Women participation in innovation and IP

International Training on IP and Innovation

April 2026

Outline:

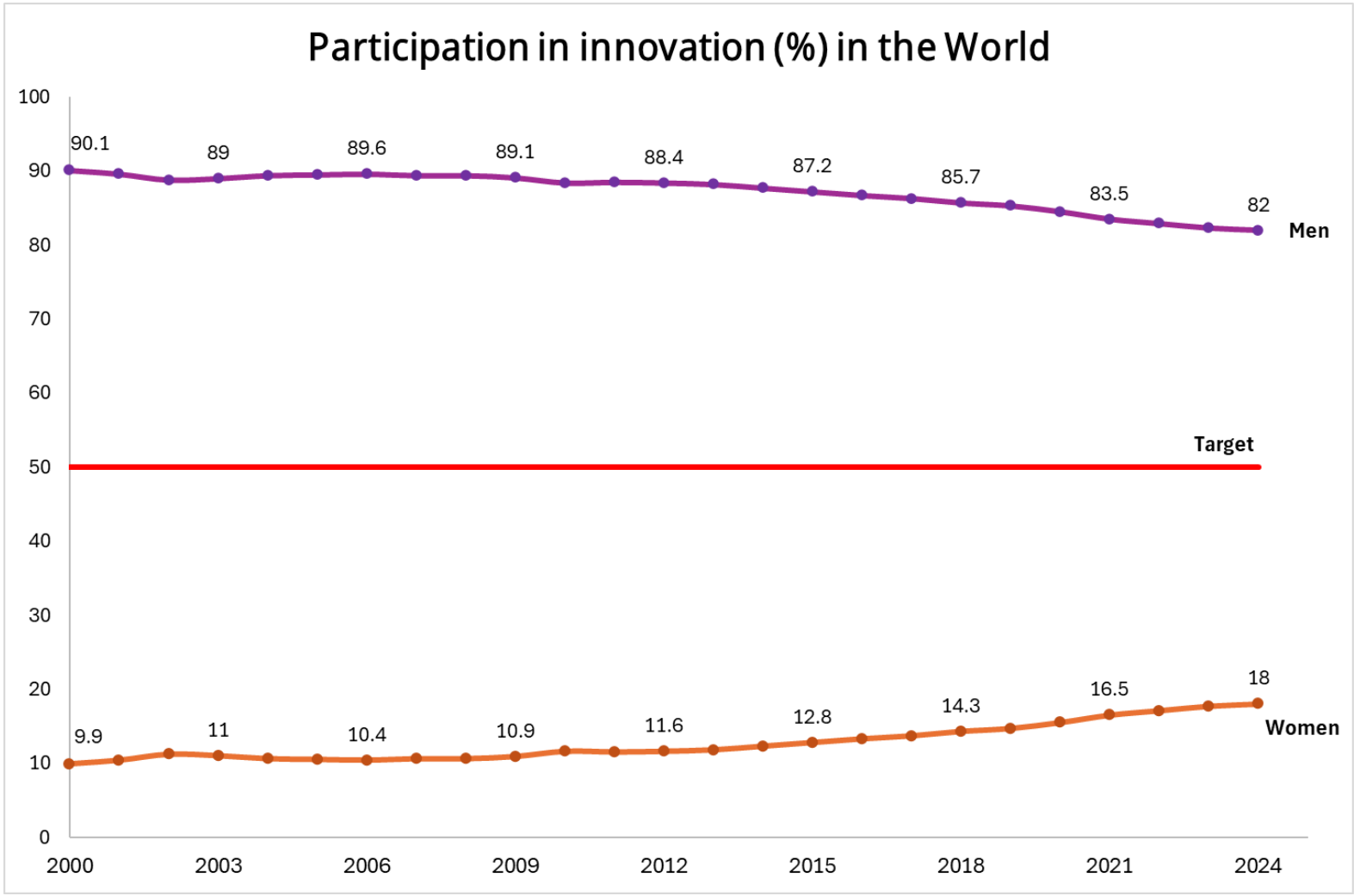
1. Women's participation in IP and innovation

2. Gender indicators for policy

3. How to obtain sex-disaggregated data

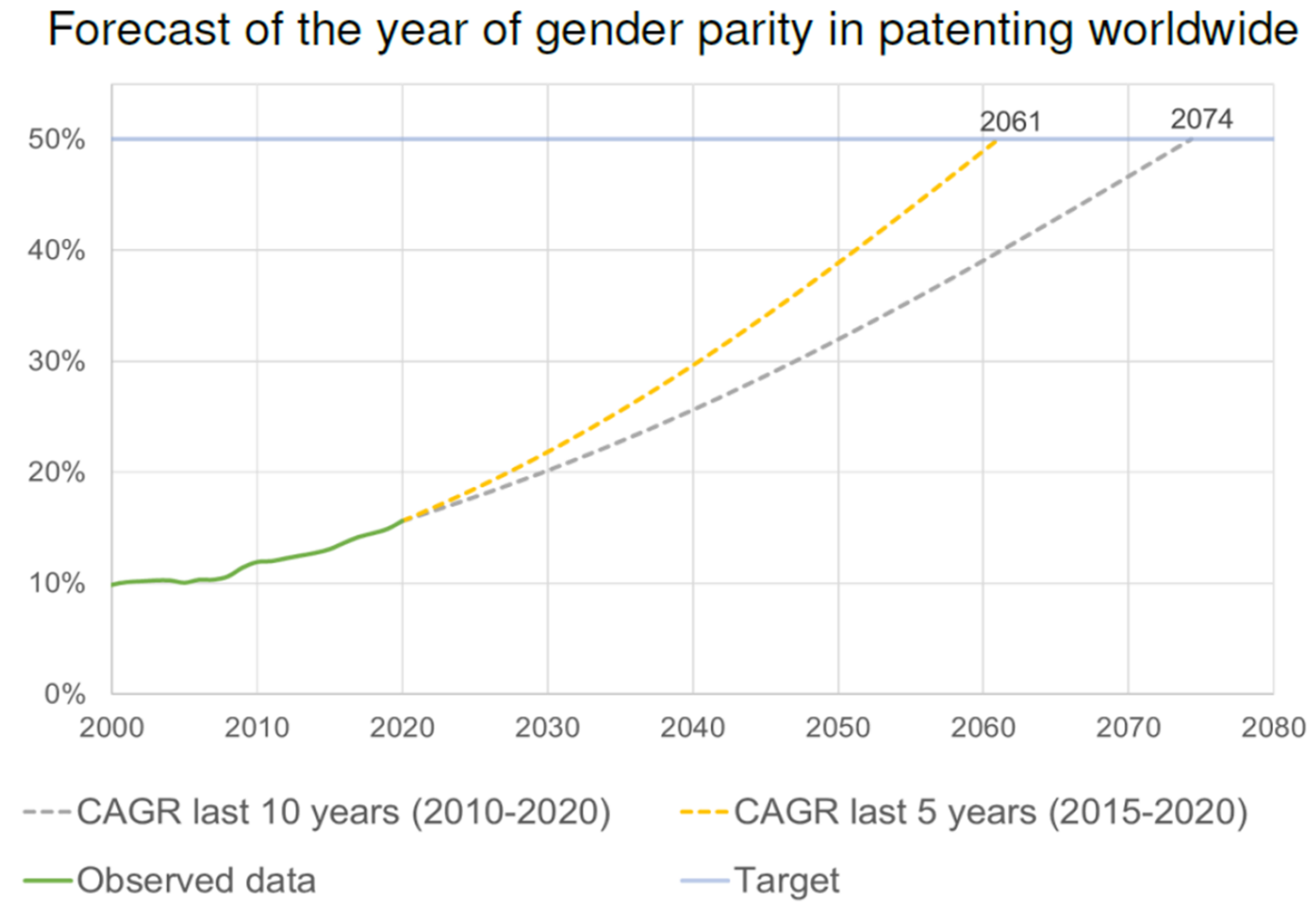
Why are we interested in women's participation?

- Over the past 25 years, women's participation has been increasing but at a slow pace



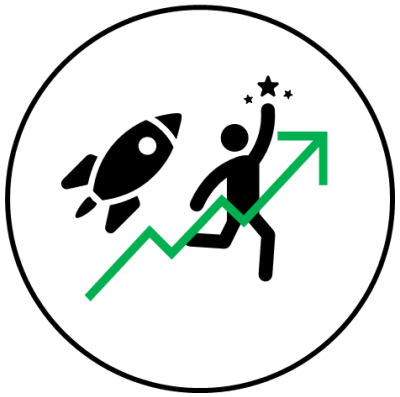
Why are we interested in women's participation?

- At the current pace, we should reach the target by 2060 (WIPO estimates)

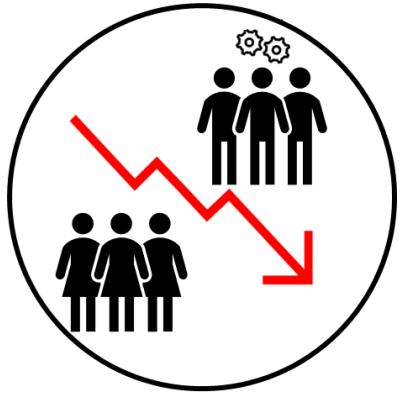


Notes: data reflects observed and estimated women inventor rates; CAGR = Cumulative Average Growth Rate.

Women's low participation is a growth issue



- Innovation and creativity are the engines of **economic growth.**



- Women represent 50% of the world population.
- If they do not participate in innovation, we are **under-using growth potential**.

