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Macroeconomic Analysis of Export Diversification in Nigeria

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Martins Iyoboyi[1]

Abstract

In this paper, the Theil index was utilized to study the impact of macroeconomic variables on diversification in Nigeria for the period 1981-2015, using the bounds test approach to cointegration on data generated from secondary sources. Cointegration was found to exist between the economic diversification indicators and associated variables. We also found that capital formation, real effective exchange rate, domestic credit to private sector and foreign direct investment promote diversification. Government efforts in Nigeria should be geared towards diversifying the economy using oil revenue, promote foreign direct investment in the non-oil sector, provide fixed capital, encourage the flow of credit to the private sector, and implement a cautious exchange rate regime.

1. Introduction

Export diversification becomes imperative for Nigeria in order to improve its productive base to ensure diversified sources of revenue required for the country's development. Consequently, different policies have been adopted at various periods. For instance, before the Structural Adjustment Programme (SAP) was adopted in 1986, the policy of import substitution was implemented through quantitative restrictions and high import duties aimed at protecting local industries which produced import substitutes, in addition to

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import licensing strategies and tariffs during the period of the Second Development Plan (Central Bank of Nigeria, 2002).

A more restrictive trade regime came into force in 1982 when the Economic Stabilisation Act was promulgated. This resulted in increases in tariffs on certain commodities, and more stringent foreign exchange regulations until 1986, when the country introduced the Structural Adjustments Programme (SAP). The structural transformation of Nigeria was the focus of economic policy after SAP and efforts were geared towards shifting away from total dependence on oil. This period was marked by reforms in exchange rate regime, and the introduction of guided deregulation in 1995.

The National Economic Empowerment and Development Strategy (NEEDS) came into force in 2004, aimed at growing the economy from multiple sectors, and driven by privatization, deregulation and liberalization of key sectors of the economy. The global financial and economic crisis in late 2000 was particularly detrimental to the country's attempts at diversification. In particular, foreign exchange earnings and external reserves were adversely affected, and due to this, the manufacturing sector (a key element of the diversification drive) could not help improve the country's export basket mix (Obadan, 2009; Mordi, Englama, & Adebusuyi, 2010; Central Bank of Nigeria, 2014).

Despite the series of economic measures adopted, the Nigerian economy is still characterised by the dominance of oil production, and this continues to make the country vulnerable to global oil price shocks.

In Figure 1, how the Nigerian economy has performed in terms of export diversification and macroeconomic indicators is presented.

Figure 1: Panel A: Export Diversification Indicators
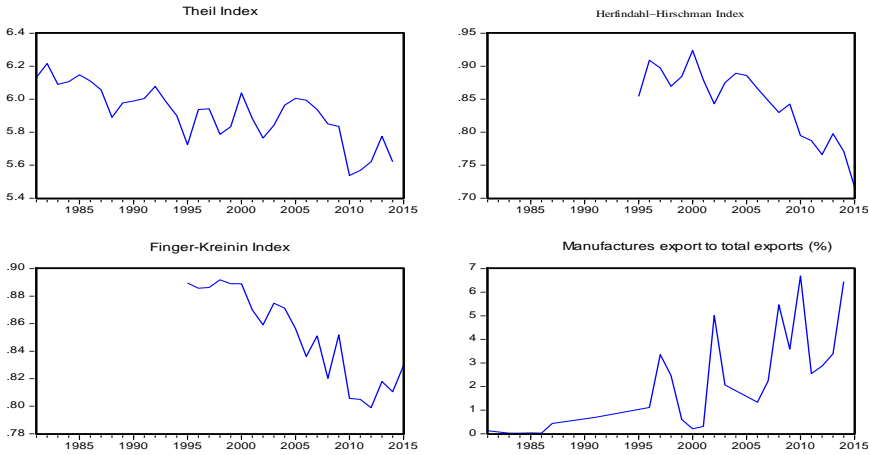
Figure 1: Panel B: Macroeconomic Indicators
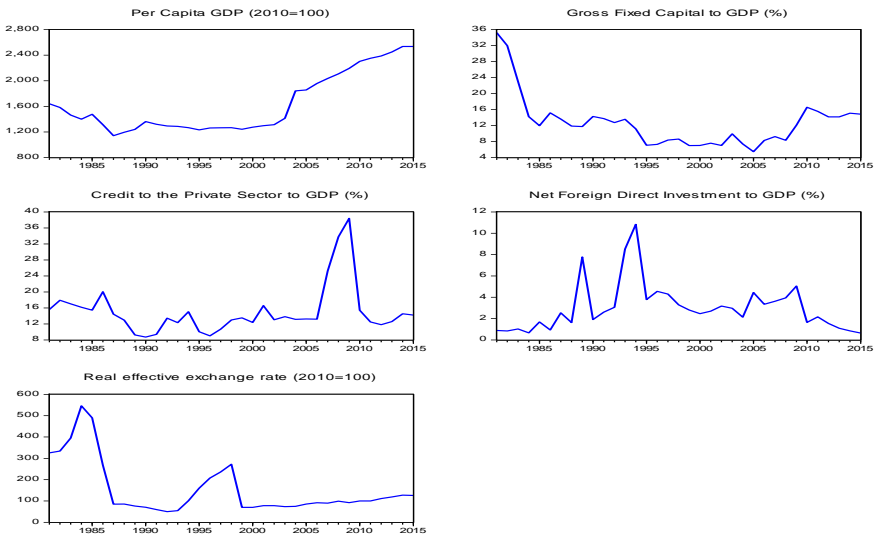
Figure 1. Export Diversification and Macroeconomic indicators in Nigeria, 1981-2015. Developed from data from World Development Indicators, by World Bank, 2017, Washington DC; United Nations Conference on Trade and Development (UNCTAD), 2017, unctad.org/en/Pages/statistics.aspx; International Financial Statistics, by International Monetary Fund, 2017, www.econdata.com/databases/imf.../ifs/

An examination of the Theil Index in Panel A indicates that there has not been significant export diversification in Nigeria. From 1981 to 2015, the index ranged roughly between 5 and 6, an

indication of relatively low export diversification. That the productive base of the Nigerian economy was relatively non-diversified from 1995 to 2015 is demonstrated by the Herfindahl–Hirschman and Finger-Kreinin indices respectively. Although their measurements differ, they are however interpreted the same way. Both indices range from 0 to 1, where 1 indicates absence of diversification or perfect concentration, and 0 indicates full diversification. From 1995 to 2015, it can be observed that the indices are in each case close to 1, an indication of export concentration.

