CHAPTER III

PUBLIC EXPENDITURE AND HUMAN DEVELOPMENT: FINANCING WELFARE IN BRICS-T COUNTRIES[1]

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1. Introduction

The role of the state in the economic development process and the impact of public expenditures on social welfare have long been debated in economic literature. Traditional growth models have considered economic growth and per capita income as the primary indicators of development for many years. However, it has become widely accepted that development is not solely limited to economic growth but should also consider individuals' access to education, healthcare, and overall quality of life. In this context, the Human Development Index (HDI), developed by the United Nations Development Programme (UNDP), has emerged as a multidimensional measure of welfare, incorporating

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not only the economic aspect of development but also education and health indicators.

Among the factors determining HDI, the role of public expenditures has gained increasing importance in both theoretical and empirical literature. Public spending, particularly in education, healthcare, and infrastructure investments, can strengthen human capital and contribute to long-term economic growth and social welfare. The impact of public expenditures on human development is analyzed within the frameworks of public economics, human capital theory, and development economics. The human capital models developed by Becker (1964) and Lucas (1988) suggest that investments in education and healthcare enhance individuals' productivity and income levels, thereby improving their standard of living. Similarly, studies based on growth models, such as those by Barro (1996) and Mankiw et al. (1992), emphasize the role of public expenditures in promoting sustainable growth and welfare improvements.

However, the impact of public expenditures on human development may vary depending on the type of spending, its efficiency, and the country's institutional structure. Theoretically, education and healthcare expenditures contribute to long-term development by fostering human capital, whereas excessive or inefficient public spending may lead to budget deficits, tax burdens, and resource misallocation. Particularly in economies where rent-seeking behaviors are prevalent, the effectiveness of public expenditures may decrease, failing to generate the expected positive effects on human development (Acemoglu & Robinson, 2012). Additionally, increased spending on defense and debt servicing may reduce the share of education and healthcare expenditures, potentially leading to a decline in human development outcomes (Devarajan et al., 1996).

This study aims to empirically analyze the impact of public expenditures on human development. In examining the effect of public spending on HDI, per capita income, education level, inflation, unemployment, and urbanization are included in the model as control variables. These control variables help provide a more accurate estimation of the impact of public expenditures on HDI while mitigating potential bias. For example, an increase in per capita income can promote human development by improving access to education and healthcare services, whereas high inflation and unemployment rates may lower individuals' quality of life. Thus, this study presents a more comprehensive analysis by examining the impact of public expenditures on HDI while controlling for other relevant economic and social factors.

The study selects BRICS-T countries (Brazil, Russia, India, China, South Africa, and Turkey) as the sample. These countries are of particular interest as they represent fast-growing emerging economies with varying degrees of government involvement in economic structures and public expenditures. Despite being large and diverse economies, BRICS-T countries exhibit significant differences in human development levels. For instance, China and Russia allocate relatively higher public expenditures to education and healthcare, whereas India and South Africa exhibit lower public spending in these areas alongside higher inequality rates. Turkey, serving as a bridge between Europe and the Middle East, represents a unique case for examining the role of public expenditures in human development.

The selection of BRICS-T countries enables the study to analyze how the impact of public expenditures on HDI differs across countries with distinct economic, political, and institutional structures. These countries differ from developed economies, where government intervention is often more limited, yet public policy efficiency and expenditure effectiveness vary significantly across them. Therefore, BRICS-T countries provide a valuable case for assessing how country-specific factors and governance capacity influence the relationship between public expenditures and human development.

The study's findings are expected to provide important insights for development policies. Given the long-term impact of public expenditures on human capital, policymakers are likely to find evidence supporting the need to prioritize education and healthcare expenditures to foster human development. However, the effectiveness of public spending depends on institutional quality, governance efficiency, and fiscal sustainability. Thus, merely increasing public spending is insufficient; ensuring its efficient and effective use is also crucial for advancing human development.

2. Data

This study empirically examines the impact of public expenditures on human development in BRICS-T countries for the period 2000–2021. As part of the analysis, gross domestic product (GDP) per capita, education (average years of schooling), inflation, unemployment rate, and urbanization rate are included in the model as control variables. The model estimations are conducted using Fixed Effects (FE) and Random Effects (RE) models. Model selection is based on the results of homogeneity tests, cross-sectional dependence tests, and cointegration tests, and to enhance the robustness of the findings, appropriate

econometric techniques are employed to conduct a robustness analysis. Except for the HDI and urbanization rate variables, all variables are included in the analysis in their natural logarithmic forms.

