

## Variation in Women's Success Across PhD Programs in Economics

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**Abstract:** We document wide and persistent variation in women's representation and success across graduate programs in economics. Using new data on early career outcomes for recent graduates, including first job placement, publications and promotion, we rank (anonymized) departments on outcomes for women relative to men graduating from the same program. We then conduct interviews with faculty and former students from five programs with better and worse relative outcomes. We find that departments with better outcomes for women also hire more women faculty, facilitate advisor-student contact, provide collegial research seminars, and are notable for senior faculty with awareness of gender issues. We offer our qualitative evidence as the first step in learning about "what works" in expanding women's representation in economics.

In 2017, women made up 32 percent of entering PhD students in economics. The share of women in economics is below many other fields in science, technology, engineering, and mathematics, and has not increased since the 1990s (as discussed in this journal by Bayer and Rouse 2016). This paper adds new data — both quantitative and qualitative — on graduate programs in economics to understand the wide and persistent variation in women’s success across departments. We then use these insights to suggest “best practices” for department chairs, PhD admissions committees and others hoping to increase the number of women in economics.

Our quantitative data come from two sources: newly available annual surveys of graduate departments conducted by the Committee on the Status of Women in the Economics Profession (CSWEP), and our own hand-collected faculty rosters from PhD-granting economics departments in the United States from 1994 to 2017. The CSWEP survey contains information on the number of men and women graduating from each program by year, and the number of job market placements by job type and gender.<sup>1</sup> We organize our roster data to associate each faculty member with their graduation cohort and alma mater to examine other early career outcomes, such as placement rank, publications, and promotion.

The opening four sections of this paper document a number of facts. First, there was wide variation in the average share of women in the graduating classes of economics PhD programs

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<sup>1</sup> CSWEP’s data are now posted on ICPSR (Study Number 37118); we received an early copy of the data for this paper. We thank Shelley Lundberg and Margaret Levenstein for access to the data. By agreement with CSWEP, names of the institutions are suppressed.

during the past 30 years, ranging from 10 percent to more than 50 percent of the class. This variation is primarily explained by differences in initial admission, rather than differential attrition from the program. Many programs, particularly the largest ones, increased the share of women on the student body from the 1990s to the 2010s. Yet, the share of women in a PhD program tends to be a persistent attribute of a department, with a strong correlation in the gender composition of graduating classes over time.

Second, we show that departments with a greater share of women on their faculty also have more women in their student body: a 10 percentage point increase in faculty share is associated with a 2.5 percentage point increase in student share. This relationship could be causal if, for example, women on the faculty serve as role models for women students or it could reflect other departmental attributes that are attractive to both women faculty members and graduate students.

Third, we document that, on average, men and women who graduated from the same program between 1994 and 2017 are no different in their propensity to be offered and accept a faculty position at a US PhD-granting department or to be promoted to associate professor within ten years of graduation. But conditional on taking a job in a US PhD-granting economics department, men land placements at higher-ranked departments and publish more in the top journals in the first seven years after obtaining their degree.

Fourth, we rank 22 large (anonymized) programs on the gender gap in these early career outcomes. We focus on programs with sufficient data for both men and women; these 22 programs train two-thirds of the faculty at PhD programs in the US. Our ranking identifies a large variation in relative success for women across graduate programs in outcomes like job placement, publication and promotion. For example, women graduating from departments with better relative outcomes have 9 percent higher placement rates than men, while women graduating from

departments with worse relative outcomes have 8 percent lower placement rates than men. Yet, in all cases, men are more likely than women to publish in top journals, suggesting that women face a common set of impediments in their early careers regardless of their graduate institution.

This ranking across departments guided our selection of departments for a set of structured qualitative interviews, designed to learn more about variation in the mechanics and culture of graduate instruction in economics. We conducted 31 interviews with faculty members and former students at five programs — two that achieved good relative outcomes for women, two that achieved poor relative outcomes for women, and one that is in the middle of the pack. All interviews were conducted and transcribed by Leyla Mocan, a Masters in Public Policy student at the Woodrow Wilson School at Princeton. Our interviews confirm that having women on the faculty inspires women in the student body to succeed. The interviews also uncover several features of graduate programs that are associated with good relative outcomes for women: structuring the graduate program to formalize key aspects of advisor-student contact; creating a collegial atmosphere in research seminars; and developing awareness of gender issues, especially by senior male faculty. We see many of these ideas as “gender neutral,” in the sense that they would likely improve the climate of graduate instruction for all students regardless of gender. However, our interviews suggest that these reforms would likely have a disparate impact on women.

### **The Share of Women Graduating from Economics PhD Programs**

This section presents new facts about variation in the share of women in graduating classes from economics PhD programs. We limit our analysis to 88 economics departments (out of 127)

with a large enough number of entering and graduating PhD students that responded to the CSWEP survey.<sup>2</sup> We aggregate the annual data into two broader graduation cohorts: students graduating between 1994-2005 and between 2006-17. These periods divide our data in half.

Figure 1 illustrates that the share of women in the graduate student body ranges from 10 percent to more than 50 percent. The share of women in a program is a persistent attribute, with a correlation between the two time periods of 0.38 (0.45 if weighting by size of the program, and 0.53 when focusing on programs above the median size). Figure 2 shows a strong relationship between the share of women in entering first-year cohorts (1994-2012) and graduating cohorts (1999-2017). The coefficient from regressing share of women in the graduating class on share of women in the entering class cannot be statistically distinguished from one, suggesting that variation in share of women across programs is not driven by differential attrition, such as gender differences in the probability of leaving the program after failing general exams. The year groupings in this figure are selected to approximately match entering first-year cohorts with corresponding graduating classes. We assume that students take around five years to graduate but the result is robust to alternative assumptions.

### **Correlations With Observable Departmental Attributes**

Differences in the share of women graduating from PhD departments in economics are correlated with some observable characteristics of these programs. Table 1 considers the

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<sup>2</sup> We focus on schools that were above the 25<sup>th</sup> percentile in the number of entering first-year students (123) and the number of graduates (68) reported to CSWEP during the full period, and for which we have faculty rosters, to permit other analyses.

association between share of women in the graduating class and six attributes of a PhD program: its *US News* department ranking; the share of women on its faculty; the field mix of its faculty; the average size of its entering class; the share of non-US-citizen entering students, and the institution's location in a small, medium or large city.

The first six columns enter each attribute separately and the last column includes all control variables that were individually statistically significant. With 88 observations, we have limited power to detect relationships. Yet we find that the share of women in the graduating class rises in a clear way with the share of women on the faculty. The final column suggests that a 10 percentage point increase in the share of women on the faculty (roughly equivalent to the inter-quartile range) is associated with a 2.5 percentage point increase in the share of women in the graduating class. This positive association is consistent with Hale and Regev (2014), which uses retirements of men to consider exogenous changes in share of women on the faculty.

