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Using Longitudinal Data to Explore the Gender Gap for Academic Economists[†]

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The 2018 American Economic Association Professional Climate Survey showed that women are less satisfied with the economics climate and more likely to experience discrimination (Allgood et al. 2019). This gendered experience has serious consequences. Less than one in three newly hired assistant professors are women (Lundberg and Stearns 2019), and women constituted less than 15 percent of full professors at research universities in 2019 (Chevalier 2019). Recent studies show that this gender imbalance has important implications for audience behavior in seminar presentations (Dupas et al. 2020), the frequency of seminar presentations (Doleac, Hengel, and Pancotti 2020), citation rates (Koffi 2019), credit for coauthorship (Sarsons 2017), and the publication process (Card et al. 2020).

Not surprisingly, recent studies also document gender gaps in initial job placement (Chevalier 2019), job mobility (Hilmer and Hilmer 2010), and earnings (Li and Koedel 2017). While Li and Koedel (2017) reveal a significant gender wage gap in a 2015 cross section of selective public universities, as do Carlin et al. (2013) for a single midwestern university, other studies find minimal or no evidence of a gender pay gap in more specialized settings. For example, Formby, Gunther, and Sakano (1993) and Formby and Hoover (2002) find a negligible gender pay gap for entry-level economists hired at four-year universities. Ragan, Warren, and Bratsberg (1999) estimate minimal salary differences between comparable men and women in a 1974–1996 panel of 176 faculty members at five midwestern universities. More recently, Bian and Kong (2020) also find little evidence of a gender pay gap using publicly available salaries of tenure-track economists at top-50 public institutions in the United States, and Taylor, Cortes, and Hearn (2019) find no evidence of a gender pay gap among economists in schools of public affairs. Note, however, that all existing research relies on cross-sectional data, short early career panels, or panels specific to a narrow set of institutions.

We contribute to this literature by constructing a panel of academic economists employed in top-50 economics departments at public universities, mostly in the mid- to late 2010s, updating much of this literature with more recent data. While existing studies start painting the picture, understanding the evolution of potential gender pay gaps requires panel data that allow us to see the pathways—productivity, job offers, and movement across jobs—through which salaries evolve over a long time span across a broad range of institutions.

I. Data

We collected salaries for all tenure-track faculty in economics departments at public institutions in the United States ranked in the top 50 by the 2017 US News & World Report rankings. Further details about data collection and the sample are included in the online Appendix. The final sample includes 254 women and 1,102 men.

II. Regression Analysis

We begin to investigate the gender differences in economists' salaries by estimating an empirical model of the following form:

$$\ln(salary_{it}) = \beta_0 + \sum_{j=1}^{3} \beta^j \left(Female_i \times D_{it}^j\right) + \phi_t + \mathbf{X}\pi + \epsilon_{it}.$$

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Table 1—Regression Estimates of Gender Gaps in Salary

Variable	ln(salary)	ln(salary)	ln(salary)	ln(salary)
Female × years since PhD 0–9	−0.045	−0.028	0.005	0.011
	(0.013)	(0.017)	(0.017)	(0.016)
Female × years since PhD 10–19	−0.095	−0.091	−0.043	−0.034
	(0.036)	(0.037)	(0.032)	(0.028)
Female × years since PhD 20+	−0.117	−0.106	−0.125	−0.119
	(0.048)	(0.045)	(0.040)	(0.038)
Year fixed effects	Yes	Yes	Yes	Yes
Year since PhD fixed effects	Yes	Yes	Yes	Yes
PhD institution fixed effects	No	Yes	Yes	Yes
Field fixed effects	No	Yes	Yes	Yes
Ranking of current institution	No	No	Yes	No
Current institution fixed effects	No	No	No	Yes
Observations	9,091	9,091	9,091	9,091

Notes: Table displays regression estimates of ln(real salary) on varying sets of controls. Ranking of current institution is a cubic function of the institution's US News & World Report ranking. Current institution fixed effects is a set of fixed effects for the institution of employment in that year. All standard errors are clustered by person.

The outcome is the natural log of salary for an individual i in year t. We observe an individual's salary for year t only if he/she is employed by one of the universities in our sample in year t. Note that D^j are a series of dummy variables, where D^1 denotes whether a person is within 0–9 years of receiving their PhD, D^2 denotes being within 10–19 years of receiving their PhD, and D^3 indicates whether the person received their PhD 20 or more years prior. The key set of coefficients is β_1, β_2, and β_3, which show how the gender gap in salaries evolve with time in the economics profession. The ϕ_t denote year fixed effects. In our regressions, we include various controls in the **X** matrix, including years since PhD fixed effects, PhD institution fixed effects, indicators for field of specialization, and current institution fixed effects (or institution ranking). We do not control for an individual's research productivity. Our basic goal is to document the gender gaps in salaries; later work will focus on how much these differences are correlated with disparities in research output.

