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THE COMBINE EFFECT OF HDI AND GLOBALIZATION ON ECONOMIC GROWTH AND ENVIRONMENTAL QUALITY IN LOW-INCOME AND HIGH-INCOME DEVELOPING COUNTRIES

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ABSTRACT

This study aims to links between globalization, human development, economic growth, and environmental quality using data from hundreds of developing countries spanning 2000–2024. For Low income developing countries. The marginal effects shows that both HDI and KOFG have positive effects on dependent variables throughout the data range. Further, the turning point for both panels showing that the turning point is outside the data range meaning to say that effect of globalization and HDI remains positive for data range. For High income developing countries The marginal effects show that both HDI and KOFG have positive effects on dependent variables throughout the data range. Further, the turning point for both panels shows that the turning point is outside the data range means to say that the effect of globalization and HDI remains positive for throughout the data range.

Keywords: Ecological Footprint, Globalization, Economic Growth, Financial Development, Foreign Direct Investment, Human Development Index, GMM

INTRODUCTION

Background of the Study

Amartya Sen came up with the idea of human growth in the 1990s. It has become an important idea in discussions about sustainable growth since then. Along with promoting economic growth, human development aims to help people live longer, healthier, and more enjoyable lives. Some of the things that make it up are access to basic services, healthcare, education, and a fair income (Singh, 2024). People think that progress in technology has a big effect on the connection between globalization, economic growth, and natural health.
As the world becomes more connected, progress in technology can help lessen the bad effects of growth on the environment. Better education and awareness of environmental problems can lead to better environmental stewardship if people and communities look forward to more environmentally friendly ways of making things and more involvement in conservation efforts (World Bank, 2023). Putting money into health care and education can help even out the unfair effects of globalization by giving people the knowledge and skills they need to take advantage of the chances that come up because of global economic integration(Qin et al., 2024). In addition, progress in human society has a big effect on the policy environment. Countries that put human development first are more likely to pass laws that protect the environment, encourage fair growth, and reduce inequality. Human development-higher countries are more likely to use green tools, invest in renewable energy, and follow environmental rules (UNDP, 2023). This is especially important in emerging countries where bad leadership and a lack of environmental management skills make it hard to find a balance between protecting the environment and growing the economy.
Globalization, economic growth, and environmental health have all been the subject of extensive investigation. However, no research has been conducted to assess the significance of human development in determining the impact of globalization on economic growth and environmental quality in underdeveloped nations. However, limited knowledge exists regarding the impact of human growth on these interactions, particularly in economically

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disadvantaged nations. Most research on globalization has examined its impact on either the economy or the environment. It has not been considered how advancements in technology may influence the impacts of globalization on both dimensions. This study aimed to elucidate the interconnections among globalization, economic growth, environmental health, and human development. The study examines the role of human development as a regulatory framework to elucidate how developing nations may address the challenges posed by globalization while ensuring that growth remains sustainable and equitable for all stakeholders.

LITERATURE REVIEW

Rong et al., (2024) investigated in order to address the drawbacks of standard environmental indicators like CO_2 emissions and ecological footprints. Using the load capacity factor (LF), they created a more comprehensive assessment of ecological quality. According to the research, the ecological footprint emphases on how human activity depletes natural resources. But it doesn't consider biocapacity, or how nature satisfies ecological demands. The study better understood ecological quality by utilizing the LF metric, which considered supply and demand. In the study, economic risk, financial risk, natural resources, economic growth, and social globalization were examined to determine their effects on load capacity factor, CO_2 emissions, and ecological footprint in China. While social globalization and economic risk improved China's ecological quality, natural resources, economic development, and financial risk degraded it, according to ARDL estimators. The study highlighted the necessity of taking these aspects into consideration when developing China's policies to achieve the UN Sustainable Development Goals, particularly Goal 8 (Decent Work and Economic Growth), Goals 12, 13, and 17 (Partnerships for the Goals). Including the LF as a more precise ecological quality measure in the literature on sustainable development in China.

