Centre for the Study of the Economies of Africa

Extra-ECOWAS Trade and Investment Flows: Any Evidence of Business Cycles Transmission?

CSEA Working Paper WPS/16/01

Solomon Abayomi Olakojo.[1]

March 2016

[1] **Acknowledgment**: The Author acknowledges, Professor E. Olawale Ogunkola, Dr. Adeolu Adewuyi and Dr. Abiodun Folawewo of the Department of Economics, University of Ibadan, Nigeria for their invaluable supervisory roles of the previous version of this study, the African Economic Research Consortium (AERC) and African Development Bank (AfDB) as well as the discussion and suggestions of Dr. Nadege Yameogo of the Development Research Department, African Development Bank.

The views expressed in this working paper do not necessarily reflect the official position of the Centre for the Study of the Economies of Africa, its trustees, or advisory council members.

4 Dep Street, Off Danube Street

Maitama

Abuja FCT

Nigeria

Tel.: +234 9 291 4820, +234 9 291 4822

Web: www.cseaafrica.org

Email: enquiries@cseaafrica.org

Abstract

This study investigates the effects of merchandise trade and investment flows on the transmission of business cycles between members of ECOWAS and the major trading partners between 1985 and 2014. Total trade and FDI significantly influence the transmission of business cycles with elasticities of 1.1% and 0.7%, respectively in the long run. There are little variations across the major trading partners and other measures of trade flows. Intra-industry trade flows with all partners, EU and USA influences the cross-country business cycles with elasticities of 1.0%, 0.5% and 1.8%, respectively. There is a weak evidence of trade and investment relationship with China transmitting business cycles in the long run, except in the case of total trade flows in the short run. Inter-industry trade flows also show weak tendencies of transmitting business cycles.

Keywords: Extra-ECOWAS Trade and investment flows, Cross-countries business cycles, Stochastic technology shocks

JEL Code: F14, F21, F44

1. Introduction

Transmission of business cycles[2] can be explained in two ways. One, it is commonly believed that development in one country may be transmitted to other countries—depending on relative size, degree and pattern of trade openness. Two, it is often accepted that common external disturbances, such as commodity and oil price shocks, can negatively affect simultaneously all primary goods dependent economies. This implies that positive and negative business cycles can be transmitted abroad through trade and investment interdependence across countries. Hence, increasing global interdependence in trade and investment poses new challenges across countries.

ECOWAS was formed in 1975 purposely to promote cooperation, integration and maintenance of enhanced regional economic stability (ECOWAS revised treaty, 1993). Regardless of this, the real gross domestic product (RGDP) of Economic Community of West African States (ECOWAS) is characterised by fluctuating growth rate, averaging 2.0%, -0.2%, 5.5%, -1.0% and 4.6 % in 1975, 1980, 1985, 1990 and 2014, respectively (WDI,2015). This could be partly traced to trade flows and investment interdependence across countries.

One of the ways of achieving the broad objective of ECOWAS regional economic stability is through intra-regional trade and investment integration; meanwhile, the objective of maintaining and enhancing regional economic stability would not be completely realised without considering extra-regional merchandise trade flows and investment linkages, especially where regional member states are more open to non-regional developed countries. For instance, accelerations in West African GDP growth rate has been found to be mostly triggered by trade and economic liberalisation, while growth collapses are linked, among other things, to negative terms of trade shocks (Imam and Salinas, 2008). Similarly, Easterly and Levine (1997) note that the period between 1965 and 1990s was characterised with growth tragedy among many developing African countries—ECOWAS inclusive. Notably, there have been significant improvements in the last two decades. Coincidentally, the last two decades have also been characterised with more extra-regional trade openness among members of ECOWAS compared with the preceding decades.

Against the above background, this study examines the sources of cross-countries[3] business cycles in ECOWAS. Specifically, the interest is on whether bilateral merchandise trade (total

[2] This means aggregate cyclical behaviour in the overall behaviour of economic activities.

[3] This includes both co-movement (synchronization) and unsynchronised movement in business cycles across countries. While co-movement is associated with high level of trade and investment integration (especially in intra-

trade, inter-industry and intra-industry trade flows) and investment (FDI) between members of ECOWAS and their major developed countries trading partners serves as sources of transmission of business cycles.

In terms of scope, the study's estimations are limited to the period between 1985[4] and 2014, while five members of ECOWAS (namely, Nigeria, Cote d'Ivoire, Ghana, Senegal and Togo) are selected as sample. The justification for the period covered and sample selection is not only based on data availability but also because the selected members of ECOWAS account for over 70% of the community's gross output (WDI, 2015). Also, the major trading partners included in the sample are the United State of America (US), five European Union (EU) [5] member states (France, Germany, United Kingdom-UK, Netherlands and Spain) and China. ECOWAS conducts about 68.3% of its trade with these partners, while the selected members of ECOWAS conduct about 54.1% of their trade with them between 1978 and 2014 (Table 1).

The rest of the paper is organised as follows; besides the introduction part, section two presents stylize facts on trade flows, business cycles and cross-country business cycles among the selected countries. Section three dwells on the review of literature covering theories, methods and evidences. In section four, the theoretical framework and methodology is presented. Section five is on the results and discussion of estimated models. Section six concludes with a summary, policy lessons, limitations and suggestions for further research.

2. Trade Flows, Business Cycles and Cross-Country Business Cycles among the Selected Countries: the Stylize Facts

2.1. Extra-ECOWAS Trade and Investment Flows: Characteristics and Components

Extra-ECOWAS trade flows are dominated by few major partners. Table 1 shows that the selected trading partners accounted for an average of approximately 54.1% of the selected members of ECOWAS trade and 68.3% of all members of ECOWAS trade flows between 1978 and 2014. These proportions may vary across commodities being traded, nevertheless.

industry trade and investment), unsynchronised movement is characterised with less trade and investment integration as well as when trade and investment integration is inter-industry dominated.

[4] Meanwhile, the stylize facts on the selected samples is extended to cover the period of ECOWAS formation, based on data availability.

[5] ECOWAS conduct about 73.1% of its trade with selected EU members (COMTRADE data base).

It is cleared that the USA and France remain the only single major trading partner to Nigeria, Senegal and Cote d'Ivoire, they accounted for an average of 30.3%, 32.0% and 12.0% of total trade flows respectively between 1978 and 2014. In Ghana, UK and USA are the leading trading partners; it traded 14.9% and 12.5%, respectively with them. Meanwhile, France and China seems to be the major trading partner of Togo, they accounted for about 16.9% and 10.8%, respectively of its total trade. Trade flows between the selected members of ECOWAS and the identified partners, especially the traditional trading partners, have relatively reduced, they accounted for 85.8% between 1978 and 1985 but stood at 54.8% between 2005 and 2014 (Table 1). This is an indication that other trading partners around the world are equally ascending into greater prominence on the external trade profile of ECOWAS, while some of the traditional markets are being displaced. Specifically, China has displaced many traditional trading partners in ECOWAS market.

The nature of commodities traded by selected members of ECOWAS clearly indicates low level of participation in global value chains[6] (GVCs). In Nigeria, it is mainly the exchange of crude oil for refined oil products, automobiles and wheat (Table 2). For Ghana, it is exchange of crude oil, gold and cocoa for refined oil products, crude oil and semi-processed gold, while it is mainly raw agricultural products for crude oil and light vessels in Cote d'Ivoire[7]. Effective participation in GVCs requires considerable high level of technology and industrialization. Hence, low level of high-technology manufactured exports of selected members of ECOWAS compared to the selected trading partners, indicated in Table 3, further explains the reason low level of participation in GVCs by ECOWAS. Premised on this, it is presumed that there will be low level of business cycles synchronisation[8] because disparity in technology makes business cycles less synchronized.

In terms of investment inflows, there is a high level of homogeneity among the selected members of ECOWAS (Table 4). In the recent time, FDI inflows are mainly concentrated in tertiary economic activates (given the huge number of foreign affiliates in the sector). Within this

[6] This involves a procedure for bringing together trade stakeholders in an intertemporal framework with a view to adding value to the goods or services being exchanged as it passes from actors involved along the spectrum from conception to the final consumer in the global market (Ogunleye, 2014).

[7] Cote d'Iviore refinery (which stared operation after the civil war) receives crude oil from West Africa and other countries and exports products to neighboring countries (Ivory Coast country analysis **http://www.marcon.com/marcon2c.cfm?SectionGroupsID=51&PageID=402**)

[8] That is, existence of common elements in aggregate cyclical behaviour across trading countries.

sector, wholesale and retail trade, transportation, storage and telecommunications and finance accounted for the largest portion, while extractive activities (petroleum and mining and quarrying) are the main sectors attracting FDI within the primary sector. The reason why tertiary sector (specifically services sectors) remains the main source of West African growth in the recent time could be explained by this. In the secondary economic activities, chemical and chemical products as well as food, beverages and tobacco are the main sectors attracting FDI.

Furthermore, Nigeria − the largest FDI host country in the ECOWAS – has been experiencing fall in its FDI inflows between 2011 and 2014 (Table 5). This is attributed to increased diversification of the economy from oil into non-oil sectors (UNCTAD, 2015). Within the same period, FDI in other countries also fell, except in the case of Cote d'Ivoire, but some of the selected members of ECOWAS' FDI inflows are already rebounding. The traditional trading partners and ex-colonial masters also remain some of the highest sources of FDI inflows to ECOWAS, while element of displacement of these traditional partners by emerging partners was noticed (see Table 6 and 7 for the cases of Nigeria and Côte d' Ivoire).

2.2. Business Cycles and Cross-country Business Cycles of the Selected Countries

2.2.1. Business Cycles of the Selected Countries

There are clear indications given the structure of any economy, that some sectors and activities of the economy do not exhibit conformity or coherence with general business cycle, while some do. This categorisation is based on causes, duration and patterns of cyclical behaviour across countries. Therefore, primary activities such as agriculture dominated by crop production which depends heavily on weather and season may not be important in the discussion of business cycle. This is because unlike the cycles of the seasons and weather which run their course within a year, business cycles are longer (Moore and Zarnowitz, 1984).

Consequently, since the selected members of ECOWAS are largely characterised with primary activities (where agricultural value added forms the bulk of total output), there is temptation to assume absence of business cycles. There are two main proofs of the potential for the existence of business cycles in ECOWAS. On one hand, the study of business cycles is related to macroeconomic dynamics which has a large interface with economics of growth, money, inflation and expectations which do exist in any economy. On the other hand, there is possibility

of a sector representing only a small fraction of the economy (e.g. manufacturing sector in most member states) accounting for significant share of the amplitudes of the business cycles.

Presented in Table 8 are the business cycles[9] of selected members of ECOWAS as well as the selected major trading partners between 1976 and 2014. On the average, 11 business cycles have occurred in ECOWAS in the past 38 years, implying about one every three and half years. While members of ECOWAS such as Cote d'Ivoire had about 13 cycles, Togo is having about 10 cycles. Among the trading partners, Spain and United Kingdom recorded about nine cycles (about one every four years), while United States and Netherlands experienced about 11 cycles. On the average, the selected ECOWAS are characterized with, marginally, more frequent cycles than the selected major trading partners. There are two reasons that may be responsible for this. First, the structure of ECOWAS economies; that is, given that duration of business cycles varies from more than 1 year to 10 or 12 years as noted by Moore and Zarnowitz (1984), business cycles of selected countries could be categorised under three-year Kitchin cycle[10]. One of the explanations that can be offered for this is that inventory investment[11] plays a central role in the cycles of members of ECOWAS (Moore and Zarnowitz, 1984 and Gabisch and Lorenz, 1987). Second, ECOWAS business cycles can be presumed to be more exposed to external shocks than those of developed countries trading partners.

