“Human development under fiscal, financial, and environmental constraints: Evidence from SAARC economies”

AUTHORS	Jainendra Kumar Verma Kothapeta Lakshman

ARTICLE INFO	Jainendra Kumar Verma and Kothapeta Lakshman (2026). Human development under fiscal, financial, and environmental constraints: Evidence from SAARC economies. *Public and Municipal Finance*, *15*(3), 126–143. doi:10.21511/pmf.15(3).2026.09
DOI	http://dx.doi.org/10.21511/pmf.15(3).2026.09
RELEASED ON	Thursday, 27 August 2026
RECEIVED ON	Monday, 11 May 2026
ACCEPTED ON	Wednesday, 15 July 2026

JOURNAL	"Public and Municipal Finance"
ISSN PRINT	2222-1867
ISSN ONLINE	2222-1875
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
79	3	8

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

Jainendra Kumar Verma (India), **Kothapeta Lakshman** (India)

HUMAN DEVELOPMENT UNDER FISCAL, FINANCIAL, AND ENVIRONMENTAL CONSTRAINTS: EVIDENCE FROM SAARC ECONOMIES

Abstract

The present study investigates the macroeconomic determinants of human development in eight South Asian Association for Regional Cooperation (SAARC) economies during the period 1990–2023, with special emphasis on the roles of public debt, economic growth, financial development, and environmental degradation. A fixed-effects estimation with Driscoll–Kraay robust standard errors and Dumitrescu–Hurlin panel causality tests on an unbalanced panel dataset of 204 observations is used to test the long-run relationships and dynamic interactions among the variables. The results indicate that economic growth and financial development are important and robust determinants of human development. The findings underscore the importance of raising income and deepening finance for the improvement of human capabilities. The effects of public debt on development depend on fiscal governance and the productive use of borrowed resources. Public debt does not have a significant independent effect once well-known econometric problems are accounted for. Environmental degradation is a serious threat to human development and a complex illustration of the link between industrial transformation and sustainability in developing economies. The study highlights the importance of integrated policies in the SAARC economies for promoting inclusive growth, financial inclusion, fiscal prudence, and environmental sustainability.

Keywords human development, public debt, financial development, economic growth, environmental sustainability, SAARC economies

JEL Classification O15, H63, G21, Q56

Type of the article: Research Article

Received on: 11th of May, 2026
Accepted on: 15th of July, 2026
Published on: 27th of August, 2026

Jainendra Kumar Verma, Dr., Associate Professor, Department of Economics, Central University of Kashmir, India. (Corresponding author)

Kothapeta Lakshman, Dr., Associate Professor, Department of Politics and Governance, Central University of Kashmir, India.

Conflict of interest statement:
Author(s) reported no conflict of interest

INTRODUCTION

One of the most widely used paradigms to measure socio-economic progress is human development. This is because it is about the growth of people's capabilities, opportunities, and well-being and not just economic growth. Development is not meant as an increase in income per capita but as an improvement in the freedom of people to live the lives they have reason to value (Sen, 1999; Anand & Sen, 2000; Nussbaum, 2011). In this regard, the Human Development Index (HDI) elaborated by the United Nations Development Programme (UNDP) is an example, which combines achievements in health, education, and income to present a multidimensional measure of development that goes beyond traditional macroeconomic indicators (UNDP, 2023). While sustained economic growth is still important for raising living standards, a growing body of theory and evidence suggests that economic growth does not necessarily translate into higher human development. The institutional, fiscal, financial, social, and environmental factors are important determinants of the economic resource transformation into human capabilities.

In the context of the South Asian Association for Regional Cooperation (SAARC), which consists of Afghanistan, Bangladesh, Bhutan, India, the

http://dx.doi.org/10.21511/pmf.15(3).2026.09

Maldives, Nepal, Pakistan, and Sri Lanka, the multi-dimensional interactions are of greater importance. Despite three decades of strong economic growth, the region continues to exhibit significant disparities in human development, shaped by fiscal capacity, institutional quality, financial inclusion, environmental conditions, and access to public services (Ahmed & Ghani, 2007; UNESCAP, 2021; World Bank, 2022; UNDP, 2023). South Asia is also one of the most climate-vulnerable regions in the world, with increasing risks to public health, education, livelihoods, and long-term economic resilience due to environmental degradation, climate change, and natural disasters (IPCC, 2022; World Bank, 2023; UNDP, 2024). These features make SAARC an appropriate framework to analyze the macroeconomic determinants of human development in an integrated framework.

Among these determinants, public debt has received increasing attention for its potential adverse effects on development. Productive public borrowing can finance infrastructure, education, healthcare, and other public investments that enhance human capabilities and contribute to long-run economic development (Barro, 1990; Elmendorf & Mankiw, 1999; Calderón & Servén, 2010). However, high debt can induce debt overhang, constrict fiscal space, crowd out private investment, and restrict the capacity of governments to finance critical social expenditure (Krugman, 1988; Sachs, 1989; Pattillo et al., 2002; Abbas et al., 2014). More recently, studies have shown that the developmental effects of public debt are conditional on fiscal institutions, debt management, expenditure efficiency, and macroeconomic stability rather than the level of debt per se (Kose et al., 2021; World Bank, 2024).

It is a key driver of human development, along with economic growth, expanding the fiscal space of governments and households to invest in education, health, and nutrition. However, the developmental benefits of growth depend on the quality of governance, the effectiveness of institutions, and the inclusiveness of public policies (Barro, 1996; Ranis et al., 2000; Suri et al., 2011; Acemoglu & Robinson, 2012). This process is associated with financial development that improves capital allocation, raises financial inclusion, promotes entrepreneurship, and facilitates access to productive credit, savings, and risk management instruments (King & Levine, 1993; Levine, 2005; Beck et al., 2007; Demirgüç-Kunt et al., 2018). However, the benefits of financial development may be constrained by weak financial regulation and lack of equality in access to financial markets, which may also worsen socio-economic and environmental issues (Baloch et al., 2019; Nasreen et al., 2017). At the same time, environmental degradation has posed a major challenge to sustainable human development. Industrialization and energy consumption have been shown to boost economic activity but also increase carbon emissions and environmental pressures that adversely impact health, agricultural productivity, and long-term well-being (Grossman & Krueger, 1995; Stern, 2004; Sarkodie & Strezov, 2019; IPCC, 2022). As a result, environmental sustainability has become an integral part of contemporary development policy, especially in climate-vulnerable developing economies (World Bank, 2023; UNDP, 2024).

The literature is still fragmented in spite of the progress. Most of the empirical studies focus on public debt, economic growth, financial development, or environmental degradation in isolation, with few studies addressing the combined effect of these on human development in a single empirical framework. Development challenges are ubiquitous; the region is structurally diverse, but comprehensive evidence is missing for SAARC economies. This gap sets the need for an integrated analysis to assess fiscal, financial, economic, and environmental determinants of human development, simultaneously accounting for cross-country heterogeneity.

1. LITERATURE REVIEW

1.1. Economic growth and human development

Development economists have done much research on the links between economic growth and human development. Earlier works have argued that sustained economic growth expands fiscal space for governments and household income to improve access to education, healthcare, and other crucial services that enhance human capabilities (Barro, 1996; Lucas, 1988; Ranis et al., 2000; Suri et al., 2011). However, economic growth alone is

not enough to improve human development, as income can be converted into better health, education, and standard of living only when institutions, governance, income distribution, and public policy are of high quality (Anand & Ravallion, 1993; Hall & Jones, 1999; Easterly, 2001; Stiglitz et al., 2009; Acemoglu & Robinson, 2012; Piketty, 2014). UNDP (2024) provides that countries with similar growth rates can have very different human development outcomes due to differences in public investment, institutional effectiveness, and social protection systems, highlighting the multidimensionality of development.

1.2. Public debt and human development

The most controversial issues of macroeconomics are public debt and its effects on development. The debt overhang hypothesis (Krugman, 1988; Sachs, 1989; Pattillo et al., 2002; Clements et al., 2003) argues that excessive government borrowing reduces private investment, increases macroeconomic uncertainty, and constrains the long-run performance of the economy. Overall, the Keynesian and endogenous growth views imply that public borrowing may be used with prudence to finance productive public investment in infrastructure, education, health, and other public goods that promote long-term development (Barro, 1990; Elmendorf & Mankiw, 1999; Calderón & Servén, 2010; Aghion & Howitt, 2009). The empirical evidence remains mixed. Many studies find that moderate levels of debt are good for development and high levels of debt are adverse for growth and welfare. The actual impact is dependent on the quality of institutions, fiscal governance, composition of debt, and efficiency of expenditure (Checherita-Westphal & Rother, 2012; Égert, 2015; Panizza & Presbitero, 2014; Chudik et al., 2017; Eberhardt & Presbitero, 2015; Kourtellos et al., 2013; Woo & Kumar, 2015; Kose et al., 2021). The mixed results point to the fact that the link between public debt and human development remains a matter of debate, especially in developing countries.