A few other departmental characteristics influence the gender composition of the student body. Programs located in a city with population greater than 150,000 have more women in the study body, as do departments further down the 2017 *US News* ranking. Faculty research field mix, program size, and the share of non-US students, as measured by the NSF *Survey of Graduate Students and Postdoctorates in Science and Engineering*, do not seem to affect gender balance. In other calculations not shown here, we also see no association between any of these department attributes and the relative placement rates of women.<sup>3</sup>

To measure gender and field composition of faculty, we compile data on academic rosters across economics departments from three sources: the *Prentice Hall Guide to Economics Faculty*,

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<sup>3</sup> Neumark and Gardecki (1998) and Hilmer and Hilmer (2007) likewise find no positive association in the late 1970s through early 1990s between the share of women on the faculty and students' early career outcomes.

published in seven editions between 1994 and 2006; departmental and faculty webpages accessed using the Wayback Machine ([www.archive.org](http://www.archive.org)); and the 1989 and 1993 AEA biographical surveys of members. More details on construction of the faculty roster are available in Langan (2018).

## **Early Career Outcomes by Gender**

We now turn to examining differences in early career outcomes of recent economics PhDs by gender. We calculate a set of relative ratios for men and women graduating from the same programs for outcomes like academic placement, placement rank, and so on. We then ask in the next section how those ratios vary across departments. Here, we start by identifying two average tendencies: First, women and men who graduated from the same department are equally likely to place into US doctoral departments. But second, conditional on receiving an academic placement, women place into lower-ranked departments and publish fewer papers in the first seven years of their career.

Figure 3 graphs the job placement rate by gender for graduates of the 88 PhD programs in our core sample from 1994 to 2017. We consider five placement categories: faculty jobs in US PhD-granting departments, other US academic jobs, US private sector jobs, US public sector jobs, and jobs outside of the US. The p-values under each panel refer to the null hypothesis that rates of placement are equal for men and women. We find *no* statistically significant difference in the average placement rate of men and women graduates from the same department into faculty jobs in US PhD granting institutions, as shown in the first panel. In contrast, women are more likely to accept other US academic jobs, and men are more likely to take jobs outside of the United States.

To develop more detailed early career outcome measures, we move from CSWEP's job placement data to our faculty rosters. We create ratios of men and women who graduated from each department by associating each faculty member in our roster with their department of graduate instruction. For example, we observe one of our co-authors, Leah Boustan, in her first job placement in the UCLA Department of Economics in 2006, but we associate her outcomes (including her placement at UCLA) to her graduation cohort at Harvard University. We use the reshaped roster to define additional outcomes for 22 departments with at least ten women placed into PhD-granting economics departments in order to calculate reasonable averages. Because our rosters include only academic economics departments and not, for instance, business, public policy, or resource economics programs, they constitute only a subset of the CSWEP placements, but the two placement rates are highly correlated overall, and by gender (correlation = 0.75).

Figure 4 compares a set of early career outcomes for men and women who graduated from each of the 22 departments. Men place at departments ranked higher by *US News* and have more publications within their first seven years of graduation. The average gap in placement rank between men and women graduates of the same program is 4.8 rank points (Figure 4a).<sup>4</sup> Figures 4b and 4c show that men publish more papers in Top 5 or Top 55 economics journals within seven years of graduation; publications are culled from the table of contents data provided by journals to *RePEc*. The average gap in Top 55 publications between men and women graduates of the same program is 0.58.<sup>5</sup> Figure 4d shows that women are marginally less likely to be promoted to

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<sup>4</sup> To be consistent with the other outcomes, we graph (100 – rank) so that “better” outcomes lie farther away from the origin. Programs not ranked by *US News* are assigned a rank of 100.

<sup>5</sup> The relative publication records of men and women in our sample is consistent with Antecol et al. (2017) and Sarsons (2017) for economics, and with broader results across fields summarized in Ceci et al. (2014). For additional work on gender and publication in economics, see Blank (1991), McDowell, Singell and Stater (2006), Abrevaya and Hamermesh (2012), Bransch and Kvasnicka (2017) and Hengel (2018).

associate or full professor at a PhD-granting economics department within ten years of graduation, relative to men from their alma mater.<sup>6</sup> Balanced promotion rates by gender could arise if men publish more than women but also face a higher publication bar for tenure, given their higher-ranked first placement.

### **Documenting Differences in Relative Outcomes for Women Across Departments**

We are particularly interested in documenting the variation across departments in relative outcomes for women, including graduation rates, placement into an academic job, and later research performance. In Table 2 we rank 22 anonymized graduate programs from A, the department with the best outcomes for women graduate students, relative to men in their programs, to V, the department with the worst relative outcomes. The ranking is derived by converting each of the outcomes into a z-score and then calculating the mean z-score across outcomes for each department; details are presented in Appendix A.

Average outcomes for three ranked categories (better, neutral, worse) are reported in the last three rows of the table. Across these categories, women make up a similar share of the student body (28 to 30 percent) and first-year students are equally likely to graduate from the program, regardless of gender. Differences arise at the job placement and assistant professor stages: at programs that are relatively better for women, women have 9 percent higher academic placement rates than men, placement ranks that are nearly identical to men in their program, and marginally lower numbers of top 55 publications. At programs that are relatively worse for women, women

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<sup>6</sup> Ginther and Kahn (2004, 2015) find that men are more likely than women to receive tenure in economics, controlling for year of graduation and institutional quality of alma mater.

have 8 percent lower academic placement rates than men, place into substantially lower-ranked departments, and publish approximately 30 percent fewer papers in a top 55 journal.

Check marks indicate the departments that were in the top 10 percent or top 25 percent of any given outcome (out of 22 departments), and Xs indicate the departments that were in the bottom 10 or 25 percent. Departments that have better relative outcomes for women on average are not *necessarily* better across the board. Even the best departments by our rankings have some poor relative outcomes for women (for example, department C has low promotion rates), and even the worst departments have some good relative outcomes for women (department T places women at highly-ranked departments relative to men).

### **Interviews about Why Some Departments Have Better Relative Outcomes for Women**

Why are relative outcomes for women graduate students better at some departments than at others? One natural approach to answer this question as empirical economists might have been to gather systematic data about each department (perhaps by conducting a survey) and then performing a quantitative analysis to determine which attributes of a program predict success for women. However, we only have complete outcome variables for 22 programs and we do not have a clear *a priori* sense of which explanatory variables may matter, nor how to measure them.

Instead, we conducted a series of exploratory interviews. We selected six departments to include in our interview sample: two departments with better than average outcomes (departments B and C), two departments with worse than average outcomes for women (departments O and T), and two departments in the middle of the group (departments F and K). For each of these departments, we started by contacting the current department chair for a short interview. From

there, we developed a snowball sample, asking the chair for a few names of faculty members and former students to reach out to next. In the end, we spoke with six or seven graduates or faculty from five departments, primarily in June and July 2018. Due to idiosyncratic scheduling difficulties we dropped one department (Department F) from the sample. Otherwise, we had a 91 percent response rate for all interview subjects contacted. Our interview subjects were 55 percent women and 45 percent men. Interviews ranged from 8 to 45 minutes, with the typical conversation lasting 15 minutes.

