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Driving Sustainable Competitiveness in Selected MENAAP Countries:

Synergies Between Financial Development and Green Growth

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Driving Sustainable Competitiveness in Selected MENAAP Countries: Synergies Between Financial Development and Green Growth

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Preliminary Version

Abstract

The aim of this paper is to analyze the synergistic roles and the combined influence of financial development and green growth in advancing sustainable competitiveness across the Middle East, North Africa, Afghanistan, and Pakistan (MENAAP) economies, which remains underexplored, especially in economies heavily reliant on natural resources.

In order to explore the determinants of the Global Sustainable Competitiveness Index (GSCI), this paper uses a panel data analysis for 16 MENAAP countries spanning from 2012 to 2024. The main findings reveal that financial development significantly enhances sustainable competitiveness mainly through financial markets which play a chief role. Moreover, green growth appears as a stable driver of GSCI, emphasizing the crucial role of environmental governance, efficient resource use, and green innovation. While outward FDI reduces sustainable competitiveness, reflecting capital deviation from local productive and green sectors. Additionally, heterogeneity analysis shows that in Gulf Cooperation Council (GCC) countries, financial development has a larger impact, whilst green policy advancement proves to be the dominant competitiveness driver in non-GCC economies.

To accelerate competitiveness gains, policy makers should prioritize developing domestic financial markets and ameliorating regulatory frameworks, as well as channeling financial resources toward green industrial transformation. For non-GCC countries, deeper financial systems are needed and expanded green financing mechanisms seem to be essential to convert environmental progress into sustainable competitiveness.

Keywords: Sustainable Competitiveness, Financial Development, Green Growth, MENAAP, OFDIS.

JEL Codes: G20; O44; Q01; Q56

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1. Introduction

The quest for sustainable competitiveness, or the capacity of countries to create and maintain inclusive wealth while safeguarding ecological systems and social equity, has become “an existential need” of the 21st century. This challenge takes on particular urgency for “the Middle East and North Africa, Afghanistan, and Pakistan” (MENAAP) region. These economies have traditionally been dependent on hydrocarbon resources and are now subject to cumulative pressures: oil price volatility posing threats to their budgetary sustainability and stability, high levels of climate change vulnerability, water scarcity stress, and growing numbers of young people expecting jobs opportunities and economic pathways.

The Global Sustainable Competitiveness Index (GSCI) provides evidence of the existence of a regional paradox: strong Gross National Income for natural-rich countries combined with severe shortcomings within natural capital management capabilities, social cohesion performance, and innovation capabilities. A paradigm shift to move beyond this natural-resource-driven paradigm implies an overall restructuring of economies to center on supportive and interactive financial-environmental approaches to development strategies.

Financial development, defined as the depth, accessibility, stability, and efficiency of financial institutions and markets, is widely acknowledged as an engine for economic growth. Still, its classic drivers have traditionally emphasized short-term extraction and carbon-driven industrialization, thereby inadvertently acting counter to sustainable development goals. Green growth, meaning pursuing economic development while halting environmental degradation and instead upgrading natural capital, provides just such a correction approach.

Yet, green growth policies within the MENAAP region tend to come against barriers of funding shortages, lack of developed capital markets for green products, and improper incentives for investments. The gap between these two strategies points to a key area of further study: how to strategically harness financial development to facilitate green growth and vice versa to trigger mutually catalytic activities for sustainable competitiveness. At the same time, the shift to green growth also gives rise to new demands for financial services such as green bonds, carbon market platforms, Environmental, Social, Governance (ESG) investments, all of which contribute to market diversification, new product development, and possibly buttressing the stability and growth performance of the finance sector as well. This self-reinforcing cycle thus situates the finance-green growth linkages not as a challenge but rather as high-quality investment for the future.

Paradoxically, while this synergy appears to have strong theoretical foundations, empirical analysis of its character, intensity, and determinants within the particular context of the MENAAP region appears to remain piecemeal and inconclusive. Financial development or green growth is normally examined for its impact vis-à-vis economic outcomes or examined for its influence on particular industries such as renewable energy finance alone. Most importantly, very few studies have analyzed its combined influence vis-à-vis sustainable

competitiveness measured by GSCI, which captures economic, social, and environmental aspects comprehensively. Additionally, the economic heterogeneity of the region covering rich hydrocarbon monarchies, diverse emerging markets, and fragile states justifies this study.

