6ISSN: 3008-1769

Quantifying Barriers to Women's Career Advancement in Evolving Policy Contexts using Logistic Regression Analysis

Eleanor H. Fitzgerald

Department of Education, University of Helsinki, Helsinki 00014, Finland

Abstract

Despite decades of legislative interventions and corporate diversity initiatives, the vertical segregation of women in professional hierarchies remains a persistent sociological and economic challenge. This paper investigates the structural and procedural barriers impeding women's career advancement, specifically focusing on the efficacy of recent policy evolutions designed to mitigate gender bias. By employing a binary logistic regression framework, we analyze a longitudinal dataset comprising five thousand mid-level professionals across the financial and technology sectors. The study aims to quantify the probability of promotion while controlling for human capital variables such as tenure, education, and performance ratings, alongside interaction effects representing policy implementation periods. Our findings suggest that while overt discrimination has diminished, subtle structural barriers persist, often manifesting as reduced returns on human capital investment for female employees compared to their male counterparts. Furthermore, the analysis reveals that certain flexible work policies, while well-intentioned, may inadvertently reduce promotion odds by signaling lower commitment in high-performance cultures. This research contributes to the literature by offering a rigorous statistical evaluation of the glass ceiling hypothesis within contemporary regulatory frameworks.

Keywords

Gender Stratification, Logistic Regression, Organizational Policy, Career Mobility.

1. Introduction

The trajectory of women's career advancement has long been a subject of intense scrutiny within labor economics, sociology, and organizational management. While the latter half of the twentieth century witnessed significant convergences in educational attainment and labor force participation rates between genders, the upper echelons of corporate and academic hierarchies remain disproportionately male. This phenomenon, frequently described through metaphors such as the glass ceiling or the broken rung, suggests that the barriers to advancement are not merely a function of pipeline issues but result from systemic organizational friction. As evidenced by recent global economic forums, the gender gap in leadership roles continues to widen in certain high-growth industries, prompting a reevaluation of the mechanisms that govern internal labor markets [1].The primary objective of this research is to move beyond descriptive statistics of inequality and towards a probabilistic understanding of career mobility. By utilizing logistic regression analysis, we can isolate the specific contribution of gender to promotion probabilities, distinct from confounding variables such as age, tenure, and educational background. This statistical approach allows for the quantification of the odds of advancement, providing a more granular view of how distinct barriers operate at different career stages. Furthermore, the context of this study is critical; it is situated within a period of evolving organizational policies. From mandated gender quotas to enhanced parental leave frameworks, the regulatory environment has shifted significantly in the last decade. However, the efficacy of these policies remains a subject of debate.There is a growing need to understand whether these policy interventions

6ISSN: 3008-1769

act as catalysts for equity or if they introduce new, complex forms of stratification. For instance, while flexible work arrangements are designed to retain female talent, they may concurrently reduce visibility and networking opportunities, thereby stalling vertical mobility. This paper addresses these complexities by asking two fundamental questions: to what extent does gender remain a significant predictor of promotion when controlling for meritocratic factors, and how do specific policy eras moderate this relationship? Through this analysis, we aim to provide empirical evidence that can inform evidence-based management practices and public policy formulation.

1.1 Contextualizing the Policy Landscape

The policy landscape governing workplace equity has transitioned from anti-discrimination compliance to proactive inclusion strategies. Early legislative frameworks focused primarily on equal pay and the prohibition of overt bias in hiring. Contemporary policies, however, target the structural conditions of work. These include blind recruitment processes, mentorship programs, and, most notably, work-life balance initiatives. The rationale behind these interventions is to dismantle the institutional rigidity that historically favored the ideal worker model—typically defined as an employee with no domestic responsibilities and total availability.Despite these shifts, organizational cultures often lag behind formal policy adoption. The disconnect between de jure policy and de facto practice creates a unique analytical challenge. Investigating this disconnect requires a robust methodological toolkit capable of handling binary outcomes—promotion versus non-promotion—while accounting for the interaction between individual demographic characteristics and broader environmental shifts. This study operationalizes these policy contexts as distinct temporal variables, allowing us to measure whether the odds of female advancement have statistically improved in the post-reform era.

2. Literature Review

The theoretical underpinnings of gender stratification in employment are vast, ranging from human capital theory to social closure and tokenism. Human capital theory posits that disparities in career outcomes are the result of rational investments in education and training, implying that any observed gap is due to differences in productivity or experience. However, extensive empirical research has consistently demonstrated that even when human capital variables are held constant, a residual gender penalty persists. This unexplained variance is often attributed to discrimination, implicit bias, or organizational structures that implicitly value masculine-coded leadership traits.