As a rule, business cycles expansions[12] must necessarily be, on the average, larger than contractions[13] in duration since the latter represents an unpleasant economic situation, which is often mitigated. In terms of duration of contractions and expansions, the selected members of ECOWAS experienced most of their contraction phases between 1978 and 1995. Specifically, the highest contraction phase lasted three years which was between 1989 and 1991. This was followed by those of 1979 to 1980, 1982 to 1983, 1985 to 1986 and 1995 to 1996 which lasted two years each (Figure A1). These periods fall within oil and commodities price shocks of late 1970s and early 1980s, Structural Adjustment Programme (SAP) era and post-SAP era. It is observed that member states such as Cote d'Ivoire, Togo and Nigeria contributed significantly to contractions noticed in ECOWAS at these periods. Overall, each contraction phase lasted for average of about

[9] A complete business cycles is measured either from trough to trough or from peak to peak, in years
[10] Other types of business cycles are 10-year Jugular cycles, 20-year Kuznets cycles and 50-year Kondratiev cycles.
[11] This refers to the difference between goods produced and sold in a given year. It is a component of ouput not sold in the year of production but may be sold in a latter year rather than in the year they were produced.
[12] Expansion is measured from trough to peak, in years
[13] Contraction is measured from peak to through, in years

one and half years. Meanwhile, there have been improvements, especially from 1996 to 2014. For instance, since the contraction of 1995/1996, the contraction phase has been reduced by about a year, while the expansion duration has been extended by around two years. The highest expansion phases were mainly between 1987 and 1988, 2000 and 2002 and 2004 and 2005 which lasted for two years each. Nevertheless, there are wide variations regarding contraction and expansion phases among the selected members of ECOWAS.

Further, relating to the business cycles of the trading partners, Table 8 reveals that there were also periods of frequent economic crises among the selected major trading partners. For instance, among the EU trading partners one of the major economic downturn periods was during the stagflation of 1970s, when expansion and contraction of business cycles are equal. Although there was stability in the 1980s and 1990s in what came to be known as The Great Moderation, this, unfortunately, was followed by the global economic recession that started around 2008. This period also featured EURO debt crises. Notably, there have been some recoveries after the 2007/2008 crises but it seems the rebounding has not been sustainable, except for Ghana (Figure A1). This situation has filtered in to the current phenomenon of falling commodity-price index.

2.2.2. Cross-countries Business Cycle among the Selected Countries.

There are two main approaches to measuring[14] cross-country business cycles; the static and the dynamic. While the dynamic approach is presently subsequently, Table 9 presents static business cycles among the selected countries partitioning the study period into two: the periods of growth disaster (pre 1995) and positive growth (post 1995). Each of the two periods is further partitioned into two to appreciate changes in the level of cross-country business cycles.

Table 9 suggests less synchronised patterns of cross-country business cycles among selected members of ECOWAS. However, they are becoming more synchronized especially between 2005 and 2014, compared with what obtained between 1978 and 1994. Generally, there is inconsistency in the level of business cycles synchronization between any pair of the selected members of ECOWAS and their trading partners, while there is no specific pattern of the cross-country business cycles over time except in few cases. Specifically, China demonstrated increasing unsynchronized business cycles, except for 1995 to 2004, when synchronisation

[14] Several approaches at measuring the cross country business cycles will be presented subsequently.

marginally improved, with selected members of ECOWAS. However, USA, on the average, is becoming more synchronised with the selected members of ECOWAS, with Senegal driving the synchronization, especially between 2005 and 2014. Also, selected EU members are becoming more synchronised with the selected members of ECOWAS except for 1995 to 2004, when synchronisation was lower than the preceding period. There are outliers; for instance, Nigeria was highly synchronised with most selected EU countries between 1978 and 1985, unlike what obtained between 2005 and 2014. While Cote d'Ivoire is becoming more synchronised with ECOWAS, the same could not be established of its extra-ECOWAS synchronization between 2005 and 2014. Overall, as in the case of intra-ECOWAS synchronisation of business cycles, extra-ECOWAS business cycles co-movement has also improved.

It is worthy of note that the EU countries have demonstrated higher level of cross-country business cycles synchronisation among themselves and the level of synchronisation has also improved significantly. Also, while USA demonstrated high level of business cycle synchronisation with the EU countries, China showed low level of business cycles synchronization with all selected countries, except with Ghana, Senegal and Togo in few cases.

2.3. Synthesis of Extra-ECOWAS Trade Flows, Investment Flows, Business Cycles and Cross-Country Business Cycles

Overall, aggregate trade flows of the selected members of ECOWAS with the identified trading partners have increased from $32.1 billion between 1978 and 1985 to about $33.0 billion and $302.8 billion between 1995 and 2004 and 2005 and 2014, respectively, except between 1986 and 1994 when total trade with the identified partners stood at $24.3 billion (UN COMTRADE data base). Similarly, trade flows with all trading partners have also increased significantly, except between 1985 and 1994. Also, a good look at Table 8 reveals that the selected members of ECOWAS experienced most of their business cycles contraction periods between 1985 and 1994. In addition, FDI inflows has also improved, except in the very recent time in the case of Nigeria, while its direction has changed significantly form primary sector dominated FDI to tertiary sector dominated. This indicates that there is a sort of correlation between business cycles of selected Members of ECOWAS and trade flows as well as investment interdependence.

Also, there have been improvements in the average synchronization of business cycles of selected ECOWAS with the identified trading partners recording approximately 0.03 between

1978 and 1985 but stood at approximately 0.28 between 2005 and 2014 (Table 9). This implies that these countries are becoming responsive to similar shocks but the extent to which trade and investment are responsible for this needs to be understood.

3. Literature Review

3.1. Review of Theoretical Issues

The concept of business cycle was developed in the era of great industrial growth and became an issue of interest after the great depression of 1929 to 1939. Chronologically, business cycles theories could be organized into four; the classical, self-correcting economy, traced to Ricardo and Marshall in which business cycles is believed to be absent given the assumption of flexible prices; the Keynesian revolution of no self-correction in which prices are argued to be rigid causing business cycles; the new classical featuring the real business cycles as one of the latest incarnations assumed cyclical behaviour across countries to be an optimal response to changes in the available production technology; and the new Keynesian theory, which focuses on contract-based wage and price stickiness. The debate along the two opposing views has important policy consequences. The classical school largely argues for minimal government policy or regulation. That is, in the absence of external shocks the market functions. The proponents of exogenous causes of business cycles such as Keynesians largely argue for large government policy and regulation and see market to move from crisis to crisis in the absence of regulations. The latest dimension to business cycles theory is based on trade and investment interdependent, often referred to as imported business cycles.

Business cycles are imported through two main channels including trade and investment across countries.

Trade Channel

In terms of sequencing, Kenen (1969 cited in Rana, Cheng and Chia, 2012) was one of the first arguments that a well-diversified economy having a large share of intra-industry trade will experience less asymmetric shocks, connoting that output shocks in such trading countries will tend to synchronise if trade is intra-industry. Krugman (1993) on the contrary, argues that the potential for asymmetric shocks increases with greater integration among countries engaging in intra-industry trade since it increases their specialisation. This implies that even if trade is intra-industry, there is a level of specialisation in differentiated goods across trading countries, creating potential asymmetry in business cycles. Krugman (1993) however, supports that if trade is inter-

industry, specialisation across countries and industry-specific shocks are important in driving business cycles. Therefore, imported business cycle may not be important in an economy engaging in inter-industry trade because the industrial structures are not the same.

It is, however, important to note that there is potential for business cycle to co-move even when trade is inter-industry. This is a situation in which there is inter-dependent across sectors and trading countries. For instance, output of domestic manufacturing industry (eg., inorganic fertilisers and pesticides) may serve as major input in foreign agricultural sector. Therefore, a damped oscillation in manufacturing sector (reduces fertiliser and pesticides exports) in domestic economy is transmitted abroad due to inadequate imported fertiliser input, resulting in low foreign agricultural output. On the other hand, foreign economy's agricultural output may serve as major input in the domestic manufacturing sector. For instance, output of cotton may be an essential input in the manufacturing of textiles. Therefore, shocks to foreign agricultural sector are transmitted to domestic economy due to inadequate imported cotton input, resulting in low domestic textile output.

These opposing views on what would be the effect of trade integration on business cycle synchronisation made Böwer and Guillemineau (2006) and Calderón, Chong and Stein (2007) conclude that the relationship between trade integration and business cycle synchronisation is fundamentally an empirical one.

New trade theories among which is theory of trade in intermediate inputs directly modeled business cycles transmission in the presence of trade in intermediate inputs, caused by firms splitting their production process across countries. The assumption is that the final output bundles together the domestically and foreign sourced intermediate inputs. There is an extension of this. This extension is referred to as model of international trade with stochastic technology shocks. This model assumes that a positive foreign productivity shocks imply sourcing for intermediate inputs from more efficient and cheaper foreign suppliers that has also experienced similar positive technology shocks. According to Juvenal and Monteiro (2010), it is assumed that the technology level in each country can be represented as the product of a deterministic component and a stochastic component. While the deterministic component governs the average technological or productivity advantage of one country over the other, the stochastic component in each country follows a serially correlated discrete Markov process, independent across countries. Hence, countries have differential access to technology make production efficiency to vary across

commodities. In this case, a positive foreign technology shock implies that foreign intermediate goods cost less and foreign output has also risen, raising the import penetration ratio. The imported intermediate inputs could then be combined with home country mobile factors leading to increase in efficiency and labour productivity and consequently to increase in home country business cycles.

In sum, imported business cycles relating to trade explains that positive technology shock in the home country, leads to an increase in domestic productivity, as well as an increased oscillation of home business cycles. This effect could be transmitted to foreign countries if home country depends on foreign country for intermediate goods required to combine with new technology surge, there is an increase in demand for foreign goods as inputs. Moreover, similar polarisation partitioned trade flows into intra-industry and inter-industry trade flows concluding that intra-industry trade flows, is the only feasible channel through which cross-country business cycles co-move, while there is potential asymmetric business cycles across trading partners engaging in inter-industry trade.

Investment Chanel

The cross-country business cycles among countries do not only come from international trade but also from international financial openness. In the recent decades, there has been increase in financial globalisation with the establishment of global supply chains and emergence of global financial institutions. Evidently, global financial crises of 2007 to 2009 reveal that countries business cycles are connected through the synchronised global downturn, the impact (though may be marginal) of this on many developing countries cannot be ignored.

Further, Kalemli-Ozcan, Sorensen and Yosha (2001) note that with higher integration in international financial and goods markets, countries should be able to insure against asymmetric shocks by diversifying ownership and can afford to have a specialised production structure. Financially integrated economies tend to specialise in different sectors, to reap the gains from diversification and insure against investment risks. In this case, high level of financial integration will lead to unsynchronised business cycles. Financial integration between two economies could also increase the similarity of their production structures, as foreign investment could be concentrated on similar activities (Dees and Zorell, 2011). For instance, Foreign Direct Investment (FDI) flows could also be concentrated on sectors where the home country has a comparative advantage, thus replicating in the host country a similar productive structure (Garcia-Herrero and

Ruiz, 2008 cited in Dees and Zorell, 2011). However, this became particularly important when asset markets are highly integrated across countries.

In the literature, three measures are often used to measure financial interdependent across countries; the level of integration in FDI, Foreign Portfolio Investment (FPI) and bilateral financial (banking) integration.

3.2. Review of Methodological and Empirical Issues

3.2.1. Measurement of Business Cycles

Given that economic fluctuations are not evenly distributed across economic activities, the problem of measuring aggregate state of the economy with respect to business cycles may not be straightforward. Hence, some of the measurements of business cycles are Harvard barometer, National Bureau of Economic Research (NBER) indicator, diffusion index, capacity utilisation, nonparametric approaches (such as Baxter-King filter and Hodrick-Prescott Filter) and parametric approaches (such as moving average, first order difference, linear regression model, unobserved components model, production function approach).

Meanwhile, the emphasis is on diffusion index not only because it is utilized in this study but also because it was an improved version of former NBER index and measures the aggregate behaviour of an economy. It has to do with; that at any point in time, some series out of a specified set may move upward while the rest move downward. If the relative number of upward moving time series is greater (less) than half, the economy is expanding (contracting). The steps involved in diffusion index are: collecting and plotting a number of time series which reflect general economic activities, for each time series the upper and lower turning points must be determined and asterisked, the turning points are then connected by a straight line given an ordinal picture of how a business cycle wonders through the individual series; diffusion index can then be calculated by counting the number of upward sloping lines at each point in time and expressing these numbers as a proportion of total number of series.

