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The Impact of ESG on Economic Growth: Evidence from BRICS+ Countries

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Abstract

Using a panel autoregressive distributed lag (ARDL) model, this paper investigates the impact of environmental, social and governance (ESG) factors on economic growth across BRICS+ countries from 2002 to 2022. The model allows analysis of both short- and long-run effects. We develop an index comprising 17 ESG variables across all three components to study the relationship between ESG and growth. Empirical results show a positive long-run association between ESG and growth for the BRICS+ bloc, however no detectable short-run dynamics. We also find no evidence of a long-term ESG effect on growth for the new member countries that joined in January 2024. This suggests these new members should prioritise developing ESG-related policies. Furthermore, we use a panel nonlinear ARDL (NARDL) model to identify asymmetric effects. Our findings reveal that there are differences in how economic growth responds to positive and negative changes related to ESG factors, highlighting the need to consider asymmetries in the ESG-growth nexus. Finally, the results of this study offer valuable insights to policymakers seeking to promote sustainable development in BRICS+ countries.

Keywords

ARDL Panels, Asymmetry, BRICS, ESG, Economic Growth

1. Introduction

The economic impact of environmental, social and governance (ESG) factors has been a subject of interest in recent research. However, there remains a paucity of studies examining the connections between all three ESG dimensions and economic growth. To date, only two studies (Shkura, 2019; Diaye et al., 2022) have investigated the relationships between ESG factors and growth. Generally, several theoretical studies provide supportive arguments for positive associations between individual ESG responsibilities and economic growth. For instance, green growth theory suggests that sustainable environmental policies promote efficient resource allocation, supporting growth (Jacobs, 2013). Additionally, social policies that improve human capital may enhance productivity (Sakamoto, 2018). Furthermore, efficient governance institutions, optimal resource distribution, and swift policy implementation facilitate economic expansion (Alam et al., 2017). Nevertheless, empirical literature questions the extent to which ESG factors stimulate growth, arguing they could potentially impede it (Martinez-Alier et al., 2010; Acheampong, 2018). Specifically, ESG efforts could reduce growth by shifting to costlier energy forms, necessitating lower consumption, or stirring distributional conflicts. Thus, while the role of ESG in economic growth is increasingly recognized, more research is required to fully understand these dynamics. Importantly, the existing literature lacks studies examining the ESG-growth links specifically within the BRICS+ countries. Hence, further academic investigation is needed to provide more comprehensive insights into this relationship.

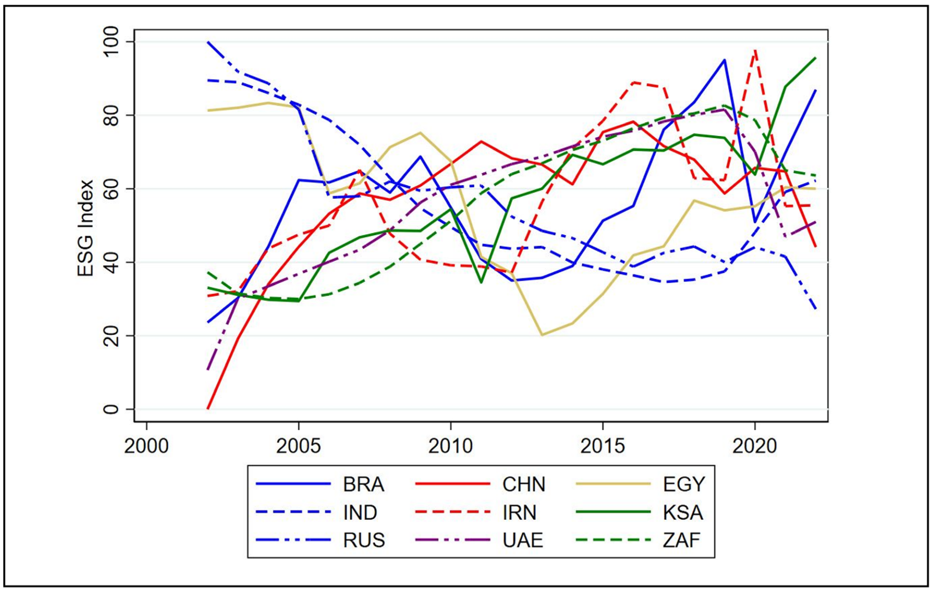
To address the aforementioned issues, this study attempts to examine the long-run relationship between ESG and economic growth in BRICS+ countries. Additionally, it investigates whether the impact of ESG on growth differs between founding BRICS members and those who joined the bloc in January 2024. Our study contributes to the empirical literature in three ways: First, we provide robust evidence on the short- and long-term ESG-growth effects in nine BRICS+ countries using panel autoregressive distributed lags (ARDL) framework. Second, we investigate these effects by constructing an index for each ESG component using annual data from 2002 to 2022. Third, we re-estimate the data using the panel nonlinear form (NARDL) to examine the robustness of our linear model findings and identify any asymmetric effects.