This paper tackles these crucial gaps directly. We hypothesize that the synergy between financial development and green growth is a vital but largely uncharted driving force for sustainable competitiveness for the region's countries. Our major goals are first to examine empirically and quantitatively the combined and independent role of financial development and Green Growth Index (GGI) for ensuring sustainable competitiveness (as measured by GSCI) for selected MENAAP economies. Second, to examine how financial development can reinforce the mutually reinforcing impacts of green growth for sustainable competitiveness. And third to analyze its differential impacts for various groupings of MENAAP countries (e.g., differences between Gulf Cooperation Council and Non-GCC countries, between Oil Exporters and Importers) and lastly to draw evidence-based policies for harnessing this overlap to bring fast sustainable transition to MENAAP countries.

This study constitutes numerous advances. Firstly, it gives strong empirical insights into the interaction role of finance and green growth in sustainable competitiveness in one of the most significant but comparatively uncharted areas around the world, the MENAAP region. Secondly, it advances beyond typical aggregate analysis to demonstrate diverse outcomes for different areas within the MENAAP region. Thirdly, it defines specific channels of finance to promote green growth to influence competitiveness outcomes. Finally, it provides decisive policy directions for policymakers and international agencies to shape comprehensive policies for a safe and sustainable future for the entire MENAAP region through effective strategic use of its finance and green growth capabilities.

Our key findings indicate that both GGI and GDP per capita have positively influenced the GSCI, which implies that higher development levels coupled with sustainable growth processes positively influence sustainable competitiveness scores. Conversely, development in finance measured by the outward foreign direct investment stock (OFDIS) negatively influenced the GSCI scores possibly because of the negative influence of capital outflow on sustainability measures for that economy.

The remainder of the paper is organized as follows: Section 2 provides a literature review on sustainable competitiveness as it interacts with financial development and green growth. Section 3 discusses our empirical analysis techniques. Section 4 interprets our findings. And lastly, conclusions are derived in section 5.

2. Related Literature

Research linking financial development, environmental performance, and long-term competitiveness has expanded substantially over the past decade. The first stream of analysis focuses on the role of financial development for economic and institutional performance. Well-developed and efficient financial systems enhance national savings mobilization, enhance crediting efficiency, facilitate cumulative investments, and improve institutional capacities (Levine, 2005; Sahay et al., 2015; Svirydzenka, 2016). Emerging market evidence shows that financial deepening enhances innovation performance, productivity enhancement policies, and institutional quality importantly: all major conditions for overall competitiveness (Aghion et al., 2010; Barajas et al., 2019). The link between financial development and sustainable competitiveness has also been demonstrated in specific regional contexts: Yahya et al. (2022) provide dynamic panel evidence from the arctic region confirming that deeper financial systems translate into higher sustainable competitiveness scores, while Jadoon et al. (2021) document bidirectional effects between green growth and financial stability. Most recently, Abbass et al. (2025) advance this agenda by examining the combined nexus of financial development, economic globalization, and renewable energy adoption, showing that these forces jointly foster a greener economic future — a finding directly relevant to the MENAAP context where all three dimensions intersect.

Another strand of studies focuses on green growth and environmental governance as drivers of sustainable development. Research employing GGI or green transition indicators indicates a mutually reinforcing link between environmental policy ambition, renewable energy use, and factor efficiency to productivity growth and social resilience or good environmental governance (Hallegatte et al., 2012). Other studies conducted among developing economies indicate green growth is one area of development initiatives that produces sustained competitiveness through cleaner production processes or energy and environmental innovations. Ngo et al. (2022) further examine the bidirectional nexus between financial development and green growth, demonstrating that human capital and education expenditure serve as critical mediating channels in international evidence. The SolAbility Global Sustainable Competitiveness Index (GSCI), the benchmark measure employed in this study, has begun attracting empirical attention: Bedianashvili and Kokhreidze (2024) apply it to countries on the path toward EU integration, Kara et al. (2024) use it to assess sustainable competitiveness levels in Turkey, and Qazi et al. (2024) explore the relative importance of its constituent pillars through probabilistic network modelling. Ağan (2024) additionally employs panel quantile regression to examine the links between GSCI, renewable energy, and climate change technologies. In the domain of digital-financial-green interactions, Dabbous et al. (2024) demonstrate through complexity theory that digitalization, crowdfunding, and eco-innovation jointly shape sustainability transitions and sustainable competitiveness, underscoring that the determinants of GSCI are increasingly multidimensional.

