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DEMYSTIFYING LITERACY DISPARITIES: THE INTERPLAY OF ECONOMIC CONDITIONS AND EDUCATIONAL SPENDING

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ABSTRACT

This study provides a comprehensive analysis of the interplay between literacy rates, GDP per capita, and government spending on education in different regions of the world. Using secondary data from the World Bank and Jamovi software for statistical analysis, the study reveals significant disparities in literacy rates. Europe and Central Asia (excluding high-income countries) have the highest literacy rates, while Sub-Saharan Africa and Central Europe and the Baltics have comparatively lower rates. The results of the correlation analysis show a weak linear relationship between GDP per capita and literacy rates, while a non-linear relationship indicates a stronger relationship. Government spending on education shows a moderate positive correlation with literacy rates, but the results of regression analysis reveal inefficiencies, suggesting that increased spending does not always translate into improved literacy outcomes. The study addresses gaps in the existing literature by challenging the simplistic view that higher economic growth and spending automatically improve literacy, and by highlighting the need for more targeted education policies.

Keywords: *Literacy Rates, Economic Development, Educational Expenditure, Global Disparities, Regression Analysis*

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Introduction

Literacy is a fundamental element of personal development and societal progress, underpinning individual empowerment and national development. As a basic human right, literacy enables individuals to participate fully in economic and social life (Bhola, 1990; Radó, 2001). Indeed, literacy has taken center stage in today's world (Bhola, 1990). It is now recognized as a basic human right, a means of emancipating the mind from the shackles of dependency, a gateway to most knowledge, and a tool for modernizing and democratizing

countries. Despite global advances in access to education, Sub-Saharan Africa faces persistent literacy challenges characterized by significant regional and gender disparities (Verner, 2005; Zua, 2021). Modern literacy extends beyond traditional reading and writing to include critical thinking and problem solving skills (Khuluvhe, 2021). Over the past fifty years, sub-Saharan Africa has experienced a significant increase in educational opportunities (Evans & Mendez Acosta, 2021).

This study aims to demystify literacy disparities by empirically examining the relationship between economic conditions, government spending on education, and literacy rates. While the term "demystify" is often used in qualitative paradigms to uncover deeper insights, here it is used to signal the clarification of these disparities through rigorous quantitative analysis. The study uses data-driven methods to bring clarity to the complex interplay between GDP per capita, government spending on education, and literacy outcomes. The intent is to simplify and clarify these relationships for policymakers and stakeholders, rather than to engage in interpretive or phenomenological inquiry. The study examines the factors that influence literacy rates, focusing on the impact of economic conditions and government spending on education. By examining these relationships, the study seeks to identify effective strategies to address regional literacy challenges and contribute to the broader discourse on educational development.

The primary objective of the study was to investigate the relationship between literacy rates, GDP per capita, and government expenditure on education across various global regions, and to assess how these factors collectively influence literacy outcomes. Below are the specific objectives:

1. Determine how literacy rates, GDP per capita, and government spending on education vary across regions and how they are related.
2. Determine how GDP per capita and government spending on education affect literacy rates.
3. Analyze how literacy rates have changed over time and vary across regions to understand the implications for education policy.

This study advances the understanding of the complex relationship between literacy rates, GDP per capita, and government spending on education. By highlighting regional disparities in literacy rates and assessing the impact of economic and educational investments, the study provides valuable insights for policymakers to optimize education strategies and spending. It addresses the pressing issue of the recent decline in literacy rates, underscoring the need for targeted interventions. A positive but negligible relationship was found in a study by Uzonwanne et al. (2020), which examined the relationship between government spending on education and educational outcomes in Nigeria from 1980 to 2018. The Nigerian statistics disproved the widely held belief that greater investment in education leads to higher quality education. To increase the nation's literacy rate, the experts recommend consistent and deliberate investment in education. In addition, this research contributes to the academic discourse on literacy and development by employing robust analytical methods and triangulation, providing a comprehensive framework for future research and policy formulation. This research is critical to guiding international development efforts and designing effective literacy programs.

Literature Review

Literacy is a cornerstone of personal empowerment and societal advancement, with profound implications for both individual and national progress. Bhola (1990) emphasizes that literacy is more than a basic skill; it is a fundamental human right and a critical enabler of modernization and democratization. Literacy enables individuals to access essential information, engage in lifelong learning, and improve their economic opportunities. As a determinant of national development, literacy contributes to human capital formation, which is essential for economic growth and social stability. Radó (2001) further supports this view by highlighting the role of literacy in promoting modernization and democratization processes within nations, demonstrating its importance for both personal and collective advancement.

Despite the recognized importance of literacy, significant global challenges remain, particularly in developing regions. Verner (2005) provides a sobering view of the literacy crisis, noting that nearly one billion people entered the twenty-first century unable to perform basic literacy tasks, two-thirds of whom were women. This gender gap in literacy rates reflects broader social and economic inequalities and severely limits women's opportunities for advancement. The impact of this disparity is profound, affecting women's ability to participate fully in economic and social spheres. The persistence of these disparities underscores the need for targeted interventions to address gender barriers to literacy.

Khuluvhe (2021) offers a broad definition of literacy that goes beyond reading and writing. Literacy encompasses the ability to understand, interpret, and engage with information in a variety of contexts. This broader perspective highlights the importance of critical information processing skills, such as problem solving and numeracy, which are critical in a technology-driven world. Understanding literacy in this expanded context underscores its role in fostering informed and active participation in local and global communities. This holistic view of literacy is essential for developing effective educational strategies that address diverse learning needs and contexts.

Regional studies provide valuable insights into the complexity of literacy and its impact on different populations. Radó (2001) examines systemic changes in education in Central and Eastern Europe, emphasizing the importance of strong educational policies, labor market integration, and quality control. The difficulties of integrating media and information literacy (MIL) into the curriculum of Kazakh, Kyrgyz, and Uzbek schools are explored by Dadakhonov (2024). He examines how professionals and educators view the value of MIL, as well as successful teaching techniques and assessment approaches. The study also assesses the possible consequences of ignoring MIL programs in Central Asia and contrasts them with international norms. Zadorin et al. (2023) examine media literacy in Central Asia, highlighting how social and economic factors influence media consumption. Dundure and Sloka (2021) and Gedvilaitė et al. (2022) examine financial and sustainability literacy among youth in the Baltic States, finding a correlation between higher financial literacy and greater financial inclusion.

Sub-Saharan Africa faces unique challenges in improving literacy rates, particularly among women and girls. Okpala and Okpala (2006) identify political instability, economic constraints, and a history of educational neglect as significant barriers. Despite efforts to expand educational opportunities, literacy rates remain low, with notable gender and regional disparities. Zua (2021) highlights the need for targeted investments in education to address these socio-political barriers and promote literacy. Thus,

Hypothesis 1: There are significant regional disparities in literacy rates influenced by economic and educational factors.

The relationship between literacy and economic development is well documented in the literature. Bhargava (2008) examines how higher literacy rates contribute to faster economic growth, particularly in countries that are more open to international trade. Literacy is essential for the development of human capital and the formation of a knowledge-based economy. Similarly, Boris et al. (2018) examine the link between literacy and economic growth in Cameroon and find that improved literacy rates play a critical role in reducing poverty and promoting overall development. These studies underscore the economic benefits of investing in literacy, highlighting its role in increasing productivity and economic resilience.

In Latin America and the Caribbean, education plays a critical role in addressing broader social and economic inequalities. Núñez Errázuriz's (2005) study examines literacy rates in the Caribbean and Latin America between 1900 and 1950. Using an innovative technique to overcome data limitations, the study provides a thorough overview of literacy rates across the region. The results show that there are significant differences in literacy rates between countries and underscore the link between increasing educational opportunities and raising literacy levels. The study also highlights the fact that the success of translating schooling into higher literacy rates has been influenced by variables other than school enrollment, such as the presence of indigenous communities. Torres (2013) discusses the challenges of adult education in the region, while Fernández et al. (2024) examine the relationship between education and other forms of inequality. Their findings underscore the importance of education in promoting adaptability, informed citizenship and economic prosperity. Thus,

Hypothesis 2: Economic growth guarantees improved literacy rates.

