

Does Going Green Open the Glass Ceiling? Environmental Performance, Legal Institutions, and Women in Management

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ABSTRACT: *This study examines whether a country's environmental performance is associated with the proportion of women in senior and middle management, and whether this relationship is conditioned by national workplace legal protections. Drawing on institutional theory, we test a moderated regression model across 122 countries, using the Environmental Performance Index (EPI) as the independent variable, the Women, Business and the Law (WBL) Index as the moderator, and SDG Indicator 5.5.2 as the outcome. EPI was not a significant predictor in the baseline model ($\beta = .189, p = .248$), but emerged as a significant positive predictor once the legal institutional context was modelled ($\beta = .348, p < .001$ in the full moderation model), indicating that EPI's effect is conditional rather than universal. WBL independently and positively predicted the outcome ($\beta = .339, p < .001$). The interaction term was significant and negative ($\beta = -.372, p < .001$), indicating that EPI's positive effect is strongest in countries with weaker legal frameworks and diminishes—approaching zero—as legal protections grow stronger. This pattern is consistent with an institutional substitution effect: environmental governance exerts a compensatory isomorphic pressure on organizations where legal protection is weak, but adds little where coercive legal pressure is already strong. The model explained 29.3% of cross-national variance. These findings introduce environmental governance as a novel macro-level predictor of gender equality in management and suggest that environmental and legal institutions operate as partial substitutes rather than complements.*

KEYWORDS: *environmental performance; gender equality; glass ceiling; green transition; institutional theory; SDG 5.5.2; Women Business and the Law; women in management*

JEL Classification: *J16; J71; M14; Q56; K38.*

I. INTRODUCTION

Women remain significantly underrepresented in senior and middle management across the world. As of 2024, they hold only 30% of managerial positions globally, and at the current pace of change, achieving gender parity in management is projected to take close to a century [42]. The World Economic Forum [46] estimates that economic gender parity will take over 170 years to achieve at the current trajectory. This persistent gap—widely referred to as the glass ceiling [12]—carries real costs: reduced organizational performance, wasted talent, and the reproduction of gender inequality across generations [23].

Research on why the glass ceiling persists has mostly focused on individual attitudes, organizational practices, or national labour market conditions. But there is a growing body of evidence showing that the institutional environment a country operates within—its laws, governance capacity, and cultural norms—shapes organizational behaviour in ways that individual firms cannot easily override [32][39]. Countries differ substantially in how much their macro-level institutional frameworks support or obstruct women's advancement into management, and these differences matter. The World Bank [44] now explicitly frames gender equality in management as a governance and institutional challenge, not merely a firm-level one.

One macro-level factor that has been almost entirely overlooked in this literature is a country's environmental governance capacity. Countries that score highly on environmental performance tend to have functional, long-horizon, accountability-driven institutions. These same qualities are plausibly linked to gender equality in organizations: a state that can coordinate sustained action on climate change is likely also one whose institutional environment generates broader pressure for inclusivity. Beyond institutional capacity, the normative landscape of environmentally progressive countries—characterized by post-materialist values and collective action orientation—may itself create organizational pressure to reflect inclusivity in management composition. There is also a growing empirical link between green transition commitments and gender equality policy: countries

investing heavily in the green economy are increasingly pairing those investments with gender-focused employment policies [34][8].

At the same time, national laws governing women's economic rights—workplace protections, anti-discrimination provisions, parental leave mandates—constitute a separate but related institutional layer that also shapes female managerial representation. The key question is not just whether each of these factors matters independently, but how they interact. Does strong environmental governance amplify the effect of legal protections? Or does it substitute for them, filling the gap where legal frameworks are weak?

This study addresses these questions using cross-sectional data from 122 countries. We test a moderation model in which the Environmental Performance Index (EPI [3]) predicts women's managerial representation (SDG 5.5.2 [25]), with the Women, Business and the Law (WBL) Index [45] as the moderator. The study makes three contributions: it introduces EPI as a novel macro-level predictor of gender equality in management; it reveals a substitution dynamic between environmental governance and legal institutions; and it shows that economic development and female labour market participation lose explanatory power once institutional quality is properly modelled.

