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Nexus Between Green Growth Drivers and Co_2 Emissions: Insights from Panel Evidence of Environmentally Vulnerable Countries

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ABSTRACT

This study explores the long-term relationship between carbon dioxide (CO_2) emissions and four dominant macroeconomic variables: technological innovation, green growth, economic growth, and financial globalization. It is based on panel data from ten environmentally sensitive countries for the period of 2000 to 2023. Firstly, panel unit root tests (LLC, IPS, ADF, and PP) tested the stationarity of the variables and established different orders of integration. Thereafter, a stable long-run equilibrium relationship was identified between the variables by Pedroni and Kao cointegration tests. Then Dynamic Ordinary Least Squares (DOLS) procedure was used to estimate these long-run impacts, which resolved endogeneity and autocorrelation problems and accommodated the inclusion of variables integrated at varying orders. Results revealed that technological innovation and financial globalization significantly lower CO_2 emissions, pointing to their mitigation potential in the environment. On the other hand, green growth and economic growth were positively correlated with emissions, reflecting continued dependence on energy-intensive development. Diagnostic tests confirmed the model's stability and consistency. These results underscore the importance of strategically designed policies that incorporate technological progress and financial openness with sustainable economic techniques to reduce environmental degradation.

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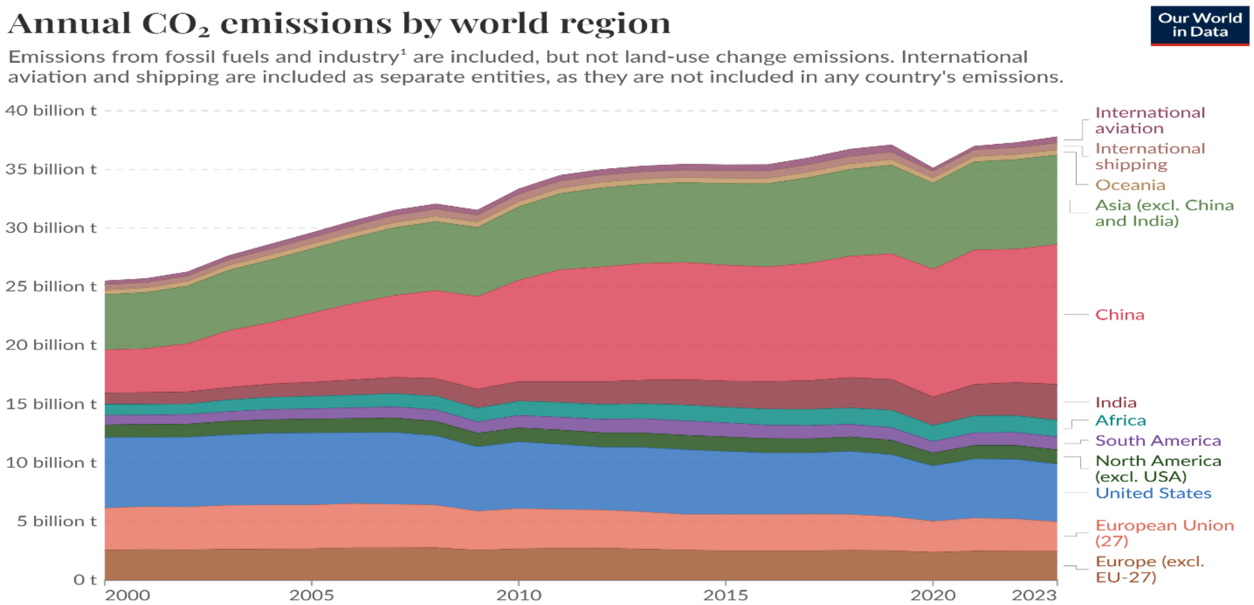
1. Introduction

Carbon dioxide (CO_2) emissions have increased continuously for the last two decades, which shows deep, long-term threats to economic and environmental stability. NOAA (2023) indicates the atmospheric CO_2 content is currently above 420 ppm, which is an indication of ongoing dependence on fossil fuels. Cumulatively over time, these emissions lead to increased global warming, agricultural stress, and reduced productivity in climate-sensitive industries. Economic studies have shown that chronic emissions increased the expense of adapting infrastructure, decreased food security, and strained public investment (Burke, Hsiang, & Miguel, 2015; World Bank, 2021). These impacts are higher and stronger where the economies are already under environmental pressure. However, economies' spending on renewable power and innovation has slowed down emissions growth and greater economic resilience (Acheampong, Adams, & Boateng, 2019; Sadorsky, 2011), and this suggests planning for the long term.

