

What Can UWE Do for Economics?[†]

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Women do not major in economics to the same degree as men. In fact, the fraction of economics majors who are female is lower than in chemistry, mathematics, and statistics. In fields that are even more male-dominated than economics, such as engineering, the fraction of majors who are female has increased in the past decades. But the fraction in economics has not budged in the last 25 years or more. The Undergraduate Women in Economics (UWE) project seeks to uncover why women do not major in economics to the same degree as men and what can be done to change that.

I. Economics Majors by Gender

Nationwide today, there are almost three males for every female economics major, expressed relative to their numbers as degree recipients (generally BA but also BS). We term that statistic the “conversion rate,” which is deflated or scaled by the number of degree recipients since women outnumber men as undergraduates. The average from 2011–2015 was 2.9 among all institutions, 2.3 among the 100 top-ranked universities (public and private), and 2.6 for the 100 top-ranked liberal arts colleges.¹

As can be seen in Figure 1, which gives the conversion rates from 1986 to 2015 in five-year intervals, there were relatively more female

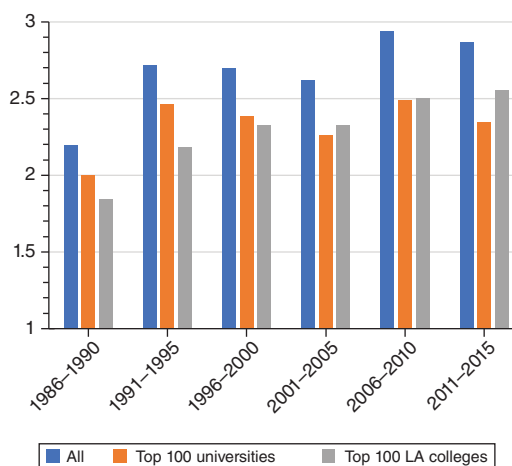


FIGURE 1. MALE/FEMALE ECONOMICS MAJORS IN US PUBLIC AND PRIVATE COLLEGES AND UNIVERSITIES, 1986 TO 2015

Notes: Majors are given at graduation. Figures are aggregated to five-year averages beginning with 1986–1990 and ending with 2011–2015. Schools are included only if they granted an undergraduate degree in economics. (Male/Female) Economics Majors is given by a conversion rate = $[(\text{Male Economics BAs}/\text{All Male BAs})/(\text{Female Economics BAs}/\text{All Female BAs})]$, where BA includes all undergraduate bachelor's degrees. See text for source of “Top 100”; “Universities” includes public and private; “LA” = Liberal Arts.

Source: US Department of Education, NCES, IPEDS.

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¹Data are from the US Department of Education, NCES, IPEDS. Schools are included only if they grant a bachelor's degree in economics and are coeducational. The top group of 100 is from *US News and World Report* at the time the UWE project was begun.

economics majors in the late 1980s than today across all types of institutions. But by around 1990, conversion rates reached levels about equal to what they are today by type of institution. We should note that economics is a popular major nationwide, although the related major of business is far more popular.

When we began designing our project, we obtained administrative data from an institution we call “Adams College.” When we obtained the data in 2013, the conversion rate for Adams was 1.8 and the fraction female among economics majors was 0.35, not much different from those at its peer institutions.

Incoming freshmen at Adams are asked what their major will likely be. Twice as many males than females at Adams put economics as their most probable major. We have discovered similar results for its peer institutions. The die is cast, it would appear, even before students unpack their bags. The first lesson from the Adams data is that useful treatments must occur soon after students arrive on campus.

Another lesson is that women are more grade sensitive when deciding whether to major in economics. A female who obtains a B+ in principles has a 27 percent chance of majoring in economics, but a male who receives a B+ has a 41 percent chance. A female who gets an A has a 42 percent likelihood of majoring in the subject and that is about the same as that for a male. Males major in economics almost independent of their grade in principles. These relationships also hold among students who gave economics as their intended major. The important point is that interventions that encourage students who get a B+ or a B in principles should have a greater impact on females than males.

What about the role of math ability? The raw difference between males and females in declaring economics upon acceptance at Adams is 0.187. Including the scores on the SAT math and the Adams math placement tests reduces the difference by just 1 percentage point to 0.177. Math ability does not have much to do with the initial preference for economics and with the eventual choice of economics as a major.

II. Origins of UWE

The observations from the IPEDS data sparked Claudia Goldin, when she was president of the AEA, to think about how to get more women to major in economics.² Economics as a field had become complacent. The major was popular among male students, who had once greatly outnumbered females as undergraduates. But that was no longer the case and economics was losing out. The discipline was concerned that there were too few female economics students at the graduate level and realized that only by increasing the undergraduate pipeline could those numbers increase.

²See Bayer and Rouse (2016) on the beneficial impact of greater diversity on the field of economics.

In addition to wanting more majors to increase enrollments, some also realized that female undergraduates, as students and as members of society, were losing out by overlooking economics.

