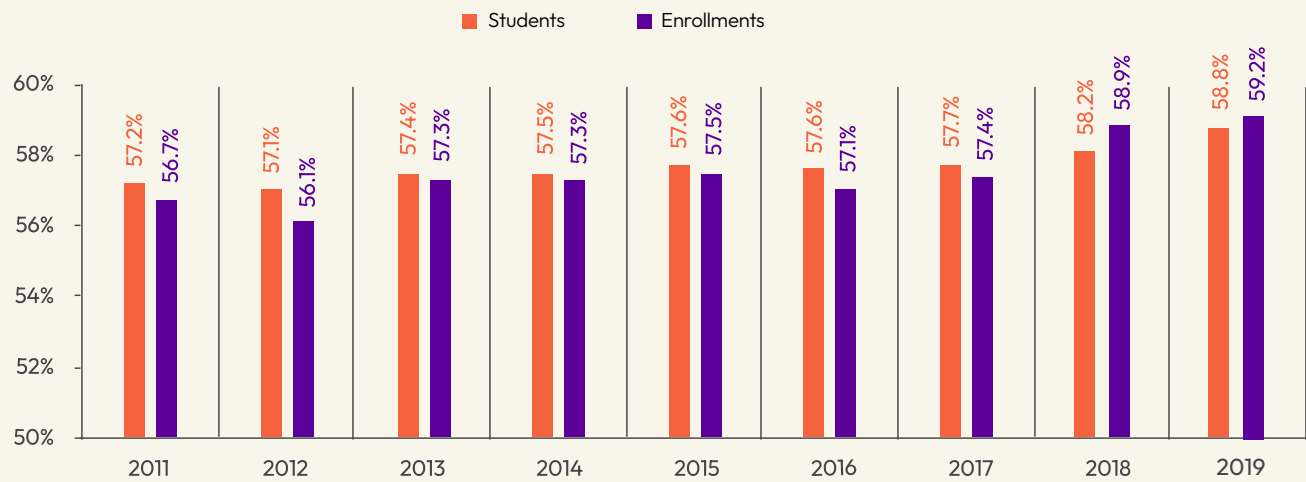
Figure 4. Evolution of the number of female and male enrollments from 2011 to 2019.

3.3 Participation of women in university

Women represent between 57% and 59% of the student body throughout the period analyzed. As mentioned above, there are more women than men in the Argentine university system. If we analyze the total number of female and male students and enrolled students, we can observe a participation rate in their favor around 58% throughout the period between 2011 and 2019, reaching 59% in the last year. First the participation of enrolled women increases and then this can be seen in a higher representation in the number of students.¹¹

¹¹. Definitions of this terminology are detailed in the glossary.

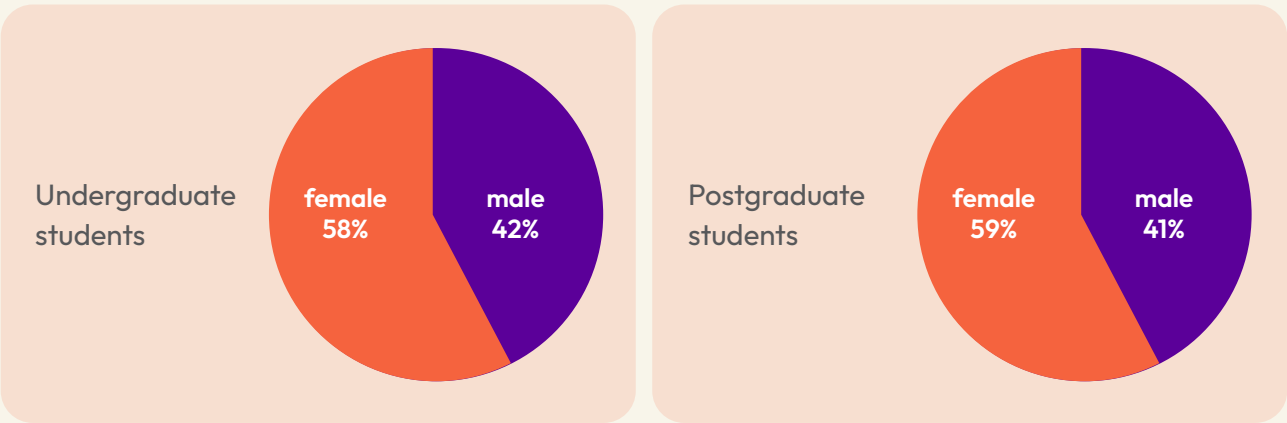
Figure 5. Participation of women among enrollments and students (2011 to 2019)



Note: vertical axis starts at 50% to facilitate comparison between reported values.

Female participation remains constant between undergraduate and postgraduate students. Disaggregating the data to see how women’s participation varies between undergraduate and postgraduate students, the situation does not appear to change significantly. As for postgraduate studies, 59% of those who enrolled as students in the period from 2010 to 2019 were women, 1 percentage point higher than in undergraduate studies. Although the number of postgraduate students is lower than that of undergraduate students, representing only 7% of the student body, this information is relevant because it indicates that women are not losing participation in the highest level of formal education.

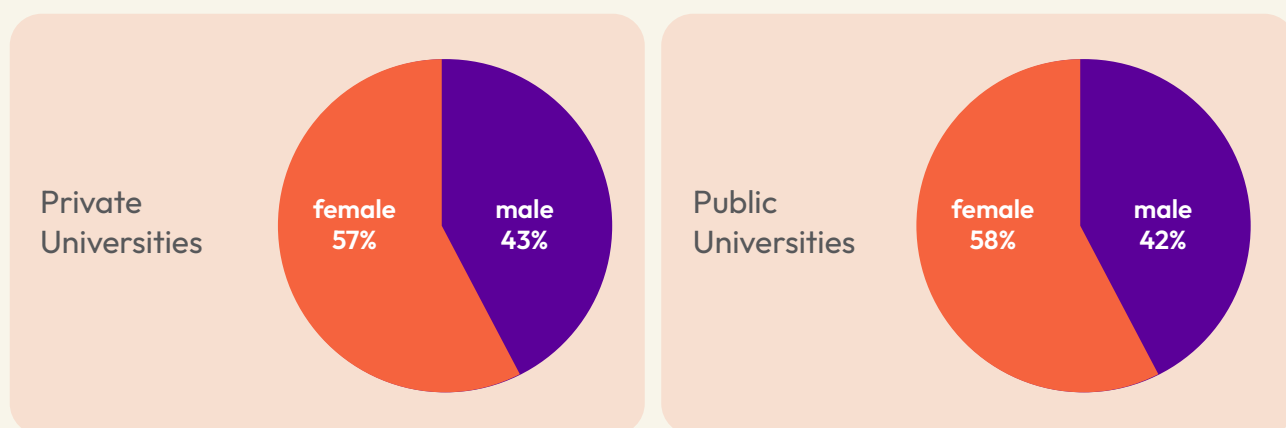
Figure 6. Female and male participation among undergraduate and postgraduate students (average from 2010 to 2019)



3. Overview of university careers

The participation of women in public universities is similar to that in private universities¹². Another relevant dimension to monitor is the distribution of students in public and private universities. In Argentina, private universities represent about half of all existing universities and colleges. Even so, 80% of the students are in a public university, i.e., the latter has a larger average student body. Private universities are characterized by the fee-based nature of their undergraduate and postgraduate careers¹³ and by offering programs that are more flexible to student demands in terms of teaching modality, geographic scope, links to the labor market, and schedules (Fuentes and Ziegler 2021). Despite these differences, when comparing the percentage of women studying in private and public institutions, no significant divergences are identified: in the former, 57% of the total number of students are women and, in the latter, 58%.

Figure 7. Participation of women and men in private and public universities (average from 2010 to 2019)



12. Excluded from this analysis are two universities that are not classified as public or private, but instead as “international management.”

13. This is in contrast to public universities, which, with a few short-lived exceptions, have not charged for undergraduate degrees even when the Higher Education Law sanctioned in 1995 allowed it (Buchbinder 2020).

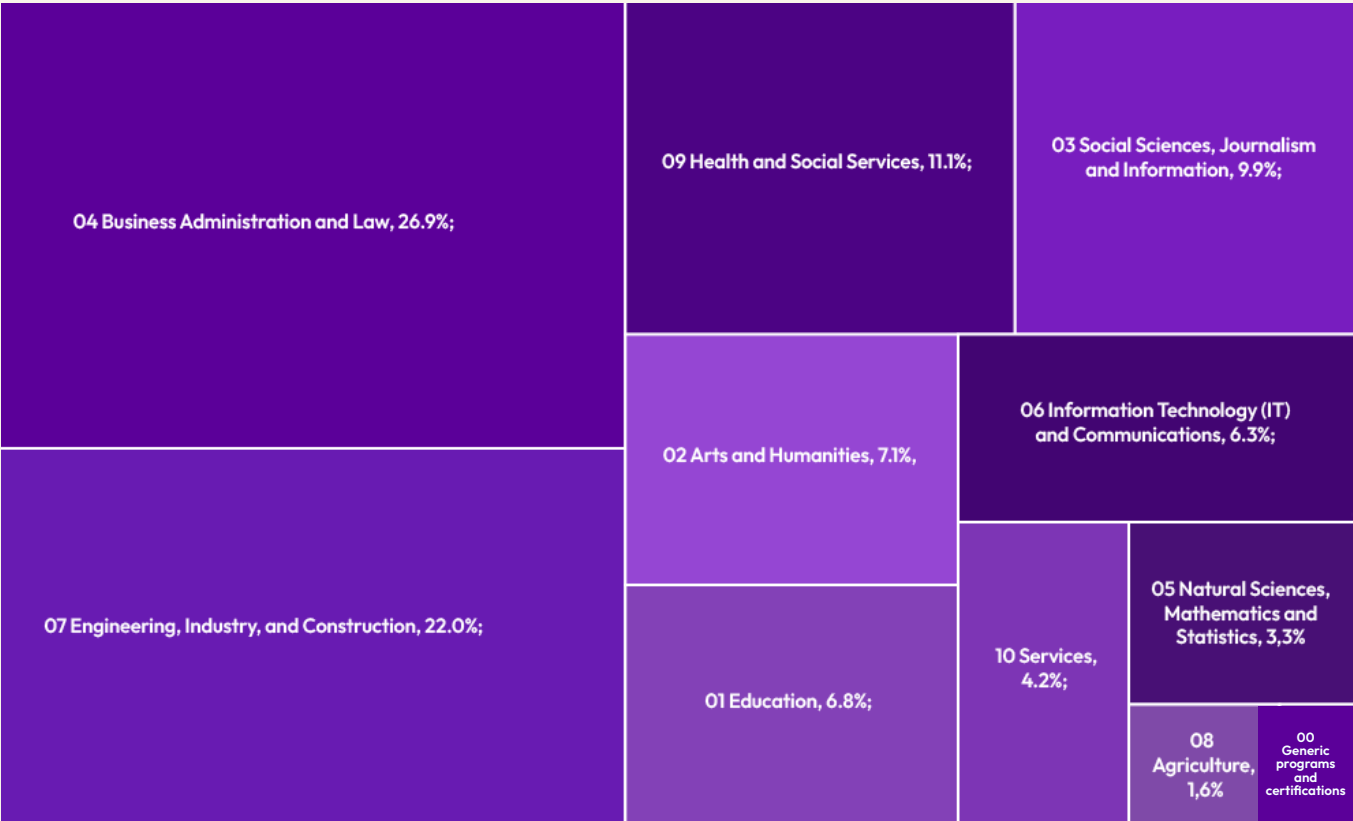
3.4 Choice of undergraduate university careers

Half of the males are distributed among business administration, law, engineering, industry, and construction careers. In 2019, the careers most chosen by male students were in the field of business administration and law (26.9%) and engineering, industry and construction (22%). The rest of the students opted for a career related to health and social services (11.1%), social sciences, journalism and information (9.9%), arts and humanities (7.1%), education (6.8%), information and communication technologies (6.3%), services (4.2%), natural sciences, mathematics and statistics (3.3%) or agriculture; forestry; fisheries and veterinary science (1.6%).

