The impact of grades in introductory maths modules on econometrics course selection by gender
A regression-discontinuity analysis in the LSE Department of Economics

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If this project has informed your practice, let us know at lse.changemakers@lse.ac.uk

Background

In my research I have applied a regression-discontinuity design to identify the causal impact of grade classification (whether a person receives a 1.1, 2.1, 2.2, or 3.0) in introductory maths course (that is MA100) on subsequent course choice in econometrics in their second year (EC220/EC221), where EC221 is known to be version of the course with more advanced mathematics involved. Especially, I investigated if this effect (i) exists at The LSE, and (ii) if it differs by gender, as, according to some of the existing literature, females are more responsive to lower grades than males, which may account for the persistent low representation of women in Economics.

My research was inspired by the findings of McEwan, Rogers and Weerapana (2019) who have shown in their paper on "Grades and the Economics Major at a Women's College" that female students who barely received higher letter grades in two introductory economics courses and thus have remained above letter grade cut-off have markedly higher probability of majoring in Economics, although they were otherwise similar to other female students below that cut-off. A causal mechanism this paper points to is the behavioural evidence that men and women react differently to negative feedback.

My research was an attempt to bring this American study to a British context, and in particular to that of my home department of LSE Economics. As in the UK one has to commit to their major selection before they start their degree, it made sense to me to look into how their initial performance in first year courses informs their further course choice (instead of major choice as in the US).

Given the persistent relevance of gender both as a topic of study and as an issue affecting the discipline of Economics, I believe there are strong reasons why studying gender disparities and the causal pathways that bring them remains a worthwhile undertaking.

Data

I worked with a large, anonymised dataset on the performance of 4130 BSc Economics students over the past 19 years. The dataset contains each student's exam scores from all

the modules they have ever taken at LSE and background information including socioeconomic class, year of study, year of entry, and, of course, gender.

The data were provided to me last academic year by the London School of Economics Data Management Plan Team from the Digital Curation Centre. I have already familiarised myself with them while working on my sophomore-year research project for LSE Chagemakers on gender differences in performance and engagement of BSc Economics students.

Thus, at the starting point of my project I already knew from my last year's findings that: (i) now there are *less* women in the Department of Economics than there were 20 years ago and though this proportion has been varying yearly it has never reached 50% level and a downward trend is clearly visible and that (ii) the majority of female students in the Departament are of Chinese ethnicity. Were it not for the Chinese female students the gender ratio amongst the Econ would have been even more skewed.

Having empirically proved the nature of gender disparity in the LSE Department of Economics this year I was interested in looking what its potential impacts might be.

Methodology

The method used in this project was an application of regression discontinuity design to identify the casual impact of grades in introductory maths modules on econometrics course selection by gender. All computations were performed on the data set described in the section above in a statistical software called STATA.

The proposed method is an especially good identification strategy as it addresses the issue of unobserved heterogeneity of students who have received different grades in introductory maths courses. As students with higher grades are also more likely to have higher motivation or ability, a simple OLS would upwardly bias the causal importance of grades. Another possible study design would be to treat overall performance in all courses as a measure of ability of a student and control for it; but doing so would disregard the possibility that students might exert higher effort in courses led by their own department and so being more at the core of their degree.

Through the regression-discontinuity quasi-experimental design I have addressed these concerns. I have compared students with very similar exam performance, but who fall to different grade categories, like people who have received a borderline 69 score (second class honors) and 70 (first class honours), which allowed me to treat their grades as if they were randomly allocated and be the basis for counterfactual reasoning about the causal importance of the introductory course grade. Finally, I have also performed a balance check of the background characteristics of treated and untreated individuals, which was satisfactory.

Findings

Firstly, I have looked into the impact of being classified as a 1.0 vs 2.1 class honours in MA100 (across +/- 5 bandwidths) on econometrics course selection in second year (EC220/EC221) across BSc Economics students and found no significant results here.

Secondly, I have looked into the impact of being classified as a 2.1 vs 2.2 class honours in MA100 on the econometrics course selection in second year (EC220/EC221) and found my results to be significant at +/-4 bandwidth. In other words, I have found that students who score in between 60-64 points in MA100 vs those who score 56-60 in that subject are significantly more likely to pick EC221 as opposed to EC220, that is the more maths heavy version of the subject. However, I have not found any significant gender differences here.

Recommendations:

- LSE Department of Economics should continue to investigate the impact of female underrepresentation in its structures on student experience and performance.
- However, since my research shows that female BSc Economics students do not perform worse on average than their male peers and they are not more sensitive to negative feedback it seems reasonable to suspect that a lot of root causes of female underrepresentation at LSE Economics takes place at earlier stages of education. Hence, LSE Department of Economics should consider developing an outreach program to girls in primary schools and high schools to show that a path in Economics is an attainable one and one they could consider.
- Finally, I draw attention to the fact that the MA100 grade plays a role in students' decision process of whether to pick EC220 or EC221. The LSE Department of Economics should consider if they wish this to be the case.