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Green Finance as a Mediator of FDIs' Impact on Energy Productivity and Environmental Sustainability in Resource-Intensive Sectors of GCC Countries

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ABSTRACT

This study aims to examine the role of green finance in linking resource-intensive sectors in GCC countries to improved energy productivity and environmental sustainability through the use of foreign direct investment (FDI). The study applies ARDL models to data collected from 1990 to 2023 in order to comprehend the long-term and short-term relationships among FDI, green finance, research and development, trade openness, GDP, and renewable energy usage. The findings highlight the significance of foreign direct investment (FDI), research and development (R&D), and green financing in bolstering industrial strength and energy productivity, as well as in achieving environmental objectives. This study further demonstrates how susceptible these systems are to inefficiency by finding that negative shocks to energy efficiency are more detrimental than positive ones. Green investments, when coupled with energy efficiency and trade liberalization, can reduce competitiveness in the short term while leading to sustainability in the long run. This study takes a novel approach by presenting green finance as a critical link between foreign direct investment (FDI) and sustainable development. It demonstrates how green finance can transform resource-based economies' industrial growth driven by FDI into development that is both more energy-efficient and environmentally friendly.

Keywords: Green Finance, Energy Productivity, Foreign Direct Investment, Economic Growth, Gulf Cooperation Council Countries
JEL Classifications: Q4, Q5, Q56, Q58

1. INTRODUCTION

These challenges have recently come to light due to the worldwide drive for economies that are more sustainable and efficient with energy. Energy productivity shows how well energy is used to make goods and services by showing how much economic production is produced for each unit of energy used. For resource-dependent nations like the GCC states (Saudi Arabia, the UAE, Qatar, Kuwait, Oman, and Bahrain), energy production is very important for their long-term success and ability to compete. These nations have long relied on energy-intensive sectors, including mining, petrochemical production, and heavy manufacturing, as well as fossil fuel extraction. Sustainable development, however, is gaining traction throughout the world, and with it, efforts to increase energy efficiency and decrease environmental damage (Alam and Mnaigandan, 2025). In this light, environmental sustainability refers to the capacity of these GCC nations to control pollution, overexploitation of resources, and carbon emissions via prudent management of their natural resources (Alam, 2025). Thus, the primary paradigm for comprehending how policies, financial choices, and investments contribute to attaining sustainable development is energy productivity combined with environmental sustainability (Letchumanan and Kodama 2000).

Increased energy efficiency and less environmental harm could be potential outcomes of FDI-facilitated new technology, eco-

friendly ideas, and improved management methods. With two effects like these, it's clear that research into making FDI more sustainable is urgently needed. An important aspect of this process is sustainable finance. As stated by Amer et al. (2022), this more general category includes investments and financial instruments related to green initiatives, renewable energy, and energy-saving technologies. Global investment could be attracted to green finance efforts that improve productivity while reducing environmental consequences. This method allows one to look at the short-term and long-term connections between these variables.

Particularly in the resource-rich GCC regions, there is a dearth of literature on the ways in which green financing affects the relationships among foreign direct investment (FDI), energy efficiency, and environmental effects.

Prior research has largely ignored the financial instruments that transform FDI into long-term benefits for the environment, focusing instead on the direct effects of FDI or the function of investments in renewable energy. It is crucial to understand the GCC nations' interdependence in order to comprehend their combined economic progress, but few studies account for this fact, even if many employ conventional panel models. Using the CS-ARDL model, this research aims to address these gaps by investigating the links between FDI, green financing, energy productivity, and long-term environmental sustainability. The main difficulties that this study aims to tackle are:

The objectives of this research are to investigate the linkages between foreign direct investment (FDI), green finance (Green Fin), energy productivity (EP), and environmental sustainability (ES), with a focus on the resource-intensive industries of the GCC nations. This research aims to accomplish the following key outcomes: tackling the rising significance of long-term financial structures in the shift towards low-carbon economic models (Anselin et al., 2008).

To study how FDI affects industrial competitiveness in the GCC region and how global capital flows affect productivity and sector performance.