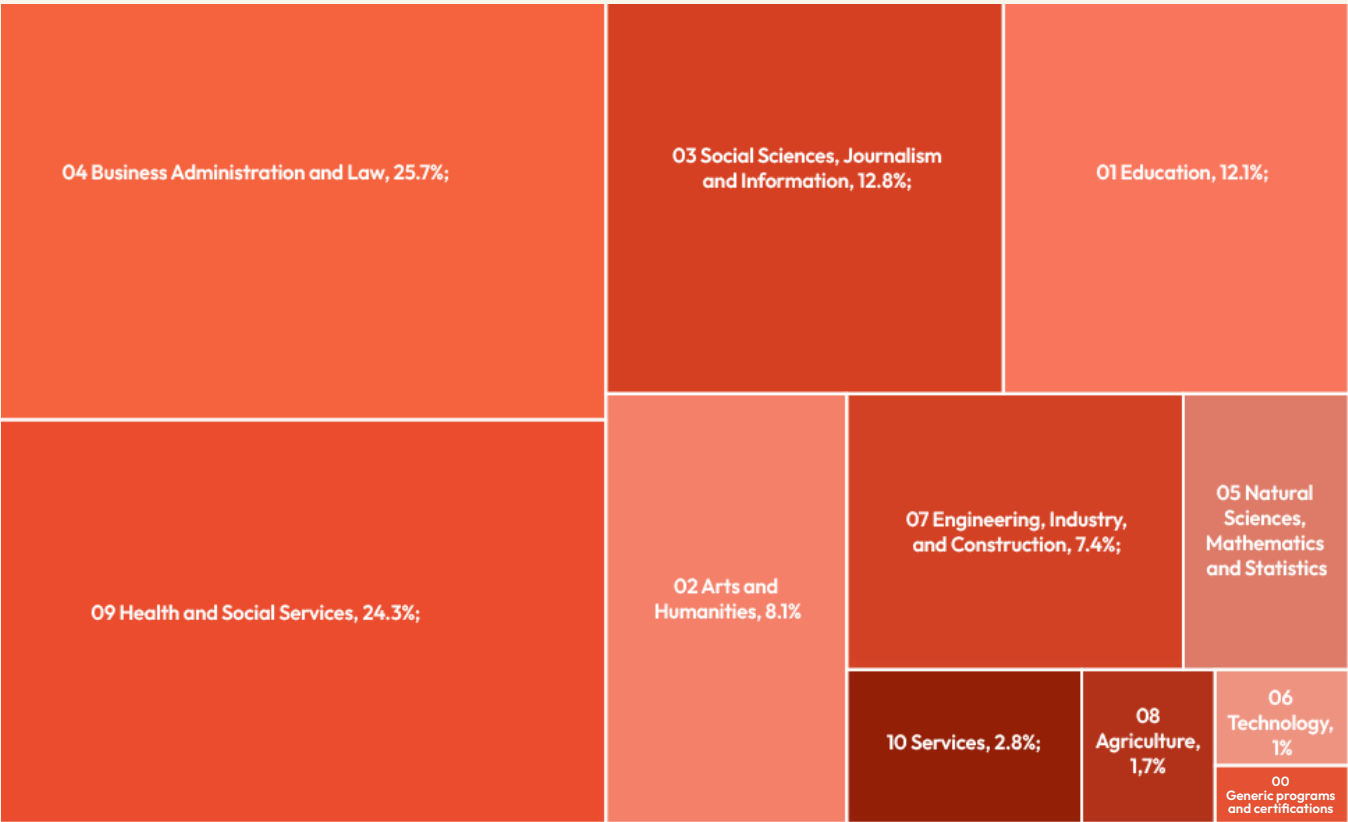
Half of the female students are oriented towards careers in business administration, law, health and social services. Business administration and law represent 26% and health and social services, 24%. The third and fourth preferences, respectively, are studies related to social sciences, journalism and information (12.8%) and education (12.1%). The remaining quarter of female students choose careers related to arts and humanities (8.1%), engineering, industry and construction (7.4%), natural sciences, mathematics and statistics (3.5%), services (2.8%), agriculture, forestry, fisheries and veterinary science (1.7%) and, lastly, information and communication technologies (1%).

Figure 8. Undergraduate students by field of study
(year 2019 - percentage participation)

Male undergraduate degrees



Female undergraduate degrees



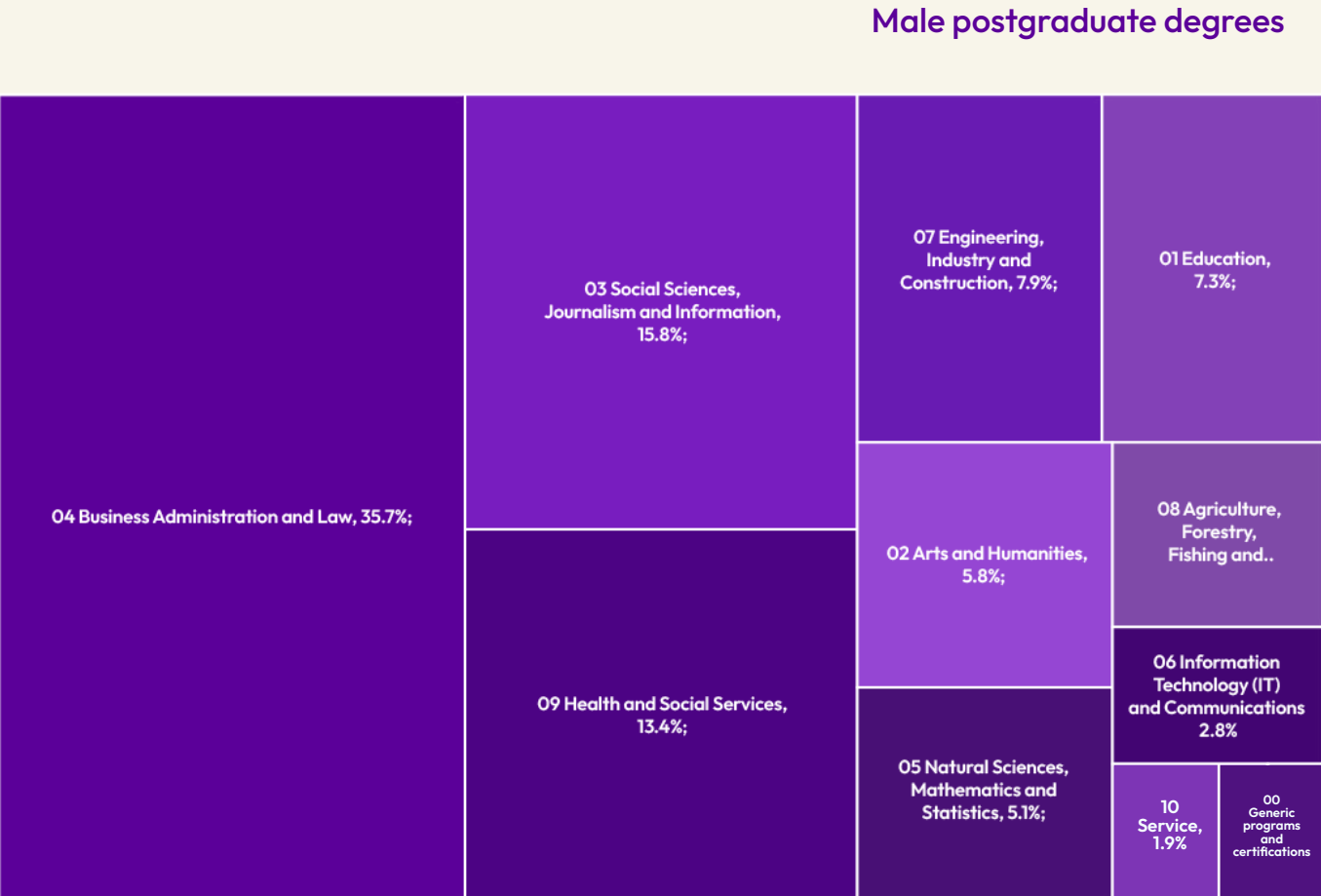
3.5 Choice of postgraduate careers

One in three male students chose a postgraduate degree in business administration and law-related paths. Business Administration and Law are the most common specializations for males in postgraduate degrees, at a rate of 35.7% in 2019. In second and third place, males chose postgraduate training related to social sciences, journalism and information (15.8%) and health and social services (13.4%). The rest of them choose to study a postgraduate degree related to engineering, industry and construction (7.9%), education (7.3%), arts and humanities (5.8%), natural sciences, mathematics and statistics (5.1%), agriculture; forestry; fisheries and veterinary science (3.6%), information and communication technologies (2.8%) and services (1.9%).

For women, the most chosen postgraduate degrees are in the fields of business administration, law, social sciences, journalism and information. In 2019, almost half of the women

concentrated their preferences in two general fields: business administration and law (23.8%) and social sciences, journalism and information (22.4%). In third and fourth place were health and social services (18.4%) and education (14.9%). The remaining 20% of female postgraduate students in 2019 chose studies linked to arts and humanities (6.4%), natural sciences, mathematics and statistics (6%), engineering, industry and construction (3.4%), agriculture; forestry; fisheries and veterinary science (1.9%), information and communication technologies (0.8%) and services (0.7%).

Figure 9. Postgraduate students by field of study (year 2019 - percentage participation)



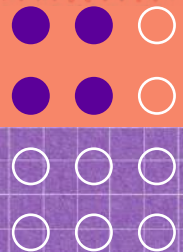
Female postgraduate degrees



4.



Radiography of STEM careers



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Radiography of STEM careers

4.1 Evolution of the number of students in STEM disciplines

STEM careers grew at a moderate pace. Between 2011 and 2019, the number of students in STEM careers rose from 406 thousand to 454 thousand, or 12% or 1.4% per year. The increase is positive when compared to the population growth in this period, which was 9% for the total population and 4% for the population aged 20-24. However, it does not match the 20% increase in the student body of all careers.

This means that STEM studies are generally growing at a slower rate than university studies. This is despite the fact that many STEM careers are among the most in-demand and highest-paying in the job market.