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1. The Glass Ceiling

The glass ceiling describes a gender-based barrier to advancement that becomes more pronounced at higher levels of organizational hierarchies. Cotter et al. [12] define it precisely: it is not just a gap in representation, but one that increases with rank, cannot be explained by relevant job-related characteristics, and has proven durable over time. Eagly and Carli [16] extend this picture with the labyrinth metaphor, arguing that the barriers women face are not concentrated at a single point but distributed across the entire career path, from entry-level hiring through to executive succession. Subsequent research has confirmed the glass ceiling across different industries, countries, and organizational types [39][36][18].

Several mechanisms have been identified. Gender stereotypes create a mismatch between how women are perceived and how leaders are expected to behave [21][35]. Eagly and Karau [17] formalise this as role incongruity: because the traits associated with effective leadership overlap far more with masculine than feminine stereotypes [29], women are evaluated less favourably as candidates and penalized more harshly for assertive behaviour. Discrimination in hiring and promotion is well-documented even in experimental settings [31]. The organizational consequences are significant: Hoobler et al.'s [23] meta-analysis across decades of research finds that the underrepresentation of women in leadership carries measurable costs for firm performance, a finding that has not translated into organizational change as rapidly as the evidence would warrant.

Work-family conflict falls disproportionately on women, limiting career investment and advancement [19][38][6]. Hochschild's [22] foundational analysis of the 'second shift' showed that women's disproportionate domestic burden compounds career disadvantage over time in ways that individual motivation or ability cannot overcome. The motherhood penalty—a wage and promotion penalty associated specifically with parenthood for women—has been measured across multiple countries and contexts [11][13][5][28].

What much of this research shares is a focus on individual and organizational mechanisms. A smaller but important strand of the literature asks instead how macro-level institutions shape these outcomes—and finds that they matter considerably.

2.2. Institutional Theory and Macro-Level Determinants of Gender Equality

DiMaggio and Powell's [14] institutional theory provides the core theoretical framework for this study. The theory holds that organizations are embedded in institutional environments that exert pressure on them to adopt certain structures and practices—not necessarily because those practices improve performance, but because they are seen as legitimate. Three mechanisms operate: coercive isomorphism (organizations comply with legal requirements and regulatory mandates); mimetic isomorphism (organizations imitate successful peers when facing uncertainty); and normative isomorphism (organizations adopt practices associated with professionalized, legitimate conduct).

Applied to gender equality in management, this framework predicts that where institutional environments send strong signals—through law, through the visible behaviour of peer organizations, or through widely shared norms of legitimacy—organizations will be under greater pressure to include women in management. Countries differ significantly in the strength of these signals, which is why cross-national variation in female managerial representation is so large even after controlling for economic development and educational attainment.

The cross-national evidence supports this. Terjesen et al. [39] show, across 43 countries, that national institutional environments explain a substantial portion of the variation in female board representation that cannot be accounted for by firm-level factors. Ng and Sears [32] demonstrate that the organizational drivers of female managerial representation operate differently depending on the macro-institutional context. Inglehart and Norris

[26] and Inglehart and Welzel [27] document the role of post-materialist values in generating cultural change toward gender equality at the national level—values strongly associated with environmental and sustainability governance.

2.3. Environmental Performance as a Predictor of Female Managerial Representation

Why should a country's environmental performance predict the share of women in management? We propose two mechanisms grounded in institutional theory.

The first is institutional quality. High environmental performance requires sustained investment in regulatory capacity, long-term policy frameworks, monitoring and enforcement systems, and accountable governance structures [3]. Countries that have built these capabilities for environmental governance are likely to have them in other policy domains too, including gender equality. In this sense, EPI acts as an observable proxy for a broader institutional quality that facilitates diverse policy outcomes—not because environmental and gender policy are directly linked, but because both require the same underlying state capacity. This argument is consistent with the finding by Ko and Leung [30] that gender inequality and ESG performance are negatively correlated across countries, with institutional capacity mediating much of that relationship.