An alternative way of calculating diffusion index according Getz and Ulmer (1990) is to find changes in the series of interest to see if a component increased, decreased, or had no change. Each component is assigned a value 0, 50 and 100%, depending on whether it decreased, no change, or increased over a given time span. Next is to sum the values of the components and divide by the number of components. This average (mean) is the diffusion index. In this case,

assigning a value of 50% to the unchanging series effectively counts one-half of them as rising and one-half of them as falling (Getz and Ulmer, 1990).

However, there is a fundamental problem in the manner values are assigned. For instance, assigning the same value to a variable that increases (decreases) at an increasing rate and the one increasing (decreasing) at a decreasing rate with the one that increases (decreases) generates missing oscillations in a particular series. Besides, a variable having a positive change all through the time span will have the same assigned values. In this case, there will be no oscillations at all. A variable may be oscillating within positive changes, therefore, the approach used in this study is that each component is assigned a value 0, 25, 50, 75 and 100% depending on whether a component is falling at an increasing rate (negative and decreasing), falling at a decreasing rate (negative and increasing), no change, rising at a decreasing rate (positive and decreasing) or rising at an increasing rate (positive and increasing) over a given time span[15].

Diffusion index takes the value of 100% when all the series are upward moving (economy is expanding) and 0%, when they are moving down (economy is contracting). If the diffusion index is between 100% and 50% (0% and 50%) the economy is on its way to expansion (contraction). Undoubtedly, diffusion index is useful in analysing historical business cycle capturing time variability, notably; using it to construct current economic state of affairs may be difficult, especially in developing countries with inadequate data. Given that a peak or trough comes to existence following a decline or rise, it seems logical to use this index to forecast the tuning points.

3.2.2. Methods of Computing Business Cycle Correlation.

Business cycles' correlation is not also directly observable and measurable; several methods to describe them have been developed in the literature. For instance, Frankel and Rose (1998) specified a cross-country covariance of output. The degree to which business cycles are correlated depends on how this covariance changes with increased integrations. Related to Frankel and Rose, Calderón, Chong and Stein (2007) computed the correlation between the cyclical components of output between any two countries. In this case, high correlation implies high level of business cycle synchronisation, while negative correlation value is an indication of unsynchronised business cycle. This approach is common among significant number of empirical works investigating the

[15]. It is important to note that values are assigned to business cycle components such as inflation rates and changes in inventories in an inverted manner. This is because such variables rise in contractions and fall in expansions.

relationship between trade flows and business cycles synchronisation. Bayoumi and Eichengreen (1997) developed an alternative measure of business cycle coherence by computing an indicator of business cycle asymmetries. The lower the value of asymm(yi, yj), the higher the degree of business cycle synchronisation and vice versa.

Further, few studies propose a correlation index that allows measuring the cross-country synchronisation period per period, rather than using time windows as done in most studies. For instance, Nikolaos (2012) employed the Dynamic Conditional Correlation (DCC) model of Engle (2002). The estimation of the DCC model involves two steps: first, each conditional (time varying) variance is specified as a univariate Generalised Autoregressive Conditional Heteroskedasticity (GARCH) process and second, the standardised residuals from the first step are used to construct the conditional correlation matrix. Lee (2010) applied DCC model developed by Engle (2002) to resolve the problems associated with convectional correlation measure. It is important to note that the DCC model is a family of GARCH model which does not only require larger sample size but also requires that the variances of the series are time varying. If the series are characterised with constant variances the appropriateness of Engel's DCC will be undermined.

Recently, Cerqueira and Martins (2009) proposed another year-by-year index that—when averaged over the entire sample—would produce the linear correlation index. This index has advantage of capturing dynamics in cross-country business cycles over the correlation index computed over the entire period (Cerqueira, 2010). Therefore, Cerqueira and Martins (2009) proposed:

$$R(y_i, y_j)_{,t} = 1 - \frac{1}{2}\left(\frac{y_{j,t} - \bar{y}_j}{\sqrt{\frac{1}{T}\sum_{t=1}^{T} (y_{j,t} - \bar{y}_j)^2}} - \frac{y_{i,t} - \bar{y}_i}{\sqrt{\frac{1}{T}\sum_{t=1}^{T} (y_{i,t} - \bar{y}_i)^2}} \right)^2 \qquad (1)$$

$R(y_i, y_j)_{,t}$ is year-by year correlation between any pair of countries and T is the total number of observations. $R(y_i, y_j)_{,t}$ is not bounded between -1 and 1, but between 3-2T and 1[16] (Cerqueira, 2010). In order to have an index bounded between -1 and 1, a sort of Fisher transformation is applied to $R(y_i, y_j)_{,t}$. This index is given by:

[16] For detail, see Cerqueira and Martins (2009) and Cerqueira (2010).

$$R^{*}(y_i, y_j)_{,t} = 1 - \frac{1}{2} In \left(\frac{1 + \frac{R(y_i, y_j)_{,t}}{2T - 3}}{1 - R(y_i, y_j)_{,t}} \right) \quad (2)$$

Then for a bounded version between -1 and 1:

$$R^{**}(y_i, y_j)_{,t} = \tanh(R^{*}(y_i, y_j)_{,t}) \quad (3)$$

Equation (3) implies that the bounded year-by-year index is the hyperbolic tangent of original unbounded year-by-year correlation index.

3.2.3 Review of Empirical Studies

A number of studies have investigated the relationship between trade flows and cross-country business cycles. These studies include Frankel and Rose (1998); Canova and Dellas (1993); Calderón, Chong and Stein (2007); Rana (2007); Lee (2010) and Rana, Cheng and Chia (2012). These studies followed a number of different approaches and obtained mix results regarding the effect of trade and investment on business cycles transmission. A cursory look at Table 10 shows none of the existing studies focused on ECOWAS and trading partners. Besides, most studies used growth cycles (a narrow measure of business cycles). This is tantamount to lack of better words (Zarnowitz, 1985). This study also computed dynamic cross-country business cycles, unlike most of the previous studies that used static cross-country business cycles, which does not capture its dynamics.

Notably, this study did not account for endogeniety between trade flows and cross-country because policy coordination (especially monetary and fiscal policy) which often create endogeniety problem is not envisaged between ECOWAS and selected trading partners.

4. Theoretical Framework and Methodology

4.1. Theoretical Framework

From all the trade theories reviewed, stochastic technology shocks model, predicated on trade in intermediate inputs theory seems to be more appropriate. This is based on the assumption that trade in intermediate inputs directly affects output given that the final output bundles

domestically and foreign sourced intermediate inputs. Therefore, the total output of good *i* in the two economies in period t is given as:

$$Y_t^i = f_i(y_{t-1}^d - x_1, y_{t-1}^f - x_2, \mu_t) \qquad \forall i = 1,2 \qquad (4)$$

$x_1 > 0$ if the domestic economy exports input 1 and $x_2 < 0$ if it imports inputs from the trading partners. The implication of this is that importing these intermediate inputs increases production of final output of trading economies, while exporting them do the converse because it makes such input less available for domestic use in the production process. Also, μ_t is a productivity shock which follows a stationary stochastic process and whose value is known when production is completed at period t but unknown when the investment decision is made at period t-1. Equation (4) implies that production of final output (Y) in period t is a function of accumulated inputs at period t-1, either sourced domestically or imported. The labour can be domestically sourced or sourced from foreign countries in the form of expatriate workers. Also, the capital can also be sourced domestically (domestic investment) or from foreign countries in the form of foreign direct investment (FDI). For simplicity, any labour and capital inputs used in the two goods are assumed given.

The optimal output for all the firms in a particular country, which includes the two activities (final output, and the two forms of intermediate inputs), can be solved by minimising the short run cost function subject to the value of output from the final good which includes net trade. Thus, rewriting equation (4.1) and linearising it gives:

$$InY_{t+1}^i = \sum_{j=1}^{2} \beta_i Iny_t^i + In(\mu_{t+1}^i) \qquad \sum_j \beta_i = 1 \qquad (5)$$

Where: β_i is the share of domestically sourced inputs and foreign inputs in the production of final good Y, which sums to unity. It also captures the extent of bilateral trade intensities-a measure of the extent of trade interdependence. A country's final output may be more intensive in foreign inputs than domestically sourced inputs and vice versa. If the short run cost function for the representative firm is given as:

$$C(p) = Min \sum_{i=1}^{2} py_i \qquad \forall i = 1,2 \qquad (6)$$

Where: p is inputs prices. Hence, if $c_i(p_1, p_2)$ denotes the unit cost function that is dual[17] to $f_i(y_1, y_2)$, whereby the final good is assembled from two intermediate inputs, the price of final good

[17] That is, an optimum combination of inputs that minimises costs, necessarily maximises output.

satisfies $p_i = c_i(p_1, p_2)$ such that $\hat{p}_i = \theta_{i1}\hat{p}_1 + \theta_{i2}\hat{p}_2$. Also, θ_{ij} is the cost share of input i in the final output. The change in the price of the final good could be seen as a weighted average of the change in the input prices. The implication of equation (5) is that final output exhibits constant return to scale in intermediate inputs[18]. Connoting that scaling up or down the intermediates goods by a constant increases or decreases the production of final output by that constant. Hence, minimizing equation (6) subject to (5) using duality principle yields:

$$y_i = Y_t^i \frac{\beta_i}{p} \tag{7}$$

Equation (7) implies that demand for tradable intermediate inputs is directly related to output of final goods and inversely related to their prices.

Substituting equation (7) in (5) gives:

$$Y_{t+1}^i = f_i(m_{ij}(Y_t^i), m_{ij}(Y_t^i), \mu_{it+1}) \tag{8}$$

$m_{ij}(i \neq j)$ is the bilateral trade flows among countries. The correlation between any countries pair of final output can be realised, by writing equation (8) explicitly as follows:

$$\begin{pmatrix} Y_{t+1}^d \\ Y_{t+1}^f \end{pmatrix} = \begin{pmatrix} m^{dd} & m^{df} \\ m^{fd} & m^{ff} \end{pmatrix} \begin{pmatrix} Y_t^d \\ Y_t^f \end{pmatrix} + \begin{pmatrix} \mu_{t+1}^d \\ \mu_{t+1}^f \end{pmatrix} \tag{9}$$

Equation (9) is a form of autoregressive model which can be expressed as;

$$Y_t^d = m^{dd} Y_{t-1}^d + m^{df} Y_{t-1}^f + \mu_t^d \tag{10}$$

$$Y_t^f = m^{fd} Y_{t-1}^d + m^{ff} Y_{t-1}^f + \mu_t^f \tag{11}$$

The interest is to obtain the variances and auto-covariance (a measure of business cycles co-movement) of domestic and foreign business cycles.

Introducing the lag operator in equation (10) and (11) gives:

$$Y_t^d = m^{dd} L Y_t^d + m^{df} L Y_t^f + \mu_t^d \tag{12}$$

$$Y_t^f = m^{df} L Y_t^d + m^{ff} L Y_t^f + \mu_t^f \tag{13}$$

Hence,

$$Y_t^d = \frac{m^{df} L Y_t^f}{1 - m^{dd} L} + \frac{\mu_t^d}{1 - m^{dd} L} \tag{14}$$

Therefore, the expected value of Y^d in equation (14) becomes;

[18] A range in-between low and high level of output as well as short and long run output

$$E(Y_t^d) = \frac{m^{df} L Y_t^f}{1 - m^{dd} L} \quad (15)$$

Note that the expected value of random variable (μ_t^d) is zero.

$$Var(Y_t^d) = E(Y_t^d)^2 = \delta_{yd}^2 = \frac{\delta_{yf}^2}{1 - m^{df\,2} - m^{dd} m^{df}} + \frac{\delta_{\mu d}^2}{1 - (m^{dd})^2} \quad (16)$$

Equation (16) implies that variation in domestic business cycles is a direct function of variation in foreign business cycles (δ_{yf}^2) and shocks to domestic technology ($\delta_{\mu d}^2$). Similar expression can be defined for foreign business cycles.

