

Olowofeso, Olorunsola E. et al.

Research Report

Vulnerability of WAMZ member countries to external shocks: Implications on the convergence process

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**VULNERABILITY OF WAMZ MEMBER COUNTRIES TO
EXTERNAL SHOCKS: IMPLICATIONS ON THE
CONVERGENCE PROCESS**

WAMI OCCASSIONAL PAPER SERIES NO. 27

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Abstract

The economic integration process requires appropriate understanding of the degree of vulnerability of member states to various kinds of shocks as well as identification of appropriate measures to mitigate the impact of these shocks on macroeconomic performance. Consequently, this study seeks to measure the degree of vulnerability of WAMZ member countries to external shocks by computing economic vulnerability indices (EVI) for each member state and the zone as a whole, utilizing data spanning over the period 2004 – 2019. The study adopted a modified version of Briguglio (2014) methods to compute the EVI for the WAMZ countries by utilizing three of the four components – trade openness, exports concentration, and dependence on strategy imports. The EVI3 was chosen as the preferred index for its robustness, as it uses statistical methodology in generating the component weights. The computed EVI values and the component indices ranged between 0 and 1, with a high score in the index corresponding to a high level of vulnerability and vice-versa. Results from the empirical analysis show that Liberia is the most open economy, followed by Ghana and Guinea, while Nigeria and The Gambia are the least open. On the other hand, export concentration is highest in Nigeria, followed by Liberia and Sierra Leone, and lowest in The Gambia, while dependence on strategic imports is highest in The Gambia and lowest in Ghana and Nigeria. The average EVI for the Zone is 0.57 point, implying that the Zone, as a whole, is vulnerable to external shocks (particularly to commodity prices such as iron ore, bauxite, gold, etc.) Specifically, Liberia, Ghana and Sierra Leone were found to be most vulnerable in the Zone, while The Gambia showed the least vulnerability to external shocks. Macroeconomic vulnerability could be mitigated in the WAMZ economies by implementing a number of measures aimed at building economic such as ensuring macroeconomic stability with a healthy fiscal position and diversifying their output and export base; promote savings and create stabilization funds both of which could come handy in periods of commodity price falls. They could also explore using market-based instruments such as forwards, futures, and options to manage commodity price risks.

Keywords: *Commodity dependence, external shocks, vulnerability index, macroeconomic convergence*

JEL Classification: *C38, C43, O13*

1.0 INTRODUCTION

Economies of the WAMZ have recorded mixed progress in recent years with average growth of real GDP of 1.7 percent between 2015-2019, compared to 7.2 percent between 2010 and 2013, and 6.0 percent during the period 2005 to 2009. However, apart from being mostly low-income countries, these economies are characterized by other features, which render them highly vulnerable to external shocks. The inherent features of these countries include export concentration on few commodities, dependence on strategic imports, reliance on foreign sources of finance and prevalence of civil and political instability, among others. These features significantly weigh down economic progress of the individual countries and the zone at large.

Generally, vulnerability increases the risks to economic growth and stability, particularly by restraining investment and exports. Economic instability engendered by the vulnerability of an economy could trigger precautionary savings as economic agents highly become risk averse with severe impact on private investment. In another dimension, being small economies limit their abilities to withstand trade-related shocks. Moreover, it has equally been established that the impact of government fiscal position on economic activities is high in small countries, such that shocks to government revenues could have

adverse effects on growth trajectories (Obadan and Adegboye, 2013). Among other adverse effects, vulnerability of these economies constitutes a drawback to the attainment of macroeconomic convergence criteria in the Zone.

Issues revolving around economic vulnerability particularly on developing economies have elicited huge research interest. However, not much has been done on determining the extent of vulnerability of these economies to external shocks, and this study will contribute to filling this gap. Among other reasons, a study that examines the implication of vulnerability of WAMZ Member States for the prospect of a monetary union is not only appropriate at the initial phase of the convergence process, but it should also be taken as a continuous exercise with a view to flagging threats, which could inform timely and robust measures to address the challenges. Therefore, the relevance of this study is underscored by the fact that the global environment is becoming more integrated due to increasing trade and financial linkages, such that contagion and spillovers have become a common occurrence. This, in essence, requires that countries build safeguards to increase resilience and insulate themselves against adverse shocks. Not surprisingly, addressing vulnerability issues has become an integral part of economic and monetary

integration processes. This study is an updated version of the previous studies on determining vulnerability to external shocks in the WAMZ, with an extended scope of the data to 2019, in view of various global economic developments after the initial study. The new indices reflect current economic realities and the impact of emerging issues in the global economy.

The objective of the study is to assess the degree of vulnerability of Member States of the WAMZ to exogenous shocks, by computing economic vulnerability indices. The study also aims to examine the implications of Member States' vulnerability to external shocks on the macroeconomic convergence process.

It has been argued that an adverse outcome of vulnerability like volatile growth is damaging because the downswings are not automatically compensated for by episodes of equal upswings, given that the harmful effects of negative growth are not cancelled by an equally positive growth rate based on neo-classical theory of diminishing factor inputs (Cordina 2004). Following the same line of argument, Briguglio (2014) stresses that downside shocks in the real world could lead to decline in real GDP of poor countries and are difficult to recover from, even when they are accompanied by positive growth rates. Beside the well-entrenched adverse consequences, economic downturns associated with vulnerability could spark off sub-optimal policy choices by

policy makers. For instance, in response to strains on the macroeconomic environment due to vulnerability, policy makers particularly in developing and emerging economies usually embark on excessive level of borrowing, pro-cyclical fiscal and monetary policies, maintain an overvalued exchange rate system, repressive capital market and financial market, and trade liberalization.

Regional economic communities (REC) generally impose convergence criteria to guide the economic policies of Member States, and the States are required to adopt sound macroeconomic policies and to commit to low inflation and prudent fiscal policies. The rationale for imposing convergence criteria on all Member States of a REC is to avoid the distortionary negative economic effects that may arise from Member States pursuing variant and inconsistent policies (UNECA, 2008). Studies have shown that African countries experience enormous difficulties in meeting the desired macroeconomic convergence criteria set by regional economic communities, as most countries struggle to achieve the desired single digit inflation targets. In addition, most countries were not able to achieve the desired fiscal targets due to negative external shocks, large budget deficits, lack of reliable statistics and poor growth performance. Thus, the pernicious effects of vulnerability in these economies not only constrain

sustainable growth and development, but also act as considerable drag on an enduring economic and monetary integration among member countries. This is largely due to the fact that the underlying vulnerability has great potential to amplify the impact of exogenous shocks and thereby weaken key macroeconomic fundamentals which, ultimately, would have severe consequences on the attainment of convergence criteria in a monetary union.

The remainder of the paper is organized as follows: following the introduction in section one, section two examines the economic performance of the WAMZ countries, while section three reviews relevant literature and theoretical issues. Section four dwells on the methodological framework and data sources. Section five presents analysis of empirical results and draws policy implications emanating from the findings. Section six concludes and makes recommendations.

2.0 ECONOMIC PERFORMANCE OF THE WAMZ MEMBER COUNTRIES AND THE CONVERGENCE PROCESS

2.1 Recent Commodity Price

Development

External shocks from the global markets continue to impact the economic performance of the WAMZ member states due to their reliance on the export of primary commodities, such as agricultural raw materials, and other natural resources. For instance, commodity prices have been unstable over the recent years, which influenced shifts in supply as against subdued demand. In fact, rising global macroeconomic uncertainties led to volatile commodity prices. The global market witnessed a nosedive in the price of crude oil, gold and diamond, which are some of the major exported commodities of the WAMZ countries. Between 2013 and 2019, Crude oil, which is the primary export of Nigeria,

witnessed a 4.1 percent slump in the price level; gold, the primary export for Ghana, Liberia and Guinea, witnessed a 3.4 percent decrease in price; while the price of rubber and iron ore, which constitute major exports for Liberia and Sierra Leone declined by 8.1 percent and 0.8 percent during the period 2013-2019. in the same vein, prices of groundnut and logs, also major exports by The Gambia, dropped by 1.8 percent and 3.5 percent, respectively (Table 1). The drop during the commodities prices shocks (2014-2016) was significantly marked for most of the exports from the zone: crude oil (-23.5 percent), Iron ore (-21.9 percent), rubber (-15.0 percent), groundnut (-15.4 percent), and gold (-3.7 percent).

These price shocks negatively affected the WAMZ member states, which destabilized the foreign exchange

earnings, slumped foreign reserves, and weakened fiscal performance of

some member countries of the Zone (WAMI, 2017).

Table 1: WAMZ Selected Primary Export Commodities

Main Commodities	2012	2013	2014	2015	2016	2017	2018	2019
Crude Oil (US\$/bbl)	105.01	104.07	96.25	50.77	42.81	52.8	68.35	61.41
Iron ore (US\$/mt)	128.53	135.36	96.84	55.21	58.42	71.76	69.75	93.85
Cocoa Beans (US\$/mt)	2,377.07	2,439.09	3,067.77	3,135.17	2,891.26	2,029.34	2,293.74	2,340.82
Rubber (cts/lb)	153.19	126.76	88.75	70.73	74.48	90.79	70.41	74.48
Groundnuts (US\$/mt)	1,688.20	2,318.16	2,148.26	1,746.21	1,392.86	1,486.68	1,319.87	1,331.24
Logs (US\$/m ³)	360.51	305.34	282.04	246.14	274.38	265.43	269.7	273.1
Diamond	94.2	183.6	172.9	112.1	217.3	218.3	215.45	213.25
Gold (\$/oz)	1,668.80	1,411.10	1,266.20	1,160.10	1,248.99	1,257.56	1,392.50	1,265.93

Source: Index Mundi, World Bank, and IMF

2.2 The Convergence Criteria

As a prerequisite to the launch of the WAMZ, Member States are required to satisfy the following four primary criteria: single-digit inflation, fiscal deficit (including grants) of not more than 3.0 percent of GDP, central bank financing of fiscal deficit of not more than 10 percent of previous year's tax revenue, and gross external reserves of not less than 3.0 months of import cover. The two secondary criteria required were public debt to GDP ratio of not more than 70 percent exchange rate and variation of not more than 10 percent per annum.

An examination of the performance of WAMZ countries on the primary convergence criteria¹ in the period 2010 – 2019 revealed that three (3) countries (The Gambia, Guinea, and Nigeria) have been the best performers among WAMZ countries as they met three (3) criteria, on average, between 2010 and 2019. The remaining three (3) countries, i.e., Ghana, Liberia, and Sierra Leone, generally met two (2) criteria, on average (Table 2).

Overall, inflation remained the most missed criterion by countries, followed by fiscal deficit during the period under

¹ We considered performance for the whole year, and not for half-year period (June).

review. During the post-Ebola and Commodity prices shocks of (2015-2019), only two (2) countries (The Gambia and Guinea) recorded single digit inflation, on average, as required by the convergence criteria. Consequently, the rate of inflation for most countries in the Zone for the entire period, was double digit, except for the period 2013-2014, thus, above the convergence criteria threshold. Countries missed the criterion on inflation due to among other factors exchange rate depreciation, increased fiscal deficits and its subsequent financing and disruptions in domestic food supplies.

The fiscal deficit criterion, on the other hand, worsened and was above the threshold during the period 2010-2013, and significantly improved in the following years (2014-2019) at zonal level remaining below the threshold. The Gambia, Ghana and Sierra Leone were the least performers over recent years (2015-2019) as they recorded 5.0 percent, 4.9 percent, and 5.9 percent, on average, respectively, as compared to an average of 0.4 percent, 1.0 percent, and 0.4 percent for Guinea, Liberia, and Nigeria, respectively, during the same period.

The criterion on central bank financing was the most met by member countries during the period prior to Ebola outbreak and commodity price shocks as all member countries on average satisfied it at a level below the convergence threshold of 10.0 percent.

However, only three (3) countries (The Gambia, Ghana, and Guinea) were able to sustain the criteria, as the remaining three (Liberia, Nigeria, and Sierra Leone) slipped the required criteria by 27.8 percentage point, 16.4 percentage point, and 4.0 percentage point, on average, respectively over the period (2015-2019). Consequently, aggregate deficit financing by the central banks for the Zone stood at 12.9 percent, on average.

Finally, member States central banks are required to have a buffer of gross official reserves that can cover at least three (3) months of their imports. All member states, except Liberia, performed relatively well on this criterion during the period. In effect, from 2010 to 2019, Liberia met the criteria only twice between (2010-2011) while Ghana and Nigeria met it during the whole period, and Sierra Leone missed it only once (2011). Finally, Guinea missed it between 2015-2018, while The Gambia slipped the criteria three times in (2015, 2016, and 2018). Overall, the zone's best performance was on this criterion as the WAMZ average reserve level stood at 7.1 months of its imports cover, during the period under review.

Table 2: Number of Primary Criteria met by Country and by Year (2010-2019)

Number of Primary Criteria(um) met by Country and by Year										
	2010 Dec	2011 Dec	2012 Dec	2013 Dec	2014 Dec	2015 Dec	2016 Dec	2017 Dec	2018 Dec	2019 Dec
Gambia	4	3	3	2	2	1	1	3	2	4
Ghana	4	3	4	3	1	2	1	2	2	3
Guinea	0	3	2	3	4	2	3	3	2	4
Liberia	4	3	3	3	3	3	2	1	1	1
Nigeria	2	3	3	4	4	4	2	3	2	2
Sierra Leone	1	1	2	4	3	2	1	1	1	2

Source: WAMI (2020)

Note: The total number of primary criteria is 4. Thus, a score of 4 means that the country satisfied 100.0% of primary criteria that year.

On the secondary convergence criteria, three countries, three (3) countries (Guinea, Nigeria, and Sierra Leone) met the two criteria on public debt to GDP ratio and exchange rate variation, while the remaining three (3) namely the Gambia, Ghana, and Liberia met one (1), on average, during the period 2010-2019.

Public debt to GDP ratio of equal or less than 70.0 percent was satisfied generally by most member countries, except The Gambia and Ghana which recorded an average of 97.7 percent and 66.9 percent during 2010-2019.

The rest of member countries stood at less than 55.0 percent, on average, public debt to GDP, which gives them more space vis a vis the threshold of 70.0 percent.

Finally, exchange rate variation criterion of 10.0 percent or less was generally conformed by all member countries during the period. However, two (2) countries (Liberia and Sierra Leone) deteriorated over recent years (2015-2019) recording 14.0 percent and 10.3 percent depreciation, on average, respectively, during that period.

Table 3: Number of Secondary Criteria met by Country and by Year (2010-2019)

Number of Secondary criteria met by Country and by Year										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gambia	2	2	1	0	1	0	1	1	1	1
Ghana	2	2	1	1	1	0	2	2	2	2
Guinea	0	0	2	2	2	2	1	2	2	2
Liberia	2	2	2	1	2	2	1	1	1	1
Nigeria	2	1	1	1	2	1	1	2	2	2
Sierra Leone	2	2	2	2	1	1	1	2	1	1

Source: WAMI (2020)

Note: The total number of secondary criteria is 2. Thus, a score of 2 means that the country satisfied 100.0% of secondary criteria that year

2.3 Macroeconomic

Performance of WAMZ Countries

Despite the setbacks suffered by WAMZ countries due to the 2014 global commodity price shocks and the outbreak of the Ebola Virus Disease (EVD) in the region, significant progress has been recorded over the years in macroeconomic performance. However, some of the gains were eroded, as the WAMZ economies experienced fluctuations in economic activities, which caused derailment on the convergence process. In the last three years, however, (2017-2019), most WAMZ countries witnessed improved macroeconomic performance, as only one (1) country recorded negative growth during that period.

The Gambia

The Gambia is the least endowed with natural resources among the WAMZ member countries. Its economy is characterized by traditional subsistence agriculture, a historic reliance on peanuts or groundnuts for export

earnings, a re-export trade built around its ocean port and a vibrant tourism industry. Growth in the agricultural sector has been volatile over the years, due to inadequate rainfall and rudimentary farming practices, leaving large portions of arable land untapped. That notwithstanding, in recent years, there have been noteworthy improvements in Macroeconomic indicators point towards uptick in private investment as well as public sector infrastructure development. Improved political environment has led to revival of business confidence. The Gambia grew by 7.0 percent and 6.2 percent in 2018 and 2019, respectively. The main drivers of growth in The Gambia for the past three years were ascribed to increased activities in the services sector, including construction, tourism, telecommunication, and distributive trade. The tourism sector is now the main source of foreign exchange earnings for the country.

Gross external reserves declined slightly to only cover 3.1 months of import in 2018 from 3.2 in 2017 but improved to 4.3 months in 2019.

