Coauthorship and the Gender Gap in Top Economics Journal Publications

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Abstract

Coauthorship has become the new norm in academics since the early 1970s because it enhances productivity. However, the gender gap in economics journal publication continues to persist, which explains why there are fewer women in the economics profession. This study investigates the role of coauthorship in the gender gap in top economics journals for untenured faculty members in the US. We construct a unique dataset from the CVs of academic economists from the top 96 PhD-granting economics departments in the US. Our results suggest that, compared to men, women are matched with less productive unique coauthors because women begin their academic careers in lower-ranked economics departments than men, which is associated with institutional gender bias. This poor-quality matching can explain approximately one-third of the gender gap in the top 20 economics journals during the period in which these women are untenured.

Keywords: Unique coauthor, coauthor publications, solo publications, journal ranking, gender bias.

JEL Codes: I23, J16, J44, J71.

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1 Introduction

The likelihood of publishing in the top 20 economics journals declines more than two times for untenured faculty members who work in schools other than the top 20 US schools. Figure 1 shows that even within these elite universities, untenured female faculty members publish less than their male counterparts, and the gap has grown over the last two decades. As a consequence of such a persistent gender gap in top economics journal publications, women are 21 percentage points less likely to obtain promotions to tenured positions in economics than men (Ginther and Kahn (2004)). This gender gap in promotion for tenure can explain why women are significantly underrepresented in top academic positions in the field of economics (Blackaby et al. (2005)). This is why we specifically focus only on untenured faculty members.

In this study, we seek to determine the role of coauthorship to explain the persistent gender gap in top economics journal publications. This question is important because arguably any publication in the top economics journals is the most important factor in the promotion of all untenured faculties in any research school. McDowell et al. (2006) argue that the gender gap in top economics journal publications is highly correlated with the institutional gender bias that exists in the male-dominated profession. We examine an alternative explanation, which is the relationship between a researcher's number of unique coauthors and the total number of coauthored publications in various ranked economics journals because Liebowitz and Palmer (1984) argue that journal ranking is close to the most ideal measure of the quality of an article in the economics profession.[1]

To investigate this issue, we first examine the role of the first job in being matched with highly productive coauthors, who usually have strong academic networks. McDowell and Melvin (1983), Barnett et al. (1988), Melin and Persson (1996), Hudson (1996), Laband and Tollison (2000), Chung et al. (2009) , Ductor (2015), Besancenot et al. (2017) and others find that intellectual collaboration positively affects research productivity. In addition to productivity, a large number of prior studies including Saloner (1985), Laband and Piette (1994), Marmaros

[1]Citation may not be the most important factor in measuring the quality of a paper for an untenured faculty because it takes time to accumulate a higher number of citations (Wang (2013)).

and Sacerdote (2002), Erickson and Jacoby (2003), Goyal et al. (2006) and Brogaard et al. (2014) show that academic connections significantly affect top economics journal publication. To quantify the impacts of such peer effects, Colussi (2018) shows that the authors of 43% of the publications in the top 5 economics journals from 2000 to 2006 are academically connected with the editors.

The faculties of top-ranked schools mostly work with researchers from similarly ranked institutions. This type of matching can be explained by using the assortative matching hypothesis, which suggests that research collaboration is most likely between authors with similar abilities (Fafchamps et al. (2010)). Therefore, the first job of the academic career can explain why women are matched with relatively lower-quality coauthors. We test the hypothesis that women start their academic career in a relatively lower-ranked economics department than men for two main reasons. First, during their PhD program, female economists are less productive than males in terms of journal publications, and second, women face employer discrimination when they seek to enter higher-ranked academic institutions (Kolpin and Singell (1996)).

Singell and Stone (1993), Kahn (1993) and McMillen and Singell (1994) discuss how the first job affects an individual's entire academic career. Specifically, Waldinger (2010) shows the extent to which the productivity of a research scholar increases in top-ranked academic institutions due to knowledge spillover. Besancenot et al. (2017) argue that publishing in the top economics journals has become increasingly difficult as the subject area has become more complex, which requires advanced techniques and specialization. Therefore, having first employment in a relatively lower-ranked school negatively affects the ability of a scholar to find better-quality coauthors, which may lead to a smaller number of both total publications and coauthored publications.

Using data from the academic CVs of scholars in the top 96 PhD-granting economics departments, we find that female economists have a 5% lower probability of obtaining first employment in the top 20 US economics departments, and this result is highly correlated with institutional gender bias. Although women in the top 20 schools are equally productive as men in terms

of solo publications, they are matched with less productive unique coauthors, resulting in 0.12 fewer publications in the top 20 economics journals during the untenured period.

The remainder of this paper is organized as follows. We discuss our empirical strategy and explain our results in Section 2, and we conclude the paper in Section 3. The detailed description of the descriptive statistics and all the robustness check results are reported in the Appendix.

2 Empirical Approach

2.1 Data

To examine the relationship between first employment and the gender gap in publications, we construct a unique dataset using the CVs of all assistant professors who were up for tenure from 1984 to 2017 at the top 96 PhD-granting economics departments in the US. The data include individuals' complete academic work histories, where and when they received their PhD, their primary research field and their number of publications. We also collect information on gender, year of PhD, the number of publications during the PhD, and the year and institution at which they first received tenure. After excluding 326 faculty members who either did not upload their CVs on the university's website or did not have sufficient information in their CVs, our final sample size is 1,437.[2]

We use the 2017 US News and World Report to rank economics departments with PhD programs.[3] Since there is no consensus on economics journal rankings (Laband (2013)), following Sarsons (2017), we use the journal rankings reported by the IDEAS project of Research Papers in Economics (RePEc), which provides an exhaustive list of over 1,000 economics journals.[4] The gender gap in publications by journal ranking and university ranking is shown in Figure 2. Consistent with the findings of Ginther and Kahn (2004) and Blackaby et al. (2005), Figure 2

[2]All information was collected from July to December 2017.

[3]In 2017, US News and World Report ranked the top 90 economics departments. However, there were 6 ties, which explains why there are 96 top-ranked PhD-granting economics departments.

[4]RePEc ranking is based on the journals' impact factor. Another journal list source is Econlit provided by the American Economic Association. However, Econlit does not provide any journal rankings.

shows that from 1984 to 2017, women published less than men irrespective of their university affiliation and journal ranking.