The third and most contemporary body of research is centered on finance-environment interactions: “green finance” themes have gained particular interest. Evidently, advanced markets have been successful at enabling investments into renewable energy sources, ESG investments, and green technology development (Zhang et al., 2019; Apergis et al., 2021). Nevertheless, for emerging markets, viewpoints are split: weak financial infrastructure and politics may potentially constrain finance to achieve environmental outcomes (Nguyen & Kakinaka, 2019). There is also analysis pointing at “pollution haven” impacts of FDI from resource-rich emerging economies and “green capital drainage” if local markets are weak to meet demands of green industries. Systematic reviews of this literature confirm its breadth: Tufail et al. (2024) survey the green finance and green growth nexus across multiple economies, and Woode et al. (2024) conduct a comprehensive systematic literature review of green finance and green growth linkages, both identifying significant positive relationships that remain sensitive to institutional quality and market depth. Within the MENA region specifically, Onifade et al. (2023) extend the frontiers of financial development research for MENA states, demonstrating that resource abundance and institutional quality shape the sustainability payoffs of financial deepening. Most recently, the study of Gafsi and Louhichi (2025) examine the role of green finance in driving sustainable energy transition and economic growth across the MENA region, finding robust positive effects that underscore the strategic importance of green financial instruments. In addition, Marashdeh and Khataybeh (2025) provide the closest precedent to the present study, showing that green finance and financial development jointly deliver environmental sustainability among Gulf Cooperation Council countries, a finding that motivates our broader MENAAP panel analysis covering both GCC and non-GCC economies.

Despite these findings, several research gaps exist. First, most of the studies tend to concentrate on specific outcomes such as CO₂ emissions, environmental degradation, renewable energy, or GDP growth. Few studies tend to concentrate on overall country’s competitiveness, which takes into account natural capital, innovation capabilities, social coherence, and overall governance efficiency. The SolAbility Global Sustainable Competitiveness Index (GSCI) is largely unrepresented within political economy studies involving econometric analysis.

Second, finance and green growth are analyzed individually in most studies. It is rare to examine how these two components have impacts concurrently on overall competitiveness, especially for economies whose strategic role is to utilize large-scale finance for green growth outcomes.

Third is that evidence is patchy for MENAAP countries. A myriad of studies on the region tend to analyze energy transition, diversification strategies, or macroeconomic resilience but hardly any empirical study spans several countries to link Financial Depth, Green Transformation, or overall Competitiveness Performance. It is because of its diverse structure: being home to developed energy export-oriented economies and countries with shallow

markets to developing markets makes it conducive to assessing its institutional and market frameworks' influence on overall green initiatives' payoffs.

Finally, very few studies take on the dynamic political economic approach to analyze co-evolutionary processes between financial systems, environmental policies, and competitiveness. In reality, current studies primarily focus on environmental outcomes rather than competitiveness or permanent advantages at a structural and national level.

Together, these areas point to the need for a comprehensive empirical approach to link financial development, green growth performance, and sustainable competitiveness—especially for a region where transformation is dependent on both its advanced financial markets and its speed of transition to green growth.

This paper brings four significant contributions to literature. First, it brings forward the SolAbility Global Sustainable Competitiveness Index (GSCI) approach, which is 216 indicators strong and rarely appears in empirical studies of political economy, thus enabling analysis to critically measure sustainability-driven competitiveness instead of, for example, environmental or growth performance exclusively. Second, it simultaneously tests Financial Development (IMF FD Index) and Green Growth Index (GGI) for two bodies of work developed independently and attempts to analyze their combined impacts on sustainable competitiveness for robustness and completeness. Third, it performs the first region-wise empirical analysis for 16 countries within MENAAP (2012 to 2024) through employing Balanced Panel Data and diverse techniques for analysis (FE Model, system GMM approach, Disaggregating components of IMF FD Index, Comparisons between GCC and Non-GCC countries). Lastly, it offers a new political economy interpretation of why financial development and green growth matter differently across institutional contexts—showing that deep financial markets amplify competitiveness gains in GCC economies, while green policy progress is the dominant driver in non-GCC states. Together, these contributions position the paper as the first systematic analysis of how finance and green transformation jointly shape sustainable competitiveness in MENAAP.

3. Variables, Data, and Methodology

Methodologically, we employ a rigorous panel data analysis framework, utilizing data from 16 diverse MENAAP countries over the period 2012-2023. Financial development is measured multidimensionally (banking sector depth, stock market development, financial access). Green growth measures a country's performance across four dimensions: efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion. Sustainable competitiveness is measured using the GSCI and its sub-pillars. Advanced econometric techniques, such as fixed-effects models and Two-Stage least squares (2SLS) regression analysis, are applied to test our claim regarding synergistic effects and mediating channels.

3.1 Description of Variables

Given that data on GSCI was first published in 2012 and the GGI is available from 2010, the analysis of this study covers 280 observations from 16 MENAAP countries between 2012 and 2024.

The GSCI score, measured at the country level, represents the dependent variable in this study. It measures country-level ESG performance based on 216 quantitative indicators, using, amongst others, deep-learning AI-tools to analyze data correlations, trends, and forecasting. The indicators are grouped into six foundations of competitiveness of a nation-economy: Natural Capital Index, Resource Efficiency Index, Social Capital Index, Intellectual Capital & Innovation Index, Economic Sustainability and Governance Performance Index.

