

Women inventors:

Latin America

Building the future

(Brazil, Colombia, Chile and
Mexico)

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Motivation.

The main motivation was the lack of statistical information in the literature to identify the number of patents invented by women residents of Brazil, Colombia and Mexico. This information is fundamental to promote and justify changes that will allow these countries to increase the participation of women in research and developmental activities, leading to patentable inventions. At the same time, these data allow decision-makers to know what the current situation is and design better policies and interventions. This research also aims to give voice to the many women who have overcome the different paradigms and challenges that have appeared in their lives in order to become inventors.

Scopes and limitations.

Like any other investigation, this one has certain limits. The first one is that the information was obtained from different sources, therefore the reliance is placed on the information provided by an authority or intermediary. The scope of the sources from which the codes were extracted is made clear in the publication. These sources may modify their lists at any time and without prior notice. Therefore, neither GLIPA nor CAIINNO can know if any changes were made and still reflect the results presented here.

Support to national intellectual and industrial property offices.

This effort looks to assist the work of the World Intellectual Property Organization (WIPO) as well as the offices of national intellectual and industrial property. Part of what makes a country better is the participation of organized civil society. An example of this is the effort made by GLIPA and CAIINNO, who seek to contribute to the knowledge of the world of intellectual property.

Political note.

GLIPA's work, that of CAIINNO, and that of this research and its researchers, are not related to any political party nor political current. It was developed because of the authors' personal interests, as well as the aim to aid with the improvement of living conditions within the countries. Although it is intended to be useful for decision-makers and public officials, many of whom are linked to political parties, this publication was not designed to support attacks between political parties or candidates, and its use for such purposes is not allowed.

Definition of gender and sex.

For this research, the terms of the World Health Organization were considered (2015). The term "gender" refers to the socially conceived characteristics of women and men, while the term "sex" focuses on purely biological differences.

Preface.

The Global Intellectual Property Alliance (GLIPA) is a non-profit organization that has been working since its creation to promote the understanding of intellectual property, as a key tool to promote creativity and the spirit of innovation of all citizens, generating greater levels of economic and social well-being.

In Latin America some sectors have been effectively taken advantage of the legal regimes for the protection of intellectual property. However, the participation of women has been particularly low. In order to help solve this problem facing regional development, especially that of increasing the number of women inventors in our countries. In this document, a retrospective study was conducted to identify how many female inventors were granted patents in Brazil, Chile, Colombia, and Mexico.

Acknowledgements.

Both the GLIPA and CAIINNO thank all those who supported this great effort, particularly:

- To GLIPA's diversity and inclusion committee, especially María Cecilia Romolerux, Gonzalo Rovira, and Perla Koziner.
- To Licks Attorneys firm, especially Otto Licks, who provided the data from Brazil.
- To the firm Alessandri Abogado, especially Santiago Ortuzar D, for his support in obtaining data from Chile.
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Summary.

The present research is the result of several months of work that aimed to identify the number of patents granted in which female residents of Brazil, Chile, Colombia, and Mexico appear as inventors.

This is an effort from civil society to contribute to the work done for years by the World Organization of Intellectual Property (WIPO), which estimates that gender parity in patenting will be attained in 2061, although in Latin America and the Caribbean it will be until 2068 (Carpentier & Raffo, 2023). Likewise, this investigation looks to add to the organization's efforts such as their Gender Action Plan (WIPO, 2023), their Gender Equity Policy (WIPO, 2014), their political approaches to close the gender breach in intellectual property matters, (Branth, Maranthe, McDole & Schultz, 2019), and the challenges faced by women inventors and innovators by using the intellectual property system (Cutura, 2019), among others.

For this research, an *ad hoc* code was designed in the R programming language that allowed the data to be identified by gender. Likewise, the database of names of the "World Dictionary of Gender Names" designed by the World Intellectual Property Organization (WIPO) was used, and it was complemented with names that were identified during the research process. The data for Brazil was obtained through the Brazilian Licks Attorneys firm. Data for Chile, Colombia, and Mexico were possible to obtain through official channels that are described later on.

First, a classification of the results was done by dividing the data into three groups that allowed to identify the role of women as inventors:

- a. Women only – Patents where only women participate as inventors of a patent.
- b. Mixed teams – Patents where at least one woman and one man participate as inventors of the same patent.
- c. Only men – Patents where only men participate as inventors of a patent.

The total number of women and men was then identified. Since it was not possible to verify whether the same inventor appears in more than one patent, it may be the case that they are counted more than once.

- a. Total women – Total number of women who appear as inventors of the patent.
- b. Total men – Total number of men who appear as inventors of the patent.

The first country was Brazil, where 14,366 patents were granted to Brazilian residents from 2017 to 2022. In the case of patents granted to women only, a variation in their participation within the years of study can be seen, going from 7.2 percent in 2017 to 5.8 percent in 2022. The patents granted to men only went from 82 percent in 2017 to 72.4 percent in 2022. Finally, granted patents of the mixed type went from 10.8 percent in 2017 to 21.8 percent in 2022.

Table 1. Concentration of patents by type of inventor in Brazil, from 2017 to 2022.

Granted	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	1482	1215	107	160	339	1790	82.0 %	7.2 %	10.8 %
2018	2132	1756	133	243	529	2599	82.4 %	6.2 %	11.4 %
2019	2021	1628	111	282	567	2766	80.6 %	5.5 %	14.0 %
2020	2591	1965	165	461	1076	3814	75.8 %	6.4 %	17.8 %
2021	3248	2210	213	825	1760	4945	68.0 %	6.6 %	25.4 %
2022	2892	2095	167	630	1364	4530	72.4 %	5.8 %	21.8 %

Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

In the case of Chile, a total of 1,464 patents were granted to residents from 2017 to 2022. During this period, patents granted to women only went from 8.6 percent in 2017 to 7.4 percent in 2022. The percentage of granted patents of the men-only type went from 77.7 percent in 2017 to 67.3 percent in 2022. The collaboration between men and women had a significant increase during the analysis period, since the granted patents of the mixed type went from 13.7 percent in 2017 to 25.3 percent in 2022.

Table 2. Concentration of patents by type of inventor in Chile, from 2017 to 2022.

Granted	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	233	181	20	32	84	339	77.7 %	8.6 %	13.7 %
2018	240	186	10	44	81	434	77.5 %	4.2 %	18.3 %
2019	356	258	17	81	144	591	72.5 %	4.8 %	22.8 %
2020	324	230	25	69	152	544	71.0 %	7.7 %	21.3 %
2021	311	208	19	84	172	566	66.9 %	6.1 %	27.0 %
2022	379	255	28	96	215	711	67.3 %	7.4 %	25.3 %

Source: Own elaboration with data obtained through information requests and then applying the filters designed with the R programming language, designed for this research.

In the case of Colombia, a total of 1,126 patents were granted to residents from 2017 to 2021. During that period, patents granted to women only went from 10.5 percent in 2017 to 6.6 percent in 2021. The percentage of the men-only type went from 63.6 percent in 2017 to 62.9 percent in 2021. It is noteworthy that the collaboration between men and women had an increase during the period of study, because while in 2017 the mixed type granted patents represented 25.9 percent, in 2021 they reached 30.5 percent

Table 3. Concentration of patents by type of inventor in Colombia, from 2017 to 2021.

Year	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	162	103	17	42	81	279	63.6 %	10.5 %	25.9 %
2018	208	141	21	46	95	360	67.8 %	10.1 %	22.1 %
2019	304	203	25	76	139	584	66.8 %	8.2 %	25.0 %
2020	239	149	16	74	138	508	62.3 %	6.7 %	31 %
2021	213	134	14	65	128	424	62.9 %	6.6 %	30.5 %

Source: Own elaboration with data obtained through information requests and then applying the filters designed with the R programming language, designed for this research.

Finally, it was identified that in Mexico, 2,825 patents were granted to residents from 2017 to 2022. In the case of patents for women only, they went from 5.3 percent in 2017 to 5.4 percent in 2022. In the case of patents granted to men only, they went from 56.6 percent in 2017 to 44.9 percent in 2022. However, the most meaningful change was for mixed-type granted patents, since collaboration between women and men increased from 38.1 percent in 2017 to 49.7 percent in 2022, surpassing those of the men-only type.

Table 4. Concentration of patents by type of inventor in Mexico, from 2017 to 2022.

Granted	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	412	233	22	157	288	877	56.6 %	5.3 %	38.1 %
2018	455	236	22	197	387	1031	51.9 %	4.8 %	43.3 %
2019	447	227	31	189	393	1067	50.8 %	6.9 %	42.3 %
2020	390	207	18	165	337	981	53.1 %	4.6 %	42.3 %
2021	618	310	28	280	552	1490	50.2 %	4.5 %	45.3 %
2022	503	226	27	250	521	1315	44.9 %	5.4 %	49.7 %

Source: Own elaboration with data obtained through information requests and then applying the filters designed with the R programming language, designed for this research.

The path to identifying women inventors.

For this research, the terms of the World Health Organization were considered (2015). The term “gender” refers to the socially conceived characteristics of women and men, while the term “sex” focuses on purely biological differences.

Based on the above definitions, the following methodology was designed and implemented to identify how many women residents of Brazil, Chile, Colombia and Mexico have been inventors of patents granted at both the national and subnational levels.

