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Gender Diversity in Inventorship

How do European countries compare?

October 2022

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Dii INCREASING DIVERSITY IN INNOVATION

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Introduction

There is no doubt that innovation is a driver of national competitiveness (which includes economic and technological competitiveness and national security).

In this highly uncertain time with increasing inflation, continued pandemic fears, a war in Ukraine, and constant supply chain issues, companies and countries are looking for any way they can maintain or increase both jobs and economic prosperity. Increasing diversity in inventorship provides both. In 2020, the USPTO published a **report** on the level of participation of women in the U.S. patent system. The "Women Inventor Rate" (WIR), which measures the share of U.S. inventors receiving patents who are women, was 12.8% in 2020. The 2021 global WIR of 16% reported by **WIPO** for the PCT system is only slightly better. What we can surmise from this number is that there are many women inventors who are not participating in either or both the innovation and inventorship processes. This has profound implications for both companies (who make up approximately 80% of patenting activity in the United States) and nations. In a time when both companies and nations are struggling to out-perform competitors, keeping a good portion of your team warming the bench seems like a bad strategy. This severe underrepresentation of women is both an issue of social justice and national competitiveness. To help provide a benchmark for both European companies and multinational corporations operating in Europe, we needed to calculate the EPO numbers ourselves as no such study already existed. The results were surprising.

Given the increasing number of European companies joining the pledge, we started searching for European country numbers to compare company performance to. There were no current numbers for Europe.

To help provide a benchmark for both European companies and multinational corporations, we decided to pull and analyze the numbers ourselves. To be honest, we expected the numbers to show that the U.S. was well behind Europe on the issue of gender inclusivity in invention and innovation. Why? There is a belief that many European companies have an almost 50/50 employee split on gender within their companies, and therefore this would likely not be an issue. However, one thing we have learned from The Diversity Pledge is to only trust the data, and to make that data transparent to others, therefore we decided to collect and analyze the data ourselves. What we found was surprising and reinforced the need for data to overcome unconscious bias.

Contents

Methodology

In order to generate comparable and reliable data, the process followed was broadly as described in "Identifying the Gender of PCT Inventors." WIPO Economic Research Working Paper 33. World Intellectual Property Organization – Economics and Statistics Division[ref].

An extract was produced from the **IFI Claims Direct** database, of all EPO utility patent publications filed in calendar years 2015-2019 inclusive. The extract was generated on December 2nd 2021, so the vast majority of the publications filed during 2019 would have been available at that point.

The fields extracted, per inventor were: publication number, with kind removed; country code of inventors address; inventors given names.

The rows of data were then uniqued, to account for inventors being named on multiple publications. This introduces a small possibility of errors, from the case where an inventor's name is misspelled in one or more publications, or where there are multiple inventors with the same given names.

Using data **2015-2019**

For each row a lookup was then performed on the WIPO **wgnd_ctry.tab** dataset, which provides a mapping from pairs of given names and ISO country codes of residence, to indicative gender. In the event of there being no data for that given names and country combination, we fell back to using the **wgnd_noctry.tab** dataset, which provides the same information, ignoring the country of residence. In the event of no matching data being found, or the dataset indicating that the name was gender neutral, the gender was marked as unknown. Three columns were added, corresponding to the predicted gender being female, male, or unknown, with a 1, indicating most likely or 0, least likely.

An example of the resulting data for three publications is shown below.

Publication	Application year	cc	Given names	Female	Male	Unknown
EP3081599	2016	FR	PIERRE ETIENNE	0	1	0
EP3081599	2016	FR	REMI	0	1	0
EP3081599	2016	FR	CHRISTINE	1	0	0
EP3081599	2016	FR	MARION	1	0	0
EP3081599	2016	FR	MATTHIEU	0	1	0
EP3081599	2016	FR	FRANCK	0	1	0
EP3081600	2016	FR	PIERRE ETIENNE	0	1	0
EP3081600	2016	FR	REMI	0	1	0
EP3081600	2016	FR	CHRISTINE	1	0	0
EP3081600	2016	FR	MARION	1	0	0
EP3081600	2016	FR	MATTHIEU	0	1	0
EP3081600	2016	FR	FRANCK	0	1	0
EP3081601	2015	DE	ADALBERT	0	1	0
EP3081601	2015	DE	FABIAN	0	1	0
EP3081601	2015	DE	KAIMAN	0	1	0

For example, to look at publications from Austria in 2015, the set of publications where all authors have a `cc` of AT, and the filing date is 2015 is selected. The data is then grouped by `publication`, and the mean of the `male`, `female`, `unknown` columns is calculated, and a number of metrics are derived:

"Results were only generated for country, year combinations with at least 500 rows of support data."

```
Total number of publications = count of rows
Publications with a female inventor = rows where female>0
        Ditto for male and unknown
Publications with both female and male inventors = rows where female>0 and male>0
Publications with all female inventors = rows where female=1
        Ditto for male and unknown
Female inventorship rate = mean (female)
```

Results were only generated for country, year combinations with at least 500 rows of support data.

