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Research paper

The Social Dimension of Sustainable Development and Inequalities: A Multi-Method Analysis of Human Development Dynamics in CIVETS Countries

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Abstract

This research explores complex interplays between Human Development Index (HDI), economic development, and environmental sustainability in CIVETS countries (Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa) during 1990-2029 in relation to multi-method research design. Findings of empirical analysis reveal significant cross-country differences; for instance, while Vietnam demonstrates sustainable development in relation to firm GDP growth and lower CO2 emissions, South Africa and Egypt face challenges in accelerating human development in relation to economic development within the SDG context, due to structural constraints. Correlation analysis tests non-linear relations between HDI and its traditional determinants and the lack of positive correlations between HDI and its components. This paper critiques traditional linear approaches to understanding the complex relationships between HDI and other variables, particularly when applied to developing nations, and proposes innovative methods, such as panel Quantile regression and Machine Learning techniques, as avenues for future research to enhance model performance beyond the benchmarks used in this study. The paper draws important conclusions regarding developing nations; for instance, when economies grow rapidly, they must invest proportionally in solar and wind energy, while in slow-growing economies, they must work towards health justice and tax justice to develop human justice. This paper presents an integrative approach to understanding the overall developments within CIVETS states.

Keywords: *CIVETS Countries; Human Development Index; Inequality; Policy Integration; Sustainable Development.*

1. Introduction

The Human Development Index (HDI) was used ever since its inception by the UNDP, acting as a focal point for significant paradigm shifts from GDP to cover statistics on health, education, and income (Sen, 1999; UNDP, 2023). However, with regard to the inter-relationship between HDI, economic development, and environmental sustainability, divergent interpretations have been offered significantly within developing economies experiencing rapid industrialization (Stern, 2004; Ravallion, 2012). These are the CIVETS group of economies—Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa. These economies have dynamic processes of industrialization but at uneven rates of development; hence, achieving synchronization between economic growth on one hand and human welfare plus natural constraints is very difficult. South Africa's strong GNI growth, for instance, has failed to reduce inequality, and Vietnam's strong HDI growth occurs with simultaneous decarbonization of its economy (World Bank 2022a).
It fulfills three major gaps that exist within current literature:
The Temporal Dynamics: Uncovering changes that have occurred within HDI for CIVETS nations, ranging from 1990 and reaching up to 2023, with forecast extensions until 2029.
Structural Drivers: The complex non-linear patterns associated with the relationship between the Human Development Index and GNI per capita, as well as for CO2 emissions, are captured by means of complex econometric modeling and forecasting.
Policy Synergies: This report highlights frameworks that can ensure synergy between economic and sustainability goals.
Methodological Approach: The research employs a multi-method approach. The methodology includes panel regression (conducted using OLS fixed-effects models), forecasting through ARIMA models, and correlation studies. These are employed to address the weaknesses presented by the former approaches. The research uses data from the World Bank as well as the UNDP. Despite the weaknesses associated with the approaches used in the research, the research is aware of the fact that ARIMA models are susceptible to external variables (like the occurrence of a pandemic), while OLS suffers from the problem of omitted variables.
Research Aim: In responding to such queries, the current study endeavours to offer a contribution to the literature on sustainable development with a distinct focus and insight pertinent to CIVETS, and a critical examination of traditional approaches to progress and human development.

Various sections that are present in this research are: (1) Conceptual Framework, (2) Literature Review, (3) Methodology, (4) Empirical Results, and (5) Concluding Remarks.

2. Literature Review

The HDI represents an integrated approach to measure socio-economic development that encompasses aspects of health, education, and income (UNDP, 2023). Contrary to other measures of economic growth, the HDI has adopted an intricate definition of development and thus represents an appropriate subject of study for new economies that are characterized by heterogeneity in their structures. Based on this assumption, this literature review has adopted three major themes to explore human development in relation to new economies that are featured by sustainability concerns and increasing adoption of new technological frontiers that rely upon machine learning techniques in studies that construct HDI indexes and predict economic phenomena (Ranis et al., 2006; Sagar & Najam, 1998; UNDP, 2016). Despite adopting an extensive approach to comprehend different issues of relevance to human development in new economies, this literature still focuses on different themes within CIVETS nations that include Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa, where economic development is linked to both social sustainability and human aspects of sustainability in new economies that represent different technological adoption aspects in machine learning approaches that construct HDI indexes for economic prediction studies.

2.1. Human development and its determinants

Human development is viewed more than a one-dimensional process with respect to income growth. The theoretical basis for the Human Development Index (HDI) is the "Capability Approach," first conceptualized by Sen (1999), whereby human development is viewed in terms of substantive freedoms deriving from the outcome variables: health, education attainment, and income. Additionally, according to Neumayer in 2016, human development must also incorporate environmental sustainability, as the assessment of development should be analyzed through both social and environmental lenses. The critical commentary on HDI is represented through the work of Ravallion in 2012, focusing on the methodological and values dilemmas posed to HDI construction, suggesting a balanced ranking for income, health, and education variables.

Ravallion's criticism is further taken up about the issue of distributive equity, giving rise to the Inequality-Adjusted Human Development Index (IHDI), whereby the effects of inequality are accounted for in the HDI calculation and further underscore the normative aspect of the goal of social justice (Anand & Sen, 2000). That is, under this approach, the quality of institutions and governance factors become central mediating factors affecting the process whereby economic growth is channeled into human development outcomes; indeed, the relevant literature provides evidence that the level of governance affects the magnitude whereby increased economic growth and increased delivery of basic services translate into increased human development outcomes in terms of its effect on inequality and social inclusion outcomes (Sarkodie & Adams, 2020), such that poor institutions could be the explanation for the gap between economic growth and human development outcomes where inequality is pronounced in countries like those in the CIVETS classification.