1. An ad hoc code was designed in the R programming language for this research. This code was trained through a supervised apprenticeship using patent databases provided by the Brazilian firm Licks Attorneys, as well as the Mexican patent database prepared by CAIINNO. The general code is available to everyone for its use, especially intellectual and industrial property offices (see Appendix).
2. The women’s names used for the code were obtained from the name database of the “World Dictionary of Gender Names” designed by the WIPO (n.d.).¹ (Lax Martínez, Raffo & Saito, 2016). This list was expanded to include some names identified in the countries in question during this research. The objective was to take advantage of the enormous effort made by the WIPO and try to contribute to its work. It is important to mention that adjustments had to be made throughout the process, for example, regarding the recognition of accents since the WIPO Dictionary does not contain them.
3. Once ready, the code was run in the Brazilian database, to verify its operation, since the Brazilian firm Links Attorneys sent GLIPA an already classified database. The same was done afterwards in a CAIINNO database. After several tests, the code worked correctly.
4. Afterwards, steps were taken to obtain information on the names of inventors of patents of national residents from the other three countries: Chile, Colombia, and Mexico. For the first one, the information was obtained through a transparency request in which it was indicated to extract the information from the portal of the National Institute of Industrial Property, although it was necessary to have a Unique Key (INAPI, 2023)². For the second, it was possible to obtain the total list of inventors for the years of the study from the portal of the Superintendence of Industry and Commerce, through its open government platform (SIC, 2023)³. In the case of Mexico, the concentrated list of inventors is not available to the public, so requests for information were submitted to the government to obtain this information, which was delivered within the legal deadline, and it was not necessary to have a citizenship registry or make any payment, as happened in other countries in which an attempt was made to replicate the Mexican exercise (PNT, 2023).
5. It is important to point out that since it was not possible to identify in all the countries studied whether all the inventors were of the nationality of the country, all were taken as such. Therefore, it is possible that there are some non-nationals, but they are counted as nationals because the country considers the patent as a resident’s patent. In a future work, the exercise of identifying foreigners could be done, for which the codes shared here could be adapted for this new task.

6. Once the data was obtained, the base code for each country was used, although since they were not homologated formats it was necessary to clean the databases to homologate them.
7. Once the former was done, the results were classified. First, the data were divided into three types to identify the role of women as inventors:
 - a. Women only – Patents where only women participate as inventors of a patent.
 - b. Mixed teams – Patent where at least one woman and one man participate as inventors of the same patent.
 - c. Men only – Patents where only men participate as inventors of a patent.
8. The total number of women and men was then identified. It is important to point out that it was not possible to verify if the same inventor appears in more than one patent, so it may be the case that they were counted more than once.
 - a. Total women – Total number of women who appear as inventors of the patent.
 - b. Total men – Total number of men who appear as inventors of the patent.
9. Finally, the results allow us to identify the patents in which women appear as inventors in each year, as well as the number of women per patent, and the state.

Brazil

According to information obtained through the Brazilian firm Licks Attorneys (2023), it was possible to identify that 14,366 patents were granted in Brazil to Brazilian residents between 2017 and 2022. In the case of granted patents of women-only type, a variation in their share over the total number of patents granted in the years of study can be seen from 7.2 percent in 2017 to 5.8 percent in 2022. In the case of granted male-only type patents, there is a decrease in their share from 82 percent in 2017 to 72.4 percent in 2022. Finally, the mixed type granted patents also underwent an increase during the period of analysis, going from 10.8 percent in 2017 to 21.8 percent in 2022.

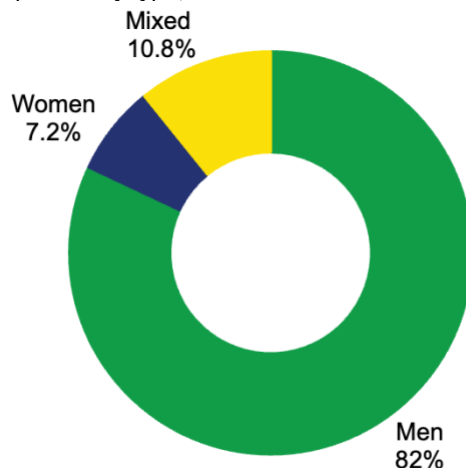
Table 5. Concentration of patents by type of inventor in Brazil, from 2017 to 2022.

Granted	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
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2021	3248	2210	213	825	1760	4945	72.9 %	6.6 %	25.4 %
2022	2892	2095	167	630	1364	4530	78.3 %	5.8 %	21.8 %

Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

In 2017, granted patents of the women-only type accounted for a total of 7.2 percent of that year's total. However, the male-only type had a share of 82 percent. Finally, the share of patents granted for the mixed type was 10.8 percent over the total number of patents granted to Brazilian residents in 2017.

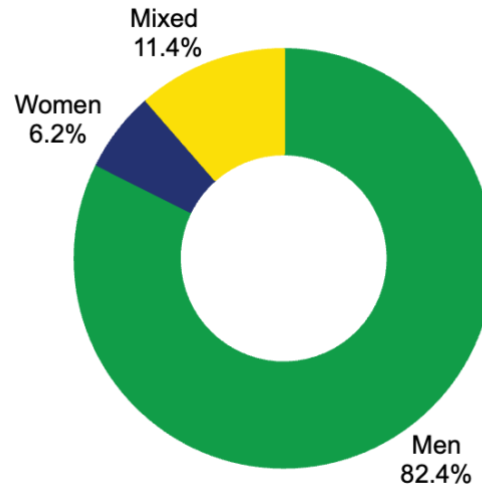
Figure 1. Percentage of total granted patents by type, in 2017 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

By 2018, the share of mixed type patents granted increased to 11.4 percent. In the case of male-only granted patents, their participation increased to 82.4 percent. Finally, women-only patents granted of the mixed type had a reduction in their share reaching 6.2 percent.

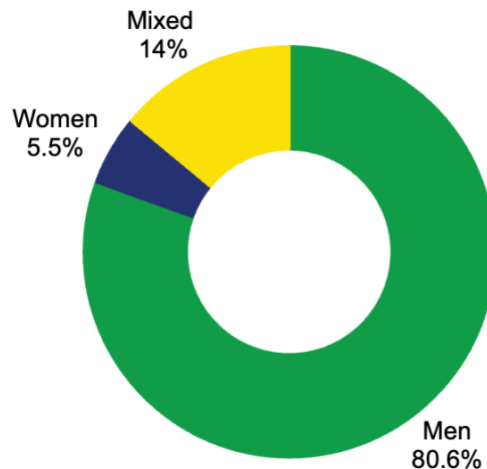
Figure 2. Percentage of total granted patents by type, in 2018 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

In 2019, the share of mixed patents granted increased to 14 percent. However, there was a reduction in the participation of men-only patents to 80.6 percent. In the case of patents granted of the women-only type, their share decreased to 5.5 percent of the total number of patents granted.

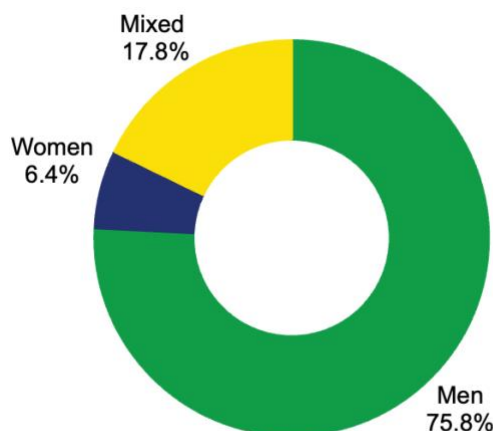
Figure 3. Percentage of total granted patents by type, in 2019 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

In 2020, an increase of participation of the women-only type can be observed, growing to 6.4 percent. On the other hand, the share of male-only patents granted decreased to 75.8 percent. For the mixed-type patents granted, their share increased compared with last year, reaching 17.8 percent of the total number of patents granted.

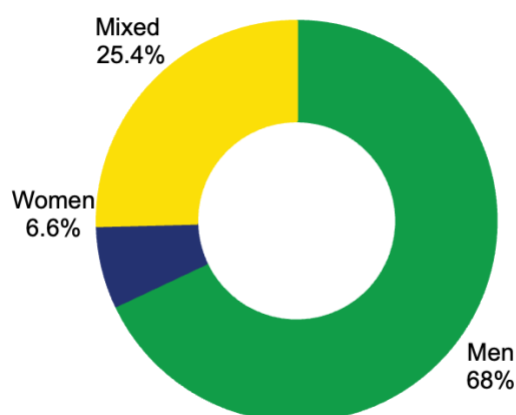
Figure 4. Percentage of total granted patents by type, in 2020 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

In 2021, patents granted of the women-only type increased their participation, reaching 6.6 percent of that year's total. On the men-only type, there is a reduction that reaches 68 percent. In the case of mixed type patents, participation increased to 25.4 percent of the total of patents granted.

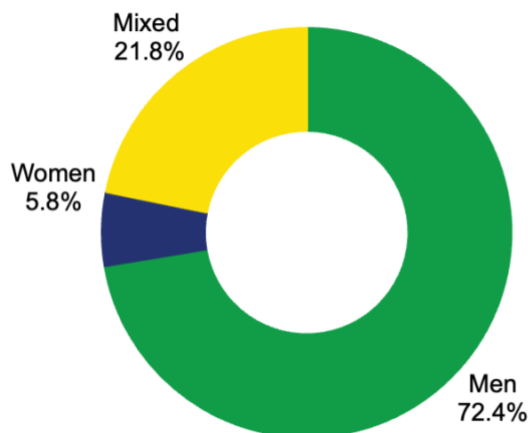
Figure 5. Percentage of total granted patents by type, in 2021 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

In the last year of the study, 2022, women-only type granted patents reduced their share to 5.8 percent. Male-only type granted patents increased their share to 72.4 percent. Lastly, mixed type granted patents again reduced their share to 21.8 percent of total granted patents.

Figure 6. Percentage of total granted patents by type, in 2022 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

Nevertheless, an analysis was carried out at the subnational level of patents granted by type in the years of study (2017 to 2022). It was observed that the states with the highest number of granted patents were São Paulo, Rio Grande do Sul, Minas Gerais, and Rio de Janeiro. Speaking specifically of those of the women-only type, the state with the highest number of patents is São Paulo (432), followed by Rio Grande do Sul (109), Minas Gerais (80) and Rio de Janeiro (63). For patents granted for men only, the states with the highest number of patents are São Paulo (4819), Rio Grande do Sul (1434), Santa Catarina (979) and Paraná (1007). Finally, for the mixed type patents granted, the states with the highest number of patents granted were identified, which are: São Paulo (913), Rio de Janeiro (386), Minas Gerais (384), Rio Grande do Sul (218) and Paraná (211).