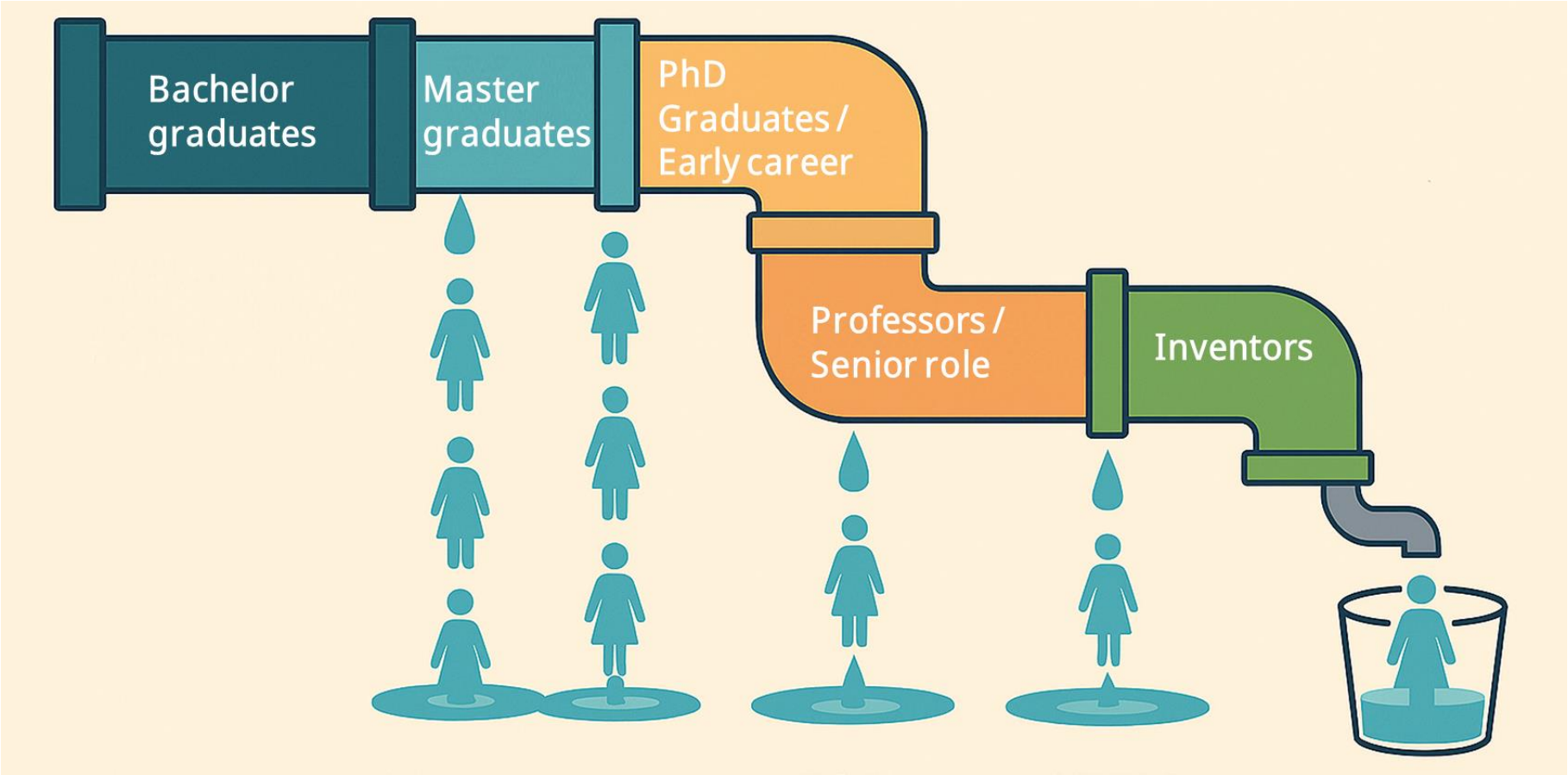
- **Ideas are becoming harder to find**.

  If we under-use growth potential :
  - We lose innovation opportunities
  - We reduce quality and quantity of ideas
  - We leave market segments unexplored

- Since the 1970s we missed out on thousands of inventions and trillions of USD.

The leaky pipeline in STEM

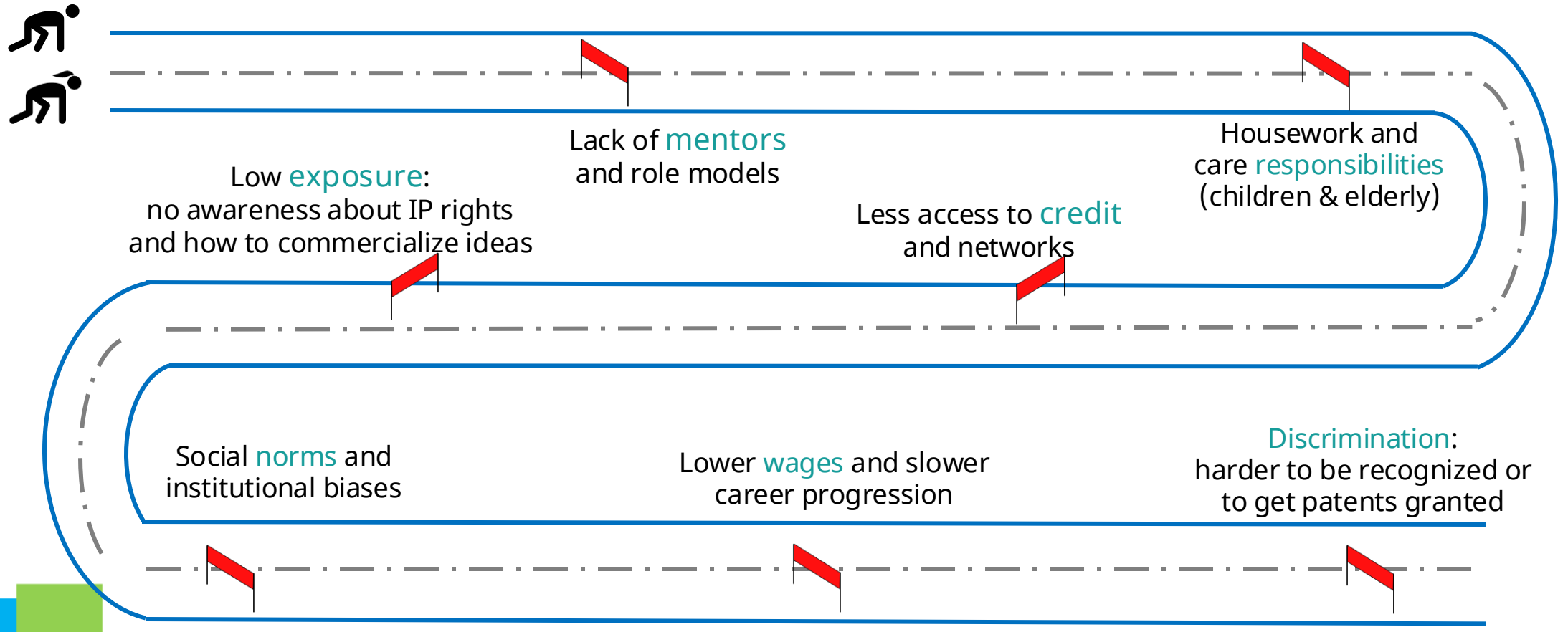
› The share of women graduating from STEM fields is increasing, but the share of women in innovation professions is not



Why is the pipeline leaking?

Poll

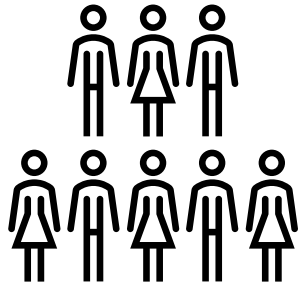
› Research shows that men and women have the same abilities, however women face additional challenges:



How do we know this?

And what can we do to address women's participation?

- **Sex-disaggregated data**
  - Nr of women designers
  - Nr of men designers



- **Gender indicators**
  - Out of all the designs, % of those by women

- They allow to:
  - **Quantify an issue**
  - **Identify barriers and trampolines**
  - **Conduct policy evaluations and recommendation**

