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Fiscal Space, Public Debt Sustainability and Economic Growth: Empirical Inference from the MINT Countries

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Abstract

This study explored the effect of fiscal space and public debt on economic growth in Mexico, Indonesia, Nigeria, and Türkiye (MINT) countries using data from 2000 to 2024. The study proceeded to establish sustainable debt level for the MINT countries as a whole. With the panel autoregressive distributed lag (PARDL) model estimation technique, our findings show that while fiscal space (measured by deficit-GDP ratio) exerts significant positive effect on the economic growth of the MINT countries, debt sustainability (measured as the debt-GDP ratio) exerts significant negative effect on economic growth of the growth. The estimate shows that a 1% increase in debt results to about 0.1227% and 0.2979% decrease in the economic growth of the MINT countries in the long run and short run respectively. On the country-specific level, the PARDL model shows that though all the MINT countries experience negative effect of debt on economic growth, the greatest negative impact is being felt by Türkiye. From the smooth transition regression analysis, a threshold debt-GDP ratio of 21.30% was established for the MINT countries. Operating below this threshold level yield positive effect on economic growth while operating beyond this threshold level reduces economic growth significantly by about 0.4627% on average. This therefore calls for fiscal sustainability practices for the MINT countries. It was recommended that these countries should stick to the established threshold of debt-GDP ratio in order to reap the gains of borrowing for growth.

Keywords:

Public debt, fiscal deficit, economic growth, threshold analysis, fiscal sustainability.

1. INTRODUCTION

The macroeconomic performance of all MINT nations (Mexico, Indonesia, Nigeria and Turkey) has exhibited resilient in the 21st century and will continue as powerhouses in the global economy (O'Neill, 2011). Each of these developing economies has made tremendous efforts to reduce poverty, raise living standards, and build a global presence as an emerging region in the global economy. In order for them to continue and achieve their respective developmental goals, MINT countries need to face substantial challenges in the management of their fiscal resources to support growth-related aspirations.

The concept of fiscal space is essential here, as it is defined as "the availability of budgetary resources, to a government, to undertake policy actions without jeopardizing their fiscal sustainability" (Heller 2005). Fiscal space is a determining factor of a government's ability to

undertake counter-cyclical policies, provide public goods and services, and encourage economic growth (Aizenman & Jinjarak 2012; Ghosh et al., 2013). In addition, the MINT countries' fiscal space is influenced by a wide variety of factors, including their ability to collect revenue, their expenditure priorities, and their ability to service their debt.

The level of fiscal space available to MINT countries is linked to their overall public debt sustainability and the overall ability to generate debt; excessive borrowing negatively impacts economic growth (Reinhart & Rogoff, 2010; IMF, 2018). The public debt to GDP ratio is one measurement that can be used to assess a nation's public debt sustainability; in all the MINT countries, this ratio is increasing which contributes to fiscal vulnerability (World Bank, 2020). For example, Nigeria's debt to GDP ratio was 14.93% in 2015 and 25.72% in 2020 before increasing to 39.33% in 2024. Similarly, Turkey's debt to GDP ratio grew on a similar trend, from 27.13% in 2015, to 38.73%. For Mexico and Indonesia, their debt GDP ratio has increased from 50.97% and 27.13% to 58.31% and 40.17% for 2015 and 2024 respectively (World Bank, 2024).

The relationship between the level of fiscal space, public debt sustainability and the overall economy can be described as inter-dependent and bi-directional: (1) The ability for governments to generate fiscal space enables investments in public goods and services, which serve to promote economic growth (i.e. infrastructure, education, health) (Alesina & Perotti, 1996; Barro, 1990); and (2) Economic growth contributes to governments being able to create fiscal space by increasing overall revenues and lowering levels of debt to GDP (Easterly & Rebelo, 1993; Gupta et al., 2005).

Data has shown that over the years, the macroeconomic performance of the MINT countries has been encouraging, though with some fluctuating trend in recent times. Figure 1 presents the situation.