The Middle East and North Africa (MENA) region faces challenges related to the quality of education, particularly in countries with centralized economic planning systems. Heyneman (1997) identifies low quality education as a major problem and advocates reforms to improve the quality of education through curriculum alignment, professional development for teachers, and innovative financing of higher education. These recommendations highlight the need for systemic changes to improve the effectiveness of education systems in the MENA region and to address the quality issues that affect literacy outcomes.

Zua (2021) highlights the need for targeted investments in education to address these socio-political barriers and promote literacy. Strategic investments in key sectors are very essential to address these challenges and promote long-term prosperity (Yangailo, 2024). According to Fute et al. (2023), literacy promotes a knowledge economy by laying the foundation for future learning and requires the development of human capital. A clear focus on literacy policy is essential to achieving national and international socio-economic goals. Thus,

Hypothesis 3: Increased government spending on education is positively correlated with improved literacy rates.

Núñez Errázuriz (2005) provides a thorough review of literacy rates throughout Latin America and the Caribbean, showing that the success of translating schooling into higher literacy rates has been influenced by variables other than enrollment. This highlights the fact that higher investments in education do not automatically lead to better literacy outcomes.

This is further supported by the findings of Torres (2013), who discusses the challenges of adult education in the region. The implication is that investment alone is not enough; effective implementation and attention to contextual factors are critical to improving literacy rates. Thus,

Hypothesis 4: Higher educational investments does not automatically lead to better literacy outcomes.

Data and Research Methods

This study uses secondary data from World Bank covering an extensive time period from 1990 to 2023 to allow for a thorough longitudinal analysis of literacy rates, GDP per capita, and government spending on education. Data analysis was performed using Jamovi software, selected for its advanced statistical capabilities. The analysis included several key steps: first, descriptive statistics were calculated to summarize the key variables and their distributions. Next, correlation analysis was performed using both Pearson's correlation coefficient and Spearman's rho to explore linear and non-linear relationships between literacy rates, GDP per capita, and government spending on education.

Pearson's correlation coefficient is a statistical measure used to quantify the strength and direction of a linear relationship between two continuous variables. In the context of this study, Pearson's *r* was used to examine how literacy, GDP per capita, and government expenditure on education are linearly related. This method assumes that the relationship between these variables follows a straight line and requires that the data be normally distributed. The use of Pearson's correlation in this study is essential to understanding the extent to which these variables move together in a linear fashion. By focusing on the linear component of the relationships, Pearson's *r* provides insight into how much one variable changes proportionally with respect to another.

Spearman's rho, a nonparametric measure of rank correlation, assesses the strength and direction of a monotonic relationship between two variables. Unlike Pearson's r, Spearman's rho does not assume a linear relationship or normal distribution of the data, making it a more flexible tool for examining associations that may be non-linear or influenced by rank order effects. In the study, Spearman's rho was used alongside Pearson's r to provide a more complete analysis of the relationships between variables. For example, if the study found that the correlation between two variables to be much stronger when assessed using Spearman's rho compared to Pearson's r. This suggests that while the linear relationship between these variables is weak, a stronger association emerges when considering their ranks or non-linear patterns, indicating that the association between these variables is more complex, non-linear manner. The use of Spearman's rho in this study is critical to uncovering relationships that may not be apparent through linear analysis alone. By focusing on rank order correlations, Spearman's rho can detect associations where higher or lower values of one variable consistently correspond to higher or lower ranks of another variable, even when the relationship does not follow a straight line.

In summary, the dual use of Pearson's correlation coefficient and Spearman's rho in this study was a strategic choice to capture different dimensions of the relationships between literacy, GDP per capita, and government spending on education. Pearson's r provides insight into the linear relationships between the variables, revealing weaker relationships that may suggest that linear changes in one variable do not necessarily lead to proportional changes in another. On the other hand, Spearman's rho reveals stronger, non-linear relationships, highlighting the importance of considering rank-order effects and non-linear dynamics in understanding how these variables interact. This comprehensive approach allowed the study to present a more nuanced analysis, showing that while linear relationships exist, they may not fully explain the complexity of how literacy, economic development, and government spending are related.

Finally, regression analysis was used to model the effects of GDP per capita and government spending on education on literacy rates, incorporating both linear and non-linear models to capture the complexity of these relationships. Regression analysis was used to analyse the model. In order to approximate the parameters of the model, only data on Literacy Rate, GDP per Capita and Government Expenditure were required. Triangulation was used to ensure the reliability and validity of the findings. This involved cross-verification of findings from different analytical methods and comparison with existing literature to confirm the robustness of the conclusions.

Equations for Pearson's Correlation Coefficient and Spearman's Rho

The equation for Pearson's correlation coefficient (r) is:

$$r = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2 \sum_{i=1}^{n}(Y_i - \bar{Y})^2}} \quad (1)$$

Where:

r is Pearson's correlation coefficient

n is the number of data points

X_i and Y_i are the individual data points for variables X and Y, respectively

$\bar{X}$ and $\bar{Y}$ are the means of X and Y, respectively

The equation for Spearman's rho (ρ) is:

$$\rho = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2 - 1)} \quad (2)$$

Where**:**

ρ is Spearman's rank correlation coefficient.

n is the number of data points

d_i is the difference between the ranks of corresponding variables X and Y.

Specification of the Model

The study used a multiple linear regression (MLR) model to analyze the relationship between the literacy rate (dependent variable) and a number of predictors, including GDP per capita, government spending on education, regional factors, and changes over time. Multiple linear regression is a statistical technique that models the relationship between a dependent variable and two or more independent variables by fitting a linear equation to observed data.

Regression Equation

The general form of the multiple linear regression equation is:

$$\mathrm{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta n X_n + \epsilon \quad (3)$$

Where:

Y is the dependent variable, which in this study is the literacy rate, defined as the adult literacy rate (% of people aged 15 and over).

β_0 is the intercept, representing the expected value of Y when all predictors ($X_1,X_2,\ldots,X_n$) are equal to zero.

$\beta_1,\beta_2,\ldots,\beta_n$ are the coefficients of the predictors $X_1,X_2,\ldots,X_n$, representing the change in Y for a one-unit change in the corresponding predictor.

$X_1,X_2,\ldots,X_n$ are the independent variables (predictors) in the model, which include GDP per capita, government expenditure on education, regional dummy variables, and year dummy variables.

ϵ is the error term, accounting for the variation in Y that cannot be explained by the predictors.

This regression model effectively quantifies the impact of various predictors on literacy rates across regions and over time. It highlights the importance of regional disparities, government spending on education, and changes in literacy rates over time, providing a comprehensive view of the factors that influence literacy outcomes globally. The inclusion of both continuous and categorical variables allows the model to capture a wide range of influences, making it a powerful tool for understanding literacy trends.

Theoretical Framework and Hypothesis Development

To justify the use of this model, we draw on established theoretical frameworks. The hypotheses formulated for this study are:

- Null Hypothesis (H_0): There is no significant relationship between literacy rates and the predictors (GDP per capita, government spending on education, regional factors, and temporal changes).
- Alternative Hypothesis (H_1): There is a significant relationship between literacy rates and the predictors.

The selection of these predictors is supported by existing literature, which highlights their relevance to literacy outcomes:

- GDP per capita: Research indicates that higher economic resources contribute to better educational outcomes (Barro, 1991).
- Government spending on education: Empirical studies have consistently shown a correlation between increased educational expenditure and improved literacy outcomes (Hanushek & Woessmann, 2015).
- Regional factors: Geographical disparities significantly influence educational attainment (Glaeser & Sacerdote, 2003).

Finding and Discussion

Descriptive Analysis

These descriptive statistics reveal significant regional differences in literacy rates, GDP per capita, and government spending on education, highlighting the diverse educational and economic landscapes of the regions.

Table 1 presents descriptive statistics for literacy rates, GDP per capita, and government expenditure on education across regions, providing valuable insights into the distribution and

central tendencies of these variables. The average literacy rate varies widely by region. Europe and Central Asia (excluding high-income countries) has the highest average literacy rate at 94.8%, while Central Europe and the Baltics have the lowest at 46.6%. The average literacy rate for Eastern and Southern Africa is 63.2%, which is relatively high compared to the 53.0% for Heavily Indebted Poor Countries (HIPC) and 53.8% for Least Developed Countries (UN classification). Latin America and the Caribbean (excluding high-income countries) has a higher average literacy rate of 87.3%, while Sub-Saharan Africa (excluding high-income countries) has a lower average of 57.9%. The standard deviation of the literacy rate is highest in Central Europe and the Baltic States (50.2) and lowest in the Heavily Indebted Poor Countries (HIPC) and Sub-Saharan Africa (excluding high income) (11.2), indicating greater variability in literacy rates in some regions than in others.

