

No Fair Sex in Academia: Evidence of Discrimination in Hiring to Editorial Boards

Abstract

The editorial boards of academic journals overrepresent men, even above their proportion in university faculties. We test whether this sex disparity is caused by anti-female bias, supposing that anti-female discrimination means women must have a higher research output than men to overcome bias against them. We collect a dataset of the research output and sex of 4,319 academics on the editorials boards of 120 journals within four social science disciplines: Anthropology, Psychology, Political Science and Economics. Using a transformation of the *h*-index as our indicator of research output, we find male research output to be 0.35 standard deviations ($p < 0.001$) above female research output. However, the gap falls to 0.13 standard deviations ($p < 0.001$) when years publishing is controlled for. Our results are replicated with alternative dependent variables and using robust regression. We followed up our research with a survey of 231 academics, asking for their attitudes towards discrimination in hiring to editorial boards. Although two-thirds of academics supported no bias, for every 1 academic who supported discrimination in favour of men, 11 supported discrimination in favour of women. Our results were consistent with the hypothesis that academics and journal editors are biased in favour of men, rather than against women.

Introduction

Academics have documented many sex disparities in their occupation that could be suggestive of pervasive anti-female bias. Despite women being more than 50% of undergraduates in many disciplines, they are less likely to go into a career in academia (Ceci et al., 2014), they achieve lower pay and lower rank within academia (Aiston, 2014; Dunkin, 1991; Ginther and Hayes, 1999, 2003; Ginther and Khan, 2004; Santos and Dang Van Phu, 2019), their papers are less likely to be cited (Abramo, et al., 2009; D'Amico et al., 2011; Dion et al., 2018; Huang et al., 2020; Maliniak et al., 2013; Schucan Bird, 2011, Strumia 2021) and they are less likely to win academic awards (Chan and Torgler, 2020; Lincoln et al., 2012). Only 2% of the individuals considered to be 'eminent' in science, before 1950, are women (Murray, 2003).

These disparities pose a key question: to what extent do sex biases or sex differences explain different outcomes? Feminist scholars have argued that anecdotal reports of sexism in the lived experience of female academics (Meyers, 2013) and the fact of sex disparities themselves, suggests that academia is systemically sexist. On the other hand, some academics have suggested psychological differences could explain sex disparities.

For example, female graduate students report being less interested in their careers than male students (Ferriman et al., 2009), a sex difference that also increases with age. Part of this difference in careerism may be because women have a greater interest in family and family commitments, being more likely to take time off for parental leave (Boston College Center For

47 Work and Family, 2019) and sick leave (Herr et al. 2020), which may have adverse effects on
48 academic career outcomes (Ahmad, 2017) and publications (Fox, 2005).

49

50 With regards to personality differences more generally, the only research we are aware of that
51 attempts to explain sex differences in academic outcomes with personality difference is
52 Helmreich et al. (1980). They argued that in a sample of 196 academics, differences in
53 motivation and masculinity/femininity could not account for the differences in citations and
54 publications, because there were no significant sex differences in the personality traits. Big
55 Five personality traits might explain sex differences in academic success. Women score
56 higher on extraversion, agreeableness and neuroticism (Weisberg et al., 2011). It has been
57 speculated that geniuses tend to be low in extraversion and agreeableness, but high in
58 neuroticism (Dutton and Charlton, 2020).

59

60 There is also the potential for intelligence differences to be driving outcomes. For example,
61 Darwin (1871) thought that the great success of men to achieve eminence in academic
62 research (Murray, 2003) could be reflective of differences in intelligence. In meta-analyses
63 (Lynn, 2017, 1994; Lynn and Irwing, 2004), women tend to have lower IQs than men.
64 Furthermore, men also outperform women in general knowledge tests (Tran et al., 2014) which
65 may be particularly useful for academics who have to memorise and synthesise knowledge
66 from prior academic literature. However, the sex differences in intelligence are not clear cut;
67 in children, boys do not have an advantage in intelligence (Lynn, 2017) and in some cognitive
68 abilities, such as reading ability (Lynn and Mikk, 2009), women outperform men. Nonetheless,
69 men have a higher variance in their intelligence (Baye and Monseur, 2016) which may cause
70 more men to outperform women in intellectually elite occupations such as academia (Nyborg,
71 2005; O'Dea et al., 2018). For example, Baye and Monseur (2016) find the male variance in
72 the Programme for International Student Assessment tests is 1.17 times the female variance.
73 If we assume aptitude to be normally distributed, this implies that for the 98th percentile score
74 in women, there are around 3 men for every 1 women at or above this level of aptitude.

75

76 This paper seeks to examine whether hiring to editorial boards in academic journals is sex-
77 biased. Many previous studies on editorial boards show that they overrepresent male
78 academics relative to their proportion in university faculties (eg. Amrien et al., 2011; Cho et
79 al., 2014; Mauleón et al., 2013; Metz and Harzing, 2009, 2012; Morton and Sonnad, 2007;
80 Ioannidou and Effie, 2015; Mazov and Gureev, 2016), indicating hiring to editorial boards could
81 be sex-biased. We contribute to this question by comparing the academic output of men and
82 women who are hired to editorial boards and through a survey of academics on their attitudes
83 towards women in academia.

84

85 The editors of journals hire academic experts, usually without pay, to sit on the editorial boards.
86 Academics sitting on editorial boards can perform three main tasks - advising on strategy for
87 the journal, helping in decisions on what to publish and improving the journal's reputation
88 through association (Wiley, 2021). Some longitudinal studies of editorial board membership
89 show that whilst the proportion of women on editorial boards is increasing, this is in parallel if
90 not below the growth in the number of women in academia (Addis and Villa, 2003; Huang et
91 al., 2020; Mauleón et al., 2013; Metz and Harzing, 2012). These studies are focused on
92 certain niches such as journals from Spain or management journals. Nonetheless, if these
93 studies are generalisable, sex representation in editorial boards are not changing over time.

94

95 A sex bias in hiring to editorial boards, or anywhere else in academia, may be detrimental to
96 the careers of those being discriminated against and for the quality of scientific research as a
97 whole. The Impact factor of journals has been found to correlate with the research productivity
98 of the members of its editorial board, although not with its sex proportion (Hafeez et al., 2019).
99 This means sex bias could undermine the quality of academic journals. Not being allowed on
100 an editorial board prevents discriminated individuals from this experience as an academic, but
101 it also might have knock-on effects on the careers of these discriminated individuals. Sitting
102 on an editorial board places an academic within a network of high-quality researchers whom
103 you can exchange ideas with or who can help each other in other ways.

104

105 A potential consequence of sex bias could be that it distorts scientific output. Addis and Villa
106 (2003) suggest that because the sexes differ in their academic interests, the proportion of
107 women on an editorial board could affect which articles are published. An example of sex
108 differences in academic interest includes men preferring 'thing-oriented topics' over 'people-
109 oriented topics' (Luoto, 2020).

110

111 Due to concerns that women are being discriminated against, multiple publishers have asked
112 their journal editors to increase the proportion of women on their editorial boards. For example,
113 *Nature* has been reviewing the sex balance in its journals and asking that editors improve this
114 balance since 2012 (Nature, 2017). More recently both the *Lancet* and *Elsevier* have been
115 urging their editors to increase the representation of women on their boards (Laudine et al.,
116 2018; Bayazit, 2020; Elsevier, 2021a). To improve transparency, *Elsevier* publishes the sex
117 ratio for each of its journals, which may act as an incentive for editors to increase female
118 representation to be seen as more progressive or avoid reputation-damaging accusations of
119 sexism (Elsevier, 2021b).

120

121 Attempts to employ affirmative for women on journal boards may be meritocratic if there is sex
122 discrimination. However, if there is no discrimination, affirmative action policies may
123 counterproductive. Moreover, if affirmative action and sex bias support the same sex, then
124 affirmative action may aggravate inequities. As such, stronger evidence on whether sex bias
125 exists is essential for judging whether affirmative action will improve meritocracy.

126

127 Our first method for investigating the possibility of whether there is bias in hiring to editorial
128 boards is to compare the academic output of men and women who have been hired. A critical
129 trait for being admitted to an editorial board is academic expertise (Lindsey, 1976) which may
130 be measured as research output. All other things being equal, if women are being
131 discriminated against they would have to be more impressive academically to compete with
132 men.

133

134 It must be noted that a sex difference in the academic output of editorial board members can
135 only be an indicator, not proof of sex bias. As mentioned, the variance in intelligence is higher
136 amongst males, and their average also seems to be somewhat higher. This would cause men,
137 on editorial boards, to have a higher academic output even if there was no bias. Thus if women
138 have a higher academic output, despite their lower variance in IQ, we can be confident that
139 there is anti-female bias. We can also say that the larger the sex difference in favour of men,
140 the lower the likelihood of anti-female bias and the higher the likelihood of anti-male bias. So
141 if men have a higher academic output than women we can be confident that there is no
142 extreme anti-female bias.

143

144 Our reasoning comes from Gary Becker's taste discrimination model of the labour market
145 (Becker, 1971). If an employer has a distaste for one group of employees, but cannot provide
146 them with a different wage rate, he will only hire members of this group that are sufficiently
147 extra productive to outweigh the cost of going against the employer's discriminatory tastes.

148

149 This same reasoning has been applied at least once before to editorial boards. Hafeez et al.
150 (2019) found that for Psychiatry journals, despite women publishing half as many papers as
151 men, they served on journals with the same mean impact factor. This result suggests women
152 are not being discriminated against, when Psychiatry journal boards hire, and may even imply
153 that women are being favoured. The authors also found that when women were in leadership
154 positions the journal was less likely to include women on its editorial and advisory boards. This
155 should not be the case if male academics are more likely to discriminate against women.
156 Hafeez et al. also found that, despite women being underrepresented on journal boards
157 relative to the proportion of women in Psychiatry, they were represented in equal proportion
158 to their level of seniority in academia. We go beyond this prior paper by testing for sex
159 differences in output, in editorial boards, in a wider range of disciplines.

