ECONOMIC & SOCIAL REVIEW

AESR VOL 11 NO 1 (2023) P-ISSN 2576-1269 E-ISSN 2576-1277

Available online at https://www.cribfb.com
Journal homepage: https://www.cribfb.com/journal/index.php/aesr
Published by CRIBFB, USA

DETERMINANTS OF GDP PER CAPITA IN BANGLADESH: AN EMPIRICAL STUDY

Md. Idris Ali [(a)] *Md. Faisal-E-Alam* [(b)1]

[(a)] *Assistant Professor (Statistics), Department of Business Studies, North Bengal International University, Rajshahi, Bangladesh; E-mail: idris.stat@gmail.com*
[(b)] *Assistant Professor, Department of Management Studies, Begum Rokeya University, Rangpur, Bangladesh; E-mail: faisal14.ru@gmail.com*

ARTICLE INFO

Article History:

Received: 8th August 2023
Revised: 26th October 2023
Accepted: 27th October 2023
Published: 28th October 2023

Keywords:

GDP per capita, Inflation Rate, Exchange Rate, Total Reserves (includes gold and USD)

JEL Classification Codes:

E31, F31, O47

ABSTRACT

When making cross-country comparisons regarding the well-being and economic conditions of a population, GDP per capita is the most commonly used indicator. Hence, various economic indicators can affect GDP per capita. This study investigates the impact of inflation, exchange rate, and total reserves (including gold and USD) on GDP per capita in Bangladesh. The study employs a quantitative approach and follows a longitudinal research design. Time series data from 2012 to 2021 is collected using a stratified random sampling technique from the World Development Indicators provided by the World Bank. A range of statistical tests, such as Normality Test, Multivariate Outlier Analysis (Mahalanobis Distance), Multicollinearity Assessment (Tolerance and VIF), Goodness-of-Fit (GoF) Test, ANOVA Test, and Multiple Regression Analysis, were performed using SPSS v.22. The results reveal that exchange rate has a significant influence on GDP per capita, making it crucial factor for economic development, resilience, and export competitiveness. Total reserves were found to have minimal relation with GDP per capita. In contrast, inflation rate, although adversely impacting GDP per capita, remains important for maintaining overall economic stability. Thus, the findings of this study suggest that effective currency management is paramount for economic development.

INTRODUCTION

Gross Domestic Product (GDP) measures a nation's total monetary value of goods and services produced within its borders in a specific time frame. Bangladesh has been experiencing economic growth, and its per capita income has been steadily increasing over the years (Ferdous et al., 2019). The GDP per capita serves as a key indicator of a country's economic health, providing insight into the average income and living standards of its citizens (Dynan & Sheiner, 2018). GDP per capita has a greater impact on cross-country happiness variation than the Human Development Index (Dipietro & Anoruo, 2006). It is a metric commonly utilized by scholars and policymakers to formulate strategies in both the public and private sectors (Voumik & Smrity, 2020). For a developing nation like Bangladesh, this metric takes on even greater significance, as it reflects the progress and prosperity of a population of over 160 million people (Huque & Khan, 2017). Numerous factors influence GDP per capita (Formánek, 2019), among which inflation, exchange rate (Semuel & Nurina, 2014), and total reserves play pivotal roles.

Bangladesh is a democratic country, but the notion that all democratic countries have a high GDP per capita is not universally true. For instance, while Qatar ranks high in GDP per capita, it does not show a strong democratic system (Ilter, 2017). The economy of Bangladesh, primarily based on agriculture (Islam et al., 2022), has evolved into a more diversified landscape with significant contributions from the manufacturing and service sectors (Raihan & Khan, 2020). This transformation has been characterized by impressive GDP growth rates and increased foreign direct investment (Abubakar, 2023). Despite these positive developments, Bangladesh faces several economic challenges (Sawada et al., 2018). Like

[1]*Corresponding author: ORCID ID: 0000-0002-7341-7945*

https://doi.org/10.46281/aesr.v11i1.2106

To cite this article: Ali, M. I., & Faisal-E-Alam, M. (2023). DETERMINANTS OF GDP PER CAPITA IN BANGLADESH: AN EMPIRICAL STUDY. *American Economic & Social Review*, *11*(1), 1-7. https://doi.org/10.46281/aesr.v11i1.2106

recurring inflation concerns, exchange rate volatility, the need to maintain adequate reserves, and the necessity for well-informed policy decisions to address these issues and promote sustainable economic growth. The quest to understand how these critical economic factors interrelate and influence a nation's GDP per capita has fueled extensive academic investigation. Therefore, this study aims to explore the impact of these economic variables on GDP per capita in Bangladesh.

