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Long-run Inter-sectoral Dynamics and Economic Growth in Nigeria

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Abstract

This paper examines the long-run intersectoral dynamics and effect of externalities from sectoral expansion on growth in Nigeria using time series data from 1981 to 2014. The real value added of the agriculture, manufacturing, minerals and services sectors was regressed against the real gross domestic product (GDP). We use the bounds testing approach to check the long-run interdependence of sectors while impulse response functions and variance decompositions test the direction and strength of linkages among the sectors. Our tests confirm the sectors evolve interdependently over the study period. The minerals sector is the most linked sector with two-way linkages to other sectors. The services sector shows the strongest backward linkage. However, both the minerals and services sectors are not significant in explaining variations in the GDP. The strength and extent of agriculture and manufacturing linkages are much less compare to minerals. Nevertheless, they are positive and significant in explaining long-run growth.

Keyword: Dynamics; economic growth; intersectoral; linkages; long-run; Nigeria

1. Introduction

The place of structural change in economic growth has been a subject of long debate among economists of different schools. The neoclassical growth approach holds the view that structural change is an unimportant side effect of economic growth, and so focuses mainly on the determinants of aggregate economic growth. Other economists, especially those associated with the World Bank, claims that growth is a product of changes in the sectoral composition of the economy. In the last three decades, there has been a resurgent of the empirical literature on sectoral economic growth and linkages. The sectoral growth literature springs mainly from the dual economy model of Lewis (1954) and Hirschman (1958) theory of 'unbalanced growth'. The dual economy models view the agricultural sector as the basis of an emerging economy and a generator of capital necessary for industrialisation. On attaining industrialisation, the agricultural sector plays a passive role with no internal economic integration, and a low degree of inter-sectoral linkage (Blunch and Verner, 1999). Recent researches on sectoral growth dispute the assertions of the dual economy model. Blunch and Verner (1999) reveal a large degree of interdependence in sectoral growth in Ghana, Cote d'Ivoire and Zimbabwe. The Ecuadorian economy also shows a large degree of interdependence in sectoral growth (Fiess and Verner, 2001). Sepehrdoust and Hye (2012) found the agricultural sector to have a positive link with economic growth and industrial sector growth in Iran.

The concept of sectoral interdependence or linkage describes a sector's relationship with the rest of the economy through it's direct and indirect intermediate demands and supplies. The supply linkage (backward linkage) arises from the interdependence of the sectors to meet their input needs. On the other hand, the demand linkage (forward linkage) arises from the interdependence of the sectors to meet final consumption needs (Saikia, 2011). The sectors with the highest linkages are likely to stimulate rapid growth of production, income and employment (Hirschman, 1958).

Many African countries in the 1960s and 1970s adopted policies, which favours the industrial sector at the expense of the agricultural sector, looking to emulate the post-World War II experiences of the industrial economies. The import-substitution industrialisation policies of the 1970s actually favour the industrial sector at the expense of the agricultural sector. However, the expected supply linkage between the industrial and agricultural sectors did not materialise. In Nigeria for instance, the Breweries and Flourmills depend heavily on imported barley and wheat to the neglect of local grains. From the mid-1980s, most African countries keyed into the global shift towards economic openness, which became a major influence on policies of the World Bank and the standard model of development recommended by the IMF to all its client countries (Palley, 2003). In the face of a rapidly integrating global economy, import-substitution industrialisation that favours or neglects some sectors of the economy cannot be optimal. Economic openness would suggest a balance of policies that include all sectors whereby economy-wide growth would gain the maximum from the positive externalities of sectoral growth (Blunch and Verner, 1999).

This paper will attempt to model the inter-sectoral linkages among the sectors of the economy in Nigeria. In analysing inter-sectoral linkages, we consider two questions: (i) is the evolution of the sectors of the Nigerian economy interdependent? (ii) what is the strength of the causal relationship among the sectors on the one hand, and the sectors and economic growth, on the other hand? The rest of the paper is set out as follows: Section 2 contains the review of some of the extant literature. We describe the data used in the study, the model and estimation techniques in section 3. Section 4 covers the report and discussion of empirical results from the various tests. We finally conclude with policy suggestions in section 5.

