2021 ASEE ANNUAL CONFERENCE
Virtual Meeting | July 26–29, 2021 | Pacific Daylight Time
Paper ID #33780

A Study of Gender Differences in Career Choice in STEM Disciplines: the Case of Chilean Students

Prof. Cristian Saavedra-Acuna, Universidad Andres Bello, Concepcion, Chile

Cristian Saavedra is an assistant professor at the School of Engineering at the University Andres Bello in Concepcion, Chile. He holds a bachelor's degree in Electronics Engineering and a master's degree in Technological Innovation and Entrepreneurship. Cristian is certified in Industrial Engineering, University Teaching, Online Hybrid and Blended Education, and Entrepreneurship Educators. He teaches industrial engineering students and carries out academic management activities. His main research interest areas are Innovation, entrepreneurship, engineering education, gender perspective studies in STEM education, and data analysis and visualization.

Dr. Monica Quezada-Espinoza, Universidad Andres Bello, Santiago, Chile

Monica Quezada-Espinoza is a professor and researcher at the School of Engineering at the Universidad Andres Bello in Santiago, Chile. Monica is currently collaborating with the Educational and Academic Innovation Unit, UNIDA (for its acronym in Spanish) at the School of Engineering of the Universidad Andres Bello, where she works as instructor in active learning methodologies. Her research interest topics involve university education in STEM areas, faculty development, research-based activities, evaluation tools and technology, and gender issues in STEM education.

A study of gender differences in career choice in STEM disciplines: the case of Chilean students

Abstract

Historically, women's participation worldwide in STEM disciplines has been lower than men's participation. Related literature recognizes that the engineering area is one of the most segregated occupations gender-wise. According to the OECD, the percentage of women who enroll in their first year in STEM disciplines does not exceed 19.8%. In Chile, the number of students who pursue a tertiary education diploma or degree has been increasing steadily in recent years; this is due to the strengthening of the Chilean educational ecosystem incorporating various modalities of schools and study programs. Despite the above, Chilean women's participation in STEM areas is not higher than the previously mentioned average. Our main objective is to analyze trends on this topic for Chilean students based on the following variables: type of institution, school shift and modality, age of students, and career type. We made a percentage analysis to investigate trends over time about students' gender within the variables: (1) type of institution (Community College, Professional Institute, and University); (2) school shift and modality (daytime face-to-face class, evening face-to-face class, and online class); (3) age of students; and (4) type of career (first or second career). We analyzed the responses given by n = 3,208,211 students entering the first year of higher education (registered data from 2008 to 2020). According to the results obtained, we assume that participation in women's careers in STEM disciplines has been gradually increasing. However, we find that the differences between males and females who hold a university career remain constant over time. Results suggest that further study is needed to investigate the predictors and correlates of students' career choices qualitative measures to support and more clearly interpret the numerical findings.

Keywords: STEM disciplines, career choice, gender differences

Introduction

The participation of women in engineering shows the highest gender disparities [1]. In countries belonging to the Organization for Economic Cooperation and Development (OECD), both in the world of work as when undergoing undergraduate studies, the percentage of women who enroll in careers such as Science, Technology, Engineering and Mathematics (collectively known as STEM) does not exceed 19.8% [2]. Various authors have studied the reasons that underlie this gender gap. Some studies have identified that the percentage of gender inequality in engineering careers in industrialized nations is more pronounced than in developing countries. In Jordan, for example, which has Islam as its official Muslim religion, 40% more women are enrolled in engineering degrees than in the United States. A similar case is seen at the University of Malaysia, in which there is a 50% higher retention of women than men [3]. Charles and Bradley (2002) have mentioned that factors such as self-expression and individualism are fundamental elements when choosing an undergraduate career, leading to a higher level of segregation in industrialized countries than in less developed countries [4].

The factors reported to lead to lower female participation in STEM disciplines are varied. Some arise from professional and personal development perspectives, including stereotypes generated around the female gender [5]. Others are based on the difficulties in reconciling academic and

family responsibilities, as reflected in a study carried out by the National Commission for Scientific and Technological Research (CONICYT, for its acronym in Spanish), which identified that, in engineering careers, women have 14.9% more difficulties in being able to combine both aspects than do their male colleagues.

Some institutions and governments have carried out various initiatives intending to reduce gender segregation in STEM disciplines. Some of them, for example, are attributed to the UNESCO project known as SAGA (STEM and Gender Advancement) [6], whose objective is to support governments in developing and formulating policies that reduce the Gender Gap in education and research. In Chile's case, some initiatives developed by the government include the creation in 2015 of the Ministry of Women and Gender Equity and Gender Management Improvement Program developed by CONICYT [7], aiming to reduce the Gender Gap in science and research projects. The following section addresses in greater detail the context within which this research is framed.

The Higher Education system in Chile

Chile is a South American country with 19.5 million inhabitants, of which 48.9% are men and 51.1% are women [8]. It has had one of the best performing economies in Latin America in recent decades from an economic perspective. In 2019, Chile and Uruguay had the highest GDP per capita in South America; Uruguay had US $16,190, while Chile had US $14,896 [9]. The country's main activity is exploiting natural resources, with copper being its largest export product. It leads the Global Innovation Index at the Latin American level, ranking N ° 40 worldwide and first in Latin America [10]. It has been a member of the OECD since 2010, being the first South American country to do so and the second Latin American country, after Mexico. Compared to other OECD countries, the Chilean gender gaps are smaller in cognitive competence areas at 15 years of age, including social support and security. However, inequality in employment and earning power is wider, reaching differences of up to 20% [11].

The higher education system in Chile has a wide range of actors, both private and public. Following, Table 1 shows a categorization of the different types of educational institutions available in Chile [12].

Table 1
Description of the types of educational institutions in Chile [12]

Types of educational institutions	*Short description*	*Average years of careers*
Technical Training Center or Community Colleges	They can teach higher-level technical careers and award technical degrees.	2
Professional Institutes	They can teach higher-level technical careers and professional careers that do not require a prior degree.	4
Universities	They can teach professional careers and offer master and doctorate programs.	5

Universities can be further classified into Institutions that belong to the Council of Rectors of Chilean Universities (CRUCH), which in 2020 accounted for 30 institutions and a second group that is not attached to the CRUCH, which also number an additional 30 institutions [13].