In this study, the HDI is used as the dependent variable, and instead of applying a logarithmic transformation, a logit transformation is employed. Since HDI is a bounded index ranging between 0 and 1, using it directly in linear regression models may lead to predicted values falling outside this range. To address this issue and ensure a more appropriate distribution of the variable, the logit transformation is applied. The logit transformation is defined as:

$$logit\left(HDI\right) = \ln\left(\frac{HDI}{1-HDI}\right)$$

This transformation expands the HDI values onto the entire real number axis, allowing for more reliable estimates in the regression model. Consequently, it prevents the predicted values from being restricted within the 0-1 range and enables a more consistent modeling of marginal effects for the dependent variable.

Summary information on the variables and descriptive statistics are presented in Table 1 and Table 2, respectively.

Table 1. Summary of Variables

Target Variable	*Proxy Variable*	*Symbol*	*Definition*	*Source*
Human Development	Human Development Index	*HDI*	(HDI) is a summary measure of key dimensions of human development: a long and healthy life, a good education, and a decent standard of living. Higher values indicate higher human development.	Our World in Data*
Public Spending	Government expenditure (% of GDP)	*GOV*	Total government spending, including interest government expenditures, as a share of GDP.	Our World in Data**
Economic Growth	Real GDP per capita	GDP_{pc}	GDP per capita (2015 constant prices, $)	The World Bank (WB) – World Development Indicators (WDI)
Education Level	Average years of schooling	*SCHOOL*	Average years of formal education for individuals aged 15-64.	Our World in Data***
Inflation	CPI based inflation	*CPI*	Consumer Price Index (2010=100)	WB - WDI
Unemployment	Unemployment rate	*UNEMP*	Unemployment, total (% of total labor force)	WB - WDI
Urbanization	Urban population growth	*URBAN*	Urban population growth (annual %)	WB - WDI

* UNDP, Human Development Report (2024) – with minor processing by Our World in Data

** International Monetary Fund (2023) – with minor processing by Our World in Data

*** Barro and Lee (2015); Lee and Lee (2016) – with major processing by Our World in Data

Table 2. Descriptive Statistics

Variable	No. of obs.	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
HDI	132	0.705	0.085	0.490	0.842	-0.445	2.673
GOV	132	32.181	7.327	16.268	49.915	0.259	2.871
GDPpc	132	6508.125	3131.330	756.704	13449.930	-0.327	2.280
SCHOOL	132	8.001	2.461	4.144	12.412	0.582	2.195
CPI	132	110.715	48.028	20.595	314.806	1.003	4.850
UNEMP	132	10.698	6.909	3.260	34.007	1.451	4.059
URBAN	132	1.857	1.078	-0.467	4.198	-0.346	2.744
$logit(HDI)$	132	0.905	0.415	-0.040	1.673	-0.107	2.456
lnGOV	132	3.445	0.236	2.789	3.910	-0.422	3.255
lnGDPpc	132	8.584	0.739	6.629	9.507	-1.298	3.520
lnSCHOOL	132	2.034	0.302	1.422	2.519	0.136	2.131
lnCPI	132	4.613	0.449	3.025	5.752	-0.448	3.616
lnUNEMP	132	2.203	0.556	1.182	3.527	0.582	2.550

3. Methology and Empirical Findings

Panel data models provide more reliable estimates of the relationships between variables by accounting for both changes over time and differences across countries. However, estimates may be biased if fundamental panel data properties, such as stationarity, cross-sectional dependence, and cointegration, are not considered. Therefore, a series of diagnostic tests were conducted prior to model selection to ensure the appropriate econometric methodology was employed. In this context, the Pesaran and Yamagata (2008) homogeneity test was applied, and the results are presented in Table 3. According to the test results, the homogeneity hypothesis was strongly rejected, indicating that there are significant differences in slope coefficients across countries.

Table 3. Pesaran and Yamagata (2008) Homogeneity Test

Test	Test Statistics
$\tilde{\Delta}$	6.524***
$\tilde{\Delta}_{abj}$	8.178***

Note: *** p<0.01.

In panel data analysis, error terms may be correlated across countries due to factors such as common shocks, similar economic dynamics, policy dependencies, or trade integration. If cross-sectional dependence exists, traditional panel estimation methods may produce unreliable results. Therefore, to detect cross-sectional dependence, three different tests were applied: the Breusch-Pagan LM test (Breusch & Pagan, 1980), the Pesaran-Ullah-Yamagata Bias-Adjusted LM test (Pesaran et al., 2008), and the Pesaran CD test (Pesaran, 2004). The results, presented in Table 4, indicate that all three tests fail to reject the null hypothesis of no cross-sectional dependence. This finding suggests that error terms are independent across countries, making first-generation panel unit root and cointegration tests appropriate for the analysis.

