Gender and the time cost of peer review

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Pathways to Gender Equality in Central Banks

“Productivity paradox” in academia

- On average, male academics publish more papers than female academics (Symonds et al., 2006; West et al., 2012; Ductor et al., 2021).
- The gender gap in publications starts right after graduate school (Symonds et al., 2006).
- Although family undoubtedly contributes to this “productivity” gap, it probably doesn’t explain it all:
  - It’s smaller in fields where research is less expensive to produce (Duch et al., 2012).
  - It’s not very present in less prestigious publication outlets (Mayer and Rathmann, 2018).
  - In fact if you measure productivity in terms of teaching and service to the profession/department, women may even be more productivity than men (Aldercotte et al., 2017; Guarino and Borden, 2017).
- In a world with a more gender equal distribution of research output, we would probably have (a) a different gender distribution of researchers/academics; and (b) a different distribution of the type of research being conducted.

Data permission and extraction

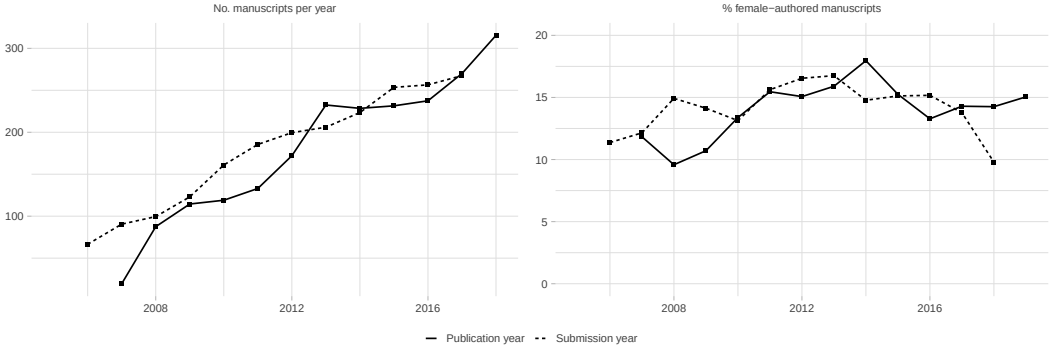
- Data were obtained with the permission and co-operation of Elsevier and Richard Tol, Editor-In-Chief of *Energy Economics*
- First collected publicly available data (*e.g.*, corresponding authors' genders, institutions, citations) on full-length, regular issue articles published or forthcoming in *Energy Economics* as of April 2019.
- We then extracted the names of all referees who had ever refereed for *Energy Economics* and consolidated them. (Some referees have multiple login accounts with Elsevier.)
- We wrote a Python program that downloaded all available data from Elsevier's Editorial System (EES). It then matched records with our own databases of consolidated referees and publicly collected information using authors' names, paper titles, *JEL* codes and DOIs.
- The data we analyse are an anonymised extracted subset of these data related to review time metrics (*e.g.*, submission dates, referee notification dates, round) for **accepted papers only**.

Research questions

- Do referees review papers by female authors as quickly as they review papers by male authors?
- Do women spend more time responding to referees?
- Do these gaps depend on how informed referees are about a journal's standards of acceptance and their skill and accuracy at assessing manuscript quality and writing referee reports?
  - Exploit exogenous variation in referee assignment—*i.e.*, assume referee assignment across author gender is orthogonal to referee experience—and see how the gender gaps change as referees become more experienced in reviewing for *Energy Economics*.
    - If referees' skill and accuracy at assessing manuscript quality and writing referee reports *doesn't* contribute to to the gender gap, then the gender gaps should not decline as referees' experience increases.
    - If referees' skill and accuracy *does* reduce the gender gap—suggesting statistical discrimination on the part of referees—then the gender gaps should go away as referees gain experience reviewing for *Energy Economics*.

