Sustainable Development

WILEY

Sustainable Development

RESEARCH ARTICLE

Comparative Determinants of Global Competitiveness: Governance, Social Progress, and Economic Trade-Offs

Naduni Kalansuriya[1] | Ruwan Jayathilaka[2]

[1]SLIIT Business School, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka | [2]Department of Information Management, SLIIT Business School, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka

Correspondence: Ruwan Jayathilaka (ruwan.j@sliit.lk; ruwanips@gmail.com)

Received: 1 November 2024 | **Revised:** 30 March 2025 | **Accepted:** 31 March 2025

Funding: The authors received no specific funding for this work.

Keywords: corruption | environmental performance | global competitiveness | human development | ordered probit regression | per capita GDP | social progress | trade openness

ABSTRACT

This study analyses the determinants of global competitiveness in 2018 and 2023, focusing on governance, social progress, economic dynamics, sustainability, and human development. Using an Ordered Probit Regression model, countries are classified into low, middle, and high competitiveness tiers, enabling a structured assessment of how these factors influence rankings over time. The results indicate that reducing corruption and improving social progress are key to enhancing competitiveness across all tiers, as governance quality and human capital investment significantly impact economic advancement. Environmental performance and trade openness present trade-offs: while they support long-term growth, they impose short-term costs, particularly in highly competitive economies. Human development emerges as a consistent driver of upward mobility, emphasising the importance of sustained investment in education and healthcare. This study contributes uniquely by providing a two-year comparative analysis and employing an Ordered Probit Model to assess competitiveness, offering deeper insights into how countries transition between tiers. The findings highlight the need for tailored policy approaches: low-tier nations should prioritise institutional reforms, middle-tier economies should focus on innovation-driven growth, and advanced economies must balance environmental policies with economic sustainability. These insights provide valuable guidance for policymakers navigating global economic transitions.

1 | Background

In an increasingly interconnected global economy, factors determining national competitiveness have evolved, reflecting a growing interdependence among countries. The movement of goods, services, and capital across borders has expanded considerably, making it essential to understand the dynamic interplay of elements that shape global competitiveness. Governance and social factors, economic dynamics, and sustainability and human development have emerged as key determinants in this complex landscape, particularly influencing how nations maintain and enhance their global standing. This study aims to conduct a comparative analysis of the impact these factors had on international competitiveness in 2018 and 2023, examining how the changes over this period reflect broader economic and social changes. Corruption is a significant barrier to economic progress, distorting market mechanisms, reducing investment, and weakening institutional integrity (Uroos et al. 2022). High levels of corruption create inefficiencies in resource allocation, lowering productivity and ultimately diminishing national competitiveness (Mondjeli et al. 2024). On the other hand, social progress, which includes education, health, and social inclusion, plays a vital role in fostering human capital and innovation. Nations that prioritise social progress through inclusive policies tend to experience higher economic growth and competitiveness (Pereira Munhoz Junior et al. 2022). Furthermore, Barth

et al. (2021) emphasise the direct link between social progress and economic resilience, highlighting its role in strengthening a nation's global standing. Given the strong interdependence between corruption and social progress, these factors collectively shape institutional effectiveness and economic stability. Thus, they can be understood under the broader concept of Governance and social factors, reflecting their combined influence on global competitiveness.

Trade openness, defined by the balance of a country's exports and imports, is a crucial determinant of global competitiveness. It enhances production efficiency, broadens market access, and fosters economic growth by integrating nations into the global economy (Pilinkiene 2016) emphasise that well-structured trade policies and deeper market integration are essential for sustaining a competitive edge in an increasingly interconnected world. Similarly, per capita GDP serves as a key indicator of a nation's economic strength, reflecting income levels, living standards, and overall financial stability. A higher per capita GDP is associated with greater economic resilience and investment attractiveness, further reinforcing a country's global standing (Kalansuriya et al. 2023; Kordalska and Olczyk 2016). Given their strong interconnection, trade openness and per capita GDP collectively shape a nation's economic landscape, influencing productivity, market dynamics, and long-term competitiveness. These factors can be grouped under the broader concept of Economic Dynamics, highlighting their combined role in sustaining economic activity and strengthening a nation's position in the global market.

Environmental performance has become a key determinant of national competitiveness, particularly in the context of sustainable development. Countries with strong environmental policies are better positioned to attract green investments and drive innovation in sustainable technologies, reinforcing long-term economic resilience (Silva et al. 2024; Zhang et al. 2024). As nations transition toward low-carbon economies, environmental sustainability increasingly shapes their competitive standing (Abbass et al. 2025; Ali et al. 2022). Similarly, human development, measured by factors such as life expectancy, education, and living standards, plays a crucial role in fostering innovation, productivity, and sustained economic growth (Celik and Kostekci 2025). Countries with higher Human Development Index (HDI) scores tend to exhibit greater economic stability and competitiveness (Hamid 2019; Lonska and Boronenko 2015). Given the strong interplay between environmental performance and human development, these elements converge within the broader framework of Sustainability and Human Development, highlighting their collective impact on long-term economic resilience and global competitiveness. Our research brings novelty by distinguishing itself from previous studies by bridging vital gaps in the literature in four impactful ways: First, while prior research predominantly examines corruption, social progress, environmental performance, and economic indicators in isolation, this study is the first to simultaneously assess their collective impact on global competitiveness. By integrating these key determinants into a unified framework, our analysis provides a systematic, cross-sectoral perspective that reveals the complex interdependencies shaping national competitiveness. Utilizing data from 43 countries, this study offers a robust cross-national evaluation, moving beyond fragmented insights and presenting a comprehensive empirical model of competitiveness.

Second, unlike conventional studies that treat competitiveness as a single continuous variable, this research introduces a three-tiered classification: low, moderate, and high competitiveness to capture the nonlinear effects of corruption, environmental policies, and socio-economic factors. This methodological advancement enables a granular examination of how each determinant influences nations at different levels of competitiveness, uncovering patterns that traditional linear models fail to detect. By differentiating between competitiveness tiers, this study enhances policy relevance, allowing for more precise and context-specific recommendations.

Third, this study is one of the first to provide a direct comparative assessment of global competitiveness before and after the COVID-19 pandemic, using 2018 and 2023 data. While existing literature primarily focuses on either pre- or post-pandemic trends separately, our research bridges this gap by identifying structural shifts in competitiveness. Specifically, this research analyzes how changes in corruption levels, environmental policies, and economic conditions reshaped global competitiveness dynamics in the wake of the pandemic, offering crucial insights into the long-term effects of global crises on national economies.

Finally, unlike prior studies that rely on traditional regression techniques and broad policy recommendations, this research employs Ordered Probit Regression, a statistical approach that accounts for the ordinal nature of competitiveness categories. This method allows for the identification of distinct policy levers for each competitiveness tier, ensuring that recommendations are not one-size-fits-all but instead tailored to the specific needs of low-, moderate-, and high-competitiveness nations. This analytical precision enhances the study's practical utility, providing actionable strategies for policymakers to strengthen national competitiveness effectively.

Consequently, it is evident that the research addresses critical gaps in the existing literature on global competitiveness by incorporating a broader set of factors and a longitudinal perspective. Prior studies have often emphasized economic variables alone, while this study's inclusion of environmental and social aspects provides a more balanced view of what drives competitiveness. Additionally, the comparative focus across different years and regions, coupled with precise policy implications, makes this research a significant contribution, helping policymakers and scholars navigate the complexities of a diverse and rapidly changing global landscape.

The following sections are structured thus: “Literature Review,” which explores existing literature; “Data and Methodology,” detailing data and methods used; “Results and Discussion,” analysing the empirical findings and providing discussion; and “Conclusion and Policy Implications,” offering conclusions and corresponding recommendations.

2 | Literature Review

This segment outlines the critical variables explored in this study: governance and social factors, economic dynamics, and sustainability and human development and global competitiveness. The objective is to examine existing research on these

variables and their linkages, which have not been extensively analysed collectively before. The literature review process is illustrated in Figure 1 and involves four key steps: searching, screening, eligibility, and inclusion.

A broad search was conducted across multiple academic databases, including ScienceDirect, Taylor & Francis, ResearchGate, Medline, Elsevier, Wiley Online, Scopus, Google Scholar, Emerald Insight, and JSTOR. Keywords related to competitiveness, corruption, environmental performance, economic progress, and development were used. This exercise yielded 170 articles, including 164 from thesis publications. After filtering out articles not directly linked to the main variables, 153 relevant studies were selected, with two excluded due to insufficient information.

The final review examined 164 studies to determine how these indices relate to GCI. The analysis revealed 33 studies on CPI's impact on GCI, 21 on SPI, 22 on EPI, 25 on TO, 24 on PGDP, and 29 on HDI. These findings serve as the basis for further investigation into how these factors influence global competitiveness.

Further, the collected articles were categorised based on the variables, highlighting the changing focus on variables by showing their percentage representation in articles from 2012 to 2024 in Figure 2. HDI has seen a significant increase in recent years, making up over 20% of the articles in 2020 and 2022, and 21% in 2024. Corruption's influence peaked in 2021, amounting to 38% of the articles, its highest percentage. Trade openness maintained a strong presence, especially in 2019 and 2020, contributing over 20% in both years. PGDP also saw a rise in prominence in 2023 and 2024, accounting for 18% and 21%, respectively. This shows how research focus on these variables has evolved. Overall, the trend indicates a higher number of articles published between 2020 and 2024 compared to the period from 2012 to 2019.

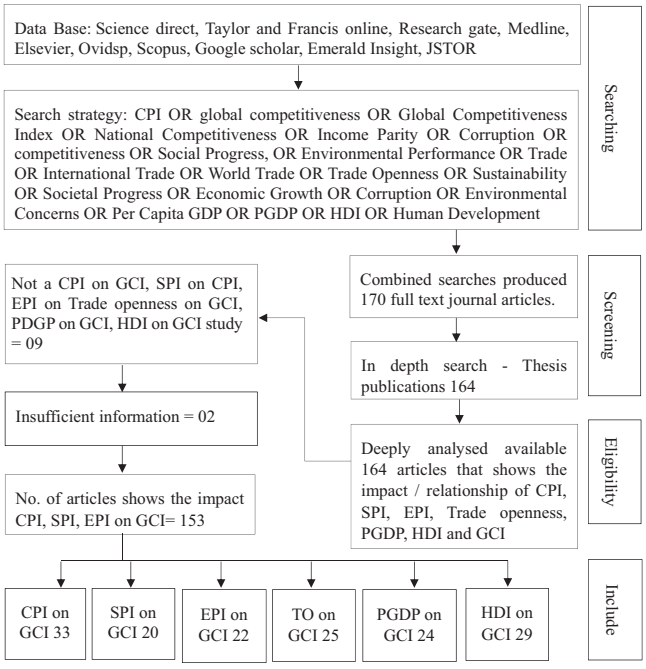

FIGURE 1 | Literature framework. *Source:* Authors' Illustration.

After categorising articles based on variables over the years, a further comprehensive classification was conducted to classify the articles country-wise. The chart in Figure 3 analyses publications by research country context, focusing on six key sub-variables: Corruption, Social Progress, Environmental Performance, Per Capita GDP, Trade Openness, and Human Development. Each pie chart represents the distribution of studies in a specific country, categorised by the proportion of research devoted to each variable.

The pie chart reveals a clear trend, indicating that a significant number of countries have conducted research in the field of corruption, while other fields have received an equal level of contribution. From the chart, it is evident that research emphasis varies significantly across countries. For instance, in Mexico ($N=5$), most studies are focused on Corruption (60%) and Social Progress (40%). In comparison, Brazil ($N=11$) shows a more balanced distribution across Corruption (33%), Social Progress (23%), Environmental Performance (33%), and Per Capita GDP (17%). In China ($N=14$), a dominant portion of studies concentrates on Corruption (50%) and Trade Openness (33%).

Other notable observations include India ($N=12$) and Nigeria ($N=10$), where research is highly distributed across several variables, reflecting diverse academic interests. Countries such as Russia ($N=6$) and South Africa ($N=13$) focus primarily on Corruption, while nations like Bangladesh ($N=4$) and the Philippines ($N=2$) have concentrated efforts on Human Development.

3 | Global Competitiveness

Global competitiveness, as defined by the Global Competitiveness Index (GCI), reflects the institutions, policies, and economic drivers shaping national productivity and growth (Schwab and Zahidi 2020) While advanced economies like Switzerland, the United States, and Singapore maintained strong competitiveness due to efficient markets, infrastructure, and innovation-driven policies (Kalansuriya et al. 2023) many developing countries struggled due to weak institutions, corruption, and inadequate infrastructure (Ulman 2013). In regions such as Sub-Saharan Africa and South Asia, challenges such as limited capital access and inefficient governance further restricted economic progress (Njangang et al. 2024), underscoring the urgent need for structural reforms in governance, education, and technological advancement.

The COVID-19 pandemic exacerbated pre-existing disparities, with nations equipped with strong institutions and digital infrastructures, like South Korea and Germany, demonstrating resilience, whereas those with weaker governance frameworks experienced sharp declines in competitiveness (Qazi 2024). The crisis accelerated digital transformation, reinforcing the role of innovation and digital infrastructure in shaping post-pandemic competitiveness (Del Carpio et al. 2022). However, uneven recovery has widened the global competitiveness divide, as developing nations continue to face significant barriers to technological adoption and capital accessibility (Clinch and Ketels 2020).

