Asia-Pacific Economic Cooperation

Women and Patents:

Towards Gender Parity in APEC

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Women and Patents: Towards Gender Parity in APEC

APEC Intellectual Property Rights Expert Group

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1

Introduction

1. Introduction

Even though the representation of women in patent applications across economies in the Asia Pacific Economic Cooperation (APEC) and the globe has experienced a slight increase over time, women inventors' continuous underrepresentation is of particular concern. This underrepresentation indicates that a vast range of talent is not put at the disposal of humanity to address pressing social and environmental needs and challenges, as well as to increase the overall competitiveness of economies.

In a bid to study the gender disparities in the patent system, APEC commissioned the "IPEG 02 2021 - Women in Patents in the APEC Region: Current Situation, Performance and Challenges" project. This is particularly significant, as no similar study has been performed before in APEC as a regional group concerning patents or intellectual property (IP).

Consequently, this Final Report represents the last stage of IPEG 02 2021. It intends to present an accurate picture and a starting point to understand how women currently interact with the patent system in the APEC region. The report aims to provide APEC member economies with relevant information about the situation and relationship between women and patents within the region, highlighting the need for greater visibility and the importance of narrowing the intellectual property gender gap. This information should be distilled to allow a better understanding of women inventors' participation in the patent landscape across APEC and translated into improved decision-making processes and policies in the hopes of promoting and supporting women in utilizing patents as an intellectual property tool to foster gender equality, sustainable economic growth, and social development.

Specifically, the report's outcomes aim to:

- Deliver aggregated information generated on women and patents in APEC to offer policymakers a deeper understanding of the current status of this topic;
- Raise awareness about the need to implement practices and monitor the performance of women in the use of the patent system on a regular basis, thus allowing for the development and implementation of specifically targeted policies to reduce and close the IP gender gap; and

- Conduct research on current measures applied by APEC economies that can be replicated to build female patent data, as well as to execute programs aimed at supporting gender parity among APEC.

The abovementioned outcomes strive to elucidate non-binding recommendations to APEC policymakers on the different approaches and measures that can be applied to spur innovative activity and change, simultaneously promoting patents within women researchers, inventors, innovators, and entrepreneurs in the region.

In order to fulfill the objective of the project and capture the gender dimension of the patent system in APEC member economies, the Project Execution Team (the Team), composed of Tambourine Innovation Ventures Inc. (TIV) experts and representatives from the National Institute for the Defense of Competition and the Protection of Intellectual Property of Perú (INDECOPI), adopted an approach based on the following three principles:

- Co-creation, flexibility, thought partnership, and multi-stakeholder involvement: The Team worked collaboratively at all stages (methodology, research design, data collection, and report finalization) to ensure that the suggested framework is applicable to and useful for various stakeholders. This allowed a joint understanding of the evolving needs, discussions on recommendations, and agreement on the next steps.

- The credibility of data and insights: The Team strives for the highest research standards and integrity of the data collected and analyzed.

- Timely and high-quality output delivery.

The study utilized a wide variety of sources to collect data and qualitative and quantitative information on the relationship between women inventors and the patent systems of APEC member economies, which made it possible to assess the current situation and challenges women face in utilizing patents and utility models (also known as petty patents). The main information sources for the study included:

Primary sources:

- Data and information from online surveys distributed to APEC member economies' Intellectual property offices;

- Data and information collected through online interviews with select APEC IP officials and/or representatives; and

- Information gathered from online interviews with select women inventors and patent holders/applicants from APEC member economies.

Secondary sources:

- Publications, statistics, and reports from intellectual property offices, both within APEC and outside of APEC;

- Reports from inter-governmental organizations, such as the World Bank, the Organization for Economic Cooperation and Development (OECD), the United Nations (UN), and the International Monetary Fund (IMF);

- Publications, statistics, and reports from the World Intellectual Property Organization (WIPO).

It is important to note that under the project's mandate, APEC envisages three different groups of beneficiaries for the information contained in the report, i.e., direct, indirect, and additional beneficiaries.

Direct beneficiaries include APEC IP and innovation policymakers and officials who will be able to benefit from the information collated and recommendations provided through this docu ment for the purpose of designing better gender-balanced policies. Indirect beneficiaries are APEC female researchers, inventors, and/or innovators, as well as young girls eager to pursue careers in innovation. For them, the project's Final Report shares information about specific APEC women's participation in the patent system, revealing their challenges and journeys for a better understanding of the measures and action plans they could also take or implement toward fostering their use of patents as an IP tool. Additional beneficiaries of the report are constituted by representatives from APEC working groups related to women, science and innovation, bodies or institutions that promote gender equality and the empowerment of women in APEC economies, and international organizations with a special interest in gender, innovation, and IP issues.

EXECUTIVE SUMMARY

The Final Report has been designed to provide an in-depth overview of women inventors' current landscape, performance, and participation in the patent systems across the APEC region. This is achieved by collecting data on women's participation in patent filing and obtainment, as well as an agglomeration of the measures and programs currently employed by the participating economies. While some economies do measure the performance and participation of inventive activities conducted by local women, this Final Report is the first attempt at analyzing the gender parity in patenting in an aggregated and regional scope.

The Final Report aims to make a compelling case for the inclusion of women in the patent and utility model systems of the economies in APEC, thus ensuring the sustainable and equitable development of the region. In order to foster dialogue across the economies that are trying to accelerate their transition to knowledge-based economic models, the Final Report provides critical recommendations on how APEC economies could include more women inventors in their respective patent systems. Furthermore, the Final Report aims to act as a catalyst for future young women and girls to pursue careers in science, technology, engineering and mathematics (STEM) and interact with the patent system by sharing the stories of successful women inventors who have been successful in obtaining patent protection for their inventions.

The Final Report's chapter titled *"Women and patents: A global overview"* provides the reader with an outline of the issues women inventors have faced and continue to combat in the 21st century. The chapter is divided into five sections:

- A section titled *Historical overview* provides the reader with the historical development of the IP system and stories of brave women who began the long and hard battles of breaking the glass ceiling in a traditionally male-dominated world.

- A section on *The economic rationale for gender equality* introduces the reader to statistical data on the benefits of the inclusion of women in the economy, as well as bridging the gap in the Decade of

Action. This section makes a compelling case that in order to achieve the UN's sustainable development goals (SDGs), achieving SDG 5, which targets women and girls' economic empowerment, is crucial.

- *The intellectual property gender gap* section provides the reader with the global trends in patenting as they relate to women inventors. Additionally, a subsection gives an overview of women's representation in inventor teams worldwide.

- A section on the *Barriers contributing to the gender gap* provides an in-depth analysis of 14 barriers women inventors face when interacting with any given IP system. This section identifies the root causes for women's underrepresentation in patenting and their inability to contribute to the knowledge economy, as they face many challenges which hinder their economic empowerment through innovation.

- Lastly, a section titled *Pockets of women's inventorship* provides an insight into the relative specialization of men and women through the sections of the International Patent Classification on a global scale. Furthermore, the section highlights the proportion of women inventors in academia, research and development, and industry.

The chapter titled *"APEC landscape, overview, and perspective"* presents an overview of the current demographics of women's participation in inventorship activities across the respondent APEC economies. This chapter was developed on the basis of the statistical data collected through a survey sent to all of the APEC economies. The chapter encapsulates the current situation of metrics collection across the 15 respondent economies that informed the design of indicators that measure the performance of women inventors in patents and utility models. Furthermore, the chapter contains a section titled "APEC measures and initiatives to foster women in patents," which serves as a comprehensive encyclopedia of the measures, programs, and initiatives that aim to support and promote women's inventorship efforts and obtain IP protection. This chapter highlights the challenges intellectual property offices face in implementing measures and programs to increase the participation of female inventors in patents and utility models. Additionally, the chapter provides the expectations intellectual property offices have in increasing the participation of female inventors and future initiatives to reach those expectations. Finally, the chapter analyzes all of the data and information collected from the survey and provides an in-depth birds-eye view of the current situation and performance of the APEC bloc regarding the participation of women inventors in the economies' domestic IP systems and local women's participation in patents.

The fourth chapter provides an in-depth overview of the information obtained through interviews conducted with intellectual property office representatives from five APEC economies. The five economies subject to our in-depth case studies are Mexico; New Zealand; Peru; the Philippines; and the United States. They were chosen to serve as samples of the different regional contexts across APEC. More specifically, the chapter aims to provide readers with a better understanding of the patent landscape regarding women's representation in economies bordering the Pacific Ocean, i.e., economies in Asia, North America, Oceania, and South America.

The chapter titled *"Women's pursuit of patents"* showcases the stories of five exceptional female inventors from four APEC economies, i.e., Chile; Mexico; Peru; and the Philippines. The information about these women's lives and inventions was obtained through in-person interviews via Microsoft Teams which were later transformed into compelling stories about their life work. The journeys they took to secure patent protection for their ground-breaking inventions are intended to serve as inspiration for other young women and girls in APEC to pursue patent protection for their own original, cutting-edge, and revolutionary ideas.

The Report's final chapter provides recommendations for APEC economies to encourage and facilitate the involvement of women inventors in the IP system. APEC member economies are advised to consider the policy recommendations provided in this chapter to bridge the gender gap in IP, which have been born out of the survey results analysis, secondary data and studies reviewed, and meetings conducted with APEC IP officials.

II

Women and intellectual property: A global overview

II. Women and intellectual property: A global overview

> ***During the preceding two centuries, patents have been used as a means of measuring creativity.***

Nowadays, obtaining patents is often seen as proof of inventiveness, and it is a fact that women apply for and hold far fewer patents than men. Many momentous discoveries of practical value made by women have been creative, though not always recognized as inventions. Innovative activity is challenging to measure, but patenting activity is one way of gauging inventiveness. During the preceding two centuries, patents have therefore been used as a means of measuring creativity. However, for female inventors, creative activity which has been of an inventive nature has not been reflected in the patent records to the same degree as for men.

> ***Although history recognizes significant, world-altering inventions in which women played a significant role, multiple studies have shown that women do not use the IP system as much as men.***

Diversity and equitable representation have emerged as significant issues in the intellectual property (IP) world, emphasizing the need for more gender-balanced participation. Various organizations have discussed and analyzed how IP protection affects women's empowerment. Although history recognizes significant, world-altering inventions in which women played a significant role, multiple studies have shown that women do not use the IP system as much as men. This is further supported by modern-day trends in patenting, as a growing number of patents that have a woman listed as an inventor; however, more men are involved in IP, especially in senior positions. These unequal numbers of patents produced by men and women suggest that women lack opportunities to monetize, promote, or develop their inventions.

1. HISTORICAL OVERVIEW

> ***Innovation is a powerful demonstration of humankind's ability to solve problems while, at the same time, allowing our society to flourish.***

Addressing new and changing problems through innovation has been crucial in advancing economies and societies throughout history. At its core, innovation is a powerful demonstration of humankind's ability to solve problems while, at the same time, allowing our society to flourish. The generation of new knowledge and tools through innovative activity fosters economic growth and development, propelling society forward, and ultimately improving the quality of life.

Innovation can ensure and drive purposeful and sustainable economic development. However, a structured legal framework that protects the inventor's activity is necessary and required for an innovative activity to be economically feasible for an inventor's idea. Therefore, institutional regulations – intellectual property rights (IPRs) – are critical to enabling and fostering innovation by creating incentives to invest in research and development (R&D).

The concept of granting protection for intangible assets is not novel. Intellectual property has been around since the development of civilization, and the earliest records relating to it date back to the 6th century BCE (Before the Common Era) in the ancient Greek city of Sybaris.[1] This first recorded IP protection grant was attributed to the Sybaris chefs, who were granted year-long monopolies for their unique recipes and culinary creations. Historical records pin the origins of IPRs to the year 1421, when the world's first modern patent was granted to the Italian architect and inventor Filippo Brunelleschi for the ship he designed to transport Carrara marble for his famous Duomo of Florence.[2] However, almost all historical records of IP protection grant favor to men regardless of IP type.

Women's long and hard-fought battles throughout history have begun to crack the IP glass ceiling. Throughout modern history, and undoubtedly, from the outset of legal grants in IP, creative occupations – such as artist, engineer, writer, scientist, and musician – from which IP might arise were largely closed to women. In a world dominated by men, social conventions at that time frowned on female activity in such professions. As legislation is a reflection of society's values at any given time, IP law followed such misogynistic social prohibitions. For example, copyright historically encompassed the "fine arts" such as sculpture, painting, literature, and music – fields that were male-dominated if not exclusively masculine, with "crafts" such as needlework, knitting, quilting, and other "domestic" fiber arts until relatively recently excluded from the tenets of copyrightable subject matter.[3]

Historically, women across the globe were not allowed to own property. Even before the Married Women's Property Act was passed in the United States and England in the 19th century, women were prohibited from owning property, including IP, equally to men. Pursuing and obtaining any form of IP, and especially patents was a costly affair. Women lacked economic resources and legal rights to make or market an invention in their own name. This led to many creative works generated by talented women throughout history being circulated anonymously or pseudonymously. An example of this is Sybilla Masters, who developed a way to process Indian corn in 1715. While her achievements were recorded in the patent document, the patent grant was issued to her husband.[4] This was mainly due to the fact that prevailing laws from that time period excluded women from owning property.

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[1] Abou Naja (2020) History and Evolution of Intellectual Property, at https://abounaja.com/blogs/history-of-intellectual-property

[2] Nard, C. A., Morris, A. P., (2006) Constitutionalizing Patents: From Venice to Philadelphia, at https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=1589&context=faculty_publications

[3] Burk, D. L. (2018) Bridging the Gender Gap in Intellectual Property, at https://www.wipo.int/wipo_magazine/en/2018/02/article_0001.html

[4] Ibid.

> ***Women were forced to patent their inventions in the name of their male relatives or husbands.***

Public perception of women had long been rooted in the idea that successful women inventors are rare exceptions, with women being viewed as incapable of inventing. Furthermore, filing for and acquiring patent protection was considered improper for women inventors, and as such, women were forced to patent their inventions in the name of their male relatives or husbands. Furthermore, social and legal recognition of inventions or creative works developed by women outside official professional settings was considered taboo. The social pressures against independent thought or action and against personal publicity forced women to renounce their ideas, losing all credit in the process.

Mary Anderson's windshield wiper patent

The patent office awarded US Patent No. 743,801 to a woman from Birmingham, Alabama, named Mary Anderson for her "window cleaning device for electric cars and other vehicles to remove snow, ice or sleet from the window" in 1903. When she received her patent, Anderson tried to sell it to a Canadian manufacturing firm, but the company refused. The company thought the device had no practical value and was not worth any money. Though mechanical windshield wipers were standard equipment in passenger cars by around 1913, Anderson never profited from the invention as the wider public scoffed at her invention, saying that the wipers' movement would distract the driver and cause accidents. Her patent expired before she could entice anyone to use her idea.

Source:
History (n.d.) Mary Anderson Patents Windshield Wiper, at
https://www.history.com/this-day-in-history/mary-anderson-patents-windshield-wiper

As we discuss further in this report, another reason why there are so few female patentees is rooted in the historical under-representation of women in engineering sciences, both in academia and engineering. There are multiple reasons for this, one being cultural stereotyping, which is based on religious and political ideas and has been institutionalized through educational and social systems throughout the world.[5] Women in the 19th century had no political or social power. Women could neither own goods nor enter into contracts, resulting in little incentives for them to pursue patents.

[5] Lindberg, K., Romare, A. (2018) Examining the Gender Patenting Gap, at https://www.managingip.com/article/2a5c2tjfx8a5wcutrrhfk/sponsored-article-examining-the-gender-patenting-gap

Under the practice of coverture, the legal existence of women was melded with those of the men in their lives, with their property being assigned to their fathers and husbands. The lives of unmarried women who shared living quarters with their male relatives lived with their legal destiny held firmly in the hands of their brothers or uncles.

Hannah Wilkinson Slater:
New method of producing sewing thread from cotton

Hannah Wilkinson Slater was an early American pioneer and inventor famous for her invention – a method of producing sewing thread from cotton. She grew up in a Protestant family in Pawtucket, Rhode Island, and was one of eight children of Lydia and Oziel Wilkinson. Her father, Oziel, was a successful businessman and was a business partner of Moses Brown, who introduced him to another business colleague – Samuel Slater, an industrialist who emigrated to the US from Derbyshire, England. Slater's principal responsibility was to design and construct duplicate models of the equipment used in British milling establishments. He built the first functional American versions of English carders, water-frame spinners, and looms with the help of a local woodworker, an iron manufacturer, and a general helper. The new mill began operations in December 1790 and quickly established itself as the economy's first productive water-powered cotton mill.

Hannah Wilkinson married Samuel Slater in 1791, not long after the mill began operating. She became interested in the work of her husband's mills. In 1793, Samuel showed Hannah some exceptionally smooth yarn spun from long staple Surinam cotton that he intended to use to produce cloth. Hannah and her sister Lydia decided to use a hand-spinning wheel to spin the cotton into a thread, which proved to be stronger than the linen threads used at the time. Her new method for creating smoother, stronger threads was a game-changer in the textile industry. That same year, Hannah applied for a patent to the US Patent Office for her invention, which she described as a new method of producing sewing thread from cotton. The resulting patent was issued in the name of "Mrs. Samuel Slater," a step forward in issuing patents in a woman's name.

Her husband and father began producing her cotton thread in 1798 under the name Samuel Slater and Company. Later, they extended their reach beyond Rhode Island to include Connecticut, Massachusetts, and New Hampshire. Sadly, Hannah died aged only 37 due to childbirth complications with her tenth child.

Source:
https://new.millsarchive.org/2020/11/09/helen-wilkinson-slater-1774-1812/

However, the few women who participated in engineering work in the 19th century came from the upper class and were often privately trained in mathematics or science. In the early years of the 20th century, although greater numbers of women were admitted to engineering programs, they were generally looked upon as anomalies by the men in their departments. [6] This, however, has not stopped women from pursuing patents for their creative ideas and inventions.

[6] Ibid.

Mary Dixon Kies: Process for weaving straw with silk or thread

Mary Dixon Kies was a Connecticut woman who had an idea worth patenting. It struck her at a time when there was a crisis in American fashion. In 1807, the Napoleonic Wars between France and Great Britain left the US in a difficult political situation. With the Embargo of 1807, President Thomas Jefferson chose to ban the import of British products after Britain, in particular, put the United States to the test about its ability to remain neutral by harassing American ships and imposing trade restrictions on seaborne business. The official trade embargo, however, had a terrible effect on the American economy, hurting exports, which fell from an estimated USD108 million in 1807 to a pitiful USD22 million the following year.

The American apparel sector was compelled to shift inward after just 15 months of the ban. New England was forced to manufacture goods since it could no longer ship them. By incorporating silk or thread throughout the straw, Kies' invention created an attractive aesthetic that quickly caught on as a trend. On 15 May 1809, she received the first patent ever given to a woman in the US. By utilizing a relatively recent law, the 1790 Patent Act, which allowed "any person or persons" to file for protection of their original methods and designs, Mary Kies could obtain patent protection.

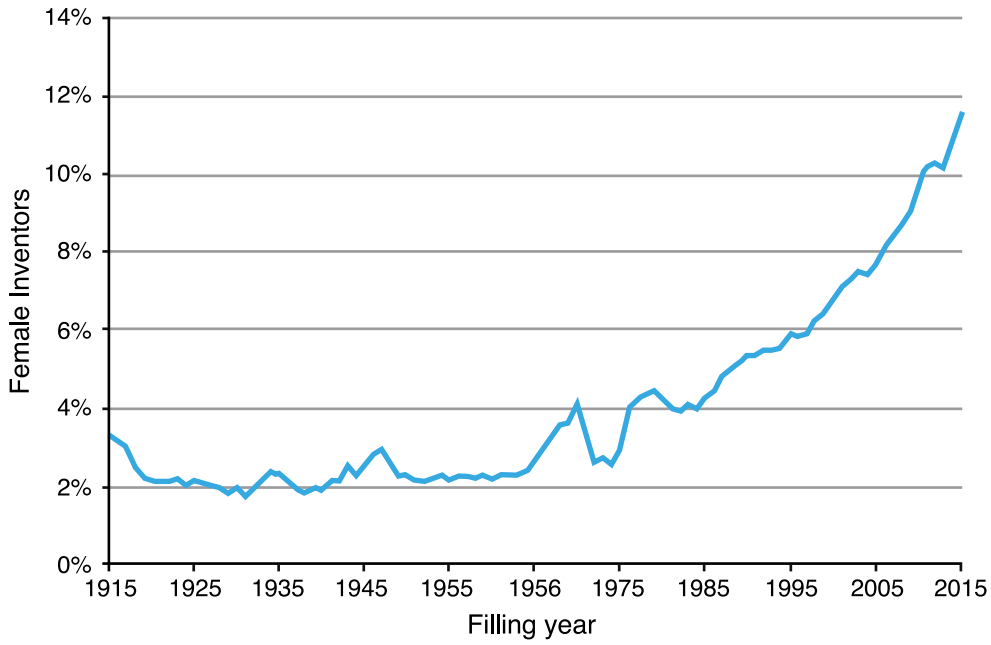
President James Madison signed Kies' patent when he was elected that year. First Lady Dolley Madison is said to have been so moved by Kies' invention that she wrote to her and congratulated her for advancing women in the industry. Kies' method was a big success and fueled the expanding straw hat industry. Sadly, despite being one of the only 20 issued patents to a woman before 1840, Kies' patent was destroyed in the Patent Office fire of 1836.

Source: https://www.smithsonianmag.com/smart-news/meet-mary-kies-americas-first-woman-become-patent-holder-180959008/

Fortunately, society has evolved, and so have its views on women's rights. Women now face fewer explicit deterrents (such as legislation that outright bans them from owning property) as inventors and creators, despite there being evidence of a latent gender bias (Figure 1). A bird's eye view of historical data of patent filings shows a clear and substantial gap between the number of female and male patent applicants, with women being conspicuously absent in every aspect of the patent system.

Figure 1

Published patent applications of women inventors



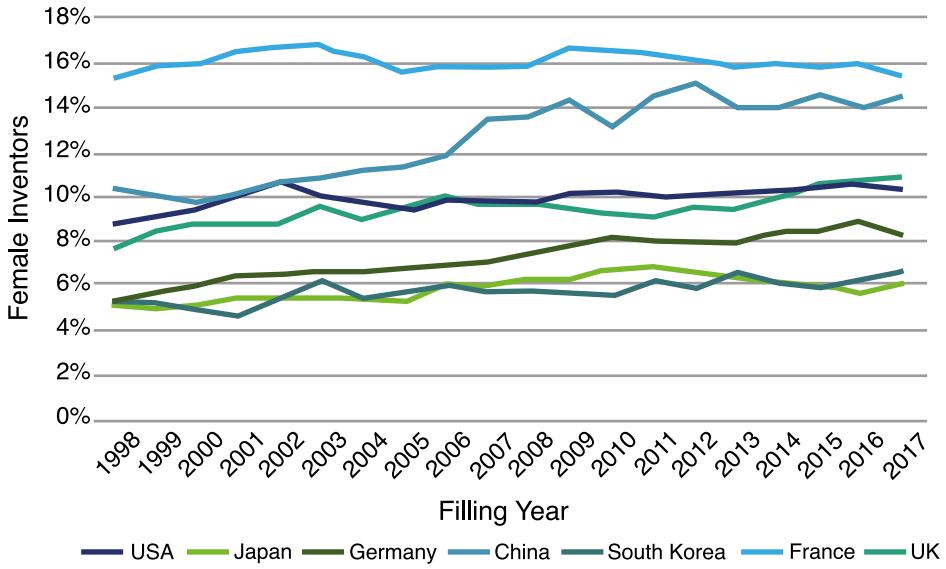
Source: UK IPO (2016) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

The IP gap varies somewhat by jurisdiction. According to a WIPO publication in 2018, patent applications include a female inventor only about 4% of the time in German-speaking nations, 10% in the United States (US), and around 20% in several Spanish-speaking economies.[7] The United Kingdom Intellectual Property Office (UK IPO) further supports this claim in its study, which shows that the annual percentage of women inventors on published patent applications from 1998 to 2017 shows noticeable differences in the percentage of women inventors between six economies (Figure 2). This shows that the number of women's patent filings is nowhere near population parity. Unsurprisingly, the number of female patent law practitioners, i.e., attorneys and agents, is dramatically lower than that of male practitioners.

[7] Burk, D. L. (2018) Bridging the Gender Gap in Intellectual Property, at https://www.wipo.int/wipo_magazine/en/2018/02/article_0001.html

Figure 2

Female inventors by select inventor economy (1998-2017)



Source: UK IPO (2016) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

Despite the considerable progress made in increasing women's participation in patenting, it has not been uniform. Even though increasing the number of female inventors is undoubtedly good news, research has shown that women and men are still not innovators on equal terms. Recent studies have discovered that significant barriers – lack of access to capital, a segregated labor market, and insufficient support systems – persist for women inventors. Therefore, closing the historically pervasive gender patenting gap will require concerted efforts to better understand why women inventors are absent in the patent system.

2. THE ECONOMIC RATIONALE FOR GENDER EQUALITY

> ***A vital ingredient to designing a strategy for a robust, durable, resilient, and more inclusive growth economy is gender equality.***

Addressing gender inequality is undoubtedly a noble cause based on ethics and fairness. However, the principles of fairness tend not to be the driving force of a market economy, and the true argument that has to be made is that of greater economic performance. A vital ingredient to designing a strategy for a robust, durable, resilient, and more inclusive growth economy is gender equality. The exclusion or partial inclusion of women in the economy significantly hampers productivity and weighs on growth, curbing women's tremendous potential for economic contribution. The lack of gender equity imposes a high economic cost, causing adverse macroeconomic consequences, such as income inequality and lower economic diversification.

Treating gender equality and women's empowerment as a business case has become widely internalized, pursued, and institutionalized by development agencies, local governments, and corporate social responsibility initiatives. [8] The concept of gender equality as smart economics [9] has long been hailed as the dominant rationale behind policies and programs implemented in low-income and developing economies.

> ***Women's participation in the labor force can significantly boost economic growth, reduce inequality, and strengthen financial resilience.***

[8] Alessio Robles, C. B. (n.d.) "Gender Equality as Smart Economics:" Questioning the Assumptions behind the Claim, at https://blogs.lse.ac.uk/gender/2020/07/23/gender-equality-as-smart-economics-questioning-the-assumptions-behind-the-claim/

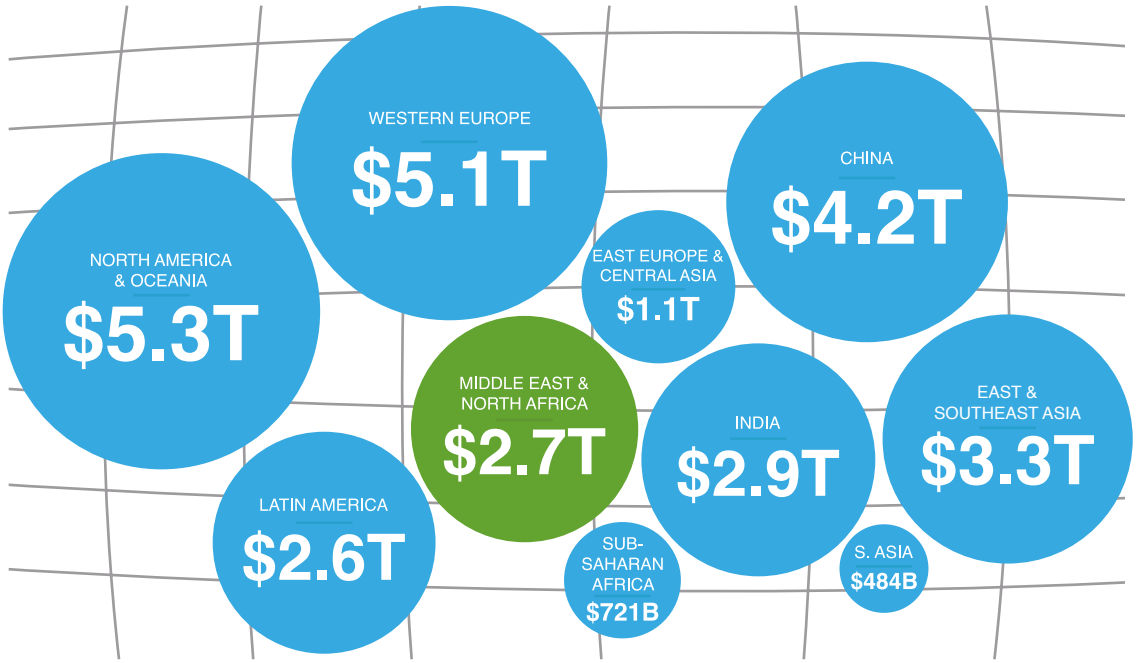
[9] The concept of gender equality as smart economics originated in the 1970s, when the term "Women in Development" (WID) was coined. The concept was based on the argument that economic development processes do not equally benefit men and women, contributing to the deterioration of women's rights and status. In advocating for gender equality, the WID movement based its discourse on the economic efficiency argument – "gender efficiency approach." This approach was founded on the idea that when women have access to education, jobs, credits, and assets, they can substantially contribute to society's economic growth and catalyze its development process.

Empowering women and girls, and achieving gender equality, are crucial for economies to achieve higher economic development. Women's participation in the labor force can significantly boost economic growth, reduce inequality, and strengthen financial resilience. Obtaining the full benefits of the equitable inclusion and participation of women in the workforce depend on women's ability to secure the fruits of their labor.

Women account for a little more than half of the world's population, resulting in the creation of government policies aimed at curbing the gender disparities in the workforce over the past 50 years. Despite these efforts, women still represent only 40% of the global labor force.[10] By closing the gender gap between women and men in the workforce, the global gross domestic product (GDP) could increase by 26%, or USD28 trillion (Figure 3), benefitting advanced and developing economies. [11]

Figure 3

GDP growth by 2025 with gender parity in the workforce



Source: https://www.cfr.org/womens-participation-in-global-economy/

[10] Kochhar, K., Sonali, J.C., Newiak, M. (2017) Women, Work, and Economic Growth Leveling the Playing Field, at https://www.imf.org/en/Publications/Books/Issues/2017/03/17/Women-Work-and-Economic-Growth-Leveling-the-Playing-Field-43640

[11] https://www.cfr.org/womens-participation-in-global-economy/

The macroeconomic benefits stemming from greater gender inclusion are vastly more significant than previously anticipated, especially for rapidly aging economies. Apart from the apparent effects of a higher female labor force on boosting growth and mitigating the impact of a shrinking workforce, the economic consequences of gender parity in the workforce can bring more significant gains by melding complementary skills and ideas that create more value. As a result of such complementarities, raising women's participation in the labor force, including leadership positions, can bring more value than increasing male participation.

> ***Gender equality will generate spillover effects that can create positive economic ripple effects across families, communities, economies, and generations, contributing to overall economic growth.***

Many studies indicate that optimizing human resources in an economy can be attained through higher gender equality in educational attainment and in the labor market, leading to productivity gains that will translate into positive outcomes in gross economic growth.[12] It is assumed that gender equality will generate spillover effects that can create positive economic ripple effects across families, communities, economies, and generations, contributing to overall economic growth.

However, in order for the assumption that gender equality will lead to productivity gains to be plausible, the gender dimensions of human capital and labor must be considered and recognized. Studies based on cross-economy macro-level data for 74 developed and developing economies have shown that for every 1% increase in female education, the GDP per worker would increase by 0.37%. [13] A study from the European Institute for Gender Equality further supports this claim. It posits that improvements in gender equality would lead to an additional 10.5 million jobs in the European Union (EU) by 2050, benefitting both men and women. [14] The lion's share of these new jobs (70%) would be occupied by women, helping to reduce poverty. [15]

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[12] Alessio Robles, C. B. (n.d.) "Gender Equality as Smart Economics:" Questioning the Assumptions behind the Claim, at https://blogs.lse.ac.uk/gender/2020/07/23/gender-equality-as-smart-economics-questioning-the-assumptions-behind-the-claim/

[13] Ibid.

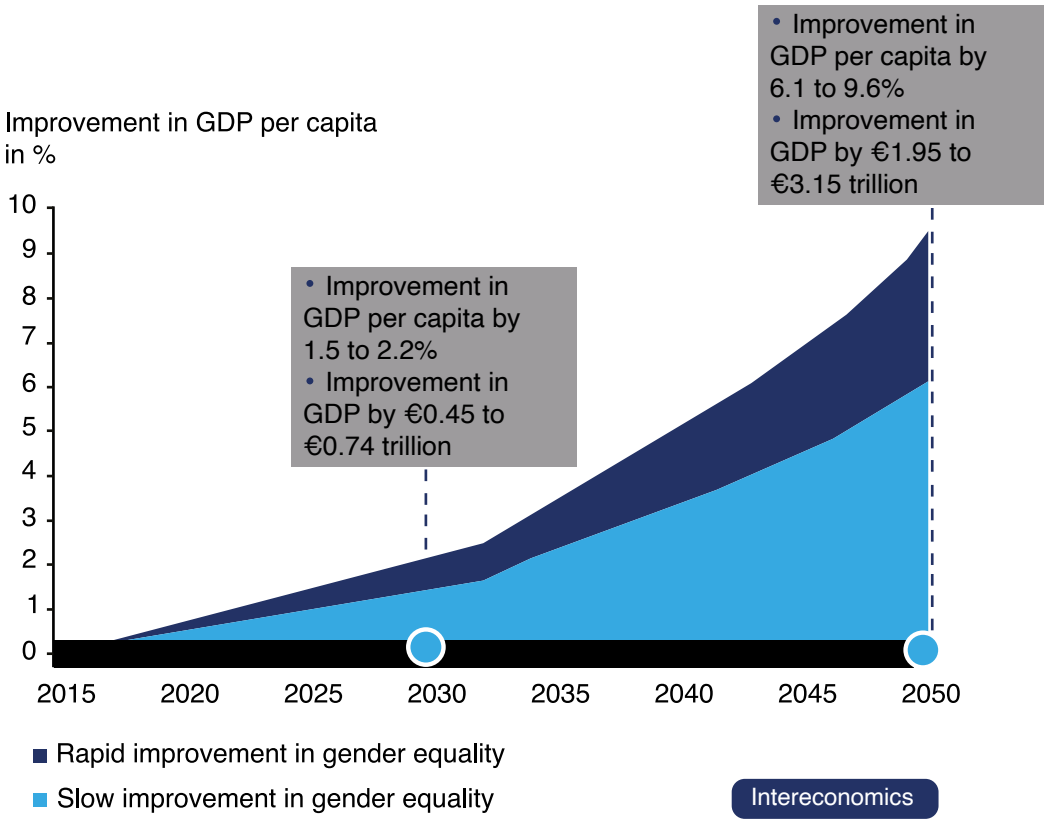
[14] Morais Maceira, H. (2017) Economic Benefits of Gender Equality in the EU, at https://www.intereconomics.eu/pdf-download/year/2017/number/3/article/economic-benefits-of-gender-equality-in-the-eu.html

[15] Ibid.

Furthermore, the study predicts that improving gender equality would lead to an increase in EU GDP per capita by 6.1% to 9.6%, amounting EUR1.95 to EUR3.15 trillion (approx. USD2.19 to USD3.53 trillion). [16] The effects of increased gender equality in the workforce, and particularly in science, technology, engineering, and mathematics (STEM) jobs, would be felt across EU economies much sooner, i.e., by 2030, when GDP per capita would have increased by 2% (Figure 4). [17]

Figure 4

Effects of improved gender equality on GDP per capita in the EU



Source: Morais Maceira, H. (2017) Economic Benefits of Gender Equality in the EU

Therefore, creating more and better opportunities for women to engage in paid work and a greater ability to control their income and assets can also contribute to more robust economic growth in emerging markets and low-income economies.[18] Growth based on women's work can be the single most poverty-reducing factor in developing economies, fostering more significant improvements in women's disadvantaged conditions. Furthermore, studies have shown that women are more likely to invest a large proportion of their household income to educate their children, including girls, when compared to their male counterparts.

[16] Ibid.
[17] Ibid.
[18] Kochhar, K., Sonali, J.C., Newiak, M. (2017) Women, Work, and Economic Growth Leveling the Playing Field, at https://www.imf.org/en/Publications/Books/Issues/2017/03/17/Women-Work-and-Economic-Growth-Leveling-the-Playing-Field-43640

These higher expenditures aimed at schooling the future labor force have the potential to trigger a generational ripple effect that will undoubtedly provide women with equal economic opportunities and unleash the full potential of the female labor force.

2.1 The gender gap in the decade of action

> ***Unlocking the innovative potential of women entrepreneurs as active agents of change is crucial for domestic economic growth and expansion, allowing economies to achieve sustainable development.***

Global efforts to achieve sustainable development have become a staple of this decade, dubbed the Decade of Action. The UN has pioneered its 2030 Agenda for Sustainable Development (2030 Agenda) under the motto "leave no one behind." Through this Agenda, the UN has laid out 17 Sustainable Development Goals (SDGs) that promote a holistic approach to achieving sustainable growth for all. These 17 goals are a tapestry of society's grand challenges and act as a blueprint that aims to address the interlinked crises of gender equality, climate change, biodiversity loss, and pollution, together with the economic and social fragility they cause.

Gender equality and empowering all women and girls (SDG 5) are interlinked with all 17 SDGs. The 2030 Agenda cannot be achieved without gender equality, as it is integral to all dimensions of inclusive and sustainable development. While there is evidence that some progress has been made in advancing gender equality, it has been highly uneven across the different facets of the 2030 Agenda. In some areas, such as girls' access to education (SDG 4), global improvement is undeniable, although insufficient, often leaving women and girls in the poorest households behind. Significant gender gaps persist in two other goals – decent work and economic growth (SDG 8), i.e., labor force participation and industry, innovation, and infrastructure (SDG 9) – where progress has been minimal. [19]

[19] UN Women (2018) Why Gender Equality Matters Across all SDGs, An Excerpt of Turning Promises Into Action: Gender Equality in the 2030 Agenda for Sustainable Development, at https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/Library/Publications/2018/SDG-report-Chapter-3-Why-gender-equality-matters-across-all-SDGs-2018-en.pdf

The unequal participation of women to men in the IP system potentially indicates missed opportunities to address pressing global challenges from women innovators and creators. Additionally, it may affect innovation and economic productivity, implying a burden on the wealth and growth of the economy. Narrowing the gender participation gap is of utmost importance to meet SDG 5. The 2030 Agenda cannot be realized without the participation of women, particularly those working in the private sector. According to a World Bank study of 141 economies, global wealth has the potential to increase by USD160 trillion, or an average of USD23,620 per person, if women had the same lifetime earnings as men. [20]

> ***"Empowering women to pursue innovative activity by investing in female entrepreneurial capacities will reduce gender inequalities."***

Female entrepreneurship has been on the rise globally, with women-owned businesses making tremendous strides in sectors as diverse as health, digital technology, agriculture, transportation, and clean energy. Unlocking the innovative potential of women entrepreneurs as active agents of change is crucial for domestic economic growth and expansion, allowing economies to achieve sustainable development. Empowering women to pursue innovative activity by investing in female entrepreneurial capacities will reduce gender inequalities, thus achieving SDG 5.

The SDGs must be essential to any economy's programs and activities. Incorporating a gender perspective will be crucial to achieving inclusive economic growth in the Decade of Action. Unless progress on gender equality is accelerated, the global community will not only fail to achieve SDG 5, but it will also forgo the catalytic effect that gender equality can have for achieving the 2030 Agenda more broadly.

[20] Mohieldin, M. (2019) Empowering Women Entrepreneurs to Achieve the SDGs, at https://blogs.worldbank.org/voices/empowering-women-entrepreneurs-achieve-sdgs

3. THE INTELLECTUAL PROPERTY GENDER GAP

> ***Access to and the effective use of IPRs will be critical to women's ability to capitalize on the intangible value that makes up an ever-increasing part of business value and investment.***

The protection of intellectual property rights is vital for economic growth. The importance of IPRs has been enshrined since 1948 with the adoption of the Universal Declaration of Human Rights (UDHR). Article 27, paragraph 2 of the UDHR states that "everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author." [21] Therefore, the exegesis of the paragraph can be viewed as the codification of IPRs as a human right.

IP protection significantly contributes to the world's diverse populations' economic, social and cultural progress. IPRs have become increasingly relevant in various policy areas, including trade, health, culture and heritage, investment, environment, food security, and scientific and technological progress. Unsurprisingly, the focus on protecting IP comes when IPRs are both of their highest importance to the global economy and the most at risk. IP-intensive firms account for more than 38% of the GDP and 45.5 million jobs in the United States (US) and 42% of the GDP and 82 million jobs in the European Union (EU). [22] These industries not only support employment but high-paying jobs. In the EU and the US, workers earn 46% more in IP-intensive sectors than in other sectors. [23]

Access to and the effective use of IPRs will be critical to women's ability to capitalize on the intangible value that makes up an ever-increasing part of business value and investment. Protecting IPRs restores this financial incentive to create and innovate by giving owners and content creators exclusive power over their creations. For women, this is of enormous importance. Statistics have shown that economies with more robust IPRs tend to have stronger measures of gender equality.

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[21] WIPO (1998) Intellectual Property and Human Rights, at https://www.wipo.int/edocs/pubdocs/en/intproperty/762/wipo_pub_762.pdf

[22] Montanari, L. (2018) How IP Rights Empower Women, at https://www.forbes.com/sites/lorenzomontanari/2018/04/26/how-ip-rights-empower-women/?sh=9a9ded36e732

[23] Ibid.

Despite the importance of the full participation of women in all aspects of economic activity, research has indicated that women are not taking part in the intellectual property (IP) system at the same rates as men and are not receiving the same benefits. In spite of women accounting for roughly half of the global labor force and more than half of college graduates worldwide, they receive far less recognition and protection for their innovative and creative labors than men. These disparities set the foundations of an IP gender gap.

> ***There is a persistent gap between the rates at which men and women obtain protection for patents and other IPRs.***

While some organizations have tried to collect gender-disaggregated data on women's participation in IP systems, understanding how these systems can better serve and include women is in its nascent stages. There is a persistent gap between the rates at which men and women obtain protection for patents and other IPRs. Furthermore, the rates at which female and male inventors participate in the most lucrative inventive and creative activities have been discerned. Domestic economies could substantially profit from closing the gender gap.

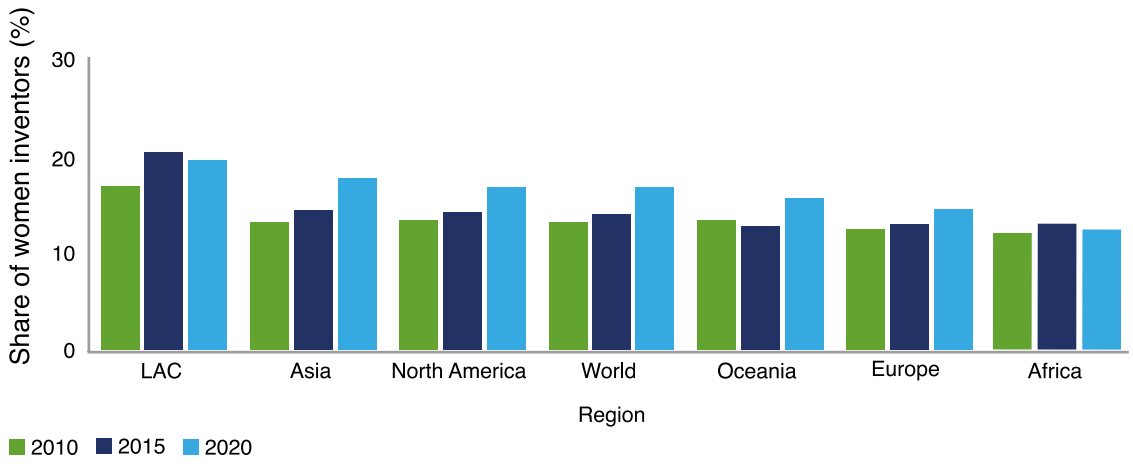
The IP gender gap has been documented in an increasing number of studies. In 2016, a worldwide study by the World Intellectual Property Organization (WIPO) on gender in patenting found that 29% of Patent Cooperation Treaty (PCT) filings from 1995 to 2015 listed women inventors, although there was significant variation among economies, and the rate rose over time. Only 5% of applications recorded women inventors exclusively. [24] A subsequent WIPO report notes that results from the 2020 PCT Yearly Review indicated that only 16.5% of inventors named in international patent applications were women, at a positive rate of only 3.8% per decade. [25] Notably, if such a rate were to hold, this would imply that gender parity would only be reached in 2058. [26]

[24] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs
[25] WIPO (2021) Gender Gap in Innovation Closing, But Progress is Slow. World Intellectual Property Organization – Gender Equality and IP
[26] Ibid.

In terms of regional differences, the PCT Yearly Review found that over the past decade, the Latin America-Caribbean (LAC) region had the highest share of women among PCT inventors (19.2%), which was followed by Asia (17.4%), North America (16.5%), Oceania (14.9%), Europe (14.2%) and Africa (12.1%) (Figure 5). [27] According to the United States Patent and Trademark Office's (USPTO) report titled "Progress and Potential: 2020 update on US women inventor-patentees", published in 2020, the USPTO found that "[t]he women inventor rate (WIR)—that is, the share of women among all US inventor-patentees—grew from 12.1% in 2016 to 12.8% by 2019." [28] The same report found that the proportion of patents with at least one woman inventor reached about 21.9% in 2019. [29]

Figure 5

Share of women among listed inventors in PCT applications by geographical region, 2010, 2015 and 2020



Source: WIPO (2021)

Furthermore, the IP gender gap was evident in the similar statistical data for the Group of Twenty (G20) published in 2014 by the Organization for Economic Cooperation and Development (OECD). Namely, the OECD study revealed that only 8.4% of patents have at least one woman inventor. [30]

[27] WIPO (2021) Patent Cooperation Treaty Yearly Review 2021: The International Patent System, at https://www.wipo.int/edocs/pubdocs/en/wipo_pub_901_2021.pdf

[28] USPTO (2020) Progress and Potential: 2020 Update on U.S. Women Inventor-Patentees, at https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf

[29] Ibid.

[30] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs

The UK IPO published a study in 2019 titled "Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship" that found that the share of women inventors globally was only 12.7% in 2017. [31] In the same study, the global percentage of patents with at least one woman inventor for 2017 was 21%. Despite the UK IPO data showing that the share of women inventors has doubled over the course of 20 years – from 6.8% in 1998 to 12.7% in 2017 – achieving gender parity with the current rate of growth would only be possible by 2070. [32]

While many studies do not analyze the impact of women-held patents specifically, their results suggest that closing the patenting gap between men and women could substantially impact the economy. Since 21% of all patents in the US have at least one female inventor, closing the gender gap in patenting by increasing women's patenting activity would substantially increase the patent stock, all else equal. [33] Not only would this likely boost productivity in the economy overall, but it could also be beneficial in promoting women's entrepreneurship more generally.

> ***IP and economic growth and development are intrinsically linked in our age.***

Bridging the IP gender gap is of the utmost importance as it could contribute to the success of individual companies and domestic economies. IP and economic growth and development are intrinsically linked in our age, as most of the value of leading businesses, such as Google, Microsoft, Facebook, and Tesla, lies in intangible assets. New business investments in developed economies are in intangibles, with the main intangible asset being IP. The ability of inventors or entrepreneurs to obtain IP protection is a deciding factor in whether an investment fund will invest in their startups. This is because companies that have been granted a patent or any other form of IP have higher revenues than those without any IP assets. In many cases, investment in startups is heavily in favor of investing in male entrepreneurs. Therefore, the gender gap in patenting makes it even more difficult for women inventors to obtain investment, with women receiving only 2.2% of investments from the US venture capital industry in 2018. [34]

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[31] UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846363/Gender-profiles-in-worldwide-patenting-2019.pdf

[32] Ibid.

[33] USPTO (2020) Progress and Potential: 2020 Update on U.S. Women Inventor-Patentees, at https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf

[34] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs

Increasing women's access to IPRs can have tangible and intangible benefits on an individual and societal level. These benefits could manifest in increased pay, preferential treatment, better professional opportunities, and increased public visibility. Presently, society cannot take advantage of opportunities to advance science and technology due to undervaluing women's contributions. Hence, gender-diverse teams could improve the financial performance of companies, social mobility, and product design that addresses the needs of a diverse set of consumers.

3.1 Inventor teams and women's representation

An area of particular interest when trying to ascertain the gender gap is to study the way women inventors interact with the IP system. Each patent application has either one named inventor – a lone or individual inventor – or multiple inventors that work collaboratively as a team. Linking the inferred gender of each named inventor and the inventions listed in a patent application provides researchers with avenues to analyze the extent to which women inventors work individually, as part of a single-gender team, or as part of a mixed team. When looking at the data collected from patent applications of inventor teams, we can see that women are slowly obtaining more patents, but often as part of a mixed-gender team of inventors rather than independently or as part of a female team.

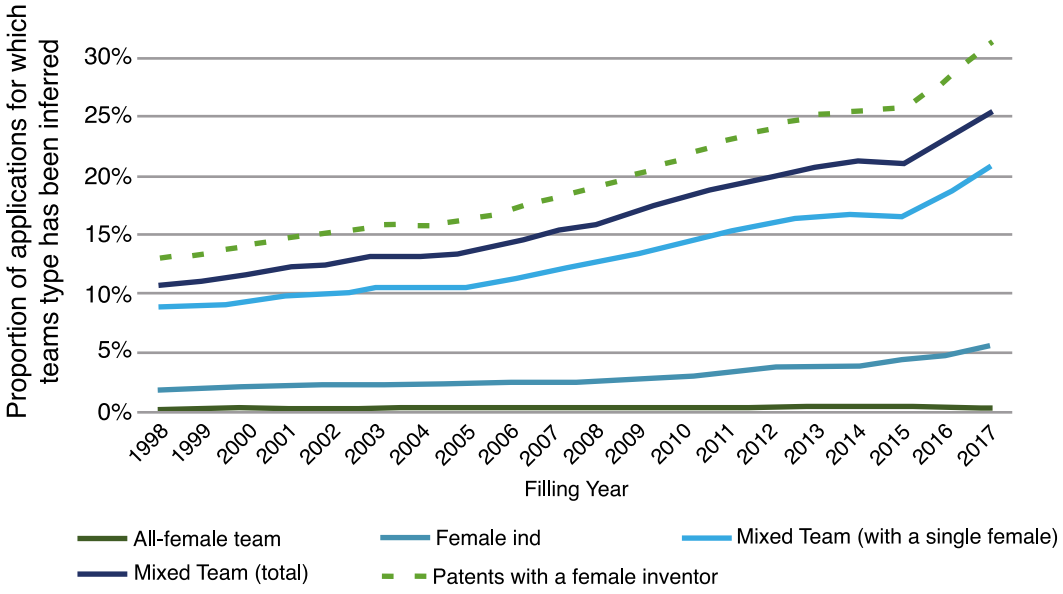
> ***Females are much more likely to contribute to a patent application as sole female inventors than jointly with other females.***

Over the course of the last two decades, a growing number of patents have had a female inventor on their team, rising from 13% in 1998 to 31% in 2017. [35] Many women inventors participate in the patent system as part of a mixed-gender inventor team. The majority of mixed-gender teams of inventors have a lone female. This trend appears to hold against a background trend of rising female participation in inventorship throughout a 20-year period (Figure 6). [36] A similar conclusion can be reached when looking at the proportion of all-female teams that comprise only females and those that include one female working individually. This suggests that females are much more likely to contribute to a patent application as sole female inventors than jointly with other females.

[35] UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846363/Gender-profiles-in-worldwide-patenting-2019.pdf
[36] Ibid.

Figure 6

Proportion of patents associated with women inventors in inventor teams

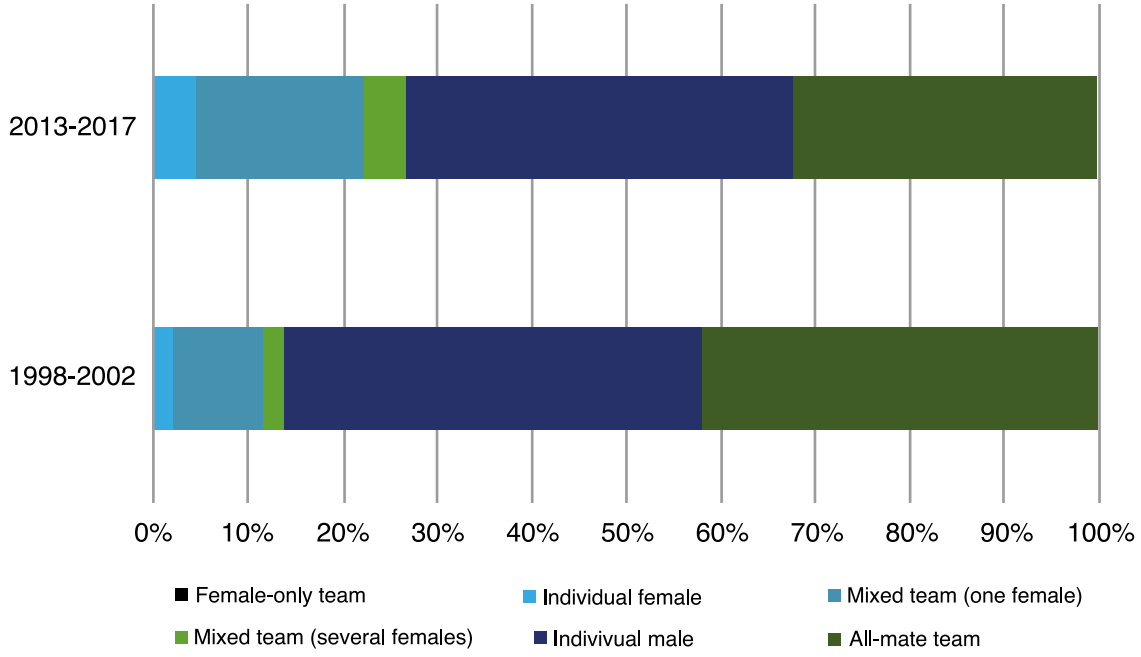


Source: UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

An apparent gender disparity in patenting can be spotted in any given time period. When looking at data from two different five-year periods, i.e., between 1998 and 2002, and from 2013 to 2017, despite showing a clear gender disparity, a marked increase in the proportion of patent applications with at least one female inventor can be seen (Figure 7). A common denominator for both time periods is that a large majority of patents for which all inventors were female had a lone inventor working alone. Between 1998-2002, 2.2% of patents had lone-female inventors out of 2.5% of patents for which all inventors were female. Similarly, between 2013-2017, 4.5% were lone-female inventors out of 4.9%. Conversely, of those patents for which all inventors are male, there are broadly similar numbers of applications with lone-male inventors as there are applications with all-male teams. This also appears to have been the case in 1998-2002 (44.1% of patents with lone-male inventors and 41.7% of patents with all-male teams) and in 2013-2017 (40.5% of patents with lone-male inventors and 32.2% of all-male teams).

Figure 7

Comparison of inventor types listed on patent applications (1998-2002 and 2013-2017)



Source: UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

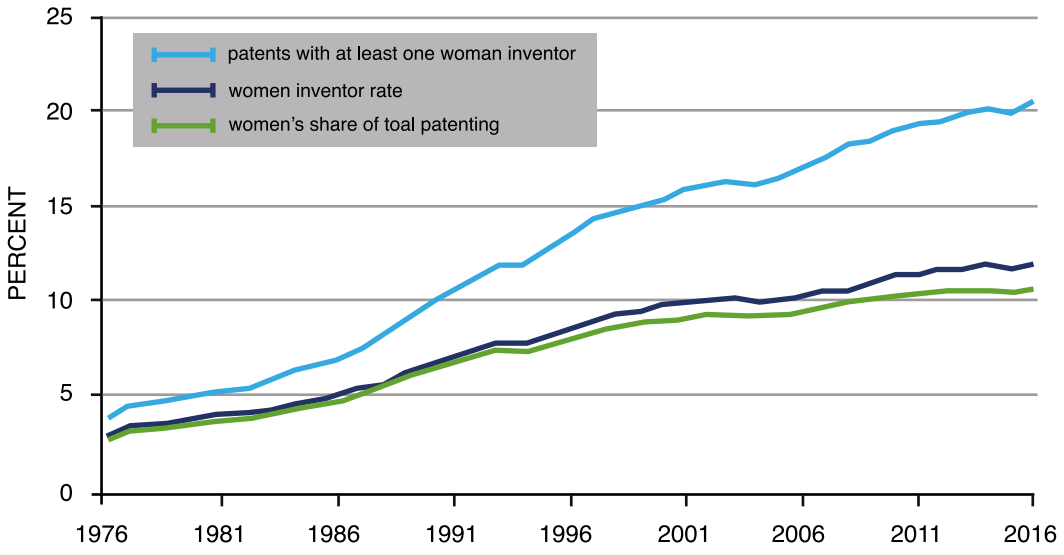
According to an analysis of data since 1976 conducted by the USPTO, women have steadily increased their interaction with and participation in the patent system. However, a large discrepancy between patents with at least one female inventor and the women inventor rate has been identified. Namely, patents with at least one woman inventor accounted for 21.9% in 2019, an increase of 1.2% points from 2016. [37] This is a strong increase when compared to the 1980s, when women's participation and inclusion in patent teams was only 8%. However, much of this growth happened in the 1980s and 1990s; since 1998, this percentage has only increased by 5%, suggesting that the increase in women inventors has slowed (Figure 8). [38]

[37] USPTO (2020) Progress and Potential: 2020 Update on US Women Inventor-Patentees, at https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf

[38] Clay, M. (2020) Though Growing, Female Patent Inventors Still Lag Behind Male Counterparts, at https://www.ptslaw.com/blog/2020/11/though-growing-female-patent-inventors-still-lag-behind-male-counterparts/

Figure 8

Percentage of women inventors over time in the US



Source: USPTO (2019) Progress and Potential: A profile of women inventors on US patents

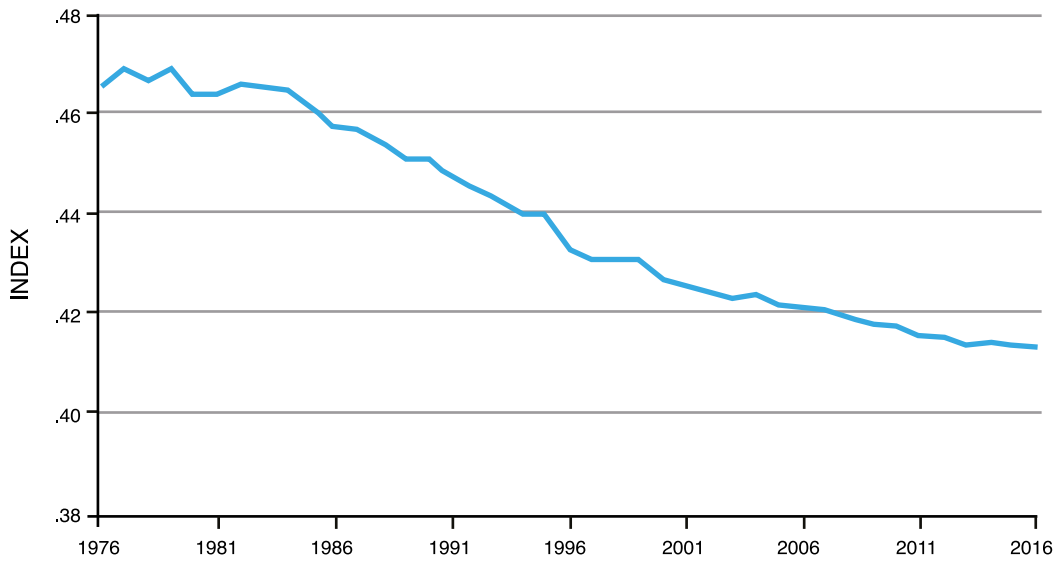
A growing gap between the proportion of mixed-gender teams and the overall women inventor rate is evident in the US. Despite more inventor teams including women, the total number of women inventors has not experienced significant growth. The women inventor rate was 12.1% in 2016 and only grew to 12.8% in 2019. [39]

The USPTO has noted that "women are increasingly likely to collaborate with other inventors rather than patent alone and more likely to participate on teams of four or more inventors."[40] In the last decade, all-female invented patents constituted only about 4% of issued patents. [41] Accordingly, the growth in women's inventorship, as measured by the share of patents with at least one female inventor, is almost entirely due to women's participation in mixed-gender teams. However, gender diversity in mixed-gender teams had experienced a gradual decline since the 1980s when mixed inventor teams were closer to gender parity when compared to more recent years (Figure 9). Even though there are more mixed-gender inventor teams, women are a shrinking minority of inventors on those teams. For example, the index value in Figure 9 of just above 0.41 in 2016 indicates that women inventors accounted for roughly 29% of gender-mixed inventor teams. [42]

[39] USPTO (2020) Progress and Potential: 2020 Update on US Women Inventor-Patentees, at https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf
[40] USPTO (2019) Progress and Potential: A profile of women inventors on US patents
[41] Ibid.
[42] Ibid.