2. Literature review

The historical experience of most industrial economies has followed the sequence of structural changes accompanying economic growth, with labour force and resources shifting from the agricultural sector to industrial sector and finally to the services sector at higher levels of per capita income and industrial development (Gill and Sharma, 2013). Tertiarisation has gained recognition as an important aspect of economic development that is strongly associated with income growth and economic modernisation. In the process of territorialisation, developed countries specialise in 'high-value' services and move 'low-value' manufacturing activities to cheaper locations. Hence, some advocates that governments must proactively facilitate the structural change of their economies to one based on services. Under this rationale, a number of developed countries have implemented economic policies that favour the promotion of service activities at the expense of manufacturing (Andreoni and Gomez, 2012). According to Francois and Reinhert (1996), services dominate the post-industrial OECD economies, typically accounting for between 60 and 70 percent of employment and a comparable share of GDP. India, unlike the experience of the developed countries, exhibits a different pattern of economic growth. The services sector emerged as the biggest sector of the economy in terms of its contribution to GDP, albeit, at low levels of per capita income, industrialisation, and labour absorption (Gill and Sharma, 2013).

On inter-sectoral linkages, the avalanche of evidence against the dual economy model refutes the assertion that there cannot exist a long-run relationship between growth in agriculture and industry. In the contexts of developing countries, recent developments in the sectoral growth literature argue that while agriculture's share in the GDP falls relative to industry and services, it nevertheless grow in absolute terms, evolving increasingly complex linkages to the non-agricultural sectors. Blunch and Verner (1999) argue that productivity in agriculture and institutional links with the rest of the economy generate backward and forward linkages. Agricultural productivity can stimulate non-agricultural activity through backward linkages fostering industrial and services sector expansion. In the same vein, non-agricultural activity could stimulate increased productivity in agriculture via forward linkages. Because of such developments, the agricultural inter-sectoral linkages become more complex (Subramaniam and Reed, 2009). However, Herzer (2007) argue that the primary sector (agriculture and minerals) by its nature does not have many linkages with, and spillovers into, the economy compared to the manufacturing sector which generates many externalities required for sustainable growth. The literature generally regards the manufacturing sector as relatively dynamic, highly productive, with the greatest potential for benefits from economies of scale, the most rapid technological progress on balance, and with the most potential for capital-intensifying factor substitution (Tregenna, 2008).

Services have become increasingly significant to national economies causing a shift in the structure of industrial production in many countries. Some economists, including Francois and Reinert (1996), Pilat and Wolfl (2005) believe that globalisation and the attendant trade reforms have played a key role in the observed shift of the industrial production structure. Globalization, mediated through multinational corporations, has changed manufacturing into a worldwide network of vertically integrated producers of various intermediate inputs. Manufacturing firms outsource indirect production activities such as finance, and research and development or spin off sections of their operations to create new firms that can provide services at lower cost or higher quality. Services and manufacturing in the process becomes intricately intertwined being incorporated both as links and as individual components into the value chain (Pasadilla and Liao, 2007). To the extent that shifts in manufacturing production structure can be explained by outsourcing, Francois and Reinert (1996) expect the share of indirect labour in manufacturing to fall as the share of services in intermediate demand by manufacturing rises. Whereas, the initial shift from agriculture to manufacturing engenders an increase in the relative importance of intermediate production linkages due to manufacturing's strong intermediate linkages to other sectors, the later shift from manufacturing to services reduces the economy-wide density of intermediate production linkages (Francois and Reinert, 1996) because services exhibits fewer inter-sectoral linkages overall than manufacturing (Park and Chan, 1989). On services inter-sectoral linkages, Singh (2007), and Gordon and Gupta (2004) advanced that the services sector backward linkage is stronger compared to its forward linkages with industry. The interdependence between agriculture and services is a one-way backward linkage.

3. Data description and estimation technique

We divide the economy into four major sectors as agriculture, manufacturing, minerals and services, and check if the sectors have evolved interdependently between 1981 and 2014. Each of the four sectors contributes to making up the gross domestic product (GDP) for any year, t. To check the interdependence of the sectors, the output of each sector is measured in terms of its total real value added embedded in the GDP. The value added basis provides a true sense of the interdependence of the sectors because it considers that the outputs of a sector go in as inputs for other sectors' contribution to the GDP. Hence, the data set consists of observations for real GDP, agriculture real value added (AGVA), manufacturing real value added (MAVA), minerals real value added (MIVA), and services real value added (SEVA). Total industrial real value added less manufacturing real value added constitutes the variable (MIVA). We source all the data from the World Development Indicators 2015, and estimate the logarithm form of the time series.