The descriptive statistics for our data are shown in Table 1. As shown, untenured female faculty members publish in 0.66 fewer journals than their male counterparts. We also report the publication gaps by four different groups of journal ranks and find that the mean difference is statistically significant only in the top 20 journals. Since female faculty members are engaging in more collaboration in recent decades, our data also show that female faculty members have, on average, a higher number of unique coauthors. We also note that in graduate school, female PhD students spent 0.2 years more on average than males and that they published in 0.12 fewer journals. Moreover, the sample consisted of 19% nonwhite faculty members.

2.2 Model

Our model specification is

$$y_i = \beta_0 + \beta_1 \text{Female}_i + \beta_2 \text{Unique Coauthor}_i + \beta_3 X + \mu_s + \gamma_F + \tau_t + \varepsilon_i \tag{1}$$

where y_i is the dependent variable. We use four different types of y_i: (i) total number of publications, (ii) solo publications, (iv) coauthored publications, and (iv) publications by journal rank. The control variable X includes whether the faculty received tenure in the first attempt, race, and a 5-year group dummy based on when an individual finished the PhD; μ_s are school group dummies; and γ_{RF} and τ_t are research field and tenure year fixed effects. The coefficient β_1 measures the conditional mean difference in the number of publications during the untenured period.

2.3 Results

The OLS estimates of the specification of equation (1) are shown in Table 2. The numbers in the first parenthesis show the cluster of standard errors by PhD graduating school. The left panel estimates show that the conditional mean difference in the number of total publications

across all journal rankings is approximately 0.76 for untenured faculty members. This gender differences might exist because those women faced the same options and opportunities, made different choices in their careers, or faced implicit discrimination such as editors' favoritism and funding sources (Kahn (1993, 2004)). Other important mechanisms are motherhood timings (Mason and Goulden (2002, 2004)) and work-life balance in academics (Misra et al. (2012)). In this study, we provide an alternative explanation, which is the role of coauthorship.

The middle and right panels of Table 2 show that the difference in solo publications by men and women are not statistically significant. Hence, the existing gender gap in total publication is entirely driven by the difference in coauthor publication, which is significant even at the 1% level. Hudson (1996), Laband and Tollison (2000), and Hamermesh and Oster (2002) show that female representation in academia has improved over time because women have been engaging more in collaboration. Consistent with this finding, Figure 1 shows that in economics, the gender gap in coauthor publications has decreased over time. In contrast, the same gap has increased in the top 20 universities in the last two decades.[5] Addressing this puzzle is the major motivation of this study.

The seminal work by Laband and Piette (1994) and a recent study by Colussi (2018) show that the editors of top journals favor their colleagues, coauthors and former graduate students. Thus, the popularity of coauthorship reflects the importance of social connections in academia (Hamermesh (2013) and Ductor (2015)). We therefore want to test the hypothesis that women have fewer coauthor publications because they are matched with relatively less productive coauthors than their male colleagues. To test this hypothesis, we first estimate whether the conditional probability of entering elite universities is the same for male and female graduates. The result of this analysis is particularly important because the initial advantages of working in a better-ranked school directly affects the academic networks needed to find good-quality coauthors and to be productive in research (McMillen and Singell (1994), McDowell et al. (2006)).

[5]Appendix Table 5 shows that the conditional mean differences in coauthored publications and in the total number of publications are statistically significant for untenured faculty from the top 20 ranked schools for the period 2010-2017.

To estimate the conditional entry probability in schools with different rankings, we divide the top 96 schools into three categories: ranks of 1-20, 21-40 and 41-96. Conditional on the number of publications during the PhD and the PhD graduate school rank fixed effects, the estimates of a logit model show that female economists are 5.1 percentage points less likely to obtain their first job in the top 20 schools, and the coefficient is significant at the 1% level. In contrast, women are more likely to enter the economics departments ranked 41-96, suggesting that women face some barriers to entering top-ranked schools, which are most likely related to institutional gender norms in those elite schools.[6] These findings are consistent with Kolpin and Singell (1996), who also show that employment discrimination exists in the top-ranked economics departments.

Table 4 shows the heterogeneous impacts of unique coauthors on coauthored publications as well as the total number of publications. As shown, although women in the top 20 schools have a greater number of coauthors than men, the marginal impact of an additional coauthor on both total and coauthored publications for women is less than that of men.[7] In the left panel, the estimate of the interaction term between the variables female and total number of unique coauthors is -0.15, which suggests that the marginal contribution of an additional coauthor on the number of coauthored publications is less for females compared to males.

Furthermore, Appendix Table 3 shows no differences in solo publications between men and women in the top 20 schools. Thus, both Table 4 and Appendix Table 3 results suggest that untenured female faculty members from the top 20 schools are matched with relatively less productive coauthors than their male colleagues.[8] Ivanova-Stenzel and Kubler (2011) argue that women seem to perform worse in mixed-gender groups, which could be the reason why women may have lower-quality coauthors in a male-dominated profession. Another potential explanation is that because women are historically less represented in top-ranked academic in-

[6]In Appendix Table 3, we show that female economists have fewer journal publications during the PhD program. Therefore, we use the number of journal publications prior to the first job and all other relevant characteristics of the graduate school as control variables in Table 2.

[7]Appendix Table 1 shows that women in the top 20 universities and those ranked 41-96 have more coauthors than men.

[8]Furthermore, in Appendix Table 4, we show that the gender differences in total and coauthored publications have increased in the top 20 schools since 2010.

stitutions, according to the assortative matching hypothesis some highly productive researchers may think that only a small fraction of women have abilities similar to theirs.

The matching of relatively poor-quality coauthors leads to lower academic productivity, which negatively affects the number of top-ranked journal publications (Hollis (2001)). Consequently, we show the heterogeneous impacts of women's lower-quality coauthors on the number of top-ranked journal publications by three school groups in Table 5. As shown, because of the lower-quality matched coauthors, female faculty members have -0.12 fewer publications in top 20 journals than men do during the untenured period. The descriptive statistics in Table 1 show that the gender gap in the top 20 journals is 0.37 for the untenured faculty members in the top 20 ranked schools. Thus, the lower-quality matched coauthors can explain about one-third of the existing gender gap in top economics journals.[9]

3 Conclusion

The main contribution of this paper is to analyze to what extent, if any, coauthorship can explain the persisting gender gap in the top-ranked economics journals. Consistent with Kolpin and Singell (1996) and McDowell et al. (2006), we find that gender plays a role in obtaining first employment in a top-ranked economics department. The results from the three-way fixed effects model suggest that the gender differences in top-ranked journal publication exist because women are matched with relatively lower-quality coauthors even though they are equally productive as men regarding the number of solo publications.[10] The matching of poor-quality coauthors can explain approximately one-third of the gender gap in the top 20 journal publications.

