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Women in Economics: Stalled Progress

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Although women are still a minority in the economics profession, female representation in the discipline has increased slowly over the past century. By the mid-2000s, just under 35 percent of PhD students and 30 percent of assistant professors were female, but these numbers have remained roughly constant ever since. This is not the first time progress on the path to gender equality in economics has stalled: women were more prominent as researchers in the early years of the 20th century than they were mid-century. Listings of dissertations in progress in the *American Economic Review* show that women were writing 6 percent of US PhD dissertations in 1912, rising to a peak of nearly 20 percent in 1920 but then falling back to 7 percent by 1940 (Forget 2011). Forget (2011) links the decline in female representation in academic economics to the emergence of home economics and social work as academic fields, the expansion of employment opportunities in government, and increased hostility and overt discrimination in economics departments. Cherrier (2017b) draws a parallel between these trends in economics and the defeminization of computer science as this field became increasingly professionalized, "scientized," and lucrative after the mid-1980s.

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Common explanations for women's underrepresentation in economics in the mid-20th century included comparative advantage and diverging preferences by gender. By the early 1970s, however, overt discrimination was blamed for "the bizarre and irrational underrepresentation of women in the economics profession" (CSWEP 1973). The contested establishment of the Committee on the Status of Women in the Economics Profession (CSWEP) at the 1971 American Economic Association (AEA) business meeting took place in the wake of public discussion and government action on discrimination, actions by other professional associations to increase the representation of women, and growing interest in discrimination as an economic phenomenon with the early work by Becker and Arrow (Cherrier, Chassonnery-Zaigouche, and Singleton 2018). A Caucus of Women Economists drafted resolutions requiring the AEA to adopt "a positive program to eliminate sex discrimination." The resolutions were presented at the business meeting, where they provoked heated debate and several speeches in opposition, but were approved by a vote of the attending membership. The room had been packed by progressive economists prior to the vote, according to a first-hand account by Strober (2016, chap. 6). Though the beginning statement "Resolved that the American Economic Association declares that economics is not a man's field," was amended to insert "not exclusively," the resolutions were adopted in full, including the establishment of CSWEP (Cherrier 2017b). Feminist activism scored similar successes throughout the academy during this period: women's committees were established in the American Sociological Association in 1970, and in the American Physical Society in 1972.

Despite large gains in female representation in economics in the 1970s and 1980s, reactions to women's progress were mixed. In the Fall 1998 issue of this journal, the 25th anniversary of CSWEP was commemorated with a symposium that reflected contrasting views of efforts to diversify the profession. The various contributions reviewed women's progress in economics favorably but expressed concern about the implications of low representation of women among economics undergraduates (Bartlett 1998); critiqued CSWEP's nonmilitancy and offered unfavorable comparisons with more activist women's committees in other fields (Bergmann 1998); and asserted that, partly as a result of CSWEP's activities, the "pendulum has probably swung too far so that men are the ones currently being discriminated against" (Friedman 1998).

Since then, women's progress in academic economics has slowed, with virtually no improvement in the female share of junior faculty or graduate students in decades. Little consensus has emerged as to why, though there has been a renewal of widespread interest in the status and future of women in economics and of the barriers they face to professional success. In this paper, we first document trends in the gender composition of academic economists over the past 25 years, the extent to which these trends encompass the most elite departments, and how women's representation across fields of study within economics has changed. We then review the recent literature on other dimensions of women's relative position in the discipline, including research productivity and income, and assess evidence on the

barriers that female economists face in publishing, promotion, and tenure. While differences in preferences and constraints may directly affect the relative productivity of men and women, productivity gaps do not fully explain the gender disparity in promotion rates in economics. Furthermore, the progress of women has stalled relative to that in other disciplines in the past two decades. We propose that differential assessment of men and women is one important factor in explaining this stalled progress, reflected in gendered institutional policies and apparent implicit bias in promotion and tenure processes.

Women in PhD-granting Economics Departments, 1972–2017

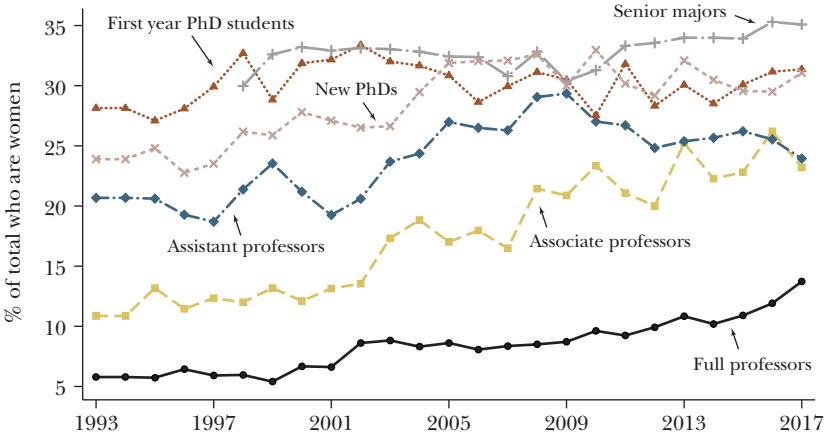
In 1972 and 1973, the Committee on the Status of Women in the Economics Profession conducted surveys of economics departments "to remedy the total lack of information on how many women economists exist or are currently being trained" (Bell 1973). This task was assumed by the American Economic Association in 1974, and questions about faculty and graduate student gender were combined with other data requests to form the Universal Academic Questionnaire (UAQ) sent to academic departments. The UAQ provided the data for CSWEP's reports on the status of women in economics until 1993, when the committee resumed their separate survey to improve response rates. This survey gathers information each fall on the gender composition of new and graduating PhD students; faculty at the assistant, associate, and full professor levels; nontenure track faculty; and senior undergraduate majors. Most of the data presented in this section combines the CSWEP and UAQ data for PhD-granting departments from 1993 to 2017.[1]

We can provide a longer-term perspective for one important set of departments. The microdata from the first CSWEP survey has been lost, but the 1972 CSWEP Annual Report, published in the AER *Papers and Proceedings* issue, includes aggregate results for one identifiable group of 43 departments—the Chairman's Group. This group was known informally as "the cartel," because the chairs met every year for breakfast at the ASSA meetings and discussed planned salary offers for new assistant professors. These departments are listed in the report, and with the exception of the University of Rochester, all of them responded to the initial survey.[2] The departments in the Chairman's Group granted about two-thirds of US economics PhDs in the early 1970s, and we can track the faculty and graduate student gender composition in this set of highly ranked departments over a 45-year period.

