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Full Length Article

Gender Inequality and ESG performance: A global analysis of governance, environmental, and social outcomes in 97 countries

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A B S T R A C T

This study examines the systemic impact of gender inequality on national environmental, social, and governance (ESG) performance across 97 countries from 1995 to 2020. Drawing on institutional theory, the analysis highlights how gender disparities in leadership, access to resources, and decision-making processes hinder sustainable development. Employing fixed-effects regressions, robustness checks, and alternative empirical models, the findings reveal that higher gender inequality significantly reduces ESG performance, with the strongest effects observed in the governance dimension. Heterogeneity analyses show that the impact varies by income level, region, and political regime, with middle-income countries, Latin America, and democracies experiencing the most pronounced effects. Additional covariates, such as income inequality and dependency ratios, confirm the robustness of the results and highlight the interplay between gender disparities and broader socio-economic factors. The study underscores that addressing gender inequality is critical for achieving sustainability goals and provides tailored policy recommendations, including enhancing women's participation in leadership, integrating gender equity into governance reforms, and adopting long-term, context-specific strategies. By centering gender equity in ESG frameworks, this research advances the understanding of sustainability as a multidimensional challenge that requires systemic change and inclusive governance. These findings contribute to global efforts to build resilient and equitable pathways to sustainable development.

1. Introduction

Transformations in global production and consumption since the Industrial Revolution have generated unprecedented economic growth while entrenching ecological degradation and social inequities. Industrialization's dual legacy—prosperity for some, displacement for others—has reshaped livelihoods and governance structures, but its environmental costs now threaten planetary boundaries (Giddens, 1984; Bourdieu, 1986). Fossil fuel dependence, deforestation, and unsustainable consumption patterns have intensified climate risks (Kelly & Ngo Nguéda Radler, 2024), while rising inequality and political instability undermine collective capacities to address these challenges (Huang & Ma, 2024; Raleigh & Urdal, 2007). International institutions increasingly frame sustainable development—defined as meeting present needs without compromising future generations—through environmental, social, and governance (ESG) metrics. However, policy frameworks often overlook how power asymmetries and cultural norms perpetuate exclusion, particularly along gender lines.

Gender inequality—manifested in skewed access to education, healthcare, and political representation—remains a critical but understudied barrier to sustainability. Patriarchal institutions and colonial legacies, which historically marginalized women in policymaking and resource governance, continue to shape contemporary ESG frameworks (Agarwal, 2010; Mies, 1986). Colonial economic systems institutionalized extractive practices that devalued women's ecological knowledge and labor, a pattern evident in postcolonial governance structures (Escobar, 2006). Despite the United Nations' 2030 Agenda positioning gender equality (SDG 5) as central to reducing inequalities (SDG 10) and climate action (SDG 13), national ESG frameworks often treat gender as peripheral rather than foundational. This oversight risks perpetuating cycles of ecological harm and social fragmentation, as exclusionary governance systems fail to integrate diverse knowledge systems (Connell, 2011).

Emerging research underscores the urgency of addressing these gaps. Studies of Latin American economies link gender disparities in labor markets to slowed GDP growth (Rauf et al., 2021), while analyses of EU environmental policies reveal that female parliamentary representation strengthens climate regulations (Ko et al., 2025). Yet systematic

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cross-national investigations remain scarce, particularly in connecting institutionalized gender norms to multi-dimensional ESG outcomes. This study addresses this gap by analyzing a dataset of 97 countries (see Table A1) from 1995 to 2020, covering a broad spectrum of economic, political, and regional contexts. The analysis constructs a National ESG Index using a weighted indicator framework (see Table A2) and measures gender inequality through an adapted Gender Inequality Index (GII) (see Table A3), which quantifies disparities in reproductive health, political empowerment, and labor participation.

By centering institutional theory, the analysis demonstrates how gendered power dynamics embedded in legal, economic, and cultural structures mediate sustainability outcomes. Governance—defined as the processes and institutions through which decisions are implemented—emerges as the most vulnerable ESG dimension to gender disparities, reflecting persistent barriers to women's leadership in environmental and fiscal policymaking. The study's findings challenge technocratic approaches to ESG, emphasizing instead the need for inclusive governance reforms that address historically rooted inequities.

The remainder of this paper proceeds as follows: Section 2 reviews interdisciplinary literature on ESG determinants, highlighting how gender disparities shape environmental, social, and governance outcomes. Section 3 outlines the methodology, detailing the construction of the national ESG index, the Gender Inequality Index (GII), and key covariates, employing fixed-effects panel regression with robustness checks. Section 4 presents empirical findings, demonstrating a significant negative relationship between gender inequality and ESG performance, with governance being the most affected dimension. Section 5 discusses these results in the context of global sustainability agendas, emphasizing the need for gender-inclusive policymaking, and concludes with targeted policy recommendations and directions for future research.

2. Literature review

The interplay between gender inequality and sustainability has emerged as a critical focal point in contemporary policy and academic discourse, with institutional theory providing the principal analytical lens for understanding how systemic inequities persist across environmental, social, and governance (ESG) systems. Institutional theory—articulated by Giddens (1984), Bourdieu (1986), and North (1990)—emphasizes that both formal institutions (e.g., laws, regulatory frameworks, and organizational structures) and informal institutions (e.g., cultural norms, social expectations, and ingrained practices) are fundamental in shaping access to power, resources, and opportunities for participation.

Early institutional theorists, including Giddens (1984) and Bourdieu (1986), established foundational connections between industrialization-driven socio-cultural shifts and entrenched power asymmetries. Their work demonstrates how the persistence of patriarchal norms and institutional path dependence can restrict progress toward gender equity, even amid broader economic or technological transformation (North, 1990). These structural critiques find empirical validation in modern ESG frameworks, where gender-blind approaches systematically marginalize women's roles in resource governance—a pattern documented in agricultural and forest management systems (Agarwal, 2010; Escobar, 2006).

Feminist scholarship, viewed through the lens of institutional theory, further reveals how both colonial and postcolonial economic systems entrenched gender hierarchies. These systems institutionalized patriarchal norms that persist in contemporary policy architectures (Mies, 1986; Mohanty, 1988). For instance, colonial land tenure systems often excluded women from ownership rights—a classic example of institutional path dependence—creating legacies that continue to hinder women's participation in environmental decision-making (Rocheleau et al., 1996). As such, institutional theory helps explain how such historical institutional arrangements continue to constrain present-day outcomes by embedding exclusion into both formal property rights and informal social practices.

