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Matilda Effect in the Hispanic American Communication co-authorship network

El Efecto Matilda en la red de coautorías Hispanoamericana en Comunicación

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Abstract

Literature has noted that female researchers encounter a 'Matilda effect' that tends to undervalue and marginalize their contributions and role in their scientific communities. This paper tests whether any such effect is present in the Hispanic American communication research community through a social network analysis of the community's co-authorship network. The results show that, although three of the five most central positions in the network are occupied by women, significant differences in general terms move female researchers to more peripheral positions. Similarly, it has been detected that the research groups formed by the different clusters or communities detected in the network tend to be organized around a male researcher. This confirms the existence of a 'Matilda effect' that is also detrimental to the centrality of women in the social network of the Communication scientific communication. The article's conclusions can only be extrapolated to intellectual (Communication) and geographical (Spain and Latin America) parameters, so that future studies will be necessary to detect such an effect in other contexts.

Keywords

Co-authorship; Matilda Effect; Gender; Latin America; Social Network Analysis; Spain.

Resumen

Investigaciones recientes con perspectiva de género han confirmado la pervivencia del "Efecto Matilda" en la ciencia, haciendo que las aportaciones y el papel de las mujeres sigan quedando relegados dentro de sus comunidades científicas. En este contexto, la propuesta que ocupa estas páginas se centra en comprobar si el fenómeno también se produce en la comunidad hispanoamericana de investigación en Comunicación, realizando para ello un análisis sociométrico sobre la red de coautorías. Los resultados señalan que pese a que tres de los cinco puestos más centrales de la red están ocupados por féminas, en términos generales se registran diferencias significativas que desplazan a las investigadoras a posiciones más periféricas. Del mismo modo, se ha detectado que las comunidades de investigación formadas por las distintas comunidades tienden a estar organizadas en torno a varones, confirmando así la presencia del Matilda effect en la red social de la disciplina de Comunicación. Cabe señalar que estas conclusiones se extrapolan a unos parámetros intelectuales (Comunicación) y geográficos (España y Latinoamérica) concretos, por lo que la puerta a estudios en otros ámbitos queda abierta.

Palabras clave

Análisis de redes; Coautoría; Efecto Matilda; España; Género; Latinoamérica.

1. Introduction

Given that women's scientific contributions have traditionally received less visibility and recognition than those of their male colleagues, there is a need to implement new approaches and reflections. Significant breakthroughs made by women in the past were usually attributed to men, a phenomenon first described by the activist Matilda Joslyn Gage and known today as the "Matilda effect" (Rossiter, 1993; Stamhuis, 1995; Benschop and Brouns, 2003; Lincoln, Pincus, Koster and Leboy, 2012; Kretschmer, Kundra, Beaver and Kretschmer, 2012; Knobloch-Westerwick, Glynn and Hugu, 2013). Indeed, the scientific community's acknowledgement that the "glass ceiling" in science remains as strong as ever (Bain and Cummings, 2000; Guil, 2008; Gallego-Morón and Matus-López, 2020) and that, as such, it must be shattered, has given rise to a profusion of papers on the subject since the 1990s.

Gallego Morón and Matus-López (2020: 105) argue in one of their latest collaborations that, "in contrast to the proliferation of research on the causes of vertical segregation in the university, there has been less empirical research on the positive conditioning factors in women's trajectories". Without detracting from this claim, ever since the historian of science Margaret Rossiter coined the term "Matilda effect" in 1993, the marginalization of women has been studied in disciplines as diverse as technology, engineering, the arts, and medicine. However, in light of the scarce research on this effect in the Social Sciences and Communication, this paper reviews the state of the question in the latter. Accordingly, it is worth highlighting the experiment that Knobloch-Westerwick, Glynn, and Hugu conducted in 2013, where they noted a certain tendency to associate publications by male authors with higher scientific quality, while at the same time a greater interest in collaboration with men.

The literature review undertaken in this study shows that the tendency to overlook the achievements of female academics and scientists is decreasing, although the practice to minimize the citation of works and papers signed by female authors persists (Davenport and Snyder, 1995; Ferber and Brun, 2011; Maliniak, Powers and Walter, 2013; Dion, Sumner, and Mitchell, 2018; Dion, Sumner, and Mitchell, 2018); Ferber and Brun, 2011; Maliniak, Powers, and Walter, 2013; Dion, Sumner, and Mitchell, 2018), leading to a lower incentive to conduct research (Aksnes, Piro, and Rorstad, 2019; Huang, Gates, Sinatra, and Barabási, 2020). Similarly, a paper by Lincoln et al. (2012) indicates that although women have been acknowledged with awards and distinctions in recent decades, men continue to take the lion's share of grants and scholarships (Bornmann, Mutz, and Hans-Dieter, 2007; Sato, Gyax, Randall and Mast, 2020), not to mention a many more of the most prestigious awards.

Often, this gender gap is due to perception bias and/or discrimination (Jones, Fanson, Lanfear, Symonds, & Higgie, 2014), as women not only conduct less valued research (Davenport & Snyder, 1995; Wenneras & Wold, 1997; Bornmann & Daniel, 2005; Knobloch-Westerwick and Glynn, 2013; Zhang and Li, 2020), they have fewer opportunities to be keynote speakers (Carter, Croft, Lukas, and Sandstrom, 2018) and are gauged as less competent and less worthy of a high starting salary (Moss-Racusin, Dovidio, Brescoll, Graham, and Handelsman, 2012). Indeed, Zhang and Li (2020) find that references to specific contributions increase when the author's name evokes the "neutral" gender (Fryer and Levitt, 2004; Sumner, 2018), for the same reason that in the publishing industry, female writers choose "gender-neutral names" as pseudonyms to increase their book sales (Finn, 2016).