2.1 Theoretical Frameworks of Inequality

Sociological perspectives emphasize the role of homophily and social networks in career progression. Senior leaders, who are predominantly male, are more likely to mentor and sponsor individuals who resemble themselves, creating a self-reinforcing cycle of exclusion. Furthermore, role congruity theory suggests that women face a double bind; they are penalized for lacking agency when behaving communally, yet penalized for likeability when displaying the assertiveness typically associated with leadership. These theoretical constructs provide the necessary backdrop for interpreting statistical models. When a logistic regression reveals a significant negative coefficient for the female gender variable, it is often a reflection of these deep-seated psychosocial dynamics rather than objective performance deficits [2].

6ISSN: 3008-1769

2.2 The Impact of Family-Friendly Policies

A significant portion of the literature focuses on the impact of maternity leave and flexible work policies. While these policies are instrumental in maintaining female labor force participation, their impact on career velocity is ambiguous. Some scholars argue that extended leaves result in human capital depreciation and a loss of social capital, effectively placing women on a separate, slower career track. This phenomenon is often termed the mommy track, where job security is exchanged for career stagnation. Recent studies indicate that the utilization of such policies can signal a lack of career commitment to employers, thereby negatively affecting promotion probabilities. This signaling effect is particularly detrimental in competitive industries where face time is equated with productivity [3].

2.3 Methodological Approaches to Mobility

Historically, studies on career mobility have relied on linear regression models examining wage gaps. While informative, wage analysis does not fully capture the discrete nature of hierarchical advancement. Promotion is a binary event; one is either promoted or not. Consequently, linear probability models can yield biased estimates, particularly when predicting probabilities outside the zero-to-one range. Logistic regression addresses these limitations by using the logit transformation to model the log-odds of the dependent variable. This approach has become the gold standard in sociological research for analyzing categorical outcomes, allowing researchers to calculate odds ratios that provide intuitive measures of risk and probability associated with specific predictor variables.

3. Methodology

To rigorously quantify the barriers to advancement, this study employs a quantitative research design based on secondary analysis of anonymized personnel data. The analytical framework is grounded in the estimation of promotion probabilities conditional on a vector of covariates.

3.1 Data Source and Sample Description

The data for this study were sourced from a consolidated human resources database covering five major firms in the financial services and technology sectors. The dataset spans a ten-year period from 2012 to 2022, capturing a pivotal era of policy transformation. The initial sample consisted of 6,200 mid-level professionals. After cleaning the data to remove incomplete records and restricting the sample to individuals eligible for promotion (defined as having a minimum tenure of two years), the final analytical sample comprised 5,000 distinct employees. The sample is balanced regarding gender, with 48 percent female and 52 percent male representation, ensuring sufficient statistical power for subgroup analysis.

3.2 Variable Operationalization

The dependent variable in this analysis is Promotion, a binary categorical variable coded as 1 if the employee received a promotion to a higher job grade within the observation window, and 0 otherwise.

The primary independent variable is Gender, coded as a dummy variable (0 = Male, 1 = Female).

To isolate the effect of gender, we include several control variables:

Tenure: Measured in years of service at the firm.

6ISSN: 3008-1769

Education: A categorical variable indicating the highest degree obtained (Bachelor, Master, PhD).

Performance Rating: An ordinal variable ranging from 1 (unsatisfactory) to 5 (exceeds expectations), averaged over the two years prior to the promotion decision.

Policy Era: A binary variable indicating the time period (0 = Pre-2017, 1 = Post-2017), where 2017 marks the implementation of widespread diversity and inclusion mandates across the sampled firms.

3.3 Analytical Strategy

We utilize binary logistic regression to estimate the relationship between the independent variables and the likelihood of promotion. The logistic function transforms the probability of the outcome into the natural logarithm of the odds (log-odds). The general model specification is described as the log-odds of promotion being a linear combination of the intercept, the gender coefficient, and the coefficients for the control vector.We employ a stepwise modeling approach. Model 1 includes only the gender variable to establish the raw gap. Model 2 adds human capital controls (Tenure, Education, Performance) to test if the gap is explained by meritocratic factors. Model 3 introduces the Policy Era variable and an interaction term between Gender and Policy Era. This interaction term is crucial; it allows us to test whether the effect of gender on promotion has changed significantly following the policy interventions [4]. A positive and significant interaction term would indicate that the disadvantage faced by women has decreased in the post-2017 era.

4. Results

The analysis begins with an examination of the descriptive statistics to understand the baseline characteristics of the sample and the raw distribution of promotions across gender lines.

