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INVESTIGATING BUSINESS CYCLE SYNCHRONIZATION IN WEST AFRICA

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Investigating Business Cycle Synchronization in West Africa

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This paper contributes to the discussion on the long term sustainability of the embryonic second monetary union in Africa, the West African Monetary Zone (WAMZ). We analyse the level of economic and monetary integration in West Africa by analysing the degree of growth cycle synchronisation between five candidate countries over the past thirty years. Our empirical approach improves on the standard Pearson Correlation between trend and cyclical components of GDP by analyzing a measure of co-movement at higher frequencies between computed *z*-scores for all possible pairings of the candidate countries. Our results indicate a lack of a consistent pattern of synchronized growth cycles, which raises concerns about the economic sustainability of the WAMZ, as it implies that members may face significant stabilisation costs. Some policy implications are discussed.

JEL classification: E32, E61, F42

1. Introduction

Events of recent years, including the global financial crisis of 2007 onwards, have generated renewed interest in the study of business cycles within and between different countries. Of key importance to policymakers being the reaction of the domestic economy to disturbances in regions either in close geographic proximity or with economic links. To this end, the recent surge of research on the topic has led to a number of papers that seek to explain cross-country business cycle correlations. As a result, much effort has gone into trying to explain synchronisation, and also into trying to predict the impact that changes such as the formation of a currency union and greater trade integration has on business cycle synchronisation. The consensus appears to be that the desirability of a currency union depends, in part, on the

extent to which participating countries economies are synchronised.[1] For instance, in Europe, the term 'synchronicity' is often associated with the co-movement in economic performance, which has been used to justify entry criteria to the EMU. Of course, the loss of some country-level control of instruments of economic policy such as exchange rate control has to be accommodated *vis-à-vis* monetary union membership, more so when asymmetric shocks are likely. Without having exchange rate as a policy instrument, it is often argued that the more synchronised the business cycles of member countries, the lower the cost of adjustment, where necessary, for a stable and well-functioning monetary union. While there has been an increase in research associated with different aspects of synchronisation of economies (see examples Imbs 2000; Clark and van Wincoop 2001; Calderón *et al*. 2007; Abbott *et al.* 2008), not much work, if any, has been done on the topic for the presently embryonic West African Monetary Zone (hereafter WAMZ).

Intuitively, West African countries, typically dominant raw material exporters, are exposed to terms of trade shocks, albeit with different degrees of exposure, which in turn raises a number of interesting policy co-ordination issues. First, in a heterogeneous environment, of different inflation rates and output gaps, how would a potential West African central bank conduct monetary policy? Specifically, should the one-size-fits-all monetary policy be fully optimal or aim to achieve output gap stabilization? Second, how possible is it for policymakers achieve the goal of price stability without sacrificing growth in some member countries? Critical consideration of how synchronized the business cycles of member states are, is necessary to provide some answers to these questions. Furthermore,

[1] Mitchell (1927) provides the seminal work in this area, finding that greater integration of financial markets and international trade across countries was a common feature of countries with positively correlated business cycles.

within the Optimal Currency Area (OCA) literature, Business Cycle Synchronization (BCS) is often cited as one of the pillars in the determination of the success of a monetary union.[2]

This study differs from previous empirical work by specifically analysing business cycles within the context of the candidate members of the WAMZ and examining their co-movement i.e. symmetries and asymmetries in real economic activity, in country pairs at high frequency. Focussing on 1980 onwards, our main findings are (*i*) that across all the possible cross-country pairings, there is little or no evidence of consistent business cycle synchronisation. We posit that the observed low cross-correlations may be reflective of the structural asymmetries across the candidate countries including differences in their main export commodity, political and legal systems, economic institutions and languages, all of which are likely to support an optimal currency area argument; (*ii*) that there is little or no evidence of the level of business cycle synchronisation between the possible country pairings improving over time.

The rest of the paper is structured as follows. Section 2 presents the brief background of the proposed monetary union. Section 3 presents the data and reviews the methodology, while Section 4 presents and discusses the empirical results. Section 5 concludes with a summary of the evidence and some policy implications.

2. Background of WAMZ

The conception of the idea of a monetary union in the region dates back to 1987, when Heads of State of the Economic Community of West African States (ECOWAS) adopted the

[2] Others are the degree of labour mobility, the system of fiscal transfers, and the extent of trade. The potential inter-relation between these four characteristics has been cited in several empirical and theoretical papers.