GDP per capita is a critical tool for the government to form tax policies, social welfare programs, and infrastructure development initiatives (Teshome, 2006). Also, the factors of Human Development Index (HDI), such as life expectancy, educational attainment, and decent living standards within a country, are interconnected with its economic growth, which is evident in GDP per capita (Elistia & Syahzuni, 2018). Understanding how inflation, exchange rate, and total reserves affect GDP per capita in Bangladesh can inform decisions on monetary and fiscal measures to control inflation, stabilize exchange rate, and maintain adequate reserves. Moreover, this study may aid investors and businesses in making informed choices in a constantly evolving economic environment. Furthermore, it can contribute to the academic literature by adding knowledge about the specific context of Bangladesh, which may also have implications for other emerging economies.

The remaining part of this study first covers a detailed literature review, highlighting existing studies in the field. Then, the materials and methods section is explained. The results section presents the study's findings, while the discussions section determines their implications for Bangladesh's economic development and policymaking. Finally, the conclusions section contains the key findings, limitations, and potential future research directions in this context.

LITERATURE REVIEW

In the evolving realm of economic theory and practice, the effect of economic factors on GDP per capita stands as a focal point of inquiry, as shown distinctly in the following reviews.

A long-standing debate in economics revolves around determining whether changes in inflation are primarily driven by demand-side factors resulting from increased economic activity or by supply-side factors arising from increased costs. Milton Friedman, in 1963, penned the famous phrase, "Inflation is, in every case, a monetary phenomenon." In simple terms, inflation can have both positive and negative impacts on GDP per capita. When inflation is moderate and controlled, it can stimulate economic growth by encouraging spending and investment. However, if inflation becomes too high and unpredictable, it can erode the purchasing power of individuals and lead to economic instability. The inflation rate and GDP per capita growth rate are co-integrated (Feyera, 2015). But the study did not provide specific finding related to the impact of inflation rate on GDP per capita. Barro (1995) found that higher inflation rates are associated with lower growth rates of real per capita GDP and a decrease in the ratio of investment to GDP. Gillman & Kejak (2011) argued that inflation negatively affects output growth, investment, and the real interest rate in the long run. The interaction between inflation rate and GDP per capita is a complex area of study that seeks to comprehend how changes in prices impact the financial security of a nation's people and the strength of its economy.

In the domain of open economies, the optimal choice of an exchange rate system has also been a subject of debate. Modern analysts have argued in favor of flexible exchange rate over fixed ones, citing that flexible rate offers better protection against foreign economic shocks (Islam & Biswas, 2009). However, the impact of the exchange rate on GDP per capita refers to how changes in a country's exchange rate can affect its GDP per capita. The exchange rate is the rate at which one country's currency can be exchanged for another, and it plays a vital role in international trade of a nation. Exchange rate can impact a country's GDP per capita through its effect on trade (Broda, 2004). A strong domestic currency can make a country's exports more expensive, potentially reducing exports and affecting economic growth. Conversely, a weaker currency can boost exports (Morrissey, 2005) and contribute to GDP per capita growth. A weaker currency may also make imports more expensive, encouraging domestic consumers to purchase locally produced goods, which can further stimulate economic growth. However, it can also lead to inflation if not managed effectively (Singh, 2013). Exchange rate significantly impacts a nation's trade balance, which, in turn, has a profound effect on both exports and imports, ultimately shaping a country's economic progress.