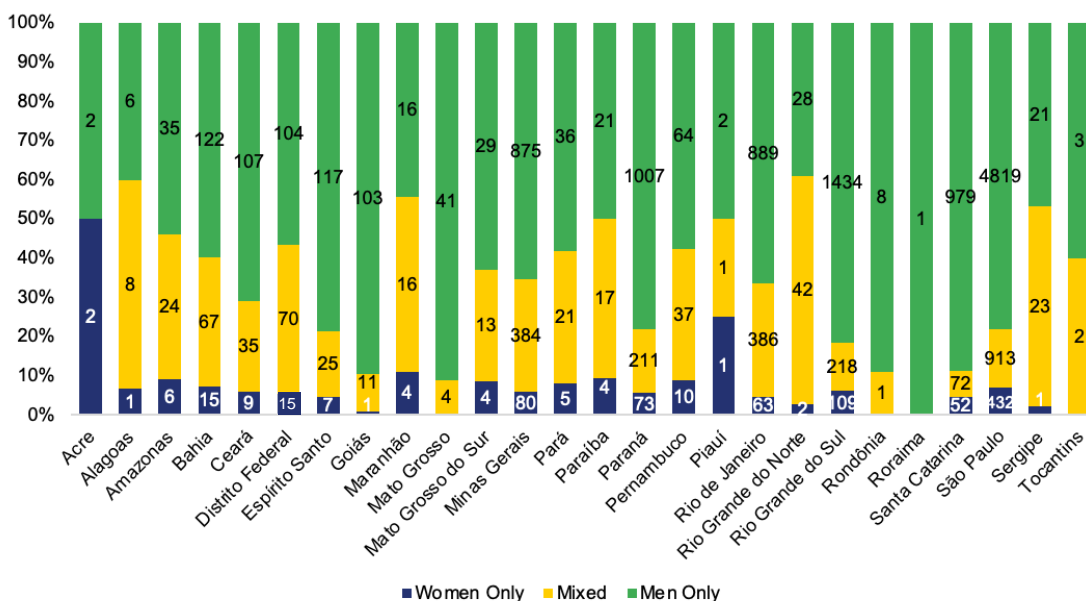
Table 6. Total of patents granted by type at the subnational level, from 2017 to 2022 in Brazil.

State	Women only	Mixed	Men only
Acre	2	0	2
Alagoas	1	8	6
Amazonas	6	24	35
Bahia	15	67	122
Ceará	9	35	107
Distrito Federal	15	70	104
Espírito Santo	7	25	117
Goiás	1	11	103
Maranhão	4	16	16
Mato Grosso	0	4	41
Mato Grosso do Sul	4	13	29
Minas Gerais	80	384	875
Pará	5	21	36
Paraíba	4	17	21
Paraná	73	211	1007
Pernambuco	10	37	64
Piauí	1	1	2
Rio de Janeiro	63	386	889
Rio Grande do Norte	2	42	28
Rio Grande do Sul	109	218	1434
Rondônia	0	1	8
Roraima	0	0	1
Santa Catarina	52	72	979
São Paulo	432	913	4819
Sergipe	1	23	21
Tocantins	0	2	3

Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

The following figure was constructed from the table above, where it can be confirmed that the most common type of patent at the subnational level was the male-only type. However, in the case of states such as Rio Grande do Norte (42), Sergipe (23) and Alagoas (8) there is a majority of the mixed type. In the case of patents granted for women only, there was never a majority in any of the states in the years under study.

Figure 7. Total of patents granted by type at the subnational level, from 2017 to 2022 in Brazil.



Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

For patents granted for women only, the states with the highest number in the years under study are São Paulo, Rio Grande do Sul, Minas Gerais, and Paraná with 432, 109, 80 and 73 respectively. Several states had zero granted patents of this type, such as Mato Grosso, Rondônia, Roraima and Tocantins.

Table 7. Total of patents granted by women-only type at the subnational level, from 2017 to 2022 in Brazil.

States	2017	2018	2019	2020	2021	2022	Total
Acre	0	0	0	1	0	1	2
Alagoas	0	0	0	0	0	1	1
Amazonas	1	0	1	1	3	0	6
Bahia	1	3	0	1	7	3	15
Ceará	2	0	1	2	3	1	9
Distrito Federal	2	1	2	3	3	4	15
Espírito Santo	0	1	1	2	1	2	7
Goiás	0	0	0	0	1	0	1
Maranhão	1	0	0	0	3	0	4
Mato Grosso	0	0	0	0	0	0	0
Mato Grosso do Sul	0	0	0	1	2	1	4
Minas Gerais	9	8	10	13	18	22	80
Pará	0	0	0	1	4	0	5
Paraíba	0	0	0	0	2	2	4
Paraná	11	11	4	16	18	13	73
Pernambuco	0	0	0	0	6	4	10
Piauí	0	1	0	0	0	0	1

Rio de Janeiro	3	16	13	15	10	6	63
Rio Grande do Norte	0	0	0	0	1	1	2
Rio Grande do Sul	4	6	20	24	33	22	109
Rondônia	0	0	0	0	0	0	0
Roraima	0	0	0	0	0	0	0
Santa Catarina	6	10	8	5	17	6	52
São Paulo	67	76	51	80	80	78	432
Sergipe	0	0	0	0	1	0	1
Tocantins	0	0	0	0	0	0	0

Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

Speaking of patents granted of the male-only type, between 2017 to 2022, the states with the highest number of patents were São Paulo, Rio Grande do Sul, Paraná, Santa Catarina and Rio de Janeiro, with 4819, 1434, 1007, 979 and 889, respectively. The states with the least number of patents granted within the time span of the study were Roraima, Piauí, Acre and Tocantins, with 1, 2, 2, and 3 patents, respectively.

Table 8. Total of patents granted by men-only type at the subnational level, from 2017 to 2022 in Brazil.

State	2017	2018	2019	2020	2021	2022	Total
Acre	0	1	1	0	0	0	2
Alagoas	1	1	0	1	1	2	6
Amazonas	3	8	6	9	5	4	35
Bahia	16	19	13	27	29	18	122
Ceará	15	15	10	16	31	20	107
Distrito Federal	14	17	9	26	21	17	104
Espírito Santo	16	15	18	22	22	24	117
Goiás	8	8	23	17	27	20	103
Maranhão	0	1	2	1	4	8	16
Mato Grosso	2	4	5	10	15	5	41
Mato Grosso do Sul	5	5	3	4	3	9	29
Minas Gerais	85	114	144	137	193	202	875
Pará	3	4	3	4	13	9	36
Paraíba	1	2	3	3	7	5	21
Paraná	121	149	169	209	169	190	1007
Pernambuco	4	8	9	14	12	17	64
Piauí	0	0	1	0	1	0	2
Rio de Janeiro	96	158	127	184	180	144	889
Rio Grande do Norte	0	3	5	1	13	6	28
Rio Grande do Sul	183	240	221	220	273	297	1434
Rondônia	0	1	1	0	3	3	8
Roraima	0	0	0	0	1	0	1
Santa Catarina	96	166	144	197	174	202	979
São Paulo	543	809	709	860	1007	891	4819

Sergipe	3	8	1	3	5	1	21
Tocantins	0	0	1	0	1	1	3

Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

Finally, for the granted patents of the mixed type, São Paulo is the state with the highest number, followed by Rio de Janeiro and Minas Gerais, with 913, 386, and 384 respectively. Acre and Roraima had zero patents granted of this type, for example.

Table 9. Total of patents granted by mixed teams' type at the subnational level, from 2017 to 2022 in Brazil.

State	2017	2018	2019	2020	2021	2022	Total
Acre	0	0	0	0	0	0	0
Alagoas	0	1	0	0	5	2	8
Amazonas	2	3	5	5	6	3	24
Bahia	1	6	5	13	29	13	67
Ceará	0	0	1	3	19	12	35
Distrito Federal	6	12	6	9	21	16	70
Espírito Santo	3	1	1	4	7	9	25
Goiás	0	0	0	2	7	2	11
Maranhão	0	1	1	1	7	6	16
Mato Grosso	0	0	0	1	2	1	4
Mato Grosso do Sul	0	1	2	2	2	6	13
Minas Gerais	23	29	38	71	121	102	384
Pará	0	1	1	6	7	6	21
Paraíba	0	2	0	3	8	4	17
Paraná	15	11	19	40	61	65	211
Pernambuco	2	2	0	9	14	10	37
Piauí	0	0	0	0	0	1	1
Rio de Janeiro	23	46	58	78	106	75	386
Rio Grande do Norte	1	1	6	5	20	9	42
Rio Grande do Sul	14	22	15	39	71	57	218
Rondônia	0	0	0	0	0	1	1
Roraima	0	0	0	0	0	0	0
Santa Catarina	4	9	10	11	21	17	72
São Paulo	64	95	112	155	280	207	913
Sergipe	2	0	2	4	9	6	23
Tocantins	0	0	0	0	2	0	2

Source: Own elaboration with data provided by the firm Licks Attorneys, which through its artificial intelligence tool improves the public data made available by the Industrial Property Office, available at: <https://www.lickslegal.com/graficos-brazilian-patent/brpto-utility-and-utility-model-patents-inventors-gender>

Chile

According to official information obtained through an information request submitted to the National Institute of Industrial Property,⁴ a total of 1,464 patents were granted to residents from 2017 to 2022.⁵ During this period, a slight decrease of granted patents of the women-only type can be observed, going from 8.6 percent in 2017, to a 7.4 percent in 2022. There is also a decrease in the percentage of men-only patents, from 77.7 percent in 2017 to 67.3 percent in 2022. It is worth mentioning, that the collaboration between men and women increased during the analysis period, since the patents granted for the mixed type went from 13.7 percent in 2017 to 25.3 percent in 2022.

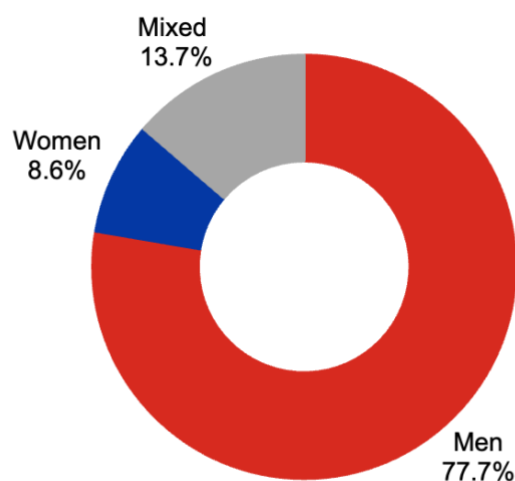
Table 10. Concentration of patents by type of inventor in Chile, from 2017 to 2022.

