

Tracing the Development of Glass Ceiling Research: A Quantitative Perspective

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ABSTRACT

The glass ceiling remains a persistent barrier to gender equality and career advancement, making it a critical subject of scholarly inquiry across disciplines. This study undertakes a systematic review to examine the evolution and development of glass ceiling research. A quantitative analysis is conducted on a corpus of 402 scholarly articles published between 2015 and September 2025. Utilizing VOSviewer and Biblioshiny software, an in-depth investigation is performed to identify the most influential factors within the literature. This analysis encompassed multiple dimensions, including the identification of prominent institutions, countries, authors, and journals that have contributed to the study of the glass ceiling. Additionally, network analyses, such as co-authorship, bibliographic coupling, and keyword co-occurrence, are employed to gain deeper insights into the intellectual structure and thematic trends of the field. The findings of this study offer valuable insights into the current state of glass ceiling research, highlight existing gaps, and suggest potential avenues for future scholarly inquiry.

Keywords: Glass Ceiling, Gender Equality, Barrier, Career Advancement, VOSviewer, Biblioshiny.

Introduction

The concept of the glass ceiling, first introduced in the 1980s, remains a salient metaphor describing the invisible barriers that inhibit women and marginalized groups from ascending to top organizational positions despite comparable qualifications and achievements (Johns, 2013). Although gender diversity in education and employment has advanced considerably in the 21st century, women's representation in senior management and executive roles continues to lag behind their male counterparts (Netchaeva et al., 2022). For instance, according to World Economic Forum 2025, women occupy only 28.1% of senior leadership positions worldwide, with substantial regional variations, Europe at 33%, North America at 28%, and the Asia-Pacific region at just 25%. The persistence of this disparity reflects systemic organizational, cultural, and cognitive barriers, including gender stereotyping, bias in promotion systems, and limited access to mentorship and social capital (Verdugo-Castro et al., 2022). Scholars increasingly emphasize that the glass ceiling extends beyond corporate contexts to academia, public administration, and technology sectors, highlighting the universality of gendered exclusion mechanisms (Son Hing et al., 2023).

Recent bibliometric and meta-analytic studies have demonstrated exponential growth in glass ceiling research since 2017, driven by global gender equality movements, such as the #MeToo movement and the United Nations' Sustainable Development Goal 5 (SDG 5) on gender equality (Adeleye et al., 2024). Analyses of over 1,199 publications indexed in Scopus and Web of Science reveal that the United States, the United Kingdom, and India collectively dominate research output, accounting for over 60% of total publications (S. Singh et al., 2023). However, gender inequality research remains unevenly distributed, with low representation from Latin America and Africa, underscoring a need for broader cross-cultural perspectives. Moreover, new research themes have emerged in the literature, such as the glass cliff, which refers to the phenomenon where women are promoted to precarious leadership positions, and the sticky floor, which relates to barriers at lower levels of employment (Grangeiro et al., 2021). The growing attention to these metaphors highlights a shift from static to dynamic conceptualizations of gender inequality, emphasizing intersectionality, sectoral variation, and the influence of digital transformation and artificial intelligence on leadership opportunities (Chahal & Kaur, 2024). Despite this scholarly expansion, the field lacks a unified, data-driven understanding of its intellectual structure, key contributors, and evolving trends. Prior bibliometric studies have identified over 2,400 unique authors and 688 journals that have contributed to glass ceiling research; yet, fragmentation persists across disciplines such as management, psychology, and sociology (Grangeiro et al., 2022).

To address these gaps, the present study performs a quantitative bibliometric analysis of 402 publications (2015–2025), mapping research productivity, collaboration networks, and thematic evolution using VOSviewer and Biblioshiny. By identifying the most influential journals, authors, countries, and institutions, this study provides a comprehensive empirical foundation for understanding how research on the glass ceiling has evolved in response to global movements for gender equity. Furthermore, it highlights underexplored areas, such as intersectional experiences, non-Western contexts, and digital-era leadership barriers, thereby informing future research agendas and policy development aimed at achieving substantive gender parity in leadership across various sectors.