The whole higher education system provides coverage to more than 1.2 million students, who are enrolled according to the following distribution (see Table 2):

Table 2
The number of students by type of institution. Source: Undersecretary of Higher Education, Ministry of Education of Chile [12]

Institution Type	*State*	*Private*	*Number of Students*	*Enrollment Percentage*
Universities	18	60	750,000	60.4%
Professional Institutes		19	361,387	29.1%
Technical Training Center	10	42	130,324	10.5%

How higher education in Chile may be accessed are varied. One of them is the Single Admission System (SUA, for its acronym in Spanish), to which 29 CRUCH universities and 12 private universities are ascribed [14]. The application is made centrally through the SUA, and the candidates are selected based on the following factors: High School Notes (NEM, for its acronym in Spanish), results obtained in the University Selection Test (PSU, for its acronym in Spanish), and a ranking according to the candidate's grades. In those cases, where the universities do not belong to the SUA and the Professional Institutes and the Technical Training Centers, the application is made directly in each institution, using their high school grades.

The distribution of enrollment preferences for first-year students in 2019 shows that women amount to 51% for Technical Training Centers. For Professional Institutes, it amounted to 50.6%, while for universities, this participation amounted to 53.7%. In that same year, the participation of women is more outstanding in Health (79.9%), Education (75%), and Social Sciences (71.5%). Areas with lower levels of female participation are seen in the areas of Science (48%) and Technology (19%) [15].

The objective of this research is to analyze career choice preferences for women in STEM disciplines entering a technical or university career between the years 2008 to 2020, and how these change over time according to the following factors: 1) type of study institution (Technical Training Center, Professional Institutes, Universities), 2) program modality (study shift), 3) age of students and 3) type of career (if following a regular career or under a continuity of study mode). Continuity of study mode is when a student already has a university degree completed and decides to study another to specialize and obtain a double degree, and a regular career is when it is the student's first college degree.

Methodology

This is quantitative exploratory research in which the preferences of first-year students entering tertiary education are analyzed through a percentage analysis from 2008 to 2020. The database was obtained from the Higher Education System (SIES, for its acronym in Spanish) [16], with 15,541,422 students. Subsequently we clean this database in a two-stage process; the first stage

saw all those students with preferences in careers in the OCDE area, corresponding to Science and Engineering, Industry and Construction were selected (n = 3,225,442). In the second stage, we eliminate those records with one or more fields with no information, representing 0.55% of the data, reducing the number of records to n = 3,208,211. The information collected was gender, age-range, educational institution type, day or night student, and type of study program. Pearson's Chi-Square test was applied to the variables, with hypothesis test H0: Between X and Y-axis there is no association (or independent variables). The results found are presented in the following section.

Results

The results of Pearson's Chi-Square test showed that the p-values were less than 0.05, so the null hypothesis is rejected, inferring that there is an association between variables, namely an association between gender and variables such as Age Range, Type of Institution, Day or night student and Study program followed.

Results of the participation of women over time according to variables: type of institution, modality, age, and type of career

First, general results about selecting STEM disciplines in men and women between the years 2008 to 2020 are shown in Figure 1.

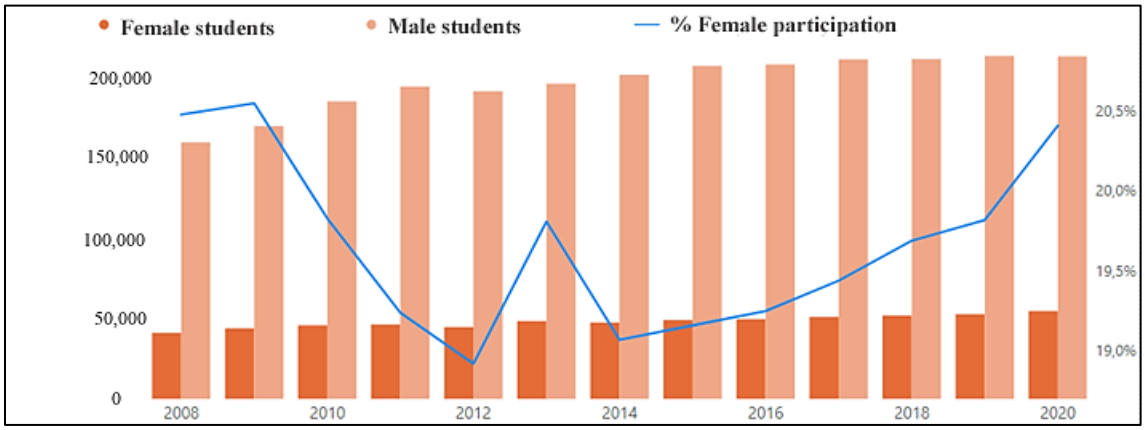

Figure 1. Distribution of preferences for first-year students in STEM disciplines concerning gender and women's participation. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

As shown in Fig. 1 the number of women who prefer STEM disciplines has gradually increased from 2008 (38,515 students) to 2020 (54,982 students). However, female´s average participation for the period under review is 19.5%, a fall in participation is seen between 2008 and 2012 (Figure 2), where minimum participation of 18.92% was seen. We can see an increase in participation between 2009 and 2020, where maximum participation of 20.41% was obtained. Although results are slightly higher than the average participation of women in OECD countries [2], there is evidence of a gender gap in STEM disciplines' first-year preferences.

Figure 2 shows two graphs; the one on the left (a) shows a decreasing trend in women's preferences towards STEM disciplines. The graph on the right (b) side shows how this behavior

changes towards a positive trend (from 2014 onwards), gradually increasing women's preferences for these disciplines.

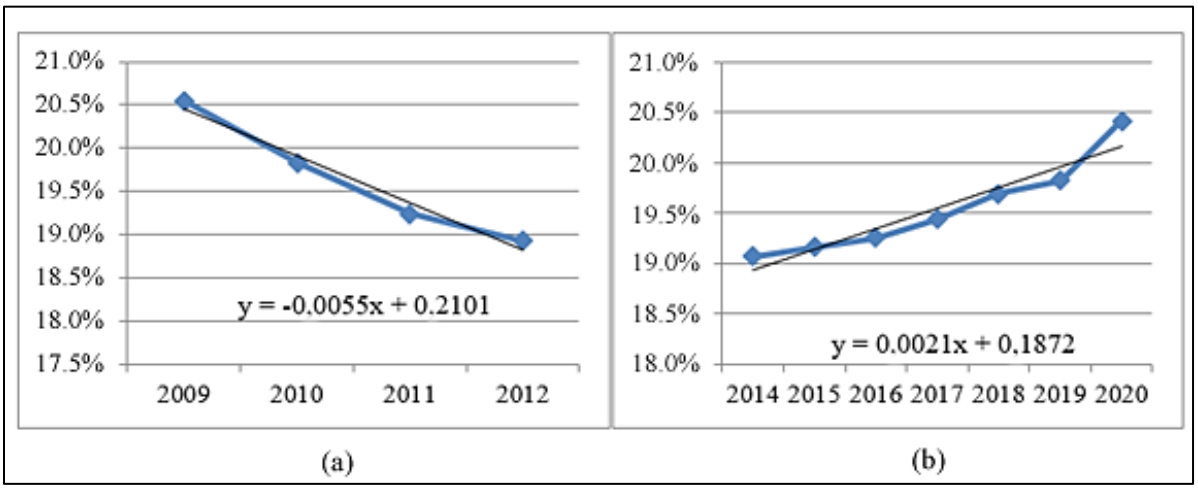

Figure 2. Decrease (a) and increase (b) in the distribution of preferences for female first-year students in STEM, Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

There is a three-year decreasing trend for women participation, amounting to 1.52%. The trend is subsequently reversed, with a positive cycle from 2014 to 2020 in which female student participation increases by 1.49%. This last period saw the initiation and implementation of public and private initiatives to reduce the gender gap in education.

