

The Publication Gender Gap, Collaboration, and an Index of Inclusion for Scholars Publishing Peer-Reviewed Research

Unislawa M. Williams, *Spelman College, USA*

We know that a gender gap in publications exists. Previous research shows that female authors in international relations (IR) have fewer publications than male authors (Maliniak, Powers, and Walter 2013). However, this article offers a novel explanation for the outcome: inclusion in collaborative research practices has a large and significant part in fueling the gap. Female authors tend to include more new collaborators in their research projects than male authors. Moreover, whether because of the ensuing startup costs or other transaction costs associated with initiating new collaborations, female authors publish less.

The result is not specific to women. In general, those authors who are more inclusive in their collaborations publish less than those who are more exclusive. Authors who repeatedly publish with the same coauthors have more articles than those with less exclusive collaborative networks. Inclusion negatively affects publishing success, as does collaboration more generally. The wider the network of collaborators, the more negative the impact on publishing success. These findings align with previous research suggesting that collaboration can be a double-edged sword, especially for female authors (Djupe, Smith, and Sokhey 2019; Lake 2010; Sarsons 2015; Teele and Thelen 2017). However, more frequent collaboration with new colleagues is particularly pernicious.

Increasing inclusion by collaborating more frequently with new colleagues is detrimental to publication productivity; it also appears to correlate negatively with the quality of the journals. Those authors who publish in the high-impact, general political science journals include, on average, fewer new coauthors. The lowest rate applies to the political science flagship journals. As a result, women who tend to be more inclusive of new coauthors in their collaborations are subject to a gender gap in quantity and quality of publications, and they may be penalized on the job market for reappointment, tenure reviews, and even when applying for grants.

RESEARCH DESIGN

The Teaching, Research, and International Policy (TRIP) Journal Article Database (2020) tracked IR publications that

appeared between 1980 and 2018 in key journals in political science (Maliniak, Peterson, Powers, and Tierney 2018, 2020). The journals include *American Political Science Review (APSR)*, *American Journal of Political Science (AJPS)*, *British Journal of Political Science (BJPS)*, *European Journal of International Relations (EJIR)*, *International Organization (IO)*, *International Security (IS)*, *International Studies Quarterly (ISQ)*, *Journal of Conflict Resolution (JCR)*, *Journal of Peace Research (JPR)*, *Journal of Politics (JOP)*, *Security Studies (SS)*, and *World Politics (WP)*.

Collaboration is conceptualized in two ways. An important existing measure is the size of the collaborative network. Teele and Thelen (2017) evaluated the average number of authors, per article, by journal. To extend this work, the present study captures the average size of collaborative networks that an author has. Namely, the mean number of coauthors was computed across all of an author's publications. This average is an important measure of an author's overall collaboration but does not help us to track inclusion.

A new way to conceptualize collaboration is through an inclusion index. The ratio of new collaborators to an author's total collaborations was computed. Collaborative practices reveal substantial variability in allowing access to new entrants into the field. At the author level, this means—at one extreme—publishing only with new collaborators. That is, every publication would have a new set of coauthors who previously have not published together. Alternatively—at the other extreme—envision a collaboration that builds on the same set of relationships with the same group of collaborators repeatedly publishing together. In most cases, collaborative practices fall somewhere between the two extremes, including both new coauthors and those who have previously published together. Where on that continuum that authors tend to fall captures the extent to which new entrants can gain access to existing publishing networks and/or the level to which existing publishing networks can cross-pollinate.

The inclusion index was computed by assessing the number of new collaborators that authors have across their publications as a ratio of their total number of collaborations.

A “collaboration” is defined as a dyad of coauthors. For example, if an author has two publications with three coauthors each, and each of the coauthors is a unique collaborator, this means that the author has published with six different individuals and has had six collaborations. That is, this is a ratio of 1, or the highest possible score for the inclusion of new coauthors in the author’s network. Conversely, if the author has two publications with three coauthors each but the set of coauthors on the second publication is the same as on the first, this means that the author has published with three different individuals and has had six collaborations. This is a ratio of 0.5 for the inclusion of new coauthors in the author’s network. The lower the score, the fewer new coauthors have published with the author.

An author can have a relatively vast collaborative network, having published with many coauthors, even when that network is not very inclusive. This broad but unvaried network means that a large set of the same coauthors continues to publish together. Likewise, an author can have a relatively narrow network of collaborators that includes mostly unique collaborations.

Therefore, an author can score highly on the first measure (i.e., collaboration or the average number of coauthors) and not on the second (i.e., inclusion) and vice versa. Inclusive authors can have a relatively small network and exclusive authors can have a relatively broad set of collaborators with whom they publish repeatedly.

