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ABSTRACT

Underrepresentation of Women in Undergraduate Economics Degrees in Europe: A Comparison with STEM and Business*

In the last decade, the proportion and academic performance of women who pursue university degrees has increased relative to men in a range of developing countries (OECD, 2015). Nonetheless, the percentage of undergraduate economics degrees awarded to women has remained between 30% and 35% during 2001-2018 in the U.S. (Siegfried, 2019). In a recent work by Lundberg and Stearns (2019), they show that the gender gap worsens as women economists progress in their professional careers in the U.S., where they end up representing only 10% of university professors. European countries seem to have less of a "leaky pipeline," where the same figure sits at 22% (Auriol, Friebel, and Wilhelm, 2020). To put this figure into perspective, our paper describes the cross-country underrepresentation of women graduating in economics degrees in Europe relative to their country-specific women/men university graduation rates. Second, we compare the underrepresentation of women in economics to its closest alternative namely business, as well as its gender underrepresented counterpart, STEM (Science, Technology, Engineering, and Mathematics). Finally, we lean on recent evidence to suggest policies to increase the relative share of women pursuing undergraduate economics degrees in Europe with a strong focus on policies aimed at high schools. Overall, we find that, over the period 2013-2018, the underrepresentation of women in economics graduates has worsened in Europe and that on average two of every five students are women. While the gender representation of university graduates in STEM is worse than in economics, it has experienced a mild increase over the period of study. Unlike Economics, its closest alternative, business, has a slight women overrepresentation, with 1.1 women graduating for every man.

JEL Classification: J16, J24

Keywords: women, economics, STEM, university

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Introduction

In the last decade, the proportion and academic performance of women who pursue university degrees has increased relative to men in a range of developing countries (OECD, 2015). Nonetheless, the percentage of undergraduate economics degrees awarded to women has remained between 30% and 35% during 2001-2018 in the U.S. (Siegfried, 2019).

In a recent work by Lundberg and Stearns (2019), they show that the gender gap worsens as women economists progress in their professional careers in the U.S., where they end up representing only 10 % of university professors.

European countries seem to have less of a "leaky pipeline," where the same figure sits at 22% (Auriol, Friebel, and Wilhelm, 2020). To put this figure into perspective, our chapter describes the cross-country underrepresentation of women graduating in economics degrees in Europe relative to their country-specific women/men university graduation rates. Second, we compare the underrepresentation of women in economics to its closest alternative namely business, as well as its gender underrepresented counterpart, STEM (Science, Technology, Engineering, and Mathematics). Finally, we lean on recent evidence to suggest policies to increase the relative share of women pursuing undergraduate economics degrees in Europe with a strong focus on policies aimed at high schools.

Overall, we find that, over the period 2013-2018, the underrepresentation of women in economics graduates has worsened in Europe and that on average two of every five students are women. While the gender representation of university graduates in STEM is worse than in economics, it has experienced a mild increase over the period of study. Unlike Economics, its closest alternative, business, has a slight women overrepresentation, with 1.1 women graduating for every man.

Recent Trends in Undergraduate Women in Economics across Europe (2014-2018)

We gain insights about recent trends in the cross-country differences in the underrepresentation of women in undergraduate economic degrees in Europe through detailed Eurostat data on the total number of graduates by gender, degree, country for all available years (2014-2018).[1]

For comparison purposes, out of the 36 countries for which data is provided by Eurostat, we focus on the 25 for which data is reliable, homogeneous, and available for most of the period of study. Henceforth, we will denote this group as *Europe-25*.[2] This group includes countries with significant size economics undergraduate programs (graduating at least 50 students each year) that have reported detailed ISCED[3] field data for at least three of the past four years via Eurostat.

Because in recent decades, women are more likely to pursue a university degree than men, we rely on a within country *conversion rate* based on the relative share of women enrolled in a particular field in with respect to the total share of women graduating in the same country (Avilova and Goldin, 2018). This conversion rate allows U.S. to abstract from the possibility that women might be overrepresented

[1] While it would be also interesting to analyse graduation rates along with the relative differences in enrolment and dropout rates, this information is unfortunately not available homogeneously for all countries studied.

