Title*:* Is Economics Becoming Gender Neutral?

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Is Economics Becoming Gender Neutral?

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We examine choice of field and research output for male and female economics PhD students from eight top PhD programs from 1993-2002 and document several facts. First, unlike preceding decades, more recent years have not seen large increases in the number of female economists produced by these programs.[1] Second, the number of women graduating in theoretical fields (such as microeconomic theory and econometrics) has been roughly constant over this time period. Third, within fields, female students are much more likely to choose female advisers. However, looking across fields using school-year-level variation we find no evidence that female students' field choices are influenced by the availability of female faculty within those fields or by the fields which other women in their school-year cohort choose to enter. Finally, we find no evidence that having a female student-female adviser match has a positive effect on the future research productivity of female students.[2]

I. Data Description

Our main source of data is the UMI/Proquest Digital Dissertation online database, which includes self-reported bibliographic citations for doctoral dissertations. We use data from 1993 to 2002 (and part of 2003) for eight top US economics PhD programs: Harvard University, Massachusetts Institute of Technology (MIT), Princeton University, Stanford University, University of California-Berkeley, University of California-Los Angeles, University of Chicago, and University of Michigan. We extract, for each student in this sample, the year in which the PhD was completed, the subject area of the PhD, the student's primary adviser, and the student's PhD committee members. We assigned gender indicators to both students and faculty by hand, leaving those as missing wherever the gender assignment was ambiguous.[3]

Using EconLit, the American Economic Association (AEA)'s electronic bibliography of the economics literature, we collected a variable which represents the total number of entries listed in EconLit for each student in our data.

Based on a more complete set of EconLit data compiled by Marcel Fafchamps, Sanjeev B. Goyal, and Marco J. van der Leij (2006), we gathered data on the sub-fields within economics in which advisers in our data published, where subfields are defined by Journal of Economic Literature (JEL) codes. Specifically, we construct variables for the (up to) four subfields in which advisers published most frequently as recorded in EconLit from the years 1991-2002. We use as our subfield definition the first letter of the JEL code, which defines twenty subfields.[4]

We created a crosswalk between the student dissertation subject codes in the UMI/Proquest data and these JEL codes in order to have a common subfield definition across students and advisers. Some of our analyses aggregate these JEL codes for students and advisers into broad "theory" and "applied" categories, where "theory" includes (C) mathematical and quantitative methods and (D) microeconomics; and where "applied" includes (I) health, education, and welfare; (J) labor and demographics; (N) economic history; and (R) urban, rural, and regional economics. Unfortunately there are no UMI/Proquest dissertation subject codes for industrial-organization, public finance, or development, so these fields could not be included in our analysis. Note that some fields (such as macroeconomics) which did not fall cleanly into either "theory" or "applied" are not included in either of the theory or applied categories.

II. Summary statistics

Table 1 reports summary statistics on our variables of interest. Approximately 6.28% of all students had a female primary adviser, and 12.76% had any female adviser on their committee. When the student sample is cut by gender, 20.36% of female students had any

female adviser and 11.21% had a female primary adviser; for male students the analogous figures are 10.30% and 4.66%.

Figure 1 plots the total number of female economics PhDs produced per year by all schools in our sample, and shows that the trend has been relatively flat since 1998 at about 55 female students (of roughly 227 students total on average) per year. Figure 2 plots the number of women and men graduating in theoretical and applied fields (defined above) within economics and shows that these numbers have also been roughly constant over this time.

III. Results

We first examine (Table 2) whether, within fields, female students are more likely to choose female advisers. We report marginal effects from a probit regression using an indicator variable for whether the student had any female adviser as the left-hand-side variable. On the right-hand-side, we include year and school fixed effects and an indicator variable for the student's gender. Specification (2) adds field fixed effects. Even within a field, women are about 6 percentage points more like men to choose a female primary adviser, which makes them almost twice as likely as men to have a female primary adviser. We then ask whether those women who worked with a male primary adviser chose male advisers who advise other women. We estimate ordinary-least-squares regressions using as the dependent variable the percent of a student's primary advisers' students in that year who were female (excluding the own observation) - intended as a measure of the "female-friendliness" of an adviser. We limit the sample to students with male primary advisers. Our estimates do not provide evidence that women select "female friendly" male advisers within their field.