Steps from no data to policy

Identify the issue

Women participation

Identify the necessary data

Nr of patents by women

Data collection

Produce statistical indicators

Patents by women / Total patents

Analysis

Compare indicators across time, places, groups

Dissemination and policy recommendations

Let’s brainstorm

- *How should a country address women’s participation in IP and innovation?*

Let’s brainstorm

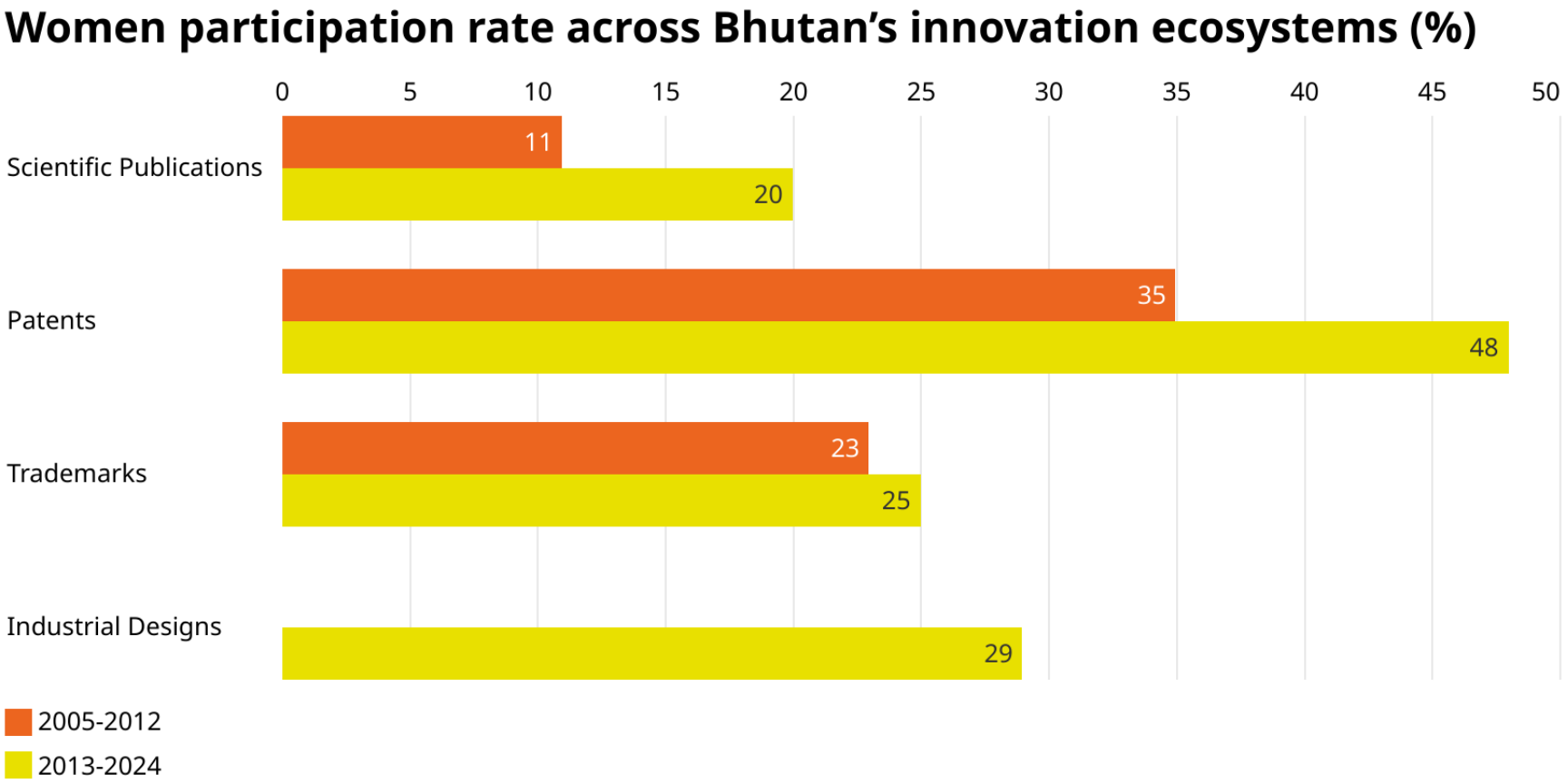
Poll

+ *How should a country address women’s participation in IP and innovation?*

- Does a country have to address women’s participation or does it have parity already?
- What is the target?
- And if so, should interventions target all the **sectors and industries**?
- And **which women** need to be targeted?
- And **how long** will it take before gender parity is reached?
- And **why** are women less present?
- And **which strategies** are more successful?

Let’s brainstorm

Poll



Challenges we will address today

- Often, IP data sources do not provide sex-disaggregated information

- How can we obtain sex-disaggregated information for all the team members?
- How can we use this information to measure gender gaps?

- Important: **sex-disaggregated data** is different from gender data
- Gender data contains information that allows to identify gender roles

Women participation in innovation and IP

Gender indicators for policy

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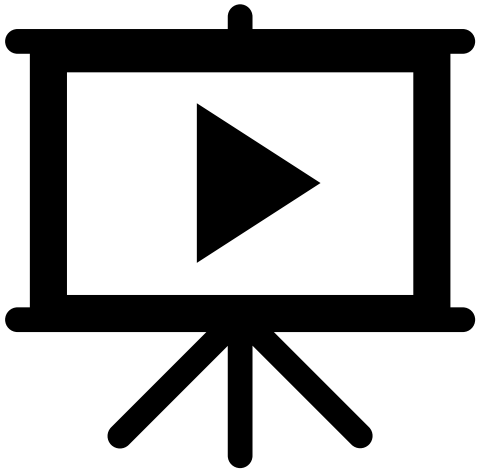
Before we continue

Let’s hear from global researchers why it is important to learn about women participation in innovation and IP



What are gender indicators

Use sex-disaggregated data

- Once we know the gender of inventors and creators, we can generate statistics that is **meaningful and informative** for policy
  - How do we show gender gaps (and their change) in participation?

- Indicators should be
  - Relevant for policy objectives
  - Based on clear definitions (who is an inventor? Who is a creator?)
  - Simple, transparent and replicable
  - Used to monitor progress (or the lack of) compared to the baseline
  - Comparable to indicators from other institutions or statistical offices

Know what you are measuring

- Who is an inventor? Who is a creator?
- There are **trade offs**

  - IP data: Anyone listed on the patent/design/etc. application
  - ➢ *Does not capture women who participate in innovation but do not appear on applications*

  - Survey data: someone who reports working in R&D/design/creative fields
  - ➢ *Self reported*

  - ➢ ***Indicators require clear definition of what is captured by the measures***

  - ➢ *With the same numbers, we can get very different indicators.*
  - ➢ *It is important to know what you are measuring and what you need to measure*

For example:

- Patents data → Name of the inventor → Measure innovation activity
- Designs data → Name of the creator → Measure creative activity
- From **trademarks**?
  - We only know **who applied** for the trademark
  - We do not know the composition of the team behind the trademark
  - But trademark are a good proxy for entrepreneurship

Trade off!!

WIPO suggested indicators

Gender indicators from IP data

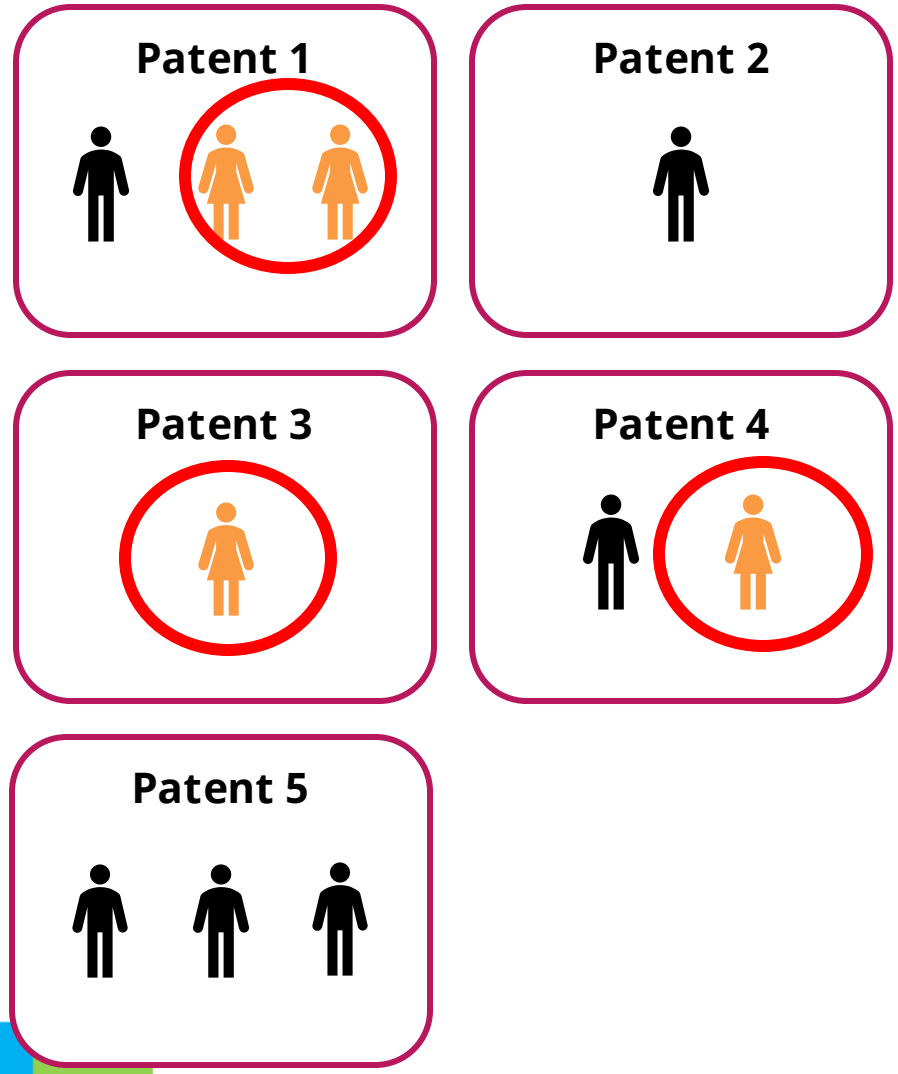
- Proportion of inventors/creators who are women (**WIR**)
- Share of patents with at least one woman (**ATL**)
- Women share of total patenting (**WSP**)
- Share of patents by gender composition of teams (**GCT**)

Can be computed by IP right, country, time, technology class

Challenges **(good to keep in mind but they will not be covered in this training)**

- Missing information on inventors/creators' names
  - Data weighting strategies
- Industrial/Technological composition of a country
  - Inclusivity index (Delgado & Murray, 2022)

Proportion of inventors who are women (WIR)



