Additional Analysis for "Gender Differences in the Choice of Major: The Importance of Female Role Models"

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Female instructors can inspire high-school and undergraduate students to pursue a STEM career (Carrell et al., 2010; Paredes, 2014). In this document I will explore whether female professors served as a catalyst for the role models and further inspire students to major in economics. The idea is that students who were exposed to the role model visit and had a female teacher would have greater engagement with the economics major.

Do female professors enhance the effects of the external role models intervention?

To explore this question, I modified paper's equation (2) and added a triple interaction between a the professor's gender, the treated classes, and if the class was taught in 2016 for each student i:

$$\begin{aligned} Y_i &= \beta_0 + \beta_1 dt_i + \beta_2 dT_i + \beta_3 dFP_i + \beta_4 dt_i \times dT_i + \beta_5 dt_i \times dFP_i + \beta_6 dT_i \times dFP_i \\ &\quad + \beta_7 dt_i \times dT_i \times dFP_i + \delta X_i + \varepsilon_i \end{aligned} \tag{1}$$

Y_i is a student's engagement with the economics major, such as taking an economics class next fall or choosing the economics major. The variable dt_i is a dummy equal to one if the class was taught in 2016 and zero if it was taught in 2015, dT_i is a dummy equal to one if it a role model visited the class (treated class) and zero otherwise, dFP_i is a dummy equal to one of the professor was female and zero if it was male, X_i is a vector

of controls accounting for the accumulated GPA of the student, the grade obtained in the principle class, if the size of the class was small and other demographic characteristics of the student.

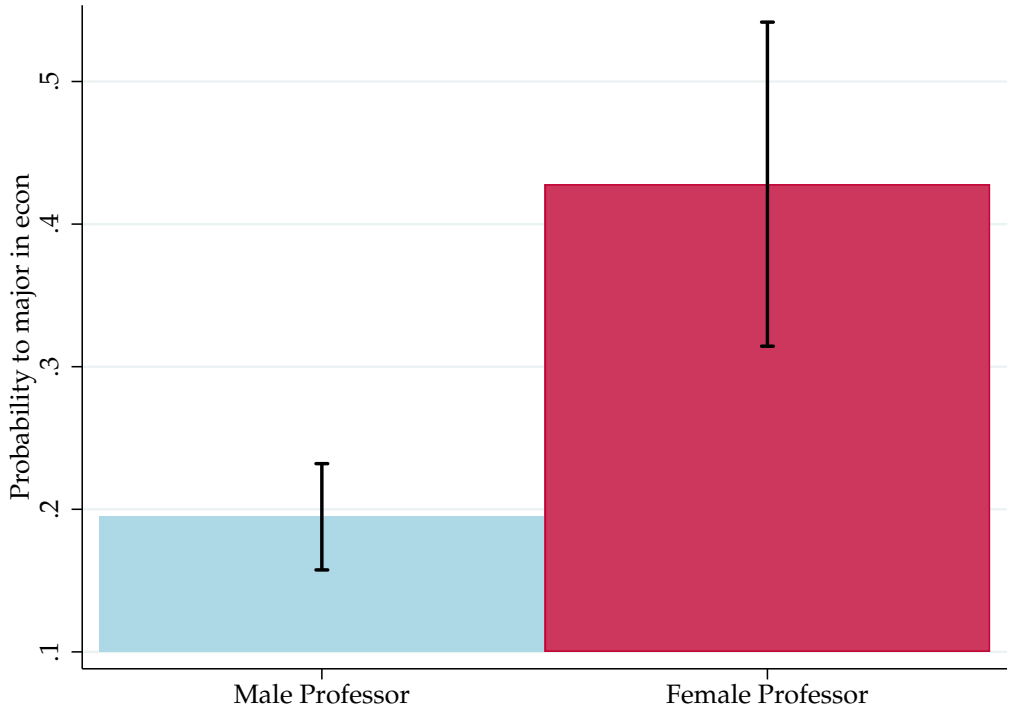
I am interested in the coefficient β_7 that can tell me whether there is a significant difference of the economics major engagement between students on treated classes in 2016 that had a female professor versus the treated classes in 2016 that had a male professor. Closely following the paper's method, I then estimated the linear model 1 for female and male students by OLS, clustered the standard errors by class and used wild bootstrapping to account for small clusters.