Figure 9

Gender diversity index (Mixed-gender inventor teams)



Source: USPTO (2019) Progress and Potential: A profile of women inventors on US patents

4. BARRIERS CONTRIBUTING TO THE PATENT GENDER GAP

> ***Remedying the lacunae that women face in patenting requires mindfulness of their complexities and the need for a comprehensive and tailored set of solutions.***

Even though women express creativity and innovative thinking equally to men, women have historically been disadvantaged. This is due to various complex and interconnected factors that have led to female under-representation among inventors, innovators, and entrepreneurs and have obstructed their success. The persistent barriers that impact women's ability to patent and commercialize their inventions are dependent on a multitude of heterogeneous factors, such as socioeconomic situation, available economic resources, family circumstances, and economy of birth. Consequently, this contributes to the inability to equally reap the material benefits and other rewards associated with their inventive labors, resulting in female inventors lagging behind their male counterparts across numerous indicators, from financing to business ownership to patenting. Therefore, remedying the lacunae that women face in patenting requires mindfulness of their complexities and the need for a comprehensive and tailored set of solutions. [43] This chapter aims to provide an overview of the many factors that have been found to influence women's patenting activity.

4.1 Lower labor market participation

The rates of female labor force participation and employment clearly indicate women's economic activity. According to the World Bank's "Women, Business and the Law 2022" report, around 2.4 billion working-age women are not afforded equal economic opportunities.[44] The Report further states that 178 economies maintain legal barriers that prevent women's full economic participation. Furthermore, women face some form of job restriction in 86 economies, and 95 economies do not guarantee equal pay for equal work.[45] These statistics show that women's participation in the labor market is much lower than that of men, either as workers or as entrepreneurs. However, they also indicate what pool of female labor is available to potentially turn to innovation. For example, researchers have found that states in the US with higher female labor force participation have higher women inventor rates, indicating that the rate of women's involvement in the labor force matters to innovation, pointing to the importance of broad-based policies to increase that rate. [46]

[43] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review
[44] The World Bank (2022) Women, Business and the Law 2022, at https://wbl.worldbank.org/en/wbl
[45] Ibid.
[46] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review

> ***The participation of women in entrepreneurship is of particular relevance for any economy that wishes to achieve gender parity and equality.***

Women's participation in the labor force tends to be confined to jobs and positions characterized by low productivity that are less likely to require innovativeness, especially in developing economies. This means that women are also less likely to work in patent-intensive fields. As a result, women are more likely to earn inadequate wages through working informally under challenging conditions, thus undermining their fundamental rights as workers.

Entrepreneurial activity acts as a catalyst for innovation. However, women are less likely to be entrepreneurs than men, who are twice as likely to be self-employed and three times more likely to own businesses with employees across OECD economies. Despite women-owned businesses engaging in R&D and producing innovative products at rates close to those owned by men, they are less likely to hold IP. Therefore, the participation of women in entrepreneurship is of particular relevance for any economy that wishes to achieve gender parity and equality.

While access to finance is a challenge that all entrepreneurs, despite their gender, race, women entrepreneurs are disproportionately affected by these issues, on top of facing a wide variety of gender-specific challenges. According to the Mastercard Index of Women Entrepreneurs, female entrepreneurs living and working in developed economies in Asia, Europe, and North America have access to a greater pool of opportunities and resources.[47] In contrast, women in developing economies turn to entrepreneurship out of necessity rather than an opportunity, thus contributing to their family income.

[47] Mastercard (2018) Mastercard Index of Women Entrepreneurs (MIWE) 2018, at http://web.archive.org/web/20220901061733/https://newsroom.mastercard.com/wp-content/uploads/2018/03/MIWE_2018_Final_Report.pdf

4.2 Burdens related to household chores and family

> ***Women's career progression can be significantly affected by gender expectations resulting from their reproductive and domestic roles.***

Family and domestic concerns hinder women's career progress and patenting potential. These challenges appear early on, influencing the course of study and job choices, for example, and continue throughout a woman's career. Around the world, working women still assume greater reproductive and household responsibilities than men. This influences their ability to participate equally in the labor market and become successful inventors. [48]

Women's career progression can be significantly affected by gender expectations resulting from their reproductive and domestic roles. For example, a woman is often expected to take time off and leave her career to have children. Usually, when she returns, it may be for part-time or temporary work, leaving her with a less stable career trajectory.

A study of graduate chemistry students from the UK found that 72% of women planned to become researchers at the beginning of their studies, but only 37% still had that goal at the end of their studies. [49] Discouraging factors included more significant problems with supervisors, feeling isolated from their research groups, and being more uncomfortable with the research culture of their group, including work patterns, working hours, and competition among peers. Female students felt the academic career would require too much personal sacrifice or were discouraged from pursuing a scientific career because of the challenges they would face as a woman.[50]

Women's unequal position in society not only limits their progress but also makes them more vulnerable to shocks and crises, as the COVID-19 pandemic has painfully shown. Girls and women have been badly impacted by the economic crisis resulting from the pandemic, especially regarding access to education and participation in the labor force. It may not be surprising, then, that among the many new poor that the pandemic has caused, women are disproportionally affected. [51]

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[48] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review

[49] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review

[50] Ibid.

[51] Loayza, N., Trumbic, T. (2022) Gender Equality is Smart Economics. Yet, its Progress Remains Slow, at https://blogs.worldbank.org/developmenttalk/gender-equality-smart-economics-yet-its-progress-remains-slow

4.3 Limited or non-existent exposure to female inventors

Women inventors can act as inspirational role models to young girls by reducing the self-stereotyping of belonging to a stigmatized group. [52] This self-stereotyping can manifest itself as a perception of incompatibility between women's gender and science, technology, engineering, and mathematics (STEM) identities, creating a lesser sense of belonging, greater insecurity, and less motivation to participate in STEM fields and pursue inventive activities. [53]

When examining gender disparities in STEM fields, studies and theories have consistently demonstrated that an individual's expectations of success play a crucial role in shaping their choices related to achievement. These expectations of success and the value assigned to specific tasks are influenced by a variety of factors. On an individual level, characteristics such as abilities, prior experiences, goals, self-concepts, beliefs, and expectations all contribute to forming these expectations and task values. In addition, environmental influences also come into play, including the cultural context, beliefs held by peers, and observed behaviors within the immediate surroundings. Collectively, these factors interact to shape an individual's mindset regarding their potential for success and the value they ascribe to different tasks in the realm of STEM. [54]

Similarly, various factors including family, schools, peers, mass media, and the immediate social environment contribute to shaping the expectations of success and self-perceived abilities of girls and boys. These influences also affect the value they assign to different subjects and academic domains. Significant individuals, such as family members, educators, peers, and others, play a pivotal role in providing encouragement for adolescents to pursue mathematics or technology-related studies. This encouragement or lack thereof significantly impacts the decision-making process regarding whether or not to pursue a career in STEM fields. The collective impact of these external factors on shaping aspirations and choices in STEM domains is substantial. [55]

> ***If girls are as exposed to female inventors as boys are to male inventors, the gender gap in innovation would halve.***

[52] Gonzalez-Perez, S., Mateos de Cabo, R., Sainz, M. (2020) Girls in STEM: Is It a Female Role-Model Thing?, at https://www.frontiersin.org/articles/10.3389/fpsyg.2020.02204/full

[53] Ibid.

[54] Ibid.

[55] Ibid.

Research has shown that exposure to such role models can be a central determinant of innovation, significantly affecting the probability of future participation of women in the patent system. Childhood exposure is a critical early influence on the likelihood of women patenting their inventions.

Familiarity with a technology class that has many female inventors does have an impact on women's inventorship. However, as we explain in subsequent sections of this report, the participation rates of women in these fields are low, presenting challenges when trying to find a sufficient number of female professionals in traditionally male-dominated STEM fields. Therefore, female-oriented STEM promotion requires children's exposure to successful women role models and mentors working in STEM fields. While research about the influence of same-sex role models on the intention to choose a STEM career is sparse, women exposed to female calculus professors have shown enhanced self-efficacy, greater self-concept, as well as a higher identification with and commitment to STEM, even among students who still maintained gender stereotypes. [56] Unsurprisingly, exposure to these role models challenges common STEM stereotypes, encouraging girls to engage in subjects related to STEM fields.

Lack of exposure to innovation may explain why talented children in low-income families, women, and minorities are significantly less likely to become inventors. These bright young individuals could have contributed valuable inventions had they been introduced to innovation and inventor role models early on. However, children's chances of becoming inventors diverge sharply due to characteristics at birth, such as their race, gender, and parents' socioeconomic class. Hence, if girls are as exposed to female inventors as boys are to male inventors, the gender gap in innovation would halve.[57] This suggests that tapping into the underexploited talent among children in low-income families, women, and minorities should be a critical area of intervention.

Furthermore, women's patenting activity tends to be clustered around stereotypical "female" fields and product types. According to WIPO, women specialize in technology fields and sectors where female predecessors have patented before, rather than entering male-dominated fields.[58] This phenomenon underpins the importance of female role model exposure in women's patenting pursuits.

[56] Stout, J. G., Dasgupta, N., Hunsinger, M., & McManus, M. A. (2011) STEMing the tide: Using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM). Journal of Personality and Social Psychology, 100(2), 255–270. https://doi.org/10.1037/a0021385

[57] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review

[58] Ibid.

4.4 Under-representation in STEM degrees

The patenting gender gap that has persisted throughout history is a causal nexus of a significant issue that prevents women from pursuing education and careers and starting businesses in innovative and creative fields. Women's participation in the patent system has been stifled due to the lack of training and career opportunities where IP is most relevant as a tool, particularly in STEM fields. Fundamentally, the striking disparity between the numbers of men and women in STEM fields results from the challenges women in many economies face – they are less likely to receive STEM education, enter careers in STEM fields, and have fewer opportunities to access finances to start and grow their businesses.[59] Hence, the under-representation of women in STEM fields is often cited as a major reason for the gender gap in innovation and patenting.

> ***By not providing women and girls with technical training, economies limit women's access to high-paying jobs.***

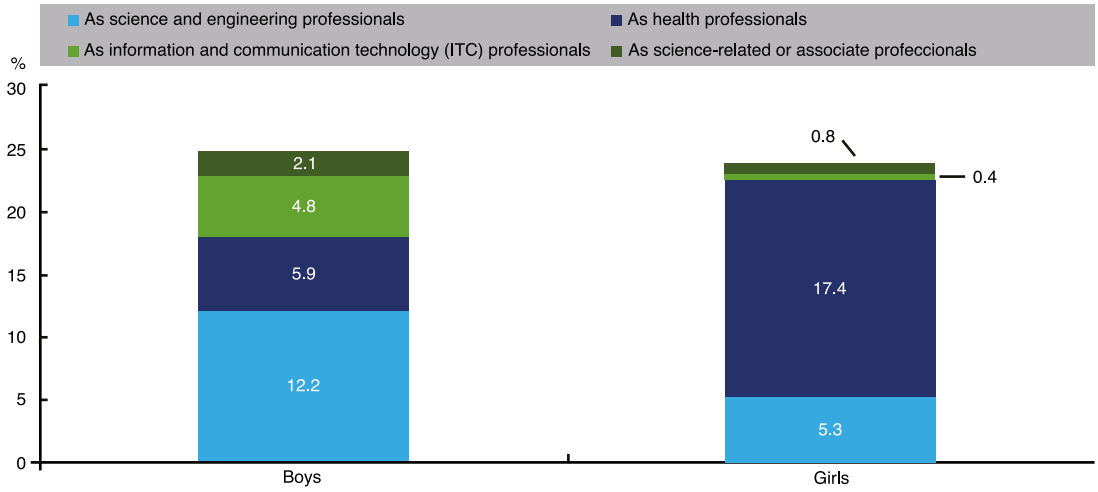
In many developing economies, girls and women are systemically tracked away from quality education from an early age. In many cases, this lack of quality education is coupled with socioeconomic barriers rooted in cultural expectations of women being home-based laborers and caregivers, thus preventing their entry into STEM fields. By not providing women and girls with technical training, economies limit women's access to high-paying jobs.

Research has shown that increasing participation in STEM degrees will positively affect increased patenting activity. However, women remain under-represented in fields of study and degrees rich in innovation. This means that the available talent pool of women that could contribute to innovation narrows at an early age. According to the OECD's Report Empowering Women in the Digital Age, girls aged 15 are twice less likely than boys to aspire to careers in engineering, science, or architecture, with women accounting for only 20% of graduates at the tertiary level in information and communications technology (ICT) fields (Figure 10). [60] This means that career paths for boys and girls start to diverge at 15 years old before making important career choices.

[59] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs
[60] OECD (2018) Empowering Women in the Digital Age

Figure 10

The proportion of 15-year-olds who expect to work in a science-related occupation by the age of 30, by type of science professional, OECD average, 2015



Source: OECD (2016) Education at a Glance, at http://dx.doi.org/10.1787/eag-2016-en

> ***Women often outnumber men in bachelor's and master's degrees; however, gender gaps persist in innovation-intense areas.***

Despite advances in female educational attainment in recent decades, men still make up 57% of the total number of PhDs globally.[61] Women often outnumber men in bachelor's and master's degrees; however, gender gaps persist in innovation-intense areas. Even though women's participation in scientific fields at the tertiary level has been growing, they only account for 30-46% of graduates in those fields.[62] Women are significantly under-represented in engineering, manufacturing, construction, and ICT. There has been a steady decline in female graduates in ICT since 2000, a problem especially pronounced in developed economies. Interestingly, economies generally considered models for gender equality, such as Sweden, Norway, or Finland, have lower levels of female STEM graduates than economies such as Albania or Algeria, which are perceived to be less equal.

[61] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review
[62] Ibid.

Even once they are engaged in STEM fields, studies indicate that women do not participate equally in R&D projects. Research has shown that at the PhD level, women are 40-66% as likely to patent as men, as opposed to 8% for college graduates.[63] According to this research, the lower share of doctorates among women accounts for about 10% of patenting gap. [64] Consequently, the low participation of women in STEM cannot be examined in a vacuum.

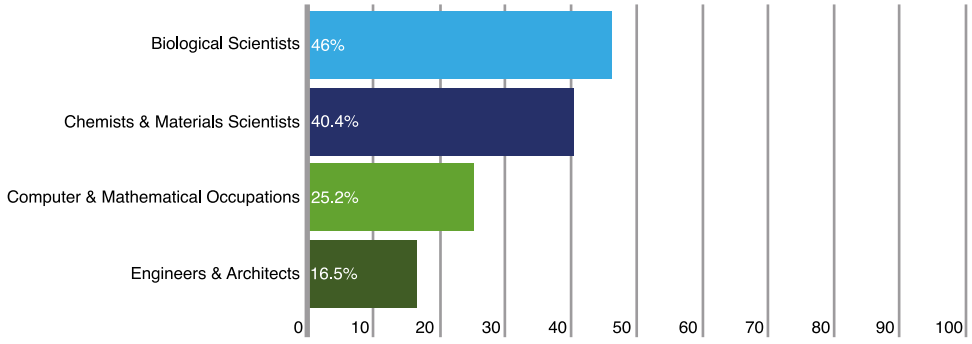
4.5 Lack of representation and the gender pay gap in STEM fields

Despite a rising female population obtaining higher education and contributing to the overall labor force, women account for a minuscule 5% of all mathematics and statistic students globally, a mere 8% of the global total in manufacturing, construction, and engineering courses. Traditionally, women have been discouraged from pursuing careers in STEM fields even though girls regularly outperformed boys in science test scores globally. However, when women decide to pursue careers in the sciences, they usually pursue careers related to life and health sciences.[65]

Women in the United States make up about 47% of the total workforce but account for only 28% of the STEM workforce. [66] These gender gaps are particularly evident in two of the most lucrative, fastest-growing, and highest-paid STEM fields – computer science and engineering (Figure 11). OECD economies face a similar gender gap, with women accounting for less than 20% of entrants into tertiary-level computer science programs and only around 18% of engineering entrants. [67]

Figure 11

Women in STEM occupation



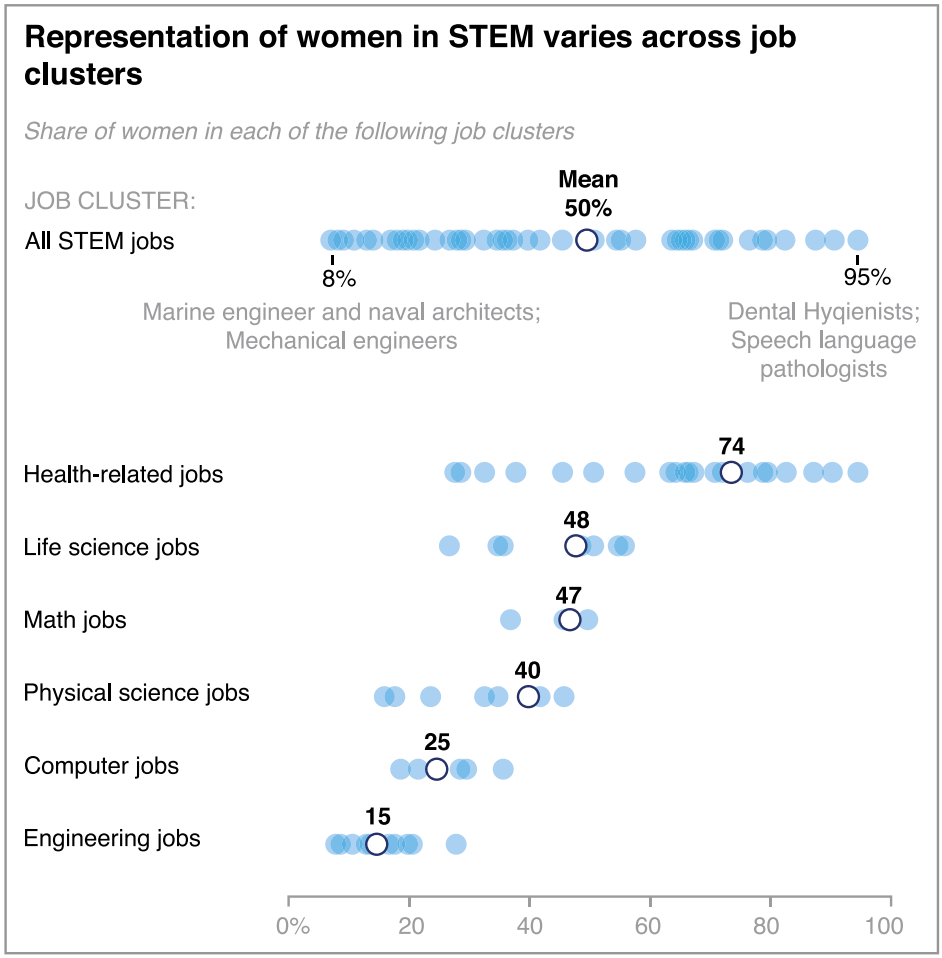
Source: https://www.aauw.org/resources/research/the-stem-gap/

[63] Ibid.
[64] Ibid.
[65] Datta, A. (2022) IWD 2022: Women in STEM and how to break the bias?, at https://www.geospatialworld.net/blogs/iwd-2022-women-in-stem-and-how-to-break-the-bias/
[66] Ibid.
[67] Ibid.

Women's representation across STEM occupations in the US follows the global trend. They are heavily overrepresented among health-related jobs and under-represented in other occupational clusters (Figure 12). Statistics show that their representation among six STEM occupational clusters has not experienced significant change since 2016. Women in the US account for 74% of healthcare practitioners and technicians, 48% of occupations in the life sciences, and 47% of jobs in mathematics. However, women only account for a quarter of those working in computer science and continue to be vastly under-represented in engineering jobs.[68]

Figure 12

Share of employed women in STEM fields



Source: Fry, R., Kennedy, B., Funk, C. (2021) STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity

[68] Fry, R., Kennedy, B., Funk, C. (2021) STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity, at https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

Additionally, women have another deterrent when participating in STEM occupations - the gender pay gap which is markedly larger in the broader labor market. According to Pew Research, women earned USD15,000 less than men on an annual average while facing greater gender discrimination (50%) in STEM workplaces as compared with women in all other occupations (41%). In 2019, the gender pay gap across all fields in the US was 80%.[69]

4.6 Limitations in accessing public and private finance

Worldwide, women's access to finance is disproportionately low. Credit rationing through high-interest rates disproportionately discourages women entrepreneurs from applying for loans, while lacking collateral means they have less access to loans than their male counterparts. The lack of financial access is a well-documented critical limitation for women inventors and entrepreneurs globally. According to the World Bank, 70% of all female-owned small and medium enterprises (SMEs) in developing economies cannot access the capital they need, thus generating a credit deficit of almost USD1.5 trillion.[70]

Women do not enjoy the same opportunities in accessing capital to fund their businesses as men. In certain economies, basic access to financial services such as banking is restricted to women. While developed economies do not outright prohibit access to finance for women, accessing adequate capital is a challenge due to disparities and bias in grant application approvals and investments.

> ***"Persistent gender biases and sociocultural and gender-specific hurdles women face necessitates separate and female-specific initiatives that will broaden female participation in sectors or domains that have traditionally been closed off to women."***

Despite many global and domestic initiatives to expand access to finance for everyone, regardless of gender, the gender financing gap persists. In order to close this gap, various donor organizations have found that women need specific female-focused encouragement and programs. Persistent gender biases and sociocultural and gender-

[69] Ibid.
[70] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review

specific hurdles women face necessitate separate and female-specific initiatives that will broaden female participation in sectors or domains that have traditionally been closed off to women. Organizations such as the World Bank, International Finance Corporation, the European Bank for Reconstruction and Development, the African Development Bank, and the Inter-American Development Bank have launched access-to-finance facilities that provide female-specific lending products targeting women in developing economies.

These mechanisms have increased the amount of finance available to women, supporting female inventors and entrepreneurs to grow their business ventures.

With innovation becoming increasingly digitalized, raising funds for women-owned startups is particularly interesting. According to the OECD, startups owned by women compared to male-owned businesses receive 23% less funding. They are 30% less likely to have a positive exit, i.e., to be acquired or issue an initial public offering. Furthermore, only 11% of innovative startups seeking venture capital investments are founded by women and receive far less of these investments. For example, women-owned startups in the US received only 2.2% of venture capital investments in 2018.[71]

Data on research funding confirms the negative trends. Examining the recipients of research awards from the United States' Institutes of Health, researchers have calculated the relative probability that female-owned firms attract private investments to fund the transition of technology developed under the program into a marketable innovation. They found that female-owned firms were as much as 16% points less likely to attract private investment than male-owned firms.

> ***"Without equal access to finance, women will be unable to either invest sufficiently in their product development or make other required financial investments along the way."***

The lack of access to finance can, directly and indirectly, affect IP gender disparities. Similar to the disparities present in STEM occupations, less funding for new ventures translates to fewer women being able to participate in ventures that are most likely to use IP. A lack of capital resources is a significant barrier since the development of IP, especially patents, tends to require substantial financial commitments. The process of applying for

[71] Ibid.

a patent is a costly endeavor, fraught with risk, with the potential for vast gains through commercialization. Without equal access to finance, women will be unable to either invest sufficiently in their product development or make other required financial investments along the way, such as covering the costs of a patent attorney. Therefore, the financial barriers linked to applying for a patent are more significant for women than men, as they tend to have fewer financial resources that prevent female inventors and entrepreneurs from filing patent applications.

4.7 The lack of gender disaggregated data

Economies across the globe are in the early stages of understanding how to address the IP gender gap, as the data that can aid in defining and understanding the problem in its entirety has not been collected. In lacking detailed information, economies are unable to draw clear conclusions regarding the challenges, solutions, and trends over time. This is not only an issue when assessing gender parity in patents but across all IP rights in local, regional, and global IP systems.

The reasons for the lack of gender-disaggregated data in IP are varied and challenging to address. In the case of copyrights, the Berne Convention for the Protection of Literary and Artistic Works, copyright protection is granted upon the creation of finished work, regardless of registration, making it difficult to track the copyright status. This, in turn, complicates efforts to determine the author's gender. In the case of patents and trademarks, intellectual property offices typically do not ask or are precluded from asking applicants about their gender under data protection legislation when they receive their applications. As a result, research on women and IPRs is underdeveloped at present.

> ***"One of the biggest challenges for researchers that work to understand and quantify how well the IP system serves women globally is the lack of data."***

Some data sets address women's entrepreneurship more generally than their IP usage. However, many of these data sets are inconsistent. They tend to be based on self-reported information and do not differentiate by business structure, varying widely between economies according to definitions of key terms. For example, the OECD defines entrepreneurs as "people who own and work in their own business, including unincorporated businesses

and own-account workers." In contrast, the United Nations Statistics Division defines entrepreneurs as "persons who have direct control over an enterprise they own alone or with other individuals." [72] Furthermore, subtle semantic differences in definitions, such as whether the business is co-owned or registered, can lead to misalignment in datasets and skewing comparisons. Additionally, disaggregated data is also needed on mixed-gender patenting teams.

One of the biggest challenges for researchers that work to understand and quantify how well the IP system serves women globally is the lack of data. As patent applications do not request information regarding the gender of the applicant, researchers have been forced to reverse-engineer estimates of women inventors on the applications by categorizing inventors based on the gender traditionally associated with the names of applicants. However, this approach is inherently flawed as it does not consider those women inventors with unisex names who may be listed in patent applications.

Data on patent attorneys or patent examiners are also missing. For example, the USPTO does not require incoming engineers to declare their gender.[73] There is not enough data collected or research conducted to examine whether gender is a factor that influences an applicant's success in obtaining a patent. However, some evidence has shown that examiners tend to exhibit bias against female applicants and their inventions and even abstain from giving female applicants the necessary feedback offered to their male counterparts.[74]

While research with respect to IP usage by women in academia has been done, IP usage by gender in corporations has not been subject to the same scrutiny. For example, the private sector produces more than 80% of PCT applications annually, while 28% of the US copyright registrations originate from the corporate sector.[75]

Collecting detailed data using universally agreed metrics would enable governments and institutions to better understand women's barriers when starting and growing IP-based businesses. This will allow for the design of policy solutions that address these barriers. However, there is a significant caveat to this point regarding data collection – intellectual property offices and applicants are concerned that asking about IP applicants' demographic information might bias examiners.

[72] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs
[73] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs
[74] Ibid.
[75] Ibid.

4.8 The complexity and expense of obtaining a patent

Obtaining a patent is often a lengthy, complicated process that requires substantial resources. In order for an idea for an invention to be patented, it must comply with two basic conditions, i.e., it must not be already publicly available nor described in a previous patent. If an inventor believes that his or her idea meets these two conditions, a patent search should be conducted to ensure that the idea is truly unique. In the US, patent search fees range from USD175 to USD700 depending on the invention's complexity and the size of the entity filing the application.[76] If an inventor chooses to conduct a PCT patent search in the European Patent Office (EPO), he or she must pay a search fee of EUR1,775 (approx. USD1,993).[77]

> ***"Financial barriers to applying for a patent are likely more significant for women than men since women tend to have fewer financial resources."***

Navigating the patent system and patent law without thorough prior knowledge is a complicated process. Drafting and prosecuting patent applications without professional assistance may help the inventor save funds on drafting fees but risks resulting in a poor-quality patent application that lacks the well-drafted claims necessary to cover all the core competencies of the inventor's business. Therefore, inventors tend to seek assistance from patent attorneys, thus adding substantially to the cost of a patent application. Depending on the complexity of the invention, a patent search with an attorney's opinion can cost between USD1,000 and USD3,000 on average. For example, if an inventor makes the decision to move forward on a patent application in the US, attorney fees can average between USD5,000 and USD16,000 or more.[78] Furthermore, examiner interviews can add to the substantial costs of a patent application, as an attorney may need to represent the inventor.

Obtaining a patent is a financially risky venture for an inventor since the monetary rewards can be outweighed by the costs of filing and prosecuting the application. However, patents have the potential to allow inventors to recoup these costs and earn a profit through commercializing their inventions, i.e., introducing the patent to the marketplace through product development, licensing the patent to an individual or company, or selling the patent.[79] Depending on the complexity of the innovation being patented, the

[76] https://www.uspto.gov/learning-and-resources/fees-and-payment/uspto-fee-schedule#Patent%20Search%20Fee
[77] https://www.epo.org/applying/fees/international-fees/important-fees.html
[78] Milli, J., Williams-Baron, E., Berlan, M., et al (2016) Equity in Innovation: Women Inventors and Patents
[79] Milli, J., Williams-Baron, E., Berlan, M., et al (2016) Equity in Innovation: Women Inventors and Patents

size of the entity filing the application, the type of application pursued, and whether the inventor chooses to hire an attorney, the total cost of applying for and maintaining the patent for 20 years could total tens of thousands of dollars (in some economies).

The accumulated cost of patenting can pose an obstacle for inventors who wish to patent an idea, especially if the invention is complex since more intricate ideas usually require more attorney time. Financial barriers to applying for a patent are likely more significant for women than men since women tend to have fewer financial resources. Thus, the cost of a patent may discourage women entrepreneurs from filing applications.

According to a Delixus, Inc. and National Women's Business Council (2012b) report women tend to view the process of obtaining patents as excessively intricate, time-consuming, and costly to maneuver, encompassing various sectors, geographical areas, and previous experiences with patenting. Scholars assert that women are deterred from pursuing patents due to inherent challenges such as handling paperwork, meeting legal obligations, comprehending the intricacies of the procedure, bearing the financial burden of acquiring intellectual property protection, and enduring lengthy timelines. Moreover, the lack of extensive networks further exacerbates the difficulties faced by women in navigating the patenting process.[80]

These findings reaffirm previous research indicating that men possess greater access to knowledge about the patenting process compared to women, primarily through their networks. Men tend to have a multitude of contacts with diverse experiences, enabling them to gather information from various perspectives. In contrast, women's networks often consist of close relationships with peers who are similarly situated. Consequently, men benefit from network configurations that provide them access to a wide range of viewpoints, whereas women's contacts are more likely to offer information from a similar position. Additionally, women tend to have fewer contacts overall, further limiting their access to diverse perspectives and information regarding the patenting process.[81]

[80] Ibid
[81] Milli, J., Williams-Baron, E., Berlan, M., et al (2016) Equity in Innovation: Women Inventors and Patents

4.9 Absence of mentoring and advancement opportunities in IP-intensive fields

> ***Aspiring female inventors lack peers in startups, as they are less represented in successful IP-intensive startup boards and scientific advisory committees.***

Finding effective mentorship and networks to assist women in their professional endeavors and guide them to success is a persistent challenge. This can be attributed to the fact that established and well-known female professionals who could act as role models that can open up networking avenues for aspiring female inventors are absent in IP-intensive fields. Women account for only 30% of all of the world's researchers and are less likely to be in positions of "power," as most high-ranking positions in the private sector, such as acting as chief executive officers, chancellors, department heads, technology transfer professionals, IP lawyers and advisors, patent agents, and venture capital investors are men. Aspiring female inventors also lack peers in startups, as they are less represented in successful IP-intensive startup boards and scientific advisory committees.

> ***Young women and girls have fewer strong, powerful female role models in these fields that they can look up to.***

Consequently, young women and girls have fewer strong, powerful female role models in these fields that they can look up to. These disparities may discourage women's entry into IP-intensive fields, making it less likely for women to be mentored by other influential female leaders in their fields.[82]

[82] Ibid.

Networking opportunities not only provide inspiration but practical know-how on how to navigate the IP system. Women receive less effective guidance in managing their IP-related activities and less sponsorship for more advanced opportunities. These disparities perpetuate numerous disadvantages that can be attributed to the absence of effective mentoring and networks, which manifest themselves as:

- Women are not often invited to take on leadership positions.
- Women have been seen to be less successful in pursuing grant-funded research. Studies show that women tend to focus on details and use more narrow or specific terms in their grant proposals, while men tend to focus on the big picture and use broader language, leading to greater success.
- Women tend to receive smaller grants than their male counterparts.
- Research shows that authors prefer co-authors of the same gender over copyrighted work.[83]

4.10 High levels of attrition in STEM fields

According to a recent study from the US, 43% of women and 23% of men left full-time STEM careers after becoming parents.[84] Additionally, compared to men, women worldwide take up more unpaid household labor and devote significant amounts of time to childcare. Those who do work outside the home, especially in IP-intensive fields, often leave after having their first child due to childcare, family leave constraints, or inflexible work hours or arrangements. Women in high-ranking positions in academia are less likely to be married or have children than their male counterparts. In both academic and commercial settings, women lack time to engage in entrepreneurial activities, including the commercialization of academic research, owing to issues relating to their work-life balance. During a WIPO meeting in 2018, the delegation of Switzerland noted this challenge, observing that the gender gap in IP may be attributed not to features of the IP system per se but rather to general social and cultural hurdles that prevent women from realizing their full potential, including but not only in relation to the exploitation of IP rights. [85]

[83] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs
[84] Ibid.
[85] Ibid

4.11 Lower levels of commercialization success

Women are often less likely to engage in the commercialization of their inventions. Research shows that women are less likely to envision the commercialization of their inventions or to take steps to lead and participate in such activities.[86] Specifically, research has indicated that women in academia tend not to utilize technology transfer offices (TTOs) as often as their male counterparts. Furthermore, studies suggest that although women in academia patent at higher rates compared to industry and government, male faculty members are 43% more likely to engage and utilize a TTO.[87] However, studies also indicate that women are more likely to re-engage with a TTO after they secure their first patent. Researchers at Washington University in St. Louis, United States, discovered that variations in risk profiles, fewer industry connections, biological (giving birth) and domestic (unpaid household and childcare work) constraints, and an unwillingness to begin the protection process before the laboratory work is deemed "ready" were all factors in female inventor's delay or general lack of interaction with a TTO.[88] Even after their IP has been protected, women generally have lower levels of commercialization, partly due to the lack of incentive structures and additional costs.

4.12 Lack of awareness of the importance and value of IP registration

IP is often considered to be an obscure and challenging topic for non-practitioners. In many cases, IP is not an intuitive subject to lay people, which tends to confuse and conflate the types of IP. According to a literature review of prior research about IP knowledge among the general public, a significant basic awareness of IP and the importance of respecting it exists. However, the research revealed a general lack of understanding of why it is crucial to affirm sincere respect for IPRs in practice, which encourages counterfeit purchases and content abuse. This undoubtedly has a negative effect on innovative SMEs, discouraging them from protecting their IP and stifling their growth.[89]

[86] Ibid.
[87] Ibid.
[88] Sohar, K., Mercier, N., Goble, L., et al. (2018) "Gender Data Gap: Baseline of U.S. Academic Institutions" Technology & Innovation 19: pp. 671-683
[89] Brant, J., Marathe, K., McDole, J., Schultz, M. (2019) Policy Approaches to Close the Intellectual Property Gender Gap – Practices to Support Access to the Intellectual Property System for Female Innovators, Creators and Entrepreneurs

Misunderstanding of the IP system results in loss of confidence in the IP system and lack of respect for IP. In keeping the IP system relevant, one must not lose sight of the basic tenets of IP – respecting the IPs of other individuals, companies and economies. Moreover, any concerns about the IP system must be addressed specifically and focus must be placed on improvement without criticizing the entire IP system.

Source: Freepik

Generally, when the value of protecting IPRs is not understood, barriers to participation in the IP system emerge for people of all genders and from all demographic groups and economies. Numerous studies have shown this phenomenon is true throughout all levels of economic development. For example, the National Union of Students in the United Kingdom published a study that suggests that IP is poorly understood even by university-level students, with 62% of respondents stating that they do not consider IP relevant in their ability to commercially exploit their ideas.[90] The Copyright Board of Kenya found that 42% of entrepreneurs said they do not understand IP, with an additional 38% stating that pursuing their IPRs is an expensive and risky investment.[91] Furthermore, a Ugandan study on small enterprises highlighted the gender disparities in IP: 0% of Ugandan female business owners stated that they had not taken any action to protect their IP, compared to 40% of male-owned Ugandan businesses.[92]

[90] Ibid
[91] Ibid.
[92] Ibid.

The lack of understanding of the value and benefits IP protection offers has the potential to significantly hinder women from pursuing protection for their inventions. Women do not have the same access to programs that would equip them to pursue patenting and entrepreneurship. Moreover, even when they do participate in such programs, they receive little information or education that will allow them to better understand the intricacies of IPRs and IP systems. Additionally, few women see the commercialization of their inventions as part of their career paths.

Research on women in business in developing economies confirms this, as women often do not understand the value and benefit of patenting or commercializing their inventions. For example, research points to 'market women' entrepreneurs in Ghana and their lack of awareness of how IP law can help them gain strategic advantages in the marketplace. These women did not know how to develop their brands by using trademarks to distinguish their businesses from competitors. Additionally, they were unaware that their creative works could be protected by copyright and patents. Hence, the first step in promoting women in IP in the case of Africa would be for these Ghanaian market women to recognize that they have created something of value that they could protect, market, and sell. Such studies point to the importance of raising awareness about the available legal protections as a critical step in increasing patenting rates and copyright and trademark protection among women.[93]

4.13 Careers in IP law and administration and the gender pay gap

Women's participation in IP law and administration careers is another persistent IP system gender gap. However, this gender gap differs from the gap among system users as it represents a significant aspect of the gender gap for two reasons:

- Intellectual property offices and the IP profession can directly and immediately impact the gender gap, unlike the broader challenges that closing the gender gap in STEM has.

- Increasing the participation of women in IP law and administration may indirectly affect other aspects of the IP gender gap.

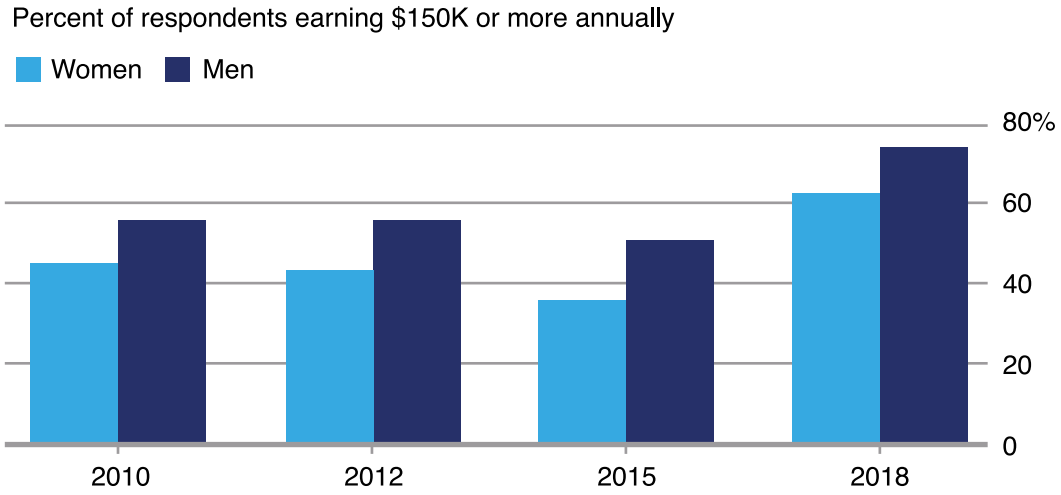
Even though women's participation in IP law and administration careers can be remedied relatively quickly, the gender pay gap is notoriously present in the IP system. According to a recent study by the American Bar Association, male partners' compensation at Am Law 200 firms was 53% higher on average than women's, while general counsels' compensation was an average of 39% higher for men than for women.[94]

[93] Cutura, J. (2019) Challenges for Women Inventors and Innovators in Using the Intellectual Property System – A Literature Review
[94] Bloomberg Law (2020) Analysis: Gender Difference in the Practice of IP Law, at https://news.bloomberglaw.com/bloomberg-law-analysis/analysis-gender-difference-in-the-practice-of-ip-law

The American IP Law Association (AIPLA) and Bloomberg Law partnered with the Women in IP subcommittee in 2020 to analyze annual survey responses from the AIPLA membership. The data analyzed from these surveys highlighted that the proportion of men making USD150,000 per annum was consistently higher than that of women making that amount (Figure 13). Furthermore, even with salaries going up over the past several years, men start out with higher wages overall, maintaining the gender pay gap.

Figure 13

The gender pay gap



Source: Bloomberg Law (2020) Analysis: Gender Difference in the Practice of IP Law

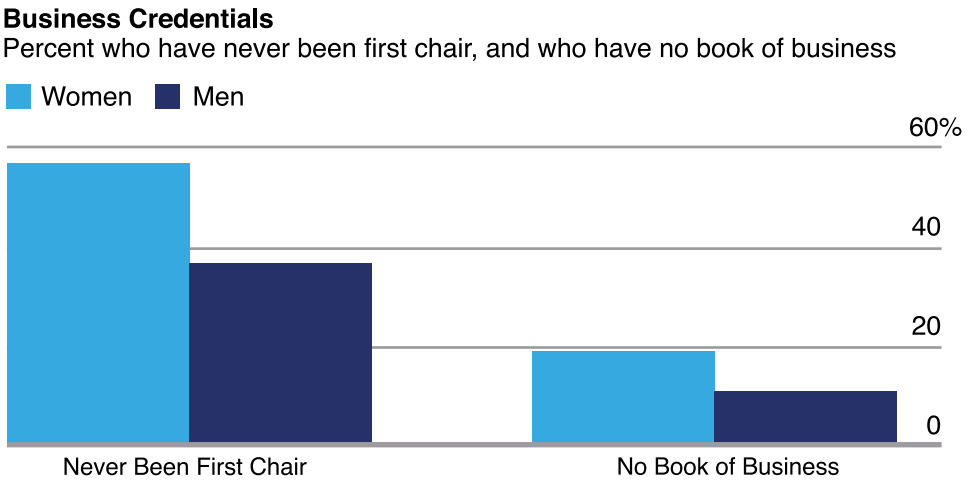
Women in IP law report that they spend more time on administrative tasks than men. In addition to these administrative tasks, anecdotally, women IP attorneys tend to devote more time to additional non-billable activities such as mentoring junior attorneys and partaking in diversity and inclusion initiatives. While these efforts are significant and usually fulfilling projects, they divert women from the most effective career path.[95]

Furthermore, women are much more likely than their male counterparts to report that they have never served as first chair in litigation. More than half of women in IP law say they have never been the first chair, compared to only one-third of men. Additionally, one out of five women in IP law report having no book of business – an essential metric in the race for partnership (Figure 14).[96]

[95] Ibid
[96] Ibid

Figure 14

Business credentials of women and men in IP



Source: Bloomberg Law (2020) Analysis: Gender Difference in the Practice of IP Law

5. POCKETS OF WOMEN'S INVENTORSHIP

The International Patent Classification (IPC) classifies patents based on the technical features of an invention and can provide valuable insight into the area of technology for which protection is sought. The data collected through the IPC allows researchers to determine the relative specialization of men and women by the sections of the IPC. Pockets of women's inventorship efforts and participation in the patent system can be seen in a sample of the inventor gender ratio for the top 20 IPC subclasses with the most inventors in PATSTAT. The average across all IPC subclasses in PATSTAT is 8.3%, with eight of the top 20 IPC subclasses with the most inventors having an above-average proportion of female inventors.[97] Furthermore, five of the top 10 IPC subclasses have over 12% female inventors (Table 1).[98]

[97] UK IPO (2016) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship
[98] Ibid

TABLE 1

Inventor gender ratio (top 20 IPC subclasses)

IPC subclass		Male Inventors	Female Inventors
A61K	Medical or Veterinary Science; Hygiene -> Preparations for Medical, Dental, or Toilet Purposes	82.8%	17.2%
C07D	Organic Chemistry -> Heterocyclic Compounds	87.6%	12.4%
A61P	Medical or Veterinary Science; Hygiene -> Therapeutic Activity of Chemical Compounds or Medicinal Preparations	83.5%	16.5%
H01L	Basic Electric Elements -> Semiconductor Devices; Electric Solid-State Devices not Otherwise Provided for	95.4%	4.6%
C07C	Organic Chemistry -> Acyclic or Carbocyclic Compounds	90.8%	9.2%
G06F	Computing; Calculating; Counting -> Electric Digital Data Processing	93.8%	6.2%
H04N	Electric Communication Technique -> Pictorial Communication, e.g. Television	95.8%	4.2%
G01N	Measuring; Testing -> Investigating or Analyzing Materials by Determining their Chemical or Physical Properties	87.9%	12.1%
C12N	Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering -> Micro-Organisms or Enzymes; Compositions Thereof; Propagating, Preserving, or Maintaining Micro-Organisms; Mutation or Genetic Engineering; Culture Media	79.0%	21.0%
H04L	Electric Communication Technique -> Transmission of Digital Information, e.g., Telegraphic Communication	94.5%	5.5%
C07K	Organic Chemistry -> Peptides	80.4%	19.6%
C08L	Organic Macromolecular Compounds; Their Preparation or Chemical Working-Up; Compositions Based Thereon -> Compositions of Macromolecular Compounds	92.7%	7.3%
G11B	Information Storage -> Information Storage Based on Relative Movement Between Record Carrier and Transducer	96.9%	3.1%
B01J	Physical Or Chemical Processes or Apparatus in General -> Chemical or Physical Processes, e.g., Catalysis, Colloid Chemistry; Their Relevant Apparatus	91.8%	8.2%
C08F	Organic Macromolecular Compounds; Their Preparation or Chemical Working-Up; Compositions Based Thereon -> Macromolecular Compounds Obtained by Reactions only Involving Carbon-To-Carbon Unsaturated Bonds	91.9%	8.1%
A61B	Medical or Veterinary Science; Hygiene -> Diagnosis; Surgery; Identification	93.0%	7.0%
H01M	Basic Electric Elements -> Processes or Means, e.g., Batteries, for the Direct Conversion of Chemical Energy into Electrical Energy	94.1%	5.9%
B01D	Physical or Chemical Processes or Apparatus in General -> Separation	94.3%	5.7%
B29C	Working of Plastics; Working of Substances in a Plastic State, in General, -> Shaping or Joining of Plastics; Shaping of Substances in a Plastic State, in General; After- Treatment of the Shaped Products, e.g., Repairing	96.6%	3.4%
A01N	Agriculture; Forestry; Animal Husbandry; Hunting; Trapping; Fishing -> Preservation of Bodies of Humans or Animals or Plants or Parts Thereof; Biocides, e.g., as Disinfectants, as Pesticides or as Herbicides; Pest Repellents or Attractants; Plant Growth Regulators	88.3%	11.7%

Source: UK IPO (2016) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

Despite considerable progress in increasing women's representation among patent holders overall, it has not been uniform, leaving women closer to parity in some patent classes than in others. This can be seen in the gender stereotypical differences in the PATSTAT top 10 and bottom 10 IPC subclasses for female inventors (Table 2).[99] The table below shows that women's participation in the patent system is closest to gender parity in the A41C (Wearing Apparel -> Corsets; Brassieres) IPC subclass, at 41.6%. Other IPC subclasses where women's inventorship can be seen to have a greater presence are medical and veterinary science, apparel, organic chemistry, and biochemistry. On the other hand, the table also shows that women are woefully underrepresented in other IPC subclasses, i.e., vehicles, machines, and combustion engines.

TABLE 2

Women inventors by IPC subclass (Top and Bottom 10)

Top 10			
IPC subclass		Male Inventors	Female Inventors
A41C	Wearing Apparel -> Corsets; Brassieres	58.4%	41.6%
A61Q	Medical or Veterinary Science; Hygiene -> Use of Cosmetics or Similar Toilet Preparations	72.6%	27.4%
A41B	Wearing Apparel -> Shirts; Underwear; Baby Linen; Handkerchiefs	73.0%	27.0%
A41F	Wearing Apparel -> Garment Fastenings; Suspenders	75.3%	24.7%
B68B	Saddlery; Upholstery -> Harness; Devices Used in Connection Therewith; Whips or the Like (CNIPA)	75.4%	24.6%
A41G	Wearing Apparel -> Artificial Flowers; Wigs; Masks; Feathers	76.2%	23.8%
B68C	Saddlery; Upholstery -> Saddles; Stirrups	76.4%	23.6%
A21D	Baking; Equipment for Making or Processing Doughs; Doughs for Baking -> Treatment, e.g., Preservation, of Flour or Dough for Baking, e.g., By Addition of Materials; Baking; Bakery Products; Preservation Thereof	76.7%	23.3%
C07K	Organic Chemistry -> Peptides	76.9%	23.1%
C12N	Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering -> Micro-Organisms or Enzymes; Compositions Thereof; Propagating, Preserving, or Maintaining Micro-Organisms; Mutation or Genetic Engineering; Culture Media	77.2%	22.8%

[99] UK IPO (2016) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

Bottom 10			
IPC subclass		Male Inventors	Female Inventors
B60W	Vehicles in General -> Conjoint Control of Vehicle Sub-Units of Different Type or Different Function; Control Systems Specially Adapted for Hybrid Vehicles; Road Vehicle Drive Control Systems for Purposes not Related to the Control of a Particular Sub-Unit	97.6%	2.4%
F01C	Machines or Engines in General; Engine Plants in General; Steam Engines -> Rotary-Piston or Oscillating-Piston Machines or Engines	97.8%	2.2%
F02D	Combustion Engines; Hot-Gas or Combustion-Product Engine Plants -> Controlling Combustion Engines	97.9%	2.1%
B60T	Vehicles in General -> Vehicle Brake Control Systems or Parts Thereof; Brake Control Systems or Parts Thereof, in General; Arrangement of Braking Elements on Vehicles in General; Portable Devices for Preventing Unwanted Movement of Vehicles; Vehicle Modifications to Facilitate Cooling of Brakes	97.9%	2.1%
D03C	Weaving -> Shedding Mechanisms; Pattern Cards or Chains; Punching of Cards; Designing Patterns	97.9%	2.1%
F01L	Machines or Engines in General; Engine Plants in General; Steam Engines -> Cyclically Operating Valves for Machines or Engines	97.9%	2.1%
F02N	Combustion Engines; Hot-Gas or Combustion-Product Engine Plants -> Starting of Combustion Engines; Starting Aids for such Engines, not Otherwise Provided for	98.0%	2.0%
B25D	Hand Tools; Portable Power-Driven Tools; Handles for Hand Implements; Workshop Equipment; Manipulators -> Percussive Tools	98.2%	1.8%
G10B	Musical Instruments; Acoustics -> Organs; Harmoniums	98.2%	1.8%
F02P	Combustion Engines; Hot-Gas or Combustion-Product Engine Plants -> Ignition, other than Compression Ignition, for Internal-Combustion Engines; Testing of Ignition Timing in Compression-Ignition Engines	98.5%	1.5%

Source: UK IPO (2016) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

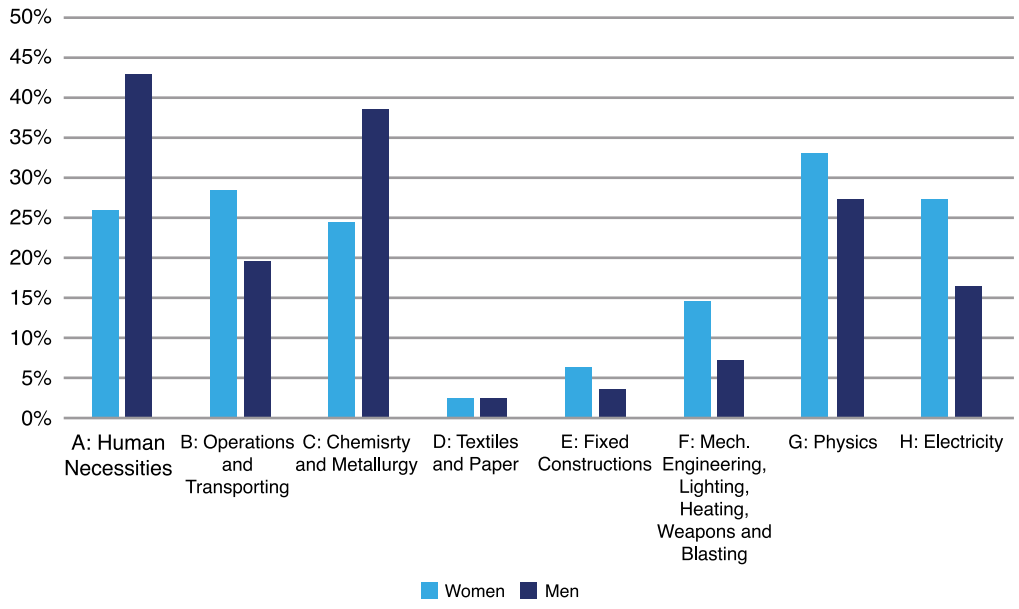
Looking at the IPC subclasses provides insight into the relative specialization of female and male inventors (Figure 15). The bars in Figure 15 correspond to the proportion of each gender that has applied for one or more patents classified in that IPC section. It shows that the total height of the bars for each gender is higher than 100 percent, as some inventors work across several sections of the IPC. This indicates the breadth of technical expertise of male and female inventors. For the most part, male and female inventors apply for patents with similar numbers of IPC sections, with males applying for patents classified in 1.64 sections and females applying for 1.60.[100] It further shows that, although the absolute number of women inventors is much smaller when compared to their male counterparts, both genders possess a similar breadth of expertise.[101]

[100] UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846363/Gender-profiles-in-worldwide-patenting-2019.pdf

[101] UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship, at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846363/Gender-profiles-in-worldwide-patenting-2019.pdf

Figure 15

Relative specialization of female and male inventors in each section of the IPC (1998-2017)



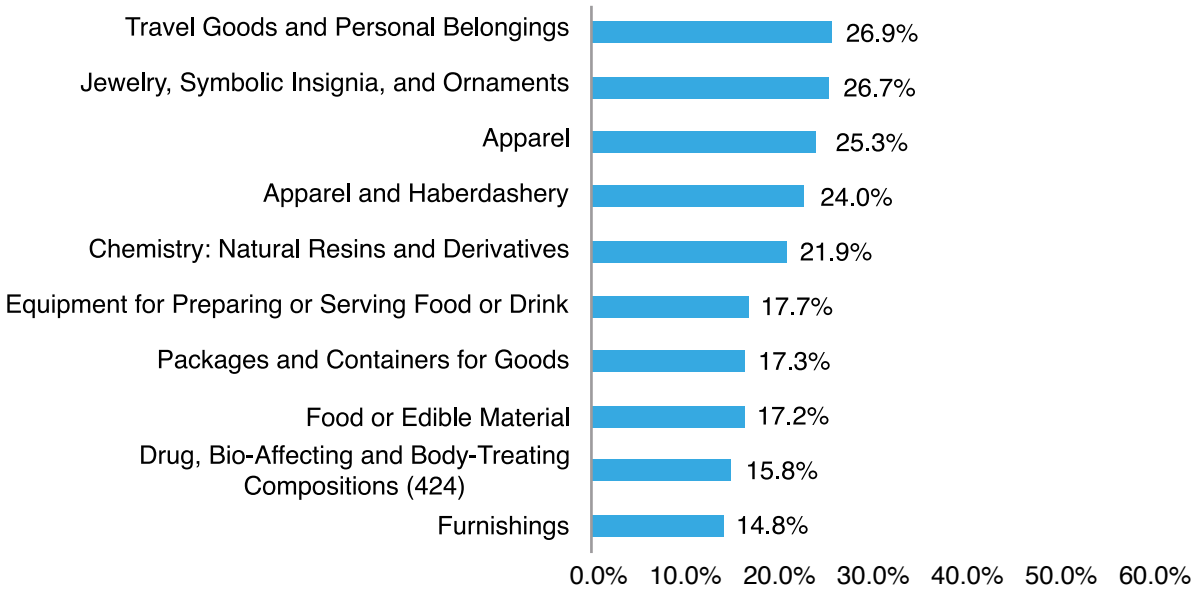
Source: UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

Another examination conducted by the Institute for Women's Policy Research further demonstrates and corroborates the previous data from the UK IPO regarding the clusters of women's patenting activity by looking into patents with at least one female inventor and their distribution across patent classes. Their study indicates that, for example, in 2010, half of all patents in the US had at least one female inventor in the patent class "Chemistry: Natural Resins or Derivatives."[102] Furthermore, more than 40% of all patents had at least one female inventor in three other classes – "Organic Compounds," "Drug, Bio-Affecting and Body Treating Compositions," and "Chemistry: Molecular Biology and Microbiology."[103]However, among the 25 patent classes with the highest percent of patents with at least one female inventor, four patent classes fell below the overall average of 18.8% – "Multiplex Communications," "Games, Toys, and Sports Goods," "Active Solid-State Devices," and "Telecommunications" (Figure 16).[104]

[102] Milli, J., Williams-Baron, E., Berlan, M., et al (2016) Equity in Innovation: Women Inventors and Patents
[103] Ibid
[104] Ibid.

Figure 16

Top 10 patent classes by share with any women inventors



Source: Milli, J., Williams-Baron, E., Berlan, M., et al. (2016) Equity in Innovation: Women Inventors and Patents

Overall, pockets of women's inventorship and participation in the patent system can be seen in patent classes that are less STEM-intensive. The data shows that out of the 10 patent classes with the highest share of patents with any women inventors in the US, six heavily involved STEM and medical expertise.[105] However, only two of these 10 classes with the highest share of patents had a woman as the primary inventor.[106] This lack of representation in STEM-related patents corresponds with one of the barriers contributing to the IP gender gap – women's under-representation in STEM degrees.

5.1 The proportion of women inventors in academia, R&D, and industry

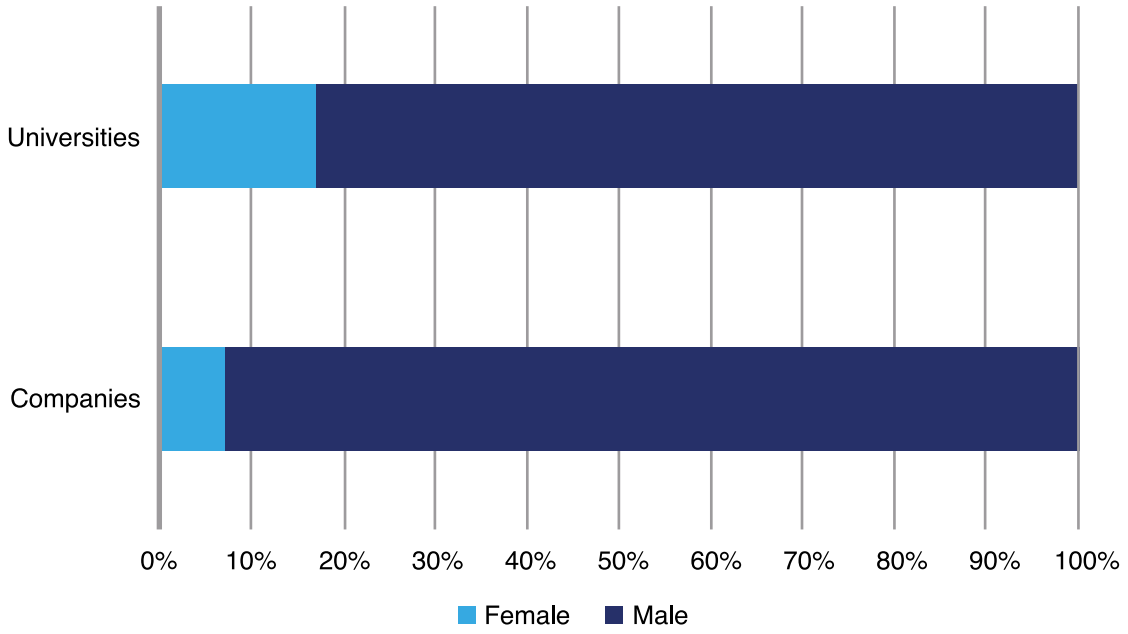
Observing PATSTAT's database, which includes information on whether an identifier relates to an individual, a company, or a university, indicates how inventorship is split by gender (academia or industry). According to this database, the number of women inventors associated with patents filed between 1998 and 2017 is much higher in academia than in industry (Figure 17). This may be due to the different environments in academia and industry, as a higher proportion of women undertake higher education than careers in research.