Given the group of female students who select STEM disciplines, Figure 3 shows a variation between 2008 to 2020 in the selection preferences according to STEM disciplines subareas.

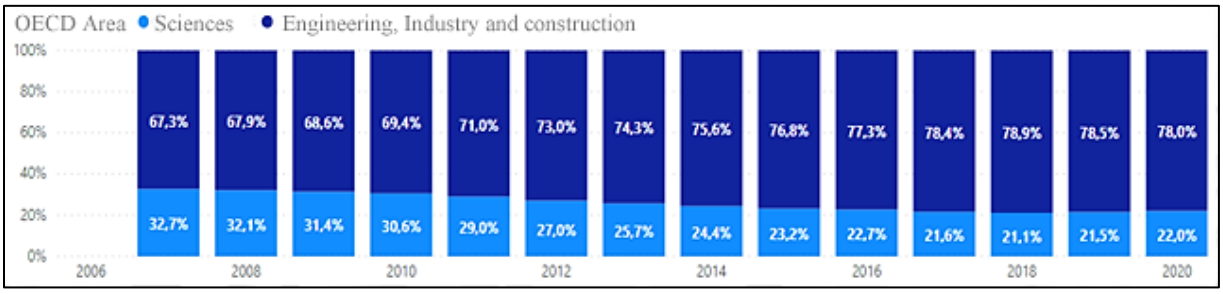

Figure 3. Distribution of first-year female student preferences in STEM disciplines. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

As shown in Figure 3, of the total number of women who chose careers in STEM disciplines, most chose Engineering, Industry and Construction. While a smaller and decreasing percentage chooses Sciences.

Further analysis is presented by type of Institution (Technical Training Center, Professional Institutes, Universities). In Figure 4, greater participation of women who choose careers in STEM disciplines in university institutions is seen, which exceeds 15% of the average participation in professional institutes and 16.1% of technical training centers.

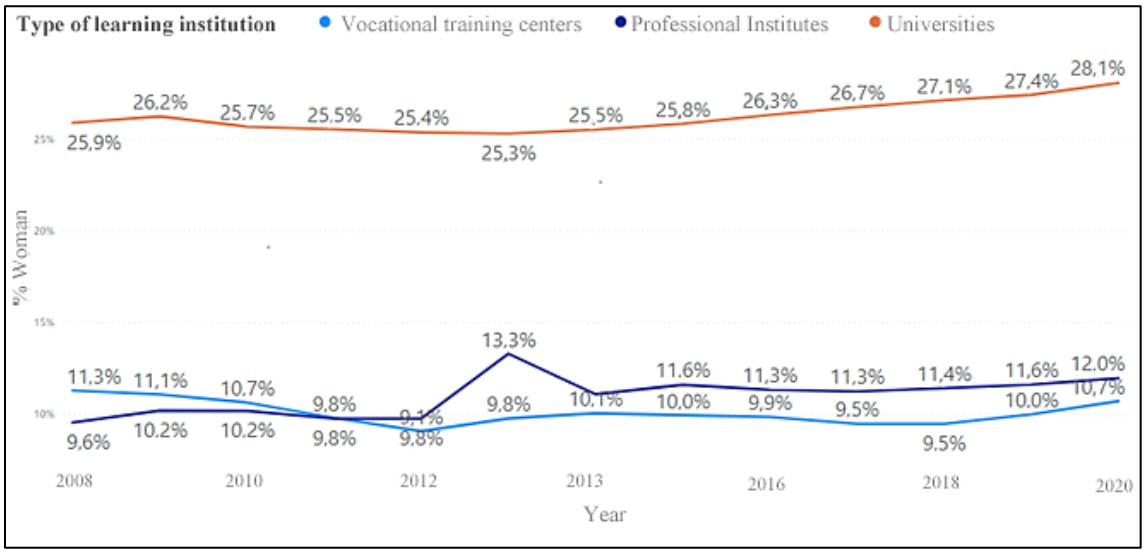

Figure 4. Distribution of first-year female student preferences for STEM disciplines by type of institution. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

As shown in Fig. 4, participation from 2008 to 2020 showed growth in university institutions and professional institutes, generating increases of 2.1% and 2.6%, respectively. However, in technical training center institutions, women's participation decreased by 0.5%. This last group of educational institutions has shorter careers. However, the interest seen in female student participation is less, concentrating their preferences in longer duration careers, namely university careers associated with better employment and economic opportunities within Chilean society [17].

The variation in female student participation per age-range was also included in the analysis of this present study. As can be seen in Figure 5, female STEM student preferences change according to their age range. The younger the women, the more preferences they have for these types of disciplines. For women aged 15 to 19, their average participation percentage is 23.2%, yet from years 2008 to 2020, they decrease from 24.6% to 22.8%.

