Why are Women Such Reluctant Economists?
Evidence From Liberal Arts Colleges

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Female undergraduates are less likely to take an introductory economics class, to continue in economics after completing the first introductory course, and to major in economics than are male undergraduates. Although these gender differences are well documented, the reasons why females are such reluctant economists are less well understood. Some have suggested that the mainstream economics curriculum excludes topics and methodology of interest to women, while others have focused on a classroom environment that is unfriendly to women. Other suspected reasons for the gender gap in economics classes are poorer math preparation of female students, poorer relative performance in economics classes, and less overall interest in the topic due to different career aspirations.   Finally, the pedagogy and types of evaluative instruments traditionally used in economics classes may favor male learning styles, contributing to the large percentage of disinterested women.[1]

Using a large multi-school sample, we investigate how students' characteristics and attitudes interact with the instructor's pedagogy and certain departmental and college level characteristics to influence students' decisions to continue in economics beyond the first semester. We find that, while attitudes formed prior to taking introductory economics affect students' decisions, experiences in the class also matter: those who receive higher grades in economics relative to their other classes, who are confident in their ability to understand economics, and who believe economics considers the ideas and issues in which they are interested are more likely to continue to study economics. To gain more insight into these relatively straightforward conclusions, we utilize our rich data set to examine what student and instructor characteristics

influence the students' relative grades, their confidence, and their perception of relevance. Although we find many factors that an introductory economics teacher cannot influence directly (e.g., high school math preparation or GPA), we are able to make some specific recommendations about factors that introductory teachers can affect.

I. Data

Our sample consists of 1,776 first-years, sophomores, and juniors taking their first economics class in one of 93 different sections taught by 67 different instructors at 34 co-ed liberal arts colleges during the Spring of 1999. Our data set includes information about student characteristics as well as instructor attributes and teaching methods. To collect the data, we started with the top 25 liberal arts colleges as ranked in *U.S. News and World Report*. We added peer institutions used by our college, Hamilton College, in assessing competitiveness of academic salaries, giving us 36 colleges on our initial contact list. Given the effort involved in completing the surveys, our response rate was quite good: We received responses from 72% of the introductory sections offered in the Spring semester at 34 colleges, and at 19 colleges we had full participation. Students completed surveys in class during the second half of the semester, a relevant time to elicit student opinion because of its proximity to pre-registration for the next semester. Instructors who did not participate in our survey were unanimous about the reason: they did not want to relinquish class time. Instructors who are more interested in the issue of female enrollments in economics were probably more likely to participate in our survey; however, because we are primarily interested in examining student behavior rather than teachers' decisions, this aspect of our sample selection technique should not affect our main results.[2]

II. Results

We estimate the probability of a student falling into one of four groups: students who intend to major in economics, students who intend to take more economics classes, discouraged students, and encouraged students. Students whose interest in taking another economics class decreased during the semester are classified as discouraged; encouraged students displayed an increased interest in continuing in economics.[3] We use a variety of measures of student and instructor characteristics as the explanatory variables in these probit estimations, controlling for classroom and college environment variables, teaching techniques, students' attitudes prior to taking the class, and their performance and opinions that may have been formed during the semester.

Although we do not report a full set of results here, our major findings can be summarized as follows: Students' grades in economics relative to their GPAs, their confidence in their ability to understand economics, their perception that economics is relevant, their predisposition to major in economics, and their perception that economics is important to their career are all determinants of their interest in studying economics further.[4] Except for the perceived importance of economics to a student's future career, all of these factors are positively correlated with being male. However, the only direct gender effect we find is that male students are less likely to become encouraged during the semester. Some evidence suggests that the gender of the instructor influences students, with students more likely to become encouraged when the gender of the instructor matches their own.