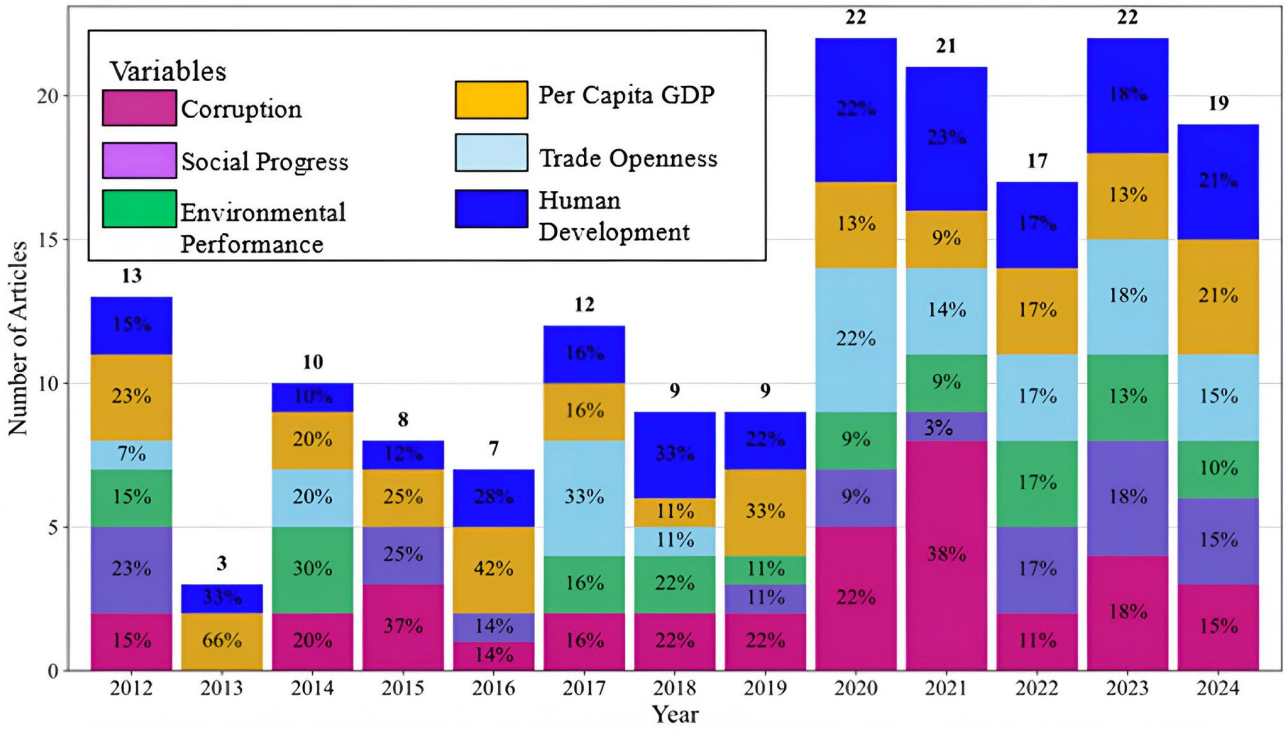

FIGURE 2 | Number of articles by variables. *Source:* Authors' Illustration.

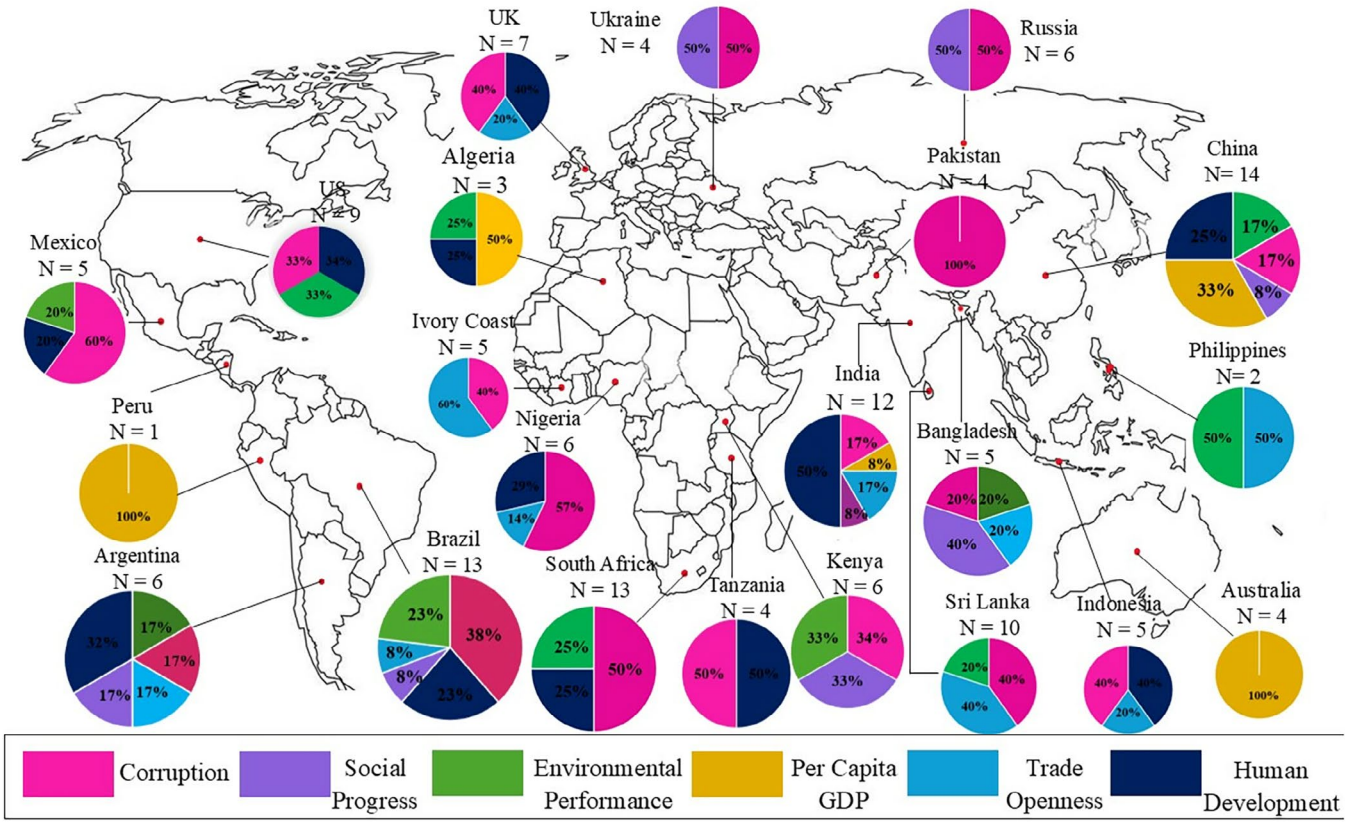

FIGURE 3 | Number of publications by research country context. *Source:* Authors' Illustration.

Governance and Social Factors on Global Competitiveness Governance and Social Factors significantly influence global competitiveness. High corruption levels weaken institutions, deter foreign investment, and stifle innovation, particularly in Sub-Saharan Africa and Southeast Asia, where weak governance correlates with lower competitiveness (Njangang et al. 2024; Ulman 2013). Conversely, countries with stronger governance, such as Denmark and Singapore, benefit from transparent

institutions and efficient regulations, enhancing their competitiveness (Uroos et al. 2022). Although some argue corruption can expedite bureaucracy, the broader consensus is that it undermines economic sustainability (Varvarigos 2023).

Beyond corruption control, governance also encompasses social progress, including education, healthcare, and inclusion, which drive competitiveness. Nations with robust social infrastructure, such as Norway and Finland, rank higher due to human capital investments (Ali et al. 2023; Despotovic et al. 2019; Doyle and Perez-Alaniz 2017; Pereira Munhoz Junior et al. 2022). However, weak social systems in developing economies hinder productivity and economic growth.

The COVID-19 pandemic intensified governance challenges, exposing weaknesses in corruption-prone and socially fragile nations. While New Zealand and South Korea managed the crisis effectively (Clinch and Ketels 2020), others suffered mismanagement and worsening inequalities (Alfano et al. 2022; Arabiat et al. 2024; Simon-Yarza 2023). Moving forward, nations prioritizing governance reforms and social investments will likely strengthen their competitiveness.

3.1 | Economic Dynamics on Global Competitiveness

Economic dynamics, encompassing trade openness and per capita GDP, significantly influence global competitiveness. Trade liberalisation fosters innovation, efficiency, and market expansion, benefiting economies like Singapore, Germany, and the U.S. (Agarwal and Chonzi 2020; Bouët et al. 2014). However, structural weaknesses and limited market access hinder developing nations, exacerbating global inequalities (Sofilda et al. 2016). The COVID-19 pandemic disrupted global trade, exposing supply chain fragilities and prompting a shift towards economic nationalism and local production (Agarwal and Chonzi 2020; Mena et al. 2022). Digital trade offers new opportunities but remains restricted by the digital divide.

Similarly, per capita GDP reflects economic performance and competitiveness. High-income nations invest heavily in education, healthcare, and infrastructure, reinforcing their global standing (Civelek et al. 2015; Nababan 2019). Conversely, low-income countries struggle to enhance productivity and innovation (Kordalska and Olczyk 2016). The pandemic deepened disparities, with wealthier nations implementing fiscal stimulus while poorer economies faced economic downturns and limited recovery capacity (Podolskaya and Singkh 2021; Syarifuddin and Setiawan 2022). Moving forward, resilient economic strategies balancing openness and stability are essential for sustaining global competitiveness.

3.2 | Sustainability and Human Development of Global Competitiveness

Sustainability and human development are integral to global competitiveness, as nations prioritizing environmental performance and human capital tend to achieve greater economic resilience. Countries like Sweden, Germany, and Denmark integrated sustainability into economic strategies, leveraging green technologies to boost competitiveness (Famiyeh et al. 2018; Sultana et al. 2022). However, for developing nations, environmental regulations, while fostering innovation, also posed short-term economic challenges (Ali et al. 2019a, 2019b; Geng et al. 2024; Koziuk et al. 2019; Lin et al. 2024). The COVID-19 pandemic momentarily reduced pollution but also led some nations to relax environmental standards in favor of economic recovery, potentially undermining long-term sustainability (De Souza Barbosa et al. 2023; Rajnoha and Lesnikova 2022; Zhang et al. 2024).

Similarly, human development, measured through education, healthcare, and income, is a key determinant of competitiveness. High-HDI countries like Norway and Switzerland benefit from strong human capital investments, fostering innovation and economic stability (Arshed et al. 2023; Hamid 2019). In contrast, developing nations struggle with inadequate healthcare and education, limiting their competitive potential (Kiseľáková et al. 2019). The pandemic deepened these inequalities, disrupting education and straining healthcare systems, with recovery remaining uneven (Cetinguc et al. 2023; Ikram and Sayagh 2023; Raza et al. 2021; Vîrjan et al. 2023). Therefore, addressing these disparities through governance, sustainability, and inclusive policies remains crucial for enhancing global competitiveness in the post-pandemic economy.

The selection of variables in this study is grounded in well-established theoretical frameworks and empirical evidence, ensuring their relevance to global competitiveness. Each variable is chosen based on its direct and indirect influence on economic performance, innovation, and sustainability, aligning with widely recognized theories in economics, development, and institutional analysis.

Rooted in institutional theory, this variable captures the impact of governance structures, regulatory quality, and corruption on economic and social outcomes. Strong governance and low corruption levels enhance institutional efficiency, reduce transaction costs, and foster a stable business environment, all of which are critical for national competitiveness.

Grounded in comparative advantage theory and development economics, the Economic Dynamics (Trade Openness and Per Capita GDP) variable reflects the role of global economic integration and domestic economic strength in driving competitiveness. Trade openness facilitates knowledge spillovers, innovation diffusion, and market expansion, while per capita GDP serves as a proxy for economic prosperity and industrial maturity.

The foundation of this study's competitiveness framework is Porter's Diamond Model, which identifies factor conditions, demand conditions, related industries, and firm strategy as key determinants of national competitive advantage. This model underscores how innovation, market conditions, and business environments collectively drive economic performance.

Derived from the Triple Bottom Line (TBL) framework, the Sustainability (Environmental Performance and Social Progress) variable examines how economic growth intersects with environmental sustainability and social well-being. The inclusion of environmental performance reflects the growing importance of

ecological responsibility in long-term competitiveness, while social progress ensures that economic gains translate into broader societal benefits. Sustainable development theories emphasize that economic growth without social and environmental considerations leads to long-term instability and reduced global competitiveness.

Based on Amartya Sen's Capability Approach, the Human Development variable captures the broader scope of national progress by focusing on education, health, and income. It recognizes that human capital development is a fundamental driver of competitiveness, as a well-educated and healthy workforce enhances productivity, innovation, and economic resilience.

Together, these variables offer a theoretically robust and empirically validated framework for assessing global competitiveness. Their selection is not arbitrary but strategically informed by foundational economic, institutional, and sustainability theories, ensuring a holistic analysis of the complex factors driving national and global economic performance.

4 | Data and Methodology

This quantitative study comprises data for the three variables outlined in the conceptual framework gathered from reliable sources for 2018 and 2023. The year 2018 was chosen for this study as it represents the most recent period before the COVID-19 pandemic for which complete data on all variables were available. Additionally, indices such as the Environmental Performance Index are published biennially, making 2018 a suitable reference point. Years prior to 2018 were not selected because the methodology for measuring the Global Competitiveness Index changed in 2018, introducing different pillars compared to the framework used in 2017 and earlier. The year 2023 was selected as the most recent period for which data on all other relevant variables could be obtained, ensuring a comprehensive and up-to-date analysis. 43 countries were selected for this study based on the availability of Global Competitiveness Index data for both 2018 and 2023, ensuring consistency in the analysis across the selected time periods. The collected data includes quantitative indicators related to corruption levels, environmental performance, social progress, trade openness, and global competitiveness. These indicators will be obtained from established indices such as the Corruption Perception Index, Environmental Performance Index, Social Progress Index, Trade openness, PGDP and HDI statistics, and the Global Competitiveness Index. The data was taken into consideration from the following data sources in Table 1.

4.1 | Categorisation of Countries Based on GCI

This study focuses on assessing the impact of various factors, including corruption, social progress, environmental performance, trade openness, PGDP, and HDI, on global competitiveness. To facilitate a more structured and comparative analysis, the GCI has been divided into three categories for 2018 and 2023, following a similar categorization approach used in prior research (Kalansuriya et al. 2023).

The categorization of competitiveness variable into three competitiveness tiers (low, middle, and high) is grounded in competitiveness and economic development theories, particularly Porter's Competitive Advantage Framework (Porter 1990) and Income Distribution Theory (Tinbergen 1956). These frameworks emphasize that countries at different levels of competitiveness exhibit distinct structural characteristics, policy needs, and economic drivers. Low-competitiveness countries typically face governance challenges, weaker institutions, and lower levels of innovation. Middle-competitiveness countries are often in transition, with mixed institutional quality and varying degrees of global integration. High-competitiveness countries exhibit strong economic fundamentals, high innovation capacity, and robust governance structures.

This classification also enhances the analytical depth of the study by facilitating structured comparisons across different competitiveness levels, ensuring that trends and policy implications are more clearly identifiable. The use of three tiers rather than a continuous scale or alternative classifications helps avoid excessive fragmentation while maintaining interpretability. Additionally, policymakers often require group-based recommendations, making a tiered classification more actionable for policy formulation.

The first and second categories each comprise fourteen countries, while the third category consists of fifteen countries. This distribution ensures a balanced analysis while maintaining sufficient statistical power. Alternative classifications, such as quartiles or continuous measures, were considered but deemed less effective in capturing meaningful distinctions for policy and academic insights.