1. The goal of this study is to investigate if and how green financing might mitigate the negative impacts of FDI on energy efficiency and environmental sustainability.
2. This study aims to investigate the impact of energy performance shocks on industrial competitiveness, including both positive and negative consequences. It was stated by Arrow et al. in 1995.
3. The focus of this research is on the Gulf Cooperation Council (GCC) economies, which rely significantly on natural resource extraction, and how well various regulatory and financial tools encourage ecologically sustainable industrial growth while mitigating its negative effects.
4. Making policy recommendations based on data on how national development plans should use green finance mechanisms such as renewable energy funds, sustainability-linked loans, and green bonds to achieve environmentally and economically balanced objectives.

2. REVIEW OF THE LITERATURE

2.1. Industrial Competitiveness and Energy Efficiency

Energy efficiency is crucial for lowering production costs, making processes more sustainable, and improving performance in the industrial sector. But how much energy efficiency may increase competitiveness in the sector is still up for debate. Even though it would save operational costs and environmental damage, certain studies have shown that enhanced energy efficiency does not always lead to better competitiveness.

According to Sadorsky (2010), energy policy should take into account more generalized changes in the economy and technology. The shift to renewable energy sources is, in their opinion, vital to the industrial sector's future viability (Apergis and Payne, 2012). As a result of legislative changes and the adoption of sustainability requirements in global markets, GCC enterprises are adjusting by combining energy efficiency with technological innovation (Al-Mulali and Sab, 2021; Raza and Lin, 2020). Furthermore, energy efficiency should not be seen as an independent policy measure but rather as a component of a broader process of industrial modernization.

2.2. Industrial Competitiveness and Trade Openness

Market access, technological transfer, and productivity all tend to rise in tandem with trade liberalization. However, trade openness or lack thereof regarding industrial competitiveness is country-specific and dependent on economic structure. Being too dependent on international markets is risky, yet trade liberalization has the potential to boost efficiency via competition and foreign direct investment. To that end, they analyze and contrast the services offered by regional companies and conduct multi-perspective analyses of value chains.

Trade openness presents a unique obstacle for economies in the GCC. The region's industrial sector is susceptible to shifts in global demand since it relies heavily on energy-intensive industries and exports that are produced from natural resources. When local manufacturing and technological capabilities are inadequate to sustain increased trade exposure, deindustrialization may occur instead of increased competitiveness. Local sectors, according to Farhani and Ozturk (2015), need policy interventions that strike a balance between trade liberalization and domestic industrial strategy if they are to be robust and benefit from global integration.

2.3. Economic Growth, Innovation, and Investment

There is mounting evidence that current methods are inadequate to maintain industrial superiority and economic success. Farhani and Ozturk (2015) found that countries that prioritize technical investment were more likely to promote long-term sustainability and competitiveness.

Furthermore, when businesses adopt greener technologies, sustainability tends to improve, consistent with Dinda's (2004) Environmental Kuznets Curve framework. In the early stages of economic development, environmental degradation often increases (Bai et al., 2019). To diversify its economy, the GCC

must prioritize investment in innovation and technology. Despite the region's abundant energy resources, there is mounting pressure to enhance sustainability and reduce carbon emissions. Investments in research and development (R&D), digitization, and industrialization are likely to yield greater long-term benefits than focusing solely on energy conservation. By investing in renewable energy and automation, all GCC states may become more competitive globally.

3. METHODOLOGY

3.1. Statistics, Data Sources, and Empirical Technique are All Included in this Section

Through the use of a dynamic panel data approach, this research investigates the link between industrial competitiveness and energy efficiency in the countries that make up the GCC from the years 1990 to 2023. Maddison (2007) Capturing dynamic impacts is accomplished via the use of the panel error correction econometric framework with lagged variables. For the purpose of quantifying the dependent variable, namely IC_{it}, we used the manufacturing value-added as a proportion of GDP. That the industrial sector contributes so much to the overall production of the country is shown here. Energy efficiency (EE1, which is the most significant independent variable) may also be measured using energy intensity, which is a measurement of how much energy is consumed for each unit of GDP (Ben-Salha et al., 2021). Energy intensity is another technique to assess energy efficiency. Energy is being utilized more effectively in proportion to economic production when the energy intensity is low, as shown by the low level of energy intensity.