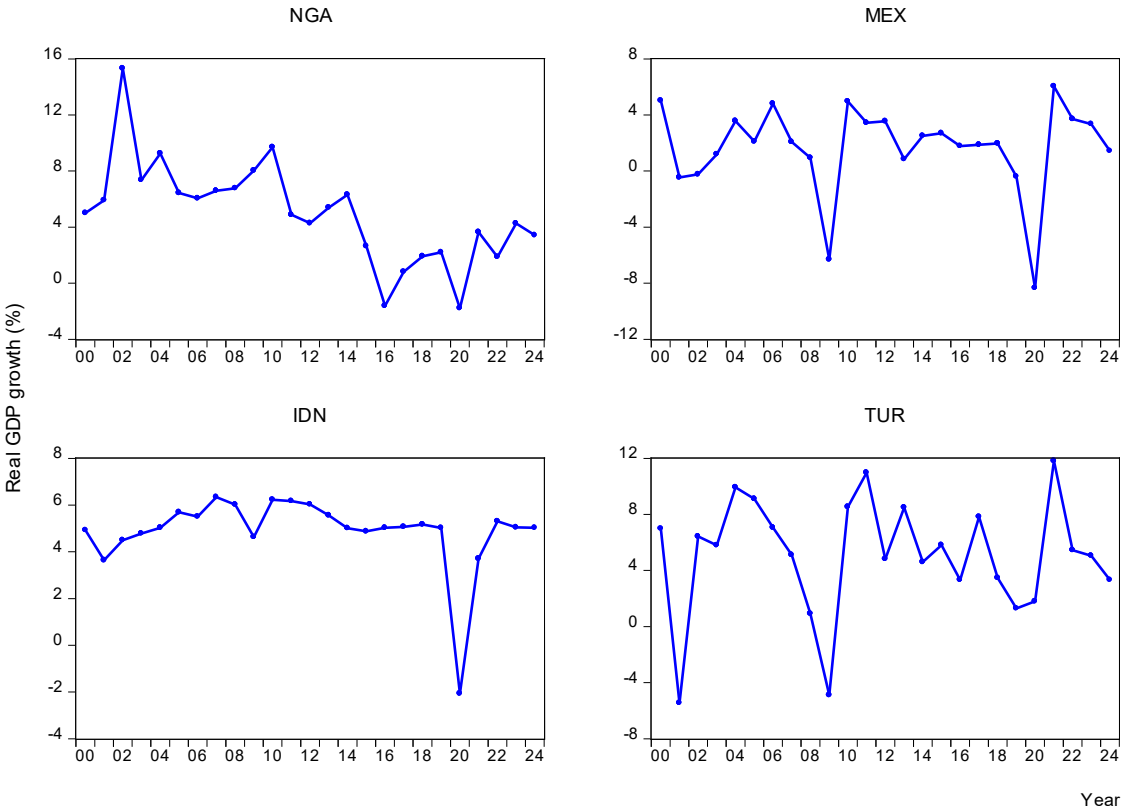

Figure 1: Trends in economic growth in MINT countries

The trend depicted in Figure 2 exhibits similar pattern of growth across the MINT countries with declining rate of growth in recent times. Within the period under investigation, the economic growth of Nigeria increased from 5.01% in 2000 to 15.33% in 2002 (the highest throughout the period) with other years characterized with plummeting growth and recoveries. Recent growth rate shows that post-Covid, Nigeria's economic growth has been fluctuating from 3.65% in 2021 to 1.87% in 2022 after which it improved to 4.26% in 2023 with an accompanied fluctuation to 3.426% in 2024. Interestingly, Nigeria has been able to maintain positive growth rate for four consecutive years post-Covid. This similar positive growth rates between 2021 to 2024 are observed for other MINT countries with Mexico recording an average of 3.64%, Indonesia with 4.77%, and Türkiye with 6.41%. It is worth noting that among all the MINT countries, only Türkiye recorded a positive GDP growth rate (1.80%) during the Covid-19 pandemic.

Different countries in the MINT region have experienced differences in their experiences when it comes to the fiscal space and sustainability of their national debts. In Mexico, for example, there have been multiple fiscal reform initiatives undertaken to increase revenue generation and improve the quality of how those resources are spent. Among other reforms, Indonesia and Nigeria has also recently passed new legislation on taxation that aims to enhance these countries' revenue collection capabilities. Nigeria continues to face significant fiscal challenges, such as declining petroleum revenues and the increased costs associated with servicing foreign public debt obligations. Turkey suffers similarly from many of the same issues with regards to their current account balance and public debt levels as well.

In light of these various problems facing fiscal policy makers throughout MINT nations, this research examines how fiscal policy influences relationships among fiscal space, sustainability

of public debt, and overall economic growth within MINT nations and subsequently produce recommendations regarding appropriate fiscal policies available for those nations to employ towards creating long-lasting, sustainable, and inclusive economic expansion. More specifically, this study will assess the relationship between debt sustainability impact and economic growth; fiscal deficit and economic growth; as well as establishing the threshold level of debt sustainability within MINT nations.

The remaining parts of this paper are organized as follows: Section 2 reviews the literature on fiscal space, public debt sustainability, and economic growth. Section 3 presents the data and methodology used in the study. Section 4 discusses the empirical results, and Section 5 concludes with policy recommendations.

2. LITERATURE REVIEW

2.1 The Concept of Fiscal Space and Debt Sustainability

Fiscal space and debt sustainability are both interconnected and complementary concepts that are essential to understanding how well a country's public finances work and whether or not it can achieve macroeconomic stability.

Fiscal Space

Fiscal space refers to the number of budgetary resources that allow governments to either increase their level of public spending or reduce their level of taxation without endangering their fiscal sustainability (Heller, 2005). Therefore, fiscal space includes all the room for maneuver within the budget to allow policymakers the opportunity to support emerging economic and social challenges, without jeopardizing the solvency of the government. Fiscal space represents an important concept in public finance because it indicates a government's ability to implement counter-cyclical policies, invest in public goods and services, and achieve its long-term development goals. The literature on fiscal space has introduced multiple terms and measure for the definition of fiscal space (Alesina & Perotti, 1995; Burnside, 2005; Krogstrup & Wälti, 2008). Heller (2005) provides a useful definition of fiscal space, as it refers to the availability of budgetary resources for governments to provide public goods and services without undermining their solvency.

Debt Sustainability

Sustainable debt means that a government can repay all the money it borrowed and have enough left over to cover expenses. Sustainable debt is defined as having enough future income (or cash flow) to pay off all present and future debts (Blanchard & Buiter, 1985; IMF, 2013). Sustainability is also an important issue for public policy because policymakers must think about how likely it is that excessive levels of debt will create both high levels of fear in investors and limit a government's ability to respond to economic events. The literature has extensively defined ways to determine if a country's debt load is sustainable, with numerous indicators and frameworks to use (Blanchard & Buiter, 1985; IMF, 2013). The most widely used framework is the IMF Debt Sustainability Framework (DSF), which evaluates a country's debt sustainability using multiple indicators and ratios such as debt as a percentage of GDP, interest as a percentage of GDP, and primary balance as a percentage of GDP. In this study, we utilized

debt as a percentage of GDP to measure debt sustainability due to its wide application in literature and its connection to the overall economic activity.

The concepts of fiscal space and debt sustainability are closely intertwined. A government's fiscal space is impacted by its level of debt sustainability; a higher debt level will diminish the ability for the government to respond to developing social and economic needs. At the same time, a government's fiscal space also has an impact on debt sustainability; if there is a greater amount of fiscal space for the government, it will provide an additional measure of protection against shocks and reduce the potential for debt distress.

2.2 Theoretical Literature

The theoretical literature of interest includes the debt crowding out effect, the det overhang theory, and debt-growth theory.

Debt Overhang Theory

Debt overhang theory, first introduced by Myers in 1977, states that when a country has more debt than it can repay, the cost of servicing that debt will create a disincentive for private sector investment and therefore reduce the economy's overall growth rate. For example, as Krugman (1988) has pointed out, if an investor were to make an investment with a projected return greater than the cost of borrowing the funds needed for that investment, it could still be the case that the investor would not make the investment because he/she expects that the projected return from that investment will eventually be taxed away to pay for servicing the country's existing debt. This effect of debt overhang has been studied extensively in academic literature and multiple studies confirm that it is an actual phenomenon and confirm that it holds true for different countries and time periods (e.g., Sachs, 1989; Deshpande, 1997).