The second is normative alignment. Countries with high environmental performance tend to score high on post-materialist values [26][27]: priorities like self-expression, quality of life, and collective well-being over economic security and survival. These are the same values that generate normative pressure for gender equality in organizations. Through DiMaggio and Powell's [14] normative isomorphism mechanism, organizations in environments where inclusivity and sustainability are treated as markers of legitimacy will face pressure to reflect those values in their management composition. This mechanism connects EPI to female representation not through direct policy linkage, but through a shared normative context.

Firm-level evidence supports the plausibility of this country-level relationship. Cordeiro et al. [10] show that board gender diversity is positively associated with corporate environmental performance across multiple national contexts. Tran et al. [41] find that companies facing ESG reputational risks are more likely to increase female board representation, particularly in countries with stronger gender equality norms. Chen [8] reviews 125 studies and concludes that women's empowerment significantly promotes green finance development while gender diversity enhances environmental management outcomes. At the country level, Salamon [37] finds that women's parliamentary participation positively predicts renewable energy policy outcomes, suggesting that gender-inclusive governance and environmental ambition co-occur not by coincidence but through shared institutional logics. While these studies examine the relationship from various angles, they collectively establish that the environmental-gender nexus is institutionally real, making the country-level relationship proposed here theoretically well-grounded.

No prior study has tested the cross-national relationship between EPI and female managerial representation, to best of author's knowledge. This study provides the first empirical test, generating the following hypothesis:

H1: A country's environmental performance score (EPI) is positively associated with the proportion of women in senior and middle management, particularly in the context of national legal institutions.

2.4. The Moderating Role of Workplace Legal Protections

National workplace legal protections—anti-discrimination laws, equal pay mandates, parental leave entitlements—constitute the coercive isomorphism channel through which institutional environments directly shape organizational gender outcomes. Countries with stronger legal frameworks create binding compliance pressure on organizations that does not depend on normative consensus or cultural values. The WBL Index [45] captures this dimension of the institutional environment across 190 economies.

The question of how EPI and WBL interact is not straightforward. One possibility is complementarity: strong legal frameworks amplify the normative pressure from environmental governance, and the two forces reinforce each other, producing the largest gains in female representation in countries that are strong on both dimensions. The other possibility is substitution: where legal frameworks are already strong and effectively enforced, organizations are already under substantial coercive pressure to promote gender equality; the additional normative pressure from environmental governance provides little further impetus. Where legal frameworks are weak, by contrast, the normative pressure from environmental governance may partially fill the gap, acting as a compensatory isomorphic force.

Prior research offers indirect support for this substitution possibility. Boeckmann et al. [4] show that institutional factors interact in complex ways to shape gender equality in employment rather than simply adding to one another. Hoch et al. [7] find that the positive effect of female leadership on corporate social responsibility outcomes is most pronounced in contexts of weaker legal gender equality, suggesting substitutive rather than complementary dynamics at the organizational level. North [33] argues more generally that different institutional arrangements can produce functionally equivalent outcomes, and Amable [2] demonstrates in a comparative

capitalism framework that institutional domains can substitute for one another when one is underdeveloped—making substitution as theoretically plausible as complementarity in cross-national institutional research.

Given the theoretical ambiguity, this study does not specify the direction of moderation in advance. The hypothesis is stated in directionally open terms, and the nature of the interaction—complementarity or substitution—is treated as an empirical question:

H2: The relationship between a country's environmental performance (EPI) and women's managerial representation is moderated by national workplace legal protections (WBL).

III. METHODOLOGY

3.1. Data and Sample

This study employs a cross-sectional research design using country-level secondary data. The final analytical sample comprises 122 countries, representing all countries for which complete data were available across all variables. The cross-sectional structure reflects the limited temporal availability of the EPI, which is published biennially [3], and follows established practice in cross-national management research employing macro-level composite indices [32][39].

3.2. Measures

Dependent variable. The proportion of women in senior and middle management positions (WOMEN_MAN) was operationalized as the female share of employment in senior and middle management (%), corresponding to SDG Indicator 5.5.2. Data were sourced from the ILOSTAT database of the International Labour Organization (ILO, 2025 [25]). The most recent available observation per country was used. It should be noted that this indicator is subject to sectorally concentrated measurement anomalies in certain national contexts, a limitation addressed in the assumption checks section.