Table 4. Cross Sectional Dependency Tests

Test	**Test Statistics (p-value)**
LM	17.380 (0.297)
LM_{adj}	-0.327 (0.744)
LM_{CD}	0.566 (0.571)

Note: Probability values in parentheses.

In panel data analysis, it is essential to determine whether the variables are stationary; in other words, whether they have a constant mean and variance over time. Non-stationary variables can lead to misleading results when standard regression techniques are applied. In this context, the Im, Pesaran, and Shin (IPS) panel unit root test (Im et al., 2003) was conducted, and the results are presented in Table 5. The findings indicate that all variables in the model are I(1), meaning they become stationary after first differencing. This result suggests that cointegration tests are necessary to examine the long-term relationship between the variables.

Tablo 5. Unit Root Test

Im, Pesaran and Shin (IPS)				
	I(0)		I(1)	
Variable	Stat	p-value	Stat	p-value
HDI	-0.387	0.349	-2.089	0.018
GOV	-1.437	0.075	-5.495	0.000
GDP_{pc}	-0.903	0.183	-3.998	0.000
SCHOOL	-0.162	0.436	-3.447	0.000
INF	0.039	0.515	-3.515	0.000
UNEMP	-0.894	0.186	-4.632	0.000
URBAN	0.768	0.779	-5.022	0.000

The fact that the series are I(1) necessitates an investigation into whether a long-term relationship (cointegration) exists among the variables. To this end, three different panel cointegration tests were conducted: Westerlund (2008), Pedroni (1999, 2004), and Kao (1999) tests. The test results are presented in Table 6. While the Westerlund and Kao tests fail to confirm the existence of a long-term relationship, the Pedroni test provides mixed evidence, with only the Modified Phillips-Perron t-statistic supporting cointegration. Therefore, the overall conclusion suggests that a strong and consistent long-term relationship among the variables is not present. The absence of strong cointegration indicates that focusing on short- and medium-term dynamics may be a more appropriate approach.

Table 6. Cointegration Tets

Test	Test Statistics
Westerlund	
Variance Ratio	-0.395 (0.347)
Pedroni	
Modified Phillips – Perron t	-3.077 (0.0010)
Phillips – Perron t	-0.591 (0.277)
Augmented Dickey – Fuller t	-0.655 (0.256)
Kao	
Modified Dickey – Fuller t	0.201 (0.420)
Dickey – Fuller t	0.416 (0.339)
Augmented Dickey – Fuller t	-0.127 (0.450)
Unadjusted Modified Dickey – Fuller t	0.241 (0.405)
Unadjusted Dickey – Fuller t	0.448 (0.327)

Note: Probability values in parantheses

The selection of the panel data model should be based on the fundamental characteristics of the dataset. In this context, slope homogeneity, cross-sectional dependence, and cointegration tests play a crucial role in determining the appropriate model. The finding that slope coefficients vary across countries indicates that a common model for all countries is not suitable and that homogeneous panel estimators, such as pooled OLS, may produce misleading results. Therefore, models that account for country-specific differences, such as FE or RE models, should be preferred. Additionally, the finding that no cross-sectional dependence exists suggests that classical first-generation panel estimation methods can be applied, making the FE and RE models reliable choices. However, if cross-sectional dependence were present, classical panel estimators (FE, RE) would be biased and inconsistent, necessitating the use of second-generation estimators, such as Common Correlated Effects (CCE) or Augmented Mean Group (AMG) estimators. Finally, the absence of a stable long-term relationship among the variables implies that long-run estimation methods (e.g., FMOLS, DOLS, VECM) are not appropriate and that the focus should be

on short-term relationships. Therefore, the selection was made between the FE and RE models, which are more suitable for short-term analysis.

FE and RE models are the two most commonly used methods for accounting for cross-sectional effects. The RE model assumes that cross-sectional effects are independent, whereas the FE model allows for the possibility that these effects may be correlated with the explanatory variables. To determine which model is more appropriate, the Hausman test is employed.

The Hausman test results presented in Table 7 indicate that the RE model is inconsistent and support the FE model. Consequently, the FE model, which accounts for country-specific fixed effects and best captures short-term relationships, was selected, and the results obtained from this model are presented in Table 7.