Debt-Crowding Out Effect

The debt crowding-out effects occur as a result of the amounts of money that the government borrows from the private sector to fund its programs and expenditures (Buiter, 1977). As the government borrows large amounts of money, there is increased competition amongst the government and the private sector for available funds, thus resulting in increased interest rates; this means that when the amount of money being borrowed rises, private sector borrowing becomes more expensive, and as such, decreases total private sector investment and consumption. As a result of this, it has been shown through various studies (e.g., Aschauer, 1989; Aiyagari & Gertler, 1995) that the debt crowding-out effects have reduced total economic activity (or slowed growth) within the economy. Some of the studies that have looked at the debt-crowding out evidence for the United States include Aschauer (1989) who finds that there is evidence of government borrowing having a direct crowding out effect on private sector investment, while Aiyagari and Gertler (1995) find that in models with imperfect capital markets, the evidence of crowding out is less severe.

Debt-Growth Theory

The debt growth theory supports that a high level of indebtedness can hinder growth in the economy (Reinhart & Rogoff 2010). When a country has an excessive amount of debt, it can decrease investor confidence; raise interest rates for businesses; and reduce growth in the

overall economy. The debt growth theory has been studied and supported in the literature (Kumar & Woo, 2010; Checherita-Westphal & Ratte, 2012). Reinhart and Rogoff (2010) found that when looking at a sample of developed countries, high levels of debt correlated to low levels of economic growth. However, there are numerous studies that contradict these findings citing country specific factors and the non-linear relationship that exists between debt and growth (Panizza & Presbitero, 2013).

2.3 Empirical Literature

Studies have been deployed to examine the nexus between public debt and economic growth in different countries and regions. The empirical study by Mudayen et al. (2025) deployed the quantile regression approach with fixed effects and bootstrapping on the to explore the effect of public debt on economic growth of 127 developing countries for the period 2012 to 2019. The empirical result showed that public debt is deleterious to economic growth. specifically, public debt retards economic growth in developing countries, especially in the 30% to 90% quantile. The paper therefore stresses the importance of debt sustainability in the driving economic growth in developing countries.

Oyedare (2025) explored the effect of public debt on Nigeria's economic growth with data from 1998 to 2023. The ARDL technique was used for the estimation with the result showing that that treasury debt, domestic debt, and external debt all having an insignificant effect on GPD. The implications of these findings are that the more the government borrows externally and internally to finance capital projects has less response on the aggregate economy.

Ayodele et al. (2025) utilized data for Nigeria within the period 1981 to 2024 to explore the dynamic effect of public debt on economic growth. With the autoregressive distributed lag (ARDL) technique of estimation, the study observed that domestic debt exerts an adverse influence on economic growth in Nigeria. Similarly, the coefficient for external debt was also negative, indicating that external borrowing adversely affects Nigeria's economic performance. These results suggest that both domestic and external debt, when not efficiently managed, can hinder the country's growth trajectory.

Carvelli (2024) examined the way that public and private debt relate by estimating the impact on private output from public debt shock during the period from 2010-2021 in the G7 nations. He addressed problems involving heterogeneity of the slope of the coefficient and cross-sectional dependence through the use of a dynamic CCE estimator to estimate the impact of cross-sectional dependence and any unobservable variable impacting all cross-sectional units using data collected by country. The empirical results revealed that public debt shock positively impacts the dynamic behaviour of private output, but shows no result in a positive direction, when there were past five years of fiscal consolidation by the country. similar results were obtained for Ekong et al. (2021), Inyang and Effiong (2020), and Effiong and Onwioduokit (2024) for Nigeria.

In a study conducted by Carvelli & Trecroci (2024) using data from 167 countries between 1970 and 2019, the authors sought to assess whether or not there is an association between government debt and economic growth. Various types of panel data features were explored, including: (a) asymmetry; (b) cointegration; (c) endogeneity; (d) country heterogeneity; and (e) cross-sectional dependence (i.e., all features of a typical 'pooled' mean group estimator). The authors found evidence that increased levels of debt per worker negatively impact long-term

output dynamics; however, both non-linear estimates and treatment of gross versus net public debts shared the potential for delivering vastly different impacts upon change in government debt across channelised effects. The authors cautioned that due to the sensitivity of their study's output to model specification variance, caution is necessary when interpreting results.

Another study conducted by Chen et al. (2024) employing panel data from 40 countries over 1980 to 2010 examined the heterogeneous threshold effect associated with government debt upon economic growth through the use of a kink panel regression with a latent group structure method of analysis examining unknown groups of previously identified patterns within this heterogeneous sample of countries was again demonstrated via their output to be independent upon changes in each countries grouped threshold levels.

Augustine and Rafi (2023) researched whether there are nonlinear connections between public debt and economic growth by estimating the level of public debt at which these countries might take an economic hit from additional borrowing or take off economically due to increases in borrowed funds across 39 developing countries from 1980-2019. Their study was based on a threshold regression model that enabled them to calculate the threshold level in the model for each country. Nevertheless, their study indicates a large variation in estimated threshold levels of public debt among these developing countries — from 24% to 132% of national income. However, there were only 6 countries with inverted U-shaped relationships between debt and growth; i.e., countries with public debts above the threshold level exhibited some level of positive economic growth due to continued borrowing, while some countries showed signs of economic decline due to low levels of borrowed funds.

Gomez-Puig et al. (2022) have modelled heterogeneity across the debt and growth relationship and the reasons why. To do so, they used panel data from 115 countries for the period from 1995 to 2016. The study used the grouped fixed effect (GFE) estimator to classify countries into endogenously derived groups. The researchers used a multinomial logit model to find explanatory variables for detected heterogeneity. The GFE estimator revealed five groups of countries that have different relationships between debt and economic growth. The study showed that the relationship between debt and economic growth was strongly influenced by the quality of institutions and the share of productive expenditures, and that these variables helped to identify different groups' levels of debt and debt maturity.

In examining how public debt relates to aggregate investment in many of the European Union (EU) states, Kostarakos (2022) looked at a number of countries through means and cross-sectional averages of observable factors and the impact of non-observable factors using mean group or country cross-sectionally correlated error estimation methods and the AMGM or average group of heterogeneously impacted cross-sectionally correlated error estimation methods. The results of the empirical model indicated that, on the whole, public debt negatively influences a country's public investment in aggregate terms, but there was also evidence supporting the notion that the relationship is nonlinear. However, the empirical evidence from Sánchez-Juárez & García-Almada (2016) portrays that debt stimulates investments and economic growth.