[1] Response rates to the CSWEP survey of PhD-granting departments have been 100 percent in recent years, but below that prior to 2015—nonresponses are replaced by UAQ data when possible. The data for 2000 has been lost. The cleaned data were produced by the Inter-university Consortium for Political and Social Research (ICPSR) under the direction of Margaret Levenstein, and is available to researchers through ICPSR. About 4 percent of the observations are imputed.

[2] The report also includes aggregate gender ratios for "all departments" based on 397 questionnaires returned out of 1364 questionnaires sent (Bell 1973).

Figure 1
Representation of Women among First-Year PhD Students, New PhDs, and Faculty by Rank for the Chairman's Group of Departments, 1993–2017



Source: Authors, using data from CSWEP and from the UAQ for PhD-granting departments from 1993 to 2017.
Note: The Chairman's Group consists of Brown University, University of California—Berkeley, University of California—Davis, University of California—Los Angeles, Carnegie Mellon University, University of Chicago, University of Colorado, Columbia University, Cornell University, Duke University, University of Florida, Harvard University, University of Illinois, Indiana University, Iowa State University, Johns Hopkins University, University of Maryland, Massachusetts Institute of Technology, University of Michigan, Michigan State University, University of Minnesota, New York University, State University of New York—Buffalo, University of North Carolina—Chapel Hill, Northwestern University, Ohio State University, University of Pennsylvania, University of Pittsburgh, Princeton University, Purdue University, University of Rochester, University of Southern California, Stanford University, Texas A & M University, University of Texas—Austin, Vanderbilt University, University of Virginia, University of Washington—Seattle, Washington State University, Washington University in St. Louis, Wayne State University, University of Wisconsin, and Yale University.

Substantial progress was made during the 1970s and 1980s in the representation of female faculty within the Chairman's Group departments. In 1972, women accounted for only 2 percent of full professors, 4 percent of associate professors, and 9 percent of assistant professors. By the time the CSWEP survey was resumed in 1993, the fraction of full professors who were female had tripled to 6 percent, 11 percent of associate professors were women, and the female share of assistant professors had more than doubled to 21 percent.

Figure 1 shows that the proportion of senior female faculty in the Chairman's Group continued to grow slowly from 1993 to the present. Among full professors, the female share increased from 6 percent to more than 13 percent, and among associate professors, from 11 to 23 percent. For assistant professors, however, the pattern is somewhat different: the share of women increased from 20 percent in 1993 to 29 percent in 2009, and then decreased over the past decade to 24 percent, leaving

little net growth at junior ranks over the past 24 years.[3] Over the same period, there has also been little improvement in female representation among first-year PhD students, from 28 percent in 1993 to an average of 30 percent in the past five years. (During the 1990s, there was a consistent gap of a couple of percentage points between the female share of first-year graduate students and exiting PhDs five years later that seems to indicate higher attrition for female graduate students, but this gap disappeared by the entering class of 2000.) This stasis extends to undergraduate study of economics as well: the female share of senior economics majors has remained between 30 and 35 percent since the data series began in 1998. Progress towards gender equality at the intake levels of the profession appears to have ceased (with some deterioration for junior faculty), while women's representation at senior levels continues to rise, fueled for now by the entry of women into academic economics in past decades.

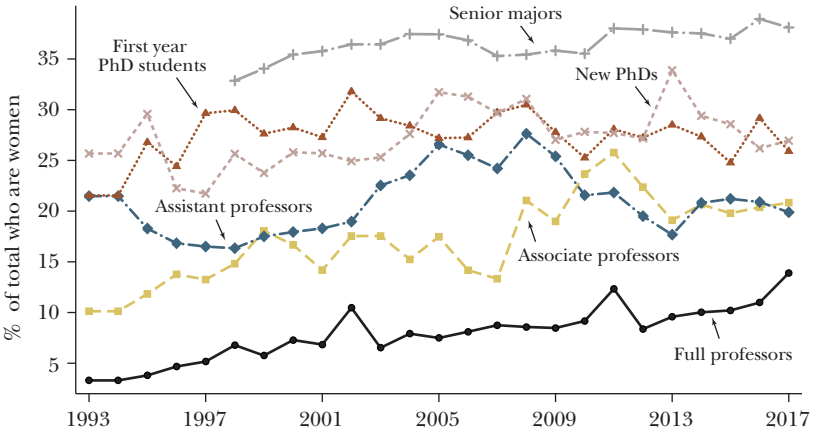
Although the Chairman's Group does not provide a complete picture of PhD departments, there are reasons to be particularly interested in the progress that women have made in elite departments. Economics is a very hierarchical social science (as discussed in this journal by Fourcade, Ollion, and Algan 2015), and a high fraction of both the articles published in top journals and the faculty who train PhD students come from the most highly-ranked departments. Figure 2 shows the 1993–2017 faculty and student data for the departments rated in the top 20 by US News and World Report. The data is a bit noisier for these smaller samples than for the Chairman's Group, but some trends are clear.