160

161 A similar test for sex bias in hiring was used by Guy Madison and Pontus Fahlman (2020).
162 The authors found that women had fewer publications and citations upon becoming professors
163 in Sweden. Likewise, Strumia (2021) found that male physicists have a greater research
164 output than women before being hired by a university. These results suggest that women are
165 unlikely to be discriminated against in hiring by universities or even a bias against women,
166 despite there being more male than female academics. Our paper thus applies the same logic
167 to test whether there might be sex bias in hiring to editorial boards.

168

169 However, other research of sex bias and hiring in academia have typically run experiments by
170 asking faculty members to judge the resumes are hypothetical hires. These studies have
171 reported mixed results. Williams and Ceci (2015) asked academics to evaluate hypothetical
172 hires, who were identical except for sex. They found on average university faculty preferred
173 women to men at a 2:1 ratio. Carlsson et al. (2020), using similar methods also found a
174 preference for women. A follow-up study (Ceci and Williams, 2015) found no preference for
175 women compared to better-qualified men. Quadlin (2018) also asked faculty to evaluate
176 hypothetical hires and found that amongst highly competent candidates with high GPAs, men
177 were preferred to women at a 2:1 ratio. Suggesting high academic achievement may be more
178 valued in men than in women. Older studies (Foschi and Sigerson, 1994; Steinpreis et al.,
179 1999) focused on hiring to non-faculty positions, such as laboratory manager (Moss-Racusin
180 et al., 2012), and found results consistently in favour of male applicants. A caveat to these
181 resume studies is that sex differences in hiring may not be caused by prejudice, but by
182 statistical discrimination.

183

184 In our test of whether editorial boards are sex-biased, we decide to use journals from the social
185 science and humanities. Firstly, women likely make up a higher proportion of academics in
186 humanities than in STEM disciplines, so getting a large sample with enough women may be
187 easier when avoiding STEM disciplines. Secondly, it has been argued that women prefer these
188 less quantitative disciplines (Kahn and Ginther, 2017), and may have less aptitude for STEM
189 disciplines (Reilly and Neumann, 2013; Lord, 1987). If this were true, the effect of higher male
190 performance would be more likely to obscure the effect of anti-female discrimination, making

191 non-STEM disciplines more appropriate for our test. Whether or not women have less interest
 192 or aptitude for STEM disciplines, we chose to study social sciences just in case this would
 193 bias our results. Thus although we are concerned with sex bias in academia as a whole, our
 194 method only focuses on testing this hypothesis within social science disciplines.

195
 196 We thought it was also important to choose disciplines within a wide range of political
 197 persuasions in case politics influences bias in hiring to editorial boards. Some research has
 198 suggested that right-wing individuals exhibit an anti-female bias (Austin and Jackson, 2019;
 199 Christopher and Mull, 2006; Hodson et al., 2017). Other research finds that left-wing
 200 individuals may be prone to bias towards groups with low status, including women (Winegard
 201 et al., 2020). Overall this body of research indicates that as one moves politically right one
 202 becomes less pro-female and more pro-male. Whilst a wide range of disciplines with a very
 203 large sample size would be necessary to test whether politics did create biased hiring, having
 204 a range of disciplines allows us to be sure that our results are not due to the political confounds
 205 of any particular discipline.

206
 207 We chose four social science disciplines to study: Anthropology, Psychology, Political Science
 208 and Economics. These disciplines vary widely in their political persuasions, with economics
 209 being the least left-wing and Anthropology being the most left-wing (Langbert, 2020). The ratio
 210 of Democrat to Republican faculty members in each discipline is presented in Table 1 below.

211

212 **Table 1**

213 *Political Affiliation of University Faculty*

Discipline	Democrat - Republican Ratio in Faculty
Economics	5.5:1
Political Science	8.2:1
Psychology	16.8:1
Anthropology	133:1

Source: Langbert (2020)

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216

217 There have been many studies on sex representation on editorial boards including in
 218 Anthropology (Bruna et al., 2017), Psychology (Evans et al., 2005; Hafeez et al., 2019; Over,
 219 1981; Palser et al., 2021; Robinson et al., 1998), Political Science (Fraga et al., 2011; Palmer
 220 et al., 2020) and Economics (Addis and Villa, 2003; Gibbons and Fish, 1991; Mumford, 2016).
 221 Anthropology, Psychology and Economic editorial boards tend to slightly underrepresent
 222 women relative to the number of academic staff in these fields. This could suggest there is
 223 anti-female bias in these journals' boards.

224

225 However in Political Science (Fraga et al., 2011; Palmer et al., 2020), Economics (Mumford,
226 2016) and Psychiatry (Hafeez et al., 2019) editorial board sex proportions have been
227 compared to the sex proportion amongst senior academics, not just the totality of junior and
228 senior staff. When this is done editorial boards have a similar sex proportion to that of senior
229 academics.

230

231

232 **Data**

233

234 To choose which journal's editorial boards to study, we employed the website Scimagojr
235 (SCImago Journal & Country Rank, <https://www.scimagojr.com/>) which contains a dataset of
236 34,346 journals on their website based on Scopus, Elsevier's abstract and citations dataset.
237 We ranked journals in each of the disciplines we studied according to the number of citations
238 per document they had in the previous two years. From this ranking, we then took the top 30
239 journals from each discipline.

240

241 We disagreed with the discipline label of some of the journals on Scimagojr. For example,
242 some of the 'Economics' journals such as the 'Journal of management' were deemed closer
243 to Business Studies than Economics. Likewise, 'Politics' journals such as the 'Journal of
244 Political Economy' typically only had economists as authors. Nonetheless, the Journal of
245 Political Economy was also classified as an Economics Journal by Scimagojr, a classification
246 we agreed with. Journals not obviously in the correct disciplines were ignored. In Table 9 of
247 appendix A, we present a list of all 120 journals used in this study and their respective
248 disciplines.

249

250 From the websites of the journals, we recorded members of their editorial boards. The term
251 'editorial board' had slightly different meanings for different journals. Some used the term to
252 describe everyone working for the journal. Most however used it to label a subsection of the
253 editorial team involved in more advisory work. When there was no subsection of a journal's
254 staff labelled the 'editorial board' we took the relevant subsection that seemed closest in
255 meaning such as 'advisory board'. As such our methodology did not include journal chief
256 editors as part of the editorial board.

257

258 In line with the practice of previous research on sex representation on editorial boards, we
259 coded the sex of academics according to whether their names were clearly male or female
260 (eg. Ionnidou & Rosiana, 2015). When this was not obvious we used Google Search to find
261 their sex from pictures or left the sex variable missing when this was insufficient. Of the 5,625
262 editorial board members in our dataset, we were unable to determine the sex of 7 individuals.

263

264 To measure the productivity of academics on editorial boards we obtained relevant statistics
265 from their Google Scholar page when it was available. These statistics included the publication
266 count, *h*-Index, *i*10 Index, citation count, *h*-Index since 2016 and the citation count since 2016.
267 Furthermore, to control for years publishing in academia we also recorded the year of the
268 researcher's first publication. When the researcher did not have a page on Google Scholar we
269 left these statistics missing.

270

271 For ease of interpretation, our measures of academic output were first log10 transformed and
272 then Z-transformed into standard deviation units within each academic discipline. This allows

273 us to compare the relative performance of researchers across disciplines. For example, a
 274 transformed *h*-index of 1 means the researcher's *h*-index is one standard deviation above the
 275 mean of the editorial board's members in the respective discipline. Nonetheless, we also used
 276 raw data in the appendix.

277

278 All our data was collected between March and June 2021¹. Although 5,625 editorial board
 279 members were recorded, 7 individuals couldn't be identified by sex and a further 1,098
 280 individuals did not have Google Scholar pages. Of the board members recorded 40% were
 281 women, but 42% of researchers without Google Scholar pages were women, meaning women
 282 were slightly less likely to have a Google Scholar page.

283

284 Sometimes Google Scholar pages for individual academics contained errors in them. Some
 285 papers had the wrong date on them and others were attributed to the wrong author. When a
 286 Google Scholar Page included five or more articles with citations that the author had not
 287 written, we noted the page as overattributing research to the author. We excluded these 'over-
 288 attributed individuals'. When the earliest paper on a Google Scholar page appeared to be of
 289 the wrong date or by a different author we made use of the next earliest paper that appeared
 290 to be correct.

291

292 Despite our attempt to remove academics with exaggerated publication metrics, some unusual
 293 results remained. Some academics had higher *h* and *i*10 indexes for the period after 2016
 294 compared to their all-time *h* and *i*10 Indexes. We removed 21 academics because they had
 295 higher indexes of academic output for the period since 2016 than they had over all-time.
 296 Furthermore, some academics had very large academic outputs. For example, one academic
 297 had 2,876 publications, possibly suggesting either errors with Google Scholar, plagiarism or
 298 that they mostly relied on co-authors to write the papers. To deal with these extreme values
 299 we applied Tukey's Fences² to identify and remove positive outliers and removed 44
 300 observations from the dataset.

301

302 In deleting observations our data cleaning approach loses information and degrees of freedom
 303 in our results and thus may be critiqued. As such, we re-ran our main results, in table 12 of
 304 Appendix B, without omitting any observations for over-attribution, being outliers, or having
 305 inconsistent metrics post-2016 and for all-time.

306

307 After excluding observations we went from having 4,520 complete cases to 4,319 complete
 308 cases. This moved the sample from being 39.4% female to 40.2% female. As such, in
 309 removing the academics with the greatest publication metrics we were more likely to exclude
 310 men making our results slightly biased in finding a female advantage in academic output. The
 311 descriptive statistics for this complete dataset are in Table 2.

