Output Composition of the Manufacturing Sector and Household Consumption in Nigeria: Evidence from A Vector Autoregressive Approach

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Abstract: This study investigated the effect of the different composition of manufacturing output on household consumption in Nigeria. A Vector Autoregressive (VAR) Approach was used. Annual time series data for the study covering the period 1970-2008 were extracted from the Central Bank of Nigeria Statistical Bulletin. The variance decomposition results reveal that bear and stout manufacturing had the largest shock to household consumption. This was also confirmed by the estimated VAR result that bear and stout manufacturing had a significantly positive effect on household consumption. Per capita GDP was found to have insignificant effect on household consumption. Researchers therefore recommend that policies aimed at bolstering other manufacturing composition to diversify the economy be pursed such as creating the right environment as such will enhance per capita income of the household.

Key words: Manufacturing output composition, household consumption, Vector Autoregressive Model, variance decomposition, economy, GDP

INTRODUCTION

Manufacturing remains one of the most powerful engines for economic growth. It acts as a catalyst to transform the economic structure of countries, from simple, slow-growing and low value activities to more productive activities (Okonjo-Iweala and Osafo-Kwaako, 2007). As an engine of growth, a boost in manufacturing production offers prospects of growing availability of manufactured products. However, the output of the Nigerian manufacturing sector has been very sluggish over the years. This is particularly revealed when comparison is made with other sectors of the economy. The crisis of performance in the manufacturing sector is obviously explained by low capacity utilization which has plummeted over the year.

With this trend and structure associated with the Nigerian manufacturing sector, its growth effective role in alleviating poverty specifically by having multiplier effect on household consumption is questioned. The Nigerian manufacturing sector has experienced fluctuations and unstable kind of growth and this has affected its share on gross domestic product and to the economy at large. Despite the introduction of the National Economic Empowerment Development Strategy which emphasized on the importance of boosting manufacturing sector performance, the sector has not performed well or performed below expectation. Low capacity utilization is still the bane of the sector (Adenikinju and Chete, 2002). The history of industrial development and manufacturing in Nigeria is a classic illustration of how a nation could neglect a vital sector through policy inconsistencies and distractions attributable to the discovery of oil. The near total neglect of the agricultural sector has denied many manufacturers and industries their primary source of raw materials.

The absence of locally sourced inputs has resulted in low industrialization. It is evident that Nigeria's industrial performance has been highly disappointing in the last decades as total manufacturing value added and exports have declined (Aluko *et al.*, 2004). As a result, Nigeria is losing its competitive manufacturing edge and is becoming increasingly marginalized in the international industrial science due to unpredictable government policies resulting from dynamic inconsistency, macroeconomic instability, a distorting business environment, lack of basic raw materials, most of which are imported and weak industrial capabilities.

Consequently, the trend in the performance of the industrial production can not but indicate the falling productivity which has serious implications for aggregate demand. Household consumption expenditure is an aspect of aggregate demand (Iyoha, 2004) and with this trend of industrialization experienced in the country,

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household consumption which in a great deal determines poverty level of the household is seriously affected. It is against this backdrop that this study intends to examine the output composition of the manufacturing sector and its implications on household consumption in Nigeria. Several studies have examined the determinants of household consumption, however to the best of our knowledge there is little or no study that has examined the effect of manufacturing output on household consumption.

For instance, Noll (2007) analyzed household consumptions, household incomes and living standards doing comparative research on household consumptions and incomes as measures of living standards based on data from household budget surveys. The study focus on substantial analysis on patterns and structural changes of expenditures, the distributions and inequalities of household income and expenditures including poverty and the way they might be related and associated. The study also examined the extent to which expenditures and consumption levels and patterns are being determined by household income as compared to other variables like family type, place of residence or employment status of household members as factors explaining levels and structures of expenditures.

