

**WOMEN AND IP COMMERCIALIZATION IN THE ASIAN REGION:
THE CASE OF PHILIPPINES**

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EXECUTIVE SUMMARY

The Philippines' economic turn-around in 2009, after six decades of weak low-innovation growth, was boosted by its top 10 rank in global gender parity. Evidence (1998-2017) of the inchoate state of its Intellectual Property (IP) system includes low patent registration of residents (36/year), with IP creators preferring to register trademarks (4917/year), industrial designs (458/year) and utility models (401/year).

This study tackles the gender imbalance in IP generation, dissemination and utilization in the Philippines, within the context of economic participation and opportunities available to women. The specific objectives of the study are four-fold. First is to assess the participation of women at different stages of the IP commercialization process. Second is to identify the root causes behind this lesser representation of women in patenting and IP commercialization, on the academic and business level. Third is to determine the factors involved in their absence from commercialization activities. And fourth is to propose incentives and best practices that can be promoted in order to address the imbalance, and to recommend models that would enable a more balanced participation of women in patenting and IP commercialization.

Data and Methods

Philippine e-gazette data for patents granted from 2012-2017 was used in assessing women participation in IP commercialization. To validate the supply-side of the leaky pipeline metaphor, data on enrolment, graduates, and professional board performance from the Commission on Higher Education were presented. Data on academic and business demand were obtained from the National Statistics Authority and from the National Academy of Science and Technology. Twenty cases for women participation in IP commercialization were carefully appraised from web-news articles, following a set of criteria. Based on their experiences, obstacles and best practices for IP commercialization were drawn, supplemented by 2017 data on Global Competitiveness Index. A novel approach was employed in crafting proposed incentives to achieve gender balance in patenting. Panel data (1960-2014, 214 economies) were used to determine the significant correlates of 2015 Global Parity Index (GPI), in terms of selected indicators published by the World Bank Database on Development Indicators. An empirical model, with GPI as the dependent variable, and selected development and intellectual property indices as independent variables, was tested for significance using multiple regression analysis.

Participation of Women at Different Stages of Commercialization. Out of the 144 patents granted (2012-2017), only 21% had female inventors, either solely (8%) or jointly (13%). Filipina inventors are active in human necessities; physics; performing operations & transporting; and textile, papers. They rarely or never dabbled in fixed construction; mechanical engineering, lighting, heating, weapons; and electricity. The analysis reveals that Filipina inventors generated low-technology products and processes, either as part of their work as researchers in RDIs or as entrepreneurs.

The issue of under-representation of women in patenting and IP commercialization is approached through the supply and demand lens. Supply refers to the provision of IP talent through the higher education process, while demand is the placement of honed talents either in the academe or business. High-technology innovation usually requires training in science, technology, engineering, and mathematics (STEM). The 2005-2015 analysis reveals that there were more women graduates in science and mathematics, while they were under-represented in engineering and technology. The female-dominated professions, in terms of 2016 successful professional board examinees are as follows: midwives, pharmacists, psychometricians, optometrists, nurses, occupational therapists, dentists, medical technologists, respiratory therapists, physical therapists, chemists, physicians and radiologic technologists. On the other hand, male-dominated professions include the engineers (mechanical, electrical, aeronautical, marine, sanitary, civil, electronics, mining and geodetic) and naval architecture.

Demand for Researchers. The 2013 estimated number of research and development personnel is 36,517, distributed as follows: business sector (61%), higher education (28%), government (10%), and non-government organizations (1%). Of these personnel, 45% are women; categorized as researchers (73%), auxiliary personnel (17%), and technicians (9%). The leaky pipeline metaphor for the Philippines pertains to the diminishing quantity of trained women scientists and technologists from STEM graduates (253094, 45%), master graduates (17972, 65%), PhD graduates (2020, 62%), and researchers (16367, 45%). STEM women scientists comprise 30% of Outstanding Young Scientist awardees, with women representation as follows: Chemical Science (46%), Biological Science (38%), Physical Science (35%), Health Science (31%), Agricultural Science (25%), and Mathematics (22%). There is only one woman-awardee for Engineering.

Women in IP Commercialization. Twenty case examples are presented to examine the role of women entrepreneurs in IP or technology commercialization. The case examples show that the commercialized IP products are rarely protected in the Philippines. All of the women entrepreneurs are multi-awarded, with their achievements categorized as follows: first-mover advantage/market leaders; application of technology to societal problems; environment-friendly technology; micro-firms in transition; local firms using international/indigenous marks; and a private university's advocacy for a Lady Engineer Club.

Obstacles in IP Commercialization

Filipina entrepreneurs comprise both ends of the income spectrum. The high-income women entrepreneurs have access to social, financial, human and institutional capital. On the other hand, low-income women turn to entrepreneurship as a source of informal and seasonal jobs since they lack the educational qualification and skills to hold a stable job. The college-educated middle-income women opt for the more stable job as professionals, technical workers and managers. Obstacles in IP commercialization can be summarized as follows: legal regulation (e.g., business expansion is hindered by the 40% limit to foreign equity, husband is required to be a co-maker in wife's business loan), social and family concerns (e.g. glass ceiling stereotype, "mompreneurs", lack of economic incentives, access to financial capital, and risk capital availability).