Manuscripts per year

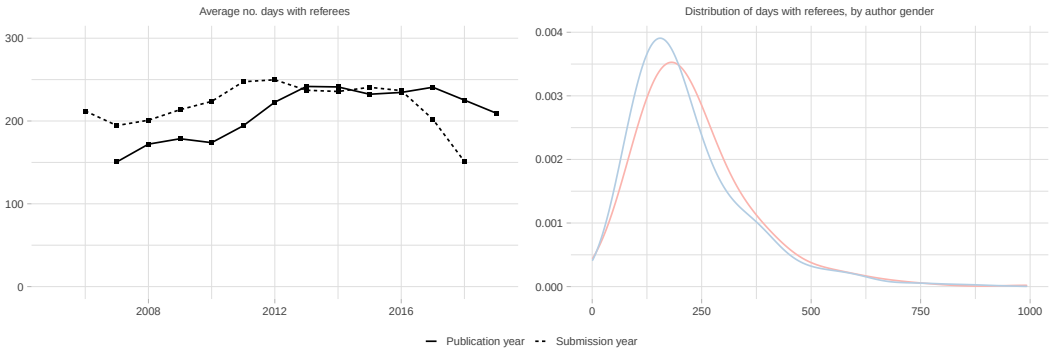
- 2,359 articles (342 female corresponding author) published in *Energy Economics*.



- Increasing number of manuscripts submitted and published per year but the percentage with a female corresponding author is relatively flat.

Time spend with referees

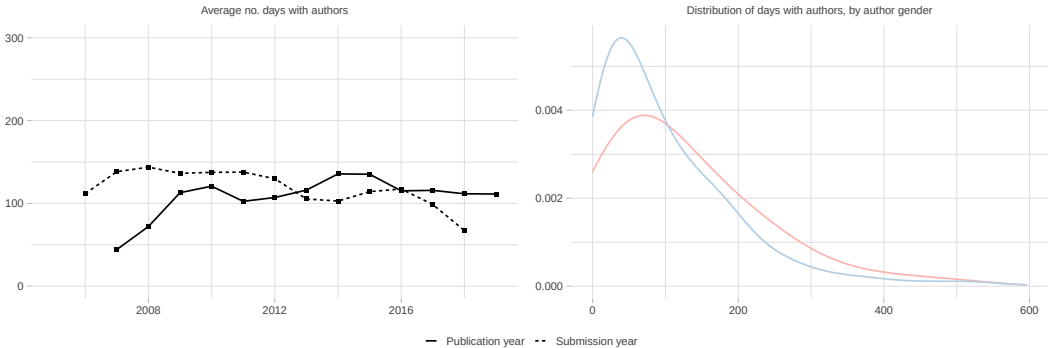
- 7,464 observations of referees reviewing a paper (1,114 female corresponding author), of which 7,035 did not recommend rejection (1,038 female corresponding author).



- Average number of total days a manuscript spends with referees has not radically changed; referees take slightly longer to review female-authored papers.

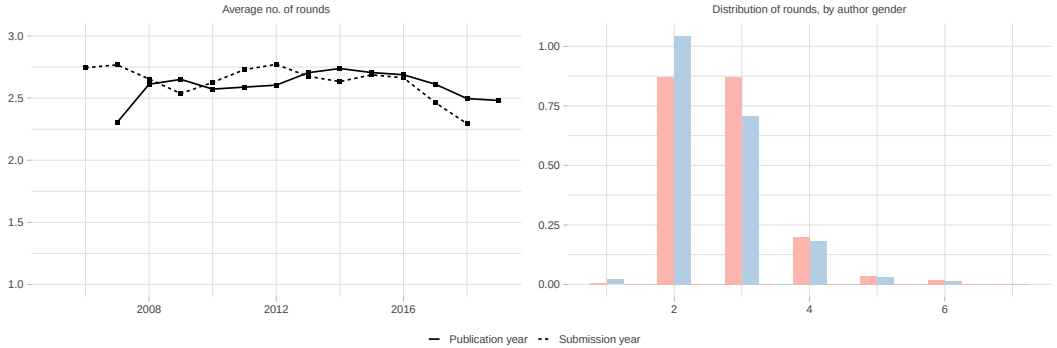
Time spend with authors

- 3,809 observations of authors revising their papers (581 female corresponding author).