A nation's total reserves have a significant impact on its economic standing, and the international financial market assesses the nation's creditworthiness and the effectiveness of its monetary policies based on these reserves (Salan et al., 2023). Adequate total reserves can help stabilize a country's exchange rate. A stable exchange rate, in turn, provides a conducive environment for international trade and investment. A stable currency encourages foreign investors to invest in the country, which can lead to economic growth. Reserve accumulation depreciates the real exchange rate and attracts FDI, which endogenously promotes productivity growth (Matsumoto, 2018). Moreover, reserve accumulation is positively associated with domestic private investment in the long-run (Mahraddika, 2019). One study found a positive correlation between the level of reserves and GDP per capita, suggesting that higher level of reserves can contribute to economic growth (Bentum-Ennin, 2014). The demand for international reserves by many developing countries has been dominated by precautionary motives against possible domestic and external uncertainties, crises, sudden stops in capital inflows, and macroeconomic fragilities (Ayhan & Turgutlu, 2015). In light of these findings, maintaining the total reserves is not only essential for economic stability but also plays an essential role in driving economic advancement.

This section reviews the effect of each individual independent variable on the dependent variable as a predictor of GDP per capita in Bangladesh. It is also worth noting that no previous study has observed these relationships simultaneously. Consequently, this study formulates the following three alternative hypotheses to determine and establish the aforesaid relationships:

H_1: There is a significant positive connection between inflation rate and GDP per capita.

H_2: Exchange rate has a significant impact on GDP per capita.

H_3: Total reserves, including gold and USD, are positively correlated with GDP per capita.

MATERIALS AND METHODS

Research Approach and Design

This study employs a quantitative research approach. A quantitative approach is chosen for its ability to systematically analyze numerical data and draw statistical inferences about the relationships between variables. The study design also incorporates the longitudinal framework.

Data Collection

This study followed a stratified random sampling method to select the dataset. The dataset spans a ten-year period from 2012 to 2021. It comprises economic variables sourced from the World Development Indicators, a reliable data repository provided by the World Bank. The selected variables include inflation rate (IR), exchange rate (ER), total reserves including gold and current USD (TR), and GDP per capita (GDPC).

Data Analysis Tools

In the data analysis phase, a series of statistical tests were applied to the dataset using SPSS v.22. A Normal Probability Plot (P-P plot) was used to evaluate the normal distribution of data, a critical assumption for parametric tests. Multivariate outlier detection through Mahalanobis Distance assessed the presence of multivariate outliers, a prerequisite for addressing potential anomalies in the dataset. A Multicollinearity Test with Tolerance and Variance Inflation Factor (VIF) determined the independence of predictor variables. Prior to presenting the Multiple Linear Regression model, a Goodness-of-Fit (GoF) Test and ANOVA Test were conducted. These critical components offered a complete view of the model's performance and statistical significance. The core analysis involved Multiple Linear Regression, which modeled the relationship between independent variables (IR, ER, and TR) and the dependent variable (GDPC). This analysis provided coefficients with statistical validity for each predictor variable. The outcomes of these statistical tests are showcased in graphical and tabular formats.

Inclusion and Exclusion Criteria

Data collected from 2012 to 2021 was included to capture a substantial time frame. Selected variables encompassed IR, ER, TR, and GDPC due to their economic significance. However, variables unrelated to economic factors, such as social or demographic factors, were also excluded to keep the study centered on economic aspects.

Ethical Considerations

Ethical issues in this study primarily involve data collection and usage. The researchers have adhered to ethical guidelines by sourcing data from reliable and reputable sources, such as the World Development Indicators provided by the World Bank. Privacy and confidentiality have been maintained, as no individual-level data or personally identifiable information was used.

RESULTS

Normal Probability Plot Test

The normal probability plot displaying a fairly straight diagonal line is a strong indicator that the sample data follows a normal distribution. This means the data is symmetrically distributed around the mean, providing a solid foundation for conducting analyses and making valid statistical inferences that rely on the assumption of normality (see figure 1).

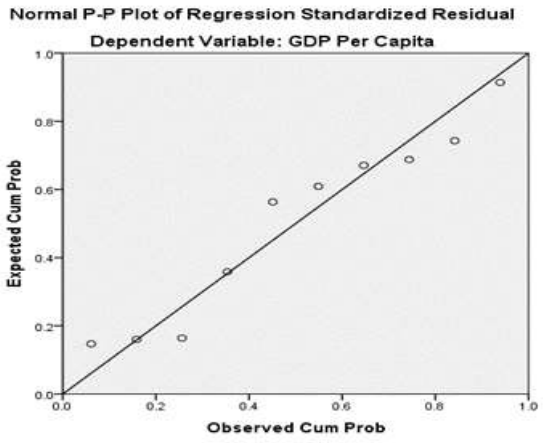

Figure 1. Normal Probability Plot of Regression Standardized Residual
Source: Authors' Calculation

Multivariate Outlier Detection

Mahalanobis Distance is a common metric for detecting multivariate outliers. For this study, the maximum Mahalanobis Distance observed is 5.879. This value is less than the critical value of 16.27 for Mahalanobis Distance with 3 degrees of freedom (df), as stated by Mahalanobis (1936). The maximum distance is lower than the critical value suggests that the data

points do not uncover extreme multivariate relationships. As a result, the dataset can be considered relatively free from multivariate outliers based on this analysis (see table 1).

