



Causal-Structural Analysis of Glass Ceiling Barriers in the Career Advancement of Female Librarians at Payame Noor University Using DEMATEL and ANP Techniques

Saeed Kianpoor¹  | Mohammad Mehdi Mohebi²  | Ebrahim Mokhtari Nabi³  | Sepideh Azimi⁴ 

1. Corresponding Author, Assistant Professor, Department of Economics, Payame Noor University, Tehran, Iran. E-mail: s_kianpoor@pnu.ac.ir
2. Assistant Professor, Department of Management, Payame Noor University, Tehran, Iran. E-mail: mohebi@pnu.ac.ir
3. Lecturer, Department of Basic Sciences, Instructor, National University of Skills, Tehran, Iran. E-mail: e.mokhtarnabi@pnu.ac.ir
4. Instructor, Department of Basic Science, Faculty of Basic and General Studies, Technical and Vocational University (TVU), Tehran, Iran.. E-mail: s_azimi@tvu.ac.ir

Article Info

ABSTRACT

Article type:

Research Article

Article history:

Received: 8 December 2025

Received in revised form: 6

January 2026

Accepted: 20 January 2026

Published online: 21 January 2026

Introduction

This study provides a causal-structural analysis of the glass ceiling phenomenon, which restricts the career advancement of female librarians at Payame Noor University in Iran. Women are still considerably underrepresented in leadership and managerial positions, despite their numerical dominance in the library profession globally, and particularly in Iran. Invisible yet persistent sociocultural and institutional barriers that impede women's upward mobility in hierarchical organizations are referred to as the "glass ceiling" metaphor, which was first popularized in the 1980s. Although prior research has established the existence of such barriers in a variety of occupational contexts, there is a dearth of systematic analyses of the causal interrelationships among these factors or quantifications of their relative influence, particularly within the specific domain of academic librarianship in developing countries. The present research utilizes a sequential mixed-methods design to address this divide, integrating qualitative exploration with advanced quantitative modeling to elucidate the structure and salience of glass ceiling drivers among a cohort of female librarians.

Methodology

The investigation was implemented in two distinct yet interconnected phases. Data were collected during the initial qualitative phase by administering open-ended questionnaires to female librarians at various Payame Noor University campuses. 19 distinct barrier indicators were identified and categorized into four overarching categories: organizational, individual, socio-cultural, and cognitive-perceptual, as a result of thematic content analysis of these narratives using Python-based natural language processing tools. The second, quantitative phase involved the deployment of a structured, researcher-designed questionnaire that was informed by these emergent themes. The instrument was completed by a cluster-random sample of 100 female librarians, the majority of whom were married (100%) and held bachelor's degrees (85%). The questionnaire exhibited strong construct validity and exceptional internal consistency (Cronbach's $\alpha = 0.917$), as confirmed by exploratory factor analysis (EFA). The first two latent factors accounted for 78% of the total variance.

The study employed an integrated Multi-Criteria decision-making (MCDM) framework to simulate the intricate interdependencies among the 19 identified barriers. Initially, the Decision-Making Trial and Evaluation Laboratory (DEMATEL) technique was employed to map the causal architecture of the glass ceiling phenomenon, distinguishing between "causal" drivers that influence other factors and "effect" variables that are primarily influenced by external influences. Secondly, the Analytic Network Process (ANP) was employed to assign global weights to each barrier, thereby facilitating precise prioritization based on systemic influence rather than isolated perception. All analyses were conducted in Python, utilizing specialized libraries (e.g., Pingouin, Scipy, Sklearn) to guarantee computational rigor and reproducibility.

Keywords:

ANP Technique,

Career Advancement,

DEAMENTAL Technique,

Female Librarians,

Glass Ceiling,

Payame Noor University.

Findings

The results indicate a barrier structure that is both nuanced and multilayered. The analysis identifies internalized, perceptual factors, which is in contrast to the assumption that structural or institutional factors dominate. The most potent impediments are constraints. In particular, the top-ranked barrier was "personal limitations" (global weight = 0.0623), which encompassed low self-efficacy, imposter syndrome, and internalized gender norms. "Perceived discrimination" (0.0620) and "perceived impact of the glass ceiling" (0.0617) were closely followed, both of which were classified under the cognitive-perceptual dimension. These findings indicate that the subjective experience of constraint among women is as significant as objective organizational policies.

