Iran. Econ. Rev. Vol. 22, No. 1, 2018. pp. 63-103

Foreign Trade and International Financial Flows: Implications for Economic Stability in the Selected ECOWAS Countries[1]

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Received: March 3, 2017 Accepted: April 13, 2017

Abstract

This study investigates the effects of extra-ECOWAS merchandise trade and investment flows on the transmission of business cycles in the selected ECOWAS between 1985 and 2014. The study finds that total trade and foreign direct investment (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. This study recommends greater needs to encourage trade (particularly, intra-industry) and foreign investment with the major trading partners. This, however, requires investment in critical infrastructure and upgrade of domestic technology to be deeply involved in global values chains necessary for the transmission of the desired business cycles. In addition, there is a need to diversify the export base and increase domestic investment to compliment foreign investments in order to minimize undesired business cycles spillovers that can undermine ECOWAS stability.

Keywords: ECOWAS, Foreign Trade, International Financial Flows, Cross-Country Business Cycles, Stochastic Technology Shocks.

JEL Classification: F14, F21, F44.

1. Introduction

Economic stability of any country goes beyond exposure to

[1]. The Author acknowledges, without implicating, 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. I also appreciate African Economic Research Consortium (AERC) and African Development Bank (AfDB) for creating the opportunity to carry out this study. Comments of Dr. Nadege Yameogo of the Development Research Department, African Development Bank are also highly appreciated.

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endogenous factors but a host of exogenous factors it receives from other countries through foreign trade and international financial flows. Hence, exposure to exogenous factors poses both opportunities for growth and challenges of economic instability across countries. In other words, foreign trade and international financial flows are potential candidates for business cycles[1] transmission. Transmission of business cycles is important to developing countries in a number of ways. Developing countries are not only small with little influence on the global market outcomes, but are also characterized with huge degree of openness to international trade. For instance, available data from World Development Indicators (WDI) shows that foreign trade accounts for over 70% of Gross Domestic Product (GDP) of some of the members of Economic Community of West African States (ECOWAS) such as Togo and Cote d'Ivoire.

ECOWAS was formed in 1975 to promote cooperation, integration and maintenance of enhanced regional economic stability (Revised ECOWAS treaty, 1993). This, notwithstanding, the real GDP of ECOWAS fluctuates abysmally with the 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 trend could be partly traced to exposure to exogenous shocks through foreign trade and international financial flows. According to Imam and Salinas (2008), accelerating West African GDP growth rate has been found to be mostly triggered by foreign trade, while growth collapses are linked, among other things, to negative terms of trade shocks. Given the above, the key question this study seeks to address is: can the observed instability in the ECOWAS region be traced to its international trade and investment interdependence?

This study, therefore, examines the sources of cross-country-business-cycles[2] in ECOWAS. Specifically, the interest is to examine whether foreign trade and investment flows between ECOWAS and the major trading partners serve as important sources of business cycles transmission. Previous studies such as Canova and Dellas (1991), Frankel and Rose (1998), Imbs (2004), Lee, (2010), and Rana et al, (2012) focused on the effects of trade and financial flows on

1. These are series of cycles of economic expansion and contraction over a given period of time.
2. This implies transmission of business cycles between countries

transmission of business cycles among developed countries, with little attention paid to what obtains between developing (such as ECOWAS) and developed countries.

This study covers the period between 1985 and 2014. This is based on data availability for some of the variables of interest. Besides, five members of ECOWAS including Nigeria, Cote d'Ivoire, Ghana, Senegal and Togo are selected as sample. The selected members of ECOWAS account for over 70% of the community's gross output (WDI, 2015). The major developed countries trading partners included in the sample are the United State of America (USA), five European Union (EU) member states (including France, Germany, United Kingdom, Netherlands and Spain) and China. The sampled ECOWAS trading partners account for about 68.3% of its external trade (UNCTAD database).

The paper is organized as follows; following the introduction part, section two presents the stylized facts on trade flows, business cycles and cross-country business cycles of the sampled economies. 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

This section presents the characteristics of ECOWAS trade, business cycles of the selected economies and cross-country business cycles between ECOWAS and the selected trading partners. The synthesis of the trend in extra-ECOWAS trade, business cycles and the cross-country business cycles is subsequently provided.

2.1 ECOWAS Foreign Trade and Investment Flows: Characteristics and Components

Extra-ECOWAS trade flows are dominated by few major partners. For instance, Table 1 shows that the selected trading partners accounted for an average of approximately 54.1% of the sampled 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, nonetheless. While USA remains the major trading partner of Nigeria by accounting for about 30.3% of its trade, France is a key trading partner of Senegal and Cote d'Ivoire as it accounts for an average of 32.0% and 12.0% of their foreign trade flows, respectively.