The covariance (a measure of business cycles co-movement) between two countries business cycles can be derived as;

$$Cov(Y_t^d, Y_t^f) = E(Y_t^d, Y_t^f) = E\left[(m^{dd} Y_{t-1}^d + m^{df} Y_{t-1}^f + \mu_t^d)(m^{fd} Y_{t-1}^d + m^{ff} Y_{t-1}^f + \mu_t^f)\right] \quad (17)$$

$$Cov(Y_t^d, Y_t^f) = E\begin{bmatrix} (m^{dd} m^{fd} (Y_{t-1}^d)^2 + m^{dd} m^{ff} Y_{t-1}^d Y_{t-1}^f + m^{dd} Y_{t-1}^d \mu_t^f + m^{df} m^{fd} Y_{t-1}^f Y_{t-1}^d \\ + m^{df} m^{ff} (Y_{t-1}^f)^2 + m^{df} Y_{t-1}^f \mu_t^f + m^{fd} Y_{t-1}^d \mu_t^d + m^{ff} Y_{t-1}^f \mu_t^d + \mu_t^d \mu_t^f \end{bmatrix} \quad (18)$$

Equations (17) and (18) are expressions for covariance between foreign and domestic business cycles. Recall that the expected value of random variable (μ_t^d, μ_t^f) is zero and assuming that

$Cov(Y_t^d, Y_t^f) = Cov(Y_{t-1}^d, Y_{t-1}^f) = Cov(Y_{t-n}^d, Y_{t-n}^f) = \rho$

ρ will be expressed as:

$$\rho = m^{dd} m^{fd} \delta_{yd}^2 + m^{dd} m^{ff} \rho + m^{df} m^{fd} \rho + m^{df} m^{ff} \delta_{yf}^2 \quad (19)$$

In this study, it is assumed that domestic (ECOWAS) and foreign (major trading partners) technologies are less correlated given differences in the level of technology. That is, E ($\mu_t^d \mu_t^f$) $\rightarrow$ zero. Otherwise, it would have been equal to δ_{ui}^2.

Equation (19) can be solved as;

$$\rho = \frac{m^{dd} m^{fd} \delta_{yd}^2 + m^{df} m^{ff} \delta_{yf}^2}{1 - m^{dd} m^{ff} - m^{df} m^{fd}} \quad (20)$$

Rearranging equation (20) yields;

$$\rho = m^{dd} m^{fd} \delta_{yd}^2 + m^{df} m^{ff} \delta_{yf}^2 \left(1 - m^{dd} m^{ff} - m^{df} m^{fd}\right)^{-1} \quad (21)$$

Share of domestically sourced intermediate input is indicated by m^{dd} ; m^{fd} is the share of imported intermediate inputs by foreign trading partner; m^{df} is the share of imported intermediate inputs by

domestic economy; and m^{ff} is the share of foreign sourced intermediate inputs in foreign production of final output. Hence, equation (21) shows that business cycles correlation is a direct function of exchange of productive intermediate inputs between domestic and foreign economy. Thus, a variant of equation (21) becomes the estimable equation.

4.2. Methodology

4.1. Model specifications

The estimable equation, derivable from equation (21), in panel regression form is expressed as:

$$\rho_{ijt} = \alpha_0 + \alpha_1 TRADE_{ijt} + \alpha_2 FDI_{ijt} + \varepsilon_{ij} \qquad (22)$$

Where: ρ_{ijt} denotes the business cycle correlation between country *i* and j, $TRADE_{ij}$ is trade flows between country i and j and FDI_{ijt} is bilateral FDI[19] inflows between any countries pair[20]. Given inadequate data for the bilateral FDI flows across countries, the approach for computing the bilateral investment ties is to find the total outward FDI flows of the selected major trading partners as a ratio of the selected members of ECOWAS total inward FDI flows. If the ratio is decreasing, there are two possibilities; the outward FDI of the partner could have fallen or that the FDI inflows to the selected members of ECOWAS are increasing but not from the identified trading partner pair. Hence, bilateral FDI inflows from the trading partners are low. On the other hand, if the ratio is increasing there are tendencies that the FDI inflows from the identified partners to the selected members of ECOWAS are increasing more proportionately. Hence, bilateral FDI inflows from the paired partner are high, showing the relative importance of the partner in terms of FDI inflows.

Further, $TRADE_{ij}$ represents total trade flows, further partitioned into intra and inter-industry trade flows. The intra-industry and inter-industry trade share, following Grubel and Lloyd (1971), is computed as:

$$IIT_{ijt} = 1 - \frac{\sum_{k=1}^{48} \left| X^{k}{}_{ijt} - M^{k}{}_{jit} \right|}{\sum_{k=1}^{48} \left(X^{k}{}_{ijt} + M^{k}{}_{jit} \right)} \qquad 0 \le IIT \le 1 \qquad (23)$$

[19] To preserve the observations with negative values in logged models, the variables with negative values were transformed by squaring them, finding the log of the square and dividing the outcome by 2. The correlations between the log-transformed (which does not account for negative values) and the log-transformation (that account for negative values) are +1 (this is presented Table A2).

[20] Overall, there are 35 countries pairs with 1050 observations.

Where: X_{ij}^{k} and M_{ij}^{k} denote the export of commodity k from country i and import of commodity k from j to i respectively. A value of zero implies a complete specialisation (if industries are either net exporters or importers of selected products, never both), while a value of 1 indicates total intra-industry trade (if trade is balance within each industry, implying countries export and import roughly equal quantities of the selected products). The value at the upper part of the right hand side of equation (23) is the absolute value of trade balance. It is important to note that in computing the intra-industry trade flows, this study will rely on data of trade structure broken down into 48 two-digit codes of the United Nation's Standard International Trade Classification (SITC), revision 2 (Table A1). In addition, the corresponding index for inter-industry trade share in total trade flows is; $INTER_{ij} = (1 - IIT_{ij})$.

The expected signs of merchandise trade and FDI are ambiguous and purely empirical.

4.2. Estimation Procedures and Techniques

4.2.1. Techniques for Computing Business Cycles and Cross-country Business Cycles

Business cycles for the study was constructed using seven series categorised into leading (e.g., value of shares traded on the stock exchange), coinciding (e.g., sectoral value-added other than agriculture and changes in price level), and lagging (e.g., changes in inventory) in business cycles. It is important to note that agricultural value-added (majorly forestry, hunting, and fishing, as well as cultivation of crops and livestock production) is excluded from business cycle computation because the sector is dominated by cash and food crops majorly driven by seasonality, a factor that is not important in business cycle theory.

Each of the seven series was differenced to correct for possible nonstationarity in the series. Consequently, each series were assigned a value of 0, 25, 50, 75 and 100% depending on whether it is falling at an increasing rate (narrowing business cycles), falling at a decreasing rate (widening business cycles), no change, rising at a decreasing rate (narrowing business cycles) and rising at an increasing rate (widening business cycles), respectively. Dynamic cross-country business cycle is computed using year-by-year correlation approach utilising Cerqueira and Martins (2009) as previously reviewed.

4.2.2. Techniques for Estimating Panel Data with Heterogeneous Slopes

The period covered by the study (30 years) necessitated the used of an approach that accounts for possible non-stationarity in the panel data. Hence, dynamic heteogenous panel data concerned with

heterogeneous slope coefficients across group members as well as correlation across panel members (cross-section dependence) is employed. In other words, the Pooled Mean Group (PMG) estimator of Pesaran, Shin, and Smith (1997, 1999), an improvement over Mean Group (MG) estimator of Pesaran and Smith (1995), was utilised. The PMG relies on a combination of pooling and averaging of coefficients, characterised with a structure implying an error correction model in which the short run dynamics of the variables in the system are influenced by the deviation from long run equilibrium. PMG estimator is specified as:

$$y_{it} = \sum_{j=1}^{k} \alpha_{ij} y_{i,t-j} + \sum_{j=0}^{l} \beta_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (24)$$

Where: X_{it} is a k x 1 vector of explanatory variables; β_{it} are the k x1 coefficient vectors; α_{ij} are scalars; μ_i is the group-specific effect; and the white noise error terms, ε_{it}. If the variables in equation (24) are, for instance, I(1) and cointegrated, then the error term is an I(0) process for all i. Thus, equation (24) can be re-parameterised into an error correction equation in the form:

$$\Delta y_{it} = \lambda_i (y_{i,t-1} - \omega_i x_{it}) + \sum_{j=1}^{k} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{l} \beta_{ij} \Delta x_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (25)$$

Where: $\lambda_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$ and $\omega_i = \sum_{j=0}^{q} \beta_{ij} / (1 - \sum_k \alpha_{ik})$. The parameter λ_i is the error-correcting speed of adjustment term. If $\lambda_i = 0$, there would be no evidence for a long-run relationship. Hence, λ_i is expected to be significantly negative under the prior assumption that the variables show a return to long run equilibrium. Of particular importance is the vector, ω_i, a measure of long-run relationships among the variables.

4.3.Data Sources

Trade data was sourced from *World Integrated Trade Solution*, based on UN COMTRADE and World Trade Organisation (WTO) utilising two-digit codes of the United Nation's Standard International Trade Classification (SITC), revision 2, and are measured in thousand US dollars. Also, variables used in computing business cycles was sourced from World Development Indicators (WDI, 2015), while variables on FDI were extracted from Organisation of Economic Corporation and Development (OECD) statistical database and WDI (2015), measured in million US dollars.

5. Empirical Analysis

5.1. Description of variables

A quick glance in to the nature of variables presented in Table 11 shows that inter industry trade flows dominates trade flows between ECOWAS and the selected trading partners. While inter-industry trade flows account for approximately 70% of trade flows, intra-industry trade flows stood at 30%. The cross-countries business cycles recorded average of 0.3-an indication of positive (but weak) business cycles co-movement between ECOWAS and the selected trading partners. The coefficient of variations (cv)-a measure of dispersion of probability distribution of the variables-shows that the variables, except share of inter-industry in total trade, exhibit high variability across panels.

5.2. Pre-estimation Diagnostics

The panel unit root tests (in Table 12) indicate that all variables, except total trade which is I(1), are stationary at level. Given the null hypothesis of Im, Pesaran and Shin (IPS) unit root test, it can be concluded that some panels are stationary across the panel. Hence, the null hypothesis that all panels have unit root is rejected. The implication of this is that total trade flows between ECOWAS and selected partners are less predictable in the short run.

Correlation between a pair of variables used in the models (in Table 13) indicate potential multicollinearity problem, especially between total trade and trade types (intra-industry trade flows and inter-industry trade flows). Therefore, the approach employed is to estimate separate models excluding variables with very high positive correlations. Needful to mention that the relationship between trade flows and FDI is inverse-an indication of substitution between them. This is because most FDI inflow is in tertiary activity; whole sale and retail trade specifically (Table 4). Hence, some of the initially imported merchandise goods are now available through foreign investment in domestic economies making trade in such goods to reduce.

5.3. Effect of trade and investment flows on cross-countries business cycles, 1985-2014

In terms of model adequacy, the log likelihood statistics compare the log likelihood of restricted (model with no explanatory variables) and unrestricted model. Given the results presented in Table 14, the log likelihood chi-square test statistic for all the partners model can be calculated as -2 [last iteration log likelihood - (0 iteration log likelihood)]. Log likelihood chi-square statistic values, with 1 degree of freedom, reject the null model (the restricted model with no parameter). This

suggests that unrestricted model with parameters, as estimated, fit well. Hence, the joint hypothesis of non-exogeneity of the regressors and non-stability of the regression parameters over time is rejected. Besides, the intercept terms are insignificant in all estimations-an indication that problem of variables omission is minimized.

Generally, the outcome reveals that trade and FDI have significant impact on the transmission of cross-countries business cycles in the long run (Table 14). While cross-countries business cycles respond more proportionately to total trade (with elasticity of 1.12) than FDI, the impact of intra-industry trade flows (with elasticity of 1.00) is more relevant in the transmission. There are variations across the trading partners. Total trade, intra-industry and FDI interdependence with EU synchronises cross-countries business cycles, while only intra-industry trade flows with USA significantly influences cross-country business cycles with elasticity value of 1.82. Trade and FDI relationship with China has no impact on business cycles co-movement, except in the short run when total trade has inelastic positive impact on cross-country business cycles between ECOWAS and China.