(For the data nerds among us; The EPO WIR is calculated on a fractional share basis that converges towards the WIR based on the law of large numbers).

Results

We investigated gender diversity in inventorship in Europe by analyzing the gender of inventors from EPO countries on published EPO utility patent applications from 2015-19. In order to generate comparable and reliable data, we followed the **method** previously used by WIPO, including the application of the WIPO worldwide gender-name dictionary.

Table 1 below shows the results of the data analysis for 2019 across three women inventorship metrics and in comparison to the same results for the USPTO and WIPO in the same year. While foreshadowed by the previous WIPO reports on PCT applications, the first surprise is that the EPO's WIR of 9.0% significantly lags the USPTO (12.8%) and WIPO (14.7%).

EPO WIR
9.0%

USPTO WIR
12.8%

WIPO WIR
14.7%

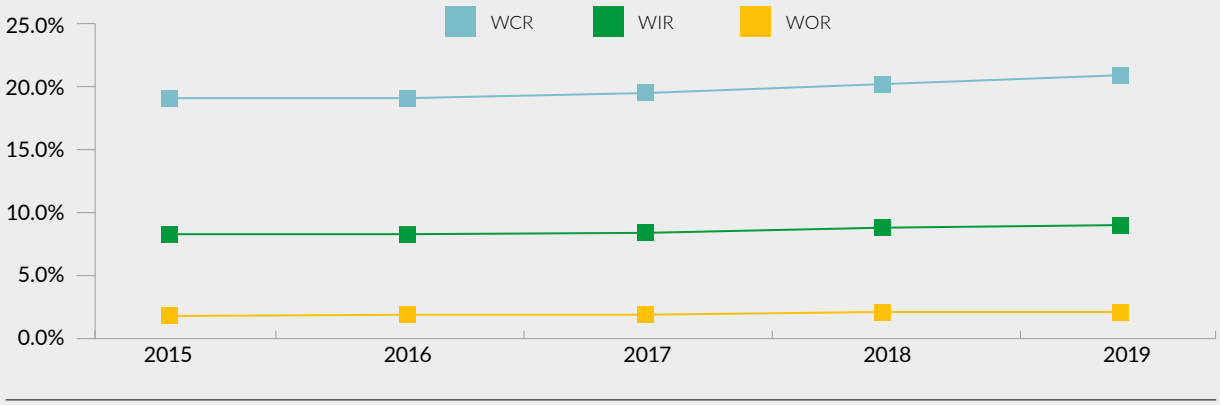
Table 1 | Women Inventorship Metrics 2019

Diversity metric	Description	EPO %	USPTO %	WIPO %
Women Inventor Rate (WIR)	% of listed inventors that are women	9.0	12.8	14.7
Women Contributor Rate (WCR)	% of patents with at least one woman inventor	20.8	21.9	30.0
Women Only Rate (WOR)	% of patents where all inventors are women	2.1	4.0	4.0

As with both WIPO and USPTO, women inventorship is also rising steadily but slowly for EPO countries. Figure 1 below shows the growth in EPO women inventorship rates for filing dates over the period, 2015-19. At the current growth of WIR, it will take greater than 100 years to reach gender parity.

"The top 3 EPO countries include Spain, Portugal, and Turkey, while the Nordic countries lie below the EPO average."