Even more controversial, and far from the trend of incorporating a greater gender perspective into science in addressing the lack of opportunities (Alonso, Diz, and Lois, 2016), a certain sector of academia holds that the differences between male and female researchers could be influenced by behavioral factors innate to gender differences (Udry, 1994), which theoretically explain why female researchers tend to publish less (Symonds, Gemmell, Braisher, Gorringer and Elgar, 2006; Conley and Stadmark, 2012; Larivière, Ni, Grasras, Cricket and Sugimoto, 2013); Conley and Stadmark, 2012; Larivière, Ni, Gingras, Cronin, & Sugimoto, 2013), use more tentative language characteristic of female rhetorical style (Leaper and Robnett, 2011; Quevedo-Redondo, 2021), and persist less when negotiating their salary (Tinsley, Cheldelin, Schneider, & Amanatullah, 2009). Despite the controversy of this biologist approach, it has not prevented the spread of beliefs such as those of the president of Harvard University between 2001 and 2006, Lawrence Summers, who, in 2005, linked women's inability to rise through the ranks of academia to their general lack of natural aptitude for science.

In contrast to Summer's premise, recent analyses suggest that gender diversity may benefit teamwork, as groups including female researchers are more creative and produce higher quality outcomes. Further, gender variety reinforces objectivity for processing information and reducing unconscious biases (Vásárhelyi, 2020) that, in some instances, lead to self-imposed standards of excellence, since female authors seem more reluctant to accept open review practices (Segado-Boj, Martín-Quevedo, & Prieto-Gutiérrez, 2018).

This research does not seek to elucidate whether the gender of the researcher shapes scholarly collaboration; instead, it addresses how women's status and reputation are undervalued due to the perpetuation of stereotypes that should be eradicated. Thus, this particular research follows the line defended by that group of authors for whom there is a direct impact of gender bias in the perpetuation of the Matilda effect, that is, the systematic under-recognition and denial of women's contributions to Engineering, Technology, Mathematics and, particularly, Communication Sciences.

Within this theoretical framework, it is also relevant to incorporate the concept contributed in 1996 by UNESCO known as the "leaky pipeline," since it constitutes the perfect metaphor to "illustrate the disproportionate flow of women who leave the professional system in the field of science" (Castaño, 2010: 256), in comparison to the bulk of men who survive each rung on the academic ladder or

equivalent (Pell, 1996; Blickenstaff, 2005).

Although the underlying reasons for the existence of the Matilda effect and the leaky pipeline are diverse, complex, and difficult to resolve (Jones et al., 2014), this paper delves into the former phenomenon with a methodology focused on identifying gender discrepancies. This analysis is often based on easy-to-obtain metrics, such as the number of publications, citations, or grants received. However, as Faulkner (2009) indicates, what is fundamental is to discern the level of "visibility" achieved by female researchers in their discipline, explore the processes of resistance and marginalization, and, ultimately, propose strategies to promote greater inclusion and success of female academics and scientists in the Communication field.

1.2 The co-authorship network as a reflection of the social structure of a discipline

This paper analyzes the social structure reflected in the Spanish and Latin American co-authorship network to identify the marginalization of female researchers in Communication studies. Network analysis is understood as a way to measure the "visibility" or "reputation" of women within an area. Not surprisingly, works focused on other disciplines and geographical contexts have used similar approaches to demonstrate that women in areas such as Accounting tend to occupy the more peripheral places (Dias et al., 2019), while in the case of Urban studies, they tend to have fewer opportunities to direct doctoral theses (Walker and Boamah, 2019). However, in areas such as Knowledge Organization Systems (Karimi, Mayr and Momeni, 2019) or Industrial and Organizational Psychology (Fell and König, 2016), no significant differences have been found in centrality according to gender. In other words, the lack of conclusive results urges further research.

The study of "co-authorships," the practice of collaborating in research that results in papers co-authored by two or more authors (Díaz-Campo and Segado-Boj, 2017), provides the ideal scenario to test the perpetuation of the Matilda effect and to verify whether collaborations are a reflection of existing relationships within any discipline (Otte and Rousseau, 2002). Furthermore, such synergies can be visualized and analyzed as a framework for investigating the social structure of a subject, and this, in turn, not only determines its cognitive level and influences the production of knowledge (Bordons, Aparicio, González-Albo and Díaz-Faes, 2015), but also makes it possible to identify the most authoritative and relevant authors in each field (Kumar, 2015).

In short, network analysis allows us to identify the most eminent researchers in a field since highly regarded academics typically attract more collaborators and co-authors (Leifeld, Wankmüller, Berger, Ingold, & Steiner, 2017). Thus, within the network, the "star" scholars of a subject monopolize the central places and raise their "status" (Coate and Howson, 2014), while those yielding less influence are relegated to the periphery, where women tend to be more often located. However, centrality is not the only index of academic prestige, and other scales such as productivity or citations could be included.

2. Objectives

The persistence of the Matilda effect in many fields of research has led us to ascertain the extent to which this phenomenon manifests itself in the co-authorship network of Communication studies by comparing the production of women with that of their male colleagues. The aim is to identify how gender differences can mark differences in prestige among researchers with similar interests or, in other words, to discover whether the Matilda effect impacts the centrality of women within the co-authorship network in the Latin American community.