The study also aimed to explore the potential of household budget survey as a data base for comparative empirical social and economic research from a methodological point of view which included cheeks of comparability as well as the assessment of the reliability of information on income and expenditures within the household budget surveys. The study concluded that household expenditures result from budget limitations and choices based on needs, demand and preferences.

Slesnick (2001) examined consumption and social welfare, living standards and their distribution in the United States. The study reveals significant differences between the distributions of income and expenditure which may even lead to different assessments of trends in the inequality of living standards. Quisumbing (2003) examined household decisions, gender and development observed that the assumptions that households pool resources and have a single set of preferences has been questioned by research on intrahousehold allocation of resources and gender roles within the household. It was shown that husbands and wives often have unequal control over resources that they may not pool income and that their consumption priorities may differ. Some alternative household models assume a corporative solution in which the distribution of benefits depend on the bargaining position of each based on the threat of non-cooperative or separation, it also indicates that a

non-cooperative solution in which each partner maximizes utility (satisfaction) subject to the decisions of the other. It found that in either case, the consumption patterns will depend partly on the legal and socioeconomic status of each partner and their ability to monitor each other's behavior.

Charles and Jr. Stephens (2006) analyzed the level and composition of consumption over the business cycle; the role of quasi-fixed expenditures. The study focused on how the level and composition of household expenditures changes over the business cycle for households at different positions in the income distribution. The study adopted data from the consumer expenditure survey from 1988-2000 and employed the regression framework econometric methodology. The study found that because of credit market and other imperfections, transitory variations in income such as those arising from business cycle fluctuations, might cause consumption behavior to depart from the textbook standard.

In particular in bad economic times, imperfections might cause affected households to lower total expenditure and to increase the share of their overall consumption devoted to expenditure items like car or vehicle payments that are difficult to adjust without a cost. It also found out that changes in the composition of expenditure outlays are also concentrated among lower income groups and also found that the only specific non-durable consumption item on which these groups lower expenditure is for category of entertainment and personal care.

Castaldo and Reilly (2007) examined the effect of migrant remittance on the consumption patterns of Albanian households. The study investigated the extent to which consumption patterns of Albanian households are affected by the receipt of migrant remittance, domestic and international remittances were considered and differences in their impacts on household consumption patterns were assessed. The study adopted data from the year 2002, Albanian Living standard Measurement Survey (ALMS) as undertaken by the Albanian National Institute of Statistics (INSTAT) with the technical assistance of the World Bank which included 3,599 households and 16,521 individuals from a sampling frame for the ALMS based on a stratified two-stage cluster design and employed household utility maximization which is provided by the working-lesser specification which relates budget shares linearly to the logarithm of total household expenditure. The study found that the consumption pattern for households in reception of internal remittances is not statistically different from those that do not receive such transfers. It also found that households who receive remittances from abroad spend on average and ceteris

paribus a lower share of their expenditure on food and higher share on consumer durables compared to household who do not receive any type of migrant remittances.

Agwu *et al.* (2009) analyzed the consumption patterns and ultra-household roles in the production, processing and marketing of soya beans in the Northern zone of Benue state, Nigeria. The study adopted data from a sample of 80 randomly selected respondents from 10 extension blocks and employed percentages and means scores econometric methodology. The study found that the majority of the households prepared their soya beans farm manually while family and hired labour were the major sources of labour. It discovered that more than half of the respondents used their income on soya beans on daily basis mostly in form of paste, since it helps to lower cholesterol levels and help prevent heart disease and reduce the risk of some cancers such as breast, prostrate and carvical. Bamidele *et al.* (2010) examined economic analysis of rice consumption patterns in Nigeria using Kwara state as a case study.

The study methodology comprised a two stage sampling technique which was used to survey 110 rice consumer households across two villages and six towns in Kwara state. The study employed analytical tools which included descriptive statistics and the multinomial logic model. The study found that the major factors that significantly influence household preferences for either a combination of local and imported rice or the imported rice only to the local rice were the income of the head of household.