Health-related factors related to HDI are observed in empirical analyses. Barro (2013) stressed the importance of the two-way interaction between health performance and development, and Cutler, Deaton, and Lleras-Muney (2006) highlighted improvements in public health structure and government actions as factors in rising life expectancy. To provide a balanced argument in this direction, it has been shown in Datta and Singh (2019) that financial inclusion is important in promoting progress in HDI results in developing economies.

The results obtained from the country and regional level analyses provide a strong basis for understanding the complexity of human development. The works of Lasdiyanti et al. (2019) and Nurhalizah & Sitompul (2022) utilize spatial analysis, geographically weighted regression, and explore the factors that determine HDI in Indonesia, accounting for the complexity of human development. Among the CIVETS, Bayar (2022) studies the determining factors of economic complexity, an indirect indicator of human development, while Cambazoğlu (2020) takes a comparative look, accounting for the macroeconomic differences among the CIVETS. Taken together, these points lay strong grounds for the need for analytical tools able to capture this complexity, rather than addressing it using homogeneous or aggregated views.

The presence of endogeneity is always a concern for estimation issues related to development indicators, calling into question the veracity of static models, such as ordinary least squares (OLS) regression.

To handle the issue of simultaneity in the relationship between GNI and HDI, and the study of dynamics, the application of the Generalized Method of Moments (GMM) in dynamic panels is an area of utmost importance in academics (Arellano and Bond, 1991; Blundell and Bond, 1998; Wooldridge, 2019).

2.2. Energy, the environment, and sustainable development

Several studies explore the interconnectedness of energy use, sustainability, and human development. In an early study, Apergis & Payne (2010) examine former Soviet nations for possible causal relationships between energy use, economic output, and CO2 emissions, consistent with the Environmental Kuznets Curve Hypothesis put forward by Stern (2004), a proposition about an inverted U-shaped link between economic output and pollution.

Current studies focus on sophisticated econometric modeling to address issues of heterogeneity and non-linearities. In applying panel quantile regression analysis, Banday and Koçoğlu (2023) reveal non-linear associations between HDI, energy use, and environmental indices, showing that relationships between development and environment vary at different levels of development. Liu et al. showed in 2023 through quantile regression that the overall association between infrastructure development in the Chinese economy and changes in HDI and CO2 emissions masks the non-linearity in the distributions.

The issue of energy diversification is an important aspect in the pursuit of sustainable development. The emergence of developing nations with ever-expanding markets calls for an approach that can ensure the sustainability of the natural environment. Khan et al. (2022 argued that advancements in energy efficiency and the use of innovative forms of renewable energy can suppress the overall levels of CO2 emissions in the face of rising population levels and energy demands. Notably, economic development and global trade could contribute to the complexities represented by the non-linearity in the relationship.

In a similar context, Kavas and Çoban (2023) have argued that, within the context of the CIVETS group, financial development is a defining factor of the use of renewable energy sources, with financial structures playing an important role in energy transitions.

To further analyze whether a reduction in emissions is a result of actual technological improvement or changes in economic structure, it is necessary to disaggregate source contributions. Decomposition analysis is highly significant to understand the underlying causes of the reduction in emissions, as observed in the case of Vietnam.

2.3. Machine learning applications in HDI and economic forecasts

Big data and Artificial Intelligence have complemented the methods toolbox for socio-economic analysis. Athey & Imbens (2015) also offer an excellent survey on machine learning approaches for the estimation of heterogeneous causal effects. In the area of Explainable Artificial Intelligence, approaches addressing the transparency issue for predictive analytics have been proposed by Ribeiro et al. (2016). Recent empirical studies demonstrate the rising benefits ML-based models offer concerning the application to human development outputs. The application of ML methods has been suggested to show greater accuracy in estimating the HDI through the use of non-linear relationships rather than traditional econometric methods (Sherman et al., 2023). However, this study positions ML as a conceptual extension for future work, without empirical implementation here. The increasing presence of big data and AI in society has led to the expansion of the toolkits available for the analysis of socio-economic phenomena. Furthermore, the limitations associated with conventional linear regression models in constructing results for human development outcomes had become apparent in previous studies. It is demonstrated by Yanuar et al. in 2018 that ridge regression is a more appropriate framework for exploring the HDI because of its ability to handle multicollinearity in the predictors, which is a typical problem with development data. This suggests the importance of alternative methods in exploring complex development phenomena such as the topic of HDI. Apart from the forecasted levels of indicators, the global macroeconomic trends of capital flow volatility, commodity price volatility, and deteriorating external financing conditions also affect the macroeconomic outcomes of emerging and developing economies. Kose and Ohnsorge (2020) offer a rich analysis of the EMDEs ten years after the global recession to illustrate how the ability of these economies to deal with the difficulties is limited by the constrained policy space, lower potential growth, and vulnerability to external shocks. The factors also involve the lower growth of investment and resilience to the volatile international capital flows, thereby influencing the developmental outcomes in scenarios similar to CIVETS countries. Thus, studies of the path of the HDIs of emerging economies would ideally involve global macroeconomic factors in context with the indicator levels to present the complete story of the developmental processes.