The rise in STEM students was relatively greater for women. In 2011, there were 266,000 male students in STEM careers and 140,000 females. Over the period analyzed, the number of males increased 11% and the number of females 15%. Even so, as described below, male students in these academic fields practically twofold the number of females. The rates of female participation in the student body and enrollment in STEM careers can be seen in Figures 11 and 12.

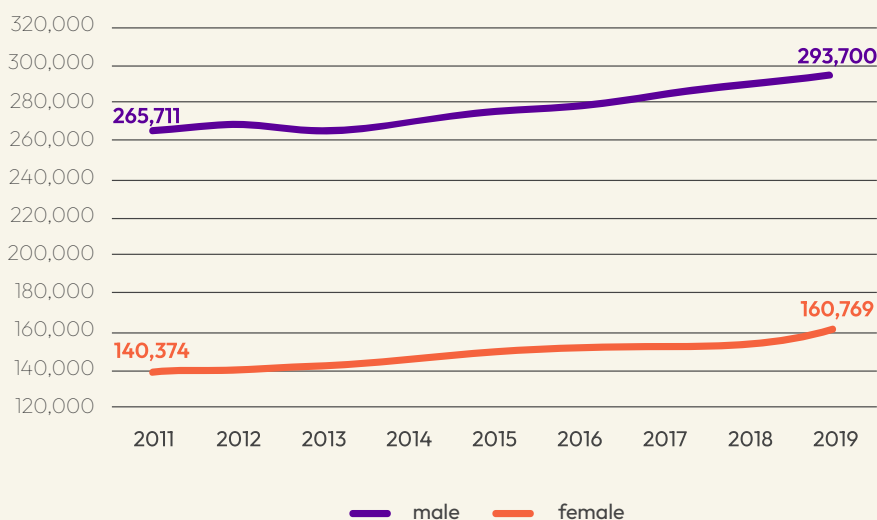


Figure 10. Evolution of the number of female and male students in STEM careers from 2011 to 2019

Among female university students, only 12% chose a STEM career.

20% of the student body is enrolled in a STEM field. But this is an average that hides large gender heterogeneities: 31% of male students study STEM careers, being the second most chosen field after administration and law (Figure 8). For women, on the other hand, the participation in STEM in the total number of careers is only 12%. In observing the evolution of these ratios over time in Figure 11, the relative drop in STEM careers mentioned above can be seen. For males, it dropped 3 percentage points during this period and for females, it dropped 1 percentage point.

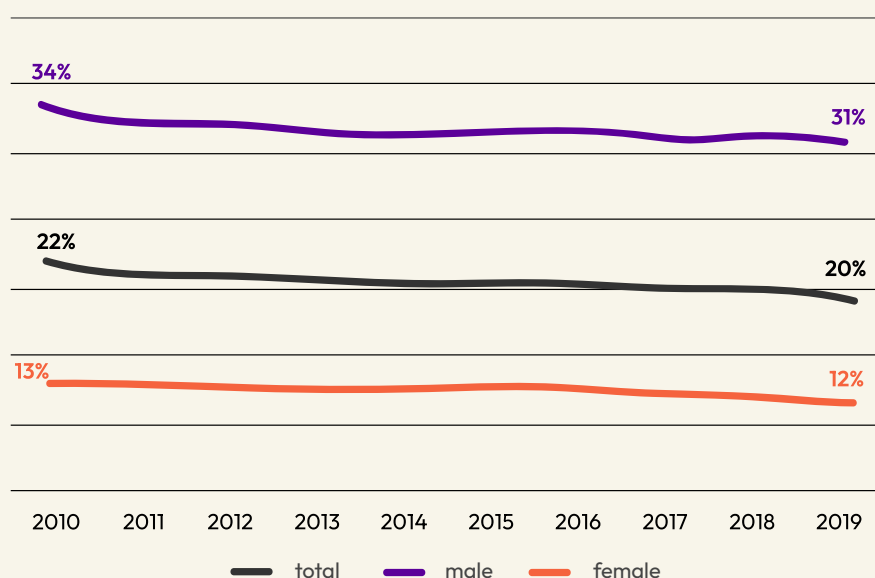


Figure 11: Evolution of the participation of male and female students in STEM careers in the total student body from 2010 to 2019

4.2 Evolution of the number of STEM enrollments

In recent years, the percentage of women enrolled in STEM careers dropped from 11% to 9%. The number of male and female enrollments in STEM careers rose from 75,000 to 103,000 over the period observed, but went from representing 19% of enrollments in all careers to 17%. For women, enrollments increased from 25,000 in 2011 to 34,000 in 2019. But, as enrollments in other careers increased proportionally more, STEM went from representing 11% to just 9% of enrollments. With enrollment numbers being a more dynamic indicator than student numbers, student participation in STEM is expected to continue to drop to reflect the current decline in enrollment numbers.

4. Radiography of STEM careers

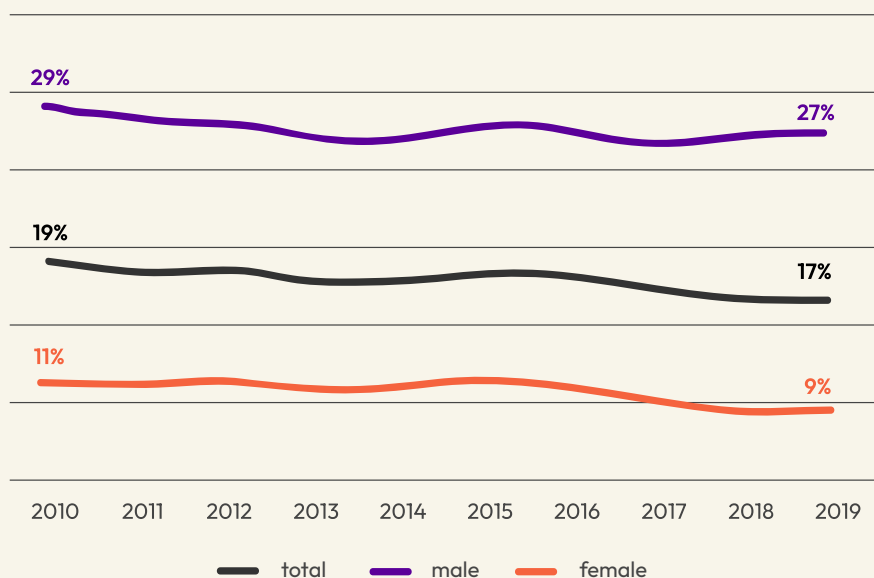


Figure 12. Evolution of the participation of enrollments in STEM careers in total enrollments from 2010 to 2019.

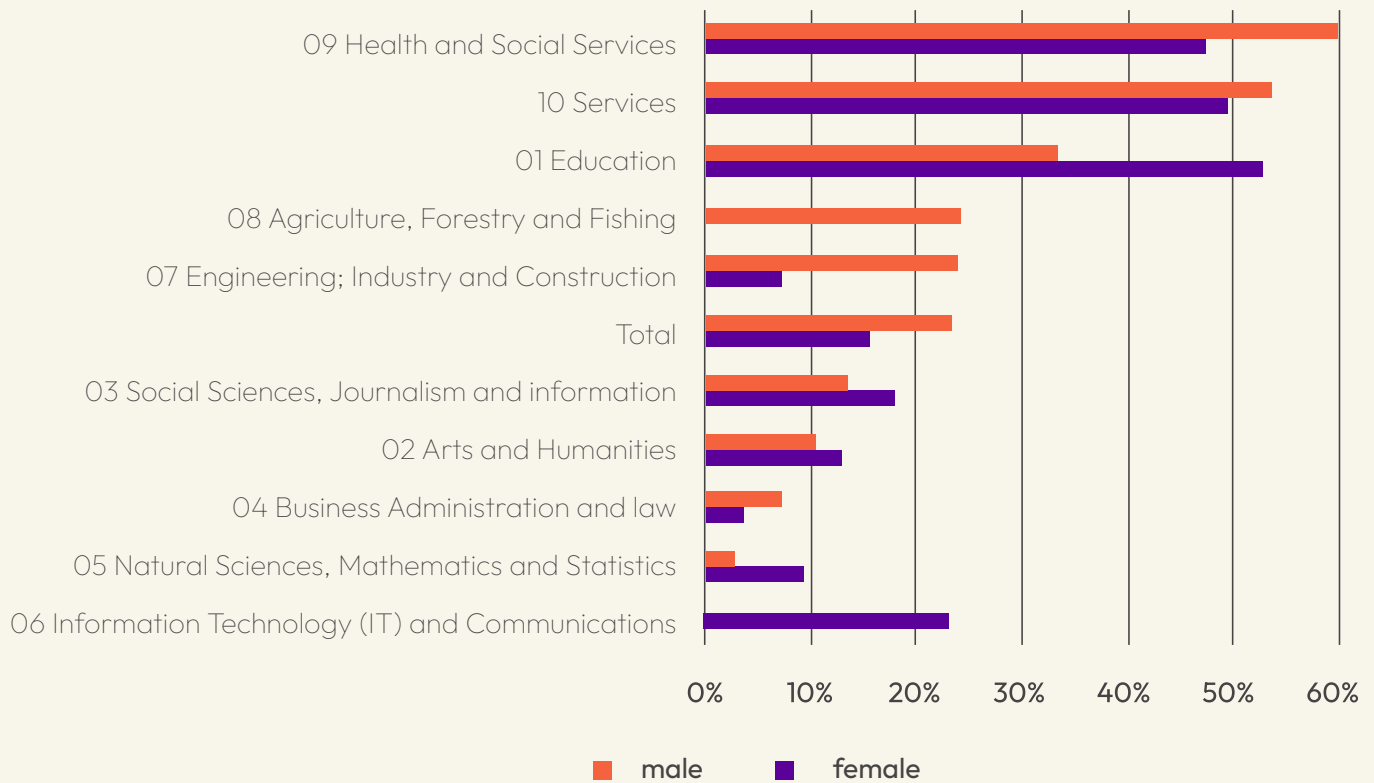
Which careers grew the most?

The participation in STEM careers in relation to total careers trended downward over the period from 2011 to 2019. Which disciplines, then, account for the 20% increase in the total number of students?

For women, the largest increases were in the fields of health and social services (+60%), services (+54%) and education (+33%). Agriculture and alike, as well as engineering, industry and construction also increased more than average, each accumulating a 24% increase.

For men, some trends were similar: the fields of education, services and health increased by magnitudes close to 50%. Information and communication technologies, however, appeared in fourth place with a 23% increase in the number of students.