In top 20 programs, the representation of women among full professors was only 3 percent in 1993, grew slowly to 10 percent in recent years, and then rose to nearly 14 percent in 2017. The female fraction of associate professors (which grew steadily throughout this period in the Chairman's Group), increased from 10 percent to as high as 26 percent in 2011, but has declined in recent years to about 20 percent. Female representation among assistant professors stood at about 21 percent in 1993, reached a peak of 27.6 percent in 2008, and has since fallen back to 20 percent, meaning that no net progress has been made at the junior faculty level in top 20 departments over the past 24 years. These patterns are qualitatively similar if we look only at the top 10 programs in the US News and World Report Rankings as well.

To compare women's progress in economics to other academic disciplines, we have combined the data from the Committee on the Status of Women in the Economics Profession on the Chairman's Group with data on the share of female faculty by rank in top-50 departments for several science and social science disciplines. These data, for 2002, 2005, 2007, and 2012, come from the Nelson (2004) Diversity Surveys of department chairs, collected under the auspices of the University

[3]This decrease is not apparent in the data on all PhD-granting departments that is presented in the CSWEP annual report (CSWEP 2018), where the assistant professor gender ratio appears flat for the 2005–2017 period. A separate analysis confirms that, for the non–Chairman's Group departments (which tend to be lower-ranked than the Chairman's Group), female representation among assistant professors has continued to grow slowly.

Figure 2
Representation of Women among First-Year PhD Students, New PhDs, and Faculty by Rank: Top 20 Economics Departments, 1993–2017

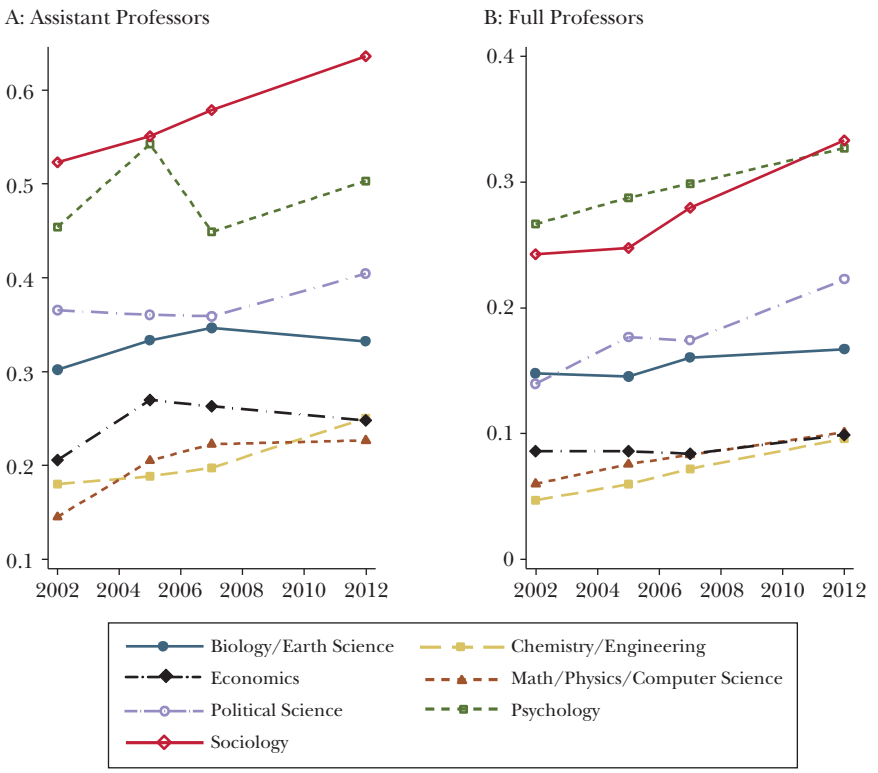


Source: Authors, using data from CSWEP and from the UAQ for PhD-granting departments from 1993 to 2017.
Note: The departments included are Brown University, Carnegie Mellon University, Columbia University, Cornell University, Duke University, Harvard University, Massachusetts Institute of Technology, New York University, Northwestern University, Princeton University, Stanford University, University of California—Berkeley, University of California—Los Angeles, University of California—San Diego, University of Chicago, University of Michigan—Ann Arbor, University of Minnesota, University of Pennsylvania, University of Wisconsin—Madison, and Yale University.

of Oklahoma. Top-50 departments are as ranked by the National Science Foundation according to field-specific research expenditures.[4] Figure 3 shows trends in the share of female assistant and full professors across seven discipline groups. For ease of presentation, we combine data from chemistry and four types of engineering departments (chemical, civil, electrical, and mechanical). We also combine biology and earth science, and math, computer science, physics, and astrophysics. In general, there is an upward trend in the share of female faculty at all ranks over this ten-year period. Hard sciences have the lowest share of female professors at all ranks, while the social sciences have the highest. Economics remains solidly within the lowest group in terms of female faculty shares, alongside physics, math, and engineering, and far below the biological and other social sciences. At the senior level, economics seems to have lost some ground relative to other sciences during

[4]Comparable data on top-50 departments is not available going back further in time. Using the NSF Survey of Doctoral Recipients (SDR), Ginther and Kahn (2004) and Ceci, Ginther, Kahn, and Williams (2014) show trends in the share of female assistant professors and tenured faculty across disciplines since 1973. However, the SDR samples doctoral recipients from all US academic institutions, and is not necessarily representative of faculty at top departments.

Figure 3
Representation of Women in Top-50 Departments, 2002–2012
(share female)



Source: Authors, using data from the Nelson Diversity Surveys and CSWEP.

this period. In all cases the share of women is decreasing with rank (note the y-axes for graphs A and B are different).

Do Women Study Different Fields of Economics than Men and Has the Distribution of Women across Fields Changed over Time?