[2] For example, through correspondence with Eurostat inquiry office, Portugal and Poland's data double counts graduates who have completed multiple specialisations. Please refer Table A.1 in Appendix A for details on the reasons for exclusion of each country.

[3] ISCED (International Standard Classification of Education) is the reference international classification for organising education programmes and related qualifications by levels and fields.

in a particular field simply because there are more women attending university than men in most European countries.

As depicted in Figure 1, preliminary cross-country analysis of the Eurostat dataset reveals an interesting spatial pattern. A range of Eastern European countries have a proportionally more women graduating in economics than men (conversion rate greater than 1), even when accounting for differences in university graduation rates between genders. Meanwhile, Northern European countries which have achieved very high levels of female representation at university as a whole, perform rather poorly when it comes to gender gap in graduation rates from economics undergraduate degrees.

Figure 1. W/M Conversion Rate for Economics Graduates across Europe, 2015-2018[4]

Next, we aim to compare economics with its closest alternative, business studies,[5] and STEM,[6] a group of degrees with an even more historically pronounced underrepresentation of women.[7]

On the one hand, some studies find that business students tend to populate introductory economics lectures and are the primary group to transfer into economics (Asarta and Butters, 2012; Emerson and Mcgoldrick, 2017). On the other hand, in the U.S., universities that offer both economics and business degrees see a wider gender gap in economics majors. Goldin (2013) points out that although all U.S. undergraduates have a preference for business over economics, this is particularly pronounced for women. In particular, men prefer business to economics at a rate of 3:1 whereas for women the ratio

[4] We use W/M to denote the ratio of the number of women to the number of men. W/M Conversion Rate for Economics Graduates is found by taking the ratio of W/M graduating from economics over W/M graduating from university. These conversion rates statistics indicate what the ratio of women to men would be if overall university populations had equal number of each gender. A reference map with the names of countries is provided in Appendix Figure A.1.

[5] We consider the ISCED-F field Business and Administration degrees. This include: Accounting and Taxation, Finance, Banking and Insurance, Management and Administration, Marketing and Advertising, Secretarial and Office Work, Wholesale and Retail Sales Work Skills.

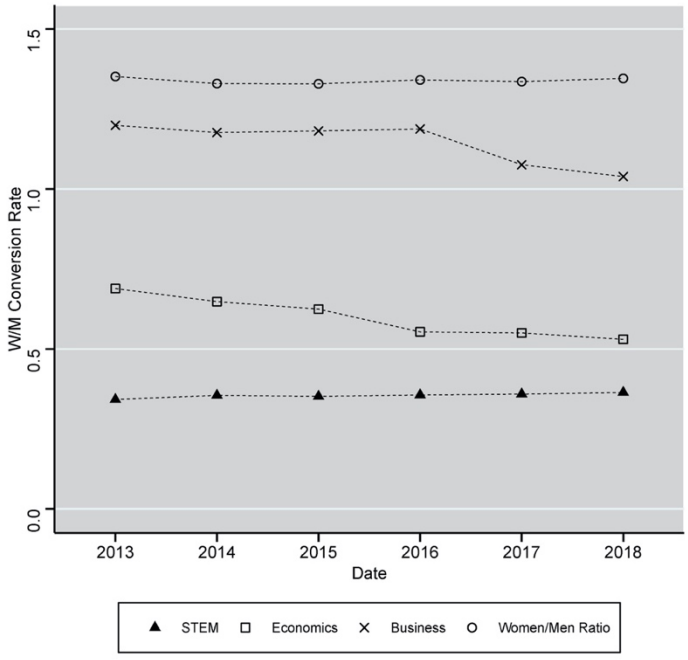
[6] We include the following ISCED-F (2013) STEM fields: Natural sciences, Mathematics and Statistics, Information and Communication Technologies, Engineering and Engineering Trades, Manufacturing and Processing. This is similar to other studies that have relied on this dataset such as Tornese and Lupiañez-Villanueva (2017).

[7] For example, see Kahn and Ginther, 2018 for the U.S. case.

is 5:1. Furthermore, studies of high school students in Australia have shown that women consider business significantly more attractive than economics (Dwyer, 2018; Livermore and Major, 2020). Like in Australia, most European University systems require students to specialize upon entry and also allow for relatively limited flexibility in unit choices (Arnold, 2020). This rigidity reduces the likelihood of business students transferring into economics and strengthens the case in Europe for business being a substitute rather than a complement to economics.

