Research Policy 52 (2023) 104797

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

Affiliation bias in peer review and the gender gap☆

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ARTICLE INFO

JEL classifications:
I2
J16

Keywords:
Author affiliation
Peer review
Gender gap
Social capital

ABSTRACT

We document an affiliation bias in top Chinese journals and the gender gap in the current affiliation effect. We find that papers written by researchers who are affiliated with the journals' host institutions on average receive fewer citation counts than those written by non-affiliated researchers. Moreover, we show that this affiliation bias is greater for men than for women. We propose that the current effect can be accounted for by a social capital mechanism, and we provide evidence consistent with our proposition. In addition, the results of our analyses demonstrate heterogeneity of the affiliation bias and the gender gap with regard to researcher status. We discuss alternative mechanisms of the current effect and implications of our research.

1. Introduction

Institutional connections between researchers and journal editors have been shown to be an important factor affecting the diffusion of scientific knowledge. Findings of the extant research point to the positive influences of such connections on peer review, suggesting that editors' institutional connections with authors of research papers offer them clearer lenses in their evaluation of manuscripts and facilitate their search for high-impact work (Brogaard et al., 2014; Laband and Piette, 1994; Medoff, 2003). However, such connections could also raise concerns about favoritism in the publication process. For example, the results of some studies suggest that applicants' institutional connections with pertinent committee members can increase their chance of getting hired or promoted to academic positions (Combes et al., 2008; Zinovyeva and Bagues, 2015).

In this research, we provide evidence of an affiliation bias in peer review that essentially manifests editorial favoritism toward authors of the same institution and study the gender gap in the current effect. Our benchmark model compares the average citation counts of *affiliated papers* with those of *non-affiliated papers* published in journals in the Chinese Social Sciences Citation Index (CSSCI), an interdisciplinary citation index covering top Chinese journals in social science fields. The majority of academic journals in China are owned and managed by a single institution, and >95 % of their editors-in-chief are from the corresponding journal's host institution. In the current research, affiliated papers in a journal refer to papers written by authors who are affiliated with the journal's host institution at the time of publication (whom we call affiliated authors). In contrast, non-affiliated papers refer to those written by authors from other institutions (whom we call non-affiliated authors). We use the citation counts of a paper as a proxy for its academic impact (Card et al., 2019; Hamermesh et al., 1982; Hirsch, 2005; Smart and Waldfogel, 1996). The results of our analyses show that affiliated papers receive significantly lower citation counts than non-affiliated papers, and this difference remains robust after controlling for a wide array of covariates. This finding suggests that editors are willing to accept affiliated papers that have on average lower potential impact as compared to non-affiliated papers and thus indicates the presence of an affiliation premium during the peer review process. More importantly, our results reveal gender heterogeneity in the magnitude of the current affiliation bias: the difference in citation counts between affiliated and non-affiliated papers is larger for papers written by men than those written by women.

☆ This work was supported by University of Macau research grants MYRG2020-00030-FBA and MYRG2022-00126-FBA granted to K. S., the Lam Woo Research Fund LWP20020 and Faculty Research Grant DB23A5 at Lingnan University granted to Y. L., and the National Natural Science Foundation of China General Program 72074045 granted to C. M.

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https://doi.org/10.1016/j.respol.2023.104797
Received 25 July 2022; Received in revised form 19 April 2023; Accepted 25 April 2023
Available online 4 May 2023
0048-7333/

We suggest that the affiliation bias and the current gender gap can be accounted for by a social capital mechanism. Affiliated authors could potentially influence in-house editors' evaluations and decisions via the positional resources or power they have in their social networks or via their direct relationship with the editors (Brass and Burkhardt, 1993; Burt, 1998; Ragins and Sundstrom, 1989). In addition, they are often endowed with information advantages throughout stages of manuscript preparation and submission (Brogaard et al., 2014; Burt, 1998; Laband and Piette, 1994). We argue that, by leveraging their social capital—the resources and information benefits that are made available via their network connections—affiliated authors are more capable of making the peer review process work in their favor than non-affiliated authors. Moreover, extensive evidence suggests that women are at a disadvantage relative to men in their network characteristics and ability to yield returns on social ties (Brass, 1985; Burt, 1998; Ibarra, 1992; Kanter, 1977; Ragins and Sundstrom, 1989; Woehler et al., 2021). Therefore, we argue that gender gaps in social capital could underlie the observed difference between men and women in the current affiliation effect.

Findings of our research provide evidence consistent with the social capital mechanism. Literature suggests that social capital is positively correlated with a person's level in a professional hierarchy (Adler and Kwon, 2002; Lincoln and Miller, 1979; Podolny and Baron, 1997). Consistently, we find that the affiliation effect is greater for researchers of higher professional rank. Furthermore, we examine the intra-individual effects of affiliation, specifically the within-individual changes in the citation counts of researchers' papers that are published in a journal before versus after their entry into or exit from that journal's host institution. The social capital mechanism predicts an asymmetry between the effect of entry versus exit. Specifically, researchers' entry into a journal's host institution (a shift from non-affiliated authors to affiliated authors with respect to the journal) could cause a decrease in the impact of their subsequent papers in the journal because they can leverage their newly acquired social capital to influence peer review. In contrast, researchers' exit from a journal's host institution (a shift from affiliated authors to non-affiliated authors with respect to the journal) might not lead to an increase in the impact of their subsequent papers in the journal because their social capital in the prior network may persist and remain efficacious (Adler and Kwon, 2002; Dahlander and McFarland, 2013; Kleinbaum, 2018).

The results of our analyses are consistent with the above propositions and therefore provide further support of the social capital mechanism. Moreover, we find that the within-individual decrease in the citation counts of papers upon researchers' entry into a journal's host institution is relatively larger for men than for women. On the other hand, though in general researchers' exit from a journal's host institution does not lead to a significant within-individual change in their papers' citation counts, an interaction emerges between the exit effect and researchers' gender. The results of further analysis show that exit from a journal's host institution leads to a within-individual increase in the citation counts of papers only for women but not for men. These findings suggest that women are at a disadvantage relative to men in both acquiring and maintaining network connections and are consistent with implications of past research on social capital (Burt, 2000; McPherson et al., 2001).

Finally, we distinguish between two groups of researchers—those affiliated with relatively high-prestige institutions and those affiliated with relatively low-prestige institutions—and investigate whether the magnitudes of the current affiliation bias and the gender gap vary between these two groups of different status. Our results show that (1) the magnitude of the affiliation bias is greater for researchers affiliated with relatively high-prestige institutions than for those affiliated with relatively low-prestige institutions and (2) the gender gap in the current affiliation effect tends to diminish among the former group. The latter finding suggests that the current gender gap is modulated by institutional contexts and is therefore consistent with structure-based theories about gender gaps in social capital (Ibarra, 1993; Moore, 1990; Morrison and VonGlinow, 1990). We provide the theoretical foundation of the social capital mechanism in the next section.

2. Theoretical background

2.1. Social capital

Success in organizations often hinges critically on people's social capital, which is broadly understood as the resources and benefits that they acquire from their positions in networks of social relationships (Adler and Kwon, 2002; Burt, 1992, 1998; Coleman, 1988; Nahapiet and Ghoshal, 1998; Portes, 1998). These resources and benefits appear in many forms, including reciprocal obligations, social norms and sanctions, and interpersonal trust (Coleman, 1988; Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998). Burt (1992, 1998) argues that strategic network positions (i.e., structural holes) provide individuals with opportunities to broker and control the flow of information. These information and control benefits constitute another important form of social capital (Adler and Kwon, 2002; Coleman, 1988; Granovetter, 1973). In short, social capital is a valuable resource that facilitates people's actions within social networks (Coleman, 1988; Nahapiet and Ghoshal, 1998).

In the science community, researchers' social capital resides in their networks of collaborations and institutional connections (Brogaard et al., 2014, Fisman et al., 2018, Li et al., 2013, Newman, 2004, Petersen, 2015). Much research has shown that network relationships can have important influences on the peer review process in science (Colussi, 2018; Combes et al., 2008; Zinovyeva and Bagues, 2015). The instrumentality of social networks is particularly salient in the science community in China (Shi and Rao, 2010), where the collectivist culture views people's social capital as especially important and efficacious in affecting their career outcomes (Bian, 1997; Farh et al., 1998; Hwang, 1987). In line with this argument, recent research indicates that favoritism toward connected individuals is not only prevalent but also capable of influencing high-stakes outcomes in Chinese science (Fisman et al., 2018; Li and Tang, 2019).