The number of journal publications is probably the most critical factor for successful tenure promotion in all academic research institutions. Therefore, the direct consequence of this relatively lower-quality matched coauthor is that it significantly reduces the likelihood that

[9]We have performed various robustness checks, and the detailed discussion of those results are shown in the Appendix.

[10]We have research field, academic institution and first time attempted tenure year fixed effects. Note that these fixed effects cannot address whether there exist any time variant factors of coauthorship formation.

untenured female faculty members receive tenure in prestigious elite schools. Thus, this study provides a potential explanation for the puzzle of why women are significantly underrepresented in top academic positions in economics even though they made a significant improvement in educational attainment over the last three decades. To address this issue, our results suggest that we need to look at the root cause of why female graduate students are academically less productive than males in the graduate school program, which subsequently affects their probability of attaining their first job in a top-ranked economics department.

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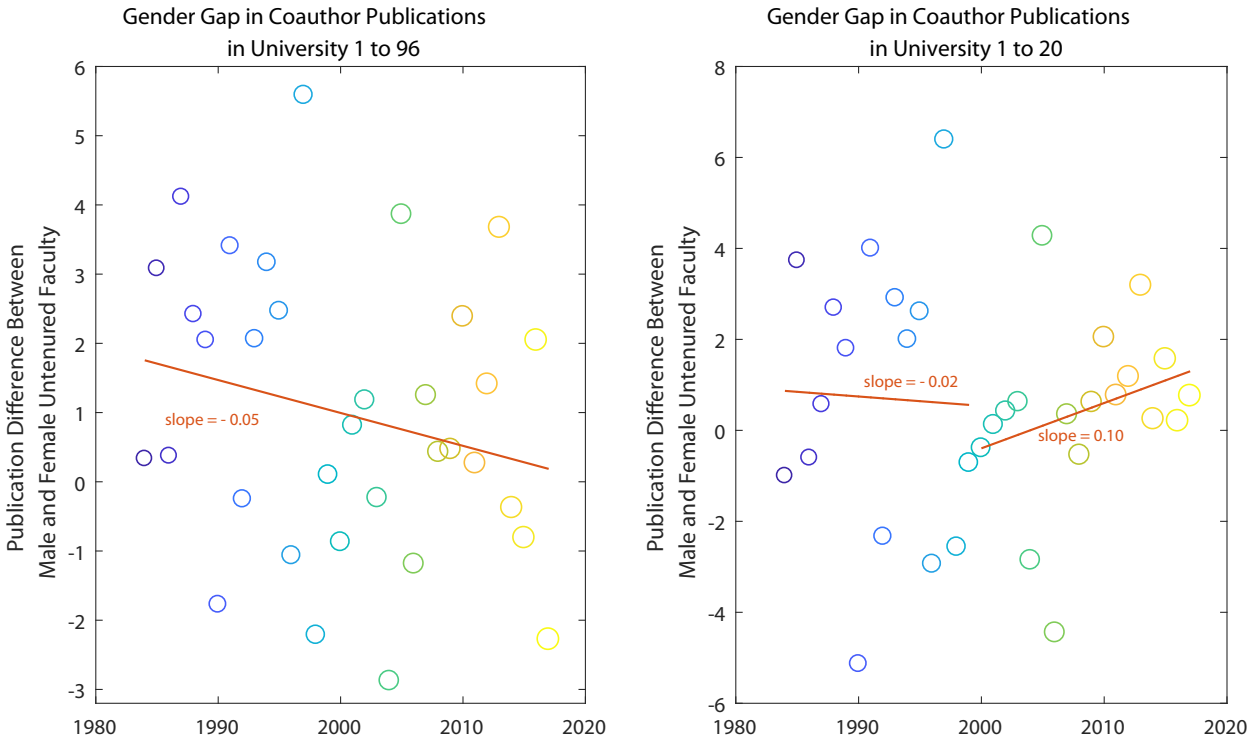
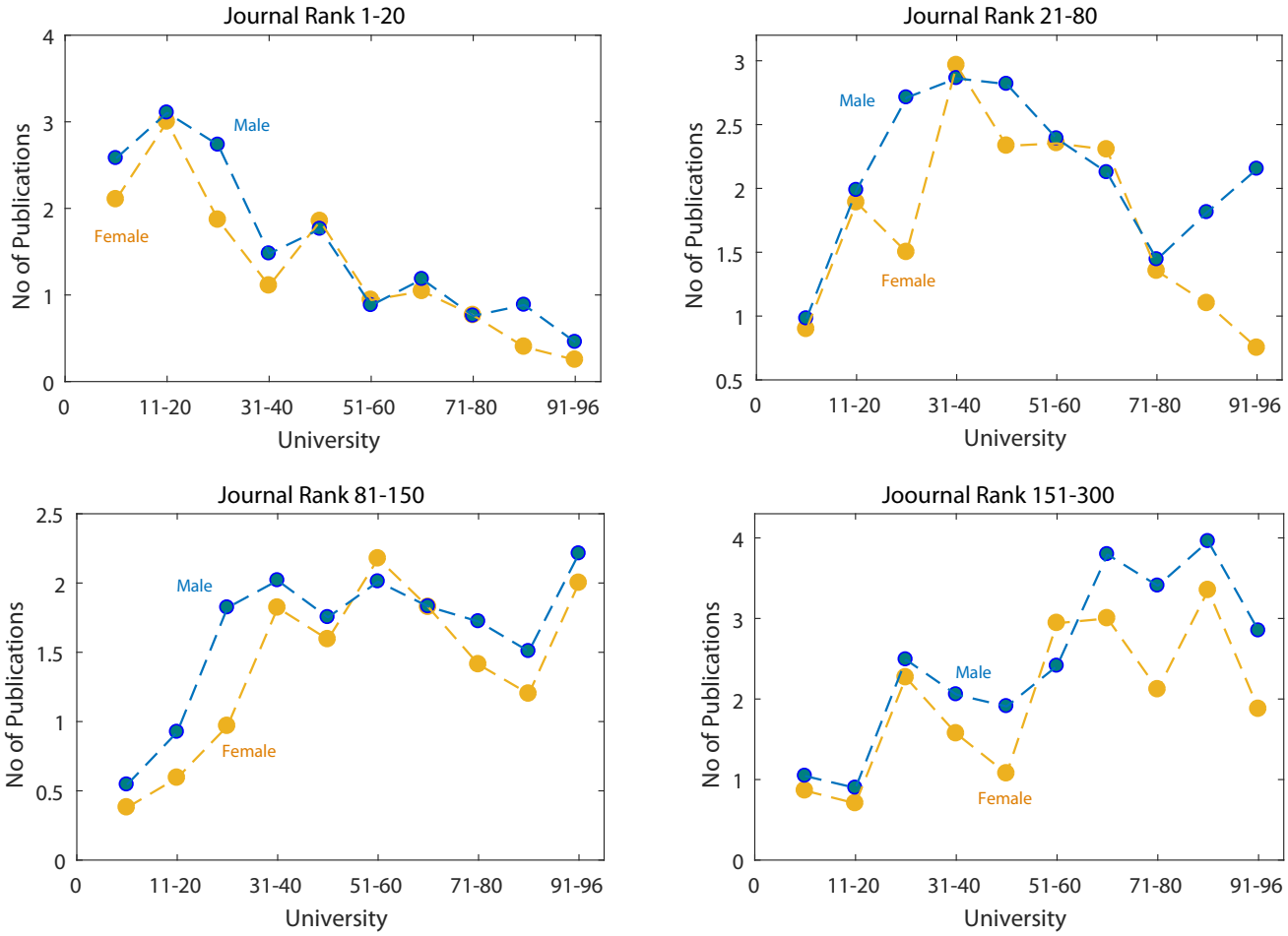
Figure 1: Gender Gap in Economics Journal Publications of Untenured Faculty Group By University Rank