Figure 13. Growth rate in the number of students between 2011 and 2019

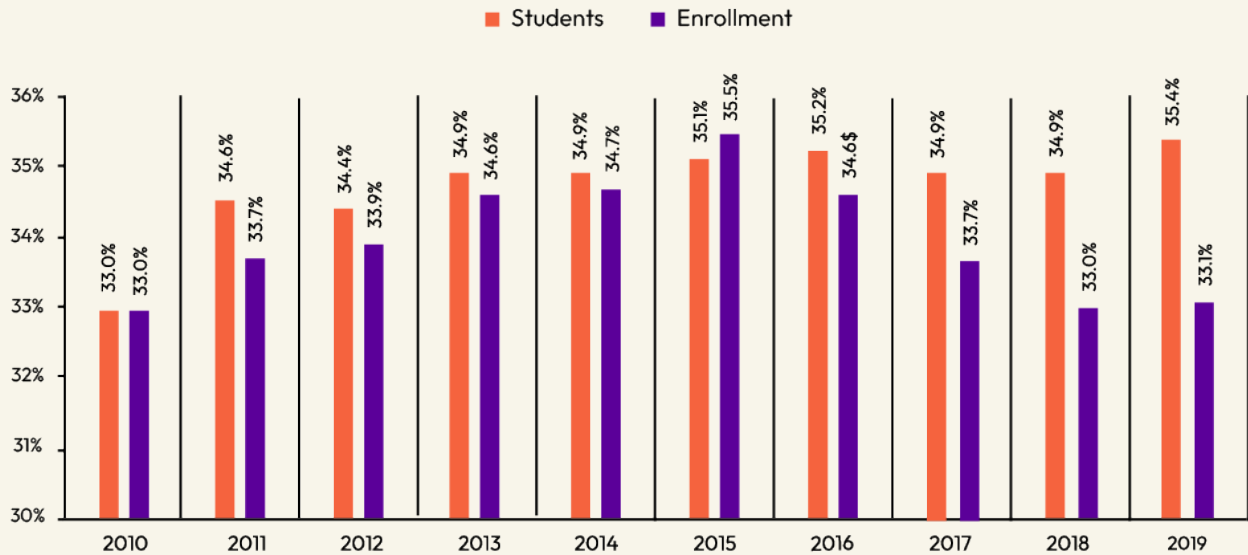


4.3 Participation of women in STEM

Only 1 in 3 students in a STEM career is female.

According to the data analyzed, 12 out of every 100 female undergraduates study a STEM discipline and 31 out of every 100 males do so. As noted in Figure 14, the participation of women remained around 35%. Looking at a less structural indicator such as enrollment numbers, female participation peaked at 35% between 2013 and 2016 and dropped to 33% in 2018 and 2019.

Figure 14. Participation of women in the student body and enrollment in STEM careers from 2010 to 2019

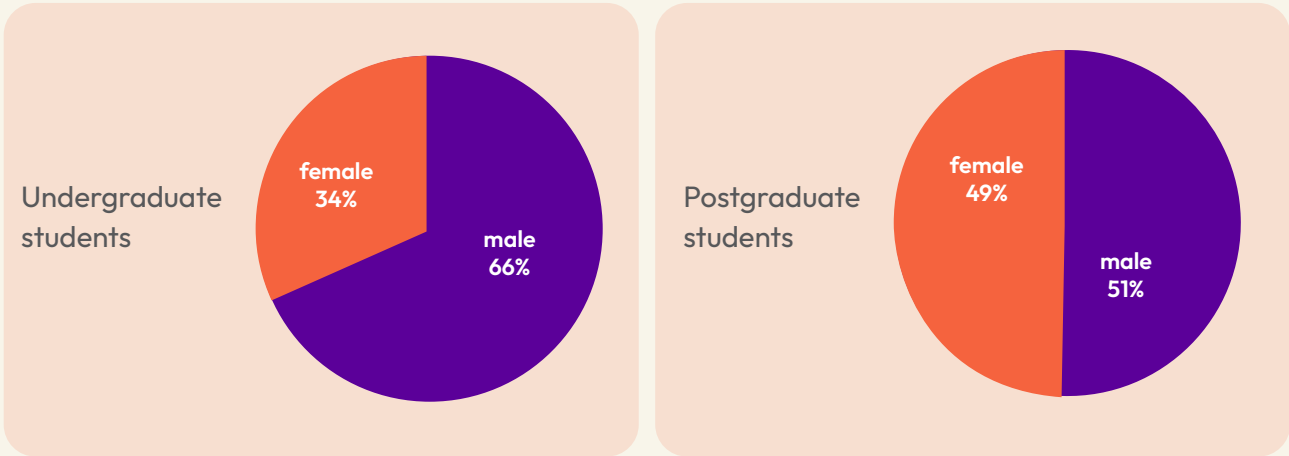


Note: vertical axis starts at 30% to make the comparison between reported values easier.

In postgraduate STEM-related careers, there is a trend towards gender parity. If a distinction is made between undergraduate and postgraduate STEM-related careers, the picture is particularly optimistic for the latter. When referring exclusively to postgraduate STEM-related careers, there is no participation gap between women and men: women represent 49% of the student body in the period from 2010 to 2019. The narrowing gap is not apparent when including undergraduate careers in the analysis because postgraduate studies represent only 5% of the total STEM student body and, thus, do not have a major impact on the overall average.

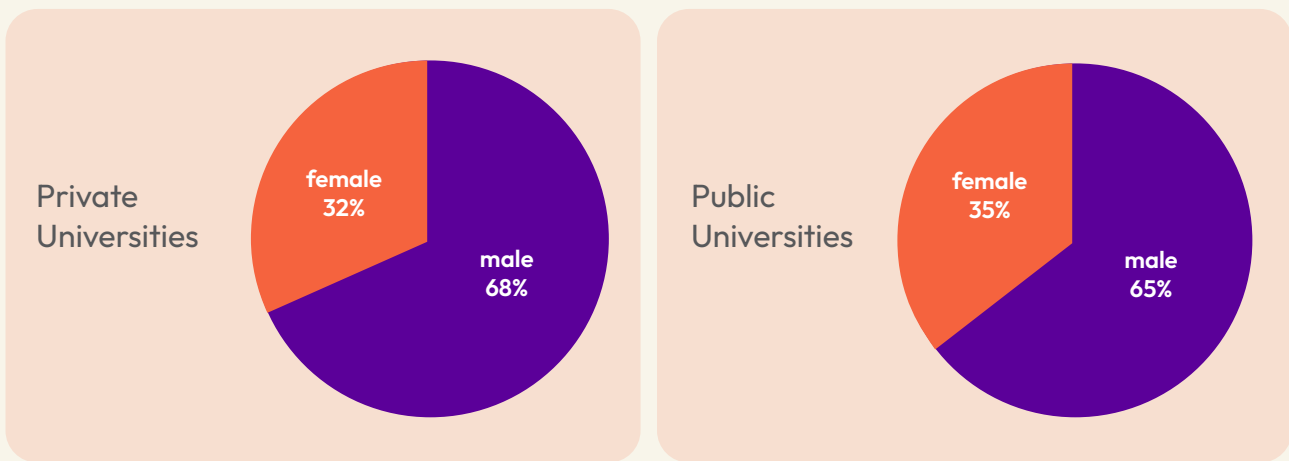
Figure 17 delves into this point to understand which specific fields explain this level of female participation so close to parity. The data can be construed as encouraging because they are consistent with gender parity at this level of study. They still leave a question mark as to the reason for the reversal, particularly because it could be consistent with a higher demand for women professionally in STEM fields, as addressed in various studies on the gender gap in STEM (Basco, Lavena, and Chicas en Tecnología 2019).

Figure 15. Participation of women and men among undergraduate and postgraduate students in STEM careers (average from 2010 to 2019)



In private universities, the participation of women in STEM careers is 3 percentage points lower than in public universities. Although private institutions represent approximately half of the country’s universities and colleges in addition to 20% of the student body, only 10% of those who study a STEM discipline do so in private institutions. In these cases, the participation of women is 32% instead of the 35% observed in public universities for the set of years analyzed. The difference was sustained over time, ranging between 3 and 4 more percentage points in public universities. The differential represents a 10% larger gender gap in private universities than in public universities.

Figure 16. Gender participation of STEM students in private and public universities (average from 2010 to 2019)



4.4 Career choice within STEM fields

Women's participation in STEM is in the majority in biological and environmental sciences and in the minority in engineering and ICTs. How do we explain the 35% participation of women in STEM careers?

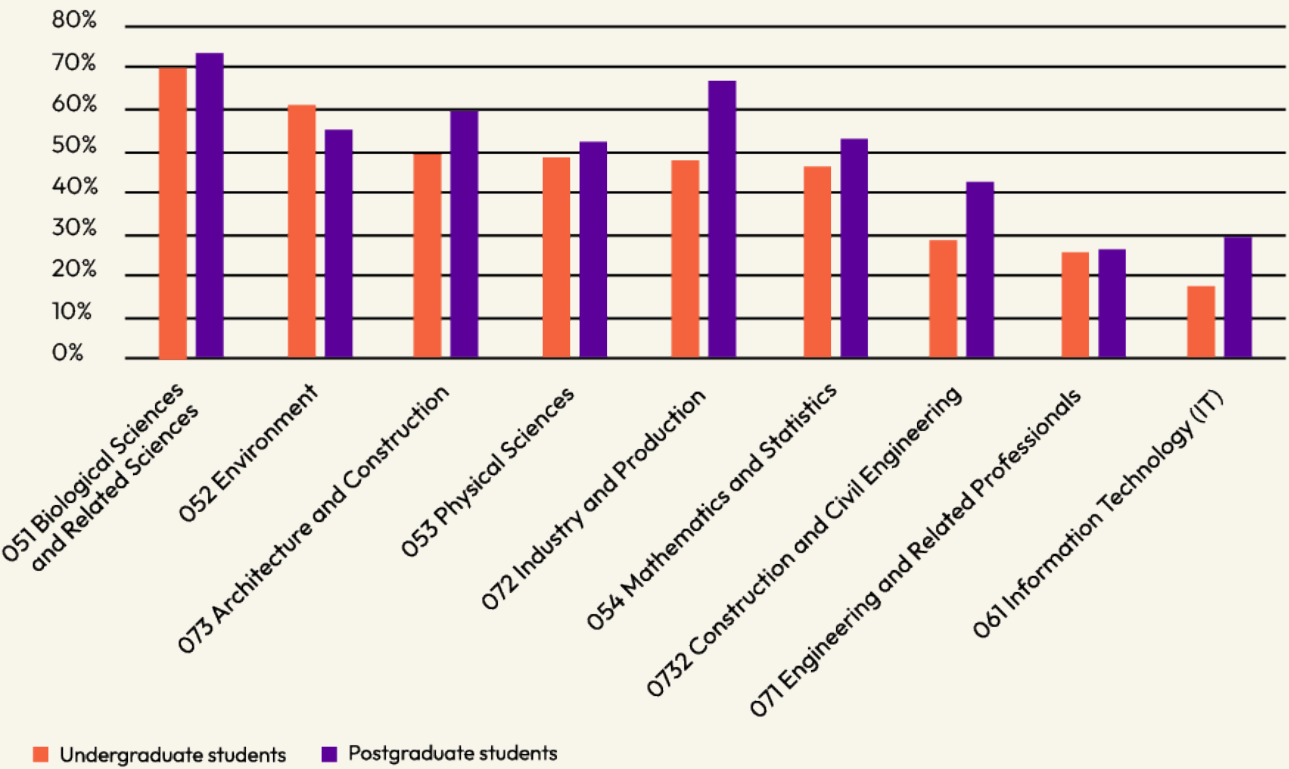
Women are not a minority in all STEM disciplines, but their participation is heterogeneously distributed within this segment.