TABLE 1 | Data sources.

Variables	Measured using	Measure	Sources
Global Competitiveness	Global competitiveness Index	Index from 0 to 100	World Economic Forum
Corruption	Corruption Perception Index	Index from 0 to 100	Transparency International
Environmental Performances	Environmental performance Index	Index from 0 to 100	World Economic Forum.
Social Progress	Social Progress Index	Index from 0 to 100	Social Progress Imperative
Trade Openness	As a percentage of GDP	As a percentage of GDP	World Trade Organization
Per Capita GDP	Current USD	USD	World Bank Report
Human Development	Human Development Index	Index from 0 to 1	World Bank Report

Source: Author's Compilation.

TABLE 2 | GCI level categorisation for 2018 and 2023.

Category	2018	2023
Low Level (Category 1 (Y = 1))	52.70 < GCI > 66.20	43.44 < GCI > 60.95
Middle Level (Category 2 (Y = 2))	66.20 < GCI > 75.20	60.95 < GCI > 72.74
High Level (Category 3 (Y = 3))	75.20 <GCI > 83.50	72.74 < GCI > 100

Source: Author's Categorisation.

Table 2 presents the distribution of countries across the three categories. Separate analyses were conducted for each group to gain a deeper understanding of the varying impacts of the independent variables at each competitive level.

The Ordered Probit Regression Model was applied to assess these relationships, given the ordered nature of the dependent variable. This statistical approach enables examining how independent variables influence the likelihood of a country being classified within a specific category (GuÌˆngÃ et al. 2019). Unlike Multinomial Logistic Regression (MNL), which treats categorical outcomes as unordered, the Ordered Probit Model explicitly accounts for the inherent order of the GCI categories, which is particularly important for capturing the cumulative structure of the data (Ye and Lord 2014). Further, the Ordered Probit Model also allows for more interpretable results, particularly when examining the probability of a country shifting between adjacent competitiveness categories (Daykin and Moffatt 2002). In contrast, MNL would require separate estimation for each pair of categories, which could lead to inefficiencies and loss of information. Given these advantages, the Ordered Probit Model is better suited for analyzing the impact of various factors on global competitiveness, providing a clearer understanding of how changes in independent variables affect a country's likelihood of moving through different competitiveness levels.

The forward stepwise estimation technique is used to compute marginal effects, providing insights into how each independent variable influences the probability of a country being classified into a specific competitiveness category. This approach ensures a comprehensive evaluation of the key determinants shaping competitiveness levels globally.

The Ordered Probit Model assumes that there exists an unobserved latent variable (GCI*) that determines the observed categorical outcome (GCI). The model can be specified as follows:

$$GCI^* = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots + \beta kXk + \varepsilon_i \quad (1)$$

where: GCI* is the latent variable representing the underlying competitiveness level, X1, X2, ..., Xk are the independent variables impacting GCI*, $\beta 0$ is the intercept, $\beta 1, \beta 2, \ldots, \beta k$ are the estimated coefficients of the independent variables, εi is the error term assumed to follow a standard normal distribution.

Since GCI* is not directly observable, the observed categorical outcome GCI (1, 2, and 3) is derived as follows:

$$GCI = 1 \text{ if } GCI^* \le \tau 1$$

$$GCI = 2 \text{ if } 1 < GCI^* \le \tau 2$$

$$GCI = 3 \text{ if } GCI^* > \tau 2 \quad (2)$$

where $\tau 1$ and $\tau 2$ are threshold parameters that define the boundaries between different GCI categories.

$$GCI\,(1,2,3) = x_i \left(\beta_0 + \beta_1 CPI + \beta_2 SPI + \beta_3 EPI + \beta_4 TO + \beta_5 PGDP + \beta_6 HDI\right) + 34\varepsilon_I \quad (3)$$

This study uses GCI (1,2,3) as the dependent variable, representing the three categories of the Global Competitiveness Index denoted as GCI for the years 2018 and 2023. These categories differentiate countries based on their competitiveness levels. The independent variables include the Corruption Perception Index, denoted as CPI; Social Progress Index, denoted as SPI; Environmental Performance Index, denoted as EPI; Trade Openness, denoted as TO; Per Capita GDP, denoted as PGDP; and Human Development Index, denoted as HDI. Finally, the error term, denoted as ε_i, accounts for random disturbances or variations not explained by the model.

4.2 | Overview of the Methodology

Figure 4 provides an overview of this study's research methodology and model development process. The analysis begins by compiling data from multiple sources on crucial variables, including global competitiveness, corruption, social progress, environmental performance, trade openness, PGDP, and HDI. Global Competitiveness is categorised into three levels (low, middle, and high) for 2018 and 2023.

The engaged methodology tested five different input combinations to determine the most effective model for analysing the relationship between GCI and its independent variables. The first combination, Model A, included the basic CPI, SPI, and EPI models. Then, in Model B, Net Migration (NM), PGDP, and HDI were added to the model to avoid omitted variable biases. Thereafter, following the forward stepwise analysis, NM was removed from the model.

In the course of the analysis, several coefficients exhibited unexpected signs, which necessitated the inclusion of higher-order terms (SPI^2, EPI^3, and TO^2) to strengthen the model. The inclusion of these higher-order terms is theoretically justified by the possibility that the relationships between the variables and the dependent outcomes may be nonlinear. Specifically, quadratic and cubic terms are often used in regression models to capture potential nonlinear effects, such as diminishing or accelerating returns, which linear terms alone may not adequately represent (Wooldridge 2016). For example, the inclusion of SPI^2, EPI^3, and TO^3 allows the model to account for more complex interactions between these variables and the dependent variable. This methodological approach was applied consistently across both years to ensure the stability and

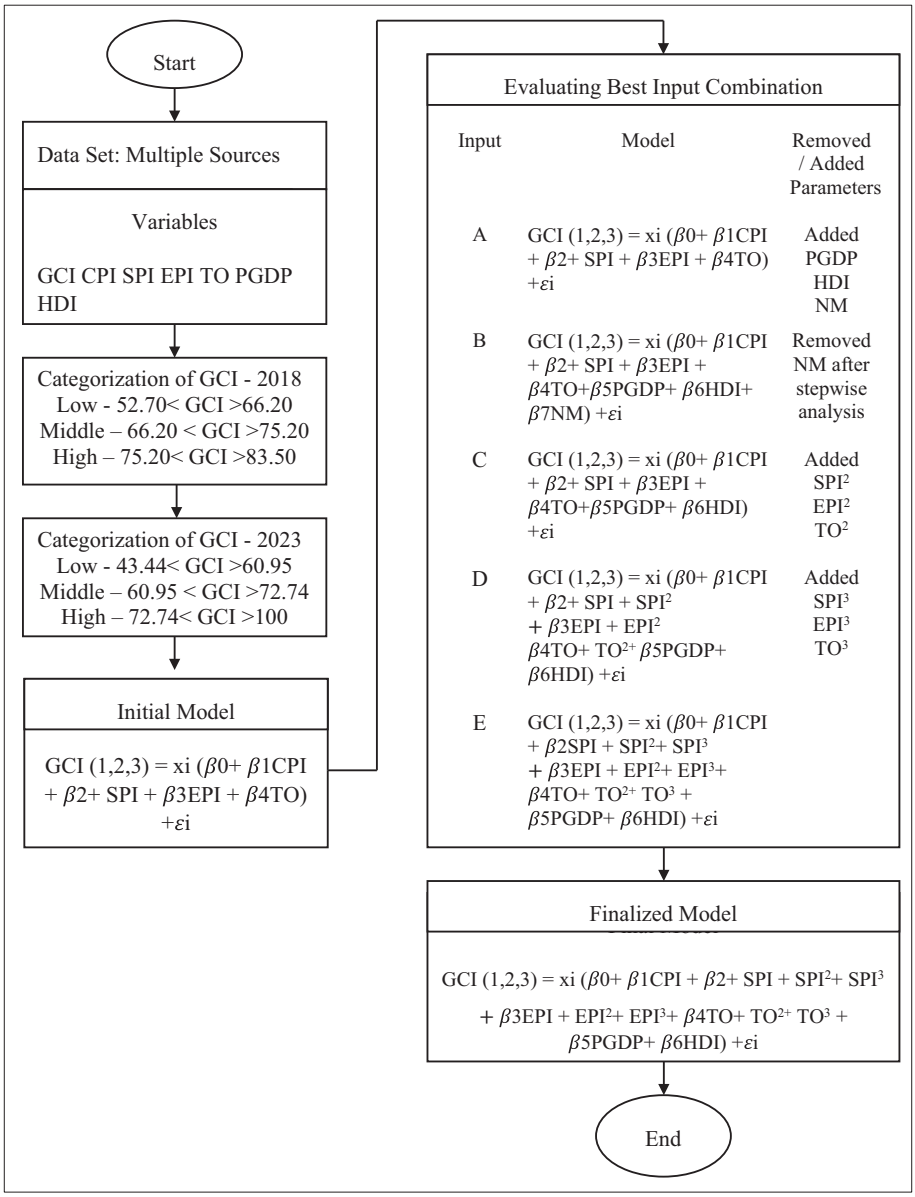

FIGURE 4 | Overview of the workflow of the study. *Source:* Authors' Illustration.

comparability of the models. Finally, predicted values for all countries were calculated, enabling a comprehensive analysis of the impact of these variables and enhancing the overall explanatory power of the model.

5 | Conceptual Framework and Hypothesis

Figure 5 presents the conceptual framework developed for this study, based on a thorough review of previous literature. The research aims to assess the influence of several vital factors: corruption, social progress, environmental performance, trade openness, PGDP, and HDI on global competitiveness for the years 2018 and 2023.

Governance and social factors are critical determinants of national competitiveness. Weak governance and corruption undermine economic growth, productivity, and a country's global standing. The higher corruption levels correlate with lower competitiveness rankings, as poor governance weakens investor confidence and economic efficiency (Ulman 2014). Simultaneously, social progress enhances national competitiveness by fostering economic resilience and human capital development. The countries with greater social progress exhibit stronger economic performance due to improvements in education, healthcare, and social welfare, which contribute to a more skilled workforce and a favourable business environment (Pereira Munhoz Junior et al. 2022). This study examines the combined impact of governance and social factors on global competitiveness, hypothesising that institutional integrity and social well-being positively influence national rankings.

Economic dynamics, encompassing trade openness and per capita GDP, play a fundamental role in global competitiveness. Open trade policies promote market expansion, innovation, and productivity, strengthening a country's economic positioning. Economies with greater trade openness benefit from deeper global integration and sustained economic growth. Moreover,

per capita GDP reflects a nation's economic strength and development level. Previous studies found that higher per capita GDP is associated with stronger national competitiveness, particularly in advanced economies where income levels shape investment, infrastructure, and technological progress (Syarifuddin and Setiawan 2022). This study hypothesises that greater economic dynamism leads to improved competitiveness rankings.

Sustainability and human development significantly influence economic stability and competitiveness. Strong environmental policies enhance economic resilience, with robust environmental performance fostering long-term competitiveness through resource efficiency and innovation (Sultana et al. 2022). Likewise, human development, reflected in education, health, and living standards, contributes to economic growth. Moreover, it states that higher human development indicators correlate with better competitiveness rankings (Kiseľáková et al. 2019). This study explores their combined influence, hypothesising that sustainable policies and human capital development enhance national competitiveness.

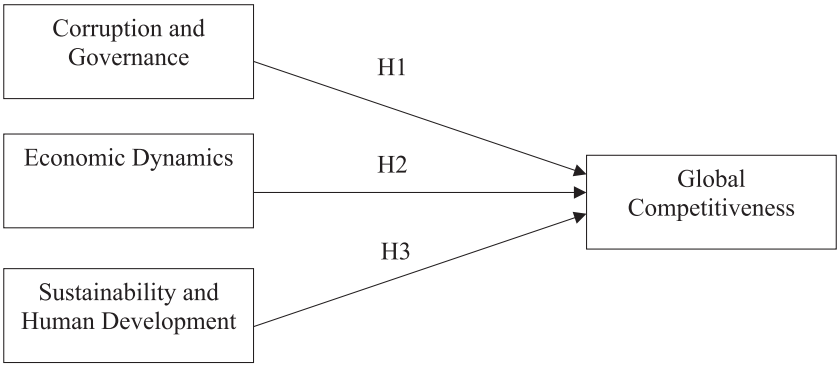

FIGURE 5 | Conceptual Framework. Governance and Social Factors variable includes corruption and social progress. Economic Dynamics variable includes Trade Openness and Per Capita GDP. Sustainability and Human Development included Environmental Performance and Human Development. *Source:* Author's Compilation.

