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Online Appendix to:

“Seeking the “Missing Women” of Economics with
the “*Undergraduate Women in Economics Challenge*”

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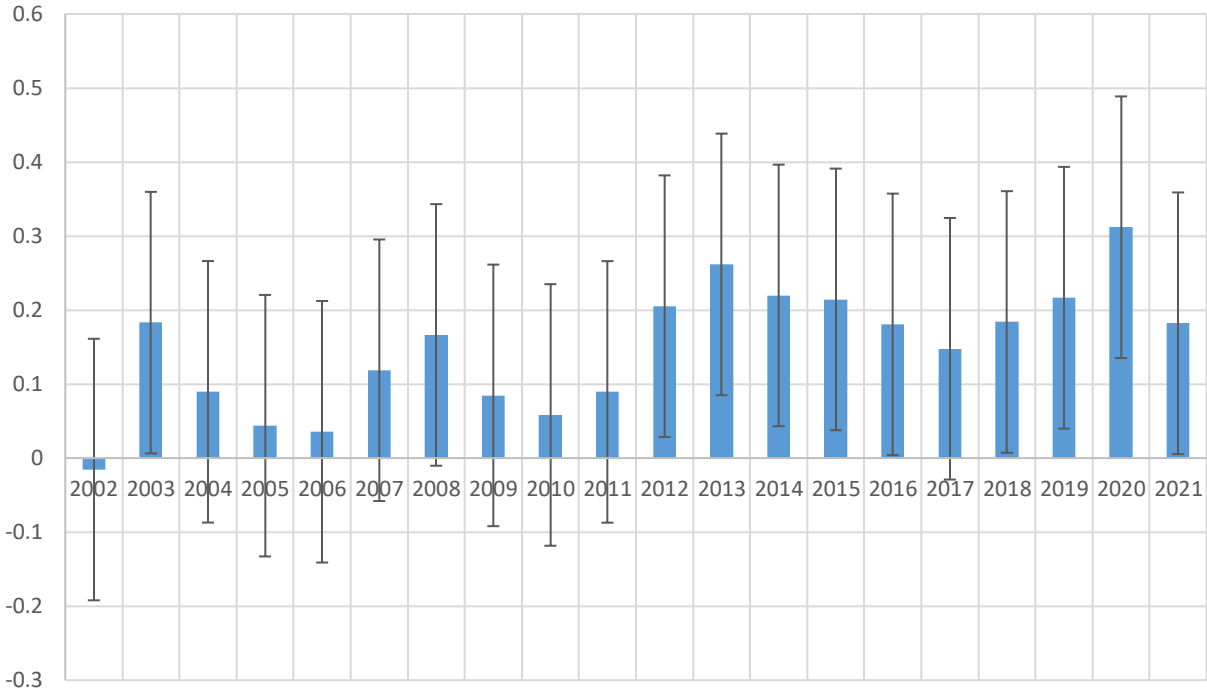
Appendix 1: Student conferences organized by, or inspired by, UWE activities.

Conferences provide an opportunity for attendees to learn about careers in economics, to share their research, and to network with professional economists and other students. The *UWE Challenge* has led to the implementation of several student-centered conferences.