For comparison purposes, Figure 2 shows the weighted average[8] of economics, STEM and business conversion rates for the EU-25 countries over the period 2013-2018 together with the ratio of total women to men university graduates. Appendix B provides individual graphs for each and every EU-25 country.

Figure 2. Conversion rates in Economics, STEM, and Business Graduates in Europe



Overall, and consistent with U.S. data, we find that during 2013-2018:

1. Except from the UK, the overall conversion rate of women versus men in economics has been stable or decreasing over time and has been around 0.6 on average.[9]
2. Unlike Economics, the conversion rate of its closest substitute, business, sits at 1.1 which indicates that more women graduate than men, adjusting for total gender ratios at university.
3. The average conversion rate in STEM is worse than economics at 0.35 but experiencing a mild increase over the period.

To put these figures into perspective, in a very recent study, Auriol, Friebel, and Wilhelm (2020) collect data of European research institutions and examine the percentage of academic women in economics

[8] Weighted by the number of graduates for each country in that particular year.

[9] As it can be seen from the individual country graphs in Appendix B, the only outliers are Cyprus, Lithuania, the Netherlands, and Serbia.

at different academic ranks. They find that in the top 300 research institutions, while women make up 33 % of academic positions in economics, they only fulfil 21.5 % of professorships.[10]

Europe-25 seems to have a slightly higher proportion (0.375) of women attending university than in the U.S. sitting at 0.3 (Lundberg, 2019). Keeping in mind that undergraduate students are less likely to move continents to pursue their studies than post-graduates, compared to the U.S., this figure improves also the relative success of European universities in the representation of women in professorship positions at 22 % (Auriol et al, 2020) compared to the U.S. (Lundberg, 2019).

Policy recommendations and future research

Unlike the U.S., undergraduate degrees in Europe are relatively inflexible in regards to switching degrees. Except for from business, there is a relatively large sunk cost involved in transferring into economics because courses are rarely exchangeable across degrees (Arnold, 2020). This is why we focus on policies aimed at informing and attracting high school students into economics.

Mentoring at the high school level

Researchers have posited a number of hypotheses for the underrepresentation of women in economics, and one of them is the lack of role models. The evidence is mixed regarding whether the gender composition of economics department faculty has a significant impact on the proportion of bachelor degrees in economics awarded to women. Most studies in U.S. find no effect, and a few find a positive effect (see the references in Emerson et al, 2018). Many existing studies have either data limitations due to focusing on one or a selected set of institutions, or failing to capture relevant characteristics such as the gender ratio of faculty in the department, or curriculum requirements. Emerson et al (2018) overcomes these limitations using a panel of 10 years of institutional data with departmental characteristics such as the gender ratio of economics department faculty and the quantitative course requirements across a large number of institutions in the U.S., and finds no evidence of a positive role model effect of presence of women faculty in attracting a more gender diverse set of undergraduate majors.

On the other hand, interventions exposing students to charismatic women role models have been shown effective in increasing gender representation. In a very recent U.S. study, Porter and Serra (2020) show that female students exposed enrolled in introductory economics classes and exposed to successful and charismatic women who majored in economics at the same university significantly increasing the likelihood of women majoring in economics by 8%.

Given that in European institutions, it is harder to switch disciplines once a student commences her degree, exposure to role models at high school level becomes more significant in order to attract more women to enrol in economic degrees. Support for this policy intervention comes from a recent study in STEM. Using a random assignment of classroom interventions carried out by 56 women scientists among 20,000 high school students in the Paris Region, Breda et al (2020) show that there is a significant positive impact of external women role models on student enrolment in STEM fields.

Addressing Unconscious Bias

[10] Note that this figure does not account for the relative fraction of women at academic positions at in other academic field.

An alternative hypothesis behind the under-representation of women in math-oriented disciplines is that women underperform in mathematics and science. However, recent trends reveal the gender achievement gap in mathematics is gradually closing. A recent OECD report based on PISA scores shows that in several European countries, such as Iceland, Sweden, Norway, Finland, Israel, and Greece the gender gap in mathematics and science has reversed in favour of women (OECD, 2016).

