Revisiting the Dynamics of Public Debt and Economic Growth in Developing Nations

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Abstract: *This paper investigates the impact of external debt on economic growth of sixty-three less-developed countries over a period of 1981 to 2023. Fixed effect model has been used for regression analysis. The study finds a negative correlation between external debt and the economic growth rate of less-developed countries. In contrast, control variables such as Gross Capital Formation (GCF) and Trade Openness (TO) exhibit a positive and strong relationship with GDP growth. Meanwhile, Foreign Direct Investment (FDI), due to its relatively low share as a percentage of GDP, shows an insignificant impact on economic growth.*

Keywords: Economic Growth, Public Debt, Less-developed Countries, Fixed Effect

JEL classification: O47, H63, C820

1. Introduction

The relationship between external debt and economic growth in less-developed countries remains a topic of intense academic and policy debate. While external borrowing can play a vital role in financing infrastructure projects, enhancing human capital, and promoting industrial development, its effectiveness largely depends on how the funds are utilized and whether the debt levels remain sustainable.

Several studies have identified a positive relationship between external debt and economic growth, particularly in specific regional and developmental contexts. For instance, Uzun, Karakoy, et al. (2012), Olamide and Maradza (2021), and Mahammed (2025) find that external borrowing has a statistically significant positive impact on growth, especially in transition economies and African countries. These findings suggest that, when managed effectively, external debt can supplement domestic savings and drive economic expansion. Meta-analytical evidence further supports this notion. Moore and Thomas (2010) find both linear and non-linear positive relationships between debt and growth, indicating that external debt, in appropriate volumes, can stimulate economic activity. In contrast, numerous studies highlight the adverse effects of external and public debt on economic performance. Research by Dipeitro and Anorua (2012), Shittu, Hassan, et al. (2018), and Onafowora and Owoye (2019) reveals a negative correlation between public debt and GDP, emphasizing the spillover effects of excessive debt on macroeconomic stability. Otieno (2024) notes that debt can hinder growth by crowding out productive investment, while Hilton (2021) identifies a unidirectional causal relationship from debt to GDP, suggesting that rising debt levels can precede economic decline. Several scholars propose a non-linear or inverted-U relationship between external debt and economic growth. This pattern suggests that external debt contributes positively to growth at early stages but becomes detrimental as it surpasses a critical threshold. Studies by Siddiqui and Malik (2001), Ayadi and Ayadi (2008), Westphal and Rother (2012), Calderon and Fuentes (2013), Munier and Mehmood (2018), Chen and Li (2019), and Shittu et al. (2020), among others, consistently demonstrate that while initial borrowing may accelerate development, excessive debt accumulation leads to a "debt overhang," diminishing investor confidence and economic potential. Penzin and Akanegbu (2024) and Elkhalfi, Chaabita, et al. (2024) emphasize that in a volatile global environment, the burden of debt becomes more pronounced, especially for fragile economies. Similarly, Abubakar and Mamman (2021) and Olamide and Maredze (2021) find that while public debt may stimulate short-term growth, its long-term effects are predominantly negative, with the adverse impacts outweighing the initial benefits.

The nature of governance and policy frameworks also plays a crucial role in moderating the debt-growth nexus. Jacobo and Jalile (2017) argue that democratic regimes tend to experience higher growth outcomes due to stronger institutions and accountability. In contrast, Ngcobo et al. (2025) find that in newly democratized African nations, macroprudential policy variables and debt exhibit an S-shaped relationship with economic growth, often leading to unfavorable outcomes in the presence of weak institutions. The concept of a debt threshold beyond which external debt turns harmful has been widely investigated. Panizza and Presbitero (2014), Mensah, Allotey, et al. (2019), and Augustine and Rafi (2023) suggest that once debt-to-GDP ratios surpass a certain level, the growth impact becomes negative. Sharaf (2022) quantifies this threshold, identifying a critical external debt-to-GDP ratio of 96.7%, beyond which debt becomes detrimental to economic progress. From a sustainability perspective, Shanmugam and Ranjith (2022) assert that debt in many less-developed nations is neither sustainable nor welfare-

enhancing. Joy and Panda (2021) observe that among BRICS nations, only China demonstrates debt sustainability, raising concerns about long-term fiscal health in other emerging economies.