[105] Milli, J., Williams-Baron, E., Berlan, M., et al (2016) Equity in Innovation: Women Inventors and Patents
[106] Ibid

Considering that inventions may be conceived during postdoctoral employment, during a PhD, or even during graduate studies, they may contribute to the large proportion of women inventors in academia.

Figure 17

Proportion of female and male inventors, academia vs. industry (1998-2017)



Source: UK IPO (2019) Gender Profiles in Worldwide Patenting: An Analysis of Female Inventorship

In a 2021 European Commission Joint Research Centre (JRC) and OECD's report on the World's Top R&D Investors,[107] there were multiple findings relevant to the role of research and patents, in addition to considerations of gender parity. For example, Table 3 demonstrates the R&D spending of different economies by headquarters location. For the APEC economies (highlighted in yellow), total R&D spending was estimated at EUR560,264 or approx. USD629,300 (millions; 69.5%), compared to EUR805,119 or approx. USD904,326 (millions; overall) of all studied economies.

[107] Amoroso S., Aristodemou L., Criscuolo C., Dechezleprêtre A., Dernis H., Grassano N., Moussiegt L., Napolitano L., Nawa D. Squicciarini M., Tübke A. (2021). World Corporate Top R&D investors: Paving the way for climate neutrality. A joint JRC and OECD report. EUR 30884 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-43373-6, doi:10.2760/49552, JRC126788.

TABLE 3

R&D Investment of the world's top R&D investors, by Headquarters location, 2018 (APEC Economies highlighted in *blue*)

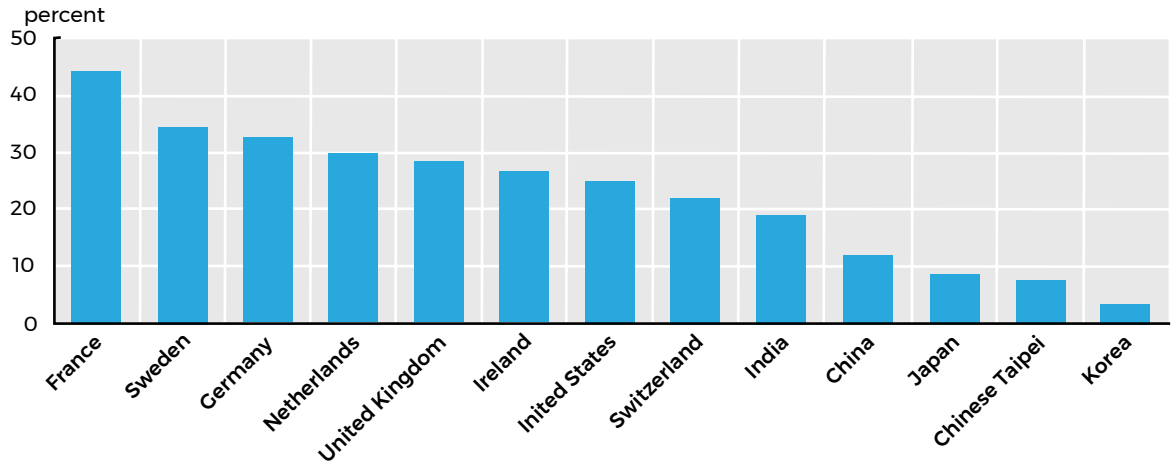
Economy (Abbreviation)	R&D (EUR millions)	Share of Total	Economy
US	307,615	38.2	United States
EU27	176,948	22.0	European Union
JPN	107,440	13.3	Japan
PRC	91,244	11.3	China
ROK	30,581	3.8	Korea
CH	28,152	3.5	Switzerland
GBR	28,129	3.5	United Kingdom
CT	15,301	1.9	Chinese Taipei
IND	4,424	0.5	India
CDA	4,362	0.5	Canada
ISR	2,942	0.4	Israel
AUS	2,826	0.4	Australia
BRA	1,010	0.1	Brazil
NOR	1,002	0.1	Norway
SAU	787	0.1	Saudi Arabia
UAE	642	0.1	United Arab Emirates
SGP	465	0.1	Singapore
LIE	315	0.0	Liechtenstein
TUR	287	0.0	Turkey
NZ	282	0.0	New Zealand
MEX	148	0.0	Mexico
ISL	81	0.0	Iceland
ARG	74	0.0	Argentina
SA	62	0.0	South Africa

Source: Amoroso S., Aristodemou L., Criscuolo C., et al. (2021) World Corporate Top R&D investors: Paving the way for climate neutrality

Specific to gender leadership of a selection of these headquarters (n=13), representative APEC economies (n=5) were notably underrepresented, with the United States ranked 7th of 13, and the remaining APEC economies ranked bottom positions 9th – 13th (Figure 18). Compared to first-ranking France, whose Gender Leadership was at approximately 44.04%, the United States had 24.5% of its leadership roles occupied by females. The lowest-ranking economy, Korea, had only 3.45% of females in leadership roles.

Figure 18

Gender leadership of the world's top R&D inventors, by headquarters location, 2018



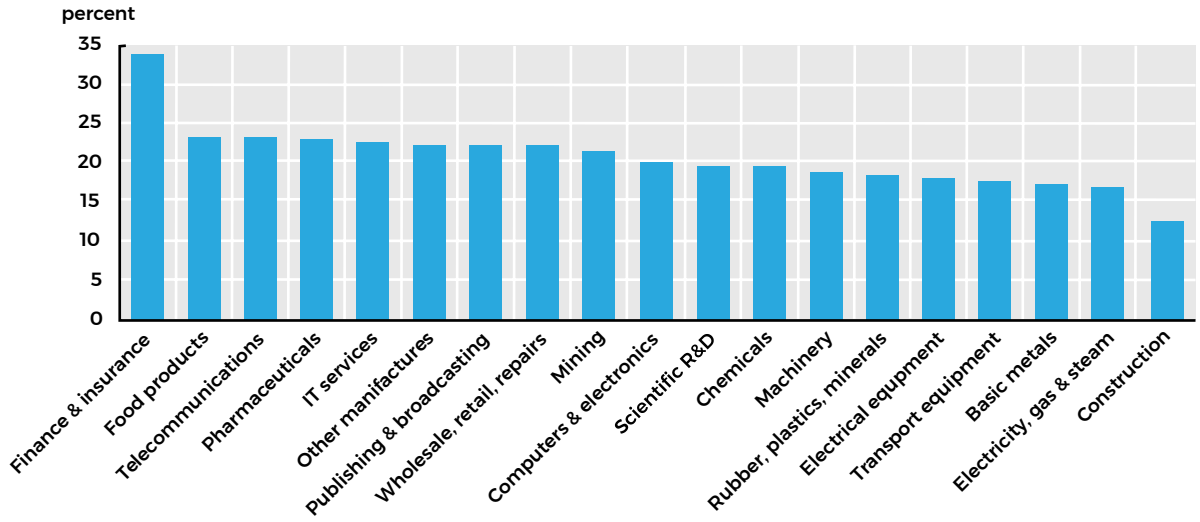
Source: Amoroso S., Aristodemou L., Criscuolo C., et al. (2021) World Corporate Top R&D investors: Paving the way for climate neutrality

Broken down by sector, the gender leadership statistics found that the highest presence of female leaders was in the fields of finance & insurance (33.77%), food products (23.44%), telecommunications (23.36%), and pharmaceuticals (22.76%). Females were most under-represented in basic metals (17.49%), electricity, gas and steam (16.93%), and construction (12.88%). These statistics are perhaps emblematic of persevered gendered norms that continue to occur globally (Figure 19).[108]

[108] Amoroso S., Aristodemou L., Criscuolo C., Dechezleprêtre A., Dernis H., Grassano N., Moussiegt L., Napolitano L., Nawa D. Squicciarini M., Tübke A. (2021). World Corporate Top R&D investors: Paving the way for climate neutrality. A joint JRC and OECD report. EUR 30884 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-43373-6, doi:10.2760/49552, JRC126788

Figure 19

Gender leadership of the world's top R&D investors, by sector, 2018



Source: Amoroso S., Aristodemou L., Criscuolo C., et al. (2021) World Corporate Top R&D investors: Paving the way for climate neutrality

Such findings are re-iterated in a WIPO study which found that globally, women participated more in fields related to biotechnology (58% in 2015), pharmaceuticals (55%), organic fine chemistry (54%), and food chemistry (51%), while the least degree of representation of women could be found in mechanical elements (11%), transport (13%), machine tools (14%) and engines (15%).[109] In terms of patents invented by women and the location of the inventor, APEC economies rank high in market share in a comparison of 24 economies (including the EU27, which aggregates 27 economies in Europe; ranked 16th with 19%), including the United States (28.9%; 2nd); China (24.5%; 7th); Canada (24%; 8th); and Australia (23.4%; 10th).[110] Surprisingly, Korea was ranked last in this pool of 24 selected economies, with only 9.3% of the market share, which counteracts information found in other studies (Figure 20).[111]

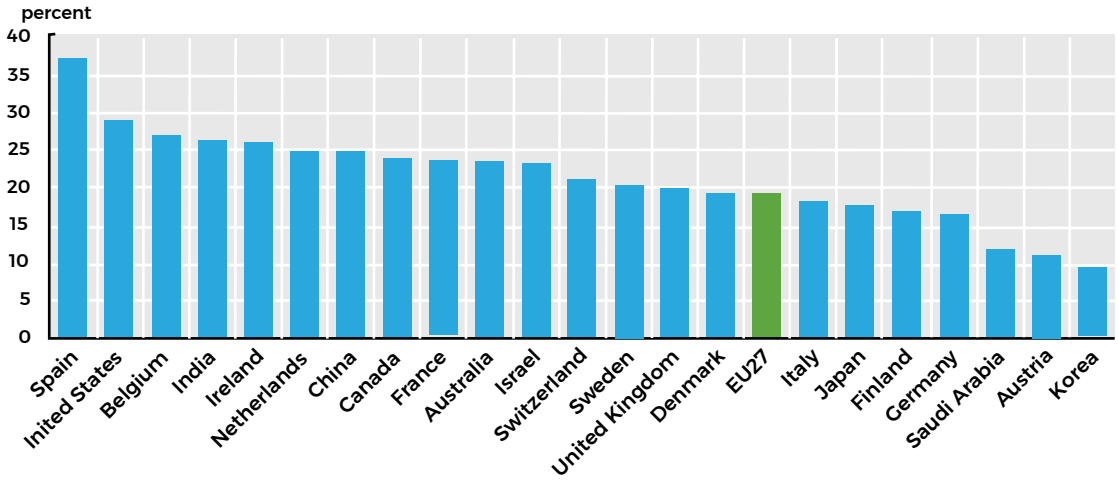
[109] Martinez, G., Raffo, J., Saito, K. (2016). Economic Research Working Paper No. 33: Identifying the gender of PCT inventors. World Intellectual Property Organization. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_econstat_wp_33.pdf

[110] Amoroso S., Aristodemou L., Criscuolo C., Dechezleprêtre A., Dernis H., Grassano N., Moussiegt L., Napolitano L., Nawa D. Squicciarini M., Tübke A. (2021). World Corporate Top R&D investors: Paving the way for climate neutrality. A joint JRC and OECD report. EUR 30884 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-43373-6, doi:10.2760/49552, JRC126788

[111] This may be due to how the criteria of location is determined for this particular question or the distinction between international vs. domestic patent applications.

Figure 20

Patents invented by women, by location of an inventor, 2016-18



Source: WIPO. (2021). Gender Gap in Innovation Closing, But Progress is Slow. World Intellectual Property Organization – Gender Equality and IP

III

APEC landscape, overview, and perspective

III. APEC Landscape, overview and perspective

1. METHODOLOGY

In order to provide personal accounts on behalf of the major patent offices of APEC Economies, a 29-question survey was designed and sent out to capture data on the role of women in the APEC IP and patent ecosystem. The survey was designed through the Qualtrics [112] software platform, which allows for a more streamlined process of collecting responses and data. The survey was sent to the government offices relating to intellectual property (Table 4).

Ultimately, the surveys were sent out via a link to the intellectual property offices across all 21 APEC economies, to which 19 attempts at responding to the survey were made by representatives from these economies. Ultimately, 15 APEC economies provided a response between 28 April 2022 and 3 June 2022, by at least one individual, and in the case of the APEC economies China (n=3); Australia (n=2); and Canada (n=2), there were multiple responses corresponding to different staff members (Table 4). However, despite a larger number of responses by these economies, the answers by individuals from the same organization tended to remain the same, except for open-ended questions.

[112] https://www.qualtrics.com/

TABLE 4

APEC respondent economies

Number	APEC Economy	Department or Office
1	Australia	IP Australia
2	Brunei Darussalam	Brunei Intellectual Property Office (BRUIPO)
3	Canada	Canadian Intellectual Property Office (CIPO)
4	Chile	National Institute of Industrial Property (INAPI)
5	China	China National Intellectual Property Administration (CNIPA)
6	Japan	Japan Patent Office (JPO)
7	Malaysia	Intellectual Property Corporation of Malaysia (MyIPO)
8	Mexico	Mexican Institute of Industrial Property (IMPI)
9	New Zealand	Intellectual Property Office of New Zealand (IPONZ)
10	Peru	National Institute for the Defense of Competition and the Protection of Intellectual Property (INDECOPI)
11	The Philippines	Intellectual Property Office of the Philippines (IPOPHIL)
12	The Russian Federation	Federal Service for Intellectual Property (Rospatent)
13	Chinese Taipei	Taiwan Intellectual Property Office (TIPO)
14	The United States	The United States Patent and Trademark Office (USPTO)
15	Thailand	Department of Intellectual Property (DIP)

The survey was designed to support the project's overall objective, i.e., to provide APEC member economies with a better understanding of the current situation and relationship between women and patents and utility models. Therefore, the questions were intended to capture multiple facets of the role of gender in the intellectual property and patent domain of the participating APEC economies. As a result, the survey included five different sections that the intellectual property offices of the participating APEC economies had to fill out. These sections comprised of:

- Questions trying to elicit information about the respondents, such as the name of the institution and APEC economy they are responding from, as well as information about their gender;

- Questions related to information on patents and women aimed at eliciting responses regarding the economies' collection of gender-disaggregated data in patents and utility models.

- Questions about the patent office. These questions were used to collect information about the specific measures, plans, or documents that the patent office is or may be implementing to promote patents and utility models. Furthermore, the questions tried to establish whether the patent office has specific indicators or targets to measure the increase of patents filed by women or women listed as inventors, as well as whether the patent office collects gender information from applicants and inventors when receiving a patent application. Additionally, the section regarding the patent office included questions about the studies, research, and reports

concerning women and patents published thus far, as well as questions about the percentage of patent examiners and staff in the patent office.

- Questions about programs for women, aimed at eliciting responses regarding the current support programs or measures employed, future measures that will be employed, the challenges and barriers the patent office has faced in implementing such programs, and future expectations on how to increase the number of female resident patent holders, applicants, and inventors.

- Questions about statistical data on women and patents and utility models.

The survey questions were conceived to attain binary responses (e.g., yes or no), quantitative information (e.g., statistics from the intellectual property office of the APEC economy, publications, and others), and free responses, in which the participants could offer long-form answers.

Through the free response questions, the respondents were afforded the opportunity to give a more idiosyncratic perspective of their representative APEC economy. Moreover, these questions also lent insights into some of the initiatives of the participating APEC economies, showcasing the progress and measures that have been made recently. All questions and the tables related to this Survey can be found in Annex 2.

2. GENERAL INFORMATION AND DEMOGRAPHICS

The survey was attempted by 19 unique respondents, involving a total of 15 APEC economies which answered through a Qualtrics questionnaire.[113] Hence the completion rate was 71% (15 out of 21 economies). For unique respondents from the same department or intellectual office, the average of their responses was used towards the representative survey result from that APEC economy. However, respondents from the same economy office generally responded similarly to questions related to statistical data regarding the use of patents and utility models.

Even though the survey was shared with all 21 economies in the APEC region through Qualtrics, only 15 economies provided responses which were analyzed and used for the development of this report. The analysis, though not all-encompassing for the entire region, as it lacks six economies, is still a valid first attempt to measure the participation of women inventors in the patent and utility model ecosystems in APEC.

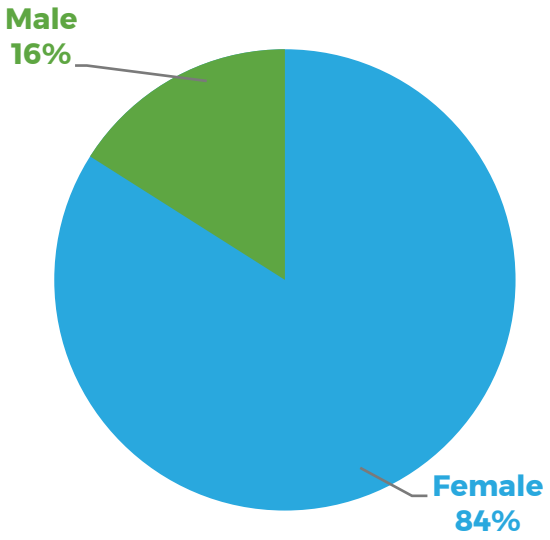
[113] There were two respondents from the CIPO and three from CNIPA, respectively

The 15 responses curated in the report are representative and provide a good overview of the current situation women inventors face when interacting with the patent systems in the region, as almost all of the largest economies in APEC participated in the survey. Therefore, the survey's completion rate of 71% is considered satisfactory and a sound basis for this analysis.

To truly understand the female perspective of participating in the patent system, it was imperative to include as many women as possible. This was due to the fact that women's voices are vital when trying to ascertain the challenges, barriers, and difficulties female inventors face when interacting with the patent system. Considering that all women working in IP fields are underrepresented, their opinions and stories were invaluable in building the patent landscape of APEC. Furthermore, one of the project's goals was for the survey to achieve a 65% response rate from women. In terms of gender distribution, women accounted finally for 84% of the responses to the survey (n=16), whereas men accounted for only 16% of the responses (n=3) (Figure 21).

Figure 21

Gender distribution of APEC respondents



Source: Survey on women & patents conducted to APEC intellectual property offices

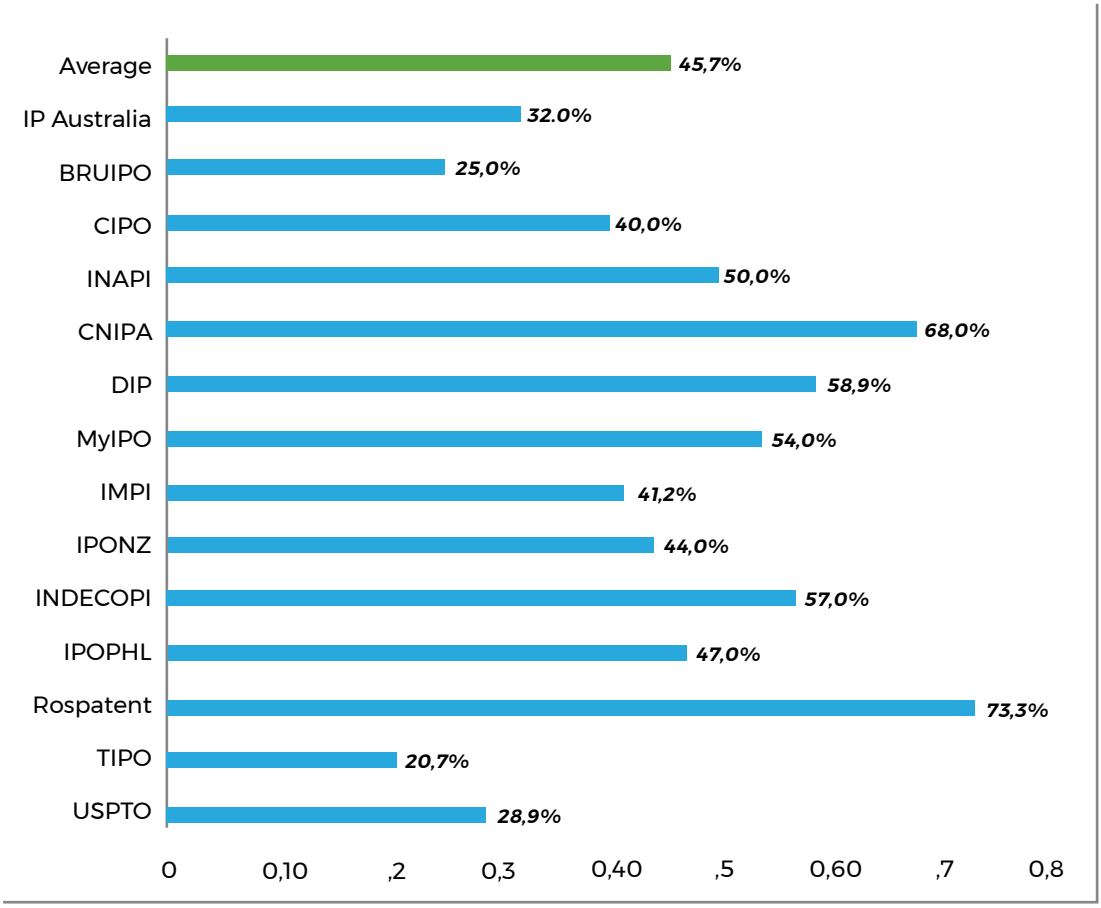
Based on the responses collected through the Qualtrics survey from the 15 respondent APEC economies, the percentage of female staff working in each intellectual property office could be collected and analyzed. The responses provided valuable insights into the gender inclusion landscape of the intellectual property offices, with some economies having exceeded gender parity in regards to their staff, others reporting statistical data that has reached gender equality, and economies whose gender ratio is below the 50% threshold for reaching gender equality. Namely, the intellectual property office of the Russian Federation had one of the highest values, at 75% composition by women, in addition to BRUIPO, at 75% women employment.

In contrast, the USPTO had the lowest percentage of its Patent Office staff composed of women, at 36.6%. The average gender inclusion employment practices across the APEC intellectual property offices surveyed were slightly below gender parity, at 56% composition by women.

Additionally, for the purpose of this comprehensive study of the patent landscape in APEC, the survey aimed to collect data on the percentage of female patent examiners working in the participating APEC intellectual property offices. The results obtained showed somewhat similar trends for some of the economies surveyed, as was the case in the Russian Federation, where 73.3% of the patent examiners employed in the intellectual property office were women. However, the economy with the lowest number of female patent examiners was Chinese Taipei, with its intellectual property office reporting a figure of 20.67% of its patent examiners being women. Interestingly, while the average for the inclusion of women in patent staff in APEC economies was a little bit above the gender equality threshold, the average percentage of women patent examiners was slightly below gender parity, at 46% (Figure 22).

Figure 22

Percentage of female patent examiners in Patent Offices of APEC economies



Source: Survey on women & patents conducted to APEC intellectual property offices

3. APEC economies' metrics collection

Local and regional governments need accurate and timely data to execute better measures, policies, and programs for improved well-being and sustainable development. Collecting data and designing indicators to measure them for strategic planning and decision-making are essential. They are also tools for fostering informed dialogues across governmental levels and societal sectors, integrating both domestic and international perspectives.

Statistics can also help in decision-making by allowing intellectual property offices to set quantitative benchmarks and track and assess the development of their policies and programs. This is crucial for ensuring that measures, policies, and programs are accomplishing their intended goals and identifying areas that need improvement. Therefore, when intellectual property offices are able to understand and interpret this data correctly, their ability to identify key areas that require change is enhanced, and their proposals for change are likely to respond to the real needs of their target groups.

In that sense, more than half of the APEC economies studied reported they are generating complete or partial data on women in patents and utility models (Table 5).

TABLE 5

APEC economies, statistics on women in patents/utility models

APEC economies that generate statistics on women in patents or utility models (n= 9)	
Economy	**Intellectual property office**
Australia	IP Australia
Canada	CIPO
Chile	INAPI
Mexico	IMPI
Peru	INDECOPI
The Philippines	IPOPHIL
Chinese Taipei	TIPO
Thailand	DIP
The United States	USPTO

The means by which these economies collect data vary, from a targeted approach to collecting gender information to the implicit use of other readily available information (e.g., government policies on gender).

In the case of IP Australia, the collection of gender-based statistics has in the past been done on an ad hoc basis, but is now routine, with these statistics most notably published in their 2022 IP report.[114] IP Australia reports statistics on women's participation as inventors in patents and utility models annually, in the annual Australian IP Report. Based on the survey response, the latest statistics on female inventors and patents were published in IP Australia's IP Report 2022. In addition, IP Australia routinely makes use of administrative data to track the representation of women in top management and STEM teams within Australian businesses. Using this data IP Australia generates evidence on the importance of diversity to innovation and IP generation and drivers of under-engagement with the IP system. Sadly, no concrete statistical data were provided by the economy; hence Australia was not included in section four of chapter three of this report. However, it is expected that IP Australia will publish a dedicated report in 2023 on diversity and IP with periodic updates in coming years.

For TIPO of the Ministry of Economic Affairs (MOEA) of Chinese Taipei, data concerning gender in patents/utility models can be found publicly on their website,[115] being only available in Mandarin. TIPO has been collecting gender information from applicants when receiving a patent application since 2006. However, as informed also by their website, this Office has cancelled the collection of statistics and the analysis of the number of female inventors since 2014.

As for the USPTO, this Office only collects limited information on the inventors of patented technology. Only the full name, city, state, or economy of residency are collected and recorded on the front of the US patent document. The USPTO does not collect information on the gender of patent inventors or applicants when receiving a patent application. Thus, to study women's participation in patenting, the inventors are often discerned as men or women based on their names, which tends to be less precise than having the identified gender by the inventor him or herself.[116] In doing so, the Office calculates a domestic women inventor's rate (WIR), defined as the number of unique women inventors as a percentage of the number of unique inventors for a given year. In addition, they also identify the number of patents with at least one woman inventor for a given year.

On the other hand, IMPI has been using CURP (Clave Única de Registro de Población or Unique Population Registry Code) to identify gender involvement in patents/utility models. The CURP is a unique code that identifies all Mexican citizens and residents and is a standard practice in patent data collection.

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[114] https://www.ipaustralia.gov.au/tools-and-research/Professional-resources/Data-research-and-reports/australian-ip-report-2022.

[115] https://www.tipo.gov.tw/tw/lp-171-1.html

[116] https://patentsview.org/gender-attribution

However, despite stating that they collect gender-disaggregated data, IMPI did not provide any clear statistical information in their response to the survey.

Regarding INAPI from Chile, this Office has been increasing the collection of metrics specific to the number of inventors by the gender of the applicant. Moreover, they have also been collecting this information specific to the applicant's origin, including universities, enterprises, or independent individuals. This theme of the gender-based metric collection has extended to other IP tools, where the Office also has collected the rate of trademarks by women vs. men owners. Likewise, INAPI indicated that they have recently signed an agreement with the Chilean Civil Registry to leverage data toward identifying female involvement in the IP arena, as information is already being collected from residents using their ID numbers (RUT) when applying for an IPR. Therefore, INAPI can check the gender of all applicants and inventors with a valid Chilean ID number. Also, the Office mentioned that as of 2022, the online application platform expressly includes gender as a specific parameter within the required data from all applicants and inventors.

Similarly, since 2022 IPOPHIL has started to collect gender information upon their revised patent and utility model application forms. Prior to this year, the Office referred to the Patent Cooperation Treaty (PCT) data to assess the performance of women in patents and utility models.

In the case of INDECOPI from Peru, the Directorate of Inventions and New Technologies (known as the Patent Office) has performed a very meticulous analysis to identify the gender of patents/utility models' applicants and inventors based on their names, generating data for the last 30 years. In addition, since 2019, this Office has included as part of the patent/utility model registration form a gender field to identify male and female applicants and inventors, which will make the statistics far easier and more accurate in this regard. INDECOPI usually measures women's performance in patents through the proportion of patent applications by residents with at least one female inventor. Other indicators used are the participation of women listed in all patent applications by residents as well the proportion of patent applications by residents with at least one female applicant.

As for Canada, even though CIPO does not collect gender information through the patent filing form, this organization uses the World Gender Name Dictionary (WGND) (used by WIPO also) to generate statistics on women in patents. In doing so, CIPO measures the volume of patent activity involving women through four different indicators:

- The trend in gender distribution by new entrants;
- Gender Classification Index (rescales the number of inventors of each gender to 100 in the first year and recalculates the number of inventors in subsequent years against this base);

- Team size per patented invention (teams with at least one female internationally, teams with at least one Canadian female, relative to number of inventors per patented invention); and

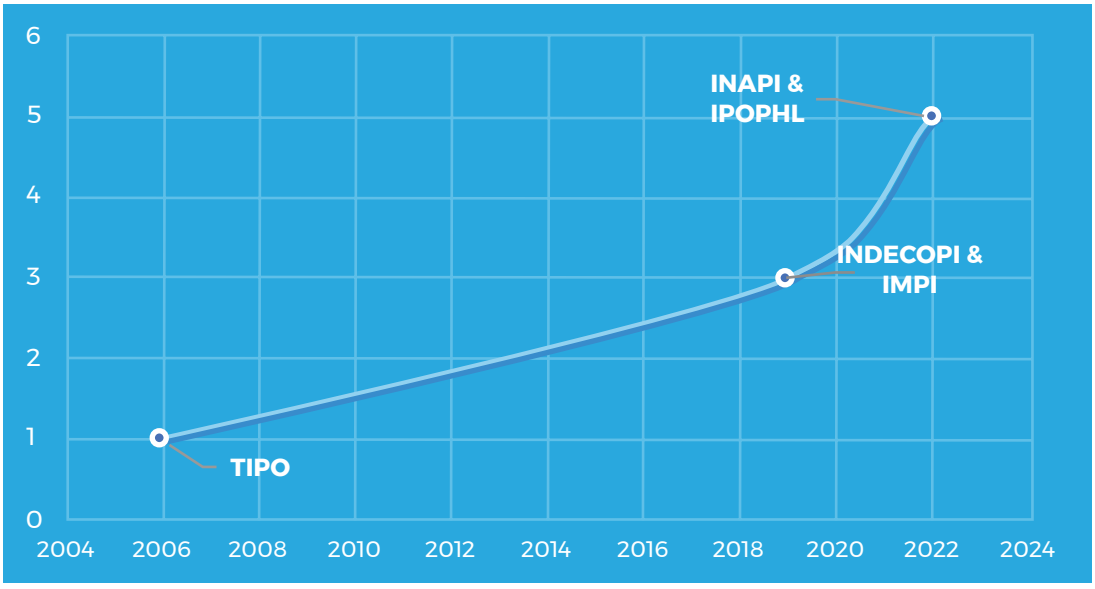
- Relative Participation of Female Index (which provides an indication of a specific economy´s prominence of women in patenting relative to its proportion of patents in a sector of interest).

The survey response from the DIP in Thailand stated that the economy does not generate statistical data on women's participation in the respective patent and utility model systems. However, DIP provided extensive statistical data on women and patents in the survey, which was analyzed and used for writing this report.

It is important to mention that the survey also allowed to obtain information regarding the year when APEC economies began collecting gender-disaggregated data. Based on the responses, the first APEC economy that started collecting data based on the gender of the patent applicant, holder, or inventor was Chinese Taipei in 2006. Peru and Mexico started collecting data in 2018, and the economies that only recently began collecting gender-disaggregated data are Chile and the Philippines (Figure 23).

Figure 23

Starting year of APEC economies collecting gender information 2006-2022



Source: Survey on women & patents conducted to APEC intellectual property offices

3.1 *Economies that do not generate data*

Certain APEC economies responded that they do not collect or generate gender-disaggregated data. The economies that do not generate data on women's participation in the patent and utility model landscape based on the responses documented in the Qualtrics survey are Japan; China; New Zealand; Malaysia; Brunei Darussalam; and the Russian Federation (Table 6).

TABLE 6

APEC economies not collecting statistics on women in patents/utility models

APEC Economies that do not generate statistics on women in patents or utility models (n= 6)	
Economy	**Intellectual property office**
Brunei Darussalam	BRUIPO
China	CNIPA
Japan	JPO
Malaysia	MyIPO
New Zealand	IPONZ
The Russian Federation	Rospatent

The reasons for not collecting gender-disaggregate data on women's participation in patents and utility models are quite varied in the case of APEC economies that do not generate and/or provide statistics to the public. For example, in one APEC economy, information on women and patents is not being collected, considering the need to enhance organizational IT systems first. In other cases, APEC economy representatives state that there are no plans to gather such information without gesturing any future initiatives towards investigating the matter further. However, while some of the economies surveyed stated that they do not generate data based on the gender of the patent applicant, holder, or inventor, future plans have been drawn up to set up such a system.

Alternatively, one APEC economy reported that no measures are being applied in this regard, as they are instead taking an institutional-specific approach tailored toward improving awareness of SMEs. Therefore, instead of collecting metrics, this APEC economy's intellectual property office is promoting campaigns directed to enterprises and innovators, including highlighting success stories of women in IP, which are found to be more productive than gender-focused tackling the issue of collecting statistics on women alone.

4. APEC women and their participation in the patent and utility model landscape: Indicators

This section provides an overview of women's interaction with the patent system in their respective economies by looking into the statistics provided by APEC intellectual property offices that responded to a comprehensive Qualtrics survey. The survey's questions were fashioned in such a way so as to elicit as much information and statistics from participating economies to provide a representative overview of women's participation in the patent system across the region. The questions informed the development of the following indicators for patents by which we measure female inventorship in the patent system in each economy that provided results:

- Patent applications filed by female residents out of the total number of patent applications filed by residents;
- Patents granted to female residents out of the total number of patents granted to residents;
- Share of patent applications filed by female residents which are denied or abandoned out of the total number of patent applications by residents;
- Patent applications with female inventors out of the total number of patent applications by residents;
- Patents granted to resident female inventors out of the total number of patents granted to residents;
- The rate of female patent applications by residents per each 100,000 female residents; and
- Patents with at least one woman inventor by selected IPC classes.

Similarly, the Qualtrics survey included questions related to utility models, or petty patents. These questions informed the development of the following indicators for utility models by which we measure female inventorship in the patent system in each economy that provided results:

- Utility model applications filed by female residents out of the total number of utility model applications by residents;
- Utility models granted to female residents out of the total number of utility models granted to residents;

- Utility model applications filed by female residents which are denied or abandoned out of the total number of utility model applications by residents;

- Utility model applications with resident female inventors out of the total number of utility model applications filed by residents;

- Utility models granted to resident female inventors out of the total number of utility models granted to residents;

The statistics collected for APEC economies allowed the creation of metrics and indicators that provide a framework for monitoring the region's patenting activity based on the data collected through the surveys. While the statistics collected did not come from all of the economies surveyed, the data obtained can still be used as a representative and accurate sample of women inventors' patenting activity within the region. This section is supplemented by statistics collected for the APEC region through secondary research. These statistics relate to APEC women inventors' activity in patenting through the PCT.

Collecting these statistics is of particular significance for APEC as it will inform decision makers on how to tailor future programs and measures that will include more women inventors in their respective economies' patent system.

4.1 Women and patents in APEC: Current situation and performance

The information obtained for the first indicator, i.e., the ***share of patent applications filed by female residents out of the total number of patent applications filed by all residents***, is relevant to the APEC regional context because it allows economies to measure resident women inventors patenting activities and efforts (as applicants). The indicator encompasses women inventors' pursuit of obtaining a patent by filing an application either as sole inventors or as part of an inventors' team, between 2016 and 2020. Its relevance in the context of APEC economies is that it provides them with information regarding women's search, as direct applicants, of ensuring an intangible asset – a patent –for themselves (the opposite figure would be to be listed as an inventor in a patent application that is being filed and will be owned by a company, research center, or any other organization). The economies whose responses were recorded in the Qualtrics survey are Canada; Chile; Peru; Chinese Taipei; and Thailand (Figure 24). In this regard, the following trends were observed:

- Among the analyzed APEC economies, Chinese Taipei has established itself as the leading economy as resident female inventors accounted for almost 12% of patent applications filed by residents in 2020. The second economy according to this indicator is Thailand, with resident female applicants filing for 6.8% of all patent applications by residents in the same year.

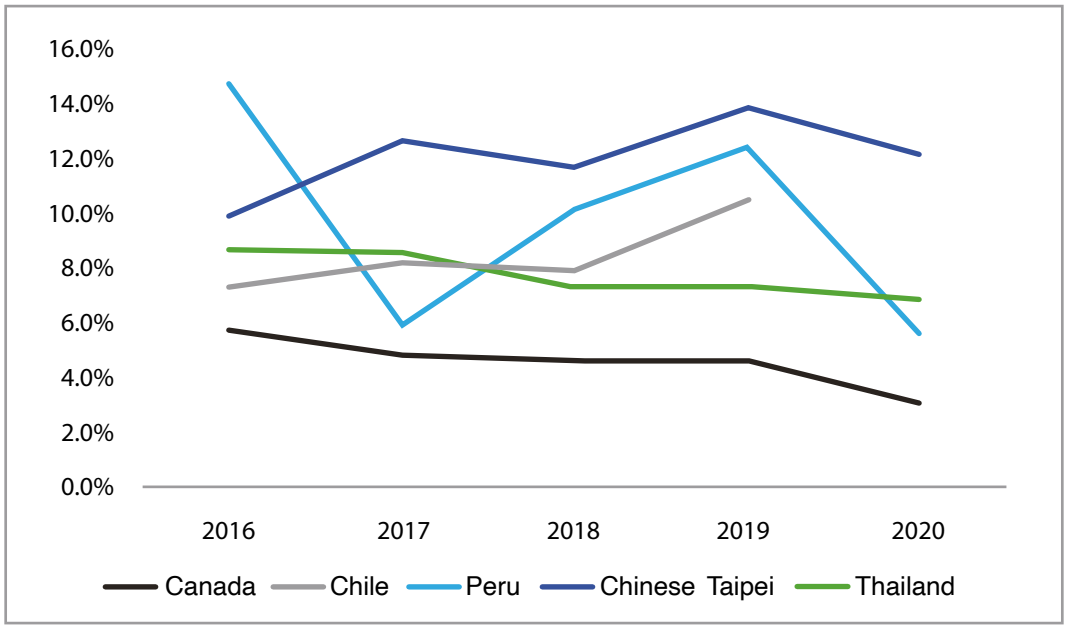
- The observed trends over the aforementioned five-year period for this indicator show that resident female applicants in Chile and Chinese Taipei has a slight upward trajectory. In contrast, the trend for the number of resident female applicants who have filed patent applications in Peru has experienced a sharp decrease from almost 12% in 2019 to almost 6% in 2020. The performance of Canada and Thailand according to this indicator has been stagnant and is showing a slight decline.

- The aggregate average of patent applications with at least one resident women applicant out of the total patent applications filed by residents in the given APEC economies between 2016 and 2020 was 8.5%.

- The average share of patent applications with at least one resident women applicant out of the total patent applications filed by residents between 2016 and 2020 reached 4.6% in Canada; 7.7% in Thailand; 8.5% in Chile; 9.7% in Peru; and 12.1% in Chinese Taipei.

Figure 24

Share of patent applications filed by female residents out of the total number of patent applications filed by residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [117]

The survey conducted through Qualtrics provided an interesting view of the data as it relates to the ***share of patents granted to female residents out of the total number of patents granted to residents.*** The indices obtained are of particular interest to APEC and its member economies as it provides a glimpse into women's

[117] Note: The graph considers patent applications by residents with at least one woman applicant.

ownership of intangible assets, such as patents, that are capable of being monetized, licensed, sold, or negotiated in the market, similar to any other tangible asset. Hence, the data obtained measures and shows the number of patents that has been granted to residents that include at least one woman holder, compared to the total number of patents granted to all residents across APEC economies that provided gender-disaggregated data. According to the data collected, we were able to distill insights about resident women's participation in the patent landscapes of Canada; Chile; Peru; Chinese Taipei; and Thailand (Figure 25). The results elucidated the following insights:

- Peru is the leading economy in this indicator among the analyzed APEC economies, with more than 15% of resident patents being granted to resident women inventors in 2020. According to this indicator, the second economy in APEC is Thailand, with resident women inventors accounting for 2.97% of all patents granted to residents for the same year.

- The data collected provides a birds-eye view of the trends in resident women inventors obtaining patents in the five aforementioned economies for the period between 2016 and 2020. Namely, three trends can be observed:

  - The only economy that has experienced a slight upward trend over the course of the past five years is Peru;

  - Chile is the only economy whose trend shows a sharp decrease in resident women inventors' patenting activity since 2017 (measured by patents granted to resident women); and

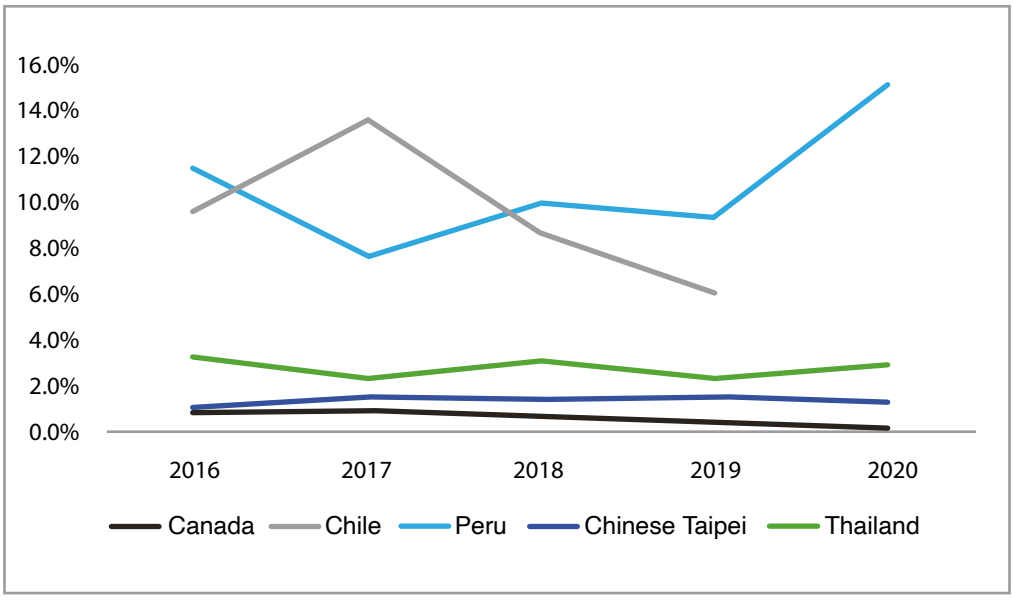
  - Canada; Chinese Taipei; and Thailand have a relatively stable and stagnant trend of resident women inventors obtaining patents in their respective economies.

- Patents granted to female residents out of the total number of patents granted to residents between 2016 and 2020 averaged to 0.6% in Canada; 1.3% in Chinese Taipei; 2.8% in Thailand; 9.5% in Chile; and 10.8% in Peru.

- The average aggregate of patents granted to female residents out of the total number of patents granted to residents in the five APEC economies was 4.8% for the five-year period between 2016 and 2020.

Figure 25

Share of patents granted to female residents out of the total number of patents granted to residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [118]

Measuring the ***share of patent applications filed by residents that include at least one woman applicant that have been denied or abandoned*** is another metric that the Qualtrics survey aimed to collect data on. The indicator is relevant to APEC because it provides quantified insights into the number of patent applications filed by women that have been denied, as well as the number of "abandons per office action." In many cases, the data on "abandons per office actions" for each individual application is a valid metric to interpret the level of speculation in the applications. Therefore, in many cases, the applications with high abandon rates are highly speculative and ultimately have little value leading to the applicant's abandonment of the patent application.

In other cases, applicants who file a patent application may abandon it later due to the lack of financial resources to go through the entire patent prosecution process. Women inventors have historically been highly disadvantaged in accessing finance across the board. Therefore, the statistical data obtained from the respondent economies on the number of patent applications filed by residents that include at least one woman applicant that have been denied or abandoned can serve as a sound indicator. This indicator can be used to accurately pinpoint the abandons per office actions that relate to applications filed by women inventors and inform intellectual property offices on ameliorating those bottlenecks through new measures or programs.

[118] Note: The graph considers patents granted to residents with at least one woman patent holder

Additional reasons for abandoning patent applications by female inventors, or inventors in general, may revolve around the inventor's lack of knowledge or lack of access to advisory services throughout the patent procedure. These factors are crucial when inventors are going through the patent prosecution process, as many female inventors abandon their patent applications due to their inability to comply with certain requirements of the process, for example, not responding on time to the intellectual property office legal or technical observations.

The economies whose responses were recorded in the Qualtrics survey are Canada; Chile: Peru; and Thailand (Figure 26). Based on the analysis of the recorded responses, the following trends were uncovered:

- The economy with the highest share of denied or abandoned patent applications filed by residents which include at least one woman applicant was Thailand with 14.3% in 2020. The second economy in APEC by the volume of denied or abandoned patent applications was Peru, which recorded a rate of 8.3% in 2019.

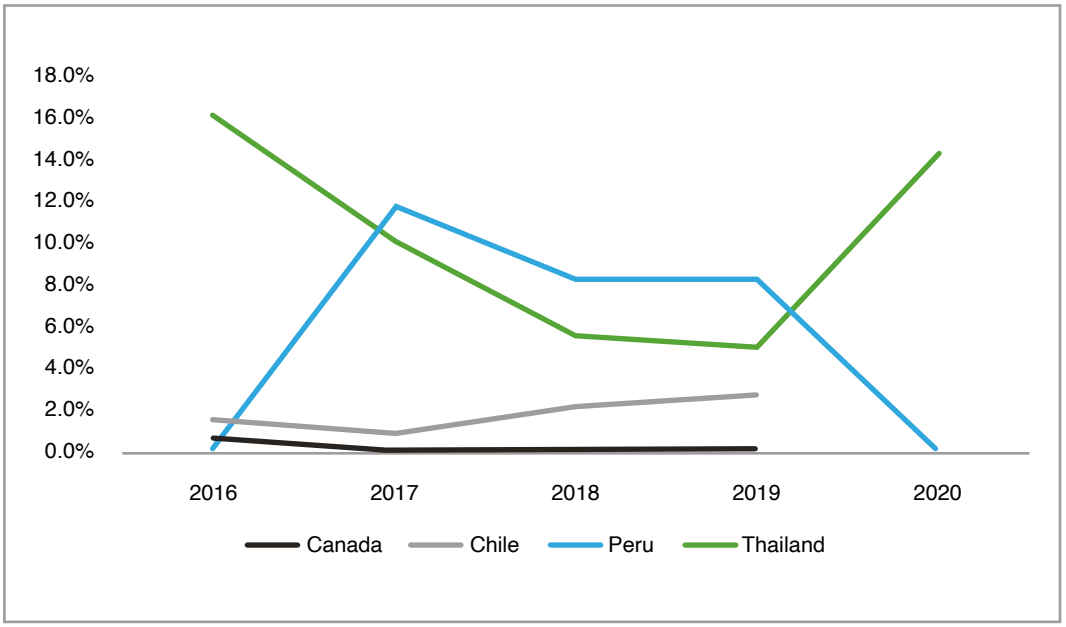
- The observed trend for this indicator, i.e., the number of patent applications filed by residents that includes at least one woman applicant that has been denied or abandoned, over the course of the last five years shows a significant downward trend for Peru. Thailand experienced a concave upward trend between 2016 and 2020 in the rate of denied or abandoned patent applications with at least one woman inventor. Canada and Chile on the other hand have recorded a somewhat stable trend of patent application rejection or abandonment by women inventors which hovered between the 1% and 2% range.

- The aggregate average of patents applications filed by female residents which are denied or abandoned out of total number of patent applications by residents in the given APEC economies was 5.1% between 2016 and 2020.

- The average of patents applications filed by female residents which are denied or abandoned out of total number of patent applications by residents between 2016 and 2020 was 10.2% in Thailand; 5.7% in Peru; 1.9% in Chile; and 0.2% in Canada.

Figure 26

Share of patent applications filed by female residents which are denied or abandoned out of the total number of patent applications filed by residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [119]

Obtaining statistics and information on the ***number of patent applications that include at least one resident woman listed as inventor compared to the total number of patent applications filed by all residents*** is of particular interest to APEC. This indicator, one of the most utilized worldwide, allows APEC economies to measure the participation of local women researchers, inventors, and scientists in inventive activities that might ultimately lead to obtaining patent protection over the course of five years, i.e., between 2016 and 2020. The economies that provided their inputs for this indicator are Canada; Chile; Peru; Thailand; and the United States (Figure 27). The statistics that were obtained through the survey were translated in percentage points to elicit the following data on women inventors' participation:

- The leading APEC economy for this indicator, based on the statistics for the number of patent applications that include at least one resident woman as inventor compared to the total number of patent applications filed by all residents provided, is Thailand, with 62% in 2020. Peru established itself as the second economy in the APEC region as per this indicator, recording female inclusion in patent applications of 50% for the same year.

[119] Note: The graph considers patent applications by residents with at least one woman applicant

- The trends observed show mixed results:

  - The overall leading economy in this indicator – Thailand – experienced a concave upward trend over the five-year period. The economy recorded a 70.7% inclusion of women inventors in patent applications in 2016, which dropped to 53.6% in 2019 and increased again to 62.1% in 2020.

  - On the other hand, Peru has experienced a steadily increasing upward trend, from only 25% of patent applications including women inventors in 2016 to 50% in 2020.

  - The United States had figures available for 2016 (20.7%) and 2019 (21.9%). The statistics show that the economy has experienced a slight increase in women inventors' inclusion in patent applications.

  - Canada had a stable upward trajectory in women inventors' inclusion in patent applications from 2016 (22.4%) to 2019 (26.1%). However, the economy experienced a sharp downward shift in 2020, when women inventors' inclusion in patent applications dropped to 16.5%.

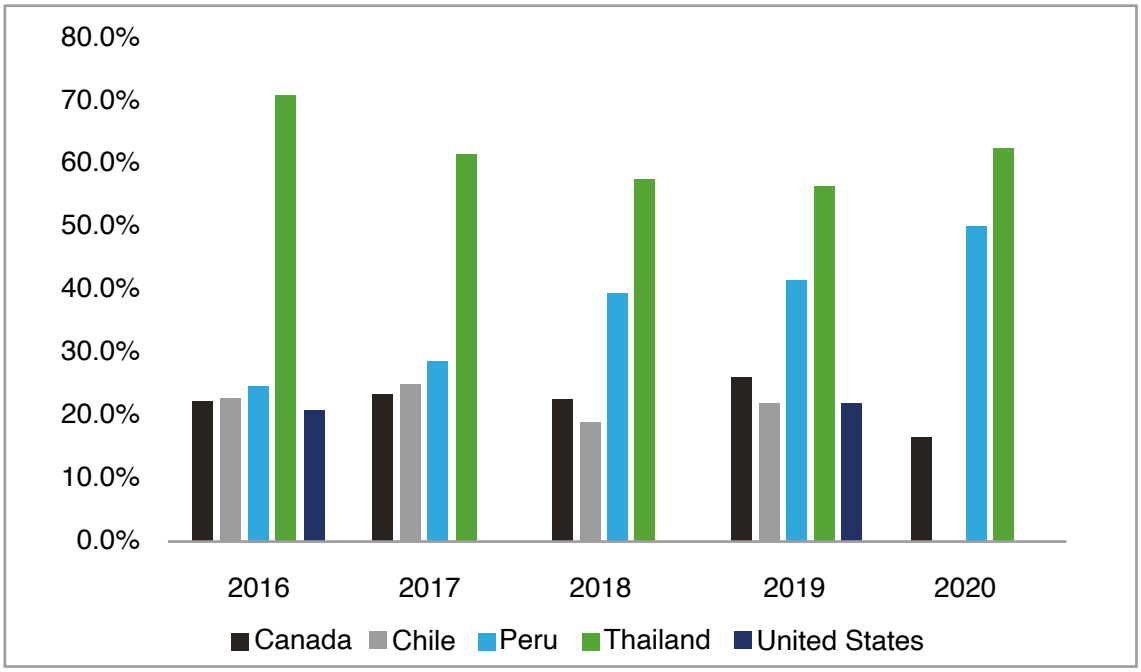
  - The trend for Chile shows that women inventors' inclusion in patent applications hovers around the 20-25% range over the recorded period.

- The average aggregate score of patent applications including resident female as inventors, compared to the total number of patent applications filed by residents in the given APEC economies, was 38.4% between 2016 and 2020.

- The average of patent applications with resident female listed as inventors compared to the total number of patent applications filed by residents between 2016 and 2020 was 21.3% in the United States; 22.2% in Canada; 22.3% in Chile; 36.9% in Peru; and 61.6% in Thailand.

Figure 27

Share of patent applications with resident female listed as inventors compared to the total number of patent applications by residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [120]

While women inventors can be included in a patent application, that does not mean that the patent will be granted by an intellectual property office. Therefore, it is imperative to obtain information about the ***number of patents that have been granted to residents with at least one woman listed as inventor compared to the total number of patents granted to all residents***. This indicator is particularly significant for APEC economies, as it allows them to measure the participation of local women researchers, inventors, and scientists in patents being issued at the domestic level. The data for this indicator was collected for a five-year period (between 2016 and 2020) for Canada; Chile; Peru; and Thailand (Figure 28). The following insights were observed for this indicator:

- Among the four APEC economies who provided statistical data regarding the number of patents that have been granted to residents with at least one woman listed as inventor compared to the total number of patents granted to all residents, Peru is a clear front-runner accounting for 36% for 2020. The economy that took second place in this indicator is Thailand, with 25% of all patents granted being granted to patent applications listing at least one woman as inventor in the same year.

[120] Note: The graph considers patent applications by residents with at least one woman inventor

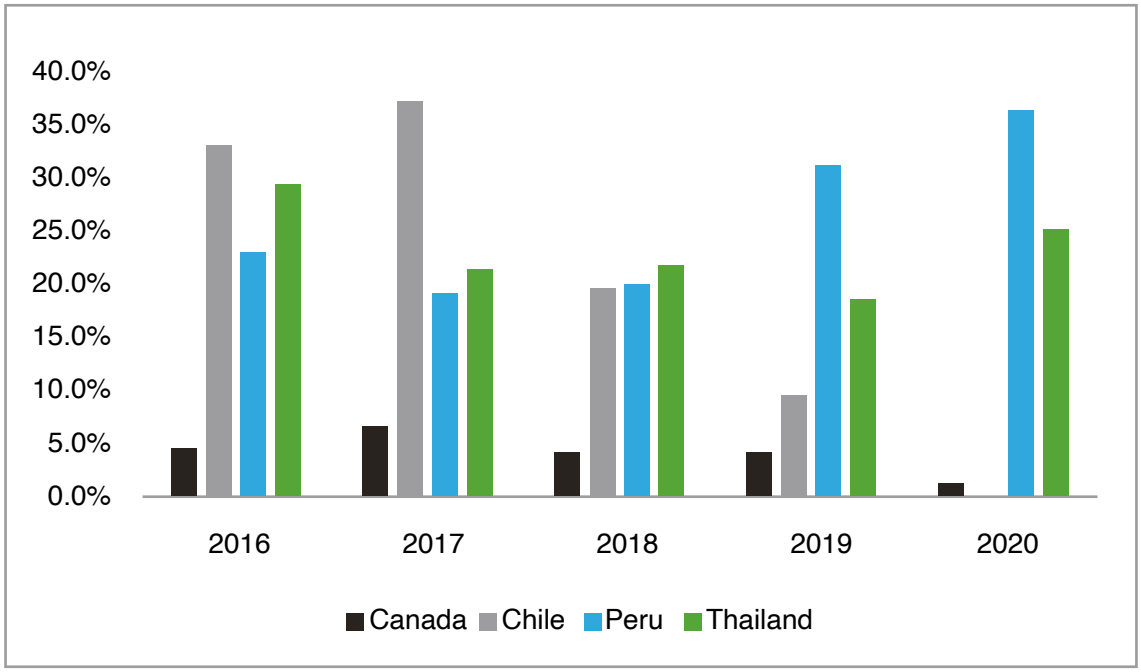
- The observed trends for this indicator for the time period between 2016 and 2020 recorded separate trajectories evident in each economy. Out of the four economies surveyed, Peru is the only economy that has experienced a steady concave upward trend. Thailand's indicator shows an overall upward trend of recovery. While Canada and Chile have both experienced a downward trend in patents granted to women listed as inventors.

- The aggregate average of patent granted with resident women listed as inventors compared to the total number of patents granted to residents in the given APEC economies was 19.5% between 2016 and 2020.

- The average of patents granted that include at least one resident female listed as inventor compared to the total number of patents granted to residents between 2016 and 2020 reached 4.3% in Canada; 23.4% in Thailand; 24.98% in Chile; and 26% in Peru.

Figure 28

Share of patent granted with resident female inventors compared to the total number of patents granted to residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [121]

[121] Note: The graph considers patents granted to residents with at least one woman inventor

The survey was supplemented by secondary research which was conducted to elicit more information about women inventors from APEC member economies and their patenting activity through utilizing the PCT. Hence, the report explores the ***number of PCT applications*** from 17 APEC economies (Australia; Canada; Chile; China; Indonesia; Malaysia; Mexico; New Zealand; Peru; the Philippines; the Republic of Korea; the Russian Federation; Singapore; Thailand; the United States; and Viet Nam) ***that include at least one woman listed as inventor compared to the total number of PCT applications filed*** by the same economy. By including this indicator, APEC economies can monitor and assess the involvement of local women researchers, inventors, and scientists in patents that are seeking protection abroad or internationally between 2019 and 2021 (Figure 29). The following insights were obtained:

- According to the available data, the leading APEC economy for this indicator is Malaysia, with 50% of PCT patent applications being related to local female inventors in 2021. The Philippines ranked second, with 48% of its female inventors related to PCT applications in the same year. The third APEC economy with PCT applications that included at least one resident female listed as inventor is China, with 47% in 2021.

- The observed trend for this indicator between 2019 and 2021 shows a steady increase in women inventors related to PCT applications for the following economies: Australia; Canada; China; Indonesia; Japan; Malaysia; Peru; the Russian Federation; Thailand; the United States; and Viet Nam.

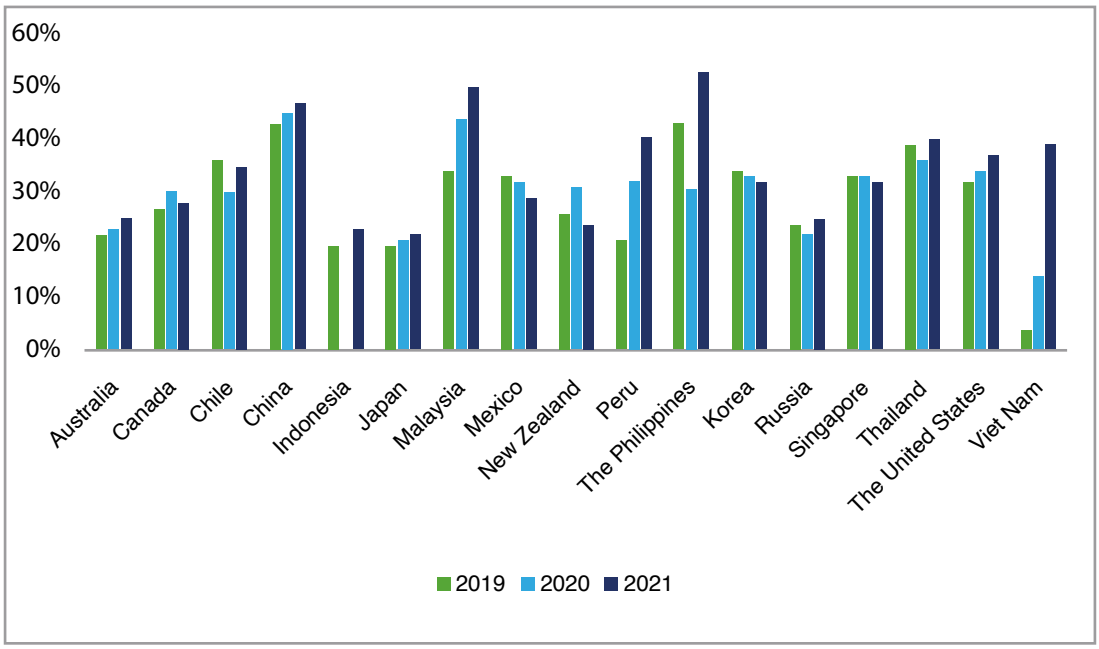
- The indicator also provided insights into the top five APEC economies with the highest average of PCT applications which have listed at least one woman inventor in the same three-year period. These were China at 45%; Malaysia at 43%; the Philippines at 38%; Thailand at 38%; and the United States at 34%.