Each interview consisted of nine questions. We asked respondents to describe student contact with advisors, seminar culture and job market preparation, and also included open-ended questions about women in economics; we report the standard interview script in Appendix B. All interview subjects were told that their answers would be confidential. In our discussion of qualitative patterns, we suppress all names of individuals and of institutions, and we redact a few details to prevent department or subject identification.

From the interview responses, we observe a series of differences between departments with better and worse relative outcomes for women that are worth keeping in mind for departments interested in improving gender diversity or balance in outcomes for their members. The departments with the best relative outcomes tended to have a commitment to hiring women onto the faculty; regular and transparent processes for student-advisor contact; a more collegial seminar culture; and a stronger general awareness of gender issues among senior faculty. Many of these departmental policies would be helpful for all students, but our interviews suggest that they may also help to narrow gender gaps. In the remainder of this section, we have organized a series of representative quotations from our interviews, emphasizing points of difference along these

dimensions between departments with better and worse relative outcomes for women graduate students.

### *Women on the Faculty*

One obvious difference between departments with better and worse relative outcomes for women is their commitment to and success in hiring women on the faculty. Students trained at Departments B and C talked about how valuable it was to have been taught by women faculty, and to have informal interaction with women faculty outside of the classroom. A former student from Department C said: “Every semester we always had one female teaching us in the core first year classes. Starting with that introduction to graduate department made me feel like ‘I can do this and be a woman.’”<sup>7</sup> A faculty member at Department C agreed, touting the value of the “women in economics group, female faculty who have lunches and dinners and coffees with female graduate students, a group that has been around as long as I can remember.” One faculty member from Department B described how the program was able to build up a group of women faculty, emphasizing that “our dean puts a lot of emphasis on diversity. It could even amount to an extra position if we come up with an additional excellent female candidate.”

In contrast, interviewees from departments with worse outcomes for women graduate students noted – and often lamented – their historical lack of representation of women on the faculty. These departments were only recently beginning to prioritize hiring women or had limited plans to do so. At our median Department K, the faculty were concerned about how their historical lack of women faculty affected their graduate students. One faculty member said, “well it starts

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<sup>7</sup> Throughout the paper, we use the terms “men and women” instead of “male and female” when discussing gender in order to emphasize that gender identity is a social phenomenon. However, we leave the quotations from our interview subjects as stated.

with hiring. I've seen over the years that role models are incredibly important. I know that in our [redacted] field, for example, we currently have five faculty members who are all male. And I think we are all nice guys and inviting and encouraging and try to be gender neutral, yet whenever we have a female [visitor or speaker], women graduate students flock to her much more readily, there's a comfort level and a role model that's very important." A faculty member at Department T concurs, relaying: "I have a student who is a woman who graduated maybe ten years ago... she thinks her experience would have been better if there were more senior female faculty, that she would have felt more comfortable... So we're working on that, we make offers, but like everyone else in the senior market it's really tough... it's hard to get acceptances." Unlike Departments B and C (and even Department K), Department T has not made an intentional effort to hire women. Instead, the chair simply tries to ensure that women are not overlooked on the job market, saying: "I look at the women we didn't fly out and I want to make sure that they're not better than the worst men that we fly out... [We] pay attention to see if we're gender neutral, at least in our junior hiring."

Hiring women on the faculty strikes us as a concrete and low cost approach to creating a productive learning environment that might encourage women to enroll in the graduate program. Our interview subjects also articulated clear mechanisms whereby women on the faculty might benefit graduate students by serving as role models and mentors.

### *Advisor Contact*

In many other disciplines in the sciences and the humanities, prospective PhD students apply to work with a particular faculty member before admission. In economics, it is typical for prospective students to apply to the department as a whole without specifying intended field. All

of the programs in our interview set have a decentralized process for second- or third-year students to select dissertation advisors. Many students reported approaching faculty with whom they took a course in the first year core or in second year field courses. This student's experience at Department O is typical of the haphazard search process: "I got [Faculty Member X as my advisor] just by talking a lot in class and by doing reasonably well... that distinguished me and made me seen as a relatively attractive person to work with."

Students and faculty speculated that the current *laissez faire* approach can be intimidating for many students. It may be particularly hard for students who are in the minority in economics departments (including women) who may fear the actual or perceived skepticism of faculty. One student at Department C reported: "I think there was some implicit bias. I remember in the first year of the PhD program, I got [a high score on a core exam]... and my husband did not do particularly well in the course. But I remember the professor who was teaching the course reached out to my husband and tried to encourage him to go into [the field] and didn't say anything to me."

One feature that distinguished departments with better relative outcomes for women was the mandatory and regular nature of student works-in-progress seminars — that is, public venues for fourth- and fifth-year students to present new research and gather comments from a group of committed faculty. According to a student from Department C, "you would actually enroll in a course that was your lunchtime workshop, you were required to attend and present at least once a quarter. The faculty were really good about going to those things. They came regularly, and they would give you comments."

In contrast, at the departments with worse relative outcomes for women in our sample, works-in-progress seminars are offered for student research presentations, but students are not required to attend. As one faculty member describes the process, "[Department T] doesn't have...

a centralized policy around making sure everyone presented once or twice a year... There are certainly students who aren't going to any lunch, or if they are going they are not presenting. We don't do record keeping." Another faculty member agrees, saying that "one or two students get almost completely lost, they don't make appointments with advisors, and their advisors don't reach out... There are some students who are not into getting advice very much, unless they're a genius and come up with some fantastic thing, they tend to get lost."

Offering regular public venues for student feedback may be especially important for women, who mentioned off-campus advising settings in which they felt uncomfortable or to which they were not invited. This concern arose at departments of all levels on our ranking. One student from Department B described how "one senior male faculty was known for having these weekly 'salons.' He would take a bunch of students out to a bar. A bunch of students would go, it routinely felt like an old boys' club... I know one woman who went, but I wouldn't have felt comfortable." A student from Department C reported that she missed advising opportunities because of her gender: "[My advisor] would often take graduate students for beers, and he would take the men one on one. When I was first working with him, he said 'we should just meet in the office, we shouldn't get a beer, it could be misconstrued or you might feel I'm taking advantage of you.' So, either my husband would have to tag along, which was really boring for him, or another male graduate student would have to come, but I wouldn't get as much one-on-one attention."

Given the highly decentralized nature of the advising process in economics, we think that all departments have some room to experiment with developing more formalized points of student-advisor contact. One of our interview departments recently established a procedure to match incoming first-year students with a faculty mentor to address the unique challenges of the first-year program. Another department is experimenting with third-year research advising groups,

wherein students are paired with field-specific faculty members. The chair of this department acknowledges that “before, it was all decentralized, students just had to reach out” and expressed hope for the new structure. Other departments have instituted regular faculty meetings to assess student progress and ensure that no students are falling between the cracks. One model for how to regularize the various steps of graduate training is the recent and widespread efforts to formalize the process of preparation for the job market – including holding information sessions, conducting mock interviews, designating a faculty member to be placement coordinator, and so on.