Monetary Co-operation Programme to accelerate the process of integration. Heads of State and government of The Gambia, Ghana, Guinea, Nigeria and Sierra Leone met in December 2000 and signed a treaty to create a second monetary union, the West African Monetary Zone (WAMZ). We note that West Africa already has a monetary union mainly comprising former French colonies, the *Communauté Financière Africaine* (CFA) zone comprising Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. In 1999, following insufficient progress in achieving a harmonized monetary system, a two-stage approach was mooted at the Lomé Summit. The first stage is the formation of a second monetary zone involving West African countries which are not members of the West African CFA zone. The ultimate objective of the treaty signed in 2000, was the establishment of a West African Central Bank, and a single currency, the *eco*. Among other actions, the second stage involves an integration of the WAMZ's *eco* and the CFA franc of the already existing West African CFA franc zone countries.[3] Although a full-blown monetary union was envisioned by 2003, to date, there have been several failed attempts since then following the failure of member states to achieve the various criteria, which include the attainment of single digit inflation, fiscal deficit/GDP ratio of less than 4%, central bank financing of deficit to be less than 10% and gross external reserves of about three months of import cover. As is evident in Table 1, the annual averages of the macroeconomic indicators suggest that the countries are at different stages in their business cycles.

[3] An action plan (Banjul Action Plan) proposed the following: Economic convergence (structural and nominal); market integration (customs unions, financial system, and payment systems); institutional preparedness (legal and institutional framework, financial commitment, sensitization, statistical harmonization, and the *eco* currency).

Table 1: Selected macroeconomic indicators of candidate states

	Exchange rate (Local currency unit/US$)		Trade balance (US$ mill.)		Current account (US$ mill.)	
	2007	*2008*	*2007*	*2008*	*2007*	*2008*
The Gambia	24.9	20.6	-172	-187	-80	-112
Ghana	9,355.0	10,524.3	-3,879	-3,974	-1,885	-1,686
Guinea	4,485.0	4,639.3	-14	-86	-456	-658
Nigeria	125.8	117.8	26,973	31,517	5,873	6,917
Sierra Leone	2,987.5	2,981.1	-100	-174	-64	-141

Source: Oshikoya (2009)

In fact, as of the last quarter of 2008, where data is available, the average inflation rate was 10%; however, there is also significant cross-country variance. For example, Ghana and Nigeria, at 17.61% and 14.84% respectively, exceeded the average by wide margins, while the lowest rates occurred in Sierra Leone and The Gambia, at 9% and 6.62% respectively. Between 1980 and 2009, GDP growth in these countries averaged 3.42%; However, individually, in 2009 growth rates ranged between -0.28% (Guinea) and 5.63% (Nigeria).

3. Data and econometric methodology

3.1 Data

In this paper, we focus on economic fluctuations in business cycles over horizons relevant for short and medium term macro-economic policy. Given the dearth of monthly and quarterly macroeconomic data available for most African economies, we concentrate on the main macroeconomic variable of interest i.e., annual growth rate of the real GDP, which we obtain from the World Economic Outlook Database of the International Monetary Fund, and our data spans thirty years, 1980-2009.

Figure 1 plots real output growth rates at business cycle frequencies for each candidate economy over the sample period 1980–2015, along with the unweighted complete

sample average real output growth rate.[4] A cursory look at the figure suggests significant variability in growth rates across countries.