We use the 2017 US News and World Report to rank the economics departments that have PhD programs.

Figure 2: Gender Gap in Economics Journal Publications of Untenured Faculty Group By University Rank



We use the 2017 US News and World Report to rank the economics departments that have PhD programs, and we rank the journals from RePEc/IDEAS rankings.

Table 1: Summary Statistics of State-level Variables (Mean and Standard Deviation)

	All	Male	Female	Diff		All	Male	Female	Diff
Total Publications	9.239	9.347	8.681	0.666	First Attempted Tenure Year	1998.239	1997.384	2002.658	-5.274***
	(5.590)	(5.790)	(4.370)	(1.663)		(12.663)	(12.812)	(10.863)	(-5.862)
Solo Publications	3.597	3.678	3.177	0.501*	Successful Tenure	0.871	0.874	0.858	0.016
	(3.380)	(3.469)	(2.839)	(2.071)	at First Attempt	(0.335)	(0.332)	(0.350)	(0.670)
Coauthor Publications	5.641	5.672	5.478	0.194	PhD Duration	5.469	5.438	5.632	-0.194*
	(4.800)	(4.927)	(4.087)	(0.563)		(1.249)	(1.256)	(1.203)	(-2.117)
Publications in Journal 1-20	1.800	1.860	1.487	0.373**	Publications in PhD	0.579	0.598	0.470	0.129
	(1.951)	(1.999)	(1.646)	(2.675)	and Post Doc	(1.232)	(1.288)	(0.858)	(1.409)
Publications in Journal 21-80	1.955	1.983	1.810	0.173	Years of Work Experience	0.736	0.777	0.526	0.251*
	(2.077)	(2.126)	(1.799)	(1.162)	Prior to Graduate School	(1.488)	(1.533)	(1.206)	(2.356)
Publications in Journal 81-150	1.355	1.371	1.272	0.100	Phd Graduation Year	1992.168	1991.378	1996.298	-4.920***
	(1.688)	(1.710)	(1.568)	(0.824)		(11.876)	(12.054)	(9.946)	(-5.797)
Publications in Journal 150-300	2.046	2.088	1.828	0.260	Nonwhite	0.188	0.175	0.254	-0.079**
	(2.578)	(2.646)	(2.179)	(1.410)		(0.391)	(0.380)	(0.436)	(-2.834)
Unique Coauthor	5.141	5.039	5.670	-0.630	Phd Graduation Age	28.557	28.470	29.014	-0.544**
	(4.732)	(4.555)	(5.539)	(-1.851)		(2.815)	(2.859)	(2.523)	(-2.638)
No of Observations	1,437	1,204	232	1,437	No of Observations	1,437	1,204	232	1,437

This unique dataset is constructed by using CVs of all assistant professors up for tenure between 1984 and 2017 at the top 96 PhD-granting economics departments in the United States.

Table 2: Gender Differences in Untenured Faculty Members' Total Number of Publications, Solo Publications and Coauthored Publications from University 1 to 96

Dependent Variable: Number of Publications											
	Publications by Journal Rank					Solo Publications			Publications With Coauthors		
	All	Rank 1-20	Rank 21-80	Rank 81-150	Rank 151-300	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.758**	-0.288**	-0.370***	-0.263***	-0.338**	-0.438*	-0.232	-0.218	-0.639***	-0.675***	-0.632***
	(0.310)	(0.131)	(0.116)	(0.089)	(0.153)	(0.225)	(0.223)	(0.217)	(0.214)	(0.220)	(0.215)
Total Unique Coauthors	0.661***	0.061***	0.096***	0.078***	0.135***	-0.093***	-0.048**	-0.057***	0.764***	0.761***	0.736***
	(0.051)	(0.016)	(0.020)	(0.016)	(0.020)	(0.019)	(0.019)	(0.017)	(0.057)	(0.058)	(0.059)
Tenure at First Attempt	-0.449	-0.374***	-0.314	-0.111	0.252	-0.558	-0.512	-0.362	0.004	0.102	-0.050
	(0.388)	(0.136)	(0.210)	(0.120)	(0.230)	(0.347)	(0.339)	(0.309)	(0.261)	(0.256)	(0.277)
Nonwhite	0.208	0.133	-0.103	0.125	0.189	-0.463**	-0.127	-0.263	0.481**	0.519**	0.424*
	(0.315)	(0.123)	(0.136)	(0.111)	(0.180)	(0.194)	(0.188)	(0.217)	(0.209)	(0.207)	(0.234)
Research Field FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PhD Graduation Year and Tenure Attempt Year FEs	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes
Attempted Tenure School FEs	Yes	Yes	Yes	Yes	Yes			Yes			Yes
Adjusted R-squared	0.440	0.308	0.215	0.214	0.340	0.023	0.065	0.171	0.567	0.576	0.597
No of Observations	1,423	1,422	1,422	1,422	1,422	1,423	1,423	1,423	1,423	1,423	1,423