Previous studies have pointed out that collaboration among authors is a growing trend both in Latin American Social Sciences (Aguado-López, Becerril-García, & Godínez-Larios, 2018) and in the Spanish case of Communication (Martínez-Nicolás, 2020). However, despite the number of papers analyzing the social structure of co-authorship in the Spanish setting (Fernández-Quijada & Masip, 2013; Fernández-Quijada, Masip & Bergillos, 2013) and in the Latin American (Segado-Boj, Prieto-Gutiérrez & Díaz-Campo, 2021), no work appears to have drawn a comparison between the two.

Having verified that the proliferation of research on the Matilda effect and the leaky pipeline in the scientific area has hardly been extended to the Hispanic-American field, the present paper aims to fill the gap in the literature by testing the two hypotheses that guide the development of this work:

- 1) Women are placed in the more peripheral positions in the general network of Hispanic American co-authorships in Communication, while men are located in the central nodes.
- 2) The communities created within the general co-authorship network are organized around men.

Hypothesis 1 is proposed from a macro perspective, from a broad point of view that takes in the entire research community in Communication created by scholars affiliated with Spanish and Latin

American institutions. Hypothesis 2 is defined from a meso perspective; that is, it analyzes the places these researchers occupy within the various stable communities of collaboration in the period under study. Thus, a researcher may occupy a secondary or peripheral position in the general co-authorship network, yet a central position within the research community in which he or she habitually collaborates.

Because the underlying reasons for the existence of the Matilda effect and the leaky pipeline are diverse and largely difficult to resolve (Jones et al., 2014), the authors addressed them with the precise methodology outlined below.

3. Methodology

This work applied network analysis to the Spanish-American co-authorship community of Communication studies, with a sample comprising 2,343 papers published in JCR journals between 2015 and 2019. The data were retrieved from the Incites service. The search criteria included documents assigned to the knowledge area "Communication" in Web of Science and written by at least one author affiliated with a Spanish or Latin American institution. In this regard, it should be noted that InCites allows institutions to be identified by specific countries and geographic areas, hence our use of the Latin American categorization available in the bibliographic service. Thus, it was found that the average number of authors per document was 1.59, and that of the 2,343 papers retrieved, 643 had some international collaboration (Annex I shows the frequency of appearance of the authors' national affiliations).

Document retrieval was restricted to the period 2015-2019 for two reasons. First, this strategy provides more recent information on the phenomenon under study. Second, the practice of co-authorship in this period was already widespread both in Communication in Spain (Martínez-Nicolás, 2020) and in the Social Sciences in Latin America (Aguado-López, Becerril-García, & Godínez-Larios, 2018).

The downloaded bibliographic information was converted to network data using VosViewer (Van Eck, Waltman, 2010). In addition, the data were manually preprocessed by one of the authors to normalize variants in the names of the same author under a unique identifier. For example, Rosa Berganza could appear in the database as "Berganza, Rosa", "Conde, MR", "Berganza Conde, María" or "Rosa Berganza-Conde, María".

The growing trend in International co-authorship in both Spain and Latin America (Segado-Boj, Prieto-Gutiérrez, Díaz-Campo, 2021) has led to the inclusion of researchers in the network from those countries, mainly from Europe and the United States, with which the former collaborate.

The individual degree centrality of all the network nodes was obtained using Pajek software (Batagelj and Mrvar, 1998), recommended for visualizing large networks with thousands or millions of vertices. In this regard, it should be emphasized that such centrality degree measures the connections that a given node maintains with other vertices (Freeman, 1978), while the scenario formed by co-authorship networks reveals the frequency with which a researcher collaborates -or has collaborated- with other authors (Collazo, Luna and Vélez, 2010; Ávila-Toscano, Vargas-Delgado and Oquendo-González, 2020).

We first calculated individual centrality degree indicators, after which we confirmed that the relationships in the network are usually concentrated in a more or less limited set of researchers before identifying the gender of each scholar. For the sake of simplicity, the only distinction was made between binary genders (male and female) since the frequently termed "first name" is regulated by "severe social and cultural norms" "in subjection to a heteronormative identity regime that obligatorily links sex with gender" (Vacarezza, 2018: 14). Consequently, the categorization was carried out manually, taking into account the name of the authors of each paper and resolving the cases that involved doubt by searching for more information about the author.

Given that the degree centrality values do not correspond to a normal distribution within the sample ($p < 0.001$ according to the Shapiro-Wilk test), a nonparametric test (Wilcoxon-Mann Whitney) was applied to look for significant differences between the two categories. This statistical test shows significant differences in the presence of a quantitative value - in this case, degree centrality - between two sets within a sample, here, male or female. When the result of the p-value was equal to or below 0.05, the hypothesis that there is a significant difference in the centrality of subjects belonging to both groups was verified.

Besides the statistical tools described above, a simplified graphical representation of the network was also made to visualize the different positions occupied by the researchers. This visualization was developed using the Kamada-Kawai (1989) algorithm, which organizes the nodes according to their centrality.

Within extensive co-authorship networks, there are smaller research communities whose members

collaborate with each other more frequently than with other nodes (Newman, 2001). Network analysis makes it possible to detect and identify these communities through various *clustering* algorithms (Porter, Onnela, and Mucha, 2009). These clusters show groups of authors who have formed stable and regular collaboration networks in the period analyzed, without expressly belonging to the same constituted research group or formally collaborating on a research grant. In this context, our proposal elucidated whether female researchers had the same possibilities as their counterparts to occupy central places in their communities. This analysis thus was conducted both at the macro level (the entire network of researchers) and at the meso level (the stable and frequent communities of collaboration between smaller groups of authors).