It is evident from the existing literature that the relationship between external debt and economic growth is neither uniform nor static. It varies across countries, time periods, and policy environments. While some nations benefit from external debt under prudent fiscal management, others experience significant economic setbacks due to excessive borrowing and poor governance. Given the dynamic nature of the global economy and changing fiscal conditions, there is a growing need for updated empirical analysis using recent data. Future research should focus on identifying the conditions under which external debt supports or hinders growth, with special attention to institutional quality, debt management strategies, and threshold effects. In light of the above, this study aims to examine the impact of external debt on economic growth in the context of less-developed countries. By incorporating recent data and advanced econometric techniques, the research seeks to offer fresh insights and policy recommendations for effective external debt management and long-term economic sustainability.

The paper is structured as follows; Section 2 presents review of literature. Section 3 presents data and model of the study. Section 4 introduce empirical result and discussion and Section 5 concludes.

2. Review of Literature

2.1 Theoretical Perspective

The less-developed nations mostly borrow for financing budget deficit, meet expense of war or recovery after war or pandemic situation and developmental activities. According to the Classical economists the government mostly, focus on the self-restoration and laissez faire policy. Government takes care of law and order and external security of the nation. Full employment is the most fundamental assumption of the Classicals. In classical view public debt is a necessary evil. Neo-classicals like Pigou (1920) supported the welfare aspect of debt. Public debt can help in improving social welfare of a nation. Keynesian (1936) argue that government revenue, expenditure and government debt solely an instrument for the control of community expenditure to stabilization of employment. James Buchanan (1958) called this as modern theory of public debt as new orthodoxy. "Creation of public debt not involve any transfer of the primary real burden to future generation." Musgrave (1950s to 1960s) argued that one generation commitment will have an effect on the next generation. By the large and in line with existing economic theories, three major relationships have been established between economic growth and debt. The relationship could either follow the Keynesian hypothesis (positive), debt overhang hypothesis (negative) or Ricardian-equivalence hypothesis (neutral) (Olamide & Maredza, 2021). For some less-developed nations external debt and growth have positive relation in short run while its long run effect on growth is negative (Abubakar & Mamman, 2021) and in other there is negative or non-linear relation between external debt and

growth (Ayadi & Ayadi,2008) (Calderon & Fuentes,2013) (Afonso & Alves, 2014) (Munier & Mehmood, 2018).

2.2. Review of Empirical Studies

Relationship between external debt and economic growth can be grouped into three main approaches-

Positive approach: Uzun et al. (2012) have tried to analyse the relationship between indebtedness and growth rate of transition countries. The main objective of their study was to analyse the relationship between GDP per capita growth rate and external debt to GNI from the year 1991 to 2009 in ten transition countries. First and second-generation unit root test, LM test and Panel ARDL test statistics have been employed. The result was there is a positive relationship between debt and growth of countries in the long run. Another study by Mohammed (2025) examined the relationship between external debt and economic growth in ten African countries from 2000 to 2022 using a fixed effects model. Driscoll-Kraay & Breusch and Pagan Lagrangian Multiplier test has been employed. The result showed that debt has significant and positive correlation effect on economic growth and inflation has negative and significant effect on the economic growth.

Negative approach: Elkhalf et al. (2024) tried to examine the impact of external debt on economic growth in emerging economic and another objective of their study was to consider the effect of globalization on economic growth. Panel data of ten emerging countries has been taken for study from the year 1990 to 2022. Fixed effect model and Breusch and Pagan Lagrangian Multiplier test statistics have been used. Although external debt may initially favour economic growth, exclusive debt becomes a burden, particularly in a volatile global environment. Globalization amplifies this effect by exposing emerging countries to fluctuation in financial market and international economic crisis. Otieno (2024) also analyse the spillover effect of foreign public debt and FDI on reginal economic growth dynamic of Eastern Africa. Panel data of four countries from the year 1992 to 2019 has been taken by using Durbin Fixed effect. The result was foreign public debt, FDI, GCF, human capital, inflation and government expenditure have significantly spatial spillover effect on region economic growth.