### *Seminar Culture*

Another theme that emerged from our interviews is that departments with better relative outcomes for women are reported to have a less aggressive and more constructive climate in their research seminars. A faculty member at Department B portrayed seminars as “not enormously aggressive... we don’t take someone apart for the sake of taking them apart.” A student from Department C had a similar impression. “Like most economics departments, [the seminar] was aggressive, but it wasn’t as aggressive as some I’ve been to. You would get through your first few slides without being asked ‘why did you choose this title? This is stupid.’ Especially with the graduate students. They would ask questions more gently like ‘don’t you think that this would be a problem with identification?’ Compared to ‘this is not how to identify it.’ But they wouldn’t sit and let you make mistakes.”

Two of the three departments with worse outcomes for women were noted for having aggressive seminar styles. A faculty member from Department K said that “the word that comes to mind is combative, perhaps aggressive. People start to talk about their work and much of their audience seems to think it’s their job to find the faults and tear it all down.” A student trained at

Department O recalled that seminars were “fiercely competitive.” On the other hand, Department T was described as having seminars that are “pretty polite.”

Unlike new hiring or a reorganization of the graduate program, working toward a more supportive seminar culture is an action that individual faculty members can take on their own, without the need to create consensus at the departmental level. One idea is to save some comments on student work for a short private meeting held after the public seminar. Meeting one-on-one after the seminar can help students take stock of the various suggestions and prioritize which next steps are most important without the immediate pressures of a presentation.

We are agnostic about why some of the specific policies described here, including developing a more supportive seminar culture, might be particularly helpful for women students. Interview subjects mentioned the possibility that women are more averse to competitive environments, more likely to take harsh feedback personally, more likely to be left out of informal (“old boys”) networks, and so on. There is observational and experimental evidence for some of these channels (for example, see Goldin 2015 on differential response by gender to receiving low grades as undergraduates), and others channels would be interesting subjects for future study.

### *Awareness of Gender Bias*

A final difference that we noticed between departments with better and worse relative outcomes for women was an awareness of gender bias, particularly in its more subtle and implicit forms, among the senior male faculty who often make up the majority of leadership positions in a department. Awareness of gender bias may influence how these senior faculty interact with women in their classes and in their advisory roles on a day-to-day basis. Moreover, we noticed that senior faculty with more cognizance of gender bias react differently to incidents of harassment (which,

although rare, were mentioned at three of our five interview departments). One woman made this point quite succinctly, saying “my personal view is that a lot of it has to come from the men, [the field is] still very male dominated, so until the men are comfortable nothing much good is going to happen for the women.”

Differences in awareness of gender bias were most obvious in responses to the interview question “do you see any difference in the [graduate department] environment for men and women?” Faculty at departments with better relative outcomes for women responded to the question in more observant and thoughtful ways. A senior faculty member at Department K was typical of this view in saying: “I’m confident that there is no explicit discrimination but perhaps what is happening is more subtle or subconscious ... The same behaviors in a man say he’s forceful and defends his ideas; he’s aggressive in a good way. Those same behaviors when taken by women tend to get a different reaction in a subtle kind of way.”

In contrast, faculty members at Departments O and T focused exclusively on the lack of *overt* discrimination against women students and did not seem aware of (or to put much credence in) the subtle differences in the way men and women experience the culture of the field. A professor at Department O said “I’m not aware of people explicitly treating anyone different in one way or another [by gender], at least from faculty perspective. I can’t – I’m not aware of any specific instances to that effect. As far as I can tell, nothing that I can think of comes to mind.” A male faculty member from Department T answered similarly, reporting that he talked to graduate students and never heard complaints about poor treatment of women students. “I’m still a little perplexed about this,” he said. “I ask graduate students what the atmosphere is like for them, and I never hear about any problem of them being harassed in the kind of extreme form, but even in more subtle ways. My sense, and I acknowledge that I might be misreading, is that women in the

department are treated well. That's my sense but I'm suspicious about if I'm gathering information correctly."

Differences in awareness of gender issues can have important consequences in how department leadership respond to instances of harassment in a learning environment, which were mentioned at three of the five departments that we profiled. By harassment, we do not mean individual cases of unwanted sexual attention, although this may also happen. Instead, we heard about intentional attempts on the part of one or more men in the student body to make women graduate students feel unwelcome. These instances of harassment, while certainly not the norm, did occur across the board. We also noticed clear differences in how the faculty at each department responded to such events. In each case, administrators condemned the harassment and sought to punish the individuals responsible, but the responses differed in whether further action was taken to change the underlying culture or institutions that contributed to the problem.

At Department C, the faculty considered the event to be outside of the norm and immediately searched for an underlying cause, which they then acted to remedy. A faculty member at Department C tells this story: "We actually had an incident [recently] that I think was unusual, [details redacted]. One thing we realized is that we had [a new admissions director] for the last couple of years, and [...] we had ended up with a couple of classes with way too few women students. Maybe only 20 percent, rather than [our usual] much higher figure. And so, the chair basically leaned on the person in charge of admissions that we had to have a lot more women, and our entering class this year is 50-50, which is the first time it's been so high. We're hoping that means it won't happen again, if you have more women even guys who think like that will feel pressured not to act. That was the first time that we had anything like that in all the years I've been

here, and I was really pleased that the Chair really got on it and pressured the admissions chair rather than ignoring it.”

At Departments K and T, instead, the harassing behavior itself was condemned but there was no further action to assess and perhaps adjust the culture. A faculty member at Department T described an instance of harassment and the departmental response: “We’ve had problems in the past. For example, there were some men [engaging in redacted activities], which is an extreme form of harassment ... In those cases, the chair went nuts. No one could figure out who was doing it, but they warned that they would be thrown out of the university if this happened again. I believe it has not happened anymore.” According to a student trained at Department K, a similar reaction occurred there in response to one individual’s harassing actions. “The Chair tried to make some statement the next year, held a meeting at the beginning of the year for all PhD students, and said that there had been [harassing behavior], people saying things about women that you shouldn’t say because you could hurt someone’s feelings.”

We acknowledge that improving awareness of gender bias—in oneself and one’s environment—is an amorphous recommendation, and hard to convert into direct action. Self-reflection, questioning one’s assumptions, and striving to learn more about the experiences of others are habits worth cultivating for any individual and especially academics. Empathy is a human virtue, and a scholarly one too. On an organizational level, attention and sensitivity to diverse perspectives in a department should be considered when making departmental leadership decisions.

## **Conclusions**

We document substantial variation in the representation of women and in the early career success of women across economics PhD programs. We provide suggestive evidence, based on a set of structured interviews, that there are large differences in culture and practices across graduate programs in economics; these differences are associated with better and worse relative outcomes for women. Important differences across departments include the number of women on the faculty, regularized opportunities for contact between advisors and students, and collegial research seminars.