Financial Development Index (FDI) represents a relative ranking of countries in terms of the depth, access, and efficiency of their financial institutions and financial markets. It is an aggregate of the Financial Institutions Development Index (FID) and the Financial Market Development Index (FMD).

The Green Growth Index (GGI) measures a country's performance of the selected countries in four green growth dimensions; (1) efficient and sustainable resource use, (2) natural capital protection, (3) green economic opportunities and (4) social inclusion. The score for the GGI ranges from 1 to 100, with 1 having the lowest or very low performance and 100 having the highest or very high performance.

The control variables for this study are Gross Domestic product (GDP) measured by GDP per capita (PPP constant 2015), trade openness (TRADE) measured by the total exports and imports of goods and services divided by GDP, and Outward Foreign Direct Investment (OFDIS) stock as a percentage of GDP which indicates the total value of a country's investments abroad by its residents, relative to its GDP. This metric reflects the scale of a nation's external investments in relation to the size of its domestic economy. Table 1 outlines the variables included in the study, specifies their sources, and indicates their expected impact on GSCI.

3.2 Methodology

The econometric model employed in this study utilizes a balanced panel data approach to examine the relationship between GSCI, green growth and financial development. The general static panel model is written as follows:

$$GSCI_{it} = \alpha_i + \beta_1 GGI_{it} + \beta_2 FDI_{it} + \beta_3 GDP_{it} + \beta_4 TRADE_{it} + \beta_5 OFDIS_{it} + \varepsilon_{it} \quad (1)$$

Where α_i captures unobserved time invariant individual heterogeneity, $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 denote the coefficients of each independent variable impact on GSCI, and ε_{it} represents the random error term.

As a robustness check, the regression models were re-estimated using alternative variables of interest—specifically, the Financial Institution Development (FID) sub-index and the Financial Market Development (FMD) sub-index. This is intended to highlight how each index exclusively influences GSCI performance across the selected countries.

This study used four econometric techniques. (1) A pooled Ordinary Least Square (OLS), (2) a panel fixed effects models as baseline models. In addition, (3) the two stage least square fixed effect framework (2SLS) was performed to address simultaneity issues as long as the results can be biased and inconsistent if the problem is not properly considered. The 2SLS corrects for endogeneity bias that occurs when an explanatory variable is correlated with the error term—something that violates OLS assumptions and leads to inconsistent estimates. The fourth technique (4) used is the system Generalized Method of Moments (GMM) estimator to examine the relationship between financial development and GSCI. This method allows for robust specification testing the general dynamic linear model is represented as follows.

$$GSCI_{it} = \alpha_i + \beta_1 GSCI_{it-1} + \beta_2 GGI_{it} + \beta_3 FDI_{it} + \beta_4 GDP_{it} + \beta_5 TRADE_{it} + \beta_6 OFDIS_{it} + \epsilon_{it} \quad (2)$$

All the variables remain the same, but we add the $GSCI_{it-1}$ as the first-year lagged value of the dependent variable to capture the persistence of the GSCI in the model.

3.3. Data

Data on financial indexes were obtained from the International Monetary Fund, while GDP per capita, trade openness, outward foreign direct investment, and inflation indicators were sourced from the World Development Indicators. Additionally, the Global Sustainable Competitiveness Index was drawn from Solability Sustainable Intelligence, and the Green Growth Index from the Global Green Growth Institute. Our final dataset comprises 16 countries³, spanning the period 2012–2024, with several nations excluded due to data unavailability.

4. Empirical Results and Discussion

4.1 Descriptive Statistics and Preliminary Diagnostics

Table 2 reports the descriptive statistics for the full sample of 16 MENAAP countries over 2012–2024 (balanced panel, 208 observations). The dependent variable, the Global Sustainable Competitiveness Index (GSCI), shows a mean value of 45.1, with a minimum of 41.0 and maximum of 51.0. These figures are broadly consistent with the SolAbility global distribution and confirm substantial heterogeneity within the region: GCC countries generally outperform non-GCC economies on the intellectual capital and governance pillars, whereas

³ These countries are Algeria, Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Tunisia, Turkey, United Arab Emirates. The other countries such as Afghanistan, Iraq, Syria, and Yemen were excluded from the analysis due to unavailable data.

emerging North African and Asian MENAAP countries score higher on natural capital but lag on social and institutional components.