Aladejare & Musa, (2024) examined the effect of globalization on inflation and government spendings in Africa. To check the prescribed association panel of twenty-four African countries selected. Feasible generalized method of moment and Driscoll kraay standard error techniques are applied for the period from 1991 to 2021. The study found that resource money can boost economic growth, but volatile and mismanaged resource-based economies do not always lead to sustainable development. African countries struggle to achieve SD because to inflation-driven price rises, which lower purchasing power and increase poverty. Dishonest and misallocated government spending prevents SD from funding healthcare and education. Globalization has varied repercussions despite its potential benefits. Opening international markets renders countries more vulnerable to economic shocks and increases inequality within and across countries.

Using data from 17 manufacturing industries in 65 countries or regions from 2000 to 2018, (Fan et al., 2024) examined how digital transformation affects manufacturing industries' global value chains. Digitizing services increased manufacturing industry participation in global value chains by lowering trade costs and improving production efficiency. Their research found that digital transformation in services affected manufacturing GVC participation based on factors such manufacturing industry service input intensity, a country's position in global value chains, and manufacturing GVC pattern. The biggest effects were shown in service-intensive industrial sectors, nations outside global value chains, and "snake-shaped" global value chains, where production is divided sequentially rather than hierarchically. The authors employed endogeneity analysis to verify their conclusions. The results showed that countries less linked into global supply networks and service-dependent businesses benefited more from the digital revolution. Through trade efficiency and barrier reduction, these nations strengthened their position in global value chains. Adding to the literature on digitization and global value chains,

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the study showed how manufacturing firms in service-intensive sectors and peripheral regions could profit from service transformation to expand their supplier networks. In developing Eastern European states, Balsalobre-Lorente et al., (2023) studied the effects of globalization, economic complication, and the Pollution Haven Hypothesis (PHH) on ecological degradation. The goal of the study was to complement earlier results about the economics, ecosystem, and globalization of these countries. The study looked at how economic complication and the effect of renewable energy on ecological deterioration might be connected to an N-shaped Environmental Kuznets Curve (EKC). The data was analyzed using both parametric and non-parametric quintile regression. The findings established a non-linear relationship between economic complication and carbon emissions and supported the N-shaped Environmental Kuznets Curve. It was shown that while the use of renewable energy compressed emissions, globalization increased them. The investigation's main conclusion was that the effect of globalization on emissions was mitigated by economic complexity. The N-shaped Environmental Kuznets Curve hypothesis for increasing emissions quintiles was not supported by the non-parametric analysis. The results of the study show that while globalization raised emissions everywhere, economic complication and globalization had a moderating effect, with renewable energy being a key factor in lowering emissions. In order to reduce carbon emissions and recover the long-term viability of growing economies in Eastern Europe, the study optional policies that sustain economic complexity and the use of renewable energy.

Onwe et al., (2024) employed advanced econometric methods, such as Wavelet Coherence (WTC) analysis and the Quantile Autoregressive Distributed Lag (QARDL) model, to examine the variables influencing Nigeria's food safety between 1980 and 2022. A complex association between globalization, GDP, population growth, and food accessibility was uncovered by the food manufacture index (FPI). Globalization has both short-term and long-term implications on food availability, depending on how wealth is dispersed, but the long-term effects were mostly unfavorable. Food availability was constantly positively correlated with all GDP quantiles, underscoring the significance of economic growth behind food production. However, an inhabitant's expansion has a short-term damaging impact on food supply, representing the higher demand for possessions brought on by rapid population development. They concurred that a complex approach comprising robust economic policies, successful population control procedures, and well-crafted globalization policies targeted at boosting agricultural yields and flexibility is necessary for Nigeria's long-term wealth and advancement toward the Sustainable Development Goals of eradicating hunger.