1. The *Undergraduate Women in Economics Conference* was run for three years (in-person in 2016, 2017, and 2019) to provide an opportunity for faculty and students from the UWE treatment institutions to discuss strategies for improving diversity in economics and to network. Students were also able to attend career and other information panels. Conference attendees listed below (hosts in bold). Of the 20 treatment schools only Princeton, UC Santa Barbara, and U of Central FL did not take part in any of the three conferences.
 - 2016: Brown, CSU, CT College, UC Berkeley, UConn, UIUC, U of Richmond, UW-Madison, **UVA**, Washington & Lee, Williams, and Yale.
 - 2017: Brown, **CSU**, CT College, CU Boulder, IL State U, St. Olaf, UConn, UC Berkeley, U of Hawaii, UIUC, U of Richmond, and UVA.
 - 2018: Brown, CSU, IL State U, SMU, UC Berkeley, UConn, **UIUC**.
2. *Promoting Inclusion in Economic Research* (PIER), formerly *Women in Economic Research* (WiER), was created as part of the *UWE Challenge* in April 2017. It is organized by Williams College (a treatment school) in the style of a research workshop. It provides a forum for 24 advanced undergraduate students to present their research to a group of peers and faculty, to receive feedback on their work, and “to engage in networking and mentoring activities.” The conference ran in-person in 2017-2019, online in 2021, and in a hybrid format in 2022 and 2023. This conference is ongoing (next event is scheduled for April 2024).
3. *Diverse Economics Conference* (*DivEc*), co-hosted by the Federal Reserve Bank of Richmond, the Robins School of Business at the University of Richmond (a treatment school), Virginia Commonwealth University (as of 2022), and the UWE, started as a successor to the *UWE Conferences*, focusing on student-oriented events. The conference ran in-person in 2019, online in 2020-2021, and in a hybrid format in 2022 and 2023, either as a one-day event or a series of talks over several evenings. Events have included a keynote speech by a prominent academic economist, separate career panels with senior professionals and young career economists, and an information session on research assistant and other careers opportunities at the Federal Reserve System. This conference is ongoing (next event is scheduled for October 2024).
4. *National Conference on Women in Economics* was hosted by University of Wisconsin-Madison (a treatment school) online in 2021. The event was similar in style to the

UWE and *DivEc* conferences and included sessions such as the “Graduate School: How to Apply, Decide, and Thrive” panel, a panel conversation with young professional economists, and a data workshop.

Appendix 2: Figure 1, Year \times Treatment Estimates from Eq. (3) for Liberal Arts College



Sources: NCES, IPEDS data on bachelors' degrees and first and second majors combined.

Notes: The blue bars are the coefficients on Year \times Treatment in an estimation of eq. (3) for liberal arts colleges only, including the cluster dummies, cluster \times Year, and log(total BAs). Black error bars are the standard errors for the estimates in each year.

Appendix 3: Summary of UWE Treatment School Progress Reports and “Best Practices”

This summarizes Progress Reports submitted at the end of the RCT by the 20 treatment schools in the UWE *Challenge* and reports of “Best Practices” submitted as of 2018 by seven of the treatment schools.¹ We define interventions as “effective” if they were implemented by three or more schools and received primarily positive feedback. “Ambiguously effective” interventions listed are those that received a mix of positive and negative feedback from the schools.

Effective Interventions:

- a. Informational flyers, staffing at academic fairs, and updated content for pre-major department information sessions (*Better Information* and *Mentoring and Role Models*)

Several departments created eye-catching flyers to help advertise the major. The flyers included a list of diverse research questions that economics studies and a selection of upper-year elective courses that the department offers. Schools distributed these flyers at academic fairs and posted them on their websites. Departments also ensured that there was at least one female professor, undergraduate adviser, or upper-year student present for all sessions of academic fairs.

A few treatment schools revamped their orientation sessions “to focus more on applications of and interesting research questions in economics rather than logistics.” Focusing on logistics (e.g., course requirements) is useful for students who already know what economics is about and who already think that they want to major in it.² At least one school combined the information intervention with a *role model* element by inviting recent alumni to talk about their careers.

- b. Implicit bias training (*Mentoring and Role Models*)

This intervention targets faculty and teaching assistants who are expected to be role models and mentors for students. Treatment schools implemented training sessions with faculty and graduate and undergraduate teaching assistants. Many invited Prof. Amanda Bayer of Swarthmore, who ran a workshop during the meetings with the treatment schools’ primary investigators. Faculty across schools were generally receptive to this kind of training, especially after taking the implicit bias test and learning about their potential unconscious biases. Holding this type of workshop/training before beginning to discuss other interventions may help convince reluctant faculty about the necessity of diversity initiatives.

¹ A fuller version of this report is posted on the [UWE website](#).

² One school covered the following topics at their information session: (1) questions economists ask and current events they work on; (2) “how economists take an analytical approach to problem solving”; (3) courses offered in the department; (4) “encouragement to students who might bypass economics due to ‘math phobia,’” and (5) variety of career paths available with a degree in economics. The department prepared a 44-slide and a 28-slide versions and conducted extensive training with economic advisers on presenting the slides. Presentations were done in all Principles sections and took about 10 minutes of class time at the beginning of the class period.

c. More highly targeted first-year/pre-major advising (*Better Information*)

For this intervention, a department identifies leaky spots in the pipeline that may occur in academic advising for pre-majors. The design of this intervention will differ based on the institutional characteristics of the school.