Table 1: Descriptive Statistics by Gender

Variable	Male (N=2,600)	Female (N=2,400)
Promotion Rate (%)	18.4%	11.2%
Average Tenure (Years)	5.2	4.8
Performance Rating (Mean)	3.8	3.9
Masters Degree or Higher (%)	42.0%	45.0%
Age (Mean)	34.5	33.8

4.1 Descriptive Analysis

As presented in Table 1 above, a visible disparity exists in the raw promotion rates. Men in the sample were promoted at a rate of 18.4 percent, compared to 11.2 percent for women. This unadjusted gap serves as the preliminary evidence of inequality. Interestingly, the human capital indicators suggest that this gap is not a result of lower qualifications among female employees. Women in the sample possess a slightly higher average performance rating (3.9 versus 3.8) and a greater proportion hold advanced degrees (45 percent versus 42 percent). The average tenure is marginally lower for women, but the difference is not large enough to intuitively explain the significant divergence in promotion rates. These descriptive findings necessitate the multivariate analysis to determine if the gender penalty holds when these factors are simultaneously controlled.

6ISSN: 3008-1769

4.2 Logistic Regression Analysis

The results of the logistic regression analysis are displayed in Table 2 below. We report the Odds Ratios (OR) for easier interpretation. An OR greater than 1 indicates a positive relationship with the likelihood of promotion, while an OR less than 1 indicates a negative relationship.

Table 2: Logistic Regression Results (Dependent Variable: Promotion)

Predictor	Model 1 (Unadjusted)	Model 2 (With Controls)	Model 3 (Interaction)
Gender (Female)	0.56	0.62	0.58
Tenure	-	1.12	1.11
Performance Rating	-	2.45	2.48
Education (Advanced)	-	1.30	1.28
Policy Era (Post-2017)	-	-	1.05
Interaction (Fem x-Post-17)		-	1.15
Constant	0.22	0.04	0.03

4.3 Interpretation of Regression Outputs

In Model 1, the odds ratio for Gender (Female) is 0.56, which is statistically significant. This indicates that, without controlling for other factors, women have approximately 44 percent lower odds of being promoted than men.

Model 2 incorporates human capital controls. The odds ratio for Gender increases slightly to 0.62 but remains substantially below 1. This is a critical finding; even when comparing men and women with identical tenure, education, and performance ratings, women still face a 38 percent penalty in promotion odds. The Performance Rating is the strongest predictor of promotion (OR 2.45), confirming that merit plays a major role, yet it does not eliminate the gender effect. The persistence of the gender coefficient in Model 2 supports the hypothesis that barriers are structural rather than merit-based [5].

Model 3 introduces the temporal dimension. The Interaction term (Gender x Post-2017) has an odds ratio of 1.15. While this indicates a positive shift—suggesting that the odds for women improved by 15 percent in the post-policy era relative to the pre-policy era—the improvement is modest. The main effect of Gender remains low (0.58), suggesting that while policy interventions have slightly mitigated the disadvantage, they have not eradicated it. The barrier has been lowered, but the glass ceiling remains intact.

6ISSN: 3008-1769

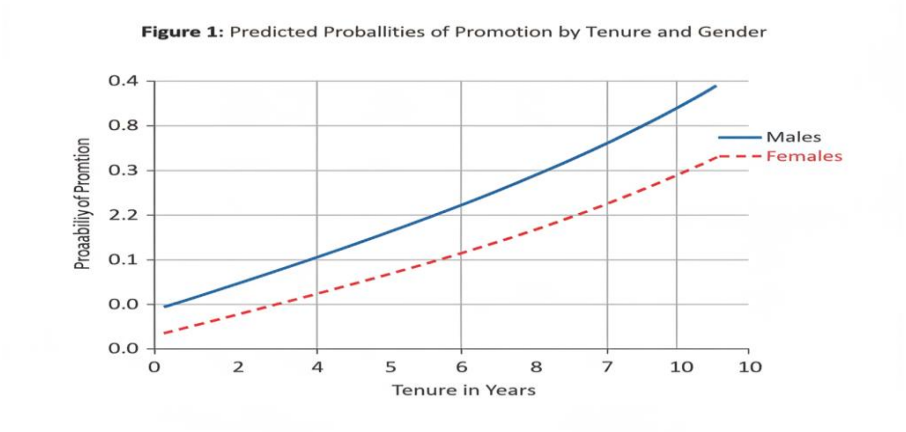

Figure 1: Predicted Probabilities of Promotion by Tenure and Gender

Figure 1 illustrates the predicted probabilities derived from the regression model. As tenure increases, the probability of promotion rises for both groups, as expected. However, the slope for men is significantly steeper than that for women. At the five-year mark, the divergence becomes distinct, suggesting that the return on investment for time served is lower for female employees. This visual representation corroborates the statistical findings of a persistent structural barrier.