Wang & Sibt-e-Ali, (2024) examined the relationships between globalization and economic growth. They also consider the environmental consequences of globalization. Cross sectional dependence based econometric techniques were chosen to quantify the relationship among the variables. Results of the study declared that all the factors taken to check the environmental consequences adversely associated with environmental quality. They were found that financial globalization was negatively associated with environmental quality of the selected countries. Based on environmental Kuznets curve the validity was tested. The results did not validate the shape of environmental Kuznets curve. Further, it was highlighted that all the deliveries affected differently the environmental quality of the countries. These results suggested that application of unified policies would not bring the desired results. Strategic policy mix must apply to achieve the carbon neutrality in the region.

The fundamental premise of these growth theories is that economic growth arises from capital accumulation, labor expansion, and technological advancement. Free trade and capital mobility, facilitated by globalization, enhances the effective allocation of resources among

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nations, underscoring the significance of globalization. The principal mechanism is that comparative advantage enhances specialization and productivity, facilitating economic expansion (Solow, 1988).

Changes in essential factors, such as environmental regulation, awareness, and education, may influence these proximate variables, which in turn may affect more basic variables.

Numerous studies have developed theoretical models that clarify the relationship between desires and technology, potentially resulting in different paths of environmental quality. This literature has written about two main approaches: static models, which solely focus on changes in output levels, and dynamic models, which consider changes in emissions or environmental quality in tandem with economic growth (Pezzey, 1992).

Political globalism and the environment were examined by (Özkan et al., 2024). Using quantile regression analysis, they examined the association between 1970 and 2020. In the study, all the evaluation indicators, such as globalization, economic performance, and energy outcomes, were significantly correlated with environmental quality. Environmental quality improved when nonrenewable energy was switched to renewable energy, according to the study. Across all quantiles, persisting environmental degradation and preventing environmental degradation result in the best results. There is evidence that a shift from fossil fuels to renewables can mitigate environmental negative effects of high energy intensity. Contrarily, political globalization has insignificant effect on environmental quality. This means that researchers observed that political globalization does not have the ability to mitigate environmental degradation. The results prescribed that policymakers should make suitable policies to shift from nonrenewable energy consumption to renewable energy consumption strategies to achieve sustainable outcomes. This study suggested that environmental policies should be implemented to mitigate environmental degradation and to achieve sustainable environmental outcomes.

Latif et al., (2023) examined the relationship between economic glogalization and environmental quality. They were taken the group of Asian countries. They have estimated both linear and nonlinear form relationship between globalization and environmental quality. KOF globalization were taken to measure the effect of globalization. A unique measure of environmental quality that capture both demand and supply side effects of environment were employed. The results of system generalized method of moment confirmed the existence of long term relationships between financial globalization and environmental quality. To check the validity of environmental Kuznets curve based on financial globalization authors introduced the squared term of financial globalization in the model. Results validated the U shape relationship between globalization and environmental quality. The turning point of the study beyond the data range. That was suggested that policymakers should integrate policies to attain the positive effects of financial globalization on environmental quality. They also interact the relationship based on institutional quality. Results confirmed the moderation effect relationship between financial development, institutional quality and environmental quality. Education effect on environment was also established to measure how education affects environment. Results indicated that higher education have significant effect on environmental quality. While primary school education did not have significant effect on environment in Asian countries.

Awad et al., (2024) explored how remittances and institutional quality affected environmental quality in 44 Sub-Saharan African economies. This study acknowledges earlier research on remittances and the environment but focusses on the often-ignored role of institutional quality in environmental effects. These sections are linked in a complex way thanks to the Pooled

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Mean Group Auto-Regressive Distributed Lag (PMG-ARDL) analysis. Research shows that remittances degrade the ecology over time. This suggested that greater capital may result in unsustainable investments or resource-intensive consumption. On the other hand, poor institutional quality harms the environment because it results in greater individual ecological footprints. This shows how important strong environmental government and resource management are. The study identified a threshold above which adjustments to institutions can lessen the environmental impacts of remittances. This demonstrates that these results are influenced by the quality of institutions. Remittances can benefit SSA countries economically and environmentally if institutional frameworks are improved. Remittances and environmental protection are addressed in the study. Among the ways to improve institutions are to increase environmental oversight and to connect money with sustainable development goals.