Granted	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	233	181	20	32	84	339	77.7 %	8.6 %	13.7 %
2018	240	186	10	44	81	434	77.5 %	4.2 %	18.3 %
2019	356	258	17	81	144	591	72.5 %	4.8 %	22.8 %
2020	324	230	25	69	152	544	71.0 %	7.7 %	21.3 %
2021	311	208	19	84	172	565	66.9 %	6.1 %	27.0 %
2022	379	255	28	96	215	711	67.3 %	7.4 %	25.3 %

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2017, granted patents of the female type accounted for a total of 8.6 percent over that year's total. Patents of the male-only type had a share of 77.7 percent. Finally, the share of patents granted of the mixed type was 13.7 percent over the total number of patents granted to residents in Chile in that year.

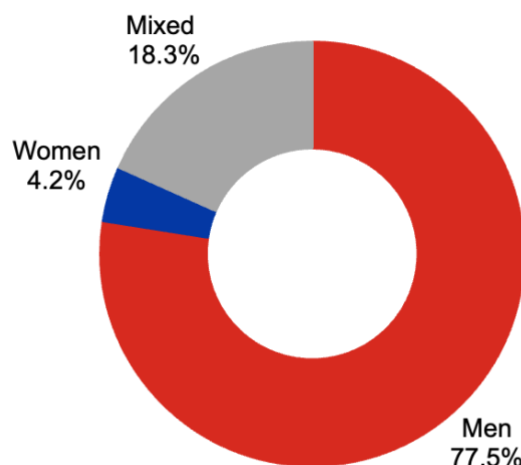
Figure 8. Percentage of total granted patents by type, in 2017 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2018, the patents granted to the female-only type decreased their share compared to 2017 (8.6 percent), representing 4.2 percent. Those of the male-only type also slightly reduced their share to 77.5 percent. On the other hand, mixed type patents significantly increased their share to represent 18.3 percent of the total number of patents granted at the national level.

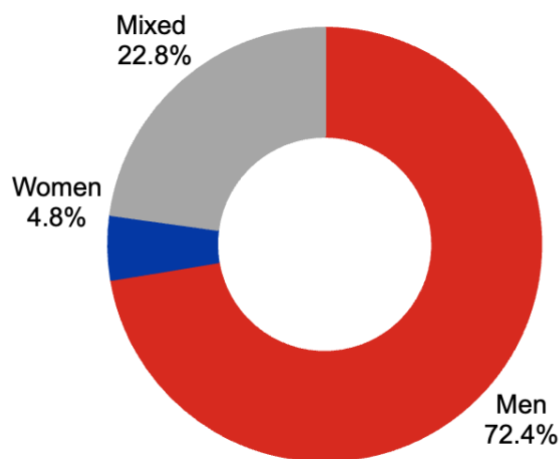
Figure 9. Percentage of total granted patents by type, in 2018 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2019, the share of granted female-only patents increased to 4.8 percent. Male-only patents reduced their share to 72.5 percent. In the case of mixed-type patents, they increased their share from the previous year to 22.8 percent of total patents granted.

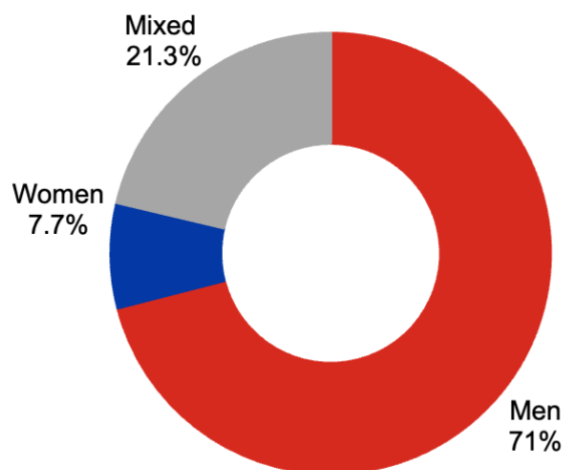
Figure 10. Percentage of total granted patents by type, in 2019 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

For 2020, patents granted for women only had an increase over the previous year, reaching 7.7 percent. In the case of male-only granted patents, their share decreased slightly to 71 percent. A similar situation can be observed in the mixed type of patents granted, as their share dropped slightly to 21.3 percent of the total for that year.

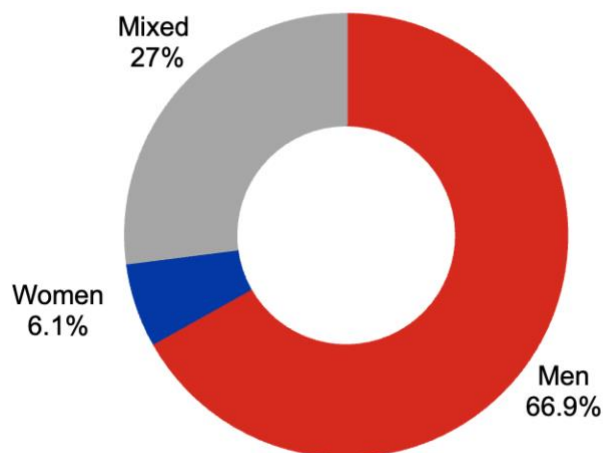
Figure 11. Percentage of total granted patents by type, in 2020 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2021, there was a decrease in the share of patents granted to women only, reaching 6.1 percent. On the other hand, male-only patents granted reduced their share to 66.9 percent, being the first time that they fell below 70 percent for the years spanning the study. In the case of mixed-type patents, their share increased compared to the previous year, reaching 27 percent of the total number of patents granted.

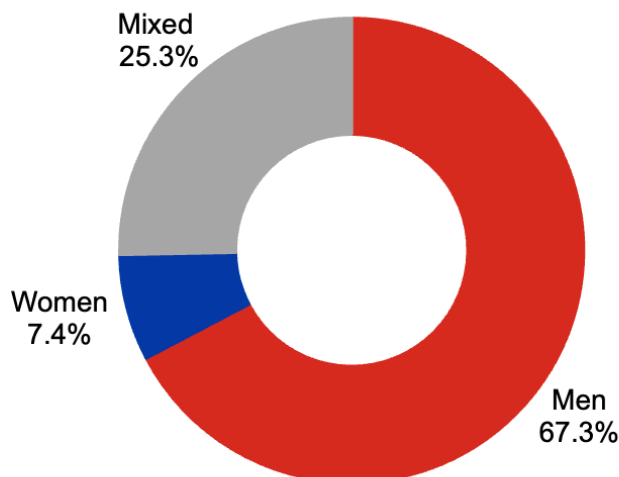
Figure 12. Percentage of total granted patents by type, in 2021 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Lastly, in 2022, women-only patents granted increased their share over the previous year to 7.4 percent. Those of the male-only type slightly increased their share to 67.3 percent. Mixed-type patents granted slightly decreased their share to 25.3 percent of the total.

Figure 13. Percentage of total granted patents by type, in 2022 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

As with previous countries, an analysis was conducted at the subnational level of patents granted by type in the study years (2017 to 2022). It was observed that the regions with the highest number of granted patents were the Metropolitan Region, Biobío, Valparaíso, and Los Lagos region. Speaking specifically of the women-only type, the region with the highest number of patents is the Metropolitan Region (57), followed by Biobío (24), Nuble (13) and Valparaíso (7). For patents granted for men only, the regions with the highest number of patents are Metropolitan Region (841), Valparaíso (108), Biobío (103) and Los Lagos (71). Finally, for the mixed type patents granted were Metropolitan Region (225), followed by Biobío (106), Valparaíso (30) and Araucanía (11). It is important to mention that it was not possible to identify the region for some patents.

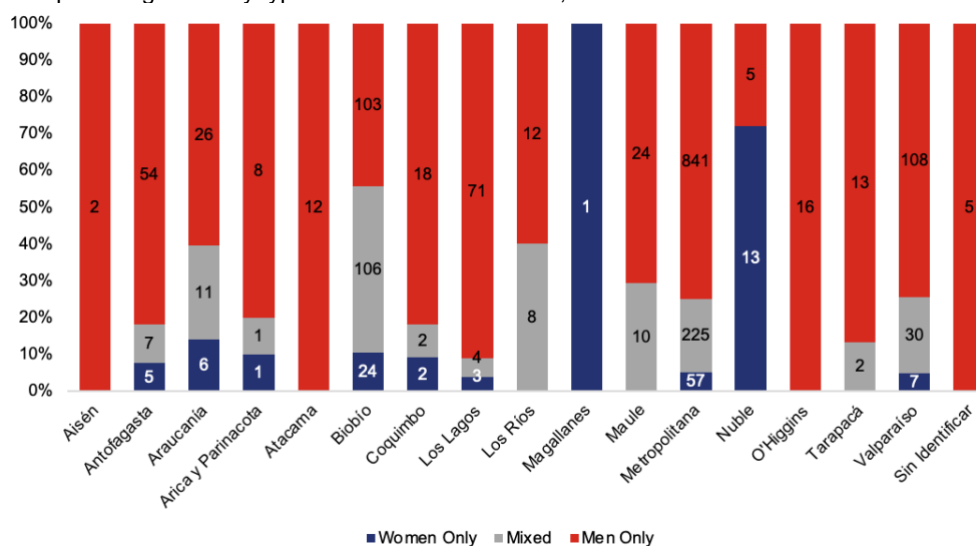
Table 11. Total of patents granted by type at the subnational level, from 2017 to 2022 in Chile.

State	Women Only	Mixed	Men Only
Aisén	0	0	2
Antofagasta	5	7	54
Araucanía	6	11	26
Arica y Parinacota	1	1	8
Atacama	0	0	12
Biobío	24	106	103
Coquimbo	2	2	18
Los Lagos	3	4	71
Los Ríos	0	8	12
Magallanes	1	0	0
Maule	0	10	24
Metropolitan	57	225	841
Nuble	13	0	5
O'Higgins	0	0	16
Tarapacá	0	2	13
Valparaíso	7	30	108
Unidentified	0	0	5

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

The following figure was constructed from the table above, where it can be confirmed that the most common type of patent at the subnational level was the male-only type. However, the Biobío region this has a majority of the mixed type. Likewise, the regions of Nuble and Magallanes have a majority of women-only patents.