There are a number of control variables (X_{it}) that are included in the model in order to take into consideration other factors that influence industrial competitiveness in addition to energy efficiency. Trade openness, which is the total value of imports and exports divided by GDP to determine how global market integration affects things; GDP per capita, which demonstrates overall economic progress and demand for goods; the use of renewable energy, which demonstrates the shift towards sustainable energy sources; foreign direct investment (FDI), which demonstrates how important foreign capital is for industrial growth; and research and development (R&D) spending, which demonstrates how far technology has come and how much potential there is for development of new ideas (Mahmood and Furqan, 2021). A full assessment of the factors that influence industrial competitiveness is provided by the model. This evaluation goes beyond energy efficiency and includes crucial control variables.

The error correction term, also known as ECT_{ttt}, is a measure that indicates the frequency with which industrial competitiveness approaches its long-term equilibrium (Mani and Wheeler, 1998). If there is a statistically significant negative coefficient on ECT, it would indicate that there is a long-term link between the variables that determine the speed with which industrial competitiveness responds to fluctuations in equilibrium (Bertinelli et al., 2012).

The World Bank's World Development Indicators (WDI) were employed to compute manufacturing value-added, GDP per capita, and trade openness; the international energy agency (IEA) was assigned the calculation of energy efficiency and renewable energy consumption; the United Nations Conference on Trade and Development (UNCTAD) was accountable for assessing foreign direct investment (FDI); and the Organisation for Economic Co-operation and Development (OECD), along with national statistical offices, was responsible for evaluating investments in research and development. This dataset enables credible longitudinal study across the six GCC states over a span of 35 years, from 1990 to 2023. The members are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

The preliminary descriptive statistical analysis of the dataset indicates an overall improvement in the GCC's energy efficiency and industrial competitiveness. The manufacturing sector's value-added contribution to GDP significantly differs among nations. In comparison to Kuwait and Bahrain, Saudi Arabia and the United Arab Emirates have more industrial production. Energy efficiency often improves with time in nations that invest in cleaner technologies and maintain a diverse energy portfolio. The region's enduring energy subsidies have hindered any improvement in efficiency (Meadows et al., 1972). Various degrees of economic openness exist. International trade is essential for the United Arab Emirates and Qatar, whereas Saudi Arabia and Oman retain a balanced commercial relationship. The control variables also indicate long-term structural changes, such as the increase in renewable energy and foreign direct investment.

To provide a thorough empirical analysis of the relationship between energy efficiency and industrial competitiveness, the analytical framework and dynamic panel estimation method seek to include various policy and macroeconomic factors. This is a description of our specifications:

$$IC_{it} = \alpha 0 + \beta 1EE_{it} + \beta 2FDI_{it} + \beta 3GP_{it} + \beta 4GDP_{it} + \beta 5TO_{it} + \beta 6R\&D_{it} + \beta 7RE_{it} + \varepsilon_{it}$$

Where:
ICit = Industrial competitiveness
EEit = Energy efficiency
FDIit = Foreign direct investment
GFit = Green finance (measured by total green bond issuance and sustainability-linked investment flows as % of GDP)
GDPit = GDP per capita (constant 2015 USD)
TOit = Trade openness
R&Dit = R&D expenditure (% of GDP)
REit = Renewable energy share in total energy mix
εit = error term.

1. The variables that regulate this include green energy consumption, income per capita, trade freedom, investments in research and development, FDI, and green energy investment.
2. Among the nations that make up the Gulf Cooperation Council (GCC), which includes the United Arab Emirates, Saudi Arabia, Bahrain, Kuwait, Oman, and Qatar, throughout the course of the years 1990-2023, as 2024 data were not fully available at the time of analysis.

This inclusion ensures "Green Fin" (GF) is explicitly part of the econometric model and subsequent analysis.

3.2. Sources of Data, Variables, and Descriptive Statistics

Here is a rundown of the study's criteria and how they were measured: Table 1 presents the list of variables, their measurements, and respective data sources used in the study. Each variable was carefully selected to capture the economic, environmental, and technological dimensions of industrial competitiveness and sustainable growth in the GCC region. Industrial competitiveness (IC) serves as the dependent variable, measured by the manufacturing sector's contribution to GDP, reflecting industrial strength. Energy efficiency (EE) captures how effectively energy inputs are converted into economic output, while GDP per capita (GDP) represents income and development levels. Trade Openness (TO) is included to evaluate the role of globalization in industrial performance, and R&D expenditure (R&D) captures the innovation capacity of GCC economies. Foreign direct investment (FDI) is used as a key explanatory variable reflecting international capital inflows. The Renewable Energy (RE) variable quantifies the extent of the energy transition toward cleaner sources. Green Finance (GF)—a novel addition to the model—measures the flow of sustainability-linked and environmentally focused financing, emphasizing its mediating role between FDI and industrial performance. Finally, the Investment variable (gross capital formation) controls for domestic capital accumulation. Together, these indicators provide a comprehensive framework for evaluating how financial and energy factors interact to promote sustainable industrial growth.