The data on manufacturing exports relative to total exports are particularly instructive. A good indicator of a country's diversification profile (i.e. structural change from agriculture to industry) is provided by how much of its exports are made up of manufactured goods. In 1981, only a paltry 0.13% of the country's total exports were manufactured goods. This did not significantly change two decades later (i.e. 2000) where only 0.21% was recorded. Even as of 2014 when the economy had exhibited growing symptoms of recession, only 6.45% of Nigeria's exports consisted of manufactured commodities.

Figure 2: Relative composition of total exports (1981 to 2015)
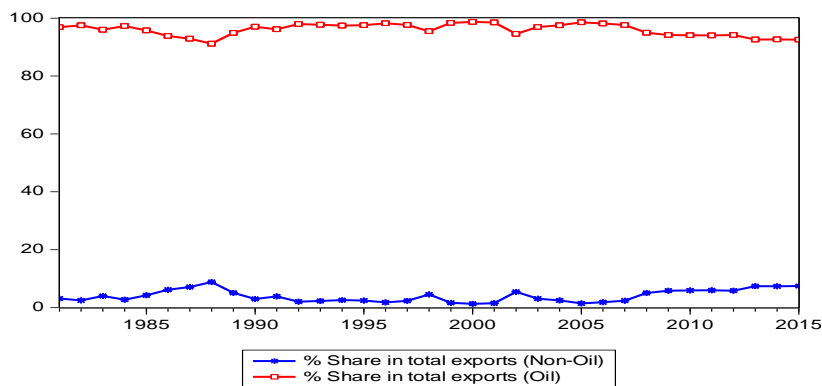
Source: Developed from Statistical Bulletin, by Central Bank of Nigeria, 2016, Abuja, Nigeria: Central Bank of Nigeria.

Figure 2 shows that Nigeria's exports have been dominated by oil from 1981 to 2015 and at no time did non-oil exports exceed it during the period. On the average, the share of oil to total exports

in Nigeria from 1981 to 2015 is 96% compared to non-oil exports which stood at 4%.

The kernel of the foregoing is that export diversification in Nigeria from 1981 to 2015 has not been successful, due partly to the macroeconomic environment. Export diversification as conceptualised in the paper follows the view expressed by Samen (2010), in which the aim of export diversification is to expand a country's export's basket so as to lessen the risks (both economic and political) associated with dependence on a few primary commodity exports.

To this end, this paper analyses export diversification in Nigeria at the margins, an area which has not been studied on the Nigerian economy. Following the introduction, the paper has the following configuration. In section 2, the extant literature is reviewed. Section 3 is on the methodology deployed. We present and discuss the empirical findings in section 4, while in section 5, the paper is concluded.

2. Literature Review
2.1. Theoretical Underpinning

Export diversification as a concept is rooted in the modern portfolio selection theory. The aim of export diversification is to lessen a country's over-reliance on a particular product or a limited range of non-tradable goods which were mostly exported before processing (Salomon, 2010). According to Jones (2002), diversification "normally refers to exports, and specifically to policies aiming to reduce the dependence on a limited number of export commodities that may be subject to price and volume fluctuations or secular declines" (p. 360).

Export diversification is the alteration in a country's export composition, product mix or destination (Ali, Alwang, & Siegel, 1991). Export diversification is also viewed as the deliberate effort by a country to increase its export portfolio. In the light of this, some authors consider the concept as embracive of how production is spread over several sectors (Berthelemy & Chauvin, 2000). Export diversification can be horizontal and vertical. Horizontal diversification takes place among products of the same sector by

adding different products in the export basket. Vertical diversification connotes the change in the structure of export from primary to manufactured goods (Cramer, 1999). Reference has also been made to diagonal diversification. It involves a change from imported input into the manufacturing and services sectors.

It needs to be noted that the concept of export diversification is perceived in the literature in terms of how it is measured. How well concentrated a given exports basket is in terms of a product, is used to explain the degree of a country's export diversification. Generally, concentration indicators quantify changes in the structure of exports at a given level of aggregation. If the greater part of earnings is generated from a small range of export commodities, it indicates export concentration. On the other hand, if export earnings are more evenly spread over a given range of export commodities, it indicates that the country's exports are diversified. Thus, in the literature, concentration and inequality indices are used to assess the magnitude of export diversification.

The concept of export diversification is as old as the discipline of economics itself, with variants of echoes reverberating in the works of classical economists such as Smith (1776) and Ricardo (1817); through neoclassical to international trade models exampled by Heckscher-Ohlin-Samuelson, all of whom postulated that production and export by countries should be based on their advantages (absolute and comparative).

However, it was argued vigorously that the traditional view of specialization of exporting products would do little to raise the prospects of developing economies (Prebisch, 1950; Singer, 1950). According to them, if developing countries specialize in exporting raw materials and importing manufactured products from the developed countries, it merely raises the dependence of developing countries on consumer and manufacturing commodities from developed countries. This is particularly instructive given that the demand for primary products is income elastic so that by diversifying their exports, developing countries can reduce the risk of commodity price shocks, instabilities and terms of trade. For developing countries, therefore, diversification has become a mantra for economic policy (Brainard & Cooper, 1968). Thus, due to

structural changes in the global economy, resulting in differences from gains in trade relations between exporters of manufactured and primary goods, the inequality of per capita income between these two economies will rise, so that the dismal economic conditions of developing countries is a direct result of their propensity to export primary products. Thus, the Prebisch-Singer thesis continues to be of relevance to the developing world in general and Nigeria in particular.