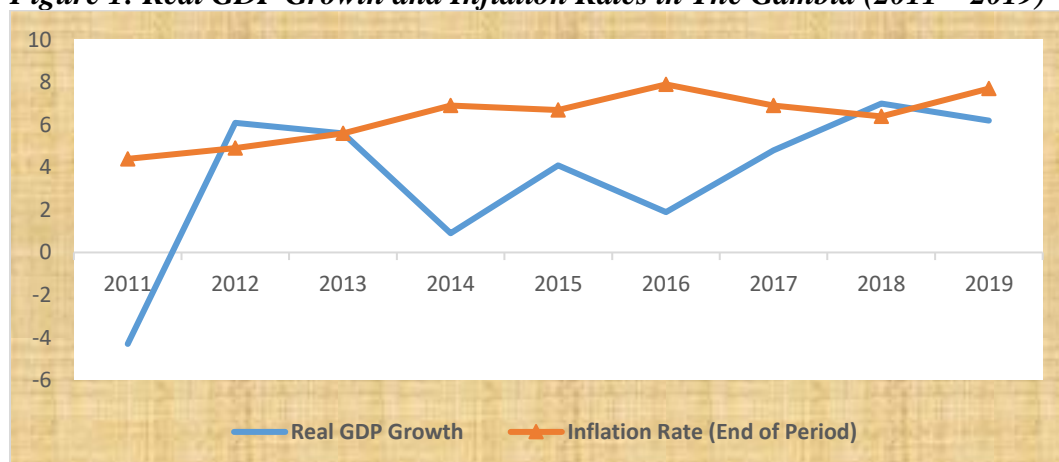
Table 4: Selected Macroeconomic Indicators for The Gambia (2011 – 2019)

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real GDP Growth	-4.3	6.1	5.6	0.9	4.1	1.9	4.8	7.0	6.2
Inflation Rate (End of Period)	4.4	4.9	5.6	6.9	6.7	7.9	6.9	6.4	7.7
Fiscal Deficit (% of GDP)	-4.2	-4.6	-8.7	-9.1	-4.3	-6.4	-5.2	-3.8	-2.9
Central Bank Financing (% of previous year tax revenue)	0.0	0.0	48.3	33.3	41.5	33.1	-24.5	6.9	-13.1
Gross External Reserves (Months of import cover)	6.1	4.8	4.6	3.7	2.5	2.4	3.2	3.1	4.3
Exchange Rate Variations (%)	-2.2	8.7	18.3	31.6	-12.6	10.8	8.7	3.8	3.2
Public Debt (% of GDP)	67.4	75.5	85.6	93.8	101.4	114.9	81.0	84.1	80.9

Source: WAMI (2020)

Enhanced fiscal management and financial intermediation has led to substantial improvements in Fiscal deficit to GDP. The overall fiscal deficit as a percent of GDP improved to 2.9 percent in 2019 from 3.8 percent in 2018, below the WAMZ threshold for the first time in five years. In addition, Government deficit financed by the central bank as a percentage of previous year's revenue improved in

2019 to negative 13.1 percent from 6.9 percent in the previous period. The Gambia contained and moderated inflation over the years due to relative stability in the exchange rate coupled with moderate global food prices as well as improved monetary policy management. End of period inflation for 2018 and 2019 were recorded at 6.4 percent and 7.7 percent, respectively.

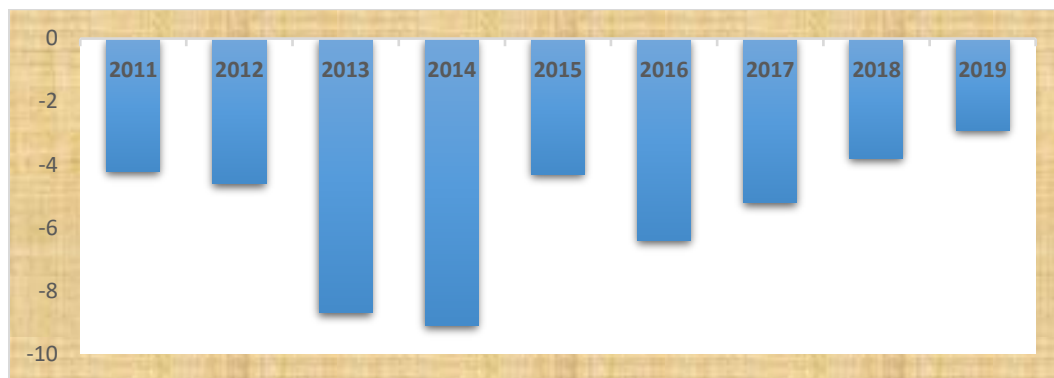
Figure 1: Real GDP Growth and Inflation Rates in The Gambia (2011 – 2019)

Source: WAMI (2020)

On the downside, the criterion of public debt to GDP in the WAMZ remained above the prescribed threshold of $\leq 70\%$, despite the rebasing of GDP a few years ago.

Conclusively, The Gambia's economic performance in recent years was robust indicating that the country attained all four (4) primary convergence criteria in 2019, but slipping on the public debt to GDP criterion.

Figure 2: Government Fiscal Balance (% of GDP) in The Gambia (2011–2019)



Source: WAMI (2020)

Ghana

Ghana has a diverse and rich resource base which includes gold, crude oil, cocoa, timber, diamond, bauxite, and manganese. It is the world's second largest producer of cocoa and has commercial quantities of offshore oil reserves. Ghana's economy has traditionally been dependent on the export of cocoa and minerals, especially gold. Ghana joined the league of crude oil exporters in 2011, with crude exports accounting for an average of about 21.8 percent of its total exports for the review period 2011 to 2019. During the period, the economy witnessed its highest growth of 15.0 percent in 2011. Growth

however, decelerated in the subsequent years the lowest being 3.5 percent in 2016 but later rebounded in 2017 recording 8.1 percent growth supported by improvements in macroeconomic imbalances, a rebound in commodity prices, favourable global financing conditions, and rising household demand due to slowing inflation.

Table 5: Selected Macroeconomic Indicators for Ghana (2011 – 2019)

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real GDP Growth	15.0	8.8	7.6	4.0	3.8	3.5	8.1	6.3	6.5
Inflation Rate (end Period)	8.6	8.8	13.5	17.0	17.7	15.4	11.8	9.4	7.9
Fiscal Deficit (% of GDP)	-0.9	-5.7	-7.6	-6.4	-4.7	-10.4	-4.1	-3.5	-4.8
Central Bank Financing (% of previous year tax revenue)	28.3	9.4	9.2	10.9	0.0	10.0	0.0	0.0	0.0
Gross External Reserves (Months of import cover)	3.2	3.4	3.6	4.2	3.6	4.2	4.3	3.6	4.0
Exchange Rate Variations (%)	5.0	17.5	14.6	31.3	15.7	9.2	4.9	8.4	12.9
Public Debt (% of GDP)	39.3	46.7	55.2	64.5	70.8	72.8	55.4	57.6	63.0

Source: WAMI (2020)

In addition, the country has faced rising inflationary pressures with consumer prices consistently rising above the WAMZ single digit criterion threshold since 2013. The end period inflation rate recorded a record high of 17.7 at year-end 2015. It however, declined in the subsequent year recording 15.4 percent in 2016. The downward trend continued to stand at 7.9 percent² at end-December 2019. This was mainly due to the fall in food and non-food inflation amid a favourable seasonal impact on cost of food during the year. The country has witnessed large fiscal deficits occasioned by revenue shortfalls and large expenditure overruns. The fiscal deficit as a

percentage of GDP was 7.6 percent in 2013 but increased to 10.4 percent in 2016. The fiscal slippages led to significant increases in public debt, reaching 70.8 percent of GDP in 2015, slightly above the convergence threshold. It increased further to 72.8 percent of GDP in 2016. This situation, however, changed in 2017 as the overall fiscal deficit (on commitment basis including grants), stood at 3.5 and 4.8 percent of GDP in 2018 and 2019, respectively.

This development also contributed to reducing the public debt portfolio down to 55.4 in 2017 and 63.0 percent in 2019 in line with the convergence threshold.

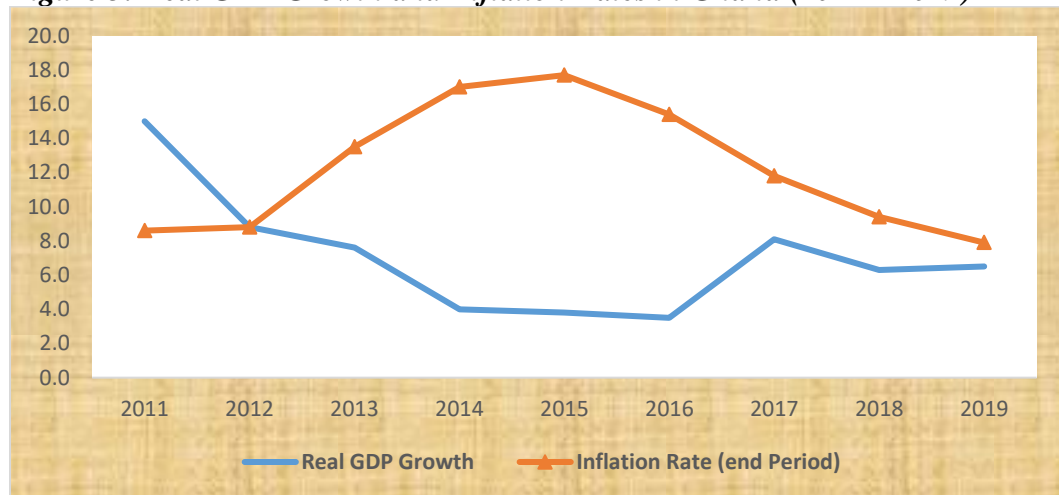
² In 2019, the Consumer Price Index (CPI) basket was reviewed, expanded and rebased to 2018. Publication of inflation estimates based

on the new CPI basket (COICOP 13 Functions) commenced in August 2019.

The external reserve level was continuously above the 3.0 months of imports threshold set by the WAMZ, increasing to 4.0 months of imports cover, from 3.6 months in 2018, despite increased pressure on the exchange rate in 2019. This is reflective of price hikes of major export commodities which

helped to increase government revenue. The cedi depreciated by 12.9 percent in 2019, compared to 8.4 percent in 2018, and 4.9 percent in 2017. The exchange rate variation was maintained below the ± 10 percent threshold set by WAMZ between 2016 and 2018 but not met in 2019.

Figure 3: Real GDP Growth and Inflation Rates in Ghana (2011 – 2019)

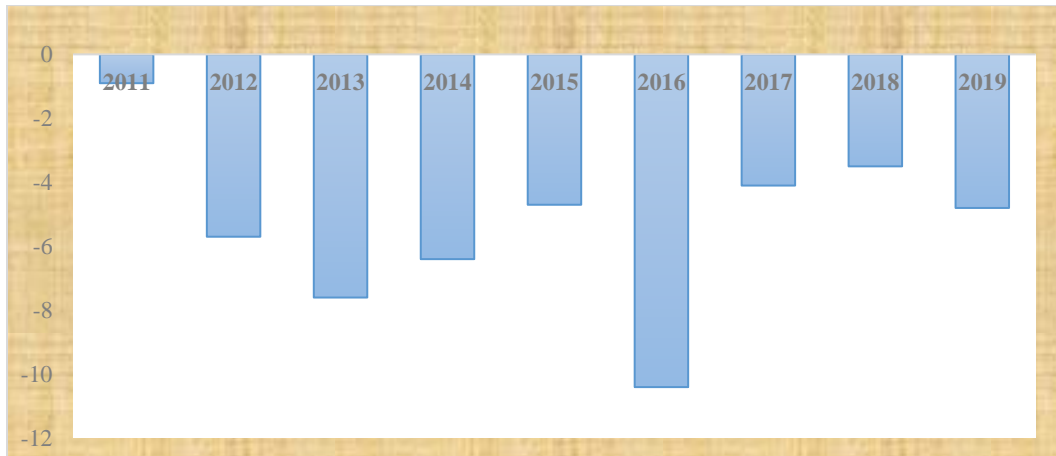


Source: WAMI (2020)

Overall Ghana improved from achieving only one primary convergence criterion in 2014, to two in 2015 and 2016, respectively to three in the subsequent years. Since 2018, Ghana has consistently met the primary criteria by satisfying three out of the four primary criteria. The country satisfied the criteria on inflation,

central bank financing of the budget deficit and GIR in months of imports. The country failed to meet the fiscal deficit criterion as well as the long-term inflation target of not more than 5.0 percent, which came into effect in 2019.

Figure 4: Government Fiscal Balance (% of GDP) in Ghana (2011 – 2019)



Source: WAMI (2020)

Guinea

Guinea accounts for about a quarter of the world's bauxite reserves. It also has significant diamond, gold, and iron ore deposits, as well as large arable land. Guinea. Like other countries of the zone, its economy relies heavily on export of primary commodities for foreign exchange earnings. Available

data indicate that the top three export products (bauxite, diamond, and gold) accounted for an average of 81.1 percent of total export earnings between 2011 and 2019. It also has considerable potential for growth in agriculture and fishing. The country experienced modest growth in some years but is now significantly emerging from the EVD scare and low commodity price shocks that ravaged its economy in 2014 and 2015.

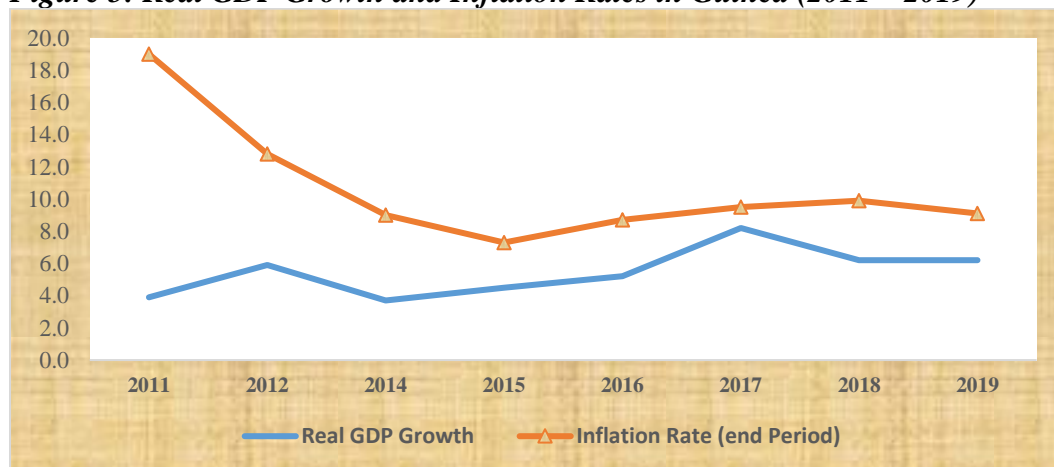
Table 6: Selected Macroeconomic Indicators for Guinea (2011 – 2019)

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real GDP Growth	3.9	5.9	3.9	3.7	4.5	5.2	8.2	6.2	6.2
Inflation Rate (end Period)	19.0	12.8	10.5	9.0	7.3	8.7	9.5	9.9	9.1
Fiscal Deficit (% of GDP)	-0.9	-0.9	-2.4	-3.2	-6.9	-0.2	-2.1	-1.2	-1.0
Central Bank Financing (% of previous year tax revenue)	-17.0	-51.8	-24.5	-12	25.0	1.9	4.8	11.7	1.7
Gross External Reserves (Months of import cover)	4.3	3.0	3.5	3.2	2.3	1.4	1.9	2.6	4.4
Exchange Rate Variations (%)	14.2	-1.7	0.5	-3.1	9.7	13.2	2.4	-0.9	-3.4
Public Debt (% of GDP)	80.0	39.5	37.5	39.9	43.9	46.6	36.5	40.2	39.3

Source: WAMI (2020)

Export receipts continued a declining trend from 2015 all through to 2017 perhaps due to fall in the prices of bauxite in the international commodity market for the country which is the main foreign exchange earner. This affected the external reserve during the period as it could only finance 2.3; 1.4,

and 1.9 months of export for the periods 2015, 2016 and 2017 and was way below the WAMZ threshold of 3.0 months of import. However, the situation began to improve in 2018 rising steadily from 2.6 to an all-time high of 4.4 months of import cover in 2019.