2.4. Institutional and global perspectives

International institutions also play a prominent role in defining the global agenda on human development. The United Nations Development Programme annually releases the Human Development Report, describing worldwide inequalities and growing human development issues (UNDP, 2023). The World Development Indicators database published by The World Bank is a normalized empirical database in common use for empirical studies on human development (World Bank, 2022a). The above databases represent a basic empirical foundation for a comparative analysis of human development.

2.5. Synthesis and research implications

Taken together, the literature provides three key findings that inform the methodological choice in the study outright. Firstly, human development is necessarily multi-dimensional and non-linear, questioning the appropriateness of linear econometric models. Secondly, the relationship between human development and environmental sustainability is context-dependent across various levels of development, suggesting the need for a more nuanced tool able to capture the difference. Thirdly, recent developments in forecasting methods and ML emphasize the shortcomings of the traditional methods while holding out the promise of innovation. Based on these findings, this study proposes a multi-method approach for analysis to empirically study HDI dynamics in CIVETS nations, simultaneously questioning the appropriateness of using standard linear approaches by using OLS and ARIMA as benchmarks to demonstrate their shortcomings and looking for other routes through which sustainable development paths can be identified, such as through future implementation of non-linear models.

3. Materials and Methods

3.1. Data and scope

The paper relies on a balanced panel study that uses a dataset of 204 observations, covering the period from 1990 to 2023 annually. These observations are sourced from the World Bank and the UNDP Human Development Reports.
The dependent variable is the Human Development Index (HDI), and the predictors include:

- Life Expectancy at birth (years)
- GNI per capita (PPP, constant USD)
- CO2 Emissions per capita (metric tons)

3.2. Analytical framework

Descriptive and Trend Analysis: Preliminary analysis for identifying patterns and tendencies associated with HDI and its factors among CIVETS countries (Figures 1-4).
Correlation Analysis: Pearson and Spearman tests for examining the relationship among variables (Figure 5)

3.3. Econometric models (benchmarking traditional approaches)

Ordinary Least Squares with country fixed effects.
Diagnostic tests: Jarque-Bera for normality, Durbin-Watson for autocorrelation, and Variance Inflation Factor for multicollinearity (Table 1-2).
Time-Series Forecasting: ARIMA models were fitted with projection paths for the HDI from 2024 to 2029 based on criteria determined by AIC/BIC values (Figures 6-9).

3.4. Model specifications

The ARIMA model is used for modeling and forecasting the time series. It combines AR, differencing, and MA to effectively model and analyze data that doesn't have temporal variability but can be made after differencing. It is represented as ARIMA (p, d, q), where p is the value for AR, d is the differencing degree, and q is the value for MA. According to Box et al. (2015), ARIMA models can be differentiated. The dependent variable HDI is given as a linear combination of variables Life Expectancy, GNI, and CO_2 emissions. The model is specified as follows (1):

$$\text{HDI} = \beta 0 + \beta 1\ \text{Life Expectancy} + \beta 2\ \text{GNI} + \beta 3\ \text{CO2} + \varepsilon \quad (1)$$

Where, HDI: Human Development Index, Life Expectancy: Average life expectancy at birth, GNI: Gross National Income per capita, CO2: Carbon dioxide emissions per capita, $\beta 0$ = Intercept, $\beta 1$, $\beta 2$, $\beta 3$ = Regression coefficients, ε: Error term.
The OLS regression assumptions—including linearity, normality, and homoscedasticity—were tested using diagnostic tests. Normality was assessed with the Jarque-Bera test (Jarque & Bera, 1987), autocorrelation with the Durbin-Watson statistic (Durbin & Watson, 1951), and multicollinearity with the variance inflation factor (Kutner et al., 2005).

3.5. Geographical and temporal scope

The analysis covers six CIVETS nations (Colombia, Indonesia, Vietnam, Egypt, Turkey, South Africa) covering 1990-2023, and out-of-sample forecasts up to 2029. To address possible measurement error, institutional data checks are included.

4. Findings

4.1. Descriptive analysis

Figure 1 illustrates an overall rising trend of HDI in all CIVETS countries from 1990 to 2023. The progress made among these nations might explain why all these countries have relatively high rankings on HDI. Countries such as Turkey and Colombia demonstrate an ongoing rising trend, while South Africa fluctuates but still shows a rising trend. Countries like Vietnam have shown a steadily low rate of progress, while Egypt and Indonesia have shown continued progress.

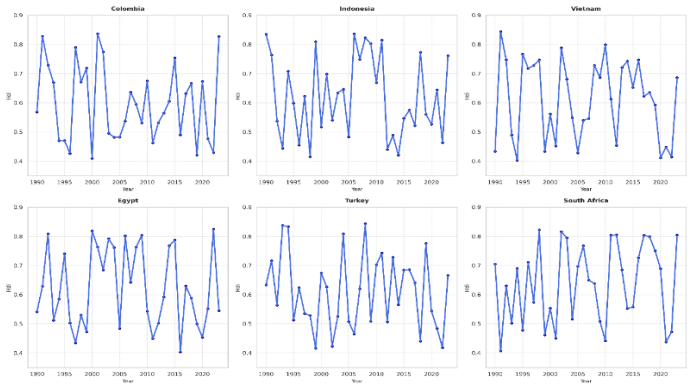

Fig. 1: HDI Trends in CIVETS Countries (1990-2023).

The data clearly indicate significant advancements in human development for most CIVETS nations during the last three decades, with varied rates.
Figure 2 shows that per capita CO_2 emissions for CIVETS nations change with time. Per capita CO_2 emission refers to the quantity of CO_2 emitted as a result of fossil fuel burning, cement manufacture, and various industries. It is measured in metric tons per person (IPCC, 2019). South Africa has been registering a remarkably high per-capita emission rate. The per-capita emission rates for Indonesia and Vietnam are expected to rise considerably due to current processes of industrialization. The Turkish rate is rather stable, taking into account processes implemented through environmental programs. The rates for Egypt and Colombia are moderate and low, respectively.

