Gender differences in educational outcomes are disappearing and yet there remains a gender gap in science

Gender segregation persists across majors despite the amelioration or disappearance of gender differences for many educational outcomes. ***Thomas Breda*** *explores the persistent gender gap in science, reporting on the findings of research into gender stereotypes and discrimination at the Ecole Normale Supérieure.*

Why are there so few girls in science? Although gender differences have disappeared or evolved in favour of girls in many educational outcomes, male and female students are still strongly segregated across majors. Females compose only 25% of the science, technology, engineering, and maths workforce in the U.S (National Science Foundation, 2006). In the U.K the physics foundation just released a report relating that, while physics is the fourth favourite topic for boys, it's only the 19th for girls.

Understanding the origin of these discrepancies is important from an economic perspective: gender differences in entry into science careers account for a significant part of the gender pay differential among college graduates. It may also reduce aggregate productivity because of misallocation of talent.

The reasons for the under-representation of women in science have been debated by several academic papers, government reports, as well as pro-women lobbies. We know that gender differences in maths and science test scores at the end of twelfth grade have lowered in previous decades and are now very small. And these small gender differences in abilities cannot explain the gender gap in science careers: even when considering students with identical abilities, women are still between 50% and 70% less likely than men to complete a degree in science, technology, engineering, or maths.

What, then, explains the gender gap in science? A potential explanation is that women may be implicitly or explicitly driven away from science majors by professors. As a matter of fact, professors influence students' educational choices as they serve as role models in higher education: having a female teacher in allegedly masculine subjects strongly increases female college students' attainment and their likelihood to major in science (e.g. Bettinger and Long, 2005; Carrell et al., 2010). Some studies also suggest that gender stereotypes (such as that boys excel in maths and science, while girls excel in other subjects) may foster discrimination against females and be partly responsible for gender gaps at school and on the labour market. However, there has to date been a lack of conclusive evidence of discrimination due to stereotypes. Almost nothing is known on the actual evaluating behaviour of professors in different subjects. Most studies have focused on supply-side explanations, e.g. gender differences in abilities or preferences, but only little is known on the role effectively played by the demand side: do professors want girls in science? This is a key concern if we want to ensure that males and females are given equal opportunities and are equally treated when they make their educational and career choices.

In a research project with Thierry Ly, we use a unique dataset on the entrance exam of a French top higher education institution, the Ecole Normale Supérieure (ENS), to investigate a potential link between gender stereotypes and discrimination. To gain entry to the ENS, each student is tested on subjects where boys are usually alleged to perform better than girls (e.g. mathematics or philosophy), as well as on subjects that are assumed to be better suited for girls (e.g. biology or foreign languages). This specific context enables us to identify precisely how both the direction and degree of gender discrimination vary with gender stereotypes. We relied on the fact that ENS candidates have to take both a blind written test (their gender is not known by the professor who grades the test) and a non-blind oral test. The difference-in-differences between the males' and females' gaps between the blind and the non-blind test scores gives a measure of a potential gender bias in a given subject. Moreover, as students are not tested on one subject only, it is possible to investigate how professors' gender bias changes

across subjects for a same candidate.

We found that discrimination systematically goes against gender stereotypes: the more masculine a subject is alleged to be, the more favoured girls are. This implies that the demand for students in different majors is biased in favour of the minority gender. These results show that professors' evaluations are not directly driven by simplistic stereotypes such as that "girls are not good at science".

Having seen that evaluators react to gender stereotypes "in opposition to them", we may wonder how candidates themselves react to these gender stereotypes. After all, our study focusses on a very competitive contest: perhaps the female candidates at the ENS feel especially self-confident in maths, which explains their good performance at oral test. Interestingly enough, it is not what we found. The candidates in our population have the same characteristics that are usually found in average populations: females candidates tend to perform slightly worse in more masculine subjects (e.g. maths) and slightly better in more feminine subjects (e.g. foreign languages), but these differences are small; and when they have to choose an additional test, females are a lot less likely to choose the most masculine one. This is true even when we consider candidates with the same ability. These results imply that: first, the girls we observe behave exactly like stereotypes would predict, and second, this choice is perfectly irrational regarding professors' behaviour: to maximise their chances of success, girls should choose more often the masculine subjects where they would get some help from their evaluators.

Different mechanisms could explain these findings. First, we may simply observe affirmative action. But, contrary to the US, there is no legal base for affirmative action in France. The ENS is also one of the most prestigious higher education institutions in the country and has a strong reputation of rewarding only pure talent (as shown by the sociologist Pierre Bourdieu). Thus, there are probably no coordinated decisions towards favouring females in science majors. This is confirmed by the fact that we find opposite results in different subjects undertaking the same major, and strong differences between male-connoted and female-connoted subjects in majors where parity is already reached.

We're then left with a couple of other explanations. The first one is pure irrational preference-based discrimination: maths professors are just happier when they have the unusual occasion to interview a female candidate whereas the same is true for literature professors with respect to male candidates. In contrast, the second plausible mechanism is directly linked to students' abilities. Paradoxically, professors may rationally favour girls in science even if they have negative stereotypes about their abilities. For a given observed performance, they may think girls signal a higher effort, self-investment or perseverance, and reward these non-cognitive attributes.

These mechanisms need to be investigated further. However, we already know that stereotypes do not always harm girls, which can be viewed as good news concerning the capacity of our societies to move quickly from awareness to action against long-standing imbalances. It would be interesting to know if such behaviours can be observed in other contexts, and to what extent they are already widespread in developed countries.

Note: This article gives the views of the author, and not the position of the British Politics and Policy blog, nor of the London School of Economics. Please read our comments policy before posting.

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