The speed of adjustment coefficients across estimations are of less concern because the estimated cross-countries business cycles are long run phenomena. Hence, any disturbance in the system is unlikely to generate a strong disequilibrium that will make the system unstable. In the worst case, in the case of positive significant coefficients of error correction mechanism, the extent to which the system will overshoot its long run equilibrium is very low. This is intuitively appealing since most members of ECOWAS depend on few tradable primary goods such that any disequilibrium in these traded goods leaves little rooms for the timely needed adjustment.

The findings of the study support theoretical position regarding the impact of trade and investment on business cycles co-movement across countries. For instance, it can be inferred from Kenen (1969 cited in Rana, Cheng and Chia, 2012) argument that countries having a large share of intra-industry trade flows will experience more symmetric shocks and thus, have their business cycles synchronised and vise versa. Relating to FDI, there is likelihood for shocks from the parent companies to spread to the investment in the host countries creating synchronisation of business cycles. This is in line with Garcia-Herrero and Ruiz (2008 cited in Dees and Zorell, 2011) that FDI flows concentrating on sectors where the home country has a comparative advantage is a replication of the host country similar productive structure, making cross-countries business cycles to synchronise. However, there is weak evidence to support the theoretical argument that inter-

industry trade flows diverges cross-countries business cycles significantly, thus contradicting the position of Krugman (1993).

6. Concluding Remarks and Recommendations

6.1. Concluding Remarks

An attempt has been made to investigate in impact of extra-ECOWAS trade and investment interdependence on the transmission of business cycles between 1985 and 2014. The estimated results show that business cycles booms and bursts of the major trading partners are likely to have positive and negative influence respectively on ECOWAS' business cycles through trade and investment interdependence in the long run, except in the case of China. While intra-industry trade flows transmit business cycles the most, there is weak evidence that inter-industry trade flows do the same. The results of the study are in line with studies such as Framkel and Rose (1998), Otto and Willard (2001, 2003), Imbs (2006), Rana (2007), Lee (2010) and Rana, et al (2012) but contradicts the findings of Canova and Dellas (1991).

This study has raised a lot of vital and important issues that could not be addressed in a single study. Therefore, it may be useful to note some limitations and possible extensions associated with the current study. Modelling with a larger sample size would be an improvement on the current study. This can be done using higher frequency quarterly data since this study only concentrated on the annual data from 1985 to 2014. Besides, future studies may include other emerging trading partners. In addition, other methodologies apart from those used in this study can be adopted. It is worthy of note that the measure of financial linkages, used in this study, is rather narrow, that is, bilateral FDI. This measure may not fully capture the financial transmission of global shocks. Therefore, other studies may include other measures of financial linkages such as portfolio investment and international banking linkages. These suggestions are expected to provide a more detailed examination of the impact of trade and financial interdependence on cross-country business cycles than what has been achieved in this study.

6.2. Recommendations

Given the objective of ECOWAS to enhance regional growth and stability as well as evidence of business cycles spillover of the selected major trading partners, there is need to have a mixture of policies that encourage trade (particularly, intra-industry) and foreign investment with the major

trading partners in order not only to benefit from their positive business cycles spill-over but to achieve the desired structural transformation. Enhancing intra-industry trade is very germane but it requires increased efforts at industrialising and upgrade domestic technology. However, trade policies must be carefully implemented without jeopardising regional stability, given that transmission of business cycles goes either way. One way of going about this is to diversify the export base as well as increase domestic investment to compliment foreign investments. This becomes necessary because absolute relying on foreign investment in sectors critical to business cycles (such as secondary economic sector) and trading with few major trading partners may have adverse effect on the regional stability in a situation of business cycles crises of the major trading partners.

References

Akin, C. 2007. Multiple determinants of business cycle synchronisation. *Mimeo, George Washington University, Department of Economics.*

Baxter, M. and Kouparitsas, M.A. 2005. Determinants of business cycle comovement: a robust analysis, *Journal of Monetary Economics* 52.1:113-157.

Bayoumi, T. and Eichengreen, B. 1997. *Ever closer to heaven? An optimum-currency-area index for European countries*. Center for International and Development Economics Research, Institute of Business and Economic Research, UC Berkeley. Retrieved January 30, 2016 from http://escholarship.org/uc/item/5dt9501ss

Bordo, M. D. and Helbling, T. 2003. Have national business cycles become more synchronized? *NBER Working Paper 10130.*

Böwer, U and Guillemineau, C. 2006. Determinants of business cycle synchronisation across Euro area countries. *ECB Working Paper 587.*

Canova, F. and Dellas, H. 1993. Trade interdependence and the international business cycle. *Journal of International Economics* 34.2: 23–47.

Cerqueira, P.A. and Martins, R. 2009. Measuring the determinants of business cycle synchronization using a panel approach. *Economics Letters* 102.2:106-108.

Cerqueira, P. A. 2010. *The Worldwide Business Cycle Synchronization Evolution.* Retrieved December 28, 2015 from: http://www.eefs.eu/conf/Athens/Papers/512.pdf.

Dellas, H. 1986. A real model of the world business cycle. *Journal of International Money and Finance* 5.1: 381-394.

Easterly, W. and Levine, R. 1997. Africa's growth tragedy: policies and ethnic divisions. *Quarterly Journal of Economics* 122.4: 1203-1250.

ECOWAS Revised Treaty. 1993. ECOWAS Executive Secretariat Abuja, Nigeria.

Engle, R. F. 2002. Dynamic conditional correlation–a simple class of multivariate GARCH models. *Journal of Business and Economic Statistics* 20.1: 339-350.

Frankel, J.A and Rose, A.K. 1998. The endogeneity of the optimum currency area criteria. *Economic Journal* 108.3:1009-1025.

_____ 2002. An estimate of the effect of common currencies on trade and income. *Quarterly Journal of Economics* 117.3: 437-466.

Gabisch, G. and Lorenz, H. 1987. *Business cycle theory: A survey of methods and concepts.* Second Revised and England Edition: Springer-Verlag.

García, H., A. and Ruiz, J. M. 2007. Do trade and financial links foster business cycle synchronisation in a small Economy? *Mimeo, Banco de España.*

Grubel, H. and Lloyd, P.J. 1971. The empirical measurement of intra-industry trade. *Economic Record* 47.4: 494-517.

Gruben, W. C., Koo, J. and Millis, E. 2002. How much does international trade affect business cycle synchronisation?, *Research department working paper 0203: Federal Reserve Bank of Dallas.*

Im, K. S., Pesaran, M., H and Shin Y. 2003. Testing for unit roots in heterogeneous panels. *Journal of Econometrics* 115.3: 53-74.

Imam, P. and Salinas, G. 2008. Explaining episodes of growth accelerations, decelerations, and collapses in Western Africa. *IMF Working Paper* /08/287

Imbs, J. 2004. Trade, finance, specialization and synchronisation, *Review of Economics and Statistics* 86.3:723-734.

_____ 2006. The real effects of financial integration, *Journal of International Economics* 68.2: 296-324.

Inklaar, R., Jong-A-Pin, R. and DeHaan, J. 2005. Trade and business cycle synchronisation in OECD countries: a re-examination. *CESifo Working Paper 1546.*

Kalemli-Ozcan, S., Sorensen, B. E. and Yosha, O. 2001. Economic integration, industrial specialization and the asymmetry of macroeconomic fluctuations. *Journal of International Economics* 55.1: 107-137.

Kenen, P. B. 2000. *Currency areas, policy domains and the institutionalization of fixed exchange rates*. London School of Economics, Centre for Economic Performance Discussion Paper No. 467.

Krugman, P. R. 1993. Lessons of Massachusetts for EMU, in: Torres, Francisco and Francesco Giavazzi (Eds.): "*Adjustment and Growth in the European Monetary Union, Cambridge".* Cambridge University Press: 241-269.

Lee, J. 2010. Trade integration and business cycle co-movement: evidence from the U.S. *The International Trade Journal* 24.4: 361-388.

Moore, G.H and Zarnowitz, V. 1984. The development and role of the national bureau's business cycle chronologies. *NBER Working Paper 1394.*

Nikolaos, A. 2012. Business cycle synchronization during US recessions since the beginning of the 1870's. *MPRA Paper 38341.*

Ogunleye, E. K. 2014. Global value chain development and structural transformation in Nigeria. *African Economic Brief* 5(2).

Otto, G. V. G. and Willard, L. 2001. *Understanding OECD output correlations*. Research Discussion Paper 2001-05: Reserve Bank of Australia.

_____ 2003. A cross section study of the international transmission of business cycles. M*imeo, University of Victoria, British Columbia.*

Pesaran, M., H. and Smith, R. 1995. Estimating long-run relationships from dynamic heterogeneous panels. *Journal of Econometrics* 68.2: 79-113.

Pesaran, M. H., Shin, Y. and Smith, R. P. 1997. Estimating long-run relationships in dynamic heterogeneous panels. *DAE Working Papers Amalgamated Series 9721.*

_____ 1999. Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association* 94.1: 621-634.

Rana, P. B. 2007. Trade intensity and business cycle synchronization: The case of East Asia. *Working Paper Series on Regional Economic Integration 10: ADB.*

Rana, P. B., Cheng T and Chia W. 2012. Trade intensity and business cycle synchronization: East Asia versus Europe. *Journal of Asian Economics* 23.4: 701- 706.

UNCTAD. 2015. *Reforming International Investment Governance*. World Investment Report 2015

World Bank's *World Integrated Trade Solution*. Retrieved from: http://wits.worldbank.org)

World Bank. 2015. *World Development Indicators*.

World Bank's *World Integrated Trade Solution*. Retrieved from: http://wits.worldbank.org)

Zarnowitz, V. 1985. Recent work on business cycles in historical perspective: a review of theories and evidence. *Journal of Economic Literature* 23.2: 523-580.

List of Tables and Figures

Table 1. Direction of trade flows (percentage conducted with trading partners)

Nigeria	Major Trading Partners	1978-1985	1986-1994	1995-2004	2005-2014	1978-2014
	Germany	13	10.3	4.3	3.7	7.5
	Spain	2.4	7.5	6.7	5.8	5.7
	France	12.2	7.9	6.2	4.7	7.5
	United Kingdom	9.4	7	3.9	3.5	5.7
	Netherlands	7	5	2.8	5.2	4.9
	USA	29.1	33.9	31.6	26.7	30.3

	China	na	0.3	2.8	6.6	2.6
	All identified partners	73.1	72	58.3	56.2	64.3
Cote d'Ivoire						
	Germany	8.9	9.6	6.1	8.4	8.2
	Spain	3.9	4.9	4.1	2.9	3.9
	France	17.8	15.2	10.2	6.4	12
	United Kingdom	4.1	3.7	2.9	2.1	3.1
	Netherlands	6.8	8.5	7.4	7	7.4
	USA	12.5	8.5	7.3	8.5	9.0
	China	na	0.6	2.5	4.3	2.0
	All identified partners	54	51	40.7	39.5	45.7
Ghana						
	Germany	11.7	16.3	6.6	3.2	9.1
	Spain	2.3	2	3	1.9	2.3
	France	2.7	4.7	5.8	5.7	4.8
	United Kingdom	21.5	20.1	14	5.9	14.9
	Netherlands	5.1	5	6.7	7.0	6.0
	USA	21	15.7	9.2	6.1	12.5
	China	na	1.2	4.1	14.1	5.2
	All identified partners	64.1	63.4	48.1	47	54.9
Senegal						
	Germany	4.2	3.7	2.7	1.5	2.9
	Spain	4.4	5.9	5	3.6	4.7
	France	45.3	44.1	27.5	14.9	32
	United Kingdom	4.9	2.4	2.9	8.4	4.7
	Netherlands	4.6	2.9	2.6	5.6	3.9
	USA	4.1	4.6	3	2.5	3.5
	China	na	1.3	2.2	7.6	3.0
	All identified partners	67.6	64.8	45.8	44.1	54.7
Togo						
	Germany	8	5.9	3	2.7	4.7
	Spain	2.8	5.6	2	1.3	2.8
	France	30.1	23.7	11.7	5.5	16.9
	United Kingdom	6.5	3.2	3.1	2.7	3.7
	Netherlands	16.7	8	3.4	6.2	8.1
	USA	5.7	3.5	2.4	4	3.8
	China	0	7.6	10	23	10.8
	All identified partners	69.7	57.4	35.5	45.3	50.9
The Selected Member States	All identified partners	65.7	61.72	45.68	46.42	54.1
All ECOWAS	All identified partners	85.8	75.6	61	54.8	68.3