At one school, academic advising for first-year students who are undecided on their major is done by a college-wide academic center. The department found that the advisers at the academic center had little information on economics and the careers available to economics majors and the salaries. The department then conducted a training session with the advisors on the main campus on the “broader application” and “scope of economics” and provided them with pamphlets (similar to those that may be handed out at an academic fair) that the advisers could give to students who expressed interest in the major. The department commented that this may be their “most effective intervention.”

Another school organized open advising hours before major registration, targeting undeclared first-years and sophomores whose advisers were outside of the economics department (and in many cases also outside of the university’s business school). The department created checklists and planning pamphlets that explained various pathways to a major in economics. There were also spillovers as announcements of the sessions incentivized other undecided students to reach out to faculty to learn about opportunities in the department. The main obstacle for this intervention was scheduling: advising hours occurred at an evening time that was convenient for students but which made arrangements for faculty more difficult.

d. UWE student clubs (*Mentoring and Role Models*)

This was one of the most popular community-building interventions implemented by the treatment schools. Departments organized clubs that either specifically focused on recruiting women to economics or opened membership to all students but made promoting diversity in economics a central mission. Initial members were typically recruited through word-of-mouth/personal invitation emails sent to students in upper-year courses. Clubs also self-advertised at club fairs. Clubs met regularly throughout the semester and organized events such as career panels, meet-and-greet sessions with alumni, and student conferences.

One PI wrote: “I heard from several of our new grads what a difference the group made in their sense of strength and well-being not just in Econ, but in their lives going forward. They are making friends and associates that will last their lifetimes.” The first UWE conference, which kicked off a series of annual diversity-focused conferences for students and faculty, was organized after a student at one such UWE club enthusiastically reached out to us by email with the idea.

Successful clubs need at least one faculty adviser who can be involved beyond administrative requirements for supervising a student club as well as department funding for student activities (e.g., refreshments and printed advertising for events, invited speakers, field trips), and a dedicated group of students to lead the club. Schools had mixed success in ensuring

continuity of club leadership beyond the initially recruited cohort of students. As clubs become institutionalized (develop a schedule of regular programming, establish a network of alumni, and become more well-known across campus) they will become easier to sustain. Schools could also work with established organizations on campus (e.g., undergraduate Economics Society or graduate Women in Economics groups) to organize joint activities.

e. Invited speaker sessions (*Mentoring and Role Models*)

Alumni panels on diverse career paths and guest faculty seminars on topics relevant to students can expose students to a more diverse group of economists and increase the probability that they are inspired by someone like them to continue in economics. See, for example, the evidence in Porter and Serra (2020), at SMU (a treatment school), and Patnaik et al. (2023) at University of Wisconsin–Madison (a treatment school).³

Identifying alumni who have pursued careers outside of stereotypical paths for economists (e.g., finance, consulting) is important. One of the role models in the SMU study started out in management consulting but then worked for an international NGO in Nicaragua and then as a director of operations for a toy company based in Honduras. The second role model had a career in marketing at an international communications company. Two of the UW–Madison role models worked in supply chain management for a cheese company in Wisconsin, and the third was a marketing executive with experience in publishing and education sectors.

One school that typically hosted about 24 seminars throughout the semester scheduled more female presenters, increasing their number from one or two in previous years to seven. One department reported an initially low response to such events from students but was able to increase attendance by sending out personalized invitation emails. Most departments do not keep alumni registries and had to reach out to the school's alumni relations office. Departments with some funding could consider bringing the students to the career panel instead by organizing a field trip to a think tank, Federal Reserve Bank branch, or another research institution.

f. Novel economics course (*Content and Presentation Style*)

Although interventions to change curriculum and pedagogy are the most labor-intensive interventions, four schools offered new economics courses. Most were on current issues such as those in health, education, economic inequality, economic development, housing, crime, marriage and the family.