When considering data on undergraduate careers from the last decade, the field of biological and related sciences has 70% female students, and in environmental sciences, 60%. In these cases, although the participation of women is high, they are not among the most numerous careers, which is why the impact on the overall average is moderate. In fields such as architecture and construction, industry and production, mathematics and physical sciences, participation is practically equal.

Lastly, the low female participation is mainly explained by disciplines associated with engineering and ICTs. Women represent 18% of the student body if we consider undergraduate courses in ICTs, about 25% for undergraduate and graduate engineering courses, and 29% in the case of postgraduate courses in ICTs.

As for STEM postgraduate degrees, the total participation of women reaches 49%. This is explained by the preponderance of women in careers such as biological sciences (73%), industry and production (67%), architecture and construction (60%) and environmental sciences (55%). Careers in ICTs (29%) and engineering (27%) gain weight compared to undergraduate studies but, even so, these are fields in which female participation continues to be a minority.

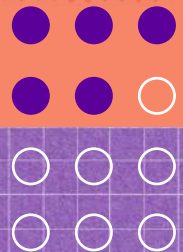
Figure 17. Participation of women in undergraduate and postgraduate STEM careers Year 2019



5.



Double click on
programming
careers



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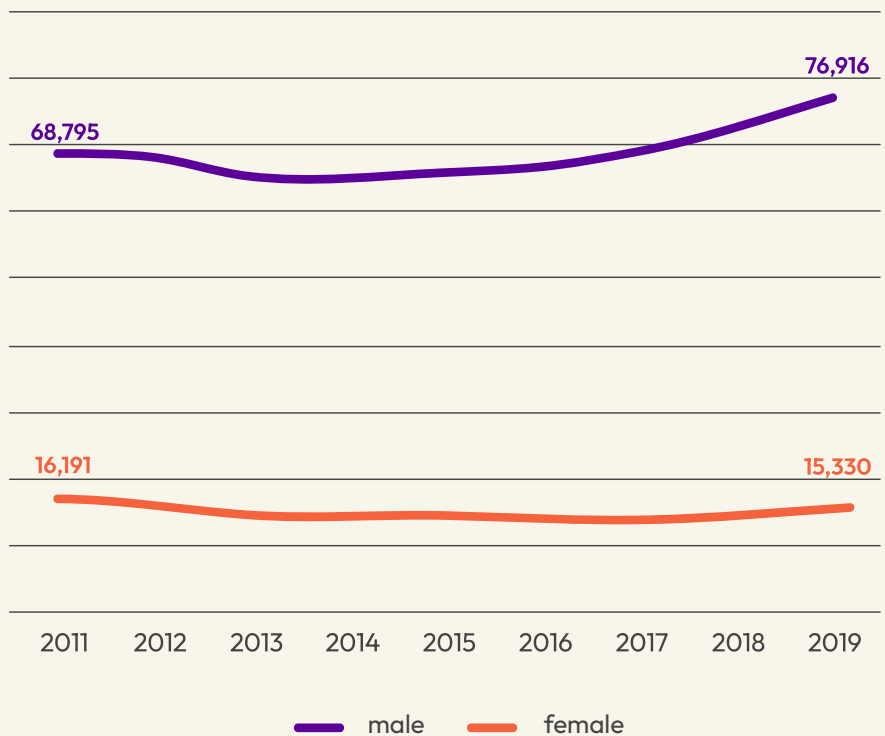
5.1 Change in the number of programming students

There are more programming students, but the increase was less than that of the total number of STEM students. Increasingly more students can be seen in programming careers in the analyzed period (2011-2019). In 2011, almost 85,000 students pursued a programming degree. Nine years later, the student body exceeded 92,000, representing an 8.5% rise. Even so, the increase contrasts with the 20% growth in the overall student body and is less than the 12% growth in the number of STEM students.

This data shows that a smaller percentage of students are choosing programming careers

The number of female programming students dropped. The total number of programming students rose 12% between 2011 and 2019, but the increase is broken down into a 16% growth in male students and a 5% drop in female students. Thus, it goes from about 16,200 students to about 15,300. As for male students, on the other hand, there is a clear acceleration in the number of students starting in 2016, reaching almost 77,000 in 2019.

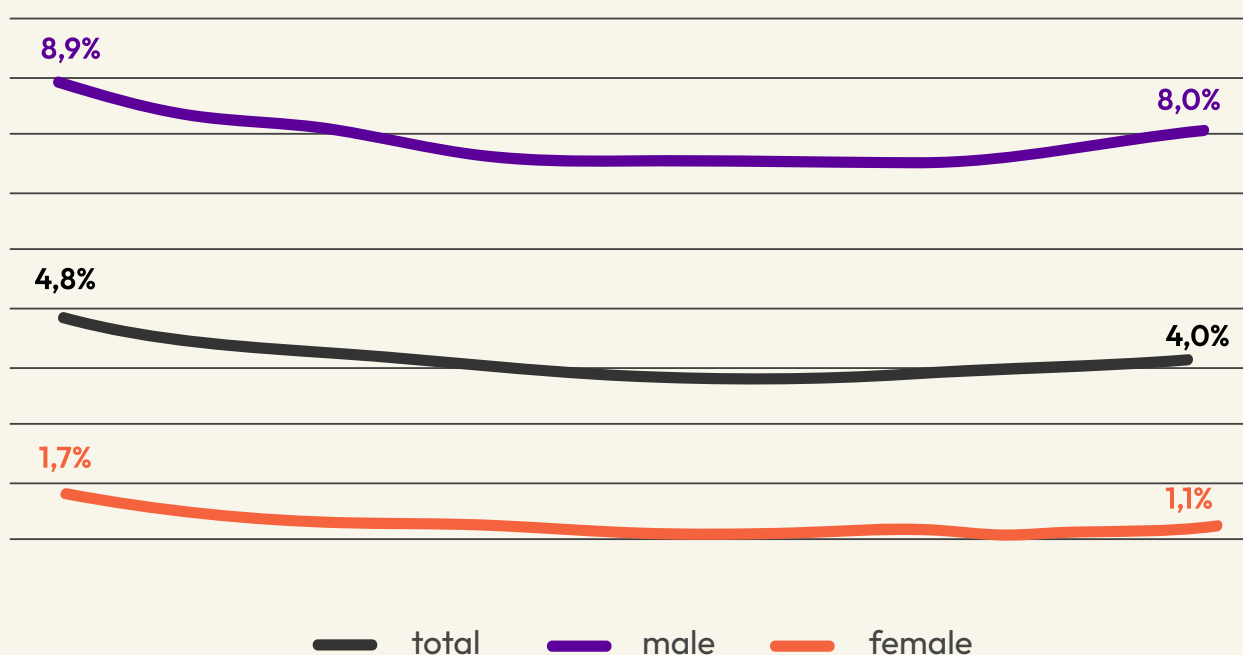
Figure 18. Evolution of the number of female and male students in programming careers 2011-2019



5. Double click on programming careers

The participation of female and male programming students dropped slightly, bringing females to 1 per 100 students. The total mass of students grew at a faster rate than programming students. For this reason, the relative weight of programming careers in the total number of careers dropped from almost 5% in 2011 to 4% in 2019. For men, this meant a drop from 9% to 8%. Meanwhile, women who chose programming dropped from 1.7% to just 1.1%.

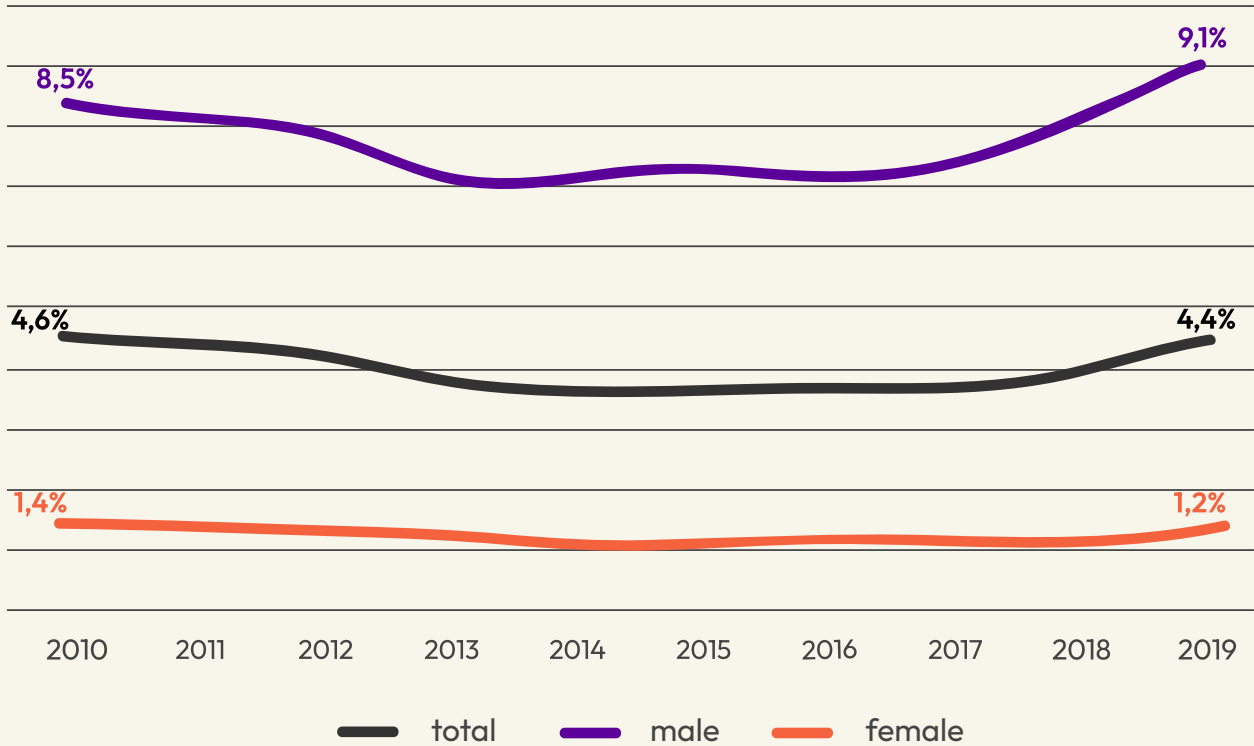
Figure 19. Evolution of the participation of male and female students in programming careers in the total student body from 2010 to 2019



5.2 Evolution of the number of programming enrollments

Enrollments in programming careers show a slight upturn, more marked for men than for women. The evolution of enrollments in programming careers as a percentage of total careers hints at a smooth “U” shape, with lower enrollments between 2013 and 2017 (approximately 3.5%) and higher enrollments at the peaks (4.6% in 2011 and 4.4% in 2019). Still, the bulk of the upward trend responds to an increase in male enrollments, which rose from 7.2% to 9.1%. Female participation remained stagnant at approximately 1% of total enrollments, peaking at 1.4% in 2011 and rebounding last year to 1.2% after a drop in the intervening period.