While the survey data from the Committee on the Status of Women in the Economics Profession allow us to track the career progression of female academic economists over time, much less is known about another dimension of women's representation in economics—their distribution across fields of study. Understanding how trends in research areas differ for men and women may be important for understanding differential trends in publishing and tenure. Field choice may

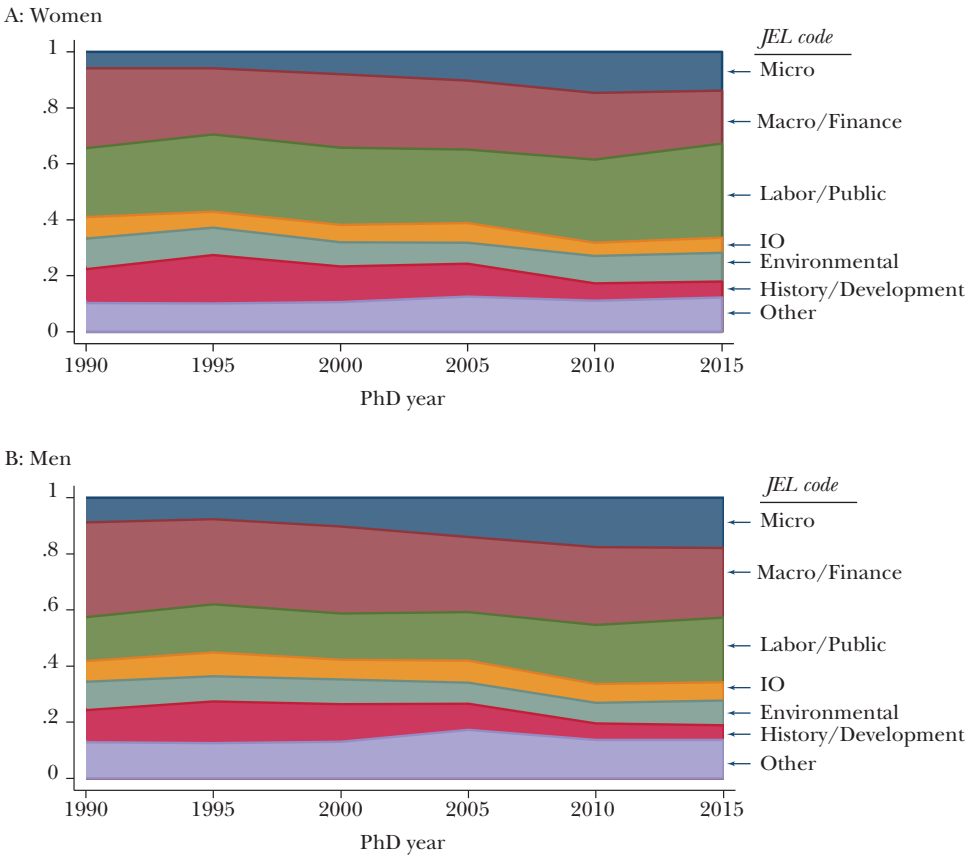
affect entry into tenure-track positions in economics, publication rates, and the probability of publishing in top journals, all of which may also affect the probability of earning tenure. However, the limited evidence estimating differences in professional success across economics fields is mixed. Recent work shows that field choice explains a large share of the gender gap in research output (Ductor, Goyal, and Prummer 2018), while Ginther and Kahn (2004) find that broad fields are an insignificant predictor of tenure among a sample of assistant professors in 1989. Several recent papers in economics document the contemporary distribution of women across fields, but to our knowledge, the existing research cannot provide insight into how fields of study have changed over the past few decades.

Using data from the National Bureau of Economic Research Summer Institute 2001–2016, Chari and Goldsmith-Pinkham (2017) show that the distribution of female economists at this event is not uniform across fields. Women are particularly scarce in macro and finance, and more abundant in labor and other applied microeconomic fields. Beneito, Pilar, Boscá, Ferri, and García (2018) use data from the annual AEA meetings from 2010–2016 to show the percentage of female authors in five subfields according to the *Journal of Economic Literature* subject codes of the sessions. For the most recent years, the authors also use machine learning to classify the paper abstracts by topic. Similar to Chari and Goldsmith-Pinkham (2017), they find that female representation is substantially lower in macro, finance, and mathematical and quantitative methods than in applied micro and other fields. An important caveat about these findings is that participation at both the AEA annual meetings and the NBER Summer Institute may be nonrepresentative across both gender and field, and again, little is known about how the gender composition across economic fields has changed over a longer period.

To provide a broader perspective on the evolution of women across fields and over time, we have collected information on recipients of PhDs in economics from 1991–2017, including the recipient's name and the JEL code of their dissertation. This information comes from the Doctoral Dissertations in Economics lists published annually in the *Journal of Economic Literature*, and represents almost all major PhD-granting departments in the United States. To classify the gender of each doctoral recipient, we use two databases that allow us to determine the probability that a given name is female: the Social Security Administration name files and the Genderize.io database for an international dimension. We match the first names in our data to these probabilities, and assign gender to those with a probability of being female that is above 0.8 or below 0.2.[5] In total, we identify the gender

[5] The first database is the Social Security Administration name files, which include all names with at least five occurrences in a given year based on applications for a US Social Security card at birth. Because this data is only representative of US-born individuals, and a large share of PhD recipients in economics are foreign-born, we also match to the Genderize.io database, which contains over 200,000 distinct names from 79 countries. Both datasets contain the number of male and female incidences of the name. We designate a name as female if the probability that the name is female is higher than 0.8, and male if the probability is lower than 0.2. We are able to match 88.5 percent of the individuals in our data to a name in at least one of the two databases, and we assign a gender to 83 percent of the total sample.