We suggest that the current affiliation bias in peer review could be made available through affiliated authors' social capital. For example, editors' evaluations and decisions about journal submissions can be biased if they have direct and communal relationships with the authors. In addition, affiliated authors could exert influences or pressure on editors' decisions by leveraging their positional resources or power (Adler and Kwon, 2002; Ragins and Sundstrom, 1989). On the other hand, editors also gain personal benefits by bestowing favors upon authors in their networks, as these favors create relationship obligations that could be reciprocated (Coleman, 1988; Nahapiet and Ghoshal, 1998). Moreover, affiliated authors often have better information regarding editors' tastes or preferences (Burt, 1992, 1998). Such information can help affiliated authors to better prepare their manuscripts or to more accurately target the right journals. As a result, the information that affiliated authors acquire due to their proximal network locations to in-house editors can increase the chance that their papers be accepted.

2.2. Gender gaps in social capital

Much research has shown that there are considerable differences between men and women in their network composition and characteristics. Women on average have smaller networks that consist of interconnected and homophilic ties (Brass, 1985; Burt, 1998; Ibarra, 1993), and they are often excluded from resource and power networks in organizations (Brass, 1985; Ibarra, 1992, 1993; Kanter, 1977; Lincoln and Miller, 1979; Ragins and Sundstrom, 1989). In contrast, men are more likely to have networks that are more open and consist of ties of higher status, and they are more likely to occupy brokerage positions (Burt, 1998; Fang et al., 2021; Ragins and Sundstrom, 1989; Woehler et al., 2021). Two perspectives have been proposed to explain gender gaps in social capital. The agency perspective attributes gender disparities to

individual differences in personality traits, relationship orientations, and propensity to engage in purposeful actions toward forming network ties (Ahuja et al., 2012; Bensaou et al., 2014; Fang et al., 2021; Kwang et al., 2013). In contrast, the structural perspective emphasizes the role of contextual or opportunity constraints, such as gender-based homophily (Brass, 1985; Ibarra, 1993; Lincoln and Miller, 1979), in producing gender inequalities and the exclusion of women from resource networks (Fang et al., 2021; Moore, 1990; Morrison and VonGlinow, 1990; Ibarra, 1993).

As a result of the gender differences in social capital, women in general are less able to acquire network resources for better career outcomes than men (Ibarra, 1992; Moore, 1990; Singh et al., 2010). These adverse effects on women are also pervasive in the field of science, in which women are under-represented (Ceci et al., 2014; Huang et al., 2020; Lerback and Hanson, 2017; Long and Fox, 1995). For example, compared to men, women have fewer collaboration opportunities (Boschini and Sjögren, 2007; Larivière et al., 2013; McDowell et al., 2006) and are less likely to access strategic positions in research collaboration networks (Jadidi et al., 2018; Whittington, 2018). We thus argue that the gender gap in the current affiliation effect could be the result of women's disadvantages in social capital. For example, women are less likely to maintain reciprocal relationships with in-house editors because they are less resourceful as exchange partners (Ibarra, 1992; Woehler et al., 2021). Women are also less able to exert influences on editors because they possess fewer positional resources or less power (Ragins and Sundstrom, 1989). Furthermore, women are less likely to occupy brokerage positions in research networks and are thus less able to have information advantages in the peer review process (Jadidi et al., 2018, Whittington, 2018). These gaps in social capital could lead women to have a smaller affiliation premium relative to men when submitting papers to their home institutions' journals.

3. Institutional background and data

Our analyses utilize information of papers published in top Chinese journals that are included in the Chinese Social Sciences Citation Index (CSSCI). The CSSCI is an interdisciplinary citation index program endorsed by the Ministry of Education of China since 1998 and covers approximately 500 top Chinese journals in the fields of arts, humanities, and other social sciences. Fig. 1 shows the number of journals in the CSSCI for each year from its inception to 2017. In most universities in China, the number of CSSCI publications is a key determinant of researchers' tenure and promotion outcomes. As a result, the majority of Chinese researchers working in relevant fields place substantial weight on publishing papers in CSSCI journals. This differs from the fields of science, technology, engineering, and mathematics (STEM) in China, in which there is no widely recognized domestic index program. Instead, assessment of research performance in these fields is based primarily on researchers' publications in international journals or other criteria. Seventy-two percent of the CSSCI journals are owned and managed by a single academic institution.[1] Among these journals, 95 % of the editors-in-chief are from the corresponding journal's host institution.

Our analyses are based on papers published between 1998 and 2017 in journals that are included in the 2017/2018 CSSCI and that are managed by a single academic institution. Moreover, we restrict our sample to single-authored papers to circumvent the difficulties with analyses that use papers written by authors of both genders. Our dataset covers 1,117,300 journal papers[2] published in 408 journals, and our final sample consists of 705,213 (63 %) single-authored papers. For each paper in our sample, we recorded its citation counts at the end of 2018, its publication year, the journal in which it was published, the name and affiliation of its author, and other attributes (see Table 1 for summary statistics and correlations among the variables). We retrieved the information from China National Knowledge Infrastructure (CNKI), which is supported by the Ministry of Education of China.

Our original dataset does not contain information about the authors' gender. Therefore, we used a machine learning method, the Naive Bayesian Classifier, to categorize each author as a man or woman using their names (in Chinese characters).[3] We utilized a subsample of about 2,300,000 individuals from the 2005 One-Percent Population Survey (OPPS) in China to train the classifier.[4] Ninety percent of the subsample was used for training, and the remaining 10 % was used for validation. The Naive Bayesian Classifier achieved an overall prediction accuracy rate of 85 %. Fig. 2 shows the percentage of woman-authored papers in our sample over time. For each paper in our sample, we coded whether it is an affiliated paper or a non-affiliated paper. Fig. 3 shows the percentage of affiliated papers in our sample over time.

4. Empirical model and results

4.1. Benchmark model

We construct the following benchmark model to quantify the effects of various variables on the citation counts of papers in our sample:

$$ln(Citation)_{ijt} = \beta_1 Affiliate_{ijt} + \beta_2 Woman_{ijt} + \beta_3 Affiliate_{ijt} \times Woman_{ijt} + X'_{ijt}\varnothing + \theta_{jt} + \varepsilon_{ijt}$$

$ln(Citation)_{ijt}$ is the natural logarithm of the citation counts of paper i in journal j since its publication in year t plus the constant 0.01. $Affiliate_{ijt}$ is a dummy variable that equals 1 if paper i is an affiliated paper and 0 if otherwise. $Woman_{ijt}$ is a dummy variable that indicates the gender of paper i's author. It equals 1 if the author is a woman and 0 if the author is a man. The interaction term $Affiliate_{ijt} \times Woman_{ijt}$ tests the hypothesis that the magnitude of the current affiliation bias is different for men versus women. θ_{jt} are journal-year fixed effects, and ε_{ijt} is the error term.

X_{ijt} represents a set of control variables that affect a paper's citation counts. They include the following: (1) previous productivity of paper i's author, defined as the number of that author's publications in our sample during the five-year period prior to year t[5] (Vásárhelyi et al., 2021); (2) dummy variables for the reported level of funding that paper i received (below national-level and national-level funding, with no funding as the baseline group[6]); (3) number of pages of paper i, which has been shown to correlate positively with a paper's citation counts (Ellison, 2011; Vieira, 2008); (4) alphabetical order of the surname initial of paper i's author, as Huang (2015) shows that papers with first authors whose surname initials appear earlier in the alphabet tend to receive more citations; (5) number of Chinese characters in paper i's title, since the length of a paper's title tends to correlate negatively with

[1] The rest of the CSSCI journals are managed by other types of entities such as banks, professional associations, and government commissions.

[2] We excluded miscellaneous journal items such as editorial announcements in our data collection.

[3] We also experimented with other common machine learning algorithms, such as Support Vector Machine, Neural Network, and Random Forest. Among all of the classifiers we explored, the Naive Bayesian Classifier generated the highest prediction accuracy rate.

[4] The 2005 OPPS was conducted by the National Bureau of Statistics of China (NBSC). It covers a population of about 17 million (1.3 % of the total population in China at that time) and discloses the participants' name and gender. The NBSC has released only a random subsample of the 2005 OPPS data.

[5] The earliest papers in our sample were published in 1998. Therefore, the value of this variable equals 0 for papers published in that year, and the time window in the definition of this variable varies for papers published between 1999 and 2002. For example, for papers published in 2002, the variable is defined as the number of publications by the authors in the preceding four years (1998–2001).

[6] In our sample, 26 % of the papers claimed to have received funding support. Among them, 36 % claimed to have received national-level funding.