Independent variable. The Environmental Performance Index (EPI) is a composite index developed by the Yale Center for Environmental Law and Policy ranking 180 countries on 58 performance indicators across 11 issue categories covering climate change mitigation, ecosystem vitality, and environmental health. The 2024 edition [3] was used.

Moderating variable. National workplace legal protections were operationalized using the Women, Business and the Law (WBL) 1.0 Index [45]. The WBL Index measures the extent to which national laws provide women with equal economic opportunities across eight domains. The overall WBL 1.0 index score (0–100) was used as the primary moderator.

Interaction term. The moderation hypothesis (H2) was tested by including a cross-product interaction term (EPI_x_WBL), calculated as the product of EPI and WBL scores, following standard moderated multiple regression practice [1].

Control variables. Three country-level controls were included: GDP per capita (log-transformed), female labour force participation rate (%), and female tertiary educational attainment (% aged 25+ with a bachelor's degree or equivalent). All were sourced from the World Development Indicators [43].

3.3. Analytic Strategy

Data were analysed using IBM SPSS Statistics (Version 27). Two successive regression models were estimated. Model 1 (baseline) regressed WOMEN_MAN on EPI and the three control variables, testing H1. Model 2 (full moderation model) added WBL_SKOR and the EPI_x_WBL interaction term, testing H2. To visualize the interaction effect, predicted values of WOMEN_MAN were computed at three levels of WBL (–1 SD, mean, +1 SD) across the observed range of EPI, holding control variables at their sample means (Figure 1). Assumption checks included Durbin-Watson statistics, normal P-P plots, standardised residual scatterplots, and Variance Inflation Factors (VIF).

IV. RESULTS

4.1. Descriptive Statistics and Correlations

Table I presents the descriptive statistics for all study variables. The mean proportion of women in senior and middle management across the 122-country sample was 32.23% (SD = 10.24), ranging from 5.89% to 63.91%. Mean EPI was 48.17 (SD = 12.80) and mean WBL score was 81.59 (SD = 16.37), indicating considerable cross-national variation in both environmental performance and gender-equality legal frameworks.

Table I: Descriptive Statistics (N = 122)

<i>Variable</i>	<i>N</i>	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
WOMEN_MAN – Women in senior/middle management (%)	122	5.89	63.91	32.23	10.24
EPI – Environmental Performance Index	122	24.60	75.70	48.17	12.80
WBL_SKOR – WBL Legal Equality Index	122	3.13	100.00	81.59	16.37
WBL_LEGAL – Workplace legal protections	122	0	100	86.89	25.76
WBL_PARENTAL – Parental rights score	122	0	100	63.93	31.03
LOG_GSYIH – GDP per capita (log)	122	5.88	11.73	8.87	1.48
WOMEN_HR – Female labour force participation (%)	122	5.37	84.40	59.16	16.55
WOMEN_EDUC – Female tertiary attainment (%)	122	0.52	51.81	16.88	13.36
EPI_x_WBL – Interaction term	122	96.88	7510.00	4053.18	1655.69

Note. WOMEN_MAN = female share of senior/middle management (%); EPI = Environmental Performance Index; WBL = Women, Business and the Law Index; LOG_GSYIH = log GDP per capita; WOMEN_HR = female labour force participation (%); WOMEN_EDUC = female tertiary attainment (%). Sources: [3][25][45][43].

Table II presents the Pearson correlation matrix. WOMEN_MAN was significantly and positively correlated with EPI ($r = .342, p < .001$), WBL_SKOR ($r = .388, p < .001$), LOG_GSYIH ($r = .313, p < .001$), WOMEN_HR ($r = .258, p < .01$), and WOMEN_EDUC ($r = .290, p < .01$). The interaction term EPI_x_WBL was also positively correlated with WOMEN_MAN ($r = .363, p < .001$). Notably, EPI and LOG_GSYIH exhibited a high bivariate correlation ($r = .820$), reflecting the well-documented association between economic development and environmental performance. This collinearity is taken into account in the interpretation of Model 1 results below.

