



Towards monetary union in the Economic Community of West African States (ECOWAS): Better policy harmonisation and greater intra-trade are needed

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Abstract

Since the launch of the euro in 1999, the policy aspiration of the Economic Community of West African States (ECOWAS) for monetary union has increased despite its convergence challenge. This study investigates the economic characteristics of ECOWAS for a successful and sustainable monetary union. We use cluster analysis for the period 1998–2018. The findings show that there is considerable heterogeneity in the economic characteristics of ECOWAS countries. This suggests that the countries are not yet economically ready for a regional wide monetary union. The study also revealed key variables, including inflation, exchange rate volatility, intra-regional trade, that clearly demarcate the two pre-existing monetary zones in the region. The study concludes that ECOWAS policymakers must enhance policy harmonisation and intra-regional trade.

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1. Introduction

Since the era of independence of African countries, African leaders have been working together towards the unity and integration of the continent. This initiative led to the formation of overlapping regional economic communities (RECs) with the ultimate aim of an African Monetary Union (AMU) by 2028. One of these RECs is the Economic Community of West African States (ECOWAS). The others include Arab Maghreb Union (AMU), Community of Sahel-Saharan States (CENSAD), Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), Economic Community of Central African States (ECCAS), Southern African Development Community (SADC).

Within this framework of the African Agenda, in 1975 fifteen West African countries, namely Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, The Gambia, and Togo initiated the formation of ECOWAS. The aims of ECOWAS, as stated in its (revised) treaty, are to promote cooperation and integration, leading to the establishment of an economic union in West Africa in order to raise the living standards of its peoples, to maintain and enhance economic stability, foster relations among member states, and contribute to the progress and development of the African continent.

In pursuit of its aims, ECOWAS has implemented several policy reforms over the years, including the establishment of a common market through trade liberalisation, common trade policy and common external tariffs, and the removal of obstacles to the mobility of persons in order to foster intra-regional trade. To date, according to many commentators the policy outcomes of all these reforms have fallen far below expectations. For instance, [Smile \(2009\)](#) claimed that the post-independence living standards of most Africans, including those living in ECOWAS countries with limited human capital and in rural areas, have been no better than pre-independence (see also [Okolo, 1988](#); [Robson, 1985](#)).

Since the launch of the Euro in 1999, ECOWAS policy effort has been directed towards the formation of a single currency for its fifteen member states, through the merger of the two pre-existing monetary zones in the region, namely the West African Economic and Monetary Union (WAEMU) and West African Monetary Zone (WAMZ), in addition to the Lusophone countries of Cape Verde and Guinea Bissau. While Guinea Bissau joined WAEMU in 1997, Cape Verde has remained neutral, despite being offered the option of joining either the WAEMU or the WAMZ.

WAMZ, formed in 2000, is (mainly) Anglophone monetary union made of Ghana, Nigeria, Sierra Leone, The Gambia, Liberia, and Guinea. By contrast, WAEMU is a Francophone monetary union made of Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo. WAEMU is backed by France, i.e. the former coloniser of these countries. The common currency is the CFA (Communauté Financière Africaine) franc, and it is pegged to the euro (prior to the euro the peg was to the French Franc). The French Treasury provides convertibility guarantee for the CFA franc. In return, each CFA country is required to deposit 50% of its monetary reserves into the Bank of France, and those deposits are maintained in the operations account. This requirement affects both the nature and adequacy of foreign exchange reserves of these countries ([Delechat & Martijrt, 2008](#)), and poses a challenge to the effective implementation of monetary policies for growth and stability.

More generally, the linguistic divide between Anglophone, Francophone, and Lusophone countries in ECOWAS with different colonial ties, different economic structures, different languages, and cultures pose a challenging issue for the ECOWAS convergence agenda.

In the opinion of several scholars this issue may represent a serious constraint for the creation of a successful and sustainable monetary union that will enhance intra-regional trade among ECOWAS member countries (Hochreiter & Tavlas, 2004; Mundell, 2012; Scrimgeour, 2002).

Initially, the ECOWAS integration plan was to follow a two-track approach with WAEMU using the CFA, and WAMZ introducing a currency of its own called the ‘eco’. However, the lack of convergence among member countries led to the abandonment of the two-track approach in July 2014. In the new arrangement, the WAMZ currency is no longer required. Instead, all countries should now work towards the fulfilment of a set of convergence criteria for full membership of the ECOWAS single currency. Yet, this convergence agenda has been met with different policy strategies, emanating from the different colonial jurisdiction and economic zones (see endnote¹). The convergence criteria for ECOWAS, WAEMU and WAMZ show that while countries in WAMZ adopted the four ECOWAS primary convergence criteria, countries in WAEMU still continue to follow their separate CFA criteria. The ECOWAS tripartite linguistic challenge does not only cause policy divergence within the regional jurisdictions, but also tension between the regional superpowers of the two economic blocs, namely Nigeria for the Anglophone WAMZ, and Cote d’Ivoire for the Francophone WAEMU. As the countries, again, failed to converge in January 2020, the ECOWAS authority had to postpone the launch of the ECOWAS single currency to 2027.

Several studies have analysed the lack of convergence of the ECOWAS countries. The findings from these studies are however conflicting and inconclusive (Alagidede et al., 2012; Asongu et al., 2017, 2019; Bénassy-Quéré & Coupet, 2005; Debrun et al., 2005; Masson, 2008; Ogunkola, 2005; Tsangarides & Qureshi, 2008). According to Asongu et al. (2017), the heterogeneity of findings can be explained by a number of factors such as scopes of inquiry involving different RECs, regional-specific factors, proxy indicators, periodicities, sample compositions and methodologies. What is noticeable in some of the ECOWAS studies is that either they include ECOWAS and other REC(s) outside ECOWAS in their sample, or only consider a sub-REC (WAEMU or WAMZ) from ECOWAS. There are others that focus on one or two variables, while ignoring the wider policy picture. Our study contributes to bridge this gap in the literature. To do this, we focus specifically on ECOWAS, and explore the implication of this linguistic divide between Anglophone, Francophone, and Lusophone countries by attempting to answer the following research questions:

- (i) Do ECOWAS countries share the economic characteristics such that to justify the possibility of creating a successful regional monetary union?
- (ii) What do ECOWAS policymakers need to do for a successful and sustainable monetary union?