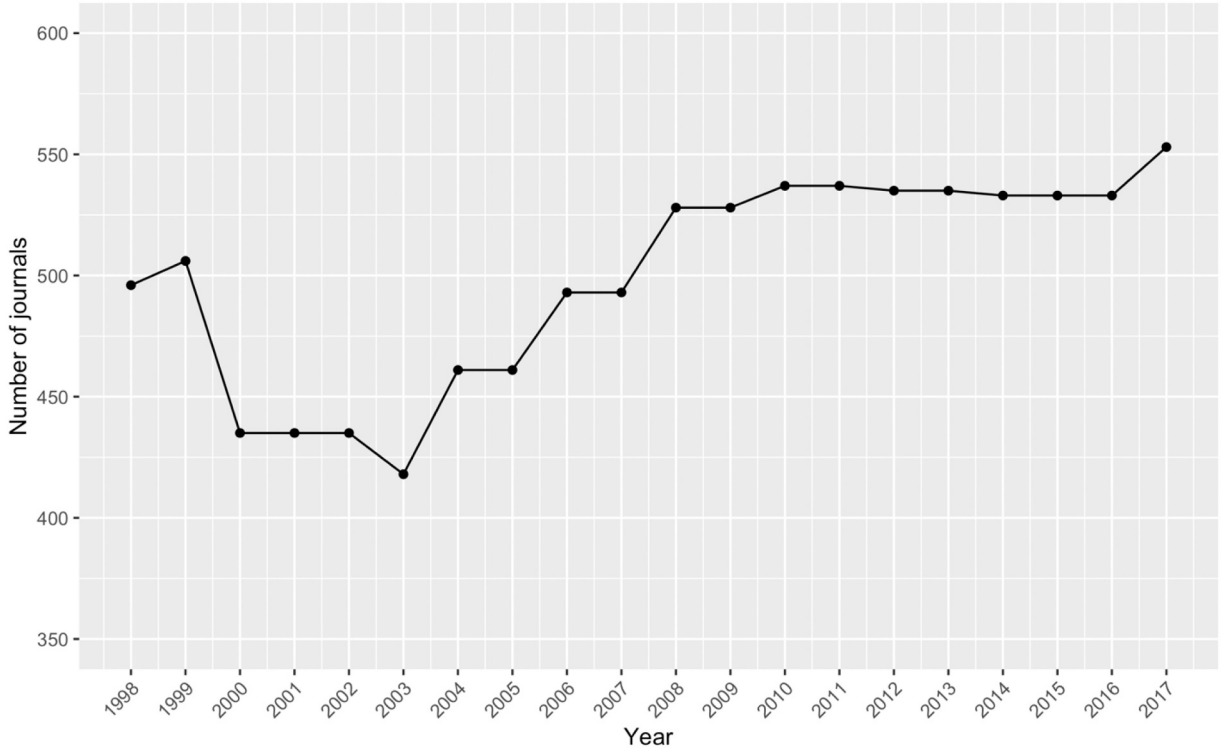

Fig. 1. Number of journals in the Chinese Social Sciences Citation Index (CSSCI) over time.

Table 1
Summary statistics and correlations.

Variables	Mean	SD	Min	Median	Max	Correlation matrix					
						1	2	3	4	5	6
1. Citation	12.113	34.388	0	4	4931	1					
2. Author productivity	2.069	4.111	0	0	81	0.0385***	1				
3. Number of pages	5.866	3.583	0	5	94	0.1204***	0.174***	1			
4. Author surname order	16.117	8.080	1	16	26	0.0004**	0.0178***	0.0004	1		
5. Title length	18.218	7.650	3	17	99	−0.0141***	0.0212***	0.1379***	0.0012	1	
6. Appearance order	15.765	17.516	1	12	296	−0.0624***	−0.0656***	−0.2425***	−0.002*	−0.0493***	1

Notes: This table provides summary statistics of our sample ($N = 705{,}213$) and the correlation coefficients among the variables. Citation denotes the total number of citation counts a paper received from its publication until the end of 2018. Author Productivity denotes the number of publications a paper's author has in our sample during the five-year period prior to the paper's publication. Number of Pages denotes the number of pages in a paper. Author Surname Order denotes the alphabetical order of the surname initial of a paper's author. Title Length denotes the number of Chinese characters in a paper's title. Appearance Order denotes a paper's order of appearance in a journal.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

its academic impact (Bramoulle and Ductor, 2018); (6) the appearance order of paper i in the journal, with 1 indicating a lead article, 2 indicating the second article in the issue, and so on (Ellison, 2011; Smart and Waldfogel, 1996); (7) fixed effects of discipline, classified according to the National Library Classification Scheme of China[7]; and (8) fixed effects of the month of the year in which paper i was published, as recent research shows that the calendar month in which papers are published can have systematic influences on their citation counts (Ma et al., 2019). Our results are robust when these control variables are excluded from the models.

Table 2 shows the results of our benchmark model. Column (1) indicates that, on average, affiliated papers have lower citation counts than non-affiliated papers and therefore provides evidence of the current affiliation bias. In Column (2), we add the variable $Woman_{ijt}$ and the $Affiliate_{ijt} \times Woman_{ijt}$ interaction term. The coefficient estimate of the $Affiliate_{ijt} \times Woman_{ijt}$ interaction is positive, indicating that the magnitude of the affiliation bias is smaller for women than for men. Column (3) shows that the current results remain robust when the control variables are added to the model. The results in Column (3) also indicate that overall, papers written by women receive more citation counts than papers written by men, which is consistent with the findings of Card et al. (2019). In Columns (4) and (5), we present the effects of author affiliation on the citation counts of papers for men and women separately. The results in these two columns confirm that the citation counts of both men's and women's papers are negatively affected by their affiliation with the journals' host institutions and that the negative effect is greater for men than for women. In Fig. 4, we plot the $Affiliate_{ijt} \times Woman_{ijt}$ interaction effect from the results in Column (3).

[7] Some journals in the CSSCI are multi-disciplinary. See https://www.clcindex.com for more information about the classification scheme.

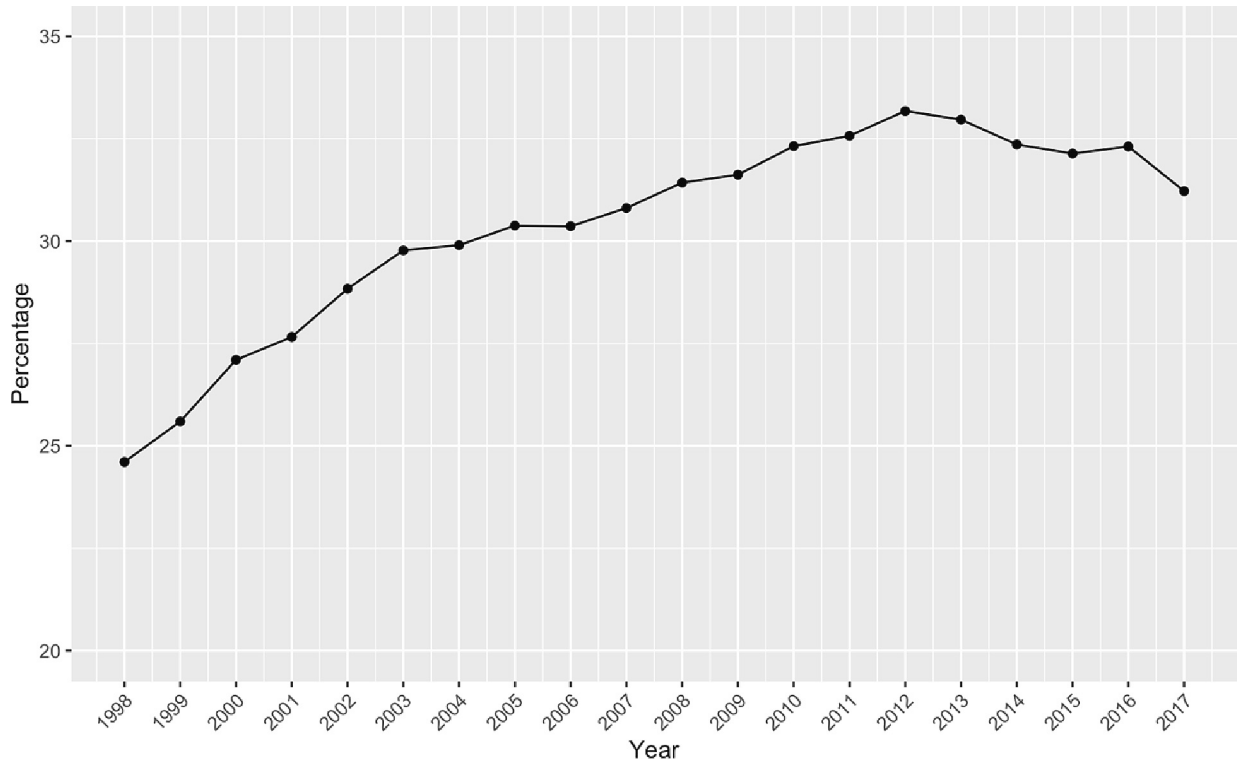

Fig. 2. Percentage of woman-authored papers in our sample over time.