Why are then women still less likely to specialize in math and science at the university level? Another reason that could discourage women to pursue math and science studies at the undergraduate level is teachers' unconscious bias. A few recent studies focus on the existence of teachers' gender biases in primary and high school in European countries. Terrier (2014) analyze teachers' biases in primary schools in France and shows that teachers´ grading biases in mathematics in favor of boys have a positive impact on boys' relative test score achievements. Lavy and Sand (2018) use data from primary schools in Israel and find that teachers' biases favoring boys in math have a positive effect on boys' performance in those subjects and negative effect on girls' achievements. Carlana (2019) uses data from Italy to show that teachers' stereotypes increase the gender gap in math performance and in self-assessment of students' own mathematical abilities in middle school.

In addition, biased teachers activate negative self-stereotypes on female students in male-typed domains. Lavy and Megalokonomou (2020) use data on high school teachers from Greece to show that teachers' grading bias in math in favor of boys have a positive (negative) impact on boys' (girls') subsequent test scores. However, girls' decision to enroll in a particular degree (i.e., math or economics) is affected by the teacher biases they are exposed to in high school, while boys are insensitive to the influences of those biases when they make field specialization decisions.

Thus, a policy tool that may be effective is to raise awareness of teachers' gender unconscious biases (Carlana, 2019) and develop gender-unbiased grading policies such as blind grading whenever possible (Bohnet, 2016). An alternative policy tool to fight stereotypes boost women's confidence in their own skills. The latter could be very effective for women who are found to be more sensitive to grades in introductory undergraduate courses and that might also happen in high school (Crawford 2017). Boosting women's confidence in their skills may encourage them to pursue more math or economics related courses even if they underperform in those subjects.

Degree flexibility and interdisciplinarity

Finally, we believe that having a more flexible degree structure in European universities would allow for recruiting undergraduate students into economics from other disciplines other than business that can be closely complementary to our field such as behavioral and data sciences, mathematics, health and public policy. This flexibility would not only allow women to get a taste of the versatility of economics without taking the risk of having to start a new degree but also generate interdisciplinary complementarities across fields.

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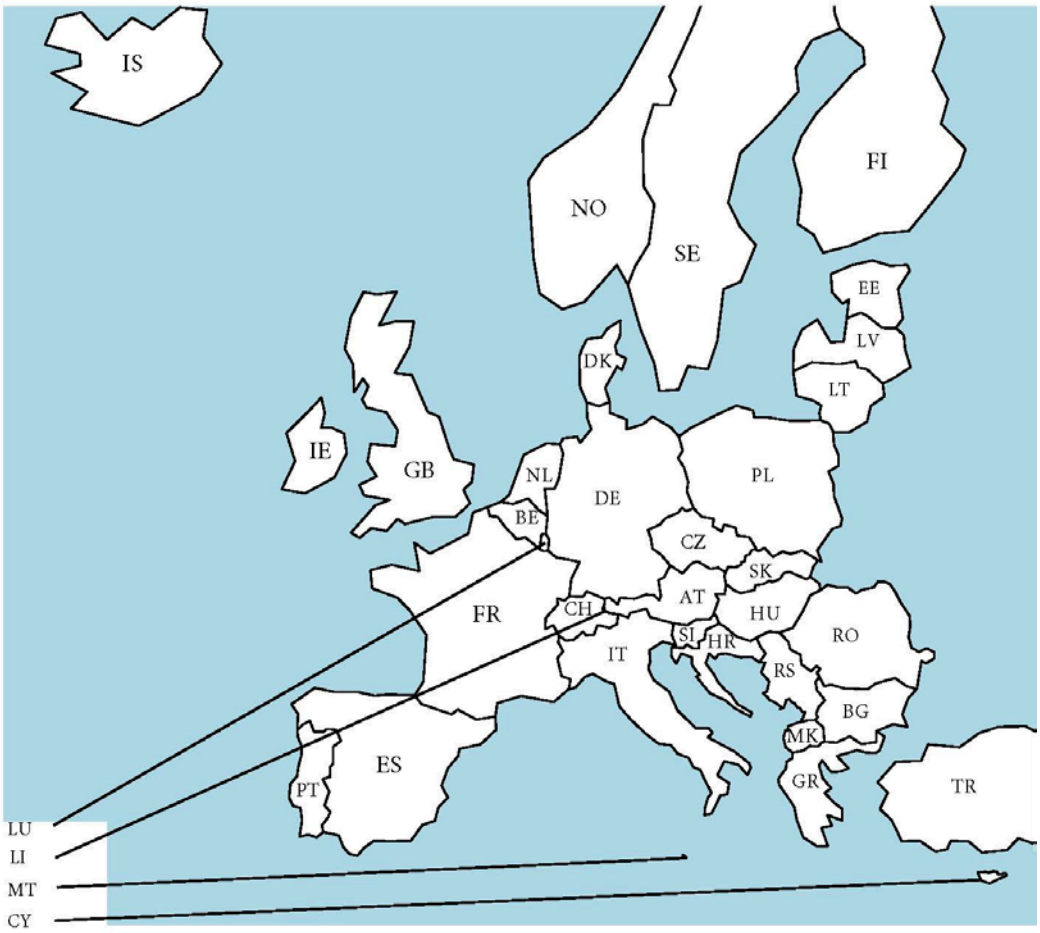
Appendix A

