Where in the World are Women in STEM?

Determining a country ranking across Euro-Asia for women in STEM education and careers

Introduction

STEM refers to the fields of science, technology, engineering, and mathematics. In the new digital age, STEM is becoming a very popular field of study as careers in STEM are in high demand and increasing rapidly. Advancements in STEM bring a more educated workforce and can be very attractive to young professionals. However, STEM is also known to be a male-dominated field. Women are constantly discouraged from entering STEM after decades and decades of gender-bias, and believing that males have a gender understanding of math and science. Women are a large and important part of the workforce and should be encouraged and empowered to enter STEM. The 2030 Agenda for Sustainable Development by the United Nations includes 17 Sustainable Development Goals (SDGs). SDG 4 addresses inclusive and equitable quality education and lifelong learning. SDG 5 addresses gender equality and girls’ and women’s empowerment. Both SDG 4 and SDG 5 “include specific targets for countries to enhance access to STEM education and technologies, and reduce gender disparities” (UNESCO, 2017).

Methods

The research questions for this project are the following: What countries experience more (or less) gender inequality in STEM? Are there groupings in certain regions with similar historical/cultural/governmental policy background? Are there certain factors the countries share that lead to more (or less) gender inequality in STEM? To answer these research questions I gathered data for 2015 from the OECD, The World Bank, and The United Nations Human Development Reports. The data gathered and factored into the analysis includes (1) total tertiary educational attainment as share of total population by gender, (2) share of tertiary graduates in STEM by gender, (3) enrollment rate for ages 15-19 by gender, (4) PISA math and science scores by gender, (5) graduates in STEM employment rates, (6) law to mandate nondiscrimination based on gender in hiring, (7) educational spending as percent of GDP, (8) gender wage gap, (9) law to mandate equal remuneration for men and women, (10) employment rate for young adults, (11) Gender Inequality Index, and (12) Gender Development Index. An ESRI shapefile was retrieved from the Tufts GIS database to provide the country placements. Each table was independently joined to this country layer to form new shapefiles. The field calculator was used to calculate the differences between men and women for data sets 1-6. This focuses on the idea of the gap between men and women and allows the data to move away from nominal levels. Using equal interval ranges as a guide and many attribute queries, each value in the data sets was reclassified to a value between 1 and 5. A value of 1 represents the “worst”, comparatively across countries. Small gaps between men and women were considered to be better. Additionally, more education spending, lower gender wage gap, presence of laws that encourage gender equality, a lower Gender Inequality Index, and a higher Gender Development Index were also considered to be better for more women in STEM. These reclassified values were then added together to create the rankings seen in the map to the left. Therefore, the higher ranking are looked to be countries that are better, comparatively, for women in STEM. Select input maps and data are shown to the right and below this text. A limitation to this analysis and a source of error results from the data collection process. Not every country had complete data sets for all the variables used in the final rankings. Certain countries did not have data for tertiary graduates in STEM or the employment rates. This can be seen in the graphs below. This results in those countries having artificially lower rankings.

Conclusion

The final rankings show a wide spread of where countries fall relative to women in STEM. It is expected to see the Scandinavian countries in the upper range because they are known to have high education rates and gender equality. However, those countries also tended to have a higher gap between men and women graduates in STEM. A selection of research presents the argument that women in countries with more gender equality tend not to choose STEM. However, comparatively, women from countries with relatively more gender equality are more inclined to choose STEM because it leads to more financial freedom, so the gap between men and women STEM tends to be lower. This results in some Eastern European countries being higher on the rankings than expected. Additionally, this analysis shows that is not all about just encouraging more women to enroll in higher education. In almost every country, there are more women than men with tertiary education. Women are outperforming men by 12 to 19 percent in many of the Eastern European countries. Women, from a young age, should be empowered to pursue STEM, specifically, in higher education and careers. Most women in STEM means a more advanced workforce and growth for the entire world. “Girls and women are key players in crafting solutions to improve lives and generate inclusive green growth that benefits all. They are the greatest untapped population to become the next generation of STEM professionals—we must invest in their talent” (UNESCO, 2017).

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Sources

Projection: Europe Albers Equal Area Conic. Datum: European 1950
Data: OECD Databank, World Bank Gender Data Portal, United Nations Human Development Data, ESRI Data Tufts GIS Database