As SACU countries receive remittances from 1990-2020, Biyase et al., (2024) examined shadow economies, consumption of energy, revenue from oil production, and deforestation in APEC countries between 1991 and 2020, primarily influenced by financial globalization. There was a complex interaction between these features. Environmental degradation was negatively correlated after excluding oil withdrawal costs and shadow economies, suggesting they could have a positive impact on ecological consequences. In contrast, advancing economies and energy usage have a positive relationship with ecological degradation, suggesting their contribution. Study findings suggest that economic globalization promotes economic integration, prosperity, and resource exploitation at the same time. It was emphasized in the report that government investments in cutting-edge technologies and infrastructure are vital to reducing greenhouse gas emissions. Furthermore, it urged the use of energy-efficient observers by industry and conveyance. Ecological sustainability needs sustainable policy strategies that balance environmental protection objectives with financial incentives despite globalization.

Barkat et al., (2024) examined the relationship between globalization and environmental quality. Panel data techniques were employed to establish the relationship among the selected variables. Results suggested that research and development and foreign capital inflow has a positive significant impact on environmental quality. Causality test were also employed to check the direction of relationships. Results confirmed the existence of two way association among the selected indicators. Study implied that policymakers should made policies to attract the foreign capital to mitigate the adverse effect of globalization on environmental quality. FGLS simulations confirm this. Also, the D-H causality test demonstrated a linear relationship, improving the accuracy of the results. Research and development spending, as well as money returned to the home nation, are crucial for the long-term economic development of developing countries. Increased R&D spending and remittance flows are needed to support long-term economic development, according to the report. In middle-income nations, remittances are strongly correlated with technological advancements and growing economies.

Human Development, Growth and Environment Nexus

Sarwar et al., (2024) assessed how industry, GDP, urbanization, and human growth affected OECD and non-OECD ecological footprints from 1990 to 2018. The study distinguished distinct tendencies between the two groups by employing GMM and an open-access solution architecture. Results suggested that economic growth had positive significant effect on environmental quality. The moderator of human development and institutional quality were also employed to establish the said relationship between globalization and environmental quality. Comparative analysis of OECD and non-OECD countries was established. Study confirmed that positive relationship exists between combining effect of globalization and

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institutional quality on environmental quality in OECD countries. Contrarily, for non-OECD countries the relationship was found to be negative. The findings suggested that the relationship was more suitable for non-OECD countries.

Yu et al., (2025) investigated the relationship between globalization and environmental quality in the panel of Chinese economy. Sustainable development goals index and sustainable development goals evenness were used to capture the environmental consequences of globalization on environment. Results suggested that on the basis of Sustainable development goals index many regions of the chines economy achieved the most of the goals related with environmental quality. Both schemes of Sustainable development goals index and Sustainable development goals evenness attained in many provinces.

Destek et al., (2023) examined shadow economies, consumption of energy, revenue from oil production, and deforestation in APEC countries between 1991 and 2020, primarily influenced by financial globalization. There was a complex interaction between these features. Environmental degradation was negatively correlated after excluding oil withdrawal costs and shadow economies, suggesting they could have a positive impact on ecological consequences. In contrast, advancing economies and energy usage have a positive relationship with ecological degradation, suggesting their contribution. Study findings suggest that economic globalization promotes economic integration, prosperity, and resource exploitation at the same time. It was emphasized in the report that government investments in cutting-edge technologies and infrastructure are vital to reducing greenhouse gas emissions. Furthermore, it urged the use of energy-efficient observers by industry and conveyance. Ecological sustainability needs sustainable policy strategies that balance environmental protection objectives with financial incentives despite globalization.