Non-linear approach: Different level of turning point of debt and growth relation were revealed like Siddiqi & Malik (2001) have examined the impact of rising debt burden on economic growth of South Asian countries (Pakistan, India and Sri Lanka) and test for non-linearity relationship. Panel data has been taken from the year 1978 to 1998. Fixed effect model had been used for analysis. The result was found that, presence of non-linear relationship between economic growth and all the indicator of debt burden. Debt-to-GDP, debt-to-export and debt servicing to export indicate the negative impact of debt burden on economic growth. FS Ayadi & FO Ayadi (2008) tried to explore a linier as well as non-liner effect of debt on growth and investment. A comparative study of Nigeria and South Africa had been done in this study from the year 1994 to 2007. Both Ordinary Least Square (OLS) and Generalized Least Square (GLS) are employed in the analysis. The empirical studied showed that negative impact

of debt on growth was confirmed in Nigeria and South Africa. In case of Nigeria non-liner (inverted U relation) effect was present. Westphal & Rother (2012) tried to investigate the impact of government debt on per capita GDP growth. Twelve Euro countries have been taken from the year 1970 to 2008 in this study. Fixed effect model and threshold regression model have been used in this study. The result was found that, there is a non-linear impact of debt on growth and government debt to GDP ratio has a negative impact on the long-term growth. Calderon & Fuentes (2013) have instigated whether public debt hinders growth and explores whether economic policy ameliorates this effect. 136 countries taken into consideration from the year 1970 to 2010. Again, all considered countries were sub divided into industrial countries, less-developed countries and Latin American Countries. GMM technique is used. The finding was a negative relationship between public debt and growth as well as non-linearity relationship by the level of development and public debt. Afonso & Alvas (2014) tried to study the effect of public debt on economic growth for annual and 5-year average growth rates, as well as the existence of non-linearity effects of debt on growth. 14 European Countries panel data had been taken from the year 1970 to 2012. Fixed effect model, GLS, 2SLS and threshold model had been used for estimation. The finding showed that debt has negative impact on growth in short run and long run. Inverted U-shaped relationship between debt ratio and economic growth exist. Jacobo & Jalile (2017) tried to investigate the impact of government debt on GDP in sixteen Latin American countries from the year 1960 to 2015. Panel fixed effect, 2SLS and GMM test statistics have been used in their study. The empirical study revealed that highly significant non-liner relationship (inverted U-shaped relationship) between government debt ratio and per capita GDP growth rate. Democratic government trends to exhibit higher growth. Munier & Mehmood (2018) analyse the effect of debt on economic growth as well as the channels, that is investment, Total Factor Productivity (TFP), interest rate, saving channel through which debt affects economic growth in South Asian Countries. Panel data had been taken from the year 1990 to 2013. Fixed effect model had been used for the estimation. The result showed that inverted U-shaped relationship exists between debt and economic growth in South Asian Countries. Debt could affect economic growth as well as private and public investment and TFP. Penzin & Akanegbu (2024) have revisited the relationship between public debt and economic growth with a spotlight on the West African Monetary zone. Both time series and panel data of six West African counties has been taken from the year 2000 to 2019. For time series data ARDL test and for panel data fixed/ random effect model and threshold regression test is used for regression analysis. Debt and economic growth have non-linear relationship obtain in this study.