Figure 4
Dissertation Topics of Women and Men by Year
(share)



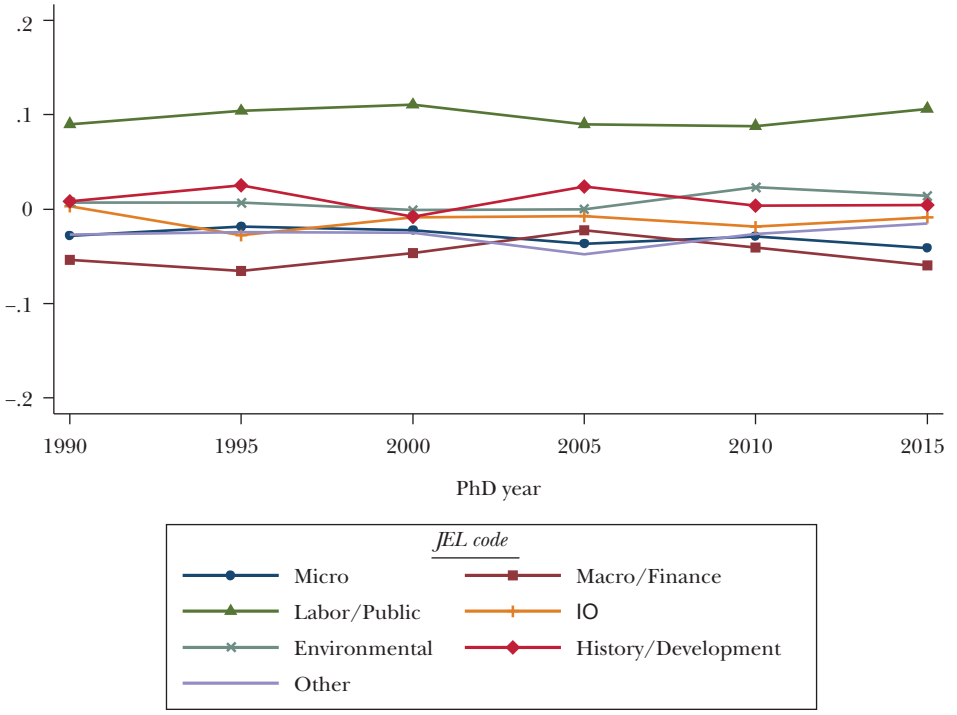
Source: Authors, using data from the annual list of Doctoral Dissertations in Economics, 1991–2017.
Note: Data collapsed into five-year bins for smoothness. The 1990 bin contains data from 1991–1994 and the 2015 bin contains data from 2015–2017; all other bins contain 5 years of data.

of 23,442 out of 28,209 individuals over 26 years. About 29 percent of new PhDs over this period are female, and the trend in the share of female PhD recipients over time mirrors the CSWEP data above.

Figures 4A and 4B show the distribution of women and men across seven fields over time.[6] In general, the distributions of men and women across these fields are very similar. The higher representation of women in labor/public is apparent,

[6]We have collapsed the JEL codes into seven categories for ease of presenting results. "Micro" is JEL code D; "Macro/Finance" is codes E, F, and G; "Labor/Public" is H, I, and J; "IO" is L; "Environmental" is Q; "History/Development" is N and O; and "Other" contains the remaining JEL codes A, B, C, K, M, P, R, Y, and Z, which all represent a relatively small share of PhD dissertations.

Figure 5
Difference between Share of Women and Share of Men in Particular Fields of Economics



Source: Authors, using data from the annual list of Doctoral Dissertations in Economics, 1991–2017.
Note: Data was collapsed into five-year bins for smoothness. The 1990 bin contains data from 1991 to 1994 and the 2015 bin contains data from 2015 to 2017; all other bins contain five years of data.

but female economists are well-represented in all fields. In terms of changes over time, women are more likely to write dissertations in micro and labor/public than they were in the early 1990s, and somewhat less likely to study macro/finance and history/development. However, in large part these trends reflect broader trends in the profession, and very similar changes in field choice can be seen among men.

In fact, the distribution of PhD recipients across fields has not evolved differentially for men and women since the early 1990s. To show this more clearly, Figure 5 plots the difference between the share of women in a particular field and the share of men in that field over time. While it is certainly the case that women are more likely than men to study topics in labor and public economics and less likely to do dissertation research in macro and finance across the entire time period, there is virtually no evidence of differential trends. (Because of the gender imbalance in economics, there are still more men than women who graduate with a dissertation classified as labor or public every year.) It is not entirely clear why a higher fraction of women than men choose labor-oriented research topics. One commonly

discussed hypothesis is that women on average have stronger interests in studying individual behavior. A survey of AEA members in 2008 showed that, while there were no gender differences in responses to beliefs about core economic concepts, female economists are more likely to support the need for government intervention versus market solutions (May, McGarvey, and Whaples 2014). This bias in choice of field could be sustained over time if the research environment across different fields is an important factor in what graduate students choose to study; that is, the higher share of female faculty in labor economics might encourage female students to study labor through role model effects.

This lack of change in the relative gender composition across fields over time is important for two reasons. First, it suggests that as the share of female PhD recipients has risen, the more recent female cohorts are no different in terms of their broad research interests. Second, differential trends in field choice over time cannot explain the observed changes in the gender gap in the share of PhD recipients who become assistant professors and who are later tenured.

The graphs shown here use data starting in 1991 because this was the last time that the *Journal of Economic Literature* subject codes were substantially redesigned. Focusing on this period means that the JEL codes are comparable over time. However, it is possible to collect similar data going back further. For a longer-term perspective, we have also compiled data from the early 1970s. JEL codes in this period were not completely comparable with those used today. In particular, "core" areas of economic theory including micro and macro theory were categorized together in a "General Economics" category, though the applied categories are reasonably comparable for our purposes.[7] There is still no evidence of differential trends by gender in these applied areas. In particular, the difference in the share of women compared to men who study labor and public economics has remained constant at about 0.1 since at least the early 1970s.

How Do Women's Academic Careers in Economics Compare With Men's?