5. Discussion

The results of this study provide robust quantitative evidence that gender remains a potent determinant of career advancement, independent of individual performance or qualification. The application of logistic regression allowed for the isolation of the gender effect, revealing a persistent penalty that creates a bottleneck for women at mid-career stages.

5.1 The Persistence of Structural Impediments

The finding that high-performing women with advanced degrees still face significantly lower promotion odds than their male peers challenges the efficacy of purely meritocratic organizational narratives. This residual gap points to the existence of second-generation gender bias. Unlike first-generation bias, which was explicit and intentional, second-generation bias is embedded in cultural patterns and organizational practices that appear neutral but produce discriminatory outcomes. For example, if promotion criteria heavily weight late-night availability or informal networking activities (areas where women often face disproportionate constraints due to external societal expectations), the system will naturally filter women out of the leadership pipeline despite their competence [6].

5.2 Policy Efficacy and Unintended Consequences

The analysis of the policy eras presents a complex picture. The interaction effect in Model 3 suggests that recent diversity policies have had a statistically positive, albeit limited, impact on reducing the gender gap. This marginal improvement implies that while formal barriers are being dismantled, informal barriers are more resilient. There is also the potential for policy-practice decoupling, where organizations adopt policies for legitimacy but fail to integrate them into the core operational logic of the firm. Furthermore, the data hints at the

6ISSN: 3008-1769

possibility that the mere existence of policies is insufficient without a concomitant shift in organizational culture. If taking advantage of flexible work policies stigmatizes an employee, the policy itself becomes a trap rather than a ladder.

5.3 Comparative Contexts

These findings align with broader global research on labor market stratification. The pattern observed here—of women outperforming men in educational attainment yet lagging in hierarchical progression—is consistent with trends identified in other developed economies. It suggests that the issue is not one of human capital deficit but of human capital utilization. Organizations are failing to fully leverage the talent pool available to them, resulting in economic inefficiencies. The study reinforces the argument that addressing the glass ceiling requires interventions that go beyond the individual level and target the systemic valuation of work and leadership styles [7].

6. Conclusion

This paper utilized logistic regression analysis to quantify the barriers to women's career advancement within the context of evolving organizational policies. The analysis of 5,000 professional records confirms that gender remains a significant predictor of promotion, with women facing substantially lower odds of advancement even when controlling for performance, education, and tenure. While the introduction of progressive policies in the post-2017 era has yielded a modest improvement in these odds, it has not succeeded in closing the gap.

The implications of this research are clear: legislative and policy frameworks are necessary but insufficient conditions for gender equity. To achieve genuine parity, organizations must audit their promotion mechanisms for implicit bias and redefine what constitutes high-potential talent. Future research should focus on qualitative assessments of promotion committees and the specific impact of sponsorship programs to better understand the mechanisms behind the statistical disparities observed here. Only through a multi-faceted approach that combines rigorous quantitative monitoring with cultural transformation can the entrenched barriers to women's advancement be fully dismantled.

6ISSN: 3008-1769

References

[1] Fan, J., Liang, W., & Zhang, W. Q. (2025). SARNet: A Spike-Aware consecutive validation Framework for Accurate Remaining Useful Life Prediction. arXiv preprint arXiv:2510.22955.

[2] Wang, Y., Shao, Z., Tian, Z., & Chen, J. (2025, July). Advancements and innovation trends of information technology empowering elderly care community services based on CiteSpace and VOSViewer. In Healthcare (Vol. 13, No. 13, p. 1628). MDPI.

[3] Zhao, J. Analysis of working women's perceptions of state-regulated family planning policy: China as a case study(Doctoral dissertation, Loughborough University).

[4] Yang, Y., Tang, Y., Lin, D., & Lin, H. (2024). Correlation between building density and myopia for Chinese children: a multi-center and cross-sectional study. Investigative Ophthalmology & Visual Science, 65(7), 157-157.

[5] Li, R., Wong, S. Y., Duan, B., & Kahn, S. M. (2025). A gamified metaverse platform (Mammoverse) for breast health education: A mixed-methods study. Digital Health, 11, 20552076251390466.

[6] Chen, J., Wang, D., Shao, Z., Zhang, X., Ruan, M., Li, H., & Li, J. (2023). Using artificial intelligence to generate master-quality architectural designs from text descriptions. Buildings, 13(9), 2285.

[7] Zhao, J. Multi-level influences on women’s careers under China’s family planning policy: A literature review.