Of course, such qualitative observations are only the beginning of establishing hypotheses about “what works” in increasing the representation of women in economics. We encourage other scholars to test the hypotheses suggested by this paper in more detail. In addition, it would be interesting to know whether prospective graduate students consider the types of factors underlying these rankings when selecting departments. If so, the association between share of women in the graduate program and positive early career outcomes could be, in part, due to students’ choices in where to matriculate.

Typical studies of the underrepresentation of women in scientific and technical fields focus on early educational experiences (e.g., differential treatment in high school courses by gender) or on the job market and in academic workplaces (see, for example, Ceci et al. 2014). These emphases, while certainly important, overlook the potentially central role of the learning environment in graduate school. To the extent that the culture and policies of a graduate program matter, there may be meaningful steps that we can all take to encourage and support women in economics. We hope that our findings will help to inform ongoing discussions – or to initiate new ones – in departments seeking to ensure the best opportunities and outcomes for all their graduates.

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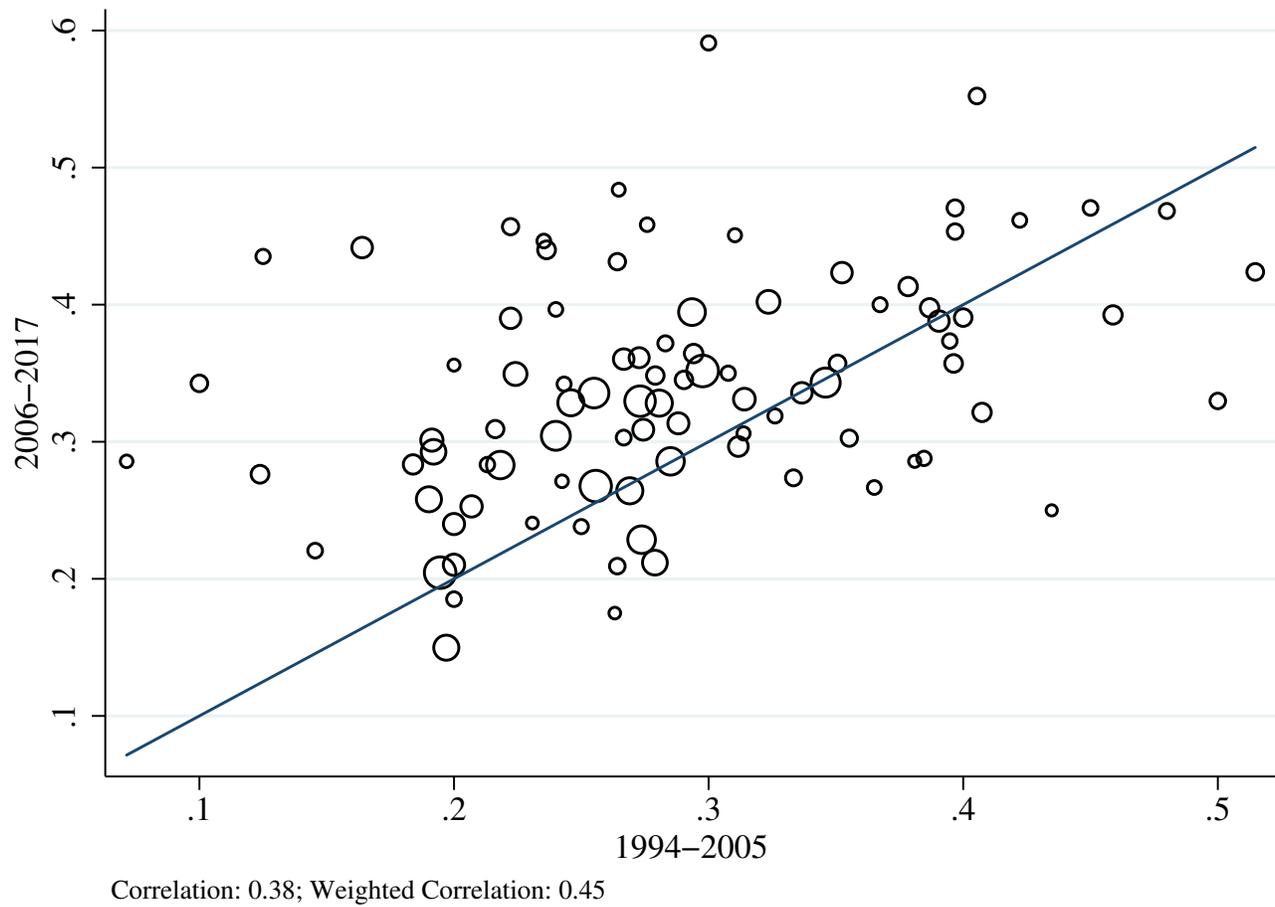
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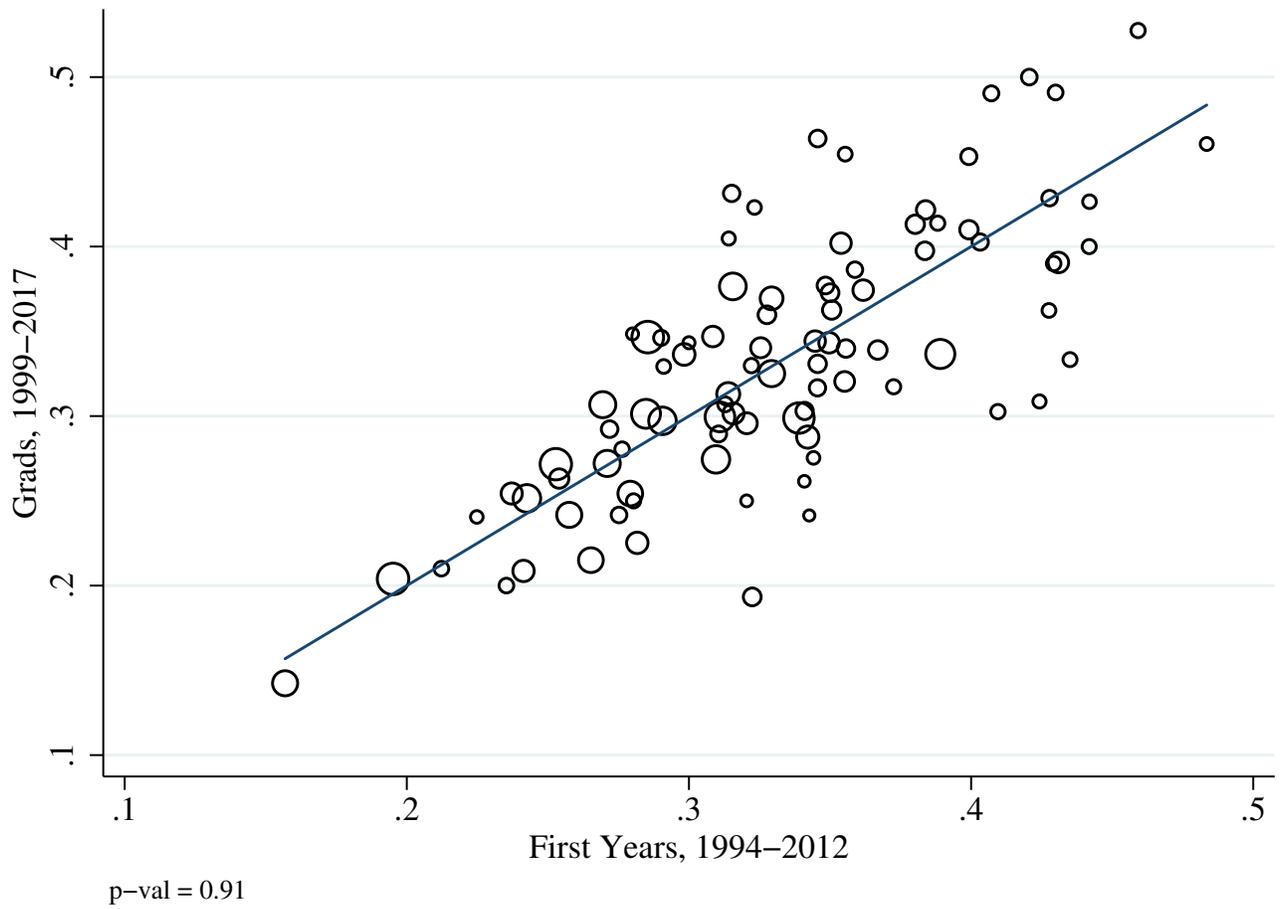
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Figure 1: Share Women PhD Recipients by Department: 1994 – 2005 vs 2006 – 2017