312

313 **Table 2**

¹ In this time period, journal rankings by citations changed from the default year of 2019 to 2020. This can be verified with the Internet Archive (Internet Archive, https://web.archive.org/web/*/https://www.scimagojr.com/journalrank.php). During data gathering, this change was not noticed meaning journals were ranked by citations in different years depending upon when the data was gathered.

² Tukey's Fences identifies positive outlier *h* index values as equal or greater than the following $Q_3 + 1.5 \times (Q_3 - Q_1)$, where Q_3 and Q_1 represent the third and first outlier respectively

314 *Descriptive Statistics*

Statistic	Mean	Standard Deviation	Minimum	25th Percentile	75th Percentile	Max	Skew	Kurtosis
Years Publishing	24.2	11.1	2.0	16.0	31.0	70.0	0.6	2.8
<i>h</i> -Index	30.5	21.4	1.0	15.0	40.0	136.0	1.8	7.8
Transformed <i>h</i> -Index	0.0	1.0	-4.1	-0.6	0.7	2.7	-0.2	3.1
<i>h</i> -Index since 2016	23.4	14.5	0.0	13.0	30.0	96.0	1.8	8.5
Transformed <i>h</i> -Index Since 2016	0.0	1.0	-5.6	-0.6	0.7	2.7	-0.3	3.5
<i>i10</i> Index	56.6	59.9	0.0	18.0	71.0	504.0	3.8	26.7
Transformed <i>i10</i> Index	0.0	1.0	-4.1	-0.7	0.7	2.8	-0.2	3.4
Publication Count	128.8	132.4	1.0	45.0	163.0	1,151.0	6.0	57.1
Transformed Publication Count	0.0	1.0	-4.2	-0.7	0.7	2.9	0.0	3.4
Citation Count	8,406.1	13,415.8	1.0	1,382.0	9,356.0	159,016.0	4.7	35.3
Transformed Citation Count	0.0	1.0	-5.0	-0.6	0.7	2.6	-0.4	3.7
Citation Count since 2016	3,895.1	5,427.3	0.0	861.0	4,626.5	58,699.0	5.9	64.0
Transformed Citation Count since 2016	0.0	1.0	-6.6	-0.6	0.7	2.7	-0.5	4.3

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317

318 In Table 3 we present a correlation matrix of our recorded variables, with the dependent
319 variables in their raw and transformed versions. Notably, our measures of research output
320 strongly correlate with each other. This suggests that any of the dependent variables will work
321 similarly well as a measure of research output. For simplicity, we thus focus on the popularly
322 used *h*-index. The *h*-index is the largest value of '*h*' for which an author has published '*h*'
323 articles with '*h*' citations each. The *h*-index has the advantage of being easy to understand
324 (Rørstad and Aksnes, 2015) and having high external validity (Ruscio et al., 2012) in its
325 association with academic rank eg. professor versus assistant professor. However, the
326 differences between the indexes for a researcher's entire career versus just what they have

327 done since 2016 may be related to sex, especially since women have been increasingly joining
 328 academia.

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331 **Table 3**

332 *Correlation Matrix*

Variable	Years Publishing	<i>h</i> -Index	Transformed <i>h</i> -Index	<i>h</i> -Index since 2016.	Transformed <i>h</i> -Index Since 2016	<i>i</i> 10 Index	Transformed <i>i</i> 10 Index	Publication Count	Transformed Publication Count	Citation Count	Transformed Citation Count	Citation Count since 2016	Transformed Citation Count since 2016
Years Publishing	1												
<i>h</i> -Index	0.62	1											
Transformed <i>h</i> -Index	0.65	0.88	1										
<i>h</i> -Index since 2016	0.58	0.96	0.86	1									
Transformed <i>h</i> -Index Since 2016	0.65	0.85	0.97	0.89	1								
<i>i</i> 10 Index	0.6	0.94	0.79	0.87	0.74	1							
Transformed <i>i</i> 10 Index	0.68	0.86	0.98	0.84	0.94	0.82	1						
Publication Count	0.5	0.81	0.71	0.73	0.66	0.89	0.76	1					
Transformed Publication Count	0.63	0.78	0.86	0.74	0.81	0.76	0.89	0.84	1				
Citation Count	0.5	0.83	0.66	0.81	0.64	0.77	0.62	0.66	0.56	1			
Transformed Citation Count	0.63	0.82	0.93	0.81	0.92	0.71	0.9	0.63	0.77	0.69	1		
Citation Count since 2016	0.41	0.82	0.66	0.85	0.68	0.75	0.62	0.63	0.55	0.95	0.7	1	
Transformed Citation Count since 2016	0.51	0.78	0.9	0.82	0.93	0.68	0.87	0.59	0.72	0.67	0.97	0.72	1

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342 Results

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344 To begin with we follow previous literature in simply comparing the sex proportions on editorial
 345 boards to comparison samples. In Table 4 we show the sex proportion in journal boards in
 346 each discipline. To see whether these proportions are representative of the field they should
 347 be compared with the population of academic researchers, be it for example faculty members
 348 or published researchers. We use the terms overrepresent and underrepresent to denote
 349 whether the fraction of women on editorial boards in a discipline is greater or less than female
 350 representation in the relevant population of academics who could be placed on editorial boards
 351 (ie. active authors and university faculty members).

352

353 For comparison, we found a range of datasets representing the sex proportion amongst
 354 academics in the disciplines studied here. Our first source of comparison is the sex proportion
 355 of active authors with at least two publications during the years 2014-2018. The figures are
 356 provided for the USA and the EU28 (The European Union plus the United Kingdom). These
 357 figures are reported by Elsevier (De Kleijn et al., 2020) in their 2020 Gender Report and are
 358 derived from the Scopus dataset. Unfortunately this data does not have sex proportions
 359 specifically for Anthropology or Political Science, so we use the proportions for the closest
 360 related discipline groups 'Arts and Humanities' and 'Social Sciences'. From the UK we have
 361 the sex proportions amongst academic staff from the Higher Education Statistics Agency
 362 (2021). We use the proportions from 2016 because newer staff might be too early in their
 363 research career to get on a journal board. For economics, we also record the proportion of
 364 published economists registered with the Research Papers in Economics Author Service as
 365 of 2021 (Research Papers in Economics Author Service, 2021).

366

367 Table 4

368 *Proportion female of editorial board members, active authors and university faculty*

Discipline	Sampled Editorial Boards	Active Authors (USA)	Active Authors (EU28)	Academics in UK Universities as of 2016	Registered authors with the Research Papers in Economics Author Service
Anthropology	49%	43% (Arts and Humanities)	43% (Arts and Humanities)	51%	N/A
Psychology	41%	56%	58%	61%	N/A
Political Science	39%	47% (Social Science)	44% (Social Science)	37%	N/A
Economics	28%	24%	34%	30%	26%

Sources: De Kleijn et al., (2020), Higher Education Statistics Agency (2021), Research Papers in Economics Author Service (2021)

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Editorial boards in Anthropology, Political Science and Economics seem to be broadly representative of their fields. Anthropology editorial boards are 49% female which is close to the proportion of UK Anthropologists who are female - 51%. Although Anthropology has a greater percentage of women than active authors in the Arts and Humanities these may not be an accurate match for the disciplines. Political Science overrepresented women relative to their role in UK Universities but not compared to active authors in social science. Whether this is because other Social Sciences have more women, or because the UK has an unusual lack of women in their Political Science departments is unclear because the data reported by Elsevier (De Kleijn et al., 2020) does not give a sex breakdown for individual disciplines within the Social Sciences. Compared to every comparison, our sample of Psychology editorial boards underrepresents women.

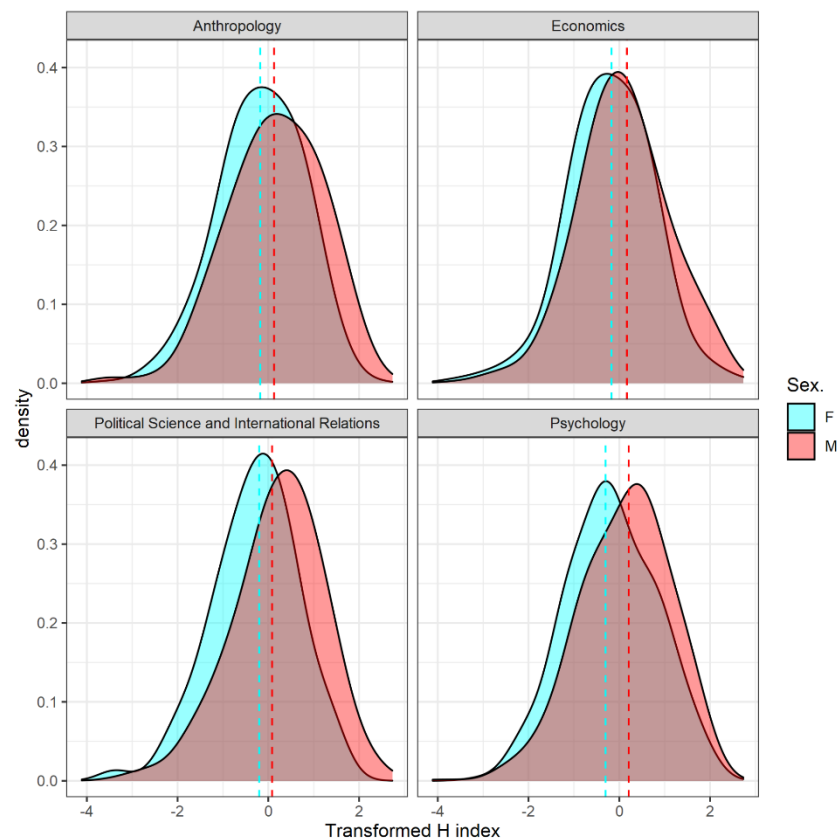
In previous research Anthropology underrepresented women (Bruna et al., 2017) but we find women proportionally represented in editorial boards. Political Science (Fraga et al., 2011; Palmer et al., 2020) and Economics (Mumford, 2016) were only representative of senior academics, however in our sample here they appear broadly representative of all academic staff. Only our results from Psychology (Evans et al., 2005; Hafeez et al., 2019; Over, 1981; Palser et al., 2021; Robinson et al., 1998) were in line with prior research suggesting women are under-represented.