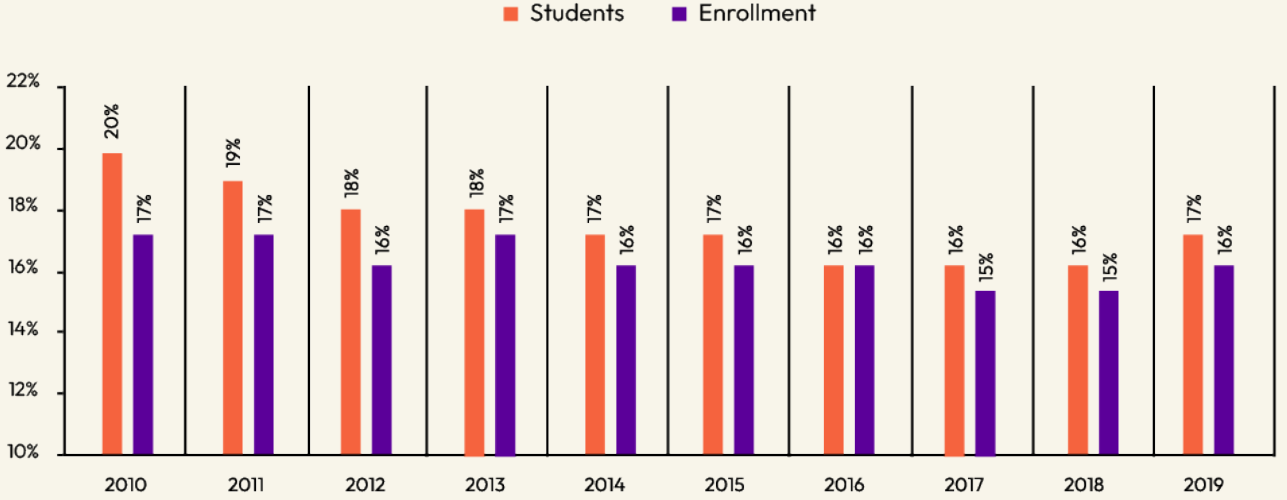
Figure 20. Evolution of the participation of enrollments in programming careers in total enrollments from 2010 to 2019



Less than 1 in 5 students in a programming career is female.

Looking at the proportion of women among programming students, 20% were women in 2011. It was the lowest participation gap of the period; since then, it dropped the relative participation of women to range between 16% and 17% from 2014 onwards. If instead of considering the number of students, the participation of enrolled women in programming careers is considered, it drops from 17% to 16%.

Figure 21. Participation of women in the student body and enrollments in programming careers from 2010 to 2019

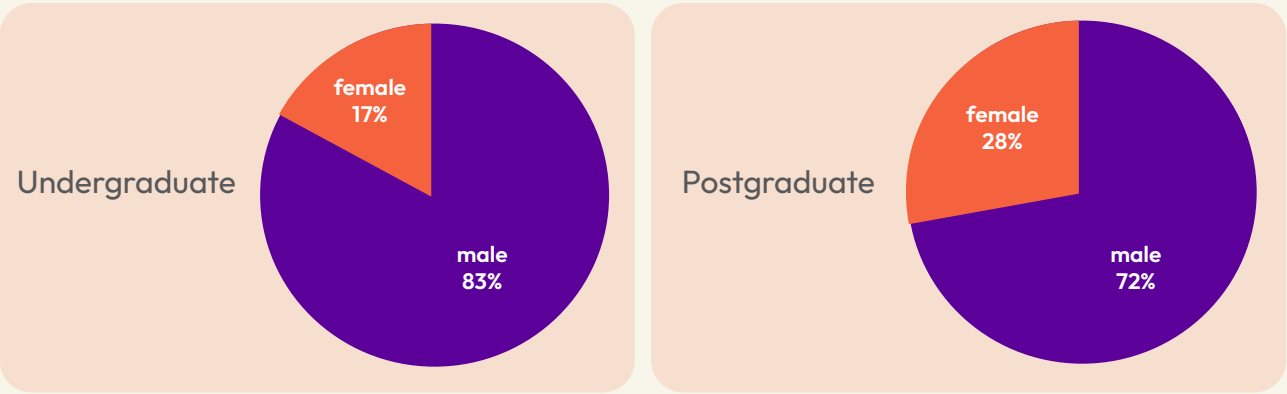


Note: vertical axis starts at 10% to make the comparison between reported values easier.

5.3 Participation of women in programming

The participation of women in postgraduate programming careers is higher than in undergraduate careers. While only 17% of the undergraduate programming students are women, the gender gap is significantly reduced among postgraduates: in these cases, the participation of women is 28%. This number is far from equal, but the improvement is significant. Both in this case and in the STEM postgraduate fields, the gender gap appears to be greater at the undergraduate level than at the postgraduate level.

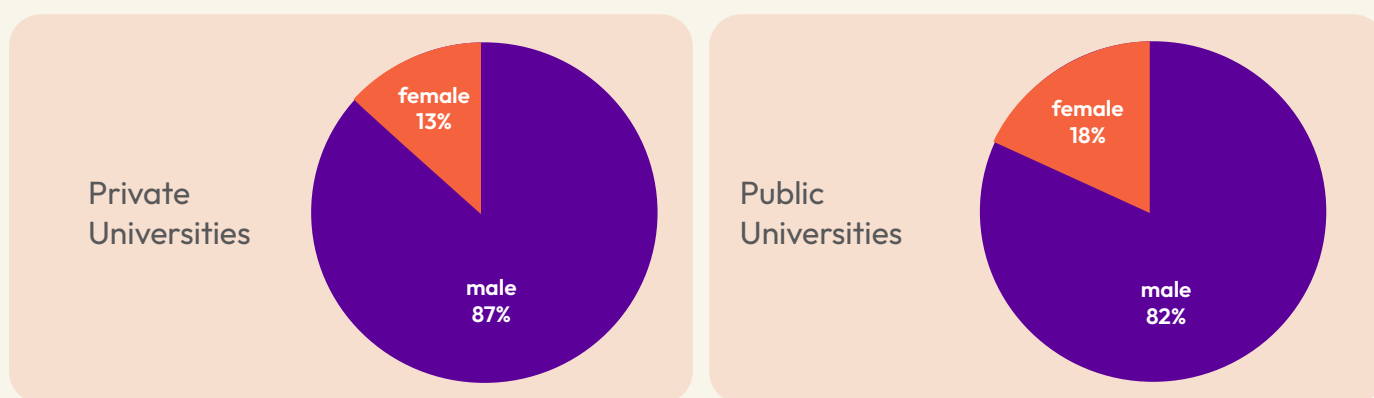
Figure 22. Participation of women and men among undergraduate and postgraduate students in programming careers (average from 2010 to 2019)



5. Double click on programming careers

The participation of women studying programming is 5 percentage points lower in private universities than in public universities. As shown in Figure 23, with a representation of 13%, the participation of women in private universities is five percentage points lower than their participation in programming careers in public universities, amounting to 18%. Private universities represent 20% of programming students. For this set of institutions, the participation of women in the programming student body is notoriously low.

Figure 23. Participation of programming students in private and public universities, by gender (average from 2010 to 2019)



Graduation rates by gender

When considering the total number of careers in the Argentine university system, there are more female than male students. It is not surprising, then, that there are also more female than male graduates in absolute terms. However, in order to know what proportion of women and men who enroll in university graduate in each field of study, it would be necessary to have data on the trajectory of each student over time. It is possible to reach an answer by estimating the graduation rates as the ratio of enrollment to graduation adjusted by the average theoretical duration of the degree programs. For this, in the case of undergraduate degrees, a quotient is calculated with the number of graduations reported in a benchmark time period in the denominator and with the enrollments registered five years earlier in the numerator.¹⁴

14. In this report, we averaged graduations recorded for the 2015–2019 period in the numerator and enrollments for the 2011–2015 period in the denominator, by gender and field of study.

5. Double click on programming careers

This is the estimate that was made for graduations for the 2015-2017 period¹⁵.

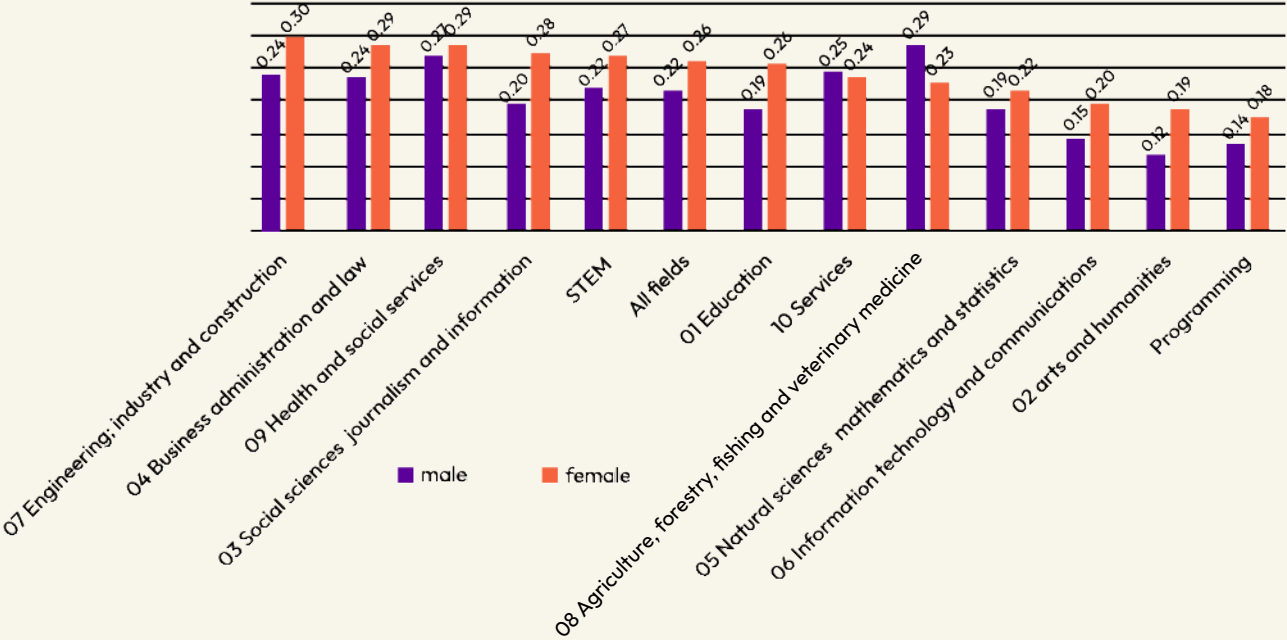
On average, the graduation rate for females is 26%, while 22% for males. As seen in Figure 24, females hold the relative superiority when considering graduation in all fields, except for agriculture and related careers, as well as service careers, which tend to include disciplines that are very diverse from each other.

In STEM fields, women also achieve a higher success rate: 27% of female enrollees graduate, compared to 22% for men. Despite being a minority in these fields, women maintain practically the same graduation rate that they achieve for the average of all careers. The barriers to entry into these careers and the difficulties that many report in the trajectory within university (Basco, Lavena and Chicas en Tecnología 2019) are not reflected in a lower ability to reach the final goal.