- The economies that saw the most significant growth in terms of their share of PCT applications with at least one woman inventor between 2019 and 2021 were Viet Nam with an increase of 875%, and Peru with a recorded increase of 62%.

- The aggregate average share of PCT applications with at least one woman listed as inventor in 17 APEC economies signatories to the PCT was 30% between 2019 and 2021.

Figure 29

Share of PCT applications with at least one women listed as inventor (APEC economies)



Source: WIPO

The next indicator shows the ***share of women inventors listed in PCT applications*** from 17 APEC economies members of the PCT over a period of three years, i.e., from 2019 to 2021 (Figure 30). The pertinence of this indicator for APEC economies is significant, as it provides the economies with metrics that can allow them to measure the volume of participation of local women researchers, inventors, and scientists from APEC member economies in invention activities that are seeking patents abroad or internationally through utilizing the PCT.

- The data presented shows that the leading economy in this indicator is the Philippines, with 38% of inventors listed in their PCT applications being women in 2021, followed by Peru, with 29% for the same year. Malaysia and Chile placed third and fourth, respectively, with 27% and 26% of the total inventors in PCT applications being women.

- By observing the data for this indicator, a clear upward trend can be recorded over the past three years for the following APEC economies: Australia; Chile; China; Indonesia; Japan; Malaysia; Peru; the Philippines; the Russian Federation; the United States; and Viet Nam.

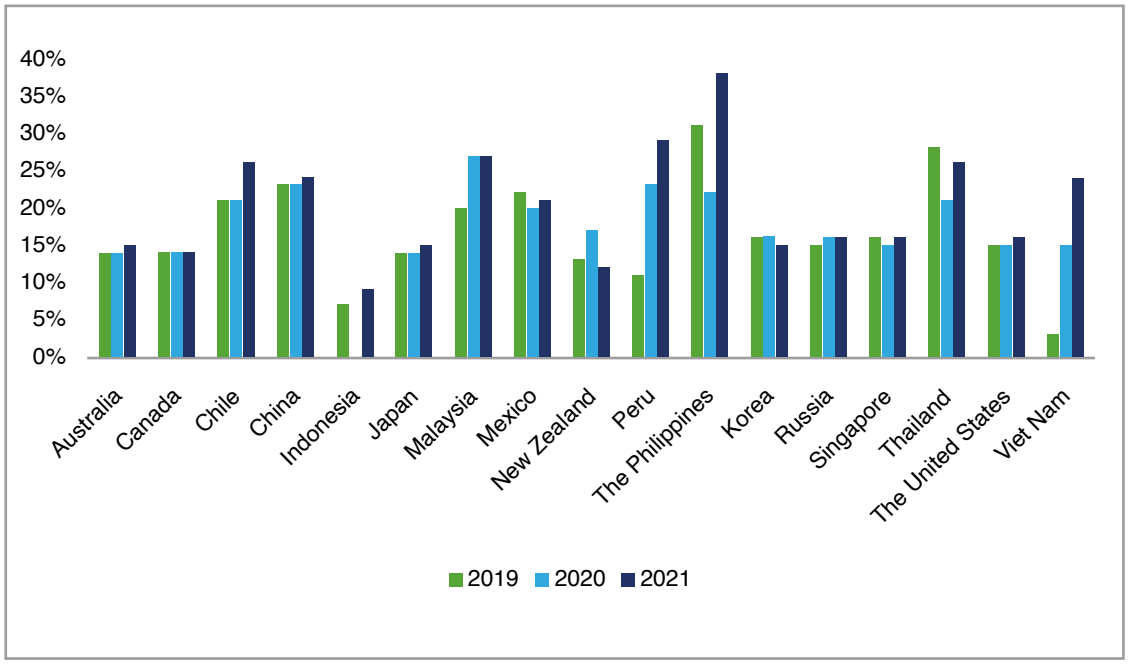
- Additionally, the indicator provides an overview of the top five APEC economies with the highest average the share of women inventors in PCT applications between 2019 and 2021. The Philippines is again the leading economy in this regard, as 30% of inventors listed in their PCT applications were women. The second and third spots are held by Malaysia and Thailand with 25% for the same period. In a similar vein, the indicator for Chile and China shows the same percentile range (23%) for the share of women inventors listed in their PCT applications.

- The economies that saw the biggest growth in terms of their share of women inventors in PCT applications between 2019 and 2021 were Viet Nam with an increase of 700%, and Peru with 164%.

- The aggregate average share of women inventors in PCT applications in 17 APEC economies part of the PCT was 18% between 2019 and 2021.

Figure 30

Share of women inventors in PCT applications (APEC economies)



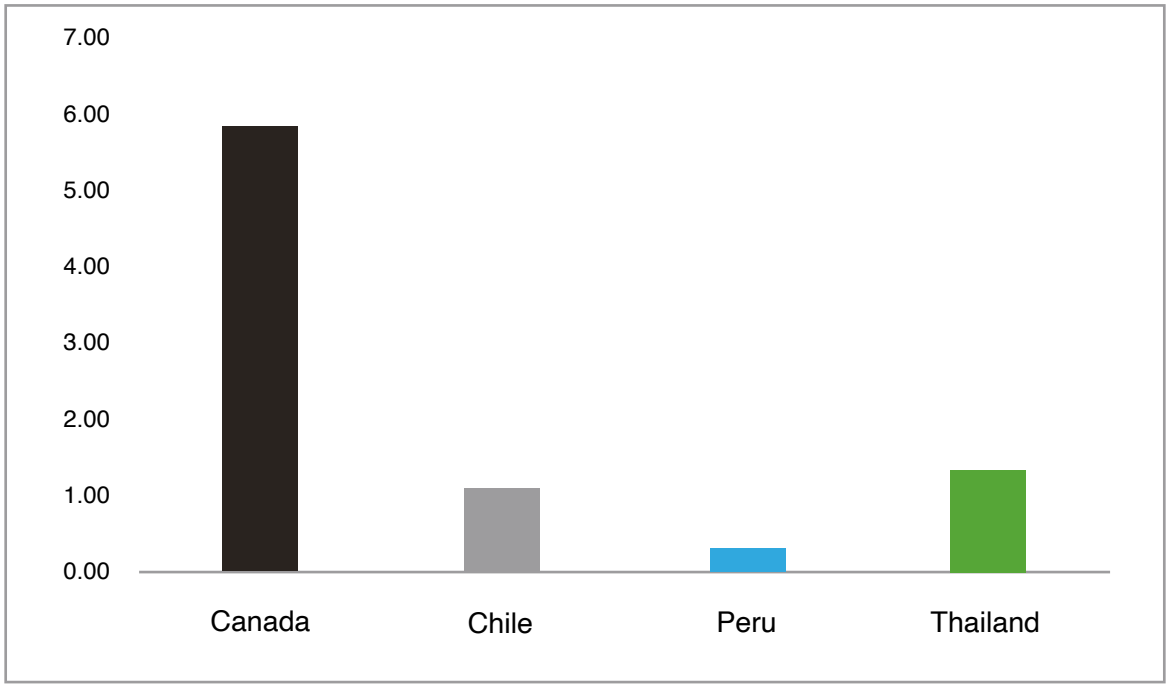
Source: WIPO

Another metric used for this report is the ***ratio of inventorship***, meaning the number of patent applications filed by residents with at least one female listed as inventor per each 100,000 female residents of the same economy. This indicator is of particular relevance for APEC members, as it offers the rate at which local women inventors are inventing and being related to patent applications compared to the overall female population within their respective borders. Hence, patent data collected can provide unique insights into the economic and inventive performance of women, women's overall entrepreneurial activity, and their technological accomplishment.

The survey allowed to build the aforementioned ratio of inventorship from four APEC economies, i.e., Canada; Chile; Peru; and Thailand. The analysis revealed that the leading economy in this regard is Canada, as 5.83 patents with at least one female listed as inventor is being filed per each 100,000 female residents. The second APEC economy according to this indicator was Thailand, with 1.36 patents with female inventors per each 100,000 female residents. Chile and Peru followed with 1.14 and 0.35 respectively (Figure 31).

Figure 31

Ratio of patent applications with at least one resident female listed as inventor per each 100,000 female residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices/ World Bank Open Data

To identify pockets of women's inventorship and patenting across the APEC region, the Qualtrics survey included a question that aimed to elicit responses from the economies on the utilization of the IPC system for patents filed with at least one woman listed as inventor. It is of particular importance to mention that the International Patent Classification (IPC) is a predefined hierarchical system of symbols used by all intellectual property offices across the globe, which divides technological knowledge into eight large sections:

- IPC class A: Human Necessities
- IPC class B: Performing Operations; Transporting
- IPC class C: Chemistry; Metallurgy
- IPC class D: Textiles; Paper
- IPC class E: Fixed Constructions
- IPC class F: Mechanical Engineering; Lighting; Heating; Weapons; Blasting
- IPC class G: Physics
- IPC class H: Electricity

This indicator is extremely relevant in the APEC regional context as it allows economies to track and better understand the technological sectors associated with patents where women's inventorship and research activities are focused. The indicator is also relevant for APEC economies as it provides them with a "glimpse of the future" of women inventors' future patentable product and process development. Five economies provided survey responses in regard to the participation of women in each of the aforementioned categories that compose the IPC system in respect of the total number of applications with at least one female inventor. These were the intellectual property offices of Canada; Chile; Peru; Chinese Taipei; and Thailand (Figure 32). The following insights were obtained for this indicator:

- The analysis shows that all of the five APEC economies experienced higher patent activity targeting IPC class A (the human necessities sector), with an overall average of 45%.

- In the case of Canada, the pockets of women's inventorship and research activities is better distributed than the other four responding economies between four IPC classes: human necessities (IPC class A), performing operations and transporting (IPC class B), chemistry and metallurgy (IPC class C), and physics (IPC class G).

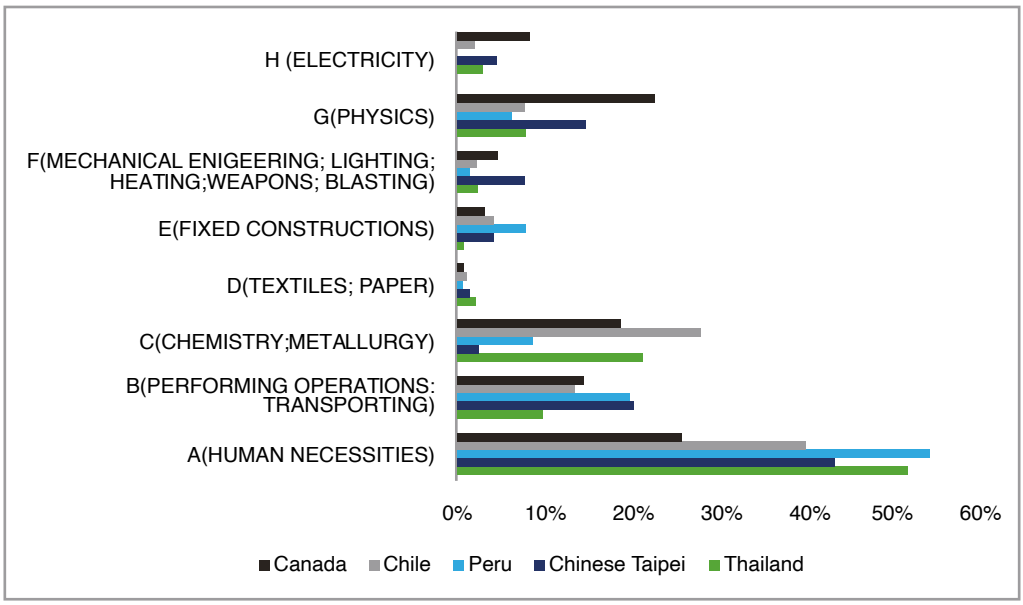
- Patenting activity related to women inventions as it regards to the IPC classes in Peru on the other hand, is heavily concentrated (at 75%) in two sectors: human necessities (IPC class A) and performing operations and transporting (IPC class B).

- No female patenting activity was recorded for inventions in electricity (IPC class H) in Peru. In contrast, the other economies showed patenting activity with this IPC class. However, women's contributions to inventions and patents in this class did not exceed more than 10% in the four other responding economies.

- The sectors with the smallest percentage points in patenting activity related to women recorded are:
  - Textiles and paper (IPC class D) and fixed constructions (IPC class E) with a combined 4% in Canada;
  - Textiles and paper (IPC class D) and mechanical engineering, lighting, heating, weapons, and blasting (IPC class F) with a combined 3% in Chile;
  - Chemistry and metallurgy (IPC class C) and textiles and paper (IPC class D) with a combined 5% in Chinese Taipei;
  - Textiles and paper (IPC class D) and electricity (IPC class H) with a combined 1% in Peru; and
  - Textiles and paper (IPC class D) and fixed constructions (IPC class E) with a combined 3% in Thailand.

Figure 32

Share of patents with at least one woman inventor by International Patent Classification (IPC)



Source: Survey on women & patents conducted to APEC intellectual property offices [122]

These results may suggest the need for APEC economies to promote more parity in terms of participation in various disciplines by women, who may be afraid to enter into fields deemed masculine or lack apparent involvement of female innovators.

[122] Notes:
- Year for Canada: 2020
- Year for Chile: Period 2016-2021
- Year for Peru: 2021
- Year for Chinese Taipei: 2021
- Year for Thailand: 2021

4.2 Women and utility models in APEC: Current situation and performance

A utility model is an exclusive IPR granted in some economies for a technical innovation, usually relating to a product or a device, for a short time, typically ranging from 6 to 10 years, depending on the economy, and giving rise to priority rights under the Paris Convention. Therefore, utility model protection lasts for a shorter period of time than patent protection, which lasts for 20 years.

Utility models grant exclusive rights, just like patents, despite their shorter duration and the fact that they are not available for all sorts of innovations. This allows the owner to prevent others from utilizing the protected innovation for commercial purposes without prior consent or authorization.

Utility model protection is typically designed to protect modest or incremental developments, frequently for mechanical or electrical devices, in economies where it is available and recognized as an IPR. Because utility models are usually granted without undergoing a detailed examination, they offer quick and affordable protection for technical ideas. As a result, they are more accessible to individual inventors or SMEs than patents, which they are comparable to in concept. Utility models are sometimes referred to as "petty patents" in various economies.

The examination of utility models is not equivalent to the patent examination procedure; instead, it is a registration. The link between gender and the number of utility model filings is not clear. Utility models have a lower inventive step requirement than patents and are less expensive. Given that utility models serve as a mechanism of safeguarding incremental ideas and that advanced engineering education should have little impact on one's likelihood of becoming a utility model inventor, the gender gap in utility models should be smaller. Considering the challenges women inventors face in obtaining patents (see chapter 2), utility model applications pose less of a risky venture than patent applications, making them more appealing to women seeking protection for their inventions.[123] Therefore, it is of particular interest in this report to see the relationship between APEC women inventors and utility models as an IP tool for their empowerment.

The statistical data obtained for a first indicator through the Qualtrics survey, i.e., ***the share of utility model applications filed by female residents out of the total number of utility model applications filed by all residents***, is relevant for APEC economies that recognize

- In the case of Canada and Chile only includes patents
- In the case of Peru and Thailand includes patents and utility models
- In the case of Chinese Taipei the distribution refers to patents applications with at least one female applicant

[123] Heikkila, J. (2019) IPR Gender Gaps: A First Look at Utility Model, Design Right and Trademark Filings, at https://link.springer.com/article/10.1007/s11192-018-2979-0

utility models as an IPR, as it allows them to measure inventive activities conducted by resident women. The indicator encompasses women inventors' pursuit of obtaining a utility model by filing an application either as sole inventors or as part of an inventors' team between 2016 and 2020. Its relevance in the context of APEC economies is that it provides them with information regarding women's search, as direct applicants, of ensuring an intangible asset – a utility model – for their own benefit (the opposite figure would be to be listed as an inventor in a utility model application that is being filed and will be owned by a company, research center, or any other organization). The economies whose responses were recorded in the Qualtrics survey are Peru; Chinese Taipei; and Thailand (Figure 33). In this regard, the following trends were observed:

- The statistical data obtained for the three economies that responded to the survey clearly indicates that Chinese Taipei is the leading economy in APEC, with 16.9% of utility model applications being filed by at least one women applicant to protect their inventions in 2020. According to this indicator, Peru ranked as the second APEC economy in 2020, as 15.8% of its petty patents were filed by women applicants.

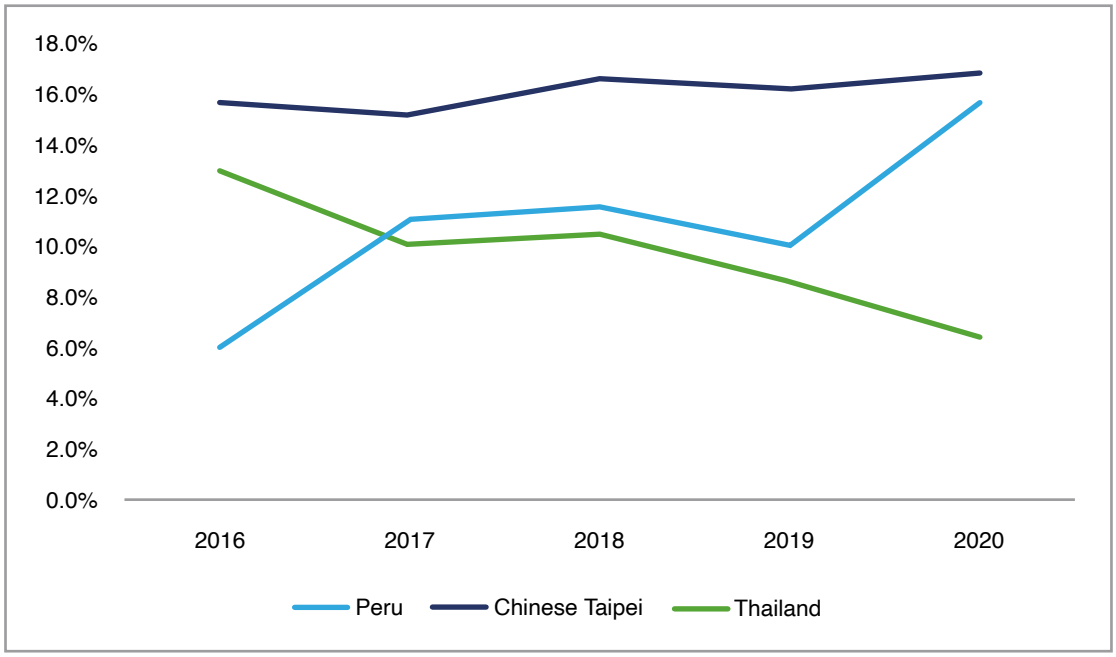
- The observed trend for this indicator shows that Chinese Taipei experienced a stable, slight upward trajectory in women inventors' utilization of utility models over the course of five years. Over the same five-year period, Peru recorded a stable and somewhat sharp upward trend in women's interaction with utility model applications. However, the statistical data of women inventors in Thailand showed a downward trend in utilizing utility model applications.

- The average share of utility model applications with at least one resident woman applicant over the total utility model applications filed by residents between 2016 and 2020 was 9.8% in Thailand; 10.9% in Peru; and 16.2% in Chinese Taipei.

- The aggregate average of utility model applications with at least one resident women applicant over the total utility model applications filed by residents in the three APEC economies was 12.3% between 2016 and 2020.

Figure 33

Share of utility model applications filed by female residents out of the total number of utility model applications filed by residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [124]

The survey conducted through Qualtrics provided an interesting view of the data regarding the ***share of utility models granted to female residents out of the total number of utility models granted to residents***. The indices obtained are of particular interest to APEC and its member economies as it provides a glimpse into women's ownership of intangible assets, such as utility models, that are capable of being monetized, licensed, sold, or negotiated in the market, similar to any other tangible asset. Hence, the data obtained measures and shows the number of utility models with at least one woman holder that has been granted to residents compared to the total number of utility models granted to all residents across APEC economies that provided gender-disaggregated data. According to the data collected, we could distill insights about resident women's participation in the petty patent landscapes of Peru; Chinese Taipei; and Thailand (Figure 34). The results informed the following insights:

- Peru is the leading economy in this indicator among the analyzed APEC economies, with more than 11% of its resident utility models being granted to resident women inventors in 2020. According to this indicator, the second economy in APEC is Chinese Taipei, with resident women inventors accounting for 6.08% of all utility models granted for the same year.

[124] Note: The graph considers utility model applications by residents with at least one woman applicant

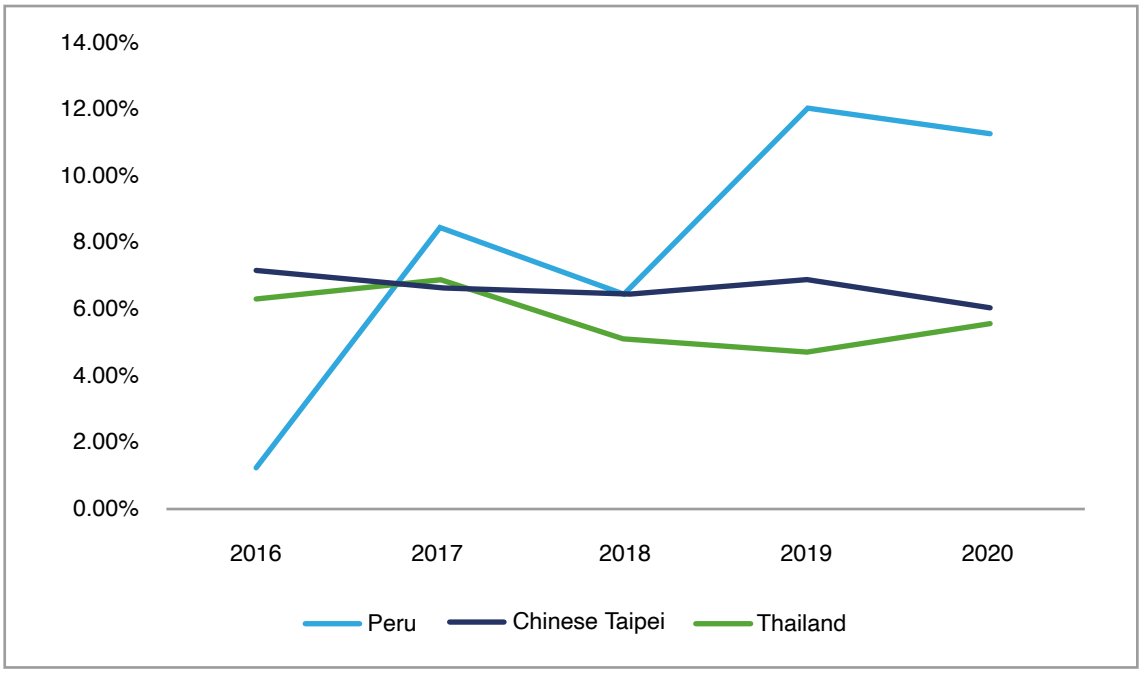
- The statistics provided by the economies allowed for a more detailed view of the utility model obtained by resident women inventors in the three economies between 2016 and 2020. Based on the data collected, Peru is the only APEC economy that experienced an upward trend in women inventors obtaining a utility model.

- The aggregate average of utility models granted to female residents compared to the total number of utility models granted to all residents in the given APEC economies was 6.8% between 2016 and 2020.

- The average of utility models granted to female residents out of the total number of utility models granted to residents between 2016 and 2020 was 5.7% in Thailand; 6.7% in Chinese Taipei; and 7.9% in Peru.

Figure 34

Share of utility models granted to female residents out of total number of utility models granted to residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [125]

Measuring the ***share of utility model applications filed by residents that include at least one woman applicant that has been denied or abandoned*** is another metric that the Qualtrics survey aimed to collect data on. The indicator is relevant to APEC because it provides quantified insights into the number of utility model applications filed by women that

[125] Note: The graph considers utility models granted to residents with at least one woman holder

have been denied and the number of "abandons per office action." In many cases, the data on "abandons per office actions" for each individual application is a valid metric to interpret the level of speculation in the applications. Therefore, in many cases, the applications that have high abandon rates are highly speculative and ultimately have little value leading to the applicant's abandonment of the utility model application. The economies whose responses were recorded in the Qualtrics survey are Peru and Thailand (Figure 35).

Similar to patents, applicants who file a utility model application may abandon it later due to the lack of financial resources to go through the entire process to obtain a utility model. Additionally, the reason for abandoning utility model applications by female inventors, or inventors in general, may revolve around the inventor's lack of knowledge or lack of access to advisory services throughout the process of obtaining a utility model. These factors are crucial when inventors are going through the utility model prosecution process, as many female inventors abandon their utility model applications due to their inability to comply with certain requirements of the process, for example, not responding on time to the intellectual property office legal or technical observations.

The analysis of the recorded responses translated into percentage terms the number of utility model applications filed by residents that include at least one woman applicant which have been denied or abandoned, compared to the total number of utility model applications filed by all residents. The following trends were recorded:

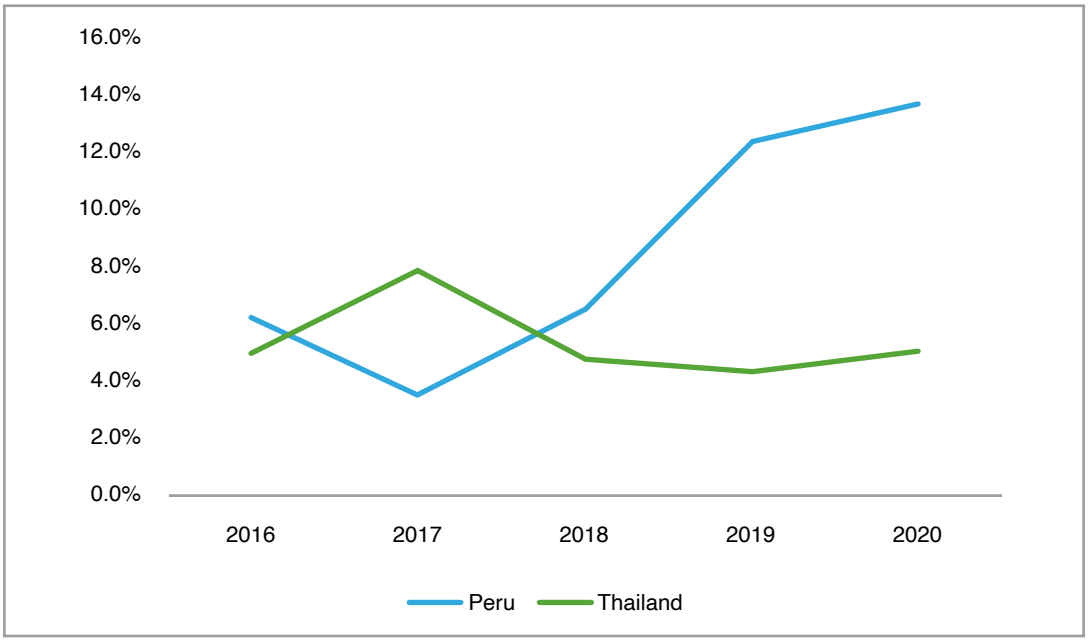
- The observed trend for this indicator for the past five years shows a slight decrease for the case of Thailand; while Perú has experienced a growth in the share of utility models filed by women applicants being denied or abandoned.

- The aggregate average of utility model applications filed by female residents denied or abandoned out of the total number of utility model applications by residents in the given APEC economies was 6.9% between 2016 and 2020.

- The average number of utility model applications filed by female residents denied or abandoned out of the total number of utility model applications filed by all residents between 2016 and 2020 was 8.5% in Peru and 5.4% in Thailand.

Figure 35

Share of utility model applications filed by female residents which are denied or abandoned out of total number of utility model applications by residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [126]

Obtaining statistics and information on the ***number of utility model applications that include at least one resident woman listed as inventor compared to the total number of utility model applications filed by all residents*** is of particular interest to APEC. This indicator allows APEC economies to measure the participation of local women researchers, inventors, and scientists in inventive activities that might ultimately lead to obtaining utility model protection over the course of five years, i.e., between 2016 and 2020. The economies that provided their inputs for this indicator are Peru and Thailand (Figure 36). The statistics that were obtained through the survey were translated in percentage points to elicit the following data on women inventors' participation:

- Based on the statistical data obtained, the analysis showed that the leading APEC economy for 2020 is Thailand, with 48% of its utility model applications listing resident female inventors.

- The trends observed for this indicator for both economies over a five-year period show an upward trajectory for Thailand and Peru. While Peru's trend shows an incremental increase in the number of utility model applications that include at least one resident woman listed as inventor, Thailand experienced a significant jump from 2017 to 2018, sustained by incremental increases in the following two years.

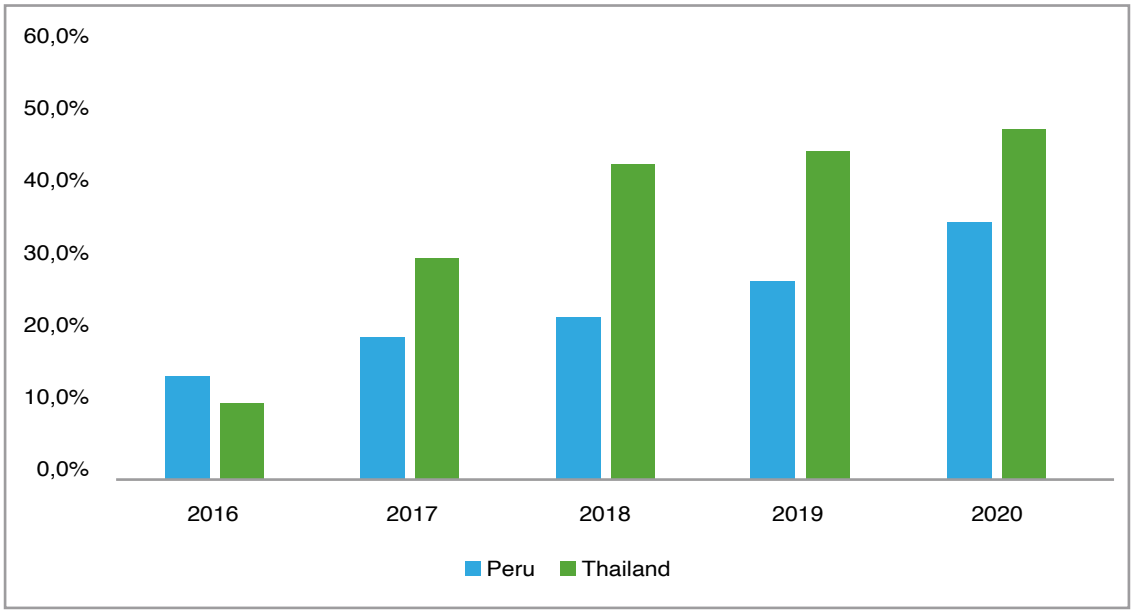
[126] Note: The graph considers utility model applications by residents with at least one woman applicant

- The average of utility model applications with resident female women as inventors compared to the total number of utility model applications filed by residents between 2016 and 2020 was 21.6% in Peru and 35.1% in Thailand.

- The aggregate average of utility model applications with resident women listed as inventors compared to the total number of utility model applications filed by residents in the given APEC economies was 28.3% between 2016 and 2020.

Figure 36

Share of utility model applications with resident female inventors out of the total number of utility model applications by residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [127]

Statistical data can be used to pinpoint the pockets of women's inventorship. While data on the number of patents granted to women is a great indicator to track women's inventorship, utility models must not be excluded from this equation, as they provide equally valuable insights. Therefore, it is imperative to obtain information about the ***number of utility models that have been granted to residents with at least one woman listed as inventor compared to the total number of utility models granted to all residents.*** This indicator is particularly significant for those APEC economies that have recognized utility models as IPRs, as it allows them to measure the participation of local women researchers, inventors, and scientists in petty patents being issued at the domestic level.

[127] Note: The graph considers utility models by residents with at least one woman inventor

The data for this indicator was collected for a five-year period (between 2016 and 2020) from two economies, i.e., Peru and Thailand (Figure 37). The following insights were observed for this indicator:

- Among the two APEC economies that provided statistical data regarding the number of utility models that have been granted to residents with at least one woman listed as inventor compared to the total number of utility models granted to all residents, Thailand is a clear front-runner accounting for 32% for 2020.

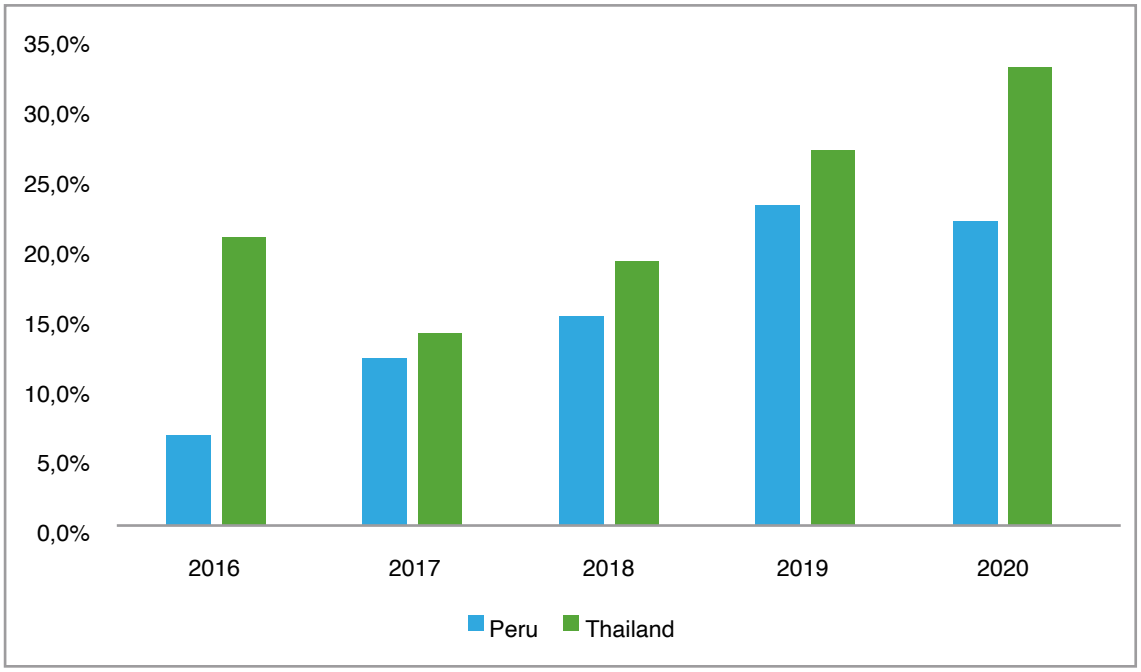
- The observed trends for this indicator are quite opposed. While Thailand recorded a convex upward trend in utility models with at least one women listed as inventor being granted, Peru experienced a concave downward trend, peaking in 2019 and dropping the next year.

- The aggregate average of utility models granted to resident women listed as inventors out of the total number of utility models granted to residents in the two APEC economies was 19.2% between 2016 and 2020.

- The average of utility models that include at least one resident woman listed as inventor out of the total number of utility models granted to residents between 2016 and 2020 was 15.7% in Peru and 22.7% in Thailand.

Figure 37

Share of utility models granted to resident female inventors out of the total number of utility models granted to residents (APEC economies)



Source: Survey on women & patents conducted to APEC intellectual property offices / TIV [128]

Based on the statistical data collected from the Qualtrics survey, their subsequent analysis, and the creation of metrics we were able to develop indicators by which to measure women inventors' participation in the economies' domestic patent and utility model systems. While not all of the economies surveyed provided statistical data, the analysis did inform the current situation of women's participation in the IP system in the APEC economies that did supply their inputs. Thus, the results obtained demonstrate a positive trend of increased female involvement in the sphere of intellectual property by the respondent APEC economies. However, the results also indicate that, despite the progress, a considerable amount of work still needs to be done for APEC economies to close the IP gender gap and reach gender equality in their respective IP systems.

[128] Note: The graph considers utility model applications by residents with at least one woman inventor

5. APEC measures and initiatives to foster women in patents

A measure can be defined as one or a set of specific actions (e.g. a program, enactment of law, others) adopted by a given economy to create a desired change in relation to a particular topic. For this study, the measures that have been or are being implemented by APEC economies have been identified, collected, reviewed, and analyzed. This was done to map and understand what measures APEC economies have taken to address the IP gender gap and the shortages women sadly face in critical know-how when navigating their respective economies' patent and utility model systems. The measures implemented had to also encompass steps that provide women inventors with the necessary knowledge, skills, registration, commercial use, and promotion of their patents or utility models in their respective economies.

In order to close the IP gender gap, it is understood that the target audience of the measures implemented by APEC member economies and their respective IP offices should exclusively target women inventors or mainly target women inventors so as to precisely cultivate sustained growth in the approach and use of patents and utility models by women inventors, innovators, and entrepreneurs.

The measures addressed in the following section are related to the following key areas:

- **Raise awareness:** Correspond to activities that seek to inform and educate women in APEC about IP with the intention of influencing their knowledge, attitudes, and even behaviors to achieve a greater approach to the use of intellectual property tools during their creation, research, invention, innovation, and entrepreneurship activities (i.e., talks, conferences, seminars, among others).

- **Capacity building:** Correspond to activities aimed at developing or deepening the knowledge, skills, and abilities of women in APEC in IP matters that may allow them to have better tools for the protection of their creation, research, invention, innovation, and entrepreneurship activities (i.e., training programs, courses, mentorship, workshops, among others).

- **Patent filing:** Correspond to activities through which direct support is provided to women inventors, entrepreneurs, or innovators in APEC in order to file for patents and utility models before domestic intellectual property offices (i.e., patent draft advisory and technical assistance services, among others).

- **Commercial benefit:** Correspond to activities aimed at promoting commercial use or business transactions regarding women's inventions or patents/utility models in APEC (i.e., trade fairs, matchmaking events, virtual showcases, among others).

- **Exposure and promotion:** Correspond to activities whose purpose is to publicize women's patented inventions in APEC, their success stories, and challenges faced in the use of the patent system, among other aspects that can make visible their contribution to the economic, social, and technological development of different economies (i.e., product exhibitions, publications, among others).

- **Others:** Correspond to any other activity or measure carried out at APEC targeting women not included in the previous options (i.e., new legislation, patents fee waiver, among others).

According to the definitions provided above, 8 of the APEC economies studied for this report (57% of surveyed economies and 38% of all 21 APEC economies) have provided information about the measures (initiatives, activities, or programs) that they have implemented or are currently implementing, and that are aimed at strengthening the relationship between women and patents/utility models in at least one of the mentioned areas.

Details of the main measures implemented by the intellectual property offices of select APEC economies are presented in the following sections. This information has been provided by the economies through the survey conducted for the project (see Annex 2), the interviews conducted with five intellectual property offices as a representative sample from each continent where APEC operates, and through complementary documentation compiled through secondary research of the websites of the domestic intellectual property offices.

5.1 IP Australia

Although the share of women inventors that compose the list of unique Australian inventors included in patent applications in Australia increased from 4% in 1980 to a very interesting 12% in 2016, IP Australia does not set a specific target for female representation in IP, nor does it provide internal programs specifically targeted toward increasing female representation.

However, it does work with female-owned businesses to develop case studies, provide educational materials to organizations working in the female founder space, and publish inspiring articles and reports on women in innovation in Australia. Much of its work is oriented around the goal of reaching women in the private sector and providing education and guidance.

CHIEFS IN INTELLECTUAL PROPERTY (ChIPs)

ChIPs is an international organization with chapters throughout North America, Europe, and Oceania that connects women in STEM, law, and policy. Its newly formed Australia and New Zealand Chapter partnered with the Intellectual Property Society of Australia & New Zealand (IPSANZ) to host its first official chapter event in September 2022.[129] This event was free and open to women who did or did not have a ChIPs membership, and it aimed to provide education from seasoned IP professionals and a space for women to network.

IP SUMMIT

In 2018, IP Australia presented this summit in Melbourne and Sydney to provide attendees with general information on IP, creating and protecting their brands, networking advice, and insight into how to use R&D to grow their businesses and tools for global expansion.[130] This event was not specifically geared toward women, but the information would be beneficial for small businesses. The keynote speaker, Catherine Ball, is the Co-Founder and Chief Engagement Officer of SheFlies, a project that gives women and girls the opportunity to work with drone technology.[131]

AUSTRALIAN INTELLECTUAL PROPERTY REPORT 2022

The Australian Intellectual Property Report is a product of IP Australia's Office of Chief Economist (OCE), established in 2012 to research IP issues and provide economic advice to IP Australia and other government agencies. It has a specific, but brief section on patents and the representation of women and girls in STEM, including a short summary of the industries in which they are more involved (biotechnology and organic fine chemistry).

The latest Australian Intellectual Property Report of 2022 found that the underrepresentation of women and girls in STEM professions is an ongoing issue for the economy. According to the evidence, there does not appear to be a consistent difference in productivity between men and women in creative and inventive endeavors. Numerous obstacles can stand in the way of women's achievements and activities. According to studies on the gender of patent inventors, there are still significant gender disparities between economies and technological disciplines. But the number of women filing patents is increasing. In 2016, there were 17 female inventors, up from 4% in 1980, and they made up about 12% of the original Australian

[129] https://bit.ly/3wJGais
[130] https://bit.ly/3Y6ZhP2
[131] https://bit.ly/3Ri2Hwf

inventors listed on patent applications in Australia.[132] Over that time, the proportion of female inventors in Australian filings for civil engineering remained low, at little over 10%. In contrast, it increased from less than 20% to more than 50% in biotechnology and organic fine chemistry.[133]

Australian citizens file the majority of their international patent applications through the PCT route. According to WIPO data on PCT applications from Australia that list female inventors, the percentage of women inventors has been rising. Around 25% of PCT applications from Australia list at least one female inventor, a share that has grown steadily over the last five years and increased by two percentage points in 2021.[134] The boost in applications attributable to mixed teams, which include both male and female inventors, is the main cause of this participation increase. The findings might result from changes in the inventor team's membership or organizational practices, with women inventors more likely to have their contributions acknowledged on patent applications.

NEWS

IP Australia regularly publishes news articles on its website about female inventors and works being done to promote female innovation in IP. For example, for International Women's Day 2022, its offices conducted a Q&A session with Dr. Kayleen Manwaring, a researcher studying law, online content regulation, and IP. She discussed challenges facing women pursuing careers in STEM fields, common misconceptions, and her current research.[135]

National Aborigines and Islanders Day Observance Committee (NAIDOC) Week commemorates the culture and achievements of Australia's native peoples. The 2018 NAIDOC Week theme was "Because of Her, We Can." To celebrate, IP Australia shared articles on its website about women who are key players in Australia's IP landscape. These included articles on Terri Janke, a lawyer whose firm provides counsel to Indigenous Australians about protecting cultural and intellectual property, and Julie-Ann Lambourne, who works to develop Indigenous businesses.[136]

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[132] IP Australia (2022) Australian Intellectual Property Report 2022, at https://www.ipaustralia.gov.au/tools-and-research/Professional-resources/Data-research-and-reports/australian-ip-report-2022
[133] Ibid.
[134] Ibid.
[135] https://bit.ly/3JtVkQn
[136] https://bit.ly/3XSDZov

5.2 CIPO

The Canadian system encourages the participation of women in IP through partnerships with the private sector, participation in promotional events, and publications of statistical analyses focusing on women. This economy's strengths lie in increasing awareness of women in STEM and education about commercialization.

INITIATIVES AND PROGRAMS

CIPO is partnering with organizations that support women entrepreneurs across Canada. For example, Women Entrepreneurs Saskatchewan (WESK) lists CIPO as a resource directing its members to CIPO's website for tips on jumpstarting their patent application process, IP strategy to integrate into business plans, and fact sheets, among others.[137] CIPO works with Women in Business New Brunswick (WBNB), Sandpiper Ventures, Women in Aerospace Canada (WIA-Canada), Women Entrepreneurship Knowledge Hub, and Ecole des entrepreneurs du Quebec and Communitech, among others. Through these collaborations, CIPO's regional IP advisors deliver seminars and webinars on various intellectual property-related topics such as IP foundations and IP strategy, holding individual meetings with women entrepreneurs as well.

EVENTS

CIPO and the larger Canadian innovation community have participated in several events, including World IP Day, International Women's Day, the USPTO-led "Women in IP" program, webinars, "Women in STEM: Barriers and Leadership (A Way Forward)" (a panel and networking event), and Canadian Agency of Innovation, Science and Economic Development (ISED) Canada's Women in STEM Network.

Women in STEM Network

CIPO has partnered with ISED to promote and support women in STEM fields. ISED's Women in STEM Network provides a forum for exchanging information on best practices, current activities, and ideas for advancing women in STEM within ISED. Members act as ambassadors for their respective sectors, seek their colleagues' feedback, and, in particular, offer advice and insights to inform the development of activities.

[137] https://wesk.ca/resources/canadian-intellectual-property-office/

On International Women's Day, CIPO was invited to join a conversation on social media using the hashtag #IWD2022. CIPO participated in multiple events, one of which was a discussion with Dr. Janice Fitzgerald hosted by ISED's Women's Network. Additionally, other discussions were organized to learn more about the achievements of Women of Impact in Canada by visiting Women and Gender Equality Canada's online gallery.

CIPO, with the Business Development Bank of Canada (BDC), hosted regional free networking events across Canada. The theme for World IP Day 2018 was "Powering change: Women in innovation and creativity". CIPO also participated in the 2022 International Women's Day theme "Gender equality today for a sustainable tomorrow".

CIPO provides women inventors with access to webinars such as ACS Webinar "How to succeed as a female in Academia and Industry". The webinar answered what it takes to create a rewarding and successful career as a female in academia or the pharmaceutical industry.

On the other hand, "Women in IP" was an event led by the USPTO that included the participation of several international Intellectual Property Offices (IPOs). Both Virginie Ethier and Christine Piche from the CIPO spoke about women in patenting in Canada. In Christine Piche's presentation, she highlighted several key statistics, including differences in sources of IP information between men and women and differences in IP registration patterns in women-led businesses.[138]

Also led by the USPTO, international IPOs, including CIPO, were encouraged to collaborate on joint projects, namely a patent drafting competition. This is based on a current USPTO program that calls on law students to prepare specifications, draft claims for hypothetical invention statements, and present them before a judging panel.

FAMOUS FIVE WOMEN OF IP

CIPO has published several success stories on Canadian women entrepreneurs, including the series Famous Five Women of IP. This series provides overviews of inspiring, successful, and creative women who have utilized different types of IP to protect their intangible assets. The five women in the series come from different backgrounds, and span the IP spectrum from trademarks, copyrights, and patents.

[138] https://www.youtube.com/watch?v=idqim_1Y0hU

Margaret Atwood: A novelist turned inventor

Margaret Atwood, a well-known and renowned Canadian novelist, is also an inventor. She is the creative force behind the LongPen, a remote signing tool that enables writers to perform readings, engage in conversation, and hold book signings without being in person. Margaret Atwood co-founded Syngrafii Inc. The LongPen is a remote-controlled pen and videoconferencing device that was first designed to provide "live" book signings in remote locations. The LongPen preserves an original handwritten record in pen and ink while allowing for individually inscribed long-distance signatures and writing. Different speeds, pen pressures, and pen types were used to compare LongPen specimens with control specimens. LongPen inscriptions may be linked to their author or recognized based on preliminary evidence. Artifacts are subdued and retain their original size and shape. However, there were certain restrictions with recording lengthy tapering strokes, delicate connecting strokes, and variations in line width.

The introduction of Syngrafii sPaperTM made the company a market leader in digital signature technology in 2014. Margaret Atwood also has several patents covering the LongPen technology, showing how important it is to her business strategy to safeguard her intellectual property.

Ms. Atwood started writing when she was just six years old. She is still a very involved writer at the age of 78. Margaret changed the literary landscape of Canada and established a place for women in literature with her literary works and their complex and mysterious female characters. She has received various honors, including the Man Booker Prize for her book The Blind Assassin. Some of her works have also been adapted for stage and screen, including The Handmaid's Tale, which recently won an Emmy, and the television series Alias Grace.

Source:
https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/wr04535.html

"WOMEN'S PARTICIPATION IN PATENTING"[139]

"Women's Participation in Patenting: An Analysis of Patent Cooperation Treaty Applications Originating in Canada", a 2017 report, builds on work done by the WIPO and finds that Canada has not seen an appreciable rise in women inventors since the early 2000s. This report is particularly useful in highlighting Canada's progress relative to the rest of the world and other G7 economies.

By going into deeper detail about Canadian women's PCT applications by technology area and comparing these to women globally, it shows that Canada lags in most fields, especially food chemistry (a 17.4% disparity). This document helps identify the areas wherein women are lagging but does not provide an analysis of the reasons behind this or propose ways of addressing it.

[139] https://www.ic.gc.ca/eic/siTe/cipointernet-internetopic.nsf/eng/h_wr04331.html

WOMEN IN AI

Similarly, CIPO has included research on gender as part of its work plan. This prompted the development of publications that evince the trends of the role of women in the patent and IP system in Canada. For example, CIPO's research efforts resulted in developing a paper titled "Processing Artificial Intelligence: Analysis from a Canadian Perspective."[140] The paper aimed to measure innovation pertaining to artificial intelligence (AI) by utilizing patent activity to mean as a proxy for measuring innovation in a particular sector.

As a comprehensive attempt to measure AI patenting activity, CIPO's study measured how their female inventors were faring in the field of AI and compared it to the global average. To better understand female participation in AI in Canada, CIPO explored the evolution of women's involvement in AI over a twenty-year period, spanning between 1998 and 2017.[141] The figures obtained showed new researchers by gender entering the field based on their participation as captured by the first patent application published. Unlike the trend observed for women in Canada, which was relatively steady over the twenty-year period, the international trend was much different, with female representation as a share of the total number of researchers decreasing over time. Through this paper, CIPO uncovered significant findings about the involvement of Canadian women inventors in the field of AI, according to which one in eight Canadian AI inventors was a woman.[142]

WOMEN IN STEM WORKING GROUP

Another initiative that CIPO has pioneered to support women in STEM (and patents) is the Women in STEM Working Group. The Women in STEM Working Group is a departmental Working Group comprised of employees representing each sector to ensure participation across the portfolio. The members of the Working Group serve as ambassadors for their respective industries, seek their colleagues' feedback, and, in particular, offer advice and insights to inform the development of activities. Members would spend up to three hours per month on related tasks and meetings. Creative and dynamic employees collaborated with colleagues to promote women's STEM presence within the department. The group organized a "Women in STEM: Systemic Barriers and Leadership (A Way Forward)" panel and networking event.

[140] Collette et al. (2020) Processing Artificial Intelligence: Highlighting the Canadian Patent Landscape, at https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/h_wr04776.html
[141] Ibid.
[142] Ibid.

5.3 INAPI

INAPI has employed different measures to address the gender gap in its domestic IP system. Based on their responses to the Qualtrics survey, INAPI periodically assess the performance of women inventors' participation in the patent and utility model landscape through collecting gender-disaggregated data and statistics. INAPI began publishing reports on the statistical data it collects regarding women's participation and involvement with the Chilean IP system in 2020, with its first Gender Report on Patents which is only available in Spanish. Subsequently, INAPI published a Gender Report on Trademarks in 2021, and it's latest Gender Report on Patents in 2022. The 2022 Gender Report on Patents contains a section on technological gender trends, offering statistical data on IPR filing sorted by the gender of the applicant or inventor.

INAPI has an Inventor Assistance Program, which is a joint program with WIPO supporting small businesses and gives out an Award for Inventor of the Year. Additionally, INAPI's website offers an open data tool for accessing these statistics.

PUBLICATIONS

The "Gender Report: Analysis of Women Inventors in Chile" was written based on data collated from the Civil Registry of Chile, WIPO's International Patent Classification (IPC), and the Tax Service Department of Chile to create the Gender Parity Index (GPI).[143] This 2022 document reports the proportion of patents with at least one female inventor, the proportion of female inventors over time, the proportion of female inventors across different tech fields, the types of applicants, the number of female inventors across universities, the proportion of female inventors across universities, and the proportion of teachers becoming inventors, by gender.[144]

INAPI recently published the "INAPI Report 2022: Fostering Innovation and Entrepreneurship Through Industrial Property", in which a section is dedicated to technological and gender trends in the application and registration of patents and trademarks by companies, SMEs, micro businesses and individuals. Additionally, the report looks into patent applications filed by Chilean inventors through the PCT. The section titled "Gender approached industrial property trends" provides gender-disaggregated patent data. Namely, the report finds that the share of Chilean female inventors that filed PCT applications in 2021 reached an all-time high of 26%, a figure that exceeds the world average by nine percentage points (Figure 38).[145]

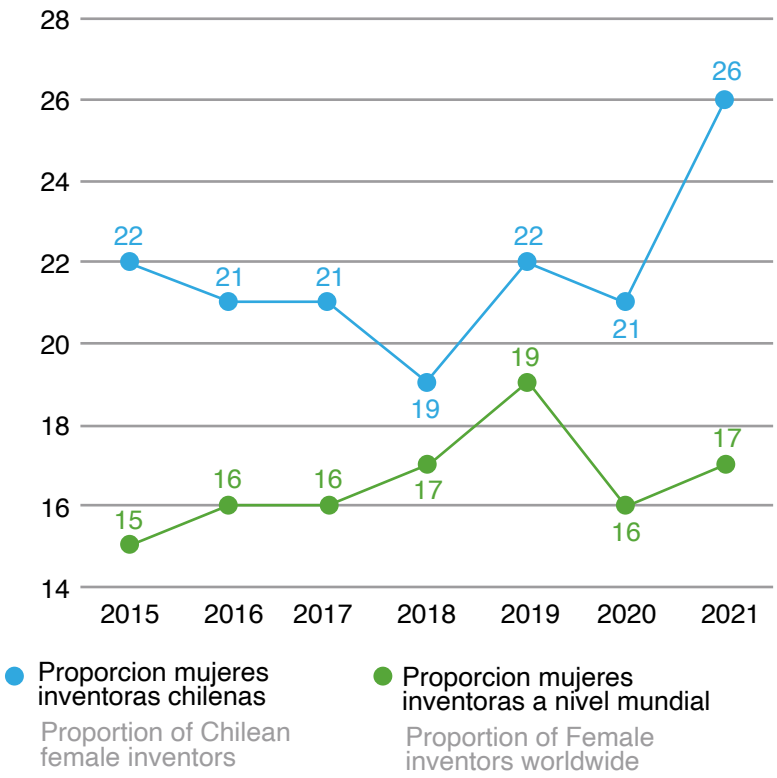
[143] https://www.wipo.int/about-ip/en/ip_innovation_economics/gender_innovation_gap/how-to-create-innovation-gender-indicators-the-chilean-way.html

[144] https://www.inapi.cl/docs/default-source/2022/centro-documentacion/estudios/reporte-de-genero/reporte_de_genero_inapi_2022_.pdf?sfvrsn=3cd3a278_2

[145] https://www.inapi.cl/docs/default-source/2022/cuenta-publica/reporte-inapi/reporte_inapi_2022-versi%C3%B3n-final-para-publicar.pdf?sfvrsn=31b77076_2

Figure 38

Chilean female inventors filing PCT applications vs. global female inventor PCT applications (2021)



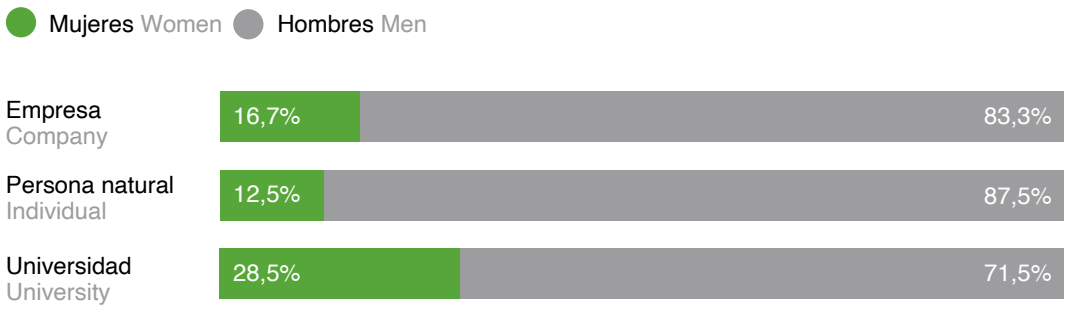
Source:
https://www.inapi.cl/docs/default-source/2022/cuenta-publica/reporte-inapi/reporte_inapi_2022-versi%C3%B3n-final-para-publicar.pdf?sfvrsn=31b77076_2

Additionally, the report found that the proportion of Chilean female inventors that filed domestic patent applications in 2021 accounted for 20.52% of all patent applications filed for that year.[146] INAPI's report further went on to state that universities in Chile have maintained the highest proportion of female inventors who have filed a patent application, when compared to patent applications filed by companies or individuals (Figure 39).[147]

[146] Ibid.
[147] Ibid.

Figure 39

Patent application origin by gender (Chile, 2021)



Source:
https://www.inapi.cl/docs/default-source/2022/cuenta-publica/reporte-inapi/reporte_inapi_2022-versi%C3%B3n-final-para-publicar.pdf?sfvrsn=31b77076_2

INAPI AWARD FOR INVENTOR OF THE YEAR

Pilar Parada, a Chilean biochemist, was the 2020 INAPI Inventor of the Year. 18 patent registrations and more than 140 international patent applications are part of her outstanding track record as inventor. Of her victory, Loreto Bresky, the director of INAPI, stated, "Pilar Parada is a clear example of the valuable role played by women inventors in relevant sectors of economic activity." This award is a great promotional tool for women in STEM and intellectual property.

Pilar Parada: Chile's Inventor of 2020

Pilar Parada is a mother, wife, aunt, and daughter from Chile. She was appointed as the General Manager of Fraunhofer Chile in January 2017. She holds a biochemistry degree from the University of Chile, a doctorate in molecular biology from the Autonomous University of Madrid, and an Executive Certificate in Innovation Strategy from the Massachusetts Institute of Technology (MIT). She has also served as the Fraunhofer Chile Biotechnology Center's director for two years.

Before joining Fraunhofer Chile, she formerly held the role of General Manager at the Chilean business BioSigma. She received the Avonni Award for Innovation in Mining and Metallurgy while working at BioSigma for successfully employing bacteria at ambient temperatures to achieve copper bioleaching (dissolution) from the extremely challenging mineral known as primary copper sulfides.

Throughout her career, she has received 18 patent registrations and more than 140 international applications that endorse her outstanding research acumen. Numerous contributions to Chile's strategic industries stand out among the innovations that have resulted from Pilar Prada's prolific work, including synthetic proteins for pharmacological use, a clarifier for the wine-making process, fish food supplements, peptides with antiviral properties, and a nanocomposite for wound healing, among others. She received the INAPI Award for Inventor of the Year in 2020 due to her efforts.

Source:
https://www.inapi.cl/sala-de-prensa/detalle-noticia/pilar-parada-recibe-el-premio-inapi-a-la-inventora-del-ano-2020

INVENTOR ASSISTANCE PROGRAM (IAP)

Earlier this year, INAPI became the seventh economy to join this WIPO program which supports small businesses by providing free patent attorneys to aid them throughout the patent application process. A program like this would be especially helpful for women in innovation, as there is a strong indication that efforts targeting small businesses would best reach them: they are best represented in patent applications filed from universities (33.2%), micro-businesses (22.5%), and SMEs (16.2%).