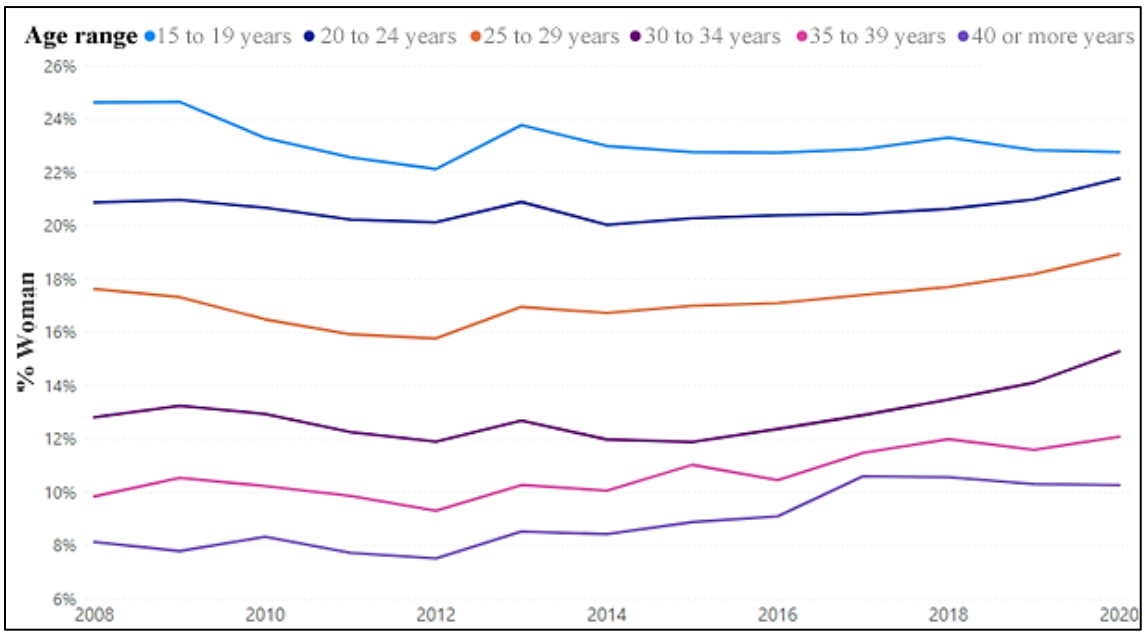

Figure 5. Distribution of preferences for first-year female students in STEM disciplines, concerning age range. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

While in the other age ranges, as can be seen in Figure 5, although with lower participation, their behavior in the period 2008 to 2020 shows an increasing trend, with an increase of 0.9% for the 20 to 24 age-range, 1.3% increase in the 25 to 29 age-range, 2.5% increase in the 30 to 34 age-range, 0, 9% in the 35 to 39 age-range and 2.2% increase in the 40 plus age range.

Regarding female student participation and their study modality, Fig. 6 shows results for the period 2008 to 2020, with the bars representing the number of female students, while the line graphs represent female percentage participation for first-year STEM disciplines. It can be seen that the daytime study mode has greater female participation, with an average of 23.5%, with a dip in participation between 2009 and 2012. Subsequently, from 2014 to 2016, it remained constant with 23.3% participation. Finally, from 2017 to 2020, participation increased gradually from 23.4% to 23.9%.

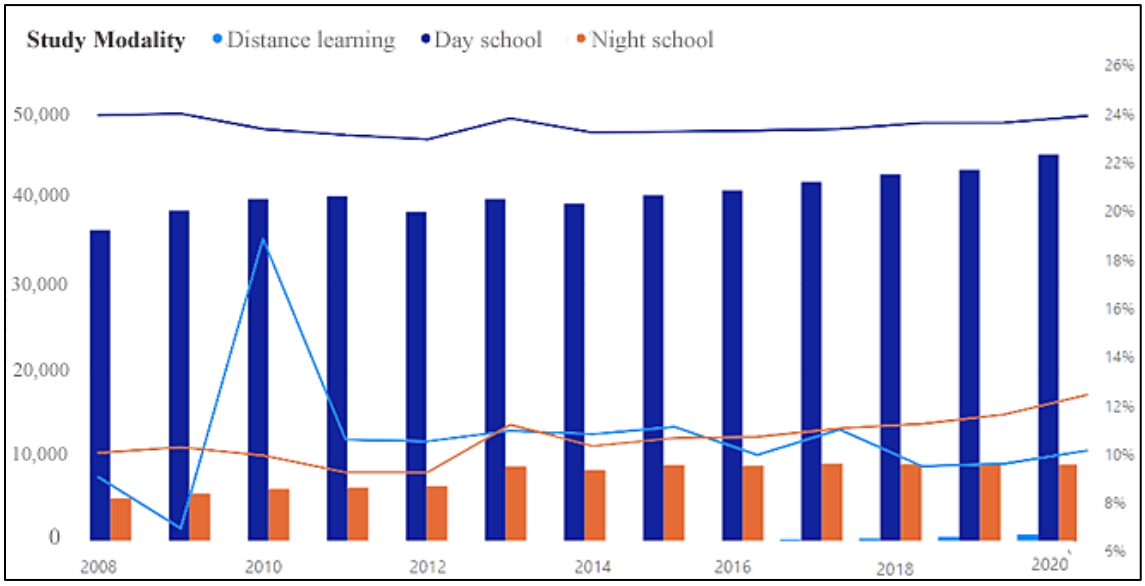

Figure 6. Total numbers and percentage distribution for first-year students in STEM disciplines, Chilean higher education institutions, concerning the type of study modality. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

As shown in Fig. 6, the greatest increase in female student participation occurred in the evening study modality, with a 2.4% increase in participation. The Online modality also saw an increase, amounting to 1.1%. The number of female students in the evening study modality increased from 5,101 in 2008 to 9,021 in 2020, an increase of 76.85%. In the daytime study modality, the increase in female students was from 36,251 to 45,180 in 2020, an increase of 24.63% in the total number of students.

Figure 7 shows first-year female students' preferences in STEM disciplines per study program (regular or continuity studies). If we remember from the first section, continuity of studies is when a student already has a university degree completed and decides to study another to specialize and obtain a double degree; and a regular career is when it is the student's first college degree.

It is seen that regular programs show a decreasing trend from years 2009 to 2012, where participation falls to a minimum of 19.2%. Subsequently, an increase is seen from 2014 to 2020, showing an increase from 19.3% to 20.5%.