Table 1. Residuals Statistics for outlier detection by using Mahalanobis Distance

	Minimum	Maximum	Mean	Std. Deviation	N
Mahal. Distance	0.881	5.879	2.700	1.691	10

Source: Authors' Calculation

Multicollinearity Test

Table 2 provides collinearity statistics, specifically Tolerance and Variance Inflation Factor (VIF), which are crucial indicators for assessing multicollinearity in the dataset. Notably, the calculated values of Tolerance for all the independent variables are less than 1.00, and the corresponding VIF values are also less than 10. This outcome implies that there are no significant issues with multicollinearity. Tolerance values below 1.00 suggest that each independent variable contributes to the regression model independently, while VIF values under 10 further affirm that there is no excessive redundancy or correlation among the predictors (Chatterjee & Hadi, 2006). These findings provide assurance that the parameter estimates of regression model are reliable. In light of the absence of multicollinearity concerns, the dataset is well-suited for multivariate analysis.

Table 2. Analysis of Multicollinearity Using Variance Inflation Factor (VIF) Statistics

	Tolerance	VIF
Inflation Rate	.441	2.267
Exchange Rate (in USD)	.544	1.837
Total reserves (including gold and current USD)	.458	2.186

Source: Authors' Calculation

Goodness-of-Fit (GoF) Test

The model summary table shows an overview of the regression model's performance. The coefficient of determination, R-squared (R^2), stands at 0.965, indicating that approximately 96.50% of the variance in GDP per capita is accounted for by the included independent variables, namely inflation rate, exchange rate, and total reserves (including gold and current USD). This high R-squared value underscores the strong explanatory power of the model, signifying that the selected predictors collectively provide an excellent fit for the variation in GDP per capita. Additionally, the adjusted R-square value, which adjusts for the number of predictors, remains notably high at 0.947, further confirming the model's goodness of fit. With a low standard error of the estimate, which is 129.188, the model demonstrates a strong ability to predict GDP per capita (see table 3).

Table 3. Model Summary

R	R Square	Adjusted R Square	Std. Error of the estimate
0.982	0.965	0.947	129.188

Source: Authors' Calculation

ANOVA Test

On the basis of the results of the F test below, the value of the calculated F Statistic is 55.111, with a probability (F-Statistic) of 0.000, which is smaller than the significance level set at 5%. Therefore, the regression model, as a whole is deemed to be statistically significant. This highly significant F Statistic accentuates the model's effectiveness in explaining variation in the dependent variable and advocates the importance of the included independent variables in enhancing our understanding of the phenomenon under investigation. Consequently, the regression model can be considered a powerful tool for making inferences related to the specific analysis (see table 4).

Table 4. Results of ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	2759336.739	3	919778.913	55.111	0.000
Residual	100136.861	6	16689.477		
Total	2859473.600	9			

Source: Authors' Calculation

Multiple Regression Analysis

In the regression equation, each independent variable holds a distinct role in explaining the variation in GDP per capita. Each coefficient represents the estimated change in the dependent variable for a one-unit change in the corresponding independent variable, while keeping all other variables constant. For the variable IR, the coefficient is negative, at -74.851, and its associated p-value is 0.455, which is greater than the significance level of 0.05. This finding suggests that IR has a negative relationship with GDP per capita, which is statistically insignificant. Conversely, ER shows statistical significance at the 5% level. This indicates the substantial impact of ER on GDP per capita. The coefficient is extremely small for TR

(B = 0.00000003824, $p<0.05$), specifying that this particular independent variable has a very low impact on the dependent variable (see table 5).