5.4 CNIPA

One of the main objectives of CNIPA is to organize the implementation of domestic IPR strategies that strengthen IPR creation, protection, and utilization. However, to achieve this objective, CNIPA had to employ a strategy that includes inventors from all walks of life, regardless of gender. As the globe's most populated economy with a sizeable pool of entrepreneurial individuals, China had to strengthen the utilization of IP to become one of the world's leaders in innovation. Therefore, the inclusion, support, promotion, and empowerment of female inventors have been included in CNIPA's work program recently.

While the economy does not collect or generate statistics on female inventors' patent utilization, CNIPA implements certain support programs and measures that target female inventors. It does so by organizing an Intellectual Property Publicity Week every year, hosting innovation contests that include women from nearly 30 provinces, autonomous regions, and municipalities, and various other events.

INNOVATION CONTESTS TO FIND INNOVATIVE WOMEN

An innovation contest named "Find the Innovative Women" was hosted by China Intellectual Property News. The contest aimed to stimulate women's participation in innovation and development activities, especially linked to the use of intellectual property.

During the one-and-a-half-month lead collection process, the organizer received many outstanding cases of female innovators recommended and submitted by nearly 30 provinces, autonomous regions, and municipalities across the economy. Through the preliminary screening and editing of the submitted materials, the organizer selected 100 female innovators and set up a special topic on the China Intellectual Property Information Network to widely publicize their outstanding deeds to the public.[148]

After carefully considering factors such as personal innovation ability and field influence, the organizer selected 30 exceptional representatives from the 100 innovative women and announced them on the official WeChat account of China Intellectual Property News to start the online voting activity. Only 3 days after the content of the online voting event was pushed, the number of views exceeded 100,000. Based on the previous online voting, the organizer also invited industry experts and scholars to organize an expert review meeting to conduct on-site reviews of 30 candidates to further improve the professionalism and impartiality of the selection work. After comprehensively calculating the scores of the online voting and expert review, the list of 10 winners of "Finding Innovative Women" was finally determined.[149]

The announcement of 10 winners was made during the World Intellectual Property Day in Beijing in April 2018. According to reports, the "Finding Innovative Women" innovative women selection activity has also received strong support from the domestic intellectual property system, women's federation system, and state-owned assets system during the organization process.[150]

EVENTS

CNIPA organizes and carries out the Intellectual Property Publicity Week every year to enhance the public's awareness of respecting and protecting intellectual property rights. In addition to this, CNIPA publicly promotes and provides education on intellectual property protection for various innovative entities, including female inventors.

CNIPA assists relevant departments in holding symposiums for female inventors, scientists, and entrepreneurs in the new era and convening special seminars on the advantages

[148] The original news released (Chinese version only) can be found at: http://www.iprchn.com/cipnews/news_content.aspx?newsId=107819.
[149] Ibid.
[150] Ibid.

and roles of female inventors and innovators in innovation activities and scientific and technological progress. Furthermore, it holds such events as an annual IP Publicity Week, symposia for female inventors, and seminars on the role of female inventors in technological progress. For example, in the 2018 edition of Publicity Week, Shen Changyu, the head of CNIPA, gave a speech titled "Change and Power: Women's Participation in Innovation and Creation" at the State Intellectual Property Office.

Another event organized by CNIPA is China IP News. One of the most interesting news reports from China IP News, titled "Her Words on IPRs at the Two Sessions," was presented during the 2019 People's Congress and Chinese People's Political Consultative Conference.

Tu Youyou: A Nobel Prize inventor from mainland China

Tu Youyou resorted to Chinese medical writings from the Zhou, Qing, and Han Dynasties to find a conventional treatment for malaria. She eventually discovered a substance called artemisinin, which has prevented millions of deaths. She offered to be the first human subject when she discovered the component she thought would work. She is the first mainland Chinese scientist to have received a Nobel Prize in a scientific category, and she did so without a doctorate, a medical degree, or training abroad.

Tu was chosen to lead Project 523 in 1969 when she was 39 years old. Her first order of business was researching the effects of malaria in situ. To do that, she went to Hainan Island in southern China, which was presently dealing with its own malaria outbreak. Tu saw firsthand the disease's devastating effects on the human body. In order to comprehend conventional Chinese methods of treating malaria, her team studied old medical texts after their return to Beijing. At that time, over 240,000 compounds had been tested as prospective antimalarial medicines, but none had proven effective. The group eventually came across a mention of sweet wormwood, which had been used in China in the 400s AD to treat "intermittent fevers," a malaria symptom.

In wormwood, Tu's team discovered one active component in 1971 that appeared to combat parasites that promote malaria. Nothing they tried, even extracts of the substance, worked. Tu then went back to the ancient manuscript. She experimented with another preparation, this time using an ether-based solvent, because she questioned whether the wormwood's medicinal constituent was being harmed when it was boiled to make the solvent. She tested it on mice and monkeys, and it worked 100% of the time because it boils at a lower temperature, protecting the wormwood. Prior to testing the chemical on 21 patients in the Hainan Province, Tu and two of her coworkers did so on themselves. Each person recovered.

The compound's active ingredient, artemisinin, was isolated by Tu's team the next year, and their findings were published. While her work was not published in English until 1979, shortly after in 1981, the WHO, World Bank, and UN each invited her to present her findings on the global stage.

After waiting for two decades, the WHO ultimately recommended artemisinin combination therapy as the primary method of malaria prevention. The Lasker Foundation named the discovery of artemisinin "probably the most important pharmaceutical intervention in the last half-century" when it awarded Tu its Clinical Medical Research Award in 2011.

Source:
https://bit.ly/40sDrHQ

5.5 Korean Intellectual Property Office (KIPO)

While Korea did not provide a response to the Qualtrics survey, it is included in this section of the report as some of its measures and programs that target women inventors' patenting activity were referenced by other APEC economies. This is why the referenced programs and measures implemented by the Korean Intellectual Property Office (KIPO) were analyzed and included. To nurture women's inventorship activities in the Korean patent system, as well as provide a platform for inspiring and creative female inventors on an international level, KIPO has been related to two very outstanding initiatives – the Korea Women Inventors Association (KWIA) and the Korea International Women's Invention Exposition (KIWIE) – which are elaborated below.

KOREA WOMEN INVENTORS ASSOCIATION (KWIA)

The Korea Women Inventors Association (KWIA) was established in 1993 with the goal of promoting women's inventorship through various support and education programs, including "Women Inventors Creativity Class," "Women Idea in Everywhere," commercialization support for women inventors and entrepreneurs, its publication of Women Inventors Newsletter, and KIWIE (details below).[151] It is currently affiliated with both KIPO and WIPO.

The Women Inventors Creativity Class seeks to help women understand patent and IP systems better. "Women Idea in Everywhere" selects women with creative ideas in the field of household items and provides them with "expert mentoring on the application of IPRs, support for prototype manufacturing, customized consulting on business, etc., to advance such ideas into rights and products."[152] KWIA provides commercialization support through various means, including consultation events, workshops, and participation in exhibitions aimed at such goals.[153] "Inventor News" is a monthly online magazine that features stories about women pursuing patents and female leaders in IP.[154]

[151] https://inventor.or.kr/en/
[152] https://inventor.or.kr/en/business/womanidea.php
[153] https://inventor.or.kr/en/business/support.php
[154] https://inventor.or.kr/en/business/webzine.php

KOREA INTERNATIONAL WOMEN'S INVENTION EXPOSITION (KIWIE)

The Korea International Women's Invention Exposition (KIWIE) is an annual 3-day event hosted by KIPO and KWIA with support from WIPO and IFIA (International Federation of Inventors' Associations), among others featuring presentations by female inventors and an award ceremony. KIWIE seeks to increase interest in women's inventions, facilitate the exchange of ideas of women inventors and build a global network, evaluate patent technologies and inventions, and promote the distribution of these inventions.[155] In 2021, it featured 274 inventions from 17 economies, including 164 inventions from Korea.

This exposition runs concurrently with the Korea International Women's Invention Forum and the IP Leadership Academy for Global Women. The forum promotes sharing ideas from female experts, and the academy aims to develop women in the field.[156]

5.6 MyIPO

MyIPO does not have programs, events, or publications exclusively targeting women or promoting female enterprise and innovation. However, some initiatives target SMEs and individual innovation, hence impacting the women's community.

IP FILING FUND 2.0

MyIPO set up the IP Filing Fund 2.0 to promote local entrepreneurs and SMEs by easing the financial burden of working through the IP application system. This fund is kicking off this year and is planned to be active for four years – through 2025. It covers filing fees and costs for technical services like patent drafting. The same fund was available from 2016 to 2020 and was reported to benefit 1,465 entrepreneurs.[157] Like many other initiatives, this does not specifically target women but may be particularly useful to them, as they are often part of SMEs and local businesses.

IP ACADEMY

MyIPO hosts an educational program that covers trademarks, IP registration procedures, industrial design in business, copyright, and patent drafting, among other topics in its offices. These are done to benefit local institutions and individuals in the public and private sectors.[158]

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[155] https://kiwie.or.kr/eng/expo/summary_new.php
[156] https://kiwie.or.kr/eng/forum/forum.php
[157] https://dayakdaily.com/intellectual-property-filing-fund-2-0-amounting-rm4-mln-to-benefit-2000-entrepreneurs/
[158] https://www.myipo.gov.my/en/ip-academy/

EVENTS

Last year, Malaysia's government passed three key bills relating to patents and IP: the Patent (Amendment) Bill 2021, the Copyright (Amendment) Bill 2021, and the Geographical Indications Bill 2021. Included in these amendments are clauses relating to Malaysia's responsibilities as part of the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) on public health, the RCEP Agreement (Regional Comprehensive Economic Partnership), and the CPTPP (Comprehensive and Progressive Agreement for Trans-Pacific Partnership). MyIPO hosted a seminar to share information on these recent amendments and provide education on the procedure changes. Approximately 30 participants attended, and about 40% were women.[159]

5.7 IMPI

The difficulties women inventors face in navigating the Mexican patent system include a lack of information, drafting capacity, and financial resources. Though IMPI does not currently have policies specifically designed to address gender disparities, a very interesting experience for raising awareness, mentorship, and capacity building in the field of women and industrial property (including patents) has been developed in collaboration with the World Intellectual Property Organization (WIPO). Together they launched in 2021 the Network for Women Innovators and Industrial Property, created to provide information and training for the use of IP rights, as well as to make visible the achievements of Mexican women inventors and entrepreneurs.

The Network was established following IMPI's 2018 joining of the WIPO Development and Intellectual Property Committee project "Strengthening the role of women in innovation and entrepreneurship: Encouraging women from developing economies to use the intellectual property system." The project included a "diagnostic and dialogue to learn about the challenges and opportunities of women inventors and entrepreneurs in Mexico".

MUJERES INNOVADORAS

The Network has a digital community hosted at IMPI's website for women's exclusive use and benefit called Mujeres Innovadoras or Innovative Women (only available in Spanish)."[160]

[159] https://www.myipo.gov.my/en/dewan-negara-passed-three-patent-amendment-bill-2021-the-copyright-amendment-bill-2021-and-the-geographical-indications-bill-2021/

[160] https://mujeresinnovadoras.impi.gob.mx/Paginas/Conocenos.aspx

This community allows visitors to share and listen to stories of innovative women, learn about promotional and protection tactics for their creations, and build a mentorship network in which experienced women join as mentors and provide free assistance and advice to women innovators through regular calls conducted by IMPI (Figure 40).

Figure 40

Network for Women Innovators and Industrial Property website

Source: https://mujeresinnovadoras.impi.gob.mx/

The website also includes a blog titled "Women who inspire and IP" and a weekly podcast, "Voices of female innovation", that features discussions with women in industry and academia.[161] There is also a tab, "Boost and protect your creations: Specialist advice", which has links to pages where women can sign up to participate in a network where they can learn about branding and inventions (Table 7).[162]

TABLE 7

IMPI's specialist advice network

Branding	Inventions
Selection of brand type, classification, and registration	Selection of patent, utility model, and industrial design
Responses to official requirements	Patent drafting
Franchises, licensing, and transfer of rights	Responses to official requirements
Declaration of use and renewal of validity	Licensing and technology transfer
Contentious procedures	Infringement procedures

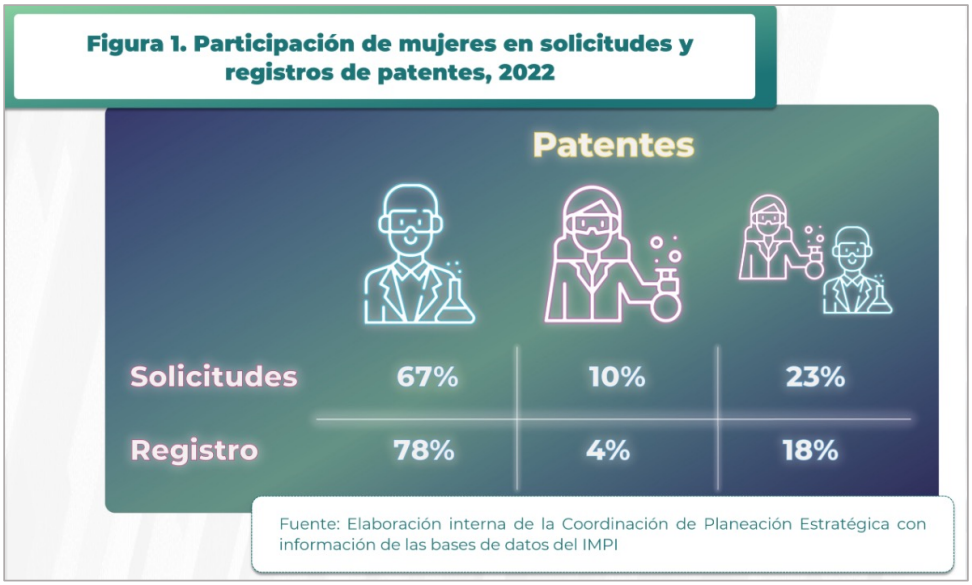
[161] https://mujeresinnovadoras.impi.gob.mx/Paginas/LasVocesDeLaInnovacionoFemenina.aspx
[162] https://mujeresinnovadoras.impi.gob.mx/Paginas/DejaQueEspecialistasTeAsesoren.aspx

Furthermore, it also contains statistics about the disparities that currently exist between men and women in IP. One key statistic on the website is that "the number of applications men submit to IMPI is practically twice as large as that of women." Thus, in trademark applications that have persons (not companies) as owners, 66% correspond to men and 34% to women."[163] It also details the classes of products and services more often pursued by men or women. While there is a significant gender gap in registering trademarks, women inventors' situation in Mexico seems to be even more unequal in terms of filing for and obtaining patents and utility models.

According to IMPI's website Mujeres Innovadoras, only 10% of Mexican patent applications filed as of June 2022 listed a woman as an inventor. This is so far a somewhat backward shift, as women inventors accounted for 12% of all Mexican patent applications in 2021. IMPI observed the same downward trend for mixed inventor teams, as the number of domestic patents listing at least one woman inventor dropped from 33% in 2021 to 23% by June 2022. These figures show that the Mexican patent landscape is predominantly saturated by male inventors, as 67% of all patent applications received were filed by male inventors in 2022, a significant jump from 55% in 2021.[164] The gender disparities are even more noticeable in the numbers IMPI reported for patents granted. Male inventors account for 78% of all domestic patents granted for (June) 2022, while women inventors account for only 4%. Mixed inventor teams whose patent application listed at least one woman inventor and received a patent account for 18% of all domestic patents granted for the same year (Figure 41).[165]

Figure 41

Female participation in Mexican patent applications and grants (2022)



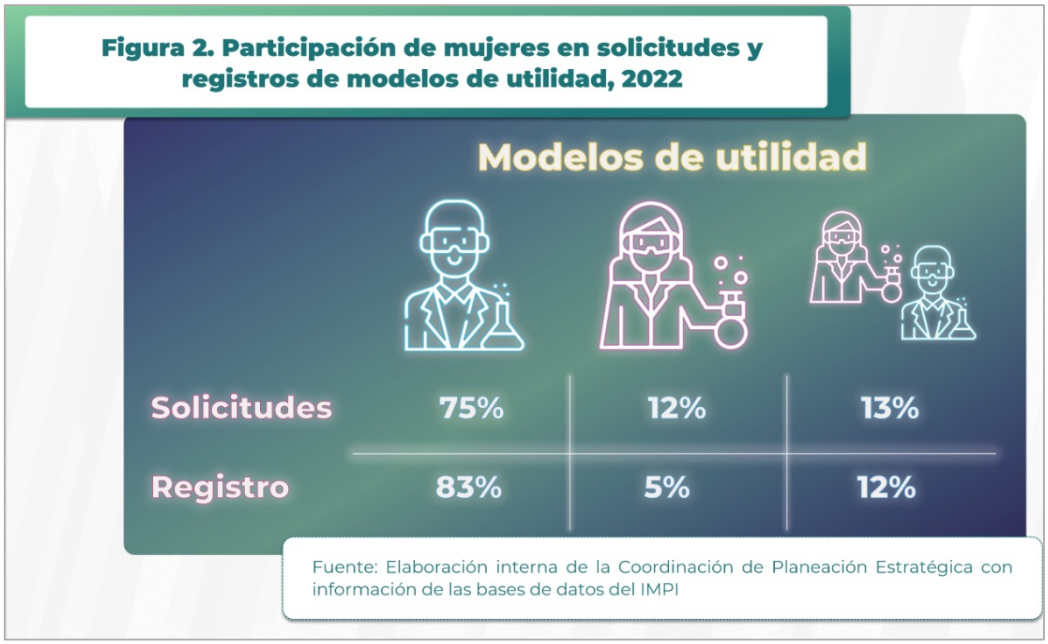
Source: https://mujeresinnovadoras.impi.gob.mx/Paginas/Cifras/TodasSumamosenPI_12.aspx

[163] https://mujeresinnovadoras.impi.gob.mx/Paginas/Cifras/TodasSumamosenPI_5.aspx
[164] https://mujeresinnovadoras.impi.gob.mx/Paginas/Cifras/TodasSumamosenPI_12.aspx
[165] Ibid.

A similar situation can be observed in the number of applications and registrations of utility models in Mexico by (June) 2022. Women inventors were listed as an inventor in only 12% of all utility model applications, a drop of 1.5 percentage points from 2021.[166] In the case of mixed inventor teams, utility model applications that listed at least one woman inventor as part of the team accounted for 13% of all utility model applications in 2022, a decrease of 0.5% from the previous year.[167] In contrast, male inventors increased their share of applications from 73% in 2021 to 75% in 2022.[168] Regarding the registration of utility models, the gender gap is even more pronounced, as 83% of all utility models granted were assigned to male inventors, and only 5% were assigned to female inventors (Figure 42).[169]

Figure 42

Female participation in Mexican utility model applications and grants (2022)



Source: https://mujeresinnovadoras.impi.gob.mx/Paginas/Cifras/TodasSumamosenPI_12.aspx

In addition, compelling data concerning women and intellectual property is shared through the Network's website as, for example, a unique women's patent funnel. This representation of the current situation of patents by women in Mexico (Figure 43) allows for estimating the universe of women with the potential to generate inventions in the economy. In doing so, it calculates a series of variables that begin with the size of the total population and the population of women in Mexico, allowing to compare it with the average number of patent applications filed by residents received by IMPI each year in which the inventors are only women or teams with women inventors as contributors to the inventive process.

[166] Ibid.
[167] Ibid.
[168] Ibid.
[169] Ibid.

Overall, the Network for Women Innovators and Industrial Property seeks to share information for women, promote their participation in the patent system, and give commercialization advice. Perhaps most importantly, though, it connects women at all stages of innovation and helps to inspire new generations of girls and young women within IP.

Figure 43

Statistics on the low participation of Mexican women in patent applications

Source: https://mujeresinnovadoras.impi.gob.mx/Paginas/Cifras/TodasSumamosenPI_10.aspx

5.8 IPONZ

IPONZ is not currently engaged in initiatives or programs designed to advance women in IP, and awareness campaigns are geared toward increasing innovation across the economy. Most programs are directed toward SMEs, which comprise a large part of the economy. The Annual Report 2021 prepared by New Zealand's Ministry for Women informed that girls and women are making progress in education; that is, more and more women are completing higher levels of education. However, men's earnings outpace women's across most fields, especially STEM.[170]

Māori IP [171]

New Zealand has made special efforts to protect Māori IP, especially cultural artifacts, traditional knowledge, images, and words and designs. It includes the Māori world view and perspectives, as well as Māori creativity and cultural practices including Te Reo, the Māori language. It has established Māori Advisory Committees to protect this cultural IP and identify other culturally offensive IPs. Though there aren't statistics available on male and female patents in this realm, this is an excellent example of a program designed to protect an underrepresented group.

WORLD IP DAY

IPONZ, along with the New Zealand Institute of Patent Attorneys (NZIPA) and the Intellectual Property Society of Australia and New Zealand (IPSANZ), hosted a panel event in celebration of World IP Day 2018's theme "Powering change: Women in innovation and creativity". In this event to celebrate the contributions of women to New Zealand IP, the speakers were leaders in tech fields and government.[172] This event was part of the Suffrage 125 domestic event program, celebrating 125 years since granting women's suffrage in 1893 and other events, including exhibitions and gatherings.[173]

CASE STUDIES

The IPONZ site publishes case studies on people and companies who have used IP to advance their businesses. One such case study was done on Ate te Kanawa and Rex Turnbull, who developed the "Miromoda Fashion Awards" to celebrate Māori fashion in New Zealand Fashion Week.[174] Though not focused on patents, this is an excellent example of women using New Zealand IP to advance their business and bring awareness to underrepresented groups.

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[170] https://women.govt.nz/sites/public_files/Annual%20Report%202021_WEB.pdf
[171] https://www.iponz.govt.nz/about-ip/maori-ip/
[172] https://www.iponz.govt.nz/news/world-ip-day-event-powering-change-women-in-innovation-and-creativity/
[173] https://women.govt.nz/about/new-zealand-women/history/suffrage-125
[174] https://www.iponz.govt.nz/case-studies/miromoda/

5.9 INDECOPI

Peru is among the leading economies in providing recognition and programs for women in innovation. There are ample resources, including legal aid and education, local events, statistics, and other information publications.

EVENTS

Every year INDECOPI celebrates International Women's Day (March 8th), carrying out different activities that relate to and highlights the importance of patents for women. For example, in 2021, Ysabel Koga, one of the top Peruvian women inventors with more patents, was invited by INDECOPI for a streaming interview through Facebook live Radio to share her work, experience, and challenges with regard to her inventive activity and the use of the patent system.

Additionally, INDECOPI, in collaboration with the USPTO and the United States Embassy in Peru, the Ministry of Women and Vulnerable Populations of Peru, and the United Nations Development Program (UNDP-Peru), organized a webinar titled "#Zero Stereotypes, creative woman, innovative woman, entrepreneurial woman." The purpose of the event was to recognize the importance of gender parity in entrepreneurship and innovation and to share success stories of women whose efforts and use of the Peruvian IP system transcend all limitations in the economy.

Furthermore, INDECOPI regularly celebrates the Day of Women and Girls in Science (February 11th) in order to raise awareness about the importance of patents and intellectual property for the empowerment and development of women. In 2021, INDECOPI partnered with the National Council for Science, Technology and Technological Innovation (CONCYTEC) to coordinate the participation of female inventors in the series of webinars organized for this Day, including teenage female inventors that have taken part in a school invention contest called "Inventors of the Future," which is organized by INDECOPI every two years.

WOMEN'S EXHIBITION

To promote local women inventors on a global scale, INDECOPI coordinates the participation of Peruvian women inventors whose inventions are deemed novel and impressive at the Korean International Women's Invention Exposition (KIWIE). KIWIE is an exposition organized annually by the Korea Women Inventors Association (KWIA). The main purpose of KIWIE is to increase the interest in inventive activities by women and strengthen the foundation for women's invention. Additionally, KIWIE facilitates the exchange of women

inventors in their respective economies and abroad and helps them establish their own global network. It also evaluates patentable technologies and inventions developed by women in their respective economies and abroad, promotes outstanding inventions developed by women, and aids in their distribution.

Over the years, Peru has become the most dominant economy at KIWIE, having presented a delegation of inventions developed by three local women inventors in 2019, 18 inventions in 2020, 34 inventions in 2021, and 35 inventions in 2022. The best year in terms of recognition for the Peruvian delegation was 2020, when the team led by Ruth Manzanares won de Semi-Grand Prize in KIWIE (second place). Ms. Manzanares is an accomplished and experienced researcher from Peru's Universidad Privada del Norte and the Peruvian woman most listed in patent applications.

KIWIE is an extremely important opportunity for INDECOPI. This is due to the fact that it can be offered to Peruvian women inventors to publicize, showcase and make visible the hard work they develop as part of their individual, entrepreneurial or academic research and invention activities, especially through an Exhibition organized by one of the most technologically advanced economies in the world.

PUBLICATIONS

Statistical Compendium: Record of Patents in Peru, 1990-2021

This report prepared by INDECOPI has a section "Patents and Peruvian Women Inventors" which lists the women who've submitted the most total patent applications across 1990-2021 and just for the year 2021. In addition, in its "Patents Statistical Record" section, it reports that the percentage of patent applications with at least one woman inventor has risen from about 15% in 1993 to about 40% in 2021. Much of this increase is accounted for by mixed-gender teams (see https://bit.ly/3LyaSBE).

The report "Peruvian Woman and Patents: Inventing the Future", was written by Sofia Miñano from INDECOPI in 2019. The report was translated and published in English through INDECOPI's collaboration with the USPTO. It includes an analysis of the gender disparities between men and women in the Peruvian patent system. Additionally, the report provides recommendations on how to ameliorate the situation and bridge the patent gender gap, the current empowerment activities that are being implemented in Peru, and the experiences of female inventors who have already navigated the economy's patent system.[175]

Another report prepared by INDECOPI that seeks to raise awareness of women inventors in this economy is "Peruvian Women Inventors: Inspirational Stories for New

[175] https://www.patenta.pe/documents/2487468/2487652/PERUVIAN+WOMEN+AND+PATENTS.pdf/7f18be43-21c5-bcc4-0643-9c3c20a6b598

Generations." This is a series of short biographies on inventors' upbringings, education, early work, description of the inspirations for their work, and advice for young women.[176]

Judith Olivera Granada: An inspirational story from Peru

Judith Olivera Granada pursued civil engineering in Peru and considered becoming a researcher to develop strategies that could benefit the economy. She wished to show her projects to the world, and she succeeded. Judith has traveled to various engineering workshops, despite experiencing constraints on financing her participation. Almost at the end of her undergraduate studies, she decided to do her thesis based on her ancestors' historical legacy. Judith proposed a technology that solves an important problem for society. She developed a stabilizer that waterproofed and improved soils using pataquisca (Austrocylindropuntia subulata exaltata), a plant native to the Peruvian Andes. Judith put into practice what she developed in her thesis. Since there are still certain restrictions to using the facilities and equipment at universities, a private company authorized her to use the laboratories, and she thus concluded her experiments.

At the end of 2017, she obtained information about protecting her intangible asset in one of INDECOPI's regional offices in her hometown of Cusco. She was able to draft the technical document through support from one of the programs offered by INDECOPI's Directorate of Inventions and New Technologies (DIN). This led to Judith filing her patent application with INDECOPI titled "Procedure for obtaining an additive to stabilize cohesive soils based on pataquisca (austrocylindropuntia subulata) mucilage."

Judith won a research project grant that same year, awarded by the Andean University of Cusco, for the project "Analysis of a modified ancestral stabilizer based on pataquisca mucilage for stabilizing cohesive soils in terrestrial routes with soils from the District of San Jerónimo in Cusco."

Likewise, Judith won first place in the soil stabilization competition of the 25th Peruvian Congress of Civil Engineering Students with her project "Stabilization of cohesive soils with pataquisca mucilage." With this project, she developed a soil improvement technique using local materials that were cost-efficient, resistant, and suitable for paving, thus decreasing the water sensitivity of these materials to control volume changes and increase resistance to deformation.

Source:
https://www.patenta.pe/documents/2487468/2487652/Cuento+inventoras-En.pdf/e64ff256-aa95-858a-bf46-42f922de32e1

[176] https://www.patenta.pe/documents/2487468/2487652/Cuento+inventoras-En.pdf/e64ff256-aa95-858a-bf46-42f922de32e1

VIRTUAL COURSES

By establishing a partnership with the Swiss Cooperation (SECO) through the Peruvian-Swiss Intellectual Property Project (PESIPRO), INDECOPI has been able to develop and offer a series of nine massive online open courses (MOOC) for innovators, entrepreneurs, researchers, inventors, and any other interested citizen for free. These courses were made available to Peruvian inventors in 2022 and are only offered in Spanish. INDECOPI's courses through the PESIPRO project provide inventors with information and instructions on drafting technical patent documents, patent search, industrial designs, IP for entrepreneurs and managers of SMEs, and the patent system in general.[177]

Although these virtual courses are not exclusively aimed at Peruvian women inventors, there is a slightly higher number of female participants compared to men. For example, during the call for the courses of the first semester of 2022, from almost 1,000 registrations received, 52% were women.

WOMEN INVENTORS' VIDEOS

INDECOPI regularly produces and presents, through social media and its website, short videos with stories of women inventors who are related independently or, through their organizations, to the patent system. These videos aim to raise awareness about the talent of Peruvian women and encourage new generations to be interested in STEM topics and keep in mind the importance of intellectual property (patents) in the context of research and innovation activities.[178]

5.10 IPOPHIL

The Philippines is currently ranked as the second leading economy in terms of stimulating women's participation in the international patent system, demonstrating the success of IPOPHIL's efforts to advance women in innovation. According to recent data from WIPO, the economy is only trailing behind Cuba, which ranked as the first economy with the largest percentage of women inventors applying through the PCT.[179] In its awareness initiatives, IPOPHL has featured female inventors, mediators, business owners, and artists in an effort to encourage more women to develop valuable intellectual property.

Therefore, as one of the leading economies globally in the representation of women in patents, the Philippines and IPOPHIL have extensive programs geared toward promoting,

[177] https://www.patenta.pe/cursos-virtuales
[178] See example videos at https://bit.ly/3nkzZfV, https://bit.ly/3nnUBnr, https://bit.ly/3OuDhJp, and https://bit.ly/3yzVrnP.
[179] IPOPHIL (2022) IPOPHL helps make PH 2nd economy with most women inventors, commits to empower more women, at https://www.ipophil.gov.ph/news/ipophl-helps-make-ph-2nd-country-with-most-women-inventors-commits-to-empower-more-women/

supporting, and encouraging women inventors in their journey to obtain protection for their novel intangible assets. The Juana Patent and Juana Design Protection program, webinar events, and social media presence will be presented in this report.

JUANA PATENT AND JUANA DESIGN PROTECTION (JPIP)

The JPIP is an expansion of the "Juana Make a Mark Program" (JMM), a trademark incentive package started in 2017 that waives certain trademark registration fees for micro, small and medium – sized enterprises (MSMEs) and women-led enterprises. In an international PTO presentation in January 2022, Rowel Barba, Director General of IPOPHIL, stated that JMM had 3,777 beneficiaries to date.[180]

The JPIP is similar to the JMM but deals with patents instead of trademarks. It is an incentive program designed to benefit women, MSMEs, and startups submitting applications for invention, utility model, and industrial design patents by waiving certain application fees and fast-tracking their applications. Specifically, filing fees, fees for claims, fees for embodiments, publication fees, and substantive examination fees are waived.[181] This program was created in alignment with Republic Act No. 9710, "Magna Carta of Women," which seeks to end discrimination against women and protect women's rights.[182]

JPIP applicants fill out a score sheet to qualify. The items on this sheet include:[183]

- Engaged in business in the priority sector.
- Engaged in business in geographical areas prone to natural disasters or facing social or economic challenges.
- Business name registered with DTI (Department of Trade and Industry), SEC (Securities and Exchange Commission), or the Cooperative Development Authority.
- 20 employees or less.
- At least one applicant is a woman.
- Engaged in business for at least one year with limited financial capability.

The JPIP complements efforts from the DTI in encouraging business registration of MSMEs.

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[180] https://www.youtube.com/watch?v=idqim_1Y0hU
[181] https://www.ipophil.gov.ph/juana-patent-and-juana-design-protection-incentive-program/
[182] http://hrlibrary.umn.edu/research/Philippines/RA%209710%20-%20Magna%20Carta%20of%20Women.pdf
[183] Ibid.

WOMEN IN PATENTS: A KNOWLEDGE PROGRAM FOR WOMEN INVENTORS

IPOPHIL's knowledge program for women inventors was a two-part webinar conducted in August and September 2021. Through this webinar, the program provided women inventors with information about the promotion of and education about the Patent Cooperation Treaty (PCT) and the Paris Convention. The webinar was tailored exclusively to women inventors interested in obtaining patent protection abroad as a means to aid in bridging the IP gender gap by increasing the participation of women in the patent system. This webinar was attended by 80 women, and of those, 21 expressed the intention to file for a patent internationally.

WOMEN IN INNOVATION IN THE PHILIPPINES

To empower women innovators in the Philippines, IPOPHIL and WIPO jointly organized a seminar that took place on 23 March 2022. The seminar provided female inventors with comprehensive knowledge, addressing the benefits of patent protection, the PCT, WIPO's Inventor Assistance Program, and drafting commercially relevant patent applications. Additionally, it offered them insights into IPOPHIL's services geared toward inventors and other information about women's innovation in the Philippines and patent commercialization and valuation.[184] The activity was attended by more than 50 women inventors, innovators, and researchers from the Innovation and Technology Support Office and Higher Educational Institutions.

"WOMEN IN IP" SERIES

IPOPHIL has an online magazine titled "Women in Intellectual Property" (WinIP), which has been "designed to encourage, engage and empower women to become advocates and active players in IP creation, protection, and commercialization in the economy." Currently, there are only two volumes, with the most recent published in 2021.[185] In that edition, WinIP highlighted the success stories of women innovators in the Philippines, such as Raquel Dumayas, who developed a "snap-on hand-type pinch-off tool" (Patent No. PH/1/2014/000119), which can assist in the repair and tightening of pipes needed in refrigeration and air-conditioning technologies.

Featured women in the "Women in IP" series include also Merlinda Palencia, who worked on an organo-material for septic water treatment; Angeline Baldapan, who worked on a project reducing plastic waste by repurposing it into usable IP products; and Maria Yzabell

[184] https://www.wipo.int/edocs/mdocs/pct/en/wipo_inn_mnl_22_1/wipo_inn_mnl_22_1_1_prov.pdf
[185] https://www.ipophil.gov.ph/winip-e-magazine/winip-volume-2/

Angel Palma, who, as a 19-year-old, won the James Dyson Award for her work on Airdisc, a cooling technology that does not require environmentally hurtful refrigerants.[186]

Raquel Dumayas: An innovator looking beyond the inclusion of women in the RAC sector

Raquel Dumayas, a pioneer in the refrigeration and air-conditioning (RAC) services sector, demonstrates how women may take advantage of their particular skills to develop in what is typically considered a male-dominated field.

As a technology instructor at the Technical Education and Skills Development Authority in General Santos City for 13 years, Dumayas has seen first-hand the challenges of women in entering the RAC services industry. She observed, in particular, how women were forced to use tools that required more physical effort, which males are better able to do given their physiology. Dumayas pondered this problem, expanding her horizon to also allow the inclusiveness of persons with disabilities. She developed a prototype for "A Snap-on Hand-Type Pinch-Off Tool" using this method. The tool has numerous actions, including clamping and pinching, which are crucial for tightening pipes needed for air-conditioning and refrigeration systems.

However, no one, not even from her own alma mater, seemed to comprehend her concept when she pitched it, perhaps because so few people could relate to the issues faced by women working in the RAC services sector. She had traversed the length and breadth of the city pitching her idea, but no one was interested because, according to the majority, they were already committed to other technologies. She was discouraged by this, but she didn't give up and kept working to make her concept a reality. When Dumayas discovered that one of her trainees could turn her concept into a sketch, everything finally fell into place for her. Nearly simultaneously, a fellow USeP alumnus who had already begun working as a machinist went to their school after learning that she was looking for someone to do the fabrication. Then he provided his knowledge.

Duyamas became the only member of her 2014 class to successfully graduate from USeP with a "Master of Vocational Education" after developing her "Snap-on Hand-Type Pinch Off Tool."

Her school's Innovation and Technology Support Offices (ITSOs) assisted her in utilizing free patent filing to safeguard her intellectual property (IP). Dumayas claimed that the tool she created might facilitate women's work in RAC services and even speed up men's work, all while promoting the inclusion of people with disabilities in the field.

Source:
https://www.ipophil.gov.ph/news/raquel-dumayasadvancing-women-in-a-mans-world-with-ip-innovation/

[186] https://drive.google.com/file/d/1V236Ad1AdRIlF7abZpMSEQ-HaRHeQWBv/view

Angeline Baldapan: Recycling for a better future

Dr. Angeline Baldapan promotes using innovation and science to change the world in her capacity as director of the Innovation and Technology Support Office (ITSO) at the Bohol Island State University (BISU). Dr. Baldapan learned that Tagbilaran City was collaborating with the Fabrication Laboratory (FABLAB) Bohol and the Japan International Cooperation Agency (JICA) to develop livelihoods for locals. She pondered how to incorporate design and creativity into the situation. KALIPI women hot-press plastic into sheets and sell them as part of the Tagbilaran-JICA-FABLAB project titled "Plastic Recycling Project for Improving Women's Income." However, because they were solely utilized as fashion ornaments at the time, there was little market for their materials. She came to the conclusion that additional work needed to be done to move the plastic sheets downstream, increase demand for the product, and assist KALIPI in making more money while cleaning up the environment. Her suggestion subsequently sparked the creation of the ecobangku, an innovation that will win numerous awards.

Ecobangku, short for "eco-friendly chair," is made mostly of medium-density polyethylene (MDPE) boards made from recycled plastic. MDPE is renowned for its excellent impact resistance, toughness, density, and resistance to moisture and chemicals. It has a wide range of uses, from toys and other domestic items to industrial pipes and car bodies. Dr. Baldapan combined several methods and formulas to create the MDPE board she required for her imagined ecobangku to make the notion a reality. She subsequently sent samples to the Department of Science and Technology's Industrial Technology Development Institute to evaluate the product's performance and physical characteristics.

One ecobangku required about 20 kg of plastic materials, which would be difficult for one person to collect. Baldapan had to collect enough plastic garbage from homes, coworkers, laundromats, and wet markets to ensure they had enough material to make the ecobangku. She has high expectations for both the ecobangku initiative and her intellectual property. She wants to see more people, particularly in rural areas, become ecologically aware and increase their spending on green items.

Source:
https://drive.google.com/file/d/1V236Ad1AdRIIF7abZpMSEQ-HaRHeQWBv/view

5.11 Rospatent

In the Russian Federation, the gender imbalance issue is not as pronounced as in some other economies. [187] Both male and female inventors in Russia have equal opportunities to reach their creative potential. Undoubtedly, encouraging more women to engage in innovation will have a huge positive influence. After all, female innovators can contribute their unique viewpoints to research and investigative work and use their persistence, creative insight, and intuition to develop novel ideas.

Rospatent observes that Russian female inventors have been actively establishing their presence and that they should be proud of their remarkable successes. According to Rospatent, women were involved in the creation of more than a third of the inventions on Russia's top 100 inventions list for 2017.[188] Given that women in Russia are in charge of bringing up future generations of innovators and transferring to them the rich heritage and accomplishments of the human intellect, Rospatent noted that it is challenging to assess their contribution to the creation of innovations using statistical data.

Rospatent is working on projects to create a system for recognizing brilliant youngsters and encouraging their scientific and technical innovation in collaboration with a large number of talented and active women. Additionally, Rospatent observes that women significantly contribute to introducing young people to the field of invention and training staff early as it carries out their own projects.

Despite low gender disparities in the Russian Federation in regards to women's STEM education, involvement, and participation, a National Strategy for Women 2017-2022 has been designed to promote and empower women.

NATIONAL STRATEGY FOR WOMEN 2017-2022

Rospatent participates in the implementation of the National Strategy for Women 2017-2022, which contains actions aimed at safeguarding the health of women of all ages, promoting economic advancement of women, fostering continuous improvement of their income and welfare, preventing social disadvantage and violence against women, enhancing women's participation in political and public life and advancing official statists related to matters of women's position in society. [189]

Some of the keystone activities of the National Strategy included the creation of specialized forms of grant support and professional competitions for women innovators to stimulate the participation of women in high-tech industries and innovation.

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[187] https://www.wipo.int/about-wipo/en/offices/russia/news/2018/news_0003.html
[188] https://www.wipo.int/about-wipo/en/offices/russia/news/2018/news_0003.html
[189] See https://rospatent.gov.ru/content/uploadfiles/otchet-2017-en.pdf

5.12 TIPO

While the programs and measures that TIPO is implementing do not explicitly and exclusively target women inventors, the Chinese Taipei innovation system has made significant steps to narrow the gaps in innovation representation between men and women. These include the launch of the "Invention and Creation Award," events including the Taiwan Innotech Expo (TIE), information sessions, and the publication of reports on the Patent Commercialization Education website.

THE INNOVATION AND CREATION AWARD

Every two years, TIPO gives this award to individuals who have been granted patents (including those who have obtained utility models, or design patents) within the previous six years to "celebrate creativity in research and development and motivate the public to engage in innovation."[190] Award winners receive prizes of 100,000-400,000 NTD (USD 3,311-13,243)[191] and free publicity, both of which are intended to create exposure for their innovations and increase the likelihood and success of commercialization, as well as act as a "catalyst that unleashes the innovation potential of Chinese Taipei."[192] Though this is not an initiative designed specifically for women, it is one that, if awarded to women, would play a key role in increasing knowledge and representation of women in patents and help with commercialization efforts.

TIE

TIE is an annual event hosted by TIPO and various offices in the MOEA (Ministry of Economic Affairs), as well as other organizations that seeks to publicize innovation in Chinese Taipei, grow international business, and foster research and development. Exhibitions are from government agencies, academia, R&D vendors, inventors, IP technology service providers, and venture capitalists who have recently been granted patents or are in the process of doing so.

Exhibition topics, from semiconductors to biochemistry and medicine, cover a wide range, amongst many others.[193] To increase female participation in TIE, teams with women are awarded extra points in the application review process. In 2021, 46.26% of expo submissions were from teams with at least one female member.

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[190] https://www.tipo.gov.tw/en/cp-282-904926-8cade-2.html
[191] Currency conversion rates are done at the time of the writing of the report.
[192] https://www.tipo.gov.tw/en/cp-282-904926-8cade-2.html
[193] https://cloudcdn.taiwantradeshows.com.tw/2022/inst/kit-en/application-kit-all.pdf

TIE attracts many outstanding inventions and submissions domestically and from across the world every year and has become a major event of its kind within the region. The Expo is utilized as a platform to facilitate matchmaking between inventors/innovators and commercial investors in an effort to furnish domestic and international business opportunities for technology exchange.

Exhibitors promote their innovations via pre-exhibition press conferences, in the opening ceremony, during the award ceremony, and at international technology conferences and seminars. This award ceremony is for the Taipei Invention Award. Innovators are judged on their:[194]

- Innovation and creativity;
- Market performance;
- Function and practicability; and
- Design.

The Platinum Prizes are awarded to the inventors to whom the jury has given the highest scores in each category. There are also gold, silver, and bronze prizes. In 2021, of the eleven submissions awarded the Platinum Prize, six included women. This statistic represents the key to progress in closing the gap between men and women in this economy's innovation field, as TIE is the biggest innovation event in Asia and one of the biggest in the world.

In order to promote outstanding submissions to the Invention Competition, TIPO delivers a press conference before the expo begins to attract potential buyers and generate greater commercial interest. Media publicity and exposure for award-winning submissions include a public announcement of winning entries, acknowledgment during the awards ceremony, as well as the publication of a bilingual album in Mandarin and English of Platinum Award-winning works.

The trend in recent years has pointed to a stable increase in the percentage of female inventors who participate in TIE, regardless of whether they submitted works to be exhibited or considered for the TIE Invention Awards. The expo for 2022 is set for October 13-15, and the online exhibition is from October 11-20.

[194] Ibid.

PATENT COMMERCIALIZATION EDUCATION WEBSITE

TIPO also has a website for patent commercialization education where guides, IP news, and analyses are posted aimed at local entrepreneurs, inventors, and innovators. An important feature on this site is the "Learning Train," which includes tabs like "understanding patent commercialization," "government resources," and "venture capital," among others that are designed to educate people about the patent system and how to use their patents to effectively commercialize their products.

The website is regularly updated with the latest reports on patent commercialization, trend analysis, successful case studies, as well as experiences of successful technology transfers, among others, to help inventors, including female inventors, commercialize and capitalize on their patents.

INFORMATION SESSIONS

TIPO organizes events every year to help women enhance their understanding of IPR protection – including information sessions on patent-related laws and the Global Patent Search System (GPSS). For example, in 2021, TIPO conducted an information session on Patent-Related Laws, which was attended by 226 women, accounting for 40.5% of the total number of participants (558).

CAPACITY-BUILDING MEASURES EMPLOYED BY TIPO

As Chinese Taipei's leading institution that oversees the economy's IP landscape and system, TIPO has developed many capacity-building activities to confer relevant professional knowledge and capabilities regarding the field of IP to women inventors. According to TIPO's data, the current engagement ratio between genders shows that for every two males involved, approximately three women inventors participate in their training programs. One such program is TIPO's Training Program for IP Professionals, which is geared toward nurturing more cross-disciplinary engagements and providing a better environment for quality innovation and R&D activities across the economy. TIPO has implemented this program for several years to ensure its inventors are global leaders across various industries.

Another capacity-building measure that has been designed and implemented by TIPO is the establishment of Taiwan Intellectual Property Training Academy (TIPA),[195] which offers IP training courses and administers the IP Practitioners Professional Capability and Certification Examination.

[195] http://web.archive.org/web/20220805184725/https://www.tipo.gov.tw/en/cp-282-904955-c4bcb-2.html

TIPA's Intellectual Property Talent Training Course consists of 17 classes that provide participants with a curated, in-depth knowledge of patents and trademarks.[196] The classes related to patents encompass the following:

- IP fundamentals;
- Patent Law;
- Patent specification and application;
- Patent scope drafting;
- Patent search;
- Patent analysis;
- Patent examination standards and practice; and
- Patent procedure examination and patent management.[197]

In addition to these courses that provide trainees with an intimate understanding of the patent application procedure, the Intellectual Property Talent Training Course includes deep cultivation courses, which include classes on (i) patent litigation, attack, and defense practice, (ii) business secret protection and management, and (iii) patent due diligence.[198]

TIPO has collected gender-disaggregated data on the participation of women inventors in TIPA's courses over the period of four years. The data showed that female inventors have become much more involved in learning about IP to better protect their inventive efforts. The ratio of female to male students enrolled in TIPA's training courses is six to four. Through these training courses and exams, TIPO hopes its efforts will help women inventors acquire relevant professional knowledge and enhance their core professional capabilities before interacting with the economy's IP system.

With the emergence and subsequent flourishing of e-commerce and the digital economy, an increasing number of women are becoming active market participants and business owners through taking on roles like online sellers and influencers. TIPO organized APEC's Workshop on the Potential for Use of Alternative Dispute Resolution (ADR) in the Field of IPR which was later translated into a report.[199]

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[196] https://www-tipa-org-tw.translate.goog/tc/index.php?_x_tr_sl=auto&_x_tr_tl=en&_x_tr_hl=es&_x_tr_pto=nui#
[197] Ibid.
[198] Ibid.
[199] https://www.apec.org/publications/2022/03/final-report-on-2021-apec-workshop-on-the-potential-for-use-of-alternative-dispute-resolution-(adr)-in-the-field-of-ipr

The workshop, which focused on IPR and alternative dispute resolutions, contributes to greater understanding, prevention, and management of IPR disputes that have already or may potentially occur – which, in turn, helps reduce the risks associated with managing a business and facilitates greater gender-inclusive economic participation. The workshop welcomed a total of 74 female participants, accounting for 48% of the total number of participants (154). Seven female experts were invited to speak at the event, accounting for 63% of the 11 speakers invited.

5.13 USPTO

The USPTO has, of all the APEC economies surveyed, one of the most varied and robust programs to meet the goals of advancing women in innovation and patents/utility models. Based on the USPTO's survey response, the information obtained stated that the agency hosts and participates in various initiatives targeting women and minority participation in the IP system. For example, the USPTO is involved in various international women's economic empowerment programs for policymakers on how SMEs can protect their IP and where support for women-owned businesses can be provided by the government. Furthermore, the agency is part of various international programs for advancing women's participation in the technology sectors. These programs highlight IP and commercialization basics, global initiatives, and the USPTO's university education and women and girls initiatives. Additional topics of interest for the USPTO focus on:

- Insights on how universities, businesses, industries, and government agencies connect to promote cooperation in the R&D of innovative technology;
- Examining best practices and strategies to successfully transfer scientific discoveries and technical breakthroughs to domestic, regional, and international markets;
- Increase understanding of how international patent rights are applied to technology;
- Studying the arrangement and management of tech startups in smaller cities and communities;
- Discussing best practices to include women as active participants rather than passive users of the IP system;
- Designing solutions that consider the needs and interests of women and girls;
- Exploring the role of professional development societies and organizations in advancing women in science, engineering and digital technology, art, design, and open source careers; and

- Exploring effective education and mentorship programs that encourage girls and young women to pursue STEM careers.

Among the programs indicated through their survey response are the Council for Inclusive Innovation (CI2), the annual Women's Entrepreneurship Symposium, the Chief Economist Speaker Series publication of the "Progress and Potential" report, and joint programs between the USPTO and the Small Business Association (SBA) that highlight IP resources for women entrepreneurs.

REPORT TO CONGRESS

In the Report to Congress pursuant to P.L. 115-273, the SUCCESS Act, the USPTO found that there were limited publicly available data regarding participation rates of these groups in the patent system, but the available data indicated that they were severely underrepresented; specifically, of all inventors named on 2016 patents, only 12% were women.[200] In response to this, the USPTO proposed the following internally directed initiatives:[201]

- Collaborative IP program aimed at corporations (which have the lowest rates for women inventor-patentees).
- Award program to recognize individuals and organizations who accelerate diversity among entrepreneurs.
- Creation of a council for innovation inclusiveness, including representatives from the general public, private corporations, academic, nonprofit organizations, and the US government.
- Expansion of USPTO educational outreach programs for youth and teachers.
- Workforce development.
- Increase professional development IP training for educators.

It also proposed a list of legislative recommendations to (i) enhance USPTO authority to gather information, especially demographic information as data about these groups are scarce, (ii) enhance authority for federal intra-agency data sharing and cooperation, (iii) expand the purpose and scope of relevant federal grant programs, (iv) create a commemorative series of quarters and postage stamps to be placed in circulation, and (v) support exhibits at domestic museums featuring inventors and entrepreneurs.[202]

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[200] https://www.uspto.gov/sites/default/files/documents/USPTOSuccessAct.pdf
[201] Ibid.
[202] Ibid.

The report is an example of work that seeks to directly address the disparity between male and female patentees by increasing knowledge and awareness. Its findings precipitated real change, with Congress passing the Inventor Diversity for Economic Advancement (IDEA) Act in 2021 to collect these demographic data.

THE COUNCIL FOR INCLUSIVE INNOVATION

The Council for Inclusive Innovation (CI2) was born out of the 2018 SUCCESS (Study of Underrepresented Classes Chasing Engineering and Science Success) Act and involves leaders from the federal government, academia, industry, IP associations, nonprofits, small businesses, as well as independent inventors and venture capitalists to pursue its goal of increasing participation of women in the IP ecosystem. This act directed the USPTO to work in conjunction with the Under Secretary of Commerce for Intellectual Property (USC(IP)) and the SBA to create a report that focused on women, minorities, and veterans, identifying the number of patents applied for and obtained, the benefits of increasing the number of patents applied for and obtained by these groups and their small businesses, and legislative recommendations for how to best promote the participation of these groups in entrepreneurial activities.[203]

The mandate of the Council is to strategize how to develop a comprehensive, lifelong approach that spurs interest in innovation and invention and provides increased access to the innovation ecosystem, thus acting as an important catalyst for increasing opportunity and fueling US' innovation economy. CI2's website provides a detailed overview of what the Council does and lays out its mission to help the USPTO develop a comprehensive domestic strategy to increase the participation of future innovators in the US innovation ecosystem by providing them with encouragement and support in a bid to empower them. Furthermore, the mission statement of CI2 clearly indicates that it aims to provide support to and increase the involvement of women and other underrepresented groups.[204]

The "Get Involved" section of CI2's website provides ways in which interested representatives from private industry, non-profit organizations, academia, and various federal government agencies can participate in the innovation ecosystem. This participation is not exclusive to individuals that are not Council members. Another interesting section on the website is the "Volunteer to provide pro bono services for under-resourced innovators."

Furthermore, the website has a section devoted to so-called "Innovation Chats," which is comprised of two sections. The first section is called "Creating Innovators," which is comprised of representatives from industry, academia, and government and was established to help guide the USPTO in developing a comprehensive domestic strategy to build a more

[203] https://www.uspto.gov/ip-policy/legislative-resources/successact?MURL=successact
[204] https://www.uspto.gov/initiatives/equity/ci2

diverse and inclusive innovation ecosystem. The Innovation Chat webinar series aims to further the discussion on how to increase opportunities for all Americans to participate in innovation.[205] The second section, "Creating an infrastructure for inclusive innovation," highlights the importance of getting women and historically overlooked people involved in the innovation ecosystem and rebuilding the US economy.[206]

CI2's pro bono volunteer program

The pro bono program is open to patent practitioners interested in providing pro bono services to eligible inventor. To become pro bono representatives, patent practitioners need to fill out a form (Form AIA/440) that certifies that a filing was pro bono to better track assistance provided to financially under-resourced inventors and small businesses.

The scope of services provided under the regional Patent Pro Bono Program is designed to be flexible, accommodating the needs of both the volunteer attorney and the inventor. An engagement letter between the volunteer attorney and the inventor is strongly recommended. This engagement letter will generally define the scope of the representation. In general, the pro bono services are focused on preparation, filing, and prosecution of a patent application before the USPTO.

The pro bono program recognizes all patent practitioners who dedicate their professional expertise to make the Patent Pro Bono Program a success. The Council recognizes that registered patent practitioners who volunteer their services are often engaged in very busy practices, which makes their pro bono contributions all the more meaningful. In appreciation, the Council offers a Patent Pro Bono Achievement Certificate to:

- ***Eligible registered patent practitioners who volunteer with a regional patent pro bono program.***
- ***Eligible law firms or corporations who support their registered patent practitioners' efforts.***

Source:
https://www.uspto.gov/patents/basics/using-legal-services/pro-bono/attorneys

[205] https://www.uspto.gov/about-us/events/nceai-innovation-chat-creating-innovators
[206] https://anitab.org/blog/policy-advocacy/diversifying-the-federal-innovation-ecosystem/

WOMEN'S ENTREPRENEURSHIP SYMPOSIUM

Another useful program is the annual Women's Entrepreneurship Symposium (WES). It focuses on increasing knowledge of patents among women and commercialization concerns. These symposia give valuable information on navigating today's marketplace and educational and mentorship opportunities for women and girls in STEM and allow attendees to hear from senior USPTO officials and other IP experts. The 2022 WES included speakers from diverse, innovative fields and was presented in three parts:[207]

- Educate and innovate, which included talks from women giving insights into their work and advice for the next generation of women innovators, as well as a panel discussion about the role policymakers play in cultivating innovation and supporting STEM for diverse student populations.
- Trends and opportunities focused on the effects of social trends on women's professional growth and business opportunities.
- From inspiration to commercialization featured talks from women who turned their ideas into commercial successes and STEM education for young girls.[208]

CHIEF ECONOMIST SPEAKER SERIES AND ECONOMIC NOTE

The USPTO also hosts a Chief Economist Speaker Series, inviting academics to present their research on patent and trademark issues and trends. A 2022 presentation, "The Effect of Female Political Leadership on Innovation: Evidence from US Cities" by Georgetown University law professor Neel Sukhatme, highlighted the effects of mayor gender on local innovation rates. Though there is still a large gender gap in political leadership, the proportion of female mayors in the US has risen from 2% in 1970 to 18% in 2005.[209]

Following this finding, Sukhatme sought to explore the question of the effects of gender in government leadership on innovation. Using election data from 1970 through 2016 and the USPTO's local innovation statistics for the number of patents and patent applications and the genders of the inventors, the study found that cities with female mayors tended to have higher innovation rates.[210] This finding highlights the importance of diversity across all levels of the innovation space, including in the government.

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[207] https://www.uspto.gov/about-us/events/womens-entrepreneurship-symposium
[208] Ibid.
[209] Krause, T., & Sukhatme, N. (2020). Do Women Mayors Enhance Patent Innovation? Halle Institute for Economic Research. Georgetown University. https://www.aeaweb.org/conference/2020/preliminary/2300?q=eNqrVipOLS7OzM8LqSxIVbKqhnGVrJQMlWp1IBKLi
[210] Ibid.

The series has included other presentations that highlight women. Recent ones include Gauri Subramini's 2021 presentation "Gender and Application Dynamics in the US Patent and Trademark Office Applications," which describes a new "open-access system that tracks inventors and identifies all patent applications and granted patents from individuals from 2001 onwards."[211] In 2019, Mercedes Delgado presented "Catalysts for Gender Inclusion in Innovation: The Role of Universities and their Top Inventors," where she identified that only 10% of US inventors in 2015 were women, and only 14% of new inventors were women, and gave insights into the challenges and barriers women face, as well as possible ways to increase representation.[212]

Additionally, the USPTO's Office of the Chief Economies has published an Economic Note in 2022 titled "USPTO Pilot Program Reduced Gender Disparities in Patenting." According to this note, women remain underrepresented as inventors named on US patents. However, the note also stated that the Pro Se Pilot program had a much larger impact for women pro se applicants, improving their chances of receiving a patent, thereby reducing gender disparities in patent application allowance rates.[213]

"PROGRESS AND POTENTIAL" REPORT

The USPTO's "Progress and Potential 2020 Update" report found that women are making a steady rise in the patent system: the women inventor rate (WIR), the proportion of women among all US inventor-patentees, increased from 12.1% in 2016 to 12.8% in 2019, and the proportion of patents including at least one woman rose from 20.7% in 2016 to 21.9% in 2019.[214] Interestingly, it also found that about 41% of all women inventor-patentees are from four states: California, Massachusetts, New York, and Texas.[215] Also included in the report is a list of the top companies featuring women patentees.