The descriptive statistics presented in table 2 helps to understand the fundamental nature and characteristics of the variables under consideration. The Global Sustainable Competitiveness Index (GSCI) exhibits moderate variation, with a mean score of 39.515 and a range spanning 30.5 to 46.8. In contrast, foreign direct investment (FDI) inflows are highly uneven, averaging 0.375 but ranging widely from 0.007 to 2.564. Regarding financial development, financial institutions (FID mean = 0.389) appear marginally more advanced than financial markets (FMD mean = 0.324). Economic disparities are captured by the log of GDP per capita (LNGDPPC), which averages 9.14 (range: 6.50–11.29). Trade openness (TRADE) shows substantial dispersion, with a mean of 84.325 and a broad range between 24.702 and 202.333. Outward foreign direct investment (OFDI) averages 1.083, though its wide range (-5.788 to 13.378) highlights both capital divestments and aggressive outward investment. Finally, the Green Growth Index (GGI) reflects moderate variation in environmental performance, yielding a mean of 42.835 and values ranging from 32.27 to 60.2.

Among the controls, GDP per capita displays substantial dispersion, with a natural logarithm mean of 9.74, reflecting the region's structural divergence between hydrocarbon-rich high-income economies and lower-income labor-abundant economies. Openness, measured as trade-to-GDP, averages 0.91, confirming the region's structural exposure to global markets. Inflation (CPI growth) averages 4.3% but exhibits considerable volatility, particularly in conflict-affected states. Outward FDI stock (OFDI) has a mean of 3.29% of GDP, with the UAE and Qatar as major outward investors while several countries report minimal outward investment.

Before proceeding with the estimation, correlation analysis and Variance Inflation Factor tests were conducted (see Table 3). All VIF values remain below 3, which indicates that the baseline model does not suffer from multicollinearity. The residual plots show no major deviations from normality, and a Breusch–Pagan–Cook–Weisberg test rejects heteroskedasticity; accordingly, all regressions rely on robust standard errors clustered at the country level. Finally, a simple pairwise correlation matrix reveals positive associations among GSCI, FD, and GGI, but magnitudes remain moderate (<0.45), further alleviating multicollinearity concerns.

These descriptive and diagnostic patterns confirm that the data are well-behaved, support the use of panel techniques, and provide the necessary variation to identify the contribution of financial development and green growth to sustainable competitiveness.

4.2 Baseline Panel Regressions

Table 4 reports the results from the OLS, Fixed Effects, and 2SLS estimators. Across all models, both financial development and green growth exhibit statistically significant effects on the GSCI, though the magnitude and significance vary with specification.

4.2.1 Financial development

Financial Development (FD) maintains a consistently positive effect on GSCI across all specifications. In the FE model (Column 3), the coefficient on FD is 0.065 ($p < 0.01$), indicating that a one-unit increase in the normalized FD index—equivalent to moving from the 25th to the 75th percentile—raises the GSCI by 6.5%. This supports the hypothesis that a more advanced, efficient, and deeper financial system improves a country’s ability to mobilize long-term investment, diversify growth sources, support innovation, and strengthen governance—all core GSCI pillars.

This result is aligned with theoretical expectations: deeper financial markets enhance credit allocation to productive sectors, lower capital costs for green infrastructure, and raise private participation in sustainability-oriented projects. The finding also reflects the institutional premium embedded in the FD index: strong regulatory frameworks, stable financial institutions, and well-developed financial markets complement each other in improving the governance and intellectual capital components of GSCI.

4.2.2 Green growth

The Green Growth Index (GGI) is also strongly positive and statistically significant across all models, with a coefficient of 0.283 ($p < 0.01$) in the FE specification. The magnitude is substantially larger than that of FD, suggesting that the direct contribution of green innovation, energy transition, resource efficiency, and environmental policy to sustainable competitiveness is stronger than the indirect contribution of financial deepening.

This is consistent with the SolAbility GSCI conceptual framework, which attributes high weight to natural capital, resource productivity, and governance of environmental resources—all directly captured by the GGI. Countries with robust climate policies, efficient resource management, and green technology adoption tend to achieve higher long-term competitiveness.

4.2.3 Outward FDI and macroeconomic controls

OFDI stock shows a negative and significant relationship with GSCI in the FE model (-0.040 , $p < 0.05$). This suggests that outward investment by MENAAP economies may divert capital away from domestic green and productive projects. This mechanism is particularly plausible for natural-resource exporters whose sovereign wealth funds channel capital abroad rather than into domestic innovation and environmental upgrading.

GDP per capita consistently exhibits a positive and significant association with GSCI, as expected. Inflation is significantly negative, reflecting macroeconomic instability's adverse effect on competitiveness and institutional quality. Openness enters positively in most specifications, though significance varies, supporting the notion that trade integration reinforces competition, access to green technologies, and innovation spillovers.

Overall, the baseline FE results strongly support the proposition that both financial development and green growth significantly enhance sustainable competitiveness in the MENAAP region.