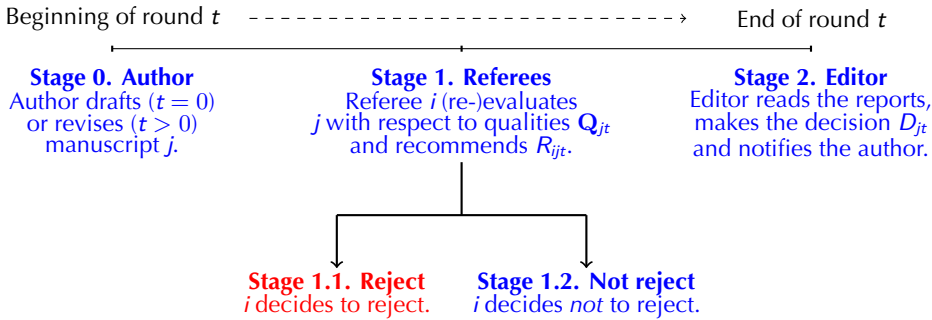
- Average number of total days authors spend revising their manuscripts *also* has not radically changed since 2005, but again, women take longer revising than do men.

Rounds of review



- Finally, the average number of rounds a manuscript goes through before being accepted has also remained relatively flat since 2005.
- Papers with a female corresponding author go through more rounds of review, on average.

All analyses are round-specific



- Analyse non-rejected papers only.
- To account for potential selection bias, we condition on $\mathbf{Q}_{jt}$.
- Contemporaneous measure of "discrimination"/"disparty"—*i.e.*, we measure disparities created at a particular point in time.

Gender differences in time spent with referees

$$\text{time}^{R}_{ijt} = \beta_0 + \beta_1 \,\text{female}_j + \beta_2 \,\mathbf{Q}_{jt} + \beta_3 \, t + \tau_j + \varepsilon_{ijt}$$

	(1)	(2)	(3)	(4)
female (β_1)	4.417***	4.753***	4.725***	4.095**
	(1.658)	(1.696)	(1.692)	(1.638)
t (round)	-15.896***	-12.930***	-13.553***	-12.704***
	(0.973)	(1.346)	(1.632)	(1.57)
citations (asinh)	-5.244***			-5.216***
	(0.837)			(0.832)
R_{ijt} (referee's recommendation)				
revise (major)		8.502***		6.781***
		(1.956)		(2.238)
revise (minor)		6.568***		5.216***
		(1.515)		(1.762)
D_{it} (editor's decision)				
revise (major)			8.099***	3.230
			(2.664)	(3.078)
revise (minor)			5.738***	3.114
			(1.698)	(1.943)
No. obs.	7,035	7,035	7,035	7,035
R^2	0.083	0.070	0.069	0.087
Oster bounds (β_1)	[4.2, 4.4]	[4.8, 4.9]	[4.7, 4.8]	[3.5, 4.1]
Year (τ)	✓	✓	✓	✓

- Controlling for current round and manuscript quality—proxied for by citations, referees' recommendations and editors' decisions—referees spend 4–5 days longer reviewing women's papers.

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- More highly cited papers are reviewed slightly faster as are papers being reviewed in later rounds.
- Referees are also quicker to accept than they are to recommend a revision.

Why do referees take longer reviewing women's papers?