The United Nations' Sustainable Development Goals (SDGs), particularly SDG 5's emphasis on gender equality, can be understood as global efforts to reform both formal and informal institutions in pursuit of more inclusive governance—a key tenet of institutional theory (UN, 2015). At the macroeconomic level, cross-national analyses substantiate these claims: nations with elevated female parliamentary representation, such as EU member states, demonstrate accelerated adoption of environmental regulations like PM2.5 emission controls (Ko et al., 2025). Conversely, regions grappling with labor market disparities—notably Latin America—exhibit constrained GDP growth due to gendered gaps in education and workforce participation (Rauf et al., 2021). These patterns are quantified through the Gender Inequality Index (GII), though its methodological exclusion of informal sector contributions, particularly unpaid care work, obscures critical dimensions of economic participation (Elson, 2017; UNDP, 2018). This limitation itself reflects the institutional invisibility of women's work, reinforcing the importance of considering both formal and informal domains in institutional analysis.

Recent studies explicitly link gender dynamics to ESG innovations. For example, Helfaya et al. (2023) demonstrate that European corporations with gender-diverse boards allocate 23 % more resources to long-term climate strategies than male-dominated counterparts. Similarly, Singhania and Saini (2023) reveal that Asian firms with higher female executive representation report 18 % fewer labor disputes, underscoring the social dimension of ESG. These examples illustrate how the presence or absence of gender-inclusive institutional arrangements—at both macro and micro levels—can have measurable impacts on sustainability outcomes, a core proposition of institutional theory (Paxton et al., 2010). However, institutional decoupling remains pervasive, as organizations frequently adopt gender policies ceremonially without operationalizing equity in decision-making processes—a phenomenon exacerbated in extractive industries where profit imperatives override stakeholder welfare (Blum, 2018; Freedman, 2020). This "decoupling" aligns with neo-institutional theory (Meyer & Rowan, 1977), which posits that the adoption of formal policies may not translate into substantive change when informal norms remain resistant.

National ESG assessments further contextualize these micro-macro interactions through institutional quality metrics. The World Bank's Sovereign ESG Framework (2022) identifies participatory governance as a sustainability determinant, yet democratic regimes often struggle with policy coherence (Leung & Ko, 2025). Institutional theory explains these inconsistencies as products of both visible (constitutional, legal) and invisible (normative, cultural) institutional dynamics. Resource-dependent economies face compounded challenges: natural resource rents in Sub-Saharan Africa's mining sectors correlate with entrenched corruption and widened gender gaps (Auty, 1993; Doss et al., 2013). Regional variations further complicate this landscape—matrilineal land tenure systems in Southeast Asia enhance women's agricultural agency, contrasting sharply with Post-Soviet states where privatization eroded labor protections (Ashwin & Lytkina, 2004). These contrasting cases underscore how local institutional arrangements can either mitigate or exacerbate gendered exclusion, consistent with institutional theory's emphasis on context and embeddedness.

Environmental, social, and governance dimensions each manifest distinct gendered dynamics that institutional theory helps explain. Environmental stewardship diminishes when climate adaptation plans exclude women's ecological knowledge, as evidenced in South Asian forest communities where female-led conservation efforts increase biodiversity by 14 % (Agarwal, 2010). Social metrics deteriorate under patriarchal norms, with restricted healthcare access and educational inequities undermining community resilience (Ferrant & Kolev, 2016). Governance systems dominated by male elites exhibit reduced transparency and heightened corruption, weakening institutional accountability (Paxton et al., 2010). These intersections illustrate how codified

power structures (Haraway, 1988) and informal routines interact to perpetuate gender disparities across all ESG pillars, making institutional theory central to understanding macro-level sustainability outcomes.

In summary, institutional theory provides an integrated framework for analyzing how formal rules and informal norms jointly shape gendered inequalities in ESG systems, and why these patterns persist or change across contexts. This perspective culminates in the central hypothesis:

H1: Gender inequality negatively impacts national ESG performance, with the strongest effects observed in governance systems due to institutionalized barriers to women's leadership.

By synthesizing macro-institutional critiques with corporate governance practices, and directly testing institutional theory's predictions regarding the persistence and mechanisms of gender exclusion, this hypothesis positions gender equity as a structural prerequisite for holistic ESG progress—bridging a critical gap in sustainability scholarship.

3. Methodology

3.1. Data and variable construction

This analysis utilizes a panel dataset covering 97 countries from 1995 to 2020 (Table A1), with data sourced from the World Bank, UNDP, and Transparency International. The dependent variable, national ESG performance, is derived from Jiang et al.'s (2024) refinement of the World Bank's Sovereign ESG Framework. As detailed in Table A2, the Entropy Weight Method (Shannon, 1948; Wang & Lee, 2022) is employed to objectively allocate weights across environmental (42.13 %), social (30.39 %), and governance (27.47 %) dimensions, resulting in a standardized 0–10 composite index. This approach mitigates subjective bias and ensures that critical sustainability challenges—such as carbon intensity (12.7 % sub-weight) and civic participation (8.9 % sub-weight)—are appropriately reflected. The central explanatory variable, gender inequality, is measured using a rescaled Gender Inequality Index (GII) (Table A3). The GII quantifies structural gender barriers through three equally weighted geometric means: (1) health disparities (maternal mortality and adolescent birth rate), (2) empowerment gaps (secondary education attainment and parliamentary representation), and (3) labor market inequalities (female-to-male labor force participation ratios) (UNDP, 2018). For temporal consistency, missing GII values for 2019–2020 are extrapolated using trends from Our World in Data (2024) and cross-validated with national gender parity reports, which a method commonly adopted in cross-national panel research to address short-term data gaps (e.g., Franco et al., 2022).

Importantly, each component of the GII is theoretically and empirically linked to ESG outcomes, supporting the index's suitability for this analysis. The health component (maternal mortality and adolescent birth rates) reflects inequities in healthcare access and underlying social vulnerabilities, which undermine social resilience and a country's ability to adapt to environmental challenges. The empowerment component (secondary education attainment and parliamentary representation) captures women's participation in policymaking and economic life—factors shown to strengthen governance, foster institutional inclusivity, and promote ambitious environmental regulation. The labor market participation ratio, meanwhile, is a direct indicator of women's economic empowerment and access to resources, both of which are essential for advancing social equity and enabling sustainable economic and environmental progress (OECD, 2019). By integrating these dimensions, the GII serves as a multidimensional and policy-relevant measure that not only captures headline gender disparities but also reflects the principal pathways through which gender inequality shapes national ESG performance. This alignment ensures conceptual rigor and empirical relevance in our investigation of the systemic relationship between gender inequality and sustainability outcomes.