A different phenomenon is observed in the selection of programming careers, which encompasses careers in the ICT and engineering fields. There is a significant drop in the graduation rate for both genders: 14% of the men who enroll graduate and 18% of the women. For women, the drop is slightly greater: they lose 8 percentage points with respect to their average graduation rate, while men lose 6 percentage points. Programming careers are the ones that report the lowest graduation rate for women of all the categories analyzed.

15. These years were taken into consideration as some universities did not report graduation data for 2018 and 2019.

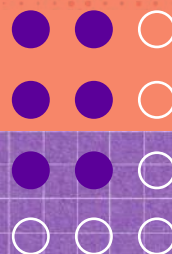
Figure 24. Estimated graduation rates by gender and field of study



6.



Final Thoughts



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Final Thoughts

Training in STEM disciplines is crucial to respond to a set of needs and opportunities that are increasingly relevant in the 21st century. On the one hand, there is a consensus on the possibilities for professional growth and advantageous working conditions offered by the productive sectors associated with science and technology. The benefits are not only remunerative, but, in view of the increasingly transversal and leading role of technology in the design of new products and services, knowledge in these areas becomes the skills required to play a leading role in the ongoing processes of creation and transformation.

There are also economic advantages beyond the individual: the literature agrees that there is a global shortage of people skilled in these fields, and that increasing the number of STEM graduates would result in higher rates of innovation and growth for the economy as a whole. If those working and researching in STEM disciplines also represent more diverse segments of the population, more ideas and solutions are expected to be generated to address a wider range of societal issues. These advantages are currently being realized, but they are likely to deepen as technological advancements and STEM-related skills — such as critical thinking, problem solving and innovation — grow in importance.

Based on data indicating that women are a minority in jobs in the technological field, and considering that university studies can act as a bridge to these professional opportunities, statistics from the Argentine university system were analyzed. The methodology consisted of categorizing the degrees awarded by the different university institutions in Argentina in order to find out how many women study STEM disciplines and how many of this group study programming.

The results show that, as it happens in most countries, women are overrepresented in the total number of students in Argentina, but they are consistently in the minority in STEM categories (García-Peñalvo et al. 2022, UNESCO 2017, Kahn and Ginther 2017). It is observed that, for every 100 students, about 60 are female and 40 are male. Only 12% of female students choose a STEM career and only 1% study programming. In contrast, 31% of males are in a career classified as STEM and 8% in a programming career. These numbers explain the gender gap observed in these sectors: only 35% of students in STEM disciplines and 17% of programming students are

women.

The causes given by the gender literature to explain the low participation of women in STEM studies are diverse and complex. The characteristics intrinsic to students that explain their decision to study STEM include preferences, motivation, performance, aptitude, and sense of identity or belonging (Eddy and Brownell 2016, van den Hurk 2019, Ito and McPherson 2018, Brown et al 2016). These attributes can be reinforced or altered by external or environmental factors. These include stereotypes and cultural aspects that affect not only students, but also teachers and authorities in educational institutions, as well as families and social settings. The confluence of factors results in lower levels of encouragement and support for women to pursue interests in STEM, which adds to the lack of role models or mentors from whom to draw inspiration, both in their own settings and among representatives in the media and popular culture (van den Hurk 2019, Olsson and Martiny 2018; Bian et al. 2017, Dou et al. 2019).

Much remains to be done to consolidate a diagnosis of which factors are most relevant in explaining the low participation of women in STEM careers in Argentina, and to develop comprehensive policies that address the different components. To analyze the lack of diversity in science and technology that is verified in the labor market, looking at the university level does not suffice, but rather the “leakage” of pipelines that begins much earlier.

A second finding is that the evolution of some indicators of interest had worsened throughout the period of scope of this study. Although the total number of students in all majors rose by 20% between 2011 and 2019, and the share of women in the student body increased from 57% to 59%, this was not reflected in equivalent variations in the STEM and programming fields. In the case of STEM, the growth in the number of students between the two peaks was 15%, five percentage points less than for the sum of all universities and careers. The relative drop was sharper for men: in 2010, 34% of all male students were pursuing a career in STEM, and in 2019, this proportion was 31%. For women, participation barely dropped, from 13% to 12%. In summary, the number of STEM students grew in absolute terms, but fell compared to the total rise in the student body. This did not change the gender gap within STEM, but the participation of women remained in the order of 35%.

As for programming careers, the situation is more alarming, because in addition to the relative decrease in the participation of these careers, the gender gap increased: the proportion of wo-

men in this discipline went from 19% in 2011 to 17% in 2019, with a drop in the absolute number of female students pursuing these careers. The rise in the total number of programming students was 12% in this period — 8 percentage points less than for the total — but this increase is composed of a 16% increase in the number of males and a 5% decrease in females. While there is an incipient rebound from the lower values, only 1.2% of female university students were studying programming careers in 2019.

The phenomenon of the relative drop in the participation of STEM and programming careers in university studies occurs despite the fact that there is unmet demand for many of these jobs, particularly those complementary to many technological implementations (LinkedIn 2020, Bumeran and City of Buenos Aires 2022). This mismatch between the demand and supply of skills transcends the gender issue. One possible hypothesis to explain it is that there are flaws in the information students have access to when choosing their careers, as well as the possibility that not all of them are aware of the development prospects offered. Another impediment may have to do with the complexity of these disciplines, which tend to have a predominant curriculum load of hard science subjects, such as mathematics, physics, chemistry and logic. These subjects entail the greatest difficulty in learning at the secondary level (OECD 2018), with which, the relative decline in STEM careers could reflect problems in educational quality at the secondary level. A third hypothesis is that, for some specific careers, such as programming and others in the field of technology, the university level competes with other shorter and more flexible training modalities. Examples of this type of training include courses, certifications or specializations that can be carried out through non-formal educational institutions.

It is crucial to generate the data and evidence needed to quantify the magnitude that these and other factors may have in explaining how the number of students choosing STEM careers, and the participation of women in the student body, is evolving. Labor markets are constantly evolving and, to a greater or lesser extent, incorporating new demands for skills, knowledge and competencies from the working population. It is of utmost importance, then, to ensure a dialogue between the education system and the labor market in order to know the unsatisfied training requirements and allow the education ecosystem to use this information when developing and prioritizing strategies. The education system, in turn, produces a series of indispensable indicators to measure the scope of formal education, both in terms of coverage and access, as well as the quality of learning, but these measurements are insufficient to understand where the obsta-

cles are for students in general, and women in particular, in pursuing a higher education path in STEM. It is vital to deepen efforts to complement these statistics with standardized surveys and diagnostic tools designed with these specific objectives in mind.

As for short courses and specializations, there are still no measurement systems in place to begin to quantify the extent of these novel modes of learning. At the time of this publication, there are no complete surveys of the available offer and the number of students they concentrate. Some organizations belonging to the community of digital training providers publish reports that, although they are very useful to address the issue initially, they do not yet have a comparable methodology or reusable data formats. Generating statistics on this sector is a challenge, not only because it is a new area, but also because it involves institutions that offer digital services that are not regulated by national ministries of education. Thus, the countries in which some of the training institutions are located do not necessarily coincide with the places that demand their products and that could be interested in accessing this data. Still, there is an open space for states and interested organizations to coordinate to standardize data requests.

A third finding and associated set of questions arises from the differentiated analysis for undergraduate and postgraduate levels. This report describes that, if the total number of careers is analyzed, the participation of women remains close to 57%, both for undergraduate and postgraduate careers. On the other hand, in the field of programming, the participation of women is considerably higher in postgraduate careers (28%) than in undergraduate careers (18%). The phenomenon is even more acute in STEM careers: here we observe a 49% participation of women in postgraduate careers and 34% in undergraduate careers. A higher participation of women in STEM and programming postgraduate careers is encouraging because it approaches the parity scenario. This may still imply more complex patterns that explain why, even if relatively few women study STEM undergraduate degrees, so many more pursue postgraduate degrees in these disciplines. The signals between the education system and the labor market are not unidirectional, but rather both spaces feed back into each other: just as educational credentials open doors to certain jobs, some jobs demand additional training that may be gender-dependent. Do women working in STEM fields need more credentials than men to advance in their career paths?

There is also a subtle differential gap in private universities when looking at the STEM and pro-

programming universe. Although when looking at the university system as a whole, the participation of women remains in the order of 58%, both in public and private universities. Their participation drops 3 percentage points in private universities if the analysis is limited to STEM careers, and 5 percentage points for programming careers. The question remains as to the causes of this difference for future research: since public universities have no fees, does the gap originate in the economic costs involved in studying at a private university? Statistics indicate that women earn less than men in the labor market, which is why this could be a plausible explanation. On the other hand, it would be important to analyze whether gender policies and protocols make public universities more open to women.

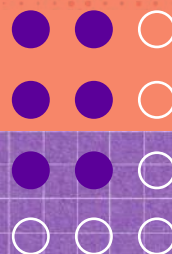
Other questions that remain pending for future research have to do, on the one hand, with the territorial dimension: How do the opportunities and challenges for women who want to study STEM or programming vary depending on where they live? What can be learned from universities and colleges that are achieving better participation rates of women in these careers? On the other hand, evidence shows that the COVID-19 pandemic disproportionately impacted women by burdening them with caregiving tasks during the period of social distancing and by hurting several economic sectors that have higher female participation (ILO 2020, 2021, Maurizio, 2021). How did the pandemic affect female STEM and programming students relative to other students? The 2020 college statistics will enable the latter question to be addressed.

This report sheds light on a small stretch of the long, leaky pipeline that represents the path of learning, training, and working for women in an unequal environment. The leak of STEM talent at the university level accounts for a number of problems that predate university. Similarly, it leaves after-effects that condition gender parity in subsequent paths, starting with a labor market increasingly intensive in technology and associated occupations. The future is under construction and the responsibility for creating the path is shared by society as a whole; however, as long as knowledge is concentrated and diversity in spaces of influence continues to be scarce, this future will be limited. Women need access to the tools and skills that are essential today to actively participate in the agendas of scientific research, entrepreneurship, social innovation and other areas with impacts that transcend the economic sphere. More women in science, technology, engineering, and mathematics means expanded, diversified, and enriched futures in broad senses.

7.



Bibliography



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Bibliography

Albrieu, R., Rapetti, M., Brest López, C., Larroulet, P. and Sorrentino, A. (2018). Inteligencia artificial y crecimiento económico. Oportunidades y desafíos para Argentina. Inteligencia Artificial y Crecimiento Económico en América Latina. Buenos Aires: CIPPEC

Basco, A. I., De Azevedo, B., Harraca, M. and Kersner, S. (2020). América Latina en movimiento: Competencias y habilidades en la Cuarta Revolución Industrial. Inter-American Development Bank (IDB) Institute for the Integration of Latin America and the Caribbean (INTAL) Integration and Trade Sector (INT). IDB Technical Note; 1844. <http://dx.doi.org/10.18235/0002132>

Basco, A. I., Lavena, C. (2021). América Latina en movimiento: competencias y habilidades para la Cuarta Revolución Industrial en el contexto de pandemia. Inter-American Development Bank (IDB) Institute for the Integration of Latin America and the Caribbean (INTAL) Integration and Trade Sector (INT). IDB Technical Note; 2176. <http://dx.doi.org/10.18235/0003292>

Basco, A., Lavena, C. and Chicas en Tecnología (2019). Un potencial con barreras: La participación de las mujeres en el área de Ciencia y Tecnología en Argentina. INTAL-IDB. Available at: <https://publications.iadb.org/es/un-potencial-con-barreras-la-participacion-de-las-mujeres-en-el-area-de-ciencia-y-tecnologia-en>.