The profoundly embedded patriarchal norms within Iranian society that shape workplace dynamics were reflected in the substantial influence of "traditional gender attitudes" (0.0612) and "cultural expectations" (0.0612) among structural factors. It is intriguing that even though organizational mechanisms such as "anti-glass ceiling initiatives" (0.0573) and "equal opportunity policies" (0.0611) were acknowledged, their perceived effectiveness was relatively low, particularly "transparent promotion criteria" (ranked 16th) and "equal training opportunities" (17th). This discrepancy between formal policy and lived experience highlights a critical implementation gap: equity frameworks are inconsistent or symbolic in their operationalization, even when they exist on paper.

The directional relationships are further clarified by the DEMATEL analysis. The following were identified as critical causal drivers: "personal limitations," "transparent promotion criteria," "perceived glass ceiling," "equal training," and "anti-glass ceiling policies." This indicates that advancements in these areas would have a ripple effect on the entire barrier system. In contrast, outcomes such as "organizational awareness," "impact of the glass ceiling," and "influence of cultural expectations" are predominantly effects that are influenced by upstream determinants.

These observations have substantial practical and theoretical implications. The study theoretically challenges the solely structural interpretations of the glass ceiling by illustrating the importance of psychological and identity-related factors, even among highly educated professionals. It is consistent with the current feminist organizational theory, which underscores the interplay between structure and agency and posits that empowerment necessitates both internal transformation and institutional reform.

In practical terms, the results provide actionable levers for policy intervention. Initially, it is imperative to institutionalize psychosocial support systems, which include confidence-building seminars, imposter syndrome counseling, and women-only leadership incubators, in order to address internalized barriers. Secondly, it is imperative to improve organizational transparency. Promotion criteria that are consistently applied, plain, and written should be communicated throughout the university, and hiring committees should be diversified to reduce unconscious bias. Third, policies that prioritize work-life integration—including parental leave, remote work options, and flexible scheduling—are indispensable, as all respondents were married and likely maintained dual domestic and professional responsibilities. Fourth, a formal mentorship network that connects junior and senior female librarians could promote professional socialization, skill development, and sponsorship. Lastly, the university should implement a monitoring mechanism to ensure that leadership is held accountable for equity outcomes and that gender disparities in promotions are monitored.

Conclusion

This research contributes to the discipline in three critical ways. Methodologically, it is a pioneer in the innovative integration of the Analytic Network Process (ANP) and the Decision-Making Trial and Evaluation Laboratory (DEMATEL) to investigate gender inequality in librarianship. This method offers a valuable paradigm for scholars who are currently investigating similar complex socio-professional issues in other Global South contexts, providing a robust and replicable framework for causal modeling and systemic analysis. The research pioneers the first evidence-based, structural analysis of glass ceiling dynamics among Iranian academic librarians, thereby breaking new ground empirically. This work addresses a critical and long-standing lacuna in the field of Library and Information Science (LIS) scholarship related to the Middle East, transcending anecdotal evidence to illustrate the tangible obstacles that women encounter in this professional field.

The research presents a substantial paradigm shift by redefining the conventional concept of the glass ceiling. The barrier is reframed as a dynamic, self-reinforcing system of intricately interacting psychological, cultural, and organizational forces, rather than a unitary, static obstacle. This systemic perspective enables a more complex comprehension of the mechanisms that perpetuate inequality.

The study acknowledges its limitations, including the relative homogeneity of its sample, which is wholly composed of married individuals, with the majority possessing bachelor's degrees, and its emphasis on a single academic institution. These factors may potentially impact the generalizability of the study's findings. These constraints establish a distinct path for future research. Subsequent research could effectively compare the dynamics of public and private universities, intentionally incorporate male perspectives to comprehend the comprehensive gender ecosystem, or utilize longitudinal designs to evaluate the long-term effects of targeted policy interventions. The study establishes a strong conceptual and methodological foundation, despite these limitations. It serves as a critical foundation for reevaluating the methods by which academic institutions in Iran and similar cultural environments can actively diagnose, dismantle, and disrupt these invisible barrier systems. This will unlock the full leadership potential of their qualified female professionals and promote greater equity.

Cite this article: Kianpoor, S., Mohebi, M. M., Mokhtari Nabi, E., & Azimi, S. (2026). Causal-Structural Analysis of Glass Ceiling Barriers in the Career Advancement of Female Librarians at Payame Noor University Using DEMATEL and ANP Techniques. *Women in Development and Politics*, 23(4), 771-805. DOI: <https://doi.org/10.22059/jwdp.2026.407798.1008591>



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DOI: <https://doi.org/10.22059/jwdp.2026.407798.1008591>

Publisher: The University of Tehran Press.