With the use of cluster analysis for the period 1998–2018 we apply recent data to achieve our objectives. In addition to less stringent data requirements in terms of time dimension, cluster analysis allows us to incorporate (simultaneously) many variables relevant for monetary unions. These features make the technique more suitable for African countries, where data poses problems for research, and, therefore, overcome limitations of previous studies.

¹ Currently at the bottom of Table 2

The study contributes to the research literature and policy debate in several ways. Firstly, it updates the research literature by using the most recent data. Secondly, unlike previous studies, with samples of mixed countries from different RECs that have different jurisdictions, regulatory and integration arrangements, this study focuses specifically on ECOWAS countries, giving scope for a deeper and more rigorous analysis and clear policy implications, without the influence of differences that may arise from regulatory and integration dissimilarities. Thirdly, the paper covers a longer period of up to twenty years, with sub-periods analysis to examine the dynamics, and all the fifteen ECOWAS countries are included in order to provide a holistic view to policy makers. Finally, the study not only sheds light on the suitability of the countries but also reveals key macroeconomic variables that separate the regional economic zones and suggests areas to which policy efforts could be directed in the future to enhance convergence and optimality for the success of the proposed monetary union. As this paper focuses only on ECOWAS, one of the RECs of the African Monetary Union (AMU), its findings will be relevant to policy makers of ECOWAS and AMU in re-evaluating their target dates of 2027 and 2028, respectively.

The rest of the paper is organised as follows. [Section 2](#) discusses the existing literature. [Section 3](#) describes the methodology. Results are presented in [Section 4](#). [Section 5](#) concludes with policy implications.

2. Literature review

The Optimum Currency Area (OCA) criteria pioneered by [Mundell \(1961\)](#) provide the analytical framework through which academics and policymakers think about preconditions for a smoothly functioning monetary union ([Eichengreen, 2014](#)). The OCA, subsequently extended by [Kenen \(1969\)](#) and [Mckinnon \(1963\)](#), determines the conditions which countries need to satisfy in order to make monetary union more attractive; that is, to ensure that the benefits of monetary union exceed its costs ([Kunroo, 2015](#)). The theory, therefore, requires convergence of countries prior to the formation of monetary union. Contrary to the OCA, the endogeneity literature as argued by [Frankel and Rose \(1998\)](#) claims that a country is more likely to satisfy the OCA criteria for entry into a currency union ex-post than ex-ante. However, this argument was opposed by [Krugman \(1993\)](#). The existence of the euro since 1999, along with the convergence literature, has not confirmed the endogeneity argument that might provide hope for emerging currency unions to be formed before convergence is achieved. The debate on the convergence of the euro countries is well documented in the extant literature. Many studies found macroeconomic imbalances and lack of convergence in the euro zone even after the launch of the euro ([Artis & Zhang, 2001](#); [Christou et al., 2020](#); [De Grauwe, 2012](#); [Gräbner et al., 2020a, 2020b](#); [Krogstrup, 2002](#)).

There is a belief that ECOWAS member states have taken measures within the context of their national structural adjustment programmes (SAPs) to facilitate the establishment of a single monetary zone in the sub-region. However, [Ogunkola \(2005\)](#) argued that even if this is true, there seems to be a lack of coordination and harmonisation among the ECOWAS members' policies which still necessitates an evaluation of the individual countries' efforts not in terms of the impact of SAPs, but as they relate to the requirements for the establishment of a single monetary zone in the sub-region. Also, given the spectre of the euro crisis which is haunting existing and embryonic monetary unions, a major lesson of this crisis is that serious disequilibria result from regional monetary arrangement not designed to be resistant to a variety of shocks ([Asongu, 2014a](#)). Therefore, a replication of the euro model without considering its

design problems could be a recipe for disaster, especially for less developed countries such as those in ECOWAS with less potent policy instruments to combat shocks. This strengthened the need for policymakers to ensure countries' convergence prior to the formation of a monetary union. With the euro experience as already discussed, a continuous and up-to-date assessment of convergence of countries prior to monetary union for a robust design is a motivation for this study.

The convergence literature on ECOWAS is well documented, covering different samples, different periods, and conflicting findings. Some studies used samples with countries in Africa but outside the scope of ECOWAS. For instance, [Ogunkola \(2005\)](#), using the real exchange rate variability model, found convergence in ECOWAS although he recommended the need for further convergence in economic policy. [Debrun et al. \(2005\)](#), in assessing ECOWAS potential for monetary integration, found ECOWAS's proposed currency union to be feasible for most non-WAEMU countries but not for WAEMU countries. Similarly, [Bénassy-Quéré and Coupet \(2005\)](#) found that the CFA zone is not an optimum currency area. They observed that a monetary union in ECOWAS, with the inclusion of Nigeria, was not economically practical. Their finding is similar to [Masson \(2008\)](#). [Tsangarides and Qureshi \(2008\)](#) also found significant differences, in economic characteristics, between WAMZ and WAEMU. However, their study, and that of [Bénassy-Quéré and Coupet \(2005\)](#), included Central African Economic and Monetary Community (CEMAC) in its sample. [Alagidede et al. \(2012\)](#) used cointegration and fractional integration to investigate the inflation dynamics in WAMZ. They found substantial heterogeneity. However, this study only included four of the fifteen ECOWAS countries and two variables, namely inflation and GDP. Similarly, [Quah \(2016\)](#) applied the OCA theory to evaluate the appropriateness of the WAEMU as a monetary zone. He found inherent asymmetries across the union. In a different approach, [Sarr \(2016\)](#) used the Blinder–Oaxaca decomposition to examine how the quality of budget institutions affects fiscal performance in sub-Saharan Africa. Sarr categorised the countries into two categories of budgetary institutions: the English-based system (anglophone) and the French-based system (francophone). He found that, on average, anglophone African countries have better budgetary institutions than their francophone counterparts, and this difference, he commented, is the main determinant of the fiscal performance gaps between the two groups. This finding has important implications for the similarity/dissimilarity of ECOWAS countries since eight of the countries are francophone, five are anglophone and two are lusophone.