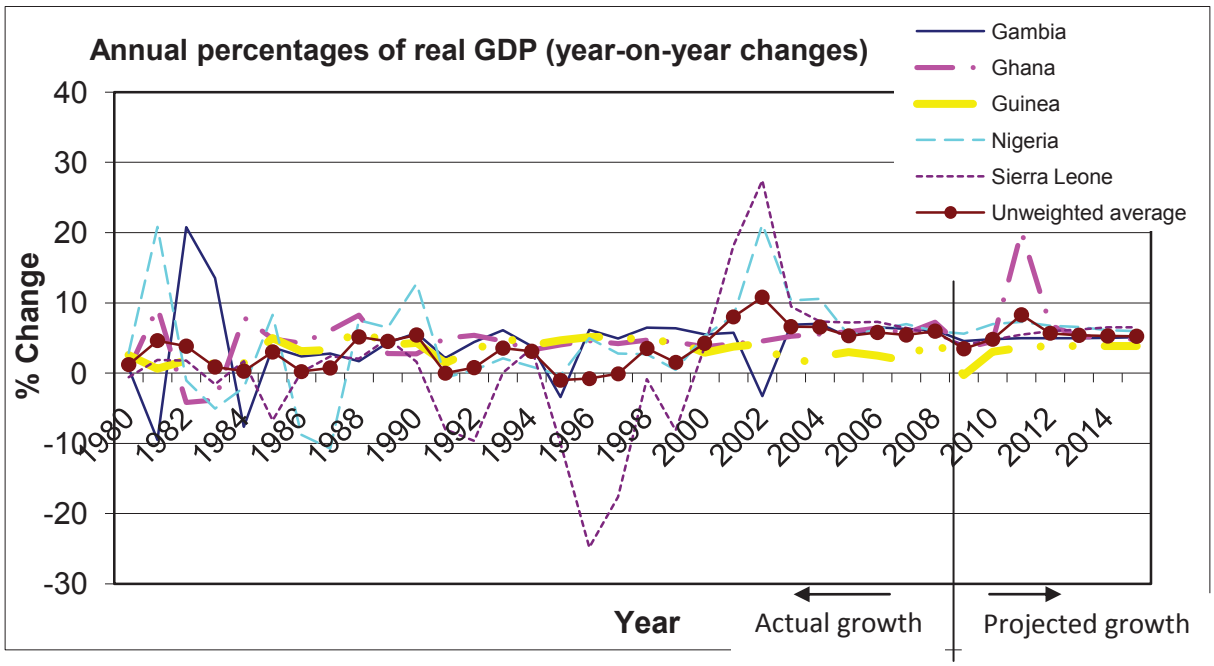

Figure 1: Percentage change in annual GDP growth rate in candidate countries.

Notably, growth rates for Sierra Leone appear to have been the most volatile over the sample period, and the unweighted mean sample growth peaked in 2002 at 10.8%. The turbulent 1980s (the 'lost decade' of terms of trade shocks, debt crisis and subdued growth) with oil shocks and the poor economic performance is reflected in the varied growth rates, as depicted by the performance of all countries in Figure 1. There are indications that following years of economic restructuring and attempts at stable economic growth, GDP growth has improved. Interestingly, after 2002, there is some visual evidence suggesting that member states growth rates are converging. Given the timing of this observation *vis-à-vis* the preparation toward

[4] In this graph, data for 2010-2015 are data projected by the IMFs World Economic Outlook, and have been included in graph purely for illustrative purposes, but have not been used in our computations.

formation of the WAMZ, it is instructive that we investigate whether this observation *actually* implies synchronization in their business cycles?

Table 2: Summary of relative growth rates

	Number of periods when growth rate is	
	> zero	*> the unweighted sample average*
The Gambia	26	21
Ghana	28	20
Guinea	29	16
Nigeria	23	19
Sierra Leone	20	12

As summarised in Table 2, while most of these countries experienced positive growth rates over the sample period, there is also evidence that the countries have experienced variegated growth. For example, Sierra Leone experienced growth above the sample average only 12 times over the thirty-year period whereas rates for Ghana, Nigeria and The Gambia were above at least seven periods more.

3.2 Methodology and related work

It has been argued that regions that have closer trade linkages tend to have more closely synchronised business cycles, therefore policies that enhance economic and trade integration between countries are likely to lead to more synchronised cycles and therefore make currency unions more advantageous (see examples Frankel and Rose 1998; Clark and van Wincoop 2001; Calderón *et al*. 2007; Abbott *et al.* 2008). Both Rose and Engel (2000) and Furceri and Kerras (2008) conclude that countries within a currency union engage in more inter-trading, and have more highly synchronised business cycles than countries not in currency unions. In contrast, Crosby 2003 finds that for the Asia-Pacific region, the role of trade is limited. Using a measure of similarity that depends on the shares of employment in each sector of the