This paper is structured as follows: Section 2 presents the data and methodology, and section 3 discusses the results. Finally, section 4 concludes.

2. Data and Methodology

We obtain annual data from the World Bank database, spanning 2002 to 2022, for nine BRICS+ countries[1]: Brazil, Russia, India, China, South Africa (ZAF), Egypt, Iran, Kingdom of Saudi Arabia (KSA), and United Arab Emirates (UAE). The dependent variable in our analysis is real GDP per capita growth (*GDPG*), measured in constant 2015 US dollars, to control for inflation and currency fluctuations. Following Nicoletti et al. (2000), we utilise the principal component analysis (PCA) method to initially construct three indices, namely the environmental equality index (*EEI*), the social development index (*SDI*), the governance equality index (*GEI*). **Table A1** in the appendix provides the component variables for each index. Using these three indices, we calculate the composite *ESG* index via PCA, as shown in **Figure 1**.

[1]Ethiopia was excluded from the analysis due to insufficient data prior to 2011.



Source: Authors' own compilation from the World Bank database, https://data.worldbank.org.

Figure 1. The ESG index for the BRICS+ countries from 2002-2022.

Based on economic growth models, we include several control variables such as *FDI*, which is the index of FDI net inflows (% of GDP)[2], *KF* is the gross capital formation (% of GDP), *RD* is the research and development expenditures (% of GDP), and *TO* is the trade openness defined as the sum of imports and exports expressed as a percentage of GDP. We utilise these control variables, while avoiding the inclusion of variables that may exhibit multicollinearity with those used in the ESG index. Additionally, to account for the economic impact of major global crises we include a dummy variable, namely *CRISES*, to represent time periods characterised by economic and geopolitical turmoil. Specifically, the dummy variable takes the value of unity for the years 2007-2010, coinciding with the global financial crisis (GFC), and again for 2020-2022, reflecting the COVID-19 pandemic and the Russo-Ukrainian conflict. For all other years in the sample, this variable takes the value of zero.

Table 1 provides the summary statistics for the dependent variable, *GDPG,* and all control variables. All control variables, except *ESG*, are presented in the log levels. The BRICS+ countries exhibit an average *GDPG* of 2.36%, indicating moderate economic growth. However, the standard deviation (4.49%) and the wide range of −18.81 and 12.78% suggest considerable variation in growth rates, likely stemming from diverse economic structures and global crises. Likewise, the *ESG* index, with a mean of 56.65 out of 100 suggests moderate overall *ESG* performance among these countries. The high standard deviation (18.84) points to significant disparities in *ESG* practices across the bloc. The index's distribution is approximately normal, as evidenced by its near-zero skewness (−0.02)

[2]In the literature, the inward FDI stock is usually used. However, due to data availability, we rely on the inflows.

and kurtosis close to 3, further confirmed by the insignificant Jarque-Brea statistic.

Table 1. Descriptive statistics.

	Obs.	Mean	S.D.	Min.	Max.	Skew.	Kurtosis	Jarque-Bera
GDPG	189	0.0236	0.0449	−0.1881	0.1278	−1.2099	6.4435	139.4916***
ESG	189	56.6450	18.8365	0	100	−0.0182	2.5399	1.6775
log *FDI*	189	0.5903	0.8238	−2.4444	2.2725	−0.6039	3.3739	92.7148***
log *KF*	189	3.2154	0.3431	2.5177	3.8429	0.2242	1.9479	10.2995***
log *RD*	189	−0.3937	0.8122	−3.1630	0.9997	−1.4856	5.4857	118.1799***
log *TO*	189	3.9708	0.4630	3.0959	5.1522	0.8717	3.7554	28.4262***

Note: ***denotes significance at 1% level. Source: Authors' own calculations.