Now a small caveat Although the intervention was random, there is no guarantee that female professors are exogenous to the model, thus I cannot infer a causal mechanism using my specification. Nevertheless, consider my results as suggestive evidence.

Female students Table 1 shows the results of the model 1 for female students. Focusing on the coefficient of interest, female professors only enhanced female students' immediate interest in the economics mayors. In the first column female professors had a significant positive correlation with female students taking an economics class the next fall. The remaining columns report positive but insignificant coefficients.

Male students While male students were not inspired by the one visit of the female role models, they might have been inspired by the combination of female professors and female role models. Table 2 reports the model 1 estimation for male students. In contrast with the female students, female professors of treated classes might have a negative immediate effect on male students. Students who were exposed to role models and had a female teacher were less likely to take an economics class next fall compared to those treated male students that had a male professors, shown by the first column of table 2. This is consistent with the idea that effective role models tend to be the same gender as the student.

Figure 1: Treated male student's probability of choosing econ major by female professor



Note: the probability was estimated using a Probit model with specification 1. The black lines represent the 95% confidence intervals.

The second column in Table 2 shows how male students who were exposed to the role models and female professors were more likely to major in economics. This finding implies that male students can be inspired by female role models in the long run, but they cannot be exposed to a male role model in the classroom. Figure 1 quantifies the likelihood of majoring in economics for treated male students by their professors's gender by estimating equation 1 as a Probit model. Treated male students with a female professor are roughly 20% more likely to mayor in economic than treated male students with a male professor.

Are female professors better teachers? Male students could be inspired by female professors to pursue economics because female professors can be more caring or better teachers than their male counterparts. Table 3 attempts to tests this hypothesis by looking at what drives male student's grades in Principles classes. Female professors might nega-

tively influence the overall grade of the class, but the coefficient is imprecise due to the small sample size.

To isolate the correlation between grades and female professors I controlled for small classes, accumulated GPA up until the Principles class, and the students intended econ major. While high achieving students prior the Principles class had better grades in the class, class size and the student's intent to major in econ had no effect on their grades.

Closing Remarks There is some evidence supporting that female professors could have inspired some male students. Even though female professors are correlated with less treated male student taking an economics class in the next semester, female professors are associated with a higher number treated male students choosing the economics major. I think this finding suggests that female professors can inspire both male and female students, but the channel of the inspiration depends on the gender of the role model and the students.

References

Carrell, S., M. Page, and J. West (2010, aug). Sex and Science: How Professor Gender Perpetuates the Gender Gap. *Quarterly Journal of Economics 125*(3), 1101–1144.

Paredes, V. (2014, apr). A teacher like me or a student like me? Role model versus teacher bias effect. *Economics of Education Review 39*, 38–49.