To check the intersectoral linkages in the Nigerian economy, we specify the linear equation:

$$y_t = \alpha_0 + \alpha_1 x_{1t} + \alpha_2 x_{2t} + \alpha_3 x_{3t} + \alpha_4 x_{4t} + \varepsilon_t \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\; (1)$$

where,
x_1 = agriculture value added (AGVA)
x_2 = manufacturing value added (MAVA)
x_3 = mining value added (MIVA)
x_4 = service value added (SEVA)

First, we examine the time-series properties of the data to be sure that none of the variables we are working with is *I*(2) using two unit-root tests. The Phillips and Perron (1988) (PP) test for the null hypothesis of non-stationarity while the Kwiatkowski, Phillips, Schmidt, and Shin (1992) (KPSS) test for the null hypothesis of stationarity. For the PP test, we fail to accept the null hypothesis of nonstationarity if the test statistic is greater than the critical value 5% level of significance. Similarly, the null hypothesis of stationarity is not valid for KPSS test if the test statistic is greater than the critical value at 5% level of significance. The possibility of cointegrating relationships exists if none of the variables is *I*(2), and we proceed to estimate an ARDL model of Pesaran and Shin (1999) and Pesaran *et al*. (2001). One of the main purposes of estimating an ARDL model is to use it as the basis for applying the bounds test for cointegration (Giles 2013). The null hypothesis is that there is no long-run relationship among the variables: AGVA, MAVA, MIVA, and SEVA. To implement the ARDL model, we formulate an "unrestricted" error-correction model (ECM), particular to our case as:

$$\Delta y_t = \beta_0 + \Sigma\, \beta_i \Delta y_{t-i} + \Sigma\gamma_j \Delta x_{1t-j} + \Sigma\delta_k \Delta x_{2t-k} + \Sigma\mho_k \Delta x_{3t-m} + \Sigma\eta_k \Delta x_{4t-n} + \theta_0 y_{t-1} + \theta_1 x_{1t-1} + \theta_2\, x_{2t-1} + \theta_3\, x_{3t-1} + \theta_4\, x_{4t-1} + et \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\; (2)$$

The ranges of summation in (2) are from 1 to p, 0 to q_1, 0 to q_2, 0 to q_3, and 0 to q_4, respectively.

A key assumption in the ARDL / bounds testing methodology is that the errors of equation (2) must be serially independent. On estimating equation (2), we use the LM test to check the null hypothesis that the errors are serially independent. If the LM test is satisfactory, we then perform the bounds testing by computing the *F*-Statistic of the null hypothesis, H_0: $\theta_0 = \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$, against the alternative that H_0 is not true. Pesaran *et al*. (2001) provide bounds on the critical values for the asymptotic distribution of the *F*-statistic. For different numbers of variables, (k + 1), they provide lower and upper bounds on the critical values. The lower bound rests on the assumption that all of the variables are *I* (0) and the upper bound on the assumption that all of the variables are *I*(1). If the computed *F*-statistic falls below the lower bound, we would conclude that no cointegration is possible, and that the four sectors in our model evolve independently over the sample period. If the *F*-statistic exceeds the upper bound, we conclude that we have cointegration, and that the four sectors evolve interdependently over the sample period. Finally, if the F-statistic falls between the bounds, the test is inconclusive.

If the bounds test leads to the conclusion of cointegration, we can meaningfully obtain the estimates of the cointegrating equation, as well as the ECM in equation (3) for the short-run dynamics and ECT, which double-checks the presence of cointegration.

$$\Delta y_t = \beta_0 + \Sigma\, \beta_i \Delta y_{t-i} + \Sigma\gamma_j \Delta x_{1t-j} + \Sigma\delta_k \Delta x_{2t-k} + \Sigma\mho_k \Delta x_{3t-m} + \Sigma\eta_k \Delta x_{4t-n} + \varphi zt\text{-}1 + et \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\; (3)$$

where $z_{t-1} = (y_{t-1} - a_0 - a_1 x_{1t-1} - a_2 x_{2t-1} - a_3 x_{3t-1} - a_4 x_{4t-1})$, and the a's are the OLS estimates of the α's in equation (1).

If the variables cointegrated, we should expect to find some causality. This paper uses both impulse response function (IRFs) and variance decomposition (VDCs) methods estimated through the vector error correction system to test the strength of causal relationship among the variables. While IRFs show the dynamic response of a variable to the effect of its own shock and of all other variables in the system, the VDCs indicate the proportion of the forecast error in a variable that is accounted for by innovations in each of the endogenous variables. Finally, we test the stability of the estimated parameters using the CUSUM and CUSUMSQ stability tests as proposed by (Pesaran and Pesaran, 1999). A decision is made regarding the stability of the estimated parameters by observing the position of the plots of the CUSUM and CUSUMSQ statistics relative to the critical bounds at 5% level of significance. If the plots fall within the critical bounds of 5% level of significance, the null hypothesis that the coefficient of the ECM is stable is valid.