One possibility could be that publishers, at least in Anthropology, Politics and Economics, have been successful in encouraging their journals to increase female representation in recent years. Nonetheless, whether these proportions are meritocratic will depend on the research output of women. Assuming no underlying differences in ability, if the sex disparities found here represent anti-female bias, women would need to substantially outperform men to get on Psychology editorial boards. Moreover, female research output should be approximately equal to men's in Anthropology, Political Science and Economics.

Our first method for testing whether women need a higher level of research productivity than men to get on editorial boards is to simply compare research productivity between men and women on editorial boards. As stated in the data section, our measures of research productivity are standardised relative to the mean research productivity of academics in editorial boards of journals residing in the same discipline. This ensures that there is no bias from differential sex interest in disciplines that may be associated with higher or lower absolute levels of research productivity.

Before using regression to compare sex differences whilst using controls, we present the sex distributions of research productivity by discipline in Figure 1. This is to create a clear visualisation of the results of our study. Test results for Welch's t-tests and their p values for the difference between male and female research productivity are reported in Table 5.

419 **Figure 1:**
 420 *Distributions of Log10 then Z-Transformed h-Index of female and male editorial board*
 421 *members*



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 446 **Table 5**
 447 *Sex Differences in log 10 transformed h-Indexes of editorial board members*

Discipline	Statistics			
	Mean Difference	<i>t</i> value	<i>P</i> value	Degrees of Freedom
Anthropology	0.34	5.23	$p < 0.001$	928.17
Psychology	0.31	6.12	$p < 0.001$	1439.83
Political Science	0.44	6.48	$p < 0.001$	757.80
Economics	0.28	4.10	$p < 0.001$	535.46

Note: Positive mean difference indicates male advantage and negative denotes female advantage.

449 In each discipline, men have a higher level of research productivity in terms of our transformed
450 *h*-index. The female disadvantage in research output is between 0.28 standard deviations
451 below men in economics to 0.44 standard deviations below men in political science. Moreover,
452 this difference is statistically significant in each discipline ($p < 0.001$). It should be noted that
453 despite including just as many journal boards in Economics as we have included in
454 Anthropology and Psychology, it has substantially fewer degrees of freedom because the
455 economics journals had fewer editorial board members.

456
457 Women are under-represented in psychology editorial boards, and yet the women who do
458 manage to get on the editorial boards dramatically underperform relative to the men that are
459 on the board by 0.44 standard deviations. In other words, women are underrepresented on
460 Psychology editorial boards relative to their proportion on faculty but are still overrepresented
461 relative to their merit. Likewise, women may be overrepresented relative to their merit in
462 Economics, Political Science and Anthropology. Despite women being proportionally
463 represented in these disciplines, male research output is still higher.

464
465 Also of note is that there is no monotonic relationship between sex differences in research
466 output and how right-wing a discipline's faculty is (disciplines are ordered in the table from the
467 most left-wing to least left-wing). To properly test for any sex bias arising from political opinion
468 between disciplines we would need to include more disciplines.

469
470 We again analyse the differences between male and female research productivity now using
471 ordinary least squares regression. This has multiple advantages. Firstly, we can combine our
472 samples from different disciplines, using dummies to control for any discipline effect, giving us
473 a larger sample size. Nonetheless, we also run regressions for each discipline separately.
474 Secondly, we can control for the number of years a researcher has been publishing. More
475 years in publishing allows an academic to increase their publication count and receive
476 additional citations for old articles, boosting metrics of research output. This means a brilliant
477 academic may have a lower *h*-index than a mediocre academic who has been publishing for
478 longer. Thus a meritocratic editorial board should take into account the length of an academic's
479 career when judging their research output. Since men tend to have had longer careers in
480 academia (Huang et al., 2020; Martinez et al., 2007) whilst women are joining academia at
481 greater rates we should control for the length of academics' publishing years to see whether
482 women are held to a higher standard. On the other hand, time in academia is itself an indicator
483 of knowledge and experience which could help as a member of an editorial board. Time in
484 academia is correlated at 0.62 with the *h*-index in our sample. Thus controlling for years
485 publishing could be partially controlling for the variable we are trying to model - merit to be on
486 a journal board. This possibility becomes more severe if younger and less experienced
487 scholars are less intelligent. Akcigit et al. (2020) have shown that there are more academics
488 today than before. The authors show that reduced selectiveness for joining academia has
489 reduced the IQ of the average PhD student. This is corroborated by the fact that scientists are
490 becoming less productive (Huang et al., 2020). Given arguments for and against this control
491 variable, we decide to run regressions with and without it.

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497 **Table 6**
 498 *Regression model of Log10 Transformed h-Index, Standardised as Z scores*

Disciplines Used in Models	Anthropology		Psychology		Political Science		Economics		All disciplines			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex Female = 1 Male = 0	-0.34*** (0.06)	-0.10* (0.05)	-0.30*** (0.05)	-0.14*** (0.04)	-0.51*** (0.07)	-0.21*** (0.06)	-0.28*** (0.07)	-0.12* (0.05)	-0.35*** (0.03)	-0.14*** (0.02)	-0.30*** (0.05)	-0.14*** (0.04)
Years Publishing		0.06*** (0.002)		0.06*** (0.002)		0.06*** (0.003)		0.07*** (0.002)		0.06*** (0.001)		0.06*** (0.001)
Anthropology									0.03 (0.04)	-0.10** (0.03)	0.03 (0.06)	-0.13** (0.04)
Economics									-0.04 (0.04)	0.15*** (0.03)	-0.04 (0.05)	0.15*** (0.04)
Political Science									-0.00 (0.04)	-0.16*** (0.03)	0.08 (0.05)	-0.14** (0.04)
Sex X Anthropology											-0.03 (0.08)	-0.06 (0.06)
Sex X Economics											0.02 (0.09)	-0.01 (0.07)
Sex X Political Science											-0.20* (0.08)	-0.05 (0.06)
Constant	0.17*** (0.05)	-1.41*** (0.07)	0.12*** (0.03)	-1.36*** (0.05)	0.21*** (0.04)	-1.39*** (0.08)	0.08* (0.04)	-1.47*** (0.06)	0.14*** (0.03)	-1.38*** (0.03)	0.12*** (0.03)	-1.38*** (0.04)
Observations	935	935	1,612	1,612	836	836	936	936	4,319	4,319	4,319	4,319
R ²	0.03	0.46	0.02	0.47	0.06	0.38	0.02	0.48	0.03	0.44	0.03	0.45
F Statistic	28***	400***	37***	672***	56***	257***	16***	439***	32***	692***	19***	432***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

499
 500 Our regression models of the transformed h -index are presented in table 6. Models using only
 501 sex as an independent variable find women perform worse in terms of research output in each
 502 discipline ($p < 0.001$). When we control for the years publishing we find it has a consistently
 503 positive effect ($p < 0.001$) on research output regardless of what disciplines are studied. Every
 504 10 years of experience in academic publishing is associated with a research output increase

505 of between 0.6-0.7 standard deviations. This is in accordance with our expectation that
506 academics with less experience tend to have a lower research output. Years publishing
507 moderates the effect size of sex in every discipline, more than halving sex's effect size in every
508 regression. Without the years publishing control, men perform better than women between
509 0.28 and 0.51 standard deviations, but with the control men only perform better by 0.1-0.21
510 standard deviations.

511
512 The moderating effect of years publishing is to be expected given sex and years in academia
513 are confounded; female academics tend to have less experience because they are becoming
514 more represented in academia over time (Miller and Wai, 2015) and they are more likely to
515 quit their academic career (Huang et al., 2020). Thus a partial cause of low female
516 representation in editorial boards may be their lower levels of experience, as evidenced by the
517 fact that years publishing correlates with the *h*-index and it moderates the sex difference in
518 academic output. This result is consistent with the findings that female scholars, and
519 particularly the worst-performing female scholars (Rørstad and Aksnes, 2015), are more likely
520 to drop out of academia and thus, presumably, editorial boards.

521
522 When we combine all the disciplines together in regression models 9-12 we find sex still has
523 a statistically significant effect on research output. In regressions 11 and 12 we use the
524 interaction terms between discipline and sex, indicating whether some disciplines significantly
525 differ in their respective sex effects. In these regressions, we find no statistically significant
526 interaction terms. Log-likelihood ratio tests were used to judge whether models 11 and 12 are
527 superior to models 9 and 10. The chi-square values were insignificant so the discipline sex
528 interaction terms do not improve the models. Thus we cannot reject the null hypothesis of
529 sex's effect being homogenous across disciplines.

530
531 To test whether our results are robust we ran the same set of regressions for alternative
532 dependent variables representing academic output. These variables were the non-
533 transformed raw *h*-index, the *h*-index score since 2016, the publication count and citation
534 count. We also reran our regressions without cleaning our data, to see whether our results
535 were the artefact of our cleaning method. We also employed robust regression, using Huber
536 weights, to test whether our results were robust to outliers. To test for whether a possible
537 confound, between-sex differences in subdiscipline and subdiscipline citations, drives our
538 results, we also tried dummy variables for each academic journal. The results of all these
539 robustness checks were extremely similar to the results in table 6. As such, we present these
540 results in appendix B. For the regressions in table 6, we also tried robust and clustered
541 standard errors. The *p* values for all regression coefficients remained within the same
542 thresholds for statistical significance. These results are not reported but are in the code within
543 the supplementary files.