Goldin submitted a proposal to the Alfred P. Sloan Foundation to support an RCT now called *The Undergraduate Women in Economics (UWE) Challenge*. The project was funded by Sloan in Summer 2014 and Tatyana Avilova was hired as the project manager. An advisory group met in November 2014.

In January 2015, emails were sent to all departmental and/or undergraduate chairs at colleges and universities (separate campuses) that granted an economics BA to at least 15 graduates per year, as given in the IPEDS data. There were only 344 of these institutions in the United States. Each email recipient was asked whether the person agreed, in principle, to implement a set of interventions to increase the number of female majors. They were told that their institution would receive \$12,500 (in increments after meeting stated goals) for their efforts and that the funds could be used in any way that would further the stated objective.

We received enthusiastic replies from 167 schools, almost half of the 344 institutions we initially contacted, demonstrating a strong latent demand for action.³ Due to the large number of positive responses, we increased the cutoff number of BAs in economics from 15 to 30 per year. We wanted to ensure that the economics program at each institution was large enough to pick up changes in majors induced by the interventions rather than from fluctuations due to small cohort size.⁴

We narrowed the group to 88 schools, which we have termed the “treatable” sample. We then stratified the 88 treatable schools into four selectivity groups and randomly picked five schools from each group of 22.⁵ All 20 randomly picked

³We later determined that some interested faculty never received the email since it was sent to presumed department chairs.

⁴The cutoff of 30 majors left 118 schools. Next, we eliminated all schools that were not in the “top 100 universities” or the “top 100 colleges” according to *US News and World Report (USN&WR)*. We also eliminated some PhD-granting institutions with fewer than three PhDs in the 2008–2012 period. This left a “treatable” sample of 88 schools.

⁵We combined the *USN&WR* rankings for top universities and top colleges, and ranked all 88 institutions from

“treatment” schools agreed to take part in the trial; 36 of the non-treatment schools agreed to be “controls.”⁶ Both treatments and controls agreed to submit data through our online tool.

III. Randomized Control Trial

A. Treatment and Control Institutions

The idea behind the RCT is that the UWE program would incentivize schools to initiate treatments that would disproportionately increase the number of female majors, possibly without decreasing the number of male economics majors. The idea was to treat incoming freshmen who would likely graduate four years later. But some students do not graduate in four years and some sophomores might get treated with the freshmen.

The treatment institutions were encouraged, although not obligated, to continue the interventions going forward, but funding is provided only in the designated treatment year. In addition to proposing and implementing interventions to target undergraduate students, treatment schools were instructed to report data, beyond what can be obtained through the IPEDS database. The additional data include contemporaneous enrollments by sex in the economics principles and intermediate courses, the number of transfer students in the courses, and the numbers of double majors. We asked for the number of economics graduates, which is also available through the IPEDS.⁷

Our 20 treatment schools are a highly-varied group. Some are large state universities, a few are flagship institutions; some are small liberal arts colleges and several are Ivy League

institutions. Some have business schools with undergraduate majors (business programs appear to syphon off females from economics more than they do males). Several allow double or even triple majors.

In terms of the variables of interest, the institutions range widely by the fraction female among their recent economics majors and by the fraction of their undergraduates who major in economics. The range for the fraction female (per BA) was considerable at the start of the RCT. At the high end were Berkeley (0.39), Brown (0.38), Princeton (0.36), and Washington and Lee (0.36). At the lower end were Illinois State (0.14), the University of Connecticut (0.16), SMU, Central Florida, and Colorado State (all at 0.19).

B. Range of Treatments

In May 2015, the treatment schools met to discuss the interventions each thought would be useful to employ. We had acknowledged early on that any treatment would not fit all schools and that a limited set of treatments would not adequately address the problem. Instead, we assembled a list of potential treatments in three (somewhat overlapping) areas and required the schools to use several:

Better Information.—These interventions are to provide more accurate information about the application of economics and the career paths open to economics majors. Interventions include informational sessions at the start of the academic year, having diverse speakers at events, and ensuring the presence of at least one female adviser in the department and at advising events.

Mentoring and Role Models.—The intent is to create networks among students and to show support for their decision to major in the field. Potential interventions include mentoring freshmen and sophomores by upper-class students (including some women), providing more guidance to students in finding summer jobs and RA-ships in economics, organizing faculty-student lunches, and producing videos about the department and its students.⁸

⁸See Carrell, Page, and West (2010) for convincing evidence that female instructors in STEM fields increase the grades of females and their likelihood of majoring in STEM more than male instructors do.

highest to lowest. Schools with the same ranking (e.g., #1 university and #1 college) were ordered based on the average SAT score. The ranked list was then divided into four groups of 22, with a number 1 through 22 assigned based on their relative *USN&WR* rank. Ten (10) random numbers were drawn from one to 22 using an online random number generator. Schools with the first five numbers were assigned to the treatment group and schools with the second five numbers were assigned to a wait list. The rest of the schools were assigned to the control group. We did not need to contact any schools on the wait list.

⁶The control group can consist of all 68 schools from the treatable sample that were not randomly selected into the treatment group since data will be available through the IPEDS.