- Editor, referee and field fixed effects do not appear to drive $\beta_1 > 0$.

$$\text{time}^R_{ijt} = \beta_0 + \beta_1 \,\text{female}_j + \beta_2 \,\mathbf{Q}_{jt} + \beta_3 \,\boldsymbol{t} + \tau_j + \mathbf{X}_{jt} + \varepsilon_{ijt}$$

	(5)	(6)	(7)	(8)	(9)
female (β_1)	4.449***	4.169***	3.308**	8.282***	9.768***
	(1.601)	(1.594)	(1.665)	(2.636)	(2.903)
t (round)	-15.050***	-13.332***	-13.224***	-13.516***	-13.557***
	(0.908)	(1.278)	(1.252)	(1.201)	(1.203)
citations (asinh)	-4.699***	-2.973***	-3.128***	-2.919***	-3.031***
	(0.846)	(0.988)	(0.868)	(0.901)	(0.895)
Referee experience					
experience					0.216**
					(0.108)
experience×female					-0.107**
					(0.05)
No. obs.	7,035	7,035	7,035	7,035	7,035
R^2	0.089	0.093	0.114	0.313	0.315
Year (τ)	✓	✓	✓	✓	✓
Editor	✓	✓	✓	✓	✓
Referee		✓	✓	✓	✓
JEL (secondary)			✓	✓	✓
Institution				✓	✓

Why do referees take longer reviewing women's papers?

- Editor, referee and field fixed effects do not appear to drive $\beta_1 > 0$.
- Institution fixed effects may…
  - β_1 doubles.
  - *Also* absorb substantial variation in the dependent variable.

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Referee		✓	✓	✓	✓
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Institution				✓	✓

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- Editor, referee and field fixed effects do not appear to drive $\beta_1 > 0$.
- Institution fixed effects may…
  - β_1 doubles.
  - *Also* absorb substantial variation in the dependent variable.
- Coefficient on interaction between author gender and referee experience is negative.

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	(1)	(2)	(3)	(4)
female	12.282**	12.467**	12.900**	10.899**
	(5.316)	(5.515)	(5.569)	(5.295)
t	-41.537***	-28.216***	-38.156***	-27.842***
	(2.372)	(2.279)	(2.37)	(2.204)
citations (asinh)	-12.444***			-12.379***
	(1.842)			(1.765)
D_{it-1} (revise (major))		46.993***		44.464***
		(3.674)		(4.206)
D_{it}				
revise (major)			25.797***	3.232
			(7.211)	(7.409)
revise (minor)			22.514***	5.905
			(3.982)	(4.478)
No. obs.	3,814	3,814	3,809	3,809
R^2	0.112	0.133	0.105	0.151
Year (τ)	✓	✓	✓	✓

- Controlling for year fixed effects, round and manuscript quality—citations, the editor's decision in the previous round and the editor's decision in the current round—women spend 11–13 more days revising their manuscripts during each round of review.

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- Controlling for year fixed effects, round and manuscript quality—citations, the editor's decision in the previous round and the editor's decision in the current round—women spend 11–13 more days revising their manuscripts during each round of review.
- In other words, conditional on the quality of the underlying manuscript, women spend longer revising than men.

Do women always take longer to return their revisions?

- Including editor and *JEL* fixed effects has no impact on the coefficient on female.

$$\text{time}_{jt}^{A} = \beta_0 + \beta_1 \,\text{female}_j + \beta_2 \,\mathbf{Q}_{jt} + \beta_3 \,t + \tau_j + \mathbf{X}_{jt} + \varepsilon_{jt}$$

	(5)	(6)	(7)	(8)	(9)
female	11.514**	11.430**	23.575***	19.522*	24.660**
	(5.352)	(5.277)	(8.032)	(10.734)	(10.837)
t	-42.336***	-43.428***	-45.079***	-58.873***	-58.823***
	(2.383)	(2.439)	(3.045)	(3.212)	(3.223)
citations (asinh)	-13.182***	-12.524***	-12.620***	-12.563***	-12.459***
	(1.857)	(1.845)	(2.793)	(3.206)	(3.192)
Referee experience					
experience					-0.043
					(0.163)
experience×female					-0.402**
					(0.19)
No. obs.	3,814	3,814	3,814	6,440	6,440
R^2	0.114	0.153	0.394	0.443	0.444
Year (τ)	✓	✓	✓	✓	✓
Editor	✓	✓	✓	✓	✓
JEL (secondary)		✓	✓	✓	✓
Institution			✓	✓	✓
Referee				✓	✓

Do women always take longer to return their revisions?