4. Empirical results and discussion

The Phillips-Perron test returned a verdict of a unit root for all variables at 5% level of significance. The null hypothesis of stationarity under the KPSS holds only for MIVA at 5% level of significance. All differenced variables attained stationarity at first difference at all levels of significance (see Table 1). This implies the possibility of cointegration of the variables. From the bound test of cointegration (see Panel B of Table 2), the value of our *F*-statistic is 32.757. For K = 4, Pesaran et al. (2001) gives the lower and upper bounds for the *F*-statistic at the 10%, 5%, and 1% significance levels are [2.2, 3.09], [2.56, 3.49], and [3.29, 4.37], respectively. As the value of our *F*-statistic exceeds the upper bound at all levels of significance, we can conclude the presence of a long-run relationship among the variables. The ECT is negative as expected to reinforce the evidence of cointegration of the variables. Both the agriculture and manufacturing value added exerts negatively on aggregate growth in the short-run, while minerals and services value added have a positive impact on aggregate growth. Although, the sectors exhibit divergent growth paths in the short-run they ultimately converge to a long-run equilibrium at a reasonable speed of adjustment. We can reasonably conclude that the four sectors considered in this study evolve interdependently over the study period. Each sector by its value added gives to (supply linkage) and receives from the others (demand linkage) in building the GDP. Sectoral growth and the aggregate growth of the economy are entwined in a web of linkages and spillovers among the various sectors.

Table 1: Results from unit root tests

Variable	PP	KPSS
Levels		
GDP	-1.874954	0.196691
AGVA	-2.062356	0.157271
MAVA	-0.343556	0.191403
MIVA	-2.720459	0.105915*
SEVA	-1.599535	0.190783
First difference		
GDP	-4.920297*	0.081202*
AGVA	-5.570044*	0.076709*
MAVA	-6.136867*	0.081240*
MIVA	-6.192830*	-
SEVA	-4.625721*	0.071602*

* denotes acceptance of the alternative hypothesis of no unit root for the PP tests at the 5% level.
*denotes acceptance of the null hypothesis of stationarity for the KPSS tests at the 5% level.
Critical values at the 5% and 10% levels of significance for the PP (with constant, linear trend) are −3.552973 and −3.209642 at *levels*, respectively.
Critical values at the 5% and 10% levels of significance for the PP (with constant, linear trend) are −3.557759 and −3.212361 at *first difference*, respectively.
Critical values at the 5% and 10% levels of significance for the KPSS (with constant, linear trend) at *levels and first difference* are 0.14600 and 0.11900, respectively.

Estimates of the cointegrating equation show that the values added of the minerals and services sectors are negative and insignificant in the long-run. This suggests that the linkages and spillovers from these sectors are insignificant to the aggregate growth of the economy in the long-run, regardless of their short-run dynamics. Agriculture value added is the largest contributor to aggregate growth. A ten percent increase in agriculture value added increases aggregate growth by 111%. Similarly, manufacturing value added exerts significant positive effects on aggregate growth. Economic growth increases by 44% for every ten percent increase in manufacturing value added. Thus, in terms of linkages and spillovers measured by the intermediate goods demand and supply of the four sectors the agriculture and manufacturing sectors appears to be the engines of growth in the Nigerian economy

Exchange of intermediate goods among sectors is recorded as either a backward linkage, forward linkage or both. The strength of the linkage is measured in terms of the strength of the response of a sector to increased activities in the other sectors. We analyse the IRFs (see Figure 1) and the VDCs (see Table 3) to check the network of linkages among the sectors as well as test their strength. The IRFs trace the dynamic response of a variable to the effect of its own shock and of all other variables. As the figure shows, a one standard deviation shock applied to AGVA produces the greatest positive effect on GDP ahead of MIVA and MAVA in all periods. MIVA equally affects the GDP positively in the short to long-run.