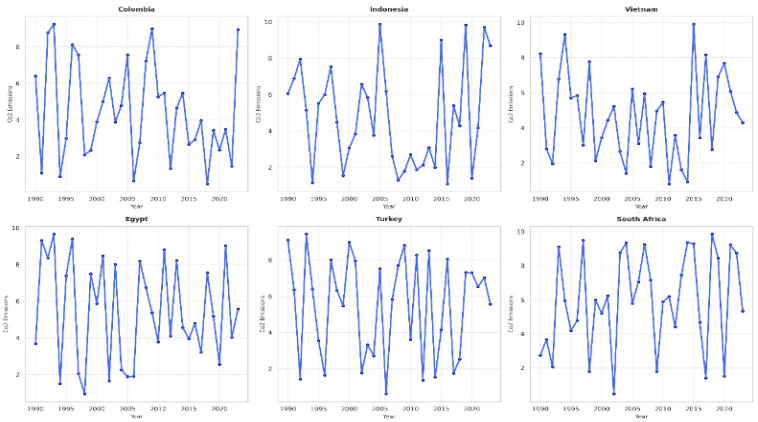

Fig. 2: CO2 Emissions Trends in CIVETS Countries (1990-2023).

To reduce environmental degradation, governments should introduce incentives for renewable energy sources, carbon pricing, and more stringent emission standards, especially within high-growth economies.
Figure 3 illustrates life expectancy changes among CIVETS nations. It should be noted that life expectancy represents an average value representing the number of years a child born today can live if current death rates remain unchanged (WHO, 2021).
Expectation of life at birth has gone up worldwide, but with uneven progress. The greatest gain amongst these nations is shown by Vietnam. Egypt and South Africa have shown poorer progress, with South Africa's due to problems like HIV/AIDS. Progress in Turkey and Colombia remains satisfactory.

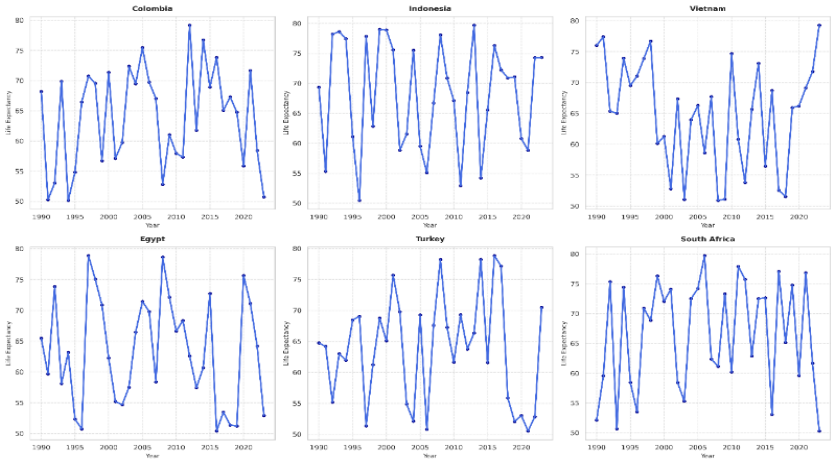

Fig. 3: Life Expectancy Trends in CIVETS Countries (1990-2023).

Advances in medical facilities and living standards make direct enhancements to HDI. South Africa began with an identifiable health crisis. Figure 4 below shows the changes in GNI per capita. GNI per capita is measured as the total domestic and foreign income that country residents claim, and then it is divided by population. It was obtained from the World Bank (2022c).
In CIVETS, it can be forecast that there will be a general increase, but with varying rates. A strong and stable growth rate is evidenced in Turkey. Colombia illustrates a stable growth rate, and Egypt might demonstrate a slow but stable growth rate. South Africa begins with a high rate, but with fluctuations. The greatest rate of GNI growth will be shown in Indonesia and Vietnam.

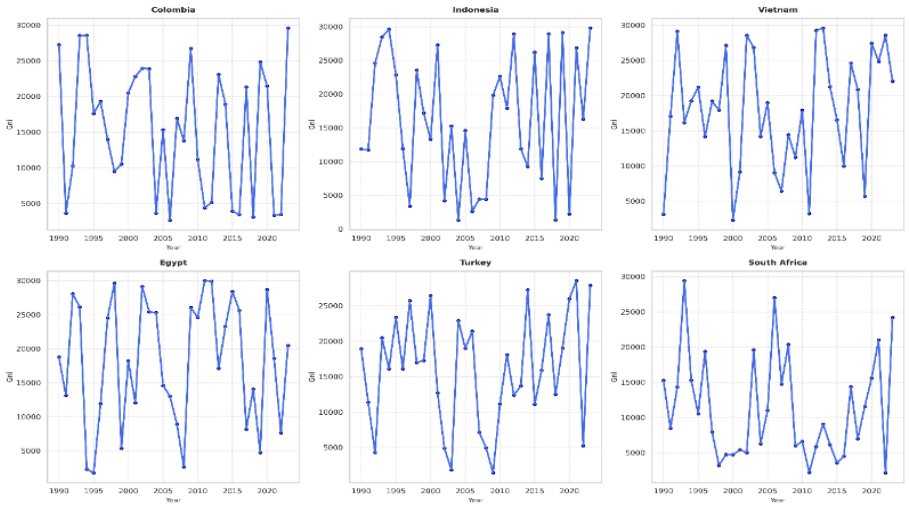

Fig. 4: GNI Trends in CIVETS Countries (1990-2023).