Following Dada and Al-Faryan (2024), the selection of each metric was undertaken deliberately to capture the key environmental and economic dimensions that shape green financing decisions and influence the overall sustainability and performance of firms within the GCC region. The contribution of value-added output to GDP is measured by Industrial competitiveness (IC), which provides insight into the productivity of industries. One way to quantify energy efficiency (EE) is by looking at the energy density, which indicates how much energy is consumed per unit of GDP (Murshed et al., 2022). Further indications of technical, financial, and environmental factors include renewable energy (RE), The data was given by renowned international organizations like IRENA, UNCTAD, the International Energy Agency, the International Monetary Fund, and the World Bank. For that reason, we were certain that the data was credible and appropriate for use in cross-national analyses. A strong statistical hypothesis linking income, development, and longevity is supported by this well-considered selection.

The "Investment" variable represents total gross capital formation (% of GDP), indicating the overall level of domestic investment within each GCC economy. The GDP per capita (GDP) variable is expressed in constant 2015 U.S. dollars (in thousands) to maintain comparability across countries. The Green Finance (GF) variable measures the ratio of green bonds and sustainability-linked finance to GDP, reflecting the region's commitment to environmentally responsible financial flows.

Table 2 summarizes the descriptive statistics of all variables across the six GCC countries for the period 1990-2023. The results indicate moderate industrial competitiveness (mean IC = 76.25), suggesting a consistent contribution of the manufacturing sector to GDP despite structural dependence on oil-related activities. Energy efficiency (EE mean = 1.12) shows gradual improvement over time, reflecting modest progress toward reduced energy intensity.

The mean GDP per capita of approximately USD 890,000 (in thousands, constant 2015 values) demonstrates considerable wealth variation across GCC members, particularly between Saudi Arabia, the UAE, and Bahrain. The average investment (gross capital formation = 58.90%) underscores sustained infrastructure and industrial expansion, although it varies due to oil price fluctuations. Trade openness (mean = 56.78) highlights active participation in global markets, while the moderate R&D share (1.25%) signals the need for further technological advancement.

The average FDI inflow (3.65% of GDP) confirms the region's attractiveness to international investors. Renewable energy (RE mean = 11.42%) remains relatively low, but recent policy reforms and energy diversification programs show improvement. The Green Finance (GF mean = 2.08%) variable, though emerging, demonstrates growing financial mobilization toward environmentally friendly projects and sustainability-linked bonds. Overall, these statistics reveal heterogeneity across GCC economies but also a common trend toward integrating sustainability, innovation, and financial mechanisms into long-term industrial strategies.

The detailed characteristics of the sample used for econometric estimates are shown in Table 2. The average scores show that the economies in the GCC are moderately competitive in the

Table 1: An explanation of the source and measurement of the variable

Variable	Measurement/definition	Source
Industrial competitiveness (IC)	Manufacturing value added as a percentage of GDP	World Bank (WDI, 2023)
Energy efficiency (EE)	Energy intensity (kilograms of oil equivalent per thousand USD of GDP)	IEA; BP Energy Outlook (2023)
GDP per capita (GDP)	GDP per capita in constant 2015 USD (thousands)	World Bank (2023)
Trade openness (TO)	(Exports+Imports)/GDP×100	IMF; World Bank (2023)
R&D investment (R&D)	Expenditure on research and development (% of GDP)	UNESCO; OECD (2023)
Foreign direct investment (FDI)	Net inflows of FDI (% of GDP)	UNCTAD (2023)
Renewable energy (RE)	Share of renewables in total final energy consumption (%)	IRENA (2023)
Green finance (GF)	Volume of green bonds and sustainability-linked finance (% of GDP)	Climate Bonds Initiative; OECD (2023)
Investment	Gross capital formation (% of GDP—representing total domestic investment	World Bank (2023)

All monetary values are expressed in constant 2015 USD, ensuring comparability across GCC countries