Tong, (2024) examined the relationship between energy consumption, greenhouse gas emissions, socioeconomic characteristics, and human well-being in China between 2000 and 2019, highlighting the moderating influence of urbanization. The Human Development Index (HDI) showed a decreasing return with time from energy use, encompassing primary energy extraction and end energy use. Interestingly, in the subsequent years, there was neither a linear nor a log-linear relationship between energy use and HDI at the subnational level. HDI, GDP per capita, and family income seemed strongly correlated. This example shows how economic growth benefits people. Two energy-GDP pathways were found: high energy consumption with low GDP and low energy use with high GDP. This helps explain why the link between HDI, energy use, and greenhouse gas emissions has been going down over time. It was observed that urbanization has a significant stabilizing influence, particularly on life expectancy and the relationships between HDI and goods that meet human needs. According to the findings, the level of urbanization should dictate the goals of subnational policies, with specialized ways for satisfying human needs at different stages of urban growth. The informative information provided by our study makes it easier to design energy and urbanization plans that support long-term human well-being outcomes in rapidly developing regions.

Nuta et al., (2025) analyzed the combined effect of globalization and human development on environment in European countries. Based on the nature of data instrumental variables methods like GMM and Driscoll-Kraay techniques were employed to check the joint effect of globalization and human development on environmental quality. Financial development effect combined with human development was checked to check the joint effect on environmental quality. examined the relationship between globalization and environment by using computer experiment. The study utilized the regional aggregation's method bias. Further the GTAP10 database with general computable equilibrium applied pre aggregation models. They

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introduced the measurement of bias based on contrasting the impacts of large-scale models with those of aggregated models. The results of the study revealed that more than thirty five percent of regional aggregation suggested the association between globalization and environment. The direction of relation reversed in the case of developing countries and due to high imports, the strength of association intensified. A major percentage of the regional aggregation bias was artificially manufactured by grouping countries that experienced initial shocks that were different from one another, and then spreading to other countries through a framework that was based on pseudo-trade arrangements. Based on the findings of the study, it was concluded that the implementation of a disaggregated global model is necessary to improve the accuracy of climate change assessments in the face of a variety of global shocks. Promoting integrative strategies that align economic, social, and environmental objectives in the pursuit of sustainable development, the study provided policymakers with significant insights.

DATA AND METHODOLOGY

The fundamental and primary phase in comprehending the relationship between globalization, ecological, economic performance, and human development is data collection.

To measure human development, we utilized HDI (Human Development Index) that will be mediator to reduce the negative impact of liberalization on environment and economic growth. Mediating effect models of the impact of joint effect of globalization and HDI on environment are presented in equation .

$$\boldsymbol{ECFP_{it} = \rho_1 ECFP_{it-1} + \rho_2 GLOZ_{it} + \rho_3 GDP_{it} + \rho_4 FDI_{it} + \rho_5 FD_{it} + \rho_6 (HDI)_{it} + \rho_7 (GLOZ * HDI)_{it} \pi_t + \mu_{it}}$$

Where,

HDI ➔ Human development index that will operate as mediator in this model.

Description of all variables used in all four models their definitions; sources of data collection are presented in table.

Table

Description of Variables Used

Proxy	**Definition**	**Data Source**
ECFP	Ecological footprints measure of environmental quality of a country	Global Footprint network[1]
GLOZ	Globalization and to measure it KOFF globalization index used	Swiss Economic Institute[2]
FDI	Foreign direct investment (Net inflow)	World Development Indicators (WDI)
GDP	Growth rate of GDP per capita	WDI
FD	Financial development measured using domestic credit to private sector	WDI
HDI	Human development Indicator Index	United Nation Development Program (UNDP)

Using statistical pre-estimation tests as well as econometric tests, we can select the most appropriate econometrics technique. With this in mind, we can select the most appropriate