Figure 5: Real GDP Growth and Inflation Rates in Guinea (2011 – 2019)

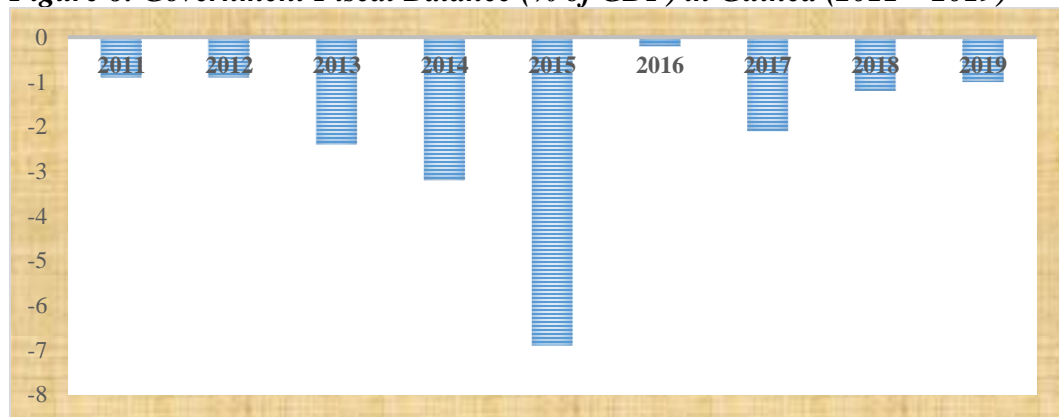
Source: WAMI (2020)

On the other hand, the fiscal position significantly improved from a deficit of 6.9 in 2015 to 0.2 percent in the following year. However, this dramatically increased to 2.1 percent in 2017 and later fell to 1.0 percent in 2019. This development was alluded to the rise in tax revenues and drop in public expenditure. During the period, inflation rate peaked at 19.0 percent at the beginning of the period and subsequently declined to 7.3 percent in 2015 perhaps due to a slight reduction in the pump prices of petroleum products. Increase in VAT rate and depreciation of the Guinea Franc saw inflation rising to 8.7 percent in 2016 and continued a single digit trend to berth at 9.9 percent in 2019. Gross public debt was on the increase over the period 2013 to 2019 and peaked at 46.6 percent in 2016. It however, remained below the WAMZ convergence threshold. The fall in external reserves appears to exact pressure on the exchange rate, partly resulting in a 13.2 percent depreciation of the Guinean Franc in 2016. It subsequently

appreciated by 0.9 and 3.4 percent in 2018 and 2019.

The vulnerabilities in 2014 and 2015 severely affected Guinea's economic performance and its attainment of the macroeconomic convergence criteria. The country attained only two of the four primary convergence criteria in 2014 and declined further to one in 2015. However, it attained three criteria in 2016, slipping on the gross reserves position due to significant increase in imports. This performance has since improved from 2016. The country meets both the primary and secondary criteria during the period 2016 – 2019. In terms of the primary criteria, the country met the inflation, fiscal deficit, central bank financing and gross external reserves. Similarly, the country satisfied the secondary criteria, including public debt to GDP ratio, and nominal exchange rate variation.

Figure 6: Government Fiscal Balance (% of GDP) in Guinea (2011 – 2019)



Source: WAMI (2020)

Liberia

Liberia is richly endowed with water, mineral resources, forests, and a climate favourable to agriculture. Its exports are dominated by primary commodities including gold, iron ore, rubber, and diamond. The country relied heavily on the mining of gold and iron ore over the past five years, which accounted for over 70 percent of Liberia's export earnings. Export earnings from gold and iron ore

constitute about 39 percent and 34 percent, respectively, of total export earnings between 2015 and 2019. Although, there has been gradual recovery in the global prices of Liberia's primary commodities, subdued performance recorded in the secondary and tertiary sectors coupled with high double-digit inflation, led to decline in economic activities. The Liberian economy contracted by 2.5 percent in 2019, from a growth rate of 1.2 percent recorded in 2018.

Table 7: Selected Macroeconomic Indicators for Liberia (2011 – 2019)

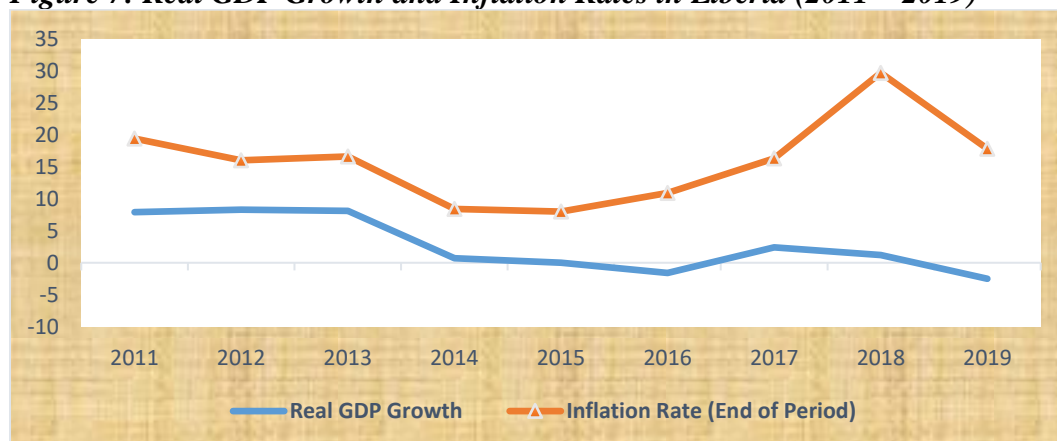
Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real GDP Growth	7.9	8.3	8.1	0.7	0.0	-1.6	2.4	1.2	-2.5
Inflation Rate (End of Period)	11.5	7.7	8.5	7.7	8.0	12.5	13.9	28.5	20.3
Fiscal Deficit (% of GDP)	-0.5	-7.5	-0.5	-0.2	1.6	2.3	-1.7	-0.3	0.9
Central Bank Financing (% of previous year tax revenue)	0.0	0.0	0.0	0.0	-11.3	3.0	61.3	43.8	32.3
Gross External Reserves (Months of import cover)	3.3	2.8	2.8	2.5	2.4	2.2	2.3	2.6	2.2
Exchange Rate Variations (%)	0.7	1.8	12.1	0.0	6.8	13.7	18.3	20.4	16.2
Public Debt (% of GDP)	32.4	34.1	30.5	37.9	32.3	37.2	42.6	33.6	42.0

Source: WAMI (2020)

Growth in the secondary sector contracted by 7.6 percent in 2019, from a positive growth of 5.7 percent recorded for 2018, reflecting the fall in beverages output. Also, activities in the tertiary sector contracted to 5.2 in 2019

from a growth of 2.2 percent growth in 2018, on account of reduction in payment for government services as well as construction, hotel and trade services.

Figure 7: Real GDP Growth and Inflation Rates in Liberia (2011 – 2019)

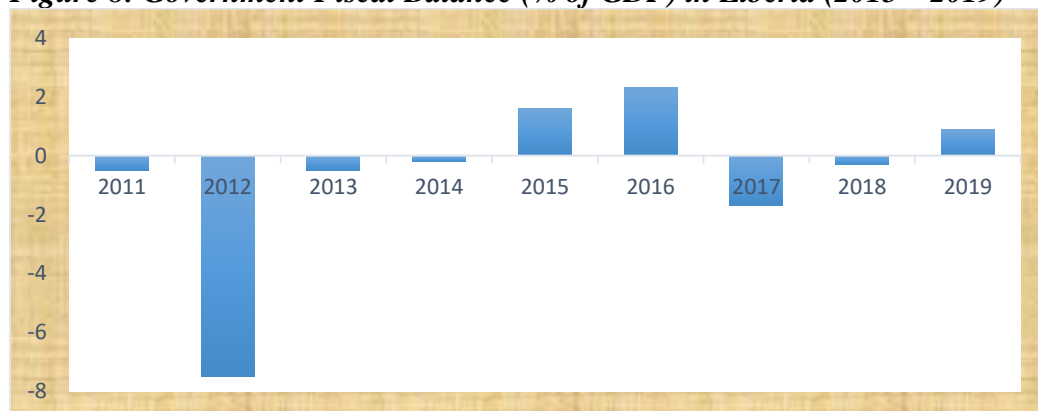


Source: WAMI (2020)

Despite declines in tax revenues and grant, as well as decreases in international trade taxes relative to their 2015 levels, austerity measures and improved revenue administration resulted into a relatively balanced fiscal

operation of 0.9 percent of GDP in 2019. Over the five-year period, gross external reserves in months of import cover remained below the threshold of ECOWAS, deteriorating to 2.2 months for 2019 from 2.6 months 2018.

Figure 8: Government Fiscal Balance (% of GDP) in Liberia (2015 – 2019)



Source: WAMI (2020)

Headline inflation rose to 28.5 percent and 20.3 percent in 2018 and 2019, respectively, from 8.0 percent in 2015. Similarly, on the same token, total

public debt rose from 33.6 percent of GDP in 2018 to 42.0 percent in 2019 on account of rise in domestic debt stemming mainly from liabilities to

financial institutions and other corporations. The level of public debt, however, remained below the WAMZ threshold of 70.0 percent of GDP.

In view of the underperformance of Liberia's economy in 2019, the country met only one primary convergence criterion (Fiscal Deficit including grant to GDP $\leq 3\%$), and one secondary convergence criterion, (Public debt to GDP ratio $\leq 70\%$).

Nigeria

Nigeria has about 37.2 billion barrels of proven crude oil reserves, ranking the country as the largest oil producer in Africa. In addition, it has about 197 trillion cubic feet of proven natural gas reserves. Oil and gas are crucial to

Nigeria's economic and social performance. For example, Oil alone accounted for 40 percent of the country's GDP, 70 percent of budget revenues, and 95 percent of foreign exchange earnings in 2019. Consequently, the economy is susceptible to oil price shocks perhaps this explains why the economy slipped into recession in 2016 when oil prices slumped.

The economy however, recovered and came out of recession in the following year recording a modest growth of 0.8 percent. It continued to expand in 2018 and 2019, though marginally. The Real Gross Domestic Product (RGDP) grew by 1.9 percent in 2018 and 2.3 percent 2019 and was attributed to the positive performance of both the oil and non-oil sectors.

Table 8: Selected Macroeconomic Indicators for Nigeria (2011 – 2019)

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real GDP Growth	7.4	6.7	5.5	6.2	2.8	-1.5	0.8	1.9	2.3
Inflation Rate (end Period)	10.3	12.0	8.0	8.0	9.6	18.6	15.4	11.4	12.0
Fiscal Deficit (% of GDP)	-1.1	-1.4	-1.4	0.9	-1.6	-2.2	-1.0	-0.8	-0.3
Central Bank Financing (% of previous year tax revenue)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.7	75.5
Gross External Reserves (Months of import cover)	6.3	8.5	8.9	6.5	5.8	8.2	11.2	12.9	6.6
Exchange Rate Variations (%)	14.2	12.9	12.8	7.9	16.1	54.8	35	0.6	0.15
Public Debt (% of GDP)	17.5	19.4	10.1	11.0	10.9	16.0	18.2	15.0	15.6

Source: WAMI (2020)

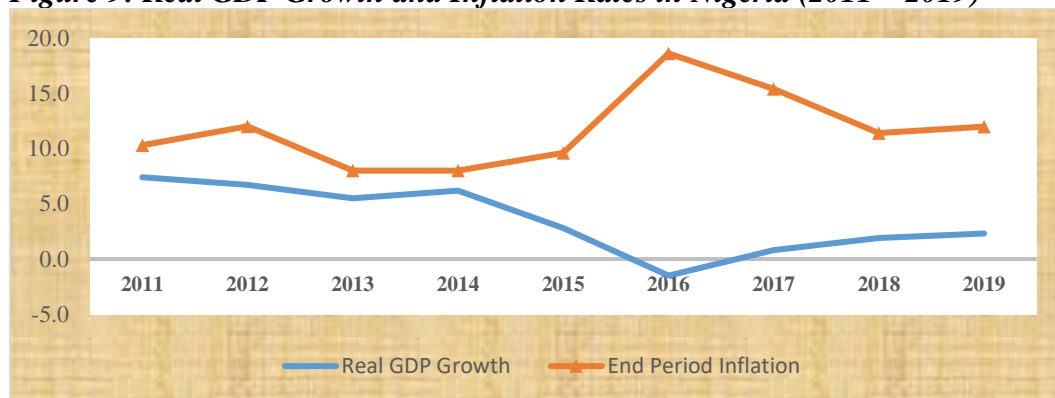
Shocks in global oil prices and disruptions in oil and gas production by insurgents in the oil-producing region

led to a gradual decline in non-tax revenues (oil revenues). As a result, the country's fiscal position deteriorated

from a surplus of 0.9 percent of GDP in 2014 to deficits of 1.6 percent and 2.2 percent of GDP in 2015 and 2016, respectively. This development was explained by shortfalls in revenue and higher expenditure that were financed through domestic and external sources, mostly from non-bank public (FGN domestic bonds – savings Bond, Sukuk

and Green Bond) and Eurobonds, respectively. Analysis, however, showed gradual improvement in the subsequent years recording narrower deficits of 1.0 percent and 0.08 in 2017 and 2018 respectively, which subsequently moderated to 0.03 percent in 2019.

Figure 9: Real GDP Growth and Inflation Rates in Nigeria (2011 – 2019)



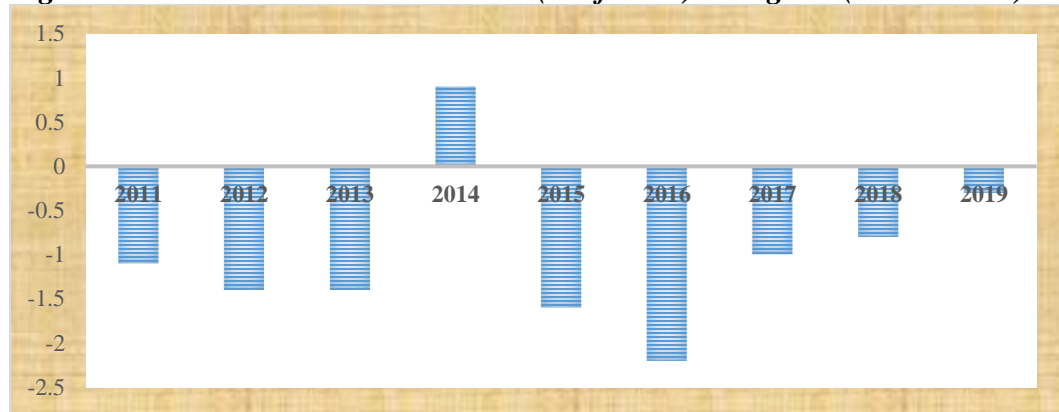
Source: WAMI (2020)

In addition, reduced export earnings led to a decline in gross external reserves relative to previous periods, as the reserves could only finance about 6.5 months and 5.8 months of imports in 2014 and 2015, respectively, from 8.9 months in 2013 but was still above the WAMZ threshold of 3.0 months of import cover. However, it increased to 8.2 months in 2016. This perhaps could partly be attributed to the significant decline in imports arising from agricultural policy on rice production and other food components. This, in turn, caused sizeable reduction in import activities of the sector. The reserve continues to grow financing 11.2 and 12.9 month of import in 2017

and 2018. The improvement in foreign exchange receipts was attributed largely to the sustained inflow of foreign exchange from the Investors' and Exports' (I & E) foreign exchange window and the exchange rate management policy measures employed by the monetary authority, has helped to curb speculative demand, improve liquidity and stability in the foreign exchange market. On the other hand, the sharp drop in global oil prices affected inflow to the reserve coupled with the CBN intervention to stabilize the domestic currency. Consequently, the domestic currency significantly depreciated by 16.1 percent and 54.8 percent in 2015 and 2016, respectively.

It however, stabilized in 2017 and continued that path depreciating at 0.15 percent in 2019.

Figure 10: Government Fiscal Balance (% of GDP) in Nigeria (2011 – 2019)



Source: WAMI (2020)

For the period (2011- 2015), consumer price inflation averaged at 9.6 percent. This almost doubled in 2016 rising to 18. 6 percent, incidentally that is the year Nigeria’s economy went into recession. Various factors accounted for the astronomical rise during the period including structural factors and exchange rate pass-through effects. Since 2018, headline inflation hiked-up to 11.44 percent and 11.98 percent in 2019. This was attributable largely to seasonality effect and the impact of the continued insurgency and herdsmen related attacks in some food producing areas of the country.

On the other part, gross public debt was below 20.0 percent during the period under review. The highest stock of debt being 19.4 percent in 2017 and continued to decline and since then, remain way below the WAMZ threshold.

Even though the recent commodity price shocks had a drastic impact on Nigeria’s economic performance, the country was able to attain all the WAMZ primary and secondary convergence targets in 2014. However, it slipped on the exchange rate variation target in 2015 and 2016 respectively as well as the inflation target in 2016. Presently, Nigeria satisfies two (fiscal deficit, and gross external reserves) out of the four primary convergence criteria. The country was unable to satisfy the criteria on Central bank financing of deficit and the single digit inflation rate. In terms of the secondary criteria, the country fulfilled the two criteria on public debt to GDP and exchange rate variability.