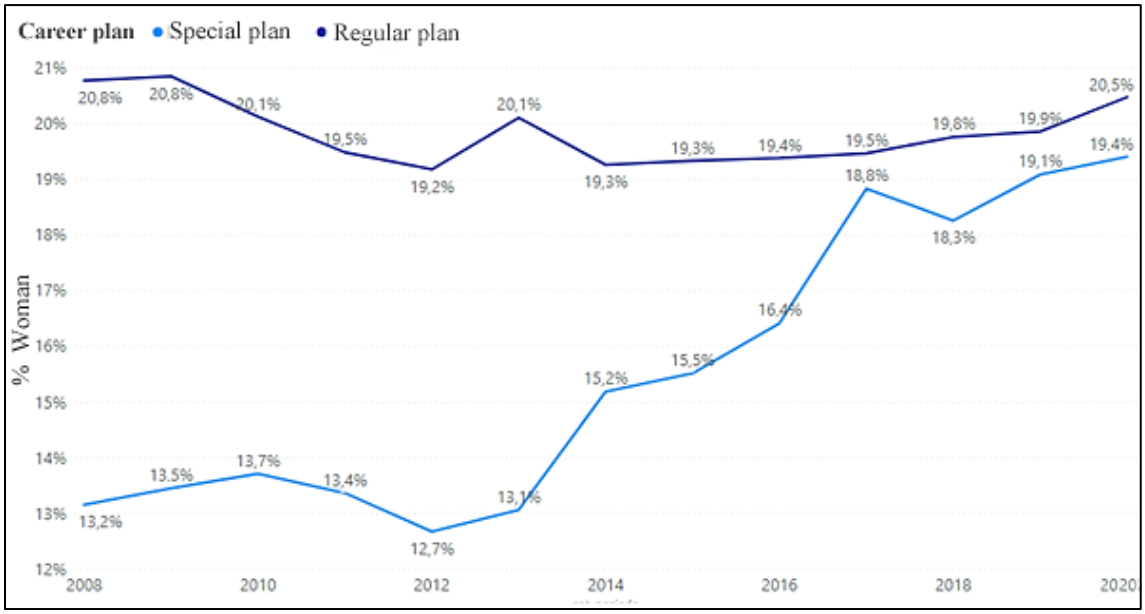

Figure 7. Distribution of preferences for first-year female students in STEM disciplines about their study plan. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

The variations shown in Fig. 7 are like general results analyzed in Fig. 1. However, in the study continuity programs, results from 2008 to 2020 show a steady increase in female participation, going from 13.2% to 19.4%. Said increase implies that the first-year gender gap between both types of study programs is reduced from 7.6% in 2008 to 1.1% in 2020.

Analysis and discussion

Figures 4, 5, and 6 reveal a small but sustainable increase in female participation independently of the type of institution, the career plan, and the study modality. In almost all cases, the proportion of female students have increased, which is good news. However, the data presented is for the last 12 years. The increase for all these years is insufficient. If we take the linear regression analysis presented in Figure 2 (b), which is the general female proportion in time, for the year 2049, we will have that the proportion of female students will increase the 0.5 of the total students at the university level.

Although the increase occurs with the type of institution, the career plan, and the study modality, there are some differences. In the type of institutions (Fig. 4), universities have the greater percentages among the different types of institutions with professional institutes and vocational training centers with a smaller proportion of female students than male students.

A similar trend is in terms of the study modality (Fig. 6), in which the day school has double of female proportion compared to the night school or the distance learning education. In the career plan case (Fig. 5), the female proportion gap is getting smaller through the years, with only a 1% difference in 2020.

An interesting but also worrisome result is what we present in Fig. 7, the proportion of female students versus time across age intervals. Notably, age is a significant factor in the proportion of

female students regardless of the year measured. The younger the students, the higher proportion of female students are. In this way, we can argue that since the young students compose a greater proportion of students' total, then we should target older female students to pursue a STEM career. However, the figure also reveals that students in the range of 15-19 years old are the only group where the proportion of female students decreased instead of increasing. Moreover, that age group is the one with the greatest absolute number of students.

To understand better the age factor, we decided to integrate results in the ways. The following figures will link up the age factor with the other three factors, type of institution, the career plan, and the study modality. By disaggregating information on first-year preference in careers under continuity of study programs, it can be identified that students participate more in disciplines such as Industry, Technology, and Construction, with lower participation in science careers (see Figure 8).

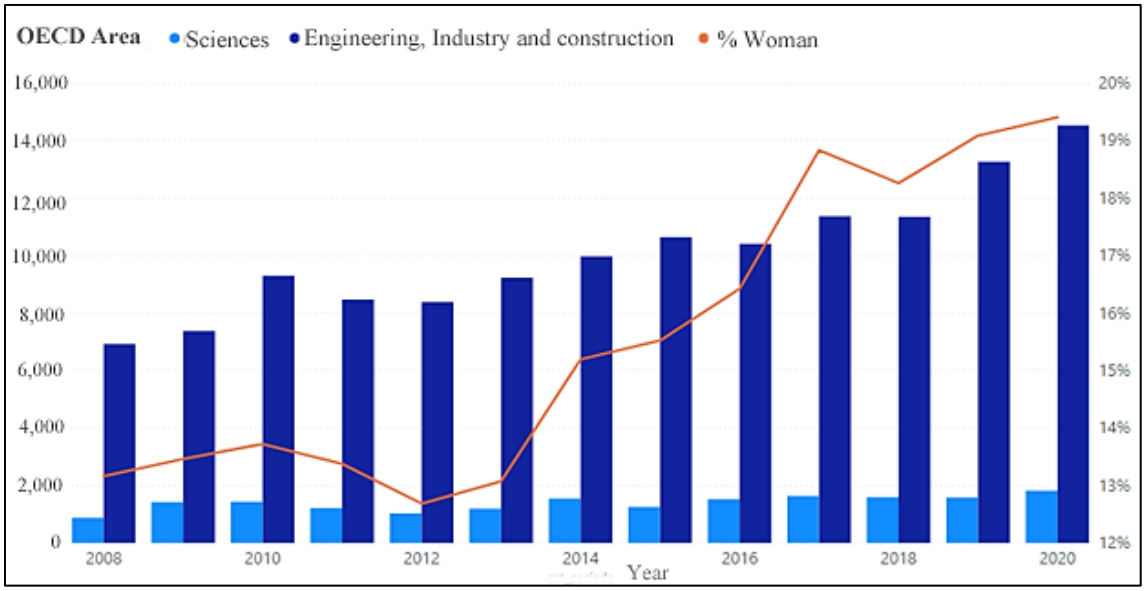

Figure 8. Distribution of preferences for first-year female students in STEM disciplines, concerning their study plan. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

Thus, as shown in Figure 8, in 2020 the number of female students who entered as first-year was 14,531 for Engineering, Industry and Construction and 1,820 for Sciences, which represents 88.9% and 11.1% of the sample.

Results of the Analysis made between the following variables: type of institution, modality, age, and type of career.

Figure 9 shows female participation according to their age and the type of institution they choose to study. An inverse relationship is seen between female participation and student age-range. The highest female student participation is seen in university institutions and the youngest age range, with a participation of 30.1%.

This percentage decreases across the board the older the women's age range, with the lowest participation seen in the 40 plus age-range, with 10% in university institutions, 10.2% in technical training centers, and 8.2% in professional institutes.