⁷The IPEDS also asks race and ethnicity of majors.

Instructional Content and Presentation Style.—This category is meant to improve introductory economics courses and to make them more relevant to a wider range of students. Examples include using more evidence-based material in gateway courses, and incorporating projects, such as those in the local community, into beginning and upper-level courses to allow students to apply knowledge to current issues.

C. Preliminary Results

We will not be able to fully evaluate the UWE *Challenge* interventions for several years. In some institutions, students do not declare a major until they graduate and students can change majors along the way. Therefore, we must wait until the students in the treatment year graduate to assess if more women majored in economics because of the initiatives.

There are a few reasons why the UWE intervention might have had an impact even if we cannot measure it. There is considerable variation in majors from year to year and we have a small sample. Our power calculation indicates that we should be able to detect a change in the fraction of female BAs who are economics majors of 0.0072 between our control and treatment groups. But because the mean (unweighted by treatment school) is about 0.04, that is a fairly large change.

There is also leakage in various ways. Some of the “treated” students were sophomores and upperclassmen at the time of treatment and will graduate before the treatment class does. In addition, we might not be able to account for some of the transfer students, none of whom would have been treated. Finally, some of the control schools after learning about the UWE *Challenge* instituted interventions of their own to increase the number of female majors.

We are fortunate that several of our treatment schools executed their own RCTs for which they obtained IRB approval at their institution. These provide results in advance of our own and are cleaner due to an absence of the complications mentioned. The two schools for which we have results—Colorado State University and SMU—were among those with the lowest fraction female

majoring in economics among recent graduating classes.⁹

Colorado State University, under the direction of Professor Hsueh-Hsiang (Cher) Li (2017), ran an RCT in Spring 2016. Three treatments were included in the principles course that mirrored those UWE suggested: (i) students in the treatment arm were shown a video during a section about careers in economics and given information on the earnings of economists; (ii) female students in the treatment arm received information on the grade distribution at mid-term and those at and above the median were sent letters praising their work and encouraging them to major in the field; and (iii) female students in the treatment arm, regardless of their grades, were encouraged to partake in peer mentoring activities.

Students were asked at the start and end of the semester whether they planned to major in economics. The aggregate impact of all three treatments was substantial (increasing stated majors of women by more than 50 percent from baseline levels of 0.13, conditional on taking principles), particularly given the small cost. Although each intervention had some impact, treatment (ii), which encouraged female students who had a grade above the median to major in the field, had the greatest effect.

At SMU, Professors Catherine Porter and Danila Serra (2017) ran a field experiment in which they randomized which principles sections would engage in a role model intervention. At the end of the semester students in the course are routinely surveyed about their probable majors. Administrative data provided information on whether students later registered for the intermediate course. The same course, with the same instructors, was offered the year preceding the experiment, giving the authors the ability to do an instructor fixed-effects model as well.

The intervention was a 15 minute statement by one of two female graduates of SMU economics on the importance of economics to their careers. The interventions increased the fraction of women taking the intermediate course within a year by 8 percentage points on a base of about 13 percent (using the raw data) and increased the

⁹UC Santa Barbara also did an RCT, but their results will not be available for another half year. Their field experiment was to send congratulatory and encouraging messages to students in the principles course who did reasonably well.

fraction giving economics as a probable major by about the same. These are extremely large effects. There was no impact on the males in the class. As in other studies (e.g., Carrell, Page, and West 2010), much of the effect came from female students with high GPAs. Furthermore, the women who shifted fields disproportionately came from the humanities and languages rather than from other STEM fields. The authors find, consistent with the results from “Adams College,” that grades in the principles course have no influence on the decision to continue with the subject for males but are strongly related to continuation for females.

IV. What UWE Has Done for Economics

We do not yet know whether the interventions adopted by the UWE treatment schools will have an impact on the number of female undergraduates who major in economics. Because the within-school RCTs had substantial effects, it appears that small interventions could have big paybacks for all.

The interventions that most of our treatment schools have used were simple and inexpensive. But they required the time and initiative of

hard-working undergraduate instructional staff and faculty. Unless the chair of the department or, better yet, the dean or the provost provides incentives, there may not be enough motivation for teaching personnel to add to their duties. The Undergraduate Women in Economics program, together with the Alfred P. Sloan Foundation, provided incentives by giving funds, recognition, and collective support and encouragement.

REFERENCES

- Bayer, Amanda, and Cecilia E. Rouse.** 2016. “Diversity in the Economics Profession: A New Attack on an Old Problem.” *Journal of Economic Perspectives* 30 (4): 221–42.
- Carrell, Scott E., Marianne E. Page, and James E. West.** 2010. “Sex and Science: How Professor Gender Perpetuates the Gender Gap.” *Quarterly Journal of Economics* 125 (3): 1101–44.
- Li, Hsueh-Hsiang.** 2017. “Does Better Information Reduce the Gender Gap in Economics Majors?” Unpublished.
- Porter, Catherine, and Danila Serra.** 2017. “Gender Differences in the Choice of Major: The Importance of Female Role Models.” Unpublished.