1.3. Financial development and human development

The role of financial development in determining investment, financial inclusion, and allocation of resources has been increasingly recognized as a determinant of human development. The efficient functioning of financial systems is paramount to improving access to credit, encouraging savings, promoting entrepreneurship, and facilitating productive investment, thereby supporting economic growth and improving living standards (King & Levine, 1993; Levine & Zervos, 1998; Levine, 2005; Beck et al., 2007; Demirgüç-Kunt et al., 2018). Financial inclusion reduces poverty through higher access to financial services among vulnerable populations (Honohan, 2008; Beck et al., 2010; Clarke et al., 2006). But the developmental gains from financial deepening are not unconditional. Financial instability, fragile financial regulation, and asymmetric access to credit may increase inequality, promote environmentally unsustainable investment, and decrease the contribution of financial development to overall human welfare (Tamazian et al., 2009; Charfeddine & Kahia, 2019; Baloch et al., 2019; Zaidi et al., 2019; Nasreen et al., 2017). Therefore, the literature suggests that institutional and environmental factors should be considered besides financial development.

1.4. Environmental degradation and human development

Environmental sustainability has become a central component of the human development discourse. According to the Environmental Kuznets Curve (EKC) hypothesis, it is expected that environmental degradation would increase initially with economic growth and then decrease as a country reaches a higher level of income (Grossman & Krueger, 1995; Dinda, 2004; Stern, 2004). A large number of developing economies are still in the pollution-intensive development phase, with industrialization and growth based on fossil fuels contributing to carbon emissions and environmental degradation (Apergis & Ozturk, 2015; Dogan & Seker, 2016; Shahbaz et al., 2019; Destek & Sarkodie, 2019). Such development strategies may bring short-term economic benefits, but there is increasing evidence that environmental degradation has negative impacts on public health, labor productivity, agricultural output, and long-term human welfare (Costantini & Monni, 2008; Heal, 2012; Stern, 2013; Nathaniel & Khan, 2020; IPCC, 2022). This means sustainable human development requires a trade-off between economic growth and environmental protection.

http://dx.doi.org/10.21511/pmf.15(3).2026.09

1.5. Research gaps and aim

There has been much progress in understanding the determinants of human development, but three large gaps remain. The first is that most of the existing literature examines public debt, economic growth, financial development, and environmental degradation separately, whereas relatively few studies investigate their joint effects in a unified empirical framework (Acheampong, 2018; Shahbaz et al., 2019; Nasreen et al., 2017; Kose et al., 2021). Second, the high structural heterogeneity, different fiscal conditions, financial development levels, and environmental vulnerabilities (Ahmed & Ghani, 2007; World Bank, 2022; UNESCAP, 2021) are still void of empirical evidence on SAARC economies. Third, in the past, studies estimated the average relationships, ignoring the joint effect of fiscal, financial, economic, and environmental factors on human development.

In this context, the present study investigates the effect of public debt, economic growth, financial development, and environmental degradation on human development in SAARC economies during the period 1990–2023. The study aims to contribute in four areas. First, it develops an integrated framework to analyze the joint effects of fiscal, economic, financial, and environmental determinants of human development. Second, it provides new comparative evidence for SAARC economies, which has been scarce. Third, it improves empirical inference by using strong panel estimation and heterogeneous panel causality techniques. Finally, it provides policy-relevant knowledge for the design of coordinated fiscal, financial, environmental, and growth strategies for the promotion of inclusive and sustainable human development in the region.

1.6. Hypotheses development

The existing literature underscores that human development is a multidimensional process determined by a complex interplay of fiscal, macroeconomic, financial, and environmental factors. While public borrowing and financial deepness can mobilize resources to expand infrastructure, health, and education, their developmental benefits are highly conditional upon institutional quality, regulatory strength, and progressive public policies (Barro, 1990; Elmendorf & Mankiw, 1999; Calderón & Servén, 2010; King & Levine, 1993; Levine, 2005). Concurrently, while economic growth serves as a primary engine for broadening societal capabilities (Lucas, 1988; Romer, 1990; Barro, 1996), its positive impacts are frequently bottlenecked by structural inequalities, weak fiscal institutions, and the severe public health and ecological costs of environmental degradation (Krugman, 1988; Sachs, 1989; Pattillo et al., 2002; Kose et al., 2021; Ranis et al., 2000; Stiglitz et al., 2009; Suri et al., 2011).

Furthermore, the developmental gains from financial deepening depend heavily on the effectiveness of regulation, as poor financial governance and uneven credit distribution may hinder its role in inclusive development (Clarke et al., 2006; Honohan, 2008; Beck et al., 2007; Demirgüç-Kunt et al., 2018; Baloch et al., 2019). This is further complicated by rising carbon emissions and ecological risks that adversely affect life expectancy, education, and labor productivity, especially in climate-vulnerable economies (Grossman & Krueger, 1995; Stern, 2004; IPCC, 2022; Costantini & Monni, 2008; Heal, 2012; Sarkodie & Strezov, 2019). Ultimately, the conflicting theoretical frameworks and mixed empirical evidence across global studies (Eberhardt & Presbitero, 2015; Chudik et al., 2017) highlight a critical knowledge gap regarding how these four structural forces interact simultaneously within highly vulnerable, heterogeneous developing blocs.

The primary objective of this study is to investigate the joint and individual empirical effects of public debt, economic growth, financial development, and environmental degradation on human development within the SAARC economies over the period 1990–2023. To achieve this objective, the following hypotheses are tested:

H1: Public debt significantly influences human development in SAARC economies.

H2: Economic growth positively influences human development in SAARC economies.

H3: Financial development positively influences human development in SAARC economies.

H4: Environmental degradation significantly influences human development in SAARC economies.

2. METHODS

2.1. Data and variables

The study examines the determinants of human development in eight South Asian Association for Regional Cooperation (SAARC) economies, namely Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka, for the period 1990–2023. The SAARC provides a relevant empirical setting, as there is considerable heterogeneity among member countries in terms of economic development, fiscal capacity, financial sector development, institutional quality, and environmental vulnerability, although they face common regional development challenges (Ahmed & Ghani, 2007; UNESCAP, 2021; World Bank, 2022).

The study covers the period 1990–2023, but not all variables are fully observed across all countries and years. The final sample excludes missing values and constitutes an unbalanced panel of 204 country-year observations. This decline is largely due to limitations in the data, especially in the early years for Afghanistan and for some of the macroeconomic indicators for some of the smaller SAARC economies. To preserve the integrity of the empirical analysis and to avoid introducing estimation bias, we do not interpolate or impute missing observations.

Human development is measured by the Human Development Index (HDI) of the United Nations Development Programme (UNDP). Aligned with the capability approach, HDI incorporates health, education, and income achievements as a composite indicator of development (Sen, 1999; Anand & Sen, 2000; UNDP, 2023). The income dimension of HDI is captured by the log of GDP per capita as an explanatory variable. The income index is only one aspect of HDI, and education and health measures capture other aspects of human development. More importantly, GDP per capita is an important macroeconomic determinant and not a mechanical copy of HDI, and similar empirical specifications are commonly used in the literature (Ranis et al., 2000; Suri et al., 2011; UNDP, 2023).

Central government debt as a percentage of GDP (CGD) is an indicator of public debt. Public debt reflects the fiscal burden and borrowing position of the government. Economic growth is measured by the natural logarithm of gross domestic product per capita (LGGDPPC). Financial development is measured by the natural logarithm of the domestic credit to the private sector as a percentage of gross domestic product (LGDCPS). Environmental degradation is measured by per capita carbon dioxide emissions (CO_2PC). This is one of the most used indicators of environmental pressure in macroeconomic studies (Barro, 1990; Levine, 2005; Beck et al., 2007; Abbas et al., 2014; Shahbaz et al., 2019).