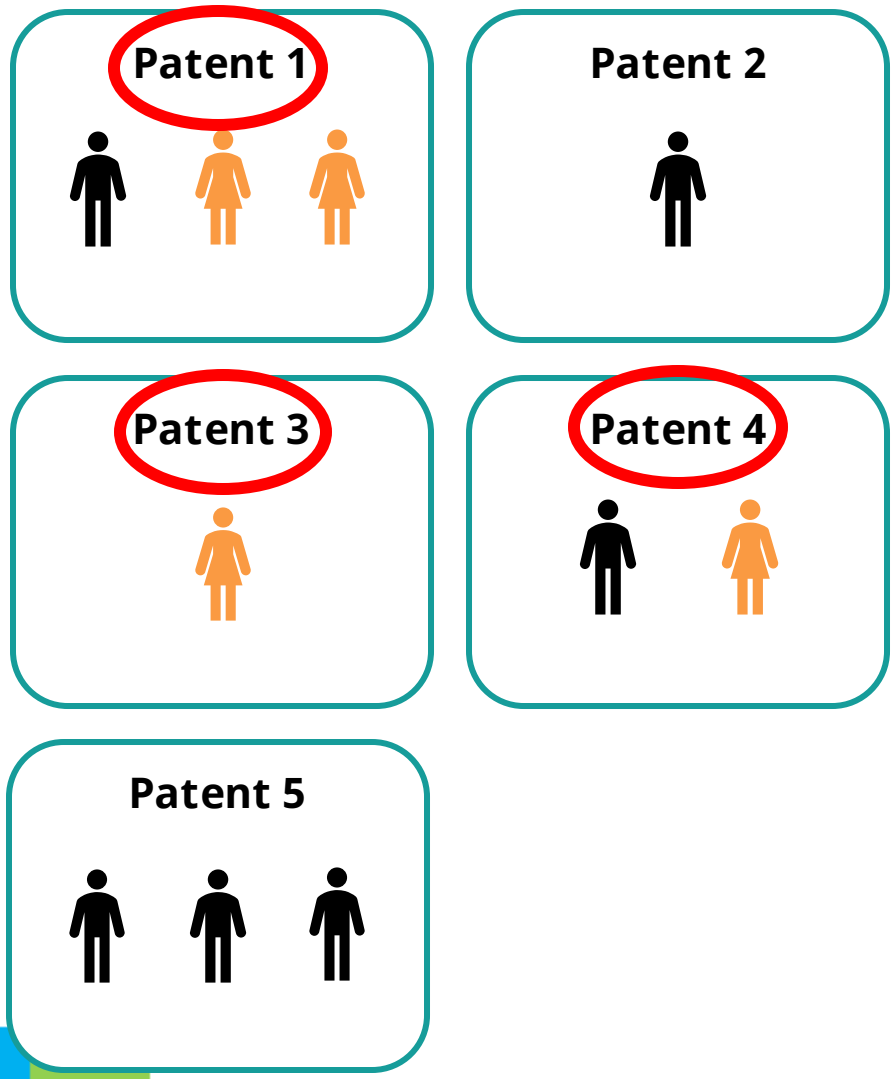
- To obtain the WIR we calculate what percentage of all the inventors are women:

$$WIR = \frac{Nr\ women\ inventors}{Nr\ total\ inventors} \times 100$$

$$= \left(\frac{4}{10}\right) \times 100 = \mathbf{40}\%$$

Target = 50%

Share of patents with at least one woman (ATL)

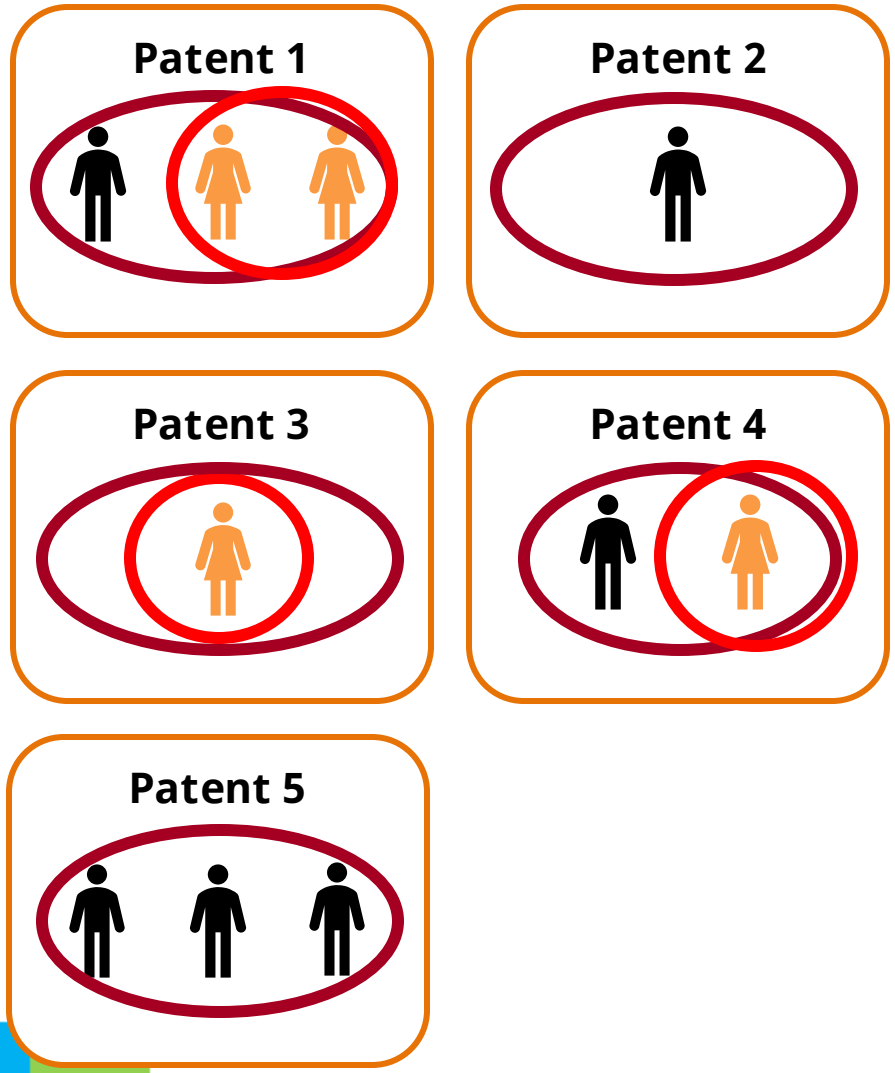


- To obtain the ATL we calculate what percentage of all patents have at least a woman in the team:

$$ATL = \frac{Nr\ patents\ with\ at\ least\ one\ woman\ inventor}{Nr\ total\ patents} \times 100$$

$$= \left(\frac{3}{5}\right) \times 100 = \mathbf{60}\%$$

Women share of total patenting (WSP)



- To obtain the WSP we calculate for each patent what percentage of creator is a woman.
  Then we take the average of this percentage over all the patents

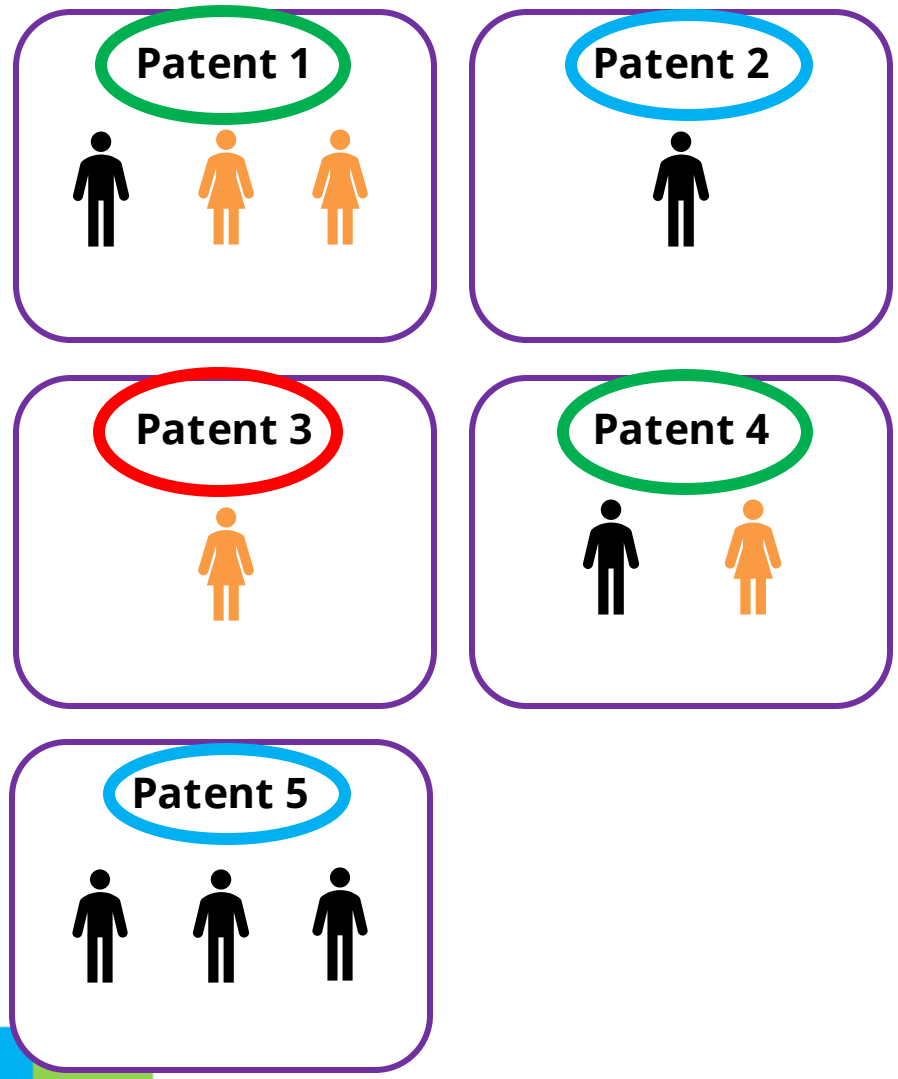
$$WSP = \%\ of\ women\ per\ patent$$

$$= \left(\frac{\frac{2}{3} + \frac{0}{1} + \frac{1}{1} + \frac{1}{2} + \frac{0}{3}}{5} \right) \times 100$$

$$= \mathbf{43.3\%}$$

Target = 50%

Share of patents by gender composition of teams (GCT)



- To obtain the share of patents by gender composition of teams, we group the patents based on whether they are: *only men, mixed gender or only women*.
- Then we calculate the percentage of patents by group type.