Table II: Pearson Correlation Matrix (N = 122)

<i>Variable</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1. WOMEN_MAN	1.00	.342**	.388**	.313**	.258**	.290**
2. EPI		1.00	.592**	.820**	.509**	.743**
3. WBL_SKOR			1.00	.506**	.681**	.489**
4. LOG_GSYIH				1.00	.401**	.827**
5. WOMEN_HR					1.00	.382**
6. WOMEN_EDUC						1.00

Note. ** $p < .01$ (2-tailed). Variable labels as in Table I.

4.2. Regression Results

Table III presents the results of the two regression models. Model 1 regressed WOMEN_MAN on EPI and three control variables. The model was statistically significant ($F(4, 117) = 4.393, p = .002$) and explained 13.1% of the variance ($R^2 = .131, \text{Adj. } R^2 = .101$). The EPI coefficient was positive but did not reach statistical significance ($B = 0.151, \beta = .189, p = .248$). This reflects the high collinearity between EPI and LOG_GSYIH ($r = .820$), which suppresses EPI's independently estimable variance when both are included without their institutional context. The effect of EPI is conditional on the legal framework—a pattern that emerges clearly in Model 2. None of the control variables reached conventional significance levels in Model 1. The Durbin-Watson statistic (2.019) indicated no residual autocorrelation.

Model 2 introduced WBL_SKOR and the EPI_x_WBL interaction term, substantially improving model fit: R² increased to .293 (Adj. R² = .256; F(6, 115) = 7.953, p < .001). In Model 2, EPI emerged as a highly significant positive predictor (B = 2.214, β = .348, p < .001), supporting H1. WBL_SKOR was also significant and positive (B = 1.106, β = .339, p < .001). The EPI_x_WBL interaction term was significant and negative (B = -0.023, β = -.372, p < .001), consistent with an institutional substitution effect. Among control variables, none reached significance in Model 2, suggesting that economic development and labour market variables lose independent explanatory power once EPI and WBL are modelled together.

Table III: Regression Results — Predictors of Women's Managerial Representation (N = 122)

<i>Variable</i>	<i>B</i>	<i>SE</i>	<i>β</i>	<i>t</i>	<i>p</i>	<i>VIF</i>
Model 1: Baseline (EPI + controls)						
(Constant)	15.494	8.175	—	1.895	.061	—
EPI	0.151	0.130	.189	1.162	.248	3.573
LOG_GSYIH	0.528	1.267	.076	0.417	.678	4.508
WOMEN_HR	0.071	0.062	.115	1.149	.253	1.352
WOMEN_EDUC	0.032	0.120	.042	0.270	.787	3.299
<i>R</i> ² = .131; <i>Adj. R</i> ² = .101; <i>F</i> (4,117) = 4.393; <i>p</i> = .002; <i>DW</i> = 2.019						
Model 2: Full moderation model						
(Constant)	-71.307	19.837	—	-3.595	<.001	—
EPI	2.214	0.495	.348*	4.475	<.001	62.214
WBL_SKOR	1.106	0.219	.339*	5.046	<.001	19.976
EPI_x_WBL (interaction)	-0.023	0.005	-.372*	-4.421	<.001	115.550
LOG_GSYIH	0.160	1.155	.023	0.139	.890	4.526
WOMEN_HR	-0.042	0.068	-.067	-0.616	.539	1.944
WOMEN_EDUC	0.066	0.110	.086	0.599	.550	3.359
<i>R</i> ² = .293; <i>Adj. R</i> ² = .256; <i>F</i> (6,115) = 7.953; <i>p</i> < .001; <i>DW</i> = 2.041						

Note. B = unstandardised coefficient; SE = standard error; β = standardised coefficient; VIF = Variance Inflation Factor; DW = Durbin-Watson. Model 1: EPI + controls. Model 2 adds WBL_SKOR and EPI_x_WBL interaction. * p < .001. The EPI_x_WBL VIF (115.55) is mathematically expected for a raw-score interaction term and does not indicate substantive collinearity [1][9].