Table 2: Results from ARDL tests

ARDL estimates

Panel A: Short-run and long-run estimates

Variables	*Short-run dynamics*		*Long-run estimâtes*	
	Coefficient	*Probability (t-statistic)*	*Coefficient*	*Probability (t-statistic)*
GDP	0.07	0.07***		
AGVA	-0.28	0.00*	1.11	0.04**
MAVA	-0.45	0.00*	0.44	0.00*
MIVA	0.25	0.00*	-0.25	0.35
SEVA	0.45	0.00*	-0.33	0.37
CointEq(-1)	-0.47	0.00*		

, ** and *** represent 1%, 5% and 10% level of significance respectively

Panel B: Bound test

Test Statistic		Value	k	-
***F*-statistic**		32.757	4	-
Critical value bounds				
Significance	I(0) Bound	I(1) Bound	-	-
10%	2.2	3.09	-	-
5%	2.56	3.49	-	-
1%	3.29	4.37	-	-

Panel C: Diagnostics

Test Statistic	Value	Probability
Jarque-Bera	4.408621	0.1103
Breusch-Godfrey LM	0.803090	0.3894
Breusch-Pagan-Godfrey	0.473080	0.9228
ARCH	0.367958	0.5607

MAVA on the other hand shows a negative effect on the GDP in the short-run with some tendency to exert a weak but rising positive effect on GDP in the medium to long-term. A one standard deviation shock applied to SEVA tends to have a negative effect on the GDP in all periods. Evidence from VDCs of the GDP shows that, on the average, in the long-run (8^{th}-10^{th} period) 39.97, 1.45, 15.91, and 8.22 percent of the variations in GDP are explained by AGVA, MAVA, MIVA, and SEVA respectively. This place the minerals sector next to agriculture and ahead of manufacturing as the long-run engines of aggregate growth. On the other hand, a one standard deviation shock applied to GDP negatively affects MAVA in all periods. AGVA responds positively to shocks from the GDP. MIVA exhibits the strongest positive response to shocks in GDP. We can reasonably conclude a two-way linkage between GDP and AGVA, and between MIVA and GDP. A one-way positive linkage from MAVA to GDP and from SEVA to GDP.