Departments may receive pushback from their faculty about changing curriculum or instructional methods because of the high cost of interventions. Offering survey courses with

³ Patnaik et al. (2023) show that the effect is strongest when there is a gender match: a female role model increases the likelihood that female students take intermediate microeconomics by 5.0 pp. (base of about 12%), with no effect on male students, and a male role model increases the same for male students by 8.1 pp (base of about 23%), with no effect on female students.

low/no prerequisites that are co-taught by multiple faculty reduces the burden on any one person, especially if the faculty can teach topics related to their research. At a school where multiple professors teach principles sections, faculty gave guest lectures in each other's courses. In addition to exposing students to diverse topics, this approach "[gave] students a way of seeing the different teaching styles of professors in the department as a way of getting [them] excited about taking courses with faculty they have not had in class yet." At least one department considered an alternative textbook for its principles courses.

g. Student outreach to high schools (*Mentoring and Role Models*; implemented by one department)

As data from Adams and several treatment schools show, many students make up their mind about economics even before they arrive on campus. Moreover, being "late to the game" can significantly impact the student's ability to enroll in courses and complete major requirements.⁴ To address this leaky point in the pipeline, the UWE club at one department began to do outreach to local high schools. The goal was to provide students with better exposure to what economics is and to show that it is socially empowering. They specifically addressed math requirements, targeting students before they made a decision about taking calculus (so that they do not give up on math courses too early) and providing an option for quantitative thinkers who are not interested in other STEM fields. Outreach activities were conducted via interactive presentations, blogs, videos, and hands-on "regression lab" tasks.

Ambiguously effective interventions include:

- a. Targeted invitation (nudges) to take further economics courses/to major in economics (*Better Information*)
- b. Tutoring/mentoring by older undergraduate students, peer study groups, and online groups (*Mentoring and Role Models*)
- c. Meet-and-greet/networking sessions with faculty (*Better Information* and *Mentoring and Role Models*)
- d. Updating the department website and promotional videos (*Better Information*)
- e. Creating research opportunities for students (*Mentoring and Role Models*)
- f. Proliferation of economic news (*Better Information* and *Content and Presentation Style*)
- g. Engaging teaching resources provided by the university/college (*Content and Presentation Style*)

⁴ This is related to the issue of departments' capacity constraints. One PI observed that the problem of getting more women in economics often stemmed not from the lack of interest but that "women are less likely to know that they want to take econ from the 'get go'" and so were often too late to enroll in the oversubscribed classes. Another PI likewise explained that their "intermediate theory courses frequently turn away interested students during the enrollment process" and that a recent "Principles course was almost entirely sophomores." This is not uncommon, as yet another PI commented that "classes like intermediate micro, intermediate macro, econometrics, and money & banking are full to the limits of the fire marshal and [their] capacity to staff discussion sections with graduate students TAs." The problem of women's underrepresentation in economics seems to be as much about increasing interest in the major among students who do not have good prior information about economics as it is about getting selection right into the major.

Appendix 4: Listing of Schools in the Four Clusters (from which five * were randomly selected)

Cluster 1

*Princeton University
*Williams College
Amherst College
*Yale University
Swarthmore College
University of Chicago
Stanford University
Massachusetts Institute of Technology
Middlebury College
Duke University
Carleton College
Claremont McKenna College
Dartmouth College
Davidson College
Northwestern University
*Washington and Lee University
Cornell University
Wesleyan University
Colby College
Vanderbilt University
*Brown University
University of Notre Dame

Cluster 2

*University of California, Berkeley
Georgetown University
*University of Virginia
Colorado College
Wake Forest University
University of Michigan
*University of Richmond
University of North Carolina at Chapel Hill
Boston College
Bucknell University
College of the Holy Cross
Brandeis University
Lafayette College
University of California, San Diego
Dickinson College
Case Western Reserve University
University of California, Davis
*University of California, Santa Barbara
Union College
Northeastern University
*University of Illinois Urbana-Champaign
Boston University

Cluster 3

Centre College
*Connecticut College
*University of Wisconsin–Madison
Gettysburg College
University of Texas at Austin
Tulane University
*St. Olaf College
George Washington University
Ohio State University
St. Lawrence University
*Southern Methodist University
*University of Connecticut
University of Maryland at College Park
Brigham Young University
University of Pittsburgh
Clemson University
Texas A&M
Wheaton College
Rutgers University–New Brunswick
American University
Texas Christian University
Indiana University, Bloomington