With the use of panel cointegration technique for the period 1985–2009, [Coulibaly and Gnimassoun \(2013\)](#) investigated the optimality of currency union for seventeen sub-Saharan African countries belonging to CFA (WAEMU and CEMAC) and WAMZ. Out of the three currency zones examined, they found WAEMU to be the most homogeneous. Their results provide justification for Ghana and The Gambia to join WAEMU, and to a lesser extent Sierra Leone. Exchange rate misalignment for Nigeria, the largest ECOWAS economy, was found to be similar to CAEMC, suggesting that Nigeria is more suitable to join CAEMC currency zone than WAEMU. [Asongu et al. \(2019\)](#) examined thirteen of the fifteen ECOWAS countries for the stability of money demand for the period 1981–2015. Their findings show divergence across ECOWAS member states in the stability of money. In another study, [Asongu \(2014b\)](#) assessed real, monetary and fiscal policy convergence within West African Monetary (WAM) and East African Monetary (EAM) zones using dynamic panel GMM estimation technique for the period 1981–2009. His sample includes four countries from each zone. The findings suggest overwhelming lack of convergence in initial conditions for financial development, monetary policy initiatives and the implementation of IMF-backed financial reform programmes. With a sample

of four WAMZ countries (The Gambia, Ghana, Nigeria and Sierra Leone) for the period 1980–2009, [Asongu \(2014a\)](#) used cointegration to analyse real effective exchange rate (REER) imbalances and examined whether the movements in the aggregate real exchange rates are consistent with the underlying macroeconomic fundamentals in the proposed WAMZ. He found significant evidence of cross-country differences in the relationship between underlying macroeconomic fundamentals and corresponding REERs.

3. Methodology and data

3.1. Cluster analysis

Cluster analysis is a technique commonly used to organise objects into groups (clusters) according to homogeneities such that objects in the same group are as similar as possible. In the context of cluster analysis, the data set consists of n objects (countries in our case) and for each country there are p variables, which are denoted by

$$X_{np} = \{X_1, X_2, \dots, X_n\}, \text{ where each } X_i = \{X_{i1}, \dots, X_{ip}\} \quad (1)$$

Each variable is standardised with mean zero and standard deviation of one, as in [Eq. \(2\)](#), in order to treat variables as having equal importance in determining the structure. Standardisation of the variables is also important in order to keep variables with high variances from dominating the cluster analysis. When variables are of different magnitude and are not directly comparable, standardisation helps to overcome this problem.

$$Z = \frac{Y - \bar{Y}}{\text{Std}Y} \quad (2)$$

Where Y is the original data, $\bar{Y}$ is the sample mean and $\text{Std}Y$ is the standard deviation of Y . We use the standardised variables to classify the objects into clusters using Euclidean distance as a dissimilarity coefficient, which is distance between two objects i and j and is defined as:

$$d(i, j) = \sqrt{\sum_{k=1}^p (x_{ki} - x_{kj})^2} \quad (3)$$

Hierarchical clustering (HC) is one of the common methods used in the literature for grouping objects. This method attempts to assign each object to one, and only one, cluster. Expressed mathematically, hierarchical clusters must satisfy the following properties:

$$u_{ik} \in 0,1 \text{ and } 1 \leq i \leq n; 1 \leq k \leq c, \quad (a)$$

$$\sum_{k=1}^c u_{ik} = 1, 1 \leq i \leq n, \text{ and} \quad (b)$$

$$0 < \sum_{i=1}^n u_{ik} < n, 1 \leq k \leq c, \quad (c)$$

where u_{ik} represents the membership coefficient or degree of belongingness of an object i to a cluster k , c is the number of possible clusters, and n is the number of objects in the data set. Properties (a)–(c) states that a membership coefficient is either zero or one, meaning that an object belongs to either one cluster or the other, the sum of the membership coefficients of an object across clusters is equal to one (i.e. every object must belong to a cluster), and the sum of the membership coefficients in a cluster lies between zero and the total number of objects in the data set (i.e. each cluster must contain at least one but less than all objects in the data set), respectively.

We use agglomerative hierarchical clustering (AHC) technique to group the countries. To determine which object/cluster to join at each stage we apply the average linkage method (ALM). In this method, the dissimilarity or closeness between clusters 1 and 2 is taken to be the average of all dissimilarities $d(i,j)$, where i is any object of cluster 1 and j is any object of cluster 2. Assume n_1 and n_2 are the number of observations in clusters 1 and 2 respectively. The average linkage method measures proximity as

$$DistGA_{1,2} = \frac{1}{n_1 n_2} \sum_{i=1}^n \sum_{j=1}^n d(x_{1i}, x_{2j}) \quad (4)$$

We joined the countries using the ALM above to produce the dendrogram. The dendrogram with the highest cophenetic correlation coefficient (CCC) is chosen to group the countries. The CCC determines how well the generated clusters represent dissimilarities between objects and a value close to one represents better clustering.