The results are reported in Table 1. Among economists with nine or fewer years of experience since earning a PhD, we estimate a 4.5 percent salary gender gap using the baseline model. When the model includes controls for the PhD institution and field of specialization, the gap decreases to 2.8 percent. Then, the gap becomes negligible once we include either the institution's ranking or institution fixed effects. As the identification of the gender gap in the last two specifications limits the comparison to faculty at similarly ranked institutions or within each department, the primary source of the gender gap among early economists is the gender disparity in the starting institution's rank.

The patterns are similar among economists with 10–19 years of experience. The gender pay gap in the first two specifications ranges between 9 and 9.5 percent, and the gap shrinks to 4.3 percent when the model includes the ranking of the current institution. While the effect of the current institution's rank remains, we find evidence that the gender gap stays negative even when we compare faculty at similarly ranked schools or within the same department in this group.

Lastly, the current institution's rank does little to change the gender gap among economists with more than 20 years of experience. The gender gap fluctuates between 10.6 and 12.5 percent in this group. Therefore, the primary source of gender gap gradually changes from the concentration of men in highly ranked institutions during their early careers to inequality in pay within departments.

III. Longitudinal Analysis

Table 1 documents that gender gaps in salaries are negligible early on but emerge within ten years after earning a PhD. The change in the gender gap's size may arise during tenure review

or through post-tenure outside offers. However, cohort differences could also drive these cross-sectional patterns—the cohort of men and women who received their PhD 20 years ago may be fundamentally different from those who received their PhD more recently. Our longitudinal data allow us to explore this possibility further.[1] More specifically, we can characterize and document how and when gaps emerge.

We consider two cohorts: cohort 5, those employed at one of our sample institutions 5 years following their PhD, and cohort 11, those employed at one of our sample institutions 11 years following their PhD.[2] Cohort 5 is on the brink of the tenure decision, whereas most of cohort 11 has passed their tenurial appraisal. To be included in the sample, individuals must have received their PhDs in 2009 or earlier for cohort 5 and 2003 or earlier for cohort 11. This sample restriction assures a balanced sample in our displayed figures. Cohort 5 consists of 52 women and 143 men, and cohort 11 includes 26 women and 99 men.[3]

Starting with cohort 5, from Figure 1, panel A, we document that by year eight after their PhD, women have left their year-five institution at a higher rate than their male counterparts. At this point, the gender difference is nearly 12 percentage points. By the end of the sample period, 45 percent of women and 52 percent of men are still employed by their year-five institution. The timing of the emergence of this gap roughly coincides with the timing of tenure review. The disparity is consistent with past work showing that women are less likely to get tenure, albeit in less recent cohorts (Ginther and Kahn 2004). As shown in Figure 1, panel B, women also advance to associate professor slower than men.[4] Figure 1, panel C, shows what this implies for salaries. Given the inherent difference in the selectivity of the institutions at which men and women reside, as documented in Table 1, we present the female versus male difference in ln(real salary) after controlling for a cubic function of academic ranking along with year fixed effects. For cohort 5, salaries are

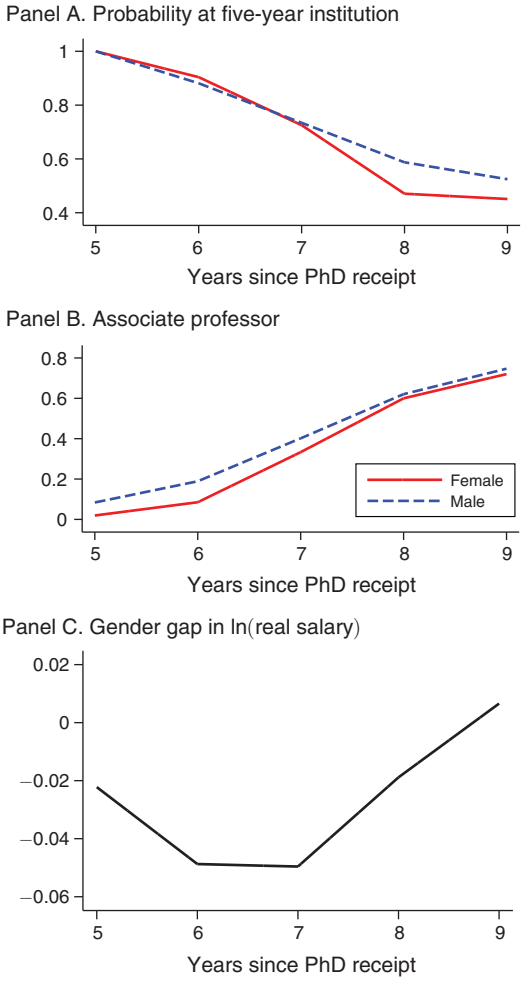

FIGURE 1. EVOLUTION OF YEAR-FIVE COHORT OUTCOMES

Notes: Sample consists of economists who appear at one of our sample institutions in the sixth year (year − year of PhD is five) after their PhD receipt. Indiana and Purdue are excluded, as they do not report academic rank. To make the sample balanced, all economists must have received their PhD in 2009 or earlier. Panel C salary gap represents the difference in ln(real salary) between women and men after controlling for a cubic function of the institution's US News & World Report ranking and year fixed effects. The data underlying panels B and C are only observed for economists employed at our sample institution in that year.