Figure 14. Total of patents granted by type at the subnational level, from 2017 to 2022 in Chile.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Regarding women-only patents, the region with the highest number of patents is the Metropolitan region, followed by Biobío, Nuble and Valparaíso, with 57, 24, 13 and 7 patents, respectively. During the study period, the regions of Aisén, Atacama, Los Ríos, O'Higgins, Maule, and Tarapacá did not have a single patent of this type.

Table 12. Total of patents granted by women-only type at the subnational level, from 2017 to 2022 in Chile.

States	2017	2018	2019	2020	2021	2022	Total
Aisén	0	0	0	0	0	0	0
Antofagasta	0	0	1	1	2	1	5
Araucanía	1	0	3	1	0	1	6
Arica y Parinacota	0	0	0	0	0	1	1
Atacama	0	0	0	0	0	0	0
Biobío	3	1	4	3	6	7	24
Coquimbo	1	0	0	1	0	0	2
Los Lagos	0	1	0	0	2	0	3
Los Ríos	0	0	0	0	0	0	0
Magallanes	1	0	0	0	0	0	1
Maule	0	0	0	0	0	0	0
Metropolitan	14	8	8	18	8	1	57
Nuble	0	0	0	0	0	13	13
O'Higgins	0	0	0	0	0	0	0
Tarapacá	0	0	0	0	0	0	0
Valparaíso	0	0	1	1	1	4	7
Unidentified	0	0	0	0	0	0	0

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In terms of patents granted of the mixed type, the region with the highest number of patents granted was the Metropolitan Region, followed by Biobío, Valparaíso, and Araucanía, with 225, 106, 30 and 11 patents, respectively. During the study period, the regions of Aisén, Atacama, Magallanes, O'Higgins and Nuble did not have a single patent of this type.

Table 13. Total of patents granted by mixed teams' type at the subnational level, from 2017 to 2022 in Chile.

States	2017	2018	2019	2020	2021	2022	Total
Aisén	0	0	0	0	0	0	0
Antofagasta	0	1	0	2	1	3	7
Araucanía	1	1	1	2	3	3	11
Arica y Parinacota	0	1	0	0	0	0	1
Atacama	0	0	0	0	0	0	0
Biobío	7	8	24	20	14	33	106
Coquimbo	0	0	1	0	1	0	2

Los Lagos	1	0	0	1	1	1	4
Los Ríos	2	2	1	1	0	2	8
Magallanes	0	0	0	0	0	0	0
Maule	0	2	3	1	1	3	10
Metropolitan	19	26	41	35	57	47	225
Nuble	0	0	0	0	0	0	0
O'Higgins	0	0	0	0	0	0	0
Tarapacá	1	1	0	0	0	0	2
Valparaíso	1	2	10	7	6	4	30
Unidentified	0	0	0	0	0	0	0

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

For patents granted to men only, the region with the highest number of patents granted was the Metropolitan Region, followed by Valparaíso, Biobío, and Los Lagos, with 841, 108, 103 and 71 patents, respectively. During the study period, only the Magallanes region did not have a single patent of this type.

Table 14. Total of patents granted by men-only type at the subnational level, from 2017 to 2022 in Chile.

States	2017	2018	2019	2020	2021	2022	Total
Aisén	1	1	0	0	0	0	2
Antofagasta	8	8	11	9	9	9	54
Araucanía	1	5	3	7	2	8	26
Arica y Parinacota	2	0	1	2	1	2	8
Atacama	1	0	2	2	4	3	12
Biobío	10	11	23	18	20	21	103
Coquimbo	1	2	6	3	2	4	18
Los Lagos	11	3	17	13	11	16	71
Los Ríos	0	1	1	1	3	6	12
Magallanes	0	0	0	0	0	0	0
Maule	2	4	1	6	3	8	24
Metropolitan	132	132	173	146	121	137	841
Nuble	0	0	1	1	2	1	5
O'Higgins	1	3	6	5	1	0	16
Tarapacá	0	1	0	1	0	11	13
Valparaíso	11	15	13	13	29	27	108
Unidentified	0	0	0	3	0	2	5

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Colombia

According to official information obtained through the platform of the *Super Intendencia de Industria y Comercio de Colombia* (Super Intendency of Industry and Commerce of Colombia),⁶ a total of 1,126 patents were granted to residents during 2017 to 2021. Throughout the aforementioned years, a decrease in the percentage of the total granted women-only type patents can be seen, going from 10.5 percent in 2017, to 6.6 percent in 2021. There is also a decrease in the percentage of the male-only type, which represented 63.6 percent in 2017, while later becoming 62.9 percent in 2021. It is noteworthy that the collaboration between men and women increased during the study period, since in 2017, the granted mixed-type patents represented 25.9 percent, whereas in 2021 they reached 30.5 percent.

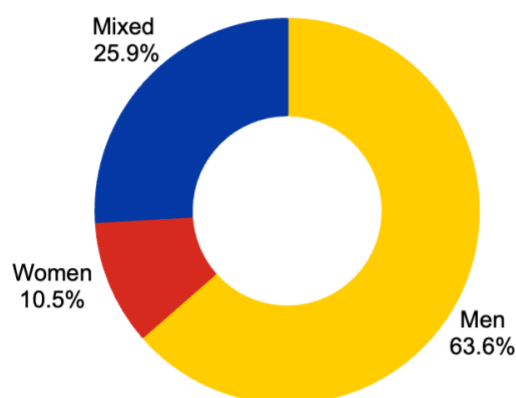
Table 15. Concentration of patents by type of inventor in Colombia, from 2017 to 2021.

Year	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	162	103	17	42	81	279	63.6 %	10.5 %	25.9 %
2018	208	141	21	46	95	360	67.8 %	10.1 %	22.1 %
2019	304	203	25	76	139	584	66.8 %	8.2 %	25.0 %
2020	239	149	16	74	138	508	62.3 %	6.7 %	31 %
2021	213	134	14	65	128	424	62.9 %	6.6 %	30.5 %

Source: Own elaboration with data obtained by applying the filters designed with the R programming language designed for this research.

In the case of the percentages for each type with respect to the total number of patents, it remains constant in most years. In 2017, there was a clear dominance male-only patents, covering 63.6 percent of the total number of patents granted to nationals. Over the total number of patents granted in 2017, the women-only type was 10.5 percent and the mixed teams 25.9 percent.

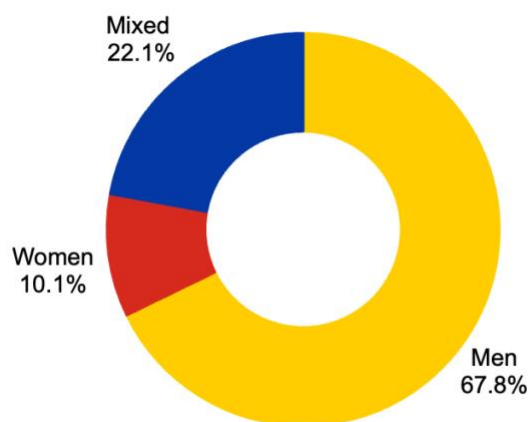
Figure 15. Percentage of total granted patents by type, in 2017 in Colombia.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2018, the high participation of male-only patents was maintained, with an increase in 67.8 percent of the total number of patents granted. In the case of the women-only type, the participation remained very similar to that of 2017, with a 10.1 percent. While the patents granted for mixed teams reduced their share compared to the previous year, with a 22.1 percent of the patents granted.

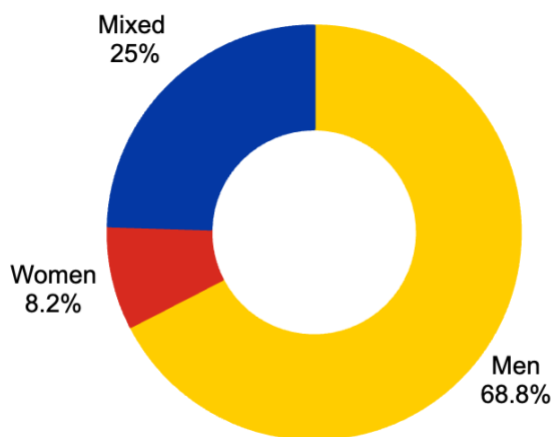
Figure 16. Percentage of total granted patents by type, in 2018 in Colombia.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2019, the value of the share of the male-only type in the total number of granted patents remains similar, with 66.8 percent, while there is a reduction in the case of the share of the female-only type compared to previous years with 8.2 percent. The share of mixed teams returns to a similar level to the one in 2017, holding a share of 25 percent of the total number of granted patents.

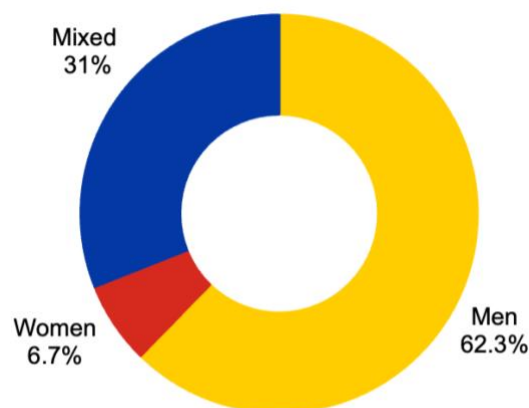
Figure 17. Percentage of total granted patents by type, in 2019 in Colombia.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

For 2020, there was a decrease in the male-only type to 62.3 percent of the total number of patents granted to nationals compared with the previous year. In the case of the women-only type, there was also a decrease to 6.7 percent. However, the number of patents granted to mixed teams increased significantly to 31 percent.