Table 1. Variable definition, measurement, and expected signs

Variable	Proxy / Measure	Description	Role	Expected Sign	Data Source
HDI	Human Development Index	Composite index capturing human development through life expectancy, education, and income dimensions.	Dependent Variable	Not Applicable	United Nations Development Programme (UNDP)
CGD	Central Government Debt (% of GDP)	Total central government debt as a percentage of GDP, reflecting fiscal burden and borrowing capacity	Independent Variable	±	International Monetary Fund (IMF)
CO_2PC	CO_2 Emissions per Capita (metric tons)	Per capita carbon emissions represent environmental degradation and sustainability pressures.	Control Variable	±	World Development Indicators (WDI)
LGGDPPC	Log of GDP per capita	Natural logarithm of GDP per capita, a proxy for economic growth and income level	Control Variable	+	World Development Indicators (WDI)
LGDCPS	(Log of Domestic Credit to Private Sector (% of GDP)	Natural logarithm of credit to the private sector, indicating financial development and depth	Control Variable	+	World Development Indicators (WDI)

http://dx.doi.org/10.21511/pmf.15(3).2026.09

The logs of GDP per capita and domestic credit are less skewed and more comparable across countries. It also allows the estimated coefficients to be interpreted as semi-elasticities and reduces the impact of outliers (Baltagi, 2021; Wooldridge, 2010). Definitions, measures, hypothesized relationships, and sources of all variables used in the analysis are presented in Table 1.

2.2. Empirical model

We develop a theoretical framework to specify human development as a function of public debt, environmental degradation, economic growth, and financial development. The estimating equation may be written as:

$$HDI_{it} = \beta_0 + \beta_1 CGD_{it} + \beta_2 CO2PC_{it} + \beta_3 LGGDPPC_{it} + \beta_4 LGDCPS_{it} + \mu_i + \lambda_t + \varepsilon_{it}, \quad (1)$$

where *i* denotes country and *t* denotes time.

The dependent variable is HDI (Human Development Index). The explanatory variables are central government debt (CGD), carbon dioxide emissions per capita (CO_2PC), log of GDP per capita (LGGDPPC), log of domestic credit to the private sector (LGDCPS), etc. Country-specific effects (μ_i) are unobserved time-invariant country characteristics such as institutional quality, governance, geography, and historical factors, while time effects (λ_t) are common shocks affecting all countries, such as global economic crises, technological change, and regional policy developments (Baltagi, 2021; Wooldridge, 2010).

The specification allows for the joint analysis of fiscal, financial, environmental, and growth determinants of human development in a common empirical framework so that the relative contribution of each factor can be assessed while controlling for unobserved heterogeneity.

2.3. Estimation strategy

The empirical analysis is based on a sequential estimation strategy to demonstrate the statistical validity and robustness of the estimated relationships. Firstly, we use the panel unit root tests proposed by Levin, Lin, and Chu (LLC) and Im, Pesaran, and Shin (IPS) to determine the order of integration of the variables and to avoid spurious regression due to non-stationary panel data (Levin et al., 2002; Im et al., 2003). Although these are first-generation panel unit root tests, they are widely used in empirical macroeconomics studies with relatively small cross-sectional dimensions, and they represent an adequate benchmark for the present analysis (Baltagi, 2021).

Second, we use the Kao (1999) residual-based panel cointegration test to examine the presence of stable long-run equilibrium relationships among the variables. Cointegration provides the statistical rationale for estimating long-run panel regression models and interpreting the estimated coefficients as equilibrium relationships.

Third, we estimate baseline specifications employing pooled ordinary least squares (POLS), random-effects (RE), and fixed-effects (FE) models. The Breusch–Pagan Lagrange multiplier test is used to decide between panel estimators and pooled OLS; the *F*-test is used to decide the existence of unobserved individual effects, and the Hausman specification test is used to choose the estimator that provides consistent and efficient parameter estimates (Breusch & Pagan, 1980; Baltagi, 2021; Hausman, 1978).

Finally, model diagnostics are carried out to test for heteroscedasticity and serial correlation. Because of these violations, we re-estimate the preferred fixed-effects model using Driscoll–Kraay robust standard errors that are consistent in the presence of heteroskedasticity, serial correlation, and cross-sectional dependence (Driscoll & Kraay, 1998; Hoechle, 2007). The Dumitrescu–Hurlin heterogeneous panel Granger causality test determines the direction of causality among the variables. This approach is complementary to the long-run estimation and separates the long-run relationship from the dynamic causal relationship (Dumitrescu & Hurlin, 2012).

3. RESULTS AND DISCUSSION

3.1. Preliminary data analysis

The first part of the empirical analysis concerns the distributional properties of the variables to get an idea of the underlying characteristics before

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
HDI	204	0.576	0.112	0.395	0.782
CGD	204	53.881	20.271	24.957	155.665
CO_2PC	204	0.954	0.907	0.056	5.302
LGGDPPC	204	3.193	0.391	2.626	4.058
LGDCPS	204	1.454	0.215	0.931	2.015

the econometric estimation. Table 2 presents the descriptive statistics of the Human Development Index (HDI), central government debt (CGD), carbon dioxide emissions per capita (CO_2PC), economic growth as the logarithm of GDP per capita (LGGDPPC), and financial development as the logarithm of domestic credit to the private sector (LGDCPS) of the unbalanced panel of eight SAARC economies during 1990–2023. The sample includes 204 country-year observations, given the availability of data across countries and years.

The average value of HDI is 0.576 with a minimum of 0.395 and a maximum of 0.782, which indicates a significant difference in the level of human development among the SAARC economies. The greatest difference is in public debt (CGD), on average 53.88%. However, it ranges from 24.96% to 155.67%. This is a consequence of different fiscal situations and different debt management. Economic growth (LGGDPPC) and financial development (LGDCPS) have moderate dispersion. This means that the region has gone through differential development in income levels and financial deepening. Similarly, there are considerable differences in the carbon emissions (CO2PC) from 0.056 to 5.302 metric tons per capita. This reflects differences in industrialization, energy use, and the pressures imposed by the environment.

The observed variation shows a large heterogeneity across countries, which justifies the use of panel data methods. Figure 1 shows the distributional properties of the variables. Kernel density plots are smooth and unimodal in general. There are no major problems with the distribution. We find a mild asymmetry for public debt and carbon emissions. However, the patterns that exist are because

