STEM Gender Gap in University Education

Peter Pointner ,Thomas Sulzbacher, Yang Hua

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1 Abstract

In this paper our team focuses on the gender gap which appears in Science Technology Engineering Mathematics and Computer ,henceforth STEM, majors in university education. First of all we want to give an overview of the current situation of inscription rates in different STEM related majors at Johannes Kepler University Linz, from now on JKU, and how the development progressed from 2002 to 2016 based on [1] [2] [3] [4]. After taking a close look at the situation in Austria we want to focus on reasons for the decision made when choosing a university major and what different influences people are committed. In the next section the gender gap in STEM majors on universities in Germany is evaluated and compared against the situation in Austria. The main focus ,of the second part of this report, is to take a closer look at the international situation of the STEM gender gap. At the end of the report a conclusion of our findings will be presented.

2 Situation in German speaking countries

2.1 Situation at JKU

The study conducted in [2][3][4] showed that from 2005 throughout 2016 the share between man and women studying at JKU was not reflecting the demographic composition of Austria which would be 51% women and 49% of men studying at JKU. In 2005 the share between man and women studying at JKU was at a rate of 45% but there is a slight increase since 2005 to 2016 where 49% of all students at JKU were female students. If a closer look is taken at the inscription rates of new students, the rate of women starting at JKU in 2016, we see that the share of women is 53%, which also represents the mean of female students of all Austrian universities. From the gender equality reports conducted from 2005 to 2016 it can be seen that JKU has a general problem in attracting women but the problem minimized during the past years.

After describing the general share of female and male students at JKU a closer look is now taken at the STEM related majors. Unfortunately the data presented in [2][3][4] is inconsistent with each other meaning some data given in [2]can not be found in [3] and [4] or is structured in a different way.

First we want to take a look at the statistics for the whole Technical faculty of Natural Science, hence TNF.

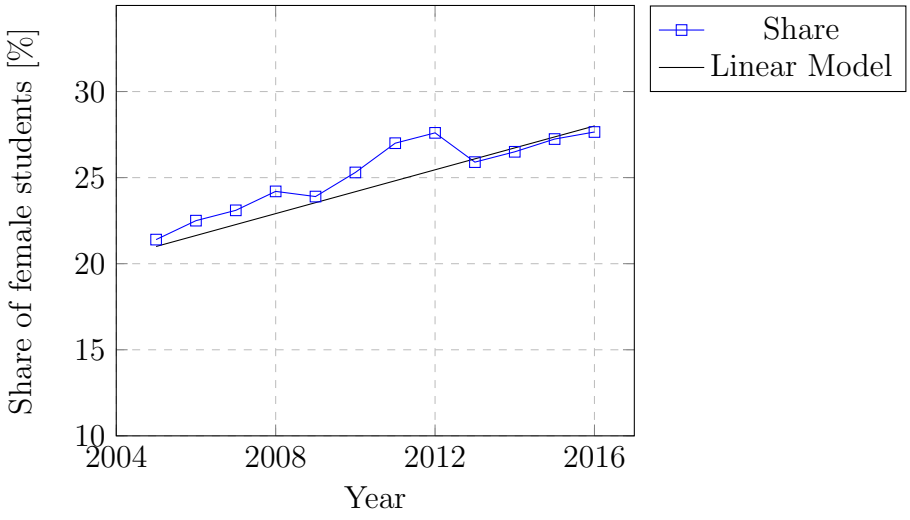

Figure 1: STEM Gender Gap developement at JKU's TNF.

2.2 Situation in Germany

In figure number 1 we can see the development of the STEM Gap at JKU's TNF over a periode of 11 Years. If a linear regression model is assigned to the data ,given by the equality reports, with

$$y = \frac{7}{11} * x + 21.4 \tag{1}$$

we see that the slight increase of female students at JKU fits the chosen model pretty well and this model might be useful for further estimates of the general decrease of the STEM Gap. If we take a closer look on the different STEM topics we notice that the STEM Gap is not found in all majors. In general it can be said that the share of male and female students in majors having a bio-science background is dominated by female students. The share is about 63% and keeps steady over the years. The highest gap which can be found at JKU is in Computer Science with only a share of 13% female students. If the data of the equality reports is analyzed in further detail it

can be seen that there is also no increase of female students in Computer Science since 2005.

3 Leaving Europe

In this section we are going to look at the general development throughout the whole world, based on some real-life reports and methods to compare gender affinity between countries.