2.2. Empirical Literature

Growth/Development and Export Diversification: Studies on the relationship and impact of macroeconomic variables on export diversification have been conducted. In terms of economic growth, different results have been reported. For example, Sachs and Warner (1995) and Maloney (2002), found that export diversification and economic growth are inversely related. Bebczuk and Berrettoni (2006) found that economic growth is positively related to export diversification. In a study on the less developed countries, Papagiorgiou and Spatafora (2012) found that higher growth is associated with greater diversification.

A major narrative in the literature is that the more developed a country is, the greater is its capacity to diversify. Consequently, a rising income per capita would tend to have a positive impact on export diversification (Acemoglu & Zilibotti, 1997). This is because a rise in the level of development promotes a country's production mix, and when this is coupled with improved quality in human capital and institutions, the heterogeneity of production is enhanced (Fiorillo, 2001). It needs to be noted that in the development trajectory, diversification can be achieved up to a stage, after which the country experiences re-concentration (Imbs & Wacziarg, 2003).

**A Flow of FDI and Export Diversification*:* The empirics of the FDI-export diversification link are mixed. While Bebeczuk and Berrettoni (2006) for instance found no significant relationship between export diversification and FDI, Tadesse and Shukralla (2013) found a positive relationship, while Kamuganga (2012) found a negative relationship.

Capital Stock and Export Diversification: According to Habiyaremye and Zeisemer (2006), diversification is made easier when a larger proportion of a country's resources is invested in capital formation. Thus infrastructure can increase economic growth, and when this is combined with new access to markets, exports are stimulated (Stiglitz, 2006).

Real Exchange Rate and Export Diversification: Real exchange depreciation and trade reforms were found to have a positive effect on export diversification in Chile (Gutierrez de Pineres & Ferrantino, 1997). Sachs and Warner (2001) argued that in natural resource-based economies, real exchange rate depreciation can have adverse impact on diversification, in that if a country appreciates its currency, this would raise the price level, which will consequently contract profits in traded manufactures that use non-traded products as inputs and which are then sold in the international market. Thus, the empirical results are mixed.

The different empirical findings are by no means surprising, given the diversity of economies studied, their stages of development, the sample size employed, the econometric techniques deployed and other research nuances.

3. Methodology

3.1. Data Sources and Description of variables

The data are from World Bank (2017) and International Monetary Fund databases (IMF, 2017). The study covers the period from 1981 to 2015. The choice of variables is underpinned on the factors that determine export diversification in the literature. For Nigeria in particular, the introduction of SAP in the mid-1980s was a major attempt at export diversification, necessitating the focus of the study on the period from 1981 to 2015.

The period investigated is underscored by the increasing call for diversification in the developing world from the 1980s, occasioned by worsening international primary commodity prices and the failure of traditional economic policies as orchestrated by international financial institutions (especially the World Bank and the IMF).

3.2. Measurement of Export diversification

Export diversification is measured in several ways in the empirical literature. However, the concentration and inequality indices (i.e. Herfindhal, Gini and Theil indices) are the most widely used when measuring export diversification.

In this paper, we used the Theil Index (TI), due to Theil (1972). A major advantage of the Theil index over alternative measures of diversification is that it can be decomposed into intensive and extensive margins. Both intensive and extensive margins are investigated in this paper.

3.3. The Model and procedure for Estimation

The literature tends to depict the determinants of exports diversification (when the emphasis is on economic development) via macroeconomic variables. On the basis of this, three models are specified as follows:

$$TI_t = \beta_0 + \beta_1 RGDP_t + \beta_2 FDI_t + \beta_3 GFCF_t + \beta_4 CPS_t + \beta_5 REER_t + \beta_6 OPN_t + \mu \quad (1)$$

$$TW_t = \beta_0 + \beta_1 RGDP_t + \beta_2 FDI_t + \beta_3 GFCF_t + \beta_4 CPS_t + \beta_5 REER_t + \beta_6 OPN_t + \mu \quad (2)$$

$$TB_t = \beta_0 + \beta_1 RGDP_t + \beta_2 FDI_t + \beta_3 GFCF_t + \beta_4 CPS_t + \beta_5 REER_t + \beta_6 OPN_t + \mu \quad (3)$$

where β_0 is the intercept term, t is time, and μ is the stochastic error term.

The variables used in the study and sources of data are presented in Table 1.

Table 1: Variable Descriptions

Variables	Definition	Source
TI	Theil index. The index is the sum of measures of diversity within sectors (horizontal diversity or intensive margin) and of diversity across sectors (vertical diversity or extensive margin). Higher values of the Theil index denote higher degrees of concentration. The reverse implies greater diversification.	IFS – IMF

Variables	Definition	Source
TW	Theil index for within industry (intensive margin)	IFS – IMF
TB	Theil index for between industry (extensive margin)	IFS – IMF
RGDP	Real GDP per capita (2000=100)	WDI - World Bank
FDI	Net foreign direct investment (% of GDP)	WDI - World Bank
GFCF	Gross fixed capital formation (% of GDP)	WDI - World Bank
CPS	Credit to private sector	WDI - World Bank
REER	Real effective exchange rate (2000=100)	WDI - World Bank
OPN	Openness (Total trade as % of GDP)	WDI - World Bank

This study first explored the stochastic properties of the time series variables used in the study. The test for unit root was undertaken in the paper using the Ng and Perron (2001) framework, in preference to the ADF and PP unit root tests, which have been found to suffer potentially from severe problems of size distortion and finite sample power, problems that the Ng and Perron (2001) tests were developed to deal with. Due to the defects of the traditional unit root frameworks, which do not reflect structural breaks, we considered the Perron and Vogelsang (1992) innovational outlier model (which represents a change occurring gradually).

To estimate the specified models in the study, the Autoregressive Distributed Lag (hereafter ARDL) Model is adopted. The ARDL model is adopted because of its reparameterization property, which generates the error-correction model.