Literature Review

Early Conceptual Period (1970s-1990s)

Research on the glass ceiling emerged from feminist organizational theory and labor market economics in the 1970s, with scholars examining structural impediments to women's upward mobility in corporate hierarchies. The term "glass ceiling" was first popularized in *The Wall Street Journal* by Hymowitz and Schellhardt (1986), describing invisible yet pervasive barriers preventing women from reaching executive ranks. This period established the foundational metaphors and conceptual models of gender-based career barriers, emphasizing discrimination, occupational segregation, and institutional bias (Hymowitz & Schellhardt, 1986). Early empirical investigations focused primarily on descriptive and qualitative accounts. Morrison, White, and Van Velsor conducted one of the first comprehensive studies, as outlined in *Breaking the Glass Ceiling*, which identified systemic biases in leadership selection and mentorship (Lowe, 1988). Similarly, Kanter's seminal work, "Men and Women of the Corporation", provided the sociological framework that links organizational structures and gendered power relations (Levine, 1977). During the 1980s and 1990s, many scholars expanded the theoretical lens to include psychosocial factors, work–family conflicts, and the interaction of gender stereotyping with organizational culture. They provided a quantitative operationalization of the glass ceiling, defining it as a distinct pattern of gender inequality that cannot be explained by human capital or experience variables (Cotter et al., 2001). This conceptual period also coincided with public policy recognition of the phenomenon. The *Glass Ceiling Commission Report* (1991-96) institutionalized the metaphor within policy discourse, documenting widespread barriers in Fortune 500 companies (<https://hdl.handle.net/1813/72763>). Subsequent international studies highlighted cross-cultural differences, showing that similar patterns of gendered exclusion persisted across OECD economies (Alvesson & Billing, 2009; Charles, 1996). These early contributions collectively established the foundation for subsequent quantitative modeling and intersectional analyses in later decades.

Methodological Expansion (1990s-2010s)

The 1990s through the 2010s marked a decisive methodological shift in glass ceiling research, from conceptual and narrative-based discussions to empirical, data-driven investigations. This era was characterized by the widespread adoption of quantitative survey instruments, large-scale organizational data analyses, and the integration of multivariate statistical techniques to measure the persistence and predictors of gender-based career barriers. Early studies in the 1990s began to operationalize the glass

ceiling effect using human capital variables, organizational hierarchies, and wage progression models. Powell and Butterfield examined gender differences in managerial promotions through logistic regression models, finding that women faced significant disadvantage even after controlling for performance and tenure (Powell & Butterfield, 1994). Similarly, Lyness and Thompson employed hierarchical regression to identify differential promotion rates and performance evaluation biases within Fortune 500 firms. These empirical works reflected the growing sophistication of methodological tools used to quantify the phenomenon (Lyness & Thompson, 1997). Blau and Kahn developed econometric decomposition models to examine gender wage gaps, laying groundwork for the measurement of structural discrimination (Blau & Kahn, 2000). Meanwhile, longitudinal approaches, such as those employed by Cotter, Hermsen, and Vanneman, provided statistical confirmation of a persistent “glass ceiling effect” distinct from general inequality (Cotter et al., 2001). During the 2000s, methodological innovation accelerated with the use of structural equation modeling (SEM), multilevel modeling, and path analyses to explore the mediating effects of organizational culture, bias, and work–family interface (Eagly & Carli, 2007). By the late 2000s and 2010s, the introduction of the Glass Ceiling Index (GCI) (Economist, 2013) and the Gender Equality Index (European Institute for Gender Equality, 2015) formalized measurement systems that combined statistical indicators across leadership, pay, and representation domains. These indices facilitated meta-analytic synthesis (Ng & Burke, 2005) and cross-country comparative studies (Cook & Glass, 2014; Hoobler et al., 2011), thereby establishing glass ceiling research as a quantitatively robust and policy-relevant domain.