Ruel *et al.* (2000) examined patterns and determinants of fraught and vegetable consumption in sub-Saharan Africa: A multi-country comparism. The study looked at low fruit and vegetable intakes as a main contributor to micro nutrient deficiencies in the developing world especially in populations with low intake of nutrient-dense animal source foods such as meat and dairy products. The study described household-level fruit and vegetable consumption patterns in 10 sub-Saharan African countries and compare consumption patterns across countries, urban and rural and income groups. The study also computed income elasticities for the consumption of fruit and vegetables and compares these elasticities across countries, urban and rural areas and income groups. It also analyzed the determinants of the demand for fruit and vegetables in different countries, focusing on the role of household economic and demographic characteristics.

The study found that vegetables consumption was almost universal in the countries studied; fruit consumption is much less common and is more variable

across countries. It found that in Ethiopia, Mozambique and Uganda, only about one-fifth of all household consume fruit whereas approximately half do so in Burundi, Malawi, Rwanda and Kenya and 3 quarters of the households do so in Tanzania and Guinea. The study, also shown that in all countries studied except Ethiopia and Rwanda, vegetables are more expensive than fruit, i.e., the cost per kg of vegetables is higher than the cost per kg per fruit. The study also shown that there is a general positive trend of increasing consumption of fruit and vegetables as GDP per capita go up but the trend is not fully linear. The study also indicated that the diets of urban dwellers are generally more diverse than those of their rural counterparts due to a combination of factors including the availability of a wider variety of foods in urban markets, the availability of storage facilities, changes in lifestyles and cultural patterns and the need for convenience leading to the purchase of more processed foods.

The study also shown that fruit and vegetables are necessities in the economic sense that as income grows, spending on fruit and vegetables also grows but at a somewhat slower pace. The estimated income elasticities for fruit are greater than the elasticities for vegetables in all countries except Burundi and Malawi. This present study deviate from these previous studies as it considers the specific case of the output composition of the manufacturing sector and its effect on household consumption in Nigeria.

MATERIALS AND METHODS

Theoretical consideration: On the theories explaining the pattern of consumption or what determines household consumption, the Diamond (1982) theoretical framework appears to be the most comprehensive, systematic and relevant to the this study. This framework is therefore chosen based on the plausibility and relevance of its assumptions to the nature and structure of the Nigerian economy and its link between household consumption and output. This theory therefore forms the theoretical background for analyzing the composition of manufacturing output and its impact on household consumption in Nigeria.

Data definition and sources: In developing a VAR Model, the 1st step is to consider the set of macroeconomic variables of concern to the study. Consequently in analyzing the output composition of the manufacturing sector on household consumption in Nigeria, researchers employed the following variables: Household consumption (con), per capita GDP (pgdp), bear and stout

manufacturing output (brs), foot wear manufacturing (ftw), soft drink manufacturing output (sfd), soap and detergent manufacturing output (spd) and cement manufacturing output (cmt). Data employed in the study were extracted from the Central Bank of Nigeria Statistical Bulletin, 2008. The study covers the period 1970-2008.

Vector Autoregressive (VAR) Model Specification: Sims (1980) VAR Model was employed to capture the effect of the output composition of the manufacturing sector on household consumption in Nigeria. By Sims (1980) specification, the concern is on the joint behaviour thorough time of a vector of variables. The model is thus:

$$Z_t = \alpha + \psi_i Z_{t-1}, \ldots, + \psi_k Z_{t-p} + \mu_t \quad (1)$$

Where:
$Z_t = Z_{1t,\ldots,} Z_{kt}$
$\psi_i = (K \times K)$ coefficient matrices
$\mu_t = \mu_{1t}, \ldots, \mu_{kt}$