Sari (2022) also explored the effect of public debt on Indonesian's economic growth using data from 1970-2018. Using the Autoregressive Distributed Lag (ARDL) method, the study found that debt had a negative effect on GDP in the short and long run. Meanwhile, it did not affect

investment in the short run but had a negative effect in the long run. Thus, appropriate debt management policies are needed to support economic growth.

In a study of selected Asian countries, Asteriou et al. (2021) examined the association between public debt and both the short-run and long-run growth of the economy over time, from 1980 to 2012. The study used three econometric methods: pooled average group (PAG), average group (AG), and dynamic fixed effects (DFE), and also contextualized the results with common correlated effects (CCE). The impact of changes in public debt was also assessed by using the asymmetric panel ARDL method. Their findings showed that increases in government debt negatively affect economic growth in both the short and long runs.

Abbas et al. (2021) applied state governance as a mediating variable in the relationship between public debt and national output. They used the WGI (World Governance Index) data and time-series observations from 106 countries for the period 1996-2015 and fixed- or random-effects least square dummy variable and GMM estimation techniques to control for endogeneity bias. Their study results suggest that public debt can exhibit either positive or negative effects on GDP growth depending on the quality of governance in a country. However, when the interaction of public debt level with the quality of governance is included in the analysis, public debt level will positively impact GDP growth.

The empirical analysis has shown that in clear terms, debt tends to have negative effect on investments and economic growth. However, mixed findings still persist in the literature thereby creating a research gap. Again, empirical studies have not treated the effect of fiscal space and debt sustainability on the economic growth of the MINT countries as a whole hence, this paper tends to fill this gap by contributing to the literature on the debt-growth nexus by focusing on the MINT countries.

3. RESEARCH METHODOLOGY

3.1 The Model

The empirical model examining the effect of fiscal space and debt sustainability on the economic growth of MINT countries is derived from the augmented traditional production function in which:

$$Q = f(L, K) \quad (1)$$

Where Q is output, L is labour, and K is capital. Denoting Q with output growth with L and K depicting labour employment and gross fixed capital formation, the augmented model with fiscal space, debt sustainability, and other control variables is presented in its notional functional form as follows:

$$RGDP_{i,t} = f\left(GFCF_{i,t}, LABF_{i,t}, DSTB_{i,t}, FCBL_{i,t}, DCPS_{i,t}, FDI_{i,t}, INFR_{i,t}, TRDP_{i,t}\right) \quad (2)$$

Where RGDP is the growth rate of gross domestic product (a proxy for economic growth), GFCF is the gross fixed capital formation (% of GDP), LABF is labour employment (% of total labour force), DSTB is debt-GDP ratio (a measure of debt sustainability), FCBL is deficit-GDP ratio (a measure of fiscal space), DCPS is the domestic credit to the private sector (% of GDP), FDI is the foreign direct invest net inflows (% of GDP), INFR is the inflation rate, TRDP is

trade openness (the sum of export and import divided by GDP), i is the country specific (i = 1, 2, 3, 4), and t is time (t = 2000 to 2024). By presenting Equation (1) in an econometric form amendable for estimation, we now have our model as

$$RGDP_{i,t} = \delta_0 + \delta_1 GFCF_{i,t} + \delta_2 LABF_{i,t} + \delta_3 DSTB_{i,t} + \delta_4 FCBL_{i,t} + \delta_5 DCPS_{i,t} + \delta_6 FDI_{i,t} + \delta_7 INFR_{i,t} + \delta_8 TRDP_{i,t} + \mu_{i,t} \quad (3)$$

Where δ_0 is the intercept of the model, $\delta_1 \; to \; \delta_8$ are the partial slope coefficients of the regressors, and μ is the stochastic term. It is expected that $\delta_1 < 0$ to denote that persistent debt accumulation above the sustainable level will be detrimental to growth; while it is expected that $\delta_4 > 0$ to align with the Keynesian postulations that deficit financing is growth-enhancing.

3.2 Nature and Sources of Data

This study utilized panel data set covering the MINT (Mexico, Indonesia, Nigeria, and Turkiye) countries for the period 2000 to 2024 (a total of 100 observations). Data were obtained from the World Bank (2024) database on World Development Indicators and the Central Bank of Nigeria (2024) statistical bulletin.

3.3 Technique of Data Analysis

This paper deployed the different techniques to address the estimation concerns from unit root test to cointegration analysis, and then to long run and short run estimation and threshold analysis. The unit root test involves both the common unit root test using Levin–Lin–Chu (2002) and the individual unit root test using Im–Pesaran–Shin (2003) techniques. To test cointegrating relationships, the study utilized the Kao residual cointegration analysis to determine the existence of long run relationship in the model. To estimate the short run and long run model, the paper employed the panel autoregressive distributed lag (ARDL) model estimation technique. The technique is utilized since our panel data were stationary at levels and first difference. Lastly, Smooth Transition Regression (STR) model technique was utilized to determine the threshold (optimal) level of debt-GDP that is sustainable for economic growth within the MINT countries.

4. EMPIRICAL RESULTS

4.1 Descriptive Statistics

We begin our analysis by exploring the descriptive properties of the variables used in the study. The result is therefore given in Table 1.

Table 1: Result of the descriptive statistics analysis

	RGDP	GFCF	LABF	DSTB	FCBL	DCPS	FDI	INFR	TRDP
Mean	4.174	23.943	67.123	36.231	-2.323	33.339	1.710	11.335	49.949
Median	4.887	23.559	66.141	36.841	-2.181	29.100	1.810	7.775	48.945
Maximum	15.329	35.378	84.273	87.437	6.220	88.600	3.836	72.308	88.798
Minimum	-8.354	13.666	49.481	5.167	-11.643	5.826	-2.757	1.560	17.856
Std. Dev.	3.581	5.758	10.393	15.901	2.576	21.035	1.070	12.646	15.393
Skewness	-0.613	-0.077	0.219	0.436	-0.305	0.860	-1.001	3.034	0.210

Kurtosis	5.266	2.014	2.057	3.540	6.466	3.390	5.671	12.311	2.712
Observations	100	100	100	100	100	100	100	100	100

Source: Researcher Computation (2026)

It can be observed that the MINT countries have an average real GDP growth rate of 4.174%, an average debt-GDP ratio of 36.231% and an average deficit-GDP ratio of 2.323%. The maximum real GDP growth rate was 15.329% while that of debt-GDP ratio and deficit-DP ratio were 87.437% and 6.220% respectively. While the RGDP and FCBL have a negative skew (skewness coefficient = -0.613 for RGDP and -0.305) and leptokurtic distribution (coefficient of kurtosis = 5.266 > 3 for RGDP and 6.466 > 3 for FCBL), DSTB has a positive skew (skewness coefficient = +0.436) and leptokurtic (kurtosis coefficient = 3.540) distribution.