Contemporary Quantitative Era (2010s-Present)

The 2010s onwards represent a transformative phase in glass ceiling research, marked by the convergence of advanced quantitative methods, cross-national datasets, and computational bibliometric tools that have significantly deepened the empirical understanding of gender inequality in leadership. This era has been characterized by the integration of big data analytics, structural equation modeling (SEM), multilevel modeling (MLM), and network analysis, enabling scholars to examine complex, multivariate relationships that underpin the persistence of the glass ceiling across industries and cultures. Empirical investigations during this period expanded beyond simple measures of representation to encompass nuanced constructs, including the glass cliff, sticky floors, and labyrinthine pathways to leadership. Ryan et al. pioneered the study of the “glass cliff,” demonstrating that women are more likely to be appointed to precarious leadership positions during periods of crisis (Ryan et al., 2010). Extending this, Bruckmüller et al. utilized experimental and cross-sectional data to confirm the existence of gendered selection dynamics in corporate board appointments (Bruckmüller et al., 2014).

From a macro perspective, large-scale indices such as The Economist’s Glass Ceiling Index (GCI) and the World Economic Forum’s Global Gender Gap Index (GGGI) have provided cross-national quantitative frameworks for measuring leadership inequality, integrating indicators across education, pay, and political representation (R. Singh & Singhal, 2025). These global datasets have facilitated regression-based analyses of policy effectiveness, demonstrating that institutional mechanisms, such as mandatory board quotas (Norway, Spain, France), significantly reduce leadership disparities (Hoobler et al., 2016; Rho et al., 2015). Researchers such as Aarntzen et al. and Han et al. have employed multilevel and mediation models to investigate the impact of bias, family-work conflict, and organizational climate on women’s advancement (Aarntzen et al., 2022; Han et al., 2020). Furthermore, machine learning techniques have recently been employed to predict leadership gaps and perform sentiment analysis of corporate reports, reflecting the digitalization of diversity analytics (Owusu Berko, 2025; Umarani et al., 2021). At the bibliometric and meta-analytic level, works have identified emergent research clusters linking gender inequality with entrepreneurship, AI leadership, and sustainability (Goncalves & Ahumada, 2025; Sánchez-Limón et al., 2025). These studies employ VOSviewer, Biblioshiny, and CiteSpace for citation and co-occurrence analyses, demonstrating growing interdisciplinarity. The rise of open data initiatives and bibliometric visualization tools has further allowed researchers to map the intellectual structure of glass ceiling scholarship, revealing thematic shifts toward intersectionality, cultural context, and digital transformation in leadership research (He & Goncalves, 2025; S. Singh et al., 2023).

Methodology

Researchers widely use the bibliometric analysis technique to assess the progress of scientific research over time. A comprehensive overview of the methodology employed, including sample selection and data collection procedures, is provided in the following section.

- **Framework for sample selection and data acquisition**

The data for this bibliometric study are obtained from the Scopus database, which serves as a comprehensive and reliable source of peer-reviewed literature across disciplines. A systematic search is conducted in September 2025, using keywords such as “glass ceiling,” “glass ceilings,” “glass ceiling beliefs,” “glass-ceiling,” and “glass ceiling effect.” The search is limited to the period between 2015 and 2025 to capture the most recent developments and emerging research trends. After applying inclusion and exclusion criteria, a total of 402 documents are retrieved from distinct sources, including journals, conference proceedings, and book chapters. The dataset is exported in BibTeX format to ensure compatibility with bibliometric analysis software. All records are carefully screened, cleaned, and standardized to eliminate duplicate entries and ensure consistency in author names, institutional affiliations, and keywords. The finalized dataset contains complete bibliographic information such as titles, abstracts, author details, publication year, and citation data. The processed data are analyzed using R Studio (Biblioshiny) and VOSviewer. Biblioshiny is employed to generate descriptive and statistical indicators, while VOSviewer is utilized for network visualization of co-authorship, citation, and keyword relationships. The integration of these analytical tools provides a comprehensive understanding of publication patterns, thematic structures, and research collaborations. This systematic approach ensures accuracy, reproducibility, and methodological rigor throughout the study.