4.3. Assumption Checks and Measurement Notes

Regression assumptions were systematically evaluated. The normal P-P plot showed points falling closely along the diagonal, supporting normality of residuals. The standardised residual scatterplot displayed random scatter around zero, supporting homoscedasticity. One outlier was identified (Case 55; Jordan; standardised residual = 3.309 in Model 2). Jordan's unusually high female managerial representation (63.91%) reflects the well-documented concentration of Jordanian female employment in the education sector, which inflates the ILO's SDG 5.5.2 indicator in that context [24]. This points to a broader limitation of the dependent variable: in countries where female employment is sectorally concentrated, the ILO indicator may overstate general female managerial representation and introduce country-specific noise. The case was retained as its exclusion did not alter the pattern of results. In Model 1, VIF values ranged from 1.35 to 4.51, well below the threshold of 10 [20]. The high VIF for EPI_x_WBL in Model 2 (115.55) is expected for an interaction term computed from raw scores [1][9].

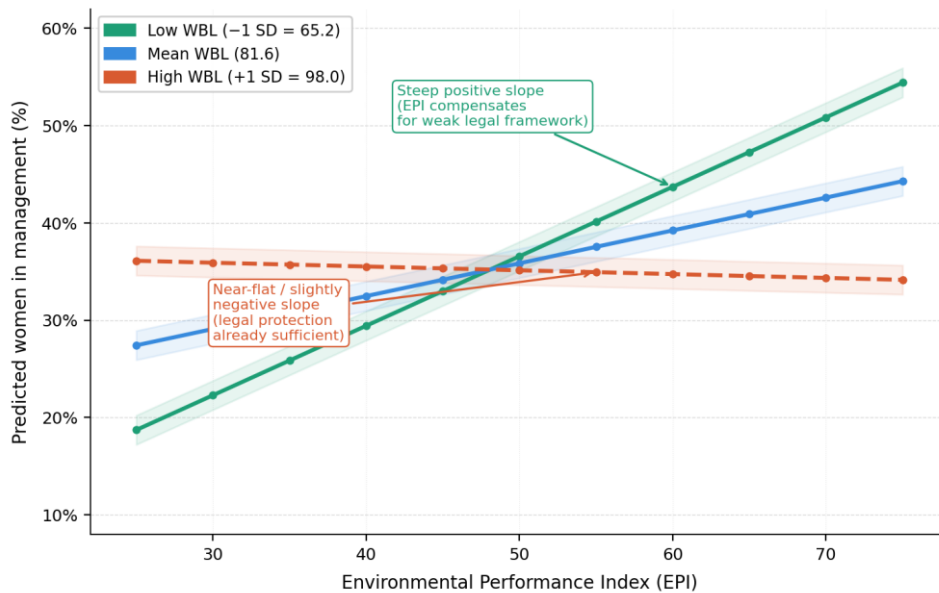


Figure 1. Predicted values of women's managerial representation (%) at three levels of WBL ($-1\text{ SD} = 65.2$, $\text{mean} = 81.6$, $+1\text{ SD} = 98.0$) across the observed EPI range. Controls held at sample means. Shaded bands = $\pm 1\text{ SE}$. The diverging slopes are consistent with an institutional substitution effect: EPI exerts a strong compensatory effect where legal protection is weak, and diminishing returns where legal frameworks are already strong.

V. DISCUSSION

The findings support H1 and provide a clear answer to H2—though not in the direction originally anticipated. We discuss each in turn, then consider the broader implications.

5.1. Environmental Performance and Women's Managerial Representation (H1)

Countries with higher environmental performance have, on average, a higher proportion of women in senior and middle management ($\beta = .348$, $p < .001$). This is consistent with both mechanisms proposed in the theoretical framework. The institutional quality argument holds that high-EPI countries possess the regulatory coherence and long-term governance capacity that independently support gender equality outcomes. The normative alignment argument holds that the post-materialist values underpinning environmental governance also generate isomorphic pressure on organizations to adopt inclusive management practices [26][27][14].