To empirically investigate whether export diversification and macroeconomic variables have a long-run equilibrium, the ARDL test for cointegration (Pesaran, Shin, & Smith, 2001) was adopted. It is preferred to the traditional approaches (for example those of Engle & Granger, 1987; Johansen, 1988, 1996; Phillips & Hansen, 1990; Johansen & Juselius, 1990), which require that the series investigated are non-stationary. Moreover, the results do not correctly take account of small sample properties. The ARDL framework can be applied when the regressors are all I(0), all I(1) or are mixed. Moreover, it is robust for small sample sizes. Post-estimation diagnostics include the goodness-of-fit, the joint significance of regressors, the serial correlation, tests for heteroskedasticity, the normality of residuals, specification error and stability tests respectively.

The ARDL specification for equation 1(the specifications for equations 2 and 3 are straightforward and are not shown, to conserve space) is as follows:

$$LogTI_t = \beta_0 + \beta_1 LogTI_{t-1} + \beta_2 LogRGDP_t + \beta_3 LogFDI_t + \beta_4 LogGFCF_t +$$
$$\beta_5 LogCPS_t + \beta_6 LogREER_t + \beta_7 LogOPN_t + \mu_t \tag{4}$$

where the variables are as earlier defined and Log denotes natural logarithm. Equation (5) is presented in logged difference form as follows:

$$\Delta Log(TI)_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \Delta Log(TI)_{t-i} + \sum_{i=0}^{k} \beta_{2i} Log \Delta RGDP_{t-i} + \sum_{i=0}^{k} \beta_{3i} Log \Delta FDI_{t-i}$$
$$+ \sum_{i=0}^{k} \beta_{4i} \Delta LogGFCF_{t-i} + \sum_{i=0}^{k} \beta_{5i} \Delta LogCPS_{t-i} + \sum_{i=0}^{k} \beta_{6i} \Delta LogREER_{t-i} +$$
$$\sum_{i=0}^{k} \beta_{7i} \Delta LogOPN_{t-i} + \mu_t \tag{5}$$

where Δ denotes the first-difference and k the lag length from Equation 5, we specify the unrestricted error correction model as follows:

$$\Delta Log(TI)_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i}\Delta Log(TI)_{t-i} + \sum_{i=0}^{k} \beta_{2i}Log\Delta RGDP_{t-i} + \sum_{i=0}^{k} \beta_{3i}\Delta LogFDI_{t-i}$$

$$+ \sum_{i=0}^{k} \beta_{4i}\Delta LogGFCF_{t-i} + \sum_{i=0}^{k} \beta_{5i}\Delta LogCPS_{t-i} + \sum_{i=0}^{k} \beta_{6i}\Delta LogREER_{t-i} + \sum_{i=0}^{k} \beta_{7i}\Delta LogOPN_{t-i}$$

$$+ \sum_{i=0}^{k} \psi_1 LogTI_{t-1} + \sum_{i=0}^{k} \psi_2 LogRGDP_{t-1} + \psi_3 FDI_{t-1} + \psi_4 LogGFCF_{t-1} + \psi_5 LogCPS_{t-1}$$

$$+ \psi_6 LogREER_{t-1} + \psi_7 LogOPN_{t-1} + ECM_{t-1} + \mu_t \qquad\qquad (6)$$

where β_i : i = 1, 2,…,7 are the dynamic short-run coefficients and ψ_i : i = 1, 2,…, 7 are the long-run multipliers. The ECM is the speed of adjustment.

To find out the existence or otherwise of a causal link between economic diversification and macroeconomic variables, the Toda and Yamamoto (1995) (TY hereafter) causality test was employed. The TY framework is based on an augmented VAR model, with a modified Wald test statistic. A major advantage of this approach to causality is that the initial test for cointegration of the series is not necessary. Compared to the conventional Granger causality, the TY framework possesses higher power for series that exhibit different levels of integration. In this way, incorrect specification and spurious regression are avoided.

4. Empirical Results

4.1. Results of Unit root tests

The results of the tests for stationarity are presented in Table 2.

Table 2. Results of Unit Root Tests without Structural Breaks
Panel A: (Intercept Specification)

Variables	MZa	MZt	MSB	MPT
TI Level	-5.222	-1.358	0.251*	5.310*
First Difference	-31.013*	-3.875**	0.125	0.982
T$_W$ Level	-5.192	-1.338	0.258*	5.364*
First Difference	-15.599*	-2.692*	0.173	1.941
T$_B$ Level	-10.846**	-2.310**	0.214*	2.293*
First Difference	-26.755	-3.653	0.137	0.930
RGDP Level	0.261	0.173	0.662*	29.812*
First Difference	-14.859*	-2.7254*	0.1835	1.641
FDI Level	-7.322***	-1.842***	0.252*	3.599*
First Difference	-12.273	-2.469	0.201	2.026
GFCF Level	-2.171	-1.035	0.476*	11.221*
First Difference	-6.469***	-1.798***	0.278	3.792

Table 2: Results of Unit root tests without Structural Breaks
Panel A: (Intercept Specification) (Continued)

Variables	MZa	MZt	MSB	MPT
CPS Level	-9.398***	-2.167**	0.231*	2.609*
First Difference	-701.522	-18.728	0.027	0.035
REER Level	-3.832	-1.369	0.358*	6.402*
First Difference	-15.474*	-2.782*	0.171	1.584
OPN Level	-5.801	-1.442	0.2485*	4.953*
First Difference	-2.371	-1.008	0.4235*	9.782*

Panel B: (Constant, Linear Trend specification)

Variables	MZa	MZt	MSB	MPT
TI Level	-13.591	-2.588	0.190*	6.809*
First Difference	-31.938*	-3.971*	0.124	2.993
T$_W$ Level	-13.484	-2.561	0.191*	6.908*
First Difference	-28.678*	-3.784*	0.132	3.195
T$_B$ Level	-14.599***	-2.666***	0.183*	6.449*
First Difference	-28.678	-3.784	0.132	3.195
RGDP Level	-1.623	-0.791	0.488*	46.533*
First Difference	-16.325***	-2.827***	0.173	5.762
FDI Level	-8.926	-1.929	0.216*	10.852*
First Difference	-11.171	-2.363	0.211	8.157
GFCF Level	-3.509	-1.179	0.336*	23.506*
First Difference	-45.151*	-4.747*	0.105	2.043