Letting d be the average of $d(i,j)$, and letting t be the average of $t(i,j)$, the distance generated by the linkage method when two objects are first joined together, then the CCC is defined as

$$CCC = \frac{\sum_{i < j} (d(i, j) - d)(t(i, j) - t)}{\sqrt{\left[\sum_{i < j} (d(i, j) - d)^2 \right] \left[\sum_{i < j} (t(i, j) - t)^2 \right]}} \quad (5)$$

To determine the optimal number of clusters we applied two formal rules jointly: the pseudo-F (CHI) index developed by Calinski and Harabasz (1974) and the Duda-Hart stopping-rule (DH). The CHI index is defined as

$$CHI = \frac{S_b/(K - 1)}{S_w(n - k)} \quad (6)$$

where S_b is the between-clusters sum of squares, S_w is the within-clusters sum of squares, k is the number of clusters and n is the number of objects. Higher values of the index indicate more distinct partitioning and, therefore, better clustering. The variables for our study are in Table 1 and data sources at the bottom of Table 2.

Table 1
Variable definition.

Variable	Definition and measurement
BUS	Synchronisation in the business cycles: the cross-correlation of the cyclical components of annual GDP using Hodrick-Prescott (H-P) filter (Hodrick & Prescott, 1997) and European Union as anchor.
RTI	Trade openness: $\frac{X_{i,ECOWAS} + M_{i,ECOWAS}}{X_i + M_i}$ (Note 1)
TOT	Terms of trade synchronisation: the cross-correlation of the first difference of the annual terms of trade index for each of the ECOWAS countries and the euro area
INF	Convergence of inflation: the absolute inflation differential between each country (X_i) and the anchor country (X_e), i.e. $ X_i - X_e $.
RER	Volatility in the real exchange rate: standard deviation of the log difference of the annual real exchange rates.
FIB	Fiscal balance: annual central government balance as a percentage of annual GDP
DSR	Debt servicing requirement: ratio of total debt service requirement to the total exports of goods and services
CAB	Current account balance: ratio of current account balance to GDP and then average over the period.

Notes (1) where $X_{i,ECOWAS}$ denotes exports of country i to other ECOWAS countries, $M_{i,ECOWAS}$ denotes imports of country i from other ECOWAS countries, X_i and M_i are country i 's total exports and total imports respectively.

4. Empirical results

4.1. Pre-clustering

First, we examine the data and the descriptive statistics before the grouping process in order to have an understanding of the data and possible variables that might be the source for dissimilarities. The optimum currency area theory and convergence criteria data with the descriptive statistics for 1998–2018 are shown in [Table 2](#). We have not shown similar data calculated for the three sub-periods (1998–2002, 2003–2007 and 2008–2014). A graphical representation of the regional averages for all four periods is shown in [Fig. 1](#). In [Table 2](#), the maximum figures are indicated in *italics and bold*, and the minimum figures are in *italics*. Clearly, [Table 2](#) and [Fig. 1](#) provide evidence of dissimilarities in variables for the ECOWAS countries. For the OCA variables (BUS, TOT, RTI, RER and INF), WAEMU countries tend to perform much better than WAMZ countries in all periods. In all five variables, the best-performing countries are from WAEMU, and overall mean is consistently above the ECOWAS mean as compared to WAMZ, which performed below the ECOWAS mean. In [Fig. 1](#), Trade openness, Real exchange rate volatility and Inflation convergence clearly demarcate the two zones, with no convergence in any of the four periods. The results for the five convergence variables (RER, INF, FIB, DSR, and CAB) are no different from those for the OCA criteria with the exception of debt service requirement and current account balance, where Nigeria shows better performance than all other ECOWAS countries. However, this is still not enough to make the WAMZ mean better than that of WAEMU. Overall, WAEMU still performed better than WAMZ countries. Looking at the trade openness variable, on average the trade of ECOWAS countries is only 15 % within the region. The trade of WAEMU countries within the ECOWAS region is 22 % as compared to 9 % for WAMZ countries ([Table 2](#)). For the period 1998–2018, as shown in [Table 2](#), Burkina Faso, with 29 %, has the highest trade within the region, with the lowest being Liberia and Cape Verde, with 2 % each. Interestingly, Nigeria, the largest ECOWAS economy, trades only 4 % within ECOWAS.

The implications of the dissimilarities of macroeconomic variables in the above statistics raise questions on whether one size fits all and the benefits the ECOWAS countries will derive from currency union.

4.2. Hierarchical clustering

We apply the cluster methodology to group the countries using data on the eight variables over the full period 1998–2018 and over three sub-periods: 1998–2002, 2003–2007 and 2008–2014. The three sub-periods enable us to analyse the degree to which the changing policy environments at the national and international levels, have impacted on the homogeneity across these countries over time. Our dynamic approach to clustering provides a test of how stable the countries are over time and acts as a validation of our model to produce robust outcomes. The merging of the countries is shown in the dendrograms in [Fig. 2](#) for the average linkage agglomerative algorithm. The average linkage is the baseline for our analysis because it has the highest cophenetic correlation coefficient (CCC) of 0.904, 0.903, 0.823 and 0.907 for the periods 1998–2018, 1998–2002, 2003–2007 and 2008–2014, respectively. The reported CCC for all the four dendrograms in [Fig. 2](#) is reasonably high, meaning that the cluster information generated by these dendrograms is a good representation of the dissimilarities in the data. The grouping results for the full period and the three sub-periods, using the eight variables, are