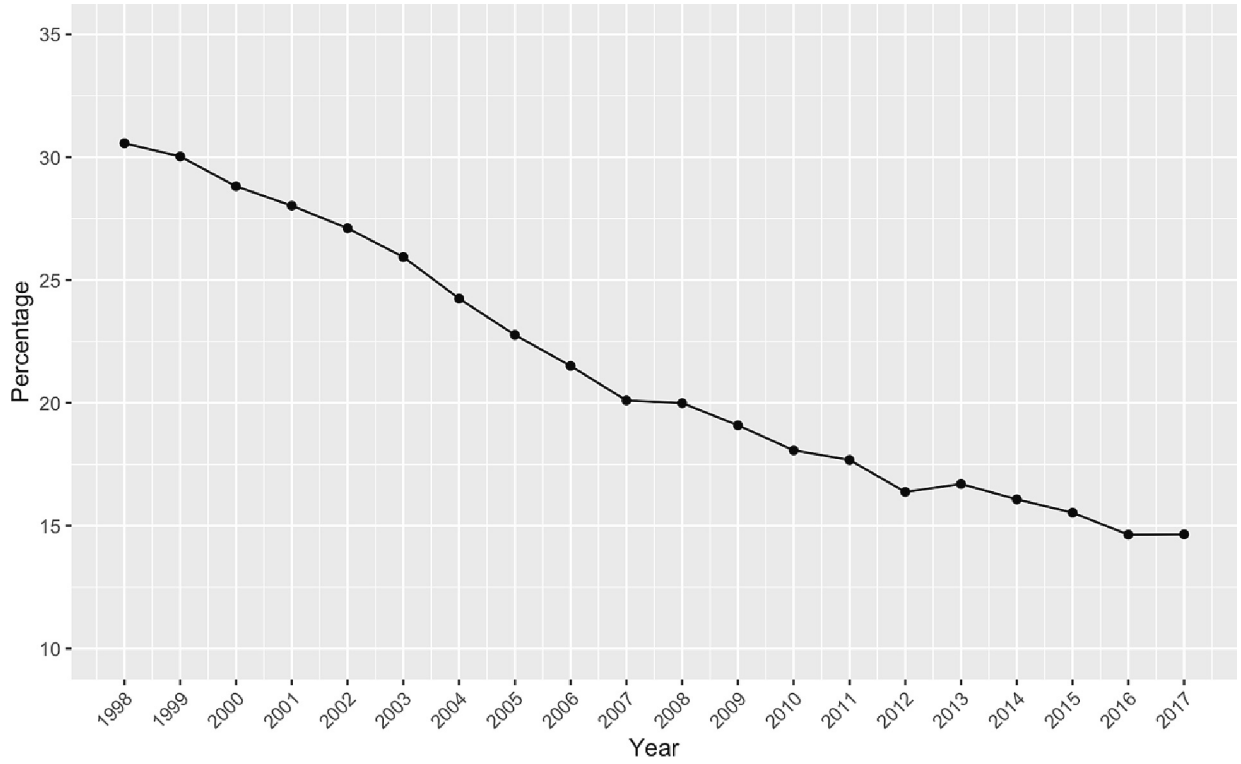

Fig. 3. Percentage of affiliated papers in our sample over time.

4.1.1. Robustness checks

In Table 3, we present the results of several robustness checks for the findings of the benchmark model. In Columns (1) and (2), we estimate the benchmark model using Poisson quasi-maximum likelihood estimation and negative binomial regression, respectively. In Column (3), we apply an inverse hyperbolic sine transformation model to account for potential non-linearity in our data. In Columns (4) and (5), we estimate the benchmark model by excluding papers with zero citations and papers with citation counts that are in the 99th percentile in our sample. Doing so helps us confirm that our benchmark results are not affected

Table 2
Benchmark model results.

	Full sample			Papers written by men	Papers written by women
	(1)	(2)	(3)	(4)	(5)
Affiliate	−0.139***	−0.147***	−0.134***	−0.136***	−0.0862***
	(0.011)	(0.011)	(0.010)	(0.010)	(0.015)
Woman		−0.0104	0.0583***		
		(0.007)	(0.007)		
Affiliate × woman		0.0275*	0.0326**		
		(0.016)	(0.015)		
Author productivity			0.0131***	0.0129***	0.0144***
			(0.001)	(0.001)	(0.002)
Below national-level funding			0.350**	0.351***	0.337***
			(0.008)	(0.010)	(0.015)
National-level funding			0.416***	0.428***	0.380***
			(0.011)	(0.012)	(0.019)
Number of pages			0.216***	0.212***	0.231***
			(0.003)	(0.003)	(0.004)
Author surname order			−0.000874***	−0.000859**	−0.000913
			(0.000)	(0.000)	(0.001)
Title length			−0.0115***	−0.0129***	−0.00764***
			(0.001)	(0.001)	(0.001)
Appearance order			−0.00435***	−0.00434***	−0.00419***
			(0.000)	(0.000)	(0.001)
Discipline fixed effects	No	No	Yes	Yes	Yes
Publication month fixed effects	No	No	Yes	Yes	Yes
Journal-year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	705,210	705,210	701,274	487,118	214,083
Adjusted-R^2	0.244	0.244	0.300	0.301	0.300

Notes: The dependent variable in all columns is the natural logarithm of the citation counts of paper *i* in journal *j* since its publication in year *t* plus the constant 0.01. Standard errors are clustered at the journal-year level and are shown in parentheses. The analyses in Columns (1) to (3) include all papers in our sample. The analyses in Columns (4) and (5) include papers written by men and women, respectively.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

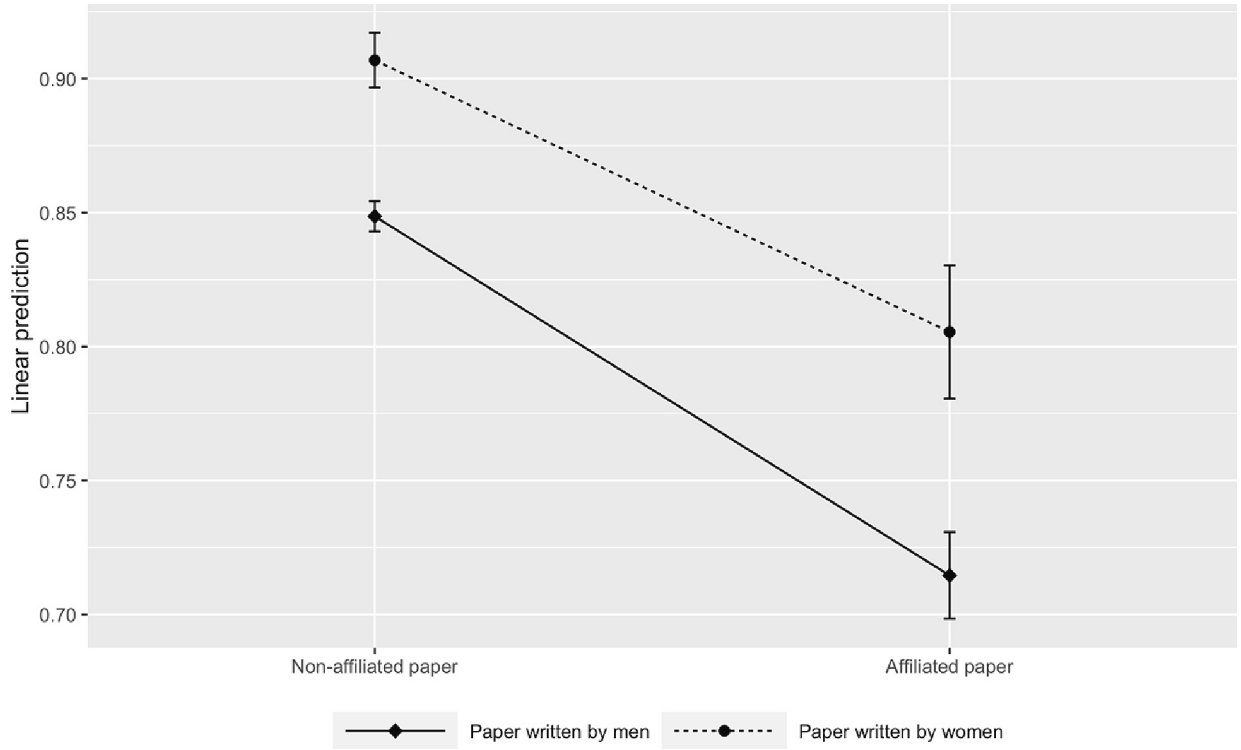

Fig. 4. The moderating effect of researchers' gender on the affiliation effect.

disproportionately by papers with extreme numbers of citations. In Column (6), we estimate our model by excluding papers written by awardees of the Yangtze River Scholar award. The award is one of the highest academic honors granted to individuals in higher education by the Ministry of Education of China and usually leads to large increases in academic resources and influences for the awardees. We therefore run

Table 3
Robustness checks.