economy in each country, Imbs (2000) argues that it is the extent to which economies are structurally similar that explains synchronisation and concludes that structural similarity is able to explain much more of the cross country variability in business cycle synchronisation than trade. Otto *et al*. (2001) include both trade and a structural variable, and measures of financial and monetary policy linkages in their model of synchronisation. By constructing the Pearson Correlation to study 17 OECD countries, they argue that most of the alternative transmission channels considered act as proxies for trade, though they do find some evidence that similarity of exchange rate behaviour can help explain synchronisation.[5] They conclude that cross-country correlations have declined between 1960-1979 and 1980-2000. Other more computationally demanding methods have also been employed including the Markov switching model allowing business cycle co-movements to change with the business cycle phase (see Filardo and Gordon, 1994) and dynamic factor analyses (see Gregory *et al.* 1997) to identify the important common components across countries. However, partly due to its simplicity, the popularity of the Pearson Correlation (PC) is readily evident in the literature. For countries *i* and *j*, the PC between the cyclical components of the GDP is constructed as:

$$\rho^{ij} = \frac{\sum_{t=1}^{T}(\Delta y_{it}-\Delta\bar{y}_i)(\Delta y_{jt}-\Delta\bar{y}_j)}{\sqrt{\sum_{t=1}^{T}(\Delta y_{it}-\Delta\bar{y}_i)^2}\sqrt{\sum_{t=1}^{T}(\Delta y_{jt}-\Delta\bar{y}_j)^2}} \qquad (1)$$

In this paper, we follow Yetman (2011) who highlight the Pearson Correlation's inability to adequately describe business cycle co-movement at higher frequencies and propose an improvement, based on a *z*-score, which addresses this limitation.

[5] However, the authors also suggest that there is evidence of misspecification in their basic model.

The *z*-score of country *x*'s growth rate at time *t*, may be written as:

$$x_{it} = \frac{(\Delta y_{it} - \Delta \bar{y}_i)}{\sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(\Delta y_{it} - \Delta \bar{y}_i)^2}} \quad (2)$$

The proposed measure, which for a pair of countries, is simply the product of the *z*-score computed for each country (say *i* and *j*) may be written as:[6]

$$\rho_t^{ij} = \frac{(\Delta y_{it} - \Delta \bar{y}_i)}{\sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(\Delta y_{it} - \Delta \bar{y}_i)^2}} \cdot \frac{(\Delta y_{jt} - \Delta \bar{y}_j)}{\sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(\Delta y_{jt} - \Delta \bar{y}_j)^2}} \quad (3)$$

At this point, we construct ρ_t^{ij} for each pair and then analyze the behaviour of over time. Having five candidate countries in our sample, we compute ten individual ρ_t^{ij}, which we can illustrate graphically over time. Positive values of ρ_t^{ij} imply that growth rates are in the same direction i.e. both either positive or both negative, whereas a negative value implies growth rates in opposite directions. Furthermore, the extent of the spike is indicative of the level of growth. Furthermore, in order to capture differences in the co-movements over time due to constant factors, such as institutional, cultural and political factors which may not be captured otherwise, we regress ρ_t^{ij} on a time variable, including fixed effects for each country pair.

4. Empirical evidence

According to Table 3, which reports the computed Pearson Correlation for each country pair, the results are mixed. While Ghana and Nigeria tend to exhibit positive co-movement with all the other candidates, bar The Gambia, The Gambia appears to be synchronised the least with

[6] As Yetman (2011) points out that, up to one-degree of freedom correction, $\frac{1}{T}\sum_{t=1}^{T}\rho_t^{ij} = \frac{T-1}{T}\rho^{ij}$.

the other countries.[7] Interestingly, two countries that share a common geographical border, Guinea and Sierra Leone, show a negative Pearson Corrrelation, suggesting limited synchronisation of their growth rates.

Table 3: Cross country Pearson Correlation estimates, 1980-2009

	The Gambia	*Ghana*	*Guinea*	*Nigeria*	*Sierra Leone*
The Gambia	1.000				
Ghana	-0.669	1.000			
Guinea	0.002	0.157	1.000		
Nigeria	-0.281	0.320	0.006	1.000	
Sierra Leone	-0.062	0.072	-0.247	0.423	1.000

Admittedly, these results are not highly informative and offer little help in identifying specific periods in time, which can be associated with specific policies or occurences of interest. Such information is necessary for the policymaker interested in BCS, and one the method we subsequently employ addresses. We illustrate our results graphically for each of the pairwise measures, ρ_t^{ij}, in Figures 2a–2j.