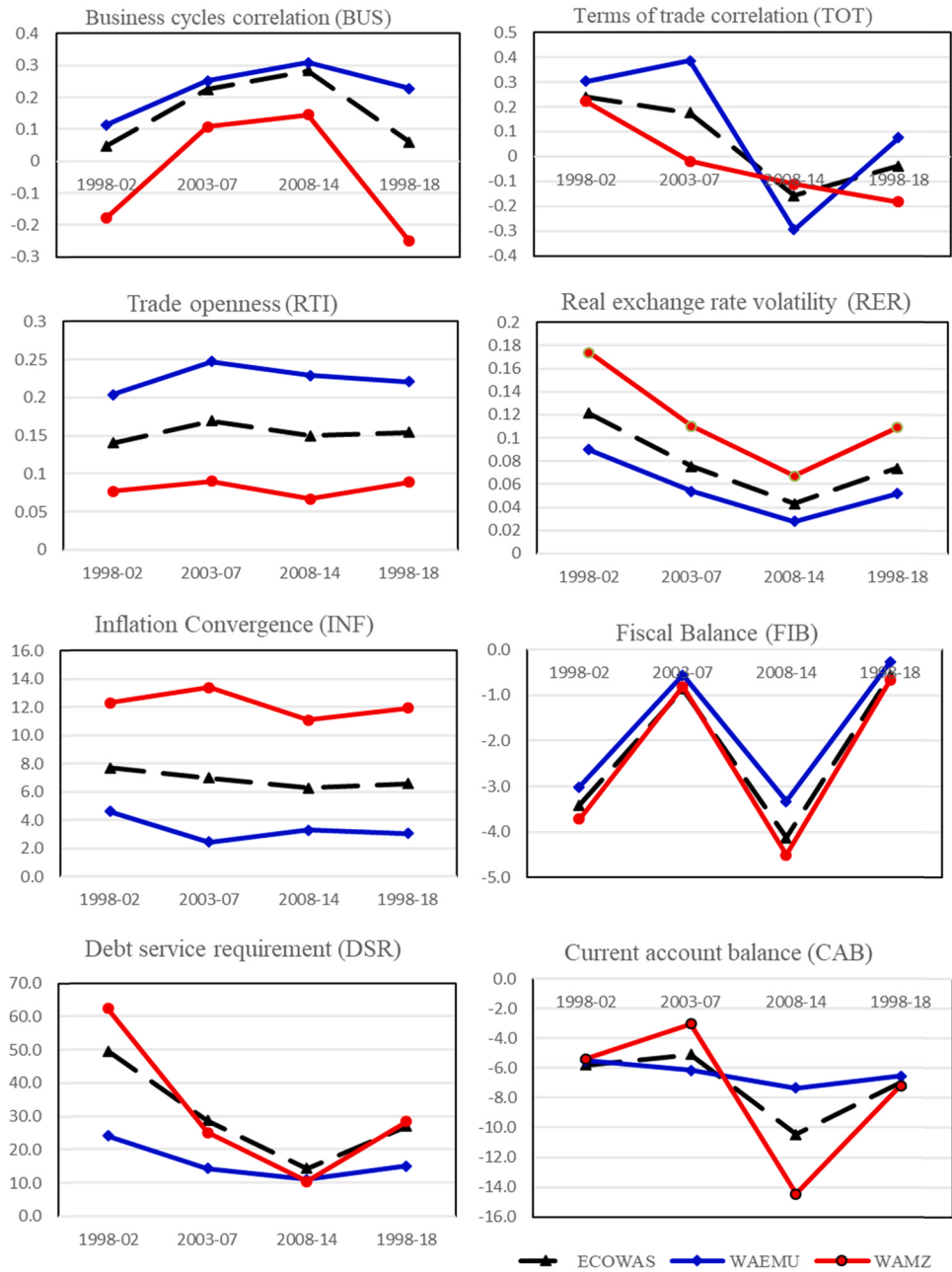


Fig. 1. Regional averages of variables.

presented in columns 2–5 of Table 3, and the mean variables for each group are in Table 4. To test the robustness of our results and the relative performance of the ECOWAS monetary zones, we further grouped the countries by using two subsets of the eight variables for 1998–2018: the

Table 2

Optimum currency area theory and convergence criteria (1998–2018).

Source: Authors' calculations from data bases: IMF (2021a): Direction of Trade Statistics <http://doi.org/10.5257/imf/dots/2021-01>, IMF (2021b): World Economic Outlook <http://doi.org/10.5257/imf/weo/2021-04>, World Bank (2020): Africa Development Indicators <http://doi.org/10.5257/wb/adi/2013-02-08>, World Bank (2021): World Development Indicators <http://doi.org/10.5257/wb/wdi/2020Q4>. All collected before 2021 from UK data service <https://ukdataservice.ac.uk/>.

Country	BUS	TOT	RTI	RER	INF	FIB	DSR	CAB
Benin (BEN)	0.34	-0.21	0.16	0.05	2.10	0.28	16.93	-7.43
Burkina Faso (BFA)	0.25	-0.22	0.29	<i>0.04</i>	2.28	-0.41	14.93	-8.85
Cape Verde (CPV)	0.58	-0.10	<i>0.02</i>	<i>0.04</i>	2.79	-2.31	114.53	-9.47
Cote d'Ivoire (CIV)	0.33	0.18	0.22	0.05	2.00	0.09	12.54	0.83
Ghana (GHA)	-0.42	-0.68	0.14	0.09	19.17	-2.19	13.32	-5.02
Guinea (GIN)	0.55	0.72	0.07	0.10	10.39	-2.47	13.04	-8.44
Guinea Bissau (GNB)	0.35	0.30	0.18	0.07	8.30	-2.80	5.85	-2.93
Liberia (LBR)	-0.28	-0.81	<i>0.02</i>	0.21	8.32	0.07	7.19	-15.44
Mali (MLI)	0.42	-0.46	0.22	0.06	2.36	0.07	28.58	-6.47
Niger (NER)	-0.13	-0.36	0.24	0.05	2.20	2.32	13.58	-12.78
Nigeria (NGA)	-0.71	-0.45	0.04	0.13	15.96	0.47	5.69	5.17
Senegal (SEN)	0.63	0.84	0.19	0.04	<i>1.34</i>	-1.42	19.29	-6.23
Sierra Leone (SLE)	-0.46	0.81	0.08	0.06	13.45	0.36	64.61	-13.49
Gambia (GMB)	-0.18	-0.68	0.18	0.06	4.34	-0.28	66.44	-5.84
Togo (TGO)	-0.37	0.55	0.26	0.05	3.75	-0.32	8.31	-8.50
Descriptive statistics:								
ECOWAS								
Min	-0.71	-0.81	0.02	0.04	1.34	-2.80	5.69	-15.44
Max	0.63	0.84	0.29	0.21	19.17	2.32	114.53	5.17
Mean	0.06	-0.04	0.15	0.07	6.58	-0.57	26.99	-6.99
WAEMU								
Min	-0.37	-0.46	0.16	0.04	1.34	-2.80	5.85	-12.78
Max	0.63	0.84	0.29	0.07	8.30	2.32	28.58	0.83
Mean	0.23	0.08	0.22	0.05	3.04	-0.27	15.00	-6.55
WAMZ								
Min	-0.71	-0.81	0.02	0.06	4.34	-2.47	5.69	-15.44
Max	0.55	0.81	0.18	0.21	19.17	0.47	66.44	5.17
Mean	-0.25	-0.18	0.09	0.11	11.94	-0.67	28.39	-7.17