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

Nigeria	Major Trading Partners	1978-1985	1986-1994	1995-2004	2005-2014	1978-2014
	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)

UK and USA are the leading Ghana's trading partners, as the two countries account for about 14.9% and 12.5% of her total trade respectively. Meanwhile, France and China are the main trading partners of Togo accounting respectively for about 16.9% and 10.8%

of its total trade. The proportion of trade flows between the selected members of ECOWAS and the identified traditional partners (excluding China) have reduced relatively from 85.8% between 1978 and 1985 to 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 the description above is relevant to appreciate ECOWAS trading partners mix, the shift in trading partners has little connection with synchronisation[1] of business cycles. For instance, China (one of the trading partners with increasing prominence in ECOWAS external trade profile) is less synchronised with ECOWAS (Table 5). Hence, what is relevant in the discussion of business cycles co-movement is the nature of traded commodities.

The nature of commodities traded by selected members of ECOWAS clearly indicates low level of participation in global value chains[2] (GVCs). In Nigeria, it is mainly the exchange of crude oil for refined oil products, automobiles and wheat (Table A1). For Ghana, foreign trade is dominated by 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[3] (Table A1). Three attributes of ECOWAS external trade stand out from the nature of commodities traded: the external trade profile is characterized with inter-industry[4] trade, participation in the GVCs is at bottom (that is, trade is dominated by vertical intra-industry trade) and the production structure of ECOWAS differs from those of the key trading partners. These characteristics limit the extent to which business cycles could be transmitted.

It is important to note that effective participation in GVCs requires considerably high level of technology and industrialization. Hence, the low level of high-technology manufactured exports of selected

1. This refers to business cycles co-movement
2. 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).
3. 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)
4. Exchange of goods belonging to different industries

members of ECOWAS compared to that of the selected trading partners, indicated in Table 2, further explains the reason for low level of participation in GVCs by ECOWAS.

Table 2: Share of High-Technology[1] 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
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.

Relating to international investment inflows, there is a high level of homogeneity among the selected members of ECOWAS. 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 sector, wholesale and retail trade, transportation, storage and telecommunications and finance account 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.

Further, Nigeria − the largest FDI host country in the ECOWAS – has been experiencing fall in its FDI inflows between 2011 and 2014

1. Products with high R&D intensity include aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery (WDI, 2015).

(Table 3). This is attributed to increase in the level diversification of the Nigerian economy; from oil into non-oil sectors (UNCTAD, 2015). Within the same period, FDI to 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 in some cases.

Table 3: 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)

2.2 Business Cycles and Cross-Country Business Cycles of the Selected Countries

2.1.1 Business Cycles of the Selected Countries

In the literature of business cycles, not all economic activities are relevant. This is based on the nature, causes, duration and patterns of cyclical behaviour across countries. Given that the selected members of ECOWAS are largely characterised with primary agricultural[1] activities, there are tendencies to assume absence of business cycles. Two main proofs of the existence of business cycles in ECOWAS context can be established. First, business cycles are related to macroeconomic dynamics which has large interface with economics of growth, money, inflation and expectations which do exist in any

1. Agricultural production, due to seasonality, runs its cycles within a year while typical business cycles duration could be longer (Moore and Zarnowitz, 1984).

economy. Second, there is possibility of a sector representing only a small fraction of the economy (e.g. manufacturing sector) to account for a significant share of the amplitudes of the business cycles.

Following this background, the diffusion indexes[1] (a proxy of business cycles) of selected members of ECOWAS as well as the sampled major trading partners between 1976 and 2014 are presented in Table 4. On the average, 11 business cycles have occurred in ECOWAS in the past 38 years, implying about one every three and half years. While member of ECOWAS such as Cote d'Ivoire had about 13 cycles, Togo had experienced 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 more frequent cycles than the selected major trading partners. Hence, ECOWAS business cycles could be categorised under three-year Kitchin cycle[2] implying that inventory investment[3] plays a central role (See Moore and Zarnowitz, 1984 and Gabisch and Lorenz, 1987). Second, ECOWAS business cycles can be presumed to be more exposed to frequent external shocks than those of developed countries trading partners.

Table 4: Business Cycles of The Selected Countries with Reference Dates

	1978-1985				**1986-1994**				**1995-2004**				**2005-2014**			
	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)**	**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
Ghana	2	6	4	1.5	3	3	7	0.4	3	6	4	1.5	2	3	3	1

1. Note that a complete business cycles is measured either from trough to trough or from peak to peak, in years
2. Other types of business cycles are 10-year Jugular cycles, 20-year Kuznets cycles and 50-year Kondratiev cycles.
3. 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.