We make the following observations. First, following some clearly negative spikes during the early 1980s, The Gambia's measures of co-movement (Figures 2a–2d) suggest that there were many periods of insignificant co-movement with the other candidates. However, since 2000, there have also been some fairly significant negative co-movement, particularly in 2001. Second, Figures 2a, 2e–2g (i.e., country-pairs that include Ghana) show that although some co-movement is indeed captured during the early 1980s, possibly due to the aforementioned 'lost decade', co-movement is fairly muted. For Ghana, the exception is with Sierra Leone post-2001, a period over which both countries have seen fairly healthy levels of

[7] Oshikoya (2009) reports that only The Gambia consistently satisfied all 4 of the primary convergence criteria over 2006-2008.

positive economic growth. Third, for country pairs including Nigeria, i.e. Figures 2c, 2f, 2h, and 2i show that, with the exception of 2001, there are not many periods of any significant co-movement, particularly in the post 1990 period. Fourth, for pairs including Guinea, a few notable periods of significant co-movement are worth higlighting: For the Nigeria-Guinea and Sierra Leone-Guinea pairings, Figures 2h and 2j suggest that relative to the other country pairings with Guinea, their co-movements have been similarly diverse, and significantly noticeable.

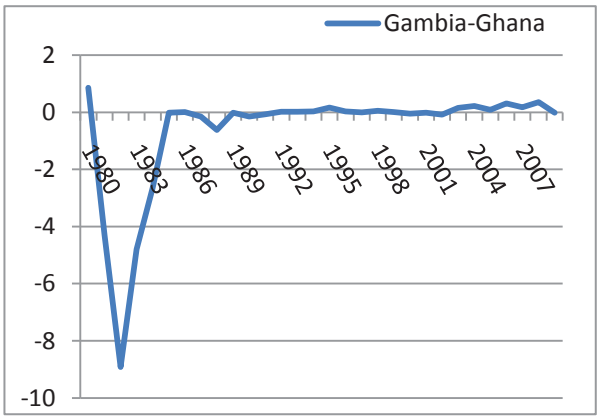

Figure 2a: Gambia - Ghana

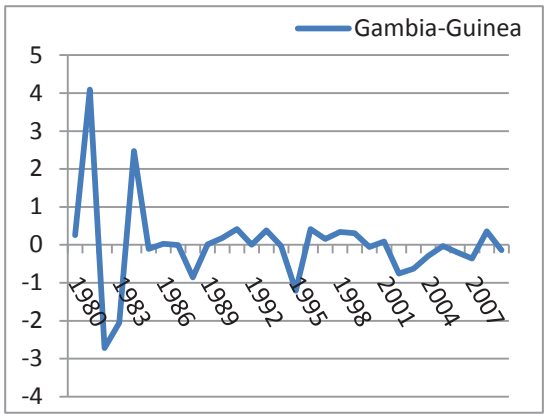

Figure 2b: Gambia - Guinea

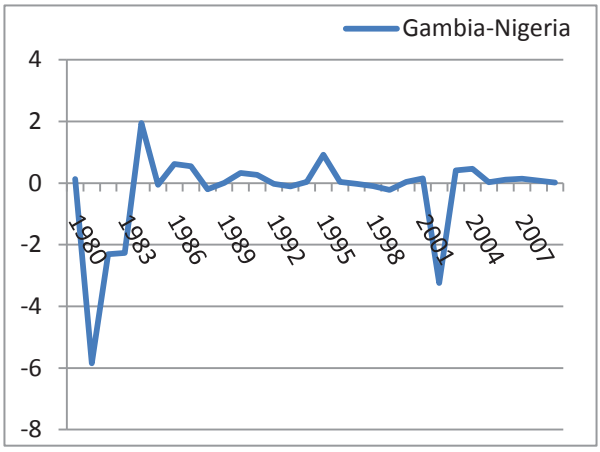

Figure 2c: Gambia - Nigeria

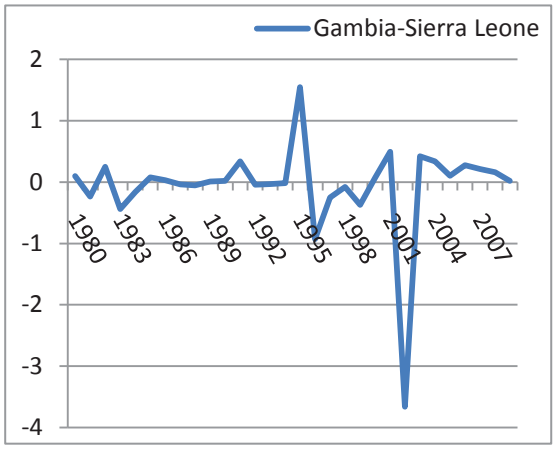

Figure 2d: Gambia - Sierra Leone

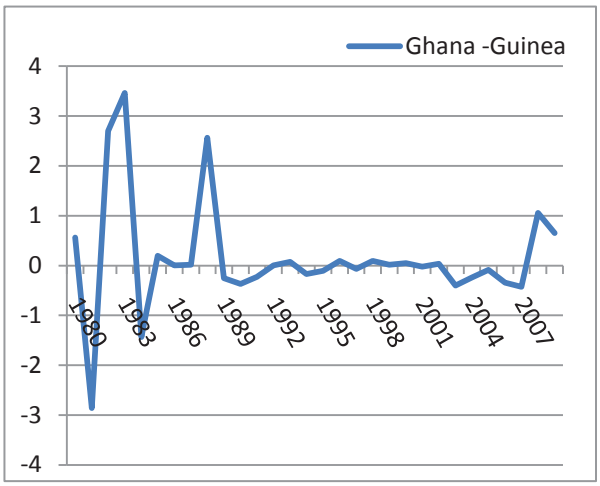

Figure 2e: Ghana - Guinea

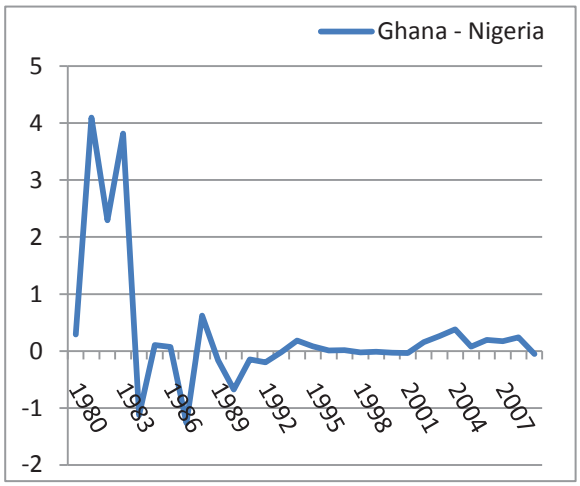

Figure 2f: Ghana - Nigeria