The numbers in the first parenthesis of each column represent the PhD-granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 3: Logit Model Estimates of Conditional Probability of the First Job in Differently Ranked Universities

	Graduated From 1-96 University			Graduated From 1-25 University			Graduated From 26-96 University		
	Uni 1-20	Uni 21-40	Uni 41-96	Uni 1-20	Uni 21-40	Uni 41-96	Uni 1-20	Uni 21-40	Uni 41-96
Female	-0.051***	0.022*	0.042***	-0.056**	0.023***	0.037***	-0.016	0.012	0.030
	(0.013)	(0.012)	(0.014)	(0.024)	(0.008)	(0.014)	(0.026)	(0.066)	(0.038)
Nonwhite	-0.131***	0.011	0.112***	-0.173***	0.042***	0.124***	-0.040	-0.098***	0.121
	(0.030)	(0.022)	(0.033)	(0.003)	(0.009)	(0.003)	(0.083)	(0.022)	(0.079)
Publications During	-0.010	-0.003	0.010	0.005***	0.004	-0.011***	-0.029	-0.009	0.024
the PhD Program	(0.013)	(0.007)	(0.015)	(0.001)	(0.004)	(0.004)	(0.031)	(0.007)	(0.020)
Years Took to Finish	-0.019***	0.005	0.015***	-0.022***	0.008**	0.017***	-0.010	-0.003	0.013
the PhD Program	(0.007)	(0.005)	(0.005)	(0.002)	(0.004)	(0.005)	(0.024)	(0.011)	(0.017)
Work Experience Prior	-0.018**	0.017***	0.001	-0.012***	0.016***	-0.003*	-0.032***	0.020	0.005
to Graduate School	(0.008)	(0.006)	(0.008)	(0.002)	(0.000)	(0.002)	(0.011)	(0.019)	(0.025)
Graduate School Rank FEs	Yes	Yes	Yes	No	No	No	No	No	No
All Other Control and FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.089	0.012	0.099	0.019	0.006	0.014	0.033	0.024	0.015
No of Observations	1,165	1,165	1,165	876	876	876	289	289	289

All other control variables are shown in Appendix Table 1. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 4: Heterogeneous Impacts of Unique Coauthors on Total and Coauthor Publications by University Rank

Dependent Variable: Number of Publications

	Total Publications By University				Coauthored Publications By University			
	All	Uni 1-20	Uni 21-40	Uni 41-96	All	Uni 1-20	Uni 21-40	Uni 41-96
Female * Unique Coauthors	-0.298**	-0.281***	-0.063	-0.385*	-0.253*	-0.149***	0.049	-0.408**
	(0.102)	(0.035)	(0.227)	(0.169)	(0.105)	(0.025)	(0.206)	(0.142)
Unique Coauthors	0.755***	0.737***	0.656***	0.807***	0.795***	0.707***	0.652***	0.912***
	(0.068)	(0.015)	(0.104)	(0.129)	(0.060)	(0.007)	(0.087)	(0.093)
Female	0.883	1.440***	-1.640	1.203	0.835	0.197	-1.051	1.749*
	(0.523)	(0.058)	(1.017)	(0.794)	(0.629)	(0.255)	(0.989)	(0.819)
Tenure at First Attempt	-0.463	-0.748***	0.200	-0.959	0.042	0.096	0.002	-0.268
	(0.239)	(0.172)	(0.446)	(0.560)	(0.183)	(0.074)	(0.349)	(0.317)
Nonwhite	0.451	0.054	0.669	0.238	0.553	0.372***	0.682	0.319
	(0.502)	(0.268)	(1.206)	(0.412)	(0.339)	(0.072)	(0.662)	(0.352)
Phd Graduation Age	-0.082*	-0.115**	-0.040	-0.097**	-0.058**	-0.101***	0.021	-0.061
	(0.038)	(0.039)	(0.070)	(0.038)	(0.022)	(0.006)	(0.030)	(0.033)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.369	0.389	0.273	0.416	0.602	0.603	0.521	0.651
No of Observations	1,366	430	322	614	1,366	430	322	614

The numbers in the first parenthesis of each column represent the PhD-granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 5: Heterogeneous Impacts of Unique Coauthors on Total and Coauthor Publications by University and Economics Journal Rank

Dependent Variable: Total Number of Publications

	Journal 1-20			Journal 21-80		
	Uni 1-20	Uni 21-40	Uni 41-96	Uni 1-20	Uni 21-40	Uni 41-96
Female * Unique Coauthor	-0.121***	0.027	-0.041**	0.028*	0.123	-0.062**
	(0.013)	(0.035)	(0.013)	(0.012)	(0.078)	(0.018)
Female	0.385***	-0.746***	0.002	-0.174**	-1.078*	-0.030
	(0.052)	(0.077)	(0.208)	(0.061)	(0.525)	(0.175)
Total Unique Coauthors	0.167***	0.043	0.047*	0.063**	0.166*	0.112***
	(0.016)	(0.022)	(0.019)	(0.017)	(0.068)	(0.026)
Phd Graduation Age	-0.106***	-0.084**	-0.028*	-0.012	-0.033	-0.052*
	(0.022)	(0.024)	(0.012)	(0.018)	(0.037)	(0.023)
All Controls and Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.098	0.016	0.064	0.028	0.122	0.079
No of Observations	430	322	614	430	322	614

The numbers in the first parenthesis of each column represent the PhD-granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Online Appendices: Coauthorship and the Gender Gap in Top Economics Journal Publications

September 2018

Data

The descriptive statistics for our data are shown in Appendix Table 1. As shown, female untenured faculty members publish in 0.66 fewer journals than their male counterparts. We also report the publication gaps by four different groups of journal ranks and find that the unconditional mean difference is statistically significant only in the top 20 journals. Since coauthorship has become the new norm and female faculty are engaging in more collaboration in recent decades, our data also show that female faculty have, on average, a higher number of unique coauthors. The 5-year difference in the first year of attempting to obtain tenure between males and females suggests that there were more male faculty members in the earlier period of our sample. We also note that in the graduate school, female PhD students spent 0.2 years more on average than males and that they published in 0.12 fewer journals. Moreover, the sample consisted of 19% nonwhite faculty members.