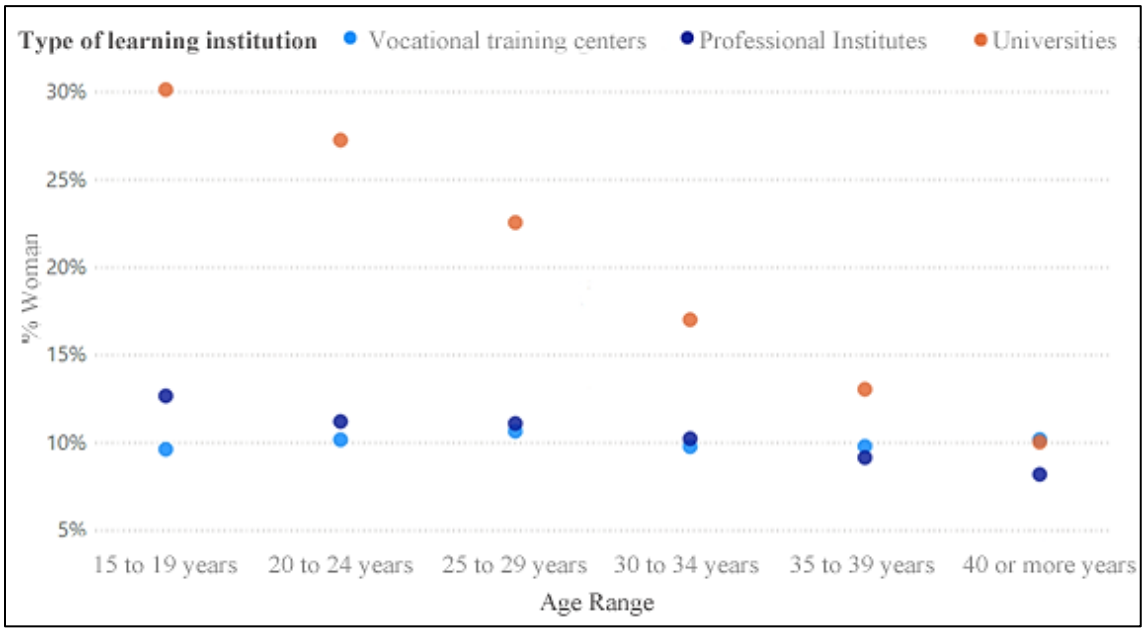

Figure 9. Distribution of preferences for first-year female students in STEM, concerning age range and type of institution. Source: Own elaboration based on SIES historical enrolment from 2008 to 2020 [16].

It is seen in Fig. 9 that technical training centers have female participation, which is independent of student age-range, yet university institutions show a strong negative correlation with age ($r = -0.99$), with a similar situation seen in professional institutes ($r = -0.97$).

The relationship seen in female student participation and first-year preferences, concerning age and type of career plan, is illustrated in Fig. 10. There is similar participation within the different programs. In the 20 to 29 age-range, and the 40 plus age range, while there is a greater difference in the 15 to 19 age-range, with 1.3% difference, and in the 30 to 34 age-range, with a difference of 2.6%.

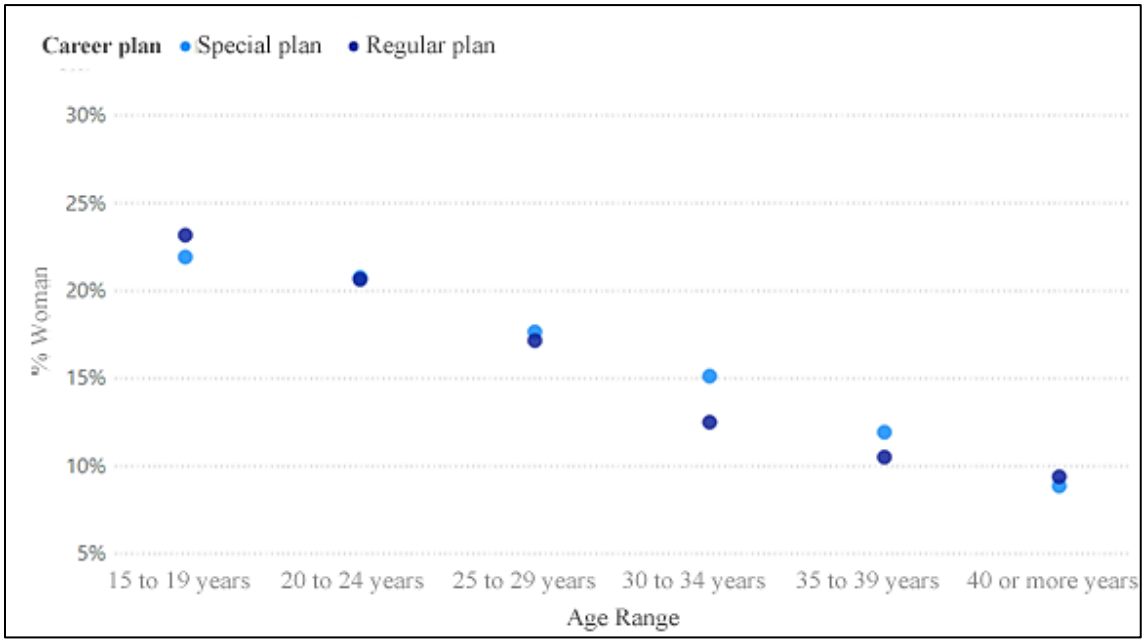

Figure 10. Distribution of preferences for first-year female students in STEM, concerning age-range and type of study program. Source: Own elaboration based on SIES historical enrolment data between 2007 and 2020 [16].

Figure 10 also shows an inverse relationship between first-year female participation and the type of study program. Both in the regular and the continuity of studies program, percentage participation decreases as female age increases. It is also seen that daytime study programs have the highest female participation in the 15 to 24 age-range. This trend reverses in the 25 to 39 age-range, where there is a higher participation of women in the evening than in the daytime study courses.

Finally, the relationship between the percentage of female participation, age range, and type of study modality was evaluated, as illustrated in Fig. 11. It is seen that, as age increases, female participation in STEM declines. Thus, in the 15 to 29 age-range, female students' higher participation is reported in the daytime study mode. The second highest would be female student participation in online programs, in the 35 plus age-range. The highest participation is seen in daytime study programs, followed by students in the evening study modality.