Figure 1 | EPO Women Inventorship Rates

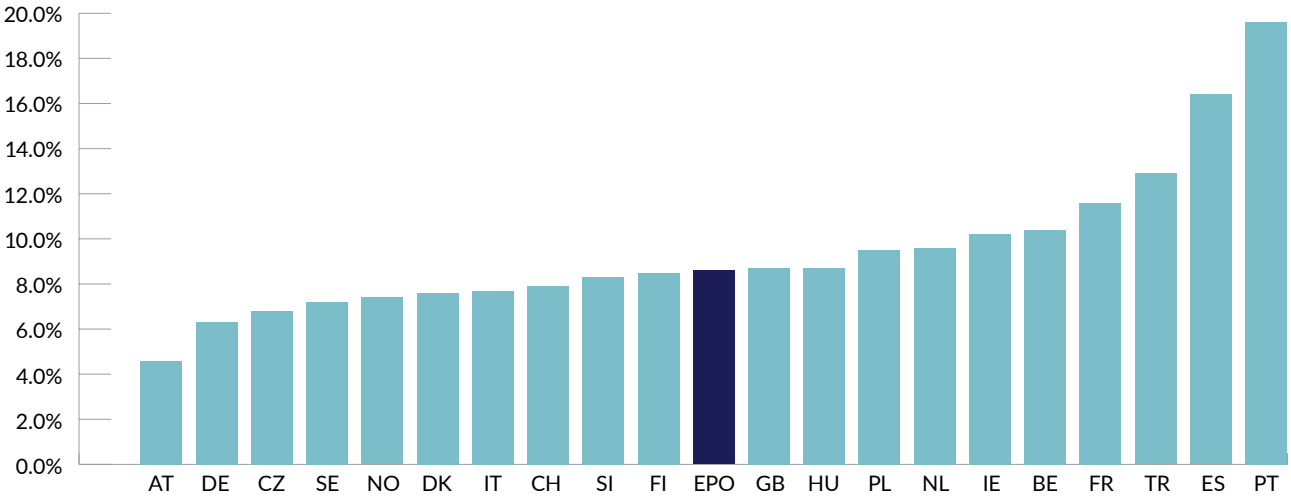


Source: Cipher

Figure 2 below shows the heterogeneity of WIR across a sample of EPO countries and in comparison with EPO, USPTO, and WIPO averages. Interestingly, the top 3 EPO countries include Spain, Portugal, and Turkey, while the Nordic countries lie below the EPO average, which is another surprising result given that these countries rank at the top of the **Gender Equality Index**.

100
The number of years to reach gender parity

Figure 2 | Woman Inventor Rates for EPO Countries

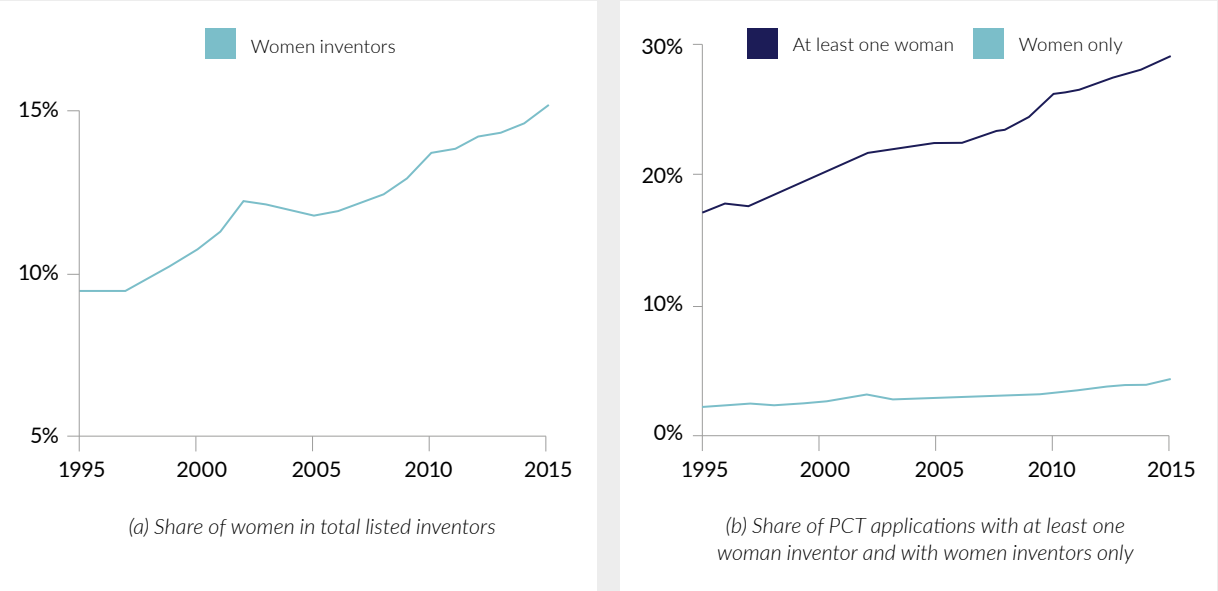


Source: Cipher

Further Analysis

You can see some trends in Inventorship over time and how different countries in the EPO perform against PCT and USA.