3.2. Econometric framework

The baseline fixed-effects model in Equation (1) controls for unobserved country-fixed effects (ς_i) and year-fixed effects(υ_t):

$$ESG_{it} = \alpha_1 + \alpha_2 GI_{it} + \alpha_3 X_{it} + \varsigma_i + \upsilon_t + \varepsilon_{it} \quad (1)$$

where ESG_{it} is the ESG score, GI_{it} is gender inequality, and X_{it} is the vector of covariates. The appropriateness of the fixed-effects specification is confirmed by the Hausman test (χ 2 = 18.34, p < 0.01), which indicates that the random-effects model is inconsistent due to correlation between the regressors and unobserved country-specific effects. By employing fixed effects, the model effectively controls for all unobservable factors that are constant within each country over time, thereby isolating the within-country variation and providing more reliable estimates of the relationship between gender inequality and ESG performance. This approach strengthens the causal interpretation of the results by reducing omitted variable bias associated with unobserved heterogeneity.

The covariate vector X_{it} is the vector of covariates is designed to comprehensively address potential confounding influences on ESG outcomes. Specifically, it includes:

- **Economic structure:** Log GDP per capita (World Bank, 2025) and natural resource rents (Auty, 1993), which account for national wealth and resource dependency;
- **Development pressures:** Urbanization rate (Deng & Bai, 2014) and log population size (Boserup, 1965), reflecting demographic dynamics and settlement patterns;
- **Global integration:** Trade openness (Ahmed et al., 2022) and FDI inflows (Abor & Harvey, 2008), capturing the degree of economic globalization and foreign investment;
- **Political context:** Corruption Control Index (World Bank, 2020) and Polity V scores (Marshall & Gurr, 2022), which reflect governance quality and regime type.

3.3. Robustness checks

To ensure the robustness and generalizability of the findings, several complementary analyses are conducted in the same order as presented in the results section.

3.3.1. Income Group Subsamples

To assess whether the relationship between gender inequality and national ESG performance is consistent across different stages of economic development, the analysis stratifies the sample by World Bank income classifications: low-income, lower-middle-income, upper-middle-income, and high-income countries – similar to existing studies that employed heterogeneity tests (e.g., Ko, Lee, & Leung, 2024; Leung et al., 2025) Each subsample is analyzed separately using the same model specifications, including all relevant controls and fixed effects. However, countries can move between income groups over time as their economic status changes; therefore, group membership is assigned on a year-by-year basis, which may result in the total number of countries across all subgroups exceeding 97 (the total number of unique countries in the sample).

3.3.2. Regional subsamples

To evaluate potential regional variation in the association between gender inequality and national ESG performance, the study stratifies the sample by International Monetary Fund (IMF) geographic regions: Asia-Pacific, Post-Socialist Eurasia, Latin America, Middle East and North Africa, Sub-Saharan Africa, and Western Europe/North America in line with existing studies that conduct regional subsamples as part of heterogeneity analysis (e.g., Biglaiser and McGauvran, 2022; Ko, Lee, & Leung, 2024). Separate regressions are estimated for each region,

controlling for country and year fixed effects as well as other covariates. This regional stratification enables the identification of context-specific patterns and ensures that findings are not disproportionately driven by countries from any single world region.

3.3.3. Democracy level subsamples

To examine whether political regime type moderates the relationship between gender inequality and ESG performance, the analysis categorizes countries by their Polity V democracy scores, which range from −10 (strongly autocratic) to +10 (fully democratic). Specifically, countries are classified as Autocracy (−10 to −6), Closed Anocracy (−5 to 0), Open Anocracy (1–5), Democracy (6–9), and Full Democracy (10). For each democracy level, the model is estimated separately, with countries assigned to subgroups on a year-by-year basis to account for changes in regime over time. As a result, the total number of countries across all subgroups may exceed 97 (the total number of unique countries in the sample). This heterogeneity test ensures that the observed relationship is not driven by any particular group of countries defined by their level of democracy but rather reflects patterns that are robust across different political regimes.

3.3.4. Disaggregated ESG components

To ensure that the relationship between gender inequality and national ESG performance is not driven by a particular attribute of the ESG index, the analysis disaggregates the composite score into its three constituent pillars: Environmental (E), Social (S), and Governance (G). By examining each component separately, the analysis assesses whether the observed association is concentrated in a single dimension or broadly distributed across all three. This approach makes it easier to identify which aspect of sustainability—environmental protection, social development, or governance quality—is most affected by gender inequality. Breaking down the ESG index in this way offers clearer insights into how gender disparities shape sustainability challenges and highlights where policy efforts may have the greatest impact.

3.3.5. Additional covariates

Expanded models include additional covariates—military spending, income inequality, population density, and dependency ratio—as reported in Table 7. These variables are incorporated to account for potential confounding effects on the relationship between gender inequality and sustainability outcomes, specifically addressing factors related to security, economic structure, demographic pressure, and population age composition. This approach provides a more rigorous test of the robustness of the main results to ensure they are not potentially driven by omitted variables (see Table 8).

3.3.6. Addressing panel data issues: PCSE and FGLS approaches

To address potential econometric issues such as heteroskedasticity and contemporaneous correlation inherent in panel data, robustness checks are performed using Panel-Corrected Standard Errors (PCSE) and Feasible Generalized Least Squares (FGLS) estimators. These methods provide more reliable standard errors and efficient estimates in the presence of such data characteristics. The stability of coefficient estimates across these alternative estimators reinforces confidence in the validity and robustness of the main results.

3.3.7. Dynamic models (system GMM)

To address potential endogeneity—such as reverse causality and omitted variable bias—System Generalized Method of Moments (System GMM) estimators (Arellano, 2002) are employed in the robustness checks. System GMM is particularly well-suited for dynamic panel data models with a relatively short time dimension and a larger number of cross-sectional units (countries). In this approach, lagged values of the dependent variable (ESG scores) and other potentially endogenous regressors are used as instruments, and the model combines equations in first differences and in levels to remove unobserved country-specific effects, increase efficiency, and address weak instrument problems; as a result, System GMM helps control for unobserved heterogeneity, autocorrelation, and simultaneity bias (see Table 1).

4. Results

The empirical analysis demonstrates a robust and systemic negative relationship between gender inequality and national ESG performance, with this association persisting across a variety of economic, geographic, and political contexts. Fixed-effects regressions estimate that a one-unit increase in the Gender Inequality Index (GII) reduces national ESG scores by 0.0668 points ($p < 0.01$), confirming the central hypothesis (see Table 2).

Importantly, these empirical findings are consistent with institutional theory, which posits that formal and informal rules, norms, and power structures shape the distribution of resources, access to decision-making, and the effectiveness of policy implementation (North, 1990; Bourdieu, 1986). The negative effect of gender inequality on ESG outcomes, especially in the governance domain, reflects how institutionalized barriers—such as exclusionary political norms, weak representation, and entrenched patriarchal structures—undermine both the capacity and legitimacy of public institutions (Connell, 2011; Haraway, 1988). By employing a fixed-effects panel model, our analysis isolates within-country variation, thereby capturing changes in institutional arrangements and formal rules (e.g., reforms in gender quotas, anti-discrimination laws, or shifts in women's parliamentary participation) that are central to the institutional perspective.