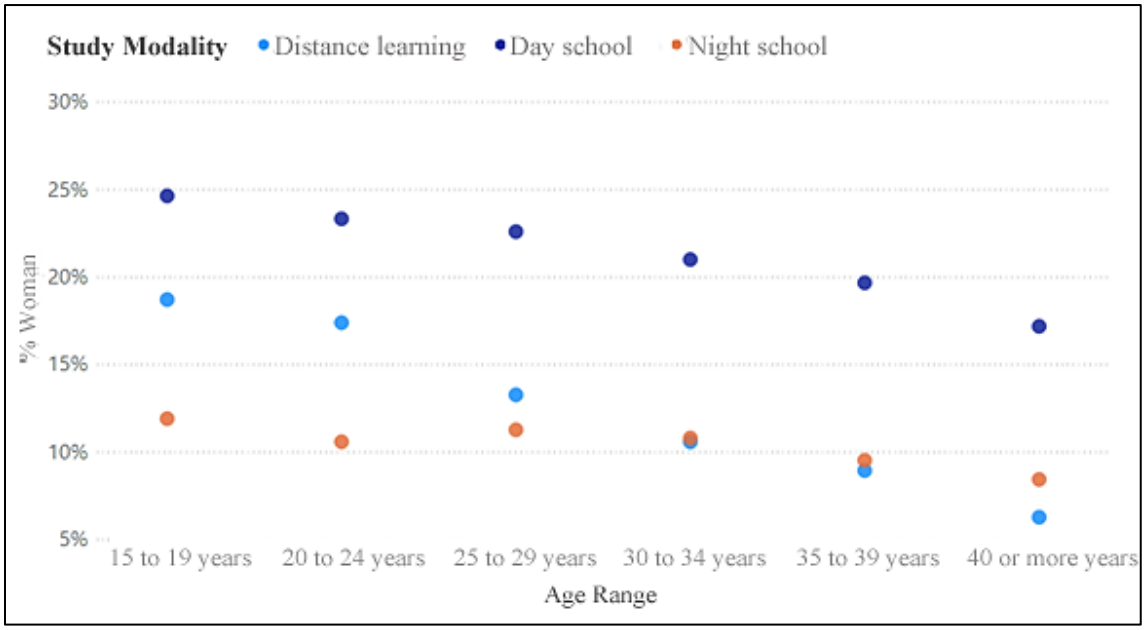

Figure 11. Distribution of preferences for first-year female students in STEM disciplines, per age-range and study modality. Source: Own elaboration based on SIES historical enrolment for 2007 to 2020 [16].

An analysis reveals that during the period 2008 to 2020, there is a sustained rise in the number of females first-year students enrolling in STEM disciplines, amounting to 33%. This increase is concentrated in the areas of Technology and Industry, less so in science. However, this increase in female students' number is not reflected in the percentage of participation concerning male students since the variation in female participation varied by -0.07% from the year 2008 to 2020.

Given the total number of female students who enrolled as first-year students in 2020, there were a total of 45,080 (82%) students in daytime careers, 9,021 (16.4%) in evening study mode, and 881 (1.6%) following online programs. Compared with male participation, the highest female participation is found in university degrees and the younger age ranges. However, there is a significant increase in the number of women following evening study programs and continuity of studies. The number of students in 2008 was 998 women, increasing to 1,828 in 2020, representing an increase of 83.13% in the number of students, reaching participation of 19.1% in 2020 in this segment.

Female first-year STEM students' participation presents certain differences concerning variables such as type of institution, study modality, age, and type of study program followed. Concerning the type of institution, female participation is higher in university institutions, attaining higher overall participation, with an average of 26.2%. Regarding study modality, the highest female participation is seen in the daytime study mode, with an average of 23.5%, while in the evening study and online study modalities, a positive trend is seen for the period from 2008 to 2020, with an increase of 2.4% and 1.1% respectively.

It is seen that the older the student, the lower the preferences for first-year studies. However, from 2014 onwards, there has been an increase in female participation in the 20 plus age-range, with the 30 to 34 age-range segments being the one with the greatest growth in participation, with

a 3.3% increase. The differences in female participation seen in regular undergraduate careers and continuity of studies modalities have narrowed since 2012, in the latter female participation has progressively increased by 6.7%, reaching a 19.4% participation in 2020 in the continuity of study programs, while a similar figure of 20.5% is seen in the regular study programs.

Although female student participation varies, on average, by -0.07%, between the years 2008 to 2020, segments were identified that concentrated higher participation. This is the case for university courses in the 15 to 19 age ranges, where average female first-year participation reached 30.1%. The segment with the lowest participation was the online segment, in the 40 plus age-range, only reaching 6.3% participation. The student segment where female student participation has increased is in those studies that fall under the continuity of study modality, with a 13.2% increase in 2008 to 19.4% in 2020, mainly attributed to a greater interest in women in pursuing a second career in industry, technology and construction, through the continuity of studies programs.

Figures 8, 9, and 10 reveal that the most important factor regarding the proportion of female students in STEM disciplines is age. Independently whether is a university or a vocational institution or whether the students are in a regular or special plan or even in the different study modality, the older the students are, regarding their age entering a technical or university career, the data shows a smaller proportion of female students. In all cases, but day school shows that the proportion of 40 or more years is the same, around 10%. Even for students in day school (Fig. 10), the proportion decreases with age, with 17% in female students of 40 years old or above.

Conclusions

This article analyses how career choice preferences, particularly in STEM disciplines, of women who have just finished middle school and are entering first-year technical or university studies. The study covers the years from 2008 through to 2020, and it describes how these preferences change in time under several factors, such as 1) type of learning center they go to (vocational centers, professional institutes, or universities), 2) Study mode is chosen, 3) age of students, and 4) type of career path (if following a regular study plan or study continuity program).

There are no gender access barriers for students wanting to enroll in careers in institutions such as Universities, Professional Institutes, and Technical Training Centers in Chile. However, there is a significant gender gap in STEM disciplines, with an average female first-year student participation of 19.5%, a figure similar to the 19,2% female participation found in the OECD countries' average [2]. From 2008 to 2020, regarding female first-year STEM study preferences, there is a 1.56% drop in preferences up until 2012. This negative trend was subsequently reversed, increasing by 1.49% from 2013 to 2020, having 20.41%first-year preference participation in 2020.

Given the study results in Chile, there is a great difference in female first-year students' preferences about STEM careers. Thus, there is greater participation of male students, leading to a gender gap similar to that seen in OECD countries [2]. Given the above, starting in 2015, several initiatives have been generated, both from government and private institutions, to promote female participation in STEM careers. These government initiatives created the Ministry of Women and Gender Equity [18] and the Gender Management Improvement Program. Private sector initiatives created are Women Community [19], Girls in Tech, Chile [20], Ingenious Girls:

Science and Technology for Every Girl [21], among others. Although these initiatives support and promote female participation in STEM disciplines and the decreasing trend has been reversed, leading to increasing female participation levels in the last six years, said participation is still low concerning that of males.