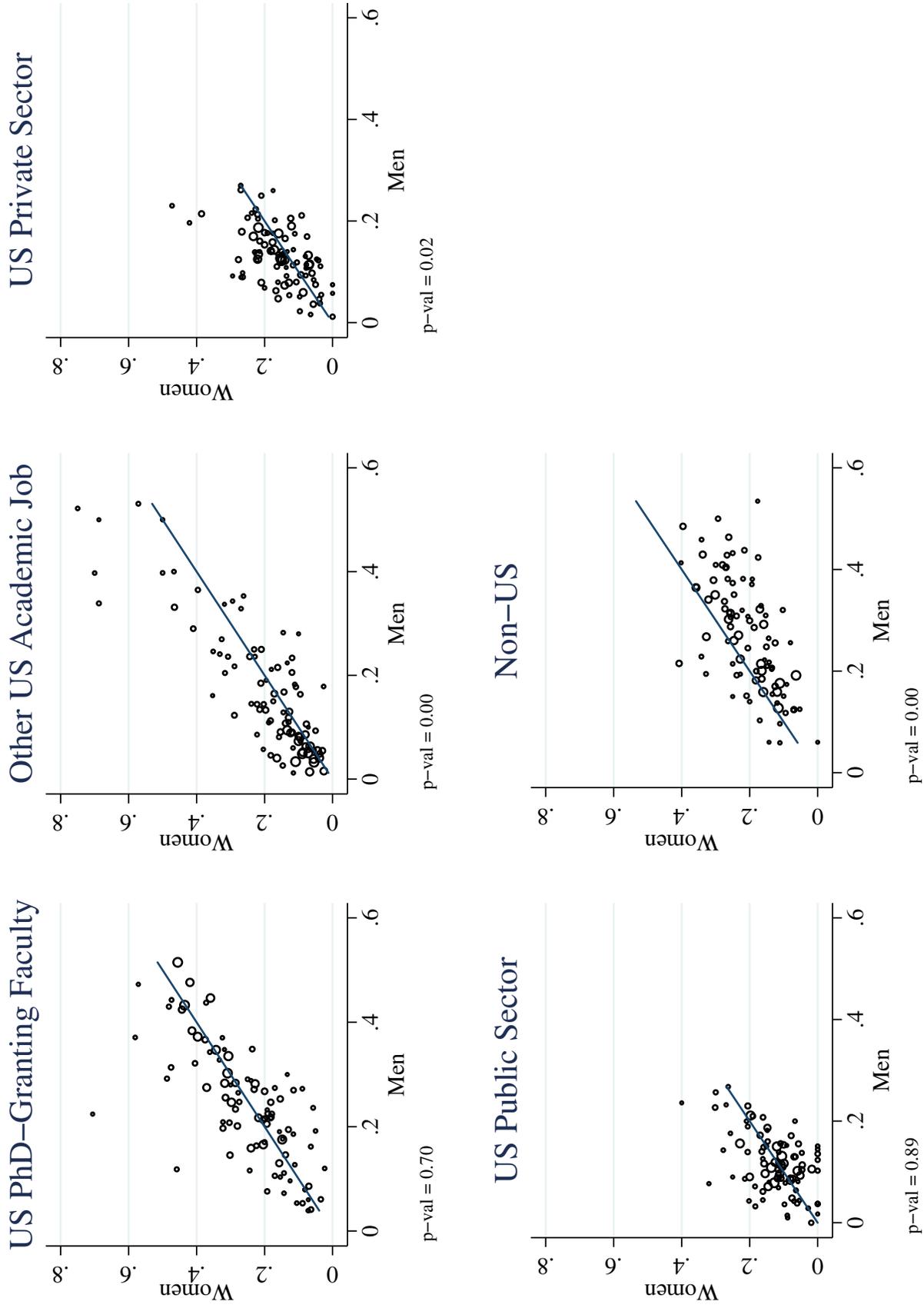
This figure plots women's share of economics PhD recipients from 2006 to 2017 against their share from 1994 to 2005, by department. Points are weighted by the total number of graduates over the entire period per school. We exclude years with imputed counts of PhD graduates and large outliers from department totals. Source: CSWEP department survey.

Figure 2: Share Women, PhD Recipients vs. First Years, by Department, Entering Classes of 1994-2012