Additionally, the Office of the Chief Economist published another report titled "Where are US Women Patentees? Assessing Three Decades of Growth" in 2022. The report mapped women's participation as inventor-patentees across U.S. counties from 1990 through 2019, and identified counties with the most women patentees by technology field.[216]

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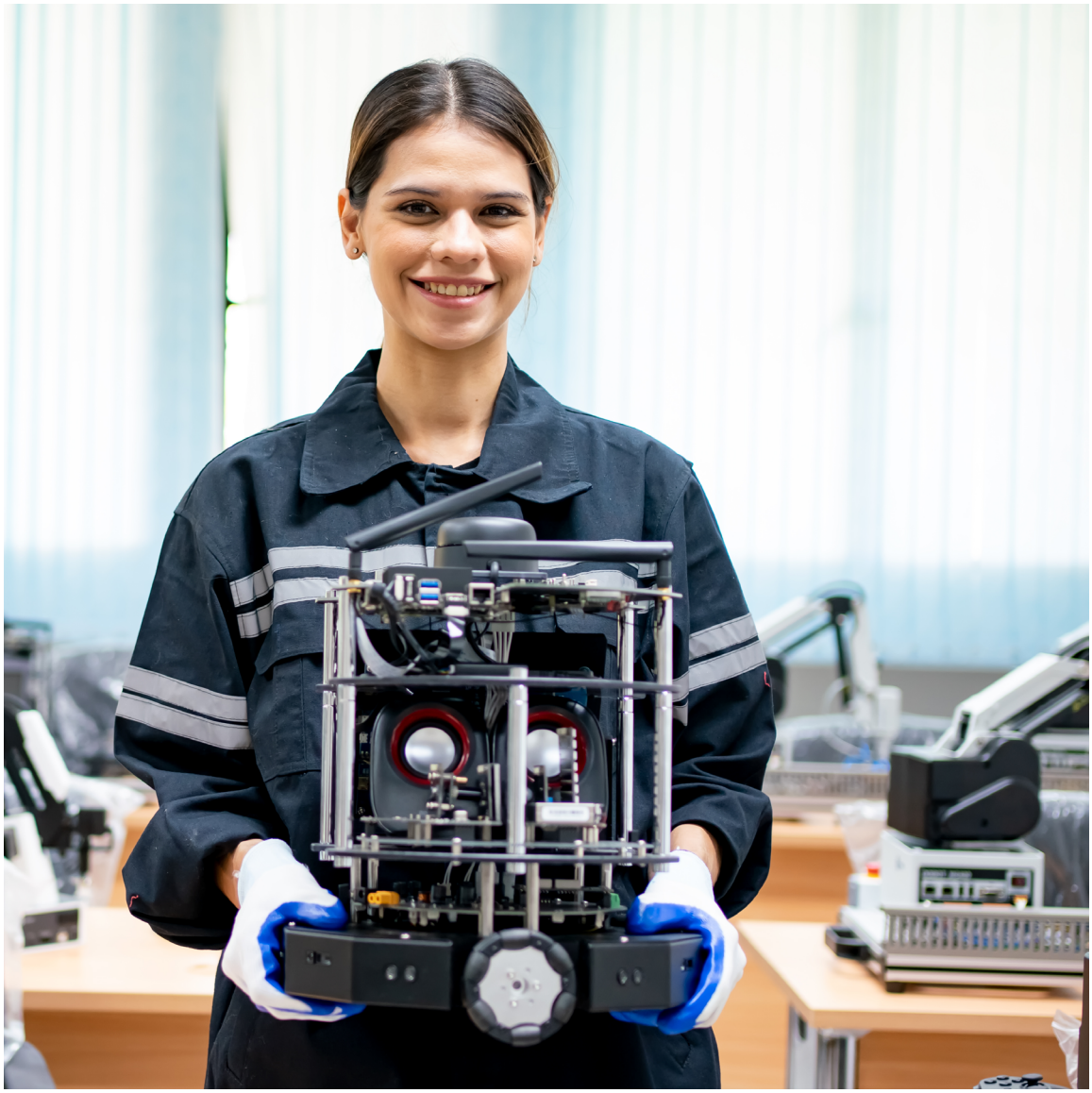
[211] https://www.gaurisubramani.com/
[212] GSSI – Gran Sasso Science Institute. (2020, October 7). Mercedes Delgado, Copenhagen Business School. [Video]. Youtube. https://www.youtube.com/watch?v=a5k1liBKJfw
[213] USPTO Office of the Chief Economist (2022) USPTO Pilot Program Reduced Gender Disparities in Patenting, at https://www.uspto.gov/sites/default/files/documents/oce-ip-econ-note-102.pdf
[214] USPTO (2020) Progress and Potential: 2020 Update on U.S. Women Inventor-Patentees, at https://www.uspto.gov/sites/default/files/documents/OCE-DH-Progress-Potential-2020.pdf
[215] Ibid.
[216] https://mujeresinnovadoras.impi.gob.mx/Paginas/Conocenos.aspx

Joint Ventures with the Small Business Association (SBA)

The USPTO and the SBA have joint programs that provide resources connecting innovators. One such program is the "Path to a Patent" series which covers IP basics and how to submit patent applications. The USPTO also directs the SBA to learn about their "research partners that provide counseling, capital, and contracting resources for small businesses. Such information may be vital to women who face more challenges in the patent and application process, especially since they are often first-time inventors involved in small- and medium-sized businesses.



Source: Freepik

6. Challenges, expectations, and future initiatives for intellectual property offices

The survey used for the Project was conducted through Qualtrics and circulated among all of the IP offices of the 21 APEC economies. The survey was designed not only to pierce the veil of solely obtaining statistical data about women inventors' participation in the economies' patent landscapes and the measures and programs to support women inventors. To pierce the veil that metrics create and look beyond the numbers, the survey aimed to elicit opinions about the challenges, barriers, or difficulties the patent offices have faced in implementing measures, activities, and programs to promote women in patents.

Through the survey responses, the intellectual property offices from the respondent APEC economies were able to share their opinions and expectations regarding women inventors' use of patents and utility models as tools that can lead to their economic empowerment. Furthermore, the survey was fashioned to serve as an outlet for the intellectual property offices from the respondent APEC economies to share their opinions on how the number of resident female patent applicants, holders, and inventors can be increased.

6.1 Challenges for APEC IP offices in implementing measures and programs

Economies in APEC and their respective intellectual property offices face similar challenges in implementing measures and programs to increase female inventors' participation in patents and utility models. Among the challenges that many intellectual property offices across the globe face when designing and implementing such measures, two challenges seem to be universal. The first challenge faced is that intellectual property offices generally lack gender-disaggregated data. Without this data, they are unable to structure their activities, measures, and programs effectively and efficiently. The second challenge intellectual property offices face universally is related to a general lack of awareness of the importance and value of IP among female inventors.

Among the 15 responses to the survey received, only seven economies provided information about the challenges, barriers, or difficulties their intellectual property faced. The following challenges were identified by the respondent economies:

- Lack of data and information;
- Difficulty identifying women inventors;
- Lack of awareness of the programs;

- Lack of domestic strategies that include a gender lens; and
- Deficient budget allocation.

Three of the seven economies, i.e., Malaysia, the Philippines, and Chile, indicated that they had difficulties tailoring, identifying, and implementing measures and programs aimed at promoting women in patents and utility models due to the fact that they lacked gender-disaggregated data. In the case of MyIPO, data regarding the gender of the patent or utility model applicant is challenging to collect, as the patent and utility model applications currently do not request the applicant to disclose their gender. IPOPHIL, on the other hand, does not have disaggregated data on female applicants and has only begun to collect such data. In Chile, INAPI initially tried identifying the inventor's gender using the inventor's name. However, collecting gender-disaggregated data using only the inventor's gender is challenging for any intellectual property office, as certain names can be used for both genders.

One economy, Australia, responded that it was difficult to identify and contact women inventors. To address this challenge, IP Australia has recognized the value of third parties to reach a female inventor audience and actively seeking them out for partnership opportunities. Additionally, IP Australia faces another challenge. As Australia's intellectual property office, IP Australia has an extensive toolkit of resources available for inventors, including educational programs and case studies. Inventors that use these resources find them extremely beneficial. However, a significant challenge is creating awareness of these resources' existence, specifically for a female audience.

In the case of New Zealand, IPONZ stated that it has not taken a gendered viewpoint of its services. The current strategy of the economy is to promote patent applications among New Zealand applicants, regardless of their gender. Furthermore, the analysis of the survey responses identified that intellectual property offices sometimes have deficient budget allocations. This was the case with Peru, which has a small budget allocated for patent promotion programs, as INDECOPI stated.

6.2 Expectations for women inventors' use of patents

Based on the Qualtrics survey responses, the nine respondent APEC economies indicated their expectations regarding the future use of patents and utility models as tools to foster economic empowerment and growth by female inventors. The expectations from the respondent intellectual property offices tended to focus on:

- Increased patent and utility model applications by female inventors;
- Increased number of women inventors;

- Encouraging women to protect their IP;
- Awareness campaigns to increase female inventorship;
- Increased PCT applications; and
- Closing the gender patenting gap.

TIPO stated that the economy's citizens enjoy universal access to education and participate actively in endeavors such as creative inventions and patent applications. In the past, inventors from Chinese Taipei have attended various international innovation and invention expos in Nuremberg (Germany), Geneva (Switzerland), and Pittsburg (US), to name a few, and have often been recognized with high accolades for their submissions. However, TIPO fears that the inventor cannot capitalize on the economic benefits of possessing a patent if the numerous patents mentioned above cannot be utilized in industry technology or marketing. The economy's commercial and industrial businesses and consumers would then be affected if they cannot access products of higher quality or efficiency, potentially leading to stagnation in the economy and industrial technology and significantly impacting their global competitiveness. Therefore, TIPO stated that it will continue to augment the information available on the IP Commercialization Education Website, implement campaigns to promote greater diversity, and cooperate with similar measures from other governmental agencies. To continue being one of the globe's innovation hubs, TIPO intends to continue to assist female inventors with accessing various resources and help them enhance the quality of their patents so that they may realize their creativity and innovations.

The responses of MyIPO, INDECOPI, and INAPI were similar, as the three intellectual property offices expect the number of women inventors in their respective economies to increase, with MyIPO expecting a 5 to 10% increase of women inventors in the near future. Additionally, the response from IPOPHIL stated that it expects the number of PCT applications filed by women inventors will increase. It anticipates a further increase in domestic patent and utility model applications that list women as inventors. In a similar vein, CIPO expects that the number of patent and utility model applications will equal those of men.

Mexico, on the other hand, is an economy that believes that even though access to patents and utility models by women is at an acceptable level, additional efforts must be made for women inventors to be encouraged to protect and benefit from their IP. While female inventors from New Zealand are provided the same support and access to patents, the future goal of IPONZ would be to implement awareness campaigns to help increase the number of female inventors in the economy.

Out of all the economies that provided responses to the survey, the Russian Federation stated that women inventors face no known legal, moral, social, practical, or any other constraints, barriers, or difficulties to file applications for inventions and utility models and be granted patents. Therefore, Rospatent's expectation for the future is that the situation will remain the same.

6.3 Increasing the number of patent holders and applicants

Similarly, participating APEC economies provided responses on the question in the Qualtrics survey regarding their respective opinions on how each economy can increase the number of resident female inventors who are applying for patents or utility models, thus bridging the gap between male and female patent or utility model holders. The respondent economies whose answers were recorded and analyzed provided a plethora of ideas for the continuation of measures and programs that support women inventors, as well as ideas on what needs to be done in future to bridge the gap in patenting. The respondent economies' opinions on increasing the number of resident female inventors' patents focused on:

- Increasing women's participation in STEM fields;
- Continuing to conduct awareness campaigns and capacity-building programs;
- Increasing their reach out efforts on promoting the importance of IP protection;
- Promoting more equality in the workplace;
- Providing greater visibility and support to women inventors;
- Designing and implementing public policies for gender equality;
- Collecting gender and demographic data; and
- Continuing to implement measures and programs which are currently in their nascent stages.

To achieve gender parity in inventive activities and increase the number of women-owned patents and utility models, economies have stated that they must double down on their efforts to increase women's participation in STEM fields. IP Australia opines that increasing the number of patents and utility models filed by women can only grow if the pool of female researchers is amplified. However, in order for that to be the case, IP Australia stated that the participation of girls and young women must be improved in STEM subjects throughout

their education, i.e., in school, undergraduate, and postgraduate programs. IPONZ believes that to close the gender patenting gaps, it needs to continue to boost women's engagement in STEM entrepreneurship and increase awareness of the importance of IP protection. IP Australia's Public Education team have hosted IP related sessions promoting women in STEM and envisage to advance efforts in engaging with women in STEM organisations in 2023.

Another economy that saw women's participation in STEM as a tool for their economic empowerment and increased participation in the patent system is Chinese Taipei. Namely, TIPO has already begun to implement policy objectives to promote gender equality and enhance women's economic empowerment and inclusion in specific sectors, such as environment, energy, and technology. TIPO has recently implemented several policies and measures that aim to increase women's participation in the field of IP, not only to facilitate greater training opportunities for women but also to raise awareness through education to promote female participation in STEM efforts which include fostering female STEM educators, encouraging female participation in scientific research and technological innovations. They hope that by starting from education, they can promote female participation in the field of IP from the roots.

Some of the intellectual property offices indicated that in order to increase the number of patents and utility models owned by women, more awareness campaigns need to be conducted about the importance of IP protection. MyIPO stated that it believes Malaysia can achieve its expectation of multiplying the number of women-owned patents between five and 10% by conducting awareness and capacity-building programs on patents and utility models. Similarly, CIPO stated that for Canada to increase the number of female patentees, it needs to continue its reach-out efforts in conducting information sessions that raise awareness among women inventors about the importance of IP protection.

To embolden future women to interact with the patent and utility models of APEC economies, the respondent intellectual property offices believed that they should continue to bring forward innovative women's stories to the limelight. In the case of IMPI, it stated that continuing to disseminate stories that promote women innovators, along with measures that support their journeys to obtaining patent protection for their innovations, is crucial to improve the number of future women patentees. Similarly, TIPO aims to continue bringing much-needed visibility to the contributions of its female inventors to attract greater numbers of future outstanding and innovative women to participate in their relevant competitions. TIPO will continue to share posts on social media to highlight images of female inventors being recognized with awards and their award-winning inventions. They hope that by emphasizing female participation and their creative energies in invention competitions, they will encourage more outstanding women to venture into other creative R&D endeavors.

Two of the respondent APEC economies, i.e., Chile and Peru, believe that in order to increase the number of women patentees, a blend of efforts to promote innovative female

inventorship in companies, research centers, and universities is needed. In the case of Chile, INAPI believes that the number of women inventors is directly affected by the number of women employees in companies and universities. Therefore, efforts to promote more equitable access to positions that allow female creativity will undoubtedly bridge the gender gap in Chile's IP ecosystem. The response provided by Peru's INDECOPI stated that public policies that support gender equality in research centers and universities are necessary if the economy is to achieve gender equality.

Some of the surveyed economies believe they need to continue implementing measures they have employed recently. For example, IPOPHIL believes that the launch of JPIP which waives the patent fees will increase the number of women inventors who wish to protect their inventions. This, coupled with continuous capacity-building programs, is expected to encourage more Filipino women to apply for patents. Similarly, the USPTO seeks to increase the number of female resident patent holders, applicants, and inventors by increasing awareness and access to the US IP system through two initiatives. By developing a domestic strategy to increase the participation of women inventors in the IP ecosystem through encouraging, empowering, and supporting all future innovators, the USPTO's CI2 initiative will increase the involvement of women and other under-represented groups in the IP system. Additionally, the USPTO will continue to build and support the STEM pipeline by focusing on encouraging women and girls to pursue and advance STEM careers and holding an annual Women's Entrepreneurship symposium which offers attendees a chance to learn about innovation and business from public and private sector experts.

Furthermore, to achieve an increased number of female patentees, the USPTO is monitoring the Inventor Diversity for Economic Advancement Act of 2021, which, when enacted, would empower the USPTO to collect and report patent application demographic data. Collecting gender and demographic data would mean that the USPTO can monitor, with renewed accuracy, the level of female participation in the patent system and help improve diversity in inventorship.

7. APEC economies dichotomy in addressing the patent gender gap

The information collected through the Qualtrics survey allowed for the analysis of vast amounts of data from the participating APEC economies. As a result, the analysis provided an in-depth birds-eye view of the current situation and performance of the APEC bloc regarding the participation of women inventors in the economies' domestic IP systems and local women's participation in patents on a global scale through the PCT.

En masse, when evaluating the aggregate results of the research carried out for the APEC economies, the combination of quantitative and qualitative information reveals an apparent trend of greater involvement of women in patents (and intellectual property) in the past three to five years. For example, the share of patents with at least one woman listed as inventor in the four economies that reported data (Canada, Chile, Peru and Thailand) rose from an average of 35.3% in 2016 to 36.5% in 2019 (and to 42.9% in 2020, not considering Chile). Likewise, the share of utility models with at least one woman listed as inventor in the two economies that reported data (Peru and Thailand) grew from an average of 11.5% in 2016 to 39.9% in 2020.

Additionally, PCT applications that include at least one female inventor has increased in the 17 APEC economies reported by WIPO from a regional bloc average of 28% in 2019 to 34% in 2021; and the share of women inventors listed in PCT applications has grown from a regional bloc average of 16% in 2019 to 20% in 2021.

In another example, the statistical data provided by economies allowed insights to be drawn regarding the pockets of APEC women's inventorship activities, juxtaposed next to PATSTAT's data on the global patent trends through the use of the IPC system.

Based on the PATSTAT data reported on women inventors by the IPC class, which gives an overview of women's relative specializations by the sections of the IPC,[217] a comparison can be made between the trends of women's inventorship activities in the respondent APEC economies and those worldwide (Table 8). The IPC data obtained shows that the concentration of APEC women inventors follows a similar trend to the global patenting trend. This means that the pockets of women's inventorship in the respondent APEC economies, to some extent, mirror those of the global trends and in some instances, are above the global average. However, due to the fact that not all of the economies surveyed provided their responses, in this particular case the data collected and presented is not representative, but very much referential, for the APEC region.

[217]The PATSTAT data for Table XYZ was obtained from the UK IPO's Gender Profiles in Worldwide Patenting report of 2019. Therefore, the authors are aware that the results may be inherently flawed, as the data provided by the UK IPO spans a time period of 20 years, whereas, the same time period was not used for the same IPC data from APEC economies.

TABLE 8

APEC female inventors by IPC class vs. global average

	APEC Economy					
IPC class	**Female inventors (global average in %, 2017)**	**Canada**	**Chile**	**Peru**	**Chinese Taipei**	**Thailand**
A: Human Necessities	43%	26%	40%	54%	43%	52%
B: Performing Operations, Transporting	19%	15%	14%	20%	20%	10%
C: Chemistry, Metallurgy	39%	19%	28%	9%	3%	22%
D: Textiles, Paper	2%	1%	1%	1%	2%	2%
E: Fixed Constructions	3%	3%	4%	8%	4%	1%
F: Mechanical Engineering, Lighting, Heating, Weapons, Blasting	7%	5%	2%	2%	8%	3%
G:Physics	28%	23%	8%	6%	15%	8%
H: Electricity	17%	9%	2%	0%	5%	3%

The survey results uncovered a clear dichotomy between APEC economies when it comes to collecting gender-disaggregated data and overall information. Out of the 15 APEC economies that responded, nine economies provided statistics on women's participation with the IP system by filing patent or utility model applications or obtaining patent or utility model protection.

Similarly, not all APEC economies employ measures and programs to empower women inventors in pursuing patent or utility model applications, therefore, not obtaining IP rights that can be associated with their inventions. For the purposes of this report, we have created four groups of APEC economies based on the survey responses regarding the measures and programs they employ to promote women's inventorship (Table 9), i.e.:

- Group 1 – economies that have at least one measure or program focused exclusively on women, apart from publishing a report that contains statistical information;
- Group 2 – economies that do not have exclusive measures for women, but in their regular activities they are targeting women performance;
- Group 3 – economies that do not have any type of measures or programs that focus on women inventors; and
- Group 4 – economies that did not take part in the study.

TABLE 9

APEC economies dichotomy in implementing measures that target women inventors

APEC Economy	Group 1	Group 2	Group3	Group 4
1.Australia	✓			
2.Brunei Darussalam			✓	
3.Canada	✓			
4.Chile		✓		
5.China	✓			
6.Hong Kong China				✓
7.Indonesia				✓
8.Japan			✓	
9.Republic of Korea				✓
10.Malaysia		✓		
11.Mexico	✓			
12.New Zealand		✓		
13.Papua New Guinea				✓
14.Peru	✓			
15.The Philippines	✓			
16.The Russian Federation			✓	
17.Singapore				✓
18.Chinese Taipei		✓		
19.Thailand			✓	
20.The United States	✓			
21.Viet Nam				✓
% of studied economies (N=21)	33%	19%	19%	29%

Based on the results in the table above, the APEC patenting landscape seems to be fragmented. Namely, the first group comprises of only seven of the 21 APEC economies, or 33%, have explicit measures and programs that target women inventors and aim to empower and promote women's inventorship within their borders. Four of the economies that responded to the survey, or 19%, can be considered as targeting women patent/utility model performance though not having explicit or exclusive measures for female inventors. The third group, comprised of four APEC economies that stated they do not have any programs or measures that promote, support, or measure women's participation in their

IP system, account for 19% of all APEC economies. Lastly, the fourth group which did not partake in the study for the participation of women in the patent landscape account for 29%.

As the first study of its kind in the APEC region, the report aimed to collect as much data on the specific measures and programs implemented to improve the participation of women inventors in the patent and utility model ecosystems across the economies that are part of APEC. The comprehensive survey sent out to the APEC economies aimed to elicit as much information regarding the gender-informed measures and programs that have been or are being implemented in the sphere of patents and utility models (Table 10).

According to the results obtained from the 15 respondent APEC economies, the data gave rise to some very interesting findings. Raising awareness of the importance of female inventorship and the utilization of the patent system can be a powerful tool to educate future women inventors about the benefits of obtaining protection for their intangible assets. Some economies share this sentiment, as six out of the 15, or 40% of economies surveyed stated that they do undertake measures to raise awareness among the general populace to bridge the gender patenting gap. However, three, or 20% of the economies that responded to the survey stated that they implement capacity-building programs that aim to promote the economic empowerment of women through IP. Regarding measures that support women inventors' efforts to file for patents or utility models, only two economies (13%) provided information.

The measures and programs related to the commercial use of patents and utility models were only recorded in one of the 15 APEC economies surveyed, which accounted for only 7%. However, a majority of the economies employed measures that increase the exposure of women inventors and aid in their promotion. Seven of the 15 economies surveyed, or 47%, stated that they have dedicated events, networks, symposia, and awards that highlight and showcase the journeys of successful women inventors. Furthermore, only 13%, or two of the economies surveyed employed other programs to support women's participation in the patent system.

Across all APEC economies, there appears to be a dichotomy – either they are completely transitioning towards gender-informed efforts or have failed to initiate any meaningful programs or initiatives. Regarding the former, APEC economies that tend to get further involved in promoting gender parity in the intellectual property arena tend to support other related programs in an apparent "feed-forward" effect. Therefore, it would be of great benefit to all APEC economies to make joint concerted efforts to share best practices that can be piloted across the various different contexts in the region, especially in economies that have not employed any type of measures or programs that support and promote women inventors' economic empowerment through the use of patents and utility models.

TABLE 10

APEC economies specific measures implemented for women's approach to patents/utility models, by the purpose of the program

APEC Economy	Raise Awareness	Capacity building	Patent/utility model filing	Commercial use of patents/utility models	Exposure & promotion	Other programs
1.Australia	✗	✗	✗	✗	✓	✗
2.Brunei Darussalam	✗	✗	✗	✗	✗	✗
3.Canada	✓	✓	✗	✗	✓	✓
4.Chile	✗	✗	✗	✗	✗	✗
5.China	✓	✗	✗	✗	✓	✗
6.Japan	✗	✗	✗	✗	✗	✗
7.Malaysia	✗	✗	✗	✗	✗	✗
8.Mexico	✓	✓	✓	✗	✓	✗
9.New Zealand	✗	✗	✗	✗	✗	✗
10.Peru	✓	✗	✗	✗	✓	✗
11.The Philippines	✓	✓	✓	✗	✓	✗
12.The Russian Federation	✗	✗	✗	✗	✗	✗
13.Chinese Taipei	✗	✗	✗	✗	✗	✗
14.Thailand	✗	✗	✗	✗	✗	✗
15.The United States	✓	✗	✗	✓	✓	✓
% of studied economies (N=15)	40%	20%	13%	7%	47%	13%

✓ = Economies with patent/utility model activities exclusive to women.
✗ = Economies with no patent/utility model activities exclusive to women.

The survey employed several metrics to better understand the measures taken by APEC economies to collect statistical data on the participation of women inventors in the region's patent and utility model landscape (Table 11). As a result of the analysis of the responses provided by the 15 participating economies, the report uncovers seven metrics by which the economies measure or promote the participation of women inventors in patents and utility models. In order to increase the number of women involved in patenting activity, three economies, or 20% of the respondent economies, have designed their own patent involvement strategies for women.

Specific gender-based metrics used by the respondent economies were used in two instances, i.e., for statistics collection and performance assessment. In the case of gender-based statistics collection, nine of the 15, or 60% of the respondent economies, used this metric to measure the participation of women inventors in their respective patent and utility model systems. In assessing women's performance in utilizing patents and utility models, seven economies (47% of the 15 surveyed) used this metric. Four of the 15 respondent economies or 27%, utilize indicators to measure patent activity by the gender of the patent applicant or owner.

Another method to collect, analyze, and disseminate statistical data about the interaction of women inventors with the patent system is to publish reports about the current trends of women's inventorship efforts in any given economy. Consequently, seven economies, or 47% of the respondent economies, have utilized publications concerning women and patents as a reliable medium to convey the trends of women inventors' participation in their respective patent systems.

Patent applications are another reliable approach to measuring participation in the patent system by gender. There are two known aspects of collecting statistical data about inventors' interaction with the patent system, i.e., collecting data by including the applicant's gender and collecting data by including the inventor's gender in a patent application. Regarding the first aspect – collecting data by including the applicant's gender in a patent application – five economies, or 33% of the economies surveyed, stated that they use this method. Conversely, four of the 15 respondent economies, or 27%, collect gender-disaggregated data by collecting data on the inventor's gender in their patent applications.

TABLE 11

Metrics used to discern women's participation in patents and utility models in APEC economies

APEC Economy	Women's patent involvement strategy	Gender-based statistic collection	Gender-based performance assessments	Indicators to measure patent activity by gender	Publications concerning women and patents	Applicant gender collection in patent applications	Inventor gender collection in patent applications
1.Australia	✗	✓	✓	✓	✓	✗	✗
2.Brunei Darussalam	✗	✗	✗	✗	✗	✗	✗
3.Canada	✗	✓	✓	✓	✓	✗	✗
4.Chile	✗	✓	✓	✓	✓	✓	✓
5.China	✗	✗	✗	✗	✗	✗	✗
6.Japan	✗	✗	✗	✗	✗	✗	✗
7.Malaysia	✗	✗	✗	✗	✗	✗	✗
8.Mexico	✓	✓	✓	✗	✓	✓	✓
9.New Zealand	✗	✗	✗	✗	✗	✗	✗
10.Peru	✗	✓	✓	✓	✓	✓	✓
11.The Philippines	✓	✓	✓	✗	✓	✓	✓
12.The Russian Federation	✓	✗	✗	✗	✗	✗	✗
13.Chinese Taipei	✗	✓	✗	✗	✗	✓	✗
14.Thailand	✗	✓	✗	✗	✗	✗	✗
15.The United States	✗	✓	✓	✗	✓	✗	✗
% of studied economies (N=15)	20%	60%	47%	27%	47%	33%	27%

Although not wholly comprehensive, a common theme from this research can be summated as follows: although gender parity is improving in the intellectual property arena in the APEC region, with growth evident in the past three to five years, it remains unsatisfactory and nuanced. Accordingly, the representative examples demonstrate areas where broad measures and policies could help benefit APEC economies in general, although specific solutions are necessary as well, due to the idiosyncrasies encountered on an economy-by-economy basis of APEC members.

IV

Case Studies

IV. Case Studies

This chapter aims to provide an in-depth overview of the information obtained through interviews conducted with intellectual property office representatives from five APEC economies. The interviews were conducted via Microsoft Teams, as the project spans four continents, and travel restrictions due to COVID-19 would have made it difficult or impossible to conduct them in person. The five economies subject to our in-depth case studies are Mexico; New Zealand; Peru; the Philippines; and the US. They were chosen to serve as samples of the different regional contexts across APEC. More specifically, the chapter aims to provide readers with a better understanding of the patent/utility model landscape regarding women's representation in economies bordering the Pacific Ocean, i.e., economies in Asia, North America, Oceania, and South America.

Each case study of one of the five APEC economies follows a similar structure to allow the reader to glance over the information in each subsection and compare the qualitative data collected through the interviews. Therefore, the individual case studies follow a similar format, i.e., provide:

- An overview of the intellectual property office that was interviewed;
- The experience of the intellectual property office in promoting the use of patents/utility models by local women;
- Whether the intellectual property office has implemented any specific measures to promote patents/utility models by local women;

- An overview of the main institutions that promote and support women in patents/ utility models in each of the five economies;
- The barriers and challenges women inventors face in each economy based on the opinions of the IP officials interviewed;
- Future expectations about women inventors' future use of patents and utility models in each respective economy;
- Opinions from the IP officials on how their respective economy can increase the number of female resident patents;
- Proposed measures for future APEC collaborative efforts in promoting women inventors and their utilization of intellectual property as an economic tool for their empowerment; and
- Additional statistics regarding women's participation in the patent/utility model ecosystem.

The information collected strives to provide the beneficiaries of this report with a better understanding of the situation between women and patents/utility models in APEC. Furthermore, this chapter provides greater visibility and importance to promote this critical issue in the region and details good practices on how to address and promote women's participation in the patent landscape from APEC economies that may be replicated in other economies in the region.

1. Mexico

Mexico is one of the world's 15 largest economies and the second largest in Latin America, with a population of almost 130 million, a diverse and rich cultural heritage, and abundant natural resources. The economy is open to commerce and has robust macroeconomic institutions.

Compared to other economies over the past three decades, Mexico has underperformed in terms of growth, inclusion, and poverty reduction. Between 1980 and 2018, its economic growth was slightly higher than 2% annually, slowing convergence with high-income economies.[218]

[218] https://www.worldbank.org/en/country/mexico/overview

The Mexican economy grew by 4.8% in 2021, after an 8.2% fall the previous year due to the COVID-19 pandemic.[219] Its recovery is progressing slowly; it is predicted that the economy will expand by 2.1% this year (2022) and 2.1% in 2023.[220] Mexico's trade openness, a robust export manufacturing base linked to international value chains integrated with the United States, and a stable macroeconomic environment support its growth. To enable a better and sustained recovery over the medium term, the economy must also deal with some of the most pressing pre-crisis challenges to growth and inclusion. Therefore, Mexico must work to eliminate gender disparities in the IP system, thus transitioning into a knowledge-based economy less susceptible to crises.

1.1 IMPI: An overview

IMPI (in Spanish: Instituto Mexicano de la Propiedad Industrial) is responsible for administering patents and trademarks in Mexico. As the main administrative agency for patents, IMPI conducts investigations, implements precautionary measures to prevent violations, and imposes appropriate sanctions in industrial property matters. IMPI's goal is to maintain effective and adequate IPR protection based on a culture of legality. To achieve this, it provides certainty to employers in their investments, generates a propitious climate to drive innovation, and protects public consumers from acquiring counterfeit products.

1.2 Experience promoting the use of patents and utility models by local

Mexico's journey of promoting and supporting women innovators and entrepreneurs started with Mexico's SMEs Women's Program created by the National Entrepreneur Institute (INADEM) in collaboration with the National Institute for Women (INMUJERES) and the Victoria 147 platform. This program provided women's micro, small, and medium-sized enterprises (MSMEs) with access to preferential financing and business development, coupled with the Victoria 147 platform, which provided training, incubation, acceleration, and networking features for women entrepreneurs and executives.

Building on this, in May 2018, at the 21st session of WIPO's Committee on Development and Intellectual Property (CDIP), Canada; Mexico; and the US co-sponsored the project titled "Increasing the Role of Women in Innovation and Entrepreneurship: Encouraging Women in Developing Economies to Use the Intellectual Property System." The project aims to strengthen the innovative capacity of the participating economies and increase the participation of women inventors in the domestic innovation ecosystem by supporting them in using the IP system more effectively. In particular, the project assists and supports

[219] https://www.worldbank.org/en/country/mexico/overview
[220] Ibid.

women inventors and innovators, broadening their awareness, knowledge, and use of the IP system through tailored support programs, mentorship, and network opportunities. Under the auspices of this project, Mexico was chosen to act as a pilot economy. As a result, IMPI implemented the project in three phases:

- Phase 1. A study on the situation of women inventors and innovators in Mexico, carried out by a consulting firm;
- Phase 2. Dialogue "Women inventors and entrepreneurs in Mexico: challenges and opportunities," carried out by IMPI; and
- Phase 3. Creation of IMPI's "Innovative Women and Industrial Property Network" and its digital community.

1.3 Implementation of specific measures promoting patents/utility models by local women

In partnership with WIPO, IMPI launched a digital community – Innovative Women and Industrial Property Network (the Network) – that aims to support the innovative potential of women in Mexico and overcome cultural, educational, and social obstacles. As WIPO's statistics from 2020 show, only 16.5% of inventors named in international patent applications are women. Hence, the IP gender gap is a well-documented issue plaguing economies across the globe. As a result, IMPI works to overcome the gender inequalities in Mexico's patent system through this particular Network.

The Network intends to close the IP gender gap by gathering public institutions, chambers, associations, and universities to materialize public policies, information and mentoring, thus strengthening the participation of women in economic activities, especially young girls. Through this Network, IMPI unveils and highlights the work of Mexican women in entrepreneurship and research.

The digital community build by the Network aims to address the gender inequality in Mexico's patent system through four main sections of resources available to women inventors, i.e.:

- Mujeres que inspiran: Las voces de la innovación femenina (Women Who Inspire: The Voices of Female Innovation);
- Impulsa y protege tus creaciones: Asesorías de expertas (Boost and protect your creations: Expert advice);
- Mentorías (Mentoring); and
- Todas sumamos en la PI: Cifras (We all add up in IP: Figures).

1.4 *Main institutions promoting and supporting women in patents/utility models*

Name of institution/body	IMPI through the Innovative Women and Industrial Property Network
Role of the institution	To encourage women inventors and entrepreneurs to patent their inventions or register their trademarks
Scope of participation	Industrial property
Activities undertaken	Dissemination, promotion, and accompaniment in the protection of IP by women inventors and entrepreneurs
Main results and achievements	• From July 2021 to January 2022, the Network's webpage obtained 53,584 views; • Experts provided advisory services for seven months to 443 members of the Network; and • Personalized mentorship was provided to 155 women inventors, and 1560 reproductions were obtained in the Las Voces de la InnovacionFemeninapodcasts.[221]

1.5 *Barriers and challenges women face in obtaining patents/utility models*

Women inventors and innovators in Mexico, and the challenges they face, were extensively covered under Phase 1 of the "Increasing the Role of Women in Innovation and Entrepreneurship: Encouraging Women in Developing Economies to Use the Intellectual Property System" project. As one of the latest reports IMPI published on gender equality in the patent system, the research did not identify challenges or obstacles that exclusively affect women inventors in using the IP system. Both women and men face challenges in participating in the patent system, such as lack of information, low capabilities in drafting patent claims, and a general lack of resources.

Generally, accessing and using the Mexican IP system affects both women and men similarly. Gender barriers can be found at the scientific and business level, which will require activities to raise awareness in inform women of the potential that a professional career in science and innovation represents.

Though the previous barriers mentioned were not exclusive to either gender, a persistent gender gap in Mexico's patenting process has been identified. Women's representation in STEM fields and careers in Mexico has hindered their participation in the patenting process. While inventive female activity does exist, inventions are concentrated in universities and academic centers. Women inventors in the economy are much less likely to be the sole patent holder, and very few of their patents are commercialized. While successful female inventors exist in Mexico, they are confined to successfully obtaining a patent and publishing an underlying paper describing their invention. Social bias hinders brilliant women inventors from contributing to STEM fields and the patent system in general, as they are perceived to be aggressive, thus limiting their chances to access financial resources.

[221] https://mujeresinnovadoras.impi.gob.mx/Paginas/LasVocesDeLaInnovacionoFemenina.aspx

Furthermore, through the pilot project, IMPI identified an absence of a gender perspective in the current policies which govern IP in Mexico. Additionally, fewer resources are allocated for research and entrepreneurship across the economy.

There are very few startups in Mexico, as is the case with the financial institutions that could support them. This represents an opportunity to support initiatives focused on science and innovation for both men and women.

1.6 Expectations for Mexican women inventors' future use of patents and utility models

The Network's digital community has a section "Todas sumamos en la PI: Cifras," where statistical data shows that out of 100% of patents granted, 55% are only from men, 12% are only from women, and 33% are for groups with at least one woman. Regarding utility models, 73% of the registrations granted are only from men; 13.5% are only from women, and the other 13.5% are from groups with at least one woman.

By implementing more activities related to data collection and analysis, IMPI expects that it will be able to use the data to identify areas of opportunity to strengthen women's approach to IP. This will encourage more Mexican women inventors to participate in the patent system, either as lone applicants or as part of an inventor's team.

1.7 How Mexico can increase the number of female resident patents/utility models

Currently, the activities carried out within the "Innovative Women and Industrial Property Network" framework aim to increase the number of women IP holders. IMPI provides women inventors and patent applicants with advisory services through the Network in the following areas:

- Education before registering, which encompasses:
  - Actions aimed at bringing girls closer to creation and invention, knowing that what they generate can be protected and have value (campaigns for the inclusion of IP in school programs).
  - Actions aimed at overcoming cultural barriers that impede girls feel capable and comfortable in studying STEM careers (school campaigns for middle and higher education).

- Actions aimed at making any woman who invents, innovates or creates something know there is a way to protect her creations, giving it additional commercial value (campaigns aimed at the public, similar to the social media campaigns currently run by IMPI).

- Access to the legal IP protection system during the registration process; and
- Personalized advisory services.

Due to the difficulties women inventors face when trying to take their inventions to the market, IMPI provides them with mentorship programs. These mentorship programs last 12 weeks and aim to give women inventors a better understanding of the patenting process. Additionally, IMPI has partnered with WIPO to provide mentorship to women in STEM fields to close the gender gap in the Mexican patent system.

1.8 Proposed collaborative measures among APEC economies

IMPI would like APEC member economies to exchange good practices from their experiences in bringing IP, especially patents, closer to women inventors.

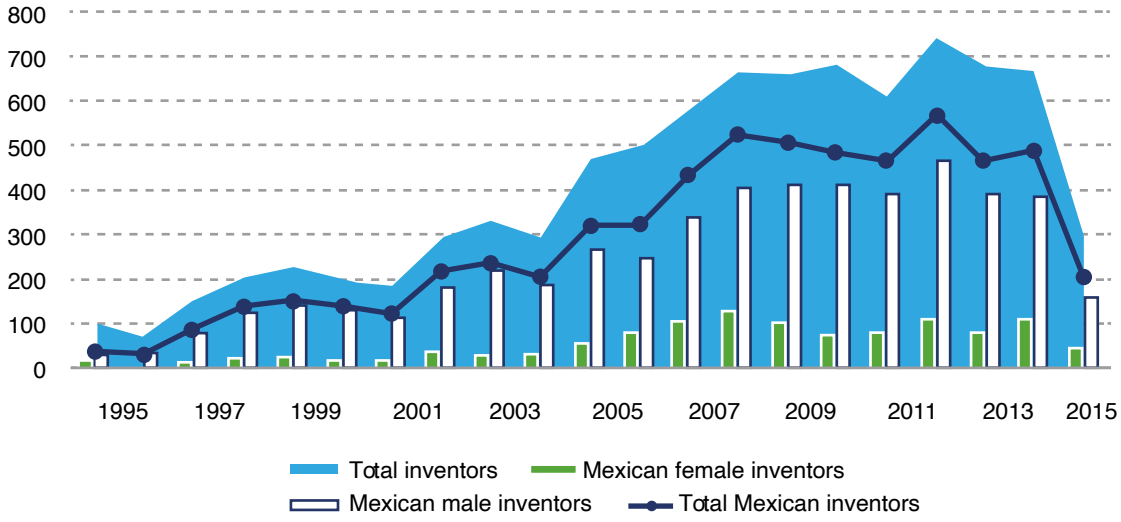
1.9 Statistics

In a study by Zetter et al. (2017), a total of 3,350 patent applications with one Mexican inventor were examined (Figure 44).[222] The basis of gender identification was done by interpreting names as typifying "Males" or "Females" based on the economy-specific context (i.e., Mexico) and supported by other studies involving Hispanic inventors. The findings demonstrated that the percentage of applications with at least one Mexican female inventor comprised as little as 8.33% in the textiles/paper sector to up to 34.12% in chemistry and metallurgy. Overall, the participation of female inventors was estimated at 12.63% of the total inventors of total patent applications.[223]

[222] Zetter, B., Brambila, C., & Angon, M. (2017). Gender desegregated analysis of Mexican inventors in patent applications under the patent cooperation treaty (PCT). Interciencia. 42(4). 204-211
[223] Zetter, B., Brambila, C., & Angon, M. (2017). Gender desegregated analysis of Mexican inventors in patent applications under the patent cooperation treaty (PCT). Interciencia. 42(4). 204-211

Figure 44

Historical Comparison of Number of Mexican Female Inventors



Source:
Zetter, B., Brambila, C., & Angon, M. (2017). Gender desegregated analysis of Mexican inventors in patent applications under the patent cooperation treaty (PCT). Interciencia. 42(4). 204-211

2. New Zealand

New Zealand has an open economy that works on free market principles. It features sizable service and manufacturing sectors in addition to a highly productive agriculture economy. The export of agricultural products such as fruits, vegetables, wine, dairy, meat, and forest products forms the backbone of New Zealand's economy.[224] About one-third of actual GDP expenditures on goods and services are exported.

With a score of 80.6, New Zealand has the fourth-freest economy in the 2022 Index.[225] In the Asia-Pacific region, New Zealand is ranked second out of 39 economies, and its overall rating is higher than both the average for the region and the entire world.[226]

New Zealand provides businesses with access to an affluent, sophisticated market, as well as a stable democratic system and a relatively transparent and open business climate. The continuously high rankings of New Zealand in terms of commercial honesty and integrity tend to balance out the economy's limited market size.

[224] https://www.trade.gov/country-commercial-guides/new-zealand-market-overview
[225] Ibid.
[226] Ibid.

The economy did well despite the disruption over the past two years thanks to New Zealand's reaction to COVID-19, which helped shield New Zealanders from the harshest effects of the pandemic. New Zealanders, however, are dealing with an increase in the cost of living for most goods and services due to a number of global trading factors.

2.1 IPONZ: An overview

IPONZ helps local and international businesses to protect their IPRs by examining, granting, and registering patents, trademarks, industrial designs, plant varieties, and geographical indications. IPONZ sits within the Ministry of Business, Innovation, and Employment (MBIE), the steward of the IP regulatory system in New Zealand. The operational functions of IPONZ encompass the following:

- Process and examine patent, trademark, design, plant variety rights, and geographical indication applications,
- Implement international agreements,
- Conduct dispute hearings about intellectual property registrations/eligibility,
- Contribute to intellectual property rights policy development,
- Act as a receiving officer for the World Intellectual Property Organization (WIPO),
- Respond to requests for information,
- Provide assistance, including information and training to customers, and
- Collect application volumes data.[227]

2.2 Experience promoting patents models by local women

New Zealand is a small economy with a relatively small patent office. As a result of the economy's size, it is a net importer of IP, with less than 10% of patents the IPONZ receives being filed by local New Zealand inventors. Considering the low threshold of local patents within the economy's patent system, instead of promoting the use and uptake of patents by women inventors, the priority of the MBIE is to "grow New Zealand for all." As a result,

[227] https://www.iponz.govt.nz/about-iponz/

IPONZ has not yet taken a gendered lens as part of its work program. However, even though IPONZ is working to increase the number of patents received from local inventors, it has tried to ensure gender balance within its case studies and outreach activities, with gender and diversity being promoted in case studies.

2.3 Implementation of specific measures promoting patents by local women

While IPONZ tries to ensure gender and diversity in its patent system so far, the institution has not yet implemented any specific measures to promote women in patents.

2.3 Main institutions promoting and supporting women in patents

The IPONZ is part of a wider ministry – the Ministry of Business, Innovation and Employment (MBIE) – which plays a central role in shaping and delivering a strong New Zealand economy for all. MBIE recognizes that a strong economy uses its people's skills, knowledge, and time in conjunction with New Zealand's natural resources and financial and physical capital to improve the well-being of current and future generations. As one of the agencies working under the MBIE, IPONZ is responsible for conducting pieces on women, innovation, diversity, and science. However, due to the broad mandate of IPONZ, which encompasses the examination, grant, and registration of all forms of industrial property rights, they have not done any pieces that specifically relate to patents.

Considering IPONZ's small size, many of the initiatives they promote are covered jointly with the MBIE. As a result of IPONS's size, it does not have an insurance policy team, and they work with the MBIE's insurance policy team, which looks at New Zealand's aims and goals more broadly.

Generally, IPONZ and the MBIE have done some work on women's innovation. IPONZ has indicated that women in patents are a particular area of interest, but the MBIE is not doing any specific work in promoting the uptake of IP by women at the moment.

2.5 Barriers and challenges women face in obtaining patents

New Zealand women inventors face quite a few challenges when navigating the economy's patent system. Much like women across the world, Kiwi women inventors are constrained by funding limitations to develop and protect their inventions. New Zealand's economy traditionally had not had enough women in grassroots-level STEM activities.

To address these barriers and challenges, IPONZ expressed the need for supporting women and supporting initiatives to increase the participation of women in STEM activities and then seeing that flow through into funding to get started on research and then continue that through into financing for their business. That has very much been the focus of IPONZ to date.

2.6 Expectations for Kiwi women inventors' future use of patents

IPONZ expects that women inventors are provided with the same access and support by their officers as any other person and have a fair and equitable way of getting their business startups going.

By running awareness campaigns, IPONZ believes it will help increase the number of female inventors in the patent application process. The focus of IPONZ has been to show that IP is for everyone. It has done this by showcasing IP messages less from the legal compliance viewpoint and more about the business case studies. IPONZ believes that anyone in business could use IP in various forms as far as their business could be utilized.

2.7 How can New Zealand increase the number of female resident patents

Increasing women's participation in New Zealand's patent system can be done through continuous efforts to boost STEM participation and entrepreneurship and increase women's awareness of the IP system in general. IPONZ, as an intellectual property office, believes that it should continue with its activities that raise awareness of the benefits of women's involvement in the patent system as a means to spur more local participation by inventors in general and women inventors in particular. However, IPONZ currently does not possess gender-disaggregated data to tailor its efforts to raise awareness among female inventors. Therefore, collecting gender-disaggregated data that will increase the awareness point of female inventors in New Zealand will be the first step for IPONZ.

IPONZ acts as a registry body with a small educational or awareness role. In order to support women inventors in navigating the patent system, IPONZ expressed that they have strategic decisions to make on how to better position themselves in the next couple of years. They are looking at some of the work coming through the Singapore IPO and hoping to learn a bit more about how they have positioned themselves as a registry body and doing other activities. Furthermore, active outreach or working at cross-promoting IP uptake, looking at funding models, as many other intellectual property offices are moving into more of an advocate active role in promoting innovation, is something IPONZ intends to explore.

2.8 Proposed collaborative measures among APEC economies

Bearing in mind the difficulties women inventors face around accessing financial resources to fund their startups and getting their inventions from the creation phase to a finalized monetized patent application, IPONZ believes APEC economies should explore ways of cross-promoting or amplifying messages on specific angel investor funding, ease of access, obtaining legal advice, and filing patent applications to ensure they're done right at the beginning.

According to IPONZ, looking at benchmarks of what a good patent application process would look like for women inventors across APEC economies would also be beneficial. Exploring different economies that women inventors look at when filing for patent protection and business strategy activities are actions that IPONZ would be interested in studying at the APEC level to get a global viewpoint.

IPONZ would also like to collaborate with APEC member economies, such as the US, on raising awareness of women in patents, as they are ahead of the curve. Deepening collaborative efforts to address common issues APEC member economies face by providing regional support and amplifying gender equality messages in the IP system is an area IPONZ thinks should be tackled.

3. Peru

Peru's macroeconomic fundamentals, which include a respectable central bank, sizeable foreign reserves, and a public debt-to-GDP ratio that is relatively low, continue to be strong. In the medium term, Peru's economy is anticipated to expand at a rate slightly below the 3% pre-pandemic level, boosted by more significant exports. In contrast, domestic demand is anticipated to weaken due to low business confidence, slower trade partner growth, and unstable energy costs. In the next two years, poverty is expected to persist above pre-pandemic levels due to lower-than-average employment quality.

Following a post-pandemic recovery of 13.3% in 2021, the first half of 2022 saw GDP grow by 3.5% year over year, driven by manufacturing, construction, and services and backed by significantly fewer restrictions than the first semester of the previous year.[228] Since last year, inflation has picked up speed, primarily due to an increase in commodity prices globally and a stimulus to domestic demand to aid in the recovery from the COVID-19 crisis. Because real salaries are still 12% below their 2019 levels and the average quality of jobs is of poorer quality, with underemployment and informality rates up 4 percentage points from pre-pandemic levels, poverty reduction has been modest.[229]

[228] https://www.worldbank.org/en/country/peru/overview
[229] Ibid.

Following a massive COVID-related stimulus, fiscal policy swiftly stabilized. By June 2022, public debt was 34% of GDP, two percentage points less than in December 2021. By July 2022, the annual fiscal deficit had decreased from 2.5% of GDP in December 2021 to 1.2%.[230] This continued a downward trend. The decrease was caused mainly by increased fiscal revenues brought on by a higher corporate income tax collection in the context of high mineral prices. Due to greater outflows to pay for foreign capital in the setting of record mineral prices and larger mining company profits, the current account deficit reached 5.6% of GDP during the first semester of 2022.[231] These extra outflows significantly outweighed the increase in mining exports and the positive trade balance.

In 2022, GDP growth is predicted to be 2.7%, continuing the pre-pandemic pace.[232] Higher mining exports are anticipated to assist the economy, but a gradual decrease in domestic demand will hurt it. Because of low corporate confidence brought on by political and institutional uncertainty, private investment is likely to stagnate. It is expected that the recovery of high-quality jobs, which are more reliant on private investment, will be gradual, restricting worker pay and productivity increases.

The recent correction in mining prices is expected to cause a minor increase in the public deficit the next year, which will be accompanied by a predicted decline in tax collections. However, the deficit's trajectory should continue to follow the fiscal rules, with a gradual decline to 1% by 2026. For this consolidation, a moderate amount of work would be required in terms of costs, particularly those connected to extraordinary transfers. According to this trajectory, the public debt is expected to stay steady in 2022–2024, hovering around 35%.[233]

3.1 INDECOPI: An overview

INDECOPI is a specialized public agency under the Presidency of the Council of Ministers. INDECOPI's authority extends to market promotion and protection of consumer rights while at the same time fostering a culture of loyal and free competition, safeguarding all forms of IP.

INDECOPI administers Peru's IPR system for product or service brands, trade names and slogans, appellations of origin, and any other distinctive sign. Furthermore, it deals with applications for:

[230] Ibid.
[231] Ibid.
[232] Ibid.
[233] Ibid.

- Patents;
- Utility models;
- Industrial designs;
- Protection certificates;
- Indigenous traditional knowledge;
- Layout designs of integrated circuits; and
- Breeder's certificates for new plant varieties.

Its mandate and procedures that govern IP fall under the auspices of three bodies: the Directorate of Copyright, the Directorate of Distinctive Signs, and the Directorate of Inventions and New Technologies.

3.2 Experience promoting the use of patents and utility models by local women

Peru has been going through a renaissance in promoting the use of patents and utility models by local women inventors. The economy has taken specific and general measures targeting local women inventors in the last decade, resulting in an increased number of women approaching the patent system.

Peru's journey to becoming a modern, gender-equal knowledge-based economy began with the issuance of the new University Law (Law 30220) in 2014. The University Law aims to promote scientific research within universities and consolidate a scientific system of excellence by increasing the importance of research and its protection through the Peruvian patent system. Additionally, the law allowed the Peruvian government to create a National Superintendency of Higher University Education (SUNEDU), which requires universities in the economy to comply with a set of quality standards, one of which is to have internal IP policies.

Following the enactment of the University Law, the National Council for Science, Technology and Technological Innovation (CONCYTEC) established a Committee for Women in Science, Technology and Innovation in 2019. The Committee is composed of 10 outstanding scientific researchers working to encourage and promote equal opportunities for women in STI-related activities, providing policy recommendations to CONCYTEC in achieving this goal.

INDECOPI's role in promoting local women's participation in the patent system started in 2018. Since then, it has directed specific efforts and initiatives that promote greater awareness and participation of women in patenting activities. INDECOPI has intensively worked toward raising awareness of the importance of patents, encouraging their utilization at the university level. It has done this through its Technology and Innovation Support Centers (TISC) Network[234], which currently comprises more than 45 members, 95% of which are public and private universities. These members are giving tremendous support to fostering a Peruvian patent culture among students and researchers, incorporating gender equality at its core. As a result of the TISC Network's activities in this area, Peruvian universities ranked first in applying for patents for the first time in 2021.

Through these specific and general measures, Peru has brought women researchers and inventors closer to patents and utility models.

3.3 Implementation of specific measures promoting patents and utility models by local women

INDECOPI has been the sole promoter and implementing authority of specific measures targeting local women inventors' participation in patents and utility models.

In order to collect much-needed data on the participation of women in the patent system, INDECOPI added a requirement in its patent and utility model registration form, which requires applicants and inventors to disclose their gender. By collecting and analyzing gender-disaggregated data, INDECOPI has been able to generate and disseminate annual statistics regarding the use of patents by women. It does this through different events, press releases, and publications.

To draw attention to the equitable use of the Peruvian IP system, INDECOPI has developed specific publications, such as the Peruvian Women Inventors: Inspirational Stories for New Generations (2021), which highlights successful Peruvian women inventors' achievements with the aim to inspire more women and girls to participate in STEM fields. Furthermore, INDECOPI actively disseminates news and articles through different platforms related to women, inventions, and patents.

To further bolster women inventors' success stories that have participated in KIWIE, INDECOPI holds an annual event to recognize and distinguish their contributions. By including the President of Peru or a specific Minister in these annual events, INDECOPI garners more media attention. Additionally, INDECOPI films short videos aimed at the

[234] The TISC is a global program initiated and supported by the World Intellectual Property Organization (WIPO) aim at providing innovators in developing economies with access to locally based, high quality technology information and related services, helping them to exploit their innovative potential and to create, protect, and manage their intellectual property (IP) rights.

younger generations that showcase Peruvian women inventors' experiences and/or inventions, thus raising awareness about the talent of Peruvian women.

Each year, INDECOPI celebrates its first patent grant on 27 October. Interestingly enough, the economy's first patent grant was to an inspiring Peruvian woman – Carmen Noriega – for her cocoa grinding machine in 1837.

Carmen Noriega: First Peruvian Patent Holder

The first patent was filed in Peru after the Independence Declaration (1821) and was granted to a woman named Carmen Noriega for a "Cocoa grinding machine." The patent was issued by the Peruvian Congress through a decree enacted on 27 October 1837. Although Carmen Noriega certainly lived in Peru at that time, it is not possible to know for sure if she was born on Peruvian soil. Nevertheless, her invention sought to contribute to developing a domestic agri-food industry, in a nascent economy fundamentally dominated by machinery inventions developed by men.

The patent resolution published in the official newspaper El Peruano briefly indicated that "…the chocolate grinding machine that the applicant has planned is original and advantageous due to the economy of time and arms with which it operates as manifested in the accompanying descriptive plan; and considering the government is willing to promote industry and stimulate other entrepreneurs to make useful establishments such as the one being filed, Mrs. Carmen Noriega is given the exclusive enjoyment of her industry for a term of 10 years, within which no other machine like this can be carried out unless organized by different mechanisms..."

Carmen was not only an inventor but also an entrepreneur who owned a place in Lima (in Molino de Monserrate), where she utilized the chocolate grinding machine.

The original text of the patent granted (Spanish version only) can be found at: https://www.leyes.congreso.gob.pe/Documentos/LeyesXIX/1837065.pdf.

INDECOPI also initiated the creation and implementation of the Latin American Network on Intellectual Property and Gender in 2021. This network promotes closing the gender gap in the field of IP in Peru; Chile; Colombia; and Costa Rica and is supported by WIPO.

In order to honor women inventors, INDECOPI included a Peruvian Female Inventor Award in 2020. This award is given at the "Domestic Invention Competition" held annually since 1996 and serves as recognition of an invention developed by a woman or a group composed only of women, considered the more outstanding in terms of economic, social, or commercial/productive impact.

3.4 *Main institutions promoting and supporting women in patents and utility models*

Name of institution/body	INDECOPI
Role of the institution	Patent Office/Patent Promotion
Activities undertaken	See Chapter 4, Section 3.3.
Main results and achievements	• Only 8% of patent and utility model applications had at least one female inventor in 2000, while in 2010, it reached 10%, 14% in 2015, and 42% in 2021. However, women inventors alone only account for an annual average of 6% of total resident applications. This implies that Peruvian women tend to relate with patents/utility models through mixed teams (usually composed more of men) at universities' engineering and life sciences faculties rather than on their own. • Another indicator shows that the percentage of women listed as inventors in resident patent/utility models applications has also steadily grown from 11.1% in 2015 to 28.2% in 2021. This means that more women (as an absolute value) are taking part as inventors and in technology development (mostly in universities) in patents/utility models every year.

3.5 *Barriers and challenges women face in obtaining patents/utility models*

To apply for a patent or utility model, a person (male or female) must have an invention that results from pure creativity and ingenuity or an R&D process. Taking this into account, the main barriers observed in Peru that limit patent/utility model applications by women are:

- Fewer research activities are conducted by women, resulting in fewer patent applications. This is in line with the statistical data provided by CONCYTEC, which states that out of approximately 5,000 officially registered researchers, only 31% are women.

- Only three out of 10 people enrolled in science and technology careers at universities are women, which accounts for 30%. Therefore, the pipeline of future female researchers and inventors who would patent technologies will be much smaller than for men.

- STEM careers, especially engineering, have been generally associated with men. Often, Peruvian families expect young women to pursue more traditional career paths, such as a nurse, teacher, lawyer, economics, business administration, and others, rather than science and technology careers. Social bias and unpaid household work are significant obstacles for women participating in STEM fields

and careers. If a girl finally decides to enroll in a STEM program without the support of her family, she will have to spend between two to four hours a day doing household duties, reducing the time that could be devoted to research. Due to these factors, girls and adolescents have not been contemplating the idea of enrolling in careers in STEM areas.

This is gradually changing in Peru as more government and private support are geared toward women's empowerment and independence. For example, the average age of Peruvian female inventors is changing at the level of patents, from 40-50 years to 25-35 years.

3.6 Expectations for Peruvian women inventors' future use of patents and utility models

The expectation is that the number of patents from women inventors and applicants will continue to increase in the near future, based on the work done by INDECOPI and CONCYTEC. INDECOPI intends to continue to carry out the already indicated measures, which will be supplemented by additional actions to facilitate women's easier approach to the patent system. For example, INDECOPI:

- Has proposed the approval of Inventor´s Day, a specific date on which Peru will celebrate, recognize, and make more visible the contributions to society of inventions done by men and women.

- Is working on an economy-level IP Policy that is focused on converting Peru into an economy that understands, values, respects, uses, and manages IP in such a way that allows sustaining a higher level of innovation, creation, and entrepreneurship in the economy and that guarantees a long-term diversified cultural, social and economic growth and development of the economy. This IP Policy will contain a gender equity approach and bring together many institutions, organizations, and sectors, given the transversal nature of IP.

- Is the leading economy working on the APEC Project of Women and Patents. INDECOPI proposed this initiative to share their experience in this field and learn from other experiences or good practices on the subject from other APEC member economies.

- Envisaged a wide array of activities that will be conducted under the Latin American Network on Intellectual Property and Gender between 2022 and 2023 under its pro-tempore Presidency:

- Diagnosis of the IP use made by women;
- Awareness workshops on gender equity issues related to IP;
- Videos of success stories regarding IP and women; and
- A publication of success stories concerning IP and women.

3.7 How Peru can increase the number of female resident patents and utility models

To increase women patent holders or applicants, Peru must increase the number of women individuals engaged in inventive activities. As Peru needs more independent women inventors, it should implement some or all of the following measures:

- Share and make more visible stories of women inventors.
- Provide subsidies, discounts, or financial help for individual women patent applicants only.
- Provide technical support for patent drafting and application through a special program organized by INDECOPI. Its current program, PATENTA, provides technical support to both men and women inventors, but it is not necessarily tailored to women's needs.

Furthermore, to increase the number of female inventors in patent applications, Peru must double its efforts at the level of universities. There is room to increase the number of patent applications from universities, especially because 50% of all Peruvian universities (which are around 100) have already filed at least one patent in the last 30 years. This means that 50 other universities must promote research that will get people interested and engaged with the patent system sooner, especially women. Another figure is that the 20 universities with the most patent applications represent 88% of the total number of patent applications filed by all Peruvian universities. This means that there is still a wide margin for growth for universities that use patents to protect their research on a small scale.

Peru is evaluating also to establish a Committee to Foster Women in Patents led by INDECOPI and other organizations, such as CONCYTEC or the Ministry of Production, to implement specific activities in this field.