While our initial estimations allow some interesting conclusions, what we did not find is equally interesting. Specifically, many variables included to measure teaching methods or classroom environment did not enter our estimations in a consistent and statistically significant

way. Concluding that these teaching techniques or environmental factors do not influence students' decisions would, however, be premature: Teaching techniques and classroom environment may have an indirect effect on students' decisions by affecting the other factors in our estimation. We examine this possibility with the estimations reported in Tables 1A and 1B. Here, we attempt to predict students' confidence, their perception of relevance, and their relative grade, again using instructor, class, and student characteristics.[5]

[Tables 1A and 1B about here]

Although each of these three variables is positively correlated with being male, adding other explanatory variables reduces the gender effects to statistically insignificant levels. Focusing first on the results for confidence, we see that math ability, overall self-confidence (measured by the fear of freezing up on exams), and higher expected grades generate students who are more confident in their ability to understand economics.[6] Interestingly, the expected grade matters more to female students, perhaps because female students rely more on external feedback to judge their performance.

More experienced teachers (up to a point) have more confident students. Teachers who grade on a curve and who spend more time in group problem solving exercises, particularly when a large percentage of the class is female, also have more confident students. These activities may give students more information about their true standing in the class. Teachers who believe discussing current events in class is particularly important have less confident students, possibly because this type of application may be more difficult for students to understand than typical textbook examples. Spending 30 or more minutes of class time on topics traditionally considered to be of special interest to women increased the confidence of both sexes. When male instructors

cover these topics, however, the increase in confidence is reduced considerably.

The second estimation in Table 1A shows that math ability is also positively related to a student's perception of relevance, possibly because students struggling to understand graphs may be unable to make connections between economic theory and the real world. Similarly, students in the upper classes and those with higher expected grades find economics more relevant. Student attitudes prior to taking the class affect their perception of relevance: those with stronger interests in finance or public policy, with a stronger desire to understand current events, and with a belief that economics will help them in their career tend to find economics more relevant. Students who think economics will help them do their job and those who think it will help them get into graduate school report that economics covers the issues and ideas in which they are interested. As in the confidence regressions, instructor gender does not enter significantly, but more experienced teachers have students who rate economics more relevant. Devoting more time to discussion increases students' perception of relevance, but that effect is not gender specific. The net effect of all the coefficients involving group problem solving is that devoting class time to group problem solving is associated with females rating economics as more relevant when the percentage of females in the class is relatively high (about 48% or higher). With fewer females in the class, group problem solving activities decrease the relevance of economics for female students. For male students, exactly the opposite is true: when the percentage of females in the class is relatively low (less than about 42%), more group problem solving increases male students' perception of the relevance of economics.

Table 1B shows determinants of a student's relative grade. Again, math ability is important in this estimation, as is students' predisposition to major in economics. Students who

think economics will help them get a job do relatively better in economics, possibly because they are concerned about how their transcript will look to a potential employer. Students at colleges in which calculus is required for the major do less well in economics classes, suggesting that the introductory classes in these departments may be more rigorous. Doing a warm-up activity at the beginning of the semester helps students' relative grades (perhaps because it facilitates students' abilities to help each other outside of class); this effect is particularly strong for females. Counting participation or exams as a larger share of the grade is associated with lower relative grades. While the coefficient on the interaction of exams and student gender is not statistically significant at the 10% level, its p-value of 11% hints that having a larger share of the grade determined by exams may particularly disadvantage female students.

III. Conclusion

Both student characteristics and attitudes that exist prior to setting foot inside an economics class and those that are formed during the class are important determinants of the decision to continue to study economics. We find that some factors affect male and female students equally; others have different effects on men and women. Teachers who allocate more time to discussion and more time to topics that are traditionally considered to be of interest to women will encourage students of both sexes. Evaluating students in ways other than exams and doing a warm-up activity at the beginning of the semester will also help students of both sexes, but may be particularly beneficial for female students. Finally, incorporating more group problem solving into a class may harm or help students, depending on the gender composition of the class.