	1978-1985				1986-1994				1995-2004				2005-2014			
	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)	Contractions (Yrs)	Ratio (E/C)	Number of full Cycles	Expansions (yrs)	Contractions (Yrs)	Ratio (E/C)
Nigeria	3	5	5	1	3	4	6	0.6	3	5	5	1	2	3	3	1
Senegal	3	5	5	1	4	6	4	1.5	3	4	6	0.6	2	4	2	2
Togo	3	7	3	2.5	3	3	7	0.4	3	6	4	1.5	1	5	1	5
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
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
France	3	5	5	1	4	4	6	0.6	3	6	4	1.5	1	4	2	2
Germany	3	3	7	0.4	3	2	8	1.5	3	6	4	1.5	1	1	5	0.2
Netherlands	2	4	6	0.6	3	4	6	0.7	3	5	5	1	1	3	3	1.0
Spain	2	6	4	0.3	3	4	6	0.7	4	7	3	2.5	1	2	4	0.5
United Kingdom	3	7	3	2.5	2	7	3	2.5	3	5	5	1	1	4	2	2.0
USA	3	4	6	0.6	2	6	4	1.5	4	6	4	1.5	1	2	4	0.5
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

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.

2.2.2 Cross-Country Business Cycles Among the Selected Countries

There are two main approaches to measuring[1] cross-country business cycles; the static and the dynamic. While the dynamic approach will be presented subsequently, Table 5 presents static cross-country business cycles between a pair of selected countries. The Table suggests less synchronised patterns of cross-country business cycles between a pair of 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

1. Several approaches at measuring the cross country business cycles will be presented subsequently.

between a pair of the selected members of ECOWAS and their trading partners. For instance, China demonstrated increasing unsynchronized business cycles, except for the period of 1995 to 2004 when its synchronisation marginally improved with selected members of ECOWAS. However, USA has become more synchronised with the selected members of ECOWAS with Senegal driving the synchronization, especially between 2005 and 2014.

Also, the sampled EU members are becoming more synchronised with the selected members of ECOWAS except for the period from 1995 to 2004, when synchronisation is lower than the preceding period (Table 5). There are outliers, notwithstanding. For instance, Nigeria was highly synchronised with most sampled EU countries between 1978 and 1985 but the trend has reduced marginally. While Cote d'Ivoire has become more synchronised with ECOWAS the rest of selected members of ECOWAS, the same could not be established of its extra-ECOWAS cross-country business cycles between 2005 and 2014. Overall, both intra-ECOWAS and extra-ECOWAS business cycles co-movement have also in the recent time. This implies that the sampled economies are becoming more responsive to similar shocks.

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

ECOWAS aggregate trade flows with the major trading partners have increased from $32.1 billion between 1978 and 1985 to about $302.8 billion between 2005 and 2014 (COMTRADE statistics). In addition, ECOWAS foreign investments have also shown significant improvements from average of $69 million between 1976 and 1985 to about average of $2,016 million between 2006 and 2014 (WDI online database). Relating these to business cycles, there have been improvements in the level of business cycles co-movement between pairs of sampled economies. For instance, the cross-country business cycles of between a pair of the selected members of ECOWAS and the major trading partners averaging 0.03 between 1978 and 1985 stood at average of 0.28 between 2005 and 2014 (Table 5). 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 investigated.

3. Literature Review

3.1 Review of Theoretical Backgrounds

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, the Keynesian revolution of no self-correction, the new classical, and the new Keynesian theory. On one hand, the classical and the new classical schools largely argue for minimal government policy or regulation. That is, in the absence of external interference, the market functions. On the other hand, the proponents of exogenous causes of business cycles such as Keynesians largely argue for government policy and regulation and see market to move from crisis to crisis in the absence of interventions. The latest dimension to business cycles theory is based on trade and investment interdependent across countries, often referred to as imported business cycles. There are two main channels through which business cycles can be imported. These are through foreign trade and investment. These are discussed below:

Table 5: 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.

Trade Channel

International trade has been identified as an important source of business cycles transmission in the literature. Meanwhile, the potency of this channel to transmit business cycles depends on trade type. For instance, Kenen (1969, cited in Rana, Cheng and Chia, 2012) argues that a well-diversified economy having a large share of intra-industry trade will experience less asymmetric shocks. This connotes that output shocks among trading countries will synchronise if trade is dominated by intra-industry trade. On the contrary, Krugman (1993) argues that there are potentials for asymmetric shocks among countries engaging in intra-industry trade since such trade increases their specialisation. That is, intra-industry in vertically differentiated goods creates potential asymmetry in business cycles. However, Krugman (1993) supports that inter-industry, specialisation across countries and industry-specific shocks are important factors in cross-country business cycles asymmetric. Therefore, imported business cycle may not be important in an economy engaging in inter-industry trade and vertical intra-industry trade because the industrial structures differ.