544

545

546 **Survey**

547

548 To see if the sex disparity in research output reflects anti-male bias we decided to run a survey
549 of academics. If academics said they supported discrimination in favour of women that would
550 support the theory that hiring to editorial boards is biased in favour of women. If this was not
551 the case, the survey results would indicate that sex disparities on editorial boards are best
552 explained by sex differences alone.

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We designed our survey using Alchemer (<https://www.alchemer.com/>). We created four questions on attitudes towards gender bias³ in hiring to journals and four questions on attitudes towards age bias in hiring to journals. We asked questions on age bias for two reasons. The first reason was to test if years publishing's effect on research output was partly due to age bias. The second reason was that given the younger age of female academics, an age bias may inadvertently cause a gender bias. We asked a further two questions on general attitudes to meritocracy in hiring. All questions were on a 0-10 scale. When questions offered a choice between two extremes (eg. pro-male bias to pro-female bias), the question stated that option 5 was a neutral answer. For questions on gender bias and age bias, higher numbers indicated a pro-female bias or a pro-young bias⁴. We achieved this by creating labels for each side of our 0-10 scale. Pictures of the questions asked can be found in the supplementary materials.

We gathered a sample of survey respondents using Prolific (<https://www.prolific.co/>). Individuals are paid to answer surveys through this website. Our inclusion criteria were for all individuals to have a PhD giving us 425 respondents. We employed a question asking respondents whether or not they worked in academia or were publishing academic papers. After excluding individuals not in academic publishing we had a sample size of 231. All respondents were from Western countries such as The United States, The United Kingdom and Israel.

³ In our survey of academics we used the term 'gender' rather than 'sex', although the rest of the paper is focused on sex. These two concepts may have different interpretations and connotations, with sex implying biology and gender implying a 'social construct'. Transgender people constitute 0.6% of all US adults (Jones, 2021), so we suppose that in practice the concepts gender and sex mostly overlap. As such we do not think changing terminology should change the interpretation of our results.

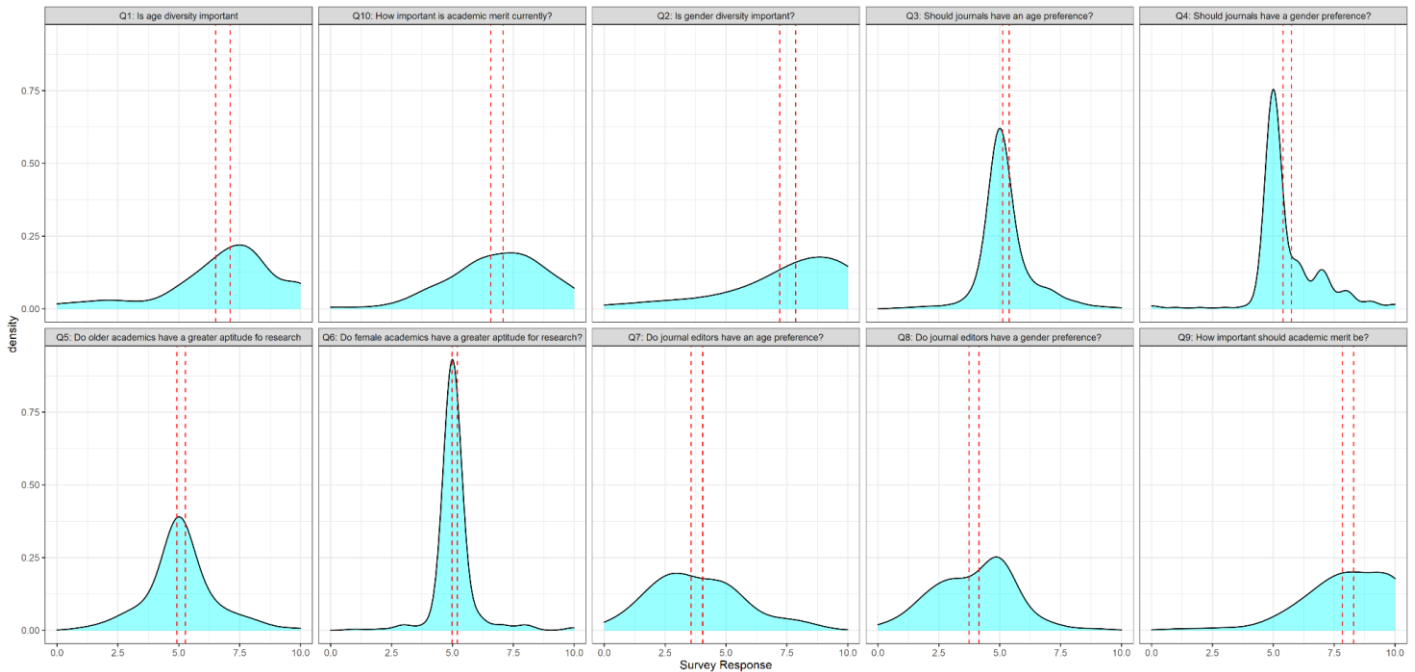
⁴ For questions 5 and 7, our survey responders were told higher numbers indicate a pro-old preference instead of a pro-young preference. For ease of interpretation across different questions, answers for questions 5 and 7 were mirrored around point 5. Thus a raw answer of 3 became an answer of 7 and vice versa.

592 **Table 7**
593 *Survey Results*

Question	Mean Response	t value (A mean response of 5 is the null hypothesis)	Percent of responses below 5	Percent of responses at 5	Percent of responses above 5	number of responses
Q1. Is age diversity in editorial boards important?	6.8***	11.9	13%	8%	79%	231
Q2. Is sex diversity in editorial boards important?	7.5***	15.3	13%	5%	82%	231
Q3. Should journal editors have an age preference in hiring to editorial boards? (Pick 5 for no age preference)	5.3***	3.8	8%	71%	21%	231
Q4. Should journal editors have a sex preference in hiring to editorial boards? (Pick 5 for no sex preference)	5.6***	6.6	3%	64%	33%	231
Q5. Do older academics have a greater aptitude for academic research than younger academics (Pick 5 for no age difference)	5.1	1.1	21%	55%	24%	231
Q6. Do female academics have a greater aptitude for academic research than men? (Pick 5 for no sex difference)	5.1	1.7	4%	87%	9%	231
Q7. Do you think journal editors have an age preference in hiring to editorial boards? (Pick 5 for no age preference)	3.8***	-9.9	62%	24%	13%	231
Q8. Do you think journal editors have a sex preference in hiring to editorial boards? (Pick 5 for no sex preference)	3.9***	-10.0	55%	35%	10%	231
Q9. How important do you think academic merit "should be" for hiring to editorial boards?	8.1***	26.2	3%	4%	93%	231
Q. 10 How important do you think academic merit currently is for hiring to editorial boards?	6.8***	14.2	13%	10%	77%	231

Notes: Critical values $p < 0.05$, $|t| > 1.96$; $p < 0.01$, $|t| > 2.60$; $p < 0.001$, $|t| > 3.3$

596 **Figure 2**
597 *Density plots of survey responses*



598 Note: The red dashed lines denote 95% confidence intervals for the mean response. For questions regarding age and sex preference, higher scores
599 indicate pro-young and pro-female preferences, whilst lower scores indicate pro-old and pro-male preferences.

600
601 Summary statistics from our survey are shown in Table 7 and density plots of question
602 responses are presented in Figure 2. The red dashed lines in figure 2 indicate the 95%
603 confidence intervals for the mean response. We used a t-test on the mean response to each
604 question to see whether it differed significantly from 5. On question 4, academics were asked,
605 “Should journal editors have a sex preference in hiring to editorial boards?”. To ensure all
606 respondents correctly interpreted the question as implying that a sex preference would be
607 discriminatory and anti-meritocratic, we labelled the right end of responses “They should favor
608 females above their academic accomplishments” and the left the same but for males.

609
610 The mean response to this question was 5.6 which is significantly different from 5 ($p < 0.001$).
611 Moreover, one-third of academics said journals should have a pro-female bias and nearly two
612 thirds (64%) said journals should have no age preference. This meant for every academic
613 preferring men, there were eleven who preferred women. Although most academics were
614 against a sex bias, they were overwhelmingly more likely to support journals preferring women
615 than the reverse. This suggests there is a large minority of academics that would act to
616 discriminate against men in hiring to editorial boards.

617
618 Only 3% of respondents believed that journal editors should be biased in favour of men. Such
619 a low response for this option could indicate academics only chose this option by mistake in
620 answering the question or were lying for the sake of humour. For comparison, an opinion poll
621 found 4% of Americans indicated that they believed reptilians ran the world (Public Policy
622 Polling, 2013). This 4% figure has been dubbed by blogger Scott Alexander (2013) as the
623 ‘Lizardman’s Constant’ to be used as a rule of thumb indicating the maximum survey response
624 that may be explained by mistakes or malice on the respondents’ behalves. Since support for

625 anti-female discrimination is lower than the Lizardman's Constant we should be sceptical
626 whether any respondents actually support bias against women at all.

627

628 The results suggest that there is a large minority of academics that want to act to discriminate
629 against men to serve on editorial boards. The reverse case of academics willing to discriminate
630 against women seems extremely rare.

631

632 In our model of research output on editorial boards, we found scholars with more years of
633 publishing performed better. This might not just be due to older scholars having more
634 experience but a result of biased lower requirements for younger scholars. In question 3
635 academics were asked, "Should journal editors have an age preference in hiring to editorial
636 boards?". The mean answer was 5.3 indicating an average pro-young bias. It was significantly
637 different from the no bias response of 5 ($p < 0.001$). 21% supported a pro-young bias, 71%
638 supported no bias and 8% supported a pro-old bias. These results, whilst not as extreme as
639 the sex responses, indicate a moderate pro-young bias in academia; nearly three academics
640 preferred young academics for every one that supported older academics.

641

642 These results indicate that academics are far more likely to be biased in favour of women and
643 younger scholars. As such, female academics are likely advantaged over men not only
644 because of their sex but also because of their relative youth.