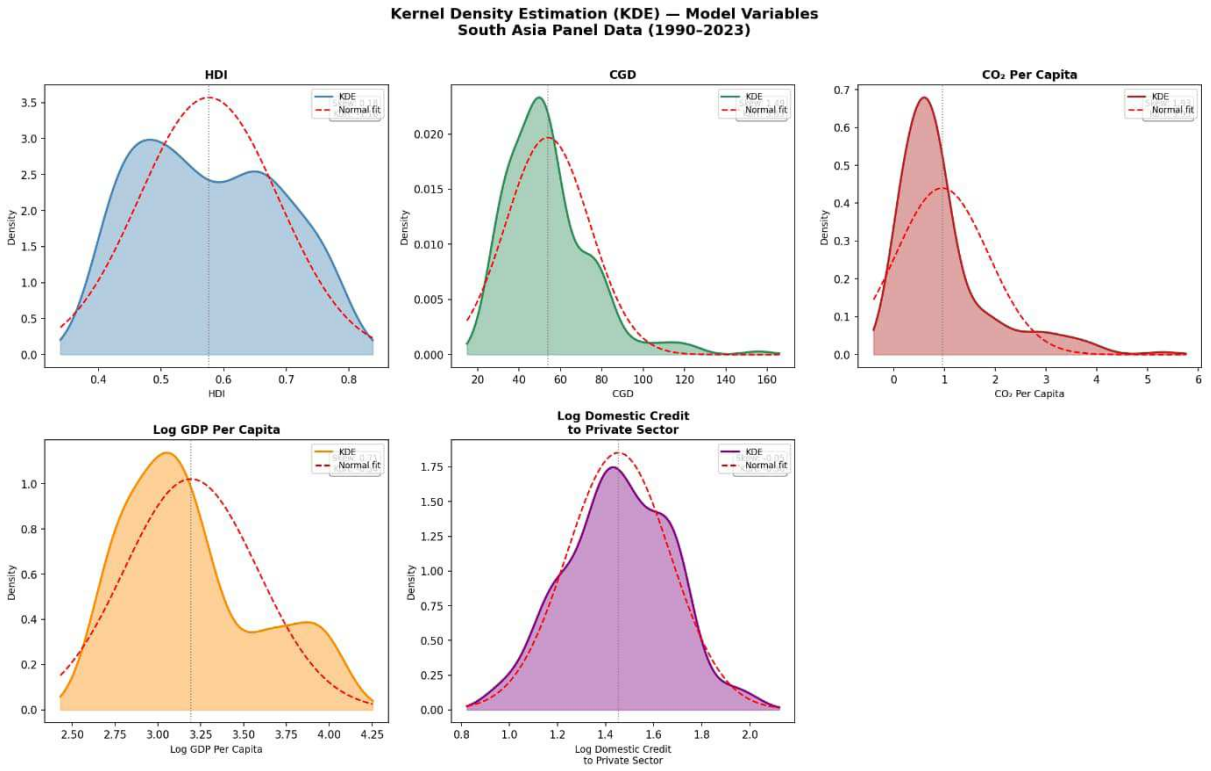

Figure 1. Kernel density estimation

http://dx.doi.org/10.21511/pmf.15(3).2026.09

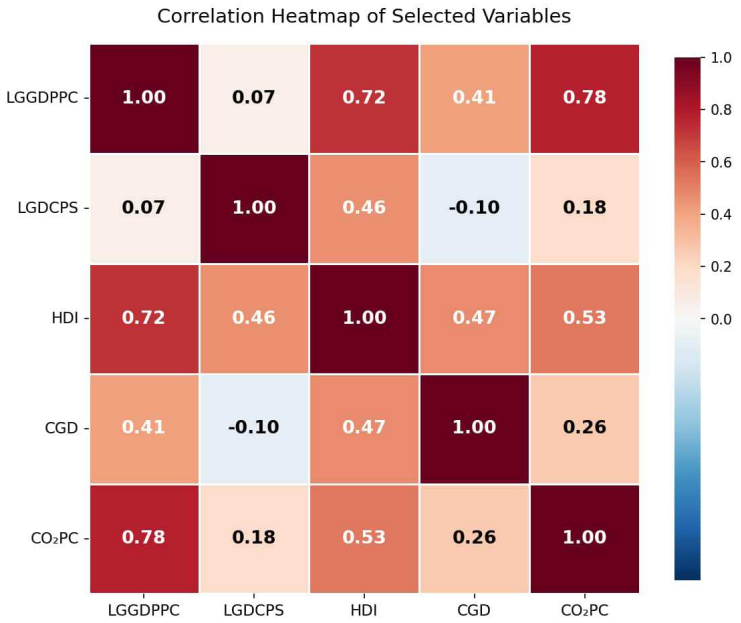

Figure 2. Correlation heatmap

of differences in the structure of SAARC economies and not because of problems of estimation.

The heat map of the Pearson correlation of the study variables is shown in Figure 2. The human development index (HDI) shows a positive relationship with economic growth (LGGDPPC) and financial development (LGDCPS). This is the first evidence that higher incomes and more developed financial systems are associated with better human development outcomes. The relationship between public debt (CGD) and HDI is weakly positive. This indicates that the development impact of CGD might be conditional on fiscal and institutional conditions. Furthermore, there is a positive correlation between CO_2PC and HDI, which could be due to the simultaneous occurrence of economic growth, industrialization, and growth of energy use in developing economies. However, these correlations are only descriptive and do not imply causality, as they do not control for other determinants, reverse relationships, or unobserved country-specific factors.

Moreover, the explanatory variables are not highly correlated with each other, as shown in Figure 2, so the regression results are less likely to be affected by severe multicollinearity. Thus, the variables appear to vary sufficiently independently to be used to estimate the respective effects on human development in a multivariate framework.

Figure 3 shows the trend of the key variables over the study period. The trend of human development, economic growth, and financial development is generally increasing, which reflects the slow pace of socio-economic development in the SAARC economies. Public debt and carbon emissions are rising in nearly all countries. Nevertheless, there are many differences among countries, reflecting differences in fiscal conditions, development paths, and environmental pressure.

Table 2 and Figures 1–3 therefore show that the dataset exhibits adequate variation and reasonable distributional features for panel econometric analysis. The preliminary results show strong relationships among public debt, economic growth, financial development, environmental degradation, and human development, which provide a reasonable basis for further testing for stationarity, cointegration, long-run relationships, and causality.

3.2. Panel unit root and cointegration analysis

The stationarity properties of the variables are tested before estimating the long-run relationships in order to avoid spurious regression results. The study employs Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS) panel unit root tests that allow for different assumptions on the cross-sectional homogeneity and heterogeneity of the autoregressive process.

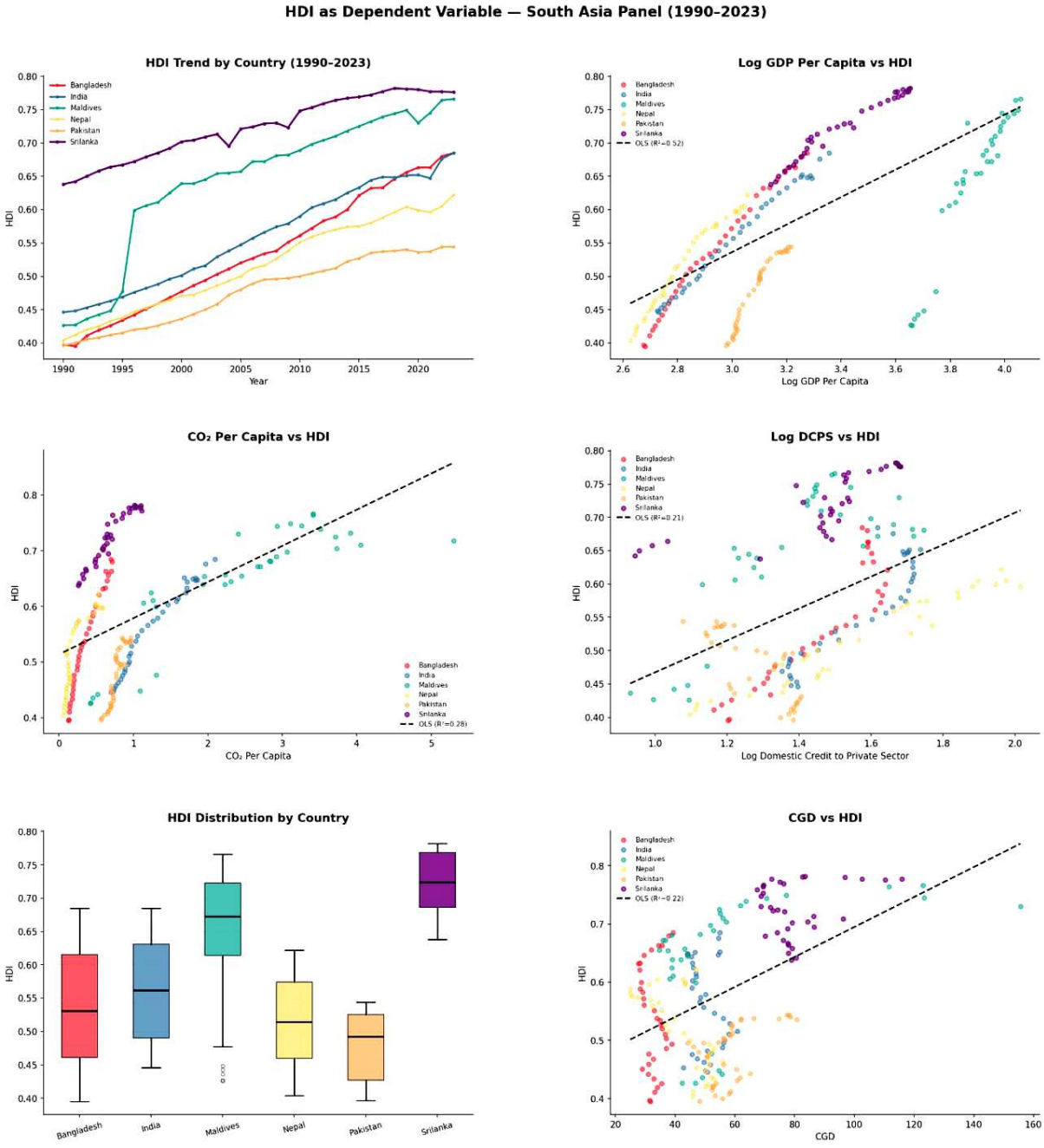

Figure 3. Trend analysis

Table 3 presents the results of the panel unit root tests, and these results show a mixed order of integration. The results of LLC and IPS unit root tests reveal that HDI, public debt (CGD), carbon emissions (CO_2PC), and economic growth (LGGDPPC) are non-stationary at levels but become stationary after first differencing. The financial development (LGDCPS) is stationary at the level of the LLC test and at the first difference of the IPS test. Thus, all variables are integrated either at I(0) or at the first difference I(1), which is required for panel cointegration analysis.