Table 1: Descriptive Statistics on Literacy Rate, GDP per Capita and Government Expenditure

	Region	Literacy rate, adult total (% of people ages 15 and above)	GDP per capita (current US$)	Government expenditure on education, total (% of GDP)
Mean	Africa Eastern and Southern	63.2	1176	2.60
	Central Europe and the Baltics	46.6	9737	3.60
	Europe & Central Asia (excluding high income)	94.8	4240	2.58
	Heavily indebted poor countries (HIPC)	53.0	669	2.03
	Latin America & Caribbean (excluding high income)	87.3	6212	3.27
	Least developed countries: UN classification	53.8	668	1.91
	Middle East & North Africa	70.6	5283	1.38
	Sub-Saharan Africa (excluding high income)	57.9	1213	2.14
Median	Africa Eastern and Southern	63.8	1291	3.91
	Central Europe and the Baltics	0.00	10740	4.62
	Europe & Central Asia (excluding high income)	97.5	4651	3.44
	Heavily indebted poor countries (HIPC)	53.6	638	2.78
	Latin America & Caribbean (excluding high income)	90.0	6168	4.01
	Least developed countries: UN classification	54.2	591	2.72
	Middle East & North Africa	74.6	5379	0.00
	Sub-Saharan Africa (excluding high income)	58.5	1316	3.07
Standard deviation	Africa Eastern and Southern	12.1	406	2.23
	Central Europe and the Baltics	50.2	5923	2.04
	Europe & Central Asia (excluding high income)	16.8	2412	1.97
	Heavily indebted poor countries (HIPC)	11.2	287	1.54
	Latin America & Caribbean (excluding high income)	15.7	2550	2.05
	Least developed countries: UN classification	11.6	348	1.45
	Middle East & North Africa	14.4	2502	2.20
	Sub-Saharan Africa (excluding high income)	11.2	458	1.62
Skewness	Africa Eastern and Southern	-4.44	-0.0357	-0.311
	Central Europe and the Baltics	0.123	0.253	-1.26
	Europe & Central Asia (excluding high income)	-5.78	0.0777	-0.518
	Heavily indebted poor countries (HIPC)	-3.18	0.237	-0.538

	Region	Literacy rate, adult total (% of people ages 15 and above)	GDP per capita (current US$)	Government expenditure on education, total (% of GDP)
	Latin America & Caribbean (excluding high income)	-5.49	0.119	-0.941
	Least developed countries: UN classification	-2.99	0.312	-0.583
	Middle East & North Africa	-3.77	0.0795	1.06
	Sub-Saharan Africa (excluding high income)	-4.30	-0.0242	-0.569
Std. error skewness	Africa Eastern and Southern	0.403	0.403	0.403
	Central Europe and the Baltics	0.403	0.403	0.403
	Europe & Central Asia (excluding high income)	0.403	0.403	0.403
	Heavily indebted poor countries (HIPC)	0.403	0.403	0.403
	Latin America & Caribbean (excluding high income)	0.403	0.403	0.403
	Least developed countries: UN classification	0.403	0.403	0.403
	Middle East & North Africa	0.403	0.403	0.403
	Sub-Saharan Africa (excluding high income)	0.403	0.403	0.403
Kurtosis	Africa Eastern and Southern	23.5	-1.74	-1.94
	Central Europe and the Baltics	-2.11	-1.15	-0.369
	Europe & Central Asia (excluding high income)	33.6	-1.67	-1.67
	Heavily indebted poor countries (HIPC)	15.0	-1.46	-1.67
	Latin America & Caribbean (excluding high income)	31.3	-1.53	-0.917
	Least developed countries: UN classification	13.7	-1.52	-1.68
	Middle East & North Africa	18.0	-1.73	-0.753
	Sub-Saharan Africa (excluding high income)	22.5	-1.68	-1.68
Std. error kurtosis	Africa Eastern and Southern	0.788	0.788	0.788
	Central Europe and the Baltics	0.788	0.788	0.788
	Europe & Central Asia (excluding high income)	0.788	0.788	0.788
	Heavily indebted poor countries (HIPC)	0.788	0.788	0.788
	Latin America & Caribbean (excluding high income)	0.788	0.788	0.788
	Least developed countries: UN classification	0.788	0.788	0.788
	Middle East & North Africa	0.788	0.788	0.788
	Sub-Saharan Africa (excluding high income)	0.788	0.788	0.788

There are significant differences in GDP per capita between regions. Central Europe and the Baltics has the highest average GDP per capita at $9,737, while Heavily Indebted Poor Countries (HIPC) and Least Developed Countries (UN classification) both have the lowest at $669. Europe and Central Asia (excluding high income) has an average GDP per capita of $4,240, which is significantly higher than Eastern and Southern Africa at $1,176 and Sub-Saharan Africa (excluding high income) at $1,213. The standard deviation for GDP per capita is highest in Central Europe and the Baltic States (5,923) and lowest in the Heavily Indebted Poor Countries (HIPC) (287), reflecting the greater variability in income levels within these regions.

Government spending on education as a percentage of GDP also varies widely. Central Europe and the Baltics has the highest average expenditure at 3.60%, while the Middle East and North Africa has the lowest at 1.38%. Latin America and the Caribbean (excluding high-

income countries) has a relatively high average expenditure of 3.27%, while Least Developed Countries (UN classification) has the lowest average expenditure of 1.91%. The standard deviation of government expenditure is highest in Central Europe and the Baltic States (2.04) and lowest in Least Developed Countries (UN classification) (1.45), indicating greater consistency in education spending in some regions than in others.

Correlation Analysis

Table 2: Correlation Matrix of Literacy Rate, GDP per Capita and Government Expenditure

		Literacy rate, adult total (% of people ages 15 and above)	GDP per capita (current US$)	Government expenditure on education, total (% of GDP)
Literacy rate, adult total (% of people ages 15 and above)	Pearson's r	—		
	df	—		
	p-value	—		
	Spearman's rho	—		
	df	—		
	p-value	—		
GDP per capita (current US$)	Pearson's r	0.120*	—	
	df	270	—	
	p-value	0.048	—	
	Spearman's rho	0.551***	—	
	df	270	—	
	p-value	< .001	—	
Government expenditure on education, total (% of GDP)	Pearson's r	0.103	0.327***	—
	df	270	270	—
	p-value	0.089	< .001	—
	Spearman's rho	0.265***	0.477***	—
	df	270	270	—
	p-value	< .001	< .001	—

Note. * p < .05, ** p < .01, *** p < .001

From Table 2, the correlation matrix reveals several important relationships between literacy rate, GDP per capita, and government expenditure on education. First, the correlation between literacy rate and GDP per capita shows a weak positive linear relationship, as indicated by a Pearson's r of 0.120 with a p-value of 0.048. This suggests that while there is a slight relationship between higher GDP per capita and higher literacy rates, the relationship is not very strong. However, Spearman's rho provides a more nuanced view, showing a moderate to strong positive correlation of 0.551 ($p < 0.001$). This suggests that when non-linear relationships or rank-order effects are taken into account, there is a stronger association between higher GDP per capita and improved literacy rates.

Second, the correlation between literacy and government expenditure on education shows a weak positive linear relationship with a Pearson's r of 0.103 and a p-value of 0.089. This suggests that there is minimal evidence of a linear relationship between these two variables. However, Spearman's rho shows a moderate positive correlation of 0.265 ($p < 0.001$), indicating a significant relationship when rank-order or non-linear associations are considered. This suggests that increased government spending on education is associated with higher literacy rates, although not strongly in a linear sense.

Finally, the correlation between GDP per capita and government expenditure on education is more pronounced. Pearson's r of 0.327 ($p < 0.001$) and Spearman's rho of 0.477 ($p < 0.001$) both indicate a moderate to strong positive correlation. This suggests that higher government spending on education tends to be associated with higher GDP per capita, with a stronger relationship when non-linear effects are considered.