[1] https://www.footprintnetwork.org/

[2] https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html

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method for quantifying the relationship between the variables that have been chosen. In the first place, we are unable to proceed with the application of the pooled mean group (PMG), fixed, random, and Hausman tests since the variables at their level do not exhibit the properties of being stationary. Cointegration tests, dynamic common correlated effect estimation, and instrumental variables methods, such as two stage least square (2SLS), three stage least square (3SLS), and the Generalized Method of Moment (GMM), are some of the options that are available to us when dealing with non-stationary variables. Based on these findings, the PMG, Fixed/Random effect, and cointegration tests were rejected in order of the coefficients while we were dealing with the problem of heteroscedasticity. This is also the case when we bring attention to the problem of autocorrelation PMG, Fixed/Random effects, and Cointegration tests, which are rejected for the purpose of applying to the quantification of the coefficients. The message that we cannot apply PMG, fixed/random effects, and cointegration type econometric approaches is the same as the message that the multicollinearity issue conveys. Considering the endogeneity problem, every conceivable alternative of econometric methodologies was unsuccessful, except for the instrumental variable method (GMM). Given that cross-sectional dependency exists, it can be concluded that the dynamic common correlation effect is the most suitable choice among all the econometric methods that are currently readily available. However, we cannot disregard the endogeneity problem, which indicated that to remove the impacts of endogenous regressors, we must proceed with the instrumental variables technique, such as the Generalized Method of Moment (GMM).

RESULTS AND DISCUSSION

This section is devoted to the segregated analysis based on income groups of included developing countries (Low/High). The objective in this chapter is to develop the interaction effect relationship between globalization, environment and economic growth. As we have two segregations based on income group of countries. So, this section further divided into two sections. First section devoted to low income developing countries and second section devoted to high income developing countries.

Low-Income Developing Countries (LIDC)

The objective here is to check the combining effect of globalization and HDI on economic growth and environmental quality in developing countries for the period from 2000 to 2024. We will present the system GMM analysis that suggested the best econometric technique is two step system GMM analysis.

Table 1 is divided into two panels depending on the dependent variables, as in first panel results of interaction effect of HDI and globalization on environmental quality are presented. Second panel reported the results of combining effect of HDI and globalization on economic growth.

Table 1

Dynamic Panel-Data Estimation, Two-Step System GMM

	Panel-1 (PCIG)		Panel-2 (ECFP)		
PCIG/ ECFP	**Coef.**	**St. Err.**	**Coef.**	**St. Err.**	**Sig**
PCIG_LAG1	0.38	0.07	------	------	***
ECFP_LAG1	------	------	0.68	0.000	***
HDI	0.01	0.06	0.03	0.000	**
KOFGI	0.02	0.02	0.12	0.000	***

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FD	0.01	.001	0.02	0.278	***
FDI	0.02	0.01	0.03	0.000	***
KOFGI_HDI	0.09	0.02	0.02	0.000	***
Constant	3.14	1.07	-1.05	0.000	***
Marginal Effects of KOFGI at HDI	Minimum		0.13	Minimum	0.12
	Mean		0.06	Mean	0.18
	Maximum		0.11	Maximum	0.25
KOFGI Turning Point	ME (HDI) = 0	-0.11	ME (HDI) = 0	-0.92	
Marginal Effects of HDI at KOFGI	Minimum	1.36	Minimum	1.97	
	Mean	4.63	Mean	6.69	
	Maximum	8.20	Maximum	11.85	
HDI Turning Point	ME KOFGI) = 0	-0.22	ME KOFGI) = 0	-0.15	
Arellano-Bond test for AR(1) in first differences: z = -3.86 Pr > z = 0.000 Arellano-Bond test for AR(2) in first differences: z = -0.03 Pr > z = 0.979 Sargan test of overid. restrictions: chi2(135) =1095.80 Prob > chi2 = 0.729 Hansen test of overid. restrictions: chi2(135) = 96.18 Prob > chi2 = 0.995					
*** p<.01, ** p<.05, * p<.1					

Results in table shows strength of relationships is weak in case of low-income developing countries. The marginal effects shows that both HDI and KOFG have positive effects on dependent variables throughout the data range. Further, the turning point for both panels showing that the turning point is outside the data range meaning to say that effect of globalization and HDI remains positive for data range.