VosViewer software (Van Eck, Waltman, 2010) was used to achieve the last objective since it is one of the most intuitive tools for visualizing bibliometric networks and locating clusters, i.e., sets of researchers that frequently collaborate showing the existence of formal or informal research communities. Thus, the VoSViewer algorithm allowed us to identify the academics with greater centrality within each cluster, quantifying the connections between the different nodes.

It should be noted that this study only considered clusters comprising at least five interconnected elements. Following a relevance criterion, we only analyzed those clusters with a minimum number of nodes (researchers) to avoid particular or excessively personal aspects of smaller communities that might distort the results. The authors placed in the central positions were identified in terms of the number of co-authorships (number of researchers with whom the subject collaborated, rather than total frequency of collaboration). Likewise, in cases where nodes had identical centrality, all were placed at the center of the cluster, resulting in 36 out of 113 clusters having more than one central node.

Finally, when dealing with two categorical variables (the researcher's gender and the leadership of a research community), the chi-square test was applied to determine whether the two were related. A p- equal to or less than 0.05 implied a relationship between the variables considered. In other words, this result suggested that at least one of the relationships between two of the categories yielded a lower or higher distribution than would be expected from a theoretical projection of the distribution of frequencies.

All statistical tests were performed using the R programming language.

4. Results

The study sample comprised 2,601 individual authors, where 1,298 (49.9%) had a first name linked to the female gender and 1,303 (50.1%) to the male gender. The average centrality degree was 0.003 (standard deviation = 1.732), and the median in this sense was 2. The results are shown below in a disaggregated manner, considering both the centrality according to gender and the differences in the research community leader.

Differences in centrality according to gender

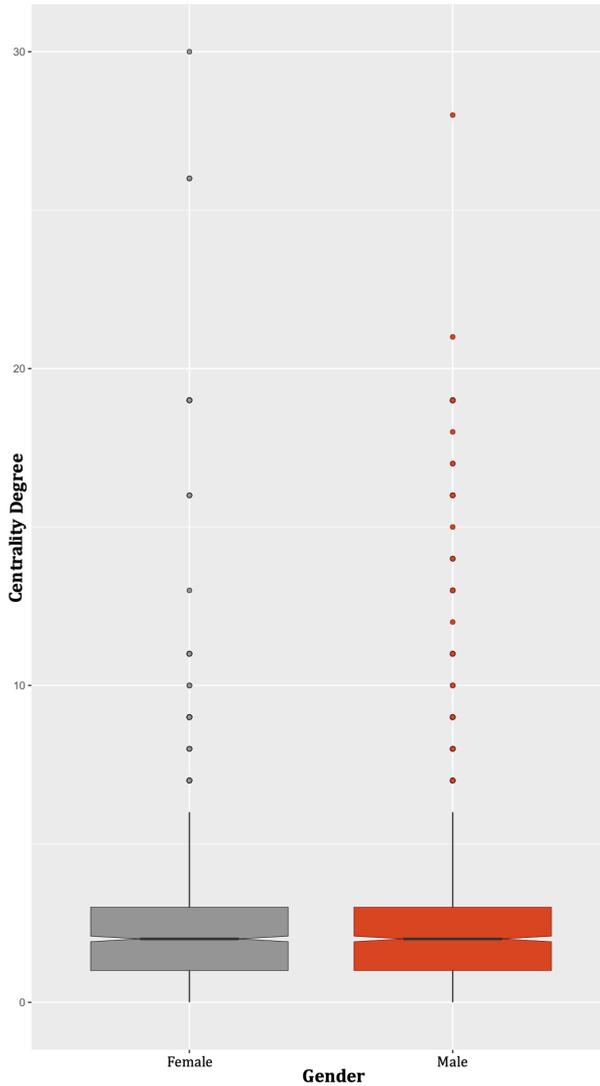
As shown in Table 1, when disaggregated by gender, our results show a greater degree centrality in the case of men, both in the average and in the median.

Table 1. Grade centrality according to authors' gender

	Researchers	
	Female	Male
Average	0,003	0,004
Median	2	5

Likewise, the Wilcoxon-Mann Whitney test was significant (p=.019) when comparing degree centrality according to the gender of each researcher. Although most male and female authors had similar levels, Figure 1 shows more male academics in the leading positions.

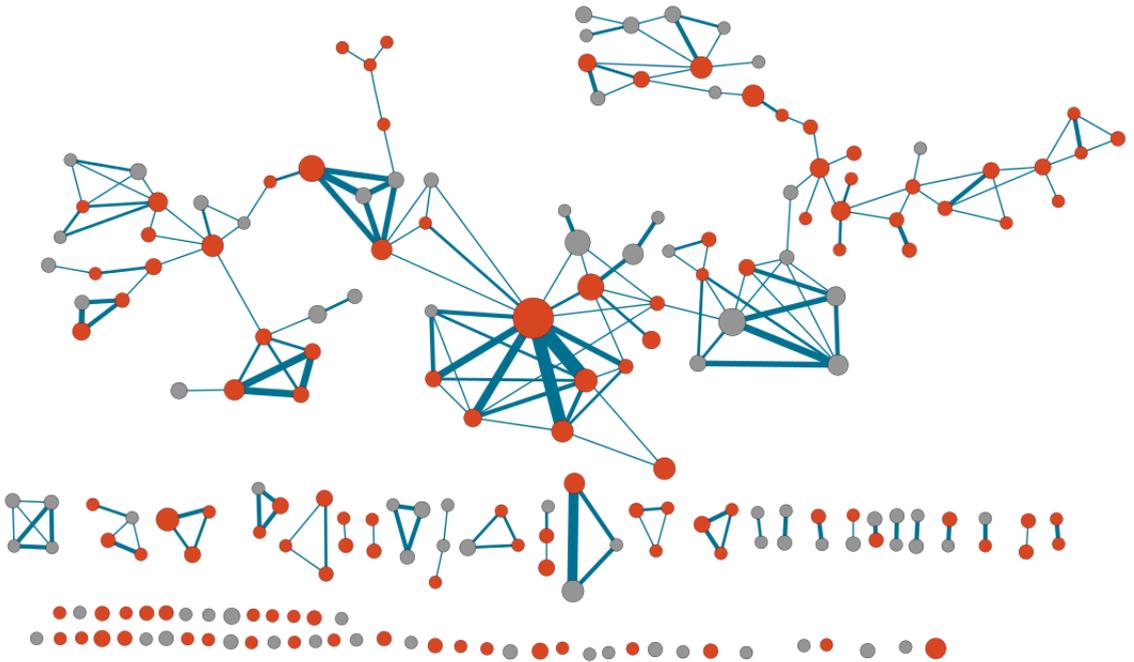
Figure 1. Degree centrality according to gender