In Appendix Table 1, we report the summary statistics by university of employment. We classify the 96 universities into three groups: ranks of 1-20, 21-40 and 41-96. We note that the fraction of untenured faculty is the lowest in the top 20 schools among these three groups. As shown, female faculty members in those elite schools have more unique coauthors but fewer coauthored publications. That leads to a lower number of total publications even though they have more solo publications. In contrast, in schools ranked 21-40 and 41-96, female untenured faculty members have both fewer solo publications and fewer coauthored publications. The descriptive statistics also reveal that in all three groups of ranked universities, there are more nonwhite female faculty members and that the gap between female and male nonwhite faculty is the lowest in top 20 schools.

Robustness

In Tables 2 to 4 of the main text, we have classified all schools into three groups to identify research institutions with very good, good and medium quality. We consider those ranked 1-20 as being very good quality, those ranked 21-40 as good, and those ranked 41-96 as medium. Obviously, this is our own classification, and economists may have different opinions about this grouping. Therefore, a concern is whether our results depend on this exact grouping criteria. To address this concern, we have also used the following criteria: very good for schools ranked 1-15, good for those ranked 16-30 and medium quality for those ranked 31-96. The estimation results for the same model specification used in Tables 2 to 4 are shown in Appendix Tables 6 to 8.

Similar to Table 2, Appendix Table 6 also shows that female economists are less likely to obtain their first job in the top 15 economics departments as well. The results in Appendix Table 7 are almost identical to those in Table 3, which suggests that female untenured faculty in the top 15 schools also are matched with lower-quality coauthors. In Table 4 of the main text, we show that the coefficient of the interaction term between female and unique coauthors for the top 20 schools for journal ranks 1-20 is -0.12. Appendix Table 7 shows that the coefficient for the top 15 schools is -0.09. All these results show that the results are qualitatively identical under both sets of grouping criteria. Therefore, the findings of this paper do not depend on how we classify institutions as very good, good and medium.

We have shown that because the lower-quality coauthors, female untenured faculty members in the top 20 schools have fewer coauthored publications in the top 20 journals. Since economists in general do not disagree with the overall rankings of the top 15-20 economics journals, we do not report the results for the top 10 or 15 journals. We performed those analysis and found again that the results are qualitatively similar to the results we obtained by using the top 20 journals. The results are available upon request.

Table 1: Summary Statistics of State-level Variables (Mean and Standard Deviation)

	All	Male	Female	Diff		All	Male	Female	Diff
Total Publications	9.239	9.347	8.681	0.666	First Attempted Tenure Year	1998.239	1997.384	2002.658	-5.274***
	(5.590)	(5.790)	(4.370)	(1.663)		(12.663)	(12.812)	(10.863)	(-5.862)
Solo Publications	3.597	3.678	3.177	0.501*	Successful Tenure	0.871	0.874	0.858	0.016
	(3.380)	(3.469)	(2.839)	(2.071)	at First Attempt	(0.335)	(0.332)	(0.350)	(0.670)
Coauthor Publications	5.641	5.672	5.478	0.194	PhD Duration	5.469	5.438	5.632	-0.194*
	(4.800)	(4.927)	(4.087)	(0.563)		(1.249)	(1.256)	(1.203)	(-2.117)
Publications in Journal 1-20	1.800	1.860	1.487	0.373**	Publications in PhD	0.579	0.598	0.470	0.129
	(1.951)	(1.999)	(1.646)	(2.675)	and Post Doc	(1.232)	(1.288)	(0.858)	(1.409)
Publications in Journal 21-80	1.955	1.983	1.810	0.173	Years of Work Experience	0.736	0.777	0.526	0.251*
	(2.077)	(2.126)	(1.799)	(1.162)	Prior to Graduate School	(1.488)	(1.533)	(1.206)	(2.356)
Publications in Journal 81-150	1.355	1.371	1.272	0.100	Phd Graduation Year	1992.168	1991.378	1996.298	-4.920***
	(1.688)	(1.710)	(1.568)	(0.824)		(11.876)	(12.054)	(9.946)	(-5.797)
Publications in Journal 150-300	2.046	2.088	1.828	0.260	Nonwhite	0.188	0.175	0.254	-0.079**
	(2.578)	(2.646)	(2.179)	(1.410)		(0.391)	(0.380)	(0.436)	(-2.834)
Unique Coauthor	5.141	5.039	5.670	-0.630	Phd Graduation Age	28.557	28.470	29.014	-0.544**
	(4.732)	(4.555)	(5.539)	(-1.851)		(2.815)	(2.859)	(2.523)	(-2.638)
No of Observations	1,437	1,204	232	1,437	No of Observations	1,437	1,204	232	1,437

This unique dataset is constructed by using CVs of all assistant professors up for tenure between 1984 and 2017 at the top 96 PhD-granting economics departments in the United States.