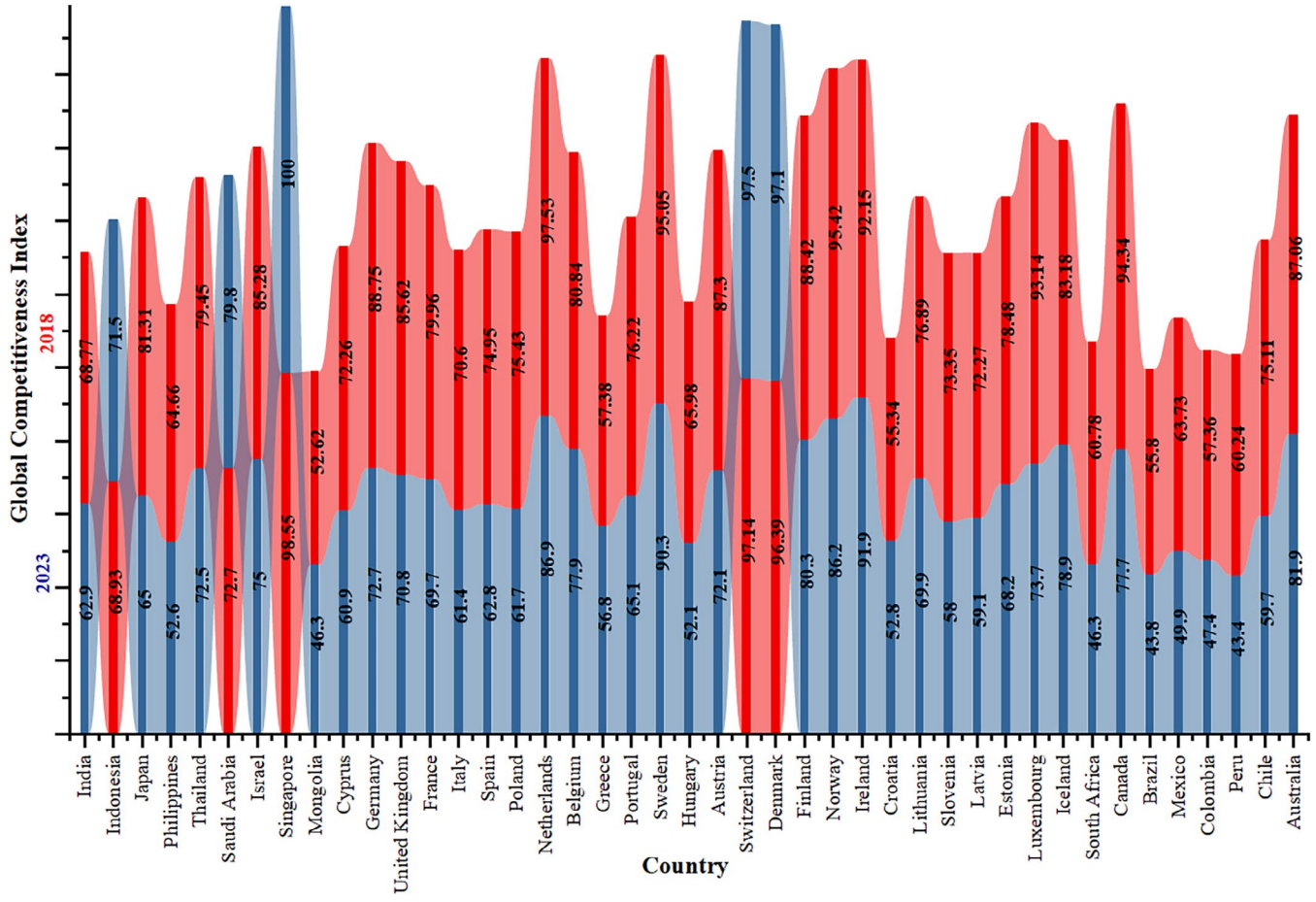

FIGURE 6 | Comparison of Global Competitiveness between 2018 and 2023. *Source: Author's Illustration Based on Secondary Data.*

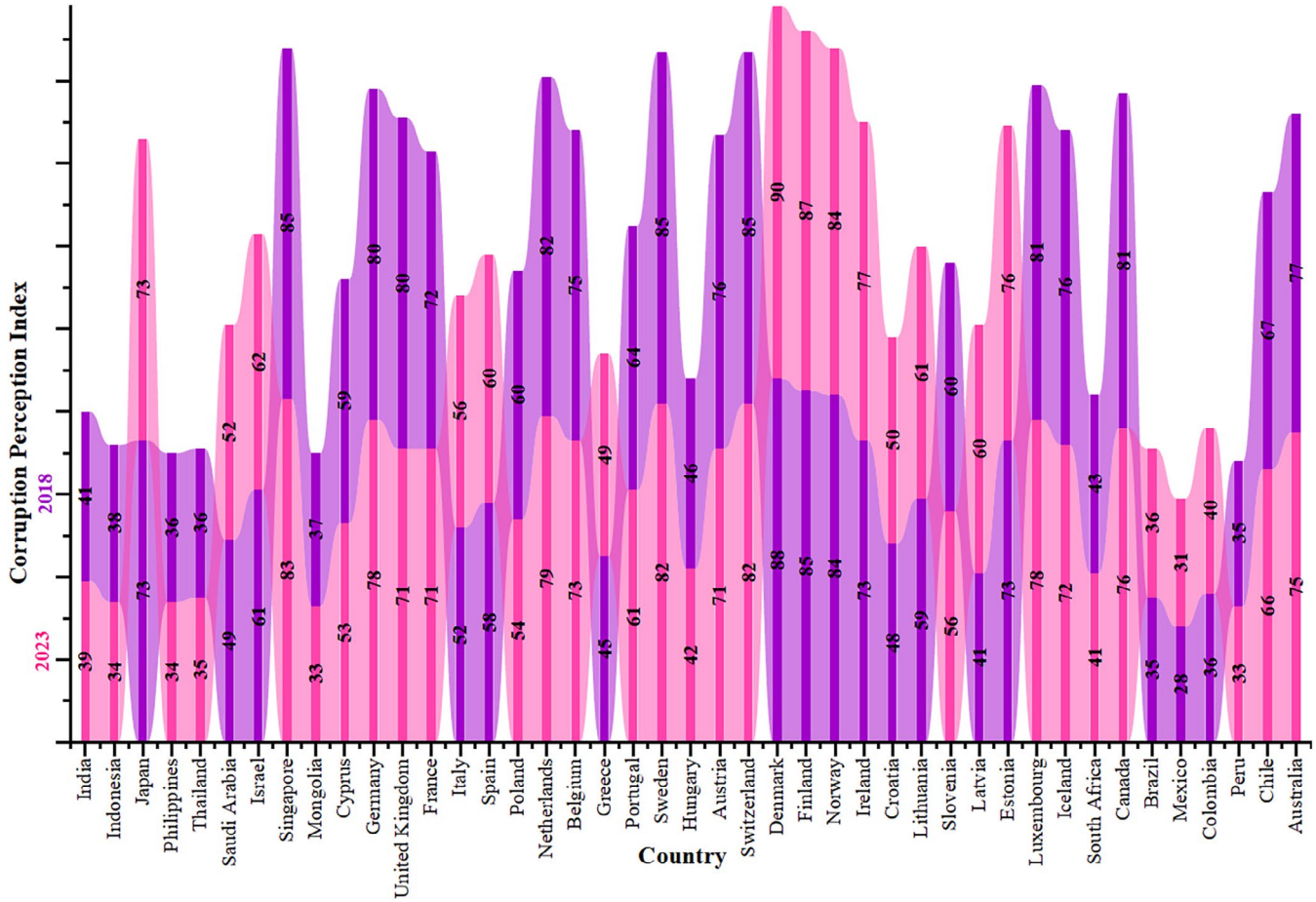

FIGURE 7 | Comparison of Corruption between 2018 and 2023. *Source:* Author's Illustration Based on Secondary Data.

Based on the framework, the following hypotheses have been formulated:

Hypothesis 1. *Governance and Social Factors positively impacts global competitiveness.*

Hypothesis 2. *Economic Dynamics positively impacts global competitiveness.*

Hypothesis 3. *Sustainability and Human Development positively impacts global competitiveness.*

These hypotheses have been formulated to examine the influence of the independent variables (governance and social factors, economic dynamic and sustainability and human development) on the dependent variable, global competitiveness. The null hypotheses state that these independent variables have no significant effect on global competitiveness at the given significance level.

6 | Results

The study investigates the impact of six independent variables: corruption, social progress, environmental performance, trade openness, PGDP, and HDI on the dependent variable, global competitiveness. As an initial step, descriptive statistics were computed for these variables using a dataset of countries categorized based on the global competitiveness level for 2018 and 2023.

Figure 6 Global Competitiveness Index (2018 vs. 2023) compares the competitiveness of nations over five years. Top performers like Switzerland, Singapore, and the United States maintain high rankings due to strong economic fundamentals, governance, and innovation, showcasing resilience despite global disruptions. Emerging economies such as India, Brazil, and South Africa face volatility, with India's decline linked to economic instability and supply chain issues, South Africa's to political instability and corruption, and Brazil's to ongoing economic challenges. Middle-tier countries like Hungary, Greece, and Portugal show improvements from reforms and technological adoption, with Greece recovering post-debt crisis. Stagnant or declining nations, including Saudi Arabia and Indonesia, struggle with economic diversification and governance issues. Rising stars like Ireland, Estonia, and Chile progress due to favorable business environments, digital transformation, and stable policies. This analysis highlights the role of innovation, governance, and adaptability in competitiveness, reflecting the impact of domestic policies and global conditions.

Figure 7 compares corruption perception scores between 2018 and 2023, revealing significant shifts across nations. High-performing countries like Denmark, Switzerland, and Singapore maintain stable scores in the 80s and 90s, reflecting

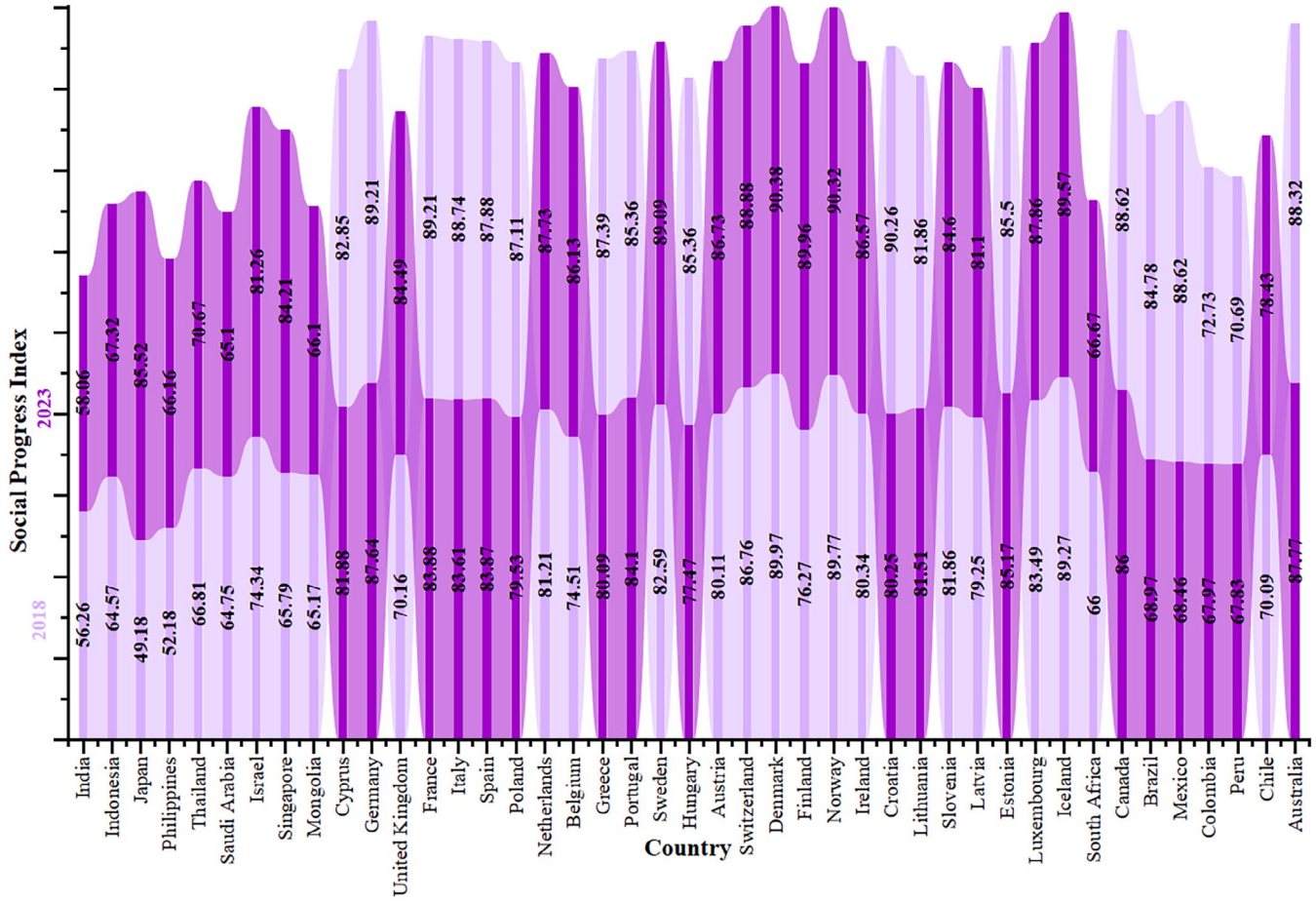

FIGURE 8 | Comparison of Social Progress between 2018 and 2023. *Source:* Author's Illustration Based on Secondary Data.

robust anti-corruption frameworks and effective governance. These nations consistently prioritise transparency and accountability, which helps sustain their high rankings. In contrast, countries such as Mexico, Brazil, and South Africa exhibit notable volatility and lower scores. Mexico's score dropped slightly from 31 to 30, Brazil from 35 to 34, and South Africa from 43 to 41. These declines highlight persistent challenges related to governance, political instability, and weak accountability mechanisms. Despite some efforts, these nations continue to struggle with systemic corruption. Middle-tier countries like Greece and Croatia have shown progress. Greece improved from 45 to 52, and Croatia advanced from 48 to 50, reflecting successful anti-corruption reforms and enhanced institutional frameworks. These improvements demonstrate the positive impact of targeted policies and governance reforms. The diagram underscores the varying trajectories of nations in combating corruption. While some countries have made significant strides, others face ongoing barriers, emphasising the need for sustained efforts in governance, transparency, and accountability to achieve meaningful progress.

Figure 8 shows high-performing countries like Denmark, Switzerland, and Sweden maintain stable scores in the high 80s to low 90s, reflecting consistent advancements in education, healthcare, and equality due to robust social policies and effective governance. In contrast, countries like Mexico, Brazil, and South Africa exhibit volatility, with Mexico's score declining slightly from 68.46 to 68.17, signalling challenges in sustaining social development amid economic and political instability. Brazil shows marginal improvement, suggesting partial progress in social reforms, while South Africa's slight decline highlights persistent issues like inequality and access to basic services. Middle-tier nations such as Portugal, Greece, and Hungary demonstrate notable progress, with Portugal's score rising from 84.00 to 85.57, driven by successful social welfare and public health initiatives. Greece and Hungary also improve, reflecting reforms aimed at enhancing social equity. The diagram underscores the varying trajectories of social progress, emphasizing the role of governance, policy effectiveness, and economic stability. While some nations thrive, others face significant barriers, illustrating the complex interplay of factors influencing social development.

Figure 9 compares environmental performance scores between 2018 and 2023, highlighting key trends. Countries like Switzerland, Denmark, and Sweden maintain high scores, with Switzerland slightly improving from 87.42 to 87.49, reflecting strong sustainability efforts and effective environmental policies. These nations prioritise renewable energy, waste management, and climate action, enabling them to lead in environmental performance. In contrast, countries like India, South Africa, and Indonesia show lower scores and significant fluctuations. India's score dropped from 30.57 to 27.16, indicating challenges in environmental management, such as air pollution and deforestation. South Africa's decline from 42.0 to 39.6 reflects struggles with energy transition and water management.