	Poisson quasi-maximum likelihood estimation	Negative binomial regression	Inverse hyperbolic sine transformation	Excluding papers with zero citations	Excluding papers with citation counts in the 99th percentile	Excluding papers written by Yangtze River scholars
	(1)	(2)	(3)	(4)	(5)	(6)
Affiliate	−0.0192*	−0.0362***	−0.0644***	−0.0325***	−0.137***	−0.130***
	(0.011)	(0.007)	(0.005)	(0.005)	(0.010)	(0.010)
Woman	0.00254	0.0101**	0.0281***	0.0126***	0.0594***	0.0626***
	(0.007)	(0.004)	(0.004)	(0.003)	(0.007)	(0.007)
Affiliate × woman	0.0367**	0.0354***	0.0196**	0.0170**	0.0301**	0.0320**
	(0.017)	(0.010)	(0.008)	(0.007)	(0.015)	(0.015)
Author productivity	0.0164***	0.0158***	0.0102***	0.0107***	0.0121***	0.00994***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Below national-level funding	0.161***	0.160***	0.188***	0.129***	0.348***	0.349***
	(0.009)	(0.005)	(0.004)	(0.004)	(0.008)	(0.008)
National-level funding	0.246***	0.208***	0.228***	0.171***	0.411***	0.416***
	(0.013)	(0.007)	(0.006)	(0.005)	(0.011)	(0.011)
Number of pages	0.0933***	0.128***	0.123***	0.0887***	0.213***	0.218***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)
Author surname order	−0.000707*	−0.000756***	−0.000541***	−0.000535***	−0.000817**	−0.000996***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Title length	−0.00747***	−0.00676***	−0.00656***	−0.00416***	−0.0110***	−0.0114***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Appearance order	−0.00303***	−0.00271***	−0.00233***	−0.00163***	−0.00430***	−0.00433***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Discipline fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Publication month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Journal-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	701,268	701,278	701,274	593,222	694,071	692,650
Adjusted-R^2	0.213	0.0815	0.360	0.309	0.289	0.299

Notes: The dependent variable in Columns (1) and (2) is the citation counts of paper *i* in journal *j* since its publication in year *t*. The dependent variable in Column (3) is paper *i*'s citation counts transformed by the inverse hyperbolic sine function. The dependent variable in Column (4) is the natural logarithm of paper *i*'s citation counts. The dependent variable in Columns (5) and (6) is the natural logarithm of paper *i*'s citation counts plus the constant 0.01. Standard errors are clustered at the journal-year level and are shown in parentheses. The analysis in Column (4) excludes papers with zero citations in our sample. The analysis in Column (5) excludes papers with citation counts that are in the 99th percentile in our sample. The analysis in Column (6) excludes papers written by awardees of the Yangtze River Scholar award in our sample.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

the analysis to show that the current effects are not primarily driven by the influences of those superstars. Across the model specifications in Table 3, we observe patterns of results that are consistent with those of our benchmark model.

4.2. Effect of professional rank

Next, we conduct several analyses to provide evidence supporting a social capital mechanism of the current affiliation bias. We first examine the affiliation effect as a function of researchers' professional rank. We predict that researchers of higher professional ranks should enjoy a relatively larger affiliation premium than their lower-ranked colleagues on average, because hierarchical level is positively associated with a person's ability to yield returns on social capital (Adler and Kwon, 2002; Lincoln and Miller, 1979). In our empirical model, we compare the citation counts of papers written by full professors with those of papers written by researchers of lower ranks. We focus on the comparison between these two groups because there are relatively large gaps in research capabilities between full professors and their lower-ranked colleagues in China. For example, only full professors can apply for the Major Programs of the National Social Science Fund of China, one of the most prestigious funding schemes in the country. Moreover, in most universities, only full professors are qualified to recruit and supervise doctoral students. Therefore, we construct the following model to test the effect of researchers' professional rank[8]:

$$\begin{aligned} ln(Citation)_{ijt} =& \beta_1 Affiliate_{ijt} + \beta_2 FullProf_{ijt} + \beta_3 Woman_{ijt} + \beta_4 Affiliate_{ijt} \\ & \times FullProf_{ijt} + \beta_5 Affiliate_{ijt} \times Woman_{ijt} + \beta_6 FullProf_{ijt} \\ & \times Woman_{ijt} + \beta_7 Affiliate_{ijt} \times FullProf_{ijt} \times Woman_{ijt} + X_{ijt}^{'} \varnothing \\ & + \theta_{jt} + \varepsilon_{ijt} \end{aligned}$$

$FullProf_{ijt}$ is a dummy variable that indicates whether the author of paper *i* is a full professor in year *t* (no = 0, yes = 1). The results of the current analysis are shown in Table 4. Consistent with our prediction, the coefficient estimate of the $Affiliate_{ijt} \times FullProf_{ijt}$ interaction effect in Column (1) is negative, indicating that the current affiliation bias is greater for full professors than for lower-ranked researchers. In Column (2), we add the variable $Woman_{ijt}$ and the relevant interaction effects. The negative $Affiliate_{ijt} \times FullProf_{ijt}$ interaction effect remains robust, and we observe the same $Affiliate_{ijt} \times Woman_{ijt}$ interaction as in our previous results. The coefficient estimate of the $Affiliate_{ijt} \times FullProf_{ijt} \times Female_{ijt}$ interaction is non-significant, suggesting that the effect of

[8] One hundred ninety-six journals in our dataset provided information about the authors' professional ranks. The current analysis is based on the papers published in those journals.

Table 4
Effect of professional rank.

	(1)	(2)
Affiliate	−0.0480***	−0.0682***
	(0.015)	(0.019)
FullProf	0.0945***	0.0972***
	(0.013)	(0.015)
Woman		0.0477***
		(0.012)
Affiliate × FullProf	−0.0687***	−0.0571**
	(0.025)	(0.029)
Affiliate × woman		0.0501*
		(0.027)
FullProf × woman		0.0104
		(0.026)
Affiliate × FullProf × woman		−0.0169
		(0.053)
Author productivity	0.0104***	0.0108***
	(0.001)	(0.001)
Below national-level funding	0.257***	0.255***
	(0.011)	(0.011)
National-level funding	0.308***	0.308***
	(0.014)	(0.014)
Number of pages	0.143***	0.143***
	(0.003)	(0.003)
Author surname order	−0.000965*	−0.000968*
	(0.001)	(0.001)
Title length	−0.000364	−0.000434
	(0.001)	(0.001)
Appearance order	−0.000518	−0.000519
	(0.000)	(0.000)
Discipline fixed effects	Yes	Yes
Publication month fixed effects	Yes	Yes
Journal-year fixed effects	Yes	Yes
Observations	229,709	229,709
Adjusted-R^2	0.313	0.313

Notes: The dependent variable in both columns is the natural logarithm of the citation counts of paper i in journal j since its publication in year t plus the constant 0.01. Standard errors are clustered at the journal-year level and are shown in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

professional rank on the magnitude of the affiliation bias works in parallel for both men and women.

In a supplementary analysis, we estimate our benchmark model and add the dummy variable indicating full professorship as an additional covariate. The results (see Table A1 in the Appendix) show that our effects are robust and thus suggest that the benchmark findings are not due to men being of disproportionately higher rank than women.

4.3. Intra-individual effects of affiliation

In this section, we provide additional support for the social capital mechanism by investigating the intra-individual effects of researchers' affiliation on the citation counts of their papers. Our strategy is to compare the average citation counts of researchers' papers that are published in a journal before their entry into (or exit from) the journal's host institution with those of their papers published in the same journal after their entry (or exit). We expect to observe a within-individual decrease in the citation counts of researchers' papers when they enter a journal's host institution. That is, for researcher I who enters into journal J's host institution at time T, we expect the average citation counts of I's papers published in journal J after T to be lower than the average citation counts of her papers published in journal J before T. This could occur because researchers can leverage their newly acquired social capital in the new institution to influence the peer review process. In contrast, we do not expect to observe a significant change in the citation counts of researchers' papers when they exit a journal's host institution. This is because the efficacy of researchers' social capital in their former institution could be sustained even after their exit (Clark, 1984; Kleinbaum, 2018; Walsh et al., 2018). We also examine the potential moderating effect of gender in the intra-individual affiliation effects.

4.3.1. Entry effect

We first examine the effect of researchers' entry into a journal's host institution. For each journal, we identify researchers whose affiliation status with the journal's host institution has shifted from non-affiliated to affiliated.[9,10] The current analysis is then based on papers that are published by this subset of researchers in those corresponding journals. We specify the model below:

$$ln(Citation)_{ijtkl} = \beta_1 Enter_{ijtk} + \beta_2 Enter_{ijtk} \times Woman_k + X'_{ijtkl}\varnothing + \theta_{jt} + \sigma_{jk} + \omega_l + \varepsilon_{ijt}$$

$ln(Citation)_{ijtkl}$ is the natural logarithm of the citation counts of paper i, which is published in journal j in year t by author k who is at that time affiliated with institution l. Again, we add the constant 0.01 to paper i's citation counts before we take the natural log. $Enter_{ijtk}$ is a dummy variable that indicates whether author k has entered the host institution of journal j when she publishes paper i in year t (no = 0, yes = 1). We include the term $Enter_{ijtk} \times Woman_k$ to investigate whether the intra-individual effect of entry into an institution is contingent on researchers' gender. We control for journal-author fixed effects (σ_{jk}), which enables us to examine within-individual changes in the citation counts of papers that author k publishes in journal j before versus after her entry into journal j's host institution. We also control for the fixed effects of the institution (ω_l) with which author k is affiliated when she publishes paper i. The variable $Woman_k$ and the covariate that controls for the alphabetical order of author k's surname initial are collinear with the journal-author fixed effects and are thus dropped from the model specification.