- Including editor and *JEL* fixed effects has no impact on the coefficient on female.
- But the coefficient doubles when we account for institution fixed effects! Referee and institution fixed effects explain a great deal of variation in the dependent variable.

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- Including editor and *JEL* fixed effects has no impact on the coefficient on female.
- But the coefficient doubles when we account for institution fixed effects! Referee and institution fixed effects explain a great deal of variation in the dependent variable.
- The gender gap in time spend revising declines in referee experience.

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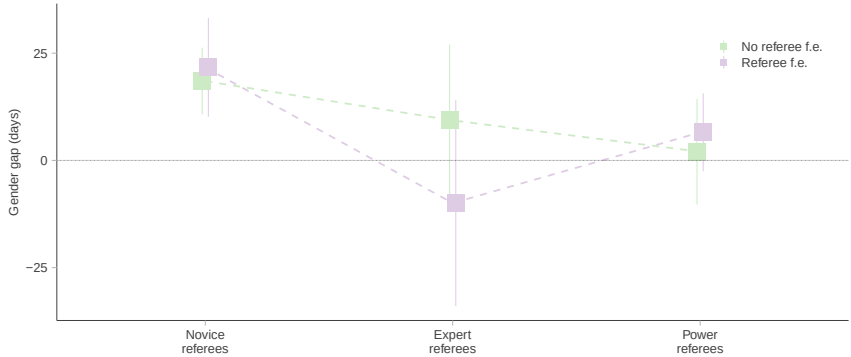
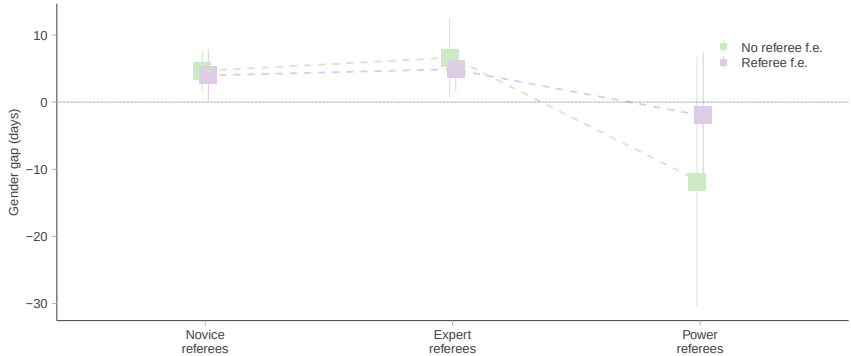
Impact of referee experience



- When assigned to inexperienced referees, women spend longer than men revising their papers.
- When assigned to experienced referees, men spend as long (or longer) than women revising their papers.

Impact of referee experience



- The review time gap also declines with referee experience, although only once one has gained *a lot* of experience refereeing for *Energy Economics*.

What is going on?

- Exploit exogenous variation in referee assignment—*i.e.*, referee assignment across author gender is orthogonal to referee experience—and find that both gender gaps decline (and eventually disappear) as referees' experience increases.
- Suggests a form of **statistical discrimination**—which includes beliefs based on correct as well as incorrect information.
  - Less experienced referees are less sure about the standards of acceptance at a particular journal.
  - Thus, they scrutinise more heavily the papers they are (for whatever reason), *most* unsure about.
- Identifies several potential policy solutions!
  - Within referee comparisons, so the gender gap in peer review times declines as the *same referee* reviews more papers for *Energy Economics*—so increase the pool of experienced referees!
  - Send papers by women (and possibly also "low prestige" men) to more experienced referees (and send papers by "high prestige" men to less experienced referees).

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