Panel B: (Constant, Linear Trend specification) Continued

Variables	MZa	MZt	MSB	MPT
CPS Level	-9.573	-2.187	0.228*	9.525*
First Difference	-7488.570*	-61.191*	0.008	0.012
REER Level	-5.610	-1.623	0.289*	16.113*
First Difference	-15.573***	-2.790***	0.179	5.855
OPN Level	-5.808	-1.434	0.247*	15.222*
First Difference	-106.896*	-7.291*	0.068	0.923

Notes: *, ** and *** denote that the null hypothesis is rejected at 1%, 5% and 10% significance levels.
Source: Computed by the author

Generally, the variables tend to be of mixed order of integration. The results of the MZa and MZt in Panel A of Table 2 tend to indicate that the variables are not stationary, while in the case of MSB and MPT, the variables are stationary. The same is true in

the results in Panel B. The results are therefore consistent. No variable was found to be integrated of order 2, making plausible the use of the autoregressive distributed lag model.

In Table 3, the unit root test results are presented, when endogenous structural breaks are considered.

Table 3: Unit Root Test Results with Structural Breaks (Innovational Outlier Model)

Variables	Intercept		Intercept and Trend	
	t-stat.	Breakpoint	t-stat.	Breakpoint
TI Level First Difference	-3.899 -6.626*	2000	-5.127 -6.359*	2000
T$_W$ Level First Difference	-4.095 -6.450*	2000	-5.184 -6.197*	2000
T$_B$ Level First Difference	-4.145 -8.478*	2008	-6.851* -7.911	1997
RGDP Level First Difference	-4.700** -6.554	2003	-4.302 -12.569*	2003
FDI Level First Difference	-3.292 -11.356*	1995	-4.856 -11.429*	1995
GFCF Level First Difference	-3.639 -6.289*	2003	-6.572* -6.899	2003
CPS Level First Difference	-4.317*** -5.812	2006	-5.544** -5.659	2006
REER Level First Difference	-5.119* -5.280	1998	-4.373 -13.849*	1998
OPN Level First Difference	-3.101 -7.209*	2014	-3.785 -6.368*	2005

Note: *, ** and *** imply significance at 1%, 5% and 10% levels respectively. Source: Computed by the author

The null hypothesis is accepted for TI, FDI, GCFC and OPN and rejected for RGDP, CPS and REER. The break dates are also consistent with the exemption of openness where 2004 is reported for the specification with intercept and 2014 in the case of intercept and trend.

4.2. Cointegration Test Result

The cointegration test results are presented in Table 4.

Table 4: Cointegration Test Results

	Model 1		**Model 2**		**Model 3**		
	Total		**Intensive margin**		**Extensive margin**		
Test Statistic	Value	k	Test Statistic	Value	Test Statistic	Value	k
F-statistic	7.91	6	F-statistic	6.46	F-statistic	11.83	6

Source: Computed by the author

The computed F-statistics (7.91, 6.46 and 11.83) exceed the critical values (see Appendix 1 for the critical values). The results suggest that economic diversification (TI, T_W and T_B) and associated variables used in the study have a long-run equilibrium relationship.

The estimated cointegrating and long-run coefficients are presented in Table 5.

Table 5: Estimated Cointegrating and Long Run Coefficients

Dependent Variables: Model 1 (TI); Model 2 (T_W); Model 3 (T_B)					
Cointegrating Form					
Model 1		**Model 2**		**Model 3**	
Total		**Intensive Margin**		**Extensive Margin**	
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
Δ **RGDP**	0.118*	ΔRGDP	0.135*	Δ RGDP	-0.023
Δ **RGDP(-1)**	0.136*	Δ RGDP(-1)	0.154*	Δ RGDP(-1)	0.024
Δ **RGDP(-2)**	0.219*	Δ RGDP(-2)	0.256*	Δ RGDP(-2)	0.044**
Δ **FDI**	0.009*	Δ FDI	0.010*	Δ FDI	-0.002
Δ **GFCF**	-0.044*	Δ GFCF	-0.047*	Δ FDI(-1)	0.017*
Δ **GFCF(-1)**	-0.081*	Δ GFCF(-1)	-0.088*	Δ FDI(-2)	0.007**
Δ **GFCF(-2)**	-0.080*	Δ GFCF(-2)	-0.086*	Δ GFCF	-0.042*

Dependent Variables: Model 1 (TI); Model 2 (TW); Model 3 (TB)					
Cointegrating Form					
Model 1		**Model 2**		**Model 3**	
Total		**Intensive Margin**		**Extensive Margin**	
Variable	**Coefficient**	**Variable**	**Coefficient**	**Variable**	**Coefficient**
Δ CPS(-1)	-0.018*	Δ CPS	0.062**	Δ GFCF(-1)	-0.026*
Δ REER	-0.008**	Δ CPS(-1)	-0.017	Δ GFCF(-2)	-0.060*
Δ REER(-1)	-0.029*	Δ REER)	-0.006*	Δ CPS(-1)	-0.037*
Δ OPN	0.024*	Δ REER(-1)	-0.034**	Δ CPS(-2)	-0.014**
Δ OPN(-1)	0.019**	Δ OPN	0.026**	Δ REER	-0.009**
Δ OPN(-2)	0.033*	Δ OPN(-1)	0.024**	Δ REER(-1)	-0.001
ECM (-1)	-0.918*	Δ OPN(-2)	0.039*	Δ OPN	0.010***
		ECM (-1)	-0.947*	ECM (-1)	-1.374*

Long run Coefficients			
	Total	**Intensive Margin**	**Extensive Margin**
RGDP	-0.072*	-0.083*	-0.009
FDI	0.000	0.001	-0.019*
GFCF	0.058*	0.064*	-0.001
CPS	0.049*	0.053*	0.025**
REER	0.001	0.004	-0.013**
OPN	0.023	0.022	0.009
C	1.924*	1.830*	-0.208