Source: Author's computation based on World Integrated Trade Solution (http://wits.worldbank.org)

Table 2. Five leading traded goods of the selected members of ECOWAS (4-digit HS), 2014

Member States	S/N	Exports	Imports
Nigeria	1	Crude petroleum oils	Petroleum oils, not crude
	2	Petroleum gases	Cars (incl. station wagon)
	3	Petroleum oils, not crude	Wheat and meslin
	4	Ferrocerium & other pyrophoric alloys, articles of combustible materia	Motorcycles, side-cars

	5	Light vessel,dredger;floating dock;floating/submersible drill platform	Fish, frozen, whole
Cote d'Ivoire	1	Cocoa beans, whole or broken, raw or roasted	Crude petroleum oils
	2	Petroleum oils, not crude	Light vessel,dredger;floating dock;floating/submersible drill platform
	3	Brazil nuts, cashew nuts & coconuts	Rice
	4	Cocoa paste, whether or not defatted	Fish, frozen, whole
	5	Gold unwrought or in semi-manuf forms	Medicament mixtures (not 3002, 3005, 3006), put in dosage
Ghana	1	Crude petroleum oils	Petroleum oils, not crude
	2	Gold unwrought or in semi-manuf forms	Crude petroleum oils
	3	Cocoa beans, whole or broken, raw or roasted	Gold unwrought or in semi-manuf forms
	4	Cocoa paste, whether or not defatted	Rice
	5	Commodities not elsewhere specified	Medicament mixtures (not 3002, 3005, 3006), put in dosage
Senegal	1	Petroleum oils, not crude	Petroleum oils, not crude
	2	Gold unwrought or in semi-manuf forms	Crude petroleum oils
	3	Fish, frozen, whole	Rice
	4	Cements, portland, aluminous, slag, supersulfate & similar hydraulic c	Medicament mixtures (not 3002, 3005, 3006), put in dosage
	5	Soups, broths & preparations thereof	Wheat and meslin
Togo	1	Plastic packing goods or closures stoppers, lids, caps, closures, plas	Petroleum oils, not crude
	2	Cotton, not carded or combed	Petroleum coke, petroleum bitumen & other residues of petroleum oils
	3	Petroleum coke, petroleum bitumen & other residues of petroleum oils	Woven cotton fabrics, 85% or more cotton, weight less than 200 g/m2
	4	Gold unwrought or in semi-manuf forms	Cements, portland, aluminous, slag, supersulfate & similar hydraulic c
	5	Beauty, make-up & skin-care preparations; sunscreens, manicure or pedi	Medicament mixtures (not 3002, 3005, 3006), put in dosage

Sources: ITC calculations based on UN COMTRADE statistics.

(http://www.trademap.org/Product_SelCountry_TS.aspx)

Table 3. Share of high-technology[21] manufactured exports in total manufactured exports of the selected countries

	Selected Members of ECOWAS					Selected Major Trading Partners						
Year	CIV	GHA	NIG	SEN	TGO	CHN	FRA	GMY	NLD	UK	USA	SPN
1998	4.5	0.6	0.0	5.8	0.6	15.4	22.3	15.2	30.2	28.7	33.2	7.0
2003	3.8	3.7	1.7	4.9	1.0	27.4	19.7	16.9	31.4	26.2	30.8	7.5

[21] Products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery (WDI, 2015).

2008	11.9	1.4	0.4	5.3	0.0	25.6	20.0	13.3	19.2	18.5	25.9	5.3
2009	8.2	3.7	2.5	11.9	0.1	27.5	22.6	15.3	20.9	20.0	21.5	6.2
2010	2.2	2.0	1.1	1.2	0.1	27.5	24.9	15.3	21.3	21.0	19.9	6.4
2011	15.1	1.7	1.2	0.6	0.2	25.8	23.7	15.0	19.8	21.4	18.1	6.5
2012	8.5	7.4	1.9	0.7	0.2	26.3	25.4	15.8	20.1	21.7	17.8	7.0
2013	1.3	4.9	2.7	2.7	0.2	27.0	25.8	16.1	20.4	7.6	17.8	7.7

Source: World Development Indicators (2015)

Note: CIV, NIG, GHA, SEN, TOG, GMY,SPN, FRA, UK, NLD, CHN, USA represents respectively, Cote d'Ivoire, Nigeria, Ghana, Senegal, Togo, Germany, Spain, France, United Kingdom, Netherlands, China and United States of America.

Table 4. Leading sectors with potential to attract FDI in the selected members of ECOWAS

	Nigeria			**Ghana**	
Sector	Activity sectors	Affiliates	Sector	Activity sectors	Affiliates
T	Wholesale and retail trade	124	T	Wholesale and retail trade	44
T	Community, social and personal service activities	64	T	Transport, storage and communications	26
T	Finance	62	T	Finance	22
T	Transport, storage and communications	54	T	Community, social and personal service activities	17

S	Chemicals and chemical products	21	P	Mining and quarrying	11
S	Machinery and equipment	14	S	Food, beverages and tobacco	9
S	Metal and metal products	14	T	Construction	8
S	Food, beverages and tobacco	10	S	Chemicals and chemical products	8
P	Mining and quarrying	5	S	Motor vehicles and other transport equipment	4
P	Petroleum	5	S	Textiles, clothing and leather	4
P	Agriculture and hunting	2	S	Metal and metal products	4
P	Forestry and Fishing	1	P	Petroleum	1
	Cote d'Ivoire			**Senegal**	
T	Wholesale and retail trade	74	T	Wholesale and retail trade	38
T	Transport, storage and communications	35	T	Finance	24
T	Finance	31	T	Other services	22
T	Community, social and personal service activities	22	T	Community, social and personal service activities	16
S	Food,beverages and tobacco	15	T	Transport, storage and communications	16
S	Chemicals and chemical products	13	S	Chemicals and chemical products	7
T	Construction	10	S	Food,beverages and tobacco	4
S	Machinery and equipment	4	P	Mining and quarrying	3
S	Other manufacturing	4	S	Other manufacturing	3
S	Textiles, clothing and leather	4	T	Health and social services	3
S	Wood and wood products	4	P	Petroleum	2
P	Agriculture and hunting	2	S	Electrical and electronic equipment	2
	Togo				
T	Wholesale and retail trade	10			
T	Transport, storage and communications	8			
T	Other services	7			
T	Finance	5			
T	Community, social and personal service activities	4			
T	Business activities	4			
P	Petroleum	2			
S	Non-metallic mineral products	2			
T	Construction	2			
P	Agriculture and hunting	1			
P	Mining and quarrying	1			
S	Health and social services	1			

Source: ITC Investment Map (http://www.investmentmap.org/prioritySector.aspx)

Note: P, S and T imply primary, secondary and tertiary economic activities, respectively.

Table 5. FDI inflows among the Selected Members of ECOWAS

Year	Cote d'Ivoire	Ghana	Nigeria	Senegal	Togo
1978	83.3	9.7	210.9	-5.0	92.9
1988	51.7	5.0	378.7	14.9	13.0
1998	380.0	167.4	1051.3	70.6	30.2
2008	466.5	2714.9	8196.6	453.9	50.7
2009	396.0	2372.5	8554.8	330.1	46.1
2010	358.1	2527.4	6026.2	266.1	124.9
2011	301.6	3247.6	8841.1	338.2	727.8
2012	330.3	3294.5	7069.9	276.2	121.5
2013	407.5	3227.0	5562.9	311.3	195.8
2014	462.0	3363.4	4655.8	342.7	292.1

Source: World Development Indicators (2015)

Table 6. FDI inflows in Nigeria by Origin

Economy/Region	2001	2006	2011	2012
France	-	-	2 529	214
Germany	-	-	101	6
Netherlands	-	-	2 188	3 257
Spain	-	-	-	157
United Kingdom	202	774	10	3 464
United States	8	32	119	4 532
China	-	-	1 132	4 631
Developed economies	210	806	- 139	14 852
Africa	330	1 264	774	18 610
Asia	30	115	1 747	20 724
World	1 277	4 898	2 277	55 234

Source: UNCTAD FDI/TNC database, based on data from the Central Bank of Nigeria.

- Data not available.

Table 7. FDI inflows in Côte d' Ivoire by Origin

Reporting economy	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
China	-	-	1	7	9	- 3	2	- 7	2	- 5	1	4
France	103	- 20	15	62	- 1	73	60	73	122	91	- 11	117
Germany	10	- 2	- 14	-	7	- 3	5	- 18	- 4	-	-	-
United States	- 64	40	20	60	54	- 23	- 88	- 166	- 8	- 12	- 8	-

Source: UNCTAD FDI/TNC database.

Table 8. **Business cycles of the selected countries with reference dates**

	1978-1985				1986-1994				1995-2004				2005-2014				1978-2014			
Selected Countries	Number of full Cycles	Expansions (yrs)	Contractions (Yrs)	Ratio(E/C)	Number of full Cycles	Expansions (yrs)	Contractions (Yrs)	Ratio, (E/C)	Number of full Cycles	Expansions (yrs)	Contraction s (Yrs)	Ratio (E/C)	Number of full Cycles	Expansion s (yrs)	Contractions (Yrs)	Ratio (E/C)	Number of full Cycles	Expansions (yrs)	Contractions (Yrs)	Ratio (E/C)
	Members of ECOWAS Business cycles																			
Cote d'Ivoire	3	3	7	0.4	3	6	4	1.5	4	6	4	1.5	2	2	4	0.5	13	16	20	0.8
Ghana	2	6	4	1.5	3	3	7	0.4	3	6	4	1.5	2	3	3	1	11	20	16	1.3
Nigeria	3	5	5	1	3	4	6	0.6	3	5	5	1	2	3	3	1	12	17	19	0.9
Senegal	3	5	5	1	4	6	4	1.5	3	4	6	0.6	2	4	2	2	11	20	16	1.3
Togo	3	7	3	2.5	3	3	7	0.4	3	6	4	1.5	1	5	1	5	10	19	17	0.9
Average	**2.8**	**5.2**	**4.8**	**1.28**	**3.2**	**4.4**	**5.6**	**0.88**	**3.2**	**5.4**	**4.6**	**1.22**	**1.8**	**3.4**	**2.6**	**1.9**	**11.4**	**18.4**	**17.6**	**1.04**
	Selected Trading Partners Business Cycles																			
China	3	5	5	1	3	3	7	0.4	3	3	7	0.4	1	1	5	0.2	10	15	21	0.7
France	3	5	5	1	4	4	6	0.6	3	6	4	1.5	1	4	2	2	12	19	17	0.9
Germany	3	3	7	0.4	3	2	8	1.5	3	6	4	1.5	1	1	5	0.2	10	13	23	0.6
Netherlands	2	4	6	0.6	3	4	6	0.7	3	5	5	1	1	3	3	1.0	11	15	21	0.7
Spain	2	6	4	0.3	3	4	6	0.7	4	7	3	2.5	1	2	4	0.5	9	22	14	1.6
United Kingdom	3	7	3	2.5	2	7	3	2.5	3	5	5	1	1	4	2	2.0	9	20	16	1.3
USA	3	4	6	0.6	2	6	4	1.5	4	6	4	1.5	1	2	4	0.5	11	19	17	0.9
Average	**2.7**	**5.0**	**5.0**	**1.0**	**3.0**	**4.0**	**6.0**	**1.1**	**3.3**	**5.4**	**4.6**	**1.3**	**1.0**	**2.3**	**3.7**	**0.9**	**10.3**	**17.6**	**18.4**	**1.0**

Source: Author's computation based on WDI (2015).