Table 2: Summary Statistics of Journal Publications and Other Characteristics by First Employed University

	University 1-20			University 21-40			University 41-96		
	Male	Female	Diff	Male	Female	Diff	Male	Female	Diff
Fraction of Faculty	0.871	0.129	0.742	0.826	0.174	0.652	0.819	0.181	0.638
Unique Coauthors	4.590	4.793	-0.203	5.143	5.088	0.055	5.314	6.400	-1.086*
	(4.388)	(4.225)	(-0.330)	(4.616)	(4.223)	(0.083)	(4.627)	(6.546)	(-2.104)
Coauthor Publications	4.908	4.241	0.667	5.861	5.220	0.640	6.135	6.235	-0.100
	(4.231)	(3.230)	(1.151)	(4.489)	(3.891)	(1.018)	(5.527)	(4.420)	(-0.181)
Solo Publications	3.327	3.500	-0.173	4.211	3.169	1.041*	3.657	3.017	0.639
	(3.196)	(3.224)	(-0.385)	(3.622)	(2.458)	(2.107)	(3.551)	(2.825)	(1.811)
Total Publications	8.253	7.724	0.528	10.071	8.373	1.699*	9.771	9.322	0.449
	(5.134)	(4.051)	(0.750)	(5.545)	(3.908)	(2.237)	(6.249)	(4.667)	(0.728)
Publication in Journal 1-20	2.722	2.448	0.274	2.093	1.492	0.601*	1.103	1.000	0.103
	(2.290)	(1.779)	(0.872)	(1.980)	(1.558)	(2.193)	(1.408)	(1.402)	(0.714)
Publication in Journal 21-80	1.408	1.397	0.012	2.639	2.220	0.419	2.062	1.809	0.253
	(1.679)	(1.544)	(0.050)	(2.645)	(1.921)	(1.153)	(2.002)	(1.820)	(1.250)
Publication in Journal 81-150	0.714	0.466	0.249	1.718	1.373	0.345	1.673	1.626	0.047
	(1.092)	(1.030)	(1.631)	(1.933)	(1.618)	(1.279)	(1.820)	(1.630)	(0.255)
Publication in Journal 150-300	0.982	0.776	0.206	2.204	1.898	0.305	2.842	2.322	0.520
	(1.846)	(1.338)	(0.819)	(2.458)	(1.954)	(0.896)	(2.950)	(2.444)	(1.765)
Publications in PhD	0.583	0.333	0.250	0.647	0.518	0.130	0.583	0.520	0.064
and Post Doc	(1.099)	(0.636)	(1.675)	(1.279)	(0.831)	(0.727)	(1.423)	(0.972)	(0.432)
Years of Work Experience	0.602	0.552	0.050	0.954	0.797	0.157	0.812	0.374	0.438**
Prior to Graduate School	(1.311)	(1.273)	(0.274)	(1.750)	(1.495)	(0.641)	(1.553)	(0.968)	(2.907)
Non-white	0.110	0.138	-0.028	0.189	0.271	-0.082	0.216	0.304	-0.089*
	(0.313)	(0.348)	(-0.632)	(0.392)	(0.448)	(-1.420)	(0.412)	(0.462)	(-2.046)
No of Observations	392	58	450	280	59	339	533	115	648

This unique data set is constructed by using CVs of all assistant professors went up for tenure in between 1984-2017 at the top-96 PhD-granting economics departments in the United States.

Table 3: Gender Differences in Total Number of Journal Publications During the PhD Program

	(1)	(2)	(3)	(4)	(5)
Female	-0.129**	-0.142**	-0.173*	-0.133***	-0.146**
	(0.041)	(0.050)	(0.070)	(0.029)	(0.037)
Non-White		0.080	0.064	0.112	0.076
		(0.064)	(0.062)	(0.084)	(0.069)
No of Years Took to Finish the PhD Program		0.024	0.023	0.016	0.017
		(0.016)	(0.016)	(0.017)	(0.017)
Work Experience Prior to Graduate School		0.003	0.013	0.009	0.014
		(0.020)	(0.022)	(0.023)	(0.022)
Graduate School Rank FE	No	No	No	Yes	Yes
FEs (Research Field, Phd Year)	No	No	Yes	No	Yes
Pseudo R^2	0.001	0.003	0.032	0.052	0.061
No of Observations	1,388	1,344	1,344	1,344	1,344

The numbers in the first parenthesis of each column represent the PhD granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 4: Gender Differences in Total Number of Publications, Solo Publications and Coauthored Economics Journal Publications by University Rank

	Total Number of Publications			Solo Publications			Coauthor Publications		
	Uni 1-20	Uni 21-40	Uni 41-96	Uni 1-20	Uni 21-40	Uni 41-96	Uni 1-20	Uni 21-40	Uni 41-96
Female	0.039	-1.948***	-1.089*	0.689	-1.180***	-0.488	-0.632***	-0.773***	-0.708
	(0.262)	(0.228)	(0.490)	(0.362)	(0.143)	(0.245)	(0.110)	(0.154)	(0.381)
Total Unique Coauthors	0.713***	0.641***	0.684***	0.009	-0.026	-0.090**	0.702***	0.660***	0.784***
	(0.024)	(0.079)	(0.117)	(0.011)	(0.035)	(0.029)	(0.023)	(0.065)	(0.088)
Tenure at First Attempt	-0.744**	0.123	-0.927	-0.882***	0.018	-0.670	0.133**	-0.059	-0.279
	(0.245)	(0.370)	(0.572)	(0.204)	(0.630)	(0.562)	(0.043)	(0.317)	(0.390)
Non-White	-0.068	0.641	0.281	-0.233	-0.122	-0.106	0.252**	0.761	0.375
	(0.242)	(1.177)	(0.353)	(0.219)	(0.560)	(0.158)	(0.065)	(0.630)	(0.314)
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.394	0.284	0.392	0.096	0.058	0.091	0.607	0.530	0.621
No of Observations	446	330	647	446	330	647	446	330	647

The numbers in the first parenthesis of each column represent the PhD granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 5: Gender Differences in Total Number of Publications, Solo Publications and Coauthored Economics Journal Publications Over Time by University Rank

	University 1-96								
	Total Publication			Solo Publications			Coauthor Publications		
	Before 2000	2000 - 2009	2010 -2017	Before 2000	2000 - 2009	2010 -2017	Before 2000	2000 - 2009	2010 -2017
Female	-0.514*	-0.911	-1.210*	0.048	-0.248*	-0.519**	-0.660***	-0.654	-0.705
	(0.235)	(0.458)	(0.498)	(0.250)	(0.097)	(0.176)	(0.161)	(0.418)	(0.418)
Unique Coauthors	0.826***	0.793***	0.428***	-0.033	-0.041	-0.096***	0.860***	0.834***	0.530***
	(0.053)	(0.074)	(0.061)	(0.037)	(0.037)	(0.023)	(0.080)	(0.061)	(0.052)
All Other Controls and FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FEs (Research Field, Phd Year, Attempted Tenure Year and School)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.358	0.452	0.405	0.012	0.054	0.067	0.627	0.636	0.537
No of Observations	715	401	307	715	401	307	715	401	307