Sierra Leone

Sierra Leone is rich in mineral resources including diamonds, rutile, bauxite, iron ore and gold. It was one of the top producers of diamond and rutile in the world. Its largest commodity exports were in diamonds and, recently, rutile. Export receipts from its top four commodity exports accounted for about 78.7 percent of its total export receipts between 2011 and 2019. Sierra Leone is essentially a

supply-constrained mono-cultural economy depending on a few commodities for output and export. A significant percentage of the population are involved in subsistence agriculture farming. Even though it achieved commendable economic growth rates in the post-war period, peaking at 20.1 percent in 2013, it faced a severe contraction in growth of 20.5 percent in 2015 following the cessation of iron ore mining.

Table 9: Selected Macroeconomic Indicators for Sierra Leone (2011 – 2019)

Indicator	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real GDP Growth	6.0	15.2	20.1	4.6	-20.5	6.3	3.8	3.5	5.1
Inflation Rate (end Period)	16.9	11.4	8.2	7.9	8.9	17.4	15.3	14.5	13.9
Fiscal Deficit (% of GDP)	-4.3	-5.1	-1.5	-3.3	-4.3	-7.5	-18.6	-5.2	-2.6
Central Bank Financing (% of previous year tax revenue)	1.1	0.0	1.7	8.1	20.1	30.6	18.9	18.8	0.8
Gross External Reserves (Months of import cover)	2.5	3.4	3.2	3.6	4.6	4.0	4.5	4.2	3.2
Exchange Rate Variations (%)	4.1	-1.0	0.5	12.0	12.2	21.6	4.5	10.2	13.6
Public Debt (% of GDP)	38.0	33.2	28.4	35.2	45.1	53.9	56.4	59.5	57.5

Source: WAMI Database

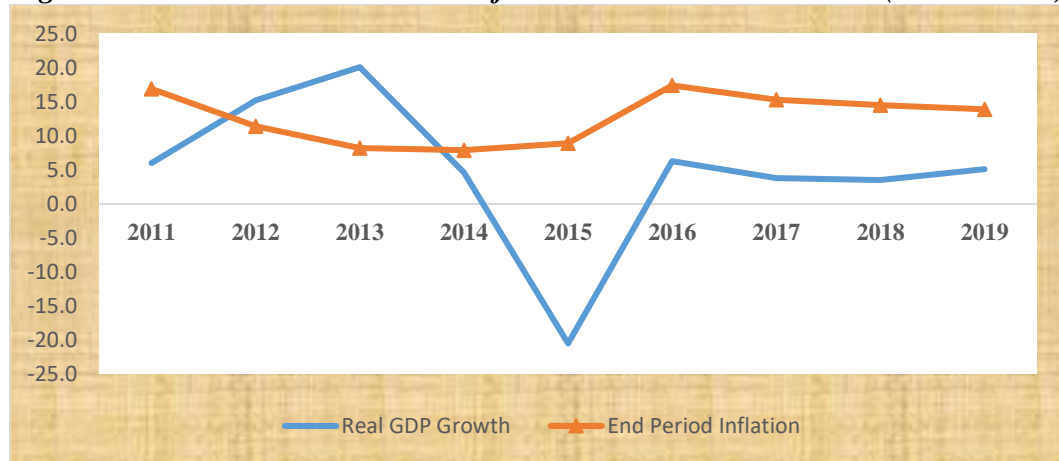
A sharp rise in iron ore exports in 2013 prompted an increase in export receipts by 56.0 percent compared to its 2012 levels. Iron ore exports constituted about 70.9 percent of the country's total export receipts that year. However, recent commodity price shocks in addition to the cessation of mining led to declines in export receipts by 20.5 percent and 57.2 percent in 2014 and 2015, respectively. Sierra Leone has achieved

commendable economic growth rates in the post-war period that peaked at 20.1% in 2013. This was attributed to the launching of the government's Agenda for Prosperity 2013-18 (A4P). The impressive growth rates were, however, disrupted by the twin-shocks of unprecedented decline in international iron-ore prices starting in late 2013; and the outbreak of Ebola Virus Disease (EVD) in 2014, together culminating in GDP contraction of 20.5

percent in 2015. The economy recovered in 2016 recording a growth rate of 6.3 percent, which continued in modest fashion driven by increased

agricultural and mining output, supply of electricity, uptick in the services and manufacturing sectors, and efficiency gains from ongoing policy reforms.

Figure 11: Real GDP Growth and Inflation Rates in Sierra Leone (2011 – 2019)

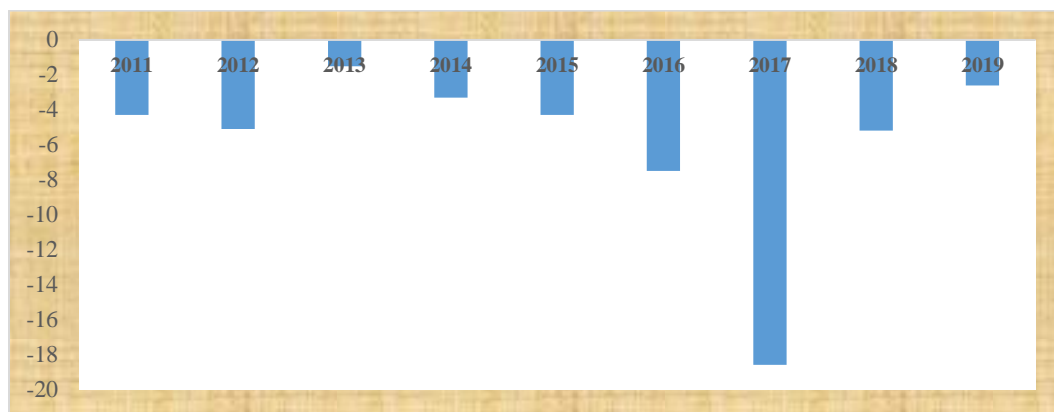


Source: WAMI (2020)

The country's fiscal position deteriorated to a deficit of 18.6 percent in 2017 from the single digit recorded from 2011. It however, moderated in the subsequent years attaining an all-time low deficit of 2.6 percent of GDP in 2019. The government's prudent fiscal consolidation efforts accentuated the improved fiscal position that led to increased collection of tax revenue and the adoption of expenditure rationalization measures. These

include the audit of public sector payroll and suspension of some capital projects. Inflation has continued a double-digit trend since 2016. This development was attributable to the continued depreciation of the Leone, the pass-through effect of exchange rate depreciation in addition to the liberalization of petroleum product prices and upward adjustments of domestic fuel pump prices as well as the electricity tariffs.

Figure 12: Government Fiscal Balance (% of GDP) in Sierra Leone (2011 – 2019)



Source: WAMZ Database

Higher fiscal deficits led to increased government borrowing from the domestic money market including the central bank. Consequently, the level of public debt rose to 57.3 on average during the period 2016-2019. However, the country's reserves stood above 3.0 months of imports cover during the period 2015-2019. The increase was largely attributable to a reduction in EVD-related imports and increased donor inflows to fund government's capital projects.

Overall, Sierra Leone's performance deteriorated over recent years as the country attained one (1) primary criterion, on average, between 2016-2019, as against two (2) primary criteria, on average, during 2011-2016.

3.0 LITERATURE REVIEW

According to Guillaumont (2009), economic vulnerability of a country can be defined by the risk that a country sees its development hampered by the shocks that it faces, be they natural or external. The study identifies two main kinds of exogenous shocks to be the main sources of vulnerability: First; natural shocks, namely, natural disasters, such as earthquakes or volcanic eruptions, and the more frequent climatic shocks, such as typhoons and hurricanes, droughts, floods, etc. Second, external (trade and exchange related) shocks, such as slumps in external demand, world commodity price instability (and correlated instability of terms of trade), etc. Briguglio (2014) sees economic vulnerability as a country's susceptibility to being harmed by external economic forces as a result of exposure to such forces.

Guillaumont (2009) identifies three main components of economic vulnerability to include: the size and frequency of exogenous shocks; the exposure to these shocks; and resilience or the capacity to react to the shocks. The first two mostly depend on the country's structural features (size, location, and structure of the economy), while resilience relies heavily on the country's current economic policy.

Cordina (2004) documents some characteristics that are most likely to

result in vulnerability to include: small economy, which constrains a country's production possibilities and ability to reap economies of scale as well as a high degree of economic openness that increases susceptibility to economic conditions in the rest of the world, lack of diversification of productive activities and dependence on exports with relatively high income and price elasticities as well as openness to vulnerable markets, and a strong dependence on imports with low price elasticities and limited import substitution possibilities, and Pace (2006) distinguishes between inherent vulnerability, which is relatively fixed, and contingent or self-inflicted vulnerability resulting from wrong policy choices and failures. Factors determining inherent vulnerabilities include location, geo-strategic importance, dependence on key imports (especially food and energy), population density, and economic specialization and diversification. Contingent vulnerabilities normally result from bad governance.

Economic vulnerability indices (EVI) have been constructed to measure economic vulnerability. The most frequent variables used in the economic vulnerability indices relate to economic openness, export concentration, dependence on imports of energy and peripherality. Other approaches attempt to measure vulnerability in terms of the variability of output and

similar indicators. For instance, Briguglio (1995) computes the economic vulnerability index, covering 114 countries comprising three components; exposure to external economic conditions measured by the ratio of imports and exports to GDP, remoteness and insularity measured by the ratio of transport and freight costs to export proceeds and disaster proneness measured by disaster damage in relation to GDP. The study utilized a Max-Min formula to standardize the variables to render the index insensitive to the scale of measurement used. The study computed the EVI utilizing two sets of weights – an equally weighted index for all the three components and assigning the following weights to the sub-indices in the second option: 50 percent to economic exposure, 40 percent to remoteness and insularity and 10 percent to the disaster proneness index. However, Briguglio (1997) modified the index by including three new variables (export concentration, dependence on strategic imports and dependence on foreign sources of finance) and excluded the variable measuring proneness to natural disasters.

The vulnerability index constructed by Briguglio (2014) is composed of four components: trade openness, export concentration, dependence on strategic imports and proneness to natural disasters. The paper measures trade openness as the average of exports and imports of goods and services as a

percentage of GDP, averaged over the period 2009 – 2011. Export concentration was measured using the sum of the three-broad group of exports of goods and services which together take the highest percentage of total exports of goods and services, expressed as a percentage of total exports of goods and services. Dependence on strategic imports was proxied by using the import of food and fuel as a percentage of total merchandise imports. The amount of damage caused by natural disasters as a percentage of GDP over the period 1980-2012 sourced from the EM-DAT database was used to measure proneness to natural disasters. The study assigns an equal weight of 25 percent to each sub-index initially and generated an alternative EVI weighting scheme by assigning different weights to sub-indices across the four other schemes, which produced different EVI indicators. The study set a threshold of 0.332 between high and low vulnerability scores.

The United Nations Committee for Development Policy (CDP) (UN, 2015) develops and includes an EVI from 2000 as one of the three broad criteria for determining whether a country should retain its LDC status in line with the mandate from the UN General Assembly and the Economic and Social Council. The CDP-EVI index consist of the shock and exposure indices. The shock index was made up of natural shock and trade shock sub-indices while the exposure index

composes of the size, location, economic structure, and environment sub-indices.

The index was composed of eight indicators, grouped into the various sub-indices, with a lower EVI indicating lower economic vulnerability. The indicators include population, remoteness, merchandise export concentration, share of agriculture, hunting, forestry and fishing, share of population in low elevated coastal zones, instability of exports of goods and services, victims of natural disasters and instability of agricultural production. The indicators are converted into index scores between 0 and 100 using the max-min procedure, and the EVI threshold for inclusion into the LDC category was set at 36 in the 2015 triennial review.

Cariolle (2011), builds on Guillaumont (2009) on the main components of vulnerability and computes the EVI as an arithmetic average of the exposure index and the shock index. The exposure index is a weighted average of population size (50 percent), remoteness from world markets (25 percent), exports concentration (12.5 percent), and the share of agriculture, forestry and fishery in GDP (12.5 percent). The shock index, however, is a weighted average of the annual mean share of homelessness due to natural disasters in the population (25 percent), instability in agricultural production (25 percent), and instability in exports of goods and services (50 percent). Cariolle and Goujon (2013) modify the

exposure index in Cariolle (2011) to include five components with the share of the population living in low elevated coastal zones (25 percent) and the weight of population size reduced to 25 percent.

EVI computations are, however, subject to some limitations. These include the subjectivity in their computation, in particular with regards to the choice of variables, the method of measurement and the averaging procedure. Cordina (2004) indicates that measurement problems arise because of the absence of data for certain variables/countries, different methods of statistical compilation across countries and errors in measurement of the variables. On the averaging procedure, there was the problem of whether to adopt a simple or a weighted average, and in the latter case, which weights are to be assigned to the different variables.

Countries across the world are susceptible to various vulnerabilities and this could emanate from either within the country or external environment. IMF (2011) indicates that Low Income Countries (LICs) are particularly vulnerable to sharp swings in commodity prices, natural disasters, and variable external financing flows—as the ensuing high output, price, and fiscal volatility imposes large growth and welfare costs. Essens (2013) analyses developing country vulnerability following the global financial crisis and proposes shock

therapy to prevent negative impact on growth and poverty reduction particularly for LIC. He shows that four actions, i.e., coping (like balance of payment and fiscal adjustment), prevention (such as export and capital portfolio diversification, countercyclical aid), self-insurance (like reserves hoarding, stabilization funds), and market insurance/hedging (such as derivatives, local currency external debt) constitute some therapy shock in dealing with external shocks. Other papers take into consideration the role of financial sector exposure and exchange rate pressure in analyzing countries' external vulnerability. They use different market segments such as banking sector, equity market and foreign exchange market (Ishrakieh, 2020; Lee et al., 2018).

Pace (2006) shows that micro-states exhibit inherent and contingent vulnerabilities, which can be addressed by policies aimed at building their resilience and by positioning themselves strategically in the international global system. He added that economic union offers micro States with more opportunities to help them overcome their vulnerabilities and strengthen their resilience. He indicates that the EU membership has led Malta to tackle its macroeconomic fundamentals, restructure its economy, strengthen internal competition through liberalization, increase efficiency through privatization, protect its citizens by tightening

environmental regulations and management, and open new avenues to its exporters of goods and services, both within the EU and beyond, thus giving incentive to diversification. In addition, Malta had to achieve some macroeconomic targets of strengthening public finances and reducing public debt in preparation for the introduction of the Euro, which not only made it comply with European Monetary Union but strengthened its resilience to external shocks.

Edwards (2006), shows that the negative effects of external crises on GDP growth tends to be more severe in currency union countries than in countries with a currency of their own and flexible exchange rates, indicating that countries that belong to a currency union had suffered a greater impact from external shocks than countries with a national currency. In addition, Didier, Hevia and Schmukler (2012) argues that even though integration tends to be associated with higher growth and other positive spillover effects, it also makes economies susceptible to foreign shocks and contagion effects. To mitigate this, emerging economies will have to keep improving their external positions, expanding their fiscal space, reducing credit mismatches, building buffers in the financial system, and gaining credibility in their monetary policy. Metzger (2008) identifies the factors that hampered trade integration in Africa to include insufficient price competitiveness, high dependence on

primary commodity exports, in particular minerals and fuels, similar production structures and an inadequate transport infrastructure.

Overall, this study contributes to the construction of economic vulnerability indices. The study constructs three EVIs for the WAMZ countries: EVI1 assigned equal weights to each

component by taking arithmetic average; EVI2 assigned higher weights to export concentration; and EVI3 or principal component analysis (PCA) partitions the variance in a set of variables and uses it to determine weights that maximize the resultant principal component variation.

4.0 METHODOLOGICAL FRAMEWORK AND DATA SOURCES

4.1 Components of the Economic Vulnerability Indices (EVI)

This study adopts a modified version of the Briguglio (2014) computation methodology to compute the EVI for the WAMZ countries by utilizing only three of the four components - trade openness, export concentration and dependence on strategic imports.

The study excludes the proneness to natural disasters from the index due to unavailability of data and the fact that WAMZ countries are less prone to natural disasters. In addition, the indices for all WAMZ countries in Briguglio (2014) were insignificant³, supporting the view that they are not prone to natural disasters.