To examine both the short-run and long-run impact of the *ESG* index on economic growth, we use the panel ARDL model, specifically the Pooled Mean Group (PMG) estimation method developed by Pesaran et al. (1999),

$$\begin{aligned} GDPG_{it} = {} & \sum_{j=1}^{p} \lambda_{ij} GDPG_{i,t-j} + \sum_{j=0}^{q} \gamma'_{ij} ESG_{i,t-j} + \sum_{j=0}^{q} \psi'_{ij} x_{i,t-j} \\ & + \delta_i CRISES_{it} + \mu_i + \varepsilon_{it} \end{aligned} \tag{1}$$

which is estimated in its corresponding error correction representation,

$$\begin{aligned} \Delta GDPG_{it} = {} & \phi_i \left(GDPG_{i,t-1} - \beta'_i ESG_{it} - \theta'_i x_{it} \right) + \sum_{j=1}^{p-1} \lambda^*_{ij} \Delta GDPG_{i,t-j} \\ & + \sum_{j=0}^{q-1} \gamma'^*_{ij} \Delta ESG_{i,t-j} + \sum_{j=0}^{q-1} \psi'^*_{ij} \Delta x_{i,t-j} + \delta_i CRISES_{it} + \mu_i + \varepsilon_{it} \end{aligned} \tag{2}$$

where ϕ_i, β_i and θ_i are the error corrector mechanism impact and the long run impact of ESG and the control variables (x_{it}), respectively. The parameters λ_i, γ_i and ψ_i are the short-run parameters, whereas the disturbances ε_{it} are distributed independently across countries and years. The panel ARDL offers several benefits for our analysis. First, given the relatively small sample size in this study, panel ARDL approach provides consistent and sufficient results. Second, panel ARDL is suitable when there are large numbers of time periods (T = 21) and smaller numbers of cross sectional unites (N = 9), as in our dataset. Third, the validity of the panel ARDL analysis is not affected by whether the control variables are integrated to order 0, order 1, or a combination of both (see **Table 2**). Hence, panel ARDL-PMG is well-suited for this study (Hsiao, 2022).

Furthermore, we conduct the panel NARDL approach developed by Shin et al. (2014) to assess any potential asymmetric dynamics between *GDPG* and *ESG*, and to compare the estimation results with our initial model. In this approach, we modify Equation (2) by replacing the *ESG* variable with ESG^+ and ESG^-, which represent the partial sum processes of positive and negative changes in the *ESG* index respectively, as shown in Equation (3).

$$\begin{aligned}\Delta GDPG_{it} &= \phi_i \left(GDPG_{i,t-1} - \beta_i^{+\prime} ESG_{it}^{+} - \beta_i^{-\prime} ESG_{it}^{-} - \theta_i' x_{it} \right) \\ &+ \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta GDPG_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}^{+*\prime} \Delta ESG_{i,t-j}^{+} + \sum_{j=0}^{q-1} \gamma_{ij}^{-*\prime} \Delta ESG_{i,t-j}^{-} \\ &+ \sum_{j=0}^{q-1} \psi_{ij}^{*\prime} \Delta x_{i,t-j} + \delta_i CRISES_{it} + \mu_i + \varepsilon_{it}\end{aligned} \tag{3}$$

where

$$ESG_{it}^{+} = \sum_{j=1}^{t} \Delta ESG_{i,j}^{+} = \sum_{j=1}^{t} \max\left(\Delta ESG_{i,j}^{+}, 0 \right)$$

$$ESG_{it}^{-} = \sum_{j=1}^{t} \Delta ESG_{i,j}^{-} = \sum_{j=1}^{t} \min\left(\Delta ESG_{i,j}^{-}, 0 \right)$$

This modification allows us to estimate separate coefficients for increases and decreases in the *ESG* index, and hence to determine whether modelling asymmetric effects improves the model fit (Shin et al., 2014).

3. Results

Table 2 presents the results of two widely used panel unit root tests, Levin, Lin & Chu (2002) and Im, Pesaran & Shin (2003), to determine the integration order of each variable in the model. Most variables are stationary when a constant is included in the LLC test, with the exception for log *KF*. Similarly, when both constant and trend are included, all variables except *ESG* are stationary. The IPS test results further confirm that the control variables are either integrated to order 0 or 1, supporting the use of the panel ARDL-PMG method.

Table 2. Panel unit root tests.