- **Analysis**

The analysis of the study comprises bibliometric analysis. An examination is conducted on the trends of publications and citations over a specific time period. This analysis aims to identify influential aspects within the literature, such as the co-occurrence of keywords, patterns of co-authorship, and bibliographic coupling. These investigations provide valuable insights into the scholarly landscape and contribute to a deeper understanding of the research domain. A variety of tools were utilised for both statistical and visual processing in our study. Graphs and tables were generated using Microsoft Excel, while network analysis was performed using VOSviewer, a software tool developed by Van Eck and Waltman. According to Van Eck and Waltman, VOSviewer is considered to be a tool of higher sophistication compared to CiteSpace and Sci2 when it comes to visualising various elements through the utilisation of distance-based mapping approaches. The majority of software applications commonly utilise Scopus RIS or Web of Science (WOS) files as separate data sources. However, it is worth noting that VOSviewer and MS Excel offer the capability to process CSV files and facilitate the integration of data from both Scopus and WOS databases. Subsequently, a comprehensive compilation of research inquiries was formulated, drawing upon the findings derived from the current investigation.

Bibliometric analysis

- **Preliminary information on the data**

The final dataset comprises 402 publications as shown in table 1, collectively contributed by 1,911 authors and disseminated across 248 distinct journals. These publications record an average citation count of 9.32 per article, reflecting a moderate yet meaningful level of scholarly impact within the research domain. The temporal distribution of these studies, as presented in Table 1, illustrates the evolution of research activity over the examined period. A careful examination of publication patterns reveals a gradual decline in the number of papers produced in recent years, suggesting a potential shift in scholarly attention or saturation of the thematic area. Despite this decline, the consistency of contributions across multiple journals and authors highlights sustained academic engagement with the glass ceiling phenomenon. This distribution underscores both the interdisciplinary nature and the continued relevance of gender inequality research in organizational and leadership contexts.

Table 1: Information on the Data

Description	Results
Main Information about Data	
Timespan	2015:2025
Sources (Journals, Books, etc)	248
Documents	402
Annual Growth Rate %	12.29
Document Average Age	4.03
Average citations per doc	9.323
References	2996

Document Contents	
Keywords Plus (ID)	546
Author's Keywords (DE)	1634
Authors	
Authors	1911
Authors of single-authored docs	1
Authors Collaboration	
Single-authored docs	1
Co-Authors per Doc	7.08
International co-authorships %	17.41
Document Types	
article	304
book	7
book chapter	55
conference paper	27
review	9

- **Influential aspects of the literature**

The influential journals, authors, countries, and institutions are identified within the existing literature addressing the glass ceiling phenomenon and using vosviewer and Rstudio.

- **Influential journals**

The identification of the most influential journals is carried out using VOSviewer, a widely recognized bibliometric analysis tool, with the results summarized in Table 2. The results indicate that the journal Gender in Management contributes the highest number of publications, with 18 articles addressing various dimensions of the glass ceiling phenomenon. It is followed by Equality, Diversity and Inclusion, which publishes 7 articles, and the Journal of Human Resources in Hospitality and Tourism, which contributes 5 articles. This distribution highlights the concentration of research efforts within specialized journals dedicated to gender studies, diversity management, and organizational behavior, reflecting the interdisciplinary nature of the topic.

Table 2: Influential Journals (Sorted by Publications)

Sources	Articles
Gender in management	18
Equality, diversity and inclusion	7
Journal of human resources in hospitality and tourism	5
Labour economics	4
Springer proceedings in business and economics	4
Sustainability (switzerland)	4
Academy of strategic management journal	3
Administrative sciences	3
Agenda	3
Applied economics letters	3

- **Influential authors**

Figure 1 illustrates the most prominent authors who have contributed to the scholarly discourse on the glass ceiling phenomenon. The visualization is generated using Biblioshiny (R Studio interface), which maps authors according to the number of documents published within the analyzed dataset. The leading author, represented at the top of the chart, records the highest number of publications (70 documents), followed by others with 66 and 63 publications, respectively. Subsequent authors demonstrate slightly lower but still significant levels of contribution, with publication counts ranging between 23 and 43 documents. This distribution suggests the presence of a core group of prolific researchers who actively shape the direction of research in this domain.