Figure 1: Annual CO_2 Emissions by World Region



Source: Global Carbon Budget (2024)

In the long term, CO_2 emissions are caused by more intrinsic economic and structural factors. Continued production and consumption of fossil fuels in developing and industrialized countries are major contributors (Burke, Hsiang, & Miguel, 2015). Yet, financial globalization can facilitate the spread of environmentally friendly technologies and boost investments in renewable energy sources. These investments help in reducing emissions in the long term (Acheampong, Adams, & Boateng, 2019). The key to lowering emissions in the long run is more use of renewable energy and the promotion of technology (Apergis & Payne, 2010; Sadorsky, 2011). Without strong environmental policies, trade liberalization can worsen the issue by pushing dirty industries to more vulnerable nations (Zhang et al., 2017). These long-term trends are why there is a need for sustainable policy to weigh growth against protecting the environment. In the long run, technological advancement has been associated with lower CO_2 emissions. Ongoing R&D spending led to a more productive industry and better production methods (Li & Lin, 2015). In the long run, widespread use of green technologies amplified these effects (Balsalobre-Lorente et al., 2019). But the speed at which older technologies were phased out was instrumental in defining the net environmental impact (Popp, 2002).

Following this line of argument, mixed outcomes have been produced by green growth. As designed to support sustainable development, some researchers found that it was still able to raise emissions if based on energy-driven growth (Dogan & Seker, 2016). As per other researchers, through the support of good policies and low-carbon investment, green growth led to a decrease in emissions in the long run (Zafar et al., 2019). Economic growth, similarly, had a strong long-term relationship with increasing emissions. With growing industries and increased energy consumption, nations typically have higher levels of CO_2 (Shahbaz et al., 2013). There was certainly evidence for the EKC postulation in which emissions eventually decrease with higher income, but the timing and consistency of this trend were very uneven (Grossman & Krueger, 1995). Financial globalization was linked with opportunities and risks. Increased emissions due to heightened industrialization and the use of resources were some research linking it (ACHARYYA, 2009). If global capital flows are directed towards green technology and cleaner production, it will reduce emissions (Shahbaz et al., 2018). It highly depended on the investment type and environmental policy in the host countries. Despite extensive studies of how innovation, energy use, and globalisation affect the environment, scholars have offered different analyses of how these factors interact. Some writers claimed that not all technological innovation will reduce CO_2 emissions in the long term unless it is complemented by the presence of institutional capacity, regulation, and effective use of cleaner technologies (Kose, Otrok, & Prasad, 2012; Mealy, Farmer, & Teytelboym, 2019). Similarly, while renewable energy is said to lower emissions, Salim and Rafiq (2012) noted that its long-term potential can be constrained by issues such as prolonged deficiencies in infrastructure, variable supply, and storage capacity, especially in the developing world, since installing renewable energy on a large scale takes time.

There are also differences in taking the GDP per capita and FDI viewpoints when it comes to emissions in the long run. Some studies emphasized that economic development leads to higher long-term emissions, especially in developing countries with industries based on fossil fuels (Stern, 2004). Others claimed that a transition towards the service sector and improved energy efficiency may weaken this relationship in the long term (Burke, Hsiang, & Miguel, 2015). So, the long-term effects of Foreign Direct Investment (FDI) have been debatable. Cole and Elliott (2005) postulated the "pollution haven" hypothesis, which claims that FDI can increase emissions where the environmental policy is relaxed. Alternatively, Jorgenson, Dick and Mahutga (2007) and Tang and Tan (2015) argued that in the long run, FDI can facilitate green technology transfer and cleaner production techniques when followed and accompanied by strong environmental policy.

1.1. Objectives

Following are the specific objectives of the research;

- To examine the long-term impact of technological innovation on CO_2 emissions.
- To assess the role of the consumption of renewable energy on emissions in the long term.
- To examine the long-term relationship between economic growth and environmental degradation.
- To examine the effect of financial globalization on carbon emissions in the long term.
- To examine the combined role of economic drivers of green growth on CO_2 emissions.
- To provide policy suggestions for carbon reduction in vulnerable countries.