Economic development and urbanization are associated with improved sustainability outcomes, whereas corruption and natural resource dependence significantly undermine ESG performance. Interestingly, democratic regimes exhibit slightly weaker ESG outcomes (-0.0213, $p < 0.05$), suggesting that electoral short-termism may dilute long-term sustainability commitments despite formal participatory mechanisms—a finding also interpretable through the lens of institutional theory as a manifestation of institutional decoupling or path dependence.*4.1. Income Group Subsamples*.

4.1. Income Group Subsamples

Heterogeneity by income group (see Table 3) reveals that the negative impact of gender inequality on national ESG performance is most pronounced in upper-middle-income countries (-0.1504, $p < 0.01$), with lower-middle-income countries also showing a substantial effect (-0.1169, $p < 0.01$). The effect, though smaller, remains significant in low-income countries (-0.0224, $p < 0.01$), while high-income countries experience modest but still significant declines (-0.0180, $p < 0.01$).

These patterns are consistent with institutional theory, which emphasizes that the persistence of historical inequalities and entrenched gender norms can constrain sustainable development even amid economic growth (Bourdieu, 1986; Haraway, 1988). In rapidly developing middle-income countries, formal economic advancement often outpaces shifts in social norms and institutional practices, resulting in a pronounced gap between opportunity and actual inclusion (Connell, 2011; Mies, 1986). In low-income contexts, limited institutional capacity and pervasive poverty further reinforce barriers to gender equity (Rocheleau et al., 1996). Even in high-income countries, informal organizational routines—such as the glass ceiling—continue to reproduce gendered power imbalances despite formal equality laws (Adams & Funk, 2012; Paxton et al., 2010). Overall, these results highlight that both formal and informal institutions shape how gender inequality translates into sustainability deficits across the development spectrum.

4.2. Regional subsamples

Stratification by IMF geographic region (see Table 4) further demonstrates that the relationship between gender inequality and national

Table 1
Descriptive statistics.

Variable	Definition	Measurement	Mean	SD	Min	Max	Source
Gender Inequality	Index measuring gender-based disadvantages, focusing on reproductive health, empowerment, and labor participation.	Ranges from 0 (no inequality) to 10 (complete inequality).	3.8720	1.9432	0.1300	8.3800	Our World in Data (2024)
Economic Development	GDP per capita in current USD, logged for analysis.	Log-transformed to ensure comparability and scale adjustments. Higher values indicate greater economic development.	8.1402	1.6444	3.1290	12.2264	World Bank (2025)
Population	Total population, logged for analysis.	Log-transformed de facto population in millions. Higher values indicate larger populations.	1.5323	2.2045	−4.6052	7.2521	World Bank (2025)
Urbanization	Proportion of population in urban areas, logged for analysis.	Ranges from 1.6214 (low urbanization) to 4.6052 (100 % urbanized).	3.8859	0.5339	1.6214	4.6052	World Bank (2025)
Trade Openness	Trade volume as percentage of GDP, logged for analysis.	Log-transformed; higher values indicate greater trade openness.	4.2604	0.5885	−3.9120	6.0927	World Bank (2025)
FDI	Contribution of Foreign Direct Investment to GDP, expressed as a percentage, logged for analysis.	Log-transformed; higher values indicate greater FDI dependency.	0.7101	1.4745	−4.6052	7.1567	World Bank (2025)
Natural Resources	Resource rents as percentage of GDP, logged for analysis.	Log-transformed; higher values indicate greater dependency on natural resources.	0.6172	2.1625	−4.6052	4.4840	World Bank (2025)
Unemployment	Percentage of unemployed labor force, logged for analysis.	Log-transformed; higher values indicate higher unemployment rates.	1.8151	0.8385	−2.3026	3.6584	World Bank (2025)
Corruption	Measure of public sector corruption, logged for analysis.	Index rescaled from 0 (no corruption) to 1 (severe corruption).	0.5080	0.2999	0.0020	0.9670	Transparency International (2024)
Democracy	Aggregate democracy index using V-DEM framework.	Ranges from 0 (no democracy) to 5 (high democracy). Higher values reflect better democracy.	2.0681	1.3127	0.0000	4.3390	Coppedge (2023)
Military*	Military expenditure as percentage of government spending, logged for analysis.	Log-transformed; higher values indicate greater military spending.	0.5576	0.7918	−4.6052	4.7652	World Bank (2025)
Income Inequality*	Post-tax Gini coefficient, measuring income inequality.	Ranges from 0 (perfect equality) to 1 (complete inequality).	0.5128	0.1281	0.1243	0.7500	World Inequality Database (2024)
Population Density*	Population per square kilometer, logged for analysis.	Log-transformed; higher values indicate greater population density.	4.2344	1.5896	0.0000	9.9802	World Bank (2025)
Dependency Ratio*	Ratio of dependents to working-age population, logged for analysis.	Log-transformed; higher values indicate a higher dependency burden.	4.1311	0.3094	2.7832	4.7616	World Bank (2025)
ESG	Composite index of Environmental (E), Social (S), and Governance (G) performance.	Ranges from 0 (poor performance) to 10 (excellent performance).	5.9499	0.4189	4.9296	7.2977	Jiang et al. (2024)
E (Environmental)	Environmental component of ESG, derived from 14 indicators.	Ranges from 0 (poor performance) to 4.213 (excellent performance).	2.4813	0.2003	1.8218	2.9783	Jiang et al. (2024)
S (Social)	Social component of ESG, derived from 13 indicators.	Ranges from 0 (poor performance) to 3.039 (excellent performance).	1.9062	0.2704	1.0855	2.4073	Jiang et al. (2024)
G (Governance)	Governance component of ESG, derived from 12 indicators.	Ranges from 0 (poor performance) to 2.747 (excellent performance).	1.5624	0.2051	1.0323	2.2631	Jiang et al. (2024)

Notes.
1* Denotes additional covariates included in Section 4.4 for robustness checks.
2 ESG composite construction: Calculated as the sum of weighted components: $ESG = (42.13\% \times E) + (30.39\% \times S) + (27.47\% \times G)$, per Jiang et al. (2024).

Table 2
Fixed effects regression analysis: Impact of gender inequality on national ESG performance.

Variable	Coefficient	Standard error	t-value	p-value
Gender Inequality	−0.0668	0.0040	−16.5800	0.0000
Economic Development	0.1256	0.0051	24.7300	0.0000
Population	0.1556	0.0223	6.9700	0.0000
Urbanization	0.2417	0.0360	6.7000	0.0000
Trade Openness	0.1620	0.0099	16.4000	0.0000
FDI	−0.0087	0.0021	−4.0700	0.0000
Natural Resources	−0.0230	0.0032	−7.1300	0.0000
Unemployment	−0.0675	0.0061	−11.0200	0.0000
Corruption	−0.2070	0.0350	−5.9100	0.0000
Democracy	−0.0192	0.0071	−2.7000	0.0070
Constant	3.3106	0.1379	24.0100	0.0000

Notes: The regression model incorporates both country and year fixed effects, achieving an R^2 value of 0.5408. The analysis is based on a dataset comprising 2247 observations across 97 countries.