The results for the entry effect are presented in Columns (1) and (2) of Table 5. The coefficient estimate of the variable $Enter_{ijtk}$ in Column (1) confirms that researchers' entry into a journal's host institution can lead to a within-individual decrease in the citation counts of their papers that are subsequently published in the journal. In Column (2), we add the $Enter_{ijtk} \times Woman_k$ interaction. The coefficient estimate of the interaction effect is positive, indicating that the decrease in citation counts caused by researchers' entry into a journal's host institution is smaller for women than for men. These results therefore demonstrate evidence of the intra-individual effect of entry into an institution on the citation counts of researchers' papers and suggest that this effect is smaller for women than for men.

4.3.2. Exit effect

We next investigate the effect of researchers' exit from a journal's host institution. For each journal, we identify researchers whose affiliation status with the journal's host institution has shifted from affiliated to non-affiliated. We specify the same model as for the entry effect but replace the variable $Enter_{ijtk}$ with another dummy variable, $Exit_{ijtk}$, which indicates whether author k has exited the host institution of journal j when she publishes paper i in year t (no = 0, yes = 1). The results are shown in Columns (3) and (4) of Table 5. Consistent with our prediction, the coefficient estimate of the variable $Exit_{ijtk}$ in Column (3) indicates that researchers' exit from a journal's host institution does not

[9] We do not include cases in which the researchers' affiliation status with a journal's host institution has changed more than once (e.g., from non-affiliated to affiliated and then to non-affiliated again). This is the same when we examine the exit effect.

[10] The China National Knowledge Infrastructure (CNKI) does not provide unique identifiers or email addresses of the authors. Therefore, for our dataset, author disambiguation was done using the authors' names (in Chinese characters) plus their affiliations.

Table 5
Intra-individual effects of affiliation.

	Entry effect		Exit effect		Asymmetry
	(1)	(2)	(3)	(4)	(5)
Enter	−0.485***	−0.625***			
	(0.170)	(0.190)			
Enter × woman		0.346*			
		(0.190)			
Exit			−0.00603	−0.0813	
			(0.081)	(0.086)	
Exit × woman				0.230**	
				(0.091)	
Affiliate					−0.251***
					(0.094)
Affiliate × direction					0.322***
					(0.121)
Affiliate × woman					0.300**
					(0.132)
Affiliate × direction × woman					−0.471***
					(0.158)
Author productivity	−0.0307	−0.0325*	−0.000950	−0.000923	−0.00888
	(0.019)	(0.020)	(0.009)	(0.009)	(0.007)
Below national-level funding	0.164	0.133	0.220***	0.212***	0.222***
	(0.123)	(0.126)	(0.072)	(0.071)	(0.055)
National-level funding	0.266	0.234	0.321***	0.325***	0.250***
	(0.163)	(0.162)	(0.103)	(0.103)	(0.075)
Number of pages	0.235***	0.238***	0.195***	0.190***	0.193***
	(0.021)	(0.021)	(0.020)	(0.020)	(0.013)
Title length	−0.0175***	−0.0187***	−0.0125***	−0.0128***	−0.0132***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.003)
Appearance order	0.00698*	0.00744*	−0.00203	−0.00245	−0.00328**
	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Discipline fixed effects	Yes	Yes	Yes	Yes	Yes
Publication month fixed effects	Yes	Yes	Yes	Yes	Yes
Journal-year fixed effects	Yes	Yes	Yes	Yes	Yes
Journal-author fixed effects	Yes	Yes	Yes	Yes	Yes
Institution fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	6205	6124	16,267	16,070	25,349
Adjusted-R^2	0.314	0.310	0.368	0.367	0.374

Notes: The dependent variable in all columns is the natural logarithm of the citation counts of paper *i*, which is published in journal *j* in year *t* by author *k* who is at that time affiliated with institution l. The constant 0.01 is added to paper *i*'s citation counts before we take the log. Standard errors are clustered at the journal-year level and are shown in parentheses. Columns (1) and (2) report the results of the entry effect. Columns (3) and (4) report the results of the exit effect. Column (5) reports the results of the analysis on the asymmetry in the intra-individual affiliation effects between researchers' entry and exit.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

significantly affect the citation counts of their papers that are subsequently published in the journal. However, the results in Column (4) suggest that the impact of researchers' exit is contingent on their gender. The positive coefficient of the $Exit_{ijtk} \times Woman_k$ interaction suggests that, relative to men's exit, women's exit from a journal's host institution is associated with a relatively larger increase in the citation counts of their papers that are subsequently published in the journal. The results thus suggest that exit from a journal's host institution does not affect the citation counts of researchers' papers overall but that the intra-individual effect of exit from an institution is relatively more evident for women than for men.

4.3.3. Asymmetry in the intra-individual affiliation effects

The results of our current analyses indicate that the intra-individual effect of affiliation is present when researchers enter a journal's host institution but that the intra-individual affiliation effect is overall absent when researchers exit from a journal's host institution. This asymmetry in the intra-individual effects of affiliation between entry and exit is consistent with predictions from a social capital mechanism. To formally test this asymmetry and the moderating role of gender in the current effects, we integrate data from the analyses of the entry and exit effects and specify the below model:

$$ln(Citation)_{ijtkl} = \beta_1 Affiliate_{ijtk} + \beta_2 Affiliate_{ijtk} \times Direction_{jk} + \beta_3 Affiliate_{ijtk} \times Woman_k + \beta_4 Affiliate_{ijtk} \times Direction_{jk} \times Woman_k + X'_{ijtkl}\varnothing + \theta_{jt} + \sigma_{jk} + \omega_l + \varepsilon_{ijt}$$

$Affiliate_{ijtk}$ is a dummy variable that equals 1 if paper *i* in journal *j* is published when its author *k* is affiliated with journal *j*'s host institution and 0 otherwise. $Direction_{jk}$ is a dummy variable that indicates whether author *k* is entering or exiting journal *j*'s host institution. The variable equals 0 for journal-author dyads in which the author enters the journal's host institution and 1 for dyads in which the author exits the journal's host institution. The variables $Direction_{jk}$, $Woman_k$, and the covariate that controls for the alphabetical order of author *k*'s surname initial are collinear with the journal-author fixed effects and are thus dropped from the model specification.

The results of the model are shown in Column (5) of Table 5. The coefficient estimate of the $Affiliate_{ijtk} \times Direction_{jk}$ interaction is significant and thus provides model evidence of the asymmetry in the intra-individual effects of affiliation between entry and exit. Furthermore, the coefficient estimate of the $Affiliate_{ijtk} \times Direction_{jk} \times Woman_k$ interaction is significant, indicating that the current asymmetry is contingent on researchers' gender. Specifically, our results suggest that the asymmetry in the intra-individual affiliation effects is more evident for men

than women: men experience a significant decrease in the citation counts of their papers in a journal after they enter the journal's host institution, but they do not experience a significant change in their papers' citation counts after they exit from a journal's host institution. Compared to men, women experience a smaller entry-induced decrease and a larger exit-induced increase in the citation counts of their papers. Together, the results of the current analyses are consistent with a social capital mechanism in explaining the current affiliation effect and the gender gap.

4.4. Prestige of affiliation

In the final section of our analysis, we group researchers according to the relative prestige (high versus low) of their affiliations. We define relatively high-prestige institutions as those included in China's "*Project 985*"[11] plus the two national academies (the Chinese Academy of Sciences and the Chinese Academy of Social Sciences), and define relatively low-prestige institutions as the rest of the institutions identified in our dataset. We investigate whether the magnitudes of the current affiliation bias and the gender gap vary between researchers in those two groups. Our analysis therefore compares the citation counts of affiliated versus non-affiliated papers written by researchers in the same group. That is, within an individual journal, we compare affiliated papers only with those non-affiliated papers written by authors whose affiliations are of the same level of prestige as the journal's host institution.[12] We estimate the model below:

$$\begin{aligned} ln(Citation)_{ijt} =& \beta_1 Affiliate_{ijt} + \beta_2 Woman_{ijt} + \beta_3 Affiliate_{ijt} \times Prestige_{ijt} \\ &+ \beta_4 Affiliate_{ijt} \times Woman_{ijt} + \beta_5 Prestige_{ijt} \times Woman_{ijt} \\ &+ \beta_6 Affiliate_{ijt} \times Prestige_{ijt} \times Woman_{ijt} + X'_{ijt}\varnothing + \theta_{jt} + \varepsilon_{ijt} \end{aligned}$$

$Prestige_{ijt}$ is a dummy variable that equals 1 if the author of paper i is affiliated with a relatively high-prestige institution at the time of paper i's publication and 0 otherwise. Because the prestige of the author's affiliation is restricted to be at the same level with that of journal j's host institution, $Prestige_{ijt}$ is collinear with journal-year fixed effects and is thus dropped from the model specification.