4.2 Correlation Analysis

The correlation analysis facilitates the detection of the direction of association between the regressand and the set of regressors and as well establish the correlation between regressors in order to detect possibility of multicollinearity. Table 2 presents the result.

Table 2: Correlation result

	RGDP	GFCF	LABF	DSTB	FCBL	DCPS	FDI	INFR	TRDP
RGDP	1								
GFCF	0.243	1							
LABF	0.101	-0.413	1						
DSTB	-0.231	0.034	-0.540	1					
FCBL	0.390	0.113	0.381	-0.443	1				
DCPS	-0.002	0.623	-0.691	0.175	-0.165	1			
FDI	-0.075	0.230	-0.167	-0.167	0.186	0.090	1		
INFR	0.048	-0.046	-0.132	0.034	-0.366	0.040	-0.279	1	
TRDP	-0.115	0.272	-0.558	0.605	-0.100	0.520	0.238	-0.004	1

Source: Researcher Computation (2026)

The result shows that while RGDP exhibits positive correlation (though weak) with GFCF (r = +0.243), LABF (r = +0.101), FCBL (r = +0.390), INFR (r = +0.048), it exhibits weak negative correlation with DSTB (r = -0.231), DCPS (r = -0.002), FDI (r = -0.075), and TRDP (r = -0.115). However, we cannot say that weak causality exists between RGDP and these variables since correlation does not in any way imply causation. Again, the set of regressors are observed to have weak correlation with each other which therefore rules out the possibility of multicollinearity in the model.

4.3 Unit Root Test

To ascertain the order of integration of the panel data sets, the panel unit root test was utilized to ascertain both the common unit root test (based on Levin, Lin, and Chu test) and individual unit root test (based on Im, Pesaran, and Shin test). Table 3 presents the result of the analysis.

Table 3: Unit root test result

Variables	Common unit root test (Levin, Lin & Chu t*)			Individual unit root test (Im, Pesaran and Shin W-stat)		
	Statistic	Probability	Order of Integration	Statistic	Probability	Order of Integration
RGDP	-6.1387	0.0000	I(0)	-5.3380	0.0000	1(0)
GFCF	0.5082	0.6943		-0.4847	0.3140	
	-7.0824	0.0000	I(1)	-9.0494	0.0000	I(1)
LABF	-0.3483	0.3638		-1.4974	0.0671	
	-6.6019	0.0000	I(1)	-6.3025	0.0000	I(1)
DSTB	-2.9989	0.0014	1(0)	-1.3834	0.0833	
	------	------		-6.2018	0.0000	I(1)
FCBL	-1.4032	0.0803		-2.4300	0.0075	
	-8.2652	0.0000	I(1)	------	------	I(0)
DCPS	2.5261	0.9942		1.9052	0.9716	
	-3.9071	0.0000	I(1)	-2.9190	0.0018	I(1)
FDI	-4.4491	0.0000	1(0)	-4.0060	0.0000	1(0)
INFR	-3.2934	0.0005	1(0)	-2.2522	0.0122	1(0)
TRDP	1.7139	0.9567		0.0156	0.5062	
	-6.1501	0.0000	I(1)	-7.3828	0.0000	I(1)

Source: Researcher Computation (2026)

Given the result in Table 3, both the common unit root test and individual unit root test indicates stationarity in mixed order of levels [I(0)] and first difference [I(1)]. Under the common unit test, the result shows that RGDP, DSTB, FDI, and INFR were all stationary at level whereas GFCF, LABF, FCBL, DCPS, and TRDP only became stationary at first difference. The result for the individual unit root test differs from the common unit test in the case of DSTB and FCBL. The DSTB was stationary at level under the common unit root test but stationary at first difference under the individual unit root test. For FCBL, it was reported to be an I(1) variable under the common unit test but an I(0) variable under the individual unit root. In summary, our variables are mixture of I(0) and I(1) variables thereby prompting a test for cointegration and the use of panel autoregressive distributed lag model approach instead of the conventional panel pooled ordinary least squares in the analysis.

4.4 Cointegration Analysis

The cointegration analysis facilitates the detection of long run relationships in the model. This is done using the Kao residual cointegration test, which Table 4 presents the result of the test. The rejection of the null hypothesis requires that the t-statistics must be statistically significant at the 5% level of significance.

Table 4: Kao residual cointegration test result

Series: RGDP GFCF LABF DSTB FCBL DCPS FDI INFR TRDP
Sample: 2000 2024
Included observations: 100
Null Hypothesis: No cointegration

Trend assumption: No deterministic trend		
User-specified lag length: 1		
	t-Statistic	Probability
ADF	-3.4891	0.0002
Residual variance	13.10688	
HAC variance	4.155006	

Source: Researcher Computation (2026)

The cointegration test result provided in Table 4 shows that the t-statistic of -3.4891 is statistically significant at the 1% level ($p < 0.01$) hence, we reject the null hypothesis of no cointegration. It therefore follows that there is a long run relationship in the model thereby warranting the estimation of both the long run and short run estimates of the model.

4.5 Panel Autoregressive Distributed Lag (PARDL) Model

To establish both the long run and the short run effect of fiscal space and debt sustainability on economic growth in the MINT countries, the panel ARDL model was estimated, and Table 5 presents the result of the analysis. The error correction term shows that about 88.77% of the short run distortions in the model is correction on an annual basis.