Women's representation in economics departments tends to fall as academic rank increases. As shown above (Figures 1 and 2), the female share of full professors in research-oriented departments ranges from 8 to 13 percent, from 20 to 25 percent for assistant professors, and from about 25 to 30 percent for PhD students. Simple "lock-step" models tracking cohorts of PhD recipients, reported annually by the Committee on the Status of Women in the Economics Profession, show a distinct drop-off from last-year-in-rank assistant professors to last-year-in-rank

[7] The full category name is "General Economics; including Economic Theory, History of Thought, Methodology, Economic History, and Economic Systems." The comparable categories include environmental, development, IO, labor/public, and international economics. See Cherrier (2017a) for a history of JEL codes, including a list of categories in this time period.

associate professors for PhD cohorts from the mid-1980s through 2003 (CSWEP 2018). This suggests that the economics career pipeline is "leaky" at the stage when most academics receive tenure.

Studies using micro-data tend to confirm that something goes wrong for female economists at the tenure stage. Using longitudinal data on all AEA members from the 1960s through the 1980s, McDowell, Singell, and Ziliak (2001) find that women were less likely than men with similar characteristics to be promoted to both associate professor and full professor. However, they also find that women's promotion prospects improved in the 1980s, leaving no unexplained gender differences in promotion for individuals observed in 1989. In contrast, Ginther and Kahn (in this journal, 2004) find clear evidence of a leaky pipeline in a sample restricted to AEA members who were assistant professors at PhD-granting departments in 1989—women in this sample were less likely to get tenure than men and took longer to achieve it. Ten years after receiving their PhDs, female economists were 21 percentage points less likely than men to have a tenured academic job. Differences in productivity, including number of publications, publication quality, and citations, explained only 30 percent of this promotion gap. In the same paper, Ginther and Kahn find a similar result using the 1972 to 1991 PhD cohorts from the National Science Foundation Survey of Doctoral Recipients, which has limited data on publication quality but does have information on family characteristics. Controlling for the presence of young children, which had an impact on promotion independent of productivity, leaves a substantial portion of the gender difference in tenure probabilities unexplained. The authors conduct the same analysis for other disciplines using the Survey of Doctoral Recipients data, and found that the gender promotion gap in economics was distinctive. There were negligible gender gaps in the transition to tenure in statistics and the sciences, and only an 8 percent gap in the other social sciences. In engineering, women were more likely than men to have been promoted after ten years.

In a later study of women's careers in academic social science that examined cohort differences using the 1981–2008 waves of the Survey of Doctoral Recipients, Ginther and Kahn (2014) find that, although there were gender differences in tenure probabilities for the 1980 cohort of PhDs in other social science disciplines, these had disappeared for the 1999 PhDs, while a 20 percent gender gap persisted in economics. They conclude: "Economics is the one field where gender differences in tenure receipt seem to remain even after background and productivity controls are factored in and even for single childless women" (p. 311). Similarly, they find no significant gender differences in promotion to tenure or full professor in the sciences overall after controlling for demographic, family, and productivity covariates (Ginther and Kahn 2009).

In an omnibus study on women in academic science written in collaboration with two psychologists, Ginther and Kahn examine recent career progression in math-intensive fields of study and find evidence of gender inequality only in economics (Ceci, Ginther, Kahn, and Williams 2014). Most of these disciplines made progress towards gender equality in income and promotion between the mid-1990s

and 2010, while economics did not. In geosciences, engineering, math/computer science, and physical sciences, men and women now enter PhD programs at rates proportionate to their representation in college majors and are equally likely as PhD students to be hired into tenure-track positions.

In addition to the persistent gender gap in promotions to tenured positions, Ceci et al. (2014) also find significant gaps in academic salaries and job satisfaction among economists that have not decreased (and in some cases have increased) over time. In the 1995 Survey of Doctoral Recipients data, female assistant professors in economics were paid lower salaries than male assistant professors, but the difference was not significant. By 2010, the average salary gap in these data had increased and become significant. Over the same period, the relative salaries of female full professors fell as well, to 74 percent of male salaries by 2010, though there are no significant salary differences at research-intensive universities with PhD programs (so-called "R1" institutions). Women in the sciences tend to report being less satisfied with their jobs than male scientists, but the gender differences in the 1997 and 2010 Survey of Doctoral Recipients were generally small and fell over time. The gap in job satisfaction among economists, in contrast, was large in 1997 and grew by 2010, with men becoming more likely to report being very or somewhat satisfied with their jobs and women becoming less likely to do so.

Gender gaps in job satisfaction may not be surprising, given the disadvantages women appear to face in promotion and pay, but what might explain these differences in substantive career progression? Many studies have shown that women in science, technology, engineering, and mathematics fields, including economics, have fewer publications than men at equivalent stages of their career, though there appears to be no difference in hours worked (Ceci et al. 2014). Ginther and Kahn (2004) report that, ten years post-PhD, women in the 1989 cohort of assistant professors have 0.3 fewer top-10 publications and 3.8 fewer articles in other journals, though these differences do not explain most of the promotion gap. The 1995 and 2008 Survey of Doctoral Recipients data includes the number of articles accepted in refereed journals in the previous five years and, according to this metric as well, female assistant professors published less than male assistant professors. Between 1995 and 2008, this gap increased and became significant, with women publishing less and men publishing more (Ceci et al. 2014). A recent study based on a broader database of journal articles from EconLit (with gender identified for 80 percent of authors) finds that the raw gender gap in research output for all economists has been relatively constant at around 50 percent since the late 1980s, though 43 percent of this gap can be explained by differences in experience and field (Ductor, Goyal, and Prummer 2018).

A leading hypothesis for why female academics are less productive is that women have more intense domestic responsibilities; indeed, the evidence from most science, engineering, technology, and mathematics fields is that publications by single childless females are not significantly different from publications by single childless men. This is not the case in economics and the physical sciences, however, where there is a significant gender gap among the childless as well. Gender norms

that assign more nurturing roles to women may also influence productivity through the way that time on the job is allocated. Studies of faculty in science, technology, engineering, and mathematics have found a gender discrepancy in time use, with women spending more time on teaching, service, and other nonresearch academic activities such as mentoring students (Xie and Shauman 2003; Misra, Lundquist, Holmes, and Agiomavritis 2011). Female faculty are more likely to volunteer for low-reward tasks (tasks unlikely to contribute to one's chances for promotion), and lab experiments confirm that women volunteer, and are asked to volunteer, more than men (Babcock, Recalde, Vesterlund, and Weingart 2017). However, we are not aware of any economics-specific evidence on professional time allocation.