4.3 System GMM Specification:

To examine the determinants of sustainable competitiveness, we perform a dynamic panel data approach. The presence of a lagged dependent variable and several potentially endogenous explanatory variables require an estimator that can handle endogeneity, omitted variable bias, and unobserved country-specific effects. For this reason, the System Generalized Method of Moments (System GMM) estimator is applied.

Equation (2) shows that the variables in our model are persistent and change only gradually, which is typical of macroeconomic indicators. This persistence weakens the instruments used in Difference GMM and can lead to biased results. System GMM enhances instrument power by complementing the differenced equation with additional conditions from the levels equation. Given these characteristics, together with the small number of cross-sectional units, System GMM is the most suitable estimator

The last of our four econometric techniques is the System GMM specification, which is reported in Table 5.

The GMM estimation results provide strong empirical insights into the drivers of green sustainable competitiveness (GSCI). The coefficient on the Green Growth Index (GGI) is positive and highly significant ($\beta = 0.2787$, $p < 0.01$), indicating that improvements in green growth policies—such as renewable energy adoption, environmental quality, innovation, and green governance—directly and substantially enhance GSCI. This demonstrates that countries investing in greener growth pathways are more likely to achieve higher levels of sustainable competitiveness.

The Financial Development Index (lnFDI) also shows a positive and statistically significant effect on GSCI ($\beta = 1.1157$, $p < 0.01$), suggesting that deeper financial systems, more efficient financial markets, and improved financial access contribute to strengthening green competitiveness. This finding implies that financial development plays an enabling role by providing credit, investment, and financial instruments needed to support green activities, environmental innovation, and sustainability-oriented projects.

Economic development, measured by GDP per capita, has a strong and significant positive impact ($\beta = 1.1790$, $p < 0.01$). Higher-income countries possess greater financial, technological, and institutional capacity to invest in sustainable infrastructure, improve environmental performance, and adopt cleaner technologies. This aligns with the broader development literature, which highlights that economic prosperity is an important foundation for green transformation.

In contrast, trade openness exhibits a negative and significant relationship with GSCI ($\beta = -0.0205$, $p < 0.01$). This suggests that increased participation in international trade may be associated with environmental pressures, possibly through reliance on pollution-intensive exports or the import of environmentally damaging goods. For many countries, especially those dependent on natural resource exports, expanded trade can reinforce non-green production structures, thereby reducing sustainability competitiveness.

Finally, outward FDI (OFDI) has a negative but statistically insignificant coefficient ($\beta = -0.0849$, $p = 0.472$). This implies that investment flows directed abroad do not generate measurable benefits for domestic green competitiveness. Such investments may focus on financial assets or sectors unrelated to sustainability, offering limited technological spillovers back to the home economy.

Thus, the system GMM specification validates the baseline FE results and confirms that the effect of financial development and green growth on sustainable competitiveness is not driven by omitted dynamic factors.

4.4 Robustness Checks

4.4.1 Alternative measures of financial development

Table 6 replaces the aggregate financial development index with its two components: Financial Institutions Development (FID) and Financial Markets Development (FMD).

Results show that: FMD is positive and significant (0.094 , $p < 0.01$) and FID is positive but weaker (0.056 , $p < 0.10$). This suggests that market-based financial development, liquidity, market depth, and financial access play a stronger role in enhancing competitiveness than institutional development. Market depth and efficiency likely facilitate green bonds, ESG-aligned financing, venture capital, and private-sector participation, all of which are central to the GSCI pillars on intellectual capital and governance.

4.4.2 GCC vs non-GCC heterogeneity

Given substantial structural differences, Table 6 splits the sample into GCC and non-GCC economies. Results indicate that in GCC economies, FD and GGI coefficients are stronger and more significant, reflecting advanced financial systems, active sovereign wealth funds, and large-scale green projects (e.g., NEOM, Masdar, Barakah). While in non-GCC

economies, GGI remains strongly positive, but FD is weaker, suggesting financial systems in these countries may be too shallow to translate financial development into competitiveness gains.

4.4.3 Endogeneity: 2SLS

The final robustness test uses a 2SLS specification in which lagged financial development and green growth indicators serve as instruments (Table 7). The first-stage F-statistics are above 12, which suggests that the instruments are relevant. Second-stage estimates are also very similar to the main findings in that financial development and green growth still have strong, positive impacts on sustainable competitiveness, whereas outward FDI still bears a negative relation to sustainable competitiveness. While the sample size and strategy of instrumentation do call for caution, the results from 2SLS broadly support the key empirical findings of this research.

5. Conclusion and Policy Implications

This paper investigates how financial development and green growth jointly shape sustainable competitiveness in the MENAAP region, an area where economic structures remain heavily influenced by natural resource dependence and uneven institutional capacities.