Diagnostics			
	Total	**Intensive Margin**	**Extensive Margin**
R^2	0.95	0.97	0.95
Adj. R^2	0.81	0.88	0.80
S.E	0.009	0.010	0.007
F-statistic	6.924 (0.005)	11.059 (0.001)	6.506 (0.005)
JB	1.989 (0.369)	1.936 (0.379)	1.660 (0.436)
BG	6.697 (0.289)	5.624 (0.314)	2.619 (0.187)

Diagnostics			
	Total	**Intensive Margin**	**Extensive Margin**
ARCH (χ^2)	0.336 (0.562)	0.262 (0.609)	0.781 (0.377)
RESET	0.097 (0.925)	0.074 (0.943)	1.999 (0.216)

Note: *, ** and *** indicate 1%, 5% and 10% significance. SER: Standard error of regression; JB: Jarque-Bera test for residual normality; BG: Breusch-Godfrey Serial Correlation LM Test; ARCH: Engle's test for conditional heteroskedasticity; RESET: Residual error specification test. For the diagnostics, probability values are in parenthesis.
Source: Computed by the author

5. Discussion

5.1. Analysis of the Short-run Results

Real Income: All the coefficients of RGDP are positively related to diversification and statistically significant. This encourages concentration and reduces diversification. The implication of the results is that the growth in Nigeria over the years has not led to increased diversification of the economy. Thus, growth is not diversification-inducing. In the light of this, Nigeria has failed to use the opportunities of growth to widen its export basket mix. It can be argued that Nigeria's oil revenues generated since the 1970s with the concomitant periodic windfalls could have been channelled towards improving the country's production base, but this has not happened.

Foreign Direct Investment: FDI has a direct relationship with diversification and it is significant at 1%. Higher net FDI inflows tend to promote concentration and reduce diversification for Nigeria. This is hardly surprising, given that net FDI inflows as a proportion of GDP have been relatively low for Nigeria within the period of investigation. Consequently, the direction of FDI flows has not encouraged diversification in Nigeria.

Gross Fixed Capital Formation: The coefficients of GFCF are inversely associated with diversification index. The results are statistically significant at 1%, implying that higher values of gross fixed capital formation are associated with greater diversification. Thus, export diversification can be improved given the country's improved fixed capital formation.

Credit to Private Sector: CPS and diversification are negatively related and statistically significant for total and extensive margins. This tends to promote diversification. Given the imperatives of the private sector in a capitalist market economy and its growth, income and employment generating capacity, it is clear that promoting higher private sector credit can be a trusted channel for diversifying the economy. For the intensive margin, the coefficient of private sector credit is positive and statistically significant, an indication of export concentration.

Real Effective Exchange Rate: REER and diversification have an indirect relationship and statistically significant, for total, intensive and extensive margins respectively. Real exchange rate overvaluation is expected to adversely affect export diversification. This is because when exchange rate appreciates, it leads to a fall in both the profitability of exports, including the number of exporters. Real exchange rate depreciation is required when a country is productive. It can be said, however, that Nigeria has not fully taken advantage of exchange rate depreciation over the years to improve its export mix and capacity.

Openness: All the coefficients of OPN (up to 2 lags) are positively associated with diversification and statistically significant, indicating that openness tends to promote concentration and reduce diversification. This is not surprising in that the Nigerian economy is mono-cultural and increased oil dominance has done very little to reduce the non-oil composition of exports for the country.

An examination of Nigeria's export composition within the period of investigation indicates the continuous dominance of oil exports, leading to increasing difficulties at diversifying the economy away from oil. In essence, the trade openness has not helped both intensive and extensive margins in Nigeria.

The ECM coefficients are negative and significant. The sign of the ECM coefficients validates the results of cointegration between respective export diversification indices and associated variables used in the study. The speed of adjustment in each case is high so that as much as 92% deviation from equilibrium is restored in the subsequent period (in the case of total Theil), 95% (in the case of intensive margin) and is overcompensated by 37% (in the case of

extensive margin). Narayan and Smyth (2006) have reported that if the coefficient of the lagged error correction term is between 1 and 2 in absolute terms, the fluctuations about the equilibrium path are dampened. Similar ECM coefficient has been reported by Loayza and Ranciere (2005).

The implication of this result is that rather than a monotonic convergence to the equilibrium path directly, there is fluctuation of the error correction process around the long-run value in a dampening way, so that convergence to the equilibrium path is rapid, once the process is complete. This argument is plausible given that the stability conditions are satisfied as indicated by the residual error specification test and the CUSUM and CUSUM Squares tests respectively.

A diagnostic exploration of the estimated models indicates that variations of about 81%, 88%, and 80% (in the models estimated respectively) in export diversification are explained by real income, foreign direct investment, gross fixed capital formation, private sector credit, real effective exchange rate and openness, all of which are jointly significant as adjudged by the F-statistics and their associated p-values.

The Jaque-Bera (JB) test statistics are not statistically significant, an indication of normally distributed residuals. The models are free from serial correlations based on the Breusch-Godfrey (BG) statistics. The null of homoskedasticity is not rejected as shown by the non-significant ARCH test results.

The estimated models are free from specification error (the null of specification bias is rejected in each of the RESET test statistics). The regressors do not suffer from multicollinearity as evident from the pair-wise correlation coefficients and the variance inflation factors (see appendix D).

5.2. Analysis of the Long-run Results

Examinations of the coefficients, in the long run, indicate that RGDP has an inverse relationship with diversification index and statistically significant at 1% for total and intensive margins, and not significant for extensive margin. Thus real income (economic development) tends to promote diversification.

Foreign direct investment tends to promote diversification at the extensive margin. Gross fixed capital formation is associated with greater concentration at the total and intensive margin and is statistically significant. Moreover, it is associated with greater diversification at the extensive margin, although it is not significant.

Also, credit to the private sector and diversification have a positive relationship and statistically significant. This tends to discourage diversification and promotes concentration. Real effective exchange rate tends to promote diversification at the extensive margin while openness has a direct association with export diversification but not significant.

5.3. Tests of stability of estimated coefficients

The results of the stability tests are presented in Figures 1B through 3B. A visual examination shows that both plots in Figures 1B through 3B do not cross the 5 per cent critical lines, an indication that the estimated coefficients are stable within the investigated period. Policy recommendations based on the empirical results would be reliable.