Source: Authors

Figure 1 shows that, although most researchers share the same centrality degree, in the smallest cases regardless of gender, the situation changes with those with a centrality higher than 6. Moreover, this trend is repeated in Figure 2, which shows a visual representation of the network that includes only those authors who have published at least three papers in the period analyzed (again, mostly men).

Figure 2. Visualization of the co-authorship network



Source: Authors

The red nodes represent male scholars, while the gray ones correspond to female scholars. As indicated in the methodology, the visualization places authors with a higher centrality degree, i.e., those who collaborate most with other authors, at the core of the graph. Thus, the size of the nodes is proportional to the number of papers published by each author, and the connections between nodes imply that two authors have collaborated at least once. Similarly, the thickness of these links is directly proportional to the frequency with which two researchers (represented by the corresponding node) have co-authored a paper. That is, the thicker the nexus, the higher the number of papers in which these authors have collaborated.

The results indicate that, although a relatively varied and large group of researchers is indeed located in the center of the network, the central positions are occupied by men to the detriment of women. Thus, female researchers are again relegated to the more peripheral or even disconnected positions in the network. When they appear in the more central places, they do so less often, in an isolated or disconnected way. In other words, the collaboration structure of their male counterparts is characterized by a greater cohesion and connection that, in the end, favors collaborations or co-authorships.

The displacement of female researchers to the periphery of the network can also be seen in Table 2. Even though female researchers such as Claudia Mellado, Adriana Amado, or Mireya Márquez-Ramírez appear in the most central positions, more than half belong to the 30 top central authors in the Spanish-American co-authorship network in Communication are male (the full ranking of the centrality degree is available at: [10.6084/m9.figshare.14540607](https://doi.org/10.6084/m9.figshare.14540607)).

Table 2. Authors with a centrality degree equal to or greater than 19.

Surname	Name	Gender	University	Country	Grade Centrality
Mellado	Claudia	Female	Catholic University of Valparaíso	Chile	
Gil de Zúñiga	Homero	Male	Vienna U. / Diego Portales U.	Austria / Chile	28
Amado	Adriana	Female	National University of La Matanza	Argentina	
Marquez-Ramirez	Mireya	Female	.Iberoamericana U.	Mexico	
Valenzuela	Sebastian	Male	Catholic Pon. U. Chile	Chile	
Aboitiz	Francisco	Male	Catholic U. of Chile	Chile	
Arbib	Michael A.	Male	Southern California U.	USA	
Burkart	Judith M.	Female	Zurich U.	Switzerland	
Corballis	Michael	Male	U. of Auckland	New Zealand	
Coude	Gino	Male	Parma U.	Italy	
Hecht	Erin	Female	Harvard U.	USA	
Humanes-Humanes	Maria-Luisa	Female	Rey Juan Carlos U.	Spain	
Lieba	Katja	Female	Leipzig U.	Germany	
Myowa-Yamakoshi	Masako	Female	U. of Shiga Prefecture	Japan	
Pustejovsky	James	Male	Brandeis U.	USA	
Putt	Shelby	Female	Illinois State U.	USA	
Rossano	Federico	Male	U. California	USA	
Russon	Anne E.	Female	York U.	USA	
Schoenemann	P. Thomas	Male	Indiana U.	USA.	
Seifert	Uwe	Male	Dresden U.	Germany	
Semendeferi	Katerina	Female	U. California	USA	
Sinha	Chris	Male	Hunan U.	China	
Sparks	Colin	Male	U. Westminster	United Kingdom	
Stepinska	Agnieszka	Female	U. Poznan	Poland	
Stout	Dietrich	Male	Emory U.	USA	
Tandoc	Edson	Male	Nanyang Tech. U.	Singapore	
Volterra	Virginia	Female	Inst. of Cognitive Sciences and Technologies	Italy	
Waciewicz	Slawomir	Male	Nicolaus Copernicus U.	Poland	
Wang	Haiyan	Female	Anhui U.	China	
Wilson	Benjamin	Male	Newcastle, U.	United Kingdom	

Source: Authors

With these elucidations, it was then of interest to know whether these differences also extend to a

leader of a research field since higher standards are imposed on female researchers directing a project (Bornmann et al., 2007).

Differences in community leadership

The results of the Chi-square test suggested that the categories "gender" and "cluster center" are related to each other (DF=1, p=.028). Table 3 shows that the presence of male researchers as cluster center leaders exceeds the expected theoretical projection that would correspond to them if these two values were unrelated.