1.2. Significance of the Study

This study is especially relevant now that climate change poses a threat to lives worldwide, especially for ecologically vulnerable countries whose share of world carbon emissions is high but whose contribution is minimal. By discussing the long-term impacts of technological advancement, renewable sources of energy, economic growth, and financial globalisation on CO_2 emissions, this research contributes to the literature that has a tendency to discuss only short-term or isolated impacts. The panel study of ten highly affected countries between 2000 and 2023 provides cross-country information that is able to catch both heterogeneity in the economy and shared environmental risks, so results are broadly applicable. Understanding how these factors influence emissions in the long run allows us to identify what policy areas can bring the maximum climate dividend without slowing economic growth.

Finally, the study offers real-world guidance for policymakers. And provide sustainable development policies that use green technologies, clean energy investments, and ethical economic globalization to reduce emissions in the future.

1.3. Importance of the Study

- Shows how technological advances can help reduce CO_2 emissions and facilitate cleaner industrial processes.
- Highlights how green growth can balance economic progress with the responsibility of environmental care.
- Analyzes how emissions are affected by long-term economic growth, leading to better environmental policies.
- Examines the impact of global financial integration on carbon emissions to attract green investments.
- Explains how emission reductions can reduce health risks as well as protect the environment in vulnerable locations.
- Provides empirical suggestions for the most climate-exposed countries, facilitating sustainable development.

1.4. Literature Gap

The majority of studies have examined the vulnerable countries separately, and not as a group. These studies have a propensity to examine short-term effects or one-off determinants without regard for how the variables interact in the long term across many countries. This study fills that vacuum by examining the combined long-term impact of the primary variables on CO_2 emissions in the most environmentally affected countries between 2000 and 2023.

2. Literature Reviews

Previous studies have examined the complex interactions between urbanization, technological innovation, and environmental performance. For China, a 2008 to 2018 period study established that urbanization had a deleterious effect on environmental performance, while technology advancement and environmental policy enhancement strengthened ecological performance (Yasmeen et al., 2020). The authors pointed out the importance of planned urban development in balancing economic growth with sustainability. Yet another pertinent work by Liu and Xie (2020) used a threshold model to analyze the influence of environmental regulations on green technological innovation. The findings, using sectoral analysis, indicated that stricter environmental regulations promoted innovation and green productivity once the regulatory thresholds were crossed, even though their effect varied across industries. A wavelet analysis done for Spain compared the interaction among globalization, innovation, renewable energy, and carbon emissions. Zhao et al. (2021) found that globalization and innovation elevated emissions in the short term, while renewable energy lowered them in the long term. The study highlighted the integration of openness and innovation with clean energy policies. Bilal et al. (2021) have also studied OBOR countries during the years from 1991 to 2019 and asserted that innovation mitigated emissions, but ICT and globalization have different effects depending on the region, reflecting the need for region-specific policies.

Environmental impacts of investment, trade, and energy use have also been examined in African economies. Wen et al. (2022), using data from 43 African countries over the period of 1990 to 2019, researchers discovered that renewable energy and trade openness were employed to reduce carbon emissions, whereas foreign direct investment, the use of fossil fuels, and urbanization were employed to produce more pollution. Their causality test revealed that fossil fuel directly impacted emissions, while there was a mutual interaction between renewable energy consumption and emissions. In the advanced economies, Sharif et al. (2022), in analyzing the G7 economies, examined the role of green finance and innovation and social globalization's mediating effect. As per their research, both green technological innovations and financial products contributed to reducing CO_2 emissions, and social globalization amplified their effects. However, economic growth remained a strong force driving emissions growth. In South Asia, Naz and Aslam (2023) utilized the 25-year panel dataset from 1996 to 2019 to investigate the effect of environmental innovation, financial development, globalization, and governance on emissions. They found that innovation reduced emissions while financial development and globalization amplified them. Governance is enhanced only if it comes with innovation. Similarly, Habiba, Xinbang and Anwar (2022), in the study of the 12 largest CO_2 producers between 1991 and 2018, concluded that renewable energy and green innovation reduced emissions, while financial development did the opposite. The two-way causality revealed the importance of incorporating environmental and economic policies to ensure effective sustainability(Dhivya et al., 2023; Ragmoun & Ben-Salha, 2024).