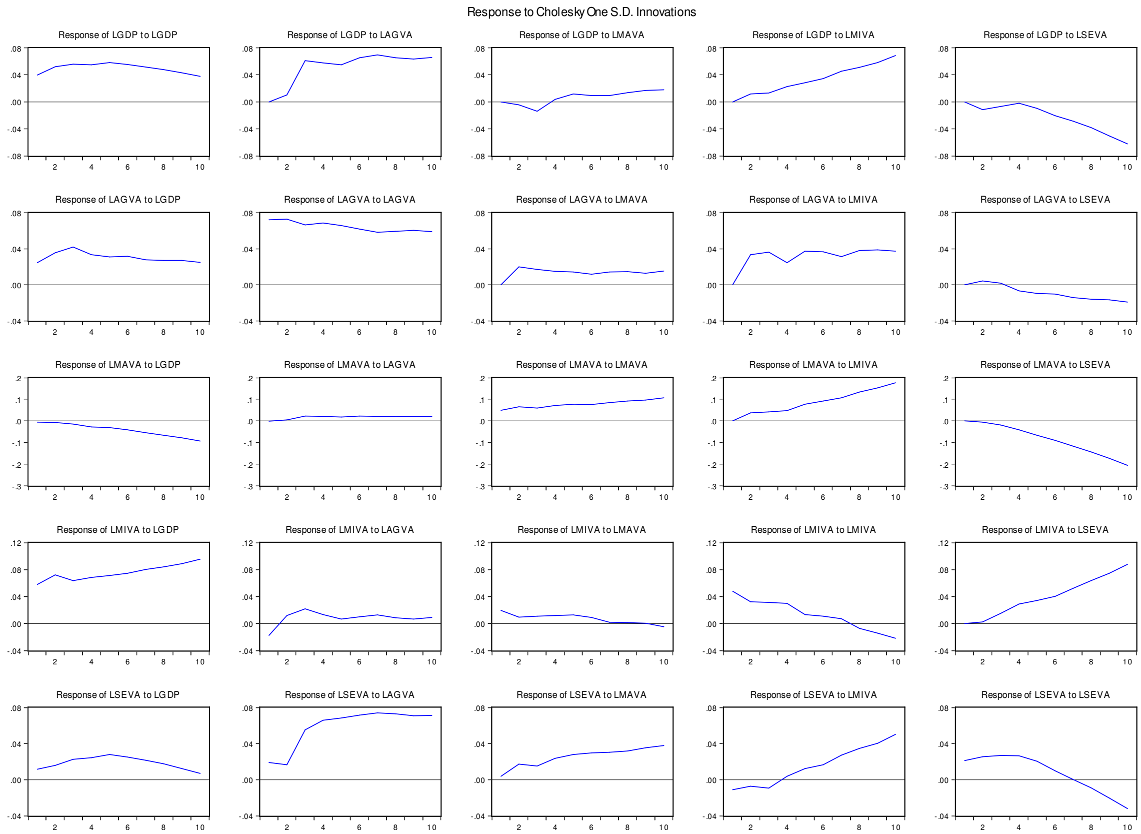

Figure 1. Impulse Response Functions

The agriculture sector exhibits linkages to manufacturing and minerals sectors. A one standard deviation shock applied to MAVa and MIVA generate a positive response from the agriculture sector indicating that increased activities in manufacturing and minerals sectors lead to increased agricultural activities. We can see a two-way linkage of the agriculture sector to both the manufacturing and minerals sectors, as a one standard deviation shock applied to agriculture positively influences the two sectors in the medium to long terms. As the IRFs shows, the positive impact of intermediate goods exchange among the three sectors appears stronger from manufacturing and minerals to agriculture than it is from agriculture to manufacturing and minerals. The VDCs of the three sectors affirms that innovations in manufacturing and minerals generate stronger shocks in agriculture, than agriculture innovation generates in manufacturing and minerals. In the medium to long-term (4^{th}-10^{th} period), 3.09 and 14.46 percent of the variation in AGVA are explained by MAVA and MIVA innovations respectively. Whereas innovation in AGVA accounts for 2.264 and 2.907 percent variation in MAVA and MIVA respectively within the period. Agriculture thus exhibits a strong forward linkage to both manufacturing and minerals sectors. The reverse linkage is however less strong. Agriculture – services linkage is strictly one-way with strong positive effect running from agriculture to services. From 24.34 percent in the 2^{nd} period AGVA explanation of services sector activity peaks at 66.989 percent in the 8^{th} period.

Three interesting observations can be made in the pattern of agriculture linkages as shown by the VDCs. First, the weak forward linkage to manufacturing tends to confirm the fact that only a small portion of agriculture output are processed locally into final consumer products, although the foods and beverages, and the brewery sub-sectors dominate the manufacturing landscape in Nigeria. Manufacturing firms in Nigeria largely depend on imported agriculture intermediate goods. Second, weak forward linkage to manufacturing may be partly responsible for the huge agricultural produce loss often attributed to poor storage infrastructure. Where productivity gains in agriculture do not feed back into food processing and storage infrastructure are lacking or poor, annual huge output loss is inevitable. Third, agriculture backward linkage to manufacturing is even weaker suggesting that agriculture demand for manufactured inputs such as machinery and equipment are import dependent. The high cost of importing these inputs may keep agriculture much longer at subsistence level and further worsen the weak forward linkage with manufacturing. However, these results clearly debunk the two-sector economy model, as evidence show high interdependence between agriculture, manufacturing, minerals and services.

Table 3: Variance Decomposition

Variance Decomposition of LGDP:

Period	S.E.	LGDP	LAGVA	LMAVA	LMIVA	LSEVA
1	0.039697	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.068527	91.48369	2.398467	0.368404	2.755858	2.993579
3	0.109024	62.08439	31.98048	1.838700	2.514036	1.582396
4	0.136822	55.47288	37.94523	1.231822	4.322610	1.027461
5	0.161755	52.68810	38.70351	1.401845	6.124096	1.082444
6	0.187693	47.86004	40.83830	1.302153	7.983268	2.016244
7	0.213653	42.76252	42.06713	1.196603	10.61850	3.355250
8	0.237499	38.65608	41.55605	1.288845	13.19626	5.302761
9	0.261786	34.51214	40.11199	1.472794	15.82540	8.077682
10	0.288436	30.16125	38.25088	1.591851	18.71369	11.28233

Variance Decomposition of LAGVA:

Period	S.E.	LGDP	LAGVA	LMAVA	LMIVA	LSEVA
1	0.076265	10.19353	89.80647	0.000000	0.000000	0.000000
2	0.117743	13.28423	75.85893	2.784774	7.934352	0.137717
3	0.147237	16.57330	69.05300	3.118885	11.15655	0.098266
4	0.168440	16.62065	69.31194	3.159871	10.67479	0.232744
5	0.188017	16.06540	67.88827	3.123583	12.47610	0.446656
6	0.204359	16.00074	66.60162	2.967775	13.79357	0.636299
7	0.217560	15.75741	65.96957	3.054848	14.23847	0.979704
8	0.231318	15.32037	64.89929	3.100853	15.32376	1.355733
9	0.244666	14.91393	64.12170	3.051489	16.22767	1.685207
10	0.256833	14.47102	63.47167	3.130563	16.83396	2.092791