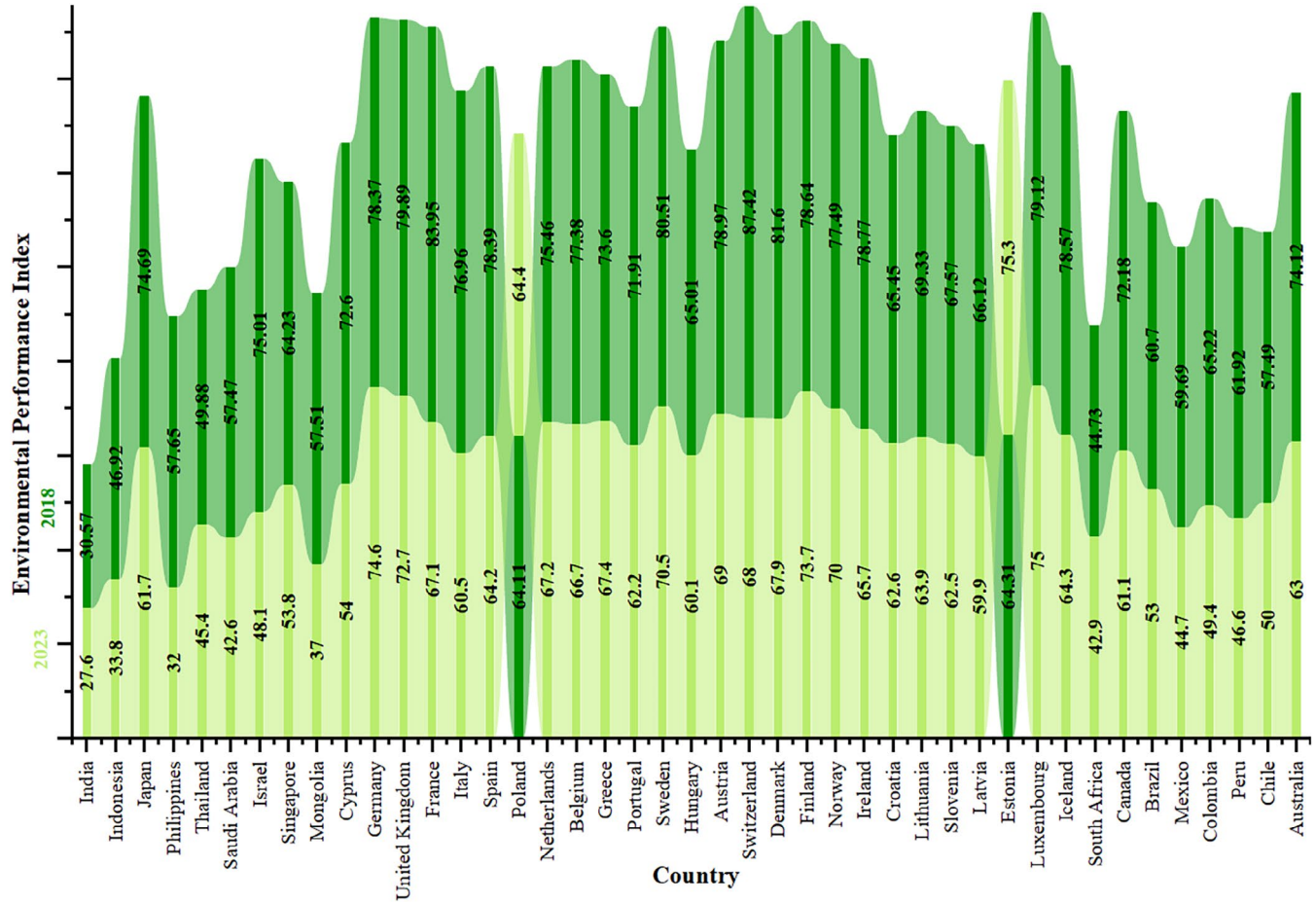

FIGURE 9 | Comparison of Environmental Performance between 2018 and 2023. *Source:* Author's Illustration Based on Secondary Data.

Middle-tier countries like France improved from 65.51 to 67.43, demonstrating progress in environmental policies, including renewable energy adoption and emissions reduction. Overall, the diagram illustrates varied success in environmental performance, with some nations advancing due to strong policies and others facing ongoing challenges due to resource constraints and governance issues.

Figure 10 compares trade openness between 2018 and 2023, revealing distinct trends across nations. High-performing countries like Singapore, Switzerland, and Denmark maintain high levels of trade openness, though slight decreases are observed. For instance, Singapore's trade openness dropped from 446 to 405, reflecting global economic shifts and potential policy adjustments. These nations remain highly integrated into global trade networks, benefiting from strong trade policies and infrastructure. In contrast, emerging markets like Mexico, India, and Brazil show low and stable levels of trade openness. India's trade openness only slightly changed from 42 to 41, indicating persistent trade barriers such as tariffs, regulatory challenges, and limited export diversification. These countries face structural issues that hinder deeper integration into global markets. Middle-tier countries like Cyprus demonstrate progress, with trade openness increasing from 195 to 222, reflecting stronger global trade integration and policy reforms aimed at boosting trade. Overall, the diagram highlights the varying trajectories of trade openness: high-performing nations remain open to trade despite minor fluctuations, emerging economies show limited progress due to structural barriers, and some middle-tier countries make significant strides in integrating into the global economy.

Figure 11 compares per capita GDP between 2018 and 2023, highlighting significant disparities in economic growth across nations. High-income countries like Luxembourg, Switzerland, and Norway show substantial growth, with Luxembourg rising from 103,684 to 128,259. These nations benefit from strong financial sectors, innovation, and stable governance, enabling robust economic expansion. In contrast, emerging markets like Mexico, Brazil, and South Africa have lower GDP levels with moderate increases. Brazil rose from 9208 to 9887, while India saw a modest rise from 2032 to 2319, reflecting slower progress due to structural challenges such as inequality, limited infrastructure, and economic volatility. Middle-tier countries like Poland demonstrate notable improvement, increasing from 15,421 to 18,174, driven by economic reforms, EU integration, and investment in technology. Overall, the diagram underscores the uneven nature of economic growth: high-income nations achieve significant gains due to advanced economies and favorable policies, while emerging markets face barriers that limit their progress. Middle-tier countries, however, show potential for upward mobility through strategic reforms.

Figure 12 compares the HDI between 2018 and 2023, revealing trends in global human development. High-performing countries

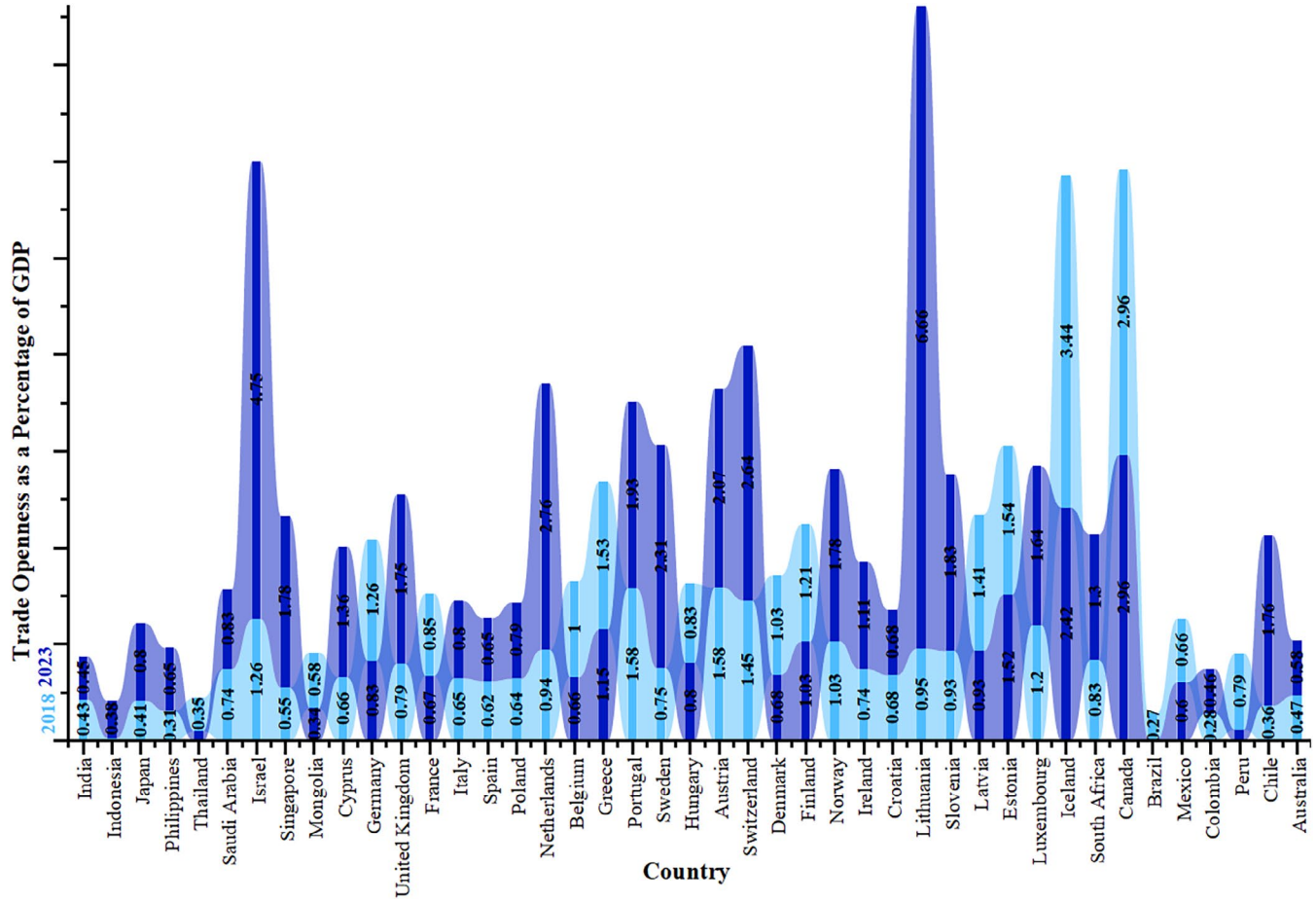

FIGURE 10 | Comparison of Trade Openness between 2018 and 2023. *Source:* Author's Illustration Based on Secondary Data.

like Switzerland, Denmark, and Norway maintain high HDI values with slight improvements, such as Switzerland rising from 0.939 to 0.945. These nations benefit from strong healthcare, education systems, and high-income levels, enabling sustained human development. In contrast, emerging markets like Mexico, Brazil, and India show moderate HDI levels with incremental gains. India's HDI increased from 0.647 to 0.674, reflecting gradual progress in education, healthcare, and income, though challenges like inequality and access to services persist. Brazil and Mexico also show modest improvements, indicating slow but steady advancements in human development. Middle-tier countries like Portugal demonstrate steady progress, with its HDI rising from 0.84 to 0.87, driven by improvements in education and healthcare access. Overall, the diagram highlights gradual global progress in human development, with developed countries maintaining high scores due to robust systems and emerging economies improving incrementally despite structural challenges.

As depicted in Table 3, the Ordered Probit results for 2018 reveal distinct effects of various factors on different levels of global competitiveness. In the low competitiveness level, governance and social factors are critical. Corruption has a significant negative effect (−0.0074152), underscoring how higher corruption undermines stability and discourages investment. Social progress also shows a strong negative impact (−0.830102), limiting economic opportunities and access to essential services. However, environmental performance positively contributes (0.0705254), and trade openness shows a significant positive effect, reflecting the benefits of integration into global trade networks. Per capita GDP has a minor negative effect, suggesting income alone is not enough to improve competitiveness without governance and social progress.

At the middle competitiveness level, human capital and sustainable policies are key. HDI demonstrates a highly significant positive effect (4.730609), highlighting the importance of investments in education and healthcare for economic resilience. Environmental performance shows a negative impact (−0.03523141), suggesting that stringent environmental policies impose short-term costs on middle-income economies. Trade openness also has a notable adverse effect (−0.45669), pointing to vulnerabilities in these economies to external shocks. The limited significance of corruption and PGDP indicates that governance and income growth alone are insufficient for long-term progress.

In the high competitiveness level, governance, social development, and human capital remain the main drivers. Corruption and social progress have strong positive effects, confirming the importance of transparent institutions and social well-being. HDI plays a significant role, reaffirming that advanced economies prioritise human capital development. However, both environmental performance and trade openness continue to show adverse effects, as stringent environmental regulations raise operational costs, and global trade exposes these countries to economic uncertainties.

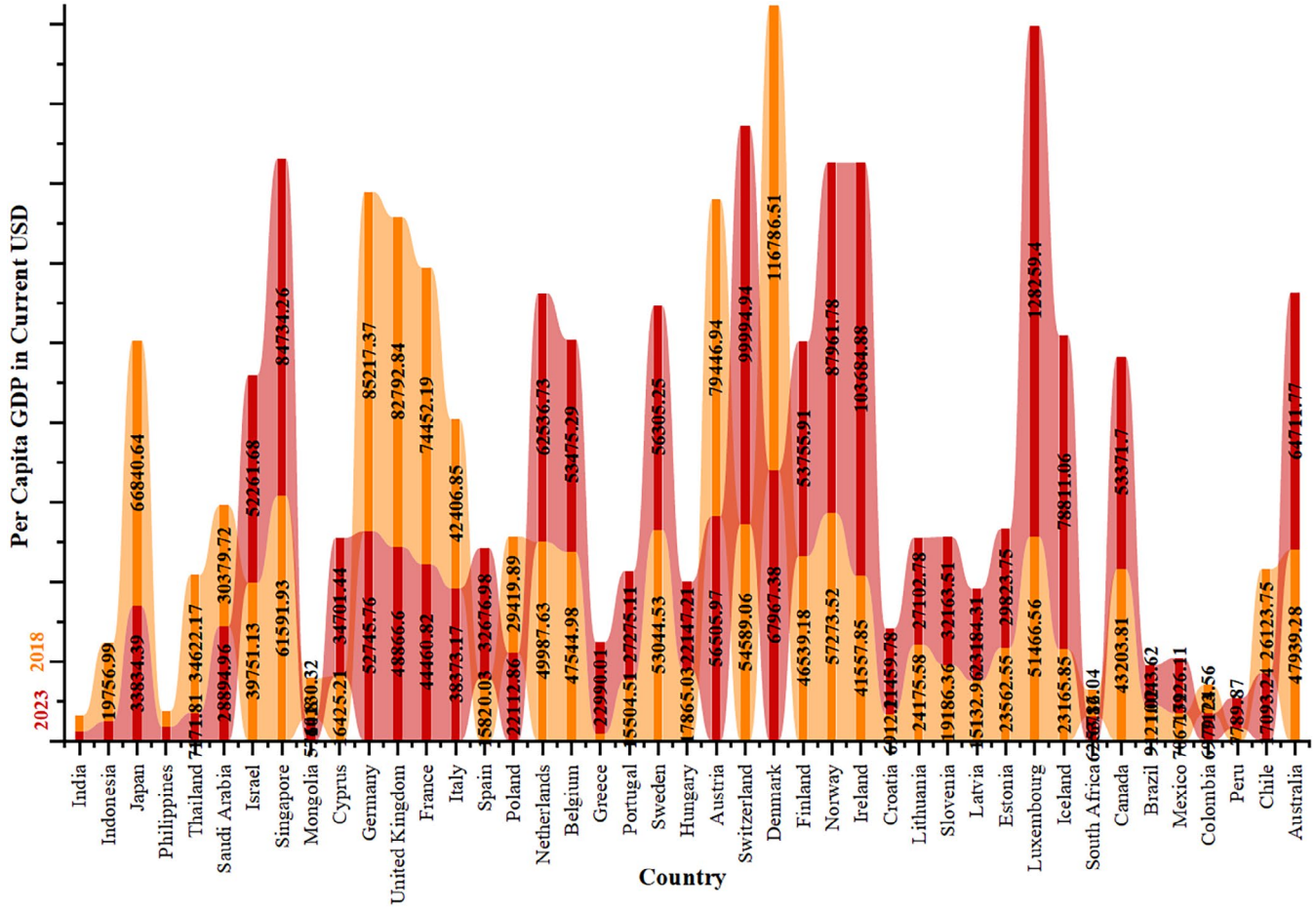

FIGURE 11 | Comparison of Per Capita GDP between 2018 and 2023. *Source:* Author's Illustration Based on Secondary Data.