4.2. Correlation analysis

Figure 5 shows the result of the correlation analysis. The Correlation Matrix provides a good set of indicators regarding possible multicollinearity problems and also helps in selecting some variables for model building.
HDI has very low correlations with other variables: life expectancy (r = 0.02), GNI (r = -0.02), and CO_2 emissions (r = -0.03). Since these values are very close to zero, these low correlations suggest limited linear associations in this dataset, though caution is warranted as HDI is a constructed composite index inherently incorporating life expectancy and income components. This may reflect non-linear relationships, lags, or data-specific artifacts rather than true independence for this data and period because HDI is a compound variable combining life expectancy and income.
Similarly, life expectancy has very small correlations with GNI (r = -0.02) and CO_2 emissions (r = -0.02). This does not agree entirely with the generally accepted relationship that economic wealth and life expectancy have a direct link, since it varies slightly; however, there may be some variation in either healthcare facilities or marked societal disparities among CIVETS nations.
The only moderately significant relationship is between GNI and CO_2 emissions at an r-value of 0.08. It does not mean much in statistical terms, but it does indicate a positive relationship between growth and ecological deterioration, which fits into patterns seen within less developed countries as well as industrialization.
In general, all correlation coefficients are close to zero with no significant linear association among the variables; hence, there is no multicollinearity problem in subsequent regressions.

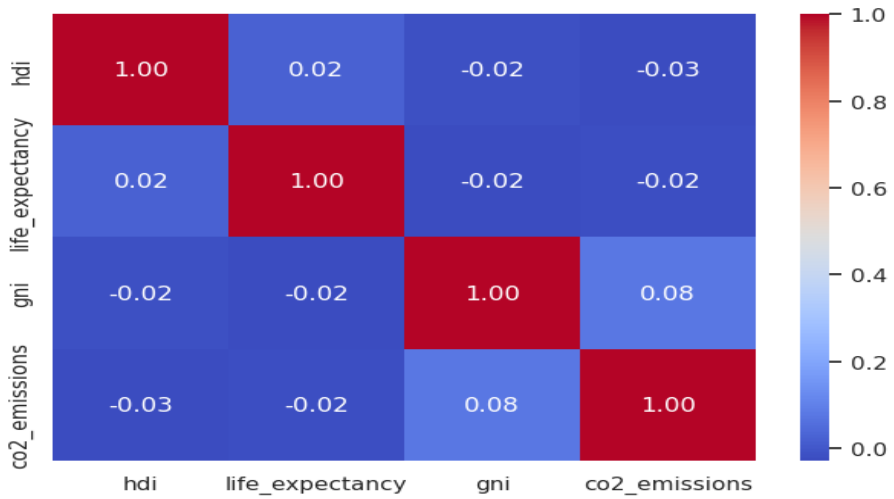

Fig. 5: Correlation Matrix.

The low correlations throughout the matrix indicate that each variable captures different dimensions of the developments among CIV-ETS countries. The low correlation of HDI with its traditional measurement variables, life expectancy and GNI, should be probed further because there could be leads and lags among the developments indicated by these variables. On the other hand, these observations also suggest that there may be some merit in using alternative models, possibly interactions, for probing HDI and associated developments since traditional linear models would not be able to capture such complexities. Because of the composite form of HDI, it is appropriate to interpret these results as representing possible nonlinear or lagged relationships rather than departures from its various constituent part measures.

4.3. Methodological framework

The empirical method moves along the lines of a benchmarking logic, in which a preliminary task of assessing the limitations of standard linear models precedes and justifies the application of more sophisticated methodological tools. The Ordinary Least Squares result shows an R-square measure of 0.011, meaning that the model accounts for 1.1 percent of the variability in HDI. The adjusted R-square measure of -0.030 also shows that there is no fit for the model, which might be due to over-specification. The result shows that an F-statistic value of 0.2688 with a p-value = 0.975 implies that there is no overall statistical significance because it doesn't refute the null hypothesis about joint insignificance.

Country effects (Egypt, Indonesia, South Africa, Turkey, and Vietnam) are not statistically significant on HDI (all p-values > 0.05). The life expectancy variable has a trivial positive relationship with HDI, with $\beta = 0.0002$, but fails to achieve statistical significance with a p-value of 0.839. GNI has an insignificant negative relationship with HDI with β = -2.759e-08 and p-value 0.980. CO_2 emission has an insignificant negative relationship with HDI, with $\beta = -0.0021$ and p-value 0.559.

The Omnibus Test result (p-value < 0.001) and Jarque Bera Test result (p-value = 0.00097) indicate that there are problems with normality. The Durbin-Watson value (1.921) shows that there are no problems with autocorrelation. But a large condition number value (1.51×10^5) shows multicollinearity. These diagnostic weaknesses underscore the limitations of linear models and justify exploring deeper alternatives, such as quantile regression or ML, in future studies to capture non-linearities and heterogeneity.

The following result is seen in Table 1, which shows the Jarque-Bera test result for heteroscedasticity on the OLS model. From the result, it can be seen that LM Statistic = 0.6444 with a p-value = 0.9997. It fails to assert the null hypothesis, meaning that there are equal variances. Similarly, F-statistic = 0.0772 with p-value = 0.9997. It fails to assert the null hypothesis, meaning no heteroscedasticity.