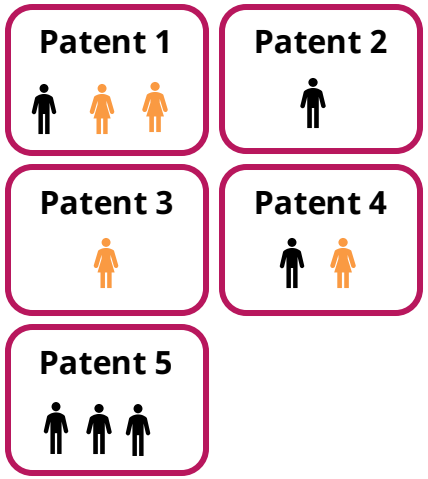
$$Only\ men = \frac{2}{5} \times 100 = \mathbf{40}\%$$

$$Mixed\ gender = \frac{2}{5} \times 100 = \mathbf{40}\%$$

$$Only\ women = \frac{1}{5} \times 100 = \mathbf{20}\%$$

Compare gender indicators

Proportion of inventors who are women (WIR)



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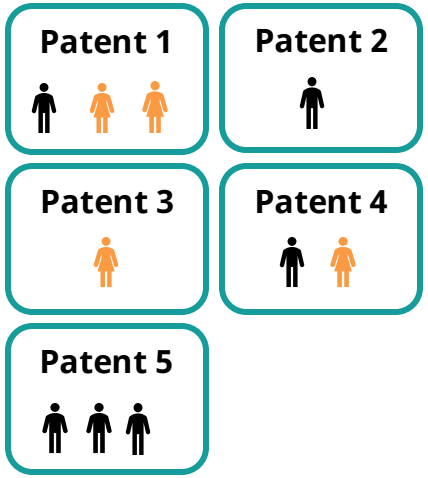
Share of patents with at least one woman (ATL)



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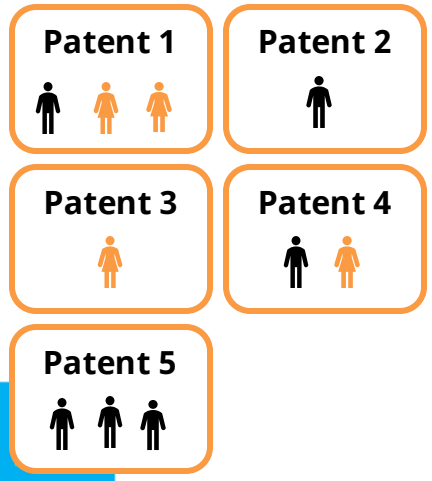
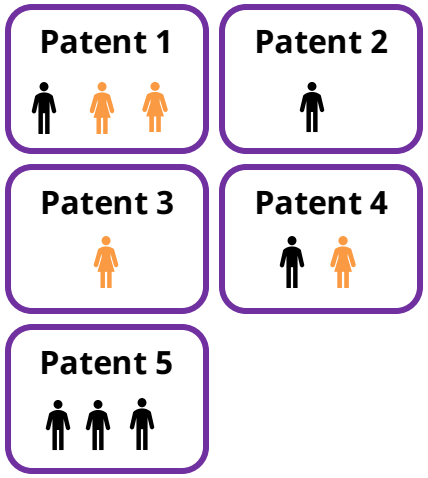


$$WSP = \%\ of\ women\ per\ patent$$

$$= \left(\frac{\frac{2}{3} + \frac{0}{1} + \frac{1}{1} + \frac{1}{2} + \frac{0}{3}}{5}\right) \times 100$$

$$= \mathbf{43.3\%}$$

Share of patents by gender composition of teams (GCT)



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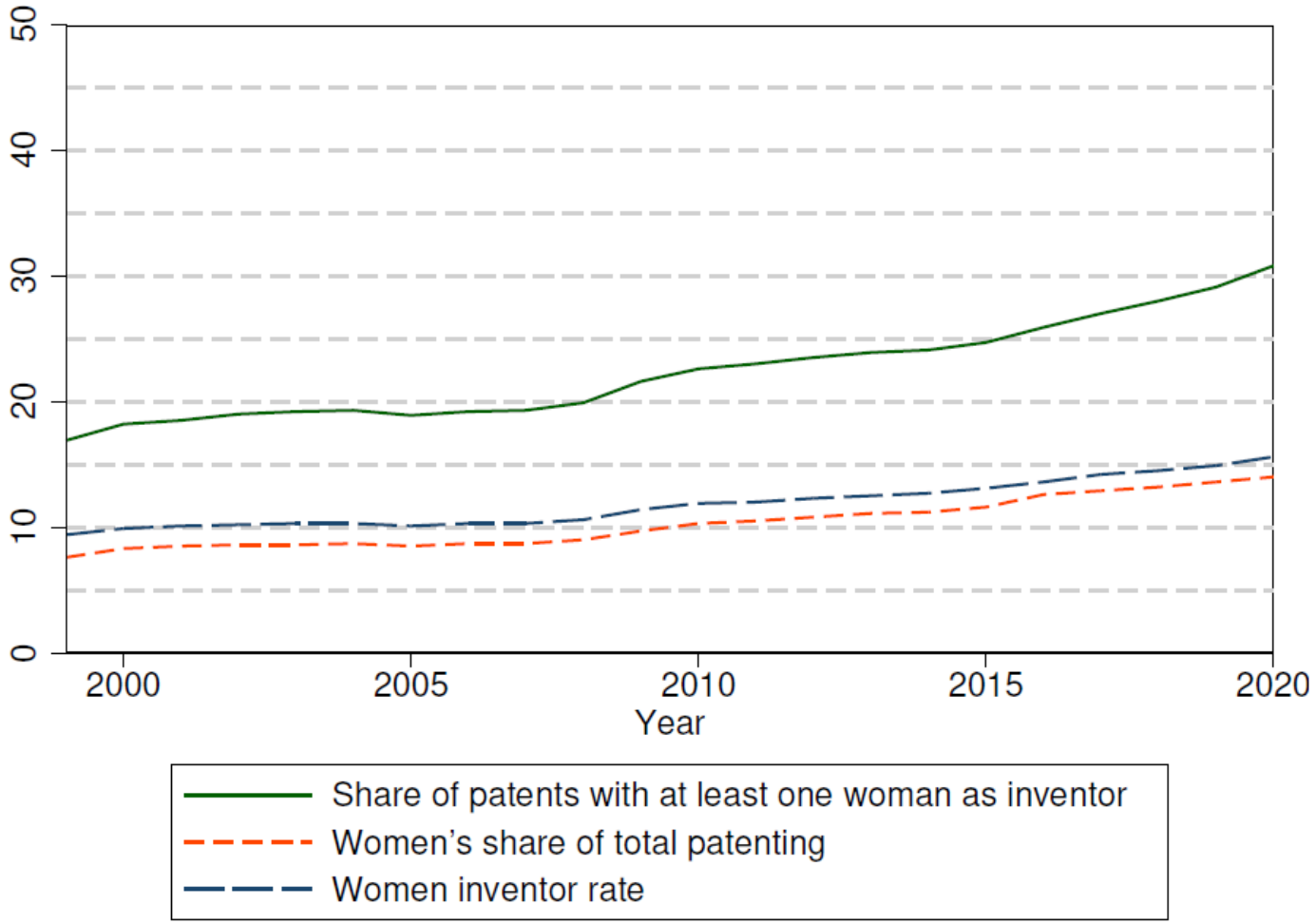
Poll

Three indicators of women contribution to patenting

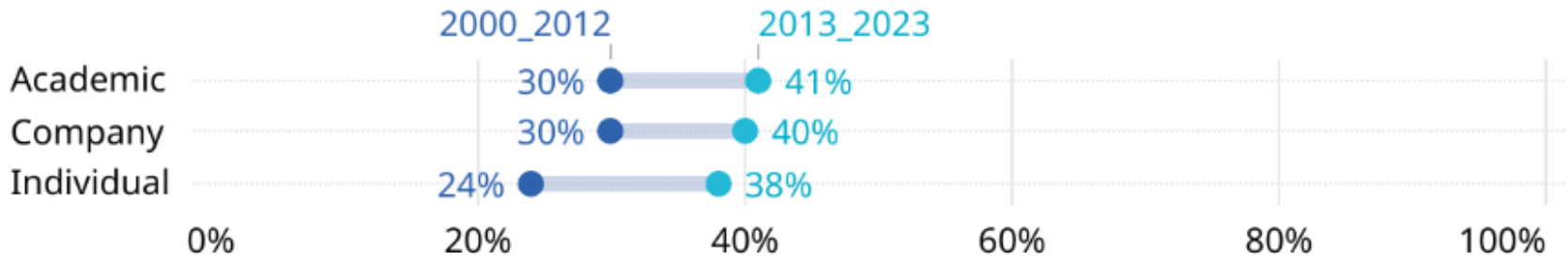


Missing information :