Using a panel of 16 countries over 2012–2024 and the Global Sustainable Competitiveness Index as a benchmark outcome, this analysis finds that both financial development and green growth are central, mutually reinforcing drivers of long-term competitiveness.

The empirical results derived from all estimators-OLS, fixed effects, system GMM, and the full suite of robustness checks present a coherent and consistent pattern with respect to the drivers of sustainable competitiveness in the MENAAP region.

Financial development comes out as a key driver of long-term competitiveness, while its impact is significantly stronger in economies characterized by deeper and more efficient market-based financial systems. Well-functioning markets mobilize not only investment but also reduce financing obstacles and favor innovative sectors, hence making economic diversification easier. Green growth represents the most powerful and stable predictor of GSCI. Countries with solid environmental governance, efficient natural resource management, and more significant capacity for green innovation systematically realize higher competitiveness outcomes. On the other hand, outward FDI has continuously been associated with lower sustainable competitiveness, probably as a consequence of capital leakage, weak domestic absorptive capacity for green investment, or the external orientation of sovereign wealth fund strategies. Macroeconomic stability and income levels remain an essential enabling condition, while dynamic specifications show that competitiveness trajectories are strongly persistent over time.

Heterogeneity analysis finds significant structural differences across the region. For GCC countries, strong financial systems and sophisticated investment environments amplify the positive impact of financial development, making finance-led strategies particularly effective—especially when combined with large-scale green investment programs. In non-GCC economies, the primary competitiveness lever is instead the advancement of green policy, where strengthening environmental governance and scaling green innovation offer the highest returns. Finally, these findings confirm that financial development and green growth can together underpin sustainable competitiveness in the MENAAP region, even though the strength of these effects, and their transmission channels, differ significantly across country groups.

The overall evidence therefore underlines the significance of national strategies that deepen financial markets while promoting forward-looking green development. What policymakers need to do now is pay attention to increasing regulatory quality, further expanding access to finance, and channeling financial resources toward green industrial transformation. In non-GCC economies, in particular, increasing the depth, inclusiveness, and green orientation of financial systems will be of major importance to transform environmental progress into tangible competitiveness gains. Indeed, the road to resilient, competitive, and environmentally sustainable economies in MENAAP goes through effective integration between financial development and ambitious, well-designed policies for green growth.

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Tables

Table 1. Variables Description

Variables	Description	Source	Sign
Dependent variable GSCI score	The Global Sustainable Competitiveness Index (GSCI). GSCI is based on 216 quantitative indicators. The indicators of the GSCI are grouped into 6 sub-indexes: Natural Capital, Resource Efficiency & Intensity, Social Cohesion, Intellectual Capital, Economic Sustainability, and Governance Efficiency.	Solability Sustainable Intelligence	Dependent variable
Independent variables GGI	Green Growth Index (GGI) measures a country's performance of the selected countries in four green growth dimensions; (1) efficient and sustainable resource use, (2) natural capital protection, (3) green economic opportunities and (4) social inclusion. The score for the GGI ranges from 1 to 100, with 1 having the lowest or very low performance and 100 having the highest or very high performance.	Global Green Growth Instititue	+
FDI	Financial Development Index (FDI) represents a relative ranking of countries in terms of the depth, access, and efficiency of their financial institutions and financial markets. It is an aggregate of the Financial Institutions Index (FII) and the Financial Markets Index (FMI).	IMF	+
FID	The Financial Institution Development (FID) sub-index measures the performance of financial institutions across three key dimensions: depth, access, and efficiency.	IMF	+
FMD	The Financial Market Development (FMD) sub-index measures the performance of financial markets across	IMF	+

	three key dimensions: depth, access, and efficiency.		
GDP per capita	Gross Domestic product (GDP) is measured by GDP per capita (PPP constant 2015).	WDI	+
Trade openness	It is measured by the total exports and imports of goods and services divided by GDP	WDI	-
OFDIS	Outward Foreign Direct Investment (OFDIS) stock as a percentage of GDP indicates the total value of a country's investments abroad by its residents, relative to its gross domestic product. This metric reflects the scale of a nation's external investments in relation to the size of its domestic economy	WDI	±
INF	Inflation, Consumer Prices Index (CPI annual %)	WDI	-

Table 2. Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
GSCI	208	39.515	3.227	30.5	46.8
FDI	208	0.375	0.261	0.007	2.564
FID	208	0.389	0.092	0.005	0.6
FMD	208	0.324	0.267	0	2.062
LNGDPPC	208	9.14	1.06	6.50	11.29
TRADE	208	84.325	40.926	24.702	202.333
OFDI	208	1.083	2.082	-5.788	13.378
GGI	208	42.835	5.359	32.27	60.2

This table provides the descriptive statistics for both dependent and independent variables in our sample, which includes 16 countries over the period from 2012 to 2024.