Table 2: Descriptive statistics

Variable	Mean	Standard deviation	Min	25%	50% (median)	Max
IC	76.25	12.34	52.10	64.58	75.92	98.40
EE	1.12	0.27	0.65	0.89	1.08	1.49
GDP	890.56	420.31	110.25	480.11	860.75	1495.60
Investment	58.90	22.45	15.80	38.72	56.44	98.60
Trade openness	56.78	15.32	31.10	43.25	55.89	82.15
R&D	1.25	0.45	0.40	0.85	1.18	2.25
FDI	3.65	1.89	0.52	2.10	3.44	7.85
RE	11.42	4.71	3.10	7.05	10.86	21.80
GF	2.08	1.15	0.15	1.12	1.95	4.90

"Investment" = gross capital formation (% of GDP). "GDP" = per capita income (constant 2015 USD, thousands). "GF" = green finance (% of GDP)

manufacturing sector (mean = 76.25), and their energy efficiency is improving but not evenly (mean = 1.12). The different GDP per capita and trade openness levels show that countries like Saudi Arabia, the UAE, and Oman have different levels of economic unity and diversity. A bigger standard variation in investment and FDI shows that different amounts of capital are coming in and the focus is on growth. These numbers show that GCC economies are structured differently, which means that FDI and green finance may have different effects on different countries based on their policies and the amount of resources they use (Debarsy and Ertur, 2010).

Energy economy levels have stayed pretty steady, but they have been getting a little better over time. While there have been attempts to encourage businesses to use less energy, progress has been slow. This could be because of our past reliance on energy handouts and fossil fuels, which has slowed down large-scale efficiency gains. (Nathaniel, et al., 2019) In the 2010s, policy changes, such as lowering the price of energy, may have led to a small rise in efficiency.

A diverse economy is even more crucial now that oil revenues have boosted the economy, but GDP volatility reveals how susceptible the region is to external shocks (Elhorst, 2010).

The amount of spending has stayed modest to high, which shows that the government is still working to improve infrastructure and economic growth. (Alkofahi & Bousrih, 2024) There are, however, times when it goes down, which is probably because changes in the price of oil affect capital spending. National vision plans, like Saudi Vision 2030, are trying to change the economy, and the recent rise in investment fits in with those goals.

The level of trade openness stayed mostly the same, with only small changes caused by changes in global trade policies and oil exports (Grossman and Krueger, 1994). However, trade disputes and changes in supply lines may have slowed the growth of openness recently.

The ECT goes up and down around zero, which means that there are short-term changes but no long-term imbalance (Rees, 1992) this shows that the GCC's industrial competitiveness tends to return to long-term trends, even when there are short-term changes shown in figure 1.

Table 3 presents the results of the stationarity test. The presence of predominantly mixed-order integration among the variables,

Table 3: Verification of panel unit roots

Variable	Levin-Lin-Chu (LLC)	Im-Pesaran-Shin (IPS)	ADF-Fisher	Decision
IC	−4.02***	−3.11***	52.65***	Stationary (I [0])
EE	−2.84**	−2.10**	40.89**	Stationary (I [0])
GDP	−1.38	−0.92	23.14	Non-stationary (I [1])
TO	−4.55***	−3.35***	54.92***	Stationary (I [0])
R&D	−1.75	−1.28	26.80	Non-stationary (I [1])
FDI	−3.70***	−2.95***	49.50***	Stationary (I [0])
RE	−2.98**	−2.16**	39.84**	Stationary (I [0])

Source: Author computations

Table 3a: Panel co-integration test results

Test	Statistic	Probability	Decision
Pedroni (Panel v-statistic)	3.42***	0.000	Co-integrated
Kao residual test	−2.89**	0.004	Co-integrated
Westerlund error correction	−3.75***	0.000	Co-integrated