- Taking averages is an option

Figure 5 Corporate and Academic Settings Show Equal Progress in Women's Research Participation

Women's Participation Rate in Scientific Publications by Institution Type, Comparing 2000-2012 and 2013-2023



Source: DGIP and WIPO Collection

Get indicators from the data

Indicators by class and time

Make sure the data is in the right format

name	gender	class	year
Frida	F	14	2016
Britney	F	5	2017
Akira	M	19	2014
Miriam	F	11	2023
Rajeev	M	16	2015
Aishwarya	F	11	2024
Jean-Paul	M	10	2024
Giovanni	M	9	2020
Carlos	M	12	2024
Watanabe	M	17	2014
Hao	M	10	2019
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Giovanni	M	9	2020
Carlos	M	12	2024
Watanabe	M	17	2014
Hao	M	10	2019
Ashraf	M	11	2023
Kofi	M	19	2024

M	F	Tot	class	year
0	1	1	14	2016
0	1	1	5	2017
1	0	1	19	2014
1	1	2	11	2023
1	0	1	16	2015
0	1	1	11	2024
1	0	1	10	2024
1	0	1	9	2020
1	0	1	12	2024
1	0	1	17	2014
1	0	1	10	2019
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1	0	1	19	2014
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1	0	1	16	2015
0	1	1	11	2024
1	0	1	10	2024
1	0	1	9	2020
1	0	1	12	2024
1	0	1	17	2014
1	0	1	10	2019
1	0	1	19	2024

Indicators by class and time

Proportion of inventors who are women (WIR = F/Tot)

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Hao	M	10	2019
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Kofi	M	19	2024

M	F	Tot	class	year	WIR
0	1	1	14	2016	4/13 = 31%
0	1	1	5	2017	31%
1	0	1	19	2014	31%
1	1	2	11	2023	31%
1	0	1	16	2015	31%
0	1	1	11	2024	31%
1	0	1	10	2024	31%
1	0	1	9	2020	31%
1	0	1	12	2024	31%
1	0	1	17	2014	31%
1	0	1	10	2019	31%
1	0	1	19	2024	31%

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M	F	Tot	class	year	WIR	WIR class
0	1	1	14	2016	31%	100%
0	1	1	5	2017	31%	100%
1	0	1	19	2014	31%	0%
1	1	2	11	2023	31%	2/3 = 67%
1	0	1	16	2015	31%	0%
0	1	1	11	2024	31%	67%
1	0	1	10	2024	31%	0%
1	0	1	9	2020	31%	0%
1	0	1	12	2024	31%	0%
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0	1	1	14	2016	31%	100%	100%
0	1	1	5	2017	31%	100%	100%
1	0	1	19	2014	31%	0%	0%
1	1	2	11	2023	31%	67%	50%
1	0	1	16	2015	31%	0%	0%
0	1	1	11	2024	31%	67%	1/4 = 25%
1	0	1	10	2024	31%	0%	25%
1	0	1	9	2020	31%	0%	0%
1	0	1	12	2024	31%	0%	25%
1	0	1	17	2014	31%	0%	0%
1	0	1	10	2019	31%	0%	0%
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M	F	Tot	class	year	WIR	WIR class	WIR year	WIR class year
0	1	1	14	2016	40%	100%	100%	100%
0	1	1	5	2017	40%	100%	100%	1/1 = 100%
1	0	1	19	2014	40%	0%	0%	0%
1	1	2	11	2023	40%	67%	50%	50%
1	0	1	16	2015	40%	0%	0%	0%
0	1	1	11	2024	40%	67%	25%	100%
1	0	1	10	2024	40%	0%	25%	0%
1	0	1	9	2020	40%	0%	0%	0%
1	0	1	12	2024	40%	0%	25%	0%
1	0	1	17	2014	40%	0%	0%	0%
1	0	1	10	2019	40%	0%	0%	0%
1	0	1	19	2024	40%	0%	25%	0%

Quick exercise

Poll

- Can you calculate the ATL (Share of patents with at least one woman inventor)
  - Overall
  - For class 3
  - For year 2020

Patent ID	M	F	Tot	class	year
001	1	0	1	3	2019
101	5	1	6	3	2020
023	2	0	2	9	2020
312	7	1	8	1	2020
509	0	3	3	7	2008

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Poll

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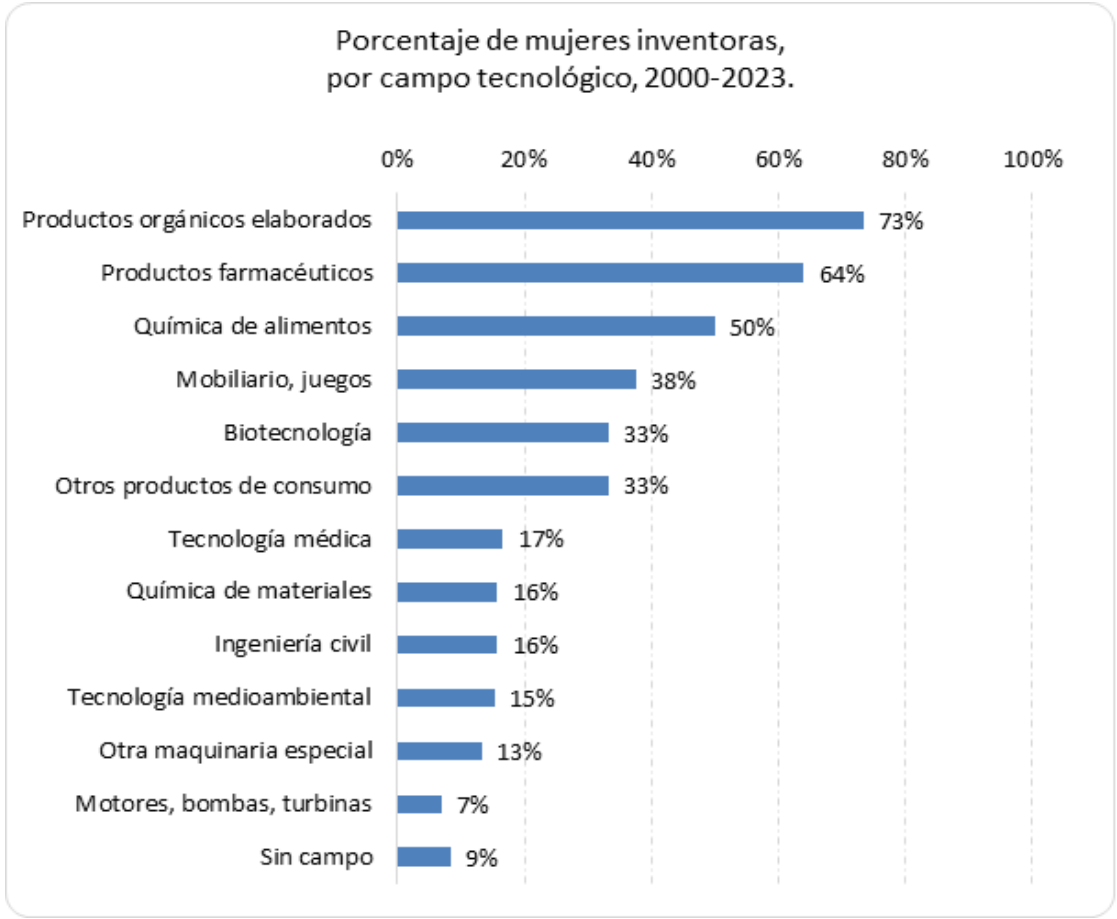
101	5	1	6	3	2020
023	2	0	2	9	2020
312	7	1	8	1	2020
509	0	3	3	7	2008

- ATL overall = 3 / 5 = 60%
- ATL class 3 = 1 / 2 = 50 %
- ATL 2020 = 2 / 3 = 67%

Policy analysis

Once quantified, tackle the issue

- Gender indicators allow us to **establish a baseline** to monitor change



- The next step is to understand what works and what does not, to reach equal representation
- **How and why indicators change across time, regions, demographic groups, etc.**

Exit the “descriptive trap”

- Understand what are the mechanisms behind the statistics we observe at baseline

- **Compare more and less successful stories**
  - Why some IP rights, or technology classes, have different participation rate?
  - Which factors contribute to women’s participation?
  - What entry barriers affect men and women differently (e.g. Access to education, credit, networks; Knowledge)
  - Which factors affect women differently (e.g. motherhood and care responsibilities)

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- **Compare existing policy interventions**
  - Identify the policy impact (remove confounding factors)
  - Did they obtain the expected outcome? Why yes? Why not?

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- **Compare existing policy interventions**
  - Identify the policy impact (remove confounding factors)
  - Did they obtain the expected outcome? Why yes? Why not?