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 where value chain is strong across sectors of the trading countries. For instance, output of domestic manufacturing industry (for example, inorganic fertilizers and pesticides) may serve as major input in foreign agricultural sector. Therefore, a decline in manufacturing sector (by reducing fertiliser and pesticides exports in domestic economy) is transmitted abroad through 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, negative shocks to foreign agricultural sector are transmitted to domestic economy resulting in low domestic textile output. These opposing views on what would be the effect of trade integration on business cycle synchronization made Böwer and Guillemineau (2006) and Calderón, Chong and Stein (2007) to conclude that the relationship between trade integration and business cycle synchronisation is fundamentally an empirical one.

Further, theory of trade in intermediate inputs directly modeled business cycles transmission caused by firms splitting their production process across countries with the assumption that the final output bundles together the domestic and foreign sourced intermediate inputs. An extension to this model is referred to as model of international trade with stochastic technology shocks. The stochastic technology trade model relates positive foreign productivity shocks to sourcing of intermediate inputs from more efficient and cheaper foreign suppliers that has also experienced similar positive technology shocks. In this case, technology level in each country is assumed to be product of a deterministic component and a stochastic component (Juvenal and Monteiro, 2010). 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 and it is independent across countries. Hence, 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's factors of production leading to increase in home's productivity.

Investment Chanel

The cross-country business cycles among countries do not only come from international trade but also from financial integration. In the recent decades, there has been rapid increase in financial globalisation, especially with the establishment of global supply chains and emergence of global financial institutions. The recent global financial crises revealed that countries business cycles are connected through the synchronised global downturn. However, 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. That is, 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.

Meanwhile, 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 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 interdependence across countries; the level of integration in FDI, Foreign Portfolio Investment (FPI) and bilateral financial (banking) integration. This study uses FDI as a measure.

In summary, the above review indicated that there are two main channels through which business cycles can be transmitted abroad; first, through trade interdependence partitioned into inter-industry and intra-industry trade flows; and second, through financial interdependence such as FDI and FPI. While intra-industry trade and foreign investment replicating home production structure are more potent at transmitting business cycles, inter-industry trade flows and foreign investment meant to insure against asymmetric shocks are less potent.

3.2 Review of Methodological and Empirical Issues

3.2.1 Measurement of Business Cycles

Computation of business cycles are not directly observable and it uses several economic variables including real income, employment, industrial production, and wholesale-retail sales, consumer prices, wages, stock prices, and inventories. Hence, there are numerous measurements of business cycles including 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). However, diffusion index is not only more comprehensive but it is an improved version of NBER index.

Moreover, the approach of Getz and Ulmer[1] (1990) to the computation of business cycles is more recent. It has to do with assigning a value 0%, 50% and 100%, depending on whether a series decreased, exhibit no change, or increased respectively, over a given time span. The next is to sum the values of all components and divide by the number of components in the computation of the business cycles. This average (mean) is the diffusion index. Hence, a value of 50% to an unchanged 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 with the one that only 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. To overcome this problem, this study employed a different but related approach which will be discussed subsequently.

3.2.2 Methods of Computing Cross-Country Business Cycles

Like Business cycles, 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 correlation of cyclical components of output between any two countries. In this case, high correlation implies high level of business cycle synchronisation, while negative correlation is an indication of unsynchronised business cycle. 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. One of these

1. This approach is a variant of diffusion index

approaches is traceable to 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. Second, the standardised residuals from the first step are used to construct the conditional correlation matrix. Nikolaos (2012) applied DCC[1] model developed by Engle (2002) to avoid the problems associated with convectional correlation measure. 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 is achievable by operationalizing the following equation:

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

Where $y_{i/j}$ is outputs of country i and j and $\bar{y}_{i/j}$ is mean of outputs in countries i and j. $R(y_i, y_j)_{,t}$ is year-by year output correlation between any pair of countries i and j and T is the total number of observations. Meanwhile, the expression $R(y_i, y_j)_{,t}$ is not bounded between -1 and 1, but between 3-2T and 1[2] (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:

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

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

1. 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.
2. For detail, see Cerqueira and Martins (2009) and Cerqueira (2010).