Table A.1: Countries Meeting the Data Criteria to be Included in the Main Analysis

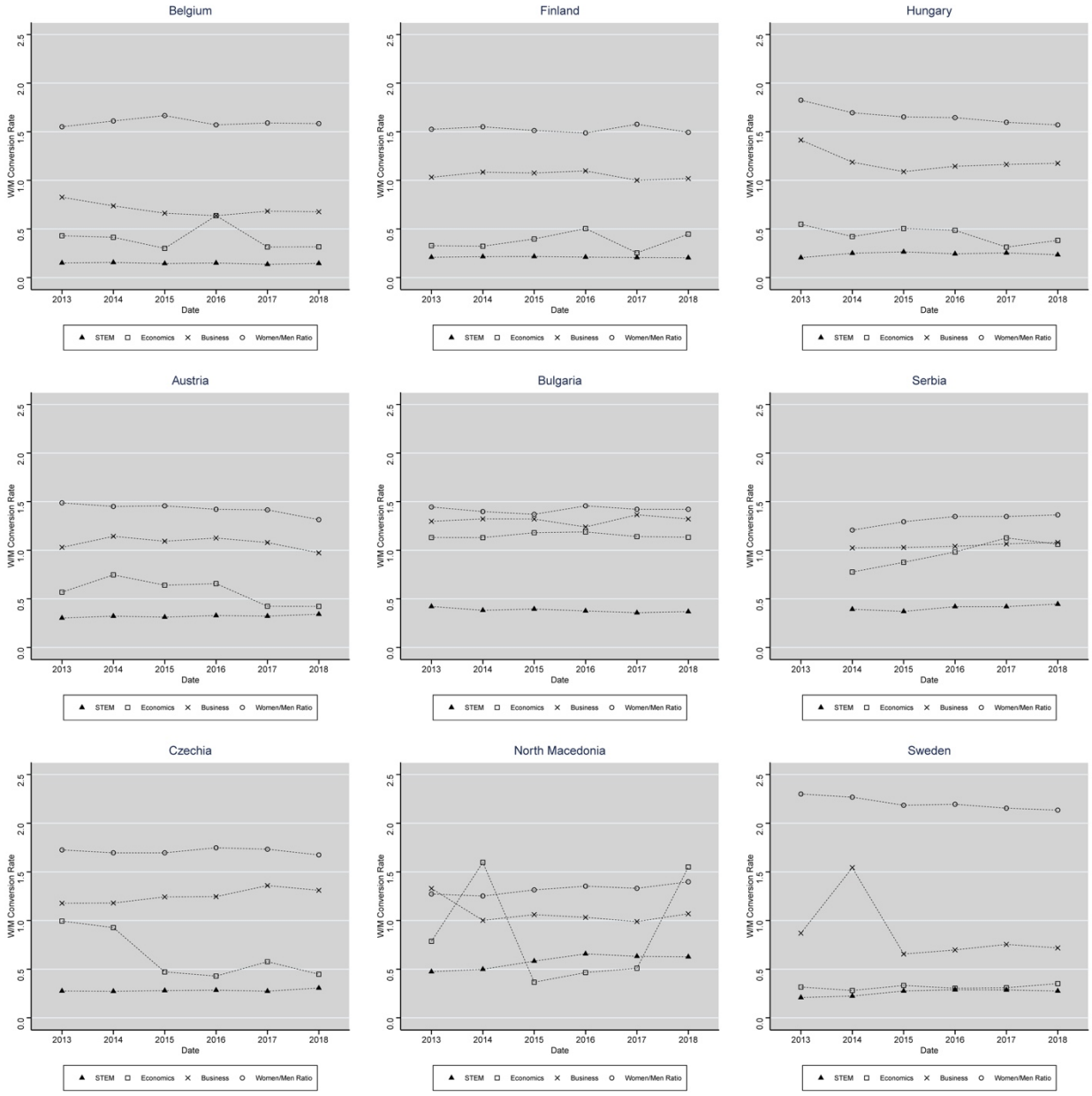
Country	Over 50 economics graduates during years when data is reported	Reported data on number of economics students for at least three of the four available years	Graduate data reported according to Eurostat guidelines
Belgium	Yes	Yes	Yes
Bulgaria	Yes	Yes	Yes
Czechia	Yes	Yes	Yes
Denmark	Yes	Yes	Yes
Germany	Yes	Yes	Yes
Estonia	Yes	Yes	Yes
Ireland	Yes	Yes	Yes
Greece	Yes	Yes	Yes
Spain	Yes	Yes	Yes
France	Yes	No	Yes
Croatia	No	Yes	Yes
Italy	Yes	No	Possible double counting of students enrolled in double degrees. Metadata describes this possibility as 'rare'.
Cyprus	Yes	Yes	Yes
Latvia	Yes	Yes	Yes
Lithuania	Yes	Yes	Yes
Luxembourg	Yes	Yes	Yes
Hungary	Yes	Yes	Yes
Malta	No	Yes	Yes
Netherlands	Yes	Yes	Yes
Austria	Yes	Yes	Yes
Poland	Yes	Yes	Vulnerable to double counting of students enrolled in double degrees.
Portugal	Yes	Yes	Vulnerable to double counting of students enrolled in double degrees.
Romania	Yes	Yes	Yes
Slovenia	Yes	No	Yes
Slovakia	Yes	Yes	Yes
Finland	Yes	Yes	Yes
Sweden	Yes	Yes	Yes
United Kingdom	Yes	Yes	Yes
Iceland	No	Yes	Not able to verify
Liechtenstein	No	Yes	Yes
Norway	Yes	Yes	Yes
Switzerland	Yes	Yes	Yes
Montenegro	No	No	Yes
North Macedonia	Yes	Yes	Yes
Serbia	Yes	Yes	Yes
Turkey	Yes	No	Yes

