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ASSESSING THE ROLE OF FINANCIAL INCLUSION ON DEBT SUSTAINABILITY: EVIDENCE FROM SUB-SAHARAN AFRICA

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Abstract
This study examines the impact of financial inclusion on debt sustainability in 37 Sub-Saharan African countries. Using panel data between 2004 and 2022, the study utilized the two-step system Generalized Method of Moments (GMM) estimator to explore how financial inclusion indicators - bank branch penetration, ATM penetration and domestic private credit - affect the primary balance ratio and its interplay with the Debt-to-GDP ratio. The findings from the study show that higher levels of ATM and bank branch penetration significantly enhance fiscal balances by promoting growth-enhancing activities that generate more tax to government. The findings generally reveal that financial inclusion ihave a significant positive impact on primary balance ratio, suggesting that access to financial services by households and firms promotes debt sustainability among SSA countries. Similarly, the interactive term for financial inclusion and debt sustainability included in the model indicates that financial inclusion reduces the consequential effect of high debt on fiscal space of SSA countries. These findings stress the need for expanding financial services in the region to promote debt sustainability.

Key Words: *Financial Inclusion, Debt Sustainability, Sub-Saharan Africa, Generalized Method of Moments.*

Introduction
Fiscal sustainability remains a central economic and public policy goal for policymakers due to its central role in fostering economic prosperity and inclusive growth (Branch & Adderley, 2007; Olaoye, 2022). In recent decades, the fiscal deterioration faced by Sub-Saharan Africa (SSA) has created serious debate about the position of the region's fiscal health (Olaoye, 2022). The total government debt for SSA countries have expanded substantially, rising from 27% to 60% on average of the GDP between 2010 and 2020. Eminently, the total foreign debt within the total debt stock experienced a surge, increasing from $465 billion in 2015 to $720 billion by 2020 (International Debt Statistics, 2022). In addition, from 2010 to 2020, the aggregate Gross Domestic Product of SSA economies in nominal terms grew by a modest 23% on average, showing that a percentage grow in government debt does not promote a related rise in output growth (International Debt Statistics, 2022). In this regard, achieving debt sustainability remains challenging due to the continuous worsening of debt profiles, which have adversely affected sustainable economic growth and development in the region (International

Monetary Fund, 2021; Olaoye, 2022). Numerous studies highlight a positive relationship between debt sustainability and economic prosperity (Branch & Adderley, 2007; Beqiraj *et al.*, 2018; Jibir *et al.*, 2018; Gobna & Usman, 2022). These studies establish that efficient debt management strategy pave-way for sustained economic growth and development. Nevertheless, the rise in fiscal space in recent time can be linked to insufficient planning for anticipated shocks (Osei-Assibey *et al.*, 2020) and poor management of public resources (Reinhart & Rogoff, 2010).

A financial inclusion can assist in addressing these challenges through expanding economic activities thereby creating more ntax to government (Ahiase et al., 2024). Similarly, financial inclusion aids financial literacy among house and firms thereby making borrowers to make informed decisions about investments and promoting decent repayment practices (Ahiase et al., 2024). Furthermore, financial inclusion reduces transaction costs and encourages savings, providing households and businesses with buffers against economic shocks that might otherwise lead to defaults (Hakura, 2020; Baldacci et al., 2011). Despite numerous empirical studies on debt and debt sustainability (Ahiase *et al.*, 2024; Cohen & Sachs, 1986; Reinhart & Rogoff, 2010; Jibir et al., 2018; Barro, 1991; Krugman, 1988), most of these studies focus on the impact of debt on economic growth and development. There is, however, a limited studies that examine the impact of financial inclusion on debt sustainability (Baldacci *et al.*, 2011). Hence, this study seeks to address this gap by assessing the impact of financial inclusion on debt sustainability.

The study adds to the body of knowledge in three critical areas. First, it provides fresh results on the impact of financial inclusion on debt sustainability in SSA. External resources such as debt and aid flows will not be enough to meet financing needs of most SSA countries to achieve SDG targets by 2030 (World Bank, 2022). Second, the study explores how improved financial services reduces the risks linked with disproportionate debt. By integrating financial inclusion into the discourse on debt sustainability, the study pave ways for policymakers and other interest groups to create macroeconomic environment where economic growth and decent borrowing coexist positively. Lastly, recognizing that SSA countries are under constant pressure to enact policies supporting debt sustainability, the study focuses on the region to examine the nexus between financial inclusion and debt sustainability. To the best of our knowledge, this area has not been explored in previous studies. Furthermore, the study applies a multi-methodological framework and utilizes a large dataset from various SSA countries to ensure robust results for better policy recommendations.

Following this introduction, Section 1 presents the review of theoretical and empirical literature. Section 3 deals with the methodology of the study, Section 4 presents the results and findings of the study and Section 5 provides conclusion and policy recommendations.