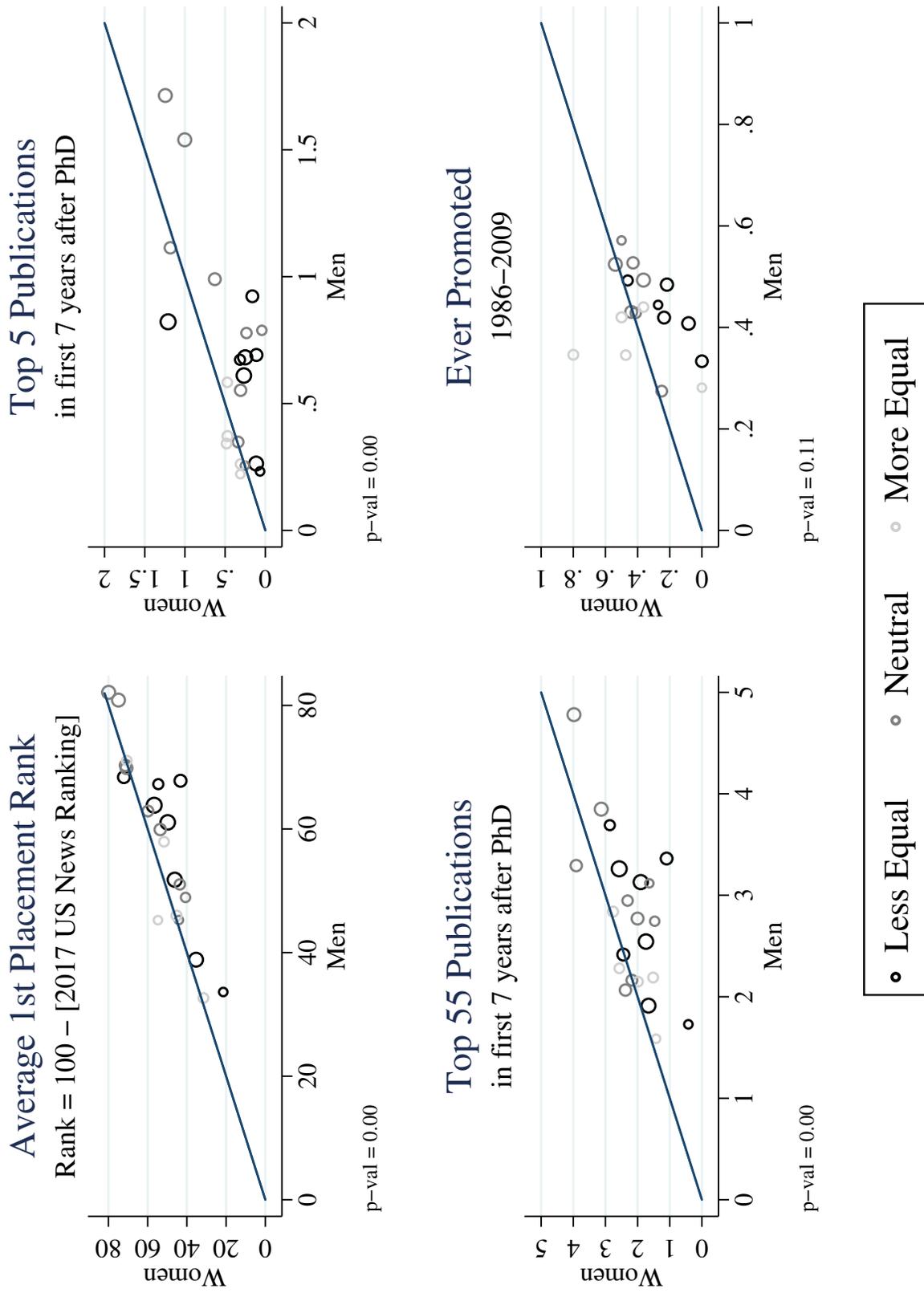
This figure plots women's share of economics PhD recipients from 1999 to 2017 against their share of first-year students from 1994 to 2012, by department. The p-value shown is taken from a t-test of the null hypothesis that the share of women is equal in the two groups within department. Points are weighted by the total number of graduates over the entire period per school. We exclude years with imputed counts of PhD graduates or first-years and large outliers from department totals. Source: CSWEP department survey.

Figure 3: Job Placement Rates by Gender and Department, Five Sectors



This figure plots women's versus men's rate of placement into five types of job, for economics PhD recipients in 1994-2017, by department. The p-values shown refer to a test of the null hypothesis that placement rates for a given job type are equal for men and women. "US PhD-Granting Faculty" refers to tenure-track faculty jobs in a department that awards doctoral degrees. Points are weighted by the total number of graduates over the entire period per school. We exclude years with imputed counts of PhD graduates or academic placements at PhD granting institutions and large outliers from department totals. Source: CSWEP department survey.

Figure 4: Post-Graduation Outcomes for Men and Women, PhD Economists by Graduate Department



This figure plots women's average outcome against men's for four early-career outcomes. We focus on PhD graduates from 22 large US economics programs, for which we can identify at least 10 women who place into a US economics doctoral program between the 1987 and 2017 graduating cohorts (or, in the case of promotion, 18 programs with 10 women placed between 1987 and 2010). In the top left, we plot the average 2017 *US News and World Report* rank for the first economics department where individuals place after graduation. Doctoral programs not ranked by *US News* are assigned rank 100, and then we replace rank with 100-rank, so that "better" outcomes lie up and to the right graphically. In the top right, we plot the average number of publications for men vs women graduates in a top 5 journal (*American Economic Review* (excluding Papers and Proceedings), *Quarterly Journal of Economics*, *Econometrica*, *Journal of Political Economy*, and *Review of Economic Studies*). In the bottom left, we plot publications in journals ranked 55 or better in the *RePEc* aggregate journal rankings as of January 4, 2018. (We chose 55 instead of 50 schools to achieve better representation of top field journals.) For both top 5 and top 55, total publications are predicted for post-2010 graduates with at least one publication. In the bottom right, we plot the share of men and women ever observed as an associate or full professor in our faculty rosters within 10 years after receiving their PhD. The p-values are taken from a t-test of the null hypothesis that men and women's average outcomes are equal within school. Points are weighted by the total number of graduates over the entire period per school. Source: Faculty rosters, Langan (2018).

Table 1: Effect of Department Characteristics on Share Women in Graduating Class, Economics PhDs

Dept. Characteristics	Mean	Share Women Graduates						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rank 11-20	0.102	0.024 (0.034)						0.035 (0.034)
Rank 21-30	0.159	0.049 (0.031)						0.060* (0.032)
Rank 31+	0.625	0.080*** (0.025)						0.079** (0.036)
Faculty Share Women	0.156		0.409*** (0.127)					0.245* (0.130)
Share Appl Micro	0.389			0.231 (0.257)				
Share Theory	0.228			-0.090 (0.254)				
Share Macro	0.252			0.007 (0.258)				
Avg Cohort Size	15.961				-0.003** (0.001)			0.000 (0.002)
Share Foreign Entrant	0.472					-0.006 (0.061)		
Medium City	0.375						0.032 (0.020)	0.023 (0.019)
Large City	0.330						0.037* (0.021)	0.050** (0.021)
Constant		0.272*** 0.023	0.268*** 0.021	0.261 0.191	0.383*** 0.021	0.335*** 0.030	0.308*** 0.015	0.214*** 0.056
Obs.		88	88	88	88	88	88	88
R <sup>2</sup>		0.136	0.108	0.027	0.073	0.000	0.042	0.243

This figure reports the result of regressing women’s share of PhD recipients from economics departments on various department characteristics. The sample includes 88 departments that responded to the CSWEP survey, exceeded the 25th percentile of both the number of entering and graduating students among respondents, and for which we have departmental rosters available from Langan (2018). Economics department rank comes from the 2017 edition of *US News and World Report*. Faculty share women and average cohort size come from 1994-2016 CSWEP responses. Field composition is obtained from our academic roster (Langan, 2018) by counting total person-years in the department by individuals’ stated fields, using JEL codes from the 1997 AEA members survey, the *Prentice Hall Guide to Economics Faculty, 1994-2006*, and keyword matching from statements on individual and department websites. Share of foreign first year students comes from 1994-2017 department responses to the NSF *Survey of Graduate Students and Postdoctorates in Science and Engineering*. Column 6 regresses share women on the size of the city in which the department is located: the top 15 metro areas are considered “large” and smaller areas with more than 150,000 population are considered “medium.” When calculating women’s share of graduates from each department in the CSWEP survey data we drop department-year observations with imputed values for graduates or academic placements at PhD granting institutions and large outlier values.