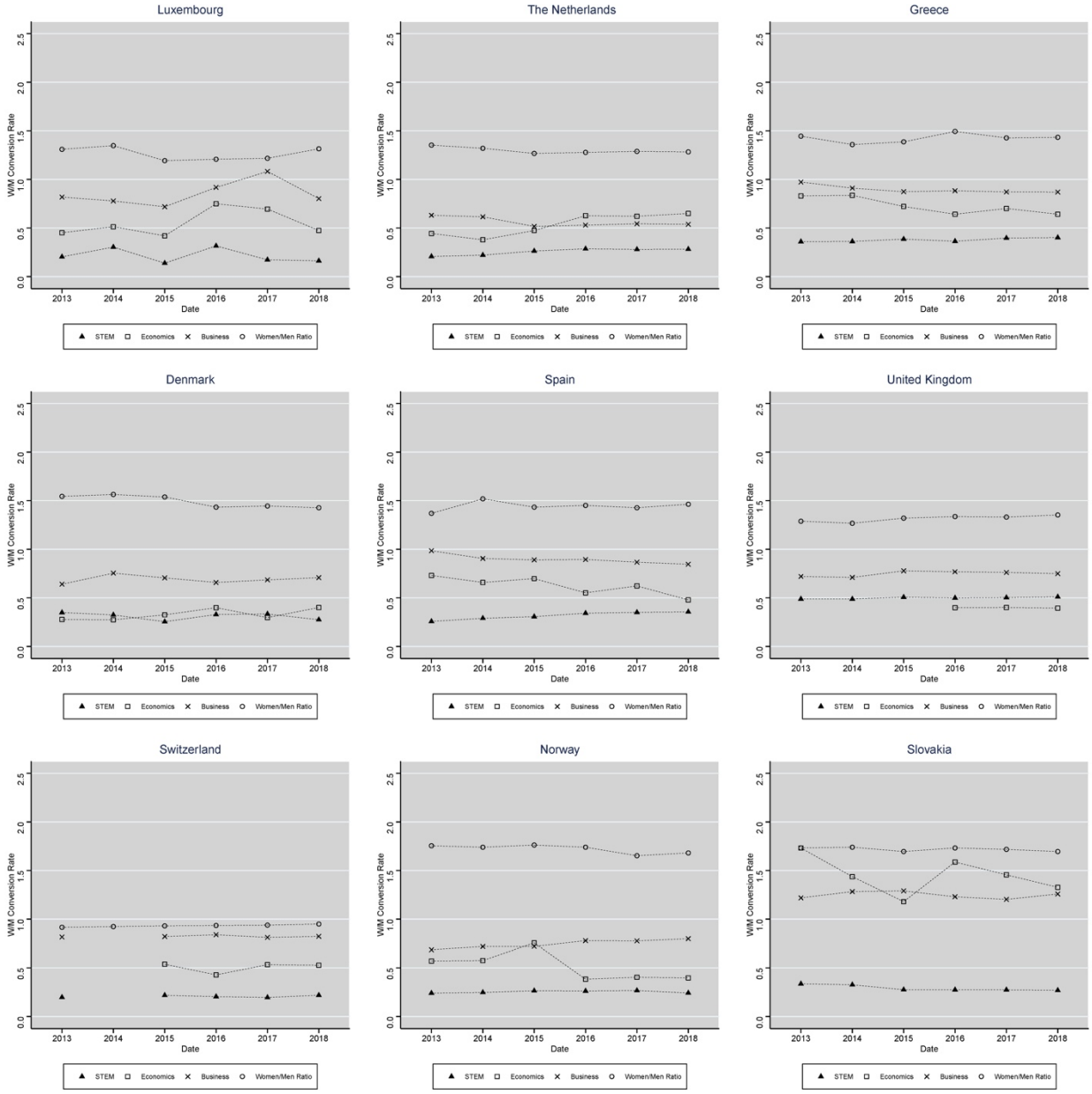
Figure A.1: Reference Map[11]

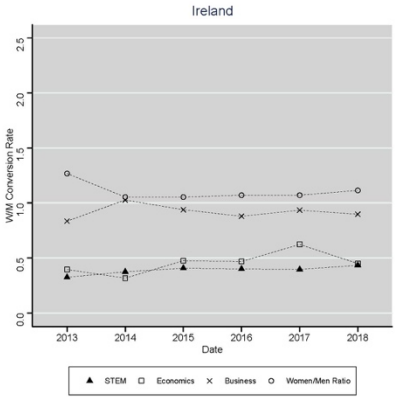


[11] Identifies European countries by their two letter country codes available here: https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Country_codes

Appendix B: W/M Conversion Rates by Country




Luxembourg
The Netherlands
Greece
Denmark
Spain
United Kingdom
Switzerland
Norway
Slovakia
WiM Conversion Rate
0.0
0.5
1.0
1.5
2.0
2.5
2013
2014
2015
2016
2017
2018
Date
STEM
Economics
Business
Women/Men Ratio


Ireland
WiM Conversion Rate
0.0
0.5
1.0
1.5
2.0
2.5
2013
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2017
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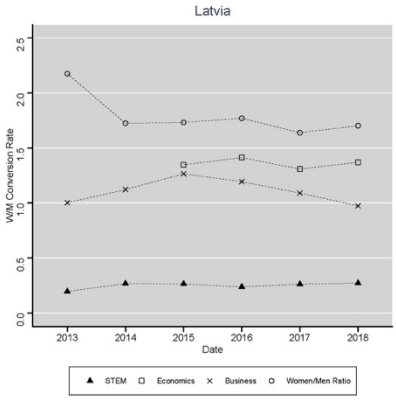
Date
STEM
Economics
Business
Women/Men Ratio