Columns (1) and (2) of Table 6 show the results of the current model, and Columns (3) to (6) of the same table depict the results of the current analyses for researchers who are affiliated with relatively high- and low-prestige institutions, respectively. In Columns (1) and (2), the coefficient estimate of the $Affiliate_{ijt} \times Prestige_{ijt}$ interaction is negative, therefore suggesting that the current affiliation bias is greater for researchers affiliated with relatively high-prestige institutions than for those affiliated with relatively low-prestige institutions. This is further confirmed by comparing the coefficient estimates of $Affiliate_{ijt}$ in Columns (3) and (5). Moreover, the coefficient estimates of the $Affiliate_{ijt} \times Woman_{ijt}$ interaction in Columns (4) and (6) suggest that the gender gap in the current affiliation effect is present for researchers affiliated with relatively low-prestige institutions but is alleviated (i.e., the interaction effect becomes non-significant) for researchers affiliated with relatively high-prestige institutions, though the coefficient estimate of the $Affiliate_{ijt} \times Prestige_{ijt} \times Woman_{ijt}$ interaction in Column (2) does not reach significance.

5. General discussion

By analyzing the citation counts of papers published in top Chinese journals, we show that papers written by affiliated authors on average receive significantly fewer citation counts than papers written by non-affiliated authors. The results suggest that editors of top Chinese journals are willing to accept affiliated papers that are of relatively lower potential academic impact. This finding indicates an affiliation bias in favor of insiders during peer review. More importantly, we find that affiliated man researchers enjoy a relatively larger affiliation premium than affiliated woman researchers: the results of our benchmark model suggest that the negative difference in citation counts of papers between affiliated and non-affiliate authors among men is approximately 32 % larger than that among women.

We suggest that a social capital mechanism could possibly account for the current affiliation effect and the gender gap. The results of our analyses show that the affiliation bias is greater for full professors than for their lower-ranked colleagues and that the intra-individual effects of affiliation on the citation counts of researchers' papers are asymmetric upon their entry into versus exit from a journal's host institution. These findings are consistent with predictions based on the social capital mechanism and therefore provide evidence supporting its validity. The results of our analyses further suggest that women might be at a disadvantage relative to men in both acquiring and maintaining their social capital: compared to men, women may be less efficient in creating new ties and less able to sustain their social capital with relatively distant ties (Burt, 2000; McPherson et al., 2001).

Although we believe that the social capital mechanism provides a viable explanation of the current affiliation-gender interaction, other mechanisms might also contribute to the current effects, in particular the difference between men and women in the citation counts of their papers. For example, a recent study by Hengel (2022) suggests that women go through longer and likely more demanding peer review than men. This causes women's papers to have relatively higher readability and in turn possibly higher citation counts than men's papers. In addition, Card et al. (2019) suggest that papers written by women tend to have more empirical content, which can positively affect the papers' citation counts. Alternatively, woman and man researchers in our context may have differential relative preferences for quantity versus impact of papers. It might be possible that men in Chinese institutions prefer to publish a larger number of papers that are less impactful in order to qualify for promotions to a higher degree than women.[13] These possibilities could lead to the finding that papers written by women overall receive more citation counts than papers written by men.

We conducted a survey[14] with 118 Chinese researchers (51 women) to provide some suggestive evidence about the validity of these alternative mechanisms and to seek further support of the social capital mechanism. Tables A2 and A3 in the Appendix show the summary statistics of our survey sample and the main results of the survey, respectively. The results are consistent with our propositions under a social capital mechanism. Specifically, woman researchers reported having connections with fewer in-house editors and interacting less frequently with those editors than man researchers. Men and women did not differ in their reported frequencies of interactions with colleagues of the same or opposite gender, and researchers of both genders reported interacting more with colleagues of the same gender than with those of the opposite gender, $ps < 0.05$. Given the fact that women are generally underrepresented in academics and editorial positions in particular (Ceci et al., 2014; Huang et al., 2020; Lerback and Hanson, 2017; Long and Fox, 1995), these findings imply that women are disadvantaged relative to men in leveraging social connections to influence peer review.

[11] Thirty-nine top Chinese institutions (including, for example, Tsinghua University and Peking University) are currently included in "*Project 985*," from which they receive national-level funding for research and development. For more information, see https://en.wikipedia.org/wiki/Project_985.

[12] For example, for a journal that is hosted by a relatively high-prestige institution, we will compare the citation counts of affiliated papers (which are written by researchers affiliated with a relatively high-prestige institution) with those of non-affiliated papers written by researchers from other relatively high-prestige institutions, but not with those of non-affiliated papers written by researchers from relatively low-prestige institutions.

[13] We thank an anonymous reviewer for suggesting this possibility.

[14] The survey materials and data are available via https://osf.io/ap527/?view_only=835dffa2de324335be129b8c3a015d47.

Table 6
Prestige of affiliation.

	Full subsample		Papers written by researchers affiliated with relatively high-prestige institutions		Papers written by researchers affiliated with relatively low-prestige institutions	
	(1)	(2)	(3)	(4)	(5)	(6)
Affiliate	−0.0791***	−0.0964***	−0.230***	−0.235***	−0.0780***	−0.0963***
	(0.012)	(0.013)	(0.019)	(0.019)	(0.012)	(0.013)
Woman		0.0863***		−0.00862		0.0879***
		(0.010)		(0.020)		(0.010)
Affiliate × prestige	−0.142***	−0.131***				
	(0.022)	(0.024)				
Affiliate × woman		0.0512***		0.0191		0.0535***
		(0.019)		(0.031)		(0.019)
Prestige × woman		−0.104***				
		(0.022)				
Affiliate × prestige × woman		−0.0247				
		(0.036)				
Author productivity	0.0104***	0.0112***	0.0214***	0.0214***	0.00178	0.00312**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Below national-level funding	0.375***	0.374***	0.370***	0.370***	0.372***	0.371***
	(0.010)	(0.010)	(0.020)	(0.020)	(0.012)	(0.012)
National-level funding	0.431***	0.427***	0.463***	0.463***	0.413***	0.413***
	(0.013)	(0.013)	(0.024)	(0.024)	(0.016)	(0.016)
Number of Pages	0.220***	0.221***	0.181***	0.181***	0.252***	0.253***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)
Author surname order	−0.000788*	−0.000807**	−0.000535	−0.000531	−0.000830*	−0.000853*
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Title length	−0.0121***	−0.0122***	−0.0147***	−0.0147***	−0.0116***	−0.0117***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Appearance order	−0.00359***	−0.00361***	−0.00528***	−0.00528***	−0.00329***	−0.00332***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Discipline fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Publication month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Journal-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	476,350	476,350	107,227	107,227	369,123	369,123
Adjusted-R^2	0.296	0.296	0.347	0.347	0.274	0.274

Notes: The dependent variable in all columns is the natural logarithm of the citation counts of paper *i* in journal *j* since its publication in year *t* plus the constant 0.01. Standard errors are clustered at the journal-year level and are shown in parentheses. The analyses in Columns (1) and (2) include all papers in the current subsample. The analyses in Columns (3) and (4) and the analyses in Columns (5) and (6) include papers written by researchers affiliated with relatively high-prestige and relatively low-prestige institutions, respectively.

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Women also reported having fewer collaborations with colleagues than men, though the current result is only directional. On the other hand, we did not find support for the claims that (1) women go through longer or more demanding peer review than men, (2) papers written by women have more empirical content than papers written by men, or (3) women have a relatively stronger preference for impact over quantity of publications than men. These results therefore suggest that those alternative mechanisms are unlikely to be the primary reasons underlying the current effects.

5.1. Limitations of present research

There are limitations of the current analyses, and further investigations are warranted. First, while social capital is inferred from authors' affiliation and professional rank in the present research, further analyses should consider other indicators of social capital to provide more support for the current mechanism. For example, authors' social capital might be measured by the number of their collaborations with in-house editors or other colleagues. Alternatively, the strength of connections between authors and editors might be measured by the number of co-attending conferences, whether they attended the same school, or whether they have the same hometown (Fisman et al., 2018). Second, though we have discussed how researchers' social capital can be leveraged to influence peer review and how it could underlie the current gender gap, those specific mechanisms are not tested in the present research.