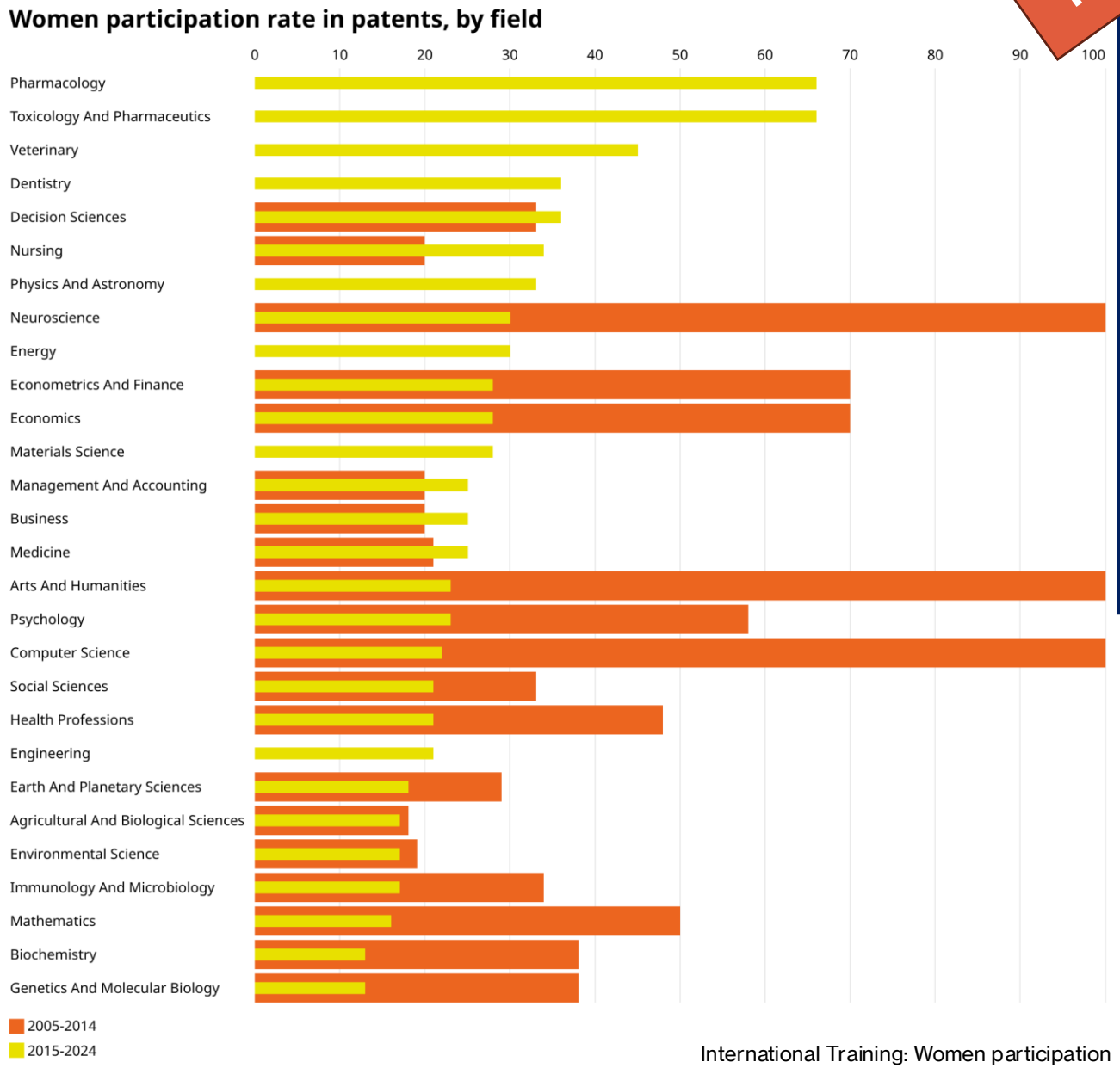
- **Use insights from existing evaluations to design new policy interventions that are**
  - (Cost) Effective
  - Targeted

Policy analysis of gender indicators

- In which field do women invent the most as of today?
- In which period did women invent the most in Earth Science?
- In which sectors women's participation decreased the most?

- Can you think of (any) factors that explain these statistics?

Poll



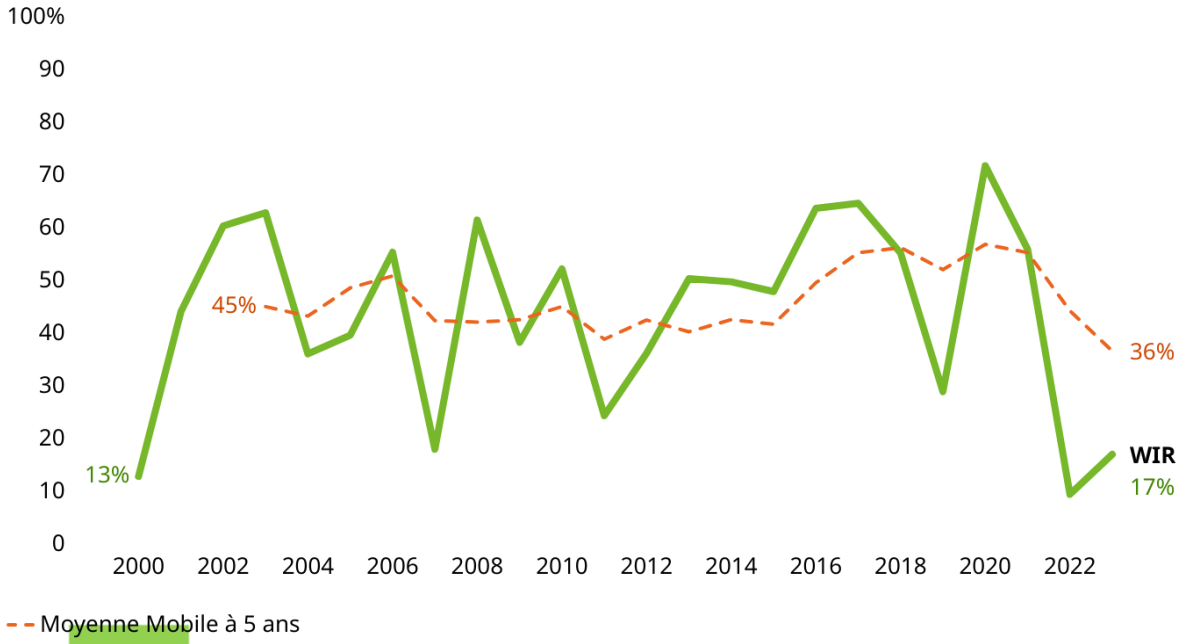
What can we say about these charts?

Poll

Industrial Designs

Figure 14. La participation des femmes aux dessins et modèles industriels ivoiriens montre une volatilité forte mais stable sur le long terme

Taux de participation des femmes (WIR%) dans les demandes de dessins et modèles industriels, 2000-2023

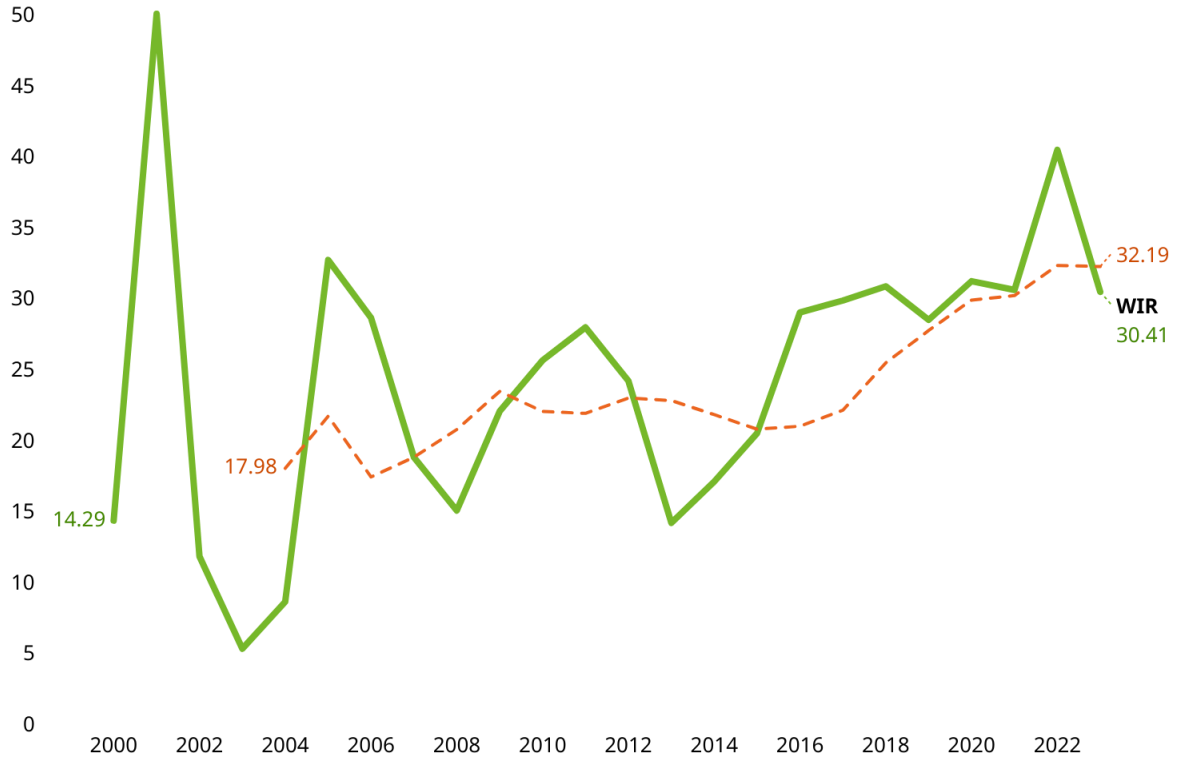


Source: OAPI et collection de l'OMPI

Trademarks

Figure 11. Une croissance stable de la participation des femmes aux activités entrepreneuriales

Taux de participation des femmes (WIR%) dans les demandes de marques déposées, 2000-2023



Source: OAPI et collection de l'OMPI

Women participation in innovation and IP

Sex-disaggregated data

International Training on IP and Innovation

April 2026

Sex-disaggregated data allows to:

- **Quantify the issue**
  - Who is under-represented
  - What is the extent of women's under-representation
  - What are the economic losses from under-representation (human capital, inventions, revenues, etc.)