4.1.1 Trade Openness

David Ricardo's classical theory of comparative advantage and the Heckscher–Ohlin theory assert that countries stand to benefit immensely from international trade. The theories indicated that countries should export goods which they have comparative advantage in, and import other goods, providing support for engagement in trade across countries. Cavallo and Frankel (2008), indeed, found that openness to trade makes countries less vulnerable to crises. However, it is widely acknowledged that an economy's vulnerability to exogenous economic shocks is largely determined by its degree of exposure to the global economy—that is, by its degree of trade openness (Briguglio 2009, World Bank 2010). Since economic openness is measured as the ratio of international

³ It was 0.000 for The Gambia, 0.001 for Ghana, 0.000 for Guinea, 0.029 for Liberia, 0.002 for Nigeria and 0.000 for Sierra Leone.

trade to GDP, a terms of trade shock could emanate from a shock to either imports or exports or both.

Briguglio (2014) indicates that the magnitude of a country's exposure to external economic shocks is determined by its relative dependence on international trade. Similarly, Montalbano, Federici, Triulzi and Pietrobelli (2005) and Loayza and Raddatz (2007) provide evidence that greater trade openness tends to magnify economic vulnerability. Yanikkaya (2003) also states that trade barriers are positively associated with growth. Thus, we include trade openness as one of the components of economic vulnerability. In line with the trends in the literature, we measure trade openness as the sum of exports and imports of goods and services as a ratio of GDP.

4.1.2 Export Concentration

Export concentration reflects the degree to which a country's exports are concentrated on a small number of products or a small number of trading partners. A country that exports one product to only one trading partner has a perfectly concentrated export portfolio. Conversely, a country whose exports are comprised of a larger number of products and that trades with a larger number of trading partners has a lower export concentration ratio, that is, it has more diversified exports (UNDP, 2011). The impact and likelihood of economic shocks are expected to be higher when countries

export a limited number of goods (Cariolle, 2011). Foxley (2009) asserts that more diversified economies should be less vulnerable to external shocks.

Some studies use the merchandise export concentration index compiled by UNCTAD as a proxy for export concentration (for example, Guillaumont, 2009 and Cariolle, 2011). However, this study measures export concentration as the sum of a maximum of four (4) largest export commodities by export earnings as a ratio of total merchandise exports. The commodities are groundnuts, cashew nuts fish and fisheries product exports for The Gambia; cocoa products, gold and crude oil for Ghana; bauxite, diamond and gold for Guinea; rubber, iron ore, diamonds and gold for Liberia; crude oil and natural gas for Nigeria; and diamonds, bauxite, rutile and iron ore for Sierra Leone.

4.1.3 Dependence on Strategic Imports

Strategic imports refer to essential products, which tend to be price and income inelastic meaning that demand for such products does not decline in response to price increases. Briguglio (2014) shows that countries depending heavily on imported fuel for production and on imported food for consumption were vulnerable to shocks. Earlier, UNDP (2011) also asserts that economies that are highly import dependent, especially on strategic imports, appear to be more vulnerable

to the availability and cost of such imports. As in Briguglio (2014), we measure this indicator as the value of imports of food and fuel products as a ratio of total merchandise imports.

4.2 Sources of Data

The EVI and its component indices were computed using annual data for the period 2004 to 2019. All international trade data including exports and imports of goods and services, and the value of the four highest export commodities were obtained from the respective central banks of WAMZ countries. The ratio of food imports to total merchandise imports obtained from the World Development Indicators (WDI) database were used to compute the value of food imports for The Gambia, Ghana and Nigeria.

The value of fuel imports was calculated using similar ratios from WDI for The Gambia, while the rest were sourced from their respective central banks. Nominal GDP data (in US Dollars) for The Gambia, Ghana, Liberia, and Sierra Leone were obtained from WDI, and the other two countries obtained from their central banks.

4.3 Constructing the EVI

We compute the EVI by taking an average of the three components, namely trade openness, export concentration and dependence on strategic imports. The study constructed three different EVI

indicators for each Member country and the WAMZ aggregate by assigning weights to each of the components of the EVI. It assigned equal weights to each of the components by taking an arithmetic average in EVI1.

Meanwhile, a higher weight was assigned to export concentration index for EVI2. In effect, the WAMZ countries depend heavily on exports of primary commodities, which contribute significantly to the maintenance of both internal and external balance in these economies (WAMI, 2017). For economies that are highly dependent on exports, the volatility in both export earnings and economic growth associated with economic shocks makes them extremely vulnerable. Exports constitute a significant and growing share of GDP for most developing economies (as over 66 percent of developing economies have an export share exceeding 20 percent). Thus, an increased dependence on exports results in significant fluctuations in export earnings, leading to fluctuations in growth (UNDP, 2011). Similarly, a country's exposure to external economic shocks generally depends on its reliance on exports because export earnings finance imports and contribute directly to investment and growth. Production structures primarily oriented towards export-led growth, expose countries to external shocks more than production structures reliant on domestic demand (Foxley 2009). In line with this argument, EVI2

assigned a higher weight to export concentration relative to the other components.

Finally, we employ principal component analysis (PCA) to derive the weights of each of the components in EVI3. PCA partitions the variance in a set of variables and uses it to determine weights that maximize the resultant principal component variation. The derived principal component is the variable that captures variations in data to the maximum extent possible.

Suppose a data vector comprises three variables, corresponding to the three indices namely trade openness (x_1), export concentration (x_2) and dependence on strategic imports (x_3); that is $X = (x_1, x_2, x_3)$. The principal component, Z_i , $i = 1, 2, 3$, is defined as:

$$Z_1 = \alpha'_1 X = \alpha_{11}x_1 + \alpha_{21}x_2 + \alpha_{31}x_3 \quad (1)$$

$$Z_2 = \alpha'_2 X = \alpha_{12}x_1 + \alpha_{22}x_2 + \alpha_{32}x_3 \quad (2)$$

$$Z_3 = \alpha'_3 X = \alpha_{13}x_1 + \alpha_{23}x_2 + \alpha_{33}x_3 \quad (3)$$

where the coefficient α_{ij} represent the weight for the i th variable and j th principal component, and

$$\sum_{i=1}^3 \alpha_{i1}^2 = \sum_{i=1}^3 \alpha_{i2}^2 = \sum_{i=1}^3 \alpha_{i3}^2 = 1 \quad (4)$$

(Normalization).

Let data vector X have a correlation matrix with eigenvalue-eigenvector pairs $(\lambda_1, e_1), (\lambda_2, e_2), (\lambda_3, e_3)$, where $\lambda_1 \geq \lambda_2 \geq \lambda_3$. The variance

for each principal component is given by the eigenvalue:

$$\text{Var}(Z_j) = \alpha'_j \Sigma \alpha_j = \lambda_j \quad (5).$$

PCA seeks linear combinations of the original variables with maximum variance. Thus, the eigenvector corresponding to the largest eigenvalue λ_1 determines $e_1 = (\alpha_{11}, \alpha_{21}, \alpha_{31})$, and the first principal component $Z_1 = e'_1 X$ explain the largest possible variation in the data. Similarly, the second principal component is constructed using the eigenvector corresponding to the second largest eigenvalue λ_2 , that is $Z_2 = e'_2 X$.

All principal components are orthogonal to previous components, and each captures additional but progressively smaller variations in the data. Since total data variance is three (corresponding to the number of variables) and equals the sum of eigenvalues, the proportion of total data variance accounted for by the j th principal component is $\lambda_j/4$.

Suppose that the first two principal components (Z_1 and Z_2) are sufficient to characterize the data variation. Correlation coefficients between X and Z are called loadings and are given as $\text{Corr}(x_i, Z_j) = \rho_{ij} = e_{ij}\sqrt{\lambda_j}$, (6)

$i = 1, 2, 3$, and $j = 1, 2$, where e_{ij} is the i th element of the eigenvector j . The square of loadings ρ_{ij}^2 represents the proportion of variance in variable x_i explained by the principal component Z_j . Owing to the

normalization equation above, (equation 4) the sum of squared loadings of Z_1 and Z_2 are λ_1 and λ_2 , which are the variances of Z_1 and Z_2 , respectively. Thus, we normalized the squared loadings to unity sum, that is,

$\bar{\rho}_{ij}^2 = \rho_{ij}^2 / \lambda_j$. We then construct $\theta_j = \lambda_j / (\lambda_1 + \lambda_2)$, where $j = 1$ and 2 , to measure the proportion of explained variance in the data when considering only the first two principal components. θ_1 and θ_2 would be the weights assigned to the respective principal components for aggregation.

The vulnerability indices range between 0 and 1, with index values closer to 1 regarded as highly vulnerable to external shocks and values towards 0 considered as low vulnerability. Trade openness indices for Liberia were found to be greater than 1 indicating that its total trade was

higher than its GDP. Consequently, those indices were capped at 1 to reduce the distorting effect of outliers (see Briguglio, 2014).

The analysis adopts EVI3 as the preferred index given its robustness as compared to the other two. In effects, the weights used for EVI1 and EVI2 are subjective and determined a priori. Equally, the weights for EVI3 are obtained using the PCA which constitutes a robust and standard statistical procedure and takes into account data properties.

We present the results by considering the evolution of the global and regional uncertainties, in particular the global financial crisis (GFC) in 2008-2009, and the global commodities prices shocks (GCP) and Ebola Disease Virus (EVD) (twin crises) in 2014-2016.

5.0 ANALYSIS OF THE WAMZ ECONOMIC VULNERABILITY INDICES

5.1 Index Weights

This study computed three different EVI indicators for WAMZ economies. EVI1 assigned equal weights to all components by taking an arithmetic average of the three component indices to obtain the EVI. Since WAMZ Member States rely heavily on the

export of primary commodities which are susceptible to excessive price shocks in the international market. EVI2 assign a higher weight of 50 percent to export concentration index (ECI), 30 percent and 20 percent to dependence on strategic imports index (DSI) and trade openness index (TOI), respectively.

Table 9: EVI Weighting Options

Index	Weighting Options		
	EVI1	EVI2	EVI3
Trade Openness (TOI)	0.33	0.20	0.33
Export Concentration (ECI)	0.33	0.50	0.33
Dependence on Strategic Imports (DSI)	0.33	0.30	0.35
Total	1.00	1.00	1.00

Source: Authors' computations

We apply the PCA to derive the weights for EVI3. The results are reported in Table 10. Results from the PCA indicates that the first two principal components together explain 95.4 percent of total variation in the component indices and have

eigenvalues of 1.84 and 1.03, respectively. Loadings and squared loadings of indicators for the selected principal components were found to be high. The weights obtained from the analysis were 0.33, 0.33 and 0.35 for TOI, ECI and DSI, respectively.

Table 10: Principal Component Analysis Results

Variable	Loadings		Squared Loadings		Rho bar Squared		Weights
	PC1	PC2	PC1	PC2	PC1	PC2	
TOI	0.95	0.15	0.91	0.02	0.50	0.02	0.33
ECI	0.96	-0.10	0.92	0.01	0.50	0.01	0.33
DSI	-0.05	1.00	0.00	0.99	0.00	0.97	0.35
							1.00
Eigenvalue	1.83	1.03					
Proportion	0.61	0.34					
Cumm. Proportion	0.61	0.95					
Theta	0.64	0.36					

Source: Authors' computations

5.2 Trade Openness Index (TOI)

Results showed that the average TOI for the WAMZ was 0.42 point during

the period 2004–2019. The Zone recorded highest TOI of 0.56 point in 2005 but dropped afterwards to 0.44 point and 0.30 point in 2010 and 2015,

respectively. It declined further to 0.29 point in 2016 before rising to 0.42 point in 2019. This result shows that WAMZ's openness to foreign trade is not high, as the indices were below 0.50 point in most years during the period under review. The downward trend was largely influenced by The Gambia's and Nigeria's index scores during the period. These two (2) countries recorded their highest TOI

index of 0.69 point in 2018 and 0.53 point and 2005, respectively. Ghana and Guinea however, showed high level of openness as both countries scored ranked above 0.70 point, on average, while Sierra Leone recorded a score of 0.59 point, on average. Liberia, on the other hand, constituted an outlier presenting a score above 100 percent.

Table 11: Trade Openness Index

Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.46	0.99	0.50	1.00	0.45	0.40	0.49	0.83
2005	0.46	0.98	0.67	1.00	0.53	0.41	0.56	0.87
2006	0.46	0.66	0.81	1.00	0.43	0.38	0.46	0.70
2007	0.45	0.65	0.67	1.00	0.44	0.38	0.47	0.67
Pre-GFC	0.46	0.82	0.66	1.00	0.46	0.39	0.50	0.77
2008	0.38	0.68	0.72	1.00	0.46	0.37	0.49	0.70
2009	0.41	0.72	0.54	1.00	0.37	0.39	0.40	0.69
GFC	0.40	0.70	0.63	1.00	0.42	0.38	0.45	0.69
2010	0.38	0.73	0.74	1.00	0.41	0.53	0.44	0.72
2011	0.36	0.87	0.84	1.00	0.48	0.89	0.52	0.87
2012	0.44	0.94	0.86	1.00	0.40	0.86	0.45	0.91
2013	0.49	0.62	0.58	1.00	0.35	0.85	0.39	0.64
Post-GFC	0.41	0.79	0.75	1.00	0.41	0.78	0.45	0.79
2014	0.55	0.64	0.57	1.00	0.30	0.84	0.35	0.67
2015	0.48	0.77	0.52	1.00	0.25	0.62	0.30	0.72
2016	0.40	0.69	0.89	1.00	0.21	0.61	0.29	0.71
EVD/GCPs	0.47	0.70	0.66	1.00	0.26	0.69	0.31	0.70
2017	0.59	0.72	0.85	1.00	0.27	0.63	0.35	0.72
2018	0.69	0.70	0.79	1.00	0.33	0.61	0.39	0.70
2019	0.60	0.78	0.75	1.00	0.36	0.62	0.42	0.76
Post EVD/GCPs	0.63	0.73	0.80	1.00	0.32	0.62	0.39	0.73
AVERAGE	0.47	0.76	0.71	1.00	0.38	0.59	0.42	0.74

Source: Authors' computations

Note⁴: GFC (Global Financial Crisis); EVD (Ebola Virus Disease); GCPs (Global Commodities Prices shocks)

Trade openness dynamics of the WAMZ is affected by global and regional uncertainties such as the

Global Financial Crisis (GFC) (2008-2009), the Global Commodities Prices shocks (GCPs) and the Ebola Virus

⁴ The same apply to the rest of the Tables

Disease (EVD) in 2014-2016, as shown by Table 11. In addition, results show that the index was largely driven by Nigeria⁵, as the Zone and Nigeria's indices were found to be similar and moved in the same direction. To insulate this impact, the study computed the TOI for the other five (5) WAMZ economies excluding Nigeria. Thus, before the GFC (2004-2007), the WAMZ TOI was 0.50 point (excluding Nigeria: 0.77 point), this reduced to 0.45 point (excluding Nigeria: 0.69 point) during the Crisis. Post-GFCs (2010 – 2013), trade levels picked-up in the Zone elevating the vulnerability level to 0.45 point (excluding Nigeria: 0.79 point) only to reduce during the EVD/ GCP (2014 – 2016) to 0.31 point (excluding Nigeria: 0.70 point). Post the crisis, the WAMZ trading activity increased marginally (2017 -2019), to 0.39 point (excluding Nigeria: 0.73 point).

All member states of the WAMZ experienced deteriorating trade exposures during global uncertainties recording a drop in the score during the shocks as compared to pre and post shock periods, stemming from

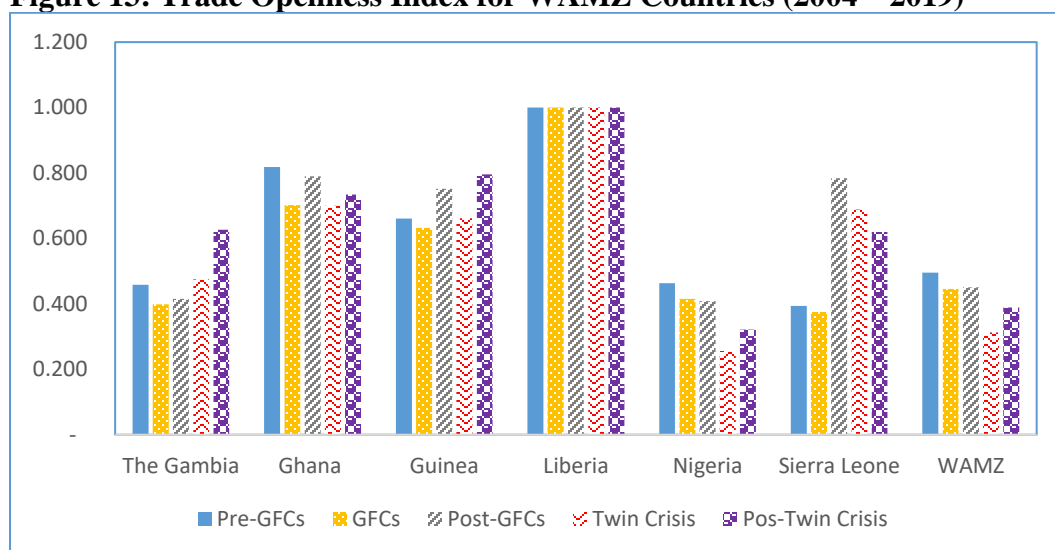
significant decline in trade during the crises. Thus, during the GFCs, both exports and imports of goods dropped by 31.3 percent and 22.2 percent, respectively, compared to a 9.6 percent decline in GDP, between 2008 and 2009 within the zone. Likewise, the zone witnessed a significant drop during GCP and EVD as the zone recorded more than 50 percent decline in export of goods coupled with around one-third drop in imports of goods during the period 2014-2016.

