

# Does gender parity foster collaboration? Trends in gender homophily in scientific publications

**Keywords:** *academia, occupational segregation, homophilic behavior, gender equality, Web of Science, scientific research*

## Extended Abstract

Jobs are increasingly becoming gender neutral. Indeed, occupational gender balance has become a major goal for gender-egalitarian policies in education and the labor market. Yet, the work dynamics of men and women in gender-neutral occupations continue to be understudied. Here, we ask whether gender balance is enough to eradicate homophilic behavior and foster gender collaboration within occupations.

To empirically test this hypothesis, we study gender collaboration patterns in academia over the last decades. More specifically, we examine how levels of gender homophily—the preferential interaction between individuals of the same gender—in scientific collaborations vary across all research areas as the presence of women increased between 1980 and 2019. Academia represents a strategic research site [Merton, 1987] for studying gender collaboration for several reasons. First, mirroring the existing dynamics in the labor market as a whole, female academics lag behind their male counterparts on nearly every major professional outcome, including hiring, earnings, and promotion [Ginther and Kahn, 2004, Leahey, 2007, West and Curtis, 2006]. Second, collaboration is a key feature of academic work. Not only is research increasingly performed by teams of academics in nearly every field, but recent studies also show that mixed-gender teams produce more novel and impactful publications than same-gender teams of equivalent characteristics [Yang et al., 2022]. Finally, academia is a unique setting because it is, by definition, a highly educated sector. Since greater levels of education have been consistently connected with progressive gender role attitudes [Cotter et al., 2011, England, 2010, Pampel, 2011, Brooks and Bolzendahl, 2004], the emergence of homophilic behaviors in academia, where these behaviors would presumably be least likely, would indicate the persistence and strength of homophily.

Our research draws on data from the Web of Science. We have collected data from all indexed articles published between 1980 to 2019 (a total of 15,642 journals, 28,241,100 articles and 15,406,477 authorships) grouped in five fields—Physical Sciences, Life Sciences and Biomedicine, Technology, Social Sciences, and Arts and Humanities—and 153 research areas. Our aim is to determine to what extent observed gender homophily in scientific collaborations is a consequence of the authors’ tendency (conscious or not) to choose peers of the same sex. Therefore, we need to disentangle the structural and behavioral aspects of the observed homophily in a particular field. Following Wang et al. [2019], we estimate a null distribution of the homophily level that should be observed if collaboration between men and women were set at random. More specifically, we represent a plausible configuration in which the author’s gender does not influence authorship composition, while maintaining the structural characteristics of the networks (e.g., sex composition, team size). For each year, country and field/area of research, we perform a series of 1,000 permutations that shape the null distribution (see Figure 1). Then, We use weighted least squared regressions—with fixed effects for year,

country, and field/research area—to estimate how behavioral gender homophily varies with the proportion of women in the given categories.

Results reveal a negative relationship between the degree of feminization and the level of gender homophily in scientific collaborations (see Table 1). Moreover, this relationship seems to be asymmetrical (see Figure 2). Gender homophily reaches maximum levels when there is rough gender parity, and minimum levels in areas where women represent a majority. Findings suggest that the observed decline in collaboration in gender-balanced contexts results from the reluctance of men to collaborate with women, rather than from mutually exclusionary behaviors. Our study can inform gender policy-making by revealing the mechanisms of gender homophily. Notably, our results support the notion that gender parity is not enough to guarantee collaboration. Therefore, effective actions for gender equality will not only need to attract women to male-dominated fields but also to promote labor integration between men and women.