The fact that EPI was not significant in the baseline model ($\beta = .189$, $p = .248$) is worth explaining directly, because it might otherwise look like an inconsistency. It is not—it is a textbook case of what methodologists call specification-induced suppression. When two highly collinear predictors (EPI and log-GDP, $r = .820$) are entered simultaneously, their shared variance is distributed between them in ways that make neither appear individually significant, even when a true effect exists [1][9]. Cohen et al. [9] demonstrate this pattern extensively: a predictor can appear non-significant in one model specification and highly significant in another simply because of how correlated covariates are handled. The introduction of WBL and the interaction term in Model 2 changes the specification in a way that separates the conditional effect of EPI from the noise introduced by its correlation with GDP—allowing EPI's effect on female representation to emerge clearly. The core finding is that EPI's effect is real but conditional: it depends on the legal institutional context, and that conditionality is precisely what the study set out to examine.

This finding adds a new dimension to the existing cross-national literature on female managerial representation [32][39][40]. Previous studies have focused primarily on legal frameworks, cultural values, and economic development as macro-level predictors. This study shows that environmental governance capacity is an additional and independent predictor that existing frameworks have overlooked.

5.2. The Moderation Effect: Substitution, Not Complementarity (H2)

H2 predicted that WBL moderates the EPI–representation relationship. It does: the interaction term is significant ($\beta = -.372$, $p < .001$). But the direction is negative, not positive. This means that EPI's effect on female managerial representation is not stronger where legal frameworks are stronger—it is weaker. This is a substitution effect, not a complementarity effect, and it requires honest acknowledgment: the theoretical framing in Section 2.4 entertained both possibilities without prediction, and the data have clearly resolved the question in favour of substitution.

Figure 1 shows this clearly. Where WBL is weak (-1 SD = 65.2), the slope of EPI on female representation is steep and positive: as environmental performance increases, women's management share rises sharply. This is consistent with a compensatory mechanism—in the absence of strong coercive legal pressure, the normative signals from a country's environmental governance framework do meaningful work in pushing organizations toward greater gender inclusivity. Where WBL is at the mean (81.6), the slope is still positive but noticeably shallower. And where WBL is strong ($+1$ SD = 98.0), the predicted slope approaches zero and the line appears nearly flat—environmental performance adds essentially nothing to female managerial representation once legal protections are already strong.

This pattern makes institutional sense. Where organizations already face strong coercive isomorphic pressure from law, they have already responded to it. The additional normative pressure from environmental governance is redundant—it is pushing on a door that is already open. Where legal pressure is weak, that same normative pressure does real work. The two institutional forces compete for the same organizational response, and whichever is stronger gets there first. This is consistent with North's [33] general argument that different institutional arrangements can produce functionally equivalent outcomes, and with the empirical pattern documented by Hoch et al. [7] at the organizational level.

The practical implication is direct: for countries seeking to increase female managerial representation, the institutional marginal return to investment is highest in the weaker dimension. A country with strong environmental governance but weak legal protections will see larger gains from strengthening its legal framework than from further improving EPI. A country with strong legal protections but weak environmental governance may find that green transition investment carries an additional, indirect gender dividend.

5.3. The Role of Controls and the Jordan Anomaly

The non-significance of GDP per capita, female labour force participation, and female educational attainment in Model 2 is theoretically interesting. These are standard predictors in the cross-national gender diversity literature [39][40], and their loss of significance when EPI and WBL are included suggests that the explanatory work previously attributed to economic development may partly reflect the institutional quality that GDP captures indirectly. Once institutional predictors are modelled directly, GDP has less to add. This does not mean economic development is irrelevant—it means its effect may operate through institutional channels rather than independently.

The Jordan outlier (Case 55) is a reminder that the dependent variable has real measurement limitations. Jordan's figure of 63.91% female management share reflects a highly sector-specific pattern—women are managers primarily in the education sector, which dominates Jordanian female employment—rather than broad organizational gender equality [24]. This kind of sectoral concentration produces indicator readings that do not translate into the kind of cross-domain female advancement the research question is about. Future studies using sector-disaggregated data would be better positioned to isolate genuine managerial advancement from sectoral artefacts.

VI. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Several limitations should be kept in mind when interpreting these findings.