Table 2: Comparative Success of Women by Program

Group	ID	Share Women	$\Delta$ Share Women	Retention	Plcmt at PhD	Plcmt Rank	Top 55	Top 5	Promotion
Best relative outcomes for women	A	✓		✗	✓✓		✓	✓✓	
	B		✓	✓	✗			✓	✓✓
	C		✓✓			✓✓		✓	✗
Better relative outcomes	D				✓			✓	✓
	E		✓	✓✓		✓			✓
Neutral	F		✗				✓		
	G			✓✓					
	H	✓					✗		
	I					✓			
	J			✗✗		✓	✓✓		
	K	✗	✗			✗	✓✓		
	L				✓	✓	✗	✗✗	
M	✗							✓	
N			✓		✓✓		✗		
Worse relative outcomes	O	✗✗						✓✓	✗
	P						✗		
	Q	✓✓	✓✓	✓	✗✗	✗✗	✗✗	✗	
	R	✓		✗		✗			✗
S	✓✓	✗	✗		✗			✗	
Worst relative outcomes	T	✗✗	✗✗			✗✗	✓	✗✗	
	U	✗			✗✗	✗			
	V		✗✗	✗✗		✓✓	✗✗	✗	
Better & Best	(A-E)	0.30	1.28	1.02	1.09	1.01	0.92	1.21	1.14
Neutral	(F-N)	0.28	1.13	1.01	1.08	0.94	0.84	0.66	0.91
Worse & Worst	(O-V)	0.28	1.14	0.99	0.92	0.83	0.66	0.47	0.46
✓✓: Top 10 Percent ✓:Top 25 Percent ✗: Bottom 25 Percent ✗✗: Bottom 10 Percent									

This table ranks 22 programs for which we can identify at least 10 women graduates who placed into an economics doctoral program from 1987 to 2017. The ranking is conducted according to relative student outcomes for women versus men. Details for the ranking procedure are in Appendix A. Icons represent a school's position in the distribution of each statistic, with averages by group in the lowest three rows. Share women is the fraction of first year women over all first year students for the whole period. For other statistics, programs are ranked on relative rates, where a value greater than 1 reflects women outperforming men (or positive growth in the case of  $\Delta$  share women).  $\Delta$  share women reports share women graduates (women graduates divided by total graduates) from 2006-2017 divided by share women graduates from 1993-2005 (see Figure 1). "Retention" is the share women graduates from 1999-2017 divided by share women first year students from 1994-2012. This statistic compares the gender ratio at entrance and graduation, allowing 5 years for matriculation. Placement at PhD is US doctoral placement from CSWEP, as defined for Figure 3. Placement rank, Top 55, Top 5, and Promotion are as defined for Figure 4.

## Appendix A: Ranking Methodology for Table 2

To sort PhD programs according to women's success compared to men's, we used eight metrics for each department:

- 1) Share women: the share of all first-years in the department, from 1994-2012, who are women.
- 2) Change in share women: the percent change in the share of women among departmental PhD graduates from 1994-2005 to 2006-2017.
- 3) Retention: the share of women among graduates from 1999-2017 over the share of women among first year students from 1994-2012.
- 4) Doctoral Placement: women's placement rate, relative to men's, into tenure-track faculty roles in any PhD-granting department .
- 5) Placement Rank: the average *US News* rank for women's economics doctoral placements, relative to men's placements from the department. For consistency of sign with other metrics, we replace rank with  $100 - (\text{US News rank})$ , so that the "best" programs are ranked 99. Programs without a *US News* ranking are assigned a value of zero on this scale.
- 6) Top 55: the ratio between women's and men's average number of publications in top 55 journals within seven years after graduating with a PhD.
- 7) Top 5: the ratio between women's and men's average number of publications in top 5 journals within 7 years after graduating with a PhD.
- 8) Promotion: the relative probability that a woman, compared to a man, who graduated from the program before 2011 is observed as an associate or full professor within 12 years after receiving her/his PhD.

We then converted each of these relative rates into z-scores with respect to the distribution of 22 schools, and calculated the mean z-score over the eight metrics. (For the four schools where fewer than 10 women graduate before 2011, we treat the promotion measure as missing.) We first looked for jumps in the mean z-scores to establish natural groupings. On the "less equal" side of the distribution, there were two large jumps of .2 standard deviations each. These served as natural division points into the "less equal" ( $<-.2$  SDs) and "least equal" ( $<-.5$  SDs) groups. There were fewer large shifts in the "more equal" side of the distribution, so we identified smaller shifts in the same vicinity as the "less equal" thresholds. After sorting the PhD programs into one of the five categories, we assigned anonymous IDs from A-V based on the average z-score, with A being the highest.

## Appendix B: Interview script

Hi, is this XX?

Hi XX, My name is Leyla Mocan and I'm a research assistant working with Professor Boustan at Princeton on a project about women in economics for the Journal of Economic Perspectives. How are you? We are talking to several departments and trying to learn more about the outcomes and experiences of men and women in graduate school. We were hoping to talk to you to learn more about the experience of students in your PhD Program. All of your comments will be anonymous, and we will not disclose your department either. Do you have any questions before we start? [pause]

- To start, could you tell me a bit about the graduate program? Do most students who start the program end up graduating with a PhD?
  - Follow up: Are all students guaranteed funding or is the funding competitive?
- How do students first get connected with their advisors? When does this match tend to take place (first year, second year, after)?
- How frequent would you say the average students' contact with their advisor is? Do students tend to meet with their advisors weekly or monthly, or more sporadically?
- Are their regular seminars or workshops for students to interact with faculty?
  - What is the seminar culture like?
- What is the classroom culture like?
- What is job market preparation process like for the average student?
  - Is the process very structured or professionalized?
- What do you think is distinctive about your graduate program? What sets it apart?
- Is the department doing anything specific to address the special challenges faced by women in economics?
  - Do you see any difference in the environment for men and women?
- Is there anyone else who I should talk to?
  - Specifically, we were hoping to talk to two additional people to get a deeper sense of your department: one would be a faculty member (or former faculty member) who can offer a long-run perspective, and another would be a graduate of the PhD program, preferably from before 2010, again so that person would have a longer-run perspective.