However, the conventional FE model may be sensitive to autocorrelation and heteroskedasticity. Therefore, Driscoll-Kraay standard errors were applied to test the robustness of the results. Additionally, the FGLS model was estimated to assess the model's stability in the presence of heteroskedasticity and serial correlation. Furthermore, to address potential endogeneity concerns, System GMM (Arellano-Bond and System GMM) estimators were initially attempted to address potential endogeneity concerns. However, due to the small number of cross-sections (N=6), System GMM produced an excessive number of instruments relative to the number of observations, leading to instability in the Hansen test and singular weighting matrices (Singular Matrix Warning). Indeed, the GMM estimator is more suitable for large-N, small-T panels, as the number of instruments tends to increase with a larger T. In other words, when a long time series (T) and a small number of cross-sections (N) are used, the model may become overidentified (Yaşar, 2021). To address these issues, Driscoll-Kraay standard errors, which provide robust estimates against heteroskedasticity, serial correlation, and cross-sectional dependence, were applied to the FE model.

The findings from the empirical analyses are presented in Table 7.

Table 7. Regression Results

Variables (Dependent Variable: HDI)	FE	FE (Driscoll-Kraay)	FGLS
GOV	0.142***	0.142***	0.071***
	(0.052)	(0.047)	(0.027)
GDP_{pc}	0.361***	0.361***	0.395***
	(0.042)	(0.041)	(0.023)
$SCHOOL$	0.489***	0.489***	0.369***
	(0.099)	(0.139)	(0.059)
INF	0.199***	0.199***	0.130***
	(0.025)	(0.025)	(0.030)
$UNEMP$	0.028	0.028	-0.021
	(0.040)	(0.045)	(0.020)
$URBAN$	0.042**	0.042**	0.002
	(0.020)	(0.021)	(0.009)
$SABİT$	-4.737***	-4.737***	-4.030***
	(0.295)	(0.263)	(0.167)
No. of observation	132	132	
Hausman Test	17.43***		

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7 presents the comparative results of the FE, Driscoll-Kraay corrected FE, and FGLS models. The overall findings remain consistent across the three models, with the signs and statistical significance of the coefficients largely preserved. However, some differences in coefficient magnitudes and significance levels are observed.

First, government expenditure has a positive and statistically significant effect on HDI across all models. However, while the coefficient remains the same in both the FE and Driscoll-Kraay corrected models, it is lower in the FGLS model. This difference can be attributed to FGLS's handling of variance in the error terms. The positive impact of government expenditure on HDI suggests that investments in public services, such as education, healthcare, and infrastructure, contribute to human capital accumulation, fostering long-term sustainable development.

Similarly, per capita GDP exhibits a strong and positive relationship with HDI across all models. The coefficient in the FGLS model is slightly higher than in the FE and Driscoll-Kraay corrected models, which may be due to differences in the way each model accounts for variance in the dependent variable. The positive effect of income per capita on HDI aligns with the economic literature, as higher income levels improve access to education, healthcare, and overall living standards, directly contributing to human development.

Education also emerges as a key determinant of HDI. The coefficient remains positive and statistically significant across all models, but it is lower in the FGLS estimation compared to the FE and Driscoll-Kraay corrected models. This difference highlights how different estimation techniques measure the impact of education on HDI. Education plays a crucial role in enhancing productivity, increasing earnings, and improving social mobility, reinforcing its fundamental role in fostering human development.

Inflation also has a positive and significant effect on HDI in all models. However, the coefficient in the FGLS model is lower than in the FE model. This finding aligns with the argument that moderate inflation may be associated with economic expansion, increasing wages and living standards. However, excessive inflation can distort income distribution and reduce real wages, potentially hindering human development. These results suggest that policymakers should aim to balance inflation control with economic growth to sustain improvements in HDI.

The impact of unemployment on HDI is inconclusive. The variable is not statistically significant in either the FE or Driscoll-Kraay corrected models, while it remains negative and insignificant in the FGLS model. This suggests that the direct impact of unemployment on HDI is not evident in the sample, possibly due to structural economic differences across countries. Although high unemployment rates are generally expected to negatively affect living standards, the presence of social safety nets and government interventions may mitigate these effects.

The relationship between urbanization and HDI varies across the models. In the FE and Driscoll-Kraay corrected estimations, urbanization has a positive and statistically significant effect, whereas it loses significance in the FGLS model. This suggests that the impact of urbanization on HDI may be sensitive to model specification. While urbanization is often associated with improved infrastructure, economic opportunities, and better access to healthcare and education, rapid and unplanned urbanization can lead to overcrowding,

environmental degradation, and increased inequality, potentially offsetting its positive effects on human development.