Table 3. Chi-Square test between leading researchers of a community and their gender.

			Female	Male	Total (rows)	Incremental Chi-square
Cluster Center	No	Frequency	460	449	909	,914
		Theoretical projection	445,588	463,412		
	Yes	Frequency			213	3,902
		Theoretical projection	104,412	108,588		
		Total (columns)	550	572	1122	4,816

Source: Authors

According to the statistical test applied, the resulting data pointed to the high probability that male researchers occupy the central position in their community and, by extension, lead their respective research communities. On the other hand, women continued to have fewer opportunities to head the projects in which they are involved, at least within the field of Communication studies.

5. Discussion and conclusions

The findings of this work support our claim that there is a Matilda effect in relation to the centrality of female authors in the Spanish and Latin American community of Communication researchers. Not surprisingly, by taking degree centrality as an indication of the prestige achieved by scholars, we can confirm there is an inequality in the status of women compared with that of their colleagues in the discipline. However, despite the preference for male specialists in collaboration and co-authorship, as in other academic fields, there are hopeful signs of greater equality in this specific context. After all, the presence of women in the most central positions in the network (see Table 2) shows that, of the five most prominent specialists in the Latin American field, three are women.

Michelle Dion, Jane Lawrence Sumner, and Sara McLaughlin Mitchel argue in their 2018 collaboration that women in the scientific environment receive more recognition as their disciplines and subfields become "more gender diverse" (Dion et al., 2018: 325). In the short to medium term, the authors assess that in fields such as Communication, the bleak situation shown in the graphs on centrality--apart from the elite positions-- could be corrected by empowering feminization in the field in question.

Forecasts aside, the current results show that women are experiencing a tendency to be significantly displaced to the periphery of their research communities and that collaboration is organized chiefly around men. Of course, the small group of women researchers that has managed to break through the glass ceiling are placed in more central positions of the networks, and - by extension - project their reputation within the discipline, but the situation is less promising for the bulk of female scholars, who appear far from prestigious positions.

The snapshot shown by the data interpreted here implies that a female researcher in Communication is more likely to encounter dynamics that displace her to peripheral positions in the network of co-authorships, either because of factors related to the perpetuation of stereotypes; for reasons that would explain the phenomenon of "leaky pipelines" to which scholars give dissimilar importance (Blickenstaff, 2005); due to the greater self-demanding nature of women quantitatively affects their production, or for other reasons that could be explored in future works through in-depth interviews or focus groups.

There is no doubt that the dynamics of inequality that were intuited when the two—verified—hypotheses guiding this proposal were put forward will eventually be broken: 1) Women occupy more peripheral places in the network of Latin American co-authorships in Communication, while men are located in the central points, and 2) The smaller communities created within the general network, in turn, revolve around men. Until the gender gap is ended, however, the need for further research is pressing.

To conclude, the results support the theory of marginalization of women highlighted in disciplines such as Urban Studies (Walker and Boamah, 2019), Accounting and Administration (Dias et al., 2019), or Literature (Haba-Osca, Osca-Lluch and González-Sala, 2019); however, they do answer the question of whether the data depend on the geographical character (Hispanic America) or, instead, on the intellectual character of the selected sample. That is to say, new comparative analyses would be desirable to observe whether the inequality is idiosyncratic to the area of Communication, compared to other spheres where there are fewer gender differences (e.g., Karimi, Mayr, and Momeni, 2019 or Fell and König, 2016).

It should also be noted that this work only examined the co-authorship relationships existing at a level of scientific production in Communication, namely, that of the papers published in JCR journals. Although this index is said to include the highest quality and reference results within the discipline, the fact is that scientific production in the field of interest is not limited to this database. In other words, it is possible to check whether the findings provided have been reproduced at other levels, such as in journals indexed in the Emerging Source Citation Index or Scopus.

Similarly, in our paper, neither the authors' order of signature nor the status of corresponding author was used as a variable. Nevertheless, such features influence the attribution of merit and responsibility in the published manuscripts (Díaz-Campo and Segado-Boj, 2017). Therefore, it remains to be seen whether female authors also occupy lower positions in the order of authorship and receive recognition as corresponding authors on fewer occasions than their male counterparts.

Likewise, the study of centrality in communities of authorship has been limited to those clusters composed of at least five nodes, so the option of exploring whether the dynamics indicated in this study have been reproduced in smaller groups or communities also remains open.

Another prospective question would lie in whether the lack of balance in the network responds to cultural, political, or structural reasons of the Latin American research space since it is worth asking whether the phenomenon occurs with identical characteristics in scenarios such as the Anglo-Saxon one. The questions to be addressed in future studies are: What does the greater inclusion and success of female academics and scientists in the field of Communication depend on, and what factors would halt the leaky pipeline that alludes to the loss of female talent?

Answering these questions and overcoming the Matilda effect will require raising awareness of the problem and "a gender-blind environment" for what constitutes the scientific core of the Social Sciences (Dion et al., 2018). An ambitious goal in which, by all accounts, efforts will have to be combined without distinction.

5.1. Coauthorship network as reflection of the social structure of the discipline

This paper analyzes the social structure reflected in the Spanish and Latin American co-authorship network to identify the marginalization of female researchers in Communication studies. Network analysis is understood as a way to measure the "visibility" or "reputation" of women within an area. Not surprisingly, works focused on other disciplines and geographical contexts have used similar approaches to demonstrate that women in areas such as Accounting tend to occupy the more peripheral places (Dias et al., 2019), while in the case of Urban studies, they tend to have fewer opportunities to direct doctoral theses (Walker and Boamah, 2019). However, in areas such as Knowledge Organization Systems (Karimi, Mayr and Momeni, 2019) or Industrial and Organizational Psychology (Fell and König, 2016), no significant differences have been found in centrality according to gender. In other words, the lack of conclusive results urges further research.