3.8 Proposed collaborative measures among APEC economies

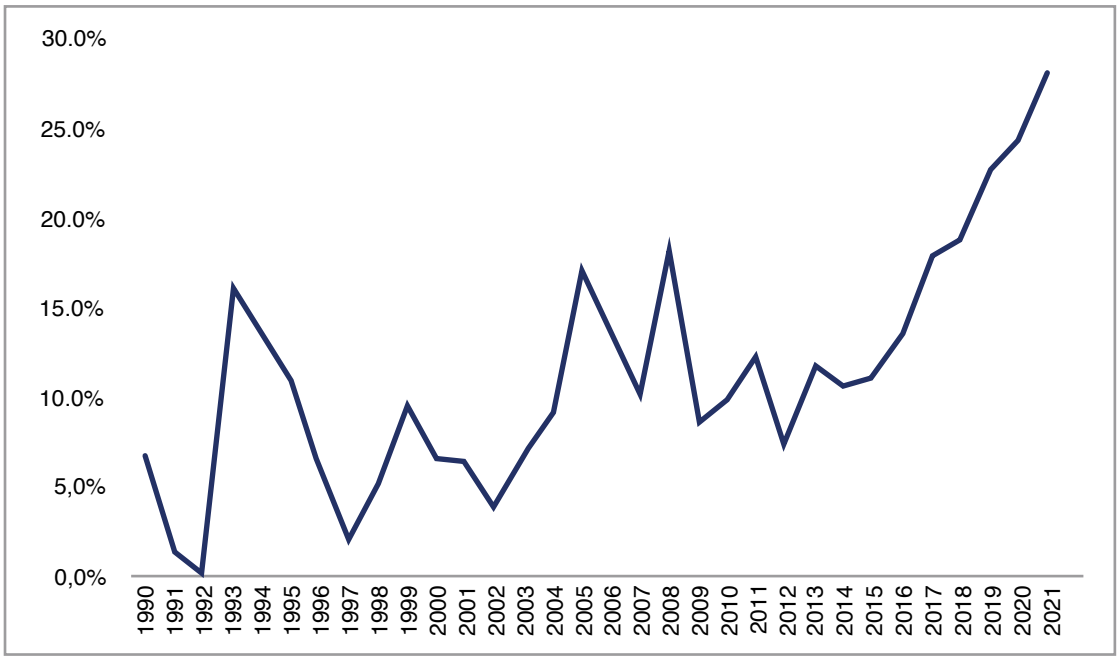
INDECOPI expressed the need for programs tailored to technology transfer and the opening up of international tenders within APEC economies. Furthermore, they believe that APEC should establish a Working Group on Women and IP that will help promote women inventors and patent applicants on a regional level.

3.9 Statistics

Based on statistical work done as part of Peru's PATENTA initiative,[235] under the Direccion de Invenciones y Nuevas Tecnologias del INDECOPI, the share of women listed in patent and utility model applications by residents has been steadily increasing. Whereas from the beginning of data available in 1993 to 2000, there were only 8.8% of female inventors listed in patent applications on an annual average, this figure increased to an annual average of 10.4% in the following decade of 2001-2010 and 16.2% as annual average from 2011 to the most recent data collected at the end of 2021 (Figure 45).[236]

Figure 45

Share of Peruvian women listed in patent applications by residents



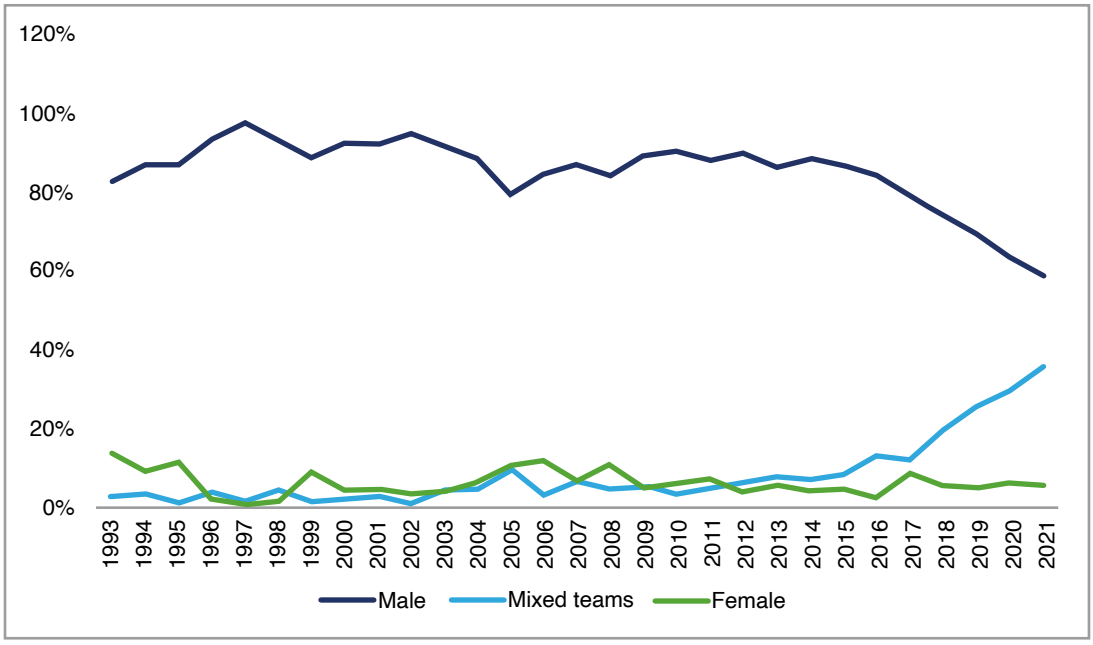
Source: INDECOPI [237]

[235] https://www.patenta.pe/programa-patenta
[236] https://bit.ly/3hhRyxD
[237] Note: Include patents and utility models

The patent and utility model landscape in Peru has been experiencing a transformation in terms of applications filed by the gender of the inventor. While patenting activity continues to be male-dominated, the participation of women has begun to increase. Sole women inventors still account for the least amount of patent applications filed in Peru. However, mixed inventor teams which list at least one woman inventor in the patent or utility model application is experiencing an upward trend since 2012 (Figure 46). Therefore, we can conclude that women's participation in inventive activity across Peru is on the rise.

Figure 46

Inventors´ gender in patent applications by residents



Source: INDECOPI [238]

At a continental level, Peru has established itself as a leader in the Americas in the number of international patent applications with female participation, according to the PCT reported by WIPO, with 28.8% of inventors in 2021 identified as women in such applications. Peru is then followed by Chile with 26% (8th place); Argentina with 24% (14th place); Colombia with 23% (19th place); Brazil with 22% (21st place); Mexico with 21% (23rd place); the United States with 16% (41st place) and Canada with 14% (48th place).

[238] Note: Includes patents and utility models

4. The Philippines

The Philippines is one of the most vibrant economies in the East Asia Pacific region. Average annual growth increased to 6.4% between 2010-2019 from an average of 4.5% between 2000-2009.[239] The Philippines' economic vitality is built on strong consumer demand supported by a vibrant labor market and significant remittances. With increasing urbanization, a growing middle class, and a sizable and young population, the Philippines is an economy with many advantages. Business activity is robust, with substantial growth in the services sector, which includes the real estate, travel, banking, and insurance industries. A decrease in poverty rates and the Gini coefficient shows that the Philippine economy has improved in generating equitable growth. Poverty declined from 23.3% in 2015 to 16.6% in 2018, while the Gini coefficient declined from 44.9 to 42.7 over the same period.[240]

However, the COVID-19 pandemic and the economy's imposed community quarantine measures have negatively impacted economic growth and the fight against poverty. Growth decreased sharply in 2020, with the slowdown in tourism and remittances exacerbating the sharp decreases in consumption and investment growth. Similarly, the previous trend in real wages, which is expected to positively impact household incomes—particularly those from the lower income groups—has been severely hampered by the effects of COVID-19, with negative consequences also for poverty reduction in the Philippines.

Despite this, the economy has begun to rebound, expanding 5.6% year over year in 2021 thanks to public investment and a strengthening external environment.[241] With continued recovery and reform efforts, the economy is getting back on track on its way from a lower middle-income economy with a gross domestic income per capita of USD3,430 in 2020 to an upper middle-income economy (per capita income range of USD4,096–USD12,695) in the short term.[242] With decreasing COVID-19 cases and a broader economic reopening, the economy is predicted to continue to improve. This recovery will be fueled by improving the domestic climate. The economy nevertheless confronts threats from the weak external environment, which is wracked by a predicted slowdown in global growth, rising prices, and geopolitical unrest. Poverty reduction is anticipated to benefit overall from the recovery.

4.1 IPOPHIL: An overview

IPOPHIL is a government agency mandated to administer and implement IP policies to strengthen the protection of IPRs in the economy. IPOPHIL's mandate performs the following functions aimed at protecting and securing the exclusive rights of scientists,

[239] https://www.worldbank.org/en/country/philippines/overview
[240] Ibid.
[241] Ibid.
[242] Ibid.

inventors, artists, and other gifted Filipino citizens to their IP creations:

- Development-oriented – to promote the use of patent information as a tool for technological development.
- Regulatory – to examine applications and grant patents or register utility models, industrial designs, geographical indications, and integrated circuits; help protect copyright by assisting in the facilitation of deposit of work with the National Library and register technology transfer arrangements.
- Enforcement – undertake enforcement functions supported by concerned agencies; conduct visits during reasonable hours to establishments and businesses engaging in activities violating IPRs and provisions of the IP Code based on reports, information, or complaints received by the Office.
- Adjudicatory – hear and decide cases related to violations of IPRs, cancellations, and oppositions to registration, compulsory licensing, and settle disputes involving technology transfer payments.
- Policy-making – coordinate efforts with relevant government agencies and the private sector to formulate and implement plans and policies to strengthen the protection of IPR in the Philippines; and develop and implement strategies to promote and facilitate technology transfer.[243]

4.2 Experience promoting the use of patents and utility models by local women

Currently, women inventors' participation in the patent and utility model system in the Philippines is very limited. As a result, IPOPHIL has tried to address this participation gap through some programs and interventions.

IPOPHIL has made efforts to promote the participation of women inventors in the patent and utility model system through several different initiatives, projects, and programs. Since June 2016, IPOPHIL has initiated the Women in IP (WinIP) project in collaboration with the members of the National Committee on Intellectual Property Rights (NCIPR). The NCIPR is an inter-governmental organization concerned with promoting and enforcing IP.

[243] https://www.ipophil.gov.ph/mandate-function/

Through the Women in IP project, IPOPHIL invited women from the NCIPR to conduct joint programs and activities on IP promotion, education, and enforcement. IPOPHIL's long-term objective with this project is to extend programs promoting women in IP to other government agencies, not just the NCIPR. Currently, the NCIPR composes of around 10 to 12 agencies, and naturally, IPOPHIL wants to expand its programs to the entire government, especially in those agencies involved in enforcement.

Based on the project's successes, IPOPHIL has expanded its scope to mainstream the Gender and Development Agenda (GAD Agenda) to ensure the equal representation of men and women in IP awareness and enforcement efforts.

IPOPHIL gathered representatives from the WinIP project in their offices in 2018 to brainstorm future activities for women IP. This resulted in IPOPHIL organizing the following activities in the same year:

- Orientation seminar on IP for women and the National Bureau of Investigation, where IPOPHIL provided training to female agents working in the Bureau.

- Organized an activity for 500 women entrepreneurs part of a kilos [244] foundation, a cooperative of women entrepreneurs and women-owned SMEs in one town of the Philippines. The activity's primary objective was to provide IP training to women entrepreneurs, which was aligned with the kilos foundation's goal of environmental clean-up.

- Co-organized a meeting with WIPO under the auspices of the Australia Fund-in-Trust on IP commercialization in Asia for a group of women inventors, innovators, and researchers. Through this activity, IPOPHIL wanted to promote the participation of women researchers in the process of IP commercialization and economic exploitation of IP.

In collaboration with the NCIPR, the Department of Science and Technology (S&T), and the Philippine Commission on Women, IPOPHIL organized IP capacity-building sessions in 2019. This was later transformed into weekly basic orientation seminars on IP held in the offices of IPOPHIL. Furthermore, during the height of the pandemic in 2020, IPOPHIL conducted an online IP seminar for women.

Additionally, IPOPHIL has its own magazine called Women in IP, which features women inventors and entrepreneurs of all ages. The magazine has articles about women inventors, their inventions, success stories, and how they used IP to promote their businesses and to invent. One of the articles worthy to note is an inspiring story of a young high school girl who invented AirDisc, a leading cooling technology for a wide array of uses, from personal

[244] Kilos – local term used in the Philippines, meaning movement.

use as home air-conditioning to business utilization, such as cold storage facilities for agricultural products. The magazine has grown in popularity and currently has two issues.

While not related to patents, IPOPHIL's flagship program targeting women entrepreneurs was the One Juana Mark. The One Juana Mark program is an incentive mechanism that waives trademark filing and application fees for women-owned MSMEs. When IPOPHIL piloted the program, it aimed to encourage the participation of female entrepreneurs in the economy's trademark system. This program was later extended to encompass patents and designs, i.e., the Juana Patent and Juana Design Protection (JPIP) program launched this year.

4.3 Implementation of specific measures promoting patents and utility models by local women

One of IPOPHIL's activities – the Juana Patent – is done in partnership with the Department of Trade and Industry (DTI). The name Juana Patent comes from the Filipino local hero Juan de la Cruz, the equivalent of Uncle Sam in the US. This partnership with the DTI aims to encourage women inventors to file patents by giving them discounts and waiving some patent fees throughout the entire process.

Furthermore, IPOPHIL has provided training for patent drafting and filing PCT applications in 2021 and 2022 during the women's month celebration. The PCT training was organized as a webinar to promote the use of the PCT, encourage Filipina inventors to use the PCT system to obtain patent protection abroad, build the capacity of women inventors pursuing patent protection, and increase the participation of women in the international patent system. The webinar was attended by more than 50 women inventors, innovators, and researchers from the Innovation and Technology Support Office and higher education institutions.

The Juana Patent and Juana Design Protection Program (JPIP)

JPIP is an incentive program that advances government's initiative to boost women, MSME and startup innovativeness and competitiveness. The program will waive certain fees in favor of 50 inventions, 150 utility models and 150 industrial designs that are qualified. Beneficiaries will also enjoy prioritized and fast-tracked processing of their applications under the JPIP. In the selection process, the individual, MSME or start-up must pass a set of criteria to benefit from the program.

Eligibility criteria to partake in the JPIP program:

- Engaged in business activities considered as priority sectors by DTI or by IPOPHL;
- Business Names registered by DTI, Securities and Exchange Commission (SEC) or the Cooperative Development Agency;
- Total Assets shall not exceed PHP100 million (approx. USD1.83 million) pursuant to Section 3 of Republic Act 9501 otherwise known as the Magna Carta for MSMEs;
- If the applicant is an enterprise, it shall have no more than 20 employees;
- Engaged in business for at least one (1) year or with limited financial capability or other similar conditions indicating inadequate financial capacity;
- At least one applicant, co-inventor or co-maker or co-designer is a woman who is a Philippine citizen or if the applicant is an MSME, it must be woman-led or woman-owned Philippine enterprise domiciled in the Philippines; and
- Has not availed funding under Republic Act 7459 otherwise known as the Philippine Inventors and Inventions Incentive Act.

Source: https://www.ipophil.gov.ph/juana-patent-and-juana-design-protection-incentive-program/

4.4 Main institutions promoting and supporting women in patents/utility models

Name of institution/body	Department of Trade and Industry/ Department of Science and Technology
Name of institution/body	• Helping pre-screen eligible applicants and beneficiaries of the Juana programs; • Monitoring of beneficiaries; • IP commercialization; • Conducting R&D; and • Facilitating patent filing.
Activities undertaken	• The Department of Science and Technology houses IP units that provide administrative and logistic support to inventors in different regions of the Philippines
Main results and achievements	The programs that have been launched in the Philippines are still in their nascent stages. Therefore, official results cannot be obtained at this stage.

4.5 Barriers and challenges women face in obtaining patents/utility models

The main challenge women inventors face in obtaining patents and utility models in the Philippines is the low awareness of IP and its value. Women inventors do not know the potential IP has in enhancing their business models.

Women inventors and entrepreneurs in the Philippines need to be educated and informed about the process of obtaining a patent. They lack training in filing and drafting patents, writing claims, and conducting a patent search. IPOPHIL has tried to somewhat alleviate this barrier through a program that teaches the basics of IP (patent application and prosecution) in 77 universities so women inventors do not have to hire a patent attorney. However, this program needs to be expanded.

Another challenge women inventors and entrepreneurs face in the Philippines is the cost of obtaining a patent. Patents are expensive to obtain and maintain, which is why IPOPHIL has started the JPIP program.

4.6 Expectations for Filipina inventors' future use of patents and utility models

Women will always be at the forefront of IP and S&T in the Philippines as they are involved in many of the components of the innovation ecosystem. Continuing to hold webinars and capacity-building efforts similar to the ones held during the pandemic will raise awareness and women's participation in the patent landscape in the Philippines. IPOPHIL expects that its programs will increase filing from women applicants in the future.

4.7 How can the Philippines increase the number of female resident patents/utility models

The Philippines is looking to institutionalize capacity building for women inventors, specifically targeting the information technology (IT) industry and women-owned MSMEs. IPOPHIL is willing to regularly offer programs that tackle IP issues to enhance women's awareness and capabilities in accessing the economy's patent system.

Apart from raising awareness and capacity-building exercises, the government and its relevant ministries and agencies would like to provide women inventors seeking to patent their inventions with certain financial incentives, such as waiving the patent application fees. Furthermore, there is a need for more patent agents that will guide women inventors through the entire process.

An additional program that could be implemented in the Philippines in the near future would be the employment of a specific financial assistance window for women inventors by the Department of Science and Technology. This program would be similar to the gender-neutral IP Protection and Commercialization Fund administered by the Technology Application Institute under the Department of Science and Technology. By providing women inventors with a specific window where they can access financial assistance, the Philippines might increase their participation in the patent system.

The Philippines has around 1800 private higher education institutions, which IPOPHIL has not reached yet. Efforts to tap into these universities, where most of the individual researchers and R&D practitioners are women, should be amplified.

Reach-out efforts might also extend to local government units to educate women about the importance and value of IP. This could be done through the existing IP Academy partnering with a local government agency that could inform women and matters of patents, utility models, and other IP types.

The new President of the Philippines, His Excellency Mr. Ferdinand Romualdez Marcos Jr., has expressed the importance of science and technology in the economy. Hence, IPOPHIL expects that there will be more initiatives to increase women's participation in the patent system in the future.

Shifting the focus of education to STEM subjects without relegating other essential subjects would be a logical step in including young girls in creative activities from an early age, which will later trickle down to the patent system. Furthermore, vocational schools need to emphasize S&T and raise awareness of IP rights from an early age.

4.8 Proposed collaborative measures among APEC economies

APEC collaboration could be further deepened by providing intra-regional access to financial assistance to women inventors and women-owned startups, especially in the case of technologies more predisposed to women's independent research. IPOPHIL believes economies should share best practices and information on how more developed APEC economies have tackled the IP gender gap, allowing for pilot programs to be implemented in the region's developing economies.

IPOPHIL believes that APEC's public-private dialogue (PPD) activities could be translated into the IP context. By reaching out to women inventors, entrepreneurs, and researchers from different economies to participate in PPD activities that APEC usually conducts, economies in the region can better understand the IP gender gap and how it can be tackled collectively.

Furthermore, raising awareness and educating women inventors about the importance and value of IP should be at the core of every APEC-sponsored program. By addressing the low levels of education and increasing awareness jointly, APEC economies will foster an IP mentality that will undoubtedly be beneficial for the region's economic and social development.

5. The United States

Despite facing domestic challenges and a rapidly transforming global landscape, the US economy is still the largest and most important in the world. The US economy, which still exceeds China's, accounts for around 20% of world output. Additionally, the IMF reports that the United States has the sixth-highest per capita GDP (PPP).[245] A highly developed and technologically advanced services sector makes up around 80% of the US economy's output.[246] Services-oriented businesses dominate the American economy in the technology, finance, healthcare, and retail sectors. With more than a fifth of the Fortune Global 500 businesses hailing from the United States, large American enterprises also significantly influence the international arena.

The United States is a global leader in higher-value industries like automobiles, airplanes, machinery, telecommunications, and chemicals and the second-largest manufacturer in the world. Although the services sector drives the economy, the United States still has a significant manufacturing sector that accounts for 15% of output.[247]

[245] https://www.bea.gov/news/glance
[246] Ibid.
[247] Ibid.

Meanwhile, less than 2% of output comes from agriculture.[248] However, the US is the largest agricultural exporting economy in the world and a net food exporter because of its abundant arable land, cutting-edge farming technologies, and hefty government subsidies.

The traits that make up the American economy help it remain a global economic powerhouse. Modern physical infrastructure and abundant natural resources are available in the economy. Additionally, it boasts a sizable, educated, and effective staff. Furthermore, the physical and human capital is fully leveraged in a free-market and business-oriented atmosphere. This distinctive economic climate in the US results from both the government and the populace. The government provides political stability, a working legal system, and a regulatory framework, enabling the economy to grow. The general population, which includes a variety of immigrants, contributes a strong work ethic, an entrepreneurial spirit, and a willingness to take risks. Continuous innovation, R&D, as well as capital investments, are the main drivers of economic growth in the US.

5.1 USPTO: An overview

The USPTO is the federal agency for granting US patents and registering trademarks. The USPTO advises the president of the United States, the secretary of commerce, and US government agencies on intellectual property (IP) policy, protection, and enforcement; and promotes stronger and more effective IP protection worldwide. The USPTO furthers effective IP protection for US innovators and entrepreneurs worldwide by working with other agencies to secure strong IP provisions in free trade and other international agreements. It also provides training, education, and capacity-building programs designed to foster respect for IP and encourage US trading partners' development of strong IP enforcement regimes.[249]

5.2 Experience promoting the use of patents by local women

The USPTO realizes that further work needs to be done to eliminate what they see as a possible underrepresentation of women in the IP system. The USPTO has found that increasing education and public awareness of the patent system among women has been critical. Supporting women through encouraging more mentorship and networking has also been a significant step in tackling the gender gap. Finding ways to celebrate innovative and creative women through events is essential in promoting creativity among women. By carrying out many of these actions, the USPTO hopes to decrease any gender gap in the use of the patent system.

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[248] Ibid.

[249] https://www.uspto.gov/about-us#:~:text=As%20a%20mechanism%20that%20protects,nation's%20technological%20progress%20and%20achievement.&text=The%20United%20States%20Patent%20and,U.S.%20patents%20and%20registering%20trademarks

5.3 *Implementation of specific measures promoting patents by local women*

The USPTO has spearheaded many programs, initiatives, and activities over the last several years to promote the use of patents by women. For example, it hosts and participates in various activities that encourage participation in innovation and entrepreneurship by both men and women. The USPTO has many plans and ideas for activities that support the message of diversity and inclusion. By bringing diverse speakers into training activities, the USPTO has been able to expand awareness of the necessity of increasing diversity for all people, including women.

One of the USPTO's flagship initiatives is the "Journey in Innovation" series. They also have several award programs, demonstrating that inventors from many different demographics can help innovators from diverse backgrounds see themselves as inventors. The USPTO has implemented many programs and initiatives, including, for example, reduced fees for SMEs and even lower fees for micro entities. The USPTO believes that these initiatives and programs offer particular help to women, mainly because women often experience more financial barriers than men regarding access to finance. Therefore, it is likely that the implemented fee discounts are especially beneficial to women inventors in the US.

"Journey in Innovation" program

Each month, as part of the "Journey in Innovation" series, the USPTO is finding ways to inspire and encourage innovation by sharing relatable stories that chronicle the experiences of inventors and entrepreneurs. In doing so, the USPTO hopes it would help to shed light on how they got a start, the challenges they faced, what it took to bring their ideas to fruition, and their brands. The rationale behind these stories is to help emphasize the importance of creating and protecting IP and its critical role in innovation. The program can be found on the USPTO website and highlights inspirational inventors, including female inventors, to increase appreciation of the diverse inventions made by women, which is the main focus.

The USPTO has a pro bono program that helps financially disadvantaged patent and trademark applications with legal representation. Through this program, the USPTO is hopeful that disadvantaged inventors, particularly women inventors, would be able to access the US patent system, as women often experience more financial barriers than men as has been previously said.

By hosting and participating in many initiatives that target women and minority populations, the USPTO aims to improve their participation through many entrepreneurship programs that include steps to navigate the IP system. Furthermore, the USPTO has training programs on patents geared toward the USPTO's entire audience. However, these training programs have proven to be of particular interest to women inventors. One example of these programs sponsored by the USPTO is an intervention focused on women filing patents, which has a speaker series with one researcher, Neel Sukhatme, a USPTO Edison Scholar.

The USPTO's Edison Scholarship is a program where scholars and professors work on projects dealing with intellectual property. Dr. Sukhatme recently presented his latest paper, "The effect of female political leadership and innovation: Evidence from US cities," a research project that focused on whether female political leaders might impact innovation. During his research project, Dr. Sukhatme measured this by the effect of the election of women mayors on patent grants in US cities. He found that female inventors seem to increase, in fact, more than double the number of grant patents relative to male mayors, generating about 52 additional patents per 100,000 city residents. These findings have persisted over time; notably, there appear to be significant effects, especially when a female incumbent wins for a second term. The USPTO found the Edison Scholarship program particularly interesting and beneficial, as it has not been done before.

Furthermore, the USPTO has also participated in many international women's economic empowerment programs for policymakers and hosted several programs in this area which can be found on their website. Many of these focused on how SMEs can protect their IP and where support for women-owned businesses can be provided by the government. These international programs have many speakers from different economies who talk about where they can access support from their governments, focusing on support measures for women inventors and women-owned businesses. Additionally, the USPTO has other international programs advancing women's participation in technology centers; these programs often highlight IP and commercialization basics, international US initiatives, and USPTO's university education in women and girls initiatives. The USPTO is hopeful that these programs will be useful as part of their public outreach series.

The USPTO has an abundance of series and programs that focus on many topics. These include, for example, insights on how universities, businesses, and government agencies connect to promote cooperation in R&D of innovation technology, examination of best practices and strategies to successfully transfer scientific discoveries and technical breakthroughs to domestic, regional, and international markets, and increasing the understanding of how international patent rights are applied to technology. The USPTO has implemented many targeted activities, as they believe that other topics, such as exploring effective education mentorship programs encouraging girls and young women to pursue STEM careers, are particularly important. When designing solutions, the USPTO aims to tailor them to consider the needs and interests of women and girls and explore the role of professional development societies and organizations in advancing women in science, engineering, digital technology, and art and design. The programs and topics mentioned above are some of the issues the USPTO has aimed to explore and tackle through its involvement in international programs.

The USPTO's current Director, Kathi Vidal, is very interested in Diversity, Equity, and Inclusion (DEI) and is focused on increasing opportunities for women and underserved minorities in the patent system. DEI is a very strong focus for Ms. Vidal and the administration, which lends itself to a more focused approach by the USPTO in tackling gender issues in innovation and entrepreneurship.

Finally, the USPTO has a joint program with the Small Business Administration (SBA) that provides an overview of domestic and international IP as part of an awareness campaign. The SBA is one of the biggest organizations in the US that supports small businesses. This joint program provides an overview and highlights the USPTO's and the SBA's resources available for women entrepreneurs and women-owned SMEs in the US.

5.4 Main institutions promoting and supporting women in patents

The USPTO is the primary agency that promotes and supports women in patents, as it is responsible for granting and issuing patents and the registration of trademarks and disseminating to the public information concerning patents and trademarks. According to its statute, the USPTO may also take other actions, including conducting programs, studies, or exchanges of items or services regarding IP law. Hence, the agency's statute allows it to deliver a wide range of programs to support women in IP. However, the USPTO generally does not provide training in topics outside the scope of IP.

Apart from heavily focusing on IP, the USPTO places a particular additional emphasis on commercialization. Therefore, one of the activities that the USPTO as an agency has been involved in and has recently begun spearheading is expanding its focus on IP commercialization.

5.5 Barriers and challenges women face in obtaining patents

Like in many economies, the USPTO understands that women face many barriers in several areas. First, one is financial; having financial resources to maintain IP protection is perhaps more of a barrier for women than men. Furthermore, traditionally, women have been burdened with more responsibilities, such as childcare, in addition to their jobs.

The USPTO is hopeful that women's participation will continue to grow, despite inventing in a more male-dominated innovation world where women may feel a bit more challenged in getting their ideas across and getting people to pay attention to their ideas and thoughts. In that way, they may be more overlooked by their male peers, especially when there are just a lot more male peers who are inventing and who are patent-holders. It may just be more complicated for women inventors to get their voices heard in such environment.

5.6 Expectations for women inventors' future use of patents

The USPTO anticipates that the use of the patent system by women in the US will increase over time and is hopeful that by conducting all of their current and future programs, the

agency will raise awareness and increase the number of women who are patent holders and applying for patents.

5.7 How the US can increase the number of female resident patents

The USPTO has implemented many programs and activities to increase the number of female resident patents. One of the main activities the agency has undertaken to expand the quantity of female resident patent-holders who are applicants or inventors has been raising awareness and access to the US IP system. The USPTO has done this through three main initiatives:

- The Council for Inclusive Innovation;
- DEI; and
- Enhancing education outreach.

Based on the USPTO's 2018 SUCCESS (Study Of Underrepresented Classes Chasing Engineering and Science Success) Act, the former Undersecretary of Commerce for IP and Director of the USPTO in consultation with the administrator of the SBA prepared a Report to Congress in 2019. The report aimed to identify publicly available data on the number of patents annually applied for and maintained by women, minorities, and veterans. Additionally, it identified available data on the benefits of increasing the number of patents applied for and maintained by women, minorities, and veterans, and the small businesses that are owned by them and provided legislative recommendations for how to promote the participation of women, minorities, and veterans in entrepreneurship activities and increase the number of women, minorities, and veterans who apply for and maintain patents. Based on the recommendations in the report, the USPTO designed the Council for Inclusive Innovation (CI2) initiative.

Born out of that Success Act in 2018, The USPTO established CI2, which is developing a domestic strategy to increase participation in the IP ecosystem by encouraging, empowering, and supporting all future innovators and increasing the involvement of women and other underrepresented groups, including geographically and economically. An important point the CI2 raised for the US economy is that all innovation does not just come from Silicon Valley or Boston; it should come from many different places in the US.

Additionally, the USPTO has been looking at diversity, equity, and inclusion internally. As previously mentioned, increasing DEI is one of the activities in which the USPTO's director has been very involved. The USPTO's staff has a significant role in the IP ecosystem by having a diverse workforce that includes women. A diverse workforce allows the USPTO to cater to and encourage more women to apply for and receive patent protection. Supporting diversity within the USPTO is an excellent first step, including and supporting female patent examiners. Several initiatives underpin the USPTO's DEI activities, including voluntary

employee organizations or affinity groups and mentoring programs aimed at increasing workforce diversity. The USPTO already has a very diverse workforce, one of the most diverse workforces in the US government. Its representatives believe that doing even more to increase the diversity of its workforce is a good first start.

The USPTO wishes to build support for STEM. It is imperative to build STEM capabilities and increase that pipeline because, without it, the USPTO cannot get more women engineers and women interested in STEM to file for patents. In order to increase the STEM pipeline by supporting education on IP, the USPTO hopes to promote programs similar to the National Summer Teacher Institute, Camp Invention, as well as other programs which focus on encouraging women and girls to pursue and advance in STEM careers, such as the Women Entrepreneurship Symposium. While the USPTO has implemented several such programs, the agency is in the process of further consolidating and strengthening its efforts in this regard.

The annual Women's Entrepreneurship Symposium (WES) organized by the USPTO offers attendees a chance to learn about innovation in business from public and private sector experts. At the symposium, participants can learn about navigating today's marketplace, explore ongoing efforts to bring women into the innovation ecosystem, and hear from senior USPTO officials, IP experts, and others to discover educational opportunities for women and girls in STEM fields. The WES is one of the USPTO's biggest annual events that aims to raise public awareness of the importance of women's participation in advancing innovation and catalyzing entrepreneurial activities.

Additionally, the USPTO is monitoring the Inventor Diversity for Economic Advancement Act of 2021 which, when enacted, would allow applicants to provide the gender of the inventor voluntarily. This is important because, like many other economies, the USPTO didn't have that data before. Collecting data would mean that the office can then monitor the level of female participation in the patent system with renewed accuracy. Studies have shown that diverse teams are more innovative. The USPTO hopes that with improving reporting, patent applicants will be encouraged to review the diversity in the inventorship of the patent applications and be incentivized to promote even more diverse collaborations. Collecting the data will help the USPTO's Office of Chief Economist to do even more reporting and more studies on the issues confounding women in inventorship and women in patents, which will, in turn, help the USPTO come up with even more efforts to promote this.

Furthermore, participating in international projects is essential for the USPTO, as many international and regional organizations, like APEC, focus on increasing gender equality. The agency believes that efforts to collaborate with overseas counterparts and intellectual property offices worldwide to promote greater gender equality and equity and greater women participation in the mentorship system and IP system, in general, is really important.

5.8 Proposed collaborative measures among APEC economies

The USPTO believes that participating in similar projects to this one and contributing to reports is seminal. APEC could focus on holding more workshops during the launch of future IPEG programs for promoting and supporting women in patents.

Next year is the US year at APEC, so the USPTO hopes it can look into having workshops where economies may benefit by exchanging ideas and experiences about what has already been done in the women's IP field and how it can be translated to other economies. The agency hopes the next IPEG meeting will be in person as COVID-19 restrictions become less strict. At that point, CI2 will be even more mature, and the USPTO could share its experience regarding CI2 and other programs that have been and are being implemented. Additionally, spinoff workshops could be beneficial.

5.9 Statistics

The USPTO recently had a 2020 update on their Progress and Potential report, a US women inventor patentee report that the Office of Chief Economist was responsible for authoring. It is a follow-up to a 2019 report that focused on female inventors. The new report updates many of the USPTO's previous findings, which were based on a review of nearly one million issued patents and three years of new data. It also provides further insights into the participation of women in the US IP system.

Among the things found in this new 2020 update was that more women are entering and staying active in the patent system than ever before. The number of patents with at least one woman inventor increased slightly from 20.7% in 2016 to 21.9% by the end of 2019. The women inventor rate, the share of US inventors receiving patents, who are women, increased from 12.1% in 2016 to 12.8% in 2019, which is a slight increase. The percentage of women among new inventors on issued patents rose from 16.6% in 2016 to 17.3% by 2019. The gender gap in the number of women inventors who remained active by patenting again within 5 years is decreasing. For the most recent group of new inventors, 46% of women patent again in the next 5 years compared to 52% of men. Among the leading patent filers, the 3M Company, known for making sticky notes and based in Minnesota, showed the most significant improvement in the participation of women inventor patentees. Their average increased from 15.2% from 2007 to 2016 to 16.6% from 2017 to 2019.

The report is a significant achievement for the USPTO and an important stepping stone for women in the IP system, providing the agency with data on the impact its efforts have had in increasing the participation of women in the US patent system. The results obtained in the 2020 report are reflective of the achievements reached during the USPTO's previous administration.

V

Women's pursuit of patents

V. Women's pursuit of patents

For any economy to develop sustainably and transition toward a knowledge-based economic model, there must be a close relationship between science and gender equality. Women persist in encountering numerous obstacles when trying to enter or advance in STEM fields, with statistics reporting that less than 30% of scientists worldwide are female. As a result of these inequalities across all STEM fields, the gender patenting gap has become a persistent reminder of the inequalities that plague every facet of society.

This report showcases the stories of five exceptional female inventors from four APEC economies, i.e., Chile; Mexico; Peru; and the Philippines. The information about these women's lives and inventions was obtained through in-person interviews via Microsoft Teams which were later transformed into compelling stories about their life work.

These five resourceful and creative women have employed patents as a tool to acquire social recognition, professional advancement, monetary independence, and equal rights. The journeys they took to secure patent protection for their ground-breaking inventions are thus intended to serve as inspiration for other young women and girls in APEC to pursue patent protection for their own original, cutting-edge, and revolutionary ideas. Their lives, accomplishments, and careers will undoubtedly leave a mark and encourage more women and girls across APEC to pursue STEM-related positions and, as a result, achieve full and equitable access to and participation in these sectors.

1. Lucia Pejerrey: A young Peruvian inventor paving the way for green innovation

Lucia Pejerrey is a young Peruvian who has paved herself with a bright future ahead. At the age of 22, she is already listed as a co-inventor of 12 patents and utility models owned by the Universidad Privada del Norte (UPN). This determined and creative young woman has also received international recognition for her innovative works and already has one PCT international patent registration and industrial design registration, for which she has been listed as the designer and inventor.

Lucia earned her BA in Industrial Design from the UPN in Peru. As a talented and motivated individual, she now works as a patent document consultant at the same university, wishing to relay her knowledge further.

Her wish to be recognized for the work that she does has taken her to several international contests. She says that the most important one for her was the Korea International Women's Invention Exposition (KIWIE) 2020, where she was awarded the semi-grand prize. What makes this international participation and prize most special to her is that this was the first and only time that a Peruvian participant managed to receive an award. Lucia was also awarded a KIWIE 2021 medal for the best invention worldwide and also earned several gold and silver medals.

Lucia states that she is also very proud of showcasing one of her patents at WUF 10 held in Abu Dhabi. Her determination, however, does not stop there. She has participated in other international and domestic contests and has received recognition. She was featured on the video call of the winners of the Global Grad Show on CNN, among other things. What drives her motivation forward is also the fact that she has been recognized as one of the female inventors with the largest number of patents in the last 30 years in Peru.

1.1 Solving an environmental or human need is Lucia's passion

The motivation that stands behind the development of all of Lucia's inventions comes from her desire to help and solve a need of some kind. Her inventions relate to either solving some human need or some environmental challenge. Lucia states that four of her patents directly aim to create new compostable materials that can be turned into new products to be used by people. One of her inventions is a pen made of a Pacay shell. What is important is that this pen, once dried out, cannot harm the environment in any way. Instead, the aim is to plant it as it fertilizes the soil.

Title	Procedure to obtain a compostable organic material based on corn husks and guinea pig manure		
Grant Date	--	Expiration Date	
Classification	D01G 13/00		
Title Number	-	Publication Date	22 March 2021
Summary	Commercially known as PACUY, the invention is a method for producing compostable organic material based on corn husks and guinea pig manure for use in products, being a totally organic and easy to degrade material when exposed to fertile soil and water.		
Applicant	Universidad Privada del Norte (UPN)		
Inventor	Ruth Aracelis Manzanares Grados, Lucía Ximena Pejerrey Florián, Jessica Porras Real		
Status	Patent APPLICATION		

Source: https://www.patenta.pe/en/detalle-producto?idProducto=2375

Lucia has been lucky, as she states she hasn't encountered any relevant difficulties or barriers as an inventor. On the contrary, she has received all the support that she needs to work in Peru. This comes as a result of Peru's undertaking an initiative to develop and foster a patent culture for people interested in this system. There have been a lot of changes, and work has been geared towards further development of its invention processes by involving more and more women.

Title	A clothing sterilization apparatus with safe evacuation of the generated steam		
Grant Date	16 Nov 2021	Expiration Date	28 May 2030
Classification	A61L 2/07; A61L 2/10		
Title Number	1667	Publication Date	15 December 2020
Summary	Commercially known as Steam Nurse, the invention is a sterilization garment device characterized by a steam evacuation system which is made up of three sections; the first is located in the lower part, which is a space where the system for the evaporation of the disinfectant liquid is located; in the second section is the sterilization area, in this, there is also the extraction hood that allows the evacuation of steam; Finally, there is the upper section, this is a compartment for the user's personal belongings, this area is removable, and allows the device to be used as a locker.		
Applicant	Universidad Privada del Norte (UPN)		
Inventor	Ruth Aracelis Manzanares Grados, Lucía Ximena Pejerrey Florián, Deivid Junior Yábar Gamarra, José Anthoni Paredes Alarcón, Jessica Porras Real		
Status	Patent AWARDED		

Source: https://rpp.pe/campanas/valor-compartido/estudiantes-peruanos-crean-un-casillero-electronico-que-desinfecta-prendas-y-utensilios-del-personal-medico-para-reducir-el-contagio-de-covid-19-primero-lo-bueno-noticia-1409331

For a young woman who has never needed to prove her worth and find her place in this man's world, Lucia remembers well and shares an anecdote that she found quite amusing. She was part of an international competition abroad for which she had teamed up and worked on a project with a male colleague inventor. During the competition, she showcased one of her patents, and one of the participants, a man, was interested in her patent. He, however, directed all of the questions to her male colleague and did not even look at her when she answered one of his questions. She later learned that this was a part of his culture – women were simply not involved in this business. Luckily for her, this is not the case in Peru.

Title	Portable device for guiding people with visual disabilities		
Grant Date	30 Dec 2021	Expiration Date	26 October 2030
Classification	A61H 3/06; A61B 5/024		
Title Number	1695	Publication Date	16 December 2020
Summary	Commercially known as QanwanQashani, this device is an electronic bracelet for people with visual disabilities that provides security, independence and freedom, which through its systems allow the user to travel independently and safely. It has buttons and links that allow the bracelet to be adjusted to the user's wrist, in addition, the color of the lights can be customized depending on the user's visual capacity. The device comprises an external structure that includes a control module; a GPS module connected to the control module, a wireless connection module connected to the control module; a wireless charger connected with the control module through the wireless connection module; fastening means located outside the external structure; characterized in that it has an emergency system that includes lighting means connected to the control module, a cardiac sensor connected to the control module and an emergency button connected to the control module.		
Applicant	Universidad Privada del Norte (UPN)		
Inventor	Ruth Aracelis Manzanares Grados, Lucía Ximena Pejerrey Florián, Deivid Junior Yábar Gamarra, Angela Estefany Fernández La Rosa		
Status	Patent AWARDED		

Source: https://www.patenta.pe/en/detalle-producto?idProducto=2373

1.2 Overcoming challenges

Lucia learned about patents during her studies at university. In order to expand her knowledge, she wanted to attend talks and conferences, but these were not always free of charge. It was thanks to the talks that were provided by INDECOPI that she learned much more. INDECOPI is a governing body that, among other things, is responsible for assisting in the registration of patents. These talks offered her free advice and guidance as a student. Being a young woman never posed an issue. If one wanted to learn more, INDECOPI and the university were there to assist.

Lucia does, however, emphasize that at the beginning, she had experienced some difficulties in understanding the process of obtaining a patent/utility model. Nevertheless, INDECOPI has been working on informing the entire Peruvian population about how inventions can be protected for several years. PATENTA has additionally been a recent initiative that has focused on providing guidance to the student, researcher, entrepreneur, and large company communities on the process of drafting a patent document free of charge. The only prerequisite they all have to meet is that upon completion of the document, it will be sent for patent registration. This advice that Lucia has received has helped her to understand the whole process of registering a patent.

The process of writing the required documents presented a challenge for Lucia, who had never written a technical patent document or a patent application. She also faced time management and financial issues. Fortunately, noticing the determination of this talented and dedicated young woman, both INDECOPI and Lucia's university provided extensive and adequate support that was much appreciated. She participated in contests organized by both entities, received finances from them to complete the patent process, and, as a result, UPN was able to patent her inventions without any problems.

1.3 Patent strategy

Lucia's work has been rewarding, and the UPN is now in the process of commercializing one of her patented inventions. This came about as a result of her participation in an international contest where she presented the objectives of her product. What she said about her invention captured the interest of many companies, and the university is now in the process of closing the sale of her patent with a foreign company.

International contests are not the only place where one can find more information about Lucia, the patents and inventions associated to her. Anyone who is interested in her work can look her up on the following links:

- Linkedin: https://pe.linkedin.com/company/giadips-upn
- Facebook: https://www.facebook.com/Giadips
- Instagram: https://www.instagram.com/giadips_upn/
- Twitter: https://twitter.com/giadips
- Youtube: https://www.youtube.com/channel/UCLMtPd4Nd6YAySNe5an5O-g

As a young and inexperienced inventor, Lucia initially encountered difficulties regarding what information she could disclose about her patents. Companies always wanted to know more and asked a lot of questions. She had to ensure that she provided 'enough' information to maintain the companies' interest and yet to ensure that she protected her patent from being copied. Her university had provided assistance throughout her studies, and this is exactly the support that she received from them again – she learned what technical data she could share about the patent so as not to encounter any problems until the patent was granted.

1.4 Keep inventing to close the gender gap

Lucia believes that there is a gender imbalance when it comes to patents. There are more male than female inventors in Peru, which should certainly change. According to her, patents are tools that enhance and strengthen the innovative efforts that should be put forth by both men and women. Both would have the opportunity to do research and develop further in their area of interest. Hence, patents can become a tool for equality.

Unfortunately, in most rural areas of Peru, women have not had as much access to education for years. However, the number of patents registered by women is increasing, and there are more and more females who are entering this field. "Now, more than ever, women are slowly being given more opportunities to develop further. If more girls have the chance to study and enter the area of research and creation, then they will all become more independent", Lucia states. "They will have more opportunities to participate in various competitions that are sponsored by the government and the media. We are talking about projects with a high level of patentability that are being financed. Unfortunately, this information must be spread around the economy so that more women can get involved", she points out.

To address and overcome the challenges women inventors face, Lucia suggests that support should not be given only to educational institutions and companies, but it should be understood as a process that would encompass all areas of the economy. She also recommends that educational institutions expose students to patents in schools from a

young age and that companies become more open to purchasing local patents as they are one of the fundamental bases of the economy. “We are talking about pure innovation; we are talking about creativity that must be exploited. Innovation must be given an opportunity. Patents are not to be seen as an expense. On the contrary, they should be seen as an investment, as creations that have value and are of great importance to each economy”, Lucia states.

Lucia encourages females, in general, to continue to advance their skills, not to focus on a single idea, and to try out different things. Despite patenting being a long and complex process, there are ways to reach one’s goals. Peru offers talks and provides guidance, advice, and financial aid. Any interested individual should keep abreast with all this information, be proactive, do their research, and not give up. They will certainly find ways that will help them reach their goals. Her final suggestion is: “Do not wait and keep inventing.”

2. Ysabel Koga: A Peruvian vet turned scientist

Ysabel Koga obtained her bachelor’s degree from the Faculty of Veterinary Medicine from the oldest university in Peru and South America – the National University of San Marcos. Her inquisitive, studious nature and thirst for knowledge led her to Japan, where she obtained a postgraduate degree in Microbiology from the University of Yamaguchi in 1989. She did not stop her education there, as she also became a Master of Research and University Teaching in 2001, a degree she obtained from the Faculty of Education at the Inca Garcilaso de la Vega University from Peru.

As her interests expanded, so did her degrees. Ysabel returned to Japan in 2002, where she continued her education and obtained a postgraduate degree in Biotechnology at the University of Obihiro. Four years later, Ysabel received another postgraduate degree in Primary Industries and Fisheries from the Animal Research Institute in Queensland, Australia.

Ysabel is an international authority on avian diseases, as she’s published scientific papers and presented her findings in Canada, Japan, and Costa Rica. Her educational background led her to become a professor of Veterinary Microbiology, Veterinary Immunology and Clinical Pathology at the Faculty of Agricultural Sciences at Alas Peruanas University. Additionally, she has taught numerous courses at the Faculty of Veterinary Medicine and Zootechnics at the Universidad Peruana Cayetano Heredia and the Faculty of Veterinary Medicine at the National University of San Marcos.

Ms. Koga has since retired from her academic positions and is the co-owner of Bioservice S.R.L, a laboratory that has been innovating for more than 20 years, developing solutions to address illnesses in livestock. Recently, she and her team have begun developing products that can be used in humans too.

Ysabel has always been fascinated by languages as they allow her to connect to different cultures and learn. She is fluent in Spanish, English, and Portuguese and has a good command of French and Japanese.

2.1 Ysabel's environmentally conscious inventions for improved livestock health

Ysabel has always been curious about researching and developing new and creative solutions to everyday problems. Throughout the years, her research interests have expanded beyond developing solutions that are used to prevent illnesses in cows, chickens, and pigs. Ysabel has developed a few products that address human problems too. Ever conscious and passionate about the environment, Ysabel strives to invent new approaches to existing problems that use no chemicals. Her portfolio of patented inventions boasts all-natural products that use vegetables and fruits in a novel way. Ysabel's only invention that does use a chemical compound is her vaccine.

Ms. Koga's first ever patent was for the development of a vaccine. This was a joint venture with two other inventors who are her colleagues. The vaccine they developed is used to stop the spread of ornithobacterium infections, a contagious disease transmitted by direct contact between birds and can be potentially fatal. By using isolated immunogenic proteins from the outer membrane of the ornithobacterium rhinotracheale (ORT), Ysabel and her team have been able to stop the spread of this infectious disease among birds in poultry farms across Peru.

Title	Methods for the isolation, identification, purification of the seed, obtaining antigenic components and preparation of the finished product called vaccine of local strains of ornithobacteriumrhinotracheale (ORT)		
Grant Date	31 December 2006	Expiration Date	27 December 2021
Classification	A61K 12/16		
Title Number	4478	Publication Date	2 February 2003
Summary	Refers to isolated immunogenic proteins from the outer membrane of the bacteria ornithobacteriumrhinotracheale (ORT), characterized by their molecular weights varying between 12 kda and 80 kda. It also refers to a vaccine comprising the outer membrane proteins of ort, a derivative immunogenic that is immunologically cross-reactive with ort and one or more carriers or diluents. The vaccine confers humoral and cellular immunity against ort and may be useful for the treatment of respiratory, nervous, joint and reproductive disease in birds caused or exacerbated by ORT.		
Applicant	Bioservice S.R.L		
Inventor	Ysabel Cristina Koga Yanagui, Arnaldo Alvarado Sanchez		
Status	Patent AWARDED/EXPIRED		

Ysabel' second invention is an immunomodulator, which she devoted a lot of time and effort to develop. Her innovative and environmentally conscious fervor led to the creation of a natural supplement that yields and offers a better quality of life to livestock while at the same time preserving the environment.

Title	Procedure for the elaboration of a nutritional supplement that includes the probiotics, prebiotics, physiological stimulating regulator, immunomodulator and energizing fractions		
Grant Date	23 June 2009	Expiration Date	4 July 2025
Classification	A23K 1/14; A23K 1/22		
Title Number	5344	Publication Date	11 April 2006
Summary	It refers to a procedure for the elaboration of a physiological and immunological regulating and stimulant oral compound comprising the following fractions: a) prebiotic fraction corresponding to natural products such as yacon root pulp (smallanthussonchifolius), alfalfa extract (medicago sativa) and chicory (cichorium intybus) that provide fructoligosaccharides (10%); b) probiotic fraction made up of microorganisms such as lactobacillus acidophilus, lactobacillus casei, bifidobacterium longum and saccharomyces cerevisiae (30%); c) physiological stimulating regulator fraction represented by yacon extract, alfalfa extract, honey, propolis, hydrated seaweed and deionized water inoculated with 2% v/v of a suspension of saccharomiycescereviseae and aspergillus ficuum (20%); d) immunomodulator fraction made up of a vegetable such as cat's claw (uncaria tomentosa), an animal component such as pollen and a microbial component based on lysates of corynebacterium pseudotuberculosis, propionabacterium granulosum and escherichia coli (20%); e) energizing and electrolytic fraction made up of maca and camucamu (5%). The fractions are mixed in the indicated percentages.		
Applicant	Bioservice S.R.L		
Inventor	Ysabel Cristina Koga Yanagui, Arnaldo Alvarado Sanchez, Robert Humberto Tinoco Romero		
Status	Patent AWARDED		

Her third invention is a solution to a problem that affects the production capacities of many farmers, poultry farmers, and pig farmers – infestations of pests, parasites, and ectoparasites. Ysabel's solution is a bioinsecticide, an alternative to existing chemical insecticides.

Ysabel's bioinsecticide allows the simultaneous growth of all four serovars of B. thuringiensis (serovar israelensis, tenebrionis, aizawai, and kurstaki) in a single medium. The bioinsecticide produced with her procedure allows the four varieties to coexist, so its spectrum of action is greater. It has an insecticidal effect on Coleoptera, Diptera, Hemiptera, and arachnids through contact or ingestion of the protoxin of the bacteria, which acts by destroying the intestinal wall of the insects, causing their death.

Title	Procedure for the preparation of a bioinsecticide comprising strains of bacillus thuringiensis		
Grant Date	21 December 2009	Expiration Date	28 March 2025
Classification	A01N 65/00		
Title Number	5519	Publication Date	11 April 2006
Summary	It refers to the procedure for the preparation of the biological insecticide characterized in that the biological fraction conformed by strains of bacillus thuringiensis in its varieties tenebrionis, aizawai, israelensis and kurstaki are cultured in a medium that uses three substrates: one protein of animal origin constituted by a 40% of a fish concentrate, one of vegetable origin made up of 20% of a green asparagus concentrate (asparagus officinalis) and one carbohydrate made up of one 20% of a yuca concentrate (manihot utilissima). The concentrates are obtained separately to then be mixed and sterilized in an autoclave. Then a mother culture of the 4 described strains is inoculated at a concentration of 3x10 6-10 8/ml. It is incubated with constant movement periodically controlling the production of spores. When the percentage of sporulation reaches 90%, the incubation is stopped, placing the culture in refrigeration (maintain the ph between 5.5 and 6.5). The biological fraction composed by strains that provide biomass and endotoxins secreted by the bacteria is mixed with a vehicle which is made up of deionized water and an acidifier in a proportion of 10:90. The diluent contains the mixture of acidifier, humectant, dispersants and adherents. The insecticide, when used by spraying/sprinkling on facilities or animals, eliminates the highest percentage of insects, even the most resistant to other insecticides the biological fraction composed by strains that provide biomass and endotoxins secreted by the bacteria is mixed with a vehicle which is made up of deionized water and an acidifier in a proportion of 10:90. The diluent contains the mixture of acidifier, humectant, dispersants and adherents. The insecticide, when used by spraying/sprinkling on facilities or animals, eliminates the highest percentage of insects, even the most resistant to other insecticides the biological fraction composed by strains that provide biomass and endotoxins secreted by the bacteria is mixed with a vehicle which is made up of deionized water and an acidifier in a proportion of 10:90. The diluent contains the mixture of acidifier, humectant, dispersants and adherents. The insecticide, when used by spraying/sprinkling on facilities or animals, eliminates the highest percentage of insects, even the most resistant to other insecticides		
Applicant	Bioservice S.R.L		
Inventor	Ysabel Cristina Koga Yanagui, Arnaldo Alvarado Sanchez, Robert Humberto Tinoco Romero		
Status	Patent AWARDED		

Ysabel's last patented invention is "Biosanit," a biodegradable and innocuous disinfectant made from natural compounds. She developed this disinfectant in response to the need for alternative disinfection products, which are not based on chemical compounds that cause allergies, various diseases due to the accumulation of toxic chemical metabolites in the body, and contamination of water, air, and soil. Biosanit won INDECOPI´s "Annual recognition for the Commercialization of a Peruvian Patented Invention" in 2018 (see video at: https://www.youtube.com/watch?v=cEpkxJpm_RA).

Title	Disinfectant based on natural compounds and its elaboration process		
Grant Date	25 May 2015	Expiration Date	8 January 2032
Classification	A01N 35/42; A01N 65/36		
Title Number	7448	Publication Date	21 December 2012
Summary	The disinfectant includes: a) a vegetable fraction, included in percentage by weight by: cineol essential oil from eucalyptus leaf extract (15%), citric acid from grapefruit (15%) and acetic acid from grape (30%); b) organic acids, included in percentage by weight by: propionic acid (7.5%) and formic acid (7.5%); c) vegetable surfactants (1%); d) stabilizers and deionized water as a vehicle, together (9%)		
Applicant	Bioservice S.R.L		
Inventor	Ysabel Cristina Koga Yanagui, Arnaldo Alvarado Sanchez, Robert Humberto Tinoco Romero		
Status	Patent AWARDED		

Last year, Ysabel and her team presented a new patent related to a product used for detoxication.

Title	Detoxicant, hepatoprotective, choleretical, collagoga, antioxidant and protective and regenerating composition of mucosa		
Grant Date	--	Expiration Date	
Classification	A61K 36/18; A61K 31/375; A61P 1/16; A61P 39/06; A61K 36/185; A61K 36/48		
Title Number	-	Publication Date	19 May 2021
Summary	The invention is related to a detoxifying, hepatoprotective, choleretic, cholagogue, antioxidant and protective and regenerative composition of mucosa that comprises, in percent by weight: a) between 12% and 18% betaine and between 3% and 7% flavonoids as a detoxifier; b) between 8% and 12% cynarine and between 8% and 12% complex B as heptaprotector; e) between 1% and 4% of berberine and between 1% and 4% of boldine as choleretic and cholagogue; d) between 8% and 12% of vitamin C as an antioxidant; e) between 8% and 12% saponin as a protector and regenerator of mucous membranes and f) the rest is water as a vehicle.		
Applicant	Bioservice S.R.L		
Inventor	Ysabel Cristina Koga Yanagui, Jorje Enrique RodriguezBailon, Robert Humberto Tinoco Romero		
Status	Patent APPLICATION		

2.2 The road to success is not without challenges

Inventors across Peru still face challenges despite efforts to address them over the years. Some of these challenges, she says, are exclusive to women inventors, and others are not confined by gender. Monitoring a patent, for example, is a very big problem in Peru that affects all inventors regardless of their gender, according to Ysabel. Another challenge is the lack of support for inventors, particularly women inventors with limited resources and understanding of the patent system. In most cases, if women inventors want to do something, they must use their own money, she says.

She believes women, in general, are not considered contributors or even capable of contributing, not only in patents but other research programs. Ysabel does not know whether this is a result of social bias that views women as pursuing more traditional careers. Fortunately, she says, the process of obtaining patents was not that difficult after she had gone through it many times.

Ysabel reminisces about the long road she had to traverse to obtain her first patent for her ORT vaccine. When she and her team finished developing the vaccine, they had to file a patent application, a task she found especially difficult. It took Ysabel a lot of time to correctly draft the patent application and understand the underlying process required to file it with INDECOPI. Ysabel did not know all the requirements she needed to fulfill for INDECOPI to grant her patent. The entire process was lengthy, as Ysabel and her team had to redo the patent application three to four times for it to comply with INDECOPI's requirements.

Additionally, she says that INDECOPI delayed the patent grant for too long for her vaccine. This was not exclusive to her case, too, as many other inventors had similar issues obtaining a patent in Peru in the early 2000s. Ysabel filed her patent application in 2000 but only obtained the patent five years later, in 2005. She says that five years were too long to wait for the patent, especially since they had to wait for the product's approval and could not do anything with it, fearing copycats. However, Ysabel noted that INDECOPI has shortened the patent grant time and generally issued her subsequent patents in 2.5 to three years.

2.3 Overcoming the challenges

Ms. Koga said that when she was filing her first patent, she and her team had conversations on training with INDECOPI that were very helpful. INDECOPI taught her how to draft the patent application and claims, ameliorating their coordination in her pursuit of a patent.

As she pointed out, funding and resources are a persistent challenge for many inventors in Peru. Individual inventors, especially women inventors, Ms. Koga says, have no support or additional aid. Luckily, Ysabel applies for her patents through her company Bioservice

S.R.L. She and her business partners utilize some of the company's profits to fund their patenting endeavors in Peru. She says she is fortunate to file for her patents through her company, as it acts as a buffer many individual inventors do not have. Additionally, Ysabel always looks for partnerships with other companies and institutions that provide her with information about copycats, which helps her monitor her patents.

In terms of funding for patents, Ysabel said that some domestic institutions provide inventors with support. However, obtaining the funds is a drawn-out and tedious process, so she prefers to use her own resources.

2.4 Patent strategy

Ms. Koga's patents have been commercialized through her company, and she has not faced any challenges or issues in this endeavor. Their sales are run by Ysabel's husband, who is also a veterinarian and a colleague. He is the person responsible for showcasing their products and personally goes to meet their clients, providing them with courses and implementing research projects on their farms without cost. By showing their products to their clients and giving them an overview of their registration model, the clients accept and buy their products. Additionally, Ysabel's company has started to use social media to showcase Bioservice S.R.L's products, and she has a company website (www.bioservice.com.pe) that offers a lot of information about the products and inventions she has developed.