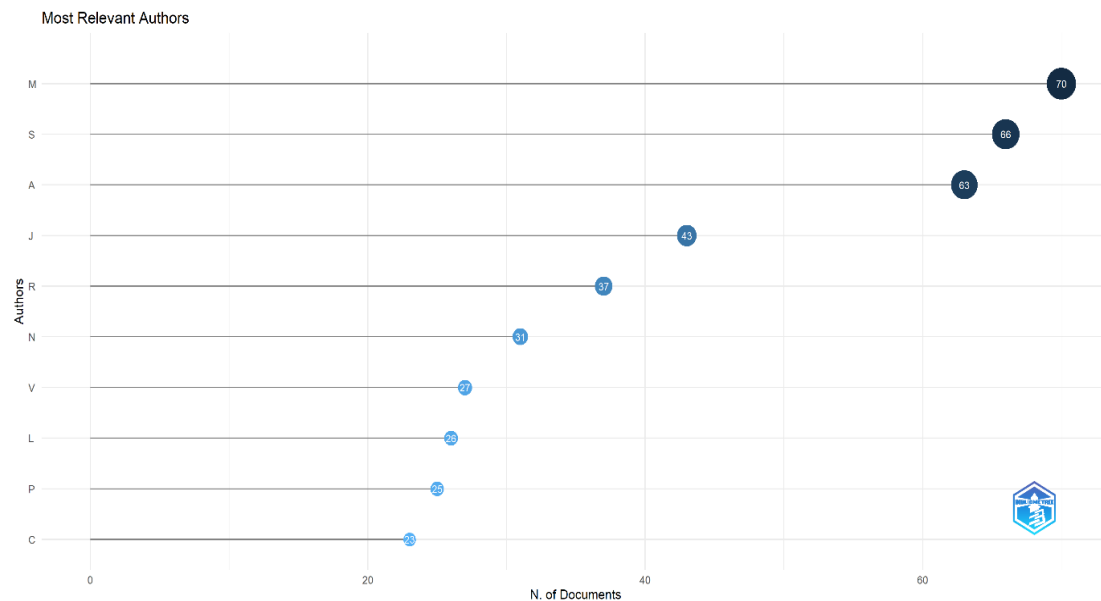


Figure 1: Influential authors

- Influential Countries**

The bibliometric analysis reveals that the United States ranks first with 131 publications, followed by India with 118 publications, indicating their leading roles and growing academic contributions in the research domain, as presented in Table 3. Spain holds the third position with 92 publications, demonstrating substantial involvement in scholarly work. The United Kingdom contributes 50 publications, showcasing consistent academic participation. These findings highlight the geographical diversity of research efforts and the collaborative nature of international studies in this domain.

Table 3: Influential Countries (Sorted by Publications)

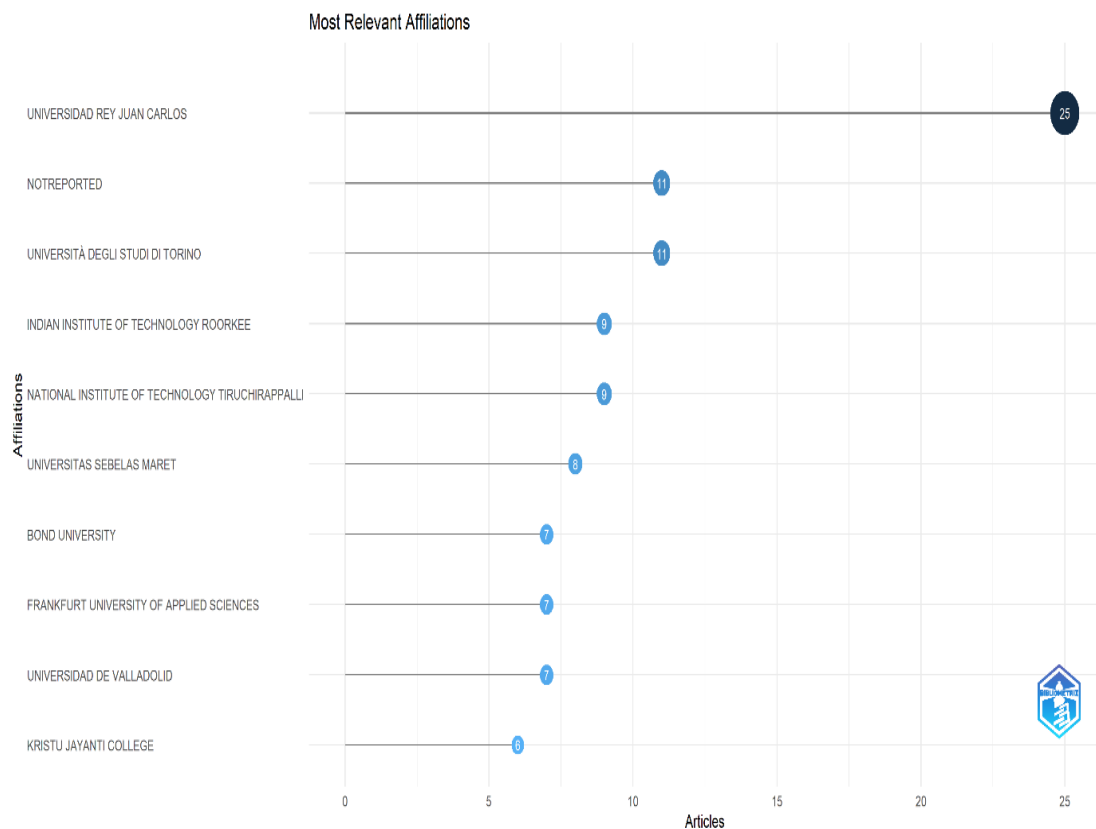
Country	Freq
USA	131
INDIA	118
SPAIN	92
UK	50
ITALY	38
SOUTH AFRICA	36
AUSTRALIA	28
GERMANY	28
MALAYSIA	24
BRAZIL	19