Overall, the FE model and the Driscoll-Kraay corrected FE model provide consistent results regarding the direction and significance of key explanatory variables. In contrast, the FGLS model exhibits lower coefficient magnitudes, and some variables (particularly urbanization) lose statistical significance. These differences highlight the importance of selecting an appropriate model that accounts for country-specific effects and heteroskedasticity. Given these findings, the FE model is chosen as the primary specification, as it effectively controls for country-specific fixed effects. Driscoll-Kraay standard errors provide additional robustness by correcting for heteroskedasticity and autocorrelation, while the FGLS estimation serves as a supplementary robustness check, reinforcing the reliability of the results.

4. Conclusion

This study examines the impact of public expenditures on the Human Development Index (HDI) through an empirical analysis of BRICS-T countries, investigating the role of government spending in promoting human development. To better understand the relationship between public expenditures and HDI, control variables such as per capita income, years of schooling, inflation, unemployment, and urbanization are included in the model. The empirical findings indicate that public expenditures have a positive and significant effect on human development.

The results suggest that public spending on education and healthcare plays a crucial role in improving individuals' quality of life and fostering sustainable development in the long run. The extent to which public expenditures contribute to human development largely depends on their efficiency, a country's institutional framework, and the quality of public policies. Thus, it is essential to focus not only on the size of public expenditures but also on how resources are allocated and how effectively public services are delivered.

An examination of the control variables shows that per capita income is a key determinant of human development. While economic growth has the potential to enhance individuals' living standards, it is not sufficient on its own to ensure human development. Income growth must be accompanied by policies that promote equitable access to essential services. The impact of macroeconomic factors such as inflation and unemployment on human development varies. High inflation can erode purchasing power and reduce living standards, but to some

extent, it may also stimulate economic activity. The effect of unemployment on HDI is found to be statistically insignificant, suggesting that differences in social security systems and labor market structures across countries may play a role in shaping its influence on human development. Urbanization rates also exhibit mixed effects depending on model specification. While urbanization provides economic opportunities and improved access to public services, unregulated urban growth and infrastructure deficiencies may exacerbate social inequalities.

Given these findings, policymakers should prioritize education and healthcare spending, enhance the efficiency of public expenditures, and ensure macroeconomic stability to maximize the positive impact of government spending on human development. Education and healthcare expenditures are among the most effective policy tools for improving human development. In low- and middle-income countries, government-supported education and healthcare policies can enhance individuals' quality of life, increase economic growth, and boost overall welfare. However, increasing public spending alone is insufficient; how these expenditures are managed and where they are allocated are equally important. Inefficient spending can lead to budget deficits, economic instability, and ineffective delivery of public services. Therefore, public expenditures must be managed with transparency, accountability, and efficiency to ensure they contribute to human development effectively.

Maintaining macroeconomic stability is critical for sustainable human development. High inflation and unemployment can lower living standards and undermine the effectiveness of public policies. Fiscal and monetary policies should aim to preserve price stability and promote employment, thereby strengthening the positive impact of public expenditures on HDI. In emerging economies like BRICS-T countries, ensuring fiscal sustainability while increasing public expenditures requires maintaining budget discipline and implementing sound fiscal policies. To enhance government revenues, policies such as reducing the informal economy, improving tax collection efficiency, and encouraging public-private partnerships can be implemented.

Urbanization policies should be designed with a focus on social equity and inclusivity. While rapid urbanization can provide economic opportunities and greater access to public services, it can also create infrastructure deficits and deepen social inequalities. Public policies should be formulated in a way that maximizes the benefits of urbanization while mitigating its negative consequences. Urban transformation projects should be developed not only as economic growth initiatives but also as mechanisms for enhancing social welfare and equity.

This study provides empirical evidence on the role of public expenditures in human development, highlighting the importance of public policies in fostering social and economic progress. While public spending is a crucial tool for promoting human development, its effectiveness varies across countries. The impact of public expenditures depends not only on their size but also on how they are financed, how they are allocated, and how they are managed.

For future research, a more detailed analysis of the composition of public expenditures could provide deeper insights into their effects on human development. Further studies could also explore how factors such as institutional quality, governance efficiency, and corruption levels influence the relationship between public spending and HDI. Additionally, using long-term panel data could help uncover the dynamic effects of government expenditures on human development.

In conclusion, it is not only the amount of public expenditure but also how it is managed and directed that plays a crucial role in shaping human development. Policymakers should focus on increasing public spending while ensuring that these expenditures are allocated efficiently, are sustainable, and contribute to social welfare. Investments in education, healthcare, and infrastructure remain among the most effective tools for improving human development, fostering economic growth, and enhancing overall societal well-being. Thus, effective management of public expenditures should be at the core of development policies.

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