Ysabel is also pleased to have the support of INDECOPI. As part of her collaboration with INDECOPI, she showcased her last patented invention, a disinfectant, in Korea at KIWIE 2019. Even though she could not attend, Ysabel was represented by a person from INDECOPI. She said that she is very fortunate to have INDECOPI's support, as she received a diploma and a gold medal at KIWIE 2019.

She is still working, researching, and developing new inventions that she can turn into patentable products and hopes to obtain another patent at the beginning of next year.

2.5 Patents: A tool to foster gender equality in Peru

Unfortunately, according to Ysabel, women are somewhat relegated to the sidelines in Peru. Social bias leads people to believe that only men can do a lot of things. She says this might be due to the mentality of Peruvian women who are accustomed to being relegated. However, Ysabel firmly believes that women can do everything as well as men. Because of her beliefs, she always tells her clients and personnel that everyone is equal and has the same capabilities. Ysabel has four brilliant female inventors who work with her to

develop new solutions to problems and present their research papers internationally. She says that she constantly emboldens them to be better persons and better professionals and not think that only men know or do best because women can do things just as well.

> ***"It is somewhat challenging to make people understand how important women are, and awareness is key."***
> ***– Ysabel Koga***

Ms. Koga has been invited by INDECOPI three or four times to empower women's participation in research, patents, and utility models. She believes that INDECOPI's work in highlighting women's success stories in patents or who are doing something important, interesting, or technical helps raise awareness and encourage creative Peruvian women to pursue science. However, Ysabel noted that INDECOPI should not be the only Peruvian institution in charge of raising awareness and combatting bias.

Her recommendations for future female inventors are to "never abandon their dreams, persist, and achieve what they want." Ysabel noted that even though there may be multiple difficulties and problems, everybody, especially women, can do their best and not give importance to people who try to diminish their work.

3. Diana Mendoza: An aspiring Mexican patentee

Diana is a biochemical engineer from Mexico. She obtained her Master of Science degree in Genetics and Molecular Biology. Diana has been a lecturer and teacher at the National Polytechnic Institute (NPI) in Mexico since 2013, where she teaches several courses related to Fluid Mechanics and research methodologies for her student's graduation project. Additionally, she has worked as a Project Manager on projects related to bioinformatics in life sciences since 2014. Ms. Mendoza currently collaborates with another NPI dependency dedicated to guiding and supporting the academic community in areas such as technology transfer and IP.

Diana is an entrepreneur as well, and she is the co-founder of ATGenomics (ATG). ATG is a Mexican initiative dedicated to promoting genomic data science through podcasts, training, and cloud services.

3.1 Accessible biocomputing solutions for all

The idea behind Diana's invention was born out of ATGenomics' bioinformatics training and workshops, during which she realized that limited computational power is an obstacle to starting a bioinformatics study. Among the challenges she and her team discovered were factors that involve the limited availability of computational clusters, public institutions, the high cost of specialized computer equipment, and specific server configurations that imply expert bioinformatics.

The solutions Diana and her team create as part of ATG is a service that aims to close the gap between the acquisition, configuration, and use of specialized computer equipment so that the end user can maximize their academic and intellectual efforts to obtain better results.

Diana's invention is called ATG Labs, a biocomputing solutions platform that allows communication between computing and people interested in analyzing biological data through a graphical interface that allows them to access a virtual terminal/programming environment/database and specialized pipelines related to bioinformatics.

3.2 Challenges for Mexican women patenting in bioinformatics

Ms. Mendoza believes that the women's community, particularly in bioinformatics, has been very collaborative. She says they often see users closely and understan

the language of the different levels of knowledge about bioinformatics projects. However, Diana notes that there is a reluctance among women to provide intellectual contributions in interdisciplinary professional careers like hers. She believes it would be beneficial to increase awareness of career pathways such as the one she chose.

In Diana's view, women in Mexico lack the necessary knowledge to navigate the Mexican IP system, which is a challenge she has had to face. A common barrier she and her peers have faced is their lack of understanding of institutional processes when pursuing patents. To make matters worse, Diana noted that many charlatans in Mexico who claim to be IP lawyers pray on women inventors' lack of knowledge of the IP system, swindling them in the process. Considering that many women face financial issues in developing a complete IP strategy, Diana says this is a serious issue that must be addressed.

Ms. Mendoza also said that women inventors like herself need more workshops and examples to learn how to navigate the patent application process. Bioinformatics is close to academia, and beginner entrepreneurs, like herself have found that writing and drafting a patent application without adequate support from seasoned professionals is very tedious. Diana particularly finds writing claims difficult, as she lacks knowledge of legal jargon. So, she says it would be beneficial to hear about the rigor of women's inventions, stories about their impacts, approaches, or statistics.

Diana's business partners are Mexicans based in Denmark and the UK and have technical expertise in bioinformatics. Ms. Mendoza's perspective throughout her professional career has focused on communicating ideas and setting goals from non-bioinformaticians to programmers. She had basic programming skills, but Diana's knowledge, management, and communication skills have allowed the progress of inventions. She says that sexist attitudes are prevalent in her field, which can be intimidating. However, Diana says she feels supported by the ATG team, as she can contribute ideas freely. Fortunately, she says that she has found support from her ATG co-founders.

3.3 Overcoming challenges in patenting is a team effort

Ms. Mendoza has dedicated her time to combating gender bias in her field. Since she founded ATG, she started her podcast, where she talks about her work with other women. Diana has also joined women's initiatives and forums in the tech world and enjoys making content to visualize the effort of everyone's role in ATG's projects.

So far, Diana's path in IP issues has not been too difficult. She says she has met very good people who have mentored her through the NPI. Additionally, she says that she has received support from IMPI, which has integrated her into women in IP networks and mentorship programs led by other women. Diana also met people at WIPO's Women in STEM workshop, which has helped her understand patents and utility models better.

3.4 Patent strategy

Diana's invention has been commercialized. However, she is currently going through the patent application process. She and her team are in the process of drafting the patent application. She says they have decided to go through the domestic patent system and are looking at possibilities for patenting another invention through the PCT. However, she was candid in stating that she and her team are experiencing some difficulties conducting a patent search because they are trying to patent software. They have yet to develop a strategy for the next level of commercial steps.

In terms of Diana and her team's strategy, they are looking at offering their invention as software as a service. Currently, Diana is looking to license or sell the service to teachers or bioinformatics training schools. However, Ms. Mendoza is also looking into offering a membership program allowing access to all the benefits her software has to offer. She and her team are analyzing that as a potential strategy.

3.5 Closing the IP gender gap in Mexico requires statistical data and case studies

Diana believes that patents can be a tool to empower women to become innovation leaders. She says that providing equal opportunities for women in the patent system will be the only way to achieve gender equality.

However, Ms. Mendoza believes it would be helpful to collect statistical data on women's inventorship to understand which bottlenecks need to be addressed. Additionally, Diana says that practical cases could inspire and embolden Mexican women to invent more, regardless of their success rate.

Furthermore, Diana says that IMPI should continue creating new initiatives that bring women inventors together. Involving women inventors who have more experience patenting can provide young women inventors, like Diana, with much-needed guidance and encourage them to invent and seek patent protection. Additionally, Ms. Mendoza believes that IMPI should train and certify more people working across varied institutions in IP.

According to Diana, finding a mentor is perhaps the most important step in attempting to patent an invention. During our interview, her final words to empower Mexican women to invent and patent were to "make a strategy and focus on your objective."

4. Merlinda Palencia: A Filipina technopreneur addressing environmental concerns

Dr. Merlinda Palencia is a full-time professor at the Chemical Engineering Department at Adamson University in the Philippines. She teaches graduate-level courses and provides her students with research and thesis advice. When she started doing research, she was fascinated by trying to tackle the issues of humanity's consumerism and its effect on the environment. Initially, Dr. Palencia's research focused on environmental protection and natural water resource conservation. Her interest in these fields has only grown and expanded, as she said, wishing to make a positive change by providing help in protecting the environment to combat the catastrophic effects and potential calamities of global warming.

Natural water resources are a vital concern of Dr. Palencia, having studied the impacts of pollutants on major water bodies in and around her hometown, Manila. Her research of the Pasig River, Manila Bay, and Laguna Lake discovered that these vital water bodies continue to be contaminated by waste and debris. As a chemical engineer, Dr. Palencia believes that she must do something to initiate change and inspire her students to achieve greater heights by becoming better researchers adept at addressing environmental concerns in the near future.

4.1 Mitigating water pollution through naturally occurring biogenic minerals

Dr. Palencia felt compelled to find solutions to the growing problems of water pollution. The idea behind her invention was to develop a solution that would not only mitigate the impacts on the affected ecosystems but will also have downstream benefits to local communities and even extend to combatting global warming.

Through Dr. Palencia's research efforts, she ultimately invented Vigormin. Vigormin is a mixture of naturally occurring biogenic minerals that significantly stimulate the growth of indigenous aerobic organisms and microorganisms present in the water, boosting the removal rate of domestic wastewater pollution. Dr. Palencia's invention – Vigormin – can significantly improve the characteristics of domestic wastewater and can result in a reduction of total suspended solids (TSS), decreased biochemical oxygen demand (BOD) and chemical oxygen demand (COD). It can also significantly increase dissolved oxygen (DO), which aerobic microorganisms need to break down waste. Vigormin is an effective water remediation and treatment technology that has the ability to absorb heavy metals, such as mercury, copper, and lead.

Vigormin conveniently possesses features that contribute to its utility, including that it is entirely natural, odorless, non-toxic, affordable, and can be stably stored at a temperature of 15 to 55 degrees Celsius for 18 months without any degradation in quality. It does not

contain any microorganisms or enzymes, yet it is a powerful means to treat wastewater. In fact, water treated with this Vigormin may promote fecundity of the soil, supporting local agriculture, and also has the ability to neutralize odors.

Vigormin's Benefits and Use Cases[250]	
Benefits	**Use Cases**
• A reduction in TSS, BOD and COD • An increase in DO • Low-levels of turbidity • Odor neutralization, and • Removal of mercury (Hg), lead (Pb), zinc (Zn), and copper (Cu) through adsorption.	• Treat septic/domestic wastewater from hotels, commercial establishments, and condominiums; • Neutralize strong acrid and rotten odors present at landfill sites, material recovery facilities, piggeries, fishing ports; and • Treat wastewater with a high organic load, for example, wastewater from food processing industries, public markets, slaughterhouses, and restaurants.

Dr. Palencia has developed a variant of Vigormin, which is used for solid waste management. It can neutralize odors, enhancing the composition of organic solid waste. This solution is applicable in landfills or composting, as it does not have any adverse effects on the quality of the compost material. Her invention actually improves the compost material, making it very suitable as a fertilizer.

Dr. Palencia says that her invention was initially developed for ordinary household use. However, to address the wider needs of wastewater treatment and to ensure that the treatment of wastewater becomes affordable and sustainable at a larger scale, Dr. Palencia designed a modular ecology-friendly domestic wastwater (MEDOW) treatment. She experimented with different designs of MEDOW for communities in Boracay, which proved successful and resulted in the treated water being used for drip irrigation. Because the product and treatment are 100% natural, the treated water has no adverse effects on plants and enhances their growth.

4.2 Doubts about commercial scale and breaking away from academia

Regarding the struggles Dr. Palencia encountered as a woman, she recounts how her mentors were concerned that Vigormin would not reach commercial scale. Dr. Palencia is part of the "first batch" of technopreneurs from the Leaders in Innovation Fellowship (LIF), which is part of the Newton Agham Program and is a collaboration between the UK government and the Department of Science and Technology (DOST) of the Philippines to bolster science, research, and innovation. Prior to this six-month-long training, she recalls

[250] Adapted from https://www.wipo.int/wipo_magazine/en/ip-at-work/2021/vigormin.html

being an academic concerned with only conducting research and publishing papers, which would allow her to advance in academic circles. However, Dr. Palencia is grateful that the LIF "opened her eyes" that research should not be for publishing only and that "the higher purpose of research is to be able to innovate, create a commercially viable product that helps people, provides employment, and solves a particular problem."

4.3 Overcoming the challenge

Specific to patent and utility models, Dr. Palencia states that there are not many obstacles for women in the Philippines and that opportunities are available for all, as she started the commercialization aspect of Vigormin at the age of 59. However, women need to be more "aggressive" to take advantage of the resources and mentors for developing innovations. Regarding procedural barriers, Dr. Palencia indicated that the Innovation & Technology Support Office's (ITSO) role reduces much of the traditional onus on researchers and inventors in filing for patents and trademarks in the Philippines. The universities also handle much of the paperwork and costs related to the patent filing, freeing inventors to focus on R&D. By seeking alternative avenues, such as receiving support from government agencies, she could streamline the implementation of her product due to its widespread utility. Further, she credits the role of government policies that make such products affordable for households, communities, and small and medium-sized enterprises.

Dr. Palencia's work on Vigormin has led to international recognition of the invention, including receiving the Dr. Gregorio Y. Zara Medal for Outstanding Technology Commercialization at the 2019 National Science and Technology Week (NSTW) Awards.[251]

Dr. Palencia attributes much of her success through knowledge and education to the inventorship process, including enrollment in an entrepreneurship program that was run through her university. She states that this empowered her with the knowledge and tools to better develop and disseminate inventions. Moreover, the support of the government and university system has been instrumental to the success of the spread of her inventions.

[251] https://www.adamson.edu.ph/v1/?page=view-news&newsid=1737

4.4 *Spin-offs to commercialize environmentally sound inventions*

Because Dr. Palencia developed Vigormin at a fortuitous moment when the Philippine government has been looking to address water pollution, she received support from her university. Her university decided to create a spin-off company called Envigor Natural Products Manufacturing, which is owned jointly by the university and the inventors. Furthermore, her university bought the facilities where Dr. Palencia and her team can set up the manufacturing plant. DOST provided the initial capital for building the structure and funding for equipment and the manufacturing plant. However, Dr. Palencia invested her salary and other incidental costs necessary to be able to produce the product. Additionally, she received support in promoting Vigormin from Adamson University and DOST.

DOST's Provincial Science and Technology Centers created different campaigns to promote Vigormin by organizing seminars for different fora to present her technology to a wider audience. Additionally, Dr. Palencia is exempt from tax by the DTI, so she could channel her profits into developing new and better products.

Title	Low-cost organo minerals for wastewater treatment and odour removal		
Grant Date	--	Expiration Date	
Classification	C02F1/28		
Title Number	-	Publication Date	23 August 2017
Summary	The invention describes a composition and method for biochemical and mechanical remediation of wastewater or river in which the biomineral is an oxygen releasing material that increases dissolved oxygen, decreases biochemical oxygen demand and chemical oxygen demand and neutralized strong odor through the use of organo-minerals, The claimed composition comprises of dolostone, organic limestone, rocks, petrified wood, clay minerals and zeolites. The claimed composition is utilized either in powder form and applied through dispersion.		
Applicant	Adamson University Clifford		
Inventor	Merlinda A. Palencia, Clifford A. Dural		
Status	Patent APPLICATION		

4.5 IP is a tool that protects creative endeavors

Gender equality is not much of a concern in the Philippines as women are highly respected. Nevertheless, Dr. Palencia believes that IP must be used as a tool that women from the APEC region can use to protect their creative endeavors.

She says that inventors in the Philippines, regardless of gender, would benefit from the removal of red tape procedures. These red tape procedures, duties and customs on imported equipment to commercialize or scale up the inventions they develop tend to significantly delay the process of commercializing an already viable product.

In terms of helpful personality traits, Dr. Palencia acknowledged the role of the courage to invent, even when doubtful due to perceived adversities. Ultimately, as a female scientist and inventor, Dr. Palencia hopes that her efforts can inspire women to conduct research to address these environmental concerns.

5. Nicole Tischler: Developing vaccines and therapeutic for orphan viruses

Nicole Tischler began her education in her homeland, Germany, where she received her degree as an Engineer in Biotechnology from the Mannheim University of Applied Sciences in 1999. She developed a functional diagnostic method for heparin-induced thrombocytopenia during her undergraduate thesis. Her passion for solving potential global health crises emboldened her to move to Chile, where she obtained her Ph.D. in Biotechnology at the Universidad Andres Bello. The focus of her Ph.D. revolved around the humoral immune responses of patients infected with the Andes virus, the development of monoclonal antibodies, and the identification of the viral membrane fusion protein. After her Ph.D., Dr. Tischler continued her post-doctoral training at the Fundacion Ciencia & Vida and the Milenio Institute for Fundamental and Applied Biology and set up her laboratory, where she is the principal investigator.

On a personal note, Dr. Tischler is a mother of two children. Her love of nature has been the catalyst for spending her free time hiking across the beautiful Chilean mountains. She is also very interested in and passionate about social movements, social justice, and politics.

5.1 Two patenting strategies to crack the hantavirus code

Dr. Tischler's research interests are human pathogen viruses, and she has dedicated the last decade of her life to one of the "nastiest" viruses that plague the Americas – hantaviruses. The hantavirus pulmonary syndrome is a rare infectious disease with high mortality rates (around 35% and higher) in humans. As a result of its various strains, this elusive virus manifests its infection patterns differently depending on where it is found.

The problem with hantaviruses is that they are quite different depending on the region of the globe where they can be found. For example, in Europe, the hantavirus strains have a lower mortality rate (at around 10%) than the one found in the Americas. In Asia, where hantavirus infections are much more common, a vaccine has been developed in China. However, the Chinese vaccine has not been proven effective over a longer period.

In Dr. Tischler's view, while there is concern from the public health viewpoint, pharmaceutical companies have been lagging behind in expressing their concerns and interest in addressing the problem that hantaviruses present. Additionally, there is little to no market interest in developing a vaccine due to the small number of infections each year (less than 1000 people annually in the Americas). As a result, Dr. Tischler has dedicated her life's work to studying these viruses to be prepared to prevent a potential epidemic or a pandemic.

> *The hantavirus is a tri-segmented negative-sense RNA genome encased in a lipid envelope studded with surface spikes that bind to a cell receptor and fuse their lipid envelope with the cell's lipid membrane. Two lipid tropes come together, and they meld. This is the lipid mixing step or the membrane fusion step, and this step requires energy. This whole process is driven by viral membrane fusion. Once these viral fusion proteins get activated, they change their configuration information, target the cell membrane, and merge them.*

Dr. Tischler has composed two patenting strategies to try to crack the hantavirus problem. The first one involves the development of a vaccine, or rather an antigen used for treating a hantavirus infection. The antigen used in vaccines, she says, can be made from deoxyribonucleic acid (DNA), ribonucleic acid (RNA), or a direct protein that resembles a piece of the pathogen. In her earliest patents, Dr. Tischler developed a vaccine that used an antigen that resembles the entire surface of the virus by using a non-infectious virus particle. She used a similar approach to develop her first vaccine akin to her mentor's Hepatitis B virus (HBV) vaccine, Dr. Pablo Valenzuela, which uses a non-infectious protein.

Her following patent applications tackled the issue of stabilizing the surface of the virus, which has spike proteins, i.e., "fixing them in a form that is non-infectious." Once a virus starts to infect cells or lives outside the body, those spike proteins change as they suffer

greatly from the external environment, which alters their form. Therefore, Dr. Tischler says that when "one embarks on the journey to develop a vaccine, one has to be absolutely certain that it's stable." Dr. Tischler has tried to stabilize the protein spike for the hantavirus. By partnering with the Pasteur Institute in France, she was able to engineer spike proteins of hantaviruses in 2016, a patent application currently going through the PCT. Her subsequent patent applications for a hantavirus vaccine are similar to the Moderna and Pfizer/BioNTech vaccines for COVID-19.

Title	Engineered spike proteins of hantaviruses and uses thereof
Publication Number	WO/2019/178286
Classification	A61K 39/12
Publication Date	19.09.2019
International Application Number	PCT/US2019/022134
Summary	The present invention describes specific engineering of the hantavirus spike proteins with modifications to stabilize (Gn/Gc)n heterodimer contacts and/or Gc homodimer contacts and/or Gn/Gn oligomer contacts on the spike with the purpose of using them as immunogens in next-generation vaccine design. Said spike proteins have been covalently stabilized by at least one disulphide inter-chain bond between Gn/Gc heterodimers and/or between Gc homodimers and/or between Gn homo-oligomers as they are presented at the surface of infectious virions. It also involves spike stabilization by introduction of cavity-filling amino acids with a bulky side chain at the above-mentioned contacts. Said spike proteins can be soluble Gn/Gc ectodomains in solution and/or incorporated as (Gn/Gc)n hetero-oligomers onto virus-like particles (VLPs) and/or used for pseudotyping virus vectors and/or form part of a stabilized recombinant virus, wherein said spike proteins can be used to select ligands and/or can be used for preventing or treating infections by one or more hantaviruses.
Applicant	Fundacion Ciencia Para la Vida, Institut Pasteur, MASS Clifford
Inventor	Nicole Tischler, Eduardo AndresBignon Silva, Felix Augusto Rey, Pablo Guardado Calvo
Status	PCT Application

Source: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2019178286&_cid=P20-LDKKJG-19056-1

The second patent strategy that Dr. Tischler has employed deals with the development of therapeutic forms that help in the early stages of a hantavirus infection – peptides. Peptides have been developed for other viruses but have not been sufficiently developed for the hantavirus. The trouble with the hantavirus is that once a person realizes they're infected, the virus has already replicated and affected their entire body. Hence, the development of peptides as a therapeutic form can help in the early stages of an infection. As a result, Dr. Tischler has set out to develop an active compound that can be encapsulated as a pill. The peptides she has been developing are derived from the virus' fusion protein.

Title	Hanta virus Gc fragments inhibiting the fusion of the virus with a cell
Publication Number	WO/2017/203436
Classification	A61K 38/10 2006.1; A61K 38/00 2006.1; A01N 37/18 2006.1
Publication Date	30.11.2017
International Application Number	PCT/IB2017/053045
Summary	A fragment of the Gc fusion protein of the Hantavirus genus that inhibits the fusion of said virus with a eukaryotic cell, consisting of the partial sequence of the putative Gc domain III, or the putative Gc stem region. A pharmaceutical composition comprising said fragment, useful for preventing, treating and/or inhibiting hantavirus infection of a eukaryotic organism that needs it. Therapeutic methods that comprise the administration of said fragments or said pharmaceutical composition for preventing, treating and/or inhibiting hantavirus infection of a eukaryotic organism. Method of preparing the Gc fusion protein fragment of the Hantavirus genus
Applicant	Fundacion Ciencia Para la Vida
Inventor	Nicole Tischler, Gonzalo Andres Barriga Pinto
Status	PCT Application

Source: https://patentscope.wipo.int/search/es/detail.jsf?docId=WO2017203436&_cid=P20-LDKKML-19804-1

By using a fragment of the fusion protein, a peptide can successfully exogenously interfere and prevent interactions between the hantavirus protein and the cell. Initially, Dr. Tischler began developing polypeptides, and subsequent patent applications utilize cut-down fragments that allow for the development of a cheaper and easier way to produce them.

Title	Fragment of the Gc protein of the genus hantavirus that inhibits fusion of said virus with a eukaryotic cell, consisting of the putative partial domain III of Gc, or the putative partial stem region of Gc; pharmaceutical composition comprising the fragment; and use of said fragment
Publication Number	2019001309
Classification	C07K 14/01; A61K 39/12
Publication Date	05.07.2019
Summary	Gc fusion protein fragment of the genus Hantavirus, which consists of the sequence of the putative partial domain III of Gc, or the putative partial stem region of Gc; wherein said fragment inhibits fusion of said virus with a eukaryotic cell. Pharmaceutical composition, comprising said fragment and method of preparing said fragment of the Gc fusion protein of the Hantavirus genus.
Applicant	Fundacion Ciencia Para la Vida
Inventor	Nicole Tischler, Gonzalo Andres Barriga Pinto
Status	PCT Application

Source: https://patentscope.wipo.int/search/es/detail.jsf?docId=CL250861029&_cid=P20-LDKKQO-20840-1

5.2 Challenges for female inventors are transcontinental

Dr. Tischler has been fortunate to have a straightforward development at the Milenio Institute for Fundamental and Applied Biology in Chile. However, that has not always been the case. During her undergraduate studies and her work in a corporate setting in Germany, she experienced barriers and challenges. She recalls not having noticed the barriers and challenges she faced in Germany when they were happening to her, but upon reflecting, she reminisces on seeing that women held far fewer leading positions and were less present in her field as research heads. Dr. Tischler noted that only as recently as the last few years has, she been able to have female collaborators from Germany. Due to the demanding nature of a job in research, many of her German female counterparts have decided to forego motherhood. She says that had she stayed in Germany, she probably would not have become a mother herself, as support systems for childcare are missing.

Coming from an economy where education is free, Dr. Tischler believes that there is a "leaky" pipeline in the education prospects for women in STEM, which trickles down to making it harder for women to access jobs and reach leading positions in STEM fields. On the other hand, she says Chile is one of the wealthiest economies in South America, albeit one of the most unequal. Chile's inequalities in accessing education have hindered many talented individuals all over the economy. By not exploring or utilizing these talents, the Chilean economy has created a barrier for "out-of-the-box" thinkers to bring their creativity to the forefront.

Furthermore, these inequalities create a phenomenon that prevents women who do end up working in a STEM field from growing professionally. This phenomenon, she says, exists and is very visible when she sees who her colleagues are and who is doing the tenure track quicker and easier. However, Dr. Tischler reiterated that while this phenomenon is present in Chile, she works at an Institute which prides itself on its gender balance. Despite this, the gender disparities are clearly visible at other Chilean institutes. This trend doesn't exist only in the Chilean microcosm but is a global negative phenomenon documented by statistical data numerous times.

In terms of patents, Dr. Tischler believes that it is difficult to assess Chilean women's understanding of patents as she is a foreigner. However, in her personal opinion and experience, understanding patents is difficult. Despite receiving theoretical knowledge of patents through her PhD program in Chile, applying that knowledge in a practical setting was challenging. Dr. Tischler recalls that drafting a patent application and defining the claims was not an easy feat.

Dr. Tischler believes that another significant barrier to patents that is not exclusive to Chile is funding. Since many inventors' funding is limited, filing, prosecution, and maintenance fees for patents dictate whether Dr. Tischler's inventions will only be used in Chile or if she'll seek patent protection abroad.

However, the largest barrier to registering patents has a psychological component in Dr. Tischler's view. She believes that women tend to be more self-critical and less comfortable taking risks than their male counterparts. Being a researcher, Dr. Tischler said that she found it very difficult to face the role of a business person, doubting the process of finding investors and licensing her inventions. This may not be exclusive to women only, she notes. According to Dr. Tischler, merging two different spirits in one person – the researcher, who discovers new technologies and methods, and the entrepreneur, who reaches out to investors and pushes the technology to the market – is a difficult feat.

5.3 Support networks are essential to overcoming challenges

Dr. Tischler believes that female inventors who have decided to be mothers need a support network to help them achieve their professional goals. As a mother of two, balancing a career and childcare responsibilities would not have been possible without support. Chile, as an economy, excels in this regard, as the private sector provides a lot of childcare support. The Chilean mentality is more conscious about the responsibilities of a mother, she says. Dr. Tischler recalls going through the patent application process for the first time, which coincided with having her second child. It was a difficult time for her, taking care of a newborn and her first child and conducting research, writing papers, and drafting the patent. She says that she would not have been able to do that had she not had her support network.

Working in a trusting environment has allowed her to excel in her career while still having time to devote to her children. Dr. Tischler said that the Institute where she works has been one of her support systems, allowing her to have flexible working hours.

Dr. Tischler believes having role models is very important for young women to pursue careers in STEM fields. She says that working at the Milenio Institute for Fundamental and Applied Biology alongside her female peers, regardless of whether they are full-time or associate professors, is beneficial for female students.

Developing an IP culture has been a priority at Universidad Andres Bello, which has an IP unit that provides a course to PhD students. The course encompasses the entire process of drafting a patent application, allowing students to better understand it during their PhD thesis.

Throughout the entire process of applying for a patent, Dr. Tischler received help from the Chilean intellectual property office. INAPI guides Chilean inventors throughout the patent application process, answering questions on whether their invention is novel, whether it's possible to patent the invention in terms of freedom to operate (FTO), and patent drafting. Dr. Tischler had extensive back and forth with INAPI throughout the patent

drafting process, where she received guidance and comments on the nuances of writing the claims. She says that applying for a patent would not have been possible without INAPI's help.

Funding is a persistent barrier for women inventors regardless of the economy they live and work in. In Dr. Tischler's case, she has been fortunate to have the support of her Institute which covers 50% of the costs of pursuing a patent. The other 50% are funded from her grants.

Dr. Tischler candidly said that she has yet to overcome her self-doubts when trying to patent her inventions, which is why she is a strong believer in support networks. She has partnered with a fellow collaborator with a more entrepreneurial mindset and who she thinks she can learn from.

5.4 Patent strategy

Sadly, due to the small market and the lack of interest from the private sector to invest in products that tackle orphan diseases like the hantavirus, Dr. Tischler believes that there is no feasible business model due to the low demand for its eradication. She has filed patent applications which are in the domestic phases of the patent process in Chile and the US, partially funded by her Institute. Additionally, Dr. Tischler has begun the process of going through the Paris Convention for the Protection of Industrial Property, as certain economies where she intends to seek protection for her inventions are not part of the PCT.

Dr. Tischler believes that because of the importance of public health, governmental tools that do not currently exist should be set in place for the development of solutions to orphan diseases.

5.5 Closing the gender gap requires a multi-pronged approach

Dr. Tischler believes that involving women in patents not only increases the number of new technologies but can also push the overall development trajectory of economies. By integrating women in the patent system, APEC economies can increase awareness and the visibility of brilliant women working in STEM fields.

However, much needs to be done to overcome the challenges women face in accessing the patent system in Chile. Dr. Tischler believes that the Chilean government should implement the following measures:

- Improve education at all levels, particularly in early schooling and across all STEM areas, allowing children, including young girls, to get interested in STEM areas.

- Enforcing gender quotas that allow women to be hired for high-level positions.
- Oversee that there are no gender pay gaps.
- Implement support mechanisms for women, such as pregnancy aid, maternity leave, and childcare support.
- Consider childcare time in productivity, i.e., giving women one additional year that can be included in productivity for the last 5 years of their employment when applying for a project if they had a baby during that period.
- INAPI should have a more regional presence to guide all women inventors going through the patent application process.
- Offer access to libraries containing patent applications so intellectual property offices can be more efficient in assessing an invention's novelty and patentability.
- Share experiences through associations in Latin America and APEC.

In her final words during our interview, Dr. Tischler said that women inventors should take on the challenge and make their dreams a reality.

> ***"While writing patent applications can be daunting, it should be viewed as writing and submitting papers with a different style and purpose. You do not have to be a patent lawyer or entrepreneur to do so. Develop a support network and take the leap."***

VI

Policy recommendations

VI. Policy recommendations

Women who are entrepreneurs and innovators make up an increasing portion of the global population, a trend that has similarly had an upward curve across APEC economies, and achieving gender equality in IP depends heavily on their active participation in the IP system. Encouraging and facilitating their involvement in the IP system can open doors for funding, business expansion, and new prospects. It also benefits society by promoting innovation and knowledge sharing. More needs to be done to encourage and empower women to participate in the IP ecosystem.

Bridging the gender gap in IP requires policy and programmatic solutions put in place at multiple levels simultaneously and synergistically. In addition, the limited availability of sex-disaggregated data and other gender-sensitive indicators hampers the ability of policymakers and IP practitioners to understand better the breadth and depth of the IP gender gap.

Crafting and implementing policies to increase women's involvement in the IP system inevitably involves addressing some extremely delicate sociological and structural issues. To be effective, policies must go beyond simplistic solutions and address the root causes that keep women out of STEM fields, from patenting at the same rate as men and from protecting and commercializing their IP. Depending on the environment in which they operate, female innovators will have different experiences with IPRs.

Therefore, APEC member economies are advised to consider the following policy recommendations in bridging the gender gap in IP, which have been born out of the survey results analysis, secondary data and studies reviewed, and meetings conducted with APEC IP officers:

1 Enable meaningful access to IP rights for women inventors

Access to and the effective use of IPRs will be critical to women's ability to capitalize on the intangible value that makes up an ever-increasing part of business value and investment. Protecting IPRs restores this financial incentive to create and innovate by giving owners and content creators exclusive power over their creations. For women, this is of enormous importance. Statistics have shown that economies with more robust IPRs tend to have stronger measures of gender equality. A helpful resource in this regard is the WIPO 2022 Guidelines for producing gender analysis from innovation and IP data.[252]

APEC member economies can support enabling meaningful access to IP rights for women inventors by offering subsidized IP clinics to them and targeted assistance for pro se female applicants. These activities can be supported by Patent and Trademark Offices in collaboration with universities and chambers of commerce. Other measures that provide meaningful access to IP include activities aimed at raising awareness about the importance of patenting targeting female inventors, innovators, entrepreneurs, and researchers, creating innovation and tech commercialization hubs that target female researchers and providing grants to female inventors to commercialize their technologies and bring their products on the domestic market.

2 Collect gender-disaggregated data on women's participation in IP systems; understanding how these systems can better serve and include women is in its nascent stages

As previously shown, there is a persistent gap between the rates at which men and women obtain protection for patents and other IPRs. The rates at which female and male inventors participate in the most lucrative inventive and creative activities have been discerned. Domestic economies could substantially profit from closing the gender gap. Specific policy measures in collecting gender-disaggregated data on female participation in the IP system include determining with greater certainty what data is being collected, and what the challenges are in terms of successful data collection.

Therefore, the first step in determining what kinds of policy efforts will have the most significant impact in this area is to get precise statistics on the proportion of women who protect their IP. This would help shape stronger policies to address women's needs in workplace and academic contexts.

[252] https://www.wipo.int/publications/en/details.jsp?id=4588

It should be noted that collecting gender-disaggregated data is instrumental in reaching the goal of gender equality in IP. There is an urgent need to collect this type of data since, according to the surveys and the interviews, less than half of the APEC member economies had provided such information or indicated that they generate and track gender-disaggregated data at all. Applications with at least 1 woman in patent applications are considered a top indicator for gender-disaggregated data in IP.

One of the most straightforward ways of doing this is to include gender-related information for patent applicants and inventors in the patent or utility model application form. However, due to privacy-related reasons for some APEC member economies, it could be difficult to ask for gender info from their inventors/applicants. In order to overcome this obstacle, member economies could undertake other measures, such as the example of Chile where INAPI gathered data collated from the Civil Registry of Chile, WIPO's International Patent Classification (IPC), and the Tax Service Department of Chile, in order to develop the Gender Parity Index.

3 Promote more female-only programs or activities in raising awareness, training, commercialization, and technical advisory in intellectual property rights. These programs should target female entrepreneurs, inventors, innovators, and researchers.

Women are less likely than men to hear about the opportunities and benefits of pursuing patenting and are less likely to view patenting, entrepreneurial and innovative activities as an achievable part of their career paths. Therefore, education about patenting and commercialization should become a significant component of female-only programs. Educational activities and resources can be provided in a variety of ways, such as through a structured curriculum, one-on-one advice, and seminar-based instruction.

It is also important that these programs support women in cultivating the networks and sponsors needed to take innovations from idea to market. This can be achieved through networking among peers, which allows participants to learn from others' challenges, troubleshoot their own issues, and receive advice. In addition, the programs should aim to help participants network and develop connections with investors and venture capital firms who might assist them in securing funding. The programs should use a variety of strategies to help women build IP networks, including hosting symposiums and workshops, bringing experts into the program, and connecting innovators to mentors.

According to the survey responses, several member economies offer such programs. For instance, in the US there are programs organized by the Council for Inclusive Innovation

(CI2), the annual Women's Entrepreneurship Symposium, the Chief Economist Speaker Series publication of the "Progress and Potential" report, and joint programs between the USPTO and the Small Business A (SBA) that highlight IP resources for women entrepreneurs. Also, in 2021 IMPI together with WIPO launched the Network for Women Innovators and Industrial Property, created to provide information and training for the use of IP rights, as well as to make visible the achievements of Mexican women inventors and entrepreneurs.

4 Organize gender-inclusive capacity-building and awareness-building programs (webinars and other types of knowledge events, such as training sessions, summer schools, specialized workshops, and conferences) in intellectual property management and commercialization for female entrepreneurs and innovators

Lack of access to or knowledge of opportunities, as well as the exclusion of women from information-sharing or professional networks, helps explain the under-representation of women in the patent system.[253] Other factors underlying the patent gender gap include: female inventors tend to focus less on the commercialization of their inventions in comparison to men; "women-only" networks typically have fewer members with patenting experience.[254]

IP Offices of the APEC Member economies might consider following the example of the Network of women innovators, created by IMPI, to raise awareness of the participation of women in the IP system, give them visibility and make IP more accessible to female entrepreneurs and inventors. The Network created by IMPI is a digital community that provides podcasts and a blog showcasing women who have successfully used IP. IMPI also leads a mentorship program for women. Another illustrative example of IP network that supports diversity and gender inclusivity is ChIPs, which is a networking organization for women in IP law, founded by women chiefs in IP (from Intuit, Apple, the USPTO, Atmel, Cadence Design Systems, eBay, and Cisco) in the Silicon Valley.[255]

Another successful example of a digital initiative at the intersection of IP and gender is the webinar "#Zero Stereotypes, creative woman, innovative woman, entrepreneurial woman" organized by INDECOPI, in collaboration with the USPTO and the United States Embassy in Peru, the Ministry of Women and Vulnerable Populations of Peru, and the United Nations

[253] Martinez, Raffo, and Saito, 3; UKIPO, 'Gender Profiles in Worldwide Patenting: An analysis of female inventorship'.
[254] Sue V. Rosser, "The Gender Gap in Patenting: Is Technology Transfer a Feminist Issue?", NWSA Journal, vol. 21, no. 2, 2009; UNCTAD, 'A Survey on Women's Entrepreneurship and Innovation', United Nations Conference on Trade and Development, 2014, 33- 35, http://empretec.unctad.org/wp-content/uploads/2015/01/UNCTAD_DIAE_ED_2013_1.pdf.
[255] https://chipsnetwork.org/about-chips/who-we-are/

Development Program (UNDP-Peru). The purpose of the event was to recognize the importance of gender parity in entrepreneurship and innovation and to share success stories of women whose efforts and use of the Peruvian IP system transcend all limitations in the economy.

Social media are another very effective instrument in raising awareness about IP among female entrepreneurs. APEC member economies might also consider the possibility of organizing regular local and/or regional IP networking and brokering events for women inventors and innovators, as well as establishing women's IP mentorship programs for new female inventors in the economy.

5 Implement policy measures aimed at facilitating access to finance for female inventors

As already discussed, the lack of financial access is a well-documented limitation for women inventors and entrepreneurs globally. This has an impact on women's ability to apply for and obtain patents and utility models for their inventions. To be successful, women inventors need specific female-focused encouragement and programs. Certain economies have already taken active steps to improve support for women innovators and entrepreneurs through initiatives such as Mexico's SMEs Women's Program created by the National Entrepreneur Institute (INADEM) in collaboration with the National Institute for Women (INMUJERES) and the Victoria 147 platform established by Academy Victoria 147 in Mexico. The SMEs Women's Program provides MSMEs led by women with access to preferential financing and business development.[256] The Victoria 147 platform offers training, incubation, acceleration, and networking features for women entrepreneurs and executives.[257] Having all-female networks gives a sense of ownership and provides a safe space for female inventors to learn and share their experiences in IP.

Governments can also promote the inclusion of women inventors by using tax exemptions and incentives. The gender funding gap can be reduced by providing incentives or tax breaks to businesses or research teams that are predominately made up of women, including those with a specific percentage of female members or those that support female entrepreneurs.

Waiving some of the fees related to patent applications and filings for female patent applicants could also be one of the policy measures aimed at enabling more women to enter the IP system. This measure has been instituted in the Philippines where it has proven very successful. Today, the Philippines is ranked as the second leading economy in

[256] https://www.aspeninstitute.org/sites/default/files/content/docs/resources/CreatingOpportunitiesReport-VfW-Dec2014.pdf
[257] https://victoria147.org/

terms of stimulating women's participation in the international patent system.

Also, APEC member economies could support early-stage venture funds that target women entrepreneurs.

6 As a more specific policy measure, IP Offices of APEC member economies might consider creating Women Innovator Resource Centers (WIRCs)

WIRCs can provide relevant IP and related support services to female inventors in an "all-women" environment. Services could include patent search, allocating mentors and locating partners, pro-bono IP legal advice, and conducting outreach to universities and research centers.[258] These WIRCs could be joint initiatives of Patent and Trademark offices, universities and chambers of commerce.

One such WIRC is the Toolkit for Women Innovators developed by Boston University which provides resources to female innovators in education, funding, networking and programs.[259] Another example is the Women Innovators Initiative at the Center for Technology Licensing, Cornell University, which features the Innovator Awards and Mentorship Program.[260]

7 Raising the number of women in STEM and developing specialized programs to prepare women for careers in IP can impact positively the number of women working in IP

As already indicated, the crux of the problem with regards to the low approach and use of patents (and IP) by women in APEC economies is that women are disproportionately underrepresented in STEM disciplines globally, with lower rates of STEM education and employment as well as lower rates of access to funding for the establishment and expansion of their own innovative endeavors. APEC member economies can support the establishment of female-targeted university-level STEM courses that would also include modules in IP commercialization and monetization for female entrepreneurs. For instance,

[258] https://www.wipo.int/meetings/en/doc_details.jsp?doc_id=406377
[259] https://www.bu.edu/researchsupport/project-lifecycle/bring-to-market/bring-to-market-tools-resources/toolkit-for-women-innovators/
[260] https://ctl.cornell.edu/innovators/women-innovators-initiative/

Laboratoria, an organization founded by a female entrepreneur, provides "boot camps" for women across Latin America to learn the skills necessary for tech careers.[261] Moreover, to encourage girls to pursue professions in IP, educators must be trained to deliver a curriculum based on innovation that is gender- and culturally-sensitive. Education professionals will be better equipped to effectively prepare aspiring female entrepreneurs by providing professional development training, workshops, and resources that are accessible in print, online, and via mobile apps.

Educating women about the changing job options available in the IP sector is one way to reduce the gender wage gap. IP has given rise to a plethora of innovative and intriguing work prospects. Customer success, for example, is a more recent role that simply did not exist until ten years ago. A lot of organizations still struggle with the question of what constitutes a good fit in a job because there was no historical IP role at the time that directly converted into the career path of a customer success manager.[262]

8 Create programs aimed at assisting women in understanding the value of IP and how to use the IP system

APEC member economies' Patent and Trademark offices could develop web portals that would feature information related to the value of IP and how to use the IP system targeting female inventors. This can be done through IP clinics targeting women, and special programs that offer assistance to pro se female applicants.

For instance, the USPTO offers two technical assistance programs with IP rights: the Pro Se Assistance Program and the Patent Pro Bono Program. The Pro Se Assistance Program is designed to help patent applicants who are filing without the help of a registered attorney or agent.[263] This includes application checklists, a tutorial about the online system and in-person assistance by phone or face-to-face. The Patent Pro Bono Program provides free legal assistance with the preparation and filing of patent applications for applicants below a certain income threshold.[264]

[261] https://www.laboratoria.la/
[262] https://www.ipwatchdog.com/2021/03/22/moving-beyond-words-to-action-women-in-ip-share-real-world-tips-to-close-the-gender-gap/id=131057/
[263] https://www.uspto.gov/sites/default/files/documents/oce-ip-econ-note-102.pdf
[264] https://www.uspto.gov/patents/basics/using-legal-services/pro-bono/patent-pro-bono-program

9 Undertake policy measures aimed at assisting female inventors to commercialize their patents and utility models

In academic environments, commercialization rates for the inventions of female researchers are lower. Women can be inspired to take the initial step toward commercializing their IP by being informed about TTOs and the services they provide. The use of TTOs by women in both the public and commercial sectors can be supported by laws, policies, and practices that facilitate and reward IP commercialization practices by female inventors and entrepreneurs.

One example of a successful policy initiative aimed at assisting female inventors to commercialize their IP is Korea International Women's Invention Exposition (KIWIE), which has used its accumulated experiences working with start-ups in research and development to support Korean women inventors and entrepreneurs, helping them to utilize the intellectual property system. Its mission is to "speak, work, and act for women inventors." [265]

Other policy initiatives can be in the form of Innovation Fund grants for patent commercialization targeting female researchers who work at domestic universities and research institutes. Also, APEC member economies could stimulate the commercialization of patents by female inventors by instituting a domestic reward system that encourages women inventors to engage in tech transfer activities. Member economies could also support the establishment of innovation hubs and accelerators that would boost women-led innovations and research.

[265] https://www.wipo.int/women-and-ip/en/news/2016/news_0005.html

10 Prepare and publish gender-friendly IP material, including patent and utility model basics, examination overviews, information on patent searching, and resources on IP legal assistance targeting women could also impact female participation in the IP economy.

As part of IP clinics targeting women, Patent and Trademark Offices in APEC member economies could publish manuals on IP basics, examination procedures, patent searches, and information on IP legal assistance targeting female inventors, researchers, innovators, and entrepreneurs. The information could be disseminated online using social media and also through universities, chambers of commerce, and innovation hubs and accelerators that target female participants.[266]

Patent and Trademark Offices in APEC member economies could also have dedicated inclusive information portals where they would feature information for female applicants. One such example is the Inclusive information portal of the USPTO.[267]

11 Identify and promote outstanding women inventors to serve as role models for future generations of creative and innovative women

For APEC economies to prevent the gender gap in patenting from becoming a gender chasm, efforts to identify successful female inventors are paramount. Women inventors who have obtained patents can be identified and used as pillars of the innovative community to act as a catalytic force to embolden future generations of women who will be brave enough to patent and commercialize their inventive ideas. By recognizing the outstanding contributions of female inventors, each economy can work with them by organizing panels and talks and developing networks at schools, universities, and research centers. Additionally, to bring innovation and the benefits of patenting closer to a younger audience in the digital age, intellectual property offices will have to prepare and distribute short videos or articles online that capture the inspiring stories of established female inventors.

[266] https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/IP/C/W685.pdf&Open=True
[267] https://www.uspto.gov/initiatives/equity

To truly break the glass ceiling in patenting, stories highlighting the challenges and achievements of outstanding female inventors can be used to bring patents and other forms of IP closer to other women whose contributions will undoubtedly embolden future innovative women to protect their creative and novel ideas of the mind.

12 Strengthening knowledge of IP among researchers and innovators in universities

As seen throughout this report, female inventors tend to conduct inventive activities in an academic setting at universities or research centers. Therefore, APEC economies, especially developing economies, should work more closely with their local universities and research centers to strengthen the knowledge of IP among all researchers and innovators employed and channel their creativity to close the IP gender gap.

13 Institutionalize activities to promote women in patents to create impact.

APEC economies must make sure not to design and implement an isolated or a one-time initiative, program, measure, or activity but rather seek to institutionalize activities to promote women in patents to create impact.

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Annex 1.

Survey for APEC intellectual property offices

This survey is part of the APEC's Project APEC IPEG 02 2021 titled "Women and Patents in the APEC Region: Current Situation, Performance and Challenges."

The survey aims to support the overall objective of the project – to provide APEC member economies with a better understanding of the current situation and relationship between women and patents and utility models. The results obtained through this survey will strive to inform improved decision-making processes and policies that promote and support women inventors across APEC member economies in utilizing patents and utility models as intellectual property tools to foster gender equality and economic growth.

Your participation in this survey will be of great value for developing policy recommendations aimed at government officials and policymakers from APEC member economies to design and improve strategies for gender parity within the patent landscape.

We wish to express our gratitude for your support in taking part in this survey.

I. INFORMATION ABOUT RESPONDENTS

1. Name of your institution and APEC economy

Name of institution: _____
APEC economy: _____

2. Name, position, e-mail and gender of the person responsible for completing the questionnaire

Name: _____
Position: _____
Email: _____
Gender: _____

II. INFORMATION ON PATENTS AND WOMEN

3. Does your economy generate statistics on women in patents or utility models?

Yes [Are there any publicly available complete or partial statistics on women in patents or utility models in your respective economy's Patent Office? Please share more details on how they can be accessed in the text box below]

No [Will your Patent Office implement (or be open to implementing) measures in the next 2-3 years to assess the performance of women in patents and/or utility models through data/statistics? Please explain what kind of measures. If there are no planned measures, please explain why. Use the text box below]

III. PATENT OFFICE INFORMATION

4. What specific measures does your intellectual property office currently undertake to assess the performance of women in patents and utility models?

5. Has your economy developed any strategic plan or document aimed at promoting patents among women for the following years?

Yes (If yes, please provide more details in the text box below)

No ___

6. Has your Patent Office defined a specific indicator/target to measure the increase of patents filed by women or list women as inventors for the following years? If yes, please, give details.

Yes (If yes, please provide more details in the text box below)

No ___

7. Does your Patent Office collect gender information from applicants when receiving a patent application?

Yes (If yes, please provide more details in the text box below)

No ___

8. Does your Patent Office collect gender information from inventors when receiving a patent application?

Yes (If yes, please provide more details in the text box below)

No ___

9. Has your Patent Office published any study, research, or Report concerning women and patents?

Yes (If yes, please provide more details in the text box below)

No ___

10. What percentage of patent examiners in the Patent Office are women?

11. What percentage of the Patent Office staff is composed of women?

IV. PROGRAMS FOR WOMEN

12. Are there any current support programs or measures being applied by your Patent Office that target women concerning raising awareness for patents/utility models?

Yes [In the text box below, please provide the following details for each of them: 1. Title of program, 2. Objective, 3. Activities involved, 4. Results, 5. Website if available].

No ____

13. Are there any current support programs or measures being applied by your Patent Office that target women concerning capacity building in patents/utility models (i.e., t raining, workshops, webinars, others)?

Yes [In the text box below, please provide the following details for each of them: 1. Title of program, 2. Objective, 3. Activities involved, 4. Results, 5. Website if available].

No ____

14. Are there any current support programs or measures being applied by your Patent Office that target women concerning patent/utility model applications/registration?

Yes [In the text box below, please provide the following details for each of them: 1. Title of program, 2. Objective, 3. Activities involved, 4. Results, 5. Website if available].

No ____

15. Are there any current support programs or measures being applied by your Patent Office that target women concerning the commercial use of patents/utility models?

Yes [In the text box below, please provide the following details for each of them: 1. Title of program, 2. Objective, 3. Activities involved, 4. Results, 5. Website if available].

No ____

16. Are there any current support programs or measures being applied by your Patent Office that target women concerning exposure/promotion of their patented inventions, stories, and others? (i.e., publications, exhibitions, others).

Yes [In the text box below, please provide the following details for each of them: 1. Title of program, 2. Objective, 3. Activities involved, 4. Results, 5. Website if available].

No ____

17. Are there any current support programs or measures being applied by your Patent Office that target women concerning another area related to patents not mentioned in Q#12 to Q#16?

Yes [In the text box below, please provide the following details for each of them: 1. Title of program, 2. Objective, 3. Activities involved, 4. Results, 5. Website if available].

No ____

18. What future programs do you think would/should be implemented in your economy to promote and support women inventors or patent/utility model holders/applicants?

19. What challenges, barriers and/or difficulties has your Patent Office faced in implementing (more or different) measures and/or activities aimed at promoting women in patents? Please explain.

20. What is your expectation regarding the use of patent/utility models by women inventors in your respective economy?

21. How do you think your economy can increase the number of female resident patent holders/applicants/inventors?

V. STATISTICAL DATA ON PATENTS AND WOMEN

22. Please provide the number of patents (P) and/or utility models (UM) applications filed by female residents in your economy (consider P & UM applications with at least 1 female applicant). In case data is not available, please indicate N/A

	Number of P applications filed by female residents (absolute value)	Number of P applications filed by female residents (percentage of total P applications)	Number of UM applications by female residents (absolute value)	Number of UM applications filed by female residents (percentage of total UM applications)
Year 2016				
Year 2017				
Year 2018				
Year 2019				
Year 2020				
Year 2021				

23. Please provide the number of patents (P) and/or utility models (UM) granted to female residents in your economy (consider P & UM with at least 1 female holder). In case data is not available, please indicate N/A..

	Number of P granted to female residents (absolute value)	Number of UM granted to female residents (absolute value)	Number of P granted to female residents (percentage of total P granted)	Number of UM granted to female residents (percentage of total UM granted)
Year 2016				
Year 2017				
Year 2018				
Year 2019				
Year 2020				
Year 2021				

24. Please provide the number of patents (P) and/or utility model (UM) applications filed by female residents in your economy (consider P & U M applications w ith a t least 1 f emale applicant), presented according to the IPC (International Patent Classification). Include only the last year with available information. In case data is not available, please indicate N/A.

	Number of P applications filed by female residents	Number of UM applications by female residents	Indicate year informed residents
A (HUMAN NECESSITIES)			
B (PERFORMING OPERATIONS: TRANSPORTING)			
C (CHEMISTRY; METALLURGY)			
D (TEXTILES; PAPER)			
E (FIXED CONSTRUCTIONS)			
F (MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING)			
G (PHYSICS)			
H (ELECTRICITY)			

25. Please provide the number of patents (P) and/or utility models (UM) applications filed by female residents (consider P & UM applications w ith a t least 1 f emale applicant) which are denied or abandoned. In case data is not available, please indicate N/A.

	Number of P applications filed by female residents which are denied or abandoned (absolute value)	Number of UM applications filed by female residents which are denied or abandoned (absolute value)	Number of UM applications filed by female residents which are denied or abandoned (percentage of total UM granted)	Number of P applications filed by female residents which are denied or abandoned (percentage of total P granted)
Year 2016				
Year 2017				
Year 2018				
Year 2019				
Year 2020				
Year 2021				

26. Please provide the number of patents (P) and/or utility models (UM) applications where female residents are listed as inventors (consider P & UM applications with at least 1 female inventor). In case data is not available, please indicate N/A.

	Number of P applications where female residents are listed as inventors (absolute value)	Number of P applications where female residents are listed as inventors (absolute value)	Number of P applications where female residents are listed as inventors (percentage of total P applications)	Number of UM applications where female residents are listed as inventors (percentage of total UM applications)
Year 2016				
Year 2017				
Year 2018				
Year 2019				
Year 2020				
Year 2021				

27. Please provide the number of patents (P) and/or utility model (UM) applications filed in your economy where women residents are listed as inventors (consider P & UM applications with at least 1 female inventor), presented according to the IPC (International Patent Classification). Include only the last year with available information. In case data is not available, please indicate N/A.

	Number of P applications filed by female residents	Number of UM applications by female residents	Indicate year informed
A (HUMAN NECESSITIES)			
B (PERFORMING OPERATIONS: TRANSPORTING)			
C (CHEMISTRY; METALLURGY)			
D (TEXTILES; PAPER)			
E (FIXED CONSTRUCTIONS)			
F (MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING)			
G (PHYSICS)			
H (ELECTRICITY)			

28. If possible, please provide us with the contact details of women inventors or patent/utility model holders/applicants from your economy (full name, e-mail, and phone). We will interview them as part of the APEC Project activities.

Annex 2.

Questionnaires for APEC IP officials and/or representatives

This questionnaire is part of the APEC's Project APEC IPEG 02 2021, titled "Women and Patents in the APEC Region: Current Situation, Performance and Challenges."

The questionnaire aims to support the overall objective of the project – to provide APEC member economies with a better understanding of the current situation and relationship between women and patents and utility models. The results obtained through this questionnaire will strive to inform improved decision-making processes and policies that promote and support women inventors across APEC member economies in utilizing patents and utility models as intellectual property tools to foster gender equality and economic growth.

Your participation in this questionnaire will be of great value for developing policy recommendations aimed at government officials and policymakers from APEC member economies to design and improve strategies for gender parity within the patent landscape.

We wish to express our gratitude for your support in taking part in this questionnaire.

1. What has been the experience in your economy to promote the use of patents and utility models by local women?
Answer:

_____

_____

2. What specific measures have been implemented in your economy to promote the use of patents and utility models by local women?
Answer:

_____

_____

3. Which are the main institutions and/or bodies promoting and supporting women in patents in your respective economy? For each one of them, please provide the following information:

Name of institution/body: _____
Role of the institution/body: _____
Scope of participation: _____
Activities undertaken: _____
Main results/achievements: _____

4. Which are the main barriers you consider women face in obtaining patents and/or utility models in your respective economy?
Answer:

_____

_____

5. What is your expectation regarding the use of patent/utility models by women in your respective economy?
Answer:

_____

6. How do you think your economy can increase the number of female resident patent holders/applicants?
Answer:

_____

7. How do you think your economy can increase the number of female resident inventors in patent applications?
Answer:

_____

8. What future programs or measures do you believe should your economy apply to promote and support women in patents?
Answer:

_____

9. What collaborative measures/programs do you think can be implemented among APEC economies to promote and support women in patents?
Answer:

_____

10. Would you be so kind as to share any additional statistics regarding women's participation in the patent landscape in your economy, either as patent/utility model holders or patent/utility model applicants? (If applicable)
Answer:

_____

11. Would you be willing to share the contact details of an inspiring woman inventor or patent/utility model holder/applicant from your economy for our second round of interviews? If yes, kindly share their information with us (full name, email, phone).
Answer:

_____

12. Please, recommend another person from your economy we should contact to have an additional perspective of your experience in promoting the use of patents and utility models by local women (full name, organization, position, email, phone). If applicable.
Answer:

_____

Annex 3.

Questionnaire for APEC Women Inventors and/or Patent Holders/Applicants

This questionnaire is part of the APEC's Project APEC IPEG 02 2021, titled "Women and Patents in the APEC Region: Current Situation, Performance and Challenges."

The questionnaire aims to support the overall objective of the project – to provide APEC member economies with a better understanding of the current situation and relationship between women and patents and utility models. The results obtained through this questionnaire will strive to inform and improve decision-making processes and policies that promote and support women inventors across APEC member economies in utilizing patents and utility models as intellectual property tools to foster gender equality and economic growth.

Your participation in this questionnaire will be of great value for developing policy recommendations aimed at government officials and policymakers from APEC member economies to design and improve strategies for gender parity within the patent landscape.

We wish to express our gratitude for your support in taking part in this questionnaire.

I. BACKGROUND

1. Please give us an overview of your personal & professional profile.
Answer:

_____

_____

II. INVENTION

2. Please provide us with details of your invention(s). What was the main idea behind the development, creation, and design of your invention(s)?
Answer:

_____

_____

3. Are there any challenges, barriers, or difficulties you have faced as a woman when carrying out inventive activities? If yes, please provide details.
Answer:

_____

_____

4. How have you overcome these challenges, barriers, or difficulties?
Answer:

_____

_____

III. APPROACH TO PATENTS/UTILITY MODELS

5. Are there any challenges, barriers, or difficulties women, such as yourself, in your respective economy face in understanding patents/utility models?
Answer:

_____

6. Have you personally experienced any difficulties in understanding the process of obtaining a patent/utility model in your economy?
Answer:

_____

7. What barriers or difficulties did you or other women in your respective economy face in registering patents/utility models (i.e., for drafting patents, patent filing & prosecution, maintenance fees, others)?
Answer:

_____

8. Please, explain how you overcame the challenges, barriers, or difficulties mentioned?
Answer:

_____

9. Have you received support from private or public institutions to approach the patent system? If yes, please explain what kind of help and from which organization.
Answer:

_____

IV. USE OF PATENT/UTILITY MODEL

10. Has your patented invention (as an inventor or patent holder/applicant) been commercialized? If yes, please explain how this was achieved and which strategy you implemented to reach the market (licensing/patent sale, strategic alliance, direct sales, other).
Answer:

_____

11. Is there a link or website for more information on your invention/patent?
Answer:

_____

12. Have there been any barriers or difficulties you may have encountered or faced in using your patent/utility model?
Answer:

_____

13. Please, explain how you overcame the challenges, barriers, or difficulties mentioned?
Answer:

_____

V. WOMEN AND PATENTS

14. Do you believe patents can be a tool to foster gender parity in APEC economies? If yes, please explain why/how.
Answer:

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15. What approaches do you believe your respective economy should take in addressing and overcoming the challenges women inventors/patent holders/applicants face?
Answer:

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16. Do you have any recommendations for other women inventors who wish to obtain a patent or utility model in your respective economy?
Answer:

Asia-Pacific
Economic Cooperation

APEC Project: IPEG 02 2021

Women and Patents:
Towards Gender Parity in APEC

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