Overall, while the relationships between these variables vary in strength and significance, there is consistent evidence that both GDP per capita and government expenditure on education have a positive impact on literacy. The nature of these relationships, particularly the stronger associations revealed by Spearman's rho, suggests that more nuanced factors beyond linear relationships are at play in these dynamics.

Regression Analysis

Tables 3 and 4 present the linear regression analysis of the literacy rate, defined as the total adult literacy rate (% of people aged 15 and over), and provide a detailed overview of how various predictors and regional factors influence this outcome.

Table 3: Model Fit Measures

				Overall Model Test			
Model	**R**	**R^2**	**Adjusted R^2**	**F**	**df1**	**df2**	**p**
1	0.808	0.652	0.589	10.2	42	229	< .001

The model shows a good fit with an R value of 0.808, indicating a robust positive correlation between the predictor variables and the literacy rate. The R^2 value is 0.652, indicating that approximately 65.2% of the variance in the literacy rate can be explained by the predictors included in the model. This indicates a good model fit, although it also shows that 34.8% of the variance remains unexplained. The adjusted R^2 value of 0.589, which is slightly lower than the R^2 value adjusted for the number of predictors, shows that about 58.9% of the variance is explained when the number of predictors is taken into account. The F-statistic of 10.2, with a p-value of less than 0.001, confirms that the model is statistically significant and at least one predictor is significantly related to literacy.

Among the predictors, GDP per capita (current US$) has a coefficient of 0.000568, but this is not statistically significant ($p = 0.328$). This suggests that GDP per capita does not have a significant effect on literacy in this model. On the other hand, government expenditure on education as a percentage of GDP has a coefficient of -3.034 and is statistically significant ($p = 0.002$). This means that an increase in government expenditure on education as a percentage of GDP is associated with a decrease in the literacy rate of approximately 3.034%. This negative relationship could indicate inefficiencies or other factors that reduce the effectiveness of education spending.

The analysis reveals significant regional differences. For example, countries in Central Europe and the Baltics have a literacy rate about 18.399% lower than Africa Eastern and Southern ($p = 0.006$). In contrast, Europe and Central Asia (excluding high income) has a literacy rate that is approximately 29.789% higher than Africa Eastern and Southern ($p < 0.001$). Similarly, Latin America and Caribbean (excluding high income) has a higher literacy rate of 23.277% compared to Africa Eastern and Southern ($p < 0.001$). Conversely, Heavily Indebted Poor Countries (HIPC) and Least Developed Countries: UN classification have lower literacy rates of about 11.665% and 11.226%, respectively, compared to Africa Eastern and Southern ($p = 0.006$ and $p = 0.009$). Other regions, such as the Middle East and North Africa and Sub-Saharan Africa (excluding high-income), show no significant difference in literacy rates compared to Africa East and Southern

Table 4: Model Coefficients - Literacy Rate, Adult Total (% of People Ages 15 and Above)

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept [a]	65.466	6.711	9.7549	< .001	
GDP per capita (current US$)	5.68e-4	5.79e-4	0.9811	0.328	0.0851
Government expenditure on education, total (% of GDP)	-3.034	0.975	-3.1101	0.002	-0.2267
Region:					
Central Europe and the Baltics – Africa Eastern and Southern	-18.399	6.675	-2.7563	0.006	-0.6852
Europe & Central Asia (excluding high income) – Africa Eastern and Southern	29.789	4.536	6.5668	< .001	1.1093
Heavily indebted poor countries (HIPC) – Africa Eastern and Southern	-11.665	4.232	-2.7564	0.006	-0.4344
Latin America & Caribbean (excluding high income) – Africa Eastern and Southern	23.277	5.197	4.4791	< .001	0.8668
Least developed countries: UN classification – Africa Eastern and Southern	-11.226	4.250	-2.6417	0.009	-0.4181
Middle East & North Africa – Africa Eastern and Southern	1.400	4.856	0.2884	0.773	0.0521
Sub-Saharan Africa (excluding high income) – Africa Eastern and Southern	-6.653	4.201	-1.5837	0.115	-0.2478
Year:					
1991 – 1990	0.454	8.612	0.0527	0.958	0.0169
1992 – 1990	0.886	8.612	0.1029	0.918	0.0330
1993 – 1990	1.271	8.612	0.1476	0.883	0.0473
1994 – 1990	1.781	8.612	0.2068	0.836	0.0663
1995 – 1990	3.916	8.633	0.4536	0.651	0.1458
1996 – 1990	-6.325	8.688	-0.728	0.467	-0.2355
1997 – 1990	-9.223	8.615	-1.070	0.285	-0.3435
1998 – 1990	-5.385	8.684	-0.620	0.536	-0.2005
1999 – 1990	1.304	9.124	0.1430	0.886	0.0486
2000 – 1990	1.119	9.100	0.1229	0.902	0.0417
2001 – 1990	3.475	9.276	0.3747	0.708	0.1294
2002 – 1990	0.900	8.974	0.1002	0.920	0.0335
2003 – 1990	-2.899	8.693	-0.334	0.739	-0.1079
2004 – 1990	5.623	9.406	0.5978	0.551	0.2094
2005 – 1990	5.277	9.487	0.5563	0.579	0.1965
2006 – 1990	4.125	9.487	0.4348	0.664	0.1536
2007 – 1990	-2.544	8.933	-0.285	0.776	-0.0947
2008 – 1990	4.123	9.728	0.4239	0.672	0.1536
2009 – 1990	3.981	9.523	0.4180	0.676	0.1482
2010 – 1990	4.328	9.595	0.4511	0.652	0.1612
2011 – 1990	4.862	9.695	0.5015	0.616	0.1811
2012 – 1990	8.045	9.989	0.8054	0.421	0.2996
2013 – 1990	18.866	9.766	1.9318	0.055	0.7026
2014 – 1990	19.565	9.744	2.0078	0.046	0.7286
2015 – 1990	20.528	9.676	2.1216	0.035	0.7644
2016 – 1990	20.789	9.590	2.1679	0.031	0.7742
2017 – 1990	22.377	9.828	2.2770	0.024	0.8333
2018 – 1990	20.900	9.668	2.1618	0.032	0.7783
2019 – 1990	22.680	9.832	2.3068	0.022	0.8446
2020 – 1990	22.157	9.655	2.2949	0.023	0.8251
2021 – 1990	21.607	9.744	2.2174	0.028	0.8046
2022 – 1990	19.470	9.605	2.0270	0.044	0.7251
2023 – 1990	-70.218	9.172	-7.656	< .001	-2.6149

[a] Represents reference level

The yearly coefficients show different effects on the literacy rate. For example, significant positive coefficients are observed in recent years, such as 2015 to 2023, indicating increased literacy rates compared to 1990. Notably, the coefficient for 2023 is strikingly negative at -70.218 with a p-value of less than 0.001. This suggests a dramatic decrease in literacy rates in the most recent year compared to 1990, which may warrant further investigation into recent educational or socioeconomic changes affecting literacy.

Overall, the model provides important insights into how government spending on education, regional disparities, and changes over time affect literacy rates. While regional differences and recent year effects are significant, the lack of significance for GDP per capita and some year changes suggests that other unaccounted for factors may play a role in shaping literacy outcomes.

Discussion

This study provides a comprehensive analysis of how literacy rates are influenced by economic and educational factors in different regions of the world. By examining the interplay between literacy rates, GDP per capita, and government spending on education, and using Jamovi software for rigorous statistical analysis, we have gained valuable insights into the dynamics that shape educational outcomes.

The results of this study reveal significant regional disparities in literacy rates, with Europe and Central Asia having the highest rates and Sub-Saharan Africa, Central Europe and the Baltic States having lower rates. These findings are consistent with those of Núñez Errázuriz (2005), who highlights the remarkable disparities in literacy rates across Latin America and the Caribbean, and emphasizes the impact of educational opportunities on literacy levels. These disparities are also consistent with previous research highlighting the impact of economic development and educational investment on literacy outcomes (Radó, 2001; Okpala & Okpala, 2006). The correlation analysis, which showed a weak linear relationship between GDP per capita and literacy rates but a stronger nonlinear relationship, echoes the findings of Bhargava (2008) that economic growth alone does not necessarily translate into improved educational outcomes. In addition, the positive but negligible relationship found by Uzonwanne et al. (2020) between government spending on education and educational outcomes in Nigeria further supports the notion that increased spending alone is not sufficient to improve literacy outcomes. The regression analysis also showed that while government spending on education has a significant impact on literacy rates, there are inefficiencies in spending that reflect the challenges identified by Heyneman (1997).