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). For instance, Canova and Dellas (1993) investigated the impact of trade interdependence on business cycle synchronization using series of gross national products of 10 major industrial countries. The study employed correlation, spectral and Vector Autoregressive (VAR) estimation methods and utilise quarterly data over the period 1960:Q1 to 1986:Q4. The study concluded that business cycle synchronization is not determined by trade integration. On the contrary, Frankel and Rose (1998) utilized Ordinary Least Squares (OLS) estimation with instrumental variables (IV) to examine the relationship between two (trade and business cycles correlation) of the criteria of optimum currency area using quarterly data including real GDP, industrial production, total employment and unemployment rate of 21 industrial countries between 1959 and 1993. For the four equally sized sampled period used, the key result is that business cycle correlation is influenced by bilateral trade intensity.

Also, Otto, Voss and Willard (2001) estimated a multivariate model with IV considering variables such as real and nominal GDP growth rates, bilateral trade flows, FDI, short-term interest rates, and stock market indices to investigate OECD output correlations. The study confirms that correlations are significantly determined by trade intensity, equity return spread, exchange rate volatility, FDI intensity, interest rate, spreads, industry structure and language. Related to Otto et al. (2001), De Haan et al. (2002) investigated whether business cycles are becoming more synchronized or not and its various determinants. The study employed both Hodrick-Prescott (HP) filter and OLS estimation techniques with yearly deflated personal income, Annual RGDP, and Industrial production data of USA (all states, excluding Alaska & Hawaii); Germany (9 states) and 18 OECD countries between 1929 and 1996. The study revealed that trade and

monetary integration account for the noticed synchronization across sampled countries.

Furthermore, Bordo and Helbling (2003) examined the extent of business cycle synchronization and its determinants among 16 developed countries. The study used first difference approach, Baxter-King filter, concordance correlations and standard output correlations in the construction of business cycles. The study's models were estimated using static factor and VAR model over a period of 1880-2001. The study concluded that global and idiosyncratic shocks, supply and demand shocks, trade, asset market integration and exchange rate are the major factors driving synchronization of business cycles.

Moreover, Groben, Koo and Millis (2003) examined the impact of international trade on business cycle synchronization using fourth differences, Quadratic time trend, Hodrick-Prescott, Baxter-King filters approaches in the construction of business cycles. The study's models were estimated utilizing OLS estimations, IVs and Panel data with fixed effects for 21 OECD countries between 1965 and 1998. The study concluded that intra-and inter-industrial trade and specialization have significant impact on business cycle synchronization. Similarly, Inklaar, Jong-A-Pin and De Haan (2005) examined business cycles synchronization among OECD economies between 1970 and 2003 employing the extreme-bounds analysis. The study found that trade specialization, monetary and fiscal policies and financial integration are the main determinants of business cycle synchronization.

In a similar manner, Imbs (2004) investigated synchronization of business cycles of 24 countries between 1980 and 2001. The basic conclusion is that synchronization of business cycles has a significant relationship with trade, financial integration, specialization, geographical distance, linguistic similarity and common border. Besides, Baxter and Kouparitsas (2005) investigated the determinants of business cycle co-movements employing the Baxter-King filter technique and extreme-bounds analysis. The study used annual RGDP data of 100 countries (developed and developing) over the period 1970 to 1995 and found that bilateral trade, sectoral structure, export/import similarities, factor endowment and gravity variables

constitute determinants of business cycle co-movements. Across Euro countries using data from EU12 countries between 1980 and 2004, Böwer and Guillemineau (2006) found that industrial and financial structures, short-term interest rate differentials and cyclical services are factors determining business cycle synchronization. Calderon et al. (2007) used first difference; HP and Baxter-king filter as well as OLS estimation techniques to investigate the causes of business cycle synchronization among 147 developing countries from 1960 to 1999. The study concludes that bilateral trade, specialization/sectoral structure and gravity variables are determinants of business cycle synchronization among developing nations. Besides, Akin (2007) investigated the determinants business cycles synchronization among 47 countries (including 27 emerging economies) between 1970 and 2003 employing GMM and 3SLS estimation techniques with IVs. The study found that trade; financial openness, partner similarity, free trade area membership, exchange rate volatility and oil-import dependency are significant determinants of business cycle synchronization. Following the analysis of Akin (2007), García-Herrero and Ruiz (2007) analyzed the effect of trade and financial links on business cycle synchronization employing Baxter-King filter, OLS and 3SLS estimations with a sample of 109 countries between 1990 and 2003. The study concluded that trade; financial linkages, similar production structures, distance, language, inflation differentials, exchange rate volatility, land area, population and oil dependency affect business cycle synchronization.

Similarly, Lee (2010) used Hodrick-Prescott (HP) filter; OLS and IV with GMM on gross state product data for 50 states in the US for the year 2002. The study concludes that trade integration and intra-industry trade flows account for business cycle co-movement. Finally, Rana, et al (2012) examined sources of business cycles co-movement among 10 East Asian and 15 European countries between 1986 and 2007. The study revealed that intra-industry trade and macroeconomic coordination influence business cycle synchronization.