In this integration pattern, we use the Kao residual-based panel cointegration test for checking the existence of a long-run equilibrium relationship. Table 4 shows that the modified Dickey-Fuller, Dickey-Fuller, and unadjusted test statistics reject the null hypothesis of no cointegration at conventional significance levels. The ADF statistic is sig-

http://dx.doi.org/10.21511/pmf.15(3).2026.09

Table 3. Panel unit root tests (LLC and IPS)

Variable	LLC I(0)	LLC I(1)	IPS I(0)	IPS I(1)
HDI	1.598 (0.945)	−4.424***	1.694 (0.955)	−6.386***
CGD	1.705 (0.956)	−5.405***	1.394 (0.918)	−5.949***
CO_2PC	1.386 (0.917)	−4.253***	2.736 (0.997)	−6.054***
LGGDPPC	2.982 (0.999)	−4.040***	4.556 (1.000)	−5.607***
LGDCPS	−2.479***	–	−0.431	−4.894***

Note: *** p < 0.01.

nificant only at 10 percent, but overall evidence indicates that there is a stable long-run relationship between human development and its macroeconomic determinants, hence justifying the subsequent long-run panel estimation.

Table 4. Kao panel cointegration test

Test Statistic	Value	p-value
Modified DF t	−1.9049	0.0284
DF t	−2.0018	0.0227
ADF t	−1.5464	0.0610
Unadjusted Modified DF	−2.2019	0.0138
Unadjusted DF	−2.1187	0.0171

The cointegration results reveal that there is a stable long-run equilibrium relationship between human development, public debt, economic growth, financial development, and environmental degradation despite the short-run fluctuations. The finding supports the developmental perspective that human development is a function of the combined effect of fiscal, economic, financial, and environmental factors and not of the individual macroeconomic determinants.

From an econometric perspective, cointegration provides us with the opportunity to estimate long-run panel models, as it ensures that the coefficients are equilibrium relationships and not spurious correlations. This is more so in the case of the SAARC economies, where the study period has witnessed a number of fiscal reforms, financial deepening, economic transformation, and environmental changes simultaneously.

The results shown in Tables 3 and 4 provide strong support for the suitability of the data set for long-run estimation. The combination of various orders and the presence of a high cointegration relationship provided a strong base to analyze the long-run effects of public debt, economic growth, financial development, and environmental degradation on human development.

3.3. Baseline panel estimation and model selection

After verifying the cointegration, the long-run impact of public debt, economic growth, financial development, and environmental degradation on human development is estimated using pooled OLS, random-effects (RE), and fixed-effects (FE) models. These alternative specifications test the robustness of the relationships and the proper estimator. Table 5 presents results for the baseline. Table 6 shows model selection and diagnostic tests.

Results are similar for other estimators (see Table 5). The coefficients of public debt (CGD), economic growth (LGGDPPC), financial development (LGDCPS), and carbon dioxide emissions (CO_2PC) are positive in all models, suggesting that the relationships are stable. However, to estimate the preferred estimator, we need specification tests to control for unobserved country-specific effects and potential econometric problems.

Table 5. Baseline panel regression results

Variable	POLS	Random Effects	Fixed Effects
CGD	0.00034**	0.00034**	0.00033**
CO_2PC	0.03284***	0.03284***	0.03373***
LGGDPPC	0.32637***	0.32637***	0.34409***
LGDCPS	0.04384***	0.04384***	0.03089**
Constant	—	−0.57968***	—

Note: ** p < 0.05; *** p < 0.01. Detailed standard errors are omitted for brevity and are available from the authors upon request.

The fixed-effects model is the preferred specification, as in Table 6. The Breusch–Pagan LM test rejects pooled OLS ($\chi^2 = 468.06$, $p < 0.001$), confirming the presence of significant panel effects. The *F*-test shows significant heterogeneity across countries. The Hausman test rejects the random effects in favor of the fixed effects ($\chi^2 = 21.28$, $p < 0.001$), indicating a correlation of country-specific effects with regressors. We use the fixed-effects

Table 6. Model selection and diagnostic tests

Test	Statistic	p-value	Decision
Breusch-Pagan LM Test	468.06	0.000	Reject POLS
F-test (FE vs POLS)	159.89	0.000	FE preferred
Hausman Test	21.28	0.0003	FE preferred
Wooldridge Autocorrelation Test	253.16	0.000	Serial correlation present
Modified Wald Test	55.98	0.0007	Heteroskedasticity is present.

estimator as a baseline model since it controls for time-invariant heterogeneity and provides consistent estimates (Baltagi, 2021; Gujarati & Porter, 2009; Wooldridge, 2010).

The fixed-effects estimates in Table 5 reveal that among the variables, economic growth (LGGDPPC) has the largest positive effect on human development ($\beta = 0.34409$, $p < 0.01$), suggesting that higher income levels are expected to improve education, health, and living standards. This gives preliminary evidence for H2 consistent with endogenous growth theory, as it shows the role of economic growth in expanding fiscal space and human beings.

Financial development (LGDCPS) has a positive and significant effect ($\beta = 0.03089$, $p < 0.05$), implying that financial deepening has improved human development through better capital allocation, credit access, and financial inclusion. This is provisionally supportive of *H3*.

The baseline model shows that public debt (CGD) is positive and significant ($\beta = 0.00033$, $p < 0.05$). This indicates that borrowing can be beneficial for development if it is spent on productive investments. However, its small size and potential econometric limitations mean that it should be read with caution, and therefore *H1* is still robust to estimation.

Environmental degradation (CO_2PC) has a positive and significant relationship with human development rather than the expected negative impact. This may be due to the developmental stage of SAARC economies, where industrialization, urbanization, and expansion of energy are concurrent with socioeconomic progress and not an indication of the welfare-enhancing effect of pollution.

Table 6 diagnostics reveal serial correlation and heteroskedasticity ($p < 0.001$), so the usual fixed-effects standard errors are not reliable. Then, the model is re-estimated using Driscoll–Kraay robust standard errors, which are used for the main empirical conclusions.

3.4. Robustness and causality analysis

The heteroskedasticity and first-order serial correlation diagnostic tests reported in Table 6 indicate that inference based on the usual fixed-effects standard errors could be unreliable. Therefore, we re-estimate the preferred fixed-effects model with Driscoll–Kraay robust standard errors that correct for heteroskedasticity, serial correlation, and cross-sectional dependence. Table 7 presents the robust estimates. The results of the Dumitrescu–Hurlin panel Granger causality are reported in Table 8.

The Driscoll–Kraay estimates are broadly in line with the baseline results. The strongest determinant of human development is LGDPPC with a positive and highly significant coefficient ($\beta = 0.3441$, $p < 0.001$). The robustness of this finding in Tables 5 and 7 suggests that sustained income growth enhances human development through improved fiscal capacity, greater household welfare, and promotion of investment in education, healthcare, and basic services. Thus, the results provide strong support for *H2*, which suggests that economic growth is an important determinant of human development in SAARC economies.

Table 7. Driscoll-Kraay robust estimation results

Variable	Coefficient	Robust SE	z-statistic	p-value
CGD	0.0003284	0.0001795	1.83	0.076
CO_2PC	0.0337333	0.0115029	2.93	0.006
LGGDPPC	0.3440856	0.0178848	19.24	0.000
LGDCPS	0.0308885	0.0082571	3.74	0.001

The result of financial development (LGDCPS) is still positive and significant after the Driscoll–Kraay correction ($\beta = 0.0309$, $p = 0.001$; Table 7), which confirms the baseline results. The findings

http://dx.doi.org/10.21511/pmf.15(3).2026.09

suggest that financial deepening improves human development through improved allocation of resources, access to formal finance, entrepreneurship, and investment in human capital. The results thus give credence to H3, confirming the role of financial development as an important determinant of inclusive development in SAARC economies.

However, in the robust estimation, public debt (CGD) is statistically insignificant (β = 0.00033, p = 0.076), whereas it was significant in the baseline model. The initial positive relationship is sensitive to econometric corrections and disappears after correcting for heteroskedasticity, serial correlation, and cross-sectional dependence. Thus, *H1* is not supported in the preferred specification. This points to the fact that the developmental dimension of public borrowing does not only depend on the level of debt but also on the quality of fiscal governance, debt sustainability, and productive use of resources.