- Influential Institutions**

As shown in Table 4 and illustrated in Figure 2, Universidad Rey Juan Carlos currently holds the highest number of contributing articles, totalling 25, which indicates its prominent role in research affiliations. Both NOTREPORTED and the UNIVERSIT DEGLI STUDI DI TORINO have 11 articles each, signifying their considerable activity in scholarly publishing. The INDIAN INSTITUTE OF TECHNOLOGY ROORKEE and the NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI are each associated with 9 articles, suggesting substantial research output from these Indian institutions. UNIVERSITAS SEBELAS MARET stands with 8 articles, emphasizing its regular engagement in academic research. BOND UNIVERSITY, FRANKFURT UNIVERSITY OF APPLIED SCIENCES, and UNIVERSIDAD DE VALLADOLID all contribute 7 articles each, marking them as active participants in the field. KRISTU JAYANTI COLLEGE is also noteworthy, as it is linked with 6 articles. This distribution reflects ongoing scholarly collaboration and highlights the leading research organizations as of the current analysis.

Table 4: Influential Institutions (Sorted by Publications)

Affiliation	Articles
Universidad rey juan carlos	25
Notreported	11
Università degli studi di torino	11
Indian institute of technology roorkee	9
National institute of technology tiruchirappalli	9
Universitas sebelas maret	8
Bond university	7
Frankfurt university of applied sciences	7
Universidad de valladolid	7
Kristu jayanti college	6

**Figure 2: Influential Institutions (Sorted by Publications)**

- Co-Authorship Network among the Countries**

Figure 3 illustrates the international co-authorship network among various countries, highlighting the strength and diversity of collaborative research efforts. The United States emerges as the central hub, showing extensive collaborative ties with countries such as India, the United Kingdom, Spain, and Italy. India and the United Kingdom also exhibit significant connections, underlining their active participation in global research partnerships. Countries like Australia, China, Malaysia, and South Africa are linked through moderate but consistent collaborations. The thickness and number of lines between nodes represent the frequency and intensity of these research collaborations. This visualization reflects ongoing trends in international research, emphasizing the importance of cross-border scientific partnerships.