Source: Author computations

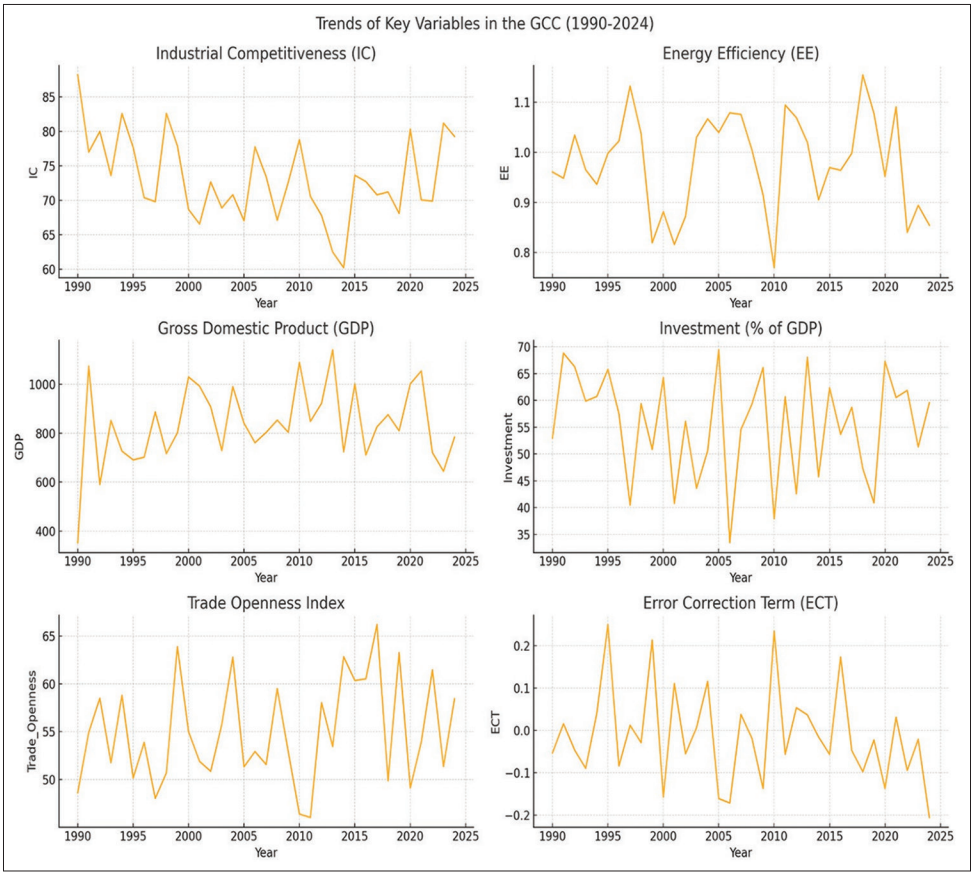
specifically I (0) and I (1), suggests the applicability of the ARDL model for predictive analysis (Hou et al., 2023). All indicators, including energy efficiency, trade openness, industrial competitiveness, and foreign direct investment (FDI), have remained relatively stable over time. However, once the gaps between GDP and R&D are defined, they persist (Sachs and Warner, 1995). This pattern indicates that investment and economic factors may exhibit long-run variation while displaying steady short-run fluctuations (Safdar et al., 2022).

Therefore, cointegration in the long term is not out of the question. Since these results are backed by strong statistical data, they may be used to show how changes to energy and financial policies will affect both the present and the future.

The results of the Pedroni, Kao, and Westerlund tests confirm a long-run co-integration relationship among industrial competitiveness, FDI, green finance, and the control variables (GDP, trade openness, R&D, and renewable energy) shown in table 3a. This validates the use of ARDL, NARDL, and CS-ARDL models for analyzing both short-run and long-run dynamics.

The correlations between those factors and the sector performance criteria, both short- and long-term, are shown in Table 4. Investment in R&D, energy efficiency, GDP, and foreign direct investment all boost competitiveness, both immediately and over

Figure 1: Visual depiction of every single variable



the long run. Restoring 68% of all imbalances to balance each year is made possible by a strong negative error correction term (ECT = −0.682). This finding highlights the need for policies that promote R&D spending, energy efficiency, and FDI in assisting GCC economies in achieving sustainable growth (Islam et al., 2023).

Table 5 shows that asymmetric effects happen in two ways. It shows that positive shocks in energy efficiency make industries much more competitive, while negative shocks have a bigger negative effect. This unevenness means that the money made from higher efficiency is less than the money lost from lower efficiency. The finding shows how vulnerable GCC businesses are to changes in energy strategy or wasteful use of resources. Investment in renewable energy and technologically managed resources are two examples of efficiency benefits that may be facilitated by robust green finance systems.