3.1 Measuring global development

3.1.1 Gender Gap Index

Where no single measure can capture the complete situation, the Global Gender Gap Index seeks to measure one important aspect of gender equality: The relative gaps between women and men across four key areas:

- health and survival
- education
- economic participation
- political empowerment

The global Gender Gap Index was introduced in 2006 to track progress. In 2017 144 countries have been analyzed. The ranking are designed to raise global awareness of the challenges posed by gender gaps and the opportunities created by reducing them. [5] [6] [7] [8]

3.1.2 Quality and Representativity

So what explains the tendency for nations that have traditionally less gender equality to have more women in science and technology than their gender-progressive counterparts do?
it could have to do with the fact that women in countries with higher gender inequality are simply seeking the clearest possible path to financial freedom. And often, that path leads through stem professions.
The issue doesnt appear to be girls aptitude for stem professions. In looking at test scores across 67 countries and regions researchers found out that girls

performed about as well or better than boys did on science in most countries, and in almost all countries, girls would have been capable of college-level science and math classes if they had enrolled in them.
But when it comes to their relative strengths, in almost all the countries boys best subject was science, and girls was reading. (That is, even if an average girl was as good as an average boy at science, she was still likely to be even better at reading.) Across all countries, 24 percent of girls had science as their best subject, 25 percent of girls strength was math, and 51 percent excelled in reading. For boys, the percentages were 38 for science, 42 for math, and 20 for reading. And the more gender-equal the country, as measured by the World Economic Forums Global Gender Gap Index, the larger this gap between boys and girls in having science as their best subject.

3.2 USA

I remember walking into one of the classes at Stanford and just deciding not to take the class because I was one of only three women there, and I just felt so intimidated, Catherina Xu president Womens Computer Science Society at Stanford University.
Incidents like this are happening all across the country, and partly due to the lack of women in the field, there is now a shortage of computer science majors.
The percentage of women in the field has been declining since the 1980s. The National Science Foundation found that in 1985, more than 35
Laura Adolfie, the Florida STEM Chair for the American Association of University Women, believes part of the problem often starts in childhood. When a child is born and you have a son or a daughter, theyre socialized by the parents and the grandparents. You tend to give a little girl a doll and a boy cars and things like that. She said boys are socialized to tinker, which can start them on a path to engineering and computer science.
So why arent more women working in computer science? Three key factors are culture, the way women think and a lack of representation in the industry.

3.3 Example Africa

Moving to another continent... shows that the general problems are similar to the rest of the world. The cause may be a different one. For instance in Kenya, out of the top 100 best performing students only 17 were girls, and

they were mostly from high-cost national secondary schools. The statistic worsens as we go down to low-cost district secondary schools. So as we heard before the core of the problem lies also in the pre university education. The university of Nairobi did an evaluation where they found out that especially the didactic skills of the teachers and general quality of the classes drastically affect the interest of students in STEM topics. The worse the teacher is, the lower the interest is in STEM topics, affecting more female students because of their different approach of learning.

4 Conclusion

Gender equality and the empowerment of women and girls will make a crucial contribution to economic development of the world, and STEM education has a big role to play. As we have seen...

References

[1] Ingo Mförth, Michaela Watzinger, Manuaela Brunner, and Walter Blumberger. Inskriptionsverhalten, studiensituation und studienerfahrungen an der jku linz. endbericht. research report, JKU, 10 2002.

[2] JKU Abteilung für Gender und Diversity Management. Gleichstellungsbericht 2009. https://www.jku.at/abteilung-gender-diversity-management/service/publikationen-und-mailinglists/, 2009.

[3] Abteilung für Gender und Diversity Management JKU. Gleichstellungsbericht 2013. https://www.jku.at/abteilung-gender-diversity-management/service/publikationen-und-mailinglists/, 2013.

[4] Abteilung für Gender und Diversity Management JKU. Gleichstellungsbericht 2016. https://www.jku.at/abteilung-gender-diversity-management/service/publikationen-und-mailinglists/, 2016.

[5] Mary Wakhaya Sichangi. Why are girls and women under-represented in science related fields in africa? https://www.globalpartnership.org/blog/why-are-girls-and-women-under-represented-science-related-fields-africa, 2017.

[6] Vivian Yan. Five ways china's women are closing the gender gap. https://www.weforum.org/agenda/2017/11/chinese-women-are-closing-the-gender-gap-heres-how/, 2017.

[7] Scott Behrens. Man, computer science needs more women. http://college.usatoday.com/2017/03/08/man-computer-science-needs-more-women/, 2017.

[8] Mary Wakhaya Sichangi. The global gender gap report 2017. http://www3.weforum.org/docs/WEF_GGGR_2017.pdf, 2017.

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