The study of "co-authorships," the practice of collaborating in research that results in papers co-authored by two or more authors (Díaz-Campo and Segado-Boj, 2017), provides the ideal scenario to test the perpetuation of the Matilda effect and to verify whether collaborations are a reflection of existing relationships within any discipline (Otte and Rousseau, 2002). Furthermore, such synergies can be visualized and analyzed as a framework for investigating the social structure of a subject, and this, in turn, not only determines its cognitive level and influences the production of knowledge (Bordons, Aparicio, González-Albo and Díaz-Faes, 2015), but also makes it possible to identify the most authoritative and relevant authors in each field (Kumar, 2015).

In short, network analysis allows us to identify the most eminent researchers in a field since highly regarded academics typically attract more collaborators and co-authors (Leifeld, Wankmüller, Berger, Ingold, & Steiner, 2017). Thus, within the network, the "star" scholars of a subject monopolize the central places and raise their "status" (Coate and Howson, 2014), while those yielding less influence are relegated to the periphery, where women tend to be more often located. However, centrality is not the only index of academic prestige, and other scales such as productivity or citations could be included.

6. Discussion and conclusions

The findings of this work support our claim that there is a Matilda effect in relation to the centrality of female authors in the Spanish and Latin American community of Communication researchers. Not surprisingly, by taking degree centrality as an indication of the prestige achieved by scholars, we can confirm there is an inequality in the status of women compared with that of their colleagues in the discipline. However, despite the preference for male specialists in collaboration and co-authorship, as in other academic fields, there are hopeful signs of greater equality in this specific context. After all, the presence of women in the most central positions in the network (see Table 2) shows that, of the five most prominent specialists in the Latin American field, three are women.

Michelle Dion, Jane Lawrence Sumner, and Sara McLaughlin Mitchel argue in their 2018 collaboration that women in the scientific environment receive more recognition as their disciplines and subfields become "more gender diverse" (Dion et al., 2018: 325). In the short to medium term, the authors assess that in fields such as Communication, the bleak situation shown in the graphs on centrality--apart from the elite positions-- could be corrected by empowering feminization in the field in question.

Forecasts aside, the current results show that women are experiencing a tendency to be significantly displaced to the periphery of their research communities and that collaboration is organized chiefly around men. Of course, the small group of women researchers that has managed to break through the glass ceiling are placed in more central positions of the networks, and - by extension - project their reputation within the discipline, but the situation is less promising for the bulk of female scholars, who appear far from prestigious positions.

The snapshot shown by the data interpreted here implies that a female researcher in Communication is more likely to encounter dynamics that displace her to peripheral positions in the network of co-authorships, either because of factors related to the perpetuation of stereotypes; for reasons that would explain the phenomenon of "leaky pipelines" to which scholars give dissimilar importance (Blickenstaff, 2005); due to the greater self-demanding nature of women quantitatively affects their production, or for other reasons that could be explored in future works through in-depth interviews or focus groups.

There is no doubt that the dynamics of inequality that were intuited when the two--verified--hypotheses guiding this proposal were put forward will eventually be broken: 1) Women occupy more peripheral places in the network of Latin American co-authorships in Communication, while men are located in the central points, and 2) The smaller communities created within the general network, in turn, revolve around men. Until the gender gap is ended, however, the need for further research is pressing.

To conclude, the results support the theory of marginalization of women highlighted in disciplines such as Urban Studies (Walker and Boamah, 2019), Accounting and Administration (Dias et al., 2019), or Literature (Haba-Osca, Osca-Lluch and González-Sala, 2019); however, they do answer the question of whether the data depend on the geographical character (Hispanic America) or, instead, on the intellectual character of the selected sample. That is to say, new comparative analyses would be desirable to observe whether the inequality is idiosyncratic to the area of Communication, compared to other spheres where there are fewer gender differences (e.g., Karimi, Mayr, and Momeni, 2019 or Fell and König, 2016).

It should also be noted that this work only examined the co-authorship relationships existing at a level of scientific production in Communication, namely, that of the papers published in JCR journals. Although this index is said to include the highest quality and reference results within the discipline, the fact is that scientific production in the field of interest is not limited to this database. In other words, it is possible to check whether the findings provided have been reproduced at other levels, such as in journals indexed in the Emerging Source Citation Index or Scopus.

Similarly, in our paper, neither the authors' order of signature nor the status of corresponding author was used as a variable. Nevertheless, such features influence the attribution of merit and responsibility in the published manuscripts (Díaz-Campo and Segado-Boj, 2017). Therefore, it remains to be seen whether female authors also occupy lower positions in the order of authorship and receive recognition as corresponding authors on fewer occasions than their male counterparts.

Likewise, the study of centrality in communities of authorship has been limited to those clusters composed of at least five nodes, so the option of exploring whether the dynamics indicated in this study have been reproduced in smaller groups or communities also remains open.

Another prospective question would lie in whether the lack of balance in the network responds to cultural, political, or structural reasons of the Latin American research space since it is worth asking whether the phenomenon occurs with identical characteristics in scenarios such as the Anglo-Saxon one. The questions to be addressed in future studies are: What does the greater inclusion and success of female academics and scientists in the field of Communication depend on, and what factors would halt the leaky pipeline that alludes to the loss of female talent?