We next use school-year variation to test whether there is evidence consistent with female students' choice of fields being affected by the availability of female faculty within those

fields or by the field choices of other women in their school-year cohort. Table 3 presents these results for "theory" and "applied" fields, as defined above. Overall, we find no evidence that female students' field choices are affected either by female adviser presence or by peer effects from other women in their school-year cohort. For example, a 10 percent increase in the share of theory advisers who are women is associated with a statistically insignificant 1.67 percent decrease in the probability that a woman chooses theory as her field. Results were similar with several alternative field and cohort definitions (for example, cohort defined as a three-year window instead of as own year). Analogous regressions for male students (not shown) also find no evidence that male students' field choices are affected by male adviser presence or male peer effects.

Finally, we test whether a female student-female adviser match has positive effects on research output. We estimate an ordinary-least-squares regression (Table 4) using the number of entries listed for the student in EconLit as the left-hand-side variable. On the right-hand-side, we include year and school fixed effects, an indicator variable for the student's gender, an indicator variable for the student having any female adviser (or, separately, a female primary adviser), and an interaction of these last two variables. We find no evidence that having a female student-female adviser match has positive effects on research output; the effect we estimate for a female student having a female primary adviser is negative (-1.413 publications) but is neither economically nor statistically significant. It is possible that selection into student-adviser pairings could be masking a positive effect from same gender mentoring. However, this would require that less productive women be selecting into same gender pairs and then that a positive "same gender mentoring effect" offsets this negative selection. Results are similar to those

reported if we instrument for the adviser's gender with the fraction of advisers who are female among all available advisers in one's school-year cohort.

III. Conclusions

Overall, our results suggest that within a subfield of economics, women economics students do select female advisers. However we find no evidence that female students choose across fields based on the share female of advisers in those fields, nor based on the fields chosen by their peers. We are unable to examine whether these results reflect a lack of variation in the numbers of female students and female faculty in certain sub-fields, or whether the effects of any increases may be lagged.

One interpretation is that our results may indicate that there is unlikely to be a policy lever in which increasing the number of female advisers in male dominated fields will increase the number of female students entering those fields. On the other hand, one might interpret our results as showing that the lack of women advisers in a given subfield may not be a barrier to women entering those fields. We also examined whether female students who have female advisers are more productive (as measured by publications) and find no effect of same gender mentoring. We find that the number of women students at top economics programs is holding steady (at roughly a 24 percent share) which may indicate a lack of progress towards gender neutrality. But we also find indications that for the women students who are in these top programs, field choices and productivity are not influenced by the number of female advisers, and in that narrow sense it may be that economics is becoming gender neutral.

References

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Table 1: Sample Means

Variable	Mean	Std Dev	Min	Max
Female Student (0-1, 1=F)	0.2438	0.4295	0	1
Female & Theory Student (0-1, 1=F)	0.0253	0.1569	0	1
Female & Applied Student (0-1, 1=F)	0.0605	0.2385	0	1
Male & Theory Student (0-1, 1=F)	0.1463	0.3535	0	1
Male & Applied Student (0-1, 1=F)	0.1058	0.3076	0	1
Percent of Theory Advisers Who Are Female	0.0529	0.0762	0	1
Percent of Applied Advisers Who Are Female	0.1245	0.1184	0	0.5
Student Has Any Female Adviser (0-1, 1=F)	0.1276	0.3337	0	1
Student's Has Female Primary Adviser (0-1, 1=F)	0.0628	0.2427	0	1
Percent Of Primary Adviser's Advisees Who Are Female Students (Own Observation Excluded)	0.2399	0.2173	0	1
Female Student With A Female Primary Adviser (0-1, 1=F)	0.0277	0.1642	0	1
Female Student With Any Female Adviser (0-1, 1=F)	0.0496	0.2172	0	1
Number Of Entries In Econlit	7.9456	19.7020	0	421

Notes for Table 1. Sample is all students in our data (*N*=2297). "Theory" includes JEL codes (C) mathematical and quantitative methods and (D) microeconomics; "applied" includes (I) health, education, and welfare; (J) labor and demographics; (N) economic history; and (R) urban, rural, and regional economics. Fields such as macroeconomics which did not fall cleanly into either "theory" or "applied" are not included in either category.