ECOWAS convergence criteria (used in the analysis): Fiscal balance/GDP $\geq -4\%$, end of period inflation rate $\leq 5\%$, Gross reserves in months of imports ≥ 6 months), ratio of tax revenue to GDP $\geq 20\%$ (due to the problem of tax revenue data we use the current account balance which is the WAEMU equivalent), and a stable nominal exchange rate. These criteria are adjusted for the empirical work.

WAMZ convergence criteria: same as ECOWAS except 10 % for inflation and 3 months for gross reserves.

WAEMU convergence criteria: Fiscal balance/GDP > 0 , Price inflation $< 3\%$, Total debt/GDP $\leq 70\%$, Change in domestic arrears ≤ 0 , Change in external arrears ≤ 0 .

OCA criteria and the convergence criteria. Note that real exchange rate volatility and inflation convergence are overlapping variables.

The grouping results for the sub variable categories are shown in columns 6 and 7 of Table 3, respectively.

In each of Fig. 2a–d the vertical axis represents distance (or dissimilarities), and the horizontal axis indicates the countries in our sample (country codes are in Table 2, first column). Starting with the left of the dendrogram in Fig. 2a, Benin and Senegal are merged first at the shortest distance at level 1. Burkina Faso and Niger are merged second. Next, at level 3, Cote

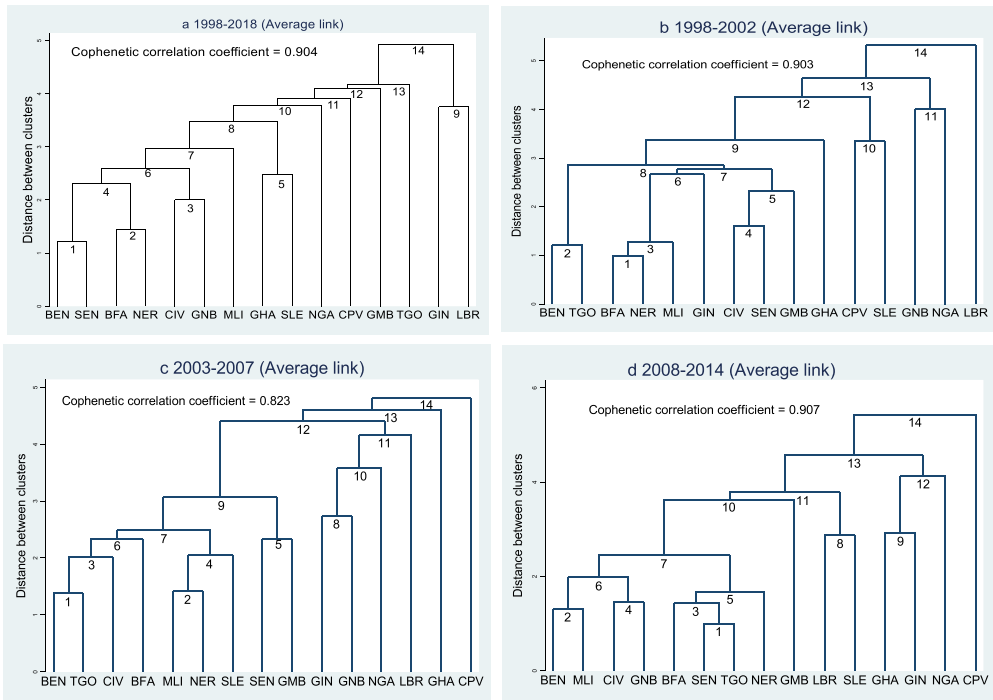


Fig. 2. Hierarchical clustering (Average link method).

d'Ivoire and Guinea Bissau are merged. Seven WAEMU countries are merged at level 7 to form one group, but Togo later joined at level 13. On the right-hand side of Fig. 2a are mainly non-WAEMU countries that joined the grouping at much longer distance.

The dendrogram for 1998–2018 with the CHI and DH stopping rules suggests an optimal number of six groups. The grouping results for 1998–2018, for all eight variables, are presented in Table 3, and the variable means in Table 4. In Table 3, countries in bold are non-WAEMU countries grouping with WAEMU countries whereas those in italics are WAEMU countries grouping with non-WAEMU countries. Group 1, in Table 3, for 1998–2018 contains six WAEMU countries (francophone) and The Gambia. The key features of group 1 are high level of trade within ECOWAS (22.6 %), low exchange rate volatility (0.051), and low inflation differential (2.719). Group 2 contains two WAEMU countries (Senegal and Guinea Bissau) and one WAMZ country (Guinea). Group 2 is characterised by high positive business cycle and terms of trade synchronisation, high trade within ECOWAS, and above ECOWAS average inflation differential. The rest of the countries are singleton, with the exception of Ghana and Nigeria, which are in-group 5. Key features of group 5 include high negative business cycle and terms of trade synchronisation, low trade within ECOWAS (9 %), high exchange rate volatility (0.11), highest inflation differential (17.56), and a positive current account balance (0.079).