Variance Decomposition of LMAVA:

Period	S.E.	LGDP	LAGVA	LMAVA	LMIVA	LSEVA
1	0.049326	1.479377	0.203581	98.31704	0.000000	0.000000
2	0.090951	1.008223	0.454721	80.99604	17.04340	0.497620
3	0.120905	1.941269	3.805070	70.21038	21.19148	2.851799
4	0.157687	4.189813	4.059156	61.57534	21.49763	8.678061
5	0.206193	4.850385	3.210502	49.82677	26.80669	15.30565
6	0.259005	5.513369	2.796421	40.16067	29.74390	21.78564
7	0.320445	6.545179	2.263134	33.15679	30.61733	27.41756
8	0.392742	7.191453	1.761656	27.53241	31.86428	31.65020
9	0.473217	7.716160	1.417854	23.17055	32.48678	35.20865
10	0.563886	8.215832	1.149532	19.85099	32.62836	38.15529

Variance Decomposition of LMIVA:

Period	S.E.	LGDP	LAGVA	LMAVA	LMIVA	LSEVA
1	0.079699	52.93119	4.637888	6.112272	36.31864	0.000000
2	0.113137	66.69739	3.422753	3.772229	26.04776	0.059871
3	0.136598	67.32601	4.937453	3.261974	23.21077	1.263788
4	0.159542	67.78195	4.339010	2.985676	20.62692	4.266445
5	0.179152	69.61934	3.585558	2.878920	16.89429	7.021894
6	0.198969	70.50147	3.179356	2.530881	14.01742	9.770871
7	0.221344	70.14784	2.900751	2.054910	11.43326	13.46324
8	0.245316	68.78458	2.482433	1.678650	9.391729	17.66261
9	0.271734	66.74677	2.085493	1.369024	7.925041	21.87367
10	0.302091	63.98222	1.776243	1.134288	6.940157	26.16709

Variance Decomposition of LSEVA:

Period	S.E.	LGDP	LAGVA	LMAVA	LMIVA	LSEVA
1	0.032664	12.31798	33.37654	1.348735	11.59951	41.35723
2	0.050951	14.65185	24.33576	12.12514	6.882445	42.00481
3	0.084843	12.33022	51.31428	7.517268	3.682906	25.15533
4	0.115765	11.03657	59.91020	8.248418	2.091782	18.71303
5	0.142141	11.19339	62.86034	9.309847	2.148472	14.48796
6	0.164992	10.64123	65.51620	10.13820	2.594055	11.11031
7	0.186636	9.641703	66.93322	10.58808	4.154081	8.682913
8	0.206771	8.583706	66.98587	11.00043	6.161901	7.268096
9	0.226344	7.455783	65.75243	11.62219	8.294691	6.874904
10	0.247724	6.309695	63.19359	12.03284	11.04365	7.420227

Cholesky Ordering: LGDP LAGVA LMAVA LMIVA LSEVA

The manufacturing sector shows a strong positive response to a one standard deviation shock applied to the minerals sector in the short, medium and long-run. The VDCs show the minerals sector as the main driver of manufacturing activities with the positive impact declining progressively from 98.32 to 49.83 and 19.85 percent in the 1st, 5th and 10th periods. On the other side of the linkage, the impact of increased activities in manufacturing on the minerals sector is positive but weak in the short and medium terms, and declining toward negative in the long-run. Only about 1.13 percent of the variation in minerals is explained by manufacturing in the 10th period as against 6.11, 2.88, and 1.13 percent in the 1st, 5th and 10th period respectively. The impact on manufacturing of a one standard deviation shock applied to the services sector is negative both in the short and long-run suggesting that productivity gains in the services sector do not feedback positively into manufacturing. On the other hand, services response to shocks from manufacturing remains positive and rising in all periods. We conclude a two-way linkage between manufacturing and minerals, with the stronger effect running from minerals to manufacturing, and a one-way linkage running from manufacturing to services. We can also conclude a two-way linkage between minerals and services with the stronger linkage running from the services sector to the minerals sector.