These results imply that there are no problems with heteroskedasticity for the OLS model. This implies that the standard error derivations for these parameters are probably correct under classical conditions for OLS. However, based on previous issues with fit statistics (low R^2 and insignificant variables), it does not automatically imply a correct model because there are no heteroscedasticities.

Table 1: Jarque-Bera Heteroskedasticity Test Results

Lagrange multiplier statistic	0.6444
p-value	0.9997
f-value	0.0772
f p-value	0.9997

From Table 2, it can be seen that Variance Inflation Factors (VIF) show high VIF values for the intercept, which signify problems with structural specifications.

The value of intercept (const) shows a highly inflated VIF of 63.49, possibly due to problems with model specifications, like unnecessary inclusion of fixed effects or scaling issues. The VIFs for the remaining variables, life_expectancy, gni, and co2_emissions, are very close to 1 (1.0009-1.0062), indicating no issue with multicollinearity.

The large intercept VIF might indicate an overly parameterized model, perhaps due to country effects and regressors being collinear. The VIFs for numerical variables indicate that multicollinearity is not a problem with life expectancy, GNI, and CO_2 emissions. Therefore, while there are no heteroscedasticity problems, outstanding structural problems exist due to large intercept VIF and low fit.

Table 2: Variance Inflation Factors (VIF)

Variable	VIF
const	63.485577
life_expectancy	1.000927
gni	1.006164
co2_emissions	1.006049

ARIMA forecasts after 2024 are given for four indicators for Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa.
Figure 6 illustrates the HDI projection for CIVETS nations, showcasing divergent paths of development. Both Turkey and South Africa have relatively consistent higher HDI indices, but with South Africa tending slightly at times. Both Indonesia and Vietnam demonstrate a consistent trend of progressive HDI improvement, reflecting a smooth and efficient socioeconomic growth process.
The divergent tendencies—either relatively consistent at higher levels (Turkey and South Africa) or demonstrating an HDI convergence pattern (Indonesia and Vietnam)—may demonstrate divergent responses among emerging nations to development challenges. South Africa's fluctuations seem interesting; perhaps they indicate weaknesses in the development model at a structural level.

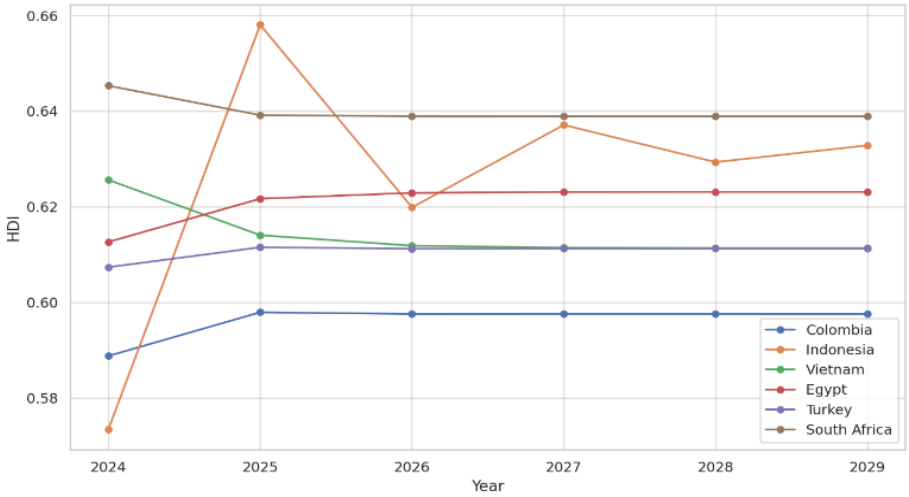

Fig. 6: HDI Forecast for CIVETS Countries (2024-2029).

Figure 7 illustrates predicted values for GNI per capita for CIVETS nations ranging from 2024 to 2029. The CIVETS nations will have varying growth rates. The Indonesian economy will have high volatility and rapid growth, meaning that it will have rapid and fluctuating growth. The Turkish and Vietnamese economies will have stable and uniform growth.
South Africa and Colombia seem to be developing at a slightly positive rate, but still at much slower and stagnant rates, suggesting some structural problems. It is interesting to note that all CIVETS countries are above the World Bank forecast for global GNI growth in 2024 of 2.7%.
These events emphasize basic differences within emerging economies concerning resilience, from which diverging Indonesian and Vietnamese stability indices, as well as South African GDP growth, emerge, whereby slow improvement highlights lingering developmental inadequacies.

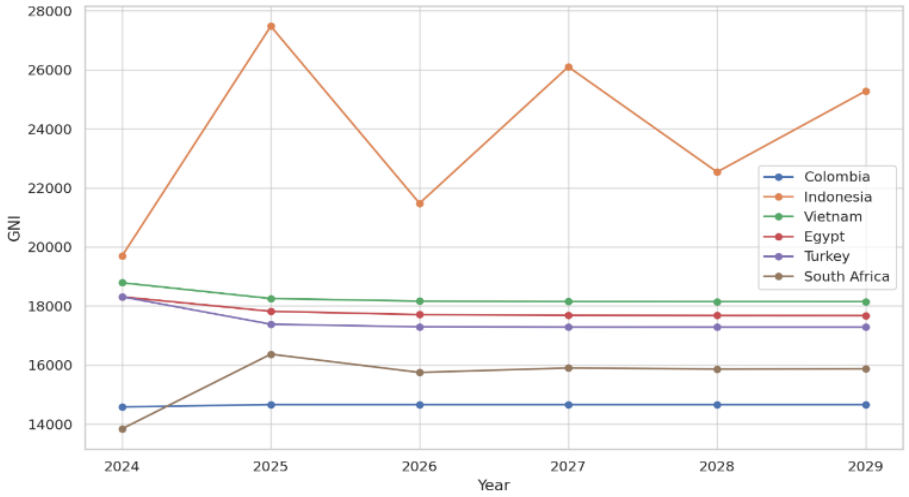

Fig. 7: GNI Forecast for CIVETS Countries (2024-2029).