Note: Duration of business cycles expansions and contractions are expressed in years. Expansions are measured from troughs to peaks and contractions from peaks to troughs. A full cycle is measured from trough to trough or from peak to peak.

Table 9. Static Cross-country business cycles with reference dates

1978-1985												**1995-2004**											
	CIV	NIG	GHA	SEN	TGO	GMY	SPN	FRA	UK	NLD	CHN		CIV	NIG	GHA	SEN	TGO	GMY	SPN	FRA	UK	NLD	CHN
CIV	1											CIV	1.00										
NIG	0.13	1.00										NIG	0.36	1.00									
GHA	-0.49	0.24	1.00									GHA	0.35	0.07	1.00								
SEN	-0.03	-0.32	-0.52	1.00								SEN	0.29	-0.12	-0.50	1.00							
TGO	-0.14	0.13	0.59	-0.26	1.00							TGO	-0.03	0.14	0.21	-0.10	1.00						
GMY	**-0.01**	**0.24**	**0.15**	**-0.20**	**-0.23**	1.00						GMY	**0.34**	**0.04**	**-0.06**	**0.01**	**-0.77**	1.00					
SPN	**-0.48**	**0.34**	**0.28**	**-0.26**	**0.06**	0.15	1.00					SPN	**0.14**	**-0.28**	**0.12**	**-0.20**	**-0.36**	0.68	1.00				
FRA	**0.01**	**0.76**	**-0.01**	**0.08**	**-0.02**	0.10	0.58	1.00				FRA	**0.34**	**0.18**	**0.48**	**-0.11**	**-0.36**	0.65	0.50	1.00			
UK	**0.02**	**0.38**	**0.30**	**-0.27**	**-0.10**	0.44	-0.17	-0.18	1.00			UK	**0.38**	**0.52**	**0.20**	**-0.39**	**0.45**	0.07	0.23	0.11	1.00		
NLD	**-0.29**	**0.27**	**0.29**	**-0.46**	**-0.11**	0.80	0.56	0.10	0.43	1.00		NLD	**0.20**	**0.20**	**-0.23**	**0.07**	**-0.65**	0.84	0.66	0.61	0.15	1.00	
CHN	**-0.50**	**0.07**	**0.43**	**0.04**	**0.52**	-0.39	-0.12	0.01	-0.14	-0.41	1.00	CHN	**-0.03**	**-0.43**	**-0.13**	**0.43**	**0.64**	-0.49	-0.11	-0.36	-0.07	-0.44	1.00
USA	**0.14**	**-0.40**	**-0.04**	**0.31**	**-0.43**	0.47	-0.19	-0.27	0.18	0.16	-0.49	USA	**0.51**	**-0.01**	**0.20**	**-0.06**	**0.13**	0.29	0.68	0.25	0.64	0.43	0.18
1986-1994												**2005-2014**											
	CIV	NIG	GHA	SEN	TGO	GMY	SPN	FRA	UK	NLD	CHN		CIV	NIG	GHA	SEN	TGO	GMY	SPN	FRA	UK	NLD	CHN
CIV	1.00											CIV	1.00										
NIG	0.42	1.00										NIG	0.71	1.00									
GHA	-0.63	0.33	1.00									GHA	0.57	0.11	1.00								
SEN	-0.47	-0.44	0.12	1.00								SEN	0.24	0.26	0.74	1.00							
TGO	0.00	0.09	0.34	-0.05	1.00							TGO	-0.37	-0.22	0.39	0.72	1.00						
GMY	**-0.25**	**0.11**	**0.49**	**-0.02**	**0.78**	1.00						GMY	**0.22**	**0.11**	**0.62**	**0.56**	**0.69**	1.00					
SPN	**0.11**	**-0.17**	**0.06**	**0.21**	**0.41**	0.43	1.00					SPN	**-0.35**	**0.13**	**-0.06**	**0.38**	**0.77**	0.64	1.00				
FRA	**0.01**	**0.02**	**0.02**	**-0.02**	**0.50**	0.75	0.46	1.00				FRA	**-0.02**	**0.14**	**0.26**	**0.37**	**0.69**	0.91	0.86	1.00			
UK	**0.17**	**-0.34**	**-0.40**	**0.16**	**0.11**	-0.09	0.32	0.02	1.00			UK	**-0.07**	**-0.03**	**0.51**	**0.64**	**0.89**	0.94	0.79	0.92	1.00		
NLD	**0.19**	**0.05**	**0.03**	**-0.39**	**0.77**	0.45	0.17	0.47	0.02	1.00		NLD	**0.17**	**0.25**	**0.47**	**0.53**	**0.69**	0.97	0.78	0.97	0.94	1.00	
CHN	**-0.64**	**-0.46**	**0.17**	**0.55**	**-0.41**	-0.12	-0.01	-0.17	0.00	-0.59	1.00	CHN	**-0.22**	**0.28**	**-0.51**	**0.00**	**-0.20**	-0.71	-0.09	-0.55	-0.53	-0.57	1.00
USA	**0.36**	**-0.09**	**-0.29**	**-0.11**	**0.19**	-0.23	0.26	-0.17	0.81	0.28	-0.42	USA	**-0.01**	**0.11**	**0.40**	**0.54**	**0.80**	0.95	0.85	0.98	0.98	0.98	-0.53

Source: Computed based on constructed diffusion index.

Note: Figures in bold are extra-ECOWAS cross-country business cycles.

Table 10. **Summary of empirical studies**

Author (s)	Objective (s)	Scope	Reference cycles periods	Data used to construct business cycles	Methodologies for de-trending BC and estimation	Significant Determinants
Canova and Dellas (1991)	To investigate impact of trade interdependence on business cycle synchronisation	10 major industrial countries, quarterly data from 1960 to 1986	Full Sample	Series of gross national products	Random walk, Linear, Hodrick-Prescott (HP) and Beveridge-Nelson (BN) de-trending/ correlation, spectral and VAR methods.	Trade is not important.
Frankel and Rose (1998)	To examine relationship between two (trade integration and business cycles correlation) of the criteria of optimum currency area.	21 industrial countries between 1959 and 1993	Four equally-sized sub-samples	Quarterly data on real GDP, industrial production (IP), total employment, unemployment rate	Fourth differences, Linear and quadratic time trends, Hodrick-Prescott Filter / OLS estimation with instrumental variables (IV)	Bilateral trade intensity
Otto and Willard (2001)	To investigate OECD output correlations	17 OECD countries between 1960-2001	Full sample and two sub-samples: 1960-1979: 1980-2000	Real and nominal GDP growth rates, Bilateral trade flows, FDI, Short-term interest rates, Stock market indices	OLS estimation with IV	Trade intensity, equity return spreads, exchange rate volatility, FDI intensity, interest rate spreads, industry structure, and language
Otto and Willard (2003)	To carry out a cross section study of the international transmission of business cycles	22 OECD countries between 1960 and 2000	Different sub-periods	Annual real GDP data	GDP growth rates, Hodrick-Prescott filter, Baxter-King filter / OLS estimation with IV	Trade intensity, Financial Linkages (FDI, equity flows, bond market), Monetary and exchange rate policies
Calderón *et al.* (2007)	To investigate the causes of business cycles synchronization among developing countries.	147 countries between 1960 and 1999	Four equally sized samples: 1960-1969, 1970-1979, 1980-1989, 1990-1999	Real GDP data	First-differences, HP filter, Baxter-King filter / OLS estimation and IV	Bilateral trade, Specialisation / sectoral Structure, Several gravity variables
De Haan *et al.* (2002)	To investigate whether business cycles have become more synchronised and their determinants	USA (all states excluding Alaska & Hawaii); Germany (9 states); 18 OECD countries between 1929 and 1996	Different sub-samples due to time horizons; 1929- 1993; 1950 -1996	Yearly deflated personal income, Annual RGDP, Industrial production	Hodrick-Prescott filter / OLS estimation	Trade and monetary integration

Source: Author's compilation

Table 10. Summary of existing empirical studies (Continued)

Author (s)	Objective (s)	Scope	Reference cycles periods	Data used to construct business cycles	Methodologies for de-trending BC and estimation	Significant Determinants
Gruben, Koo and Millis (2002)	To investigate the impact of international trade on business cycle synchronisation	21 OECD countries between 1965 and 1998	Four sub-samples: 1965-1972, 1973-1981, 1982-1990, 1991-1999	Quarterly real GDP, Industrial production index, Total employment & Unemployment	Fourth differences, Quadratic time trend, Hodrick-Prescott filter Baxter-King filter / OLS estimations with IV & Panel data with fixed effects	Intra-and inter-industrial trade and specialisation
Bordo and Helbling (2003)	To investigate whether business cycles have become more synchronised and their determinants	16 countries between 1880 and 2001	Four eras: 1880-1913 1920-1938 1948-1972 1973-2001	Annual GDP data and annual industrial production data	First differences, Baxter-King filter, Concordance correlations and Standard output correlations /Static factor model and VAR model	Global and idiosyncratic shocks, supply and demand shocks, trade, asset market integration & exchange rate
Imbs (2004)	To investigate relationship among trade, finance, specialisation and synchronization.	24 countries between 1980 and 2000, 1960 and 2000, and 1977 and 2001	As indicated in the covered periods	Quarterly and annual GDP	Baxter-King filter / Simple OLS and 3SLS estimation with instrumental variables	Trade, financial integration, specialisation , geographical distance, linguistic similarity & common border
Baxter and Kouparitsas (2005)	To investigate the determinants of business cycle co-movement.	100 countries (developed and developing) between 1970 and 1995	Full sample	Annual RGDP	Baxter-King filter/ Extreme-bounds analysis	Bilateral trade, sectoral structure, export/import similarities, factor endowment & gravity variables
Inklaar, Jong-A-Pin and De Haan (2005)	To examine the relationship between trade and business cycle synchronisation in OECD countries	21 OECD countries between 1970 and 2003	Three sub-samples: 1970-1981, 1981-1992, 1992-2003.	Quarterly GDP, Monthly index of industrial production	Baxter-King filter / OLS estimation with instrumental variables, Least trimmed squares estimation, Extreme-bounds analysis	Trade, Specialisation, Monetary policy, Fiscal policy, Financial Integration
Böwer and Guillemineau (2006)	To analyse the determinants of business cycle synchronisation across euro area countries	EU12 countries between 1980 and 2004	Three sub-periods: 1980-1988, 1989-1996, 1997-2004	Annual real GDP data	Baxter-King filter /Extreme-bounds analysis	Industrial and financial structures, short-term interest rate differentials and cyclical services.
Imbs (2006)	To investigate real effects of financial integration	41(large), 12 core and 31 periphery countries: 1960 to 2000.	Full sample	Annual GDP and bilateral portfolio investment	Hodrick-Prescott filter / Simple OLS and 3SLS estimation with instrumental variables	Trade specialisation in machinery and equipment , stock market, real interest rate differentials and geographical distance