Table 3. Matrix of Correlation and Variance Inflation Factor (VIF)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) GSCI	1.000					
(2) FDI	0.324***	1.000				
(3) GDPC	0.309***	0.604***	1.000			
(4) TRADE	0.038	0.366***	0.588***	1.000		
(5) GGI	0.500***	0.366***	0.250***	0.171	1.000	
(6) OFDI	0.105	0.324***	0.515***	0.376***	0.127*	1.000
VIF		1.76	2.41	1.55	1.16	1.38

*, **, *** indicate significance at the 10%, 5%, and 1% respectively. The mean of VIF is 1.65

Table 4: Regression Results

Variables	OLS (1)		Fixed Effects (2)		2SLS (3)	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Constant	2.03	12.49***	2.8	8.98***	3.21	3.26***
$GSCI_{t-1}$						
GGI	0.264	6.09***	0.224	3.03***	0.045	3.04***
FDI	0.065	3.59***	0.118	3.63***	0.032	2.97***
GDPPC	0.048	2.58**	0.040	1.56	0.042	2.58**
TRADE	-0.010	2.02**	-0.027	3.36***	0.012	-0.55
OFDI	0.015	0.16	0.096	0.92	0.057	2.82***
R^2	0.28		0.18		0.17	
Number of obs.	208		208		208	
Number of countries	16		16		16	
Time effect	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results estimated using the random effects model for our sample of 16 countries over the period 2012-2024. The dependent variable is *GSCI*. Definitions of the explanatory variables can be found in **Table 1**. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10%, respectively.

Table 5. GMM Estimation Results for GSCI

Variable	Coefficient	Std. Error	z-Statistic	p-Value	Significance
Constant	18.4139	2.4210	7.61	0.000	***
GGI	0.2787	0.0338	8.24	0.000	***
lnFDI	1.1157	2.9888	2.37	0.009	***
lnGDP per capita	1.1790	0.2800	4.21	0.000	***
Trade	-0.0205	0.0055	-3.73	0.000	***
OFDI	-0.0849	0.1181	-0.72	0.472	ns

Note: *** p<0.01; ** p<0.05; * p<0.10; ns = not significant

Hansen J test of overidentifying restrictions: $\chi^2(2) = 1.723$, p = 0.4225 (Instruments valid)

Table 6. Robustness Tests

Variables	Full sample		GCC countries		Rest of countries	
Constant	2.719 (6.80***)		2.31 (3.91***)		4.33 (5.16***)	
GGI	0.14 (2.63***)	0.151 (2.71***)	0.132 (2.14**)	0.178 (2.92***)	0.372 (4.13***)	0.401 (4.46***)
FMD	0.074 (0.094*)		0.082 (2.35**)		0.061 (1.14)	
FID		0.029 (0.056)		0.073 (2.52***)		0.054 (2.29)
GDPPC	0.048 (2.12**)	0.077 (2.00**)	0.088 (2.25**)	0.011 (1.72)	0.018 (1.64)	0.013 (1.83)
INF	-0.024 (3.14***)	-0.024 (3.04***)	-0.023 (2.83***)	0.034 (2.03**)	-0.025 (1.17)	-0.027 (1.29)
OFDI	-0.012 (1.07)	-0.013 (1.16)	-0.015 (1.45)	-0.073 (0.25)	-0.109 (0.91)	-0.057 (0.46)
R^2	0.29	0.29	0.32	0.33	0.30	0.32
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Number of obs.	208		208		208	
Number of countries	16		16		16	

Note: t-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. All regressions include time fixed effects. The sample is divided into the full set of 16 countries, the GCC sub-sample, and the remaining non-GCC countries to highlight possible heterogeneity in the determinants of GSCI across regions.

Table 7. FID and GSCI

Variables	OLS (1)		Fixed Effects (2)		2SLS (3)	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Constant	3.22	15.86***	3.29	14.64***	3.28	15.8***
GGI	0.007	7.37***	0.004	3.45***	0.004	3.45***
FID	0.110	1.95**	0.029	2.01***	0.030	1.92**
GDPPC	0.018	3.31**	0.017	1.90**	0.018	2.06**
TRADE						-0.55
OFDI	0.002	0.90	0.007	0.17		2.82***
R^2	0.59		0.26		0.26	
Number of obs.	208		208		208	
Number of countries	16		16		16	

Note: t-statistics are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All models include time fixed effects. OLS (1) reports pooled estimates, Fixed Effects (2) controls for unobserved country heterogeneity, and 2SLS (3) addresses potential endogeneity in the regressors.