Promoting Female Interest in Economics: Limits to Nudges

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Economics degrees offer high future salaries and a variety of important careers, but the low female share of graduates (Bayer and Rouse 2016; Lundberg and Stearns 2018) contributes to workplace inequality (Siegfried 2018) and may also have consequences for the questions studied by economists and corresponding policy recommendations (May, McGarvey, and Whaples 2014). The scarcity of women in Economics begins with undergraduate majors.

The American Economic Association (AEA) recommends sharing information, including via email, about the Economics major as a "Best Practice" to "correct gender and racial/ethnic disparities in knowledge about economics," noting the effectiveness of such interventions: "When faculty proactively offer information about the breadth of the field of economics, more students from underrepresented groups study economics" (Bayer et al. 2019). We test that claim, focusing on women as the underrepresented group.

We randomly assigned more than 2,000 students enrolled in Economics Principles courses at Oregon State University to receive an email message with basic information about the major, or messages emphasizing the rewarding careers or financial returns associated with the Economics major. A control group received no message.

Messages increased the probability that a student went on to major in Economics by around two percentage points, a magnitude similar to the control group mean. Because the outcome is measured by administrative data from the academic year following treatment,

the effects represent a durable change in revealed preference. All effects were driven by male students, however. We find no effects among female students.

If sending the most effective message became departmental policy, the male/female ratio of Economics majors the year after intervention would increase by 96%. Averaging over the effects of all message types, the predicted male/female ratio would rise by 54%. Our results sound a note of caution about the potential for simple nudges to exacerbate inequalities within Economics.

I. Research Design

A. Context and experiment

The study took place on the main campus of Oregon State University (OSU), the largest university in the state, during the 2018-2019 academic year. That year, OSU awarded 83 Economics degrees, 18 of them to female students (22%). The ratio of male to female Economics graduates, scaled by the corresponding ratio of total bachelor's degrees, was 3.1, greater than the recent national average of 2.9 (Avilova and Goldin 2018). OSU's academic year consists of three 10-week quarters. The study included all 13 sections of Economics Principles courses, introductory microeconomics and macroeconomics. While the Economics major is relatively small, the Principles classes fulfill requirements for 40 other majors.

Students who consented to participate in the study were randomly assigned to one of five groups:

1. *Control*: no message
2. *Basic information*: encouragement message based on description of Economics major on departmental website
3. *Earnings information*: basic information, plus information on earnings of Economics graduates.
4. *AEA video*: basic information, plus link to American Economic Association career video

5. *OSU video*: basic information, plus link to video testimonials by OSU Economics students and alumni.

The earnings information and video treatments align with recommendations to promote diversity in Economics (e.g., Bayer, Hoover, and Washington 2020). The AEA video is used

Messages were sent once, in Week 8 of the 10-week course, from the email account of the student's instructor. We assigned treatment at the individual student level, stratifying by course section and class year (freshman/sophomore/other). Within strata, we assigned treatments with equal probability.[4]

B. Data and methods

Our outcome of interest is an indicator of whether a student was an Economics major in Winter 2020, two to four terms after the experiment.[5] Analysis follows a pre-registered analysis plan (Pugatch and Schroeder 2019) and uses administrative data, from which there is no attrition. We estimate the ordinary least squares (OLS) regression:

$$y_{is} = \alpha_0 + \alpha_1 basicinfo_{is} + \alpha_2 earnings_{is} + \alpha_3 AEAvideo_{is} + \alpha_4 OSUvideo_{is} + \theta y_{0is} + \gamma_s + \varepsilon_{is} \quad (1)$$

where i indexes students; s indexes strata; y is an outcome of interest, such as majoring in Economics; $basicinfo, earnings, AEAvideo$ and $OSUvideo$ are indicators for belonging to these treatment groups; y_0 is the baseline outcome; γ is a strata dummy; and ε is an error term. Our coefficients of interest, α_1 through

[4] Since the same student may take both Principles courses in the same term, or repeat the same course in multiple terms, it is possible to be assigned to a treatment group more than once. We use student course enrollment as the unit of analysis, but results are robust when accounting for repeated observations from the same student.

[5] For the 48 students without data on major in Winter 2020, the outcome is an indicator for being an Economics major in the last term observed, provided this was at least one term later than when the student was in the experiment. Additional outcomes specified in the analysis plan appear in the working paper version (Pugatch and Schroeder 2020).

α_4, measure the difference in outcomes (intent-to-treat [ITT]) between each treatment arm and the control group. We estimate heteroscedasticity-robust standard errors.

II. Results

A. Majoring in Economics

Our sample includes 2,277 students who consented to participate in the study, or 85% of those enrolled. Among participants, 803 were female, or 35%. Most baseline characteristics were balanced across treatment arms, with results robust to controls for these characteristics. Most treated students opened the email, ranging from 60-80% across treatment arms and genders.