The merging of the countries for the sub-periods 1998–2002, 2003–2007 and 2008–2014 is reported in Fig. 2b–d respectively. The merging results are similar to those in Fig. 2a. In all the three sub-periods, mainly WAEMU countries are merged at the shortest distances on the left of the dendrogram. On the right are mainly WAMZ countries (anglophone) that merged at high distances with more fragmentation. The dendrograms for the OCA and convergence criteria are

Table 3
Grouping results using average linkage.

Group no	All eight variables				OCA Variables 1998–2018	Convergence criteria 1998–2018
	1998–2018	1998–2002	2003–2007	2008–2014	1998–2018	1998–2018
1	Burkina Faso	Ghana	Niger	Guinea Bissau	Togo	Sierra Leone
1	Mali	Guinea	Mali	Burkina Faso	Mali	Niger
1	Togo	Burkina Faso	Benin	Cote d'Ivoire	Gambia	Cote d'Ivoire
1	Niger	Mali	Cote d'Ivoire	Benin	Benin	Benin
1	Benin	Senegal	Burkina Faso	Gambia	Niger	Burkina Faso
1	Cote d'Ivoire	Togo	Togo	Mali	Burkina Faso	Togo
1	Gambia	Gambia	Gambia	Mali	Cote d'Ivoire	Senegal
1		Niger	Sierra Leone	Niger		Gambia
1		Benin	Senegal	Senegal		Mali
1		Cote d'Ivoire				
2	<i>Senegal</i>	Sierra Leone	Guinea	Liberia	<i>Senegal</i>	Ghana
2	Guinea	Cape Verde	<i>Guinea Bissau</i>	Sierra Leone	<i>Guinea Bissau</i>	<i>Guinea Bissau</i>
2	<i>Guinea Bissau</i>				Cape Verde	Guinea
2					Guinea	
3	Sierra Leone	<i>Guinea Bissau</i>	Nigeria	Ghana	Nigeria	Cape Verde
3				Guinea	Ghana	
3						
4	Cape Verde	Nigeria	Liberia	Nigeria	Sierra Leone	Nigeria
5	Nigeria	Liberia	Ghana	Cape Verde	Liberia	Liberia
5	Ghana					
6	Liberia		Cape Verde			

not reported, but the groupings for these two sets of variables are in the last two columns of [Table 3](#). Again, the separate grouping of the countries using the OCA criteria and ECOWAS convergence variables are alternative options to further validate the robustness of our grouping technique. The results revealed a number of findings. In all the six groupings in [Table 3](#), six of the WAEMU countries (Burkina Faso, Mali, Togo, Niger, Benin, Cote d'Ivoire) and The Gambia always group together in group 1. Seen in [Table 4](#), this group, which tends to be the core of ECOWAS, has high trade within ECOWAS (22.6 %, 21.7 %, 22.3 % and 18.7 % for 1998–2018, 2008–2014, 2003–2007 and 1998–2002 respectively). Real exchange rate volatility and inflation differential are low, well below the ECOWAS average. Relatively, the group shows better performance in business cycle and terms of trade synchronisation. Senegal (WAEMU country) could also be part of the core countries since its level of similarities to group 1 is highest compared to the rest of the countries. Out of the six groupings, only on two occasions (1998–2018 in columns 2 and 6) did Senegal fall outside of the WAEMU group. Overall, seven out of the eight WAEMU bloc, all francophone countries, grouped together. Guinea Bissau, the only Lusophone country in the WAEMU bloc, showed great differences from its WAEMU francophone counterparts. Out of the six groupings, the country only grouped with WAEMU once in the period 2008–2014 which is the financial crisis period. This means Guinea Bissau is not in convergence with other WAEMU countries although it is a member of the CFA. Three WAMZ countries showed weak evidence of belonging to the WAEMU core (group 1): Guinea and Ghana, one out of six (1998–2002); Sierra Leone, two out of six (2003–2007 and 1998–2018) convergence criteria. For Nigeria, apart from grouping together with Ghana in two out of the six groupings (1998–2018 in columns 2 and 6), the country

Table 4

Variable mean for each group (Average Linkage).