[1] Note that the widest span of our data is 14 years.

[2] One implicit restriction is that our salary data include data 5 years post-PhD for cohort 5 and 11 years for cohort 11. For example, someone earning a PhD in 2004 and employed in the University of California system whose salary data begins in 2010 will not be a part of the cohort 5 sample.

[3] This sample excludes Purdue and Indiana faculty because their academic rank is not reported.

[4] Part of the convergence of men and women in year eight is due to the fact that these means are conditional on still being in our sample. Thus, for individuals exiting the sample, this variable will be missing.

lower for women than men throughout most of the sample, with the biggest gap at years six to seven of nearly 5 percent. Not surprisingly, after that year, the gap narrows—likely due to the differential attrition of women relative to men at that time—and becomes slightly positive.

Most of cohort 11 have achieved tenure by year 11 (88 percent of women and 95 percent of men).[5] As such, the mobility of this sample contrasts strikingly with that of cohort 5. By the end of our sample period, 77 percent of women and 84 percent of men still work at their year-11 institution (Figure 2, panel A). Thus, in this sample, salary gaps are less the result of changing sample composition. Even among this mostly tenured sample, we still observe women advancing through the professorial ranks slower. By year 15, 29 percent of women are full professors compared to 56 percent of men. This gender gap in the fraction of full professors is statistically significant at the 5 percent level. The patterns for salaries continue the same patterns seen at year 9 for cohort 5 with a small positive gap at year 11. The difference grows and oscillates between 1 and 5 percent. Some of the salary difference is due to the differential rate of men being promoted to full professor.

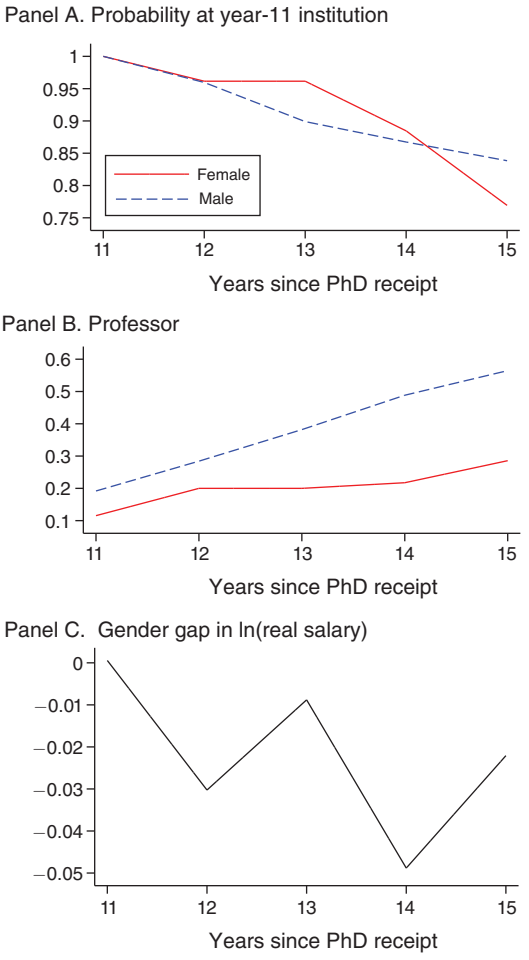

Figure 2. Evolution of Year-11 Cohort Outcomes

Notes: Sample consists of economists who appear at one of our sample institutions in the twelfth year (year − year of PhD is 11) after their PhD receipt. Indiana and Purdue are excluded, as they do not report academic rank. To make the sample balanced, all economists must have received their PhD in 2003 or earlier. Panel C salary gap represents the difference in ln(real salary) between women and men after controlling for a cubic function of the institution's US News & World Report ranking and year fixed effects. The data underlying panels B and C are only observed for economists employed at our sample institution in that year.

IV. Concluding Thoughts

Diversity is a longstanding goal of the economics profession. Despite efforts to reduce disparities within the profession, gender gaps in salaries remain. For newly appointed assistant professors, gender gaps (not attributable to institutional rank), at least in our sample, are nonexistent but grow with time in the profession. Our data suggest that part of the explanation for this emerging gap is that women progress through the ranks more slowly than men. Moreover, women are more likely to exit our sample.[6] A complete explanation for why these gender gaps exist is a lingering question. An inexhaustive and non–mutually exclusive list of proposed explanations is differences in productivity; compensated administrative roles; mobility, including the receipt of outside offers; and discrimination. In ongoing work, we plan to further explore whether these gaps close after accounting for research productivity.

[5] We select those employed at year 11 rather than year 10 because over a quarter of women at year 10 are still not tenured.

[6] Looking at faculty who start at one of the institutions in our sample immediately following their PhD, we observe 91 percent in academia, 7 percent in the government or public sector, and 2 percent in the private sector by the seventh year after their PhD.

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