	LLC		IPS	
Variable	Constant	Const. & trend	Constant	Const. & trend
GDPG	−3.098***	−2.731***	−3.083***	−3.655***
ESG	−2.334***	1.062	−2.026*	−1.444
log *FDI*	−1.612*	−1.976**	−2.972***	−3.273***
log *KF*	−0.925	−2.730***	−0.877	−1.852
log *RD*	−1.656**	−3.567***	−1.935	−2.417***
log *TO*	−2.318**	−2.074**	−1.695	−2.508***

Notes: LLC and IPS represents the Levin-Lin-Chu test, and Im, Pesaran and Shin test, respectively. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Source: Authors' own calculations.

Table 3 shows the panel ARDL and NARDL models estimations. Initially, the linear model is evaluated including the full dataset of the BRICS+ countries in column (1). The PMG estimator indicates a statistically significant positive relationship between ESG and growth in the long run, however there is no detectable short-run effect. This result could arise from several dynamics. Stricter ESG standards could increase costs and reduce competitiveness for some firms and industries, limiting investment and economic expansion in the short-term. Transitioning to sustainable energy and production methods requires major upfront investment. However, ESG reforms can also promote stability and transparent economic conditions, contributing to long-term growth. Additionally, the long-run estimates of *FDI*, *KF*, *RD* and *TO* are also positively significant at 10% level, except for which *RD* is strongly significant at 1%. Conversely, the error correction term (ECT) is negative and statistically significant at 1% level, indicating cointegration relationships among all variables. Specifically, the model converges quickly to long-run equilibrium, correcting 69.5% of any deviation each year.

Table 3. Panel ARDL and NARDL estimation results.

		Panel ARDL			Panel NARDL		
	Variable	(1)	(2)	(3)	(4)	(5)	(6)
Long run	ESG	0.0099*** (0.0020)	0.0089*** (0.0022)	0.0033 (0.0022)			
	ESG^{+}				0.0121*** (0.0016)	0.0108*** (0.0018)	−0.0012 (0.0046)
	ESG^{-}				−0.0068*** (0.0024)	−0.0092*** (0.0025)	0.0068 (0.0046)
	$\log FDI$	0.0022* (0.0014)	0.0053* (0.0032)	0.0092** (0.0037)	0.0043* (0.0026)	0.0049* (0.0030)	0.0162* (0.0096)
	$\log KF$	0.0136* (0.0083)	0.0154* (0.0092)	0.0376* (0.0226)	0.0243* (0.0146)	0.0082* (0.0049)	0.0096* (0.0057)
	$\log RD$	0.0206*** (0.0069)	0.0289* (0.0174)	0.0013 (0.0056)	0.0237*** (0.0067)	0.0280** (0.0136)	0.0177* (0.0099)
	$\log TO$	0.0153* (0.0092)	0.0252* (0.0151)	0.0183* (0.0110)	0.0158* (0.0079)	0.0304* (0.0153)	0.0112 (0.0260)
Short run	ΔESG	−0.0098 (0.0090)	−0.0100 (0.0142)	−0.0132 (0.0101)			
	ΔESG^{+}				−0.0451 (0.0342)	−0.876 (0.0616)	0.0027 (0.0065)
	ΔESG^{-}				−0.0268 (0.0227)	−0.0582 (0.0359)	−0.0241* (0.0134)
	$\Delta \log FDI$	0.0082* (0.0048)	0.0083 (0.0084)	0.0018 (0.0080)	0.0086* (0.0052)	0.0088 (0.1002)	0.0022 (0.0036)
	$\Delta \log KF$	0.0925* (0.0525)	0.1740*** (0.0548)	0.0523 (0.0750)	0.1045* (0.0623)	0.1890** (0.0793)	−0.0163 (0.0821)
	$\Delta \log RD$	0.0502* (0.0285)	0.1172*** (0.0283)	0.0440*** (0.0155)	0.0411* (0.0248)	0.0880*** (0.0320)	0.0319** (0.01444)
	$\Delta \log TO$	0.0914** (0.0445)	0.0869* (0.0523)	0.0841 (0.0757)	0.0852** (0.0402)	0.0939* (0.0543)	0.0920 (0.0847)
	ECT	−0.6945*** (0.1378)	−0.7240*** (0.2139)	−0.6617*** (0.1923)	−0.8461*** (0.1788)	−0.9178*** (0.3106)	−0.7593*** (0.1501)

Continued

CRISES	−0.0028** (0.0013)	−0.0032** (0.0015)	0.0003 (0.0137)	−0.0062** (0.0029)	−0.0108** (0.0050)	0.0019 (0.0142)
Constant	0.0530*** (0.0117)	0.0757*** (0.0264)	−0.0409*** (0.0123)	0.0583*** (0.0158)	0.0784*** (0.0297)	0.0368*** (0.0106)
Loglikelihood	492.09	298.55	192.50	504.26	308.93	194.50
Obs.	180	100	78	180	100	78

Notes: ESG^+ and ESG^- denote the positive and negative effects of ESG, respectively. Standard errors in parenthesis. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Source: Authors' own calculations.