Using a logistic regression model and a negative binomial of over-dispersed count data, these two measures were assessed to determine how they affect the quality and quantity of publications and gender diversity. The appropriate

authors per article. This study supports this finding: female scholars in IR have slightly wider collaborative networks (i.e., number of authors per article; mean=2.43) than male authors (mean=2.32) and the difference is statistically significant (Welch t-test, p-value=0.001). However, there also is a gender difference in how inclusive the collaborations are. This measure of collaboration, which is called the inclusion index, was not assessed previously.

Female authors tend to collaborate with more new coauthors (i.e., collaboration with new coauthors versus total collaborations; mean rate=0.95) than male authors (mean rate=0.92), which also is statistically significant (Welch t-test, p-value <0.001). Only those authors who collaborate were considered in this analysis to account for the field’s move away from solo publications. However, the results are even starker when solo publications are included (i.e., collaborations with new coauthors versus total collaborations; male=0.59, female=0.65; Welch t-test, p-value <0.001; number of authors per article; male mean=1.85, female mean=1.99; Welch t-test, p-value <0.001). Similarly, an alternative explanation for the gender differences may be that women coauthors became more common as more collaborative practices took hold in the field. The data support this hypothesis only weakly. Since 2000, female collaborative networks have not been significantly broader than male networks; however, female authors’ proclivity to work with more new coauthors has remained significantly higher (Welch t-test, p-value=0.005).

In summary, there is a gender gap in inclusion. Women tend to not only be more collaborative but also more inclusive

Women tend to not only be more collaborative but also more inclusive authors, publishing with more new coauthors.

statistical model identifies the number of articles that an author publishes as a count. Despite over-dispersion, dispersion zero-truncated models can fit poorly because there are no zeroes. There is no record for authors who do not publish. To meet the model requirements, a model of over-dispersed count data was estimated by conceptualizing those authors publishing only one article as having zero subsequent publications (Rodriguez 2020). The negative binomial model of over-dispersed count data fits best; however, there was no substantive difference in results across different models. The analysis included 3,887 cases. To focus on comparing collaborative practices, solo publications were not extensively examined. Unless stated otherwise, only those authors who collaborated were evaluated and the analysis was limited to those whose gender was coded in the dataset. The analysis was conducted using R-4.0.2 (R Core Team 2013).

WOMEN ARE MORE COLLABORATIVE AND INCLUSIVE AUTHORS

Teele and Thelen (2017) found that female authors are generally more collaborative in terms of the average number of

authors, publishing with more new coauthors. During the past 20 years, male authors have collaborated more, but they have done so by repeatedly publishing with the same set of coauthors, including fewer new collaborators in their networks than women authors. Conversely, women authors have collaborated by continuing to include new collaborators in their network. The gender gap in the inclusion of new collaborators profoundly impacts factors such as publishing success and diversity.

MORE INCLUSIVE AUTHORS ARE LESS LIKELY TO PUBLISH

Inclusion negatively affects publishing success, as does collaboration more generally (table 1). As measured by the author’s average number of coauthors per publication, smaller networks publish more on average than authors who have more collaborators. However, the effect is less pronounced than the effect of a tight network—namely, authors who repeatedly publish with the same coauthors have more articles than those who do not. More inclusive authors who publish with more new coauthors are much

Table 1

Number of Publications (Negative Binomial Model of Over-Dispersed Count Data)

	Estimate	CI (lower)	CI (upper)	Std. Error	t Value	Pr(> t)
(Intercept)	46.36	35.96	56.80	5.14	9.03	<0.001***
Year of First Publication	-0.02	-0.03	-0.01	0.00	-7.75	<0.001***
Inclusion	-4.56	-4.92	-4.21	0.14	-31.45	<0.001***
Author: Female	-0.30	-0.44	-0.16	0.07	-4.11	<0.001***
Collaboration	-0.89	-0.98	-0.80	0.05	-17.73	<0.001***

less likely to publish. In summary, one key to publishing in IR is to do so repeatedly with the same small group of coauthors.

Other factors that negatively affect publishing success are the female gender and the year of first publication. In terms of the latter, those authors who had their first publication more recently have had less time to publish more articles. In terms of the former, female authors have

likely to have a female coauthor, which suggests a positive trend for the field overall. The likelihood of a female coauthor also is greater for authors who have more collaborators. Collaboration writ large leads to more female researchers in the field.

However, the largest statistical effect on the likelihood of having a female coauthor is from the inclusion of new coauthors. Those authors whose networks tend to have more unique collaborations are more likely to include female col-

More inclusive authors who publish with more new coauthors are much less likely to publish.

fewer publications than male authors, which is consistent with findings of the gender gap in publications (Maliniak, Powers, and Walter 2013).

Inclusion also appears to correlate negatively with the quality of the journal (table 2). On average, those authors who publish in the high-impact, general political science journals have lower rates of inclusion of new coauthors. The lowest rate applies to the political science flagship journal (APSR), followed by AJPS and JOP, with other journals to follow.