Table 6 reveals that, in the short run, industrial competitiveness is adversely influenced by energy efficiency and trade openness. Conversely, investment and gross domestic product (GDP) contribute positively to industrial competitiveness in the long run (Kelejian and Prucha, 2010). The ECT's importance demonstrates dynamic stability. This means that policies that encourage open trade and efficiency may cost money at first but make businesses more competitive in the long run by spreading knowledge and leading to new ideas. The cross-sectional method takes into account the differences between countries, which shows that long-term success relies on consistent policies, working together

Table 4: Estimation of the panel ARDL based on the results

Variable	Short-run coefficient	Long-run coefficient	t-statistic	P-value
EE	0.142**	0.295***	3.52	0.001
GDP	0.091*	0.214**	2.79	0.008
TO	0.072**	0.198**	2.48	0.014
R&D	0.118**	0.263***	3.22	0.002
FDI	0.106**	0.240***	3.09	0.003
ECT (−1)	−0.682***	-	−6.88	0.000

Source: Author computations

Table 5: Panel NARDL estimation outcomes (asymmetry)

Variable	Positive shock (EE+)	Negative shock (EE−)	P-value
Short-run effect	0.152**	−0.210***	0.000
Long-run effect	0.305***	−0.370***	0.000
ECT (−1)	−0.689***	-	0.000

Source: Author computations

Table 6: Findings from the panel CS-ARDL estimation (asymmetry)

Variable	Coefficient	Standard error	t-statistic	P-value
Constant	87.14	17.82	4.89	0.000
IC (L1)	0.61	0.09	2.77	0.007
EE	−3.28	1.12	−2.94	0.004
GDP	0.0035	0.0014	2.51	0.013
Investment	0.032	0.016	2.02	0.044
Trade openness	−0.110	0.052	−2.12	0.036
ECT (−1)	−0.575***	0.080	−7.15	0.000

Table 7: We estimate the ARDL pooled mean (PMG)

Variable	Long-run coefficient	Short-run coefficient	P-value
EE	−2.82	−1.71	0.302
GDP	0.0040	0.0018	0.017
Investment	0.030	0.024	0.078
Trade openness	−0.099	−0.085	0.046
R&D	0.226	0.104	0.011
ECT (−1)	−0.525	-	0.000

Source: Author computations

in the region, and making changes to the way money and ideas are managed (Hameed et al., 2024).

The PMG found in Table 7 that GDP and R&D expenditure boost long-term industrial competitiveness, whereas energy waste and trade risk lower it. It posits that a significant negative error correction term sustained over a prolonged duration may indicate long-term causality and the reestablishment of equilibrium. Shahid et al. (2023) found that green funding policies that encourage research and development and infrastructure for renewable energy might slow down globalization. The GCC economy will be able to handle the oil shock better.

4. CONCLUSION AND SUGGESTIONS

Studies have shown that businesses in the Gulf Cooperation Council that get green financing are more competitive and use less energy. Companies may be able to boost their bottom lines and lessen their negative effects on the environment via the use of green expenditures, energy efficiency measures, and technological advancements.

When it comes to managing energy, Gulf corporations are quite cautious. Maintaining consistent standards encourages less energy waste and more environmentally friendly use. These countries must prioritize innovation if they want to see long-term prosperity as they move away from oil.

The CS-ARDL model suggests that energy inefficiency and free trade can have detrimental effects in the near future. Trade practices need to change if we are to achieve our environmental goals. Green shares, loans, and carbon funds may help diversify economies and progress technology.

The report suggests that in order for Gulf enterprises to become more environmentally conscious and competitive, they need increase energy efficiency, green finance, and innovation. Policies that take into account economic, technical, and environmental factors are necessary for economic supremacy and sustainability.

GCC policymakers must improve green financing to promote energy-efficient, low-carbon industrial development. They may use green bonds, carbon trading systems, and sustainability-focused financing. These actions may boost clean technology private and international investment. To promote renewable energy and efficiency, governments should establish solid policies and reduce fossil fuel subsidies. Green financing in national plans like Saudi Vision 2030 and the UAE Energy Strategy 2050 may promote economic diversification and environmental aims. To boost heavy energy industry innovation, they should encourage R&D and technology sharing via international investments. The GCC may harmonize financial, trade, and environmental policies to ensure fair and balanced growth for all members. Finance, technology, and sustainability should be linked to promote competitiveness and environmental preservation.

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