Focusing on a specific country case, Hussain et al. (2023) analyzed Pakistan from 1990 to 2021 and found that green finance and innovation reduced emissions and environmental footprints, while GDP growth and FDI increased environmental degradation. On a larger scale, Murshed (2024) analyzed 119 developing countries for the time span of 1990 to 2019 and observed that renewable energy reduced emissions in the long term, innovation increased them in the long term, and governance always improved the environmental performance. Latest studies highlighted institutional heterogeneity and emission intensity. Kartal and Pata (2023) used quantile analysis for China from 1990 to 2020 and concluded that renewable energy reduced emissions at all quantiles, while globalization of trade and technological change worsened emissions at higher quantiles, indicating policy interventions depending on the context. So did Kılıçaslan et al. (2024), who analyzed 18 OECD countries (1994–2020) and concluded that environmental taxation and green innovation improved environmental quality but had contrasting implications for institutional quality and natural resource depletion, emphasizing that policies of sustainability should be compatible with national institutional contexts. Deeper macro-regional analysis was conducted by Rehan et al. (2025), who compared G7 and BRICS countries and discovered that trade increased CO_2 emissions, while renewable energy and green investment reduced them. This highlighted the need for balanced policies to support growth and sustainability. Similarly, Khoa et al. (2025) reviewed Vietnam's offshore renewable energy prospects, indicating rich resources but planning and regulatory shortfalls. They concluded that institutional changes are needed for this industry to be developed successfully.

3. Theoretical Framework and Econometric Methodology

Technological advancements play a vital role in CO_2 reduction in the long term, which enables cleaner production processes and cleaner energy. Endogenous Growth Theory (Romer, 1990) had linked long-run growth with spending on R&D. Studies conducted by Li and Lin (2015) and Balsalobre-Lorente et al. (2019) affirm a negative relationship between innovation and emissions, and favorable policies and strong institutions are required. The factor green growth, which is designed to bring both economic development and environmental sustainability, presents a more detailed picture. While it promotes sustainable development, its effect on emissions will depend on economic conditions. In the majority of developing countries, green growth is followed by energy-intensive industries, and at times, this results in higher CO_2 emissions. Only when economic, social, and environmental goals are attained comprehensively does sustainability occur, as argued in the Sustainable Development Theory (Barbier, 1987). With strong governance, clean energy investment, and strict environmental regulation, green growth has the potential to reduce emissions (Zafar et al., 2019). Without them, however, green growth will most likely be superficial, masking ongoing environmental degradation. Economic growth, which is usually measured through GDP per capita, is certain to increase emissions as industrial manufacturing and energy use increase.

The Environmental Kuznets Curve (EKC) Hypothesis (Grossman & Krueger, 1995) encapsulates this pattern by proposing that pollution initially rises with income but subsequently falls after the attainment of a specific level of wealth and ecological wisdom. Despite this hypothesis, the majority of developing nations are still on the rising arm of the curve, where economic growth continues to enhance environmental degradation (Shahbaz et al., 2013). This is a pointer to the importance of putting policies in place to reverse growth through environmental deterioration before reaching the turning point of the EKC. Finally, the factor of financial globalization threatens as well as offers opportunities to the environment. While potentially enhancing pollution through triggering the relocation of polluting sectors to countries with more lenient environmental policies, as described by the Pollution Haven Hypothesis (Copeland & Taylor, 2004). On the other hand, it may help to diffuse cleaner technologies and green investment through foreign direct investment, as envisaged by the Technology Transfer Theory (Antweiler, Copeland, & Taylor, 2001). Ultimately, the long-term environmental implication of financial globalization depends heavily on the institutional capability and regulatory environment of host economies (Shahbaz et al., 2018). Efficient policies are needed to direct financial flows to sustainable sectors and subject environmental standards so that globalization works in favor of green development.

3.1. Variables of the Study

Table 1: Description of Variables

	Variable	Description
Environmental sustainability (CO_2)	CO_2	CO_2 emissions in metric tons per capita
Technology innovation (TI)	Patent	Patent applications by residents
Green Growth (GG)	Renewable energy	Renewable energy consumption (percent of total final energy consumption)
Economic Growth (EG)	GDP per capita	GDP per capita, PPP (constant 2011 international $)
Financial Globalization (FG)	FDI	Financial Development Index

Targeted countries for this study are Bangladesh, China, Egypt, India, Japan, Nepal, Nigeria, Pakistan, Philippines and Sri Lanka, which are most likely economies to be affected by rising tides of global warming and environmental degradation. The data is collected from 2000 to 2023.