High-Income Developing Countries (HIDC)

The objective here is to check the combining effect of globalization and HDI on economic growth and environmental quality in developing countries for the period from 2000 to 2024. In previous section we considered the Low-Income developing countries. In this section we are interested in checking the same association in high-income developing countries. We will present the system GMM analysis that suggested the best econometric technique is two step system GMM analysis. Results are reported in table.

Table 2 is divided into two panels depending on the dependent variables, as in first panel results of interaction effect of HDI and globalization on environmental quality are presented. Second panel reported the results of combining effect of HDI and globalization on economic growth.

Table 2

Dynamic Panel-Data Estimation, Two-Step System GMM

	Panel-1 (PCIG)		**Panel-2 (ECFP)**		
	Coef.	**St. Err.**	**Coef.**	**St. Err.**	**Sig**
PCIG_LAG1	0.85	0.07	------	------	***
ECFP_LAG1	------	------	0.96	0.000	***
HDI	0.04	0.06	0.06	0.000	**
KOFGI	0.03	0.05	0.18	0.000	***

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FD	0.04	.003	0.11	0.078	***
FDI	0.05	0.02	0.09	0.000	***
KOFGI_HDI	0.08	0.07	0.07	0.000	***
Constant	5.92	1.09	-1.69	0.000	***

Marginal Effects of KOFGI at HDI	Minimum	0.04	Minimum	0.19
	Mean	0.06	Mean	0.21
	Maximum	0.11	Maximum	0.26
KOFGI Turning Point	ME (HDI) = 0	-0.38	ME (HDI) = 0	-2.25
Marginal Effects of HDI at KOFGI	Minimum	1.24	Minimum	1.26
	Mean	4.14	Mean	4.16
	Maximum	7.32	Maximum	7.34
HDI Turning Point	ME KOFGI) = 0	-0.50	ME KOFGI) = 0	-0.75

Arellano-Bond test for AR(1) in first differences: z = -3.86 Pr > z = 0.000
Arellano-Bond test for AR(2) in first differences: z = -0.03 Pr > z = 0.979
Sargan test of overid. restrictions: chi2(135) =1095.80 Prob > chi2 = 0.783
Hansen test of overid. restrictions: chi2(135) = 96.18 Prob > chi2 = 0.995

*** p<.01, ** p<.05, * p<.1

Results in table shows strength of relationships is similar as estimated for High income developing countries. The marginal effects show that both HDI and KOFG have positive effects on dependent variables throughout the data range. Further, the turning point for both panels shows that the turning point is outside the data range means to say that the effect of globalization and HDI remains positive for throughout the data range.

Conclusion

This section designed to presents the interaction effect model for the panel of overall developing countries, low-income developing countries and high-income developing countries for the period from 2000 to 2024. Statistical and econometrics pre-estimation tests declared the two step system GMM analysis as the best econometric technique. Results of GMM estimator suggested that combined effect of HDI and KOFGI have positive significant effects on both economic growth and ecological footprints. The marginal effects for both HDI and KOFGI show that both have positive effects throughout the data range. As the turning point in all cases is beyond the data range. Segregated analysis also presented the same results for both panels of low-income and high-income countries.

POLICY RECOMMENDATIONS

Based on the study findings, the study recommends some policy recommendations for developing countries.

- As globalization is found to increase the environmental degradation, then government should design policies to channel globalization towards environmentally friendly outcomes.
- Human development has reported the mitigating negative effect on environmental degradation and strengthening the positive effect on economic growth.
- Financial development adversely affects environmental quality.
- Foreign direct investment mitigating the environmental quality.
- Economic growth adversely affects the environmental quality.