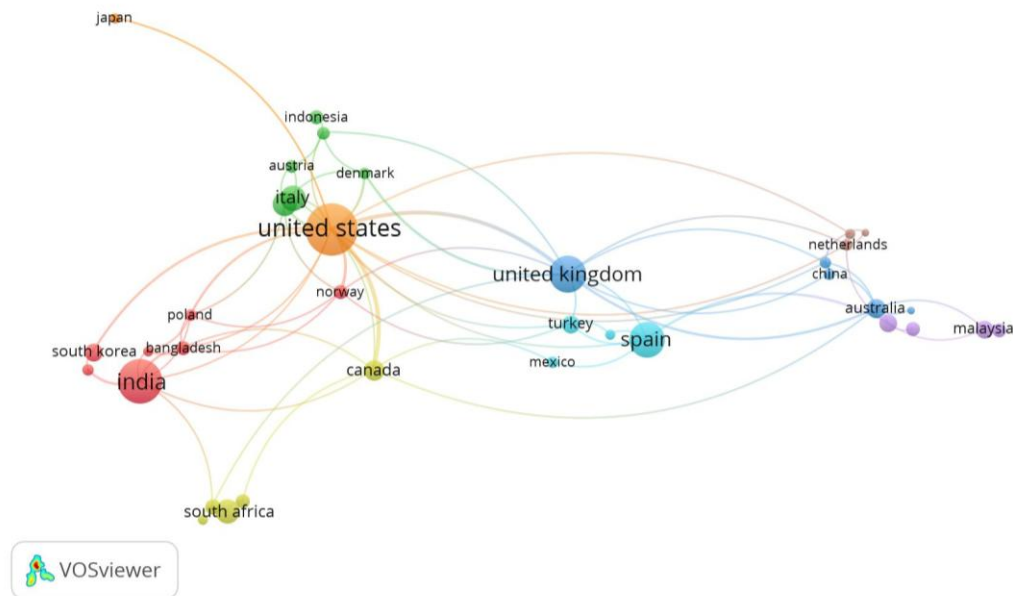


Figure 3: Co-Authorship Network Analysis

- **Bibliographic articles coupling**

Figure 4 visualizes bibliographic coupling among academic documents using VOSviewer software. It presents clusters of studies, with each node representing a publication and its size indicating the relative importance of that publication within the network. Colored nodes and connecting lines show the strength and nature of bibliographic links between documents—works citing similar references tend to cluster together. Prominent names such as segovia-pérez (2019), folke (2016), and tyrowicz (2020) act as central nodes within their respective communities. Cross-cluster connections reflect interdisciplinary influence, while node positions illustrate thematic or scholarly proximity. This mapping assists researchers in identifying influential studies and thematic structures within a field.