Table 5: Panel long run and short run estimates

Method: PARDL				
Sample: 2001 2024				
Maximum dependent lags: 1 (Automatic selection)				
Model selection method: Akaike info criterion (AIC)				
Dynamic regressors (1 lag, automatic): GFCF LABF DSTB FCBL DCPS FDI INFR TRDP				
Selected Model: ARDL(1, 1, 1, 1, 1, 1, 1, 1, 1)				
Variable	Coefficient	Std. Error	t-Statistic	Probability
Long Run Equation				
GFCF	0.7267	0.1035	7.0202	0.0000
LABF	0.4172	0.1151	3.6250	0.0005
DSTB	-0.1227	0.0332	-3.6991	0.0005
FCBL	-0.3828	0.1936	-1.9778	0.0534
DCPS	0.2351	0.0348	6.7502	0.0000
FDI	0.7614	0.2915	2.6117	0.0134
INFR	0.0519	0.0512	1.0151	0.3149
TRDP	0.0882	0.0269	3.2823	0.0019
Short Run Equation				
COINTEQ01	-0.8877	0.1459	-6.0826	0.0000
D(GFCF)	0.2285	0.2829	0.8078	0.4230
D(LABF)	1.1011	0.5346	2.0596	0.0446
D(DSTB)	-0.2979	0.0827	-3.6038	0.0007
D(FCBL)	0.7433	0.2997	2.4798	0.0165
D(DCPS)	0.1215	0.1234	0.9850	0.3293
D(FDI)	0.2172	0.2337	0.9293	0.3571

D(INFR)	-0.2542	0.0828	-3.0722	0.0034
D(TRDP)	0.0686	0.1110	0.6181	0.5393
C	-18.5288	2.4287	-7.6292	0.0000
Mean dependent var	-0.0832	S.D. dependent var		4.3014
S.E. of regression	1.8251	Akaike info criterion		3.9447
Sum squared resid	169.8800	Schwarz criterion		5.2029
Log likelihood	-147.2603	Hannan-Quinn criterion		4.4537

Source: Researcher Computation (2026)

Both in the long run and the short run, debt sustainability (debt-GDP ratio) was observed to exert significant negative impact on the economic growth of MINT countries. This implies that increased debt impedes growth in the MINT countries. The negative effect of debt on economic growth aligns with the findings of Inyang and Effiong (2020), Ekong et al. (2021), Asteriou et al. (2021), Sari (2022), Carvelli (2024), Effiong and Onwioduokit (2024), Carvelli and Trecroci (2024), Ayodele (2025), and Mudayen et al. (2025); but negates the findings of Sánchez-Juárez & García-Almada (2016). From the estimates, a 1% increase in debt retards growth by about 0.1227% and 0.2979% in the long run and in the short run respectively. It follows that debt exerts greater negative impact on economic growth in the short run than in the long run.

Also, fiscal deficit was observed to positively impact economic growth of MINT countries significantly in the short run, but the effect became negative and significant in the long run. This implies that persistent deficit will be deleterious to the economic growth of the MINT countries over time. From the estimate, a 1% increase in deficit enhances economic growth in the MINT countries by about 0.7433% in the short run but reduces economic growth by 0.3828% in the long run.

For the control variables, gross fixed capital formation exerts positive but insignificant short run effects on economic growth, but the effect became positive and significant in the long run. Thus, a 1% increase in GFCF will lead to approximately 0.7267% increase in economic growth of the MINT countries in the long run. The labour employment exerts significant effect on economic growth of the MINT countries both in the short run and in the long run. Consequently, a 1% increase in labour employment leads to about 1.1011% increase in economic growth in the short run and 0.4172% increase in the long run. The estimates therefore show that the marginal productivity of labour declines (from 1.1011 to 0.4172) in the long run.

Both domestic credit to the private sector (DCPS) and foreign direct investment (FDI) were observed to exert significant positive effect on the economic growth of the MINT countries, though the effect is only significant in the long run. Thus, increased domestic credit and increased foreign direct investment net inflows will improve the economic growth of the MINT countries. The estimates show that a 1% increase in DCPS and FDI will prompt RGDP of the MINT countries to increase by about 0.2351% and 0.7614% respectively.

The effect of inflation on economic growth of the MINT countries was observed to be negative and significant in the short run while the effect became positive but statistically insignificant in the long run. Therefore, inflation is only detrimental to the economic growth of the MINT countries in the short run. The estimate shows that a 1% increase in inflation will yield about 0.2542% decrease in the economic growth of the MINT countries. Again, trade openness exerts positive but insignificant effect on economic growth of the MINT countries in the short run but

the effect became significant in the long run. This therefore implies that it takes time for the MINT countries to benefit from trade liberalization. The estimate therefore shows that a 1% increase in trade openness increased economic growth of the MINT countries by 0.0882% in the long run. The constant term of the model, which is statistically significant, implies that the MINT countries will experience a GDP growth of -18.5288% if the regressors are held constant.

4.6 Short Run Country Specific Effect

We explore the effect of the regressors on economic growth for each of the MINT countries to check for variations in the direction and magnitude of their effects on the respective country's economic growth. The result in Table 7 presents the result of the analysis. Beginning with the error correction term, we observed that Nigeria and Indonesia have the potential of their model being adjusted in the long run to correct the short run disequilibrium at the speed of 48.47% and 86.22% respectively, portraying that Indonesia has higher speed of adjustment compared to Nigeria. Also, Mexico and Türkiye's model are explosive given that their respective error correction term of -1.1199 and -1.0842 are greater than unity.

Table 7: Short run country specific effect for the MINT countries

	Nigeria		Mexico		Indonesia		Türkiye	
Variables	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
ECM_{t-1}	-0.4847	0.0001	-1.1199	0.0000	-0.8622	0.0001	-1.0842	0.0000
D(GFCF)	0.3961	0.0006	0.7510	0.0039	0.1026	0.0549	0.6616	0.0022
D(LABF)	2.6918	0.0375	0.5023	0.0150	0.4489	0.0156	0.7613	0.0047
D(DSTB)	-0.3753	0.0002	-0.2504	0.0017	-0.0915	0.0058	-0.4743	0.0002
D(FCBL)	0.1952	0.0035	1.4828	0.0003	0.9734	0.0005	0.3217	0.0153
D(DCPS)	-0.1438	0.2098	0.1977	0.0712	0.0057	0.6409	0.4265	0.0002
D(FDI)	0.0241	0.9793	-0.1298	0.2655	0.0677	0.2208	0.9068	0.1262
D(INFR)	-0.2095	0.0010	-0.4934	0.0013	-0.2020	0.0001	-0.1120	0.0000
D(TRDP)	-0.1809	0.0002	0.1299	0.0001	-0.0163	0.0067	0.3417	0.0001
C	-14.0122	0.8873	-25.4231	0.9114	-17.2317	0.9050	-17.4483	0.8840