Figure 3 | Upward trend in women participation in international patenting

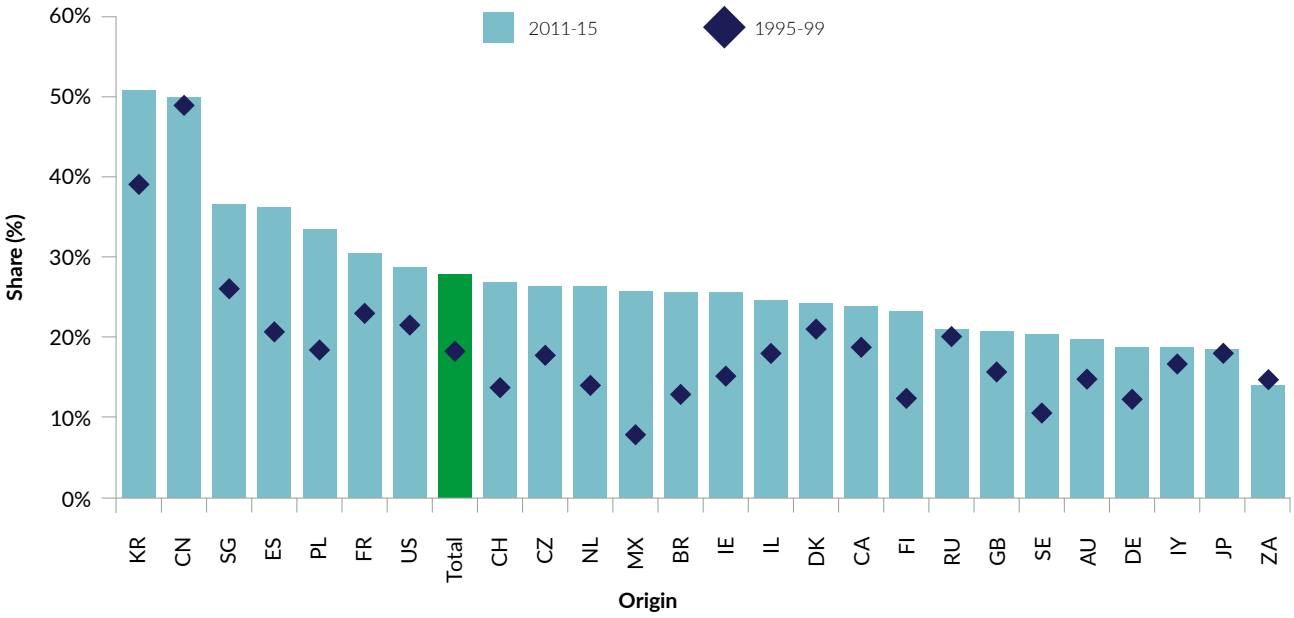


(a) Share of women in total listed inventors

(b) Share of PCT applications with at least one woman inventor and with women inventors only

Source: WIPO

Figure 4 | Share of international patent application with at least one woman inventor by selected origins



Source: WIPO

What does this mean?

The first and most important insight is that gender diversity is improving but all countries have a long way to go before reaching gender parity in inventorship. The second key insight is that the heterogeneity across countries and regions means that we still have a lot to learn about the different factors that impact gender diversity in this context, including culture, technology field, and differential use of public policies to name a few. Understanding why helps us to understand how to steepen the curve to parity. At a more granular level, why are only three countries above the U.S. WIR percentage? Is there anything that can be gleaned from Spain, Portugal and Turkey that would help other countries looking to increase their own WIR numbers? Answers to these questions will certainly come quicker if we all work together to share insights and apply a data-centric approach to measure impact. This study is just a first step, and helps frame follow on research needed to address some of the questions raised.

EPO WIR
9.0%

USPTO WIR
12.8%

WIPO WIR
14.7%

Call to action

While these results are shown at the country level, they have profound implications for companies (who make up greater than 80% of patenting activity in the U.S. and Europe). This explains why The Diversity Pledge was launched with a core focus to improve diversity and inclusivity in technology firms. Today, over 50 companies in both the US and Europe have stepped up to create, update and implement a set of best practices designed to increase participation of under-represented inventor (URI) groups (of which women are only one of many). With the call to action of The Diversity Pledge, over 50 companies in both the US and Europe have stepped up to create, update and implement a set of best practices designed to increase participation of under-represented inventor (URI) groups (of which women are only one of many). While it has been helpful to have a US national number for firms to compare themselves to, this is an issue that plagues both companies and countries around the world.

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