Towards a More Balanced Participation of Women in Patent and IP Commercialization

The supply-side of the leaky pipeline metaphor has a favorable gender balance in science, agriculture and mathematics, but not in engineering and technology. Women outperform men in professional board examination results in STEM, except engineering. Women scientists are likewise given national recognition for their research works, although the gender balance tilts in favor of male scientists. Social capital is paramount in achieving gender balance in the intellectual property ecosystem. Innovative products enjoy first-mover advantage, resulting to market leadership of the firms. IP commercialization is illustrated in the case examples. To address the gender bias in engineering, a private technological university organized an *Inhinyera* (Lady Engineer) Club. Proposed incentives to improve gender balance is presented, using significant correlates of GPI.

The empirical model predicts that closing the gender gap entails boosting patenting activities, especially for women inventors, and improving female access to financial capital. The former ensures that the innovative goods and services produced shall cater to the special needs of women, while improving the gender balance in jobs and incomes. The latter guarantees that women inventions are brought to the market. Long-term efforts should address the wide gender gap in attracting female engineers and technologists, in putting them in-charge of technology-based research projects and transforming them into IP-savvy entrepreneurs.

In the medium term, incentives are proposed that could improve gender balance in patenting and IP activities, based on significant correlates of GPI. Since these incentives are already provided in existing laws, there is a need to cull the provisions of these laws together and come up with a specific women-responsive research, development, and innovation culture and a corresponding action plan. While laws provide for gender disaggregation in data collection, there is still a need to collect more gender-based data for the intellectual property system, especially for copyrights, trademarks, utility models, industrial designs, geographical indications and the like. Intellectual creation behavior can likewise be analyzed, just like women patenting behavior. Case studies on women in IP commercialization can be expanded to include women in the academic, business (preferably, MSME), and government setting. Assuming data availability, a roadmap for Women in IP Commercialization for 2030 (UN SDG), 2040 (*Ambisyon Natin 2040*), and 2050 (when the Philippines may join the G-20 countries) can be crafted, synthesizing the provisions of laws relevant to Women in Innovation and Commercialization. Further, there should be a regular survey of women STEM teachers, researchers and entrepreneurs, and a periodic report of the results of graduate tracer studies on women STEM graduates.

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ACRONYMS AND GLOSSARY

Academe-industry linkage	Sharing of economic value between academe and industry arising from the generation of intellectual property through: collaborative research and development, commissioned research, technology licensing, and the creation of spin-off companies.
ASEAN	Association of Southeast Asian Nations. Includes 10 member states: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam
ASEAN-5	5 original member states: Indonesia, Malaysia, Philippines, Singapore, Thailand
CHED	Commission on Higher Education. Philippine agency tasked to promote quality higher education, and to provide access to those financially-disadvantaged who seek it.
Demand	Jobs available to and held by STEM graduates.
DOST	Department of Science and Technology.
FiRe	Fourth Industrial Revolution. Characterized by a fusion of technologies involving the physical, digital, and biological spheres.
Gawad Kalinga	Translated in English as ‘give care’. A Philippine-based movement aiming to end poverty by employing an integrated and holistic approach to empower
GCI	Global Competitiveness Index. Assessment of the ability of a country to provide high levels of prosperity its citizens, and to efficiently use its available resources.
GDP	Gross Domestic Product. Total value of goods produced and services provided in a country during one year.
GDPC	Gross Domestic Product per Capita.
Gender balance	Equal ease of access to resources and opportunities regardless of gender, including economic participation and decision-making
Glass ceiling	Invisible barrier to the advancement of women in a profession, preventing them to rise beyond a certain level in a hierarchy
Leaky pipeline	Analogy to explain underrepresentation of women in STEM (science, technology, engineering, and mathematics) or the systematic diminution across time of the percentage of women pursuing STEM careers.
MIWE	Mastercard Index of Women Entrepreneurs. Focus on the achievement of women entrepreneurs in 57 economies, using 12 indicators and 25 sub-indicators. Criteria include women’s advancement outcomes; knowledge assets & financial access; and supporting entrepreneurial factors.
Mompreneur	Female business owner who balances the roles of mom and entrepreneur
IP	Intellectual Property

NAST	National Academy of Science and Technology. Philippine academy of recognized experts serving as principal adviser to the nation on science, technology, and innovation contributing to national development.
OYS	Outstanding Young Scientists. National recognition awarded to young (40 years old or younger) outstanding authors of books/monographs in the fields of the sciences (agricultural, biological, engineering mathematical, physical, health, social) and technology,
PRC	Professional Regulation Commission. National government agency mandated to enforce the laws regulating the various professions.
PSA	Philippine Statistics Authority. Central statistical authority of the Philippine government on primary data collection.
Social capital	Networks together with shared norms, values and understandings that facilitate cooperation within or among groups.
Shift-share analysis	Decomposition of changes (frequency, percentage) in enrolment/graduates over time.
STEM	Science, Technology, Engineering and Mathematics.
STRIDE	Science, Technology, Research and Innovation for Development Program. Funded by the United States Agency for International Development to stimulate inclusive economic growth by boosting science and technology research.
Supply	Graduates of STEM courses
UN SDG	United Nations Sustainable Development Goals. It is a shared blueprint for peace and prosperity for people and the planet, now and the future. It has 17 sustainable development goals.
WIPO	World Intellectual Property Organization. Global forum for intellectual property services, policy, information and cooperation.
WIPO-FIT	Australia Fund-In-Trust for Intellectual Property. Assists developing and least developed countries to improve their intellectual property systems and enhance their capabilities to facilitate innovation, investment and technology transfer in the Asia-Pacific Region.