Figure 8 shows the forecast life expectancy for CIVETS countries between 2024 and 2029. The life expectancy indices follow certain trends. Several countries successfully improved their respective healthcare expenditures towards enhancing life expectancies, with the country having the highest life expectancy emerging victorious, as Indonesia reverses its declining trend.
A drastic change is expected to occur in South Africa in 2025, indicating issues with the infrastructure of health systems. A slight decrease and plateau in life expectancy were projected in Turkey.
On the other hand, Egypt and Colombia have displayed encouraging trends, with Egypt making rapid progress in life expectancy and Colombia making consistent progress.
The ARIMA model employed requires some historical data and does not necessarily tackle sudden changes that may happen, for example, as a result of government policies or disasters.

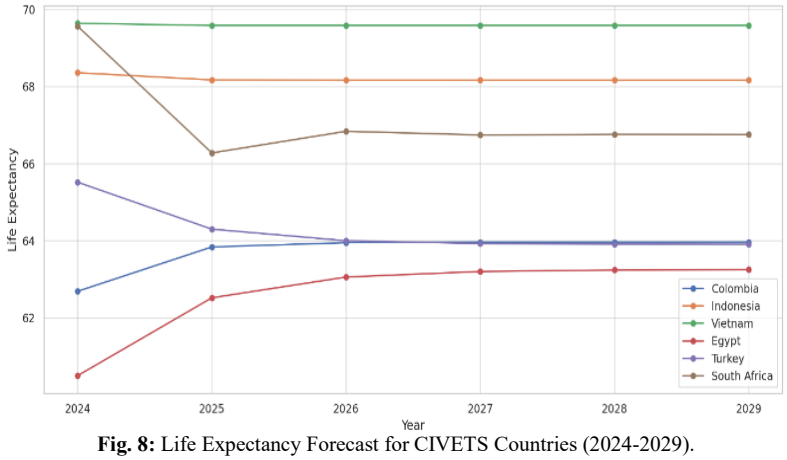

Fig. 8: Life Expectancy Forecast for CIVETS Countries (2024-2029).

Figure 9 below indicates the per capita emissions of CO_2 projected for the CIVETS countries from 2024 to 2029. Large gaps appear in this case with respect to the performance of each country. South Africa and Turkey have established themselves as pacesetters within this group with the highest level of per capita CO_2 emissions above one metric ton because of their reliance upon fossil fuel resources for the production of energy. Indonesia displays a promising falling trend.

The emissions in Vietnam and Colombia are still at a significantly lower level but with stable paths, and this could mean that the stability of emissions is a sign of unrealized opportunities. It is pertinent to note that all the CIVETS countries, except Indonesia, are expected to exceed the global average in 2023.

These points shed light on the interplay that exists between economic development and the concept of sustainability. Countries going through periods of accelerated growth are confronted with specific issues regarding the implementation of the provisions of the Paris Agreement while pursuing growth and industrialization.

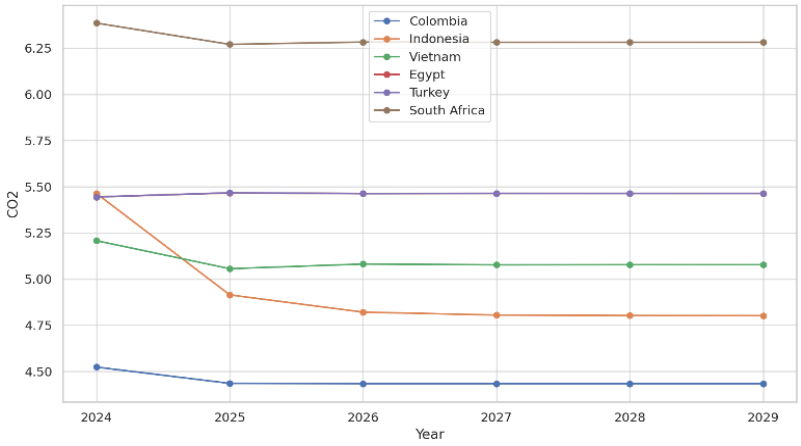

Fig. 9: CO2 Emissions Forecast for CIVETS Countries (2024-2029).

5. Discussion

Figure 10 below shows the percentage change in the different factors that can drive development and how these factors have changed between 1990 and 2023, and it can be observed that there is a great disparity in these factors amongst the CIVETS nations.