The 2023 Ordered Probit results presented in Table 4 reveal a complex interplay of governance, economic openness, human development, and sustainability in shaping global competitiveness. The findings underscore that different economies face distinct challenges at various levels of competitiveness, necessitating tailored policy responses.

At the low competitiveness level, corruption has a significantly negative effect (−0.0074152), emphasizing its role in hindering economic progress. Social progress shows a strong negative impact (−2.231221), while HDI exhibits the highest negative coefficient (−7.938105), indicating that without substantial human capital investment, countries remain economically stagnant. Trade openness shows a positive impact, suggesting economic integration facilitates growth, while environmental performance and per capita GDP show minor negative effects, with the latter indicating income alone does not guarantee competitiveness.

In the middle competitiveness level, reducing corruption has a significant positive impact, reflecting the importance of governance reforms. Social progress (1.30528) and HDI (4.643847) show positive effects, reinforcing the value of education, healthcare, and social protections. However, environmental performance (−0.03523141) and trade openness (−0.45669) exhibit negative effects, signaling that middle-income economies face short-term costs with stricter environmental policies and economic liberalisation.

At the high competitiveness level, governance remains crucial, with corruption reduction showing a positive effect. Social progress and HDI continue to play significant roles in sustaining competitiveness. However, environmental performance and trade openness show negative effects, indicating that stringent environmental regulations and global trade expose high-performing economies to risks that may undermine short-term economic performance.

7 | Discussion

Based on the 2018 results shown in Table 3, The findings suggest that governance and social progress are consistently important across all levels of competitiveness, but their relative importance varies. At lower competitiveness levels, the negative effects of corruption and social progress emphasize the foundational role of institutional and social development in fostering economic growth. This aligns with previous studies (Lonska and Boronenko 2015; Pilinkiene 2016) that stress the importance of addressing governance and social issues for countries struggling to improve their competitiveness. Moreover, investment in renewable energy and sustainable infrastructure has already shown potential in boosting industrial productivity while reducing dependency on volatile fossil fuel markets. Additionally, better environmental governance can attract

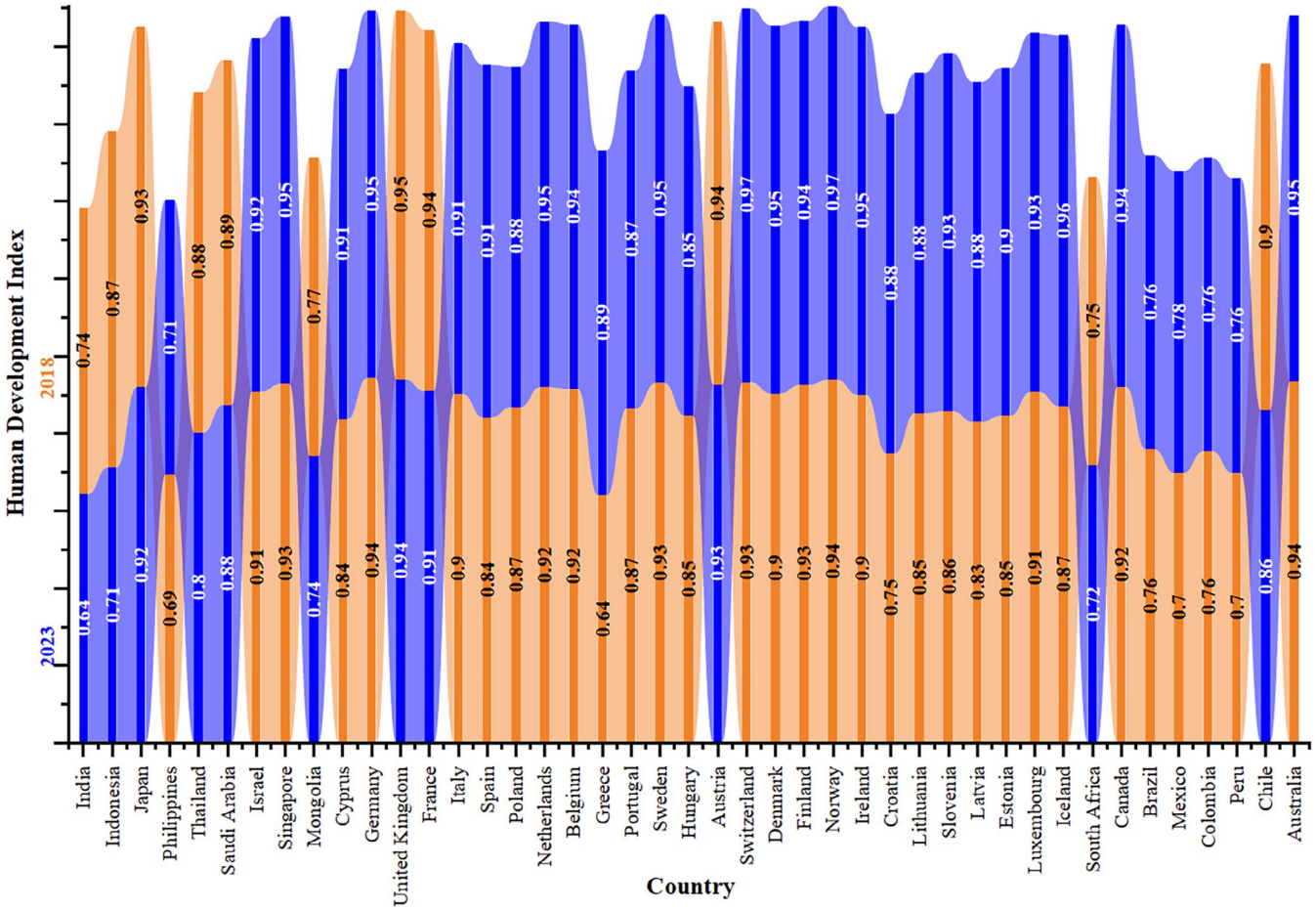

FIGURE 12 | Comparison of Human Development between 2018 and 2023. *Source:* Author's Illustration Based on Secondary Data.

TABLE 3 | Final ordered probit results for 2018.

Variable	Estimate	Robust SE	Low level	Middle level	High level
CPI	0.1245	0.0651	−0.0075**	0.0037	0.0037**
SPI	13.9462	5.2185	−0.8303***	0.4148	0.4155**
EPI	−1.1846	0.3857	0.0705***	−0.0352*	−0.0353**
TO	−15.3553	5.8616	0.9142***	−0.4567	−0.4575*
PGDP	1.359e−4	5.45e−5	−8.09e−6*	4.04e−6	4.05e−6
HDI	159.0555	49.5204	−9.4696***	4.7306*	4.7390**
Ancillary parameters			**Marginal effect after ordered probit**		
$\hat{y}1$	354.7799	142.221	0.05602	0.09312	0.07625
$\hat{y}2$	366.9515	144.764			
Pseudo R^2	0.8484				
Log likelihood −7.1563836					
No. of observations 43					

Source: Author's Calculation Based on Data.
***Significant at the 1% level.
**Significant at the 5% level.
*Significant at the 10% level.

foreign direct investment, particularly as multinational corporations prioritize sustainability in their global supply chains (Yaseen et al. 2018).

At the middle competitiveness level, the importance of human capital becomes clear. HDI has a significant positive impact, supporting the idea that countries investing in education,

TABLE 4 | Final ordered probit results for 2023.

Variable	Estimate	Robust SE	Low level	Middle level	High level
CPI	0.4124	0.1084	−0.0356***	0.0208***	0.0147***
SPI	25.8403	7.5576	−2.2312***	1.3053***	0.9259***
EPI	−8.5085	2.7884	−0.0099***	−0.4298***	−0.3048***
TO	−20.2629	7.1846	1.7496***	−1.0235***	−0.7260***
PGDP	2.06e−5	1.39e−5	−1.78e−6*	1.04e−6	7.39e−7*
HDI	91.9332	35.3419	−7.9381***	4.6438***	3.2943***
Ancillary parameters			Marginal effect after ordered probit		
$\hat{y}1$	786.0582	246.2659	0.0374	0.0992	0.07087
$\hat{y}2$	793.7284	247.3318			
Pseudo R^2	0.8010				
Log likelihood −9.3964637					
No. of Observations 43					

Source: Author's Calculation Based on Data.
***Significant at the 1% level.
*Significant at the 10% level.

healthcare, and quality of life experience enhanced economic resilience and long-term growth (Hamid 2019). However, the negative impact of environmental performance and trade openness highlights the challenges of balancing economic growth with sustainability. This suggests that middle-tier economies may struggle to reconcile environmental policies with economic expansion, as seen in the "pollution haven" hypothesis. Additionally, environmental performance in low-income countries appears to have a limited direct impact on competitiveness, as economic and governance challenges take precedence (Khan et al. 2018). Weak regulatory frameworks and resource constraints often hinder the implementation of sustainable policies, exacerbating environmental degradation. However, long-term improvements in environmental sustainability could play a crucial role in enhancing economic resilience and attracting investment, particularly as global markets increasingly value green initiatives.

For high-competitiveness countries, the results reinforce the idea that strong governance, social progress, and human capital are key to maintaining a leadership position in global rankings. However, the adverse effects of environmental performance and trade openness suggest that even high-performing nations face challenges related to stringent environmental regulations and global economic risks. These findings are in line with existing literature (Famiyeh et al. 2018; Koziuk et al. 2019), which discusses how the costs of environmental policies and the risks of trade liberalisation can undermine competitiveness if not carefully managed. The trade-off between environmental performance and competitiveness in high-income countries arises from the financial and regulatory burdens associated with stringent environmental policies, and compliance with strict emission targets, carbon taxes, and sustainable production standards increases operational costs for businesses, potentially reducing their global market advantage.

Overall, the results highlight the importance of context-specific policies. While governance and social development remain critical across all competitiveness levels, middle-tier economies may require policies that strike a balance between sustainability and growth, while high-performing nations need to manage the challenges posed by environmental regulations and global trade.

As per the 2023 results shown in Table 4, At the low competitiveness level, corruption and social progress hinder economic development, with corruption causing inefficiencies and resource misallocation (Barros et al. 2020) and poor social development limiting growth opportunities (Ikram and Sayagh 2023). HDI's highest negative coefficient (−7.938105) suggests that without substantial investment in human capital, countries remain trapped in stagnation (Cetinguc et al. 2023). These results underscore the importance of addressing institutional reforms, education, and healthcare to boost competitiveness (Saeed et al. 2025). While trade openness fosters growth, its benefits may be uneven without supportive policies, and environmental performance and PGDP alone are insufficient to trigger substantial gains. For low-income countries, environmental performance remains a significant challenge due to weak regulatory frameworks, insufficient investment in green infrastructure, and dependence on resource-based industries. Limited access to clean energy and sustainable technologies further exacerbates environmental degradation, reducing long-term economic resilience (Syarifuddin and Setiawan 2022). Without targeted policy interventions and international support, these countries risk being caught in a cycle where poor environmental conditions further hinder their ability to improve competitiveness (Naseer et al. 2020).