Cluster 4

University of Delaware
University of Vermont
Michigan State University
SUNY at Binghamton
Stony Brook University
*University of Colorado Boulder
University of Missouri, Columbia
University of Tennessee
University of Oklahoma
University of Kansas
*Colorado State University (Fort Collins)
Temple University
University of Arizona
University of Utah
University of Kentucky
George Mason University
Oregon State University
*Illinois State University
Texas Tech University
*University of Hawaii at Manoa
*University of Central Florida
University of Houston

Appendix 5: Table 1 including coefficients on the cluster dummies and Cluster \times Post

	(1)	(2)	(3)	(4)
	All Institutions	Liberal Arts Colleges	All Except LA Colleges	All Except LA Colleges
Mean of the dependent variable	0.567	0.580	0.562	0.562
Mean of (female econ/total econ) ^a	0.300	0.308	0.297	0.297
Treatment school	0.0051 (0.0087)	0.0332 (0.0160)	-0.0109 (0.0103)	0.00811 (0.0128)
Post period	0.0479 (0.0171)	0.0210 (0.0229)	0.0630 (0.0235)	0.0715 (0.0238)
Treatment \times Post	0.0127 (0.0197)	0.101 (0.0353)	-0.0169 (0.0234)	-0.0511 (0.0291)
Own RCT				-0.0471 (0.0185)
Own RCT \times Post				0.0846 (0.0426)
Liberal Arts	-0.139 (0.0138)			
Public	0.0250 (0.0144)		0.0577 (0.0159)	0.0560 (0.0159)
log(Total BAs)	-0.0599 (0.00861)	-0.0473 (0.0228)	-0.0646 (0.00962)	-0.0635 (0.00962)
Cluster 2	0.0121 (0.0108)	0.0615 (0.0163)	-0.0354 (0.0147)	-0.0293 (0.0149)
Cluster 3	-0.114 (0.0111)	-0.0647 (0.0157)	-0.162 (0.0152)	-0.155 (0.0155)
Cluster 4	-0.178 (0.0140)		-0.228 (0.170)	-0.223 (0.171)
Cluster 2 \times Post	0.0120 (0.0233)	0.0100 (0.0339)	0.0131 (0.0305)	0.00226 (0.0309)
Cluster 3 \times Post	0.0114 (0.0233)	-0.0156 (0.0358)	0.0120 (0.0302)	-0.00092 (0.0308)
Cluster 4 \times Post	0.00503 (0.0234)		-0.00269 (0.0284)	-0.0115 (0.0287)
Constant	1.106 (0.0640)	0.858 (0.140)	1.167 (0.0716)	1.154 (0.0718)
R ² (adjusted)	0.287	0.132	0.338	0.341
Number of observations	1,848	483	1,365	1,365

Sources: NCES, IPEDS data on bachelors' degrees and first and second majors combined.

Notes: Standard errors are in parentheses. Dependent variable is the female to total (= female + male) conversion ratio defined as $\left[\frac{(\text{Female Econ Majors} / \text{Total Econ Majors})}{(\text{Female BAs} / \text{Total BAs})} \right]_{iy}$ for each

institution (*i*) in year (*y*). *Treatment* = 1 for the 20 treatment schools (see Appendix 1). The sample is from AY 2000-01 to AY 2020-21. *Post* = 1 for the four years: AY 2017-18 to AY 2020-21. *Own RCT* = 1 for the six treatment schools that did their own RCTs (see text): Colorado State University; University of California, Santa Barbara; University of Illinois Urbana Champaign; University of Colorado Boulder; Southern Methodist University; and University of Wisconsin–Madison. Treatment was delayed for one year at the University of Central Florida, and we have changed the *Post* indicator accordingly. For details on “Cluster” dummies, see Appendix 2. Observations = number schools × years. There are no liberal arts colleges in the fourth cluster because they are all in the top 100 liberal arts schools.

^a The fraction of all economics majors who are female, *not* scaled by the fraction of BAs who are female. See also Figure 3, part A of the article.