This study addresses several gaps in the existing literature by highlighting the limitations of GDP per capita as a predictor of literacy rates and by challenging the assumption that increased education spending is directly correlated with improved literacy outcomes. Previous studies have often focused on overall economic growth without considering the nuanced effects of educational investment or the efficiency of spending (Verner, 2005). This analysis provides a more detailed understanding of these relationships and underscores the need for a more targeted approach to education spending, as supported by the research of Uzonwanne et al. (2020). In addition, Dadakhonov's (2024) research on media and information literacy (MIL) in Central Asia highlights the importance of incorporating MIL into educational curricula, an area that has been less explored in the current literature. This study also contributes to the understanding of how broader definitions of literacy and regional differences affect educational outcomes.

Conclusion

This study provides a detailed examination of the factors that influence literacy rates in different regions of the world, focusing on the interplay between economic growth, government spending on education, and literacy outcomes. Through rigorous data analysis using Jamovi software, the study highlights key findings that challenge conventional assumptions and offer new insights into the dynamics of educational development.

The analysis revealed significant regional disparities in literacy rates, with Europe and Central Asia achieving higher rates than Sub-Saharan Africa, Central Europe, and the Baltic States. The study found a weak linear relationship between GDP per capita and literacy rates, suggesting that economic growth alone does not guarantee improved educational outcomes. This observation is consistent with the findings of Bhargava (2008) and underscores the need for more nuanced approaches to understanding the impact of economic factors on education.

The study also underscores the importance of government spending on education, which has a significant positive impact on literacy rates. However, it also identified inefficiencies in education spending, consistent with the challenges reported by Heyneman (1997). These findings underscore the need for policymakers to focus not only on increasing education budgets, but also on improving the effectiveness of resource allocation.

The study contributes to the existing literature by addressing gaps related to the effectiveness of education spending and the non-linear relationship between economic growth and literacy outcomes. It challenges the simplistic view that higher spending automatically leads to better literacy outcomes and argues for a more targeted approach to education policy.

The results of the study have important implications for policy development. The weak linear relationship between GDP per capita and literacy rates suggests that economic growth alone is not sufficient to improve literacy. Policymakers should focus on improving the efficiency and effectiveness of education spending, rather than simply increasing budgets. This could include reallocating resources to critical areas such as teacher training and curriculum development. The findings of Uzonwanne et al. (2020) suggest that consistent and targeted investments in education are needed, rather than relying on increased spending alone. Significant regional disparities and recent declines in literacy rates also call for tailored policies that address specific local challenges and adapt to emerging educational needs. The study's emphasis on the integration of media and information literacy (MIL), as highlighted by Dadakhonov (2024), could inform policies aimed at modernizing curricula and addressing specific regional needs.

Despite its contributions, this study has limitations. The reliance on secondary data from the World Bank may not capture all regional differences and may be affected by reporting inconsistencies. In addition, the use of aggregate data may obscure local factors that influence literacy rates. The study's focus on quantitative analysis may also overlook qualitative aspects of education spending and literacy outcomes.

Future research should explore the qualitative dimensions of education spending to understand how resources are allocated and used at the local level. Examining the impact of specific educational interventions and policies, such as those related to media and information literacy (MIL) as studied by Dadakhonov (2024), could provide deeper insights into effective strategies. Examining the role of socio-cultural factors and their interaction with economic and educational variables could improve our understanding of regional disparities in literacy

outcomes. In addition, exploring the findings of Núñez Errázuriz (2005) and Uzonwanne et al. (2020) could provide further insights into the relationship between educational investment and literacy rates.

Overall, this study highlights the complex interplay between economic growth, government spending, and literacy rates and provides valuable insights for improving educational outcomes. Addressing the limitations and exploring new avenues of research will be critical to developing more effective educational policies and strategies.

Declaration

I would like to declare that this article has not been pre-sponsored by any organization and there is no conflict of interest for me to disclose; I can provide data and material research upon request; I would also like to extend my sincere thanks to the editor and reviewers for their valuable time in reviewing this paper.

Conflict of Interest

I would like to declare that there is no conflict of interest to declare, as there are no significant competing financial, professional or personal interests that could have influenced the performance.

Availability of Data and Materials

Data and material searches can be provided upon request, although all materials used have been from the published materials and World Bank's database and no primary data is used.

Authors' Contribution

Tryson Yangailo designed the study, developed the methodology, drafted, reviewed, and edited the manuscript; Tryson Yangailo wrote the original draft.

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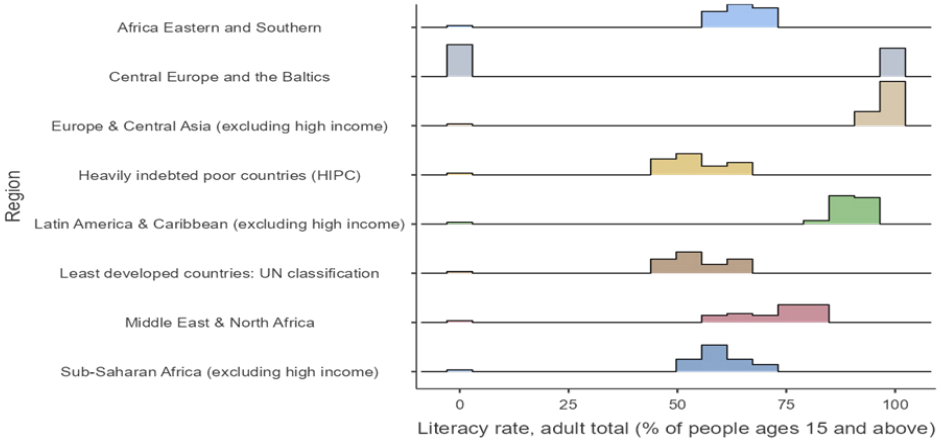
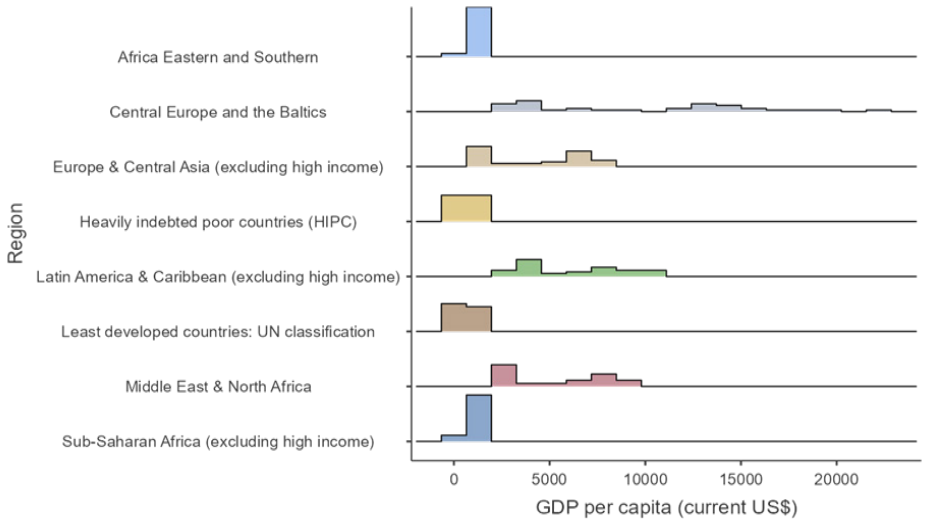
Appendices