Consequently, results shows that WAMZ countries were highly vulnerable to shocks through foreign trade except for Nigeria. The computed indices were all above 0.63 point during the study period with Liberia having the highest averaging 1.00 point. This confirms the assertion that small countries are more open to trade than the big ones (see Alesina and Wacziarg, 1998). The high degree of trade openness in most countries of the Zone as corroborated by the scores exacerbates member countries' vulnerability arising from external shocks through terms of trade shocks.

⁵ Given the size of Nigeria and the fact that this country seems to drive the results, we

estimate all indices for WAMZ as well as for WAMZ less Nigeria.

Figure 13: Trade Openness Index for WAMZ Countries (2004 – 2019)



Source: Authors' computations

Note⁶: GFC (Global Financial Crisis); EVD (Ebola Virus Disease); GCP (Global Commodities Prices); Twin Crisis (EVD and GCP)

5.3 Export Concentration Index (ECI)

The average WAMZ ECI score for the period was 0.91 point inclusive of Nigeria and stood at 0.73 point excluding Nigeria. This illustrates a higher dependence on fewer export commodities, as the index was consistently above 0.84 point throughout the entire period of the analysis. The highest ECI for the Zone was 0.96 point in 2005 and the least score of 0.84 point was recorded in 2019.

It recorded 0.96 point in 2005, but declined to 0.92 point, further to 0.88 point, and down to 0.84 point in 2010, 2016, and 2019, respectively. These

indicate some semblance of diversification of the export base albeit at an unnoticeable pace largely driven by Nigeria which recorded the highest ECI averaging 0.94 point, and this was influenced by the significant proportion of crude oil and natural gas exports in Nigeria's total exports during the period. The Gambia, however, recorded the lowest index of 0.10 point.

The ECI for the other five WAMZ countries excluding Nigeria averaged 0.73 point over the period 2004 to 2019. The index has been on a downward trend moving from 0.90 point between 2004 and 2014 to stand at 0.88 point on average between the years (2015 and 2019). The downward

⁶ The same apply to the rest of the Charts

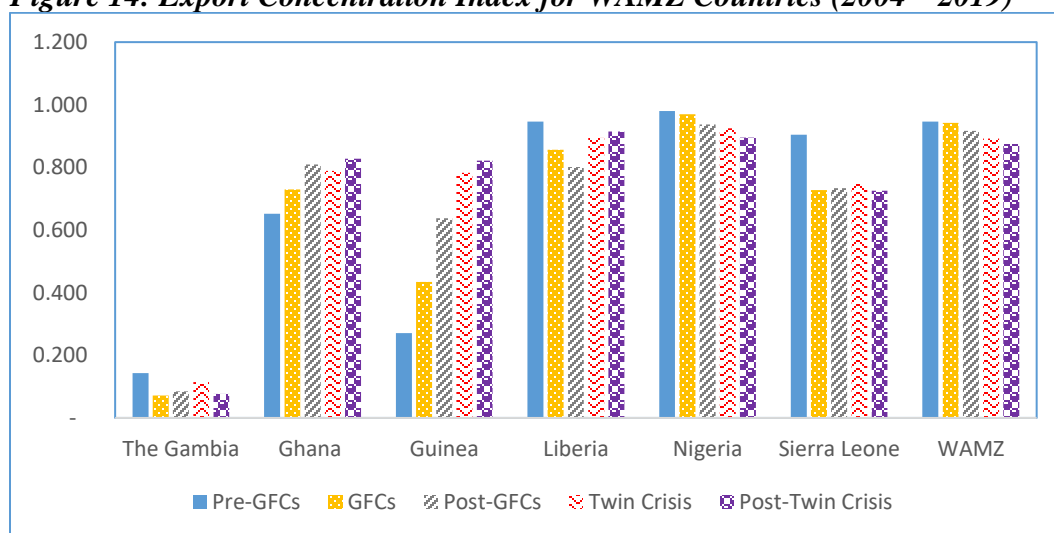
remained constant, despite the occurrence of major global shocks such as the GFC and GCP.

Table 12: Export Concentration Index

Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.14	0.61	0.32	0.90	0.98	0.93	0.93	0.56
2005	0.09	0.66	0.32	0.96	0.99	0.94	0.96	0.59
2006	0.20	0.66	0.11	0.96	0.98	0.87	0.95	0.56
2007	0.14	0.68	0.33	0.96	0.98	0.88	0.95	0.62
Pre-GFC	0.14	0.65	0.27	0.95	0.98	0.90	0.95	0.58
2008	0.09	0.71	0.37	0.95	0.98	0.81	0.95	0.65
2009	0.05	0.75	0.50	0.76	0.96	0.64	0.93	0.70
GFC	0.07	0.73	0.43	0.86	0.97	0.73	0.94	0.67
2010	0.07	0.76	0.59	0.88	0.94	0.58	0.92	0.72
2011	0.07	0.83	0.64	0.77	0.94	0.69	0.92	0.80
2012	0.08	0.84	0.57	0.69	0.94	0.73	0.92	0.80
2013	0.12	0.81	0.75	0.87	0.93	0.93	0.91	0.81
Post-GFC	0.09	0.81	0.64	0.80	0.94	0.73	0.92	0.78
2014	0.11	0.81	0.79	0.89	0.93	0.91	0.91	0.81
2015	0.11	0.76	0.72	0.90	0.92	0.63	0.89	0.75
2016	0.12	0.79	0.84	0.89	0.92	0.70	0.88	0.79
EVD/GCPs	0.11	0.79	0.78	0.89	0.92	0.75	0.89	0.79
2017	0.07	0.84	0.78	0.89	0.92	0.66	0.89	0.81
2018	0.07	0.82	0.79	0.91	0.92	0.74	0.89	0.80
2019	0.08	0.83	0.89	0.95	0.84	0.77	0.84	0.84
Post EVD/GCPs	0.08	0.83	0.82	0.91	0.90	0.73	0.87	0.82
AVERAGE	0.10	0.76	0.58	0.88	0.94	0.78	0.91	0.73

Source: Authors' computations

Figure 14: Export Concentration Index for WAMZ Countries (2004 – 2019)



Source: Authors' computations

On international and regional developments, in the pre-GFCs period, the average index for the zone is 0.95 point and stood at 0.58 point excluding Nigeria. This reveals that Nigeria is systemic, and its absence tends to reduce the vulnerability of the WAMZ in terms of export concentration. There has been generally, a constant reduction of the WAMZ index during the GFCs, Post- GFCs, and the EVD/ GCP. The interesting observation is that Nigeria's dominance as a significant player in the export concentration reduces over time as other member states such as Ghana discover and commercialize the production of crude oil. This led to instance to Post-EVD/ GCP's ECI of 0.87 point and excluding Nigeria 0.82 point.

The bulk of foreign exchange earnings in the Zone is derived from exports,

implying that the member states contend with revenue volatilities as commodity prices are elastic and pass-through phases of peaks and booms interspersed by longer troughs (slumps). Export revenues, a significant determinant of the fiscal and balance of payment positions in the WAMZ therefore becomes unpredictable with attendant macro-economic stability issues. This suggests the need to diversify the export base of these economies from depending so much on limited export sources.

5.4 Dependence on Strategic

Imports Index (DSI)

All member countries rely heavily on imported energy (fuel) for productive activities and food for consumption. The level of dependence on strategic imports can raise the level of external

sector risks faced by Member countries. The average score of the DSI in the WAMZ was 0.38 point. The index declined to 0.25 point in 2010,

from 0.35 point in 2005. However, it increased to 0.34 point in 2015 before dropping to 0.29 point in 2019.

Table 13: Dependence on Strategic Imports Index

Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.62	0.39	0.43	0.48	0.31	0.44	0.34	0.41
2005	0.63	0.35	0.36	0.51	0.35	0.41	0.35	0.37
2006	0.57	0.38	0.59	0.51	0.41	0.45	0.41	0.42
2007	0.58	0.40	0.70	0.47	0.40	0.42	0.41	0.45
Pre-GFC	0.60	0.38	0.52	0.49	0.37	0.43	0.38	0.41
2008	0.46	0.38	0.33	0.44	0.36	0.54	0.37	0.38
2009	0.51	0.35	0.33	0.42	0.34	0.40	0.34	0.36
GFC	0.48	0.36	0.33	0.43	0.35	0.47	0.36	0.37
2010	0.53	0.36	0.50	0.47	0.21	0.33	0.25	0.38
2011	1.36	0.36	0.50	0.50	0.60	0.29	0.54	0.38
2012	0.78	0.33	0.42	0.40	0.56	0.37	0.50	0.35
2013	0.59	0.37	0.46	0.39	0.45	0.41	0.43	0.39
Post-GFC	0.81	0.35	0.47	0.44	0.45	0.35	0.43	0.37
2014	0.79	0.46	0.50	0.34	0.39	0.50	0.41	0.46
2015	0.70	0.30	0.44	0.45	0.33	0.57	0.34	0.36
2016	0.66	0.29	0.23	0.50	0.38	0.48	0.35	0.30
EVD/GCPs	0.72	0.35	0.39	0.43	0.37	0.52	0.37	0.38
2017	0.56	0.34	0.28	0.45	0.41	0.55	0.39	0.35
2018	0.57	0.40	0.32	0.36	0.39	0.47	0.39	0.39
2019	0.56	0.35	0.29	0.39	0.28	0.38	0.29	0.35
Post								
EVD/GCPs	0.56	0.36	0.30	0.40	0.36	0.47	0.36	0.37
AVERAGE	0.65	0.36	0.42	0.44	0.39	0.44	0.38	0.38

Source: Authors' computations

The Gambia has the highest DSI averaging 0.65 point, the only country scoring an average of more than 0.5 point, indicating that the country is more dependent on strategic imports than any other WAMZ Member country during the period. It recorded 0.63 point in 2005, and 0.53 point in 2010, before increasing to 0.70 point and 0.56 point in 2015 and 2019, respectively. This supports the argument that small states are open to and dependent on international trade

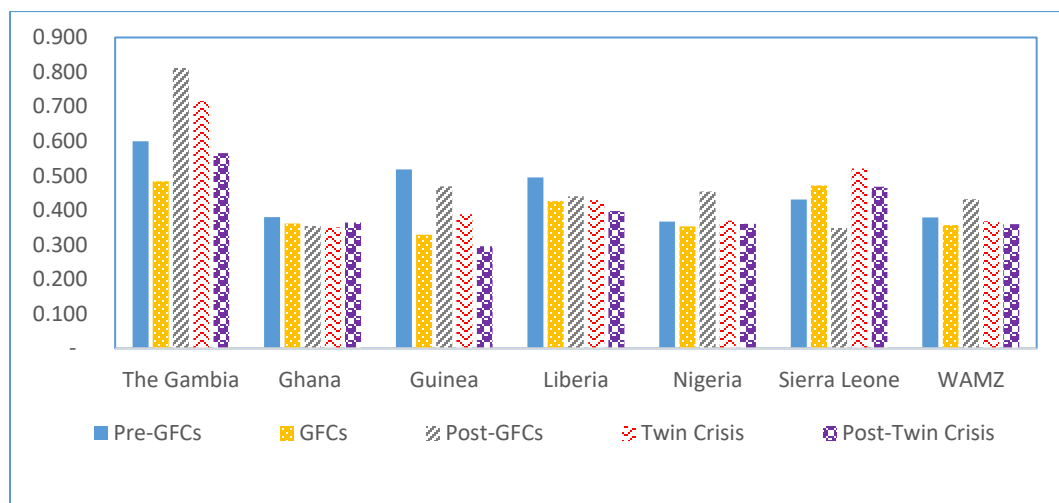
principally because their local markets are subject to economies of scale. The Gambia and others seem to have inadequate manufacturing capacity for import substitution. They therefore rely on strategic imports such as energy, food, capital and consumer goods to support economic growth and also meet the subsistence needs of the citizenry. The impact of shocks on strategic imports are fed into the domestic economy through changes in import prices – of which supply-side

constraints often lead to shortfalls. On the other hand, Guinea has the lowest index score averaging 0.30 point, followed by Ghana and Nigeria with an average score of 0.36 point for both countries during the period 2004-2019. As compared to the other two (2) previous indices (TOI and ECI), member countries have presented a relatively low index below 0.5 for all countries, except The Gambia during the review period. Even though this score seems to be relatively low, the results indicate a significant level of vulnerability as it shows that Member countries depend heavily on strategic imports of energy (fuel) and food, whose demand is price and income inelastic. This tends to amplify the vulnerable state of these economies to swings in the prices of these imported items, thereby increasing the economic

risks in the face of external shocks. Smaller economies in the Zone tend to have higher scores on this index because of their weak manufacturing sector, exacerbated by structural and financial constraints.

International and domestic uncertainties affected the patterns of dependence on strategic imports in the Zone. Member States level of trading activities slows down during crisis as opposed to normal times. The DSI of the WAMZ, consequently reduced from 0.38 point in pre-GFCs to 0.36 point during GFCs. Post GFCs normality led to an up-tick of the index to 0.43 point before the twin Ebola and commodity price shocks marked it at 0.37 point. The exclusion of Nigeria from all these episodic scenarios resulted in minimal impact.

Figure 15: Dependence on Strategic Imports Index for WAMZ Countries (2004 – 2019)



Source: Authors' computations

5.5 WAMZ Economic

Vulnerability Index

Results from the scenario-wise analysis revealed significant levels of economic vulnerability in the WAMZ. The economic vulnerability index 1 (EVI1) shows that the WAMZ as a whole recorded an average index of 0.57 point during the period 2004 – 2019. All computed EVI1 indices are higher than 0.50 point, but a downward trend was observed over time. That is, from an average of 0.60 point during the first period 2004-2014 to an average of 0.53 point between (2015-2019).

The three (3) EVI declined during global and regional imbalances, as expected, due to the drop in foreign trade activities during these periods. As indicated earlier, both the GFC and GCP&EVD appear to lead to drop in global demand including for commodities which negatively impacted the level of output and exports as well as imports of goods and services, and consequently a decrease of the vulnerability index during periods of uncertainty. However, as economic activities recovered during the post-shocks' periods, the index's score rose as well.