5.4. Causality Test

The TY causality test results (restricted to Total Theil, due to space) are presented in Table 6. The preliminary conditions for the TY test are satisfied as shown in appendix 3. Consequently, 1 lag was the preferred option (see Table 1C in the appendix). There is no autocorrelation even up to 5 lags (see Table 2C of the appendix). The VAR is also stable (see Figure 1C of the appendix)

From Table 6, causality is from RGDP, FDI, GFCF and CPS to TI (Panel A), and from TI to REER (Panel B). Bidirectional causality exists between TI and CPS (Panels A and B results combined). The null hypothesis of no causality from all the variables to TI is rejected as indicated by the significant (at 1%) chi-square statistic in Panel A. The implication of the causality results is that export diversification can be reasonably predicted given the information on all the regressors employed in the study.

Table 6: Causality Test Results

Panel A: Causality from other variables to Economic Diversification (TI)

Dependent variable: TI			
Excluded	Chi-sq	df	Prob.
RGDP	10.396	1	0.001*
FDI	7.429	1	0.006*
GFCF	3.664	1	0.056**
CPS	3.339	1	0.068**
REER	0.748	1	0.387
OPN	2.524	1	0.112
All	30.769	6	0.000*

*Significant at 5%. ** Significant at 10%

Panel B: Causality from Economic Diversification (TI) to other Variable

Independent variable: TI			
Excluded	Chi-sq	df	Prob.
RGDP	0.002	1	0.965
FDI	0.009	1	0.926
GFCF	0.258	1	0.612
CPS	4.533	1	0.033*
REER	5.694	1	0.017*
OPN	4.34E-05	1	0.995

Source: Computed by the author *Significant at 5%.

6. Conclusions

The impact of macroeconomic variables on diversification in Nigeria from 1981 to 2015 was investigated in this paper. Secondary data were used. Diversification was proxied by the Theil index, decomposed into intensive and extensive margins.

Cointegration was found between the economic diversification indicators and the macroeconomic variables used in the study. In the short run, growth, foreign direct investment and openness are positively related to diversification index and hence promote export concentration. Other findings are that fixed capital formation and real effective are inversely related to diversification index and thus encourage export diversification. Credit to the private sector was found to be linked to diversification for total and extensive margins, and to concentration for intensive margin.

In the long run, real income was found to promote diversification at the intensive margin; foreign direct investment and real effective exchange rate induce diversification at the extensive margin. Gross fixed capital formation is linked to export concentration at the intensive margin; Credit to private sector promotes concentration. Openness was found to be associated with export concentration but not statistically significant.

Given that an economy will tend to experience concentration at the initial stage of development, and then diversification up to a stage in the process of development, after which it will become more specific (i.e. re-concentration) at higher levels of development, as evidenced by nearly all the countries in the western world, it follows that recommendations that encourage diversification for a developing economy are imperative.

From the foregoing, we have made the following recommendations:

(i)   Economic growth should be towards diversifying the economy. The gains of growth (such as oil revenue) should be deliberately used to support Nigeria's economic diversification.

(ii)   Policies that promote FDI in the non-oil sector of the economy should be implemented, with a view to discouraging export concentration in the short run.

(iii)   Fixed capital in all its ramifications should be provided. The role of good transport (land air and rail) network is emphasized. Higher budgetary allocation to capital expenditure is desirable.

(iv)   Policies that promote credit to the private sector are recommended. Government agencies in Nigeria such as SMEDAN and BOI should be strengthened, given the role they can play in self-employment creation.

(v)   An exchange rate regime that promotes competition is desirable, given its international advantage. However, this can only apply to a situation where the real sector of the economy is strengthened in order to have a greater proportion of non-oil in the country's export basket.

(vi)   Openness that seeks to promote export concentration as is the case with Nigeria (in terms of crude oil exports) should be discouraged. What can be produced locally should not be imported in order to conserve foreign exchange, reduce unemployment, and improve the value of the local currency.

Findings in this study have important policy implications for Nigeria. First, without a deliberate attempt to utilize the gains of growth arising mainly from oil revenue to diversify into the non-oil sector of the economy, will spell doom, partly experienced from increasing exogenous shocks to oil price volatility.

Second, the macroeconomic environment should be made to attract improved domestic and foreign investment, encourage the competitiveness of non-oil exports, improve the efficiency of the financial sector and above all encourage the local production of goods. Lastly, governments at all tiers must take up diversification as a key objective in their short and medium-term economic frameworks.

The paper is open for further exploration in the future. An area that this work can be extended in the future includes using cross-sectional and panel data to examine export diversification at the margins. Other export diversification indicators, different from those used in the present study can also been utilized.

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Appendix- A

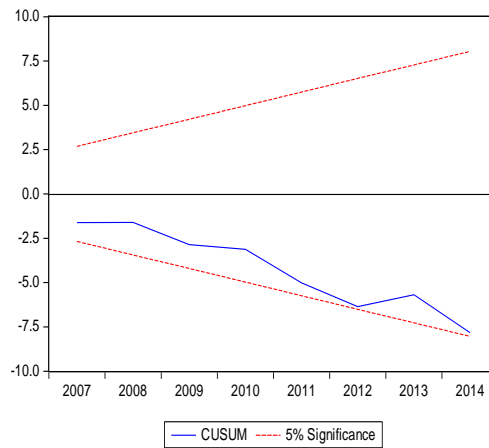## Table 1A: Critical Values of the Cointegration Test

| Significance | Critical Value Bounds | |
	I0 Bound	I1 Bound
10%	1.99	2.94
5%	2.27	3.28
1%	2.88	3.99

Source: Pesaran et al. (2001)