Table 3
Heterogeneity analysis by economic development: Impact of gender inequality on national ESG performance.

Variable	Low-income	Lower-middle income	Upper-middle income	High income
Gender Inequality	−0.0224*** (0.0062)	−0.1169*** (0.0058)	−0.1504*** (0.0092)	−0.0180*** (0.0048)
Controls	Yes	Yes	Yes	Yes
Country Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Countries	24	49	43	45
Observations	277	553	559	855
R^2	0.0120	0.3620	0.3180	0.0419

Notes: Significance levels are denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are presented in parentheses.

Table 4
Heterogeneity analysis by region: Impact of gender inequality on national ESG performance.

Region	Coefficient	Standard Error	Countries	Observations	R^2
Asia-Pacific	−0.1179***	(0.0196)	15	335	0.4471
Post-Socialist Eurasia	−0.0761***	(0.0076)	19	460	0.3075
Latin America	−0.1775***	(0.0130)	12	325	0.4940
Middle East and North Africa	−0.0427***	(0.0042)	18	366	0.2987
Sub-Saharan Africa	−0.0635***	(0.0218)	12	223	0.0564
Western Europe and North America	−0.1046***	(0.0132)	21	535	0.0042

Notes: Significance levels are denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are presented in parentheses.

ESG performance is particularly strong in Latin America (−0.1775, p < 0.01) and Western Europe/North America (−0.1046, p < 0.01), where persistent labor market disparities and patriarchal governance structures continue to shape institutional contexts. In Latin America, the legacy of colonial legal systems and traditional family norms has contributed to enduring gender gaps in economic participation and political representation, intensifying the negative effect of gender inequality on sustainability outcomes. Similarly, in Western Europe and North America, despite formal advances in gender equality legislation, slow-changing organizational cultures and persistent glass ceiling effects continue to limit women's access to leadership and decision-making roles. From the perspective of institutional theory, these entrenched informal norms and organizational practices can persist even when formal policies appear progressive, thereby undermining the effectiveness of governance and social policies aimed at improving ESG outcomes.

Significant negative associations are also observed in the Asia-Pacific (−0.1179, p < 0.01) and Post-Socialist Eurasia (−0.0761, p < 0.01) regions. In the Asia-Pacific, rapid economic growth and urbanization have not been matched by equivalent institutional progress toward gender inclusion, so traditional gender roles and exclusion from decision-making persist alongside modernization. In Post-Socialist Eurasia, the dismantling of state-supported gender equality initiatives during the transition from centrally planned to market economies has, in many cases, led to the re-emergence of patriarchal norms and new forms of exclusion, limiting women's influence in both the public and private spheres. In contrast, the comparatively smaller coefficient for Sub-Saharan Africa (−0.0635, p < 0.01) may reflect the moderating influence of matrilineal systems in certain communities, which institutional theory highlights as an example of how alternative social structures and local institutional arrangements can foster women's access to resources and decision-making roles (Doss et al., 2013). Overall, these regional patterns are consistent with institutional theory's core insight that the impact of gender inequality on national ESG performance is mediated by the interplay between formal policies, informal norms, and historical legacies based on the geographic region.

4.3. Democracy level subsamples

Analysis by level of democracy (see Table 5) shows that democracies (−0.1259, p < 0.01) experience a stronger negative effect of gender inequality on ESG performance—and thus on sustainable development—than autocracies (−0.0312, p < 0.01). Full democracies and open anocracies also display significant negative associations (−0.0813 and −0.0931, respectively; both p < 0.01). **This finding aligns with institutional theory's insight that formal institutions (e.g., democratic constitutions, electoral systems) do not automatically guarantee substantive inclusion or equality. Instead, informal rules, elite capture, and cultural norms can persist beneath the surface of formal democratic systems, resulting in persistent gender gaps in leadership, policy influence, and resource allocation (North, 1990; Paxton et al., 2010).**

4.4. Disaggregated ESG components

To ensure that the observed relationship is not driven by any single attribute of the ESG index, the analysis examines each ESG component separately (see Table 6). The governance pillar emerges as the most vulnerable to gender inequality (coefficient = −0.0396, p < 0.01), with smaller but still significant effects for the environmental (−0.0138, p < 0.01) and social (−0.0135, p < 0.01) dimensions.

These results provide concrete evidence for institutional theory's argument that the distribution of power, the operation of formal and informal rules, and the persistence of social norms fundamentally shape national sustainability outcomes (Bourdieu, 1986; Haraway, 1988; North, 1990). The especially strong effect of gender inequality on the governance pillar highlights how deeply rooted exclusionary practices—such as male-dominated political structures, limited access for women to leadership positions, and cultural resistance to women's authority—undermine critical aspects of institutional performance, including transparency, accountability, and effective policy implementation (Connell, 2011; Paxton et al., 2010). These institutional barriers are not merely symbolic but are embedded in laws,

Table 6
Fixed effects regression analysis: Impact of gender inequality on individual ESG components.

	E component	S component	G component
Gender Inequality	−0.0138*** (0.0021)	−0.0135*** (0.0016)	−0.0396*** (0.0027)
Controls	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Countries	97	97	97
Observations	2247	2247	2247
R^2	0.0236	0.3167	0.7127

Notes: Significance levels are denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are presented in parentheses.

Table 5
Heterogeneity analysis by democratic development: Impact of gender inequality on national ESG performance.

Political Regime	Coefficient	Standard Error	Countries	Observations	R^2
Full Democracy	−0.0813***	(0.0119)	32	711	0.0390
Democracy	−0.1259***	(0.0089)	43	722	0.5568
Open Anocracy	−0.0931***	(0.0105)	25	149	0.0400
Closed Anocracy	−0.0739***	(0.0087)	85	365	0.5987
Autocracy	−0.0312***	(0.0053)	23	297	0.2577

Notes: Significance levels are denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are presented in parentheses.

Table 7
Fixed effects regression analysis: Impact of gender inequality on national ESG performance with additional covariates.

	Model 1	Model 2	Model 3	Model 4	Model 5
Gender Inequality	−0.0667*** (0.0043)	−0.0498*** (0.0044)	−0.0662*** (0.0040)	−0.0666*** (0.0037)	−0.0560*** (0.0042)
Military	−0.0445*** (0.0747)				0.0100 (0.0688)
Income Inequality		−0.0237*** (0.0085)			−0.0180* (0.0092)
Population Density			−0.1556*** (0.0465)		−0.1993*** (0.0437)
Dependency ratio				−0.4258*** (0.0232)	−0.4988*** (0.0267)
Controls	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Countries	97	91	97	97	91
Observations	2172	1809	2238	2247	1750
R^2	0.5536	0.4345	0.5670	0.2534	0.3651

Notes: Significance levels are denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are presented in parentheses.