In the middle competitiveness level, reducing corruption enhances governance, and social progress and HDI positively impact economic mobility, as seen in the findings of Arabiat et al. (2024)

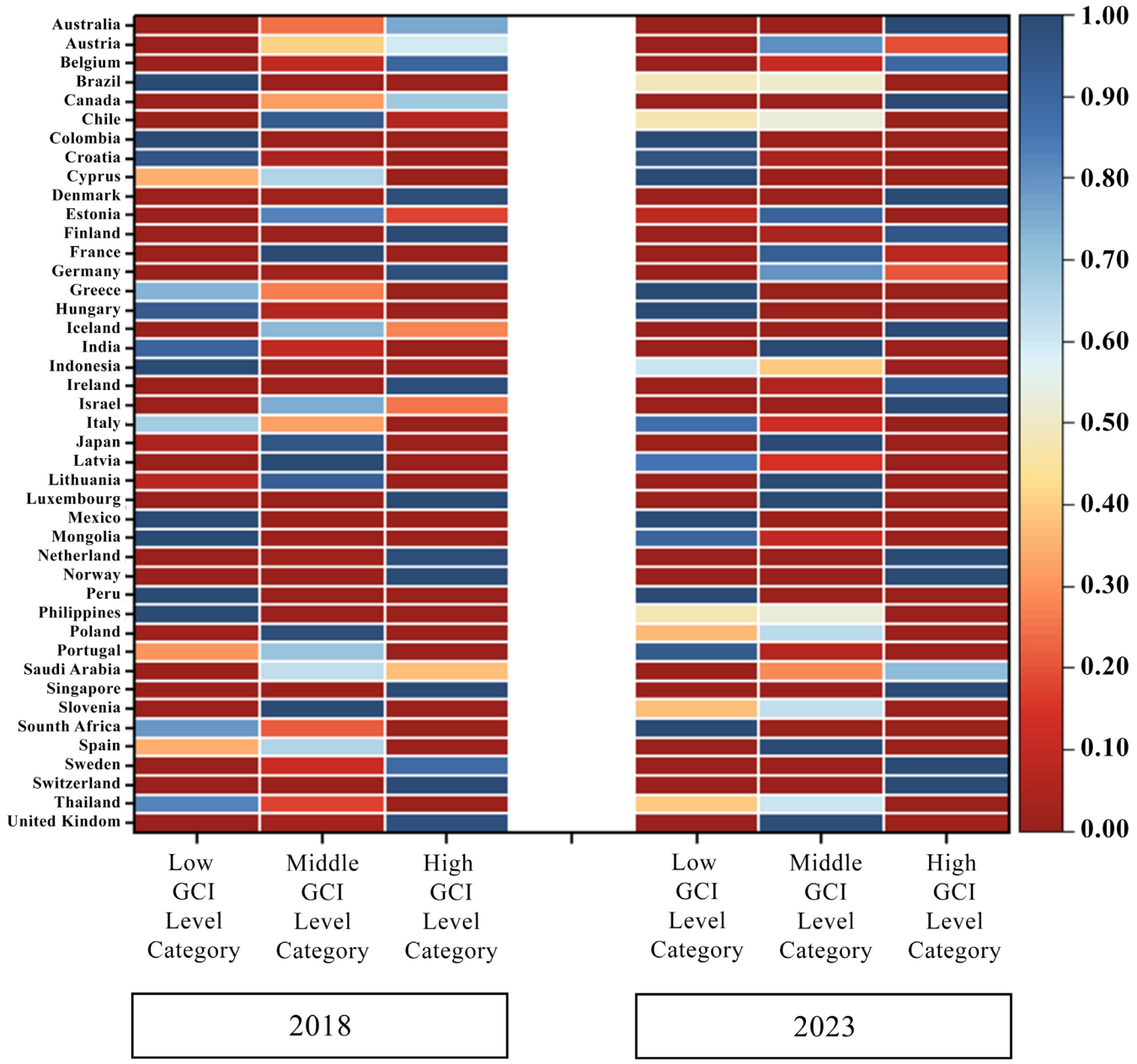

FIGURE 13 | Comparison of Predicted GCI values for 2018 and 2023. *Source:* Author's Illustration Based on Predicted GCI.

and Cetinguc et al. (2023). However, the negative effects of environmental performance and trade openness reflect the trade-offs that middle-income economies face when implementing stricter environmental policies or liberalising markets (Agarwal and Chonzi 2020) To mitigate these challenges, innovation-driven sustainability policies that integrate clean technology and phased regulatory transitions may offer a viable solution. Gradual liberalisation paired with industrial policy can help middle-income economies navigate the risks of globalisation.

For high-performing economies, the positive effects of reducing corruption and prioritising human capital and social progress align with the findings of Alfano et al. (2022) and Cetinguc et al. (2023). These economies focus on long-term resilience through governance and social stability rather than rapid industrial expansion. However, the negative effects of environmental performance and trade openness present challenges. Stringent environmental regulations can reduce global competitiveness in the short run (Blum and Neumärker 2021). Additionally, firms may face relocation pressures, as industries seek to move production to regions with more lenient environmental regulations, leading to potential job losses and economic restructuring. While such policies are essential for long-term sustainability, they can create short-term disadvantages in terms of cost competitiveness and industrial growth. Policymakers must balance sustainability measures with economic performance, potentially through incentive-based mechanisms, and diversify trade strategies to buffer against external economic shocks.

To provide more insight into this study, the predicted values in Global Competitiveness Index categories were calculated in

Figure 13. In 2018, many countries were clustered within the low global competitiveness category, represented by a heavier concentration of blue shading, indicating lower predicted global competitiveness values. By 2023, however, there is a visible shift, with more countries moving into the middle and high global competitiveness categories, characterised by more red shading. This overall transition points to a worldwide competitiveness improvement over the five-year period, with several countries showing an upward movement in their predicted global competitiveness rankings.

Notably, countries from regions such as Sub-Saharan Africa, South Asia, and some parts of Southeast Asia, predominantly in the low global competitiveness category in 2018, have shown significant improvement by 2023. Many of these countries have moved up into the middle or even high global competitiveness categories, suggesting positive developments in infrastructure, technological readiness, and institutional reforms that contribute to higher competitiveness. This shift aligns with international efforts to increase economic growth and enhance competitiveness in emerging economies.

Conversely, the figure highlights specific countries that experienced a noticeable decline in their predicted global competitiveness values from 2018 to 2023. For example, countries like South Africa and Brazil, which were in the middle GCI category in 2018, have dropped into the lower category by 2023. This decline could be attributed to various factors such as economic stagnation, challenges in political governance, or difficulties in maintaining competitiveness in a fast-evolving global market. These changes may reflect issues like corruption, institutional weaknesses, or limited progress in critical areas like innovation and infrastructure development. The drop in global competitiveness values for these countries underscores the importance of continuous reforms and proactive measures. It also emphasizes that remaining competitive in the global arena requires nations to adapt and respond to internal and external challenges. Without sustained efforts to improve critical drivers of competitiveness, countries risk losing ground in the global economy, as illustrated by the performance of these nations.

The analysis also shows that countries in regions such as Western Europe, North America, and East Asia, which held high global competitiveness rankings in 2018, have largely maintained their positions in 2023. These countries exhibit strong consistency in competitiveness, underpinned by advanced infrastructure, innovation capacity, and robust institutional frameworks. While there are minor fluctuations, the general stability of high global competitiveness nations suggests that once a country attains a certain level of competitiveness, maintaining that position is achievable with consistent policy and economic efforts.

In summary, comparing predicted global competitiveness values for 2018 and 2023 shows a positive global trajectory, with numerous countries moving toward higher competitiveness categories. However, this progress is uneven, as some countries show stagnation or decline while others continue to excel. These findings are critical to understanding the evolving landscape of global competitiveness and the factors that influence a country's ability to succeed in the worldwide economy.

8 | Conclusion and Policy Implications

This study comprehensively examines the factors that influence global competitiveness by analysing data from 2018 and 2023. Utilising an Ordered Probit Regression Model, it explores how variables like governance and social factors, economic dynamics and sustainability, and human development impact a country's competitiveness. The analysis demonstrates that these factors affect countries differently depending on their competitiveness level, categorised as low, middle, and high.

Key findings reveal that in countries such as South Africa, Peru, and Colombia, at lower competitiveness levels, governance and social development are critical for upward mobility. In contrast, advanced economies face trade-offs between stringent environmental standards and economic growth, indicating the challenges of sustaining competitiveness amid regulatory constraints.

One notable outcome of this research is the consistent importance of HDI across all levels of competitiveness. This finding highlights that investing in human capital through education, healthcare, and social services is vital for both climbing the competitiveness ladder and maintaining a solid position. Additionally, the nuanced effects of corruption and social progress on competitiveness at different levels reaffirm that governance reforms and social improvements are crucial for emerging economies, but also for those at the top tiers, such as Canada, Finland, the UK, and Japan.

Finally, the analysis of predicted values for 2018 and 2023 indicates a general global improvement in competitiveness, with several emerging economies moving up the competitiveness scale. This positive trajectory suggests that global efforts to enhance infrastructure, technological readiness, and institutional capacity are bearing fruit. However, the study also illustrates that progress is uneven. Some nations, particularly in Sub-Saharan Africa and South Asia, have made significant strides, while others, such as South Africa and Brazil, have faced setbacks. These declines highlight the ongoing challenges related to political governance, economic stagnation, and innovation that may hinder sustained competitiveness.

9 | Policy Implications

Low Competitiveness Economies, governance reforms should be a top priority for economies with high corruption and weak institutions. Strengthening anti-corruption frameworks, ensuring judicial independence, and enhancing transparency will help build investor confidence and stabilise the economy (e.g., Brazil, Nigeria). Investments in human capital, especially in education, healthcare, and social infrastructure, are essential for long-term growth (e.g., Bangladesh, South Africa). To shield from external shocks and the short-run trade-off, diversifying trade partners and encouraging domestic production will support economic stability. Reforming regulatory frameworks and improving government efficiency will further enhance institutional capacity (e.g., Mexico, Indonesia).

Middle Competitiveness Economies, middle-tier countries should focus on improving institutional quality and diversifying

their economies. Strengthening regulatory frameworks and investing in R&D and innovation will foster competitiveness (e.g., India, Thailand). While environmental regulations are important, they must be implemented gradually to avoid harming industrial output. Labour market flexibility and social protection will ensure that vulnerable populations are not disproportionately impacted by these transitions.

High Competitiveness Economies, for high-tier economies, sustaining innovation-driven growth is key. Continued investment in advanced technologies and sustainable industries will help maintain competitiveness (e.g., Germany, Japan). These economies should foster public-private partnerships for green technology and collaborate on international environmental governance to balance sustainability with economic performance. Ensuring inclusive growth by addressing income inequality, enhancing social mobility, and adapting the workforce will further strengthen economic dynamism (e.g., Canada, Sweden).

This study examines the impact of Corruption and Governance, Environmental Performance, Economic Dynamics, and HDI on global competitiveness across different country categories for 2018 and 2023. While the analysis provides valuable cross-sectional insights, several limitations must be acknowledged. First, the focus on a specific set of variables, though grounded in theory and prior research, may not capture the full complexity of global competitiveness. Additionally, the study is heavily quantitative, lacking qualitative insights into how cultural, institutional, and geopolitical factors interact with the analysed variables. The analysis is restricted to two specific years due to data availability; expanding the timeframe could offer deeper insight into long-term trends. Moreover, regional trade agreements and geopolitical dynamics—both critical drivers of competitiveness—were not examined. Methodologically, the sample includes 43 countries with complete data across all variables for both 2018 and 2023. While this ensures consistency, it may introduce a degree of selection bias by excluding countries with incomplete records, though the selection was not based on competitiveness levels. The data used is drawn from internationally recognised sources and did not require imputation, minimising concerns about missing data. Finally, although endogeneity—especially reverse causality between competitiveness and indicators like HDI—remains a possible concern, the use of an Ordered Probit Regression Model mitigates this to some extent by focusing on ordinal classification rather than direct causal inference. Nonetheless, future research could apply panel data models or instrumental variable techniques and incorporate qualitative case studies to strengthen causal interpretation and deepen contextual understanding.

Author Contributions

All authors contributed to the conception and design of the project. N.K. composed the writing of the manuscript. N.K. and R.J. carried out a significant share of tasks on statistical work in the manuscript. R.J. provided critical knowledge in drafting the paper and supervised the entire study. The authors have read and approved the final manuscript.

Acknowledgements

The authors would like to thank Mr. Harasha Gunewardene for proofreading and editing this manuscript.

Ethics Statement

Ethical review and approval were waived for this study because no additional institutional review board approval was required for the publicly available secondary analysis.

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All data generated or analysed during this study are included in this published article and its supplementary information files.

References

Abbass, K., C. L. Voinea, N. Roijakkers, M. Usman, and H. Song. 2025. "Innovation Strategies for Ecological Sustainability: Effects of Natural Resources and Energy Consumption." *Sustainable Development*. https://doi.org/10.1002/sd.3287.

Agarwal, P., and M. Chonzi. 2020. "Impact of COVID-19 on International Trade: Lessons for African LDCs. Available at SSRN 3693901." https://doi.org/10.2139/ssrn.3693901.

Alfano, V., S. Capasso, S. Ercolano, and R. K. Goel. 2022. "Death Takes no Bribes: Impact of Perceived Corruption on the Effectiveness of Non-Pharmaceutical Interventions at Combating COVID-19." *Social Science & Medicine* 301: 114958. https://doi.org/10.1016/j.socscimed.2022.114958.

Ali, Q., A. Abbas, M. T. I. Khan, et al. 2022. "Sustainable Agriculture Through Reduced Emission and Energy Efficiency: Estimation of Input–Output Energy and GHG Emission Under Tunnel Cultivation of Tomato." *Agronomy* 12, no. 8: 1730. https://doi.org/10.3390/agronomy12081730.

Ali, Q., S. Anwar, M. T. I. Khan, M. R. Yaseen, and M. Ashfaq. 2023. "Estimation of Economic, Environmental, and Social Efficiency for Sustainable Development in G-8 and SAARC Countries: A Data Envelopment Analysis." *Environmental Science and Pollution Research* 30, no. 10: 26819–26842. https://doi.org/10.1007/s11356-022-23894-w.

Ali, Q., M. R. Yaseen, and M. T. I. Khan. 2019a. "The Causality of Road Traffic Fatalities With Its Determinants in Upper Middle Income Countries: A Continent-Wide Comparison." *Transportation Research Part A: Policy and Practice* 119: 301–312. https://doi.org/10.1016/j.tra.2018.12.002.

Ali, Q., M. R. Yaseen, and M. T. I. Khan. 2019b. "Energy Budgeting and Greenhouse Gas Emission in Cucumber Under Tunnel Farming in Punjab, Pakistan." *Scientia Horticulturae* 250: 168–173. https://doi.org/10.1016/j.scienta.2019.02.045.

Arabiat, O., S. Abu-Asabeh, and H. Alshurafat. 2024. "Between Freedom and Corruption: The Interplay of Total Reserves During the COVID-19 Epoch–a Cross-Country Inquiry." *International Journal of Emerging Markets*. https://doi.org/10.1108/ijoem-09-2023-1500.

Arshed, N., R. Kalim, M. Iqbal, and S. Shaheen. 2023. "Role of Real Sector and HDI: Does Competitiveness Contribute?" *Journal of the Knowledge Economy* 14, no. 3: 3044–3070. https://doi.org/10.1007/s13132-022-00997-w.

Barros, A. d. N. F., L. L. R. dos Santos, R. A. de Lemos Bernardo, L. de Oliveira Xavier, and A. G. d. C. T. Cavalcanti. 2020. "Corruption and Covid-19's Lethality:'So What?'" *International Journal of Advances in Management and Economics* 9, no. 3: 28–38. https://doi.org/10.31270/ijame/v09/i03/2020/4.

Barth, H., P. Ulvenblad, P.-O. Ulvenblad, and M. Hoveskog. 2021. "Unpacking Sustainable Business Models in the Swedish Agricultural Sector– The Challenges of Technological, Social and Organisational Innovation." *Journal of Cleaner Production* 304: 127004. https://doi.org/10.1016/j.jclepro.2021.127004.