Third, we employed a machine learning approach to infer the gender of authors in our dataset and achieved a prediction accuracy rate of 85 %. This might raise concerns about the validity of our results. We believe that the current prediction accuracy rate is reasonably high for studies that estimate gender based on names (Gallagher and Chen, 2008; Larivière et al., 2013). Moreover, a significant proportion of Chinese characters are commonly used in the names of both men and women,[15] therefore making the predictions more susceptible to errors in the current context. To further improve prediction accuracy, future investigations might disambiguate any uncertainty by looking up the profile pictures of researchers. Further, relevant parties could consider crowdsourcing a database that tracks gender and name choices of the newborns, in a similar vein as the Social Security Administration (SSA) database, which researchers often leverage to infer people's gender based on the popularity of names for the newborns (Flory et al., 2015; Kalnins and Williams, 2021; Leibbrandt and List, 2015).

[15] For example, there are 40 overlapping characters between the top-100 frequently used Chinese characters in the names of men and women in the subsample of the 2005 One-Percent Population Survey (OPPS) used to train the classifier in the current research.

Finally, the current analyses of the intra-individual affiliation effects are based on a subset of researchers who have changed affiliations in their academic careers. The dynamics that underpin the job moves and journal submission decisions could raise endogeneity concerns about our results. One possible concern is that job moves are often associated with changes in researchers' capacity to conduct impactful research. For example, downward moves (i.e., moves from relatively high-prestige institutions to relatively low-prestige institutions) may often result from researchers' failure to obtain tenure in the high-prestige institutions and could be associated with decreases in their general capacity to conduct impactful research. In contrast, upward moves are often associated with increases in researchers' academic achievement or impact. In addition, the results of the exit analysis might be susceptible to other selection effects since certain factors could make some researchers more likely to submit papers to their previous institutions than others. It is unclear how these possible effects can account for the observed asymmetry in the intra-individual affiliation effects and the relevant gender differences. Nevertheless, following the present approach, future investigations could exploit job moves that are more likely to be exogenous (e.g., moves due to family reasons) in order to provide stronger evidence for the current propositions.

5.2. Implications and future research

Our research helps advance understanding of gender disparities in various aspects of science and the role of researchers' network connections in the creation and diffusion of scientific knowledge. As discussed above, women might be treated unfavorably in peer review as compared to men (Card et al., 2019; Hengel, 2022). The results of other studies suggest that women are also at a disadvantage relative to men with regard to research dissemination, patenting, and entrepreneurial activities (Ding et al., 2006, 2013; Nittrouer et al., 2018; Vásárhelyi et al., 2021). The current research sheds light on these phenomena by highlighting the adverse effects of differences in social capital on women. Future investigations should continue to provide more evidence regarding the mediating role of social capital in these issues and provide implications about how to remedy such gender inequality in the science community.

The extant literature shows that researchers' network connections are an important factor in knowledge diffusion via their impacts on peer review. However, this line of research argues that those network connections can facilitate journal editors' search and evaluation of potentially high-impact papers (Brogaard et al., 2014; Laband and Piette, 1994; Medoff, 2003). In contrast, findings from our research suggest that researchers could leverage their social capital in their professional networks to influence peer review in their favor, which leads to publication of papers of lower potential impact. We suggest that researchers' network connections could influence the creation and diffusion of scientific knowledge in both directions. It is important that future studies investigate the factors that moderate the relative strength of these opposing forces. For example, the current effect of social connections on peer review might be more prominent in cultures or institutional settings in which people are bound more strongly by interdependent relationships.

Furthermore, the results of the current analyses also demonstrate heterogeneity of the affiliation bias and the gender gap with regard to researcher status, and future research is warranted to further investigate the mechanisms underlying these phenomena. We show that the affiliation bias is greater for researchers affiliated with relatively high-prestige institutions than for those affiliated with relatively low-prestige institutions. This finding may suggest that social capital is a relatively more critical resource that affects the performance of researchers in the elite group than in the relatively lower-status group. One possible explanation of this finding is that certain network characteristics vary as a function of prestige. For example, high-status researchers are generally more resourceful and therefore may find it more rewarding to establish and maintain inter-connected networks with similar peers to reap benefits. This may lead researchers in high-prestige institutions to have greater capabilities to influence in-house editors' evaluations and decisions. Alternatively, the competition for limited tenure and promotion quota is presumably fiercer in high-prestige institutions; therefore, researchers in these institutions may face greater pressure to engage in networking activities in order to facilitate the publication of their work.

Finally, we find evidence suggesting that the gender gap in the current affiliation effect diminishes among researchers affiliated with relatively high-prestige institutions. The results indicate that the current gender gap is modulated by institutional contexts and are thus consistent with the structural perspective about gender gaps in social capital, which suggests that gender differences in network outcomes are largely reduced or eliminated when structural factors are controlled for (Aldrich, 1989; Ding et al., 2013; Ibarra, 1992; Moore, 1990). The finding may suggest that being affiliated with high-prestige institutions confers certain capacities on women, which they can capitalize on to alleviate their relative disadvantages in networking. In conclusion, the current research investigates important issues affecting peer review and spurs future work that is of potential to provide important implications for the field of science. We believe that further investigations into the issues identified in this paper constitute a meaningful avenue for future research.

CRediT authorship contribution statement

Kao Si: Conceptualization, Methodology, Investigation, Writing
Yiwei Li: Conceptualization, Methodology, Writing - Original Draft
Chao Ma: Methodology, Validation, Investigation
Feng Guo: Software, Validation, Data Curation, Visualization

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A

Table A1
Benchmark model results with FullProf as an additional covariate.

Affiliate	−0.0912***
	(0.015)
Woman	0.0482***
	(0.011)
Affiliate × woman	0.0554**

(*continued on next page*)

Table A1 (*continued*)

	(0.023)
FullProf	0.0863***
	(0.012)
Author productivity	0.0109***
	(0.001)
Below national-level funding	0.255***
	(0.011)
National-level funding	0.308***
	(0.014)
Number of pages	0.143***
	(0.003)
Author surname order	−0.000978*
	(0.001)
Title length	−0.000433
	(0.001)
Appearance order	0.000521
	(0.000)
Discipline fixed effects	Yes
Publication month fixed effects	Yes
Journal-year fixed effects	Yes
Observations	229,709
Adjusted-R^2	0.313

Notes: The dependent variable is the natural logarithm of the citation counts of paper i in journal j since its publication in year t plus the constant 0.01. Standard errors are clustered at the journal-year level and are shown in parentheses.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

Table A2
Summary statistics of survey sample.

Variable	Count (percentage)/mean (SD)
Gender	
Men	67 (57 %)
Women	51 (43 %)
Average years after Ph.D. graduation	7.40 (4.72)
Discipline	
Economics	70 (59 %)
Finance	18 (15 %)
Accounting	6 (5 %)
Management	5 (4 %)
Sociology	4 (4 %)
Public administration	4 (4 %)
Others	11 (9 %)
Current professional rank	
Postdoctoral researcher/research assistant professor	6 (5 %)
Lecturer/assistant professor	39 (33 %)
Associate professor	47 (40 %)
Full professor	26 (22 %)
Status of affiliated institution	
Neither 985 nor 211 institution	28 (24 %)
211 institution	48 (41 %)
985 institution	42 (35 %)

Notes: There are around 100 participating institutions in "*Project 211*." These institutions are generally of relatively lower status as compared to those in "*Project 985*." For more information, see https://en.wikipedia.org/wiki/Project_211.

Table A3
Survey results.

Variable	Men	Women	p value
1. Frequency of interactions with colleagues of the same gender	3.90 (0.80)	3.71 (0.78)	0.2004
2. Frequency of interactions with colleagues of the opposite gender	3.46 (0.77)	3.51 (0.70)	0.7323
3. Number of acquainted in-house editors	2.82 (2.88)	1.82 (1.66)	0.0300
4. Frequency of interactions with acquainted in-house editors	2.48 (0.96)	2.14 (0.87)	0.0495
5. Number of collaborations with colleagues since Ph.D. graduation	6.39 (5.73)	5.66 (4.90)	0.4691
6. Average review duration of publications	3.61 (0.67)	3.65 (0.91)	0.8103
7. Average extent of revision of publications	3.60 (0.63)	3.43 (0.64)	0.1624
8. Average extent of empirical content in publications	4.25 (0.89)	4.12 (0.93)	0.4224
9. Preference for publishing a larger number but less impactful papers (1) versus publishing a smaller number but more impactful papers (5)	4.16 (1.25)	4.27 (0.92)	0.5969

Notes: Numbers indicate means and numbers in parentheses indicate standard deviations of the means. All variables (except 3 and 5) were measured using five-point scales (from 1 to 5). We excluded values that are more than three standard deviations away from the sample means when performing *t*-tests on variables 3 (one outlier) and 5 (two outliers).

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