INCLUSIVE AUTHORS ARE MORE LIKELY TO HAVE WOMEN COAUTHORS, INCREASING GENDER DIVERSITY AMONG SCHOLARS

Table 3 presents the results of logistic regression assessing the likelihood of an author having a female coauthor. The likelihood increases when the author is female. Moreover, it increases as the number of articles that the author has published increases. More published female authors are even more likely to work with female coauthors. Furthermore, those authors who have had their first publication more recently also are more

laborators. Concomitantly, those authors who tend to publish with the same collaborators across publications are significantly less likely to include female coauthors. Collaboration among coauthors may lead to more gender diversity—especially if collaboration includes new entrants to a network. The significance of this effect is that it suggests that a willingness to work with new collaborators can affect gender equity in the field. Inclusive authors who publish with more new coauthors are much more likely to have women coauthors, growing gender diversity in the field. As discussed previously, women tend to outperform men in embracing collaborations with new coauthors, which suggests that the gender gap in inclusion affects the field’s diversity.

DISCUSSION AND CONCLUSION

The results of this study demonstrate that there is an inclusion gap among male authors. This study defines the gender gap in inclusion as collaborating with fewer new coauthors. Whereas male authors are significantly less likely to publish with new collaborators, female authors are significantly more likely to publish with them rather than rely on the same set of coauthors across their publications.

The impact of this inclusion gap is felt in the IR field in terms of diversity because less-inclusive authors have less-diverse coauthors. Based on these findings, female authors not only include more female coauthors in their collaborations but more inclusive authors (who tend to be female) also have more female collaborators and vice versa. In summary, whereas research indicates a gender gap showing greater publishing success among men (Maliniak, Powers, and Walter 2013), the

Table 2

Inclusion: Mean Rate of New to Total

Collaborations	APSR	AJPS	JOP	All Other
Journal	0.776	0.812	0.829	0.832

Table 3
Likelihood of Female Coauthor (Logistic Regression)

	Estimate	CI (lower)	CI (upper)	Std. Error	z Value	Pr(> z)
(Intercept)	-67.25	0.00	0.00	6.98	-9.64	<0.001 ***
Year of First Publication	0.03	1.03	1.04	0.00	9.03	<0.001 ***
Inclusion	1.38	2.34	6.82	0.27	5.05	<0.001 ***
Number of Articles	0.29	1.29	1.39	0.02	15.57	<0.001 ***
Author: Female	0.24	1.05	1.53	0.10	2.48	0.01 *
Collaboration	0.75	1.93	2.33	0.05	15.56	<0.001 ***
No. Articles * Author: Female	0.21	1.12	1.38	0.05	4.01	<0.001 ***

inclusion gender gap indicates that women are more successful in expanding diversity in the field.

Collaboration with and inclusion of new coauthors in research partnerships are positive not only for gender diversity in the field. Many wide-ranging studies also share a positive underlying view of collaboration (Butler, Butler, and Rich 2008; Frasure-Yokley et al. 2020; Herrick, Mat-

The measure introduced in this article assessing a researcher's proclivity toward new collaborations may be used beneficially as an index of inclusion. This inclusion index is an easy-to-compute measure that can serve as a marker of academic success, similar to the way that indexes of scholarly productivity currently are used across the disciplines. Moreover, through its transparency, the inclusion index encourages

Inclusive authors who publish with more new coauthors are much more likely to have women coauthors, growing gender diversity in the field.

tias, and Nielson 2015; McDermott 2010; McDermott and Hatemi 2010; Sigelman 2009; Wildavsky 1986). Collaboration has been widely discussed as necessary for the internationalization of scholarship (Appleton and Mazur 2006; Bleck, Dendere, and Sangaré 2018; Mazur 2005; Sinmazdemir 2019). However, collaboration is connected to questions of recognition (Biggs 2008). Learning how to collaborate must be a more critical part of graduate training (King, Kuriwaki, and Park 2020). Moreover, this training must consider the benefits as well as the drawbacks for publication success.

In addition, future studies should examine whether those authors who collaborate more inclusively with new coauthors also are more likely to have greater racial and ethnic diversity in their collaborative networks. This study evaluated the impact of inclusion on only one dimension of diversity. However, this measure of inclusion—assessing new collaborations—is general. It offers a way for future research to explore how inclusion can impact diversity in other ways. To make inclusion a higher priority, we must make the nature of collaborative practices among academics more visible.

Although several indexes (including Google Scholar H-Index) track scholarly productivity, similar indexes tracking inclusion are still missing. An author who has new collaborations, mentors others, and supports newcomers in their research area significantly impacts the field. As this research shows, such an author also is significantly more likely to have diverse collaborators, thereby contributing positively to diversity in the field. For this reason, an index of inclusion is a needed tool in academia.

less exclusive and more diverse collaborative practices in future research by providing researchers a way to build, track, and compare their collaboration.

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CONFLICTS OF INTEREST

The author declares that there are no ethical issues or conflicts of interest in this research. ■

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