Table 14: WAMZ Economic Vulnerability Indices (EVI1)

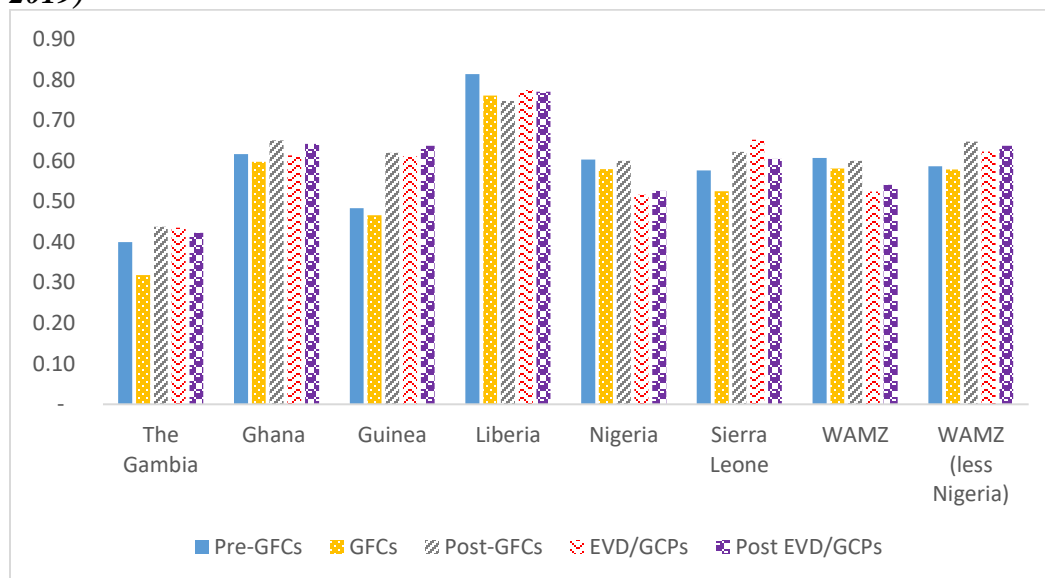
Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.41	0.66	0.42	0.79	0.58	0.59	0.59	0.60
2005	0.39	0.66	0.45	0.83	0.62	0.58	0.63	0.61
2006	0.41	0.57	0.50	0.82	0.61	0.57	0.61	0.56
2007	0.39	0.58	0.57	0.81	0.60	0.56	0.61	0.58
Pre-GFCs	0.40	0.62	0.48	0.81	0.60	0.58	0.61	0.59
2008	0.31	0.59	0.47	0.80	0.60	0.57	0.60	0.58
2009	0.32	0.61	0.46	0.73	0.56	0.48	0.56	0.58
GFCs	0.32	0.60	0.47	0.76	0.58	0.53	0.58	0.58
2010	0.33	0.61	0.61	0.78	0.52	0.48	0.54	0.61
2011	0.59	0.69	0.66	0.76	0.67	0.62	0.66	0.68
2012	0.43	0.70	0.62	0.70	0.63	0.66	0.62	0.69
2013	0.40	0.60	0.60	0.75	0.58	0.73	0.58	0.61
Post-GFCs	0.44	0.65	0.62	0.75	0.60	0.62	0.60	0.65
2014	0.48	0.64	0.62	0.74	0.54	0.75	0.55	0.65
2015	0.43	0.61	0.56	0.78	0.50	0.61	0.51	0.61
2016	0.39	0.59	0.65	0.80	0.51	0.60	0.51	0.60
EVD/GCPs	0.44	0.61	0.61	0.77	0.52	0.65	0.52	0.62
2017	0.41	0.63	0.64	0.78	0.54	0.61	0.54	0.63
2018	0.44	0.64	0.63	0.75	0.55	0.61	0.56	0.63
2019	0.41	0.66	0.64	0.78	0.49	0.59	0.52	0.65
Post EVD/GCPs	0.42	0.64	0.64	0.77	0.53	0.60	0.54	0.64
AVERAGE	0.41	0.63	0.57	0.77	0.57	0.60	0.57	0.62

Source: Authors' computations

Liberia, Ghana and Sierra Leone exhibited the highest vulnerability to external shocks of 0.60 point or more during the period of analysis, which is attributable to their high vulnerability to trade shocks occasioned by higher TOI during the period. Guinea and Nigeria recorded a vulnerability

corresponding to the zone level (0.57 point) while The Gambia recorded the lowest index at 0.41 point owing largely to lesser dependence on export of primary commodities, as the country depends more on tourism services for its foreign exchange earnings.

Figure 16: Economic Vulnerability Index (EVI1) for WAMZ Countries (2004 – 2019)



The WAMZ recorded a higher average index of 0.66 point in the EVI2 results during the same period, when export concentration on few primary commodities was given a higher weight. Similarly, all EVI2 indicators for the WAMZ crossed the 0.58 point mark and were higher than those of EVI1. All member countries experienced higher vulnerability to

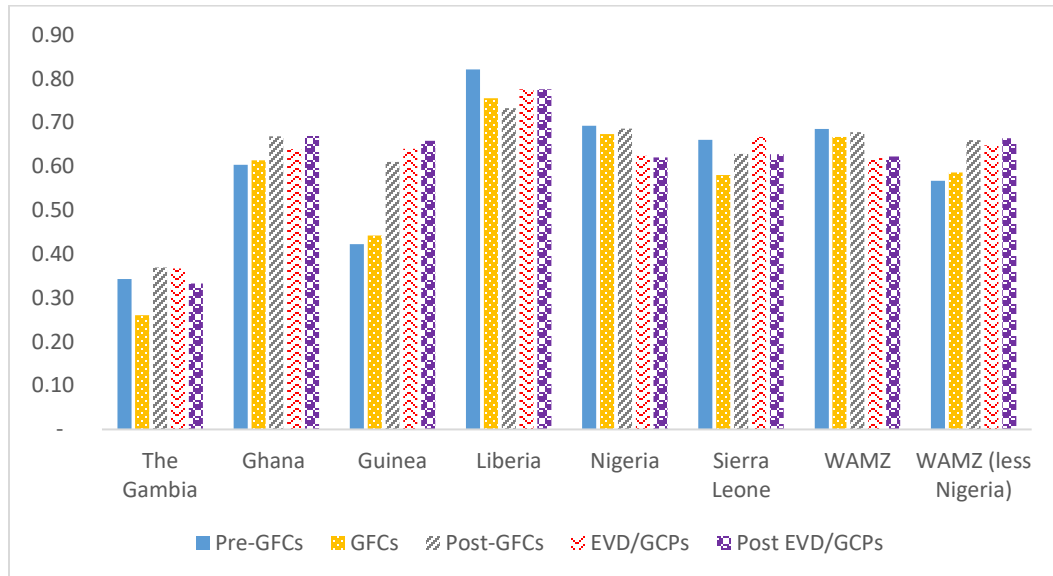
external shocks during the period, except The Gambia, due to their higher ECI scores. This reveals the inherent nature of all the WAMZ economies, which are susceptible to shocks arising from the external sector through huge dependence on primary commodities for their export earnings.

Table 15: WAMZ Economic Vulnerability Indices (EVI2)

Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.35	0.62	0.39	0.79	0.67	0.68	0.67	0.57
2005	0.33	0.63	0.40	0.84	0.70	0.67	0.70	0.58
2006	0.36	0.58	0.39	0.83	0.70	0.65	0.69	0.55
2007	0.34	0.59	0.51	0.82	0.69	0.64	0.69	0.58
Pre-GFC	0.34	0.60	0.42	0.82	0.69	0.66	0.69	0.57
2008	0.26	0.60	0.43	0.81	0.69	0.64	0.68	0.58
2009	0.26	0.62	0.46	0.70	0.66	0.52	0.65	0.59
GFC	0.26	0.61	0.44	0.76	0.67	0.58	0.67	0.59
2010	0.27	0.63	0.59	0.78	0.62	0.50	0.62	0.62
2011	0.51	0.70	0.64	0.73	0.74	0.61	0.73	0.69
2012	0.36	0.71	0.58	0.67	0.72	0.65	0.70	0.69
2013	0.34	0.64	0.63	0.75	0.67	0.76	0.66	0.65
Post-GFC	0.37	0.67	0.61	0.73	0.69	0.63	0.68	0.66
2014	0.40	0.67	0.66	0.74	0.64	0.77	0.65	0.68
2015	0.36	0.63	0.60	0.79	0.61	0.61	0.61	0.62
2016	0.34	0.62	0.66	0.80	0.62	0.62	0.61	0.63
EVD/GCPs	0.37	0.64	0.64	0.78	0.62	0.67	0.62	0.65
2017	0.32	0.66	0.65	0.78	0.64	0.62	0.63	0.66
2018	0.35	0.67	0.65	0.76	0.65	0.63	0.64	0.66
2019	0.33	0.68	0.68	0.79	0.57	0.63	0.59	0.68
Post EVD/GCPs	0.33	0.67	0.66	0.78	0.62	0.63	0.62	0.66
AVERAGE	0.34	0.64	0.56	0.77	0.66	0.64	0.66	0.63

Source: Authors' computations

Figure 18: Economic Vulnerability Index (EVI2) for WAMZ Countries (2004 – 2019)



Source: Authors' computations

The EVI3 scores, which were computed by utilizing the weights generated from the PCA results, were found to be similar to EVI1 in magnitude, and this is attributable to the similarities in the weights between the two EVI indicators. The WAMZ EVI3 score averaged 0.57 point during the same period. Similarly, all index scores indicate high vulnerability as they exceed the 0.50 mark. The index declined from 0.62 point in 2005 to 0.53 point in 2010 to 0.51 point in both 2015 and 2019. The score of the EVI and its components for the WAMZ mirrors that of Nigeria. This can be attributed to the weight of Nigeria, since the variables used in the

computation of the composite index for the Zone were aggregated.

All Member countries, except The Gambia, have an average index score above 0.55 point, connoting high vulnerability. Liberia, Ghana and Sierra Leone have the highest index of 0.77 point, 0.62 point, and 0.60 point, respectively, while The Gambia has the lowest index score at 0.42 point. The index reveals how exposed the WAMZ economies are to external shocks because of the inherent nature and/or characteristics of their economies. This has implications on the WAMZ integration agenda. The high vulnerability index might reveal why

most member countries are unable to meet the macroeconomic convergence criteria for economic and financial integration on a sustained basis.

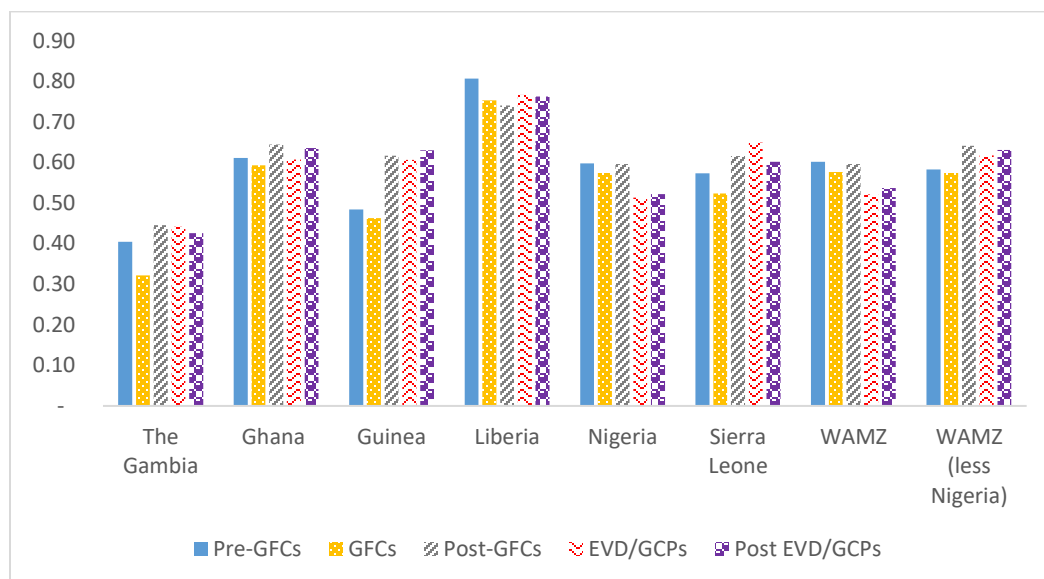
A further examination of the EVI3 scores showed some interesting dynamics in the trend of the country scores overtime.

Table 16: WAMZ Economic Vulnerability Indices (EVI3)

Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.41	0.66	0.42	0.79	0.57	0.59	0.58	0.59
2005	0.40	0.66	0.45	0.82	0.62	0.58	0.62	0.61
2006	0.41	0.56	0.50	0.82	0.60	0.57	0.60	0.56
2007	0.39	0.57	0.57	0.80	0.60	0.56	0.60	0.57
Pre-GFC	0.40	0.61	0.48	0.81	0.60	0.57	0.60	0.58
2008	0.31	0.59	0.47	0.79	0.60	0.57	0.60	0.57
2009	0.33	0.60	0.46	0.72	0.55	0.48	0.55	0.57
GFC	0.32	0.59	0.46	0.75	0.57	0.52	0.58	0.57
2010	0.33	0.61	0.61	0.78	0.51	0.48	0.53	0.60
2011	0.61	0.68	0.65	0.75	0.67	0.61	0.66	0.68
2012	0.44	0.70	0.61	0.69	0.63	0.65	0.62	0.68
2013	0.40	0.59	0.59	0.74	0.57	0.72	0.57	0.61
Post-GFC	0.45	0.64	0.62	0.74	0.60	0.62	0.60	0.64
2014	0.49	0.63	0.62	0.73	0.54	0.74	0.55	0.64
2015	0.44	0.60	0.56	0.78	0.50	0.61	0.51	0.60
2016	0.40	0.58	0.64	0.79	0.50	0.60	0.51	0.59
EVD/GCPs	0.44	0.61	0.61	0.77	0.51	0.65	0.52	0.62
2017	0.41	0.63	0.63	0.77	0.53	0.61	0.54	0.62
2018	0.45	0.63	0.62	0.75	0.55	0.60	0.56	0.63
2019	0.42	0.65	0.64	0.77	0.49	0.59	0.51	0.64
Post EVD/GCPs	0.43	0.64	0.63	0.76	0.52	0.60	0.54	0.63
AVERAGE	0.42	0.62	0.56	0.77	0.56	0.60	0.57	0.61

Source: Authors' computations

Figure 19: Economic Vulnerability Index (EVI3) for WAMZ Countries (2004-2019)



Source: Authors' computations

The index scores for Liberia and Nigeria reveal a declining trend as they declined from 0.82 point and 0.62 point in 2005 to 0.78 point and 0.51 point in 2010, respectively. The index score of the two (2) countries declined further to 0.77 point and 0.49 point in 2019. The indices for Gambia, Ghana, and Sierra Leone, however, exhibited relative stability over the period under review, while the index for Guinea was in an upward trend, increasing from 0.40 point at the initial period to above 0.60 point in 2019. The global external shocks such as the GFC and GCP had a drastic impact on the WAMZ Member States, as they witnessed declines in their export earnings and total trade values in 2009 relative to 2008 and in 2015 relative to their 2014 levels. Similarly, their import bills on fuel

decreased occasioned by the fall in crude oil prices. This led to declines in their vulnerability scores during the same period.

5.5.1 Exchange Market Pressure Component

Exchange market pressure constitutes one channel through which external vulnerability is transmitted. In order to take into account the impact of development in exchange market on external exposures of the zone and equally to check the robustness of the results, we added a new component of exchange market to compute the EVI. In fact, exchange market pressure explains the extent to which high exchange rate volatility and depreciation may lead to currency

crisis, and eventually to financial and economic disturbances (Eichengreen et al., 2007). We build the exchange market pressure index using a simple average of two (2) indicators⁷, namely change in reserves and dollarization proxied by foreign exchange deposit to total deposit ratio, and current account deficit (Ishrakieh et al., 2020; Moore and Wang, 2009). The higher the variability in reserves, the more a country is exposed to currency shocks. Similarly, dollarization is highly associated with sudden stop and systemic crises such as financial and economic instability in developing and emerging markets (Calvo et al., 2008).

The results indicate a moderate level of vulnerability for the zone during the period (0.53 point). All member countries recorded a score below 0.6 point, except Liberia. The Gambia still records the lowest score. The index score has been in downward trend over time as most countries were able to improve their exchange market volatility over recent years, leading to a decrease of dollarization within the zone.

Table 17: WAMZ Economic Vulnerability Indices including Exchange Market Pressure Component

Period	The Gambia	Ghana	Guinea	Liberia	Nigeria	Sierra Leone	WAMZ	WAMZ (less Nigeria)
2004	0.37	0.58	0.39	0.76	0.50	0.61	0.56	0.56
2005	0.35	0.57	0.41	0.72	0.56	0.53	0.56	0.54
2006	0.37	0.50	0.44	0.73	0.57	0.53	0.56	0.50
2007	0.35	0.51	0.50	0.73	0.52	0.51	0.55	0.52
Pre-GFC	0.36	0.54	0.43	0.73	0.54	0.54	0.56	0.53
2008	0.29	0.53	0.51	0.69	0.53	0.51	0.56	0.53
2009	0.34	0.58	0.54	0.63	0.48	0.48	0.55	0.57
GFC	0.31	0.56	0.53	0.66	0.51	0.50	0.56	0.55
2010	0.29	0.57	0.53	0.71	0.47	0.43	0.50	0.55
2011	0.49	0.60	0.79	0.66	0.59	0.55	0.62	0.64
2012	0.36	0.60	0.55	0.61	0.54	0.58	0.55	0.60
2013	0.34	0.52	0.53	0.74	0.49	0.64	0.53	0.56
Post-GFC	0.37	0.57	0.60	0.68	0.52	0.55	0.55	0.59
2014	0.43	0.55	0.53	0.65	0.50	0.65	0.51	0.57
2015	0.39	0.53	0.52	0.68	0.46	0.52	0.47	0.54
2016	0.35	0.52	0.59	0.72	0.46	0.53	0.48	0.55
EVD/GCPs	0.39	0.53	0.55	0.68	0.47	0.57	0.49	0.56
2017	0.48	0.56	0.56	0.68	0.47	0.53	0.51	0.58
2018	0.37	0.55	0.58	0.66	0.52	0.53	0.51	0.56
2019	0.39	0.58	0.62	0.69	0.44	0.52	0.49	0.59
Post-EVD/GCPs	0.41	0.57	0.58	0.67	0.48	0.53	0.50	0.58
AVERAGE	0.37	0.55	0.54	0.69	0.51	0.54	0.53	0.56

Source: Authors computation

⁷ Other studies used more indicators, however, we could not get more than these two (2)

indicators available for the entire six (6) countries of WAMZ.