3.2. Econometric Model

The model's mathematical form shows carbon dioxide emissions (CO_2) as a dependent variable influenced by four independent or explanatory variables. These are technological innovation (TI), green growth (GG), economic growth (EG), and financial globalization (FG). This relationship is initially defined through a functional form written as:

$$CO_2 = f(TI, GG, EG, FG)$$

This indicates that carbon emissions are a function of these four determinants. To estimate this relationship empirically, the functional form is converted into a linear econometric equation given as:

$$CO_{2\text{it}} = \alpha_0 + \alpha_1 TI_{\text{it}} + \alpha_2 GG_{\text{it}} + \alpha_3 EG_{\text{it}} + \alpha_4 FG_{\text{it}} + \mu_{\text{it}}$$

In the above equation, the subscript *i* refers to the individual country, and *t* refers to the period, reflecting the panel data structure of the study. The term α_0 represents the constant or intercept, indicating the baseline level of emissions when all explanatory variables are zero. The coefficients α_1, α_2, α_3, and α_4 measure the long-run marginal effects of their respective variables on CO_2 emissions, showing how much CO_2 changes in response to a one-unit change in each independent variable, holding others constant. The term μ_{it} is the stochastic error term, which captures unobserved influences, measurement errors, or random shocks that are not included in the model. This model allows for examining the collective and individual contributions of key economic and environmental variables to emissions levels across countries over time in a statistically testable form.

3.3. Methodology

To estimate the long-run relationship between the selected variables in the panel of 10 different countries, this study first conducted tests to check the stationarity of the data. Four panel unit root tests were used to get accurate and consistent identification of each variable's order of integration: Levin, Lin, and Chu (LLC); Im, Pesaran, and Shin (IPS); Fisher-type Augmented Dickey-Fuller (ADF); and Fisher-type Phillips-Perron (PP) tests. The results showed that variables were stationary at their levels (I(0)) in some, while others were stationary after once differencing (I(1)), indicating mixed integration orders. Pedroni and Kao panel cointegration tests were employed to determine the presence of a long-run equilibrium relation. Both tests confirmed the presence of cointegration, enabling the use of long-run estimates. With the cointegration and mixed integration, the coefficients in the long run were estimated using the Dynamic Ordinary Least Squares (DOLS) method. This is because it solves issues of serial correlation and endogeneity through the use of leads and lags of the explanatory variables. Two diagnostic tests were applied after estimation: the Hausman test tested for endogeneity, while the Jarque-Bera test checked for normality of residuals. These steps ensured the reliability and validity of the model, assuring the robustness and methodological soundness of the estimation results for the analysis of the long-run relationships in the data.

4. Data Analysis and Interpretation

4.1. Results of Unit Root Tests

Table 2: Unit Root Tests

Test	At	Scenario	CO_2	TI	GG	EG	FG
LLC	Level	None	0.803	-0.812	-3.284	-2.826	-2.461
		Intercept	-1.491	2.541			
	1st Diff	None	-9.04	-4.314			
IPS	Level	Intercept	-0.574	3.177	1.900	-5.967	2.191
		Intercept & Trend	-0.278	1.751	1.454	-	-8.659
	1st Diff	Intercept	-5.28	-4.219			
ADF	Level	None	11.414	15.694	40.230	57.025	36.088
		Intercept	21.183	9.909			
	1st Diff	None	105.75	68.756			
FPP	Level	None	17.513	30.403	72.411	70.290	0.004
		Intercept	40.294	14.742	-	-	141.457
	1st Diff	None	185.91	111.681			
Decision			I(1)	I(1)	I(0)	I(0)	I(0)

In the above table, panel unit root tests indicated that some variables are stationary at level, I(0), while others become stationary after first differencing, I(1). Because of this combination of mixed integration orders, the Dynamic Ordinary Least Squares (DOLS) method was chosen. DOLS is appropriate for estimating long-run relationships in panel data when variables are integrated of order zero and one, as it corrects for endogeneity and serial correlation, ensuring consistent and unbiased estimates.