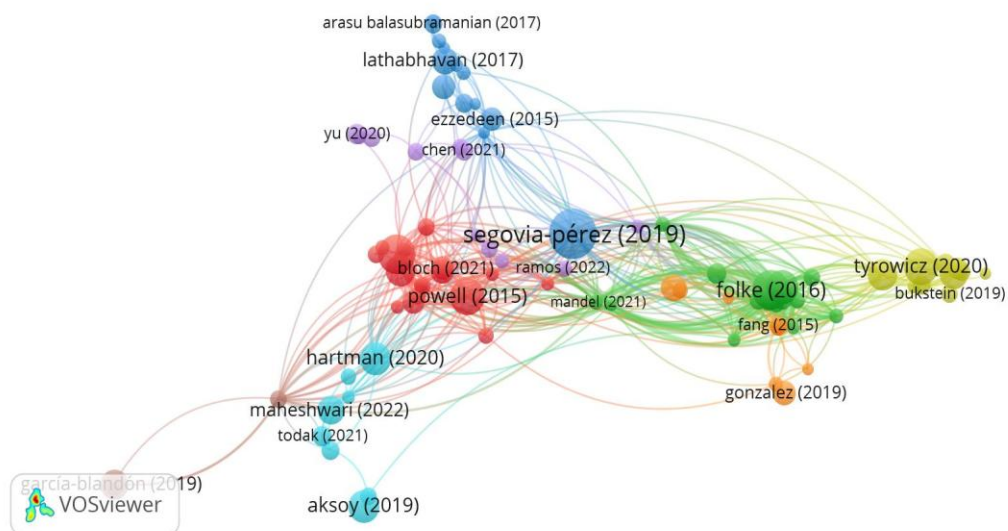


Figure 4: Bibliographic Coupling Analysis

• Annual Production

The annual production analysis (Table 5) reveals a progressive increase in research publications on the glass ceiling from 2015 to 2025. The number of articles rises from 16 in 2015 to 35 in 2017, indicating a growing academic interest in the subject. Although minor fluctuations occur in subsequent years, the overall trend demonstrates a steady upward trajectory in scholarly contributions. The publication output continues to rise in the later years, reaching 48 articles in 2024 and peaking at 52 articles in 2025, which signifies the highest level of research activity during the analyzed period and emphasizes the growing scholarly commitment to addressing the glass ceiling phenomenon. The pattern illustrated in Picture 5 visually supports this finding, reflecting the sustained momentum and evolving scope of research in this field.

Table 5: Annual Scientific Production

Year	Articles
2015	16
2016	18
2017	35
2018	26
2019	36
2020	37
2021	46
2022	34
2023	45
2024	58
2025	51

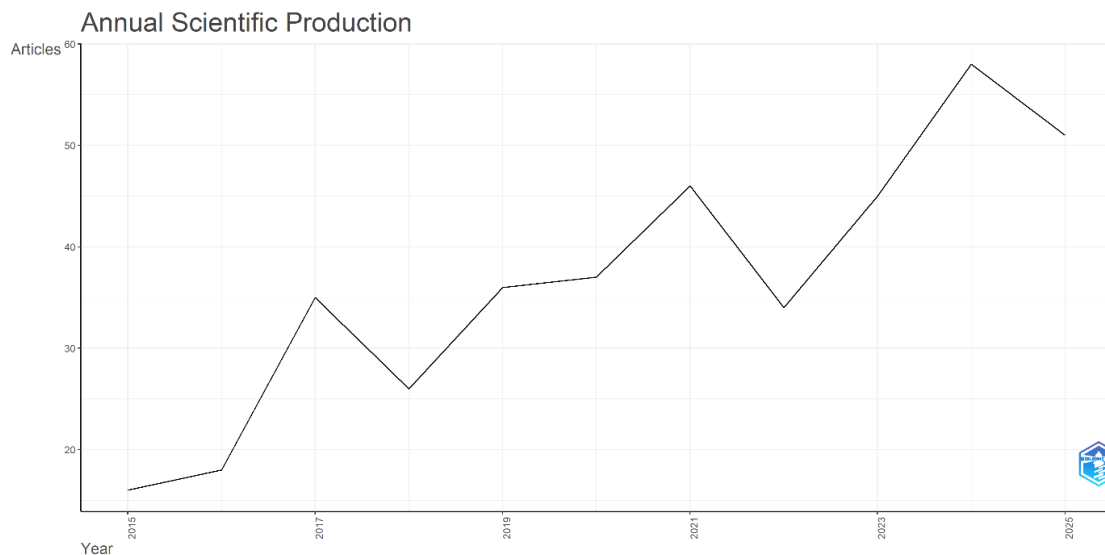


Figure 5: Annual Scientific Production

Limitations

Despite providing valuable insights into the research trends on the glass ceiling, this study has certain limitations. The analysis is confined to publications from the period 2015 to 2025, which may exclude earlier influential works that contributed to the conceptual development of the topic. Additionally, the study relies solely on data visualization and analytical tools available in VOSviewer and RStudio, which, although robust, may not capture all dimensions of bibliometric relationships offered by other advanced software. These constraints should be considered when interpreting the results, and future research could extend the temporal scope and employ additional analytical tools to achieve a more comprehensive understanding of the field.

Conclusion

The bibliometric analysis on the glass ceiling provides a comprehensive overview of the research landscape, highlighting the intellectual structure, thematic evolution, and emerging trends within this critical field. The findings reveal a growing scholarly interest in gender equality, organizational diversity, and leadership representation, with increasing contributions from both developed and developing countries. The dominance of certain authors, institutions, and countries underscores the global recognition of gender barriers in professional advancement. Furthermore, the co-authorship and keyword analyses illustrate the interdisciplinary nature of the topic, linking management, sociology, and human resource studies. Overall, this study offers valuable insights into the progression of glass ceiling research, serving as a reference point for policymakers, scholars, and organizations striving to foster equitable and inclusive workplaces.

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