5.6 Implications of Vulnerability of WAMZ Member States on the Convergence Process

Evidence indicates that WAMZ countries and the entire zone have been vulnerable to external shocks such as GFC and GCP, as well as the EVD over the years, and this has far reached implications on the macroeconomic convergence process. This is so because most of these countries rely heavily on the export of primary commodities, whose prices are very volatile and extremely difficult to predict, for foreign exchange earnings and government revenues. Thus, commodity price booms are accompanied by rapid output growth, massive investments and increased fiscal space for commodity exporters, among others. However, price falls put macroeconomic policies in commodity dependent countries, like WAMZ Member countries, to a serious test.

Commodity price falls usually induce substantial declines in government revenues in commodity-dependent countries. Countries with no adequate fiscal frameworks – fiscal rules or savings/stabilization funds to counter the volatility in revenues may find it difficult to meet their desired fiscal deficit levels, as governments have had difficulties in quickly adjusting their public investment programmes to lower expenditure outlays in line with the fall in revenues. Consequently, price volatility has made it difficult for WAMZ economies to attain the fiscal

deficit criterion of not more than 3 percent of GDP on a sustained basis.

Countries that select public investment programmes and undertake those considered necessary to improve growth with a view to reducing expenditures in response to falling revenues tend to witness declines in income and employment.

Increased fiscal deficits are mainly financed by debt creation, giving rise to increases in debt profile of those countries. Domestic debt is usually financed either by the banking system, including the central bank, or the public. Central bank financing may surpass the prescribed thresholds in periods of low commodity prices. In addition, financing through debt flows tend to increase the public debt profile and its accompanying debt ratios, making it difficult to satisfy the secondary convergence criteria requiring Member States to attain a public debt to GDP ratio of not more than 70 percent.

Substantial declines in foreign exchange inflows during commodity price shocks are accompanied by declines in international reserves of these economies, with the reserves falling below the prescribed minimum in some instances. In addition, lower prices and weaker capital inflows have the potential to trigger higher current account deficits and substantial currency depreciation. Widening fiscal deficits and currency depreciation has led to hikes in inflation in some instances, making it difficult to attain a

single digit inflation criterion. Higher inflation has been followed by increases in policy interest rates by central banks, and the tighter monetary policy stance, combined with higher government borrowing, cause increases in borrowing costs, leading to deceleration of growth in credit to the private sector and its attendant consequences on economic growth.

In addition, vulnerability of Member States to external shocks would reinforce the differential growth paths, which would create divergence in standard of living across the countries. Given that free mobility of goods and persons is one of the core elements of the proposed WAMZ monetary union, movement of people, in particular,

would skew towards countries with higher standard of living thereby putting pressure on resources in these countries.

Experience from most countries indicated that governments have had difficulties in putting in place a macroeconomic framework that safeguards the stability of economic growth during commodity price swings (IMF, 2015). Thus, high vulnerability to external shocks emanating largely from huge dependence on commodity exports tends to exacerbate economic downturn in WAMZ countries making it difficult to attain the agreed macroeconomic convergence criteria on a sustained basis.

6.0 Conclusion and Recommendations

WAMZ member states are mostly low-income countries and exhibit characteristics which make them susceptible to macroeconomic vulnerability. The small size of most of these economies, huge dependence on strategic imports of food and fuel products, concentration of exports on few primary commodities, dependence on foreign sources of finance (foreign aid) and to a lesser extent, prevalence of crises and natural disasters make them very susceptible to shocks and output growth volatility. This paper is an update of a previous study by WAMI which sought to measure the degree of vulnerability of WAMZ

member countries and the entire zone to external shocks and the implications of these on the convergence process. The paper adopted a modified version of Briguglio (2014) computation methodology to calculate the economic vulnerability indices for all the WAMZ countries. The computed EVI was made up of three components – trade openness, export concentration and dependence on strategic imports – and was derived by averaging the indices from the three components.

The paper computed three (3) different EVI indicators by assigning distinguishing weights to each of the components, and selected EVI3 as the

preferred vulnerability indicator. Results from the analysis indicated that the average EVI for the zone was 0.57 point, implying that the zone as a whole was vulnerable to external shocks. Liberia, Ghana, and Sierra Leone were the most vulnerable countries during the period while The Gambia was the least.

The trade openness indicator for the zone averaged 0.42 point, with Liberia having the highest index averaging 1.00 point, while Nigeria was the least open. The export exportation component recorded the highest score among the three (3) components with 0.91 point at the zonal level. This suggests that the zone's most vulnerability stems from its high concentration of exports in few commodities for most of member countries. Nigeria recorded the highest export concentration index averaging 0.94 point, while The Gambia had the lowest (0.10 point). As regarding the third component, i.e., dependence on strategic imports index, the zone recorded 0.38 point with The Gambia having the highest (0.65 point), indicating that it was highly vulnerable to external shocks through the importation of food and fuel products and Ghana recording the lowest at 0.36 point.

Being highly vulnerable to external shocks may have profound implications on the achievement of the convergence criteria and the sustenance of the monetary union. High vulnerability may trigger wider

fiscal deficits in countries with no adequate fiscal frameworks/buffers to control volatility in government revenues, increase in public debt arising from the financing of higher budget deficits, lower international reserves emanating from lower foreign exchange inflows, exchange rate instability, and higher inflationary pressures.

The huge impact of macroeconomic vulnerability could be mitigated in WAMZ economies by implementing a number of measures aimed at building economic resilience – enhancing countries' ability to economically cope with or withstand economic vulnerability emanating from external shocks. The emphasis on resilience was important because of the huge success achieved by countries such as Singapore in nurturing economic resilience through appropriate economic policies to neutralize risks emanating from macroeconomic vulnerability and achieve a high level of economic development. These measures include firstly diversifying their export base and reducing their dependence on few export commodities and ensuring macroeconomic stability with a solid government fiscal position. Healthy foreign exchange reserve buffers can also help a country withstand the adverse impact of external shocks without significant welfare losses, while a healthy fiscal position would allow the government to undertake counter-cyclical measures such as

increasing public expenditures to cope with shocks.

Other measures to increase resilience include ensuring good governance, especially the rule of law and security of property rights; ensuring social development as it allows for an effective functioning of an economy and limits the possibility of civil unrest when economic crises occur; and ensuring market efficiency so that such markets could adjust rapidly towards equilibrium following an external shock. In addition to building resilience, member countries need to make efforts to establish and adequately utilize savings and stabilization funds and implement fiscal rules to enable countries save a certain portion of earnings and utilize the saved funds to augment

government revenues in periods of bad times (commodity price falls); and use market-based instruments including forwards, futures and options to manage commodity price risks. This study was limited in that it only computed the EVI for the WAMZ Member countries, and the results showed that the zone was highly vulnerable to external shocks during the study period. However, there is need to compute the economic resilience index to examine the extent to which WAMZ Member countries can withstand such vulnerability in their economies. There might equally be a need to compute a financial vulnerability index for the zone as a complement to the present paper. These are areas we suggest for further research.

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APPENDIX

Table A 1: Economic Vulnerability Indices of The Gambia

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.46	0.14	0.62	0.41	0.35	0.41
2005	0.46	0.09	0.63	0.39	0.33	0.40
2006	0.46	0.20	0.57	0.41	0.36	0.41
2007	0.45	0.14	0.58	0.39	0.34	0.39
2008	0.38	0.09	0.46	0.31	0.26	0.31
2009	0.41	0.05	0.51	0.32	0.26	0.33
2010	0.38	0.07	0.53	0.33	0.27	0.33
2011	0.36	0.07	1.36	0.59	0.51	0.61
2012	0.44	0.08	0.78	0.43	0.36	0.44
2013	0.49	0.12	0.59	0.40	0.34	0.40
2014	0.55	0.11	0.79	0.48	0.40	0.49
2015	0.48	0.11	0.70	0.43	0.36	0.44
2016	0.40	0.12	0.66	0.39	0.34	0.40
2017	0.59	0.07	0.56	0.41	0.32	0.41
2018	0.69	0.07	0.57	0.44	0.35	0.45
2019	0.60	0.08	0.56	0.41	0.33	0.42
AVERAGE	0.47	0.10	0.65	0.41	0.34	0.42

Table A 2: Economic Vulnerability Indices of Ghana

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.99	0.61	0.39	0.66	0.62	0.66
2005	0.98	0.66	0.35	0.66	0.63	0.66
2006	0.66	0.66	0.38	0.57	0.58	0.56
2007	0.65	0.68	0.40	0.58	0.59	0.57
2008	0.68	0.71	0.38	0.59	0.60	0.59
2009	0.72	0.75	0.35	0.61	0.62	0.60
2010	0.73	0.76	0.36	0.61	0.63	0.61
2011	0.87	0.83	0.36	0.69	0.70	0.68
2012	0.94	0.84	0.33	0.70	0.71	0.70
2013	0.62	0.81	0.37	0.60	0.64	0.59
2014	0.64	0.81	0.46	0.64	0.67	0.63
2015	0.77	0.76	0.30	0.61	0.63	0.60
2016	0.69	0.79	0.29	0.59	0.62	0.58
2017	0.72	0.84	0.34	0.63	0.66	0.63
2018	0.70	0.82	0.40	0.64	0.67	0.63
2019	0.78	0.83	0.35	0.66	0.68	0.65
AVERAGE	0.76	0.76	0.36	0.63	0.64	0.62

Table A 3: Economic Vulnerability Indices of Guinea

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.50	0.32	0.43	0.42	0.39	0.42
2005	0.67	0.32	0.36	0.45	0.40	0.45
2006	0.81	0.11	0.59	0.50	0.39	0.50
2007	0.67	0.33	0.70	0.57	0.51	0.57
2008	0.72	0.37	0.33	0.47	0.43	0.47
2009	0.54	0.50	0.33	0.46	0.46	0.46
2010	0.74	0.59	0.50	0.61	0.59	0.61
2011	0.84	0.64	0.50	0.66	0.64	0.65
2012	0.86	0.57	0.42	0.62	0.58	0.61
2013	0.58	0.75	0.46	0.60	0.63	0.59
2014	0.57	0.79	0.50	0.62	0.66	0.62
2015	0.52	0.72	0.44	0.56	0.60	0.56
2016	0.89	0.84	0.23	0.65	0.66	0.64
2017	0.85	0.78	0.28	0.64	0.65	0.63
2018	0.79	0.79	0.32	0.63	0.65	0.62
2019	0.75	0.89	0.29	0.64	0.68	0.64
AVERAGE	0.71	0.58	0.42	0.57	0.56	0.56

Table A 4: Economic Vulnerability Indices of Liberia

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	1.00	0.90	0.48	0.79	0.79	0.79
2005	1.00	0.96	0.51	0.83	0.84	0.82
2006	1.00	0.96	0.51	0.82	0.83	0.82
2007	1.00	0.96	0.47	0.81	0.82	0.80
2008	1.00	0.95	0.44	0.80	0.81	0.79
2009	1.00	0.76	0.42	0.73	0.70	0.72
2010	1.00	0.88	0.47	0.78	0.78	0.78
2011	1.00	0.77	0.50	0.76	0.73	0.75
2012	1.00	0.69	0.40	0.70	0.67	0.69
2013	1.00	0.87	0.39	0.75	0.75	0.74
2014	1.00	0.89	0.34	0.74	0.74	0.73
2015	1.00	0.90	0.45	0.78	0.79	0.78
2016	1.00	0.89	0.50	0.80	0.80	0.79
2017	1.00	0.89	0.45	0.78	0.78	0.77
2018	1.00	0.91	0.36	0.75	0.76	0.75
2019	1.00	0.95	0.39	0.78	0.79	0.77
AVERAGE	1.00	0.88	0.44	0.77	0.77	0.77

Table A 5: Economic Vulnerability Indices of Nigeria

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.45	0.98	0.31	0.58	0.67	0.57
2005	0.53	0.99	0.35	0.62	0.70	0.62
2006	0.43	0.98	0.41	0.61	0.70	0.60
2007	0.44	0.98	0.40	0.60	0.69	0.60
2008	0.46	0.98	0.36	0.60	0.69	0.60
2009	0.37	0.96	0.34	0.56	0.66	0.55
2010	0.41	0.94	0.21	0.52	0.62	0.51
2011	0.48	0.94	0.60	0.67	0.74	0.67
2012	0.40	0.94	0.56	0.63	0.72	0.63
2013	0.35	0.93	0.45	0.58	0.67	0.57
2014	0.30	0.93	0.39	0.54	0.64	0.54
2015	0.25	0.92	0.33	0.50	0.61	0.50
2016	0.21	0.92	0.38	0.51	0.62	0.50
2017	0.27	0.92	0.41	0.54	0.64	0.53
2018	0.33	0.92	0.39	0.55	0.65	0.55
2019	0.36	0.84	0.28	0.49	0.57	0.49
AVERAGE	0.38	0.94	0.39	0.57	0.66	0.56

Table A 6: Economic Vulnerability Indices of Sierra Leone

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.40	0.93	0.44	0.59	0.68	0.59
2005	0.41	0.94	0.41	0.58	0.67	0.58
2006	0.38	0.87	0.45	0.57	0.65	0.57
2007	0.38	0.88	0.42	0.56	0.64	0.56
2008	0.37	0.81	0.54	0.57	0.64	0.57
2009	0.39	0.64	0.40	0.48	0.52	0.48
2010	0.53	0.58	0.33	0.48	0.50	0.48
2011	0.89	0.69	0.29	0.62	0.61	0.61
2012	0.86	0.73	0.37	0.66	0.65	0.65
2013	0.85	0.93	0.41	0.73	0.76	0.72
2014	0.84	0.91	0.50	0.75	0.77	0.74
2015	0.62	0.63	0.57	0.61	0.61	0.61
2016	0.61	0.70	0.48	0.60	0.62	0.60
2017	0.63	0.66	0.55	0.61	0.62	0.61
2018	0.61	0.74	0.47	0.61	0.63	0.60
2019	0.62	0.77	0.38	0.59	0.63	0.59
AVERAGE	0.59	0.78	0.44	0.60	0.64	0.60

Table A 7: Economic Vulnerability Indices of the WAMZ

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.49	0.93	0.34	0.59	0.67	0.58
2005	0.56	0.96	0.35	0.63	0.70	0.62
2006	0.46	0.95	0.41	0.61	0.69	0.60
2007	0.47	0.95	0.41	0.61	0.69	0.60
2008	0.49	0.95	0.37	0.60	0.68	0.60
2009	0.40	0.93	0.34	0.56	0.65	0.55
2010	0.44	0.92	0.25	0.54	0.62	0.53
2011	0.52	0.92	0.54	0.66	0.73	0.66
2012	0.45	0.92	0.50	0.62	0.70	0.62
2013	0.39	0.91	0.43	0.58	0.66	0.57
2014	0.35	0.91	0.41	0.55	0.65	0.55
2015	0.30	0.89	0.34	0.51	0.61	0.51
2016	0.29	0.88	0.35	0.51	0.61	0.51
2017	0.35	0.89	0.39	0.54	0.63	0.54
2018	0.39	0.89	0.39	0.56	0.64	0.56
2019	0.42	0.84	0.29	0.52	0.59	0.51
AVERAGE	0.42	0.91	0.38	0.57	0.66	0.57

Table A 8: Economic Vulnerability Indices of the WAMZ (Less Nigeria)

Period	Trade Openness Index (TOI)	Export Concentration Index (ECI)	Dependence on Strategic Imports Index (DSI)	Economic Vulnerability Indices (EVI)		
				EVI1	EVI2	EVI3
2004	0.83	0.56	0.41	0.60	0.57	0.59
2005	0.87	0.59	0.37	0.61	0.58	0.61
2006	0.70	0.56	0.42	0.56	0.55	0.56
2007	0.67	0.62	0.45	0.58	0.58	0.57
2008	0.70	0.65	0.38	0.58	0.58	0.57
2009	0.69	0.70	0.36	0.58	0.59	0.57
2010	0.72	0.72	0.38	0.61	0.62	0.60
2011	0.87	0.80	0.38	0.68	0.69	0.68
2012	0.91	0.80	0.35	0.69	0.69	0.68
2013	0.64	0.81	0.39	0.61	0.65	0.61
2014	0.67	0.81	0.46	0.65	0.68	0.64
2015	0.72	0.75	0.36	0.61	0.62	0.60
2016	0.71	0.79	0.30	0.60	0.63	0.59
2017	0.72	0.81	0.35	0.63	0.66	0.62
2018	0.70	0.80	0.39	0.63	0.66	0.63
2019	0.76	0.84	0.35	0.65	0.68	0.64
AVERAGE	0.74	0.73	0.38	0.62	0.63	0.61