Dai (2014) examined the behavior and determinants of business cycles in Asia utilizing panel data with IV regressions and data ranging between 1994 and 2012. Three countries including China, Japan, and the United States were selected as sample. The study found

that trade channels, financial channels, and policy channels are key determinants of business cycle synchronization. Alimi (2015) examined the impact of bilateral trade, similarity of specialization and capital flows between some Mediterranean countries (Egypt, Morocco, Tunisia and Turkey) and their main European partners (Germany, France and Italy) on Business cycles synchronization. Using the system Generalized Method of Moments (GMM) for dynamic panel over the period of 1980 to 2010, the study found a positive relationship between bilateral trade and similarity of specialization on one hand and business cycle correlation on the other hand. However, financial flows (proxy with FDI) remain without significant effect on business cycle synchronization. Similarly, Caporale and Girardi (2016) adopted a flexible framework to assess both short- and long-run business cycle linkages between the Latin American (LA) bloc and the four largest economies in the world (namely the US, the Euro area, Japan and China) between 1980 and 2011. The result indicates that the LA region is largely dependent on external developments and trade channel appears to be the most important source of business cycle co-movement, whilst capital flows are found to have a limited role in the very short run.

Pentecote, Poutineau and Rondeau (2015) question the impact of trade integration on business cycle synchronization in the European Monetary Union (EMU) between 1995 and 2007. Employing a DSGE model, the study found that synchronization is weakened when new firms are allowed to export in response to productivity gains. Also, the study found that trade intensity has a positive direct effect while new trade flows have a negative effect on business cycle synchronization.

The review of previous empirical studies above show that trade and financial integration are key factors influencing synchronization of business cycles across countries; however, this is yet to be investigated between ECOWAS and its major trading partners. Hence, this paper contributes as the first logical analysis of the effect of international trade and financial flows on the business cycles synchronization between selected ECOWAS countries and the major trading partners. This is one of the gaps this study seeks to fill.

4. Theoretical Framework and Methodology

4.1 Theoretical Framework

A stochastic technology shocks trade model provides the theoretical framework for this study. This is related to models of Canova and Dellas (1993) and Lee (2010) and it 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 *(Y)* in the two economies in period t is given as:

$$Y_t = f_i(y^d_{t-1} - x_1, y^f_{t-1} - x_2, \mu_t) \quad (4)$$

Where Y is the final output in either domestic or foreign country in time (t), y^d_{t-1} and y^d_{t-1} is intermediate inputs sourced from home and foreign country in time t-1 in producing the final output (Y) in time t, respectively. For simplicity, the domestic economic will be used as reference point. Hence, $x_1 > 0$ if the domestic economy exports the intermediate input and $x_2 < 0$ if it imports inputs from the trading partners. This argument ensures that effective use of domestically sourced intermediate inputs and imports of valuable intermediate inputs increases output of Y. In other words, importing the 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[1] 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 labor 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 labor and capital inputs used in the two goods are assumed given.

1. These represent shocks to production that are predictable, given the level of technology endowment, but unknown at the time of making investment decisions.

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 minimizing the short run cost function subject to the value of output from the final good which includes net trade. Thus, rewriting equation (4) and linearizing it gives:

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

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:

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

Where: p is inputs prices. Hence, if $c_i(p_1, p_2)$ denotes the unit cost function that is dual[1] to $f_i(y_1, y_2)$, whereby the final good is assembled from two intermediate inputs, the price of final good 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[2]. 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.

1. That is, an optimum combination of inputs that minimizes costs, necessarily maximizes output.
2. A range in-between low and high level of output as well as short and long run output

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 realized, by writing equation (8) explicitly as follows:

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

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;

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

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

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

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;

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

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

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 ($\mu_t^d \mu_t^f$) → 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;

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

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. δ_{yd}^2 and δ_{yf}^2 is variation in domestic and foreign business cycles causing synchronization of business cycles between home and foreign countries, respectively but independent of trade in intermediate inputs. Some of the variations are rooted in policy coordination and countries' size effect. Hence, equation (21) shows that business cycles correlation is a direct function of exchange of productive intermediate inputs between domestic and foreign economies. Thus, a variant of equation (21) becomes the estimable equation.

4.2 Methodology

4.2.1 Model Specifications

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

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

Where: ρ_{ijt} denotes the business cycle correlation[1] between country *i* and j, $TRADE_{ij}$ is trade flows between country i and j and FDI_{ijt} is bilateral FDI[2] inflows between any countries pair[3]. Given inadequate data for the bilateral FDI flows across countries, the approach for computing the bilateral investment ties is based on benchmarking approach by finding the total outward FDI flows of the selected major trading partners as a ratio of the selected members of ECOWAS total inward FDI flows.