The cross-sectional design does not allow causal inference. The associations we document could reflect reverse causality—countries with more gender-equal organizations may develop stronger environmental governance—or both could be driven by unmeasured third variables such as general state capacity or political ideology. Panel data with fixed effects would help address this. The EPI and WBL datasets both contain annual or biennial time series, and a difference-in-differences design exploiting variation in WBL legal reforms [15] would be a natural next step for establishing causal direction.

The EPI is a composite measure, and it is possible that different components of environmental performance have different relationships with gender outcomes. Climate performance, ecosystem vitality, and environmental health are bundled together in a single score. Future research disaggregating the EPI could identify which aspects of environmental governance are most strongly connected to female managerial representation—and whether the substitution effect holds across all components or is driven by specific ones.

The WBL Index measures formal legal frameworks rather than actual enforcement. A country can have strong laws on paper while enforcement remains limited in practice. Research has shown that the effects of legal gender equality frameworks depend substantially on how they are implemented [7]. Future research incorporating de facto indicators of legal protection—such as litigation rates, enforcement agency capacity, or perceived legal effectiveness—would add important nuance to the moderation findings.

The regression models explain 29.3% of the variance in female managerial representation. A considerable share of the variance remains unaccounted for. Likely omitted factors include cultural values (such as Hofstede's

masculinity dimension), corporate board gender quota legislation [15], and the quality and availability of childcare infrastructure [4]. A more complete institutional model would incorporate these alongside EPI and WBL.

Finally, the substitution effect documented here may not hold equally across income levels. Ko and Leung [30] find that the gender–ESG relationship varies significantly by income group. In low-income contexts, where both environmental governance and legal frameworks are weak, the substitution dynamic may operate differently—or not at all, if neither institutional force has reached the threshold required to exert meaningful isomorphic pressure on organizations. Income-stratified analyses would be a valuable extension.

VII. CONCLUSION

This study has examined the relationship between national environmental performance and women's representation in senior and middle management across 122 countries. The central finding is straightforward: countries that perform better on environmental governance also tend to have higher proportions of women in management, and this effect operates through the institutional environment rather than through economic development or labour market conditions alone.

Three takeaways stand out. First, EPI is a significant positive predictor of female managerial representation when modelled within its legal institutional context ($\beta = .348, p < .001$ in Model 2). It does not appear significant in isolation—a pattern that reflects specification-induced suppression from EPI's high collinearity with GDP [1][9], not the absence of an effect. This introduces environmental governance as a novel macro-level predictor that the cross-national management literature has not previously considered, and it suggests that the effect of environmental governance on gender outcomes is conditional rather than universal: it operates through the institutional context, not independently of it.

Second, WBL moderates the EPI effect in a direction consistent with institutional substitution: EPI's positive effect is strongest where legal frameworks are weakest, and diminishes as legal protections grow stronger. This is not the complementarity pattern one might expect from two reinforcing institutional forces. Instead, the data suggest that environmental governance and legal protection compete for the same organizational response—and where one is already strong, the other has less to add. This is a theoretically meaningful finding with direct implications for how we model institutional interactions in cross-national research.

Third, and perhaps most practically relevant: the highest marginal return to institutional investment in gender equality is in the weaker dimension. For policymakers, this means that the green transition and the gender equality agenda are not simply parallel tracks—they are connected, and investment in one can partially substitute for gaps in the other, especially in contexts of weak legal frameworks.

As the green transition accelerates across the world, questions about who participates and who benefits from that transition are becoming more urgent. At the current pace of progress, gender parity in management will take close to a century [42]. The present study provides evidence that environmentally progressive national institutions are part of the story—not just as a parallel policy achievement, but as an institutional force that shapes the organizational opportunities available to women in management today.

ETHICAL STATEMENT AND USE OF ARTIFICIAL INTELLIGENCE

This study was conducted using publicly available secondary data that are open to all users. Therefore, there is no requirement for ethical approval.

During the preparation of this article, artificial intelligence was utilized in several stages, including determining which data to use and how to analyze them through idea exchange, identifying additional relevant studies, extracting the main arguments of these studies, and evaluating where they could be most effectively integrated into the text, as well as refining the English language, preparing the tables, and formatting the manuscript in accordance with the journal's guidelines. The advancement of technology is truly remarkable.

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