Literature Review

Theoretical Review

The Debt Sustainability Growth Model (DSGM), introduced by Barkbu, Beddies, and Le Manchec (2008) and supported by studies such as those by Reinhart and Rogoff (2010), serves as a critical framework for examining the interconnections between economic growth, fiscal strategies, and public debt. This model, frequently employed by institutions like the World Bank and the International Monetary Fund (IMF), provides a robust analytical foundation for evaluating the sustainability of debt levels. A core component of the DSGM is the debt-to-GDP ratio, which compares the total public debt (Dt) to the nation's gross domestic product (Yt). This ratio is critical in understanding the sustainability of public debt, as rising debt levels relative to economic output can signal unsustainable fiscal paths. Moreover, the debt dynamic equation reflects how the debt-to-GDP ratio evolves over time, primarily influenced by the primary balance. The primary balance captures the difference between government revenues and expenditures excluding interest payments. As highlighted by Kumar and Woo (2010), maintaining a positive primary balance helps mitigate the risk of escalating debt ratios.

Financial inclusion is increasingly recognized as a vital component in enhancing sustainable economic development and debt management. Atta and Ibrahim (2024); Hasan and Lu (2023); Ozili (2023); Edeminam and Abdullahi (2022). Access to financial services such as credit, savings, and insurance expands opportunities for individuals and businesses, particularly those excluded from formal financial systems. According to Beck, Demirgüç-Kunt, and Levine (2007), financial inclusion fosters economic dynamism by improving resource allocation and facilitating higher investment levels. This, in turn, contributes to a broader tax base and boosts government revenues, thereby reducing the primary deficit or increasing the primary surplus needed for debt stabilization. Additionally, financial inclusion enhances the mobilization of domestic savings, minimizing reliance on external debt and reducing borrowing costs (Olaoye, 2022). The increased availability of financial resources allows governments to pursue development projects without over-burdening future generations with debt (World Bank, 2024; Ozili, 2023).

Classical economic theories provide valuable insights into the relationship between financial inclusion and debt sustainability. The classical framework emphasizes the importance of institutions and efficient resource allocation for promoting economic growth. According to Harris (2007); Atta and Ibrahim (2024), strong institutions are critical in facilitating financial inclusion, particularly in regions such as Sub-Saharan Africa (SSA), where barriers to financial access remain significant. By fostering inclusive financial systems, SSA nations can encourage greater economic participation, which drives both growth and fiscal sustainability. Moreover, the classical theory aligns with the notion that and effective financial system contributes to reducing the volatility of public debt, ensuring that economic growth outpaces debt accumulation. This perspective is echoed in the work of Beck and Demirgüç-Kunt (2009); Boikos, Panagiotidis and Voucharas (2022), where they underscore the importance of financial reforms to support stable economic expansion.

The endogenous growth model presents a dynamic approach to understanding the connection between financial inclusion and sustainable debt management. This model highlights that investments in human capital, innovation, and institutional development can generate lasting economic benefits. By extending financial services to underserved populations, marginalized communities can unlock latent economic potential, fostering equitable growth and fiscal resilience (Soyemi et al., 2020; Jima & Makoni, 2023). The endogenous growth model also offers practical pathways for achieving debt sustainability through financial inclusion and human capital development. When economic growth consistently outpaces borrowing costs, fiscal sustainability becomes more achievable (Maebayashi, 2024; Greiner, 2012). Institutions that prioritize inclusivity and strong fiscal discipline can mitigate the risks of fiscal instability, while promoting trust and participation in the financial system.

Empirical Review

There are plethora of studies that investigate the nexus between financial inclusion and debt sustainability across countries and regions. However, Studies such as Atta and Ibrahim (2024); Hasan and Lu (2023); Ozili (2023); Edeminam and Abdullahi (2022) and Odugbesan, Ike, Olowu and Adeleye (2020) have shown evidence of financial inclusion in promoting economic growth and development and improving debt sustainability. Other studies such as Duvendack and Mader (2019) indicated mixed results on the impact of financial inclusion in enhancing growth and development that will facilitate debt sustainability.

There are studies that also observed that debt sustainability can only be achieved through factors that influences economic growth such as expansion of productive sectors and increase in diversified sources of government revenues. Among these studies are Mwaba (2005); Gobna, Usman and Mohammed (2022), Werake (2024) and Mose, Arthur, Fumey and Thomi (2005) also observed that rising earning from export revenue and inclusive economic growth can expand budget provision for debt repayment. Furthermore, some studies observed the impact of primary balance (debt dynamics), that is, the difference between public revenues and public spending excluding interest payments in explaining debt sustainability. Esu (2024) found that the size of government primary balance determine to a large extent the changes in government debt stock and recommend a robust primary fiscal surplus to stabilise growth in public debt. Sundus, Naveed and Islam (2022) observed that the main driving force of debt burden in Pakistan are fiscal indiscipline. Ncube and Brixiova (2015) posited that the key source of debt sustainability in Africa has been the growth of interest rate differential which underscores the importance of supporting economic growth. Thus, sound fiscal policies are required for greater fiscal space to ensure sustainable debt in the future.

In another study by Abindaw, Minlah and Mensah (2023), using data from SSA found that the lagged primary balance positively affects fiscal deficit both in the short and long run. The study therefore recommends deliberate fiscal policy approaches on fiscal balance to improve debt sustainability and economic performance. Similarly, in another study by Battaille, Hernandez and Norambuena (2015) noted that fiscal tightening and higher economic growth are expected to contribute to a reduction in the size of

government debt in the SSA region. Mandri and El-Jai (2019) opined that macroeconomic environment and government investment decisions to align across countries and regions to generate more revenue streams and meet the challenges causing the increase in the cost of servicing debt.

Financial inclusion therefore, can play a pivotal role in enhancing debt sustainability by fostering economic growth, increasing household and institutional resilience, reducing public borrowing costs, and supporting a stable financial ecosystem. Studies such as Jima and Makoni (2023); Adedokun and Aga (2023); Boachi and Adu-Darko (2024), have noted that financial inclusion and economic growth have a significant long-term nexus signifying a positive synergy betweenthem. However, the success of this linkage depends on the quality of financial governance and the broader economic context. Furthermore, policy makers in SSA must ensure that financial inclusion initiatives are aligned with public investments in sectors with the highest potential for sustainable growth. These initiatives will contribute to improved productivity and long-term fiscal stability, reducing the risk of over-indebtedness (Gobna et al., 2022). From the review of literatures in this study, it is notably clear there are paucity of studies examining the underlying nexus between financial inclusion and debt sustainability especially in SSA. This creates a critical knowledge gap in the area. Thus, this study plans to contribute to body of knowledge by addressing this lacuna by assessing the impact of financial inclusion on debt sustainability in SSA.

Methodology

This study is underpinned within Bohn's (1995) *fiscal reaction function framework*, which is widely applied a recent burgeoning studies to analyse the determinants and dynamics of debt sustainability (see Abindaw-Nabieu, Minlah & Mensah, 2023; Abubakar, McCausland & Theodossiou, 2024; Beqiraj, Fedeli & Forte, 2018; Checherita-Westphal & Ždarek, 2017; Woldu & Kanó, 2024). This framework postulates how a government's primary balance, reacts to changes in government debt and other relevant economic variables, and debt is sustainable if the primary balance react positively to rise in government debt (Bohn, 1995, 1998). We have extended the Bohn's (1995) baseline framework to include indicators of financial inclusion and other macroeconomic variables including inflation and trade openness. Equation (1) specifies the Bohn's (1995) baseline framework:

$$PBR_{it} = \theta + \varphi_1 DGR_{it} + \varphi_2 BZC_{it} + \mu_{it} \quad \ldots\ldots (1)$$

Where PBR_{it} stands for government primary balance to GDP ratio; DGR_{it} is Debt-to-GDP ratio and BCZ_{it} represents business cycle for country i at time t. The important parameter is φ_1 reflecting how primary balance adjusts to government debt accumulation.

A positive value φ_1 implies that public debt is sustainable. Equation (2) is an extension of the Bohn's (1995) baseline framework:

$$PBR_{it} = \theta + \varphi_1 DGR_{it} + \varphi_2 BZC_{it} + \varphi_3 INF_{it} + \varphi_4 TOP_{it} + \varphi_5 FNI_{it} + \mu_{it} \quad \ldots\ldots (2)$$

Where INF_{it}, TOP_{it} and FNI_{it} represent inflation, trade openness and financial inclusion indicators of the sample countries over the study period. Abindaw-Nabieu, Minlah and

Mensah (2023) and Abubakar, McCausland and Theodossiou, (2024) have established that inflation significantly improves debt sustainability by eroding the real value of government expenditure. Kamo et al. (2024) observe that the effect of that trade gap leads to lower primary balances, implying that debt is not sustainable. Equation (3) specifies how financial inclusion moderate debt sustainability among the sampled countries by including interaction term between financial inclusion and Debt-to-GDP ratio:

$$PBR_{it} = \theta + \varphi_1 DGR_{it} + \varphi_2 BZC_{it} + \varphi_3 INF_{it} + \varphi_4 TOP_{it} + \varphi_5 (DGR_{it} \times FNI_{it}) + \mu_{it} \ldots\ldots (2)$$

While there are many indicators of financial inclusion, the commonly adopted indicators of the variable of financial inclusion at macro level are the bank accounts penetration, the bank branches penetration, ATMs penetration, domestic private credits offered by banks and the amount of bank deposits. In this study, we have adopted the bank branches penetration, ATMs penetration, and domestic private credits offered by banks. The first two indicators reflect the accessibility of banking sectors, while the latter measures the utilization of the banking system. Since the share of total credit relative to GDP is a more general indicator of financial conditions, we focus on a more specific aspect of financial inclusion by using the bank credit to the private sector, which better captures the nature of financial inclusion. Again, the choice of these indicators is informed by data availability.

This study examines the effect of financial inclusion on debt sustainability among 37 sub-Saharan African countries. The data is extracted from the World Bank's World Development Indicators (WDI), the World Bank's International Database of Potential Growth (IPG), the World Bank's Cross-Country Database of Fiscal Space (CFS) and IMF's Financial Access Survey (FAS) Data, World Bank. And the dataset is for the period 2004–2022. The selection of this timeframe is informed data availability, as the FAS data begins from 2004. We have also Rubin's (1987) imputation technique to impute the missing data for most of the variables. Table 1 presents the definition and measurements of the variables

Table 1: Variables and Measurement

Variables	**Measurements**	
Primary Balance Ratio (PBR)	National budget balance (less debt servicing) as a percentage of GDP	CFS
Debt-to-GDP Ratio (DGR)	Total government debt outstanding as a percentage of GDP.	CFS
Business Cycle (BZC)	Difference between actual growth rate and potential economic growth rate	WDI and IPG
Inflation (INF)	Annual rate of inflation based on consumer price index.	WDI
Trade Openness TOP	Total value of trade as a percentage of GDP	WDI
Bank Penetration (FNI)	Bank penetration refers to the number of commercial bank branches per 100,000 adults. It serves as a proxy for the availability of banking services and the reach of the formal financial system within a country.	FAS

ATM Penetration (FNI)	ATM penetration measures the number of automated teller machines (ATMs) per 100,000 adults in a country. This indicator reflects the accessibility of banking services and financial infrastructure to the general population.	FAS
Domestic Private Credit (FNI)	Banks' Credit to the Private Sector as a Percentage of GDP This indicator measures the total amount of credit extended by deposit-taking institutions (e.g., commercial banks) to the private sector, as a percentage of GDP.	FAS
Overall Financial Inclusion Index (FNI)	This is constructed using Principal Component Analysis and the components used include Bank Penetration, ATM Penetration and Domestic Private Credit.	FAS

Source: Authors' Construction

This study employs the two-step system Generalized Method of Moments (GMM) estimator to analyze the effects of financial inclusion indicators on debt sustainability in 37 SSA countries over the period 2004-2020. The estimator is suited for this study given its ability to address endogeneity in the variables. It uses lagged variables as instruments to mitigate collinearities between regressors and the error term. In this study, there is a strong possibility for reverse causality between primary balance ratio and Debt-to-GDP ratio. This approach is most appropriate in a study's panel structure, where the number of cross-sectional units (countries) outnumbers the time dimension, ensuring robust and efficient parameter estimates. Key diagnostic tests, such as Hansen's overidentification test and second-order autocorrelation tests, are employed to check the instrument set and ensure the reliability of the results.

Results and Discussion

In Table 2, the average government primary balance is 2.162% of GDP, indicating that on average, governments in the sample achieved a slight surplus but with considerable surplus as reflected by high standard deviation (14.95%) and wide range of -14.71 to 122.59%. This signifies a volatile primary balance justifying the need for consistent fiscal discipline and counter-cyclical policies. The mean debt-GDP ratio (46.819%) is moderate while a high standard deviation of 30.93% reflects significant disparity in debt burdens among countries. Also, the upper range indicates critical debt sustainability challenges for some countries. The mean of 0.57% signifies narrow output gap but high standard deviation (4.904) indicates varying economic fluctuations among the countries, affecting fiscal balances and debt dynamics.

Table 2: Summary Statistics and Pair-wise Correlation Results

	Pri. Bal.	Debt Ratio	Biz Cycle	Inflation	Trade Op	Bank	ATM	Credit
Summary Statistics								
Obs.	703	703	703	703	703	703	703	703
Mean	2.162	46.819	0.570	7.872	67.006	6.315	6.33	19.819
SD	14.925	30.932	4.904	24.180	32.40	8.503	8.499	17.623
Min	-14.71	-17.16	-36.310	-8.975	17.225	0.207	0.207	0.002
Max	122.59	203.65	27.425	557.202	222.178	54.448	54.448	104.849
Pair-wise Correlation Matrix								
Pri. Bal.								
Debt Ratio	-0.211							
Biz Cycle	-0.058	0.174						

Inflation	-0.035	0.099	0.118				
Trade Op	0.233	0.103	-0.109	-0.039			
Bank	-0.051	0.336	0.007	-0.029	0.681		
ATM	-0.052	0.336	0.006	-0.028	0.680	0.999	
Credit	-0.113	0.148	0.109	-0.084	0.288	0.508	0.508

Source: Authors' computation

On average, there are roughly 6.3 bank branches per 100,000 individuals, implying limited physical access to banking services in many countries. Nonetheless, a high standard deviation indicates significant disparities in banking infrastructure between countries. Similarly, the average number of ATMs 6.3 machines per 100,000 individuals. This highlights a comparable level of financial access when compared to bank branches. Like branches, ATM access varies significantly between the countries as suggested by high standard deviation (8.5). Finally, Table 2 reveals that, on average, private sector credit is about 20% of GDP, showing relatively low levels of financial intermediation in the sample countries. Again, high standard deviation indicates substantial variability in access to private credit among countries.

In the lower part of Table 2, the correlation matrix results generally indicate weak correlations between the variables. However, there are cases of strong correlations. The cases with strong correlations include correlation between bank branches and trade openness, ATMs and trade openness, bank branches and ATMs, ATMs and private credits, and bank branches and private credits. This suggests the possibility of multicollinearity in the models estimated.

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Figure 1 illustrates the comparative levels of government primary balance ratio and Debt-GDP ratio across the sampled countries.

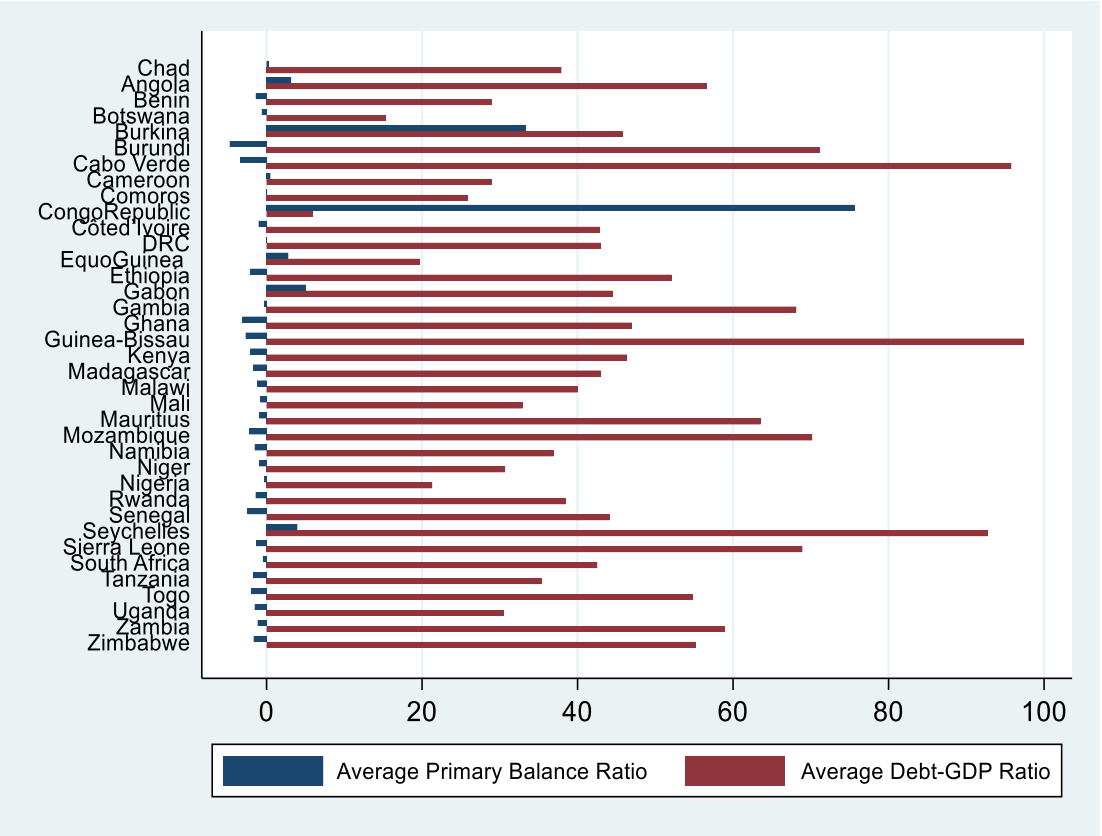

Figure 1: Cross-Country Comparison of Primary Balance Ratio and Debt-GDP Ration

The figure indicates the vast majority of the countries have relatively high debt-to-GDP ratio but with negative primary balance ratio. Only a handful number of countries (Angola, Burkina Faso, Congo Republic, Cameroon, Equatorial Guinea, Gabon, and Seychelles). Another general trend where countries with high primary balance ratios typically exhibit low or moderate debt-to-GDP ratios, while those with low primary balance ratios often experience higher debt burdens. For example, the Congo Republic maintains the highest average primary balance ratio alongside one of the lowest debt-to-GDP ratios, whereas Burundi records one of the lowest primary balance ratios and one of the highest debt-to-GDP ratios. The primary balance, which excludes interest payments, serves as an indicator of a government's fiscal discipline and its capacity to generate revenues exceeding expenditures. In the Congo Republic, resource windfalls, particularly from oil, likely contribute to its strong fiscal surplus. In contrast, resource-poor or less diversified economies like Burundi struggle to achieve fiscal surpluses, resulting in increased debt reliance.

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Table 3: Two-Step System GMM Estimation of the Extended Fiscal Reaction Functions

Prim Bal. Ratio	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Prim. Bal. Ratio$_{t-1}$	0.691***	0.746***	0.802***	0.903***	0.779***
	(0.0811)	(0.0618)	(0.118)	(0.0874)	(0.0532)
Deb-to-GDP ratio	0.00322	-0.173*	-0.460**	-0.247*	-0.217**
	(0.0228)	(0.0899)	(0.223)	(0.150)	(0.0912)
Biz. cycle	0.850	-0.0244	0.0502	-0.792	-0.302
	(0.556)	(0.417)	(0.453)	(0.685)	(0.521)
Inflation		-0.0251	-0.0295	0.373	0.0590
		(0.191)	(0.178)	(0.501)	(0.246)
Trade Openness		-0.311	-0.415	0.0652	-0.264
		(0.199)	(0.267)	(0.201)	(0.187)
ATM penetration		2.630**			
		(1.059)			
Bank Branch Pen.			0.0432*		
			(0.0251)		
Domestic priv.				1.917***	
				(0.668)	
Overall Fin. Incl. Index					18.28***
					(6.813)
Year Effect	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Constant	336.8***	544.9	67.88	725.5	786.1
	(116.1)	(511.1)	(650.4)	(1,011)	(512.6)
Hansen test Prob	0.399	0.657	0.537	0.466	0.794
AR(2) Prob. Value	0.525	0.358	0.628	0.655	0.268
Observations	666	666	666	640	666
Number of countries	37	37	37	37	37

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Lagged debt-GDP ratio and lagged business cycle are the instruments

Nigeria, however, deviates from this pattern. Despite being resource-rich like the Congo Republic, Nigeria's primary balance ratio is negative, indicating fiscal deficits, while its debt-to-GDP ratio remains moderate. Unlike the Congo Republic, Nigeria experiences significant challenges in transforming its resource wealth into government revenue. Inefficiencies in the oil and gas sector, subsidies, and revenue leakages have reduced the fiscal benefits of its resource wealth. The baseline model results in Table 3 indicate that debt-GDP ratio is positive but insignificant (see Column 1), implying that debt sustainability is not significant across the countries, which is partially consistent with fiscal reaction function. The possible explanation is that the vast majority of the countries have relatively high debt-to-GDP ratio but with negative primary balance ratio as reflected in Figure 1. The lagged primary balance ratio is highly significant and positive across all models, ranging from 0.691 to 0.903.

This shows a strong persistence in fiscal behavior, and that countries with high primary balances in the past tend to maintain higher primary balances in the present. With the introduction of control variables and proxies of financial inclusion, the debt-to-GDP ratio becomes negatively significant across the extended functions (see Columns 2-5) suggesting that higher debt levels reduce the primary balance ratio. The possible reasons

are that high debt-to-GDP ratios can erode investors' confidence, leading to higher borrowing costs and limited access to financial markets. This can further strain fiscal resources, lowering the primary balance ratio. Also, high trade openness can expose countries to external shocks.

Table 3: Two-Step System GMM Estimations of Extended Fiscal Reaction Fun. Continued

	(6)	**(7)**	**(8)**	**(9)**
Prim. Bal. Ratio$_{t-1}$	0.800***	0.802***	0.693***	0.820***
	(0.121)	(0.118)	(0.0722)	(0.114)
Deb-to-GDP ratio	-0.456**	-0.460**	-0.0953	-0.175
	(0.228)	(0.223)	(0.125)	(0.136)
Biz. cycle	0.0337	0.0502	0.620	0.0940
	(0.459)	(0.453)	(0.612)	(0.467)
Inflation	-0.0536	-0.0295	-0.0988	-0.0271
	(0.185)	(0.178)	(0.253)	(0.176)
Trade Openness	-0.421	-0.415	-0.123	-0.373
	(0.268)	(0.267)	(0.125)	(0.232)
ATM Pen. X Debt-GDP	0.0417*			
	(0.0250)			
Bank Pen. X Debt-GDP		0.0432*		
		(0.0251)		
Priv. Domes. X Debt-GDP			0.00576	
			(0.00415)	
Overall Fin. Incl. X Debt-GDP				0.254
				(0.160)
Year Effect	**Yes**	**Yes**	**Yes**	**Yes**
Constant	47.11	67.88	942.4*	481.0
	(629.2)	(650.4)	(487.1)	(714.5)
Hansen test Prob,	0.531	0.536	0.341	0.660
AR(2) Prob. Value	0.644	0.628	0.889	0.513
Observations	666	666	666	666
Number of countries	37	37	37	37

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Lagged debt-GDP ratio and lagged business cycle are the instruments.

Among the financial inclusion indicators, ATM penetration (see Column 2 in Table 3) is positively significant suggesting that better access to ATMs leads to improved primary balances, possibly due to enhanced financial intermediation and revenue mobilization. Although significant at 10%, bank branch penetration results in increased access to banking services and this modestly supports fiscal balance improvements (see Column 3). Domestic private credit is strongly positive and significant in determining fiscal outcomes (see Column 4). This could be due to improved economic activity and government revenue from competitive private sector. Overall, the financial inclusion index has strong and significant positive effect on primary balance ratio. This suggests that broader financial inclusion significantly enhances the primary balance ratio.

To observe how financial indicators enhance or reduce debt sustainability in sub-Saharan Africa (SSA), we have interacted the indicators with debt-to-GDP ratio (and the results are reported in Columns 6-9 of Table 3). The interaction between ATM penetration and the Debt-to-GDP ratio is positive and significant at the 10% level. This means higher ATM penetration mitigates the adverse impact of debt on the primary balance ratio. In economies with better ATM penetration, improved access to financial services may enhance financial inclusion, fostering economic activity and broadening the tax base, which supports fiscal balances. Similarly, the interaction between bank branch penetration and the Debt-to-GDP ratio is also positive and significant at the 10%. This implies better access to physical banking infrastructure cancels out some negative effects of high debt levels on the primary balance. Bank branches facilitate credit access, savings mobilization, and financial inclusion. These altogether drive economic growth and government revenue.

Conversely, the interaction between domestic private credit and the Debt-to-GDP ratio, and that between overall financial inclusion index and Debt-to-GDP ratio are positive but not statistically significant. While domestic private credit plays a role in economic activity, its impact in enhancing debt sustainability remains weaker compared to ATM and bank branch penetration. This may be due to uneven credit distribution or crowding out effects when governments rely excessively on domestic borrowing.

Table 4: Two-Step System GMM Effect of Financial Inclusion on Debt Ratio

Debt-to-GDP Ratio	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Deb-to-GDP ratio$_{t-1}$	0.761***	0.677***	0.772***	0.760***	0.761***
	(0.0527)	(0.0631)	(0.0564)	(0.0595)	(0.0547)
Prim. Bal. Ratio	0.0639	0.143*	0.118	0.0239	0.0740
	(0.0645)	(0.0775)	(0.145)	(0.197)	(0.146)
Biz. cycle	0.990	0.730	0.985*	1.105*	1.042**
	(0.606)	(0.609)	(0.565)	(0.600)	(0.522)
Inflation	0.200	0.188	0.244	0.160	0.214
	(0.171)	(0.214)	(0.241)	(0.213)	(0.210)
Trade Openness	-0.107	-0.174*	-0.126	-0.0287	-0.101
	(0.0999)	(0.0969)	(0.134)	(0.239)	(0.143)
ATM penetration		0.0280*			
		(0.0148)			
Bank Branch Pen.			1.027		
			(1.247)		
Domestic priv.				-0.0777	
				(0.542)	
Overall Fin. Incl. Index					1.810
					(6.867)
Year Effect	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Constant	-1,172***	-617.7	-905.6**	-1,284**	-1,089**
	(253.7)	(540.9)	(422.9)	(574.1)	(529.4)
Hansen test Prob,	0.445	0.470	0.409	0.487	0.469
AR(2) Prob. Value	0.636	0.539	0.621	0.728	0.605
Observations	666	666	666	666	666
Number of countries	37	37	37	37	37

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Lagged primary balance ratio and lagged business cycle are the instruments.

While exploring the effects of financial inclusion on debt sustainability, it is equally important to explore how financial inclusion influences debt accumulation among SSA countries. In Table 4, ATM Penetration is positively significant at the 10% level, higher ATM penetration is related with a rise in the Debt-to-GDP ratio. This implies that more access to financial resources and services encourages government to borrow or consume more, thereby lead to high debt levels. While bank branch penetration and overall financial inclusion index are positive but not statistically significant; domestic private credit is negative but not statistically significant, possibly due to competition between private and public sectors for domestic borrowing.

Robustness Check

To check the consistency of our results in Table 3, we have estimated the fiscal reaction function using Hausman-Taylor estimator based on Amemiya and Macurdy (1986) procedure.

Table 5: Amemiya–MaCurdy's Hausman-Taylor estimation of Fiscal Reaction Functions

Primary Bal. Ratio	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Deb-GDP ratio	0.000286	0.00187	0.00187	-0.000295	0.00152
	(0.0106)	(0.0106)	(0.0106)	(0.0106)	(0.0106)
Biz. cycle	-0.0899*	-0.0957*	-0.0960*	-0.0803	-0.0976*
	(0.0526)	(0.0525)	(0.0525)	(0.0536)	(0.0529)
Inflation	0.0144	0.0163	0.0163	0.0123	0.0164
	(0.0106)	(0.0106)	(0.0106)	(0.0108)	(0.0107)
Trade Openness	0.0412**	0.0364*	0.0363*	0.0436**	0.0372*
	(0.0198)	(0.0199)	(0.0199)	(0.0199)	(0.0200)
ATM penetration		0.212*			
		(0.119)			
Bank Branch Pen.			0.215*		
			(0.119)		
Domestic priv.				-0.0541	
					0.872
Overall Fin. Incl. Index					(0.702)
Year Effect	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
cons	379.7***	453.2***	453.2***	321.7***	449.9***
	(89.80)	(98.39)	(98.14)	(107.9)	(105.7)
Wald chi2(6)	37.06***	48.34***	48.50***	39.44***	45.91***
Observations	703	703	703	703	703
Number of countries	37	37	37	37	37

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Debt-to-GDP ratio and business cycle are the endogenous variables.

The results in Table 5 validate those obtained in Table 3. For instance, ATM penetration and bank branch penetration both have positive and significant effects on primary balance ratio. The major discrepancies are that domestic private credit is negatively insignificant and that overall financial inclusion index is positive but not significant.

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Table 5: Amemiya–MaCurdy's Hausman-Taylor estimation of Fiscal Reaction Fun. Contd.

Primary Bal. Ratio	**(6)**	**(7)**	**(8)**	**(9)**
Deb-GDP ratio	-0.00939	-0.00944	-0.00567	-9.86e-05
	(0.0120)	(0.0120)	(0.0129)	(0.0106)
Biz. cycle	-0.0930*	-0.0932*	-0.0946*	-0.0948*
	(0.0526)	(0.0526)	(0.0530)	(0.0526)
Inflation	0.0148	0.0148	0.0156	0.0153
	(0.0106)	(0.0106)	(0.0107)	(0.0106)
Trade Openness	0.0399**	0.0399**	0.0398**	0.0395**
	(0.0198)	(0.0198)	(0.0199)	(0.0198)
ATM Pen. X Debt-GDP	0.00125*			
	(0.000732)			
Bank Pen. X Debt-GDP		0.00126*		
		(0.000732)		
Priv. Domes. X Debt-GDP			0.000425	
			(0.000525)	
Overall Fin. Incl. X Debt-GDP				0.00725*
				(0.00433)
Year Effect				
cons	393.6***	393.3***	417.8***	408.5***
	(89.99)	(89.97)	(101.3)	(91.25)
Wald chi2(6)	136.15***	136.51***	37.17***	102.73***
Observations	703	703	703	703
Number of countryid	37	37	37	37

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Debt-to-GDP ratio and business cycle are the endogenous variables.

Similarly, the interaction between Debt-to-GDP ratio and indicators of financial inclusion are positively significant except the interaction between Debt-to-GDP ratio and domestic private credit, as also established in Table 3. Overall, the robustness check results have corroborated our findings that financial inclusion, especially ATM and bank branch penetration significantly improve debt sustainability by enhancing government primary balances.

Discussion of Findings

Evident from the analysis, bank and ATM penetrations remains important drivers of debt sustainability in sub-Saharan Africa. Greater bank penetration promotes higher economic activity and formalization of businesses, leading to expansion of the tax base. As more individuals and businesses engage with the banking system, governments can collect more taxes, improving their revenue streams. This is crucial for managing public debt, as increased revenues can help service existing obligations and reduce reliance on borrowing (Ahiase et al., 2024). With wide formalization, governments can better track income and expenditures for appropriate taxes, thereby increase fiscal revenues. Stronger fiscal capacity enables governments to meet debt obligations more sustainably.

Sound access to financial services promotes savings and investment paving way for mobilization of local resource. In line with this, Comelli et al. (2023) opine those countries that judiciously utilize sound fiscal policies and expand revenue collection process have better chances of achieving sustainable fiscal environment.

Conclusion and Recommendations

In recent time, discussion on financial inclusion has taken a central position among academics, policy makers and other key stakeholders the world over. This paper investigated the impact of financial inclusion on debt sustainability among 37 sub-Saharan African countries using data spanning between 2004 and 2022. To achieve this objective, the study utilized the two-step system Generalized Method of Moments (GMM) estimator. The findings show that substantial number of SSA countries face difficulties maintaining sustainable debt levels, as shown by negative primary balance ratios and rising debt-to-GDP ratios among most SSA countries. Based on the study's results, financial inclusion appears to be a critical factor in achieving debt sustainability. Measures of Financial inclusion such as ATM penetration, availability of bank branch significantly impact fiscal balance through stimulating growth-enhancing activities and in turn generating tax revenue to government.

These results necessitate the need for deliberate efforts to expand access to financial services in SSA to achieve debt sustainability. Policymakers should invest in expanding financial infrastructure, such as ATMs and bank branches, especially in rural areas. Efforts should also focus on increasing private credit via targeted policies that stimulate easy lending procedures to productive sectors of the economy. Despite the promising results from this study, it is not free from certain limitations. it is therefore recommended that further empirical studies should focus on all African countries and apply more disaggregated data in the analysis. This will give more insight about how financial inclusion translate to creating opportunities for tax generation and in turn promotes debt sustainability.

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