Plots

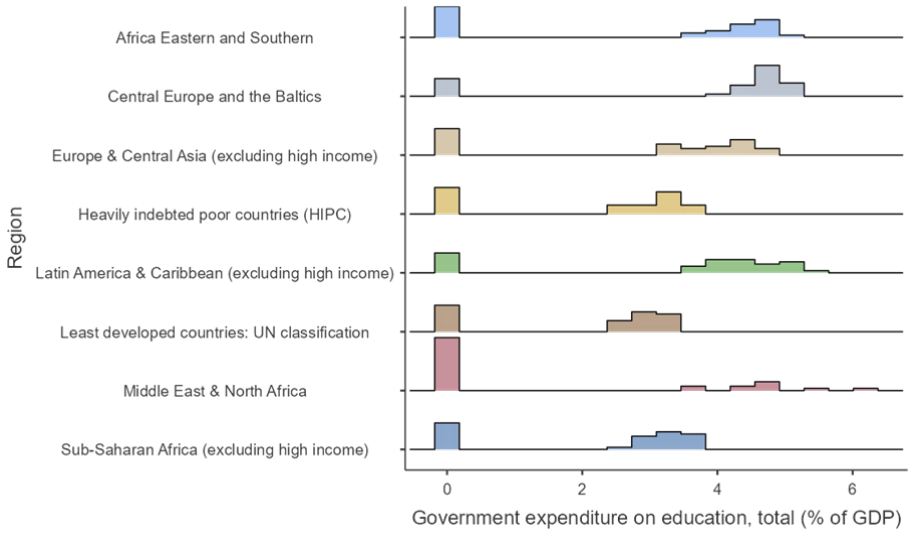
Literacy rate, adult total (% of people ages 15 and above)



GDP per capita (current US$)



Government expenditure on education, total (% of GDP)



Data compiled from World Bank Data Statistics (2024)

Region	Year	Literacy rate, adult total (% of people ages 15 and above)	GDP per capita (current US$)	Government expenditure on education, total (% of GDP)
Africa Eastern and Southern	1990	58.18001938	810.6467001	0
Africa Eastern and Southern	1991	58.14118958	858.7276186	0
Africa Eastern and Southern	1992	58.53063965	732.3604178	0
Africa Eastern and Southern	1993	58.91260147	715.8921172	0
Africa Eastern and Southern	1994	59.52685165	707.1772016	0
Africa Eastern and Southern	1995	59.92193985	773.5753686	0
Africa Eastern and Southern	1996	60.43492889	750.7713557	0
Africa Eastern and Southern	1997	61.17406082	774.5496348	0
Africa Eastern and Southern	1998	61.40871048	704.2773157	0
Africa Eastern and Southern	1999	62.25841904	678.004156	3.93975997
Africa Eastern and Southern	2000	62.49517822	715.1425073	3.606129885
Africa Eastern and Southern	2001	63.41788864	633.4733816	4.341670036
Africa Eastern and Southern	2002	63.74940872	633.5202007	0
Africa Eastern and Southern	2003	64.35030365	819.986705	0
Africa Eastern and Southern	2004	65.60041809	994.1938544	3.74496007
Africa Eastern and Southern	2005	63.94247055	1130.168938	4.00578022
Africa Eastern and Southern	2006	62.13386917	1235.847125	3.871469975
Africa Eastern and Southern	2007	62.83575821	1379.746756	0
Africa Eastern and Southern	2008	63.30950928	1439.240924	4.28008008
Africa Eastern and Southern	2009	64.00041962	1404.535948	0
Africa Eastern and Southern	2010	64.61788177	1622.684093	4.496590137
Africa Eastern and Southern	2011	66.82965088	1757.998404	4.639065027
Africa Eastern and Southern	2012	68.36135101	1724.204053	5.227220058
Africa Eastern and Southern	2013	69.38310242	1696.35604	4.690069914
Africa Eastern and Southern	2014	69.8347702	1678.55361	4.717299938
Africa Eastern and Southern	2015	70.31342316	1498.805084	4.750985146
Africa Eastern and Southern	2016	71.09519958	1346.301281	4.882070065
Africa Eastern and Southern	2017	71.00907135	1485.753579	4.820445061
Africa Eastern and Southern	2018	71.39261627	1558.612079	4.739749908
Africa Eastern and Southern	2019	72.63497162	1508.486886	4.511475086
Africa Eastern and Southern	2020	72.78562164	1356.088871	4.35243988
Africa Eastern and Southern	2021	72.5811615	1545.956697	4.674409866
Africa Eastern and Southern	2022	72.60040283	1642.432039	4.244120121
Africa Eastern and Southern	2023	0	1672.505957	0
Central Europe and the Baltics	1990	98.34538269	2452.857602	0
Central Europe and the Baltics	1991	98.40634918	2260.98846	0
Central Europe and the Baltics	1992	98.46269989	2328.952399	0
Central Europe and the Baltics	1993	98.51394653	2452.035151	0
Central Europe and the Baltics	1994	98.56429291	2799.638268	0
Central Europe and the Baltics	1995	98.61206818	3580.948316	4.642334938
Central Europe and the Baltics	1996	0	3796.496075	4.334750175
Central Europe and the Baltics	1997	0	3748.508595	0
Central Europe and the Baltics	1998	0	4109.312868	4.942009926

Region	Year	Literacy rate, adult total (% of people ages 15 and above)	GDP per capita (current US$)	Government expenditure on education, total (% of GDP)
Central Europe and the Baltics	1999	0	3989.197637	4.579434872
Central Europe and the Baltics	2000	0	3952.108476	4.868400097
Central Europe and the Baltics	2001	0	4352.721427	5.079734802
Central Europe and the Baltics	2002	0	4937.13171	5.179230213
Central Europe and the Baltics	2003	0	5949.814253	5.057149887
Central Europe and the Baltics	2004	0	7176.508384	4.834060192
Central Europe and the Baltics	2005	0	8355.86921	4.878399849
Central Europe and the Baltics	2006	0	9469.733567	4.825729847
Central Europe and the Baltics	2007	0	12009.6865	4.595210075
Central Europe and the Baltics	2008	0	14578.01413	4.839900017
Central Europe and the Baltics	2009	0	12307.7075	4.946360111
Central Europe and the Baltics	2010	0	12608.02304	4.723750114
Central Europe and the Baltics	2011	0	13964.44289	4.56317997
Central Europe and the Baltics	2012	0	13075.94919	4.717720032
Central Europe and the Baltics	2013	99.29846954	13667.98138	4.538440228
Central Europe and the Baltics	2014	99.31572723	14143.73975	4.486579895
Central Europe and the Baltics	2015	99.3327713	12528.08264	4.817009926
Central Europe and the Baltics	2016	99.35350037	12785.38592	4.65749979
Central Europe and the Baltics	2017	99.37042999	14225.87732	4.075270176
Central Europe and the Baltics	2018	99.38723755	16081.91106	4.243569851
Central Europe and the Baltics	2019	99.4021225	16355.85815	4.273190022
Central Europe and the Baltics	2020	99.41718292	16302.75462	4.721590042
Central Europe and the Baltics	2021	99.42526245	18816.13369	5.010000229
Central Europe and the Baltics	2022	99.42752075	19414.74166	0
Central Europe and the Baltics	2023	0	22494.48066	0
Europe & Central Asia (excluding high income)	1990	95.56111908	1690.133092	0
Europe & Central Asia (excluding high income)	1991	95.69683838	1608.549604	0
Europe & Central Asia (excluding high income)	1992	95.81835938	1544.362395	0
Europe & Central Asia (excluding high income)	1993	95.93470001	1625.7504	0
Europe & Central Asia (excluding high income)	1994	96.04705048	1291.792282	0
Europe & Central Asia (excluding high income)	1995	96.15783691	1444.134518	0
Europe & Central Asia (excluding high income)	1996	96.33358002	1523.504554	0
Europe & Central Asia (excluding high income)	1997	96.44084167	1609.744521	0
Europe & Central Asia (excluding high income)	1998	96.76509094	1953.99102	0
Europe & Central Asia (excluding high income)	1999	96.8602066	1777.711796	3.75532496
Europe & Central Asia (excluding high income)	2000	97.04724884	1806.71402	3.469280005
Europe & Central Asia (excluding high income)	2001	97.13098145	1541.930879	0
Europe & Central Asia (excluding high income)	2002	97.2120285	1786.103603	3.136129975
Europe & Central Asia (excluding high income)	2003	97.2931366	2267.100003	0
Europe & Central Asia (excluding high income)	2004	97.35060883	2906.977413	3.337610006
Europe & Central Asia (excluding high income)	2005	97.49954987	3602.233846	3.396839976
Europe & Central Asia (excluding high income)	2006	97.45533752	4167.687129	3.297479987
Europe & Central Asia (excluding high income)	2007	97.54762268	5222.838424	3.413269997
Europe & Central Asia (excluding high income)	2008	97.65766907	6206.964951	3.484528065
Europe & Central Asia (excluding high income)	2009	98.04763031	5133.423164	4.098309994