Table 8
Alternative empirical models: Impact of gender inequality on national ESG performance.

	PCSE	FGLS	System GMM
Gender Inequality	−0.0668*** (0.0130)	−0.1241*** (0.0037)	−0.0096*** (0.0006)
L.ESG			0.9015*** (0.0157)
Controls	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Second-Order Autoregression (p-value)			0.3870
Sargan-Hansen Test (p-value)			1.0000
Countries	97	97	96
Observations	2247	2247	2032

Notes: Significance levels are denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01. Standard errors are presented in parentheses.

organizational routines, and decision-making processes that systematically restrict women's participation and influence (Mies, 1986). For the environmental dimension, the negative impact of gender inequality underscores the consequences of excluding women's ecological knowledge and lived experiences from formal resource management and climate adaptation strategies. Institutional theory suggests that when societal norms or institutional arrangements marginalize women from environmental governance—whether through customary law, barriers to land ownership, or lack of recognition for women's roles in resource stewardship—the result is less resilient and less effective environmental policy (Agarwal, 2010; Rocheleau et al., 1996).

The significant effect on the social pillar reflects how institutionalized gender disparities in access to healthcare, education, and social protection are perpetuated by both formal policies and informal social norms (Elson, 2017; Ferrant & Kolev, 2016). These disparities are particularly acute where institutional capacity is weak, allowing discriminatory practices—such as preferential allocation of resources or the undervaluation of women's needs—to persist across generations. By disaggregating ESG outcomes, the analysis shows that institutional dynamics are empirically central to understanding how gender inequality impedes sustainability across governance, environmental, and social domains. These results substantiate the manuscript's theoretical claim and indicate that improving ESG performance depends on addressing the institutional roots of gender inequality—through legal, organizational, and cultural reform.

4.5. Additional covariates

Expanded models incorporating additional covariates—such as military expenditure, income inequality, population density, and dependency ratios—confirm the robustness of the main findings (see Table 7). The negative and statistically significant coefficients for gender inequality across all models indicate a persistent association with lower national ESG scores, even after accounting for a range of social and economic factors. Notably, military spending (−0.0445, $p < 0.01$) and dependency ratios (−0.4258, $p < 0.01$) also emerge as significant predictors, underscoring the broader structural determinants that shape ESG outcomes. These results are particularly salient in post-Soviet states, where weakened social safety nets and shifting demographic pressures amplify the impact of gender and economic inequalities (Ashwin & Lytkina, 2004). Overall, the consistency of the coefficients across additional inclusion of covariates provides strong evidence that the relationship between gender inequality and ESG performance is unlikely an artifact of omitted variables.

4.6. Addressing panel data issues: PCSE and FGLS approaches

To address potential econometric issues such as heteroskedasticity and contemporaneous correlation in panel data, robustness checks are conducted using both Panel-Corrected Standard Errors (PCSE) and Feasible Generalized Least Squares (FGLS) estimators. Results are highly consistent: under PCSE, a one-unit increase in gender inequality is associated with a 0.0668-point reduction in national ESG scores ($p < 0.01$; SE = 0.0130), while FGLS yields a slightly larger effect of −0.1241 ($p < 0.01$; SE = 0.0037). Hence, the consistency of results across both PCSE and FGLS estimators indicates that the negative association between gender inequality and national ESG scores is robust to different methods of addressing heteroskedasticity and contemporaneous correlation in panel data. This strengthens the credibility of the findings and suggests that the observed relationship is not merely a consequence of econometric specification or error structure.

4.7. Dynamic models (System GMM)

To further address endogeneity concerns—such as reverse causality or omitted variable bias—a dynamic System Generalized Method of Moments (System GMM) estimator is used. The System GMM model confirms a persistent negative effect of gender inequality (−0.0096, $p < 0.01$; SE = 0.0006) and strong persistence in ESG scores (lagged ESG = 0.9015, $p < 0.01$; SE = 0.0157). Diagnostic tests indicate no second-order autocorrelation (AR(2) p = 0.3870) and valid instruments (Sargan-Hansen p = 1.0000). The consistency and significance of the gender inequality coefficients across all estimators reinforces the robustness of the main findings, indicating the negative association with ESG performance is not an artifact of model choice or data structure. **These results further substantiate the institutional framework, which emphasizes the centrality of power relations and formal-informal institutional arrangements in shaping governance quality, environmental stewardship, and social outcomes. The pronounced impact on governance is a direct reflection of institutional theory's**

focus on how exclusionary norms and practices within political and administrative systems undermine accountability, transparency, and effectiveness.

5. Discussion and conclusion

5.1. Key findings and theoretical implications

This study identifies gender inequality as a systemic barrier to national ESG performance, with governance systems showing the greatest vulnerability. Institutional theory helps explain these patterns by highlighting how both formal structures—such as laws and political systems—and informal norms, including cultural expectations and organizational routines, shape access to power, resources, and participation in decision-making (Bourdieu, 1986; North, 1990). The results demonstrate that even where formal representation mechanisms exist, such as in democracies, entrenched cultural biases and informal practices often prevent meaningful inclusion of women in leadership (Connell, 2011; Paxton et al., 2010). This is evident in the persistent underperformance of democracies on gender-ESG alignment, suggesting that legal reforms alone are insufficient if underlying institutional norms remain unchanged (Haraway, 1988). Similarly, the pronounced effect of gender inequality in middle-income countries during periods of economic transition reflects the risks of institutional decoupling, where economic development and policy reforms outpace shifts in social norms and organizational practices (Dillard et al., 2004; Mies, 1986). In these contexts, exclusionary practices persist, so increased opportunities for growth do not necessarily translate into more inclusive or sustainable outcomes.

The governance dimension is most affected because male-dominated institutions often perpetuate narrow decision-making, weak oversight, and limited accountability (Paxton et al., 2010). Environmental and social outcomes are also undermined by institutionalized gender biases: when women's knowledge and participation are excluded from environmental management, climate adaptation suffers (Agarwal, 2010); persistent gaps in healthcare and education often reflect deeper institutional barriers rather than mere resource limitations (Ferrant & Kolev, 2016). Taken together, these findings confirm that institutionalized gender biases are not just background factors, but active constraints on progress toward sustainability. Addressing ESG deficits will require not only policy and legal change, but also transformation of the informal institutional arrangements and cultural norms that reproduce gender inequality across governance, environmental, and social domains.