Further, $TRADE_{ij}$ represents total trade flows, further partitioned into intra and inter-industry trade flows. The intra-industry and inter-industry trade share in total trade is computed using Grubel and Lloyd (1971) approach. It is important to note that in computing the intra-

1. Note that the determinants of business cycles are assumed endogenous while the aim of this study is to assess transmission of endogenous business cycles through trade. In other words, the focus of this study is on imported business cycles.
2. 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 A4).
3. Overall, there are 35 countries pairs with 1050 observations.

industry trade flows, this study relied on data of trade structure broken down into 48 two-digit codes of the United Nation's Standard International Trade Classification (SITC), revision 2.

4.3 Estimation Procedures and Techniques

4.3.1 Techniques for Computing Business Cycles and Cross-Country Business Cycles

Business cycles for the study was constructed using seven series categorized into leading (e.g., value of shares traded on the stock exchange), coinciding (e.g., sectoral value-added other than agriculture[1] and changes in price level), and lagging (e.g., changes in inventory) of business cycles. 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 respectively 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. This is to overcome missing oscillations problem associated with Getz and Ulmer (1990)[2] approach. Dynamic cross-country business cycle is computed using year-by-year correlation approach utilizing Cerqueira and Martins (2009) as previously reviewed.

4.3.2 Techniques for Estimating Panel Data with Heterogeneous Slopes

This study estimated a dynamic heterogeneous panel data model which accounts for possible non-stationarity in the panel data. This is necessitated by fairly long time series within the panel data. The heterogeneous panel data is estimated with Pooled Mean Group (PMG)[3] estimator of Pesaran, Shin, and Smith (1997, 1999). This is an

1. It is important to note that agricultural value-added is excluded from business cycle computation because the sector is dominated by cash and food crops majorly driven by seasonality.
2. Getz and Ulmer (1990) assigned a value 0, 50 and 100%, depending on whether a variable is decreasing, no change, or increasing over a given time span. This has a problem of missing oscillations because a positive change all through the time span of a variable will have the same assigned values. In this case, there will be no oscillations at all and this may not be the case.
3. Initially, panel estimators are designed for moderate-T (length of the time series), large-N (number of cross-sectional observations). Over time, the panel data econometrics has shifted towards studying the asymptotics of macro panels with large N and large T rather than the usual asymptotics of panel data with large N and small T. This is because with increase in time→

improvement over Mean Group (MG) estimator of Pesaran and Smith (1995). The PMG relies on a combination of pooling and averaging of coefficients and it is characterized 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:

$$y_{it} = \sum_{j=1}^{k} \alpha_{ij} y_{i,t-j} + \sum_{j=0}^{l} \beta_{ij} x_{i,t-j} + \mu_i + \varepsilon_{it} \tag{23}$$

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 (23) are, for instance, I (1) and cointegrated, then the error term is an I (0) process for all i. Thus, equation (23) can be re-parameterized into an error correction equation in the form:

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

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 λ_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

←observations inherent in large N, large T macro panels and issues such as nonstationarity, spurious regression, cointegration, parameters heterogeneity across countries and serially correlation of the regressors are often of concerns. Thus, literature warns against the use of standard pooled estimators such as Fixed and Random Effects to estimate large N and large T and dynamic panel data models, claiming they are subject to large potential bias when the parameters are heterogeneous across countries and the regressors are serially correlated. Also, the literature argues that with *T* being large, each country's regression can be estimated separately. But for efficiency, the PMG approach was developed to account for shortcomings that may be inherent with large N and T panel data. Hence, the PMG relies on a combination of pooling and averaging of coefficients, characterized 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. This accounts for the error-correcting speed of adjustment making it suitable in estimating nonstationary panels. Also, PMG is an intermediate estimator that allows the intercept, short run coefficients, and error variances to differ across the groups but constrains the long run coefficients to be equal across groups (as would the fixed effect estimator).

vector, ω_i, a measure of long-run relationships among the variables.

4.4 Data Sources

Trade data was sourced from *World Integrated Trade Solution*, based on UN COMTRADE and World Trade Organization (WTO) utilizing 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 were sourced from World Development Indicators (WDI, 2015), while FDI were extracted from Organization of Economic Corporation and Development (OECD) statistical database and WDI (2015), measured in million US dollars.

5 Empirical Analysis

5.2 Description of Variables

The descriptive analysis presented in Table 6 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-country 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) shows that the variables, except the share of inter-industry, exhibit high variability across panels.