Region	Year	Literacy rate, adult total (% of people ages 15 and above)	GDP per capita (current US$)	Government expenditure on education, total (% of GDP)
Europe & Central Asia (excluding high income)	2010	98.36354065	6022.630098	3.843972802
Europe & Central Asia (excluding high income)	2011	98.62870789	6785.422424	4.221519947
Europe & Central Asia (excluding high income)	2012	98.75997925	7100.35951	3.959858179
Europe & Central Asia (excluding high income)	2013	98.80506134	7678.785031	4.344810009
Europe & Central Asia (excluding high income)	2014	98.8331604	7307.046191	4.412580013
Europe & Central Asia (excluding high income)	2015	98.85582733	6312.150342	4.55485487
Europe & Central Asia (excluding high income)	2016	98.98377991	6006.367089	4.627739906
Europe & Central Asia (excluding high income)	2017	98.98262787	6111.394337	4.323689938
Europe & Central Asia (excluding high income)	2018	99.1621933	5957.826424	4.300039768
Europe & Central Asia (excluding high income)	2019	99.18015289	6022.632386	4.185135007
Europe & Central Asia (excluding high income)	2020	99.26638031	5738.254992	4.446000099
Europe & Central Asia (excluding high income)	2021	99.30091858	6620.203796	4.386000156
Europe & Central Asia (excluding high income)	2022	99.32569122	7302.238611	4.69618535
Europe & Central Asia (excluding high income)	2023	0	8479.056831	0
Heavily indebted poor countries (HIPC)	1990	45.72388077	468.2710973	0
Heavily indebted poor countries (HIPC)	1991	46.06182098	496.6188156	0
Heavily indebted poor countries (HIPC)	1992	46.38306046	363.2163945	0
Heavily indebted poor countries (HIPC)	1993	46.75841141	364.1475313	0
Heavily indebted poor countries (HIPC)	1994	47.34815979	301.9887454	0
Heavily indebted poor countries (HIPC)	1995	47.36819077	341.6410048	0
Heavily indebted poor countries (HIPC)	1996	47.83016968	361.9767972	0
Heavily indebted poor countries (HIPC)	1997	48.57666016	368.6912749	0
Heavily indebted poor countries (HIPC)	1998	49.08264923	370.8754707	0
Heavily indebted poor countries (HIPC)	1999	49.91112137	362.8051958	2.685290098
Heavily indebted poor countries (HIPC)	2000	50.49876022	381.7520747	2.565020084
Heavily indebted poor countries (HIPC)	2001	51.86756134	357.8043726	2.658449888
Heavily indebted poor countries (HIPC)	2002	52.37380981	377.025503	2.580104947
Heavily indebted poor countries (HIPC)	2003	52.95256042	415.2224922	0
Heavily indebted poor countries (HIPC)	2004	54.37559891	465.1838684	2.803959966
Heavily indebted poor countries (HIPC)	2005	53.61996078	518.0122093	2.837270021
Heavily indebted poor countries (HIPC)	2006	52.07809067	590.4667571	2.819999933
Heavily indebted poor countries (HIPC)	2007	53.55432129	685.4545998	0
Heavily indebted poor countries (HIPC)	2008	53.89402008	792.1617003	2.750200033
Heavily indebted poor countries (HIPC)	2009	54.03974915	764.0568703	3.131605029
Heavily indebted poor countries (HIPC)	2010	54.88135147	806.8135579	3.343889952
Heavily indebted poor countries (HIPC)	2011	56.94076157	869.2272511	3.124369979
Heavily indebted poor countries (HIPC)	2012	58.23162842	874.7117298	3.310644984
Heavily indebted poor countries (HIPC)	2013	59.26762009	955.1945963	3.454459906
Heavily indebted poor countries (HIPC)	2014	60.12533188	982.6315078	3.325690031
Heavily indebted poor countries (HIPC)	2015	60.60031891	917.7214597	3.570609927
Heavily indebted poor countries (HIPC)	2016	61.43769836	901.3248931	3.188679934
Heavily indebted poor countries (HIPC)	2017	62.5403595	940.7673999	3.63261497
Heavily indebted poor countries (HIPC)	2018	63.87129974	977.2792262	3.39011991
Heavily indebted poor countries (HIPC)	2019	64.20760345	985.5908764	3.483335018
Heavily indebted poor countries (HIPC)	2020	64.4329071	968.1333675	3.599224925

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Heavily indebted poor countries (HIPC)	2021	64.94760132	1047.734015	3.395879984
Heavily indebted poor countries (HIPC)	2022	65.21852112	1110.130433	3.224499941
Heavily indebted poor countries (HIPC)	2023	0	1245.019656	0
Latin America & Caribbean (excluding high income)	1990	83.59468842	2416.161317	0
Latin America & Caribbean (excluding high income)	1991	84.24974823	2553.53295	0
Latin America & Caribbean (excluding high income)	1992	84.87783051	2721.907062	0
Latin America & Caribbean (excluding high income)	1993	85.52954865	3222.507246	0
Latin America & Caribbean (excluding high income)	1994	86.15093994	3741.508391	0
Latin America & Caribbean (excluding high income)	1995	86.78253937	3921.006676	0
Latin America & Caribbean (excluding high income)	1996	87.11849213	4209.756214	0
Latin America & Caribbean (excluding high income)	1997	87.45191956	4520.318961	0
Latin America & Caribbean (excluding high income)	1998	87.80683136	4487.531188	3.645864964
Latin America & Caribbean (excluding high income)	1999	88.13613129	3924.491072	3.800620079
Latin America & Caribbean (excluding high income)	2000	88.4030304	4275.555716	3.948930025
Latin America & Caribbean (excluding high income)	2001	88.59390259	4109.867093	4.04286015
Latin America & Caribbean (excluding high income)	2002	88.74488068	3650.292031	3.883855104
Latin America & Caribbean (excluding high income)	2003	89.61829376	3678.462948	3.535049915
Latin America & Caribbean (excluding high income)	2004	89.5352478	4137.701046	3.974479914
Latin America & Caribbean (excluding high income)	2005	90.05692291	4940.247216	4.4790802
Latin America & Caribbean (excluding high income)	2006	89.91970825	5692.79514	4.372174978
Latin America & Caribbean (excluding high income)	2007	90.51132202	6643.877037	4.462600231
Latin America & Caribbean (excluding high income)	2008	90.78736877	7593.117527	4.844409943
Latin America & Caribbean (excluding high income)	2009	91.09883881	6959.748031	5.463550091
Latin America & Caribbean (excluding high income)	2010	91.09777832	8613.655127	4.926769972
Latin America & Caribbean (excluding high income)	2011	91.78595734	9944.482587	4.916270018
Latin America & Caribbean (excluding high income)	2012	92.03304291	9791.838689	5.224464893
Latin America & Caribbean (excluding high income)	2013	92.10153198	9939.83042	5.004640102
Latin America & Caribbean (excluding high income)	2014	92.51148224	9872.411055	5.257470131
Latin America & Caribbean (excluding high income)	2015	92.6756897	8297.302258	4.998700142
Latin America & Caribbean (excluding high income)	2016	93.16713715	7968.022179	4.477210045
Latin America & Caribbean (excluding high income)	2017	93.25913239	8788.654343	4.526865005
Latin America & Caribbean (excluding high income)	2018	93.39646149	8446.455053	4.461549997
Latin America & Caribbean (excluding high income)	2019	93.89241791	8245.295661	4.555345058
Latin America & Caribbean (excluding high income)	2020	93.91342926	6882.220608	4.603859901
Latin America & Caribbean (excluding high income)	2021	94.1902771	7916.81292	3.973500013
Latin America & Caribbean (excluding high income)	2022	94.34609222	9033.75538	3.917050004
Latin America & Caribbean (excluding high income)	2023	0	10070.44338	0
Least developed countries: UN classification	1990	44.99671173	366.9148115	0
Least developed countries: UN classification	1991	45.25144958	392.2022972	0
Least developed countries: UN classification	1992	45.77349854	300.7432169	0