Source: Author's Compilation

Table 10. **Summary of existing empirical studies (Continued)**

Author (s)	Objective (s)	Scope	Reference cycles periods	Data used to construct business cycles	Methodologies for de-trending BC and estimation	Significant Determinants
Akin (2007)	To investigate the determinants of Business cycle synchronisatio n	47 countries (including 27 emerging countries) between 1970 and 2003	3 sub-periods: 1970-1979, 1980-1989, 1990-2003	Real annual GDP data	Baxter-King filter / OLS, GMM and 3SLS estimations with IVs (simultaneous equations)	Trade, financial openness, partner similarity, free trade area membership, exchange rate volatility, oil-import dependency
García-Herrero and Ruiz (2007)	To analyse the effect of trade and financial links on business cycle synchronisation	109 countries between 1990 and 2003	Full Sample	Annual GDP data	Baxter-King filter / Simple OLS as well as 3SLS estimation with instrumental variables	Trade, financial linkages, similar production structures, distance, language, inflation differentials, exchange rate volatility, land area, population and oil dependency
Rana (2007)	To investigate the relationship between trade intensity and business cycle synchronisation	East Asia between January 1989 and December 2004	Full Sample	Monthly industrial production index (IPI)	Hodrick-Prescott filter/ OLS and the IVs approach	Intra-industry trade leads to synchronisation of business cycles
Lee (2010)	To evaluate the impact of bilateral trade integration on business cycle co-movements	50 states in the US for the year 2002	Full Sample	gross state product (GSP)	Hodrick-Prescott (HP) filter/ OLS and IV with GMM.	Trade integration, intra-industry trade flows
Dees and Zorell (2011)	To examine whether economic ties between countries foster business cycle synchronisatio n	Central and Eastern Europe between 1993 and 2007	Full sample	GDP	HP-filtered GDP/3SLS	Trade integration and similarity in production structure are significant with the expected signs, while financial integration influences indirectly, through similarities in production structure
Rana, *et al* (2012)	To carry out a comparative analysis of the relationship between trade intensities and synchronisation of business cycles	10 East Asia and 15 European countries between 1986 and 2007	Two periods, 1987–1996 and 1997–2007	Annual real GDP data at constant price	The output data are first-differenced in logarithm / OLS and the IV approach	Intra-industry trade and macroeconomic coordination variables

Source: Author's compilation

Table 11. Descriptive Statistics

stats	ccbc	intra_s	inter_s	ttrade	fdi
mean	0.3	0.3	0.7	1169773.0	376.8
sd	0.6	0.3	0.3	3478785.0	3550.0
cv	2.1	1.0	0.5	3.0	9.4

Source: Computed

Table 12. Panel Unit Root Test

	Level Test				
Variables	t-bar	t-tilde-bar	Z-t-tilde-bar	P-values	Remarks
ccbc_lt	-4.8681	-3.5401	-15.7483	0	I(0)
Intra_ls	-2.6891	-2.2864	-6.3951	0	I(0)
Inter_ls	-1.9096	-1.7433	-2.3049	0.011	I(0)
ttrade_lt	-1.4272	-1.3763	0.4702	0.6809	
fdi_lt	-3.351	-2.7363	-9.7235	0	I(0)
	First Difference Test				
d.(ttrade_lt)	-6.1743	-3.9603	-18.9645	0	I(1)

Source: Computed

Table 13. Multicollinearity Test

	intra_ls	inter_ls	ttrade_lt	fdi_lt
intra_ls	1			
inter_ls	0.4556	1		
	(0.0000)			
ttrade_lt	0.7367	0.863	1	
	(0.0000)	(0.0000)		
fdi_lt	-0.2265	-0.3411	-0.2591	1
	(0.0000)	(0.0000)	(0.0000)	

Source: Computed

Note: Probability values are in the parenthesis

Table 14. PMG estimates of the impact of trade and FDI flows on cross-countries business cycles

Long Run	**All Partners**		**EU**		**China**		**USA**	
ttrade_lt	1.121 (3.46)***	-	1.470 (3.19)***	-	-1.179 (-1.72)*	-	0.201 (0.9)	-
fdi_lt	0.686 (3.39)***	-	0.918 (3.22)***	-	0.452 (1.43)	-	-0.268 (-1.16)	-
intra_ls	-	0.999 (5.47)***	-	0.451 (3.3)***	-	-0.328 (-1.17)	-	1.824 (2.47)**
Inter_ls	-	-0.300 (-1.81)*	-	-0.082 (-0.66)	-	-0.433 (-0.70)	-	-1.141 (-1.73)*
Short Run								
ec	0.062 (2.34)**	0.003 (1.06)	0.066 (2.08)**	0.006 (1.51)	-0.110 (-1.88)	-0.096 (-2.48)**	0.137 (1.21)	0.020 (0.20)
D1.ttrade_lt	0.300 (3.97)***	-	0.310 (3.24)***	-	0.544 (2.65)***	-	0.147 (0.89)	-
_cons	0.154 (0.69)	-0.197 (-1.60)	0.346 (1.00)	-0.170 (-1.82)	0.102 (0.31)	-0.106 (-0.89)	-0.218 (-1.47)	-0.239 (-0.65)
Statistics								
0 Iteration LL	-205.532	-200.707	-110.161	110.161	-66.199	-56.023	-32.329	-34.459
last Iteration LL	-195.005 (5)	-195.794 (5)	-108.621 (4)	108.621 (4)	-63.862 (6)	-54.255 (5)	-31.164 (5)	-29.149 (6)
LL X^2 ratio test	10.527***	9.84***	3.08***	3.12***	4.674**	3.888***	2.33**	10.62***
Observations	1015	1050	725	750	145	150	145	150
Number of Groups	35	35	25	25	5	5	5	5
Observations per group	29	30	29	30	29	30	29	30

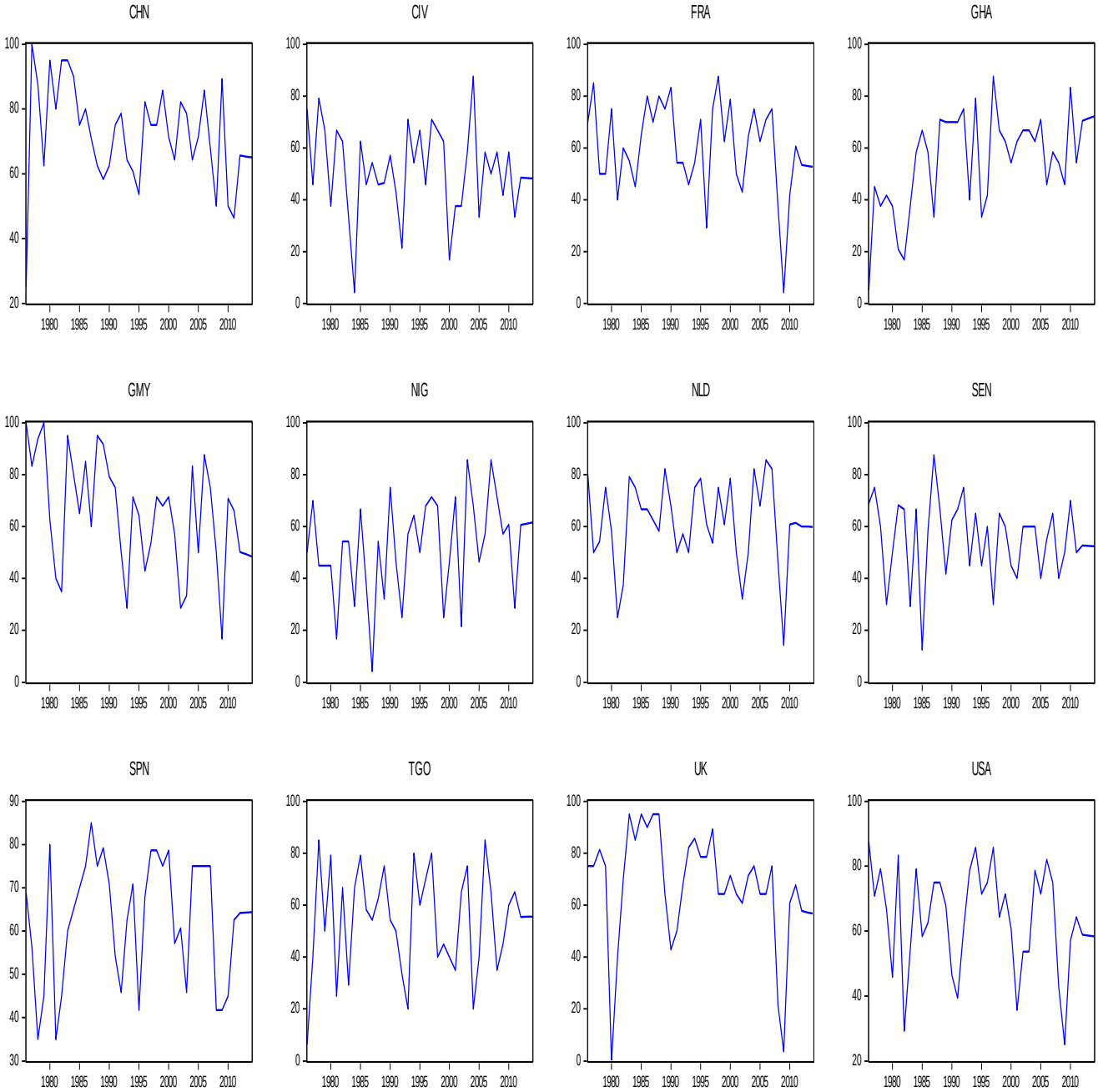
Source: Computed

Note: ***,**,* implies significant at 1%,5%, and 10% level, respectively. Values in the parentheses are z-statistics, while those in the parentheses of row corresponding to last iteration are number of iterations for the models to converge.

APPENDIX

List of Tables and Figures

Figure A1. Business cycles (diffusion indexes) of the selected countries



Source: Author's Computation Based on WDI, 2015.

Note: CIV, NIG, GHA, SEN, TOG, GMY,SPN, FRA, UK, NLD, CHN, USA represents respectively, Cote d'Ivoire, Nigeria, Ghana, Senegal, Togo, Germany, Spain, France, United Kingdom, Netherlands, China and United States of America

Table A1. List of commodities surveyed, data by 2-digit SITC, revision 2

S/N	SITC 2-Digit	Product Description
1	2	Dairy products
2	4	Cereal preparations
3	6	Sugar,sugar preparations
4	7	Coffee,tea,cocoa,spices,manufactures thereof
5	9	Miscel.edible products and preparations
6	11	Beverages
7	12	Tobacco and tobacco manufactures
8	33	Petroleum,petroleum products and related materials
9	34	Gas,natural and manufactured
10	35	Electric current
11	41	Animal oils and fats
12	42	Fixed vegetable oils and fats
13	43	Animal-vegetable oils-fats, processed and waxes
14	51	Organic chemicals
15	52	Inorganic chemicals
16	53	Dyeing,tanning and colouring materials
17	54	Medicinal and pharmaceutical products
18	55	Essential oils & perfume mat.;toilet-cleansing mat
19	56	Fertilizers,manufactured
20	57	Explosives and pyrotechnic products
21	58	Artif.resins,plastic mat.,cellulose esters/ethers
22	59	Chemical materials and products,n.e.s.
23	61	Leather,leather manuf.,n.e.s.and dressed furskisg
24	62	Rubber manufactures,n.e.s.
25	63	Cork and wood manufactures (excl.furniture)
26	64	Paper,paperboard,artic.of paper,paper-pulp/board
27	65	Textile yarn,fabrics,made-upart.,related products
28	66	Non-metallic mineral manufactures,n.e.s.
29	67	Iron and steel
30	68	Non-ferrous metals
31	69	Manufactures of metal,n.e.s.

Source: Author's Survey Based on Word Integrated Trade Solution Data Base

Table A2 (continued). List of commodities surveyed, data by 2-digit SITC, revision 2

S/N	SITC 2-Digit	Product Description
32	71	Power generating machinery and equipment
33	72	Machinery specialized for particular industries
34	73	Metalworking machinery
35	74	General industrial machinery & equipment,and parts
36	75	Office machines & automatic data processing equip.
37	76	Telecommunications & sound recording apparatus
38	77	Electrical machinery,apparatus & appliances n.e.s.
39	78	Road vehicles (incl. air cushion vehicles
40	79	Other transport equipment
41	81	Sanitary,plumbing,heating and lighting fixtures
42	82	Furniture and parts thereof
43	83	Travel goods,handbags and similair containers
44	84	Articles of apparel and clothing accessories
45	85	Footwear
46	87	Professional,scientific & controling instruments
47	88	Photographic apparatus,optical goods,watches
48	89	Miscellaneous manufactured articles,n.e.s.

Source: Author's Survey Based on Word Integrated Trade Solution Data Base

Table A2. Comparisons between transformed variables

	logccbc ccbc_lt	
logccbc	1	
ccbc_lt	1.0000 1.0000	
	0.0000	
	logfdi	fdi_lt
logfdi	1	
fdi_lt	1	1
	0.000	

Source: Computed