Evidence for Barriers

If women's relative failure to advance in departments of economics cannot be explained by the gender gap in productivity, the possibility of differential treatment arises. As we will discuss, a number of recent papers explore the role of gender per se in the economics profession, examining the possible causes of differential attrition and the persistent gap in tenure probabilities. Taken together, this work builds a case that female economists face substantial barriers throughout their career. These barriers may influence persistence in the profession by reducing expectations of future success, impeding research activity and publication outcomes, or affecting the probability of promotion even conditional on observed productivity.

Barriers that act to limit women from becoming tenured economists may start earlier. For example, Figure 1 shows that only about one-third of undergraduate economics majors are women. Also, Figure 1 shows that attrition rates in economics PhD programs were higher for women than men until the mid-2000s (as shown by the gap between the share of women who were first-year PhD students and the share that were new PhDs). In this symposium, the paper by Buckles discusses the research on policies that have been used in trying to raise the share of women at all stages of the economics career pipeline, while the paper by Boustan and Langan looks at the heterogeneity across departments in the share of women admitted to and completing PhD programs. We focus here primarily on issues affecting the research productivity of female economists.

An accumulating body of evidence suggests that early-career female economists may be adversely affected by limited access to the mentoring and social networks that support research activities, as well as by potential biases in the referee process. For example, a lack of senior female mentors may disadvantage assistant professors, especially if important information about publishing and tenure is transmitted informally within departments or research networks. In an effort to expose female assistant professors to successful female role models, boost research productivity, and help prepare them for the tenure process, the CSWEP Mentoring Program, CeMENT, matches junior female faculty with senior mentors. The program has been routinely oversubscribed, enabling a randomized control trial of the program

to be conducted in the 2000s. This evaluation found that CeMENT significantly increased the publication rates and grant funding of participants, bolstering the argument that a lack of mentoring may be important for women (Blau, Currie, Croson, and Ginther 2010).

Barriers in social network formation that hinder mentoring in a male-dominated field may lead men and women to have different research collaboration and coauthorship networks as well (McDowell, Singell, and Stater 2006). Although women in economics have a higher share of coauthored papers, their coauthorship patterns are distinct from those of men in ways that are predictive of lower output—fewer coauthors, higher clustering, and more collaboration with the same coauthors (Ductor, Goyal, and Prummer 2018). Coauthored publications also appear to be evaluated differently based on the gender of the authors. Male and female economists receive similar credit for sole-authored papers of similar quality in terms of their impact on tenure decisions (Sarsons 2017a). However, women receive significantly less credit for coauthored work, particularly when they coauthor with men. This contrasts with evidence from sociology, where Sarsons finds that men and women benefit equally from coauthored work.

Women and men in economics may also face different experiences throughout the publishing process. Several papers have tested for outright discrimination against women in manuscript review, but the empirical evidence is mixed. Ferber and Teiman (1980) study double-blind reviewing in economics journals and find that the gender gap in acceptance rates is lower when journals use double-blind reviewing. In an experiment of single-blind versus double-blind reviewing, Blank (1991) finds women fare slightly better under a double-blind reviewing system, but the estimated effects are not significant. Abrevaya and Hamermesh (2012) find no evidence of gender discrimination or altruism based on the gender pairing of reviewers and authors in the review process at a top field journal, though the journal uses a double-blind review process. (Of course, reviewers are often able to determine the identity and gender of authors if the paper is posted online.) An important limitation of this gender-pairing research design, however, is that it may fail to identify gender bias in the peer review process if women and men both discriminate against female authors. Card, DellaVigna, Funk, and Iriberri (2018) study referee decisions at four leading economics journals and similarly find no evidence of differential gender bias among reviewers or editors. However, they show that both male and female referees appear to hold female authors to a higher standard (as measured by citation counts), resulting in a substantial difference in the probability that female-authored papers receive a revise and resubmit. Similarly, Grossbard, Yilmazer, and Zhang (2018) show that papers in demographic economics journals with female authors receive more citations. Hengel (2017) adds a different dimension to the evidence that higher editorial standards are imposed on women in economics. She finds that economic research papers written by female authors spend six months longer under review at one top journal, although female-authored papers are more readable (using five different measures of writing clarity) and the gender gap in readability grows over the peer-review process. Hamermesh (2013) finds that, regardless of the reason, female authors have been substantially

underrepresented in top journals since the 1980s. While the evidence is not conclusive, differences in coauthorship networks and potential bias in the publishing process may both contribute to this gap.

External recognition through conference participation may also serve as a barrier to success for women. Women are underrepresented at high-profile conferences in economics compared to the overall share of female assistant professors, which is important if tenure committees use these presentations as a measure of prestige or external recognition of quality work (Chari and Goldsmith-Pinkham 2017).

Finally, the evaluation process for tenure and promotion may systematically disadvantage women. Evidence has been accumulating that implicit bias, which can lead to discrimination on the basis of unconscious attitudes and associations, is a problem in academia and can affect both hiring and promotion decisions on many margins (for a discussion in this journal, see Bayer and Rouse 2016). For example, faculty evaluating curriculum vitae with randomly assigned names are more likely to positively evaluate and hire male applicants for tenure-track jobs (Steinpreis, Anders, and Ritzke 1999). Letters of recommendation written for individuals applying for academic positions use different adjectives to describe men and women, and the characteristics used to describe women are viewed more negatively in hiring decisions (Madera, Hebl, and Martin 2009; Schmader, Whitehead, and Wysocki 2007). More specific to economics, equally productive female economists in Italy are less likely to be promoted to associate or full professor when randomly assigned to an all-male promotion committee, but there is no gender gap when women are assigned to a mixed-gender committee (De Paola and Scoppa 2015).