The results of estimating equation (1) appear in Table 1. In the full sample (Panel A), basic information increased the likelihood of majoring in Economics by 1.9 percentage points, significant at 5% (column 1). This effect was driven by male students, for whom the magnitude was 2.5 percentage points, also significant at 5% (column 2). The earnings information had a weakly significant effect of 1.5 percentage points (column 1). These magnitudes are similar to the control means. The positive effects represent a lasting change in revealed preference, since the outcome is measured by administrative data from the academic year following treatment.

None of the treatments had a significant effect on majoring in Economics for female students (column 3), and the point estimate for basic information is near zero.

Limiting the sample to students earning a B- or above yields a similar pattern, with magnitudes more than double those for the full sample (Panel B). When bundling all treatments into a single indicator (Panel C), we again observe significant increases for male students only. Tests for differential effects of the treatments on students from underrepresented minority groups produced null results.

Overall, we find that a simple nudge—a single email during a 10-week course—can

increase majoring in Economics by the following academic year. Effects are driven by male students, with no statistically significant effects for female students.

Table 1 – Major in Economics

Outcome	Major in Economics (binary)		
	all	male	female
	(1)	(2)	(3)
Panel A: full sample			
basic information	0.019**	0.025**	0.004
	(0.009)	(0.013)	(0.012)
earnings information	0.015*	0.013	0.012
	(0.009)	(0.011)	(0.017)
AEA video	0.011	0.011	0.005
	(0.008)	(0.010)	(0.013)
OSU video	0.005	0.010	-0.010
	(0.008)	(0.010)	(0.012)
N	2,238	1,448	790
Control mean	0.023	0.020	0.027
H0: all treatments=0	0.16	0.37	0.42
Panel B: B- or above			
basic information	0.044**	0.063***	0.011
	(0.018)	(0.023)	(0.031)
earnings information	0.033*	0.038*	0.022
	(0.018)	(0.020)	(0.038)
AEA video	0.026	0.030	0.006
	(0.017)	(0.020)	(0.033)
OSU video	0.010	0.028*	-0.032
	(0.015)	(0.017)	(0.028)
N	1,003	665	338
Control mean	0.037	0.030	0.052
H0: all treatments=0	0.08	0.05	0.26
Panel C: bundled treatment			
treatment	0.013*	0.015*	0.003
	(0.007)	(0.009)	(0.010)
N	2,238	1,448	790
Control mean	0.022	0.020	0.027

Notes: Table reports coefficients of regressions of dummy for majoring in Economics on treatment status. Sample is all students who consented to participate in study. Outcome is dummy for majoring in Economics, from administrative data in Winter 2020 or most recent available. All regressions include strata dummies and baseline outcome. Robust standard errors in parenthesis. H0: all treatments=0 reports p-value from F-test of joint hypothesis that coefficients on all treatments equal zero. *** Significant at the 1 percent level; ** Significant at the 5 percent level; * Significant at the 10 percent level.

B. Policy simulation

We simulate the predicted changes in the number of Economics majors and the male/female ratio if all Principles students were to receive the basic information message. Extrapolating the fraction of Economics majors in the control group to the entire study population would result in 29 male and 21 female Economics majors, a male/female ratio of 1.4. If we adjust the proportions according to the gender-specific point estimates for the "basic information" intervention, the male/female ratio rises to 2.7. This represents an increase of 96% over the control scenario, a stunning change. Repeating the exercise for the subsample of students earning a B- or better raises the projected male/female ratio to 4.4, an increase of 166% over the control scenario, reflecting the wide gender discrepancy in point estimates for these better-performing students (Table 1, Panel B). Even when using point estimates for the bundled treatment (Panel C), the male/female ratio rises to 2.1, or a 54% increase over the control scenario.

This exercise suffers from the well-known limitations of counterfactual exercises in partial equilibrium, and does not account for

further changes to the gender ratio that occur between the Principles courses and graduation. Our results nevertheless consistently suggest that a simple nudge can exacerbate the gender gap in the Economics major.

III. Conclusions

Why does our simple intervention increase Economics majors among male students, but not female? A higher level of engagement may be required to attract female students to Economics. Informational nudges, such as in our study and in Bayer, Bhanot, and Lozano (2019), can increase student interest in the field. But neither our intervention nor theirs increased revealed preference for Economics among the subsample of female students. By contrast, the interventions studied by Li (2018), which included mentoring of potential Economics students, and Porter and Serra (2019), in which female role models visited Economics courses, featured deeper engagement with students. These latter studies increased female interest in Economics. Our results suggest potential limits to informational nudges to promote interest in Economics among women and other groups underrepresented in the field. Simple nudges can have the unintended effect of exacerbating existing inequalities.

If more direct engagement with students from underrepresented groups is key, Economics Departments at large universities or with limited resources face a formidable challenge. One approach that scales relatively easily is changing the content of introductory courses (e.g., Bayer et al. 2020; Benjamin, Cohen, and Hamilton 2020; Bowles and Carlin 2020). Shifting course content may offer more promise than targeted messaging alone.

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