There were further studies like threshold level debt, signifies the appropriate range of debt which leads to economic growth. Augustine & Rafi (2023) in their study explores the non-linear dynamic relationship between public debt and economic growth by estimating threshold level of debt. Thirty-nine emerging and less-developed countries from the year 1980 to 2019 had been taken in this study. Threshold regression model, Robustness test, Wald test had been used for analysis. Inverted U-shape relationship had been found for

six countries. Debt being growth stimulating factor below the threshold and growth retarding factor above the threshold level. It was found that some countries have growth retardation even at low level of debt. Further there is also study about debt sustainability. Constant debt indicates the debt sustainability of a country. Joy & Panda (2021) have tried to verify the public debt sustainability of BRICS nations as a whole and for individual countries from political-economic perspective. Secondary annual data has been taken from the year 1980 to 2017 for this study. Hodrick-Prescott test, Bohn's sustainability model and robustness test have been used. The empirical study revealed that previous year debt of BRICS countries is generating a positive primary balance. Only China has positive and larger sustainable debt. Election year has negatively affected sustainability. In the same vein, Shanmugam & Ranjith (2022) also tried to investigate debt sustainability of 20 major states of India from the year 2007-08 to 2018-19 by using Bohn Sustainability test. The finding showed that primary balance is the root cause for all forms of deficit. Only three states was debt sustainable and welfare enhancing.

3. Data, Variables and Estimation Techniques

3.1 Data and Variables

The study is based on the secondary unbalanced data from 63 less-developed countries considering the period from 1981 to 2023. 63 less-developed countries are Algeria, Argentina, Bangladesh, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Central Africa Republic, Chad, China, Colombia, Comoros, Costa Rica, Congo Republic, Dominican republic, Ecuador, El Salvador, Fiji, Gabon, Gambia, Ghana, Guatemala, Gunia, Gunia-Bissau, Haiti, Honduras, India, Indonesia, Iran Republic, Jamaica, Jordan, Keniya, Madagascar, Mali, Mauritania, Mauritius, Mexico, Morocco, Nepal, Nicaragua, Niger, Pakistan, Paraguay, Peru, Philippines, Ruanda, Senegal, Sierra Leone, Solomen Islands, Sri Lankas, Sudan, Thailand, Togo, Tunisia, Turiya, Uganda, Vanuatu and Zimbabwe. The data are taken from World Development Indicators (WDI), World Bank. However, the selection of countries is dictated on the basis of availability of data. The dependent variable used in this study is Gross Domestic Product (GDP) growth rate. This study's explanatory variable is taken as external debt stock as a percentage of gross national income Olamide & Maredza (2021) and other control variables are gross capital formation, trade openness and foreign direct investment.

Variable Definition and Sources

S. No.	Variable	Definition	Data Sources
1	GDPR	Gross Domestic Product (GDP) Growth Rate	WDI
2	Debt	External Debt Stock as a percentage of Gross National Income (GNI)	WDI
3	GCF	Gross Capital Formation as percentage of GDP	WDI
4	TO	Trade openness as a percentage of GDP	WDI
5	FDI	Foreign Direct Investment as a percentage of GDP	WDI

*Note: WDI means World Development Indicators

In this study economic growth is used as a dependent variable. Debt (External debt Stocks) as a percentage of Gross National Income (GNI) has taken as independent variables & other control variables are Gross Capital Formation (GCF), trade openness (TO) and Foreign Direct Investment (FDI) are used as a percentage of Gross Domestic Product (GDP).

The standard practice to report for summary statistics is to present observation, mean value, standard deviation, minimum and maximum of variables is adopted. Table-1 represents variables used in the study with summary of descriptive statistics.

Table 1: Descriptive Statistics

Variables	Obs	Mean	Std. dev.	Min	Max
GDPR	2,706	3.55	4.72	-50.2	35.22
Debt	2,708	55.87	58.38	0.30	1233.09
GCF	2,671	22.43	9.02	-2.42	76.78
TO	2,684	60.61	29.13	2.47	193.46
FDI	2,677	2.14	3.26	-28.6	46.27

Source: Author's estimation

A correlation matrix is a table showing the correlation coefficient between different sets of variables. In order to verify the multi-collinearity, cross correlations among the variable's correlation matrix is tested. Table 2 represent the result of the correlation matrix of variables. The table signifies that there is a less correlation among the explanatory variables. It identifies that there is no multi-collinearity in this regression.