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  - Which entry-barriers affect women and men differently
  - Which mechanisms drive disparities and lead to women's higher exit rates
  - Identify factors that favor women participation in innovation ecosystems

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  - Identify factors that favor women participation in innovation ecosystems

- **Policy evaluations**
  - Compare outcomes: what works and what does not and why
  - What is the impact of policy interventions targeting gender-equality
  - Can a program be scalded up? What are the benefits? What are the costs?
  - Which groups benefit the most from a policy intervention
  - How do patterns evolve over time for men and women?

Steps from no data to policy

Identify the issue

Women participation

Identify the necessary data

Nr of patents by women

Data collection

Produce statistical indicators

Patents by women / Total patents

Analysis

Compare indicators across time, places, groups

Dissemination and policy recommendations

From no data to sex-disaggregated data

Obtaining sex-disaggregated data

Directly from the source

- **Self-reported** through surveys
- Adding a **gender field** in IP application forms

→ Advantage: accuracy and diversity

→ Limitation: cost, volume, no past analysis

Obtaining sex-disaggregated data

Attribute the gender retrospectively

- **Merge the data with national individuals' records**

→ Advantage: past analysis, volume

→ Limitation: access, requires identifiers, might not work for foreign individuals

IP data

Social Security Nr	Name
11111190-1	Jack Smith
99999998-1	Y. Takana
11111192-2	Mary Shelly
11111192-2	M. Shelly
99999998-2	Marie Curie

National statistics data

Social Security Nr	Name	Gender
11111190-2	Mary Shelly	F
11111198-1	Jack Smith	M

Note: sometimes social security number have a special digit to distinguish men and women

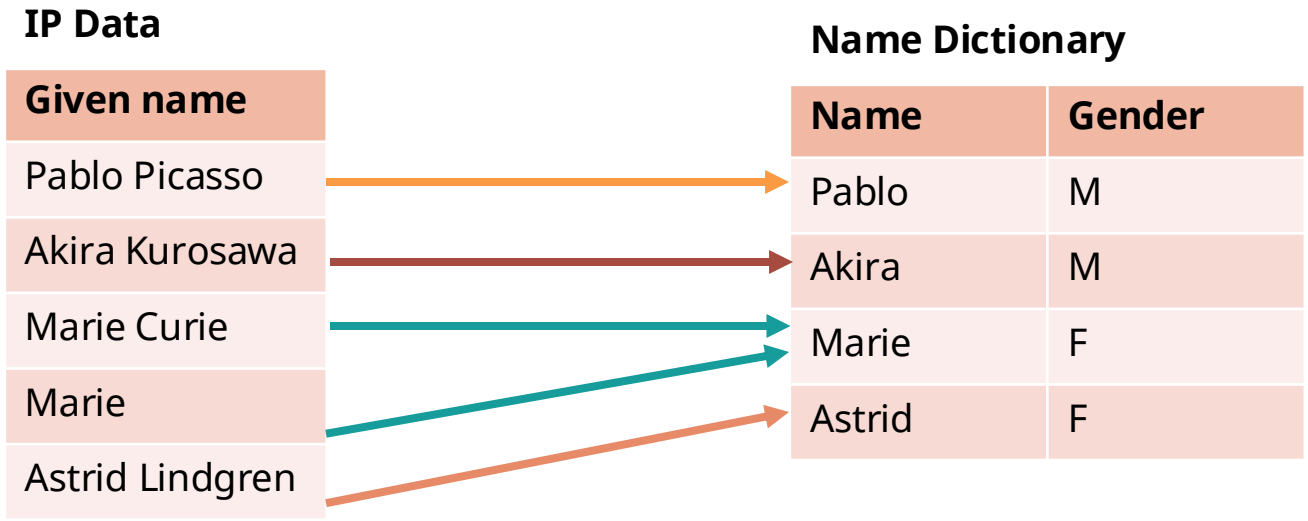
Obtaining sex-disaggregated data

Attribute the gender retrospectively

- **Use algorithms to match names with their individuals' gender**

→ Advantage: past analysis, covers many countries

→ Limitation: name spelling, quality and coverage of the dictionaries



Artificial Intelligence

Attribute the gender retrospectively

- **Use AI prompts to identify individuals' gender**

→ Advantage: past analysis, covers many countries, requires less data cleaning beforehand

→ Limitation: costs, speed, data confidentiality

→ Example of a prompt:

Predict the gender of a person based on their name. Consider cultural naming conventions based on the country context if provided

INPUT: an excel file containing two variables: name (the given + family name of applicants) and country_code (the country of origin of the applicant).

GUIDELINES:

- *Use the given name (name) as the primary indicator*
- *Consider cultural naming patterns from the country context (country_code)*

OUTPUT: a new variable called gender, containing the following options

- *MALE: Clearly masculine names*
- *FEMALE: Clearly feminine names*
- *UNKNOWN: Gender-neutral names, ambiguous names, or names you're uncertain about*

WIPO World Name Gender Dictionary (WNGD)

WIPO WNGD

*An **open-source tool** **to** attribute the gender to innovators and creators based on their names.*

Main features:

1. Provides combinations of name-country-most frequent gender attributed to that name
2. It propagates name-gender pairs for all countries with the same official languages
3. Global coverage: 26 million names linked to 195 different countries and territories
4. Can be applied to the data retrospectively
5. It requires only two input variables: the **given name** and the **country of origin (ISO-2 country code)**
6. It can be used in STATA (with license) or Python (free access)

WIPO World Name Gender Dictionary

- **Procedure**:

1. Extract the given names from IP data

→ Make sure the names are uniform (lowercase, no punctuation, no leading or following space, no family names)

→ If there is more than one inventor or creator per item, split the observation in two (one for each given name)

→ Make sure you are using the 2-ISO country code

2. Apply the dictionary

Ip data

ID	Original name	name	country	country code
0123	Picasso; Pablo	Pablo	Spain	ES
0123	Akira; Kurosawa	Akira	Japan	JP
0192	N'Dour Youssou	Youssou	Senegal	SN
6543	Gong Li	Gong	China	CN
9876	Astrid L.	Astrid	Sweden	SW
2468	Marie S. Curie, ulica Freta 16, 00-227 Warsaw, Poland	Marie	Poland	PL

WGND

Gender
M
M
M
F
F
F

Apply the WGND

In STATA

```
// set directory
global dir "ENTER YOUR PATH HERE"

// Install genderit
net from "https://raw.githubusercontent.com/IES-platform/r4r_gender/master/genderit/STATA/"
net install genderit

// Install WGND dictionaries
genderit_install_wgnd // WGND 2.0 (default)

// Load the data
import delimited "$dir\practice_wngd.csv", varnames(1) encoding(UTF-8) clear

// Assign the gender
genderit name country_code, b attribthreshold(.85)
```

Outputs summary:

```
. tab gender
```

Most likely gender (>=.85)	Freq.	Percent	Cum.
F	34	42.50	42.50
M	37	46.25	88.75
U	9	11.25	100.00
Total	80	100.00	

```
sum probF probM probU
```

Variable	Obs	Mean	Std. Dev.	Min	Max
probF	80	.4342015	.495606	0	1
probM	80	.4657985	.4988236	0	1
probU	80	0	0	0	0

Apply the WGND

In Python

```python
# 1) Obtain the genderit functions
import git
git.Git().clone('https://github.com/ClemSternWIPO/gender_it.git')
import sys
sys.path.append('YOUR DIRECTORY/gender_it')

# 2) Import the function
import gender_it_functions as gf

# 3) Import the required libraries
import pandas as pd
import requests
from io import StringIO
import string
from unidecode import unidecode
pd.options.mode.chained_assignment = None
import numpy as np
import re as re
import unicodedata as ud

# 4) Set up the data

# Define file paths
my_path = "YOUR DIRECTORY/CDIP training"

# Load the data
my_file = my_path + "/practice_wngd.csv"
df = pd.read_csv(my_file)
df.sample(10)

# 5) Apply gender function
df_gendered = gf.get_gender(df, name_column='name', country_column='country_code', threshold=0.85)
```

- Outputs summary:

```
Results distribution is as follows:
            count  Percentage
gender
F              41       51.25
M              38       47.50
not found       1        1.25
```

Additional resources

- **WIPO best practices to obtain sex-disaggregated IP data**: *https://www.wipo.int/publications/en/details.jsp?id=4588*
- **Identifying the gender of PCT inventors:** *https://www.wipo.int/publications/en/details.jsp?id=4125*
- **World Name Gender Dictionary Toolkit:** *https://www.wipo.int/web/economics/w/blogs/gender-dictionary*
- **WIPO gender GitHub repository:** *https://github.com/IES-platform/r4r_gender/tree/main*
- **IP and gender indicators review:** *https://www.wipo.int/publications/en/details.jsp?id=4653*
- **Barriers and solution for women's participation:** *https://www.wipo.int/publications/en/details.jsp?id=4743&plang=EN*
- **IP and gender indicators, additional measures:** *https://www.wipo.int/web/economics/w/blogs/how-to-create-innovation-gender-indicators-the-chilean-way*
- **What do we know about gender gaps in innovation?** *https://www.wipo.int/web/economics/w/blogs/gender-by-fields*

Thank you

WIPO Innovation Gender Gap