Latvia
WiM Conversion Rate
0.0
0.5
1.0
1.5
2.0
2.5
2013
2014
2015
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2017
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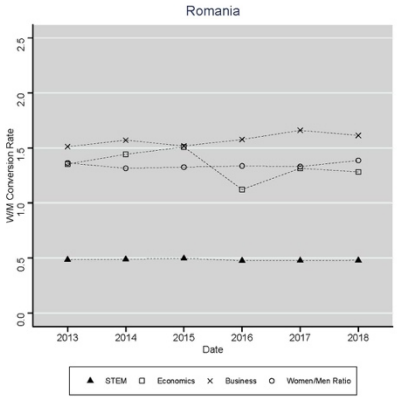
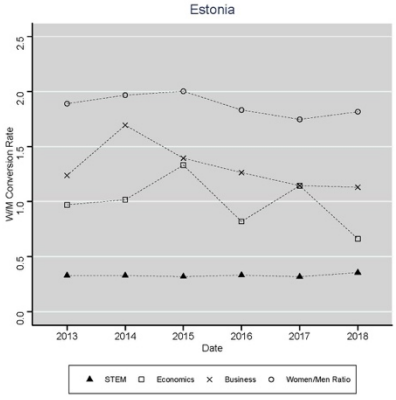
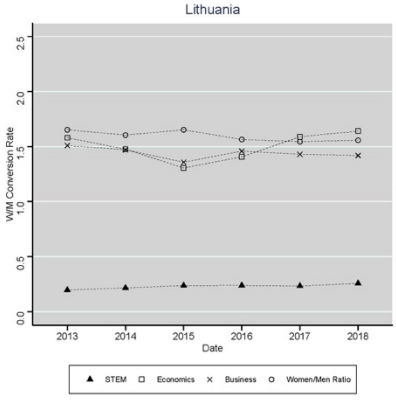
Date
STEM
Economics
Business
Women/Men Ratio


Romania
WiM Conversion Rate
0.0
0.5
1.0
1.5
2.0
2.5
2013
2014
2015
2016
2017
2018
Date
STEM
Economics
Business
Women/Men Ratio


Estonia
WiM Conversion Rate
0.0
0.5
1.0
1.5
2.0
2.5
2013
2014
2015
2016
2017
2018
Date
STEM
Economics
Business
Women/Men Ratio


Lithuania
WiM Conversion Rate
0.0
0.5
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2013
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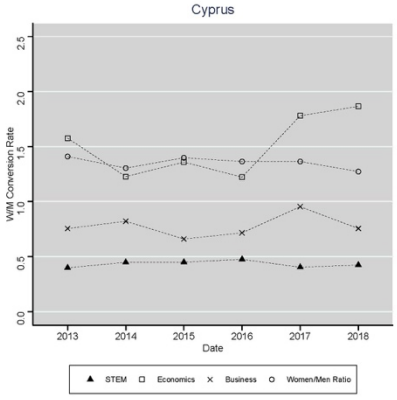
Date
STEM
Economics
Business
Women/Men Ratio


Cyprus
WiM Conversion Rate
0.0
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1.0
1.5
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2013
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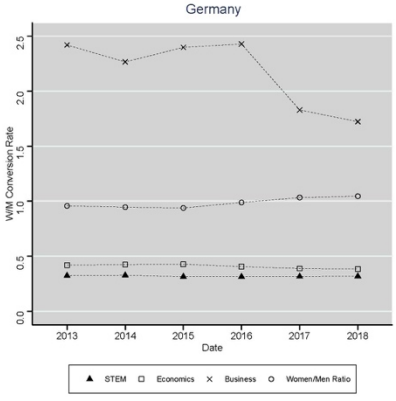
2017
2018
Date
STEM
Economics
Business
Women/Men Ratio


Germany
WiM Conversion Rate
0.0
0.5
1.0
1.5
2.0
2.5
2013
2014
2015
2016
2017
2018
Date
STEM
Economics
Business
Women/Men Ratio