Source: Researcher Computation (2026)

In the MINT countries, it was observed that both capital and labour exert significant positive effect on each of the countries' economic growth. Thus, an increase in capital stock and labour employment will prompt an improvement in the economic growth of these countries. In terms of the magnitude of the effect, a 1% increase in GFCF leads to approximately 0.3961%, 0.7510%, 0.1026%, and 0.6616% increase in economic growth of Nigeria, Mexico, Indonesia, and Türkiye respectively. Thus, GFCF has greater effect on economic growth of Mexico compared to other MINT countries. With respect to labour, a 1% increase will prompt economic growth to increase by 2.6918%, 0.5023%, 0.4489%, and 0.7613% in Nigeria, Mexico, Indonesia, and Türkiye respectively. It follows that increased labour employment will have greater influence on economic growth of Nigeria compared to other MINT countries. This therefore implies that the marginal productivity of labour in Nigeria is still positive and higher relative to other countries in the group.

The result further shows that the debt sustainability level for each of the MINT countries is detrimental to their growth significantly, implying that increased debt level stifles economic

growth. The estimate shows that a 1% increase in the debt level will trigger 0.3753%, 0.2504%, 0.0915%, and 0.4743% decrease in the economic growth in Nigeria, Mexico, Indonesia, and Türkiye respectively. Therefore, Indonesia has lesser deleterious impact of debt on the country's growth whereas Türkiye has the greatest impact. For the fiscal balance, our results show that all the countries experience positive and significant effect of deficit on their economic growth. Thus, deficit has been growth-enhancing for the MINT countries over the years. From the estimates, a 1% increase in deficit will yield 0.1952%, 1.4828%, 0.9734%, and 0.3217% increase in the economic growth of Nigeria, Mexico, Indonesia, and Türkiye respectively; portraying that deficit has the greatest positive effect on the economic growth of Mexico compared to other countries in the group. This can therefore explain the increased debt in Mexico to finance such deficits.

The result further shows that while domestic credit to the private sector exerts negative but insignificant effect on Nigeria's economic growth, the effect was positive but insignificant in the case of Indonesia. Hence, only Mexico and Türkiye experienced significant positive effect of domestic credit to the private sector on their economic growth. The estimates shows that a 1% increase in domestic credit to the private sector will spur economic growth by 0.1977% and 0.4265% in Mexico and Türkiye respectively hence, Türkiye experiences the greatest positive effect of domestic credit to the private sector on her economic growth. Foreign direct investment was observed to exert an insignificant effect on all the MINT countries, with the effect being positive for Nigeria, Indonesia, and Türkiye but negative in the case of Mexico.

The effect of inflation on economic growth was observed to be negative and statistically significant for all the MINT countries; hence, inflation is deleterious to their growth. The estimates indicate that a 1% increase in inflation will yield about 0.2095%, 0.4934%, 0.2020%, and 0.1120% decrease in the economic growth of Nigeria, Mexico, Indonesia, and Türkiye respectively. It follows that among the MINT countries; inflation has the greatest negative impact on the economic growth of Mexico compared to other MINT countries. Trade openness was observed to negative and significant effect on the economic growth of Nigeria and Indonesia, but a positive and significant effect on that of Mexico and Türkiye. It follows that a 1% increase in trade openness will stifle the economic growth of Nigeria and Indonesia by 0.1809% and 0.0163% respectively whereas a 1% increase in trade openness spur economic growth in Mexico and Türkiye by 0.1299% and 0.3417% respectively, indicating that Türkiye benefits more from trade liberalization compared to other MINT countries. The negative constants show the deleterious level of economic growth in the MINT countries when the regressors are being held constant.

4.7 Debt Sustainability Level for the MINT Countries

The threshold regression analysis provides the optimal level of debt-GDP that will not be deleterious for growth among the MINT countries. Table 7 presents the result with both the linear and non-linear part of the model.

Table 7: Smooth Threshold Regression Result

Dependent Variable: RGDP				
Transition function: Logistic				
Included observations: 100				
Threshold variable: DSTB				
Variable	Coefficient	Std. Error	t-Statistic	Probability
Threshold Variables (linear part)				
DSTB	0.5244	0.2173	2.4130	0.0178
C	10.9901	2.6107	4.2096	0.0001
Threshold Variables (nonlinear part)				
DSTB	-0.4627	0.2183	-2.1193	0.0367
C	-4.4192	2.8615	-1.5444	0.1259
Slopes				
SLOPE	2.0111	5.0916	0.3950	0.6937
Thresholds				
THRESHOLD	21.2982	1.2993	16.3922	0.0000
R-squared	0.7163	Mean dependent var		4.1670
Adjusted R-squared	0.6930	S.D. dependent var		3.5641
S.E. of regression	3.4384	Akaike info criterion		5.3660
Sum squared resid	1111.3220	Schwarz criterion		5.5223
Log likelihood	-262.3006	Hannan-Quinn criterion		5.4293
F-statistic	12.4744	Durbin-Watson stat		1.5477
Prob(F-statistic)	0.0000			

Source: Researcher Computation (2026)

The result in Table 7 shows that the optimal debt-GDP threshold for the MINT countries is 21.30%, implying that debt-GDP ratio below 21.30% will spur growth whereas above this level will be detrimental to economic growth among the MINT countries. On the linear part (below the threshold level), our result shows that debt exhibits significant positive effect on economic growth with a 1% increase in debt leading to 0.5244% improvement in economic growth among the MINT countries. On the nonlinear part (above the threshold level), it is observed that debt exerts significant negative effect on economic growth among the MINT countries. The estimate shows that a 1% increase in debt beyond the threshold level will trigger about 0.4627% decrease in economic growth among the MINT countries. This result therefore offers insight into the sustainable debt level to be maintained among these economies to foster their growth trajectory. The established negative effect of debt in the panel ARDL model can be traced to the fact that these countries have all exceeded the threshold level of public debt hence, the prevalent deleterious effect.