Table 1: Female professor and treated effects on female student's outcomes

	Took class next fall	Major in economics	Number of econ classes	Took another econ class
Female Professor × Year 2016 × Treated class	0.118 (0.041) [0.005, 0.220]	0.099 (0.322) [-0.099, 0.253]	0.353 (0.633) [-1.757, 1.375]	0.023 (0.877) [-0.481, 0.281]
Female Professor × Year 2016	-0.020 (0.667) [-0.129, 0.142]	-0.059 (0.397) [-0.214, 0.224]	-0.256 (0.636) [-1.125, 2.052]	0.028 (0.705) [-0.126, 0.399]
Female Professor × Treated class	0.075 (0.384) [-0.079, 0.232]	0.051 (0.310) [-0.047, 0.204]	0.419 (0.368) [-0.572, 1.738]	0.082 (0.108) [-0.018, 0.256]
Treated class × Year 2016	0.029 (0.379) [-0.100, 0.180]	0.026 (0.593) [-0.117, 0.255]	0.323 (0.338) [-0.295, 2.332]	0.128 (0.029) [0.030, 0.480]
Female Professor	-0.008 (0.824) [-0.139, 0.044]	0.004 (0.908) [-0.173, 0.074]	-0.123 (0.736) [-1.338, 0.526]	-0.035 (0.417) [-0.186, 0.044]
Year 2016	-0.016 (0.620) [-0.144, 0.084]	0.011 (0.830) [-0.169, 0.133]	-0.012 (0.954) [-1.211, 0.652]	-0.078 (0.126) [-0.324, 0.046]
Treated class	-0.059 (0.073) [-0.226, 0.076]	-0.061 (0.067) [-0.203, 0.034]	-0.449 (0.118) [-1.944, 0.514]	-0.107 (0.026) [-0.279,-0.053]
Constant	0.009 (0.277) [-0.122, 0.351]	0.540 (0.004) [0.110, 1.028]	0.019 (0.001) [2.378, 9.292]	0.842 (0.006) [0.342, 1.354]
Controls	Yes	Yes	Yes	Yes
Observations	627	627	627	627

Note: the table reports the coefficients estimated by OLS using specification 1. Wild bootstrapping p-values are reported in parenthesis and confidence intervals in brackets.

Table 2: Female professor and treated effects on male student's outcomes

	Took class next fall	Major in economics	Number of econ classes	Took another econ class
Female Professor × Year 2016 × Treated class	-0.085 (0.036) [-0.174,-0.009]	0.194 (0.067) [-0.018, 0.387]	1.870 (0.176) [-0.704, 4.132]	0.170 (0.104) [-0.046, 0.347]
Female Professor × Year 2016	-0.044 (0.187) [-0.104, 0.041]	-0.083 (0.055) [-0.162, 0.009]	-1.151 (0.095) [-2.222, 0.250]	-0.113 (0.135) [-0.285, 0.052]
Female Professor × Treated class	0.095 (0.466) [-0.177, 0.383]	-0.216 (0.008) [-0.345,-0.075]	-1.724 (0.015) [-2.639,-0.449]	-0.107 (0.288) [-0.273, 0.123]
Treated class × Year 2016	0.040 (0.160) [-0.035, 0.234]	-0.155 (0.069) [-0.326, 0.010]	-1.518 (0.134) [-3.906, 0.427]	-0.156 (0.034) [-0.269,-0.031]
Female Professor	0.057 (0.640) [-0.163, 0.179]	0.141 (0.016) [0.040, 0.254]	1.197 (0.037) [0.079, 2.443]	0.128 (0.099) [-0.024, 0.234]
Year 2016	0.003 (0.896) [-0.225, 0.121]	0.081 (0.172) [-0.121, 0.365]	0.841 (0.051) [-0.004, 3.155]	0.047 (0.151) [-0.086, 0.235]
Treated class	-0.045 (0.656) [-0.525, 0.080]	0.213 (0.046) [0.012, 0.365]	1.836 (0.020) [0.419, 3.286]	0.169 (0.214) [-0.118, 0.358]
Constant	-0.022 (0.001) [0.282, 0.565]	0.737 (0.004) [0.329, 1.261]	-0.321 (0.001) [4.321,11.408]	0.857 (0.006) [0.492, 1.371]
Controls	Yes	Yes	Yes	Yes
Observations	770	770	770	770

Note: the table reports the coefficients estimated by OLS using specification 1. Wild bootstrapping p-values are reported in parenthesis and confidence intervals in brackets.

Table 3: Female professors's quality on male students

	Grade in econ principles
Female Professor	-0.175 (0.123) [-0.359, 0.087]
Small Class	0.142 (0.166) [-0.063, 0.363]
GPA	1.389 (0.000) [1.061, 1.577]
Intended econ major	0.047 (0.473) [-0.136, 0.174]
Constant	-1.531 (0.028) [-2.163,-0.249]
Observations	513

Note: the table reports the coefficients estimated by OLS using specification 1. Wild bootstrapping p-values are reported in parenthesis and confidence intervals in brackets.