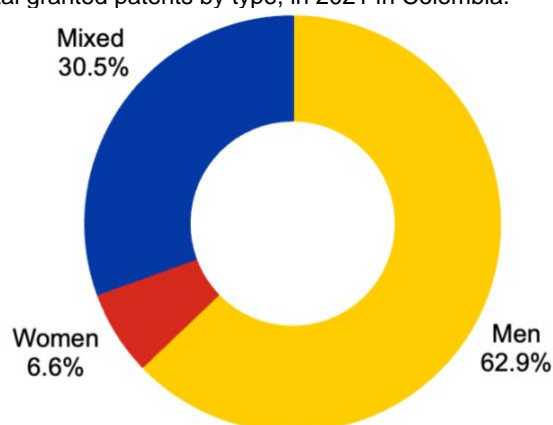
Figure 18. Percentage of total granted patents by type, in 2020 in Colombia.



Source: Own elaboration with data obtained by applying filters designed with the R programming language, designed for this research.

For 2021, the shares of each of the types remained very similar. In the case of the male-only type, the share increased to 62.9 percent of the total number of patents granted to residents. For the women-only type there is a reduced decrease to 6.6 percent, and in the case of patents granted for the mixed equipment type, there was a small decrease that leaves it at 30.5 percent of the total in 2021.

Figure 19. Percentage of total granted patents by type, in 2021 in Colombia.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

With the information obtained it was possible to identify the total number of patents granted to each type at the subnational level during 2017 to 2021. This is one of the most important contributions made by the present research. It was identified that the four departments with the highest number of patents granted in total of the three types are Bogotá, Antioquia, Cauca Valley and Santander. The first one concentrated a total of 675 granted patents.

In the case of patents granted for women only, their presence is greater in those departments where there is a greater number of patents granted of the three types. Bogotá has the highest number of women-only patents (63), followed by Antioquia (21), and in third place is Cauca Valley (17). While it is true that patents of the men-only type are the majority in all departments, those granted of the mixed type have an important presence. This shows a collaboration between men and women.

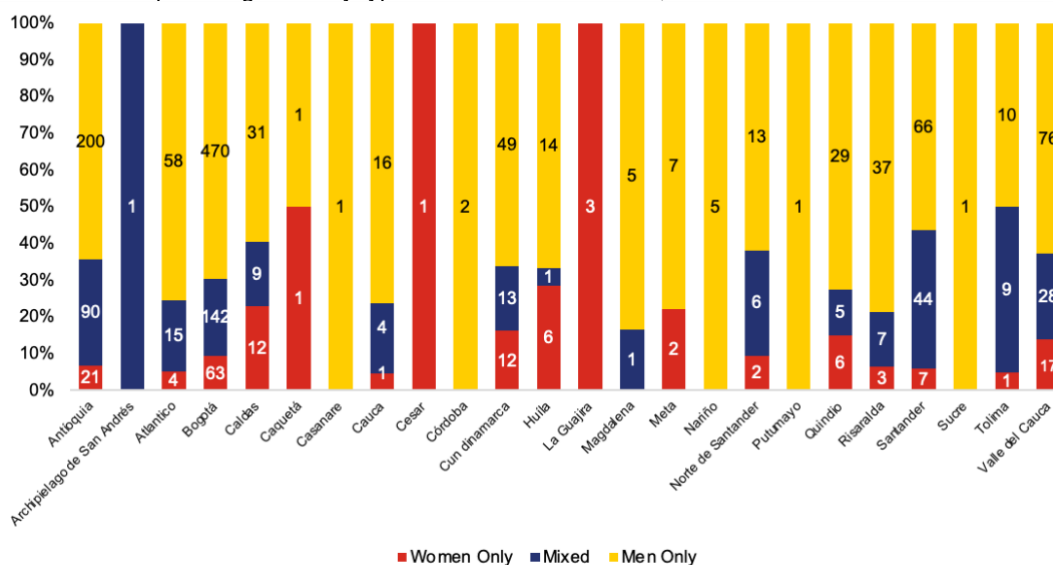
Table 16. Total of granted patents by type at the subnational level, from 2017 to 2021 in Colombia.

State	Women Only	Mixed	Men Only
Antioquia	21	90	200
Archipelago of San Andrés	0	1	0
Atlántico	4	15	58
Bogotá	63	142	470
Bolívar	2	2	7
Boyacá	2	5	10
Caldas	12	9	31
Caquetá	1	0	1
Casanare	0	0	1
Cauca	1	4	16
Cesar	1	0	0
Córdoba	0	0	2
Cundinamarca	12	13	49
Huila	6	1	14
La Guajira	3	0	0
Magdalena	0	1	5
Meta	2	0	7
Nariño	0	0	5
North Santander	2	6	13
Putumayo	0	0	1
Quindío	6	5	29
Risaralda	3	7	37
Santander	7	44	66
Sucre	0	0	1
Tolima	1	9	10
Cauca Valley	17	28	76

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

The above results are shown graphically below. This graph makes it easier to highlight the gap that exists at the subnational level. A few departments concentrate the majority of patents. This gap impacts the three types of granted patents analyzed here.

Figure 20. Total of patents granted by type at the subnational level, from 2017 to 2021 in Colombia.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Other data that was possible to obtain is that of each of the types for all the years of study at the subnational level. In the case of patents granted of the women-only type, it was identified that Bogotá and Antioquia have the highest number with 63 and 21 patents granted to residents. At the other extreme, it was identified that seven departments did not have any patents of this type between 2017 and 2021. This highlights the gap that exists at the subnational level.

Table 17. Total of patents granted by type of equipment only women at the subnational level, from 2017 to 2021 in Colombia.

State	2017	2018	2019	2020	2021	Total
Antioquia	3	3	8	3	4	21
Archipelago of San Andrés	0	0	0	0	0	0
Atlántico	0	0	1	3	0	4
Bogotá	19	11	7	15	11	63
Bolívar	0	1	0	1	0	2
Boyacá	0	0	1	0	1	2
Caldas	4	1	5	2	0	12
Caquetá	1	0	0	0	0	1
Casanare	0	0	0	0	0	0

Cauca	0	0	0	0	1	1
Cesar	0	0	0	0	1	1
Córdoba	0	0	0	0	0	0
Cundinamarca	1	2	0	3	6	12
Huila	1	1	0	2	2	6
La Guajira	0	0	2	1	0	3
Magdalena	0	0	0	0	0	0
Meta	1	1	0	0	0	2
Nariño	0	0	0	0	0	0
North Santander	0	1	1	0	0	2
Putumayo	0	0	0	0	0	0
Quindío	1	3	1	1	0	6
Risaralda	0	0	3	0	0	3
Santander	0	1	2	1	3	7
Sucre	0	0	0	0	0	0
Tolima	0	0	0	0	1	1
Cauca Valley	1	10	3	2	1	17

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

For the male-only type, the departments with the highest number of patents granted between 2017 and 2021 were Bogotá and Antioquia, with 470 and 200, respectively. In the case of the department of the Archipelago of San Andrés and Cesar, both have zero granted patents of the male-only type in the same period.

Table 18. Total of patents granted by type of equipment only men at the subnational level, from 2017 to 2021 in Colombia.

State	2017	2018	2019	2020	2021	Total
Antioquia	49	34	51	33	33	200
Archipelago of San Andrés	0	0	0	0	0	0
Atlántico	9	9	14	13	13	58
Bogotá	91	101	96	93	89	470
Bolívar	1	0	2	1	3	7
Boyacá	1	1	3	5	0	10
Caldas	2	7	6	12	4	31
Caquetá	0	0	0	0	1	1
Casanare	0	0	0	0	1	1
Cauca	2	1	4	2	7	16
Cesar	0	0	0	0	0	0
Córdoba	0	1	0	1	0	2
Cundinamarca	4	9	9	14	13	49
Huila	1	4	4	3	2	14

La Guajira	0	0	0	0	0	0
Magdalena	0	2	0	2	1	5
Meta	0	1	3	2	1	7
Nariño	0	0	0	3	2	5
North Santander	4	1	4	3	1	13
Putumayo	0	0	1	0	0	1
Quindío	4	1	5	10	9	29
Risaralda	9	11	7	7	3	37
Santander	9	5	13	20	19	66
Sucre	0	1	0	0	0	1
Tolima	1	3	1	5	0	10
Cauca Valley	17	19	23	8	9	76

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Finally, for the case of mixed teams (where at least one woman and one man participate as inventors of the same patent), a concentration of granted patents was found in the departments mentioned above: Bogotá and Antioquia. The former was found with 142 and the latter with 90 granted between 2017 and 2021. As it happened in the previous types, the subnational gap is significant, as it stands out that ten departments had zero patents of this type.

Table 19. Total of patents granted by type of mixed teams at the subnational level, form 2017 to 2021 in Colombia.

State	2017	2018	2019	2020	2021	Total
Antioquia	16	18	25	13	18	90
Archipelago of San Andrés	1	0	0	0	0	1
Atlántico	3	4	2	2	4	15
Bogotá	26	31	22	36	27	142
Bolívar	0	0	0	0	2	2
Boyacá	0	0	3	1	1	5
Caldas	0	2	2	4	1	9
Caquetá	0	0	0	0	0	0
Casanare	0	0	0	0	0	0
Cauca	0	2	1	1	0	4
Cesar	0	0	0	0	0	0
Córdoba	0	0	0	0	0	0
Cundinamarca	2	0	3	5	3	13
Huila	0	0	0	1	0	1
La Guajira	0	0	0	0	0	0
Magdalena	0	0	1	0	0	1
Meta	0	0	0	0	0	0
Nariño	0	0	0	0	0	0

North Santander	0	0	4	1	1	6
Putumayo	0	0	0	0	0	0
Quindío	1	1	2	1	0	5
Risaralda	0	2	4	0	1	7
Santander	1	3	8	19	13	44
Sucre	0	0	0	0	0	0
Tolima	0	1	1	5	2	9
Cauca Valley	4	6	8	1	9	28

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

México

According to official information obtained through information requests⁷ it was identified that 2,825 patents were granted in Mexico to Mexican residents between 2017 and 2022. In the case of female-only type patents, there was a slight increase in their percentage over the total number of patents granted in the years of study, going from 5.3 percent in 2017 to 5.4 percent in 2022. In the case of male-only granted patents, there was a significant reduction from 56.6 percent in 2017 to 44.9 percent in 2022. The most significant change was seen in mixed type patents granted, as collaboration between women and men increased from 38.1 percent in 2017 to 49.7 percent in 2022, surpassing those of the men-only type.