Table 6: 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: Author's own computations

Note: ccbc, intra_s, inter_s and ttrade implies cross-country business cycles, intra-industry trade share, inter-industry trades share and total trade flows, respectively.

5.3 Pre-estimation Diagnostics

The panel unit root tests (in Table A2) indicate that all variables are stationary at level, except total trade which is I(1). 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. Further, correlation between a pair of variables used in the estimations indicated in Table A3 shows 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.

5.4 Effect of Trade and Investment Flows on Cross-Country Business Cycles

To test for the adequacy of the estimated models, the study compared the log likelihood of the restricted and unrestricted model. Given the results presented in Table 7, the log likelihood chi-square test statistic in the aggregate model can be calculated as -2 [(last iteration log likelihood) - (0 iteration log likelihood)]. Log likelihood chi-square statistic values suggest that unrestricted model with parameters, as estimated, fits well. Hence, the joint hypothesis of non-exogeneity of the regressors and non-stability of the regression parameters is rejected. Besides, the intercept terms are insignificant in all estimations-an indication that problem of variables omission is minimized.

The results in Table 7 reveal that foreign trade and FDI have significant positive impact on the transmission of cross-country business cycles in the long run. While cross-country 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. This result implies that ECOWAS is susceptible to business cycles of its major trading partners. Hence, trade and investment integration with the major trading partners could be ECOWAS development strategy. However, these channels also create potential instability problems. Relating to FDI, the positive impact of FDI on the business cycles transmission implies that FDI inflows in ECOWAS replicate investing partners'

productive structure. The results also indicate insignificant positive effect of inter-industry trade flows on cross-country business cycles. This supports the theoretical argument that inter-industry trade flows diverges cross-country business cycles. Overall, the findings of the study support the theoretical position regarding the impact of intra-industry trade and investment integration on business cycles co-movement across countries.

Table 7: PMG Estimates of Cross-Country 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: Author's own computations

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.

Further, there are variations across the sampled trading partners. Total trade, intra-industry and FDI with EU synchronizes cross-country 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 where total trade has inelastic positive impact on cross-country business cycles. This implies that trade with China is dominated with inter-industry trade, while the FDI inflows does not replicate China's production structure. Hence, ECOWAS trade and investment ties with China do not generate potential for business cycles spill-overs in the long run. This implies that ECOWAS is not vulnerable to China's business cycles but there is weak evidence that ECOWAS will benefit from positive business cycles spill-over from China. In sum, only intra-trade trade and investment flows with EU and intra-industry trade flows with USA show evidence of business cycles transmission in ECOWAS. These outcomes are in line with the findings of previous studies such as Frankel and Rose (1998), Otto et al. (2001), Imbs (2006), Rana (2007), Lee (2010) and Rana et al. (2012). However, this study's findings contradict that of Canova and Dellas (1991) which found that business cycle synchronization is not determined by trade.

Finally, the speed of adjustment coefficients across estimations is of less concern because the estimated cross-country 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 long run. In the case of positive significant coefficients of error correction mechanism, it implies that 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.

6. Concluding Remarks and Recommendations

6.1 Concluding Remarks

This study investigated the impact of foreign trade and international financial flows on economic stability of ECOWAS. This objective is accomplished by assessing the impact of extra-ECOWAS trade and investment flows on the transmission of business cycles between 1985 and 2014. The estimated results show that business cycles of the major trading partners (except with China) have effects on ECOWAS' business cycles through foreign trade and investment flows. While intra-industry trade flows transmit business cycles is very potent at

transmitting business cycles, there is weak evidence that inter-industry trade flows do the same.

6.2 Recommendations

Given the objective of ECOWAS to enhance regional growth and stability the outcomes of this study, 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 to benefit from positive business cycles spill-over. Meanwhile, enhancing intra-industry trade is very germane but it in turn requires adequate participation in GVCs which can be achieved by intensifying efforts at industrializing, upgrading domestic technology and investing in critical infrastructure. However, foreign trade and investment policies must be carefully implemented without jeopardizing regional stability since undesired business cycles could also be transmitted. One way of going about this is to diversify export base and increase domestic investment to compliment foreign investment. This becomes necessary because absolute reliance on foreign investment in sectors critical to business cycles and trading with few trading partners may have adverse effect on the regional stability in a situation of business cycles crises of the major trading partners. Finally, ECOWAS needs to keep abreast of the economic policies of major trading partners. This is necessary to make timely policy moves that insulate ECOWAS from the undesired spill-over effect of such foreign policies.

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Appendix

Table A1: 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

Table A1: Five Leading Traded Goods of the Selected Members of ECOWAS (4-Digit HS), 2014

Member States	S/N	Exports	Imports
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 A2: 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 A3: 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 A4: 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