The VDCs reveals interesting but alarming facts about the state of the manufacturing sector in Nigeria. Firstly, the uptake of manufacturing intermediates by agriculture and minerals declined progressively all through the periods. Interestingly, it also declined within the manufacturing sector itself. Secondly, manufacturing related services largely domiciles in the manufacturing firms as increased activities in services negatively affect the manufacturing sector. The two observations combined gives an indication of rapid de-industrialisation that arises from the failure of sectoral policies integration rather from a shift in the structure of production that favours services, as is the current experience of some developing countries such as India (Saikia, 2011) and Lao PDR (2016).

Generally, the minerals and services sectors exhibit more extensive backward linkages than the agriculture and manufacturing sectors, with services showing the strongest backward linkage to each of the other three sectors. The minerals sector exhibits the strongest forward linkages to the other three sectors. Agriculture and manufacturing are also widely connected forward, while the services sector shows positive forward linkage only to the minerals sector. The minerals sector two-way linkages to the rest of the economy as well as the strong backward linkages of the services sector hold more potentials to stimulate rapid growth of production, income and employment.

The results of our diagnostic and stability tests indicate that our model is correctly specified and the estimated parameters stable. The results of the diagnostic tests are in Panel C of Table 2. Figure 2 show the plots of the CUSUM and CUSUMSQ statistics as lying within the critical bounds at 5% level of significance. Results obtained from the study are therefore reliable and gives meaningful interpretation.

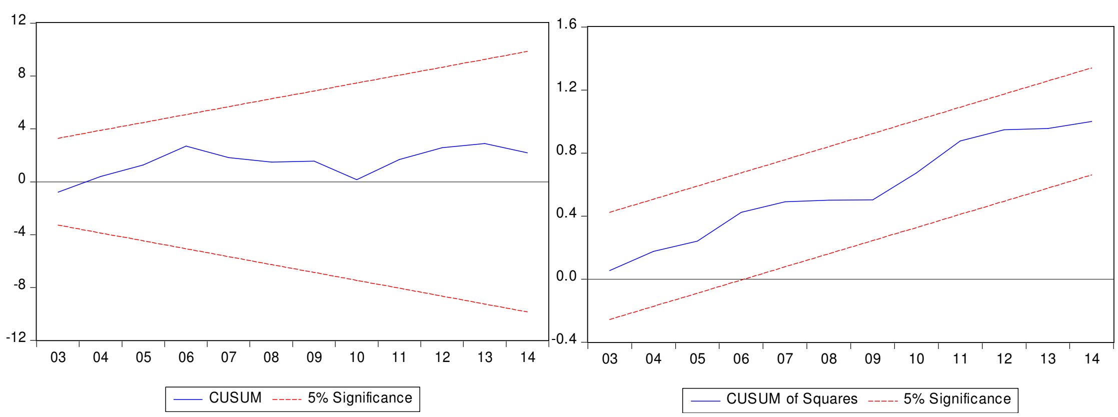

Figure 2. CUSUM & CUSUMSQ Plots

5. Conclusion and policy suggestions

This paper examines the long-run intersectoral dynamics and effect of externalities from sectoral expansion on aggregate growth in Nigeria. While there is evidence to support the long-run interdependence of the sectors, there are concerns for the long-run aggregate growth of the economy. A major concern is the extensive two-way linkages of the minerals sector and the very strong backward linkage of the services sector, which position the two sectors as the drivers of sectoral growth when they are insignificant in explaining long-run growth of the economy. Also, the pattern of relationships that emerge points to the need for strategic sectoral policies reappraisal and alignment. Though agriculture value added explains a large proportion of the variation in GDP during the study period, it is losing ground to minerals and services values added. This, by itself, is not worrisome if the structure of production is shifting in response to advancement in economic development. The concern is that the expected shift from agriculture to manufacturing is not seen to be taking place following the experience of the developed countries, neither is there a shift from agriculture to services as is the case with some developing countries. The backward linkage of manufacturing to agriculture is weak though the manufacturing sector is predominantly foods, beverages, and breweries. Similarly, the backward linkage of agriculture to manufacturing is weak signifying that the inputs demand of both sectors is oriented toward imports. Thus, the shock and innovation in the two sectors are not mutually reinforcing. It becomes therefore necessary to realign manufacturing development with agriculture sector development by means of policy.

The strength of the services sector appears to be in its strong backward linkages to the other sectors that afford it the benefit of lower-priced inputs. However, its forward linkage to agriculture and manufacturing is negative calling for deliberate policy intervention to build the capacity of the services sector to meet demands in agriculture and manufacturing. The current local content policy unduly addresses the need for the minerals sector to build local capacity in the services sector. Government needs to direct policy attention toward building capacity in the services sector to serve agriculture and manufacturing.

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