This is K-dimension white noise with zero mean, i.e., $E(\mu_t) = 0$ and contemporaneous covariance matrix $E(\mu_t, \mu_t) = \mu.\mu$ is a diagonal matrix where diagnonal elements are the variance of the structural disturbances and off-diagonal elements are zero (Structure errors are assumed to be uncorrelated). Thus, Eq. 1 can be written compactly as:

$$Z_t = \alpha + \sum_{i=0}^{p} \psi_i Z_{t-1} + \mu_t \quad (2)$$

Where Z_t is a (7×1) vector of observations at time t on the variables under consideration (i.e., con, pgdp, sfd, spd, ftw, cmt, brs). $\alpha = [(\alpha_i, \ldots, \alpha_n), n = 7]$ is the (7×1) intercept vector of the VAR Model, ψ_i is a sequence of (7×7) matrix of autoregressive coefficients for i = 1, 2, 3,..., p and $\mu_t = (\mu_{1t}, \ldots, \mu_{7t})$, the (7×1) generalization of a white noise process or vector of stochastic disturbances. The dynamic behaviour of Z_t is governed by the following structural model:

$$B(L) = Z_t = \alpha + \mu_t \quad (3)$$

where B(L) is a 7th order matrix polynomials in the lag operator (L):

$$B(L) = B_0 - B_1 L - B_2 L^2, \ldots, B_7 L^7 \quad (4)$$

B_0 is a non-singular matrix normalized to have one on the diagonal and summarizes the contemporaneous relationship between the variables contained in the vector Z_t.

RESULTS AND DISCUSSION

Unit root: The analysis begins by conducting stationarity test to ascertain the stationarity or otherwise of the variables and the appropriateness of the specification of the VAR Model. Thus, both the Augmented Dicky Fuller (ADF) and the Philips Perron (PP) tests are employed. The ADF and PP-test are shown in Table 1.

The results show that the variables are non-stationary in their levels. The variables only became stationary after first difference. This is confirmed by both the ADF and the PP-test statistics in Table 1. Since, the variables follow order one [I(1)] process, the next step is to test if there exists a long run relationship (cointegration) among the variables.

Cointegration test: To ascertain the long run relationship among the variables, researchers employed the Johansen Maximum-likelihood Approach. The number of cointegrating relations from all the models on the basis of trace statistics and the maximal Eigen value statistics using critical values at 5% are shown in Table 2.

The results of the maximal Eigen value and the trace statistics in Table 2 indicate that the hypothesis of no cointegration among the variables can be rejected for Nigeria. The results revealed that at least three cointegrating vectors exist among the variables of interest.

Considering the existence of long run equilibrium relationship established among the variables as shown in Table 2, the analysis employs an unrestricted VAR system. However, the need arise to establish the optimal lag length (Table 3).

Table 1: Unit root test results

| Variables | Augmented Dickey Fuller Test | | | | Philips Perron Test | | | |
| | Without trend | | With trend | | Without trend | | With trend | |
	Level	1st diff.	Level	1st diff.	Level	1st diff.	Level	1st diff.
sfd	-1.79	-1.79*	-2.31	-5.74*	-1.82	-5.77*	-2.49	-5.73*
brs	-2.09	-8.36*	-3.76**	-8.34*	-1.92	-9.46*	-3.68**	-9.65*
ftw	-1.67	-6.72*	-2.67	-6.64*	-1.5	-6.99*	-2.65	-6.89*
cmt	-3.46*	-	-4.85*	-	-3.29**	-9.11*	-4.71*	-
spd	-2.69***	-7.72*	-2.79	-7.68*	-2.66	-7.62*	-2.83	-7.59*
con	-1.78	-6.69*	-2.45	-6.65*	-1.72	-6.75*	-2.51	-6.70*

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

VAR empirical: In Table 4, the unrestricted VAR estimation result are shown. From Table 4, the value of the coefficient of determinant (R^2) of 0.72 implies that about 72% of the variation in household consumption is explained by the explanatory variables included in the model of household consumption. The F-statistics of 3.96 which is significant at 1% also indicates that there exists a considerable harmony between household consumption and the independent variables put together. