FISCAL POLICY CONVERGENCE IN THE WEST AFRICAN MONETARY ZONE

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ABSTRACT

This study examines the convergence of fiscal policy in the West African Monetary Zone (WAMZ) using annual panel data between 2001-2020 in a log t regression convergence model. The findings reveal compelling evidence of divergences across the four fiscal policy instruments (tax revenue, expenditure, deficit and debt), with the largest divergences in debt (-4.32) and expenditure (-3.39) policies. In view of its findings, the study proposes a multiple fiscal rule regime to accommodate the idiosyncrasies of member states; and advocates the introduction of non-binding tax and expenditure rules to complement the existing deficit and public debt rules, and enable a more complete evaluation of fiscal policy performance and compliance within the zone.

***Keywords*: Fiscal Policy, Fiscal Rules, Policy Coordination and Convergence**

***JEL Code*: E61, E62, O47**

1. INTRODUCTION

An integral part of regional economic communities (RECs) is the alignment of the policies of constituent states with the mean-policy choice. The convergence or synchronization of fiscal policies, as an aspect of the broader macroeconomic convergence criteria in a regional setup, has been strongly prioritized (Arcabic, 2018). This is because fiscal policy divergences in a region, in the absence of binding fiscal rules, could accentuate regional business cycle fluctuations, as fiscal risks in one country could spill over to another (Kebalo, 2019; and Caselli & Wingender, 2021). Besides preventing the transmission of the adverse effects of unstable fiscal operations from one member country to another; convergence rules could strengthen fiscal discipline and enhance monetary policy credibility (Creel et al. 2001; and Gammadigbe et al., 2018). This stimulates curiosity about the degree of fiscal synchronization in the West African Monetary Zone (WAMZ), particularly in view of the zone's aspiration of macroeconomic convergence, stability and a single currency.

The quest for a monetary union in West Africa commenced with the establishment of the Economic Community of West African States (ECOWAS) in May 28 1975 in Lagos, Nigeria. The objectives of the ECOWAS, among others, include policy harmonization, economic union and macroeconomic stability (Harvey & Cushing, 2015). By the time the ECOWAS was formed, there was, seemingly, a partial monetary zone in the region, the West African Economic and Monetary Union (WAEMU), consisting five former French colonies or CFA countries. To achieve the objective of a single currency, ECOWAS created a second monetary

zone for the non-CFA countries, known as the West African Monetary Zone (WAMZ) in December 15, 2000, with the Gambia, Ghana, Guinea (Bissau), Liberia, Nigeria and Sierra Leone as members. The WAMZ was established to facilitate ECOWAS' objective of a single monetary in the zone by January 2003 (convergence date) and was to be merged with the WAEMU a year later (Asante & Masson, 2001). Consistent with the objective of an optimal currency area, including minimizing the effects of asymmetric shocks in the region, member countries were required to converge to some set macroeconomic thresholds, under the ECOWAS Monetary Cooperation Programme (EMCP) (WAMA, 2022). A cursory assessment of member states' compliance with the set convergence criteria, reveals a mixed but largely weak performance across the countries in the WAMZ (See Tables 1.1 and 1.2, Appendix A).

Over two decades since the establishment of the WAMZ, no single country has maintained full convergence on a consistent basis, as macroeconomic policies remain divergent (Onakoya et al., 2013; Mogaji, 2017; Gammadigbe et al., 2018; and Olowofeso et al. 2021), resulting in several shifts in the convergence and single currency dates, since 2003. Besides a lack of political will and weak governance, the observed divergences could, in part, be attributed to the adverse effects of successive global and regional shocks, including the 2008 global financial crisis (GFC), the 2014/2015 commodity price slumps, the 2015 Ebola crisis, and the 2019/2021 COVID-19 pandemic (Alabi and Amirthalingam, 2020). Symmetry in fiscal policy shocks has ramifications for macroeconomic stability (Onakoya et al., 2013; Gammadigbe et al., 2018; Tapsoba et al., 2019; and Olowofeso et al., 2021), and the shared prosperity of WAMZ countries. This study aims to enrich the rather limited literature on fiscal policy synchronization in the WAMZ by verifying evidence of fiscal policy homogeneity in WAMZ countries between 2001 and 2020. Although earlier efforts in investigating this relationship in the WAMZ (Gammadigbe et al, 2018; Olowofeso et al, 2021) have focused on public debt and fiscal deficit policies. This paper extends the frontier by examining convergence in tax and expenditure policies, an unexplored aspect of the sub-Saharan African literature. It also confirms the synchronicity in debt and deficit policies as well as expands the literature on observing club convergence within the WAMZ, relying on the log t regression methodology. Thus, this research tests the null hypothesis of homogeneity of fiscal policy in WAMZ countries. The ensuing section discusses the literature, including related concepts and theory, the empirical literature the views from the theoretical and empirical literature. Section three presents the methodology and data; while section four has the model and estimations. The results are discussed in section five, while section six presents the conclusion and recommendations.

2. LITERATURE REVIEW

2.1 Theoretical Review

The need to foster shared regional development and economic progress have been the major rationale for the formation of regional blocs and convergence criteria are the implementation mechanisms (Jackson et al., 2019). The term convergence or macroeconomic convergence has been defined in different ways depending on context or epistemological connotations. There is 'Beta' convergence which indicates the catching-up of poorer countries or regions with richer ones on the basis of capital abundance (Barro and Sala-i-Martin, 1992), and it is underlined by Solow's (1956) neoclassical growth theory. This is different from 'Sigma' convergence proposed by Sala-i-Martin (1996), which captures reduction in dispersion between countries or regions as they converge towards different steady-states. Sala-i-Martin (1996) argues that countries converge, but towards different steady-states (Paprotny, 2020). This study defines 'convergence' in the context of regional economic communities, to mean policy harmonization, synchrony, or homogeneity in macroeconomic indicators (including fiscal, monetary and

external balance parameters). It focuses on the degree of internal consistencies and alignment of the economic policies of member states, to foster economic integration (Gammadigbe et al., 2018). Fiscal policy convergence, as a subset of the broader macroeconomic convergence program, describes the homogeneity or similarity of fiscal policy across member states in an economic or monetary union.

The instruments of policy harmonization include fiscal rules, limits or criteria. The degree of policy convergence in a regional setting is largely a function of the nature of the fiscal rule(s) and the cost or benefits of compliance with such rules. Fiscal rules have been defined as long-lasting and often numerical limits that are intended to constrain government spending and entrench 'fiscal responsibility' and debt 'sustainability' (Schaechter et al., 2012). As institutional mechanisms that promote fiscal discipline and credibility, fiscal rules minimize fiscal policy inefficiencies, such as procyclicality, overspending and or poor revenue collection (Bandaogo, 2020). Two broad approaches to designing fiscal rules in the literature are the 'principles-based' and 'rules-based' approaches (Brenton, 2016). The IMF identifies four rule-based approaches: revenue rule, expenditure rule; debt rule, balanced budget rule or a fiscal deficit rule (Davoodi, et al., 2022). The rebalancing and strengthening of incentives are critical to encouraging compliance to fiscal rules (Larch et al., 2021) and widespread non-compliance by some countries could dissuade more prudent economies to relax fiscal efforts (Halac & Yared, 2018; Caselli & Wingender, 2021). In the WAMZ region, fiscal rules are rule-based, and includes a primary criterion of 3% fiscal deficit limit, and a secondary criterion of public debt-GDP ratio threshold of 70%.

From a theoretical stance, the establishment of regional economic communities and the viability of currency unions, are underscored by the Optimum Currency Area (OCA) theory. The OCA requires macroeconomic shocks (including real and monetary, fiscal, trade, and inflation) in monetary unions to be symmetric, in order to offset the cost of surrendering monetary policy to a supranational regional bank (Tapsoba et al., 2019). The appropriate domain for the OCA of coexistence of 'internal' factor mobility and external factor immobility and fixed exchange rate regime, with a single authority that conducts monetary policy (Mundell, 1961). Under the OCA assumptions, the benefits of adopting a single currency outweighs the cost to an economy relinquishing its exchange rate instrument. This is because a single currency under a fixed exchange rate regime, in a currency area, eliminates transaction costs, as money functions much better as a medium of exchange and unit of account (*ibid*). The desire to synchronize macroeconomic shocks by homogenizing union-wide policies is at the heart of a single currency area and underscores the establishment of convergence criteria. Although the OCA advocates and thrives on policy harmonization, it possibly downplays the potential trade-off between national efficiency and interregional equity (Jackson et al., 2019). Arguably, what is optimal for the union, might not necessarily be for a member country, and the mechanism for achieving regional or national development might differ across countries.

2.3 Empirical Literature

The objective of macroeconomic policies in monetary unions is policy convergence and macroeconomic stability. Caselli and Wingender (2021) argue that fiscal policy convergence is more likely under coordination, compared with countries acting individually. Using the treatment effect framework, the authors show that fiscal deficits in EU countries are generally lower under the 3 per cent Maastricht treaty fiscal rule, when compared with fiscal deficits in countries outside the rule. Thus, convergence rules enable member states reduce cases of large budget deficits and surpluses. Arcabi (2018), however, contrasts Caselli and Wingender (2021) with the finding of absolute policy divergence in 28 EU countries, particularly after the sovereign debt crisis. It thus follows that major macroeconomic shocks could induce policy

divergence in a union, regardless of the subsisting fiscal rule. Besides, Okano (2014), based on constructs from a dynamic stochastic general equilibrium model of a currency union of two countries, submits that fiscal policy cooperation has no benefits and national fiscal policies can indeed produce optimal social welfare outcomes.

In the ECOWAS sub-region, Agba et al. (2017) observes increasing symmetry in macroeconomic policies in the ECOWAS region as a whole, and the pace is greater within the WAEMU, relative to the WAMZ. Within the WAMZ, empirical findings largely support divergences in macroeconomic policies (Harvey & Cushing, 2015; Mogaji, 2017; Kebalo, 2019; Asiedu et al., 2020; Olowfeso et al., 2021). In the light of weak evidence of policy synchronization in the WAMZ, Harvey and Cushing (2015) suggest the suspension of the idea of a monetary union in the WAMZ, until convergence among member countries is achieved as individual countries are lkely to respond differently to common policy monetary or fiscal policy shocks. Generally, policy synchronization in the zone is influenced by the diverse and differentiated economic structures across member countries, the quality of governance, political stability, and external shocks (Mogaji, 2017; Harvey & Cushing, 2015; Adedokun et al., 2019).

While studies on fiscal policy convergence in the WAMZ are largely limited, the findings have been mixed. The investigation by Olowofeso et al. (2021) on policy convergence in the zone, using the log t regression model is the most contemporary and robust, however, the scope of the enquiry is limited. The major departure of this study and contribution to the literature is the examination of convergence in government expenditure, tax revenue, public debt and fiscal deficits in WAMZ countries. It also goes further to investigate 'club' convergence in the zone, that is, the possibility of fiscal policy converging in sub-groups of countries in the zone, as against the rest of the WAMZ. This is important for a broader perspective on the homogeneity or otherwise of fiscal policy in the WAMZ.

3. METHODOLOGY

Ascertaining the synchronicity of fiscal policy in the WAMZ zone is important in any evaluation of macroeconomic convergence in the zone and the realization of the single currency objective. This study adopts the log t convergence test developed by Phillips and Sul (2009) in investigating convergence in the WAMZ zone. The hypothesis of fiscal policy homogeneity in WAMZ countries is tested using the log t convergence test developed by Phillips and Sul (2009). The main merits of the test include its accounting for heterogeneity in cross-sectional time-series; placing no restriction on trend stationarity or stochastic non-stationarity, thus allowing for robustness in the stationarity behavior of the series. Philips and Sul (2009) flawed the augmented Solow regression under transitional heterogeneity and the conventional cointegration tests for common errors, including endogeneity and omitted variables and low power of convergence detection, respectively (Du & China, 2017). Although the log t is notably superior to other convergence tests, including unit root and AR-1 regressions, however, the test is an asymptotic test, as such the outcome is sensitive to the time dimension of the panel. It also relies on a balanced panel.

3.1 Theoretical framework

The theoretical framework that underlines the methodology choice is based on Degiannakis et al. (2016), who formulated a dynamic correlation model between the business cycle and fiscal policy in a currency area. The synchronization of business cycle, which refers to co-movement in boost-bust phases in member-states of a currency union, is strongly linked with the concept of policy convergence, particularly in a regional setting. A pre-requisite for an optimum currency area is the synchronization of national business cycles (or policies) with union-wide

business cycle (or policies). Assuming the business cycle of country i at time t is denoted by $c_{i,t}$; while the union-wide cycle is indicated by $c_{U,t}$, equation (3.1) represents the relationship between both cycles:

$$c_{U,t} = \emptyset_{i,t} c_{i,t} \quad (3.1)$$

$\emptyset_{i,t}$ represents each country's target, and measures the degree of synchronization as ($\emptyset_{i,t} \to 1$). The closer this target is to one, the more synchronized a country's business cycle is with the union-wide cycle. Degiannakis et al. (2016) further assume that fluctuations in each country's business cycle is a function of certain economic variables ($\aleph_{i,t-k}$) and fiscal policy ($x_{i,t-k}$), such that $x_i \in \aleph_i$; that is, fiscal policy is subset of economic policies. Consequently, the business cycle in country i could be expressed as a linear or non-linear function of these economic variables:

$$c_{i,t} = f(\aleph_{i,t-k}) \quad (3.2)$$

This indicates the reaction of business cycles in national economies to economic conditions. These variables or macroeconomic environment are defined at time $t-k$, where k ranges from 0 to n.

Business cycle fluctuations induced by factors other than fiscal policy are expressed as:

$$c^*_{i,t} = c_{i,t} - g(x_{i,t-k}) \quad (3.3)$$

Such that $g(.)$ could be a linear or non-linear function of fiscal policy at time $t-k$. With the disentanglement of fiscal policy ($x_{i,t-k}$) from the macroeconomic policy function ($\aleph_{i,t-k}$), the degree of business cycle synchronization between country i and currency union can be stated as:

$$c^*_{U,t} = \emptyset^*_{i,t} c^*_{i,t} \quad (3.4)$$

Thus $c^*_{U,t}$ and $c^*_{i,t}$ are the non-fiscally induced business cycle fluctuations. Therefore, the difference between equation (3.1) and equation (3.4) provides the fiscal policy effect on business cycle synchronization in individual national economies and the union.

$$\emptyset_{i,t} - \emptyset^*_{i,t} = f(x_{i,t-k}) \quad (3.5)$$

If fiscal policy matters for business cycle synchronization then:

$$\emptyset_{i,t} - \emptyset^*_{i,t} \neq 0 \quad (3.6)$$

$$x_{U,t} = \gamma x_{i,t} \quad (3.7)$$

If equation (3.6) is valid, then equation (3.7) which measures the degree of convergence in fiscal policy (γ) must have been fulfilled. Where $x_{U,t}$ is the union-wide fiscal policy target, and γ (gamma) is the coefficient of fiscal convergence. Fiscal policy in country i is said to be converging with the union's target if $\gamma \geq 0$.

3.2 Model Specification

Fiscal convergence in equation 3.7, is estimate for each of the fiscal policy instruments ($x_{i,t}$) using the formal log t convergence regression model as specified below:

$$log\left(\frac{H_1}{H_t}\right) - 2\log\{\log(t)\} = a + \gamma log(t) + \varepsilon_t \qquad (3.8)$$

Where $H_{it} = \sum_{i=1}^{N}(h_{it} - 1)^2 \rightarrow 0$, is the variance of h_{it}, the mean of the vector of the series $x_{i,t}$ (tax revenue, expenditure, deficit and debt) for the six countries under consideration (See Appendix C for the derivation of equation 3.8). Formally, γ is the convergence coefficient; a the intercept and ε_t, the well-behaved disturbance term. One of the procedures suggested by Phillips and Sul (2009) is filtering the variables in question to remove the cyclical components. The same procedure was implemented on the fiscal policy variables using the HP filter. The filtering procedure and implementation in the STATA environment is presented in Appendix D.

The hypothesis test is structured thus: $H_0: \delta_i = \delta$ and $\gamma \geq 0$ and $H_A: \delta_i \neq \delta$ and $\gamma < 0$. The null hypothesis infers the convergence of the individual variances to a cross-section variance. This is the case where $\gamma \geq 0$ and significant. Phillips and Sul (2009) note that convergence could be conditional ($0 \geq \gamma < 2$) or absolute. ($\gamma \geq 2$). On the other hand, if γ is negative ($\gamma < 0$) and statistically significant, we reject the null hypothesis of convergence, and conclude that fiscal policy in at least one country behaves differently from the panel average with respect to the variable in question, and the null hypothesis of convergence ($H_0: \delta_i = \delta;\ \gamma \geq 0$). Where γ is subjected to a one-sided test:

$$t_\gamma = \frac{\hat{\gamma} - \gamma}{se_\gamma} \rightarrow N(0,1) \quad (3.9)$$

The log (t) regression is performed using non-linear regression with standard errors that are homoscedastic and non-serially correlated. In line with the Optimal Currency Area (OCA) theory, the expectation is that fiscal variables converge (i.e., $\gamma \geq 0$).

The main variables used in the analysis include: government expenditure (G), tax revenue (R), public debt (Debt) and fiscal deficit (FD). They are defined as the fiscal policy instruments in the study and are expressed as shares of GDP. These variables were collected for the six (6) WAMZ countries – The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone – that make up the WAMZ for the period 2001-2020. The data sources are the databases of the West African Monetary Institute (WAMI) and the West African Monetary Agency (WAMA). A summary of the variables used in the analysis is presented in Table 3.1.

Table 3.1: Descriptive Statistics

	WAMZ				**WAMZ Less Nigeria**			
	Tax Revenue	Expenditure	Fiscal deficit	Public debt	Tax Revenue	Expenditure	Fiscal deficit	Public debt
Mean	13.7	21.3	-5.2	78.9	14.6	21.8	-6	90.1
Median	13.1	20.6	-5.2	55.1	13.5	20.7	-6.6	61.5
Max	30.3	45.7	8.3	485.7	30.6	34.8	8.3	485.7
Min	1.5	3.5	-22.3	11.2	7.4	14.1	-22.3	20.3
Std. Dev.	5.1	7.0	5.5	86.5	4.4	4.8	5.5	90.5
Skewness	0.3	0.0	-0.3	3	1.0	0.6	0.0	2.8
Kurtosis	3.7	4.0	3.6	12.1	3.8	2.5	3.8	10.6
Jarque-Bera	4.9	5.5	3.2	594.4	20.2	7.1	2.9	375.4
Prob.	0.1	0.1	0.2	0.0	0.0	0.0	0.2	0
Obs.	**120**	**120**	**120**	**120**	**100**	**100**	**100**	**100**

Source: Authors' output using Stata 17.0

In the WAMZ panel, all the fiscal policy indicators were normally distributed, except public debt, which averaged 78.9 per cent of GDP in the region with considerable variation across member countries. The average debt-to-GDP level and standard deviation are higher when

Nigeria is excluded from the WAMZ basket. The difference in the behaviour of the series suggests significant influence of Nigeria in the zone. Notably, all the fiscal policy series are leptokurtic, suggesting the possibility of extreme numbers at both ends of the distribution. However, the series are largely clustered around the mean apart from fiscal deficit and public debt, which exhibited extreme skewness with their values below -1 and above 1.

The series, tax revenue (R), government expenditure (G), and fiscal deficit (FD) exhibit cross-sectional dependence which traditional convergence tests cannot handle (Du & China, 2017) (See Table 3.2). Given that stationarity is not a precondition for the estimation of the log t convergence model, the test was ignored.

Table 3.2: Test for cross-sectional dependence in variables.

Test	Statistic	$R_{i,t}$	$G_{i,t}$	$Debt_{i,t}$	$FD_{i,t}$
CD_P	$\sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{i,j}\right)$	-0.36 [a]	0.15 [a]	7.36	0.36 [a]

Note: [a] represents statistical significance of 1%. The null hypothesis of the CD test is weak cross-sectional dependence in the residuals. The CD_P is Pesaran (2015) test for cross-sectional dependence.
Source: Authors' estimations using STATA 17.0

Equation 3.7 was subsequently estimated across sample periods: 2001-2010, 2011 and 2020, with (WAMZ) and without Nigeria (WAMZ_NGN), to ascertain the synchronization of fiscal policy in the region. In the former, the estimation was done for the six WAMZ economies, as a bloc, while in the latter (WAMZ_NGN) the model excluded Nigeria from the group of countries given the country's disproportionate size (accounting for 85 per cent of WAMZ GDP) and the importance of isolating its influence on outcomes for the entire zone. This was done because macroeconomic outcomes for the region tend to mimic dynamics in the Nigerian economy (Mogaji, 2017). The rest four (4) models investigated club convergence of the group of WAMZ countries across the four (4) fiscal policy parameters – deficit, tax revenue, expenditure and debt.

4. RESULTS AND DISCUSSION

The result from the log ($_t$) regression shows that fiscal policies in WAMZ are significantly heterogenous, with the degree of divergence varying with the type of fiscal instrument under scrutiny (See Table 4.1). The gamma coefficient (γ), estimated by the log ($_t$) regression at the 5 per cent level of significance, was negative for all the fiscal policy indicators in the WAMZ across the sample periods (except for expenditure in the period 2011-2020). The result supports the findings of Olowofeso et al. (2021) on the divergence of fiscal deficit policy in the region. On average, the largest divergences across the sample periods are in expenditure (-3.39) and debt policies (-4.32), in the 2001-2020 and 2001-2010 samples, respectively.

Comparing the synchronization of fiscal policy in WAMZ across sub-samples, reveals lower policy divergence in the period 2011-2020, relative to the preceding decade (2001-2010) and the full sample period. Notably, divergences in all the fiscal policy indicators (tax revenue, fiscal deficit, expenditure and debt) were minimal, compared to the full sample (2001-2020) and the region experienced conditional convergence in public expenditure policy (gamma= 0.11) in 2011-2020. This reflects the bandwagon response of WAMZ countries to successive

and, largely, common shocks in the zone – commodity price slumps, aftermath of the GFC-2008/2010, the Ebola crisis and the COVID-19 pandemic – that prompted cross-cutting expansionary fiscal policies.

The asymmetry in fiscal policy in the zone appears to be generally lower when Nigeria is excluded from the sample (2001-2020). For instance, tax revenue, which was estimated to be divergent (gamma = -1.27) in the full sample (2001-2020), exhibited symmetry with gamma at 0.85 (conditional convergence) when Nigeria is excluded from the sample. This underscores the influence of Nigeria on macroeconomic outcomes in the region and suggests that policy synchronization in WAMZ appears to be largely hinged on policy dynamics in Nigeria (Mogaji, 2017).

The absence of fiscal policy homogeneity in the WAMZ, as a bloc, does not rule out the possibility of convergence within subgroups of member countries. Analysis of club convergence was done by altering the original algorithm for the panel convergence test. To achieve this, individual countries are sorted into club membership, provided the test statistics computed by the algorithm proposed by Phillips and Sul (2009) exceeds the critical value. This is accompanied by the log (t) regression and convergence clubs are identified if the test statistics exceeds -1.65 (Phillips & Sul, 2009). From the result, club 1 captures a cluster of countries in WAMZ with similar convergence or divergence path, with respect to a given fiscal policy variable; while club 2 is the group of WAMZ member states with identical convergence or divergence path, different from club 1's (See Table 4.2).

The test affirms convergence of tax revenue in Gambia, Ghana, Guinea, Liberia and Sierra Leone at gamma-coefficient of 0.94. While the test suggests that the convergence path of Nigeria for tax revenue is different from those of the rest of WAMZ countries, it was inconclusive about nature of the convergence, given that the requirement of at least two countries in a club for the evaluation of clustering convergence was unmet (Du and China, 2017). This also explains why tax revenue policy converged in WAMZ when Nigeria was excluded from the model, as noted in the preceding analysis. With regards to expenditure, a conditional convergence was recorded for a cluster of four countries - Ghana, Guinea, Liberia, Sierra Leone – compared with a divergence in Nigeria and the Gambia. On the synchronization of fiscal deficit, there is absolute fiscal convergence within the cluster of Nigeria and Liberia at 2.21; and a divergence in the group, consisting of Gambia, Ghana, Guinea, Sierra Leone (gamma = -2.89). With regards to public debt, fiscal policy clearly diverged across all the WAMZ countries. However, discernably, the divergence or clustering was distinct and similar for Nigeria and Liberia, relative to the rest countries of the zone. Although clubs 1 and 2 registered divergences in public debt, the size of the divergence (gamma-coefficient) was smaller in club 1 (-1.33), relative to club 2 (-5.71). A major import from the analysis is that there are clusters within the WAMZ with distinct policy synchronization paths. This corroborates the findings of Olowofeso et al. (2021) and Mogaji (2017). Notably, Nigeria, appears to be an outlier in the group. This is not surprising in view of the size of its economy relative to the rest member states.

5. CONCLUSION, POLICY AND RECOMMENDATIONS

The result shows that fiscal policy indicators in WAMZ generally diverge, but there have been marked improvement towards convergence in the last decade (2011-2020), particularly in expenditure policies. Notably, the divergences tend to be lower when Nigeria is excluded from the sample, underscoring the overwhelming influence of Nigeria on the region's policy dynamics. Further investigation with regards to club convergence within the WAMZ, reveals convergence in tax-revenue policies in five WAMZ states, except Nigeria. On expenditure policies, there was convergence in four states, excluding Nigeria and the Gambia. However, on fiscal deficit and public debt policies, Nigeria and Liberia converged, while the rest of the WAMZ region recorded divergence in fiscal deficit. The convergence test suggests that although fiscal policy are heterogenous in WAMZ as a bloc, there are convergences in clubs or sub-groups of countries, offering insight on the idiosyncrasies and pair attributes of member countries.

By way of recommendation, the outlier effect of Nigeria in the zone suggests that a one-size-fit-all policy rule might not suffice for the WAMZ. Fiscal rules in the WAMZ should accommodate the idiosyncrasies of member countries, including the size and structural peculiarities of individual economies. With the continued implementation of a flat or mean fiscal rule, it is highly unlikely that all the countries in WAMZ would meet the fiscal convergence criteria, thus delaying the realization of its single currency objective. As a way of recommendation, identical countries, in terms of size, policies, structure or macroeconomic fundamentals should be subject to similar set of fiscal rules, through the creation of club-based fiscal rules. Also, traditional assessment of fiscal convergence in the WAMZ has been limited to fiscal deficit and public debt, information on implicit fiscal policy convergence in tax revenue (as a share of GDP) and aggregate expenditure (as a share of GDP) may hold valuable information on the quality, direction, and potential synchrony in fiscal policy in the zone. Consequently, as part of WAMZ's dashboard for evaluating the performance and compliance of member states to set fiscal conditions, taxes and expenditure rules should be accommodated as non-binding flexible targets for member states.

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Appendix A

State of Macroeconomic Convergence in WAMZ

Table 1.1: Macroeconomic Convergence Criteria in WAMZ in 2020.

	Target	Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone
Primary Criteria							
1. Inflation rate	**<10%**	6	11.2	11.3	13.1	12.6	17.5
2. Deficit-GDP	**≤3%**	4.2	13.7	0.9	0.9	4	6
3. Central Bank Financing of Fiscal Deficit as % of preceding year's revenue	**≤10%**	0.0	31.2	8.8	12.4	0.7	26
4. Gross External Reserves (Months of Imports)	**3 months**	5.7	4.3	4.6	2.4	7.7	4.5
*Criteria satisfied	4	3	1	3	1	2	1
Secondary Criteria							
1. Exchange rate variation (% fluctuation band)	**15%**	1.2	3.5	3.8	-	19.5	2.8
2. Public Debt to GDP Ratio	**70%**	78.1	56.9	41	-	15.7	72.4
*Criteria satisfied	2	1	2	2	-	1	1

Source: WAMI database

Table 1.2: Macroeconomic Convergence Status in WAMZ (2010-2020).

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Primary Criteria											
The Gambia	4	3	3	2	2	1	1	3	3	3	3
Ghana	3	3	3	2	1	2	1	2	3	3	1
Guinea	0	2	3	3	4	2	3	3	2	4	3
Liberia	3	3	3	3	3	3	2	1	1	1	1
Nigeria	2	3	3	4	4	4	2	3	2	2	2
Sierra Leone	1	1	1	4	2	2	1	1	1	3	1
WAMZ	2	3	3	4	4	2	2	3	3	3	3
Secondary Criteria											
The Gambia	2	2	1	0	1	0	1	1	1	1	1
Ghana	2	2	1	1	1	0	1	2	2	2	2
Guinea	0	0	2	2	2	2	1	2	2	2	2
Liberia	2	2	2	1	2	2	1	1	1	1	2
Nigeria	2	1	1	1	2	1	1	2	2	2	1
Sierra Leone	2	2	2	2	1	1	1	2	1	2	1
WAMZ	1	1	1	1	1	1	1	1	1	1	1

Note: The table indicates the performance of WAMZ countries across the four primary convergence and two secondary convergence criteria between 2010 and 2020
Source: WAMI database

Appendix B

Results

Table 4.1: Fiscal convergence tests, Log(t) regression results

	WAMZ	WAMZ_NGN	Remark
Sample: 2001-2020			
Fiscal deficit	-1.57	-1.53	Divergence (+)
Tax revenue	-1.27	0.85	Divergence→Convergence
Expenditure	-3.39	-0.71	Divergence (+)
Debt	-1.09	-0.94	Divergence (+)
Sub-sample: 2001-2010			
Fiscal deficit	-1.50	-1.92	Divergence (-)
Tax revenue	-1.71	-1.46	Divergence (+)
Expenditure	-2.69	-3.27	Divergence (-)
Debt	-4.32	-1.51	Divergence (+)
Sub-sample: 2011-2020			
Fiscal deficit	-1.29	-1.19	Divergence (+)
Tax revenue	-0.79	1.05	Divergence→Convergence
Expenditure	0.11	-0.82	Convergence→Divergence
Debt	-0.49	-0.52	Divergence (-)

Note: All the γ coefficients are based on a significant t-test at the 5% level of significance
(+) indicates less divergence, and (-) greater divergence, → suggests transformation in sign
Source: Authors' estimations

Table 4.2: Log(t) regression for club convergence, Model 4.

Fiscal policy variables	Club1	log(t)	Club2	log(t)
1 Tax revenue	Gambia, Ghana, Guinea, Liberia, Sierra Leone	0.94* (7.37)	Nigeria	NA NA
2 Expenditure	Ghana, Guinea, Liberia, Sierra Leone	1.04* (5.96)	Nigeria and Gambia	-7.31* (-16.87)
3 Fiscal deficit	Nigeria and Liberia	2.21* (4.56)	Gambia, Ghana, Guinea, Sierra Leone	-2.89* (-139.44)
4 Debt	Nigeria and Liberia	-1.33* (-0.70)	Gambia, Ghana, Guinea, Sierra Leone	-5.71* (-46.26)

Note: () t-statistics, * convergence coefficients at the 5% significance level. NA – No other country to compare with.
Source: Stata output

Appendix C

Derivation of the log t model

The model begins by decomposing the panel data, X_{it} into:

$$X_{it} = b_{it} + c_{it} \qquad (A.1)$$

Where b_{it} is the systematic components such as permanent common components and c_{it} is the transitory component. The equation is further transformed to separate common components from peculiar or individual components, such that:

$$X_{it} = \left(\frac{b_{it} + c_{it}}{u_t}\right) u_t = \delta_{it}\, u_t \quad (A.2)$$

ϑ_{it} is the time-varying idiosyncratic component, while u_t is the common component of the group. However, the model cannot be directly fitted without imposing a restriction on δ_{it} and u_t, in which case Phillips and Sul (2009) propose eliminating the common factor, such that:

$$h_{it} = \frac{X_{it}}{\frac{1}{N}\sum_{i=1}^{N} X_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_{i=1}^{N} \delta_{it}} \quad (A.3)$$

Where h_{it} is defined as the relative transmission parameter, measuring the loading coefficient, relative to the panel average at time t, and for the purposes of this research, X_{it} is a vector of series on government revenue, expenditure and debt, tested individually. The convergence condition requires that the mean of all the countries (h_{it}) equals to one and its variance (H_{it}) tends to zero:

$$H_{it} = \sum_{i=1}^{N} (h_{it} - 1)^2 \to 0 \text{ if } \lim_{t\to\infty} \delta_{it} = \delta, \text{for all } i \quad (A.4)$$

According to Phillips and Sul (2009), the convergence of X_{it} requires that $\lim_{t\to\infty} \frac{X_{it}}{X_{jt}} = 1, \text{for all } i \text{ and } j$
with the time-varying factor-loading coefficient tending to a constant: $\lim_{t\to\infty} \delta_{it} = \delta, \text{for all } i$; and assumed to be $\delta_{it} = \delta_i + \sigma_{it}\aleph_{it}, \sigma_{it} = \frac{\sigma_i}{L(t)t^{\gamma}}, t \geq 1, \sigma_i > 0$ for all i. $L(t)$ is a varying function, taking the forms: $\log(t)$, $log^{2}(t)$ or $\log\{\log(t)\}$ but set at $L(t) = \log(t)$ in the Stata code. With the formal log t function expressed as:

$$log\left(\frac{H_1}{H_t}\right) - 2\log\{\log(t)\} = a + \gamma log(t) + \varepsilon_t \qquad (A.5)$$

Appendix D

Estimation Codes for the Convergence Tests

```
*Data Filtering
pfilter fd, method("hp") trend(fd_trend) cyc(fd_cyc)
pfilter r, method("hp") trend(r_trend) cyc(r_cyc)
pfilter g, method("hp") trend(g_trend) cyc(g_cyc)
pfilter debt, method("hp") trend(debt_trend) cyc(debt_cyc)

*log t regression WAMZ (sample)
logtreg fd_trend if year>2010, kq(0.3) nomata
logtreg fd_trend if year<2011, kq(0.3) nomata
logtreg r_trend if year>2010, kq(0.3) nomata
logtreg r_trend if year<2011, kq(0.3) nomata
logtreg g_trend if year>2010, kq(0.3) nomata
logtreg g_trend if year<2011, kq(0.3) nomata
logtreg debt_trend if year>2010, kq(0.3) nomata
logtreg debt_trend if year<2011, kq(0.3) nomata

*log t regression WAMZ less Nigeria (sample)
logtreg fd_trend if year>2010| id!=5, kq(0.3) nomata
logtreg fd_trend if year<2011| id!=5, kq(0.3) nomata
logtreg r_trend if year>2010| id!=5, kq(0.3) nomata
logtreg r_trend if year<2011| id!=5, kq(0.3) nomata
logtreg g_trend if year>2010| id!=5, kq(0.3) nomata
logtreg g_trend if year<2011| id!=5, kq(0.3) nomata
logtreg debt_trend if year>2010| id!=5, kq(0.3) nomata
logtreg debt_trend if year<2011| id!=5, kq(0.3) nomata

*WAMZ
logtreg fd_trend, kq(0.3) nomata
logtreg r_trend, kq(0.3) nomata
logtreg g_trend, kq(0.3) nomata
logtreg debt_trend, kq(0.3) nomata

*WAMZ less Nigeria
logtreg fd_trend if id!=5, kq(0.3) nomata
logtreg r_trend if id!=5, kq(0.3) nomata
logtreg g_trend if id!=5, kq(0.3) nomata
logtreg debt_trend if id!=5, kq(0.3) nomata

*Club convergence Test
drop club
psecta fd_trend, name(country) kq(0.333) gen(club) noprt
matrix b=e(bm)
matrix t=e(tm)
matrix result1=(b \ t)
```

```
matlist result1, border(rows) rowtitle("log(t)") format
(%9.3f) left(4)
drop club
psecta r_trend, name(country) kq(0.333) gen(club) noprt
matrix b=e(bm)
matrix t=e(tm)
matrix result1=(b \ t)
matlist result1, border(rows) rowtitle("log(t)") format
(%9.3f) left(4)
drop club
psecta g_trend, name(country) kq(0.333) gen(club) noprt
matrix b=e(bm)
matrix t=e(tm)
matrix result1=(b \ t)
matlist result1, border(rows) rowtitle("log(t)") format
(%9.3f) left(4)
drop club
psecta debt_trend, name(country) kq(0.333) gen(club) noprt
matrix b=e(bm)
matrix t=e(tm)
matrix result1=(b \ t)
matlist result1, border(rows) rowtitle("log(t)") format
(%9.3f) left(4)
```