645

646 In addition to asking academics whether they had an age or sex preference, we asked them
647 whether they thought journal editors were biased. For the sex question, the mean answer was
648 3.9 and for age 3.8. These differed significantly from 5 ($p < 0.001$), suggesting that academics
649 thought journals were biased in favour of men and older scholars. So whilst academics are
650 biased in favour of women and young people, they simultaneously believe other academics
651 have the opposite bias. This result seems somewhat paradoxical. We speculate in the
652 discussion that academics have such a strong anti-male bias that it deludes them into thinking
653 that academia has the opposite bias.

654

655 What motivates the academics to prefer young and female academics? In Question 2 we
656 asked, "Is gender diversity in editorial boards important". Question 1 asked the same but age
657 diversity. A response of 0 meant diversity was "not important", whilst a response of 10
658 indicated that diversity was "very important". Mean responses were 7.5 for sex diversity and
659 6.8 for age diversity. 82% and 79% gave responses above 5 for sex and age diversity
660 respectively. With responses overwhelmingly closer to 10 than 0, it seems academics place
661 much value on diversity.

662

663 We also asked academics whether they believed men and older scholars have greater
664 aptitude for academic research than female and young scholars. The mean response to both
665 questions was 5.1 which was not significantly different from 5. This indicates academics
666 believed neither sex had a greater aptitude for research, despite the fact men tend to receive
667 more citations (Abramo, et al., 2009; D'Amico et al., 2011; Dion et al., 2018; Huang et al.,
668 2020; Maliniak et al., 2013; Schucan Bird, 2011), academic awards (Chan and Torgler, 2020;
669 Lincoln et al., 2012) and are more likely to be considered eminent in their field (Murray, 2003).
670 It also suggests academics believe that young scholars are just as good as older scholars.

671

672 In Table 8 we present a correlation matrix of all our survey questions to better examine what
673 makes scholars prefer women. Concern for sex diversity (Question 2) correlates at 0.34 ($p <$
674 0.001) with belief that journal editors should prefer women (Question 4). Curiously, concern
675 for age diversity (Question 1) does not appear to correlate with belief that journal editors should
676 prefer younger scholars (Question 3). This could suggest that whilst academics prefer women
677 for the sake of diversity, preference for younger scholars is not to do with a general concern
678 for age diversity. This could be because some scholars that believe in age diversity think this
679 requires more older scholars to be represented on journal boards.

680

681 In our survey, we found no statistically significant belief that younger or female scholars had
682 a greater aptitude than older or male scholars. This could indicate that bias against men is so
683 strong amongst academics that they refuse to believe in greater male academic ability. We
684 find belief in higher female aptitude (Question 6) correlates at 0.22 ($p < 0.001$) with a
685 preference for hiring women (Question 4). This would support the idea that bias in favour of
686 women is motivating bias regarding their ability and also discrimination in favour of women.
687 The belief that journals are biased against women (Question 8) had a small negative
688 correlation (-0.12) with a preference to discriminate in women (Question 4). This could suggest
689 that discrimination in favour of women is motivated by countering perceived injustices against
690 women. However, this correlation was not statistically significant.

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720 **Table 8**
721 *Survey Correlation Matrix*

Question	Q1.	Q2.	Q3.	Q4.	Q5.	Q6.	Q7.	Q8.	Q9.	Q10.
Q1. Is age diversity in editorial boards important?	1									
Q2. Is gender diversity in editorial boards important?	0.54***	1								
Q3. Should journal editors have an age preference in hiring to editorial boards? (Pick 5 for no age preference)	0.05	0.005	1							
Q4. Should journal editors have a gender preference in hiring to editorial boards? (Pick 5 for no gender preference)	0.14*	0.23***	0.34***	1						
Q5. Do older academics have a greater aptitude for academic research than younger academics (Pick 5 for no age difference)	0.02	0.07	0.04	0.03	1					
Q6. Do female academics have a greater aptitude for academic research than men? (Pick 5 for no gender difference)	0.14*	0.17*	0.06	0.22***	-0.004	1				
Q7. Do you think journal editors have an age preference in hiring to editorial boards? (Pick 5 for no age preference)	-0.04	-0.03	-0.06	-0.11	0.03	-0.20**	1			
Q8. Do you think journal editors have a gender preference in hiring to editorial boards? (Pick 5 for no gender preference)	-0.11	-0.18**	0.04	-0.12	-0.15*	0.004	0.18**	1		
Q9. How important do you think academic merit "should be" for hiring to editorial boards?	-0.04	-0.05	-0.10	0.02	0.03	0.06	-0.13	0.07	1	
Q10. How important do you think academic merit currently is for hiring to editorial boards?	-0.15*	0.01	0.07	-0.04	-0.17**	-0.07	-0.11	0.17*	0.16*	1

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

722

723

724 Discussion and Limitations

725

726 Our results have shown that men substantially outperform women on editorial boards in
727 Political Science, Psychology and Anthropology between 0.10-0.45 standard deviations in
728 research output depending on model specification. These results are robust, remaining stable
729 when different measures of research output are used, when journal effects are controlled for,
730 when robust regression was used in addition to OLS and whether or not we cleaned our data
731 to discard outliers (including clearly erroneous data). In regression results, we found that
732 controlling for years publishing reduces the male advantage in research output, implying men
733 in our sample have been publishing for longer. We are uncertain about the reasons for this,
734 but suggest that (1) older scholars have had more time to publish papers, (2) younger cohorts
735 of scholars are worse than older ones and (3) journals could have a pro-old age bias.

736

737 Overall we can be confident that male research output is higher than women's on editorial
738 boards. This is unlikely under the hypothesis of anti-female bias which predicts that women

739 have a higher research output. The regression results update our prior beliefs away from anti-
740 female discrimination and towards the possibilities of anti-male discrimination and higher
741 performance amongst male academics. To further explore the hypothesis of anti-male bias,
742 we surveyed academics on their attitudes to gender bias. We found that whilst most
743 academics were opposed to discrimination, they were eleven times more likely to support
744 discrimination in favour of women than against with regards to hiring to editorial boards.
745 Moreover, support for anti-male discrimination represented only a trivial 3% of our sample.
746 This further supports the idea that there is anti-male bias in hiring to editorial boards.
747 Academics also supported discrimination in favour of younger scholars. This means the
748 moderating effect of years publishing on the sex disparity in research output may be because
749 age bias indirectly creates a sex bias.

750
751 There are some limitations to our research methods. There may be potential errors in our data
752 gathering because of human error or Google Scholar making errors. Nonetheless, we do not
753 believe any such data errors could substantially alter our results. This is because our results
754 were extremely similar when using different dependent variables, both when we included and
755 excluded outliers and when we used robust regression. Furthermore, when citations on
756 Google Scholar have been compared with citations on the Web of Science database no sex
757 bias was found (Andersen and Nielsen, 2018). This suggests any errors from Google Scholar
758 are unlikely to cause bias in our results.

759
760 A limitation of our survey work of academics is that the respondents may not be a
761 representative sample. Respondents were people who supplemented their income by
762 answering online surveys, suggesting our respondents were disproportionately poor and
763 possibly poorly performing academics. It could be that academics near the bottom of the
764 career ladder have different attitudes to discrimination than those higher up, such as journal
765 editors. We sampled 'elite' journals, with the greatest citations per paper, creating further
766 differences to the academics in our survey sample. It is possible that whilst our respondents
767 wanted to discriminate against men, journal editors may discriminate against women.
768 Nonetheless, this hypothesis seems very unlikely. The fact that top publishers and journals
769 are supporting affirmative action in favour of women (Bayazit, 2020; Elsevier, 2021a, 2021b;
770 Laudine et al., 2018; Nature, 2017) would suggest that high performing academics share the
771 same attitudes to sex bias as our surveyed academics who are likely poor performing.
772 Moreover, academics at elite institutions are overwhelmingly left-wing, which is associated
773 with having pro-female preferences (Winegard et al., 2020), suggesting editors of top journals
774 are likely to share the same preferences. For example, 39% of elite American liberal arts
775 colleges have no registered Republican professors (Langbert, 2020).

776
777 Another limitation, pointed out by a reviewer, of our survey is the possible ambiguities of our
778 questions. In our questions we gave a 0-10 scale, with 0 and 10 labelled as extreme responses
779 and 5 as intermediate. For example, in question 4 on whether editors should have a preference
780 for women, 10 was labelled, "They should favor females above their academic
781 accomplishments", 0 was given the same label but for men and 5 was labelled as no
782 preference. As such, the difference between 1-4 and 6-9 was not defined although we meant
783 higher numbers to represent more pro-female preferences. Some respondents may not have
784 realised that these intermediate values represented different points on the dimension of pro-
785 male to pro-female preferences. Nonetheless, we do not think any ambiguity in our questions
786 have distorted our results. Respondents were given the opportunity to give feedback, but did

787 not make comments about the scale of our questions being confusing. Furthermore, a visual
788 inspection of the results in Figure 2 show smooth distributions, with modal answers not always
789 being 0, 5 or 10, suggesting respondents correctly interpreted the other values on our 0-10
790 scale.

791

792 The fact that many academics and publishers are concerned that academia has an anti-female
793 bias would seem to make the theory of anti-male bias unlikely if these academics were rational
794 in their claims. However, this also poses a paradox, if so many academics are publicly against
795 anti-female discrimination how can academia still be so biased against women? For example,
796 in our survey results, whilst academics on net supported discrimination in favour of women
797 and younger scholars they believed other academics who ran journals had the opposite
798 biases.