Dimension for Future Research

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Future research could expand as follows:

- The effect of globalization on economic growth and environmental quality can be revisited by using the threshold effect model.
- Disaggregate analysis can be used to detect which indicator worsens the environmental quality.
- Future research can be extended for different panels such as for global panels, extended BRICS economies etc.
- Time variant can provide avenue

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Appendix:

Table:		
List of countries		
Country Name	**Income Group**	**Area**
Afghanistan	Low Income	Asia Pacific
Bangladesh	Low income	Asia Pacific
Bhutan	Low income	Asia Pacific
Cambodia	Low income	Asia Pacific
China	High income	Asia Pacific
India	Low income	Asia Pacific
Indonesia	Low income	Asia Pacific

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Iran	High income	Asia Pacific
Kazakhstan	High income	Asia Pacific
Laos	Low income	Asia Pacific
Malaysia	High income	Asia Pacific
Maldives	High income	Asia Pacific
Mongolia	Low income	Asia Pacific
Myanmar	Low income	Asia Pacific
Nepal	Low income	Asia Pacific
Pakistan	Low income	Asia Pacific
Philippines	Low income	Asia Pacific
Sri Lanka	Low income	Asia Pacific
Thailand	High income	Asia Pacific
Uzbekistan	Low income	Asia Pacific
Vietnam	Low income	Asia Pacific
Algeria	High income	Africa
Angola	High income	Africa
Benin	Low income	Africa
Botswana	High income	Africa
Burkina Faso	Low income	Africa
Burundi	Low income	Africa
Cameron	Low income	Africa
Central African Republic	Low income	Africa
Chad	Low income	Africa
Comoros	Low income	Africa
Congo Rep	Low income	Africa
DR Congo	Low income	Africa
Cote d'Ivoire	Low income	Africa
Egypt	High income	Africa
Ethiopia	High income	Africa
Gabon	High income	Africa
Gambia	High income	Africa
Ghana	Low income	Africa
Guinea	Low income	Africa
Kenya	Low income	Africa
Lesotho	Low income	Africa
Liberia	Low income	Africa
Madagascar	Low income	Africa
Malawi	Low income	Africa
Mali	Low income	Africa
Mauritania	Low income	Africa
Mauritius	High income	Africa
Morocco	High income	Africa
Mozambique	Low income	Africa
Namibia	High income	Africa
Nigeria	Low income	Africa

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Rwanda	Low income	Africa
Senegal	Low income	Africa
Sierra Leone	Low income	Africa
South Africa	High income	Africa
Sudan	High income	Africa
Tanzania	Low income	Africa
Togo	Low income	Africa
Tunisia	High income	Africa
Uganda	Low income	Africa
Zambia	Low income	Africa
Zimbabwe	Low income	Africa
Bahrain	High income	Middle East
Iraq	High income	Middle East
Jordon	High income	Middle East
Kuwait	High income	Middle East
Lebanon	High income	Middle East
Oman	High income	Middle East
Qatar	High income	Middle East
Saudi Arabia	High income	Middle East
Syria	High income	Middle East
UAE	High income	Middle East
Yemen	Low income	Middle East
Argentina	High income	Latin American & Caribbean
Belize	High income	Latin American & Caribbean
Bolivia	High income	Latin American & Caribbean
Brazil	High income	Latin American & Caribbean
Chile	High income	Latin American & Caribbean
Colombia	High income	Latin American & Caribbean
Cost Rica	High income	Latin American & Caribbean
Cuba	High income	Latin American & Caribbean
Dominican Rep	High income	Latin American & Caribbean
Ecuador	High income	Latin American & Caribbean
El Salvador	High income	Latin American & Caribbean
Guatemala	High income	Latin American & Caribbean
Guyana	High income	Latin American & Caribbean
Haiti	High income	Latin American & Caribbean
Honduras	High income	Latin American & Caribbean
Jamaica	High income	Latin American & Caribbean
Mexico	High income	Latin American & Caribbean
Nicaragua	High income	Latin American & Caribbean
Panama	High income	Latin American & Caribbean
Paraguay	High income	Latin American & Caribbean
Peru	High income	Latin American & Caribbean
Suriname	High income	Latin American & Caribbean
Trinidad & Tobago	High income	Latin American & Caribbean

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Uruguay	High income	Latin American & Caribbean
Venezuela	High income	Latin American & Caribbean