Answering these questions and overcoming the Matilda effect will require raising awareness of the problem and "a gender-blind environment" for what constitutes the scientific core of the Social Sciences (Dion et al., 2018). An ambitious goal in which, by all accounts, efforts will have to be combined without distinction.

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Annex I. Countries in the sample and number of documents by country

Country	Number of Documents
Argentina	45
Australia	30
Austria	36
Bangladesh	1
Belgium	11
Bolivia	2
Brazil	107
Canada	31
Chile	137
China	11
Chipre	
Colombia	57
Costa Rica	8
Croatia	1
Cuba	3

Czech Republic	1
Denmark	5
Dominican Republic	1
Ecuador	19
El Salvador	1
Estonia	1
Finland	6
France	11
Germany	34
Greece	3
Guatemala	1
Hungary	3
Iceland	1
Indonesia	1
Ireland	5
Israel	4
Italy	19
Jamaica	2
Japan	4
Kuwait	2
Latvia	1
Malasya	1
México	87
Morocco	1
Netherlands	27
New Zealand	13
Nigeria	1
Norway	9
Panamá	1
Peru	9
Poland	7
Portugal	22
Romania	3
Russian Federation	4
Serbia	3
Singapour	5

Slovenia	2
South Africa	10
South Korea	3
Spain	1117
Surinam	1
Sweden	8
Switzerland	8
Thailand	1
Trinidad and Tobago	4
United Kingdom	76
Uruguay	4
USA	156
Venezuela	4

Annex II: Sources in the Sample

Revista	Documentos
<i>El Profesional de la Información</i>	489
<i>Comunicar</i>	164
<i>International Journal of Communication</i>	86
<i>Telecommunications Policy</i>	43
<i>Information Communication & Society</i>	33
<i>Discourse & Society</i>	30
<i>Public Relations Review</i>	29
<i>Public Understanding of Science</i>	28
<i>Journalism Practice</i>	26
<i>Journalism</i>	25
<i>Journalism Studies</i>	25
<i>New media & Society</i>	21
<i>European Journal of Communication</i>	16
<i>Argumentation</i>	15
<i>Discourse & Communication</i>	15
<i>Discourse Studies</i>	15
<i>International Communication Gazette</i>	15
<i>International Journal of Press-Politics</i>	14
<i>Feminist Media Studies</i>	13
<i>Language & Communication</i>	13

<i>Convergence-the International Journal of Research into New Media Technologies</i>	12
<i>Digital Journalism</i>	12
<i>Discourse Context & Media</i>	12
<i>Journal of Communication</i>	12
<i>Critical Discourse Studies</i>	11
<i>Games and Culture</i>	11
<i>International Journal of Advertising</i>	11
<i>International Journal of Public Opinion Research</i>	11
<i>Media culture & Society</i>	11
<i>Science Communication</i>	11
<i>Social media + Society</i>	11
<i>Continuum-Journal of Media & Cultural Studies</i>	10
<i>Health Communication</i>	10
<i>Journal of Social and Personal Relationships</i>	10
<i>Television & New media</i>	10
<i>Translator</i>	10
<i>Journal of Computer-Mediated Communication</i>	9
<i>Social Semiotics</i>	9
<i>Text & Talk</i>	9
<i>Communications-European Journal of Communication Research</i>	8
<i>Javnost-the Public</i>	8
<i>Journal of Broadcasting & Electronic Media</i>	8
<i>Journalism & Mass Communication Quarterly</i>	8
<i>Communication Theory</i>	7
<i>Interaction Studies</i>	7
<i>Narrative Inquiry</i>	7
<i>Political Communication</i>	7
<i>International Journal of Mobile Communications</i>	6
<i>Journal of Children and Media</i>	6
<i>Journal of Health Communication</i>	6
<i>Management Communication Quarterly</i>	6
<i>Mass Communication and society</i>	6
<i>Media and Communication</i>	6
<i>Visual Communication</i>	6
<i>Anais da Academia Brasileira de Ciencias</i>	5
<i>Environmental Communication -a Journal of Nature and Culture</i>	5
<i>Human Communication research</i>	5

<i>International Journal of Business Communication</i>	5
<i>Media International Australia</i>	5
<i>Rhetoric Society Quarterly</i>	5
<i>Communication & Sport</i>	4
<i>Journal of Advertising Research</i>	4
<i>Journal of Information Technology & Politics</i>	4
<i>Journal of Public relations Research</i>	4
<i>Media Psychology</i>	4
<i>Policy and Internet</i>	4
<i>Public Opinion Quarterly</i>	4
<i>Communication Research</i>	3
<i>Cyberpsychology- Journal of Psychosocial Research on Cyberspace</i>	3
<i>Information Society</i>	3
<i>International Journal of Conflict Management</i>	3
<i>Journal of Advertising</i>	3
<i>Journal of Language and Social Psychology</i>	3
<i>Journal of Media Economics</i>	3
<i>Mobile Media & Communication</i>	3
<i>Technical Communication</i>	3
<i>Critical Studies in Media Communication</i>	2
<i>IEEE Transactions on Professional Communication</i>	2
<i>Personal Relationships</i>	2
<i>Plos One</i>	2
<i>African Journalism Studies</i>	1
<i>Chinese journal of Communication</i>	1
<i>Communication Culture & Critique</i>	1
<i>Journal of African Media Studies</i>	1
<i>Journal of Applied Communication Research</i>	1
<i>Journal of Business and Technical Communication</i>	1
<i>Journal of Media Ethics</i>	1
<i>Quarterly Journal of Speech</i>	1
<i>Written Communication</i>	1