4.2. Cointegration Tests

This study used the Long run model, i.e, DOLS. For the verification that there exists a long-run relation among the variables, cointegration tests were used. Their results are as follows:

Table 3: Pedroni and Kao Tests

	Statistic	**Prob.**
Panel v-Statistic	-1.837022	0.9669
Panel rho-Statistic	1.114887	0.8676
Panel PP-Statistic	-2.301313	0.0047
Panel ADF-Statistic	-2.976422	0.0015
Group rho-Statistic	2.577886	0.9950
Group PP-Statistic	-3.156929	0.0008
Group ADF-Statistic	-2.009619	0.0222
Kao Test		
	t-Statistic	Prob.
ADF	-3.331758	0.0004

The Pedroni cointegration test gave mixed findings. Some of the statistics, like the Panel v-Statistic (−1.837, p = 0.9669) and Panel rho-Statistic (1.115, p = 0.8676), were found to be statistically insignificant, indicating there was no cointegration. Other statistics, like the Panel PP-Statistic (−2.301, p = 0.0047) and Panel ADF-Statistic (−2.976, p = 0.0015), indicated a significant long-run relationship. Likewise, in the between-dimension statistics, the Group PP-Statistic (−3.157, p = 0.0008) and the Group ADF-Statistic (−2.010, p = 0.0222) confirmed cointegration, although the Group rho-Statistic (2.578, p = 0.9950) was still insignificant. These findings were also supported by the Kao test, which indicated that the highly significant ADF t-statistic (−3.332, p = 0.0004) upheld cointegration among the variables. On this persistent evidence, the study continues with long-run estimation methods like Dynamic Ordinary Least Squares (DOLS) to investigate the long-term relationships.

4.3. DOLS Results

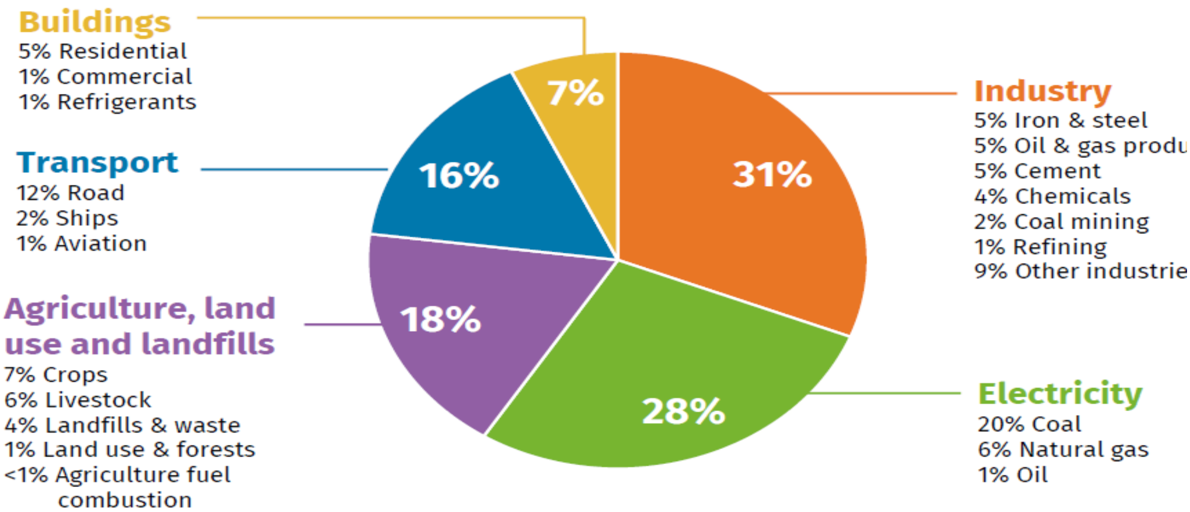
Table 4: DOLS Results

Variable	**Coefficient**	**Standard Error**	**t-Statistic**
Technological Innovation	-0.093	0.030	-3.100
Green Growth	0.134	0.025	5.360
Economic Growth	0.071	0.014	5.071
Financial Globalization	-0.051	0.020	-2.550
R-squared	0.805		
Standard Error	0.064		

The large and negative coefficient of technological innovation, i.e, -0.093, indicates its important role in reducing CO_2 emissions in the long run. This verifies the Endogenous Growth Theory (Romer, 1990), which emphasizes that investments in research and development guarantee cleaner technologies and green methods of production. Evidence like that of Li and Lin (2015) and Balsalobre-Lorente et al. (2019) also confirms that innovation plays a role in environmental improvement in the long run. The findings point towards the necessity to promote policies that enhance technological development and green innovation. Green growth is positively and significantly related to CO_2 emissions, with a value of 0.134. According to the Sustainable Development Theory (Barbier, 1987), green growth initiatives aim to balance economic growth with environmental sustainability. In practice, however, it depends on how successfully this growth is managed. In the majority of developing contexts, having green policies together with energy-intensive industries may lead to heightened emissions, as also dealt with by Zafar et al. (2019). Therefore, good governance and strong environmental standards are imperative to realize the optimal potential of green growth.