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Least developed countries: UN classification	1993	46.2151413	307.245819	0
Least developed countries: UN classification	1994	47.09207153	293.5376073	0
Least developed countries: UN classification	1995	47.85871124	293.3868574	0
Least developed countries: UN classification	1996	48.38576889	299.7580555	0
Least developed countries: UN classification	1997	49.10992813	307.2418697	0
Least developed countries: UN classification	1998	50.71712875	303.9074045	0
Least developed countries: UN classification	1999	51.60596848	305.7032999	2.568530083
Least developed countries: UN classification	2000	52.00701141	338.9935662	2.593400002
Least developed countries: UN classification	2001	52.86777878	317.916465	2.682824969
Least developed countries: UN classification	2002	53.58768082	338.8104128	2.580104947
Least developed countries: UN classification	2003	54.27254868	373.7230003	0
Least developed countries: UN classification	2004	55.45003128	418.829979	2.566900015
Least developed countries: UN classification	2005	55.23220825	481.692155	2.837270021
Least developed countries: UN classification	2006	52.76303864	543.9789712	2.830970049
Least developed countries: UN classification	2007	53.82540894	638.044345	0
Least developed countries: UN classification	2008	54.08395004	764.2475419	2.750200033
Least developed countries: UN classification	2009	54.65924835	739.2771689	2.920000076
Least developed countries: UN classification	2010	57.18325043	815.6469596	3.343889952
Least developed countries: UN classification	2011	57.32062149	907.9360122	3.171119928
Least developed countries: UN classification	2012	58.12456131	926.0868521	3.082000017
Least developed countries: UN classification	2013	59.48825836	984.5806746	3.244534969
Least developed countries: UN classification	2014	60.27825928	1033.334449	2.937809944
Least developed countries: UN classification	2015	61.52569962	968.1238895	3.217999935
Least developed countries: UN classification	2016	63.52428818	961.0529416	2.911339998
Least developed countries: UN classification	2017	64.46736145	1026.568708	2.946855068
Least developed countries: UN classification	2018	64.68551636	1066.181355	3.198354959
Least developed countries: UN classification	2019	65.81971741	1098.407539	3.013000011
Least developed countries: UN classification	2020	66.04328156	1082.992921	3.242499948
Least developed countries: UN classification	2021	66.61650085	1152.852423	3.110499978
Least developed countries: UN classification	2022	66.96414948	1267.004415	3.210999966
Least developed countries: UN classification	2023	0	1307.650175	0
Middle East & North Africa	1990	58.23571014	2908.241391	0
Middle East & North Africa	1991	59.51876068	2085.368627	0
Middle East & North Africa	1992	60.49935913	2218.289205	0
Middle East & North Africa	1993	61.3924408	2205.003142	0
Middle East & North Africa	1994	62.19766998	2285.601519	0
Middle East & North Africa	1995	63.81457138	2468.358703	0
Middle East & North Africa	1996	65.12471008	2688.795504	4.671569824
Middle East & North Africa	1997	66.04062653	2760.065417	0
Middle East & North Africa	1998	67.25557709	2644.031468	0
Middle East & North Africa	1999	68.3557663	2817.332827	0
Middle East & North Africa	2000	69.23674011	3091.713327	0
Middle East & North Africa	2001	70.50839996	3013.454747	6.193160057
Middle East & North Africa	2002	71.02651978	2932.633344	0
Middle East & North Africa	2003	74.09117126	3205.262523	0

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Middle East & North Africa	2004	74.70030212	3706.475913	5.371479988
Middle East & North Africa	2005	74.46501923	4350.510776	4.794429779
Middle East & North Africa	2006	74.54418945	4993.873469	4.717202902
Middle East & North Africa	2007	75.23201752	5763.882095	0
Middle East & North Africa	2008	75.84242249	7032.085697	4.466135025
Middle East & North Africa	2009	75.86177063	6163.519633	4.509464979
Middle East & North Africa	2010	76.66654968	7086.154552	0
Middle East & North Africa	2011	77.35668945	8365.338557	0
Middle East & North Africa	2012	79.85405731	8838.399073	4.742109776
Middle East & North Africa	2013	77.86290741	8518.954105	0
Middle East & North Africa	2014	81.56906128	8403.789856	0
Middle East & North Africa	2015	79.55847931	7266.659229	0
Middle East & North Africa	2016	80.59259033	7204.573744	0
Middle East & North Africa	2017	81.51193237	7380.405699	3.733449936
Middle East & North Africa	2018	79.00978851	7607.522629	0
Middle East & North Africa	2019	79.34100342	7501.968964	3.558979988
Middle East & North Africa	2020	79.7623291	6665.217177	0
Middle East & North Africa	2021	80.01225281	7775.551951	0
Middle East & North Africa	2022	80.35758972	9116.772783	0
Middle East & North Africa	2023	0	8561.886485	0
Sub-Saharan Africa (excluding high income)	1990	52.3336792	722.6844894	0
Sub-Saharan Africa (excluding high income)	1991	52.8059082	756.5113717	0
Sub-Saharan Africa (excluding high income)	1992	53.16691971	665.7730208	0
Sub-Saharan Africa (excluding high income)	1993	53.71892166	659.3265871	0
Sub-Saharan Africa (excluding high income)	1994	54.42776108	657.0173753	0
Sub-Saharan Africa (excluding high income)	1995	54.72232056	814.5005901	0
Sub-Saharan Africa (excluding high income)	1996	55.34027863	884.31823	0
Sub-Saharan Africa (excluding high income)	1997	56.18748856	908.356157	0
Sub-Saharan Africa (excluding high income)	1998	56.86299133	887.2467146	0
Sub-Saharan Africa (excluding high income)	1999	57.72032928	617.0115681	3.081229925
Sub-Saharan Africa (excluding high income)	2000	56.24827957	637.2644878	2.646094918
Sub-Saharan Africa (excluding high income)	2001	57.48923111	593.6993583	2.903909922
Sub-Saharan Africa (excluding high income)	2002	57.97988892	629.391682	2.896229982
Sub-Saharan Africa (excluding high income)	2003	58.34194183	772.0722432	0
Sub-Saharan Africa (excluding high income)	2004	59.86169052	933.455364	3.077780008
Sub-Saharan Africa (excluding high income)	2005	58.89062119	1078.308697	3.309639931
Sub-Saharan Africa (excluding high income)	2006	60.25033951	1237.90227	2.920444965
Sub-Saharan Africa (excluding high income)	2007	57.71216965	1394.513406	0
Sub-Saharan Africa (excluding high income)	2008	57.87607956	1537.987608	3.063070059
Sub-Saharan Africa (excluding high income)	2009	58.64847183	1429.293399	3.131605029
Sub-Saharan Africa (excluding high income)	2010	59.20811081	1645.007577	3.379944921
Sub-Saharan Africa (excluding high income)	2011	60.7833786	1798.963796	3.286035061
Sub-Saharan Africa (excluding high income)	2012	61.96463013	1818.028923	3.472759962
Sub-Saharan Africa (excluding high income)	2013	62.82595825	1880.797931	3.689529896
Sub-Saharan Africa (excluding high income)	2014	63.50904083	1908.353803	3.384880066

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Sub-Saharan Africa (excluding high income)	2015	64.12805939	1653.005847	3.714699984
Sub-Saharan Africa (excluding high income)	2016	64.85732269	1467.521771	3.434789896
Sub-Saharan Africa (excluding high income)	2017	65.21926117	1526.787372	3.736540079
Sub-Saharan Africa (excluding high income)	2018	66.67989349	1628.776772	3.507725
Sub-Saharan Africa (excluding high income)	2019	67.40724945	1630.558574	3.54052496
Sub-Saharan Africa (excluding high income)	2020	67.54411316	1489.604641	3.819000006
Sub-Saharan Africa (excluding high income)	2021	67.58847809	1635.202189	3.41899991
Sub-Saharan Africa (excluding high income)	2022	67.7116394	1700.186414	3.378859997
Sub-Saharan Africa (excluding high income)	2023	-	1635.242113	-