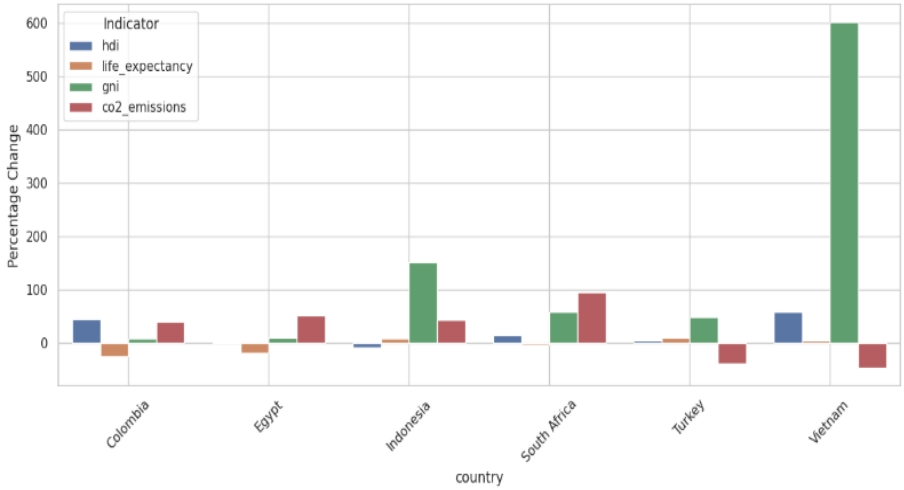

Fig. 10: Percentage Change (1990–2023) by Country and Indicator.

Summary of Empirical Findings: The empirical findings dispute the general perception that the GDP is a broad enough vehicle for ensuring human growth and development. In fact, the model in Vietnam, in its bid to successfully integrate economic performance with the social pillar and the environment, has set the pace on the matter of sustainability initiatives. Otherwise, examination of Egypt and South Africa shows that unsustainability in health and resource factors within the GDP may not improve the Human Development Index (HDI) in those countries.

Normative Policy Recommendations: On the other hand, the Indonesian figures show an outstanding rate of growth of GNI of 150 percent, coupled with moderate progress in life expectancy and a mere deterioration in HDI values. The sharp increase in CO_2 emissions indicates the environmental cost of deterioration due to industrialization.

A moderate rate of economic expansion translates to further improvements in life expectancy during the time of the HIV/AIDS epidemic in South Africa during the early 2000s. However, it seems that the paradigm for growth in South Africa is environmentally unsustainable, given that there has been an increase of 90% in the amount of CO_2 emitted.

Empirical evidence shows that the balanced development in Turkey is directly related to energy reform measures, indicating that there is a focus on renewable resources.

There are major gains in Colombia in terms of HDI value, above 50 percent, but the trend in the rate of life expectancy is, contrary to expectation, declining. Even though the rate of GNI is low, CO_2 emissions are on an increasing trend. Though there have been some advances in terms of HDI, Colombia ranks 88th among 128 countries.

This corresponds to Egypt's stagnation in development, as it shows deterioration in its HDI and life expectancy and only slight changes in its GNI, in addition to evidence of significant growth in its CO_2 emissions.

6. Conclusion and Policy Implications

This paper examines the dynamics of human development in CIVETS nations from a multi-dimensional angle. From the analysis of the paper, it is clear that while the overall improvement in HDI for the sample nations shows positive development in the human development index, the improvement is not uniform. A lot of variability in the development performance of the countries seems to exist. This seems to support the idea that economic development is not sufficient for the development of a human.

Based on the Discussion, the major implication is that Vietnam has balanced growth, while Egypt and South Africa experience structural issues, thus the need for tailored policy intervention.

Such different trends have a number of important implications in relation to energy investment and policy in the context of emerging countries such as Vietnam and Indonesia, whose rapidly growing industries have significantly driven energy demand, hence pointing to the need to shift to alternative energy resources. Policies aimed at green investment, such as tax incentives and more public-private collaborations, are likely to promote growth while protecting the environment (IEA, 2023; World Bank, 2022b). These approaches may very well support sustainability and human development.

Nevertheless, the results obtained for lower-growth economies, namely Egypt and South Africa, indicate the importance of giving more emphasis to the social base of development policies. Enhancing general health facilities, raising public expenditure in health systems, raising health coverage, and implementing more progressive taxation reforms lie at the core of reducing existing inequalities and achieving the Human Development Index of the respective nations. Upgradation of such areas takes paramount importance for the eradication of poverty and realizing the better distribution of economic activity in the world (UNDP, 2023; OECD, 2021) and thereby realizing the goals of the United Nations Sustainable Development Goals.

From an academic viewpoint, the findings represented in the thesis are important to the literature in several ways. It increases the literature regarding the effects on the CIVETS nations because it examines the data through a multi-method analytical framework, taking sustainability perspectives systematically into consideration when analyzing human development, thus questioning the adequacy of linear frameworks to the problem. Although the findings tend to confirm the views between economic growth and the emissions presented by Stern (2004), they tend to contradict the assumption of the linear relationship between health and economic development presented by Barro in 2013, rather than the perspectives outlined in the writings by Ravallion in 2012 regarding the trade-offs between composite human development indices, for example, the HDI itself.

Methodologically, the analysis draws attention to the shortcomings of traditional approaches, such as Ordinary Least Squares (OLS) regression, in the context of complex development patterns. Non-linearities and the presence of diverse effects across different countries point towards the advantage of using more flexible approaches, which can better identify the distributional dynamics and structural variations that assume importance while analyzing human development patterns in the context of emerging economies. There clearly exists a need for a higher degree of methodology convergence in order to attain more complex ideas and concepts. In particular, future studies might operationalize machine learning (ML) concepts through the use of random forest or neural network approaches in forecasting the Human Development Index (HDI) with a larger dataset including institutional factors, while quantile regression analysis might be carried out using panel data approaches (for example, through Stata's xtqreg command).

Therefore, in conclusion, it is pertinent to highlight that findings ascertain that human development in CIVETS nations is assessed in relation to qualitative policy frameworks and methodologies adopted in analyzing developmental trends rather than merely focusing on economic growth rates. Inclusive development calls for adopting methodologies that are adept at recognizing complexities embedded in new models of development.

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