H4 is confirmed in the robust model (β = 0.0337, p = 0.006; Table 7). The environmental degradation (CO_2PC) is still important. The positive coefficient is explained by the dynamics of the SAARC economies in the development stage, where emissions grow with industrialization, urbanization, and socio-economic progress. That is not to say that environmental degradation is good for human development. The finding suggests, rather, a complex relationship between growth and environment, and the need for nonlinear approaches and alternative environmental measures.

Tables 5 and 7 report that the coefficients are rather stable in sign and magnitude. Only strong correction makes public debt insignificant. This points to confidence in the effects of economic growth and financial development but warns about the effects of debt. The results of the Dumitrescu–Hurlin causality test (Table 8) also support a two-way causality between economic growth and human development, indicating that income growth and human capabilities development are mutually reinforcing.

Table 8. Dumitrescu–Hurlin panel granger causality results

Direction of Causality	Result
HDI ↔ CGD	No causality
CO_2PC → HDI	Unidirectional
HDI ↔ LGGDPPC	Bidirectional
HDI ↔ LGDCPS	Bidirectional

Moreover, Table 8 demonstrates bidirectional causation between financial development and human development, suggesting that financial deepening results in human capabilities and progress in education, health, and productivity, which in turn foster financial development. The result supports H3 and is consistent with the regression analysis.

On the contrary, we do not find a causal relation between public debt and human development, which is consistent with the Driscoll–Kraay insignificant estimate (Table 7). Overall, the evidence suggests that public debt does not independently influence human development in SAARC economies. It is rather the fiscal governance, the sustainability of debt, and the productive use of borrowed funds that determine its effectiveness. Therefore, *H1* is not supported.

The causality results also indicate that carbon dioxide emissions have a one-way effect on human development (Table 8). This finding further affirms the importance of environmental conditions in determining long-run development outcomes. This, together with the large Driscoll–Kraay coefficient (Table 7), supports *H4*. However, the positive association is more likely to be due to industrialization and structural transformation of SAARC economies rather than a positive outcome of environmental degradation.

Overall, the robust regression and causality results highlight economic growth and financial development as the most consistent drivers of human development with strong support to *H2* and *H3*. Public debt has no independent explanatory power, but environmental degradation significantly impacts development outcomes. This shows the complex relationship between economic transformation, environmental change, and human well-being.

3.5. Discussion on hypotheses

The empirical results, a combination of baseline estimates, Driscoll and Kraay robust regression results (Table 7), and Dumitrescu and Hurlin causality tests (Table 8), provide evidence on macroeconomic determinants of human development in SAARC economies. The results indicate that the combined effect of economic,

financial, fiscal, and environmental factors is more important in affecting human development than a single determinant.

There is no more powerful and steady engine of human progress than economic growth. The positive and highly significant Driscoll-Kraay coefficient and the bidirectional causality between economic growth and human development indicate a reinforcing relationship. Higher-income people have more resources for education, health, and social protection. This will, in the long run, help to grow and improve productivity by increasing human capabilities. Our results offer strong support to *H2* and underline the importance of inclusive growth strategies that translate economic gains into more general human welfare gains.

In addition, financial development is an important determinant of human development. The consistency of the coefficients and the two-way causality imply that financial deepening and human development are complementary. Good financial systems mean better access to credit, greater entrepreneurship, investment in human capital, and improved financial inclusion. Meanwhile, increased human capabilities drive participation in formal financial systems, supporting the validity of *H3*.

In contrast, public debt has no independent long-run effect on human development in the preferred specification. The baseline fixed-effects model indicates a positive association; however, the effect is not statistically significant after applying the Driscoll–Kraay correction. Thus, *H1* is rejected. It means that the developmental impact of public borrowing is conditional on the amount of debt, fiscal governance, debt sustainability, institutional quality, and productive use of borrowed resources.

Environmental degradation strongly affects human development. Robust estimation shows that carbon emissions have a one-way causality effect on human development and are statistically significant. However, this positive coefficient cannot be taken as proof that environmental degradation increases welfare. Instead, the pattern indicates the development-stage effect in SAARC economies, where industrialization, urbanization, and increasing energy consumption have all come together to affect economic growth and environmental pressures. The finding underscores the need for policies to accelerate the roll-out of renewable energy, cleaner technologies, and environmental governance while spurring economic transformation.

H1 is not supported, but *H2*, *H3*, and *H4* are supported. The findings support a multidimensional view of human development, where economic and financial development are the key drivers of growth, environmental conditions determine sustainability outcomes, and public debt is only relevant if supported by good fiscal management. The panel's robust estimation and the causality heterogeneous analysis provide a wide understanding of the dynamics of human development in developing economies.

Our empirical outcomes present a nuanced departure from traditional, unidirectional macroeconomic paradigms by proving that the developmental impacts of fiscal and financial variables are highly conditional rather than absolute. Most notably, our rejection of *H1* which reveals that public debt has no independent long-run effect on human development directly contrasts with the conventional 'debt overhang' hypothesis pioneered by Krugman (1988), Sachs (1989), and Pattillo et al. (2002), who argue that high public debt inherently cripples long-term socio-economic progress. Furthermore, while traditional linear growth models often treat economic expansions as automatically beneficial, our confirmation of *H2*, *H3*, and *H4* demonstrates that the human development gains from economic growth and financial deepness (Demirgüç-Kunt et al., 2018; Suri et al., 2011) are structurally bottlenecked by environmental degradation, as explained by the initial phase of the Environmental Kuznets Curve (Grossman & Krueger, 1995; Stern, 2004). By validating these hypotheses in a single, unified empirical framework, our study challenges separate, siloed literature and establishes that for SAARC economies, macro-fiscal expansions only translate into authentic human capabilities when conditioned by environmental sustainability and institutional quality.

http://dx.doi.org/10.21511/pmf.15(3).2026.09

CONCLUSION

This study analyzed the joint and individual empirical effects of public debt, economic growth, financial development, and environmental degradation on human development within the SAARC economies over the period 1990–2023. The study used an integrated panel econometric framework to examine the effect of public debt, economic growth, financial development, and environmental degradation on human development for eight SAARC countries for the period of 1990–2023. The study uses a holistic approach to the drivers of human development in a diverse developing region in terms of fiscal, economic, financial, and environmental dimensions.

The results indicate that economic growth and financial development are the most important factors of human development. Driscoll–Kraay estimates indicate that the roles of income and financial systems are positive for human development through increased investment, financial inclusion, and access to basic services. In contrast, the positive relationship between public debt and human development in the baseline model vanishes once controlling for econometric problems, implying that debt per se cannot guarantee developmental outcomes. The success of public borrowing depends not on the volume of borrowing but on fiscal discipline, institutional quality, sustainability of debt, and productive use of resources. Environmental degradation also affects human development, and so the need for economic transformation must be balanced with environmental sustainability.

The results offer policy implications. Inclusive growth strategies that create jobs and raise investment in education, health, and social protection will be needed by the SAARC economies. A vibrant and inclusive financial sector can improve access to credit and productive activity. At the same time, environmental sustainability must be mainstreamed in development planning through cleaner technologies, the adoption of renewable energy, and the building of climate-resilient infrastructure. Public debt policies should be directed toward reducing the level of borrowing and improving transparency, efficiency, and developmental returns on borrowed resources.

The paper contributes to the literature by proposing an integrated framework that includes fiscal, economic, financial, and environmental determinants of human development. Methodologically, it contributes to the empirical evidence by using the fixed-effects estimation, the Driscoll–Kraay robust inference, and the Dumitrescu–Hurlin panel causality analysis. For SAARC economies, there is a lack of integrated analysis, and we present fresh evidence.

The present study has some limitations. The analysis is based on linear relationships and does not explicitly consider nonlinearities, threshold effects, or interaction mechanisms. The panel is unbalanced due to data availability constraints. Future research may incorporate institutional quality, governance, digitalization, and climate-related indicators with advanced heterogeneous and nonlinear panel techniques. The findings suggest that human development is a multidimensional process, which is influenced by the interaction between economic performance, financial development, fiscal governance, and environmental sustainability. SAARC economies need to pursue inclusive growth through coordinated policies, undertake financial system strengthening, adopt prudent fiscal management, and speed up the transition to environmentally sustainable development for sustainable improvements in human well-being.

AUTHOR CONTRIBUTIONS

Conceptualization: Jainendra Kumar Verma, Kothapeta Lakshman.
Data curation: Jainendra Kumar Verma, Kothapeta Lakshman.
Formal analysis: Jainendra Kumar Verma.
Investigation: Jainendra Kumar Verma, Kothapeta Lakshman.
Methodology: Jainendra Kumar Verma, Kothapeta Lakshman.