## References

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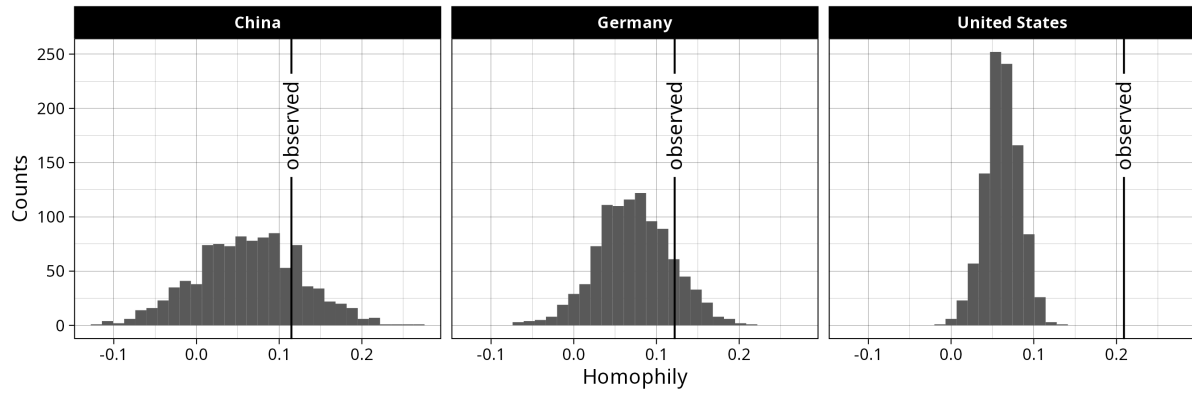


Figure 1: Structural (null) homophily histograms vs. observed homophily (vertical lines) for sociology in 2019 for three countries.

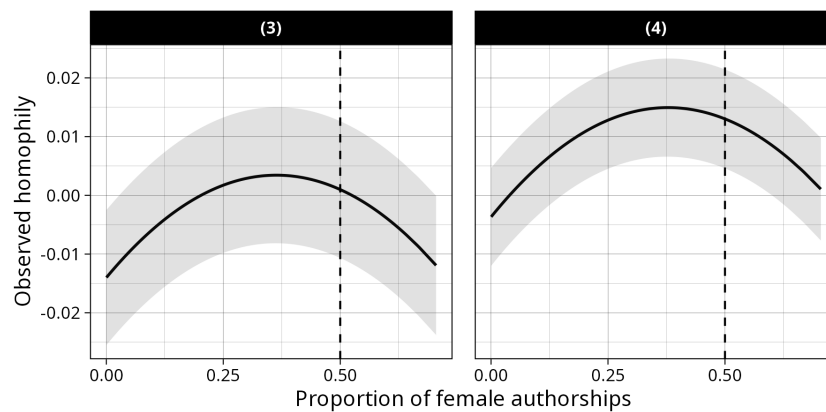


Figure 2: Marginal effect for the proportion of female authorships for the research area models, (3) and (4) (see Table 1), depicting a second order effect and an asymmetry around 50%.

Table 1: Models.

	<i>Dependent variable:</i>			
	Behavioral homophily			
	By field		By research area	
	(1)	(2)	(3)	(4)
Proportion of female authorships	0.064*** (0.016)	0.090*** (0.017)	0.096*** (0.009)	0.099*** (0.009)
Proportion of female authorships <sup>2</sup>	-0.084*** (0.023)	-0.121*** (0.025)	-0.132*** (0.012)	-0.130*** (0.012)
Internationalization	0.004 (0.005)	0.005 (0.005)	-0.005** (0.002)	-0.003 (0.002)
Proportion of solo authorships	-0.033*** (0.009)	-0.032*** (0.009)	-0.039*** (0.005)	-0.033*** (0.005)
Journal Impact Factor		-0.029*** (0.007)		-0.009*** (0.002)
Fixed effect by year	✓	✓	✓	✓
Fixed effect by country	✓	✓	✓	✓
Fixed effect by field	✓	✓		
Fixed effect by research area			✓	✓
Observations	8,697	6,947	87,795	80,168
Adjusted R <sup>2</sup>	0.958	0.963	0.713	0.725
Residual Std. Error	1.376	1.427	1.377	1.387
F Statistic	1,338.378***	1,407.938***	757.038***	781.838***

*Note:* \*p<0.05; \*\*p<0.01; \*\*\*p<0.001 (two-tailed tests)  
HAC robust standard errors are in parentheses