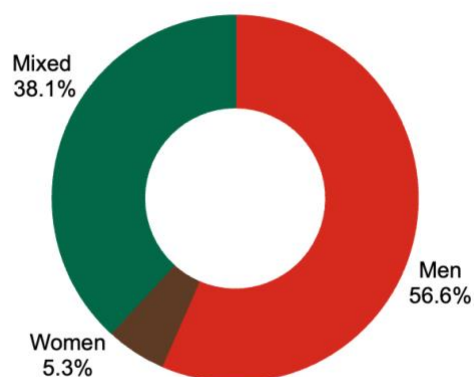
Table 20. Concentration of patents by type of inventor in Mexico, from 2017 to 2021.

Granted	Total Patents	Men Only	Women Only	Mixed	Total Women	Total Men	% Men Only	% Women Only	% Mixed
2017	412	233	22	157	288	877	56.6 %	5.3 %	38.1 %
2018	455	236	22	197	387	1031	51.9 %	4.8 %	43.3 %
2019	447	227	31	189	393	1067	50.8 %	6.9 %	42.3 %
2020	390	207	18	165	337	981	53.1 %	4.6 %	42.3 %
2021	618	310	28	280	552	1490	50.2 %	4.5 %	45.3 %
2022	503	226	27	250	521	1315	44.9 %	5.4 %	49.7 %

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

However, in 2017, patents granted for women only represented 5.3 percent. In the case of those granted for men only, they had a representation of 56.6 percent. Finally, for patents granted mixed type, they had a share of 38.1 percent over total number of patents granted in 2017.

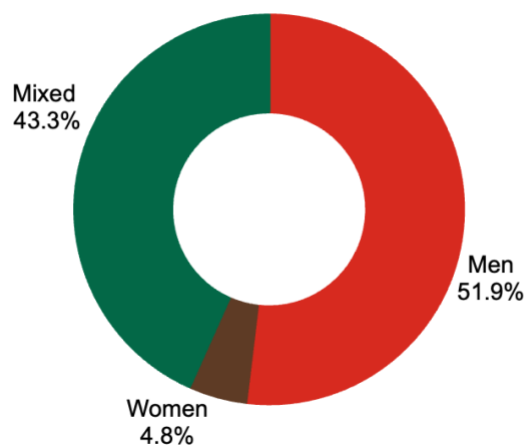
Figure 21. Percentage of total granted patents by type, in 2017 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In the case of 2018, there are changes in the participation percentages of each type of granted patent. For women-only patents, there was a reduction to 4.8 percent. Those of the men-only type also had a reduction to reach 51.9 percent. Those of the mixed type showed a significant increase to reach 43.3 percent of the total number of patents granted this year.

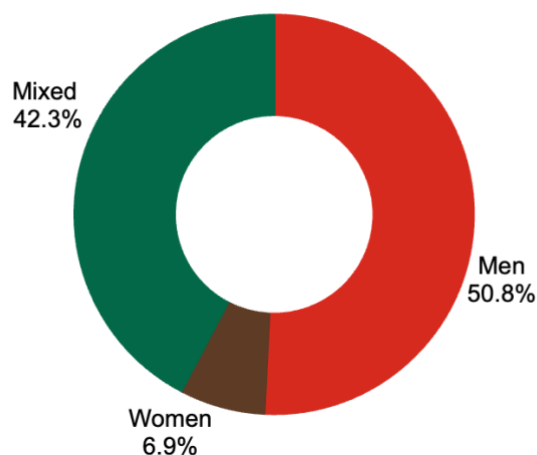
Figure 22. Percentage of total patents granted by type, in 2018 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

For 2019, women-only granted patents had an increase over the previous year, reaching 6.9 percent. In the case of male-only granted patents, their share decreased by a slight margin to 50.8 percent. A similar situation can be seen in the mixed type of patents granted, as their share dropped slightly to 42.3 percent of the total for that year.

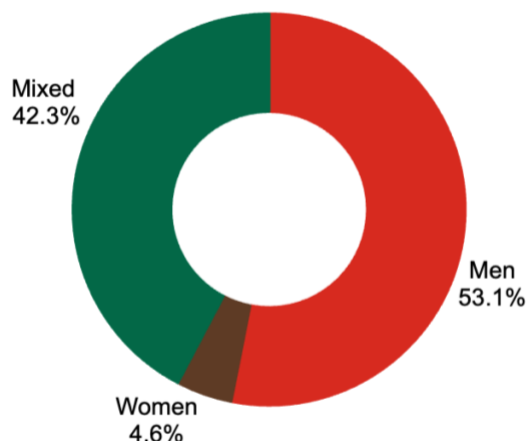
Figure 23. Percentage of total patents granted by type, in 2019 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

In 2020, patents granted to the female-only type decreased their share with respect to 2019 until they reached 4.6 percent. Meanwhile, in the case of the male-only type, they increased their share to 53.1 percent. Lastly, patents of the mixed type slightly reduce their share to represent 42.3 percent over the total number of patents granted at the national level.

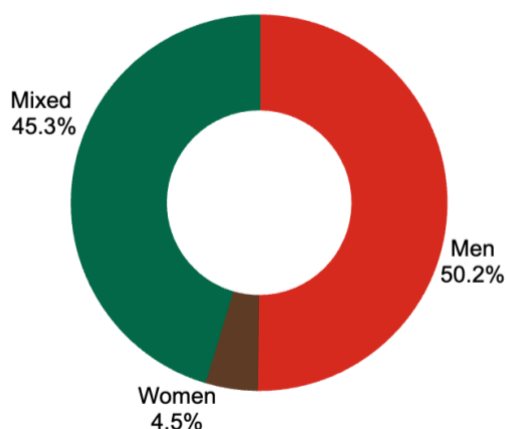
Figure 24. Percentage of total patents granted by type, in 2020 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language designed for this research.

By 2021, the share of women-only patents granted was 4.5 percent. The share of male-only patents decreased compared to the previous year, reaching 50.2 percent. This reduction is reflected in the increase in the share of mixed type patents, which reached 45.3 percent of the total number of patents granted to residents in Mexico.

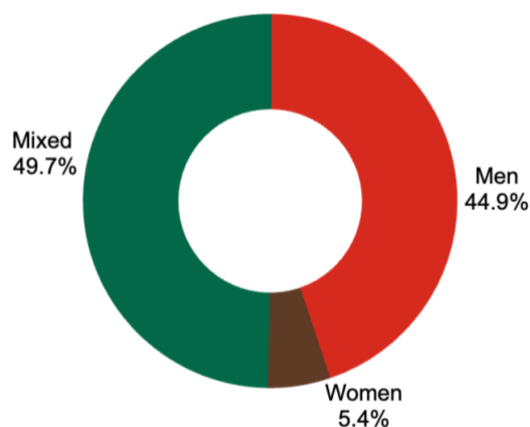
Figure 25. Percentage of total patents granted by type, in 2021 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Finally, in 2022, women-only patents granted increase their share compared to the previous year, reaching 5.4 percent. Those of the men-only type reduce their share to 44.9 percent. For patents granted of the mixed type, they continue to increase and reached a share of 49.7 percent of the total. Compared to 2017, it is possible to identify a significant increase in collaboration between women and men in patents in Mexico.

Figure 26. Percentage of total patents granted by type, in 2022 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Nevertheless, with the information obtained it was possible to identify the total number of patents granted to each type at the subnational level from 2017 to 2022. This is one of the most relevant contributions made by this research. It was identified that the four states with the highest number of patents granted in total of the three types are Mexico City, Nuevo León, Jalisco and the State of Mexico.

Mexico City (51), Jalisco (25) and Nuevo León (18) had the highest number of women-only patents granted from 2017 to 2022. The same three states concentrate the highest number of patents granted for men only, with 519 in Mexico City, 159 in Nuevo León, and 158 in Jalisco. Following within the same period of study, and in the case of patents granted of the mixed type, the same order is maintained, so that Mexico City accumulated 541, Nuevo León had 149 and, finally, Jalisco concentrated 109.

Table 21. Total of patents granted by type at the subnational level, from 2017 to 2022 in México.

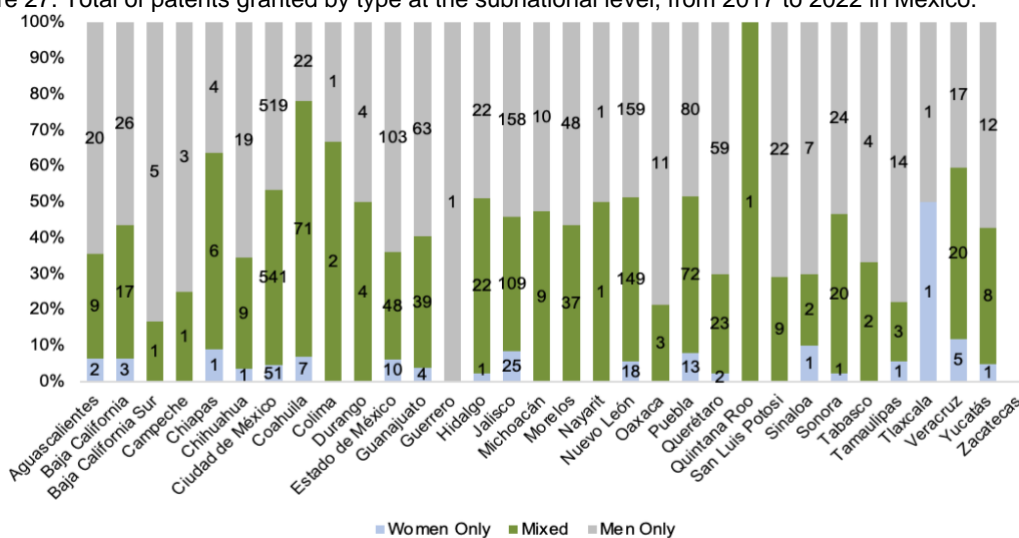
State	Women Only	Mixed	Men Only
Aguascalientes	2	9	20
Baja California	3	17	26
Baja California Sur	0	1	5
Campeche	0	1	3
Chiapas	1	6	4
Chihuahua	1	9	19
Mexico City	51	541	519

Coahuila	7	71	22
Colima	0	2	1
Durango	0	4	4
State of Mexico	10	48	103
Guanajuato	4	39	63
Guerrero	0	0	1
Hidalgo	1	22	22
Jalisco	25	109	158
Michoacán	0	9	10
Morelos	0	37	48
Nayarit	0	1	1
Nuevo León	18	149	159
Oaxaca	0	3	11
Puebla	13	72	80
Querétaro	2	23	59
Quintana Roo	0	1	0
San Luis Potosí	0	9	22
Sinaloa	1	2	7
Sonora	1	20	24
Tabasco	0	2	4
Tamaulipas	1	3	14
Tlaxcala	1	0	1
Veracruz	5	20	17
Yucatán	1	8	12
Zacatecas	0	0	0

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

The following figure shows the data of the previous table. It can be seen more clearly that in the case of Mexico City, Coahuila, Colima, Quintana Roo and Veracruz, the number of patents granted of the mixed type is greater than the total of the other types. The only case in which a small gap is identified is that of Tlaxcala which ties with 1 patent granted of the male-only type with that of the female-only type.