Resources: Jainendra Kumar Verma.
Software: Jainendra Kumar Verma.
Supervision: Jainendra Kumar Verma, Kothapeta Lakshman.
Validation: Jainendra Kumar Verma.
Visualization: Jainendra Kumar Verma.
Writing – original draft: Jainendra Kumar Verma, Kothapeta Lakshman.
Writing – review & editing: Jainendra Kumar Verma.

REFERENCES

1. Abbas, S. A., Belhocine, N., El-Ganainy, A., & Horton, M. (2014). *A historical public debt database* (IMF Working Paper No. WP/10/245). International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/ft/wp/2010/wp10245.pdf
2. Acemoglu, D., & Robinson, J. A. (2012). *Why nations fail: The origins of power, prosperity, and poverty*. Crown. Retrieved from https://ia801506.us.archive.org/27/items/WhyNationsFailTheOriginsODaronAcemoglu/Why-Nations-Fail_-The-Origins-o-Daron-Acemoglu.pdf
3. Acheampong, A. O. (2018). Economic growth, CO_2 emissions and energy consumption: What causes what and where? *Energy Economics, 74,* 677-692. https://doi.org/10.1016/j.eneco.2018.07.022
4. Aghion, P., & Howitt, P. (2009). *The economics of growth*. MIT Press. Retrieved from https://discovery.ucl.ac.uk/id/eprint/17829/1/17829.pdf
5. Ahmed, S., & Ghani, E. (2007). *South Asia: Growth and regional integration*. World Bank. Retrieved from https://documents1.worldbank.org/curated/en/843381468334773128/pdf/378580SAS.pdf
6. Anand, S., & Ravallion, M. (1993). Human development in poor countries. *Journal of Economic Perspectives, 7*(1), 133-150. https://doi.org/10.1257/jep.7.1.133
7. Anand, S., & Sen, A. (2000). Human development and economic sustainability. *World Development, 28*(12), 2029-2049. https://doi.org/10.1016/S0305-750X(00)00071-1
8. Apergis, N., & Ozturk, I. (2015). Testing environmental Kuznets curve hypothesis. *Ecological Indicators, 52,* 16-22. https://doi.org/10.1016/j.ecolind.2014.11.026
9. Baloch, M. A., Zhang, J., Iqbal, K., & Iqbal, Z. (2019). The effect of financial development on ecological footprint in BRI countries: Evidence from panel data estimation. *Environmental Science and Pollution Research, 26*(6), 5629-5641. https://doi.org/10.1007/s11356-018-3992-9
10. Baltagi, B. H. (2021). *Econometric analysis of panel data* (6th ed.). Springer. https://doi.org/10.1007/978-3-030-53953-5
11. Barro, R. J. (1990). Government spending in a simple model of endogenous growth. *Journal of Political Economy, 98*(5), S103-S125. https://doi.org/10.1086/261726
12. Barro, R. J. (1996). Determinants of economic growth. *Journal of Economic Growth, 1*(1), 1-27. https://doi.org/10.1007/BF00163340
13. Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality, and poverty. *Journal of Economic Growth, 12*(1), 27-49. https://doi.org/10.1007/s10887-007-9010-6
14. Beck, T., Demirgüç-Kunt, A., & Levine, R. (2010). Financial institutions and markets across countries and over time: The updated financial development and structure database. *World Bank Economic Review, 24*(1), 77-92. https://doi.org/10.1093/wber/lhp016
15. Breusch, T. S., & Pagan, A. R. (1980). Lagrange multiplier test. *Review of Economic Studies, 47*(1), 239-253. https://doi.org/10.2307/2297111
16. Burke, M., Hsiang, S., & Miguel, E. (2015). Global non-linear effect of temperature on growth. *Nature, 527,* 235-239. https://doi.org/10.1038/nature15725
17. Calderón, C., & Servén, L. (2010). *Infrastructure and economic development* (Policy Research Working Paper No. WPS4712). World Bank. Retrieved from https://documents.worldbank.org/en/publication/documents-reports/documentdetail/393241468180903623
18. Charfeddine, L., & Kahia, M. (2019). Impact of renewable energy consumption and financial development on CO2 emissions and economic growth in the MENA region: A panel vector autoregressive (PVAR) analysis. *Renewable Energy, 139,* 198-213. https://doi.org/10.1016/j.renene.2019.01.010
19. Checherita-Westphal, C., & Rother, P. (2012). The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area. *European Economic Review, 56*(7), 1392-1405. https://doi.org/10.1016/j.euroecorev.2012.06.007
20. Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2017). Is there a debt-threshold effect on output growth? *The Review of Economics and Statistics*, *99*(1), 135-150. https://doi.org/10.1162/REST_a_0059
21. Clarke, G. R. G., Xu, L. C., & Zou, H. F. (2006). Finance and income inequality: What do the data tell us? *Southern Economic Journal*, *72*(3), 578-596. https://doi.org/10.1002/j.2325-8012.2006.tb00721.x

http://dx.doi.org/10.21511/pmf.15(3).2026.09

22. Clements, B., Bhattacharya, R., & Nguyen, T. Q. (2003). *External debt, public investment, and growth in low-income countries* (IMF Working Paper No. WP/03/249). International Monetary Fund. https://doi.org/10.5089/9781451875904.001

23. Costantini, V., & Monni, S. (2008). Environment, human development and growth. *Ecological Economics, 64*(4), 867-880. https://doi.org/10.1016/j.ecolecon.2007.05.011

24. Dell, M., Jones, B., & Olken, B. (2012). Temperature shocks and economic growth: Evidence from the last half century. *American Economic Review, 4*(3), 66-95. https://doi.org/10.1257/mac.4.3.66

25. Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. World Bank Group. https://doi.org/10.1596/978-1-4648-1259-0

26. Destek, M. A., & Sarkodie, S. A. (2019). Investigation of environmental Kuznets curve for ecological footprint: The role of energy and financial development. *Science of the Total Environment, 650*(2), 2483-2489. https://doi.org/10.1016/j.scitotenv.2018.10.017

27. Dinda, S. (2004). Environmental Kuznets curve hypothesis: A survey. *Ecological Economics, 49*(4), 431-455. https://doi.org/10.1016/j.ecolecon.2004.02.011

28. Dogan, E., & Seker, F. (2016). Determinants of CO_2 emissions in the European Union: The role of renewable and non-renewable energy. *Renewable Energy, 94,* 429-439. https://doi.org/10.1016/j.renene.2016.03.078

29. Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance estimation with spatially dependent panel data. *Review of Economics and Statistics, 80*(4), 549-560. https://doi.org/10.1162/003465398557825

30. Dumitrescu, E. I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic Modelling, 29*(4), 1450-1460. https://doi.org/10.1016/j.econmod.2012.02.014

31. Easterly, W. (2001). *The elusive quest for growth*. MIT Press. Retrieved from https://sociologiadeldesarrolloi.wordpress.com/wp-content/uploads/2014/11/245593638-william-r-easterly-the-elusive-quest-for-growth-bookzz-org-pdf.pdf

32. Eberhardt, M., & Presbitero, A. F. (2015). Public debt and growth: Heterogeneity and non-linearity. *Journal of International Economics, 97*(1), 45-58. https://doi.org/10.1016/j.jinteco.2015.04.005

33. Égert, B. (2015). Public debt, economic growth and nonlinear effects: Myth or reality? *Journal of Macroeconomics*, *43*, 226–238. https://doi.org/10.1016/j.jmacro.2014.11.006

34. Elmendorf, D. W., & Mankiw, N. G. (1999). Government debt. In J. B. Taylor & M. Woodford (Eds.), *Handbook of macroeconomics* (Vol. 1, Part C, pp. 1615-1669). Elsevier. https://doi.org/10.1016/S1574-0048(99)10038-7

35. Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. *Quarterly Journal of Economics, 110*(2), 353-377. https://doi.org/10.2307/2118443

36. Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill Irwin.