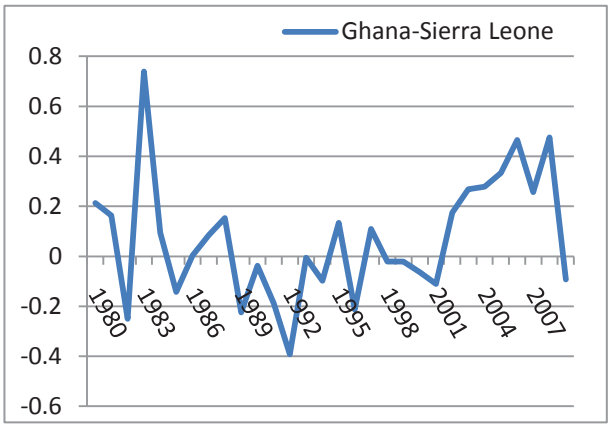

Figure 2g: Ghana – Sierra Leone

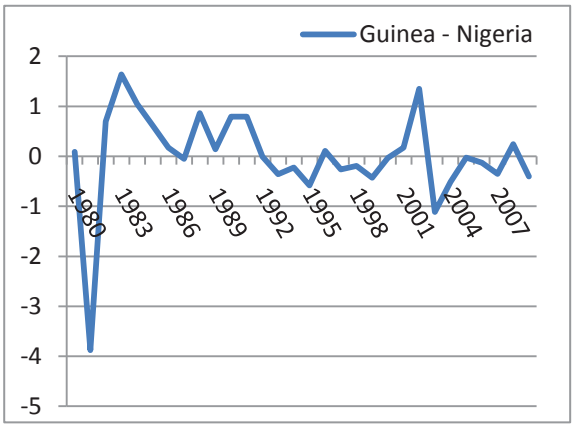

Figure 2h: Guinea - Nigeria

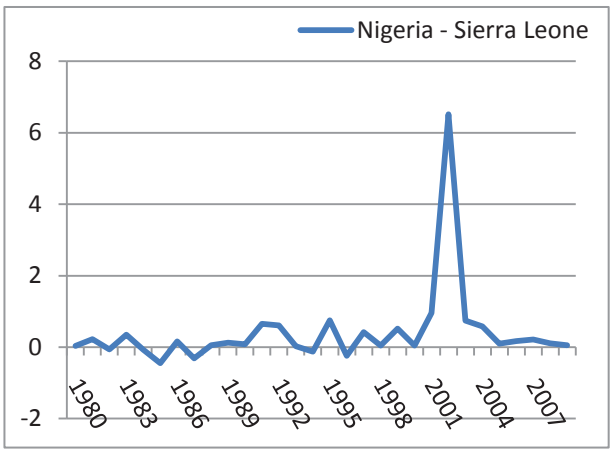

Figure 2i: Nigeria – Sierra Leone

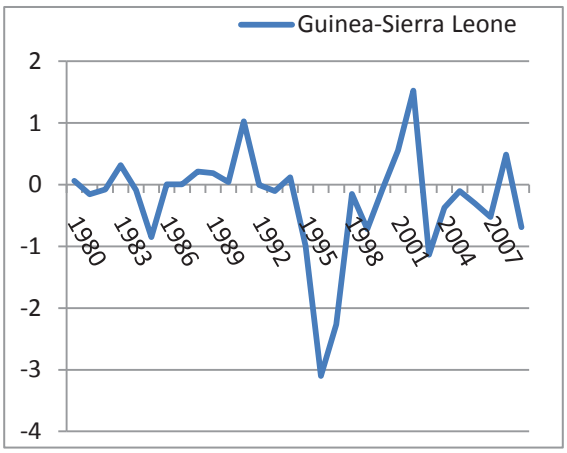

Figure 2j: Guinea – Sierra Leone

Overall, there is no clear indication that any of these country-pairings depict consistently positive co-movement (or synchronisation). Over the period under investigation, the Nigeria-Sierra Leone pairing appears to be the most synchronised, and noticeably, in 2002, both countries experienced very high and positive growth rates.

Table 3: Time trend regression results

	The Gambia	*Ghana*	*Guinea*	*Nigeria*
Ghana	0.115**			
	(0.051)			
Guinea	-0.017	-0.015		
	(0.034)	(0.032)		
Nigeria	0.040	-0.043	-0.009	
	(0.039)	(0.030)	(0.028)	
Sierra Leone	-0.003	0.005	-0.011	0.032
	(0.013)	(0.006)	(0.011)	(0.022)

Notes: ** represents rejection of the null of insignificance at the 5% level. Entries are the estimated coefficients on the time trend and the standard errors are provided in parenthesis.

Further, Table 3 reports the results obtained when we regress ρ_t^{ij} for each of the 10 possible country pairings on a time trend, including a fixed effect. At the conventional significance levels, there is no evidence that, over the period considered, there has been a time effect on the BCS. The exception is in the case of the Ghana-Gambia pairing, where we find a significant positive time effect, over the period, at the 5% level of significance. However, a revisit of Figure 2a suggests that this may be due to the improvement on the extreme level of business cycle '*un*synchronization' observed at the start of the 1980s between these two countries.

5. Policy implications and concluding remarks