Figure 27. Total of patents granted by type at the subnational level, from 2017 to 2022 in Mexico.



Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

When reviewing patents granted by women-only type at the subnational level, it was identified that the states with the highest number from 2017 to 2022 are Mexico City, Jalisco, Nuevo León and Puebla with 51, 25, 18 and 13 respectively. At the other extreme, within the study's time frame, several states had zero patents granted of this type (Baja California Sur, Campeche, Colima, Durango, Guerrero, Michoacán, Morelos, Nayarit, Oaxaca, Quintana Roo, San Luis Potosí, Tabasco, Yucatán and Zacatecas).

Table 22. Total of patents granted by women-only type at the subnational level, from 2017 to 2022 in Mexico.

States	2017	2018	2019	2020	2021	2022	Total
Aguascalientes	0	0	2	0	0	0	2
Baja California	0	0	2	0	1	0	3
Baja California Sur	0	0	0	0	0	0	0
Campeche	0	0	0	0	0	0	0
Chiapas	0	0	0	0	0	1	1
Chihuahua	1	0	0	0	0	0	1
Mexico City	10	7	11	8	9	6	51
Coahuila	3	3	1	0	0	0	7
Colima	0	0	0	0	0	0	0
Durango	0	0	0	0	0	0	0
State of Mexico	0	1	2	1	2	4	10
Guanajuato	0	0	1	2	0	1	4
Guerrero	0	0	0	0	0	0	0
Hidalgo	0	0	0	0	0	1	1
Jalisco	3	3	3	2	9	5	25
Michoacán	0	0	0	0	0	0	0
Morelos	0	0	0	0	0	0	0
Nayarit	0	0	0	0	0	0	0
Nuevo León	3	3	4	2	5	1	18

Oaxaca	0	0	0	0	0	0	0
Puebla	2	5	2	1	0	3	13
Querétaro	0	0	1	0	1	0	2
Quintana Roo	0	0	0	0	0	0	0
San Luis Potosí	0	0	0	0	0	0	0
Sinaloa	0	0	0	0	0	1	1
Sonora	0	0	0	0	0	1	1
Tabasco	0	0	0	0	0	0	0
Tamaulipas	0	0	0	1	0	0	1
Tlaxcala	0	0	1	0	0	0	1
Veracruz	0	0	1	1	1	2	5
Yucatán	0	0	0	0	0	1	1
Zacatecas	0	0	0	0	0	0	0

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

For the men-only type from 2017 to 2022, the states with the highest number of patents granted were Mexico City, Nuevo León, Jalisco and the State of Mexico, with 519, 159, 158 and 103 respectively. On the other extreme, Quintana Roo and Zacatecas had zero patents granted of the men-only type in the years of the study.³⁶

Table 23. Total of patents granted by men-only type at the subnational level, from 2017 to 2022 in Mexico.

States	2017	2018	2019	2020	2021	2022	Total
Aguascalientes	1	3	5	2	5	4	20
Baja California	7	1	4	4	5	5	26
Baja California Sur	0	0	0	2	3	0	5
Campeche	0	1	0	0	2	0	3
Chiapas	0	1	0	2	0	1	4
Chihuahua	3	3	3	1	4	5	19
Mexico City	80	76	79	74	125	85	519
Coahuila	3	4	3	4	4	4	22
Colima	0	0	1	0	0	0	1
Durango	0	0	2	2	0	0	4
State of Mexico	21	17	17	14	22	12	103
Guanajuato	7	11	10	6	19	10	63
Guerrero	0	0	0	0	0	1	1
Hidalgo	2	0	9	6	3	2	22
Jalisco	15	21	24	15	41	42	158
Michoacán	2	1	5	1	0	1	10
Morelos	8	18	8	6	5	3	48
Nayarit	0	0	1	0	0	0	1
Nuevo León	37	27	25	29	26	15	159
Oaxaca	1	2	3	1	2	2	11
Puebla	13	22	14	8	15	8	80
Querétaro	16	10	5	8	9	11	59

Quintana Roo	0	0	0	0	0	0	0
San Luis Potosí	1	4	1	3	7	6	22
Sinaloa	1	3	1	0	2	0	7
Sonora	2	4	5	7	3	3	24
Tabasco	0	1	0	1	0	2	4
Tamaulipas	5	2	1	4	0	2	14
Tlaxcala	0	0	0	0	1	0	1
Veracruz	6	3	0	2	5	1	17
Yucatán	2	1	1	5	2	1	12
Zacatecas	0	0	0	0	0	0	0

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Finally, the states with the highest number of patents granted of the mixed type between 2017 and 2022 were Mexico City, Nuevo León, Jalisco and Puebla with 541, 149, 109 and 72 respectively. At the other extreme, two states had zero patents granted of this type for the period in question (Quintana Roo and Zacatecas).

Table 24. Total of patents granted by mixed teams' type at the subnational level, from 2017 to 2022 in Mexico.

States	2017	2018	2019	2020	2021	2022	Total
Aguascalientes	2	1	1	0	4	1	9
Baja California	1	0	2	6	3	5	17
Baja California Sur	0	0	0	0	0	1	1
Campeche	0	1	0	0	0	0	1
Chiapas	2	0	0	1	1	2	6
Chihuahua	1	1	5	0	2	0	9
Mexico City	75	100	80	67	112	107	541
Coahuila	4	9	14	4	19	21	71
Colima	0	0	0	1	1	0	2
Durango	1	1	0	2	0	0	4
State of Mexico	12	3	5	6	12	10	48
Guanajuato	3	6	7	3	8	12	39
Guerrero	0	0	0	0	0	0	0
Hidalgo	1	2	4	2	6	7	22
Jalisco	7	16	10	11	34	31	109
Michoacan	1	1	2	2	3	0	9
Morelos	8	7	6	4	9	3	37
Nayarit	0	0	0	0	0	1	1
Nuevo León	20	27	30	31	21	20	149
Oaxaca	0	1	0	0	1	1	3
Puebla	9	9	14	12	16	12	72
Querétaro	3	3	2	4	8	3	23

Quintana Roo	0	0	0	0	1	0	1
San Luis Potosí	3	1	0	1	2	2	9
Sinaloa	0	0	0	1	1	0	2
Sonora	1	3	2	1	9	4	20
Tabasco	0	0	0	1	1	0	2
Tamaulipas	1	1	0	1	0	0	3
Tlaxcala	0	0	0	0	0	0	0
Veracruz	2	3	2	4	4	5	20
Yucatán	0	1	3	0	2	2	8
Zacatecas	0	0	0	0	0	0	0

Source: Own elaboration with data obtained by applying the filters designed with the R programming language, designed for this research.

Conclusions.

1. In the four countries analyzed in this research, it was found that women are not the population group that most takes advantage of the patent system. However, it is observed that the participation of women has been increasing during the years of study.
2. The most significant increase in women's participation is observed in patents where inventors of both genders collaborate, which shows that joint work between men and women is important.
3. The indicators of patenting of women in the countries studied, show that there is a significant gap at the subnational or subregional level in all, not only of women inventors, but also of men inventors.
4. In the countries analyzed, the constant is that a few states, entities or regions concentrate the majority of granted patents of all types. The constant concentration is observed in the states or regions where the capitals are located, as well as the most important states from the economic point of view.
5. With regard to patent information, two major challenges were identified in relation to most national intellectual or industrial property offices in Latin America:
 - i. To obtain information such as file numbers, names of inventors, among other data, there are access barriers that sometimes cannot be broken;
 - ii. The way offices structure their information does not follow any standardized format used by all or the majority, so it is important work to homogenize the data. Therefore, it is very difficult to obtain information and data from other countries in the region that would allow us to broaden the study base in order to continue carrying out this type of academic and statistical exercises.
6. Although an increase in the participation of women as inventors of patents was identified in all four countries, it has been gradual.

Recommendations

1. Working collaboratively with the WIPO to standardize the databases of the national intellectual or industrial property offices of Latin America. This will provide an interesting route for ecosystem actors to adequately monitor the impact of national policies on innovation issue.
2. Conducting technical studies to identify how ad hoc policies can be designed and implemented to increase the number of women inventors, without generating negative externalities.
3. The joint work between government, civil society and the actors of innovation ecosystems at the local level is essential to work to increase the chances of success of actions that seek to increase the number of women inventors who patent. .
4. Efforts to ensure that more users can benefit from national intellectual property systems should be State efforts, free from partisan political conjunctures. Ideally actors from local and regional ecosystems can contribute to complement existing local agendas to promote the use of intellectual property as a tool for development in Latin America.
5. This study presents the results of only one of the species of intellectual property (patents), where the national inventive capacity in the territories under analysis is evident. All intellectual property rights are equally important, and as a society, efforts must be added so that the benefits derived from their use reach other social segments that have not traditionally been exposed to the tool. Support for greater inclusion should not be limited to integrating more women but should be expanded to promote intellectual property as a form of development and social inclusion.
- 6.
7. Not limiting efforts to increase the number of patents to postgraduate degrees, but rather include undergraduate students. It would even be ideal to promote intellectual property from basic education. This type of changes should be worked upon different actors with a long-term vision.

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