Next, we divide the BRICS+ countries into two groups: the original members (Brazil, Russia, India, China, and South Africa) and the new members joined in 2024 (Egypt, Iran, Saudi Arabia, and the UAE). The results from analysing these two groups are presented in columns (2) and (3) respectively. For the founding BRICS+ members, the long-term effect of all variables is statistically significant. However, for the new member countries, the long-term effect of *ESG* on growth is statistically insignificant, suggesting that these new members should prioritise developing ESG-related policies. The directions and the statistical significance of the remaining long-run coefficients align with the full sample and old members results. Furthermore, results show that it takes more time for new members to correct deviations from long-term equilibrium. This highlights the importance of having effective ESG-related policies in place to respond to economic shocks and enable faster recovery. Regarding the dummy variable, *CRISES*, its estimated coefficient is negative and statistically significant only for the founding members. This differing impact of the crises highlights even further variation in economic conditions and policy responses within the BRICS+ members.

To further assess the sensitivity of our findings, we re-estimate the same samples using the panel NARDL. The results in columns (4)-(6) show that the direction and significance of the coefficients are largely consistent with the linear model for the full sample and subsamples. Similarly, the ECT coefficients appear consistent with our previous results. The asymmetric effects are also significant, aligning with the nonlinear framework. Notably, the variation in growth responses to positive and negative ESG shocks highlights the importance of accounting for asymmetries in the ESG-growth nexus. Finally, the panel NARDL model seems to provide a better fit to the data compared to the linear framework, as shown by its higher loglikelihood values. Overall, our results support the hypothesis that ESG and growth are positively related in the long run, suggesting that ESG as an important driver of economic growth in BRICS+ countries.

4. Conclusion

This study aims to further the understanding of the ESG-growth nexus within the BRICS+ countries. While theoretical reasoning links ESG and growth, the empirical literature remains inconclusive. This paper explores the impact of ESG on economic growth in BRICS+ countries over the period 2002-2022 using panel ARDL and NARDL models. ESG impact is assessed alongside control variables: FDI, capital formation, R&D, and trade openness. The results provide evidence of a positive ESG-growth nexus for the BRICS+ in the long-run. However, adjustment coefficients indicate older BRICS+ members are better able to adapt to shocks. This finding suggests further efforts are needed in the economies that joined in 2024. Additionally, analysis of asymmetric ESG shocks reveals positive and negative ESG changes do not affect growth equally. This points to the need for models to account for potential asymmetric ESG-growth effects.

While this paper makes valuable contributions, it is limited by data availability, particularly lack of observations prior to 2002 for most BRICS+ countries and 2011 for Ethiopia. Expanding the dataset, in the future, would enhance the empirical analysis and provide more comprehensive insights.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Sub-indices selected to create the *ESG* index.

Index	Component variable and description
Environmental Equality (*EEI*)	Particulate matter (PM2.5) air pollution, mean annual exposure (micrograms per cubic meter)
	People using safely managed drinking water services (% of population)
	Forest area (% of land area)
	Fossil fuel energy consumption (% of total)
	Renewable electricity output (% of total electricity output)
	Renewable energy consumption (% of total final energy consumption)
Social Development (*SDI*)	Total government expenditure on education (% of government expenditure)
	School enrolment, primary and secondary (gross), gender parity index (GPI)
	Total life expectancy at birth (years)
	Total unemployment (% of total labour force) (modelled ILO estimate)
	Ratio of female to male labour force participation rate (%) (modelled ILO estimate)
Governance Equality (*GEI*)	Control of corruption
	Rule of law
	Voice and accountability
	Government effectiveness
	Political stability and absence of violence/terrorism
	Regulatory quality

Source: Authors' own compilation from the World Bank database, https://data.worldbank.org.