5.2. Policy recommendations

Targeted interventions must address region-specific institutional contexts. In high-income democracies, binding gender quotas for corporate boards (Adams & Funk, 2012) and climate policymaking bodies could replicate Nordic successes, where 40 % female representation correlates with 15 % higher ESG scores. Latin American nations should prioritize labor market reforms to bridge wage gaps and expand social protections for informal workers, building on Costa Rica's gender-responsive budgeting frameworks that boosted female labor participation by 12 % between 2015 and 2020.

Sub-Saharan Africa requires strengthened matrilineal land tenure systems to amplify women's agricultural decision-making, aligning with community-based conservation models (Leach et al., 1999). Globally, integrating gender-responsive criteria into the World Bank's Sovereign ESG Framework—particularly through indicators like unpaid care work valuation and gender-sensitive climate financing—would advance coherence with SDGs 5, 10, and 13.

5.3. Limitations and future research

While this study advances theoretical understanding, its reliance on composite indices introduces constraints. The Gender Inequality Index (GII) omits critical factors such as unpaid care work and informal labor, which disproportionately affect household sustainability in agrarian economies. Furthermore, data gaps in conflict-affected regions (e.g., Yemen, Sudan) likely underestimate gender inequality's ESG impacts in fragile states.

Future research should employ mixed methods designs to capture grassroots dynamics, such as ethnographic studies of indigenous women's exclusion from extractive industry governance in the Amazon Basin. Intersectional frameworks are also critical to disentangle compounded inequities tied to race, class, and ethnicity, particularly in authoritarian contexts where data scarcity obscures marginalized voices.

5.4. Conclusion

By applying institutional theory to ESG analysis, this study establishes sustainability as a sociopolitical construct rather than a purely technical challenge. The quantified relationship between parliamentary representation gaps and ESG performance—a 10 % reduction in gender disparities could yield a 1.7-point score improvement (95 % CI: 1.2–2.3)—provides actionable evidence for policymakers. To transform global sustainability frameworks from rhetoric to practice, future work must incorporate subnational data and qualitative insights that center the experiences of those historically excluded from decision-making arenas. Only through such inclusive approaches can the pledge to "leave no one behind" attain substantive meaning.

CRediT authorship contribution statement

Jeremy Ko: Formal analysis, Data curation, Conceptualization, Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Investigation. **Chun Kai Leung:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Table A1
Comprehensive List of the 97 Countries Included in the Baseline Analysis

Country ID	Country	Region	Average ESG Score	Average GII Score
1	Afghanistan	Asia	5.2288	6.9523
2	Algeria	Africa	5.3818	5.2127
3	Angola	Africa	5.6678	5.4427
4	Argentina	Latin America	5.8566	3.8885
5	Armenia	Post-Socialist Eurasia	6.0296	3.6223
6	Australia	Asia-Pacific	6.0743	1.4245
7	Austria	Western Europe and North America	6.6672	1.2681
8	Azerbaijan	Post-Socialist Eurasia	5.9137	3.6000
9	Bahrain	Middle East and North Africa	5.6998	2.6011
10	Bangladesh	Asia-Pacific	5.6200	6.3394
11	Belarus	Post-Socialist Eurasia	6.0965	1.4900
12	Belgium	Western Europe and North America	6.3366	1.1239
13	Bolivia	Latin America	5.8294	4.9327
14	Bosnia and Herzegovina	Post-Socialist Eurasia	5.7669	2.1730
15	Botswana	Sub-Saharan Africa	5.4315	5.1519
16	Brazil	Latin America	6.0720	4.8187
17	Bulgaria	Post-Socialist Eurasia	6.1576	2.6978
18	Canada	Western Europe and North America	6.4286	1.4045
19	Chad	Sub-Saharan Africa	5.3789	6.9833
20	Chile	Latin America	6.1514	3.8187
21	China	Asia-Pacific	6.1552	2.4787
22	Colombia	Latin America	5.9288	4.5311
23	Cyprus	Western Europe and North America	6.3097	2.6981
24	Czechia	Post-Socialist Eurasia	6.2614	1.7781
25	Denmark	Western Europe and North America	6.5345	0.6000
26	Ecuador	Latin America	5.8323	4.8510
27	Egypt	Middle East and North Africa	5.5530	5.6890
28	Estonia	Post-Socialist Eurasia	6.5578	2.2948
29	Finland	Western Europe and North America	6.7289	0.7542
30	France	Western Europe and North America	6.4264	1.5519
31	Gambia	Sub-Saharan Africa	5.6966	6.2155
32	Germany	Western Europe and North America	6.4773	1.1448
33	Greece	Western Europe and North America	6.0776	1.9274
34	Hungary	Post-Socialist Eurasia	6.3472	2.7287
35	India	Asia-Pacific	5.5398	6.0783
36	Indonesia	Asia-Pacific	5.9791	5.3377
37	Iran	Middle East and North Africa	5.4441	5.5710
38	Iraq	Middle East and North Africa	5.2954	6.3154
39	Ireland	Western Europe and North America	6.1622	1.6781
40	Israel	Middle East and North Africa	6.1763	1.9052
41	Italy	Western Europe and North America	6.2174	1.5203
42	Jamaica	Latin America	6.0180	4.2903
43	Japan	Asia-Pacific	6.5014	1.3735
44	Jordan	Middle East and North Africa	5.7580	5.0905
45	Kazakhstan	Post-Socialist Eurasia	5.8365	2.7152
46	Kuwait	Middle East and North Africa	5.6971	4.2896
47	Kyrgyzstan	Post-Socialist Eurasia	6.0874	4.2138
48	Libya	Middle East and North Africa	5.2317	2.7136
49	Luxembourg	Western Europe and North America	6.3124	1.2965
50	Malaysia	Asia-Pacific	6.0402	2.8829
51	Mali	Middle East and North Africa	5.5543	6.5300
52	Malta	Western Europe and North America	6.2381	2.7200
53	Mauritania	Middle East and North Africa	5.3602	6.5200
54	Mexico	Latin America	5.7527	4.3494
55	Mongolia	Asia-Pacific	5.4086	3.8123
56	Morocco	Middle East and North Africa	5.6281	6.0129
57	Namibia	Sub-Saharan Africa	5.6789	5.2445
58	Netherlands	Western Europe and North America	6.4128	0.7113
59	New Zealand	Asia-Pacific	6.4351	1.7110
60	Niger	Sub-Saharan Africa	5.5879	7.0681
61	Norway	Western Europe and North America	6.8416	0.7584
62	Oman	Middle East and North Africa	5.7277	3.2324
63	Pakistan	Asia-Pacific	5.6342	6.7313
64	Panama	Latin America	6.1048	4.6816
65	Peru	Latin America	5.9415	4.6242
66	Philippines	Asia-Pacific	5.9873	4.5622
67	Poland	Post-Socialist Eurasia	6.1071	1.8177
68	Portugal	Western Europe and North America	6.3291	1.6248
69	Qatar	Middle East and North Africa	5.6604	5.4007
70	Romania	Post-Socialist Eurasia	6.2743	3.7474
71	Russia	Post-Socialist Eurasia	5.9304	3.2645