799

800 Clark and Winegard (2020) explain this paradox by arguing that the pervasive narrative of
801 misogyny could itself be caused by academia and society at large having an anti-male bias.
802 This could be an example of preference falsification (Kuran, 1997), whereby individuals lie
803 about their true preferences, or self-deception (Trivers, 2011) whereby individuals lie to
804 themselves about what is true or desirable to avoid the reputational costs of breaking social
805 taboos. After all, there are large incentives to believe in the value of diversity and affirmative
806 action. Academics who do not support affirmative action for women or diversity might be
807 shunned or even 'cancelled' by their overwhelmingly left-wing colleagues, if they are hired at
808 all. For example, Cern physicist Alessandro Strumia lost his job for publicly arguing that higher
809 male performance in academia was not a result of discrimination. This theory would also
810 explain why, in our survey results, academics do not believe in sex differences in academic
811 aptitude despite greater male average intelligence (Lynn, 1994, 2017, 2021; Lynn and Irwing,
812 2004; Nyborg, 2005), greater variance in male intelligence (Baye and Monseur, 2016) and the
813 overwhelming representation of men as eminent figures in science (Darwin, 1871; Murray,
814 2003).

815

816 We find some evidence supportive of the Clark and Winegard (2020) view, those who were
817 more strongly biased against men, more strongly believed academia was biased against
818 women. Although this could be a rational desire to balance the scale, it could also illustrate
819 anti-male bias making scholars biased in their evaluation of academia. We also found that
820 academics' female sex preference was associated with a belief in greater female aptitude,
821 despite lower female publication metrics. Indicating that sex biases can distort academic's
822 non-normative beliefs about sex in academia.

823

824 We cannot determine whether editorial boards have previously exhibited a bias against
825 women because our data are not longitudinal, but we can be reasonably confident that they
826 do not now. As such, affirmative action policies for editorial boards may be undermining
827 meritocracy. In Gary Becker's taste discrimination model of the labour market (1971), profit-
828 seeking firms should employ discriminated groups because they are accepting of lower wages.
829 Likewise, journals looking for top talent could do well in recruiting men other editorial boards
830 have ignored.

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Appendix A

Table 9
List of Journal Editorial Boards

Anthropology Journals	Economics Journals	Political Science and International Relations Journals	Psychology Journals
Journal of Consumer Research	Quarterly Journal of Economics	American Journal of Political Science	The Annual Review of Psychology
Journal of Peasant Studies	Journal of Economic Perspectives	American Political Science Review	Psychological Bulletin
American Ethnologist	Brookings Papers on Economic Activity	International Organization	Psychological Science in the Public Interest
Journal of Human Evolution	Journal of Political Economy	British Journal of Political Science	International Review of Sport and Exercise Psychology
Annual Review of Anthropology	Journal of Economic Literature	Political Analysis	Annual Review of Clinical Psychology
Science, Technology & Human Values	Journal of Financial Economics	International Security	Annual Review of Organizational Psychology and Organizational Behavior
Journal of Marriage and Family	Review of Environmental Economics and Policy	International Affairs	Personality and Social Psychology Review
American Journal of Physical Anthropology	Energy Economics	Review of International Organizations	Social Issues and Policy Review
Journal of Cross-Cultural Psychology	American Economic Review	Geopolitics, History, and International Relations	Journal of Personality and Social Psychology
Evolutionary Anthropology	Economic Policy	Critical Social Policy	Journal of Occupational Health Psychology
Games and Culture	Journal of Finance	European Journal of International Relations	Clinical Psychology Review

Evolutionary Human Sciences	Cambridge Journal of Regions, Economy and Society	Journal of Peace Research	Educational Psychology Review
Archaeological and Anthropological Sciences	American Economic Journal: Applied Economics	Policy and Society	Educational Psychologist
Journal of Racial and Ethnic Health Disparities	Econometrica	Global Environmental Politics	Current Directions in Psychological Science
Race and Social Problems	Economic Geography	Chinese Journal of International Politics	Trends in Cognitive Sciences
Anthropological Theory	Review of Economics and Statistics	East European Politics	Developmental Review
Cross-Cultural Research	Small Business Economics	Research and Politics	Behavior Research Methods
Sexualities	Review of Economics Studies	Journal of Conflict Resolution	Behaviour Research and Therapy
Journal of Anthropological Sciences	The Review of Financial Studies	Security Dialogue	Neuropsychology Review
Human Ecology	Journal of Business & Economic Statistics	Cooperation and Conflict	Psychological Methods
Culture, Medicine, and Psychiatry	Annual Review of Economics	World Politics	Perspectives on Psychological Science
Medical Anthropology: Cross Cultural Studies in Health and Illness	Finance Research Letters	European Union Politics	European Journal of Psychology Applied to Legal Context
Discourse Studies	World Development	Political Science Research and Methods	Computers in Human Behavior
Chinese Sociological Review	Journal of Accounting and Economics	Perspectives on Politics	Psychological review
Anthrozoas	American Economic Journal: Economic Policy	Democratization	Journal of the Learning Science
Journal of Contemporary Ethnography	Ecological Economics	Political Studies Review	European Review of Social Psychology
American Journal of Human Biology	Annual Review of Resource Economics	Journal of Contemporary China	Trauma, Violence & Abuse
Journal of Eastern African Studies	Journal of Asian Finance, Economics and Business	Politics	Journal of Business and Psychology
Journal of Human Trafficking	American Economic Journal: Macroeconomics	International Studies Quarterly	Journal of Applied Psychology
Culture and Psychology	Oeconomia Copernicana	Geopolitics	Journal of Behavioral Addictions

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Appendix B

In Table 10 we re-run the results of table 6 with dummy variables for journals. This is to check whether women have a lower academic output because they prefer subdisciplines that receive fewer citations. Some of the sex coefficients are lower and some higher after controlling for journal effects. In model 2, controlling for journal effects make the sex coefficient lower from -0.10 to -0.09. This makes the coefficient lose its statistical significance at the 5% level. Given the close consistency of the table 10 results and the low p values for coefficients in the other 11 models, it is very likely that model 2 is a false negative.

Table 10

Regression models of Log10 Transformed h-Index, Standardised as Z scores

Model Number	Anthropology		Psychology		Political Science		Economics		All disciplines			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex	-0.23***	-0.09	-0.33***	-0.19***	-0.44***	-0.24***	-0.23***	-0.13*	-0.31***	-0.17***	-0.33***	-0.19***
Female = 1 Male = 0	(0.06)	(0.05)	(0.05)	(0.04)	(0.07)	(0.06)	(0.07)	(0.05)	(0.03)	(0.02)	(0.05)	(0.04)

Years Publishing	0.06*** (0.002)		0.05*** (0.002)		0.05*** (0.003)		0.06*** (0.003)		0.06*** (0.001)		0.06*** (0.001)	
Anthropology									-1.24*** (0.27)	-0.97** (0.21)	-1.29*** (0.27)	-1.02** (0.20)
Economics									-1.46*** (0.27)	-0.60*** (0.21)	-1.49*** (0.25)	-0.62*** (0.20)
Political Science									-1.25*** (0.28)	-0.83*** (0.22)	-1.21*** (0.26)	-0.82*** (0.21)
Sex X Anthropology											0.10 (0.08)	0.10 (0.06)
Sex X Economics											0.10 (0.08)	0.05 (0.06)
Sex X Political Science											-0.11 (0.08)	-0.05 (0.06)
Journal Dummy Variables	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Constant	-0.42** (0.04)	-1.92*** (0.12)	1.30* (0.50)	-1.07*** (0.05)	0.04 (0.04)	-1.39*** (0.07)	-0.14*** (0.04)	-1.63*** (0.06)	0.43*** (0.03)	-1.06*** (0.03)	0.43*** (0.03)	-1.05*** (0.03)
Observations	935	935	1,643	1,643	843	843	941	941	4,362	4,362	4,362	4,362
R ²	0.19	0.53	0.24	0.55	0.24	0.48	0.29	0.53	0.24	0.53	0.24	0.53
F Statistic	7***	33***	17***	63***	8***	24***	13***	33***	11***	39***	11***	38***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

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1287 As a robustness test, we use the robust regression with Huber weights. This approach puts
 1288 lower weights on observations with a high residual. This is useful for seeing whether lessening
 1289 the effect of outlier values changes our results. For example, this helps us to be confident that
 1290 human errors in data gathering or random errors by Google Scholar have not distorted the
 1291 results. Our robust regressions are created using the *rlm()* function in the R package **MASS**.
 1292 For details on the robust regression see Venables and Ripley (2010). The Robust regression
 1293 results are shown in Table 11.

1294

1295 The use of robust regression does not seem to change our results substantially. The predicted
 1296 sex disparity appears approximately the same and is still statistically significant in every model.
 1297 Likewise, the coefficients for years publishing are the same, rounded to two decimal places.

1298 There are still no significant sex discipline interaction terms. Overall this suggests that outlier
 1299 observations are not distorting our regression results.