	University 1-20								
	Total Publication			Solo Publications			Coauthor Publications		
	Before 2000	2000 - 2009	2010 -2017	Before 2000	2000 - 2009	2010 -2017	Before 2000	2000 - 2009	2010 -2017
Female	0.703	-0.435	-1.237***	1.656**	-0.726***	0.090	-0.911***	0.265	-1.286***
	(0.326)	(0.517)	(0.220)	(0.418)	(0.101)	(0.302)	(0.186)	(0.415)	(0.129)
Unique Coauthors	0.823***	0.704***	0.617***	0.040**	0.011	-0.060	0.778***	0.699***	0.677***
	(0.017)	(0.073)	(0.006)	(0.014)	(0.033)	(0.041)	(0.011)	(0.045)	(0.043)
All Other Controls and FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FEs (Research Field, Phd Year, Attempted Tenure Year and School)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.392	0.451	0.444	0.088	-0.026	0.054	0.653	0.545	0.582
No of Observations	220	123	103	220	123	103	220	123	103

The numbers in the first parenthesis of each column represent the PhD granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 6: Robustness Check Results for Logit Model Estimates of the Probability of First Employment in Different Rank University

	University 1-15	University 16-30	University 31-96
Female	-0.043**	0.001	0.059
	(0.022)	(0.017)	(0.039)
Non-White	-0.100***	0.006	0.089**
	(0.020)	(0.008)	(0.042)
Publications During the PhD Program	0.005	-0.004	-0.003
	(0.012)	(0.004)	(0.014)
Years Took to Finish the PhD Program	-0.030***	0.007**	0.026***
	(0.005)	(0.003)	(0.007)
Work Experience Prior to Graduate School	-0.024***	0.018***	0.005
	(0.005)	(0.005)	(0.006)
Graduate School Rank FE	Yes	Yes	Yes
All Other Control and FE	Yes	Yes	Yes
Pseudo R^2	0.087	0.025	0.105
No of Observations	1,165	1,165	1,165

All other control variables are shown in Appendix Table 1. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 7: Robustness Checks of the Heterogeneous Impacts of Unique Coauthors on Total Number of Publications and Coauthored Publications by University Ranks

Dependent Variable: Number of Publications

	Total Publications By University				Coauthor Publications By University Rank			
	All	Uni 1-15	Uni 16-30	Uni 31-96	All	Uni 1-15	Uni 16-30	Uni 31-96
Female × Unique Coauthors	-0.300**	-0.371***	-0.099	-0.314*	-0.255*	-0.244***	-0.023	-0.314**
	(0.105)	(0.045)	(0.113)	(0.125)	(0.109)	(0.044)	(0.122)	(0.114)
Unique Coauthors	0.756***	0.822***	0.672***	0.758***	0.799***	0.794***	0.659***	0.847***
	(0.067)	(0.020)	(0.142)	(0.103)	(0.062)	(0.024)	(0.107)	(0.070)
Female	0.908	1.562***	-0.932	0.914	0.829	0.474*	-0.514	1.263
	(0.542)	(0.116)	(0.742)	(0.628)	(0.618)	(0.190)	(0.771)	(0.696)
Tenure at First Attempt	-0.491*	-0.820***	1.327	-0.996*	-0.003	0.186*	0.402	-0.368
	(0.238)	(0.173)	(0.661)	(0.413)	(0.161)	(0.077)	(0.464)	(0.247)
Non-White	0.394	0.280	0.191	0.367	0.496	0.242*	0.473	0.559
	(0.468)	(0.253)	(0.647)	(0.452)	(0.308)	(0.096)	(0.370)	(0.434)
All Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.372	0.414	0.386	0.376	0.605	0.604	0.610	0.605
No of Observations	1,423	370	252	801	1,423	370	252	801

The numbers in the first parenthesis of each column represent the PhD granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 8: Robustness Checks of The Heterogeneous Impacts of Unique Coauthors on Total Number of Publications and Coauthored Publications by University and Economics Journal Ranks

Dependent Variable: Number of Publications

	Journal 1-20			Journal 21-80		
	Uni 1-15	Uni 16-30	Uni 31-96	Uni 1-15	Uni 16-30	Uni 31-96
Female × Unique Coauthor	-0.086***	0.021	-0.032**	-0.016	-0.045	-0.025
	(0.017)	(0.012)	(0.012)	(0.040)	(0.087)	(0.035)
Female	0.136	-0.748***	-0.038	0.045	-0.338	-0.157
	(0.068)	(0.116)	(0.156)	(0.348)	(0.237)	(0.187)
Total Unique Coauthors	0.185***	0.075***	0.033*	0.102*	0.189*	0.099**
	(0.007)	(0.007)	(0.014)	(0.047)	(0.072)	(0.027)
All Controls and Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.102	0.018	0.039	0.053	0.131	0.077
No of Observations	370	252	800	370	252	800

The numbers in the first parenthesis of each column represent the PhD granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.

Table 9: Robustness Checks: Gender Differences in Total Number of Publications, Solo Publications and Coauthored Economics Journal Publications Over Time by University Rank

	University 1-15								
	Total Publication			Solo Publications			Coauthor Publications		
	Before 2000	2000 - 2010	2010 -2017	Before 2000	2000 - 2010	2010 -2017	Before 2000	2000 - 2010	2010 -2017
Female	1.242***	-0.738	-1.741**	1.756***	-0.810***	-0.113	-0.463	-0.012	-1.575***
	(0.170)	(0.570)	(0.403)	(0.313)	(0.163)	(0.258)	(0.283)	(0.404)	(0.140)
Unique Coauthors	0.992***	0.673***	0.835***	0.102**	-0.016	-0.162*	0.884***	0.696***	0.996***
	(0.019)	(0.059)	(0.036)	(0.028)	(0.011)	(0.054)	(0.014)	(0.050)	(0.020)
All Other Controls and FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FEs (Research Field, Phd Year, Attempted Tenure Year and School)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.423	0.491	0.435	0.073	-0.005	0.214	0.671	0.542	0.638
No of Observations	186	105	79	186	105	79	186	105	79

The numbers in the first parenthesis of each column represent the PhD granting school level clustered robust standard errors. The notation $*$ represents the statistical significance levels: $*p < 0.10$, $**$ $p < 0.05$ and $***p < 0.01$.