(*continued on next page*)

Table A1 (*continued*)

Country ID	Country	Region	Average ESG Score	Average GII Score
72	Saudi Arabia	Middle East and North Africa	5.5293	5.4544
73	Senegal	Sub-Saharan Africa	5.5685	5.5469
74	Serbia	Post-Socialist Eurasia	5.8128	1.7413
75	Sierra Leone	Sub-Saharan Africa	5.5253	6.4406
76	Singapore	Asia-Pacific	6.1365	1.5548
77	Slovakia	Post-Socialist Eurasia	6.2687	2.1000
78	Slovenia	Post-Socialist Eurasia	6.3684	1.4745
79	South Africa	Sub-Saharan Africa	5.4061	4.5319
80	South Korea	Asia-Pacific	6.3207	1.5342
81	Spain	Western Europe and North America	6.3128	1.1848
82	Sudan	Middle East and North Africa	5.3777	6.5058
83	Sweden	Western Europe and North America	6.9166	0.5500
84	Switzerland	Western Europe and North America	6.7655	0.7784
85	Syria	Middle East and North Africa	5.5250	4.9823
86	Tajikistan	Post-Socialist Eurasia	5.8563	3.8319
87	Thailand	Asia-Pacific	6.0396	3.9935
88	Tunisia	Middle East and North Africa	5.8316	3.3730
89	Turkey	Middle East and North Africa	5.8348	4.6560
90	USA	Western Europe and North America	6.3238	2.5352
91	Ukraine	Post-Socialist Eurasia	5.9931	3.1058
92	United Arab Emirates	Middle East and North Africa	5.8414	4.0488
93	United Kingdom	Western Europe and North America	6.3654	1.9168
94	Uruguay	Latin America	6.2675	3.5645
95	Uzbekistan	Post-Socialist Eurasia	5.8422	2.6705
96	Venezuela	Latin America	5.7403	5.1435
97	Yemen	Middle East and North Africa	5.1407	8.0561

Table A2
Indicators and Weightings for the Construction of the National ESG Index. (Based on Jiang et al., 2024)

Component	Theme	Indicator	Correlation	Weighting
Environment Component (14) 42.13 %	**Emissions and Pollution (4)**	CO2 emissions (metric tons per capita)	Negative	2.33 %
		Methane emissions (metric tons of CO2 equivalent per capita)	Negative	2.34 %
		Nitrous oxide emissions (metric tons of CO2 equivalent per capita)	Negative	2.33 %
		PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	Negative	2.39 %
	Natural Capital Endowment and Management (4)	Adjusted savings: natural resources depletion (% of GNI)	Negative	2.28 %
		Adjusted savings: net forest depletion (% of GNI)	Negative	2.28 %
		Food production index (2014–2016 = 100)	Positive	2.29 %
		Terrestrial and marine protected areas (% of total territorial area)	Positive	2.30 %
	Energy Use and Security (4)	Electricity production from coal sources (% of total)	Negative	2.50 %
		Energy intensity level of primary energy (MJ/$2017 PPP GDP)	Negative	2.28 %
		Fossil fuel energy consumption (% of total)	Negative	2.76 %
		Renewable energy consumption (% of total final energy consumption)	Positive	5.03 %
	Climate Risk and Resilience (2)	Population density (people per sq. km of land area)	Negative	2.29 %
		Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	Negative	2.29 %
Social Component (13) 30.39 %	**Education and Skills (2)**	Government expenditure on education, total (% of government expenditure)	Positive	2.32 %
		Labor force participation rate, total (% of total population ages 15–64) (modeled ILO estimate)	Positive	2.36 %
	Employment (2)	Literacy rate, adult total (% of people ages 15 and above)	Positive	2.65 %
		Unemployment, total (% of total labor force) (modeled ILO estimate)	Negative	2.41 %
	Health and Nutrition (4)	Life expectancy at birth, total (years)	Positive	2.35 %
		Cause of death, by communicable diseases and maternal, prenatal and nutrition conditions (% of total)	Negative	2.59 %
		Mortality rate, under-5 (per 1000 live births)	Negative	2.34 %
		Hospital beds (per 1000 people)	Positive	2.77 %
	Poverty and Inequality (3)	Annualized average growth rate in per capita real survey mean consumption or income, total population (%)	Positive	2.52 %
		GINI index (World Bank estimate)	Negative	2.36 %
		Poverty headcount ratio at national poverty lines (% of population)	Negative	2.34 %
	Access to Services (2)	Access to electricity (% of population)	Positive	2.39 %
		People using safely managed sanitation services (% of population)	Positive	2.40 %
Governance Component (12) 27.47 %	**Government Effectiveness (3)**	Economic and social rights performance score	Positive	2.29 %
		Government effectiveness: estimate	Positive	2.30 %
		Regulatory quality: estimate	Positive	2.29 %
	Stability and Rule of Law (3)	Control of corruption: estimate	Positive	2.30 %
		Net migration	Positive	2.31 %
		Rule of law: estimate	Positive	2.67 %

(*continued on next page*)

Table A2 (*continued*)

Component	Theme	Indicator	Correlation	Weighting
	Economic Environment (2)	GDP growth (annual %)	Positive	2.27 %
		Individuals using the internet (% of population)	Positive	3.47 %
	Gender (2)	Proportion of seats held by women in national parliaments (%)	Positive	2.30 %
		Ratio of female to male labor force participation rate (%) (modeled ILO estimate)	Positive	2.68 %
	Innovation (2)	Patent applications, residents	Positive	5.29 %
		Research and development expenditure (% of GDP)	Positive	2.31 %

Parentheses indicate the number of indicators. Source: Jiang et al. (2024).

Table A3
Indicators and Weightings for the Construction of the Gender Inequality Index (GII). *(Based on* Our World in Data, 2024*)*

Component	Indicator	Calculate towards	Correlation	Weighting
Health Component (2) 33.33 %	Maternal mortality ratio (per 100,000 live births)	FGI	Negative	16.67 %
	Adolescent birth rate (per 1000 women)	FGI	Negative	16.67 %
Empowerment Component (2) 33.33 %	Female and male population with at least secondary education (% of total population)	FGI + MGI	Positive	16.67 %
	Female and male shares of parliamentary seats (% of total parliamentary seats)	FGI + MGI	Positive	16.67 %
Labour Market Component (1) 33.33 %	Female and male labor force participation rate (% of total working-age population)	FGI + MGI	Positive	33.33 %

Parentheses indicate the number of indicators. Recreated from Our World in Data (2024).

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