Bian, L., Leslie, S. J., and Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science*, 355(6323), 389–391.

Blickenstaff, J. (2005). Women and science careers: Leaky pipeline or gender filter? *Gender and Education*, 17(4), p. 369–386

Brown, P. L., Concannon, J. P., Marx, D., Donaldson, C. W., and Black, A. (2016). An examination of middle school students' STEM self-efficacy with relation to interest and perceptions of STEM. *Journal of STEM Education: Innovations and Research*, 17(3), 27.

Bumeran and City of Buenos Aires (2022). Informe semestral sobre el mercado laboral de tecnología. Bumeran and Office of Productive Strategy, Assistant Department of Economic

7. Bibliography

trabajo_en_tecnologia_bumeran_gcba_is2022.pdf

CESSI (2020) OPSSI 2020 Results. Chamber of Computer Software and Services Companies of Argentina. <https://cessi.org.ar/wp-content/uploads/2022/02/20-12-02-cessi-opssi-mujeresenlaindustriait.pdf>

Contreras S., Hadad C., Masnatta M. and Varela M. (2021). Chicas en tecnología. Reiniciando el sistema. Buenos Aires. Editorial Conecta.

Dou, R., Hazari, Z., Dabney, K., Sonnert, G., and Sadler, P. (2019). Early informal STEM experiences and STEM identity: the importance of talking science. *Science Education*, 103(3), 623–637.

Eddy, S. L., and Brownell, S. E. (2016). Beneath the numbers: A review of gender disparities in undergraduate education across science, technology, engineering, and math disciplines. *Physical Review Physics Education Research*, 12(2), 020106.

European Commission (2018). Women in the digital age. Directorate-General for Communications Networks, Content and Technology, Publications Office, European Commission <https://data.europa.eu/doi/10.2759/526938>

García-Holgado, A., García-Peñalvo, F.J. (2022). A Model for Bridging the Gender Gap in STEM in Higher Education Institutions. In: García-Peñalvo, F.J., García-Holgado, A., Dominguez, A., Pascual, J. (eds) *Women in STEM in Higher Education. Lecture Notes in Educational Technology*. Springer, Singapore. https://doi.org/10.1007/978-981-19-1552-9_1

Gragnolati, M., Rofman, R., Apella, I. and Troiano, S. (2020). Los años no vienen solos. Oportunidades y desafíos económicos de la transición demográfica en Argentina. Technical Note No. 88055. World Bank: Montevideo. <https://documents1.worldbank.org/curated/en/419121468002092154/pdf/880550WP0P13310o0vienen0solos0FINAL.pdf>

Hong, L. and Page, S. E. (2004). Groups of diverse problem solvers can outperform groups of high-ability problem solvers. *Proceedings of the National Academy of Sciences* 101(46):16385–16389. doi:10.1073/pnas.0403723101

7. Bibliography

INDEC (2022). Dossier estadístico en conmemoración del 111° Día Internacional de la Mujer. Department of Sectoral Statistics and National Department of Social and Population Statistics. National Institute of Statistics and Censuses. https://www.indec.gob.ar/ftp/cadres/publicaciones/dossier_estadistico_8M_2022.pdf

Ito, T. A., and McPherson, E. (2018). Factors influencing high school students' interest in pS-TEM. *Frontiers in Psychology*, 9, 1535. <https://doi.org/10.3389/fpsyg.2018.01535>

Kahn, S. and Ginther, D. (2017). Women and STEM. NBER Working Paper No. 23525. <https://www.nber.org/papers/w23525>

LinkedIn (2020). Informe de empleos emergentes 2020. LinkedIn Talent Solutions. <https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions/emerging-jobs-report/Empleos-Emergentes-2020.pdf>

López-Bassols, V., Grazi, M., Guillard, C. and Salazar, M. (2018). Las brechas de género en ciencia, tecnología e innovación en América Latina y el Caribe. Resultados de una recolección piloto y propuesta metodológica para la medición. Inter-American Development Bank. Technical Note No. IDB-TN-1408.

Marchionni, M.; Gasparini, L.; and Edo, M. (2019). Brechas de género en América Latina. Un estado desituación. Caracas: CAF.

OCDE (2015). The ABC of Gender Equality in Education. Aptitude, Behaviour, Confidence. OECD Publishing, Paris. <https://doi.org/10.1787/9789264229945-en>

OECD (2019). PISA 2018 Results (Volume II): Where All Students Can Succeed, PISA, OECD Publishing, Paris. <https://doi.org/10.1787/b5fd1b8f-en>

Olsson, M., and Martiny, S. E. (2018). Does exposure to counterstereotypical role models influence girls' and women's gender stereotypes and career choices? A review of social psychological research. *Frontiers in psychology*, 9, 2264.

ONU Mujeres (2020). Las mujeres en ciencias, tecnología, ingeniería y matemáticas en América Latina y el Caribe. Entidad de Naciones Unidas para la Igualdad de Género y el Empoderamiento de las Mujeres. Montevideo: UN Women

7. Bibliography

UNIDO (2019). Informe sobre el Desarrollo Industrial 2020. La industrialización en la era digital. United Nations Industrial Development Organization.

Ostry, J. D., Alvarez, J. Espinoza, R. A. and Papageorgiou, C. (2018) Economic Gains From Gender Inclusion: New Mechanisms, New Evidence. Staff Discussion Notes No. 2018/006. <https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2018/10/09/Economic-Gains-From-Gender-Inclusion-New-Mechanisms-New-Evidence-45543>

Stromquist, N. (2019). World Development Report 2019: The changing nature of work. World Bank. Washington, DC, World Bank, 2019, 151 pp. ISBN 978-1-4648-1342-9 (hbk). <https://doi.org/10.1007/s11159-019-09762-9>

Szenkman, P., Lottito, E. and Alberro, S. (2021). Mujeres en ciencia y tecnología. Cómo derribar las paredes de cristal en América Latina. Work Document No. 206. Buenos Aires: CIPPEC. Tannenbaum, C., Ellis, R.P., Eyssel, F. et al (2019). Sex and gender analysis improves science and engineering. *Nature* 575, 137–146. <https://doi.org/10.1038/s41586-019-1657-6>

Trombetta, M. and Cabezón Cruz, J. (2020). Brecha salarial de género en la estructura productiva argentina. CEP XXI Work Documents No. 2, November 2020, Center for Studies for Production XXI - Ministry of Productive Development of the Nation.

UNESCO (2014). Campos de Educación y Capacitación 2013 de la CINE (IsCEd-F 2013). Manual que acompaña la Clasificación Internacional Normalizada de la Educación 2011. UNESCO Institute for Statistics. United Nations Educational, Scientific and Cultural Organization. Montreal: UNESCO. <http://dx.doi.org/10.15220/978-92-9189-157-3-sp>

UNESCO (2015). International Standard Classification of Education. Fields of education and training 2013 (ISCED-F 2013) – Detailed field descriptions. UNESCO Institute for Statistics. United Nations Educational, Scientific and Cultural Organization. Montreal: UNESCO. <http://dx.doi.org/10.15220/978-92-9189-179-5-en>

UNESCO (2019). “Cracking the code: Girls’ and women’s education in science, technology, engineering and mathematics (STEM)”. United Nations Educational, Scientific and Cultural Organization (UNESCO). <https://unesdoc.unesco.org/ark:/48223/pf0000253479>

7. Bibliography

UNESCO (2019). "Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM)". United Nations Educational, Scientific and Cultural Organization (UNESCO). <https://unesdoc.unesco.org/ark:/48223/pf0000253479>

UNESCO and FLACSO (2017). Infancia, Ciencia y Tecnología: un análisis de género desde el entorno familiar, educativo y cultural. Cátedra Regional UNESCO Mujer Ciencia y Tecnología en América Latina - FLACSO Argentina. <http://www.catunescomujer.org/wp-content/uploads/2017/11/STEM.pdf>

Van den Hurk, A., Meelissen, M. and Van Langen, A. (2019). Interventions in education to prevent STEM pipeline leakage, International Journal of Science Education, 41:2, 150-164, DOI: 10.1080/09500693.2018.1540897

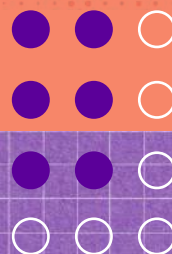
WEF (2016). The Future of Jobs. Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution. World Economic Forum

WEF (2021). The 2018 Global Gender Gap Report. World Economic Forum

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Argentine University Higher Education System: made up of both publicly and privately managed institutions, with coverage within the entire national territory. Higher Education Law No. 24,521 determines the bases necessary for a degree to qualify for this level in Argentina.

Undergraduate degrees: degrees with a minimum of 2,600 hours of study over a minimum of 4 (four) academic years issued by University Higher Education Institutions. These degrees qualify for professional practice and for direct access to the postgraduate level (specialization, master's degree — academic or professional — or doctorate). According to the provisions set forth in Article No. 43 of Higher Education Law No. 24,521, quality accreditation is mandatory for those undergraduate degrees that could compromise the public interest by directly jeopardizing the health, safety, rights, property or training of the inhabitants. For example: doctor, architect, lawyer, among others. This report also includes, as part of this category, post-secondary studies, training courses with a minimum hourly load of 1,600 hours and a minimum duration of two years. These are courses that may or may not articulate with the undergraduate level. Examples of this level are university technicians, analysts and assistants, among others.

Postgraduate careers: training paths with the purpose of strengthening the mastery of a specific subject or area within a professional field. There are different paths with different levels of workload/type of course: specialization, master's degree and doctorate. Each type of postgraduate course has its own minimum hourly load. (e.g., specialization 360 hours, master's degree 540 hours, etc.).

All postgraduate degrees must go through an accreditation instance before the National Commission for University Evaluation and Accreditation (CONEAU).

University Institution: Higher education institution that grants undergraduate and postgraduate university degrees. It includes universities and university institutes, the latter being limiting their academic offerings to a single disciplinary area.

Enrollment: given by the sum of students who enter for the first time in an academic discipline having fulfilled the administrative and academic requirements established by each institution;

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and the new enrollees by equivalence, i.e., those who enroll for the first time in the discipline but with subjects approved “by equivalence” from another discipline (in the same institution or another institution).

Re-enrollment: students whose enrollment in the same discipline is updated in an academic year after their last enrollment.

Students: the sum of new enrollments plus re-enrollments belonging to an academic discipline in a given year.

Graduates: the sum of students who complete all the courses and regulatory requirements of the academic discipline to which they belong.

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