4.8 Discussion of Findings

The findings of this study provide valuable insights into the complex relationships between public debt, fiscal deficit, and economic growth in the MINT countries. This discussion will holistically examine these findings, presenting their implications, theoretical backing, and empirical validations.

1. Public Debt and Economic Growth

The study's conclusion that public debt negatively impacts MINT countries' economic growth (in both a short and long-term context) is consistent with what is predicted by the debt-overhang hypothesis (Krugman 1988). The logic of this hypothesis states that when there is a large amount of public debt, future expectations surrounding taxation create disincentives for individuals and investors to invest. Additionally, according to this theory, large sums of public debts result in a lack of investor confidence, which inhibits economic growth and makes it difficult for governments to raise capital by way of bonds. The results obtained in this study are similar to the results found in previous studies such as Reinhart and Rogoff (2010) which concluded that public debt is inversely related to economic performance. The implications for MINT policymakers are that they must focus on ensuring sustainability of their public debt and develop mechanisms to reduce their public debt to GDP ratio. This may entail implementing fiscal consolidation policies such as reducing governmental spending, increasing revenue sources, and implementing structural reforms that foster economic development and thus decrease public debt levels.

2. Fiscal Deficit and Economic Growth

The findings of the study indicate that fiscal deficits have a significant and positive impact on short-term economic growth in MINT countries, while long-term fiscal deficits have a significant and negative impact (Keynes, 1936). The reason for this difference may stem from the Keynesian theory of fiscal policy, which believes that fiscal deficits boost aggregate demand through short-term economic growth. MINT's findings support Barro's (1974) belief that fiscal deficits tend to crowd out private investment, thus reducing long-term economic growth. Policymakers in MINT should be cautious about using fiscal deficit as an engine for short-term economic growth. They should be careful that how they use fiscal deficits to spur short-term economic growth does not affect their ability to maintain long-term economic growth.

3. Threshold Level of Public Debt

According to the results of the study, the threshold level of public debt for the MINT countries is 21.30 percent of GDP. Therefore, policymakers in MINT countries should keep debt-to-GDP ratios below this threshold in order to maintain economic growth. The empirical literature on debt thresholds also supports this conclusion, indicating a non-linear relationship between public debt and economic growth (Reinhart & Rogoff, 2010). This implies that policymakers in MINT countries need to prioritize debt sustainability and implement policies that reduce their debt-to-GDP ratios to below the threshold level of 21.30 percent of GDP.

A wide variety of theoretical frameworks support the findings of this study including the debt-overhang hypothesis, the Keynesian view on fiscal policy, and the neoclassical view on fiscal policy. Additionally, the empirical findings presented here are consistent with the findings of other studies; for example, Reinhart and Rogoff (2010) found an inverse relationship between high levels of public debt and low levels of economic growth.

5. CONCLUSION AND RECOMMENDATIONS

This paper explored the influence of fiscal space and debt sustainability on the economic growth of the MINT countries from 2000 to 2024. The study arises from the need to establish sustainable debt level for these countries that would be sustainable for their economic growth. Based on the findings of this study, the following conclusions can be drawn:

1. The negative relationship between public debt and economic growth: The study observed that public debt negatively affects economic growth in the MINT countries in both the short run and the long run. This means that when MINT countries have a lot of public debt, it will slow down their ability to grow economically.

2. The fiscal deficit has a positive impact on short-term economic growth, but a negative impact on long-term economic growth: The study noted that fiscal deficits are beneficial for short-term economic growth; however, fiscal deficits will negatively affect long-term economic growth if not managed appropriately. In order for fiscal deficits to increase long-term economic growth in MINT countries, those fiscal deficits must be made with the intent of stimulating long-term economic growth and managed properly.

3. The level of public debt at which there are no negative effects on economic growth: The study stated that the threshold level of public debt in MINT countries is 21.30% of GDP. Public debt levels above 21.30% will have a negative effect on economic growth in MINT countries; however, public debt levels below 21.30% will likely have a neutral to positive effect on economic growth in MINT countries.

Ultimately, the policy implications and lessons learned from this study support the idea that policymakers in MINT nations should prioritize fiscal sustainability; the judicious management of public debt; and implementing policies that directly foster economic growth. The findings of this study provide the following recommendations for policymakers in MINT nations:

Mexico:

1. Reduce the debt-to-GDP ratio to below 21.30% by implementing fiscal consolidation measures, such as reducing government expenditure by 1% of GDP annually and increasing revenue mobilization through tax reforms.

2. Implement a fiscal rule that targets a balanced budget and limits the growth of government expenditure to 3% per annum.

3. Invest in infrastructure development, such as transportation and energy, to stimulate economic growth and reduce poverty.

Indonesia:

1. Increase revenue mobilization by 2% of GDP annually through tax reforms and improving tax administration.

2. Reduce the debt-to-GDP ratio to below 21.30% by implementing fiscal consolidation measures, such as reducing government expenditure by 1% of GDP annually.

3. Implement a medium-term fiscal framework that prioritizes investments in human capital, such as education and healthcare.

Nigeria:

1. Implement a fiscal rule that targets a balanced budget and limits the growth of government expenditure to 3% per annum.

2. Reduce the debt-to-GDP ratio to below 21.30% by implementing fiscal consolidation measures, such as reducing government expenditure by 1% of GDP annually and increasing revenue mobilization through tax reforms.

3. Invest in infrastructure development, such as transportation and energy, to stimulate economic growth and reduce poverty.

Türkiye:

1. Reduce the debt-to-GDP ratio to below 21.30% by implementing fiscal consolidation measures, such as reducing government expenditure by 1% of GDP annually and increasing revenue mobilization through tax reforms.

2. Implement a medium-term fiscal framework that prioritizes investments in human capital, such as education and healthcare.

3. Improve the business environment by reducing bureaucracy and corruption and increasing transparency and accountability in government procurement processes.

Common Recommendations:

1. Implement a debt management strategy that prioritizes long-term debt instruments and reduces reliance on short-term debt.

2. Establish a fiscal council or an independent fiscal institution to monitor and advise on fiscal policy.

3. Improve transparency and accountability in government finance by publishing regular fiscal reports and conducting regular audits.

These recommendations are aimed at promoting fiscal sustainability, reducing debt vulnerability, and stimulating economic growth in the MINT countries.

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