Even policies that have been supported on the grounds of gender equity may create biases against women's success. Antecol, Bedard, and Stearns (2018) examine the effect of gender-neutral tenure-clock stopping policies, which allow assistant professors who have children to extend their tenure clock. They find that such policies substantially increase the probability that men get tenure in their first job, but reduce the probability that women get tenure. Observed publishing outcomes suggest that men use the additional time on the tenure clock to continue to work and publish while women do not. Moreover, this study also finds that a large and significant gap in the probability of tenure remains even when controlling for the number of publications in top-five and non-top-five journals.

Evidence of gendered expectations of performance exists in many other high-skilled occupations as well. In a study of physician referral practices, Sarsons (2017b) finds that female surgeons are more heavily penalized for negative patient outcomes, while male surgeons are more strongly rewarded after positive outcomes. Another study, of misconduct by financial advisors, finds female financial advisors engage in less-costly types of misconduct on average, but are also significantly more likely relative to men to face harsh punishments following misconduct (Egan, Matvos, and Seru 2017). Finally, men serving on promotion committees across academic disciplines evaluate female candidates less favorably when there are women on the committee as well (Bagues, Sylos-Labini, and Zinovyeva 2017). The contrast between economics and other academic disciplines in the lack of progress

that has been made in reducing gender inequalities, however, suggests that biases within institutions of economics may be particularly pervasive.

Discussion

Following the considerable growth in women's representation among economics students and faculty during the 1970s and 1980s, progress has leveled off in the last two decades. Economics has made less headway than the science, technology, engineering, and mathematics fields in terms of increasing the share of female undergraduate majors and PhD recipients (Bayer and Rouse 2016), which will make it even more difficult to close the faculty gender gap in economics going forward. Furthermore, common explanations for female academic disadvantage, such as heavier domestic responsibilities and an aversion to math intensity, fail to explain why economics is falling behind these other fields in terms of female persistence and promotion probabilities. What can explain the unique challenges that women seem to face in economics?

An adversarial and aggressive culture within academic economics is often advanced as a causal force in women's stalled progress in the profession, though its impact is difficult to quantify. Economics seminars, for example, have a reputation for being particularly hostile environments. The culture of an academic discipline can have gendered implications if women either fail to fully adapt to the culture or if they receive differential treatment as a result of it. Female economists appear to be less likely to engage in practices that are positively correlated with professional success, suggesting an inability or unwillingness to adapt to professional norms. For example, male academics self-cite more than female academics in many fields, but the male-to-female self-cite ratio is twice as high and more persistent in economics (King, Bergstrom, Correll, Jacquet, and West 2017). Applied economics fields attract a higher proportion of women, but this work is still seen by some as less rigorous or less important than traditionally male-dominated topics. Anecdotal evidence suggests that women may choose to go into less-male-dominated fields or leave academia altogether based on early experiences with toxic environments that men are more likely to tolerate.

It is obviously difficult to obtain quantitative estimates of the extent of outright harassment of women in economics. We do know that there are many reports of women in economics experiencing inappropriate behavior in job interviews, seminars, meetings, and at conferences (Shinall 2018). In addition, the language used to describe female economists on at least one anonymous online forum is often sexual and derogatory, in a way that it is not for men (Wu 2017). Recent evidence suggests that gender harassment is a problem in academics more broadly (National Academies of Sciences, Engineering, and Medicine, 2018). Such behavior is often normalized and tolerated in male-dominated settings, making it difficult to change. Thus, the National Academies of Sciences offer several evidence-based recommendations to address harassment in the university setting that may be directly relevant

to economics. In particular, they advise reducing the importance of hierarchical relationships and implementing "power-diffusion" mechanisms such as mentoring networks. They also argue that taking explicit actions to achieve greater gender equity in the hiring and promotion process is an essential step in creating a diverse and respectful environment.

The evidence summarized above suggests two primary mechanisms through which the barriers against women in economics may operate: differences in productivity between men and women, and differences in how they are evaluated. Women may be on average less productive than men due to childbearing and other family responsibilities, a higher propensity to engage in service activities instead of research, or differences in the type of research in which they choose to invest their time. The distinct experiences of men and women in the profession may also contribute to productivity gaps that arise as a result of differences in collaborative networks, access to mentors, and gender harassment. But gender gaps conditional on productivity are also larger in economics than in other academic disciplines, suggesting that a second factor explaining female disadvantage in economics may be disparate assessment of men and women. It appears that women are held to higher standards than men of equal ability, and need to publish more, higher-quality work to achieve equal levels of success in this profession.

Continued progress toward equality in academic economics will require a widespread awareness that these barriers exist, accompanied by a concerted effort to remove opportunities for bias in the hiring and promotion process. However, first steps have been slow in coming. A 2008 survey of AEA members found, in addition to substantial differences in the policy views of male and female economists, a meaningful gender gap in their beliefs on equal opportunity in the profession (May, McGarvey, and Whaples 2014). While 76 percent of female AEA members believed that opportunities for economics faculty in the US favor men, fewer than 20 percent of men shared the same view. In fact, one-third of male economists felt that opportunities in economics actually favor women. To the extent that such beliefs persist, they are a major obstacle to the development of new diversity initiatives.

Diversifying the economics profession is important, because a greater breadth of individual perspectives will affect what is taught in the classroom, what research questions are asked, and how policy discussions are addressed. In addition, to the extent that women's stalled progress in economics is the result of discrimination or biased assessment, as recent evidence suggests, continued action to remove these barriers can be justified both on the basis of simple fairness and also on the benefits of creating an environment where equal work yields equal rewards.

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