Appendix- B Stability Test Results

Figure 1B: Model 1

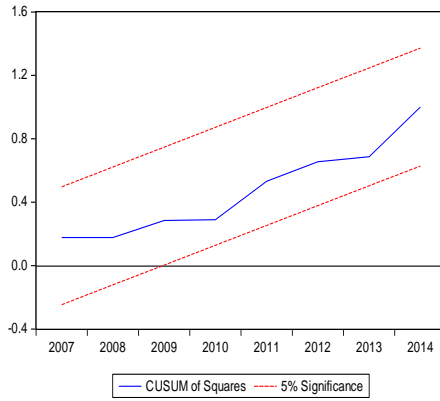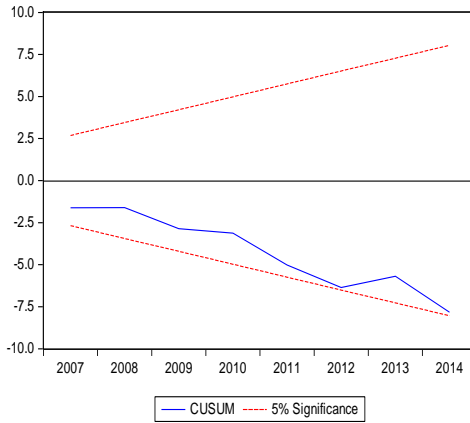### Panel 1. CUSUM Test

Panel 2. CUSUM Squares Test

CUSUM of Squares — — — 5% Significance

Figure 2B: Model 1

Panel 1. CUSUM Test

CUSUM — — — 5% Significance

Panel 2. CUSUM Squares Test

CUSUM of Squares — — — 5% Significance

Figure 3B: Model 3

Panel 1. CUSUM Test

CUSUM —— 5% Significance -----

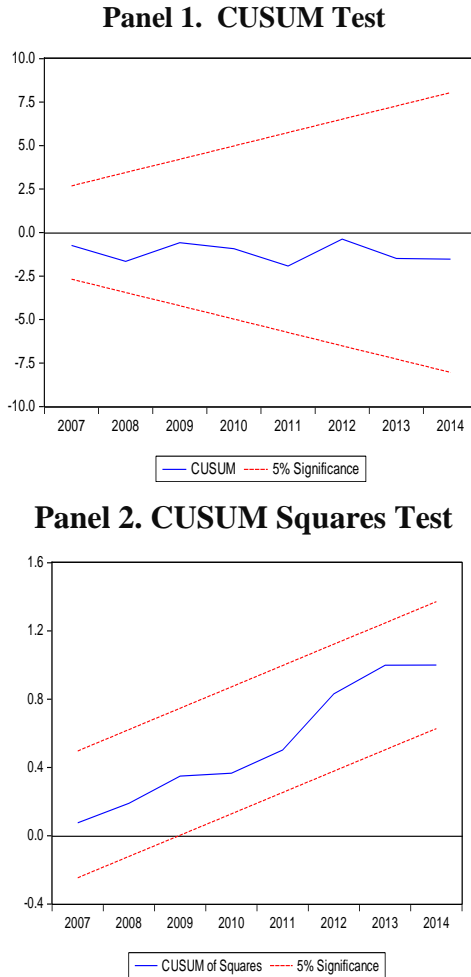### Panel 2. CUSUM Squares Test

CUSUM of Squares —— 5% Significance -----
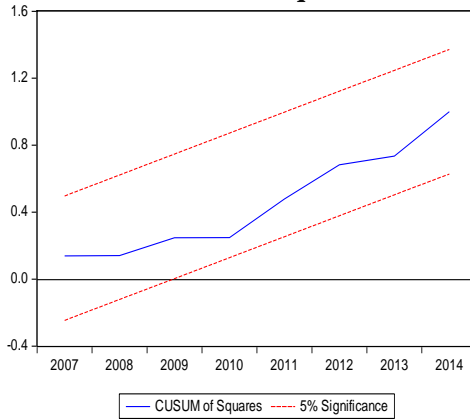
Appendix-C Causality Test Diagnostics

Table 1C: Selection Criteria for Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	14.714	NA	1.46e-09	-0.482	-0.161	-0.375
1	148.091	200.064*	8.05e-12*	-5.755*	-3.190*	-4.905*
2	188.686	43.132	2.20e-11	-5.230	-0.421	-3.636

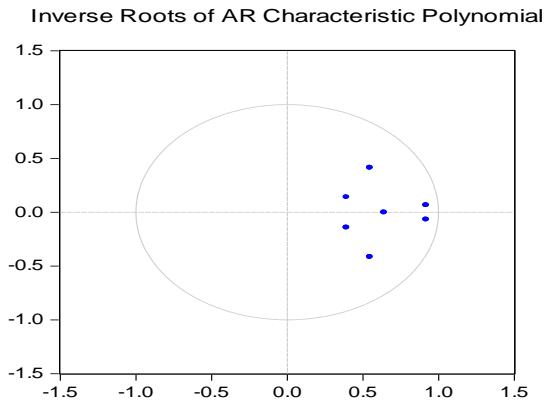Note: The asterisk denotes lag order selected by the criterion
Source: Computed by the author

Table 2C: Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	41.966	0.752
2	51.381	0.381
3	43.293	0.703
4	52.583	0.337
5	60.322	0.129

Source: Computed by the author

Figure 1C: VAR Stability Test

Inverse Roots of AR Characteristic Polynomial

Appendix-D Tests of Multicollinearity

Table 1D: Results of Multicollinearity tests
Panel 1. Correlation Matrix

	RGDP	FDI	GFCF	CPS	REER	OPN
RGDP	1.00					
	-					
FDI	-0.27	1.00				
	(0.11)	-				
GFCF	0.19	-0.58	1.00			
	(0.28)	(0.00)	-			
CPS	0.38	-0.09	0.14	1.00		
	(0.02)	(0.59)	(0.43)	-		
REER	-0.03	-0.52	0.40	0.14	1.00	
	(0.85)	(0.00)	(0.01)	(0.41)	-	
OPN	-0.15	0.66	-0.52	-0.13	-0.58	1.00
	(0.37)	(0.00)	(0.00)	(0.46)	(0.0)	-

Note: The probability values are in parenthesis

Panel 2: Variance Inflation Factor

Variable	VIF
RGDP	1.37
FDI	2.37
GFCF	1.61
CPS	1.24
REER	1.75
OPN	2.17
Mean VIF	1.75

Source: Computed by the author