Table 2: Correlation Matrix

	GDPR	Debt	GCF	TO	FDI
GDPR	1				
Debt	-0.1426	1			
GCF	0.1967	-0.0684	1		
TO	0.0389	0.1379	0.2506	1	
FDI	0.0955	-0.0559	0.2205	0.307	1

Source: Author's estimation

3.2 Model Specification

The most important things are to select the model for the analysis. In our study GLS random and fixed effect techniques has been used to get coefficient of the explanatory variables. To make a choice between GLS random effect and fixed effect models the Hausman test statistics has been used. The coefficient which are favoured

Table: 3 Random and Fixed Effect
Source: Author's estimation
Note:(**) implies statistical significance at 5 percent level and standard errors in parentheses.
by Hausman test statistics has been considered for further analysis. The model used in this analysis as follows:
GDPR= f (Debt, GCF, TO, FDI)
$$GDPR = \alpha + \beta_1 Debt + \beta_2 GCF + \beta_3 TO + \beta_4 FDI + \lambda_i + \mu_t + \varepsilon_{it}$$
GDPR = Gross Domestic Product (GDP) Growth Rate
Debt = External Debt Stock as a percentage of Gross National Income (GNI)
GCF = Gross Capital Formation as percentage of GDP
TO = Trade openness as a percentage of GDP
FDI = Foreign Direct Investment as a percentage of GDP
α = intercept coefficient

β_i = coefficient of explanatory variables
λ_i = country specific effect
μ_t = time specific effect
ε = random error term
i= 1, 2……,63 (country)
t= time (1981 to 2023)

4. Empirical Results and Discussion

Result of GLS random and fixed effect is shown in table: 3 In the GLS random effect model debt, GCF, FDI are significant at five percent level of significant. On the other hand, in fixed effect all the explanatory variables are significant. Debt is negatively significant with the economic growth in both the random and fixed effects model.

Table 3: Random and Fixed Effect

Dependent variable	GDPR	GDPR
Explanatory variables	Random-effects	Fixed-effects
Debt	-0.0098667** (0.000)	-0.0095376** (0.000)
GCF	0.0895494** (0.000)	0.0847813** (0.000)
TO	0.007329 (-0.100)	0.0201915** (-0.001)
FDI	0.0745579** (-0.013)	0.0754279** (-0.016)
Constant	1.511037** (0.000)	0.819232 (-0.068)
Wald chi2	130.19	
F test		3.34
R-sq:	0.055	0.0449

Source: Author's estimation
Note: "**" at significant 5% level

For choosing appropriate model for analysis Hausman test statistics has been used Elkhalf & et al. (2024). Table:4 shows the result of Hausman test.

Table 4: Hausman Fixed Random

GDPR	fixed	random	Difference	S.E.
Debt	-0.0095376	-0.0098667	0.0003292	0.0006675
GCF	0.0847813	0.0895494	-0.004768	0.0084407
TO	0.0201915	0.0073291	0.0128624	0.0038684
FDI	0.0754279	0.0745579	0.0008699	0.0089414
chi2=11.22		Prob>chi2 = 0.0242		

Source: Author's estimation

Here probability value is 0.0242, which is less than 0.05 (five percent level of significant), it signifies that we reject the null hypothesis (H$_0$) and accept the alternative hypothesis(H$_1$) that fixed- effect is the appropriate.

To check the presence of random effect in the model, Breusch and Pagan Lagrangian Multiplier test, we have applied (Moore & Thomas,2010) Elkhalf et al. (2024) (Mohammed, 2025). It is shown in table- 5 as follows:

Table 5: Breusch and Pagan Lagrangian Multiplier Test for Random Effects

	Var	sd = sqrt (Var)
GDPR	21.84797	4.674181
e	19.54964	4.421498
u	1.061668	1.030373
Test: Var(u) = 0	chibar2(01) = 117.08	Prob > chibar2 = 0.0000

Source: Author's estimation

The variance of the dependent variable, labelled as GDPR, is 21.8 with a standard deviation of 4.7. The variance of the idiosyncratic error term (denoted as "e"), which captures variation within individual units over time, is 19.5 with a standard deviation of 4.4. The variance of the random effect (denoted as "u"), which reflects unobserved heterogeneity across units that remains constant over time, is estimated at 1.06 with a standard deviation of 1.03. The test statistic is large and the p-value is less than 0.05, so we reject the null hypothesis. This suggests that the variance of the random effect (u) is statistically significant, indicating that a random effects model is more appropriate than pooled OLS.