Table 2: Do Women Choose Female Advisers and "Female Friendly" Advisers?

	Any Female Adviser (1)	Any Female Adviser (2)	% Advisees Female (3)	% Advisees Female (4)
Student is Female (0-1)	0.084	0.063	0.017	0.009
	(0.017)	(0.016)	(0.020)	(0.019)
Field Fixed Effects?	No	Yes	No	Yes
Number Of Observations	2297	2297	1800	1800

Notes for Table 2. Columns (1) and (2) are probit regressions; $\partial y/\partial x$ is shown with standard errors in parenthesis. Columns (3) and (4) are ordinary-least-squares regressions, with robust standard errors clustered at the school level shown in parentheses. Samples for (1) and (2) are all students in our data; for (3) and (4) the sample is limited to students with a male primary adviser who advised at least two students in that school-year cohort (own observation is excluded from the percent advisees female calculation). School and year fixed effects included in all regressions. MIT is the omitted school fixed effect and 1993 is the omitted year fixed effect.

Table 3: Are Women's Field Choices Influenced By Availability of Female Advisers or By Female Peers' Choices?

	Woman Chooses Theory (1)	Woman Chooses Theory (2)	Woman Chooses Applied (3)	Woman Chooses Applied (4)
Share Female Of Theory Advisers	-0.017			
	(0.169)			
Share Of Female Students Choosing Theory		-0.438		
		(0.121)		
Share Female Of Applied Advisers			0.175	
			(0.219)	
Share Of Female Students Choosing Applied				-0.191
				(0.112)
Number Of Observations	557	551	551	549

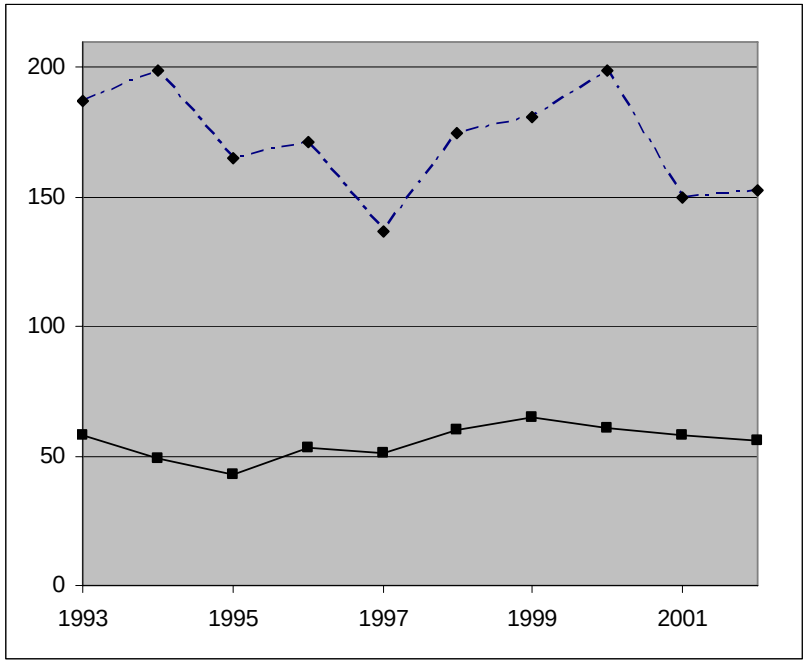
Notes for Table 3. All regressions are probit regressions; $\partial y/\partial x$ is shown with standard errors in parentheses. Sample is all female students in our data (560 students); smaller sample sizes reflect school-year cohorts in which there were no theory/applied faculty or peers in some years. School and year fixed effects included in all regressions. MIT is the omitted school fixed effect and 1993 is the omitted year fixed effect. Share female of advisers uses all faculty who served as an adviser in the student's school-year cohort. Share female students in a field uses women in the student's school-year cohort, excluding the own observation.

Table 4: Does Having a Female Adviser Enhance Research Productivity for Women?