Table 5. Coefficients of Multiple Linear Regression

Model	Unstandardized Coefficients			
	B	Std. Error	t	p
(Constant)	-3382.721	1810.742	-1.868	.111
IR	-74.851	93.756	-.798	.455
ER	53.333	18.926	2.818	.030
TR	3.824E-8	.000	6.228	.001

Source: Authors' Calculation

DISCUSSIONS

The study findings hold important implications for policymakers and stakeholders in Bangladesh. The first hypothesis is not supported by the outcomes of this study. Close attention to inflation patterns in Bangladesh is required (Hassan & Shakur, 2017). While this variable exhibits a negative connection with GDP per capita, it remains important to control inflation for managing economic fluctuations and achieving price stability. Several studies have also confirmed that inflation and GDP per capita are inversely related (Ilter, 2017; Ayyoub et al., 2011). The second hypothesis is accepted, validating a significant impact of the exchange rate on GDP per capita (Salan et al., 2023). Effective management of exchange rate also enhances a country's resilience against global economic challenges, such as currency crises or economic recessions. It provides a buffer that can be used to stabilize the economy during periods of uncertainty, protecting businesses and jobs. In addition to these benefits, a favorable exchange rate can boost the competitiveness of exports, especially in labor-intensive industries like textiles and garments in Bangladesh. This can generate an expansion of the export sector, creating a positive trade balance and contributing to GDP per capita growth. Such growth can also enhance the livelihoods of workers in those industries and potentially reduce income inequality. Further, a fixed exchange rate sends positive signals to foreign investors. This can result in increased foreign direct investment (FDI) inflows (Hossain, 2008), which are necessary for economic growth. Attracting foreign capital through FDI can lead to the creation of new industries, technological advancements, and employment opportunities, also driving GDP per capita growth (Shourave, 2020). The third hypothesis finds support in the presence of a notably weaker connection between total reserves and GDP per capita. Although, accumulating reserves does not necessarily represent a prerequisite or guarantee of economic growth (Polterovich & Popov, 2003). Because, total reserves are more related to a nation's capacity to manage its external financial obligations and maintain confidence in its currency (Qian & Steiner, 2017). Policymakers can use this information to create more effective economic strategies for sustainable improvements in GDP per capita, ultimately enhancing citizens' quality of life.

CONCLUSIONS

This study specifically identifies the role of exchange rate on variation in GDP per capita in case of Bangladesh. The results also illustrate a substantially weak link between total reserves and GDP per capita as well as an adverse link between inflation and GDP per capita. The considerations from this study illuminate the path to economic growth, stressing the significance of currency management, sensible investments, and the need for inflation control. Further, developing countries like Bangladesh should increase their development budgets while reducing non-developmental expenditures, as this strategy plays a significant role in controlling inflation, reducing unemployment, and enhancing economic growth. This study not only serves as a beacon for Bangladesh's policymakers but also contributes to the comprehensive dialogue on economic development. However, this study primarily employs economic factors, potentially overlooking social and demographic factors, such as transparency ranking and population growth that can significantly influence GDP per capita. Further, the exclusion of other relevant macroeconomic indicators, including the unemployment rate, gross national product, purchasing power parity, and poverty level, may restrict the breadth of analysis. To address these limitations, future research efforts could explore a wider range of variables that affect economic growth. Additionally, comparative studies involving multiple countries or regions could provide a broader perspective on the relationships observed here, further advancing our knowledge of economic development processes.

Author Contributions: "Conceptualization, M.I.A. and M.F.A.; Methodology, M.I.A. and M.F.A.; Software, M.I.A. and M.F.A.; Validation, M.I.A. and M.F.A.; Formal Analysis, M.I.A. and M.F.A.; Investigation, M.I.A. and M.F.A.; Resources, M.I.A. and M.F.A.; Data Curation, M.I.A. and M.F.A.; Writing – Original Draft Preparation, M.I.A. and M.F.A.; Writing – Review & Editing, M.I.A. and M.F.A.; Visualization, M.I.A. and M.F.A.; Supervision, M.I.A. and M.F.A.; Project Administration, M.I.A. and M.F.A.; Funding Acquisition, M.I.A. and M.F.A. Authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Ethical review and approval were waived for this study, due to that the research does not deal with vulnerable groups or sensitive issues.

Funding: The authors received no direct funding for this research.

Acknowledgement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions.

Conflicts of Interest: The authors declare no conflict of interest.

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