IV. References

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Table 1A

Independent Variable	Confidence	Independent Variable	Relevance
Male	.997 (.981)	Male	.281 (.671)
Math SAT/class average	.447** (.239)	Discomfort with graphs	-.113* (.030)
Freeze-up on exams	-.114* (.018)	Class	.111* (.033)
Expected grade/class average	9.53* (.541)	Importance of economics to career	.054* (.021)
(Expected grade /class average)*male	-2.74* (.748)	Think economics will help do job	.238* (.027)
GPA	-.024* (.008)	Interest in finance	.090* (.024)
GPA*Male	.025* (.012)	Expected grade	.026* (.006)
More than 30 minutes spent on female topics	.628* (.139)	Interest in public policy	.134* (.022)
More than 30 minutes spent on female topics*instructor gender	-.571* (.143)	Think economics will help get into grad school	.054* (.026)
Grade on curve	.128* (.061)	Interest in current events	.145* (.024)
Percent of time devoted to group problem solving *percent female in class	.072** (.041)	Percent of time devoted to group problem solving *percent female in class	.073** (.039)
Instructor Opinion: Importance of current events discussion	-.059* (.027)	Percent of time devoted to group problem solving *percent female in class*male	-.173* (.060)
Teaching experience	.026* (.012)	Percent of time devoted to group problem solving	-.035* (.019)
Teaching experience^2	-.001* (.000)	Percent of time devoted to group problem solving*male	.077* (.028)
		Percent of time in discussion	.005* (.002)
		Teaching experience	.019* (.009)
		Teaching experience^2	-.0004* (.0002)

Table 1B

Independent Variable	Relative Grade
Male student	-.011
	(.021)
Discomfort with graphs	-.025*
	(.001)
Considering economics as a possible major	.006*
	(.001)
Thinks economics will help get job	.005*
	(.001)
Class	.011*
	(.002)
Calculus required for major	-.010*
	(.003)
Warm-up activity	.020*
	(.005)
Participation: percent of grade	-.0009**
	(.0005)
Warm-up activity*male	-.011**
	(.006)
Exams: percent of grade	-.0039*
	(.00017)
Exams: percent of grade*male	.00037
	(.00023)

*significant at 5% level, **significant at 10% level. Standard errors are in parentheses. See footnote 5 for a list of variables included in the estimations but not reported here. Variables not reported in Table 1A or 1B had p-values greater than 10%.

ENDNOTES

1.See, for example, Robin L. Bartlett (1996), Karen E. Dynan and Cecilia Elena Rouse (1997),
Susan Feiner and Bruce Roberts (1995), Marianne A. Ferber (1995), Roberta M. Hall and Bernice
R. Sandler (1982), and Keith Lumsden and Alex Scott (1986) for a discussion of these issues.

2.See Elizabeth J. Jensen and Ann L. Owen (1999) for a more detailed description of the data and
a more thorough presentation of the results discussed here.

3.Students who did not intend to take another economics class when they signed up for the first
one are not considered in the discouraged estimations. Likewise, students who intended to take
another economics class when they signed up are not considered in the encouraged estimations.
We do not consider juniors in the economics major probit.

4.Students rated (on a scale of 1 to 5) how strongly they agreed with the statements "I understand
the material in this class as well as everybody else" and "Economics discusses the topics and
issues in which I am interested."   The response to the first question was our confidence variable
and the second response was our relevance variable.

5.Each of the estimations included several additional control variables whose coefficients were not
statistically significant and are not reported in Table 1. All three estimations included instructor
gender, percentage of female students in the class, instructor gender*student gender, percentage
females*student gender, and the female topics*student gender. In addition, the confidence
regression included: warmup activity dummy, percent of grade attributed to participation

10

(interacted with student gender), the class year of the student, percent of class time devoted to group problem solving (interacted with student gender), and percent of class time devoted to group problem solving*percentage of females in class*student gender. The relevant regression also included: dummy variable for type of class (macroeconomics or microeconomics or combined), female topics dummy, students' perception of how important economics was to getting their jobs, GPA, and expected grade*student gender. The relative grade equation also included: percentage of time spent lecturing and group problem solving (interacted with student gender also), percent of course grade determined by participation*student gender, female topic dummy, and instructor's teaching experience.

6.We measure math ability in two ways. Discomfort with graphs is measured using a question developed by Dynan and Rouse (1997). In the confidence regression, we use the SAT score of the student relative to everybody else in the class because the confidence of students is expressed in terms of their ability to understand in relation to everybody else in the class.