To identify the problem of heteroskedasticity we have use the Breusch-Pagan / Cook-Weisberg test, which is shown in the table 6;

Table 6: Heteroskedasticity Test

Breusch-Pagan / Cook-Weisberg Test for Heteroskedasticity	
Ho: Constant variance	Variables: fitted values of GDPR
chi2 (1) = 94.15	
Prob > chi2 = 0.0000	

Source: Author's estimation

In the Breusch-Pagan/Cook-Weisberg test null hypothesis (H_0) is considered as no heteroskedasticity (homoskedasticity) in the model. As the probability value (p=0.0000) is less than 0.05, we reject the null hypothesis that means the model has heteroskedasticity. For making homoskedasticity we have used robust Fixed-effect model, which is represented in table 7.

Table 7: Fixed-Effects (within) Regression (robust)

GDPR	Coeff.	Std. Err.	t	P>|t|
Debt	-0.0095376**	0.0041918	-2.28	0.026
GCF	0.0847813**	0.024777	3.42	0.001
TO	0.0201915**	0.0093212	2.17	0.034
FDI	0.0754279	0.0492715	1.53	0.131
Cons	0.8192322	0.4634565	1.77	0.082
Correlation with μ_i= -0.2201		Prob > F= 0.0000		
R-sq: 0.0449		rho = 0.08989346		

Source: Author's estimation
Note:(**) implies statistical significance at 5 percent level and standard errors in parentheses.

Table: 7 represent the robust fixed effect analysis. On the above-mentioned result debt, GCF, and TO are significant at five percent level of significant as their probability value is less than 0.05. The t value has to be more than 1.96 (for 95% confidence), indicate that variable has significant influence on dependent variable. The higher the t-value higher the relevance of the variable.

From the above table it is clear that, the main explanatory variable external debt is negatively significant with the economic growth. As one percent increase in external debt will decrease 0.0095 percent of economic growth. It signifies that increase in the debt burden will lead to retardation of economic growth in case of less-developed countries. It is not a good indicator. Debt being growth stimulating factor to a limit, when debt is used for productive purpose (Augustine & Rafi, 2023). Increase in one percent in GCF will lead to the increase in the GDP growth by 0.084 percent. GCF and GDP growth rate has a strong and positive relation in the context of

the less-developed nations has been observed. The other control variable like trade openness also a growth stimulating factor as increase in the trade openness will enhance the economic growth by 0.020 percent of the less-developed countries. Meanwhile, Foreign Direct Investment (FDI), due to its relatively low share as a percentage of GDP, indicate an insignificant impact on economic growth.

The correlation with μ_i represent how much the error term μ_i is correlated with the regressors in the fixed effect model. In our model the error term is correlated by 0.2201 percent with the explanatory variables. The probability value 0.0000 indicate model is good fit in this analysis. "rho" is 0 .08989346 (fraction of variance due to μ_i) indicate that 89 parentage of the variance is due to different across panels. Rho is known as the intraclass correlation.

5. Conclusion

The study investigates the impact of external debt on the economic growth of the less-developed countries using fixed effect model. From the empirical analysis it is observed that external debt negatively affects the economic growth of less-developed countries. It indicates that external debt has causal relationship with economic growth. Other control variable like gross capital formation and trade openness has positive impact on the GDP growth. Foreign Direct Investment is insignificant may be due to low volume. The policy recommendation of this study is for effective external debt management and control over the debt to a limit. Debt should be utilized for productive purpose.

Conflict of Interest: The authors declare that they have no financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

Declaration of originality: We confirm that the work is an original piece of work and has not been submitted anywhere for publication. The submission has been approved by all authors as well as the responsible authorities where the work was conducted.

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