In this paper, we empirically investigate the extent of business cycle synchronization among the five candidate members of the embryonic WAMZ over 1980–2009. Our analysis is based on the approach employed by Yetman (2011) for a constructed *z*-score of each country's growth rate at each point in time. We specifically concentrate on the co-movement between each pair of the candidate countries, but at each point in time.

First, according to our results, there is no consistent and clear indication of positive business cycle synchronization between any of the ten possible pairing of the candidate member states over the period. Second, our analyses, results reported in Table 3, also suggest that, over time, with the exception of the Ghana-Gambia pairing, there has not been a significant increase (or decrease, for that matter) in the level of BCS in any of the ten pairings.

Our empirical analyses of the data provide several interesting findings and some outstanding policy questions arise. First, if there is no improvement in the BCS across the candidate countries, how prepared and willing will these governments be to bear continuing, and possibly increasing, adjustment costs? Second, on the assumption that the size and monetary wealth of Nigeria will imply a central role within such a union, our inability to uncover any credible BCS in any of the possible country pairings with the other countries raises the question of the likelihood of self-interest, which may be problematic. Therefore, how committed will member states be to upholding the merits of the union if they continue to be net losers? To the extent that BCS is important for the operation of an Optimum Currency Area, critical consideration of these findings are crucial in shaping a more formidable, beneficial and sustainable monetary union.

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