Moreover, the increase is insufficient since it will take years to have a leveled proportion if it continues at this pace. Given the importance of science and technology for countries' growth, Chile needs to promote STEM education for all. As can be seen from the results derived from this study, we need more women in these fields; women must be leaders in these areas for their own sake and motivation and serve as role models for the next generation of women in STEM areas. It is, therefore, necessary to continue promoting the development of initiatives and activities that encourage female participation in these areas.

Acknowledgements

The authors would like to acknowledge the leadership and financial support of the School of Engineering of Universidad Andres Bello, Chile. We also express our gratitude to the Educational and Academic Innovation Unit (UNIDA) for mentoring and guidance in developing scientific articles in higher education research. Furthermore, we thank Genaro Zavala, who provided helpful feedback on earlier versions of this manuscript.

References

[1] M. Cardador, K. Jensen, K. Cross, and G. Lopez-Alvarez, "Work in Progress: A Qualitative Exploration of Female Undergraduate Decisions to Specialize within Eng. Disciplines", in Women in Eng. Division: Proc. of the 2020 ASEE Virtual Annual Conf., Virtual Online, June 22-26, 2020. Available: https://peer.asee.org/work-in-progress-a-qualitative-exploration-of-female-undergraduate-decisions-to-specialize-within-engineering-disciplines.

[2] Panorama de la educación: Indicadores de la OCDE 2019, Informe Español, 2019. Available: https://www.educacionyfp.gob.es/dam/jcr:b8f3deec-3fda-4622-befb-386a4681b299/panorama%20de%20la%20educaci%C3%B3n%202019.pdf. [Accessed: 07-Jan- 2020]

[3] N. I. Abu-lail, F. A. Phang, A. Ater Kranov, K. Mohd-Yusof, R. G. Olsen, R. L. Williams, and A. Zainal Abidin, “Persistent Gender Inequity in U.S. Undergraduate Eng.: Looking to Jordan and Malaysia for Factors to their Success in Achieving Gender Parity,” in Women in Eng. Division: Proc. of 2012 ASEE Annual Conf. & Expo., San Antonio, TX, USA, June 10-13, 2012, pp. 25.1036.1 - 25.1036.34. Available: https://peer.asee.org/persistent-gender-inequity-in-u-s-undergraduate-engineering-looking-to-jordan-and-malaysia-for-factors-to-their-success-in-achieving-gender-parity

[4] M. Charles and K. Bradley, “Equal but Separate? A Cross-National Study of Sex Segregation in Higher Education,” American Sociological Review, vol. 67, no. 4, pp. 573-599, 2002. Available: http://www.jstor.org/stable/3088946

[5] M. D. Jiménez, “Análisis de la situación de la mujer en el sector STEM. Comparativa España - Países Bajos.” B. S. thesis, Business Economics, Polytechnic University of Cartagena, Spain, 2018. Available: https://repositorio.upct.es/handle/10317/7443

[6] Unesco, “STEM and Gender Advancement (SAGA).” Unesco.org. https://en.unesco.org/saga (accessed Feb. 1, 2020).

[7] K. Berlien, P. Varela, and C. Roballo, “Realidad nacional en formación y promoción de mujeres científicas en ciencia, tecnología, ingeniería y matemáticas”, Isónoma Consultorías Sociales Ltda., CONICYT, Santiago, Chile, Final report, Jan. 2017. Accessed: March 5, 2020. [Online]. Available: https://www.conicyt.cl/wp-content/uploads/2017/05/Realidad-Nacional-en-Formacion-y-Promocion-de-Mujeres-STEM-2016-CONICYT-ISONOMA.pdf
[8] INE, “Censo de población y vivienda.”, https://www.ine.cl/estadisticas/sociales/censos-de-poblacion-y-vivienda (accessed, jul. 22, 2020).
[9] PIB per cápita (US$ a precios actuales) - Latin America & Caribbean, Chile, Uruguay, Banco Mundial [Online]. Available: https://datos.bancomundial.org/indicador/NY.GDP.PCAP.CD?locations=ZJ-CL-UY
[10] Analysis: Explore economy profiles, Global Innovation Index, 2020. [Online]. Available: https://www.globalinnovationindex.org/analysis-economy
[11] OECD, “¿Cómo va la vida en Chile?”, OECD Better Life Index, nov. 2017. [Online]. Available: https://www.oecd.org/statistics/Better-Life-Initiative-country-note-Chile-in-Espagnol.pdf
[12] J. J. Brunner, “El sistema de educación superior en Chile: un enfoque de economía política comparada”, Avaliação: Revista da Avaliação da Educação Superior (Campinas), vol. 13, no. 2, pp. 451-486, June 2008. [Online]. Available: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1414-40772008000200010&lng=es&tlng=es
[13] Subsecretaría de educación superior, “Mi futuro: Universidades”, Ministerio de Educación, https://www.mifuturo.cl/universidades/. (accessed: june 10th, 2020).
[14] Centro de Estudios, “¿Qué sabemos sobre admisión a la educación superior? Una revisión para implementación del nuevo Sistema de Acceso en Chile”, Ministerio de Educación, Santiago, Chile, 2019. Accessed: May 3rd, 2020. [Online]. Available: https://bibliotecadigital.mineduc.cl/bitstream/handle/20.500.12365/4466/admision_edsuperior.pdf?sequence=1&isAllowed=y
[15] Consejo Nacional de Educación. “Presidente del CNED entrega las principales tendencias de matrícula de pregrado 2019.” Consejo Nacional de Educación. https://www.cned.cl/noticia/presidente-del-cned-entrega-las-principales-tendencias-de-matricula-de-pregrado-2019 (accessed Feb. 1, 2020)
[16] *Servicio de información de educación superior (SIES), Ministerio de Educación, Descarga Bases de Datos Matrícula en Educación Superior, Jan. 2020.* [Online]. Available: http://datos.mineduc.cl/dashboards/20195/descarga-bases-de-datos-matricula-en-educacion-superior/
[17] G. Nazar and B. I. J. M. van der Heijden, “Career identity and its impact upon self-perceived employability among chilean male middle-aged managers,” *Hum. Resour. Dev. Int.*, vol. 15, no. 2, pp. 141–156, 2012.
[18] Ministry of Women and Gender Equity, “Ministry of Women and Gender Equity.” https://minmujeryeg.gob.cl/ (accessed, May 11, 2020).
[19] Women Community, “Women Community.” https://www.comunidadmujer.cl/, (accessed Feb. 3, 2020).
[20] Girls in Tech, Chile, “Girls in Tech, Chile.” https://chile.girlsintech.org/, (accessed Feb 3, 2020).
[21] Ingenious Girls: Science and Technology for Every Girl, “Ingenious Girls: Science and Technology for Every Girl.”, https://ingeniosas.org/, (accessed, Feb. 3, 2020).