Period	Group no	BUS	TOT	RTI	RER	INF	FIB	DSR	CAB
1998–2018	1	0.094	-0.174	0.226	0.051	2.719	0.253	23.046	-7.007
	2	0.512	0.622	0.145	0.071	6.675	-0.230	12.728	-5.868
	3	-0.465	0.809	0.083	0.061	13.451	0.359	64.612	-13.486
	4	0.579	-0.097	0.015	0.04	2.79	-2.311	114.531	-9.473
	5	-0.565	-0.564	0.090	0.111	17.564	-0.861	9.51	0.079
	6	-0.278	-0.813	0.02	0.215	8.322	0.068	7.194	-15.435
2008–2014	ECOWAS mean	0.060	-0.039	0.154	0.074	6.583	-0.568	26.991	-6.993
	1	0.212	-0.235	0.217	0.032	3.271	-3.207	12.996	-7.864
	2	0.195	0.267	0.031	0.042	8.435	-2.69	8.605	-25.721
	3	0.544	-0.242	0.09	0.087	13.139	-8.39	7.229	-13.652
	4	-0.035	-0.953	0.04	0.085	20.211	-2.6	0.792	4.165
	5	0.904	0.665	0.012	0.026	1.103	-8.32	63.818	-11.738
2003–2007	ECOWAS mean	0.283	-0.157	0.150	0.043	6.260	-4.129	14.216	-10.473
	1	0.362	0.527	0.223	0.052	3.403	0.076	23.524	-6.981
	2	-0.606	-0.585	0.148	0.094	11.942	-2.72	12.133	-1.828
	3	-0.451	-0.788	0.043	0.152	9.468	2.04	9.057	13.312
	4	0.901	-0.659	0.012	0.178	6.788	1.26	6.441	-8.576
	5	0.166	0.86	0.159	0.107	28.931	-7.8	13.136	-5.703
1998–2002	6	0.709	-0.337	0.02	0.04	4.688	-3.66	165.09	-8.806
	ECOWAS mean	0.225	0.177	0.169	0.075	6.959	-0.861	28.647	-5.084
	1	-0.106	0.496	0.187	0.075	4.285	-0.066	32.838	-6.181
	2	0.089	0.048	0.042	0.078	13.919	-5.82	197.998	-9.317
	3	0.906	-0.803	0.097	0.115	19.881	-9.36	7.768	3.037
	4	-0.259	-0.62	0.05	0.228	19.116	0.642	9.728	3.215
	5	0.946	-0.05	0.008	0.577	5.855	-0.24	0.275	-12.616
	ECOWAS mean	0.047	0.239	0.140	0.121	7.703	-3.417	49.476	-5.787

remained a singleton for most of the times with no grouping together with the WAEMU countries. This could raise a policy concern, as Nigeria is the largest ECOWAS economy with the potential to influence monetary policy in a regional central bank. It seems clear in [Table 3](#) that whilst WAEMU countries demonstrate a great degree of similarity in macroeconomic terms, WAMZ countries and Cape Verde appeared to demonstrate the opposite. WAMZ and Cape Verde are not only fragmented countries, but they also have little in common with WAEMU countries. The ECOWAS tripartite challenge, discussed earlier, appears to be reflected in our results as we have seen clear disparity between WAMZ (anglophone) and WAEMU (francophone) countries, and a disparity within WAEMU between the seven francophone countries and the only one lusophone country.

Consistent with the descriptive statistics discussed in [Table 2](#), our grouping results in [Table 3](#) revealed that ECOWAS countries are not similar in macroeconomic terms for either OCA criteria or convergence criteria. Such dissimilarities have implications for the one-size-fits-all policy in a currency union.

5. Conclusion and policy implications

This study investigates whether ECOWAS countries share the economic characteristics such that to justify the possibility of creating a successful regional wide monetary union and what

ECOWAS policymakers need to do for a successful and sustainable monetary union. We use cluster analysis to group the countries over the period 1998–2018 using OCA and ECOWAS convergence variables. The main findings in this study indicate that while the seven francophone WAEMU countries are homogeneous, belonging to the same cluster, the ECOWAS countries are highly heterogeneous, especially the WAMZ (mainly anglophone) countries and Cape Verde (lusophone country). This means that WAEMU countries share several economic characteristics, which their regional counterparts do not. However, Guinea Bissau, another lusophone country, is found to cluster mostly with the non-WAEMU countries, which suggests that it is not well converged with the other WAEMU members. These findings corroborate with the ECOWAS tripartite challenge, suggesting that policy makers in ECOWAS should not ignore the anglophone, francophone and lusophone divide in the region. The Gambia clustered with WAEMU in most cases, indicating that the country could potentially be part of the WAEMU zone. This finding is similar to [Bénassy-Quéré and Coupet \(2005\)](#), [Coulibaly and Gnimassoun \(2013\)](#) and [Tsangarides and Qureshi \(2008\)](#). Our results differed from theirs in that there is no evidence of economic viability to link Ghana and Sierra Leone to WAEMU.

The study also revealed three variables that distinguished WAEMU from the rest of ECOWAS: low inflation differential, low exchange rates volatility, and relatively high intra-regional trade. The performance of the WAMZ countries on these three variables is not only below the WAEMU average, but also below the ECOWAS average, with Nigeria having one of the lowest levels of intra-regional trade (about 4 %) and the highest inflation differential, which is sometimes in double digits. Ghana is among the high inflation countries in the region. The policy concern of this finding is whether Nigeria or Ghana, the two largest economies in the region, can provide the credibility of monetary policy that is necessary for a successful and sustainable monetary union.

The policy implication of these asymmetry, in light of the OCA theory, is that a one-size-fits-all monetary policy for these countries is inappropriate and may have costly consequences due to the loss of flexible policy instruments for individual countries. This policy implication is supported by [Regmi et al. \(2015\)](#), which argue that for heterogeneous countries a single monetary policy will not be effective enough to absorb region-specific disturbances across countries. A policy question from our findings is whether the WAEMU low inflation rate and low exchange rate volatility can serve as the basis for the ECOWAS single currency to take the form of a peg with the expectation of meeting convergence and OCA criteria ex-post.

Based on our findings, we conclude that the fifteen member states of ECOWAS are still far from being ready for a successful and sustainable regional wide monetary union. Whilst supranational institutions and relevant treaties and protocols for economic integration are well established in the tripartite region, policymakers should now refocus their commitment to expedite the implementation of the existing policies to promote intra-regional trade, policy harmonisation and infrastructural development. Since our findings also reflect the heterogeneity of the ECOWAS countries in the tripartite linguistic jurisdictions, we suggest the need for policy initiatives in ECOWAS to address this issue for the success and sustainability of the regional wide monetary union.

Further research is needed to establish the types of items traded in ECOWAS and whether the relatively higher intra-trading activities of WAEMU are in any way associated with the CFA zone single currency or are caused by other factors. Such understanding will provide more information to policy makers on whether an ECOWAS-wide monetary union has any potential to increase intra-regional trade and where that potential lies.

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