Greater economic growth is linearly correlated with greater CO_2 emissions, and its coefficient is 0.071, validating the Environmental Kuznets Curve (EKC) hypothesis (Grossman & Krueger, 1995) that pollution levels escalate in initial growth stages. Shahbaz et al. (2013) also point out that developing countries are largely at this stage of economic progress, so greater environmental pressures are being exerted. This adds to the need for policies that can disentangle economic growth from ecological degradation. Lastly, the financial globalization coefficient is significant and negative having coefficient of -0.051, which indicates that it serves to reduce emissions in the long term. This is consistent with the Technology Transfer Theory (Antweiler, Copeland, & Taylor, 2001), where financial integration boosts the availability of cleaner technology and green investments. While the Pollution Haven Hypothesis (Copeland & Taylor, 2004) alarms, the results are suggestive of the power of regulatory frameworks and institutional capacity to use globalization for sustainable development. Shahbaz et al. (2018) concur in this viewpoint, noting how important it is to direct financial flows into green sectors.

Figure 2: Global Emissions by Sector



Source: 1 Rhodium Group

4.4. Diagnostic Tests

Table 5: Diagnostic tests

Serial	Test	p-value	Decision (5 percent level)
1	Hausman Test Results for Endogeneity	0.084	No Endogeneity
2	Jarque-Bera Test for Residual Normality	0.078	Residuals normally distributed

The Hausman test statistic with a value of 0.084 shows the absence of endogeneity in the model. This shows that the explanatory variables do not have relation with error term. Similarly, Jarque-Bera test, whose p-value is 0.078, it means that residuals follow a normal distribution.

5. Conclusion

The long-term results from this analysis, which are based on the ten environmentally affected countries covering the time period from 2000 to 2023, have established very high correlations between carbon emissions and the key explanatory variables. Technological innovation and financial globalization are negatively correlated with emissions, suggesting they may play a role in enabling environmental advancement. Economic growth and green growth, on the other hand, are positively correlated with emissions, possibly due to continued dependence on conventional energy-intensive development patterns. These findings reinforce the necessity for policies that encourage cleaner technologies, contain environmentally harmful activities, and align financial and economic policy with sustainability goals. The robustness of the model is validated through diagnostic checks, which confirm the absence of endogeneity and validate the normal distribution of residuals, reinforcing confidence in the robustness of the long-run estimations.

5.1. Policy Recommendations

- The significant and negative impact of technological innovation (−0.093) on CO_2 emissions in the long run emphasized that governments should prioritize policies that provide tax breaks and dedicated funding to support research and development in clean technologies.

- Construction of innovation clusters that bring public and private institutions together to collaborate on green technology can accelerate sustainable practices, enhancing the long-term emission reduction effects noted in the data.
- Given the fact that green growth has a positive and significant relationship with emissions (0.134), there is a need to implement good environmental regulations to ensure that growth policies do not offer room for dirty sectors to undermine sustainability goals.
- Green growth initiatives need to be led wisely by policymakers towards low-carbon and clean industries since the results point out that if left uncontrolled, green growth would increase emissions in the long run.
- The positive economic growth coefficient of 0.071 specifies that economic growth is currently linked with higher emissions and therefore, clean technologies must be incorporated into production so that it can break the association in the long run.
- Integration of national development plans with environmental sustainability is required to reduce the environmental impact of economic growth, as in a long-term positive correlation between emissions and growth.
- Financial globalization has a negative and statistically significant long-run effect on emissions (-0.051), which indicates that policies making foreign investment in renewable energy and sustainable infrastructure easier can increase their positive environmental effect.
- Establishing and enforcing green finance norms for cross-border capital flows will ensure that financial globalisation will continue to contribute to emission reductions instead of to environmental degradation.
- Promoting technological advancements through long-term stimuli to R&D, subsidies, and partnerships remains indispensable, as these have consistently had a persistent ability to mitigate CO_2 emissions over the decades.

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