37. Hall, R. E., & Jones, C. I. (1999). Why do some countries produce so much more output per worker than others? *Quarterly Journal of Economics, 114*(1), 83-116. https://doi.org/10.1162/003355399555954

38. Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251-1271. https://doi.org/10.2307/1913827

39. Heal, G. (2012). Reflections – definitions and measures of sustainability. *Review of Environmental Economics and Policy, 6*(1), 147-163. https://doi.org/10.1093/reep/rer023

40. Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *Stata Journal, 7*(3), 281-312. https://doi.org/10.1177/1536867X0700700301

41. Honohan, P. (2008). Cross-country variation in household access to financial services. *Journal of Banking & Finance, 32*(11), 2493-2500. https://doi.org/10.1016/j.jbankfin.2008.05.004

42. Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*(1), 53-74. https://doi.org/10.1016/S0304-4076(03)00092-7

43. Intergovernmental Panel on Climate Change (IPCC). (2022). *Climate change 2022: Impacts, adaptation and vulnerability*. Cambridge University Press. https://doi.org/10.1017/9781009325844

44. Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics, 90*(1), 1-44. https://doi.org/10.1016/S0304-4076(98)00023-2

45. King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics, 108*(3), 717-737. https://doi.org/10.2307/2118406

46. Kose, M. A., Nagle, P., Ohnsorge, F., & Sugawara, N. (2021). *Global waves of debt: Causes and consequences*. World Bank. Retrieved from https://documents1.worldbank.org/curated/en/121251614759884881/pdf/Global-Waves-of-Debt-Causes-and-Consequences.pdf

47. Kourtellos, A., Stengos, T., & Tan, C. M. (2013). The effect of public debt on growth in multiple regimes. *Journal of Macroeconomics, 38*(Part A), 35-43. https://doi.org/10.1016/j.jmacro.2013.08.023

48. Krugman, P. (1988). Financing vs. forgiving a debt overhang. *Journal of Development Economics, 29*(3), 253-268. https://doi.org/10.1016/0304-3878(88)90044-2

49. Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal*

of Econometrics, 108(1), 1-24. https://doi.org/10.1016/S0304-4076(01)00098-7

50. Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of economic growth* (vol. 1A, pp. 865-934). Elsevier. https://doi.org/10.1016/S1574-0684(05)01012-9

51. Levine, R., & Zervos, S. (1998). Stock markets, banks, and economic growth. *The American Economic Review*, *88*(3), 537-558. Retrieved from https://www.jstor.org/stable/116848

52. Lucas, R. E., Jr. (1988). On the mechanics of economic development. *Journal of Monetary Economics, 21*(1), 3-42. https://doi.org/10.1016/0304-3932(88)90168-7

53. Nasreen, S., Anwar, S., & Ozturk, I. (2017). Financial stability, energy consumption and environmental quality: Evidence from South Asian economies. *Renewable and Sustainable Energy Reviews, 67,* 1105-1122. https://doi.org/10.1016/j.rser.2016.09.021

54. Nathaniel, S. P., & Khan, S. A. R. (2020). The nexus between urbanization, renewable energy, trade openness, and ecological footprint in ASEAN countries. *Journal of Cleaner Production, 272,* Article 122745. https://doi.org/10.1016/j.jclepro.2020.122709

55. Nussbaum, M. C. (2011*). Creating capabilities: The human development approach.* Harvard University Press. https://doi.org/10.4159/harvard.9780674061200

56. Panizza, U., & Presbitero, A. F. (2014). Public debt and economic growth: Is there a causal effect? *Journal of Macroeconomics, 41,* 21-41. https://doi.org/10.1016/j.jmacro.2014.03.009

57. Pattillo, C., Poirson, H., & Ricci, L. A. (2002). *External debt and growth* (IMF Working Paper No. WP/02/69). International Monetary Fund. Retrieved from https://www.imf.org/external/pubs/ft/wp/2002/wp0269.pdf

58. Piketty, T. (2014). *Capital in the twenty-first century*. Harvard University Press. https://doi.org/10.4159/9780674369542

59. Ranis, G., Stewart, F., & Ramirez, A. (2000). Economic growth and human development. *World Development, 28*(2), 197-219. https://doi.org/10.1016/S0305-750X(99)00131-X

60. Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5, Part 2), S71-S102. https://doi.org/10.1086/261725

61. Sachs, J. D. (1989). The debt overhang of developing countries. In G. A. Calvo, R. Findlay, P. Kouri, & J. B. de Macedo (Eds.), *Debt, stabilization and development: Essays in memory of Carlos Díaz-Alejandro* (pp. 80-102). Basil Blackwell. Retrieved from https://www.wider.unu.edu/publication/debt-overhang-developing-countries

62. Sarkodie, S. A., & Strezov, V. (2019). Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. *Science of the Total Environment*, *646*, 862-871. https://doi.org/10.1016/j.scitotenv.2018.07.365

63. Sen, A. (1999). *Development as freedom*. Oxford University Press. Retrieved from https://raggeduniversity.co.uk/wp-content/uploads/2025/01/1_x_senDevelopmentasFreedom-_compressed.pdf

64. Shahbaz, M., Solarin, S. A., & Ozturk, I. (2016). Environmental Kuznets curve hypothesis and the role of globalization in selected African countries. *Ecological Indicators, 67,* 623-636. https://doi.org/10.1016/j.ecolind.2016.03.024

65. Stern, D. I. (2004). The rise and fall of the environmental Kuznets curve. *World Development, 32*(8), 1419-1439. https://doi.org/10.1016/j.worlddev.2004.03.004

66. Stern, N. (2013). The structure of economic modeling of climate change: Assessing the harsh-criticisms and suggesting better approaches. *Journal of Economic Literature, 51*(3), 838-859. https://doi.org/10.1257/jel.51.3.838

67. Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Organisation for Economic Co-operation and Development. Retrieved from https://ec.europa.eu/eurostat/documents/8131721/8131772/Stiglitz-Sen-Fitoussi-Commission-report.pdf

68. Suri, T., Boozer, M. A., Ranis, G., & Stewart, F. (2011). Paths to success: The relationship between human development and economic growth. *World Development, 39*(4), 506-522. https://doi.org/10.1016/j.worlddev.2010.08.020

69. Tamazian, A., Chousa, J. P., & Vadlamannati, K. C. (2009). Does higher economic and financial development lead to environmental degradation: Evidence from BRIC countries. *Energy Policy, 37*(1), 246-253. https://doi.org/10.1016/j.enpol.2008.08.025

70. United Nations Development Programme (UNDP). (2023). *Human Development Report 2023/24: Breaking the gridlock Reimagining cooperation in a polarized world*. United Nations Development Programme. Retrieved from https://hdr.undp.org/content/human-development-report-2023-24

71. United Nations Development Programme (UNDP). (2024a). *Human Development Report 2023/2024: Breaking the gridlock: Reimagining cooperation in a polarized world*. United Nations Development Programme. Retrieved from https://hdr.undp.org/system/files/documents/global-report-document/hdr2023-24reporten.pdf

72. United Nations Development Programme (UNDP). (2024b). *Making our future: New directions for human development in Asia and the Pacific* (Regional Human Development Report for Asia and the Pacific). United Nations Development Programme. Retrieved from https://www.undp.org/asia-pacific/publications/making-our-future-new-directions-human-development-asia-and-pacific

73. United Nations Economic and

http://dx.doi.org/10.21511/pmf.15(3).2026.09

Social Commission for Asia and the Pacific (UNESCAP). (2021). *Economic and Social Survey of Asia and the Pacific 2021: Towards post-COVID-19 resilient economies*. Retrieved from https://www.unescap.org/kp/2021/economic-and-social-survey-asia-and-pacific-2021-towards-post-covid-19-resilient-economies

74. Woo, J., & Kumar, M. S. (2015). *Public debt and growth* (IMF Working Papers No. WP/10/174). https://doi.org/10.5089/9781455201853.001

75. Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press. Retrieved from https://ipcid.org/evaluation/apoio/Wooldridge%20-%20Cross-section%20and%20Panel%20Data.pdf

76. World Bank. (2022). *World development indicators 2022*. World Bank. Retrieved from https://databank.worldbank.org/source/world-development-indicators

77. World Bank. (2023). *South Asia development update, October 2023: Toward faster, cleaner growth*. World Bank. Retrieved from https://openknowledge.worldbank.org/entities/publication/ca7eda87-55ad-4d03-9e54-092ba943fe0e

78. World Bank. (2024). *International Debt Report 2024*. World Bank Group. Retrieved from https://openknowledge.worldbank.org/entities/publication/f1700aa0-cc73-42b7-8ceb-630c5528a574

79. Zaidi, S. A. H., Zafar, M. W., Shahbaz, M., & Hou, F. (2019). Dynamic linkages between globalization, financial development and carbon emissions: Evidence from Asia Pacific Economic Cooperation countries. *Journal of Cleaner Production,* 228, 533-543. https://doi.org/10.1016/j.jclepro.2019.04.210