	Number Of Econlit Entries	
	(1)	(2)
Female Student	-2.380	-2.465
	(0.382)	(0.349)
Student Has A Female Primary Adviser	0.345	
	(3.024)	
Female Student * Female Primary Adviser	-1.413	
	(2.884)	
Student Has Any Female Adviser		-0.345
		(1.854)
Female Student * Any Female Adviser		-0.514
		(1.948)
Number Of Observations	2164	2297

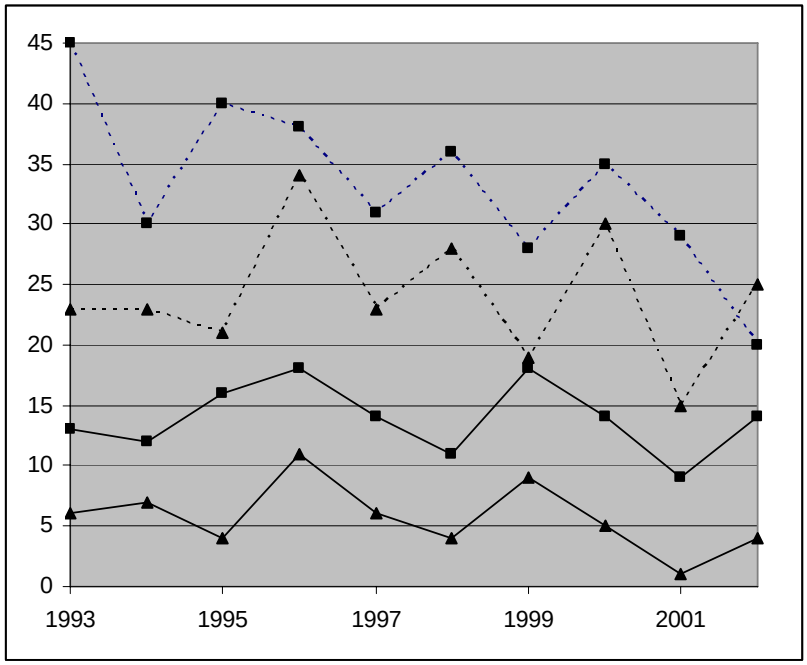
Notes for Table 4. Regressions are ordinary-least-squares estimates, with robust standard errors clustered at the school level shown in parentheses. Sample is all students in our data with data on primary advisers (for (1)) or any committee member (for (2)). School and year fixed effects included in all regressions. MIT is the omitted school fixed effect. 1993 is the omitted year fixed effect.

Figure 1. Number of male and female students (all schools), by year



Notes for Figure 1: Dotted: male; solid: female.

Figure 2. Number of students (by gender) in theory and applied fields (all schools), by year



Notes for Figure 2: Dotted-square: male theory; dotted-triangle: male applied; solid-square: female theory; solid-triangle: female applied

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[1] Both trends are consistent with surveys undertaken by the Committee on the Status of Women in the Economics Profession (CSWEP) as well as the work of Donna K. Ginther and Shulamit Kahn (2004). On "flat" trends in top institutions (similar to our sample) over our time period, see CSWEP (2003). On increasing trends over the 1970s and 1980s in a broader set of institutions, see CSWEP (1997).

[2] This is consistent with the previous literature, most notably David B. Neumark and Rosella M. Gardecki (1998).

[3] We were unable to confidently assign gender to twenty-seven students in our data, while were able to confidently assign gender to all advisers in our data. In our analysis, we drop these twenty-seven students from our data and also drop eighty-eight students who did not have any subject codes listed in the UMI/Proquest data.

[4] Specifically, these subfields are: (A) general economics and teaching; (B) schools of economic thought and methodology; (C) mathematical and quantitative methods; (D) microeconomics; (E) macroeconomics and monetary economics; (F) international economics; (G) financial economics; (H) public economics; (I) health, education, and welfare; (J) labor and demographic economics; (K) law and economics; (L) industrial organization; (M) business administration and business economics; marketing; accounting; (N) economic history; (O) economic development, technological change, and growth; (P) economic systems; (Q) agricultural and natural resource economics; environmental and ecological economics; (R) urban, rural, and regional economics; (Y) miscellaneous categories; and (Z) other special topics.