Blum, B., and B. K. Neumärker. 2021. "Lessons From Globalization and the COVID-19 Pandemic for Economic, Environmental and Social Policy." *World* 2, no. 2: 308–333. https://doi.org/10.3390/world2020020.

Bouët, A., D. Laborde Debucquet, and L. Deason. 2014. "Global Trade Patterns, Competitiveness, and Growth Outlook."

Celik, A., and A. Kostekci. 2025. "Empirical Exploration of the Drivers of Human Development in Central and West Asian Countries: How Effective Are Control of Corruption, Political Stability and the Rule of Law?" *Sustainable Development*. https://doi.org/10.1002/sd.3365.

Cetinguc, B., F. Calisir, M. Guven, and B. Guloglu. 2023. "Are Human Development and Innovativeness Levels Good Predictors of the Competitiveness of Nations? A Panel Data Approach." *Sustainability* 15, no. 24: 16788. https://doi.org/10.3390/su152416788.

Civelek, M. E., N. Uca, and M. Çemberci. 2015. "The Mediator Effect of Logistics Performance Index on the Relation Between Global Competitiveness Index and Gross Domestic Product." *European Scientific Journal* 11, no. 13: 368–375. https://hdl.handle.net/11467/1326.

Clinch, J. P., and C. Ketels. 2020. "Acting now While Preparing for Tomorrow: Competitiveness Upgrading Under the Shadow of COVID-19." https://www.hbs.edu/faculty/Pages/item.aspx?num=62801.

Daykin, A. R., and P. G. Moffatt. 2002. "Analyzing Ordered Responses: A Review of the Ordered Probit Model." *Understanding Statistics* 1, no. 3: 157–166. https://doi.org/10.1207/S15328031US0103_02.

De Souza Barbosa, A., M. C. B. C. Da Silva, L. B. Da Silva, S. N. Morioka, and V. F. De Souza. 2023. "Integration of Environmental, Social, and Governance (ESG) Criteria: Their Impacts on Corporate Sustainability Performance." *Humanities and Social Sciences Communications* 10, no. 1: 1–18. https://doi.org/10.1057/s41599-023-01919-0.

Del Carpio, X., J. A. Cuesta, M. D. Kugler, G. Hernández, and G. Piraquive. 2022. "What Effects Could Global Value Chain and Digital Infrastructure Development Policies Have on Poverty and Inequality After COVID-19?" *Journal of Risk and Financial Management* 15, no. 2: 43. https://doi.org/10.3390/jrfm15020043.

Despotovic, D., S. Cvetanovic, V. Nedic, and M. Despotovic. 2019. "Social Aspects of Sustainable Competitiveness in the Selected European Countries in the Period 2012–2015." *Social Indicators Research* 141: 841–860. https://doi.org/10.1007/s11205-018-1840-4.

Doyle, E., and M. Perez-Alaniz. 2017. "From the Concept to the Measurement of Sustainable Competitiveness: Social and Environmental Aspects." *Entrepreneurial Business and Economics Review* 5, no. 4: 35–59. https://doi.org/10.15678/EBER.2017.050402.

Famiyeh, S., E. Adaku, K. Amoako-Gyampah, D. Asante-Darko, and C. T. Amoatey. 2018. "Environmental Management Practices, Operational Competitiveness and Environmental Performance: Empirical Evidence From a Developing Country." *Journal of Manufacturing Technology Management* 29, no. 3: 588–607. https://doi.org/10.1108/JMTM-06-2017-0124.

Geng, B., D. Wu, C. Zhang, W. Xie, M. A. Mahmood, and Q. Ali. 2024. "How Can the Blue Economy Contribute to Inclusive Growth and Ecosystem Resources in Asia? A Comparative Analysis." *Sustainability* 16, no. 1: 429. https://doi.org/10.3390/su16010429.

GuÎˆngÃ, H., M. BalcÄ±lar, and G. Olasehinde-Williams. 2019. "The Empirical Relationship Between Financial Development and Foreign Exchange Regimes: Did Global Financial Crisis of 2007-2009 Change Regime Preferences?" *European Journal of Sustainable Development* 8, no. 1: 324–324. https://doi.org/10.14207/ejsd.2019.v8n1p324.

Hamid, E. S. 2019. "Human Development Index and the Forming Factors: The Effect of Global Competitiveness Index in Ten Asean Countries." *Journal of International Business and Economics* 7, no. 2: 74–81. https://doi.org/10.15640/jibe.v7n2a7.

Ikram, M., and Y. Sayagh. 2023. "The Consequences of COVID-19 Disruption on Sustainable Economy in the Top 30 High-Tech Innovative Countries." *Global Journal of Flexible Systems Management* 24, no. 2: 247–269. https://doi.org/10.1007/s40171-023-00338-z.

Kalansuriya, N., S. De Silva, N. Perera, et al. 2023. "Analysing the Influence of Logistics, Corruption, FDI and GDP on Global Competitiveness: A Cross-Sectional Study." *Journal of the Knowledge Economy* 15, no. 3: 1–20. https://doi.org/10.1007/s13132-023-01615-z.

Khan, M. T. I., M. R. Yaseen, and Q. Ali. 2018. "The Dependency Analysis Between Energy Consumption, Sanitation, Forest Area, Financial Development, and Greenhouse Gas: A Continent-Wise Comparison of Lower Middle-Income Countries." *Environmental Science and Pollution Research* 25: 24013–24040. https://doi.org/10.1007/s11356-018-2460-x.

Kiseľáková, D., B. Šofranková, M. Gombár, V. Čabinová, and E. Onuferová. 2019. "Competitiveness and Its Impact on Sustainability, Business Environment, and Human Development of EU (28) Countries in Terms of Global Multi-Criteria Indices." *Sustainability* 11, no. 12: 3365. https://doi.org/10.3390/su11123365.

Kordalska, A. K., and M. Olczyk. 2016. "Global Competitiveness and Economic Growth: A One-Way or Two-Way Relationship? Equilibrium." *Quarterly Journal of Economics and Economic Policy* 11, no. 1: 121–142. https://doi.org/10.2139/ssrn.2891304.

Koziuk, V., Y. Hayda, O. Dluhopolskyi, and Y. Klapkiv. 2019. "Stringency of Environmental Regulations vs Global Competitiveness: Empirical Analysis." *Economics & Sociology* 12, no. 4: 278–298. https://doi.org/10.14254/2071-789X.2019/12-4/17.

Lin, Y., M. A. Mahmood, W. Meng, and Q. Ali. 2024. "Green Economy Transition in Asia Pacific: A Holistic Assessment of Renewable Energy Production." *Journal of Cleaner Production* 437: 140648. https://doi.org/10.1016/j.jclepro.2024.140648.

Lonska, J., and V. Boronenko. 2015. "Rethinking Competitiveness and Human Development in Global Comparative Researches." *Procedia Economics and Finance* 23: 1030–1036. https://doi.org/10.1016/S2212-5671(15)00475-X.

Mena, C., A. Karatzas, and C. Hansen. 2022. "International Trade Resilience and the Covid-19 Pandemic." *Journal of Business Research* 138: 77–91. https://doi.org/10.1016/j.jbusres.2021.08.064.

Mondjeli, I. M. M. N., P. C. Tsopmo, and M. M. Ambassa. 2024. "Re-Examining the Curse of Natural Resources in SSA: New Evidence From Disaggregated Natural Resources and Types of Corruption." *Journal of Economic Criminology* 5: 100072. https://doi.org/10.1016/j.jeconc.2024.100072.

Nababan, T. S. 2019. "Development Analysis of Global Competitiveness Index of ASEAN-7 Countries and Its Relationship on Gross Domestic Product." *IJBE (Integrated Journal of Business and Economics)* 3, no. 1: 1–14. https://doi.org/10.33019/ijbe.v3i1.108.

Naseer, M. A. u. R., M. Ashfaq, A. Razzaq, and Q. Ali. 2020. "Comparison of Water Use Efficiency, Profitability and Consumer Preferences of Different Rice Varieties in Punjab, Pakistan." *Paddy and Water Environment* 18, no. 1: 273–282. https://doi.org/10.1007/s10333-019-00780-9.

Njangang, H., S. A. Asongu, and E. Mouchili. 2024. "Does Corruption Starve Africa? The Mitigating Effect of Political Distribution of Power." *Journal of Policy Modeling* 46, no. 1: 171–197. https://doi.org/10.1016/j.jpolmod.2023.12.003.

Pereira Munhoz Junior, J., L. Luiz Dalazen, L. Santos Costa Viera Da Silva, et al. 2022. "Relationship Between Competitiveness and Social Progress Indicators." *International Journal of Scientific Research*

and Management 10(05): 1079–1094. https://doi.org/10.18535/ijsrm/v10i5.sh03.

Pilinkiene, V. 2016. "Trade Openness, Economic Growth and Competitiveness. The Case of the Central and Eastern European Countries." *Inžinerinė Ekonomika* 27, no. 2: 185–194. https://doi.org/10.5755/j01.ee.27.2.14013.

Podolskaya, T., and M. Singkh. 2021. "Factors of China's International Competitiveness and the Sustainability of Its Economy Under the COVID-19 Pandemic (The Case Study for BRICS)." In *Paper Presented at the E3S Web of Conferences*.

Porter, M. E. 1990. "New Global Strategies for Competitive Advantage." *Planning Review* 18, no. 3: 4–14. https://doi.org/10.1108/eb054287.

Qazi, A. 2024. "Exploring the Impact of Global Competitiveness Pillars on Sustainable Development." *Environmental Impact Assessment Review* 105: 107404. https://doi.org/10.1016/j.eiar.2023.107404.

Rajnoha, R., and P. Lesnikova. 2022. "Sustainable Competitiveness: How Does Global Competitiveness Index Relate to Economic Performance Accompanied by the Sustainable Development?" *Journal of Competitiveness* 14: 136–154. https://doi.org/10.7441/joc.2022.01.08.

Raza, A., Q. Ali, and T. Hussain. 2021. "Role of Knowledge, Behavior, Norms, and e-Guidelines in Controlling the Spread of COVID-19: Evidence From Pakistan." *Environmental Science and Pollution Research* 28, no. 30: 40329–40345. https://doi.org/10.1007/s11356-020-10931-9.

Saeed, M. M., S. S. Mohammed, A. Adeniyi, and M. Osei. 2025. "The Impact of Corporate Governance on the Contribution of Listed Firms to Sustainable Development Goals (SDGs) Disclosures in Ghana." https://doi.org/10.1002/sd.3367.

Schwab, K., and S. Zahidi. 2020. "Global Competitiveness Report: Special Edition 2020."

Silva, N., J. A. Fuinhas, M. Koengkan, and E. Kazemzadeh. 2024. "What Are the Causal Conditions That Lead to High or Low Environmental Performance? A Worldwide Assessment." *Environmental Impact Assessment Review* 104: 107342. https://doi.org/10.1016/j.eiar.2023.107342.

Simon-Yarza, B. 2023. "The Changing Wheels Hypothesis. Corruption and Development: Evidence From China." *Journal of Government and Economics* 12: 100094. https://doi.org/10.1016/j.jge.2023.100094.

Sofilda, E., D. Hariyanti, and T. Ismawaty. 2016. "The Effect of Global Competitiveness and Trade Openness Through the Investment, Tax, and Inflation Towards Economic Growth." *OIDA International Journal of Sustainable Development* 9(02): 71–88. https://ssrn.com/abstract=2739888.

Sultana, N., M. M. Rahman, R. Khanam, and Z. Kabir. 2022. "Environmental Quality and Its Nexus With Informal Economy, Corruption Control, Energy Use, and Socioeconomic Aspects: The Perspective of Emerging Economies." *Heliyon* 8, no. 6: e09569. https://doi.org/10.1016/j.heliyon.2022.e09569.

Syarifuddin, F., and M. Setiawan. 2022. "The Relationship Between COVID-19 Pandemic, Foreign Direct Investment, and Gross Domestic Product in Indonesia." *Sustainability* 14, no. 5: 2786. https://doi.org/10.3390/su14052786.

Tinbergen, J. 1956. "On the Theory of Income Distribution." *Weltwirtschaftliches Archiv* 77: 155–175. http://www.jstor.org/stable/40435398.

Ulman, S.-R. 2013. "Corruption and National Competitiveness in Different Stages of Country Development." *Procedia Economics and Finance* 6: 150–160. https://doi.org/10.1016/s2212-5671(13)00127-5.

Ulman, S.-R. 2014. "Different Levels of Corruption Influence on the Main Components of the Macroeconomic Environment." *Procedia Economics and Finance* 16: 438–447. https://doi.org/10.1016/s2212-5671(14)00823-5.

Uroos, A., M. S. Shabbir, M. U. Zahid, G. Yahya, and B. A. Abbasi. 2022. "Economic Analysis of Corruption: Evidence From Pakistan." *Transnational Corporations Review* 14, no. 1: 46–61. https://doi.org/10.1080/19186444.2021.1917331.

Varvarigos, D. 2023. "Cultural Persistence in Corruption, Economic Growth, and the Environment." *Journal of Economic Dynamics and Control* 147: 104590. https://doi.org/10.1016/j.jedc.2022.104590.

Vîrjan, D., A. Manole, M. Stanef-Puică, et al. 2023. "Competitiveness—The Engine That Boosts Economic Growth and Revives the Economy." *Frontiers in Environmental Science* 11: 1130173. https://doi.org/10.3389/fenvs.2023.1130173.

Wooldridge, J. M. 2016. Introductory Econometrics: A Modern Approach. Supplement: Cengage Learning.

Yaseen, M. R., Q. Ali, and M. T. I. Khan. 2018. "General Dependencies and Causality Analysis of Road Traffic Fatalities in OECD Countries." *Environmental Science and Pollution Research* 25: 19612–19627. https://doi.org/10.1007/s11356-018-2146-4.

Ye, F., and D. Lord. 2014. "Comparing Three Commonly Used Crash Severity Models on Sample Size Requirements: Multinomial Logit, Ordered Probit and Mixed Logit Models." *Analytic Methods in Accident Research* 1: 72–85. https://doi.org/10.1016/j.amar.2013.03.001.

Zhang, S., G. Xu, Y. Shu, J. Zhu, and W. Cheng. 2024. "Comparing Developed and Emerging Nations' Economic Development With Environmental Footprint for Low-Carbon Competitiveness." *Heliyon* 10, no. 14: e34039. https://doi.org/10.1016/j.heliyon.2024.e34039.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.