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1302 **Table 11**

1303 *Robust Regression models of Log10 Transformed h-Index, Standardised as Z scores*

	Anthropology		Psychology		Political Science		Economics		All disciplines			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex Female = 1 Male = 0	-0.34*** (0.07)	-0.11* (0.05)	-0.33*** (0.05)	-0.14*** (0.04)	-0.53*** (0.07)	-0.25*** (0.05)	-0.26*** (0.07)	-0.13* (0.05)	-0.36*** (0.03)	-0.15*** (0.02)	-0.33*** (0.05)	-0.14*** (0.04)
Years Publishing		0.06*** (0.002)		0.06*** (0.002)		0.06*** (0.003)		0.07*** (0.002)		0.06*** (0.001)		0.06*** (0.001)
Anthropology									0.04 (0.04)	-0.11** (0.03)	0.04 (0.06)	-0.13** (0.04)
Economics									-0.06 (0.04)	0.15*** (0.03)	-0.07 (0.05)	0.15*** (0.04)
Political Science									0.02 (0.04)	-0.14*** (0.03)	0.09 (0.05)	-0.01* (0.04)
Sex X Anthropology											-0.01 (0.08)	0.04 (0.06)
Sex X Economics											0.07 (0.09)	-0.01 (0.06)
Sex X Political Science											-0.19* (0.09)	-0.09 (0.06)
Constant	0.20*** (0.05)	-1.40*** (0.06)	0.16*** (0.03)	-1.37*** (0.05)	0.25*** (0.04)	-1.34*** (0.08)	0.08* (0.04)	-1.46*** (0.06)	0.17*** (0.03)	-1.38*** (0.03)	0.16*** (0.03)	-1.38*** (0.03)
Observations	935	935	1,612	1,612	836	836	936	936	4,318	4,319	4,319	4,319
Residual Standard Error	1.02	0.66	1.06	0.71	0.96	0.72	0.94	0.62	1.01	0.69	1.00	0.68

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

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1307 **Table 12**

1308 *Regression models of Log10 Transformed h-Index, Standardised as Z scores.*
 1309 *Includes individuals with erroneous Google Scholar pages*

	Anthropology		Psychology		Political Science		Economics		All disciplines			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex Female = 1 Male = 0	-0.36*** (0.06)	-0.10* (0.05)	-0.34*** (0.05)	-0.15*** (0.04)	-0.49*** (0.06)	-0.20** (0.05)	-0.30*** (0.07)	-0.11* (0.07)	-0.37*** (0.03)	-0.14*** (0.02)	-0.34*** (0.05)	-0.15*** (0.04)
Years Publishing		0.06*** (0.002)		0.06*** (0.002)		0.05*** (0.002)		0.07*** (0.002)		0.06*** (0.001)		0.06*** (0.001)
Anthropology									-0.42*** (0.04)	-0.53*** (0.03)	-0.41*** (0.05)	-0.55*** (0.04)
Economics									-0.55*** (0.04)	-0.33*** (0.03)	-0.55*** (0.05)	-0.34** (0.04)
Political Science									-0.42*** (0.04)	-0.56*** (0.03)	-0.36*** (0.05)	-0.56*** (0.04)
Sex X Anthropology											-0.03 (0.08)	0.06 (0.06)
Sex X Economics											0.04 (0.08)	0.06 (0.06)
Sex X Political Science											-0.16 (0.08)	0.001 (0.06)
Constant	0.01	-1.57***	0.42***	-1.07***	0.06	-1.39***	-0.13***	-1.64***	0.43***	-1.07***	0.42***	-1.07***

	(0.04)	(0.06)	(0.03)	(0.05)	(0.04)	(0.07)	(0.04)	(0.06)	(0.03)	(0.03)	(0.03)	(0.03)
Observations	961	961	1,707	1,707	884	884	970	970	4,522	4,522	4,522	4,522
R ²	0.03	0.47	0.03	0.47	0.07	0.40	0.02	0.50	0.08	0.49	0.08	0.49
F Statistic	33***	426***	48***	754.85***	68.5***	296***	19***	476***	100***	858***	58***	536***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

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1311 In table 12 we rerun our regression analyses but with the inclusion of individuals that Google
 1312 Scholar has misattributed 5 or more papers to and without removing outlier observations. We
 1313 do this to see whether our exclusion of these individuals may have biased our results. The
 1314 results are almost indistinguishable from the regression results in table 6. Some of the
 1315 coefficients on sex are slightly different - within 0.03 of the coefficients in table 6. This means
 1316 our exclusion of 'overattributed individuals' has only changed our estimates of the sex gap in
 1317 research productivity by a maximum of 0.03 standard deviations. This suggests that our results
 1318 are not an artefact of our data cleaning process.

1319

1320 In tables 13-15 we use alternative dependent variables for research output instead of our
 1321 transformed h -index. The variables employed are the raw h -index and transformed citation
 1322 and publication counts. There are no notable differences between these regressions and our
 1323 main results in table 6. This suggests the sex difference in academic output is measurement
 1324 invariant and not a coincidence or p -hacked result of relying on our transformed h -index.

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Table 13

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Regression models of Raw h -Index

	Anthropology		Psychology		Political Science		Economics		All disciplines			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex Female = 1 Male = 0	-7.53*** (1.23)	-3.23*** (0.96)	-7.21*** (1.23)	-3.30*** (0.93)	-8.53*** (1.09)	-3.92** (0.93)	-5.60*** (1.35)	-2.67** (1.02)	-7.24*** (0.64)	-3.03*** (0.50)	-7.21*** (1.04)	-3.94*** (0.80)
Years Publishing		1.03*** (0.04)		1.44*** (0.04)		0.87*** (0.04)		1.30*** (0.05)		1.21*** (0.02)		1.21*** (0.02)
Anthropology									-8.69*** (0.84)	-11.33*** (0.65)	-8.54** (1.15)	-11.7*** (0.89)
Economics									-11.75*** (0.85)	-7.79*** (0.66)	-12.21*** (1.04)	0.14** (0.04)
Political Science									-10.56*** (0.87)	-13.68*** (0.68)	-10.03*** (1.14)	-14.42*** (0.88)

Sex X Anthropology											-0.32 (1.70)	1.45 (1.31)
Sex X Economics											1.61 (1.81)	1.07 (1.40)
Sex X Political Science											-1.32 (1.78)	-1.81 (1.47)
Constant	31.3*** (0.86)	2.55 (1.31)	39.87*** (0.79)	3.68** (1.19)	29.85*** (0.70)	4.85*** (1.37)	27.67*** (0.73)	-0.52 (1.18)	29.89*** (0.58)	9.11*** (0.72)	30.87*** (0.67)	9.44*** (0.76)
Observations	935	935	1,612	1,612	836	836	936	936	4,319	4,319	4,319	4,319
R ²	0.04	0.43	0.02	0.45	0.07	0.37	0.02	0.45	0.08	0.45	0.08	0.45
F Statistic	38***	359***	34***	647***	61***	245***	17***	379***	95***	714***	55***	446***

*p<0.05; **p<0.01; ***p<0.001

1328 **Table 14**1329 *Regression models of Log10 Publication Count, Standardised as Z score*

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	Anthropology		Psychology		Political Science		Economics		All disciplines			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex Female = 1 Male = 0	-0.36*** (0.06)	-0.12*** (0.05)	-0.29*** (0.03)	-0.13*** (0.04)	-0.53*** (0.07)	-0.20** (0.05)	-0.23*** (0.07)	-0.06 (0.05)	-0.34*** (0.03)	-0.34*** (0.02)	-0.29*** (0.05)	-0.12*** (0.04)
Years Publishing		0.06*** (0.002)		0.06*** (0.002)		0.06*** (0.002)		0.07*** (0.002)		0.06*** (0.001)		0.06*** (0.001)
Anthropology									0.03 (0.04)	-0.11*** (0.03)	0.06 (0.06)	-0.12*** (0.04)
Economics									-0.04 (0.04)	0.16*** (0.03)	-0.05 (0.05)	0.15** (0.04)
Political Science									-0.002 (0.04)	-0.16*** (0.03)	0.10 (0.05)	-0.13** (0.04)
Sex X Anthropology											-0.07 (0.08)	0.02 (0.06)
Sex X Economics											0.07 (0.09)	0.04 (0.06)

Sex X Political Science											-0.34** (0.09)	-0.08 (0.06)
Constant	31.3*** (0.86)	2.55 (1.31)	39.87*** (0.79)	3.68** (1.19)	29.85*** (0.70)	4.85*** (1.37)	27.67*** (0.73)	-0.52 (1.18)	29.89*** (0.58)	9.11*** (0.72)	30.87*** (0.67)	9.44*** (0.76)

Observations	935	935	1,612	1,612	836	836	936	936	4,319	4,319	4,319	4,319
R ²	0.04	0.43	0.02	0.45	0.07	0.37	0.02	0.45	0.08	0.45	0.08	0.45
F Statistic	38***	359***	34***	647***	61***	245***	17***	379***	95***	714***	55***	446***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ 1331
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Table 15
Transformed Log₁₀ Citation Count, Standardised as Z score

	Anthropology		Psychology		Political Science		Economics		All disciplines			
Model Number	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Sex Female = 1 Male = 0	-0.34*** (0.06)	-0.12* (0.05)	-0.25*** (0.03)	-0.09* (0.04)	-0.43*** (0.07)	-0.14** (0.05)	-0.25*** (0.07)	-0.10 (0.06)	-0.31*** (0.03)	-0.11*** (0.02)	-0.25*** (0.05)	-0.10* (0.04)
Years Publishing		0.05*** (0.002)		0.06*** (0.002)		0.05*** (0.003)		0.07*** (0.003)		0.06*** (0.001)		0.06*** (0.001)
Anthropology									0.03 (0.04)	-0.10*** (0.03)	0.06 (0.06)	-0.10** (0.04)
Economics									-0.04 (0.04)	0.15*** (0.03)	-0.03 (0.05)	0.16** (0.04)
Political Science									-0.002 (0.04)	-0.15*** (0.03)	0.07 (0.05)	-0.14** (0.04)
Sex X Anthropology											-0.09 (0.08)	-0.00 (0.06)
Sex X Economics											0.00 (0.09)	-0.03 (0.07)

Sex X Political Science											-0.17*	-0.02
											(0.09)	(0.07)
Constant	0.17***	-1.34***	0.10**	-1.37***	0.17***	-1.39***	0.07	-1.37***	0.13***	-1.35***	0.10**	-1.35***
	(0.05)	(0.07)	(0.03)	(0.05)	(0.04)	(0.09)	(0.04)	(0.06)	(0.03)	(0.03)	(0.03)	(0.04)
Observations	935	935	1,612	1,612	836	836	936	936	4,319	4,319	4,319	4,319
R ²	0.03	0.43	0.02	0.44	0.04	0.35	0.01	0.42	0.02	0.41	0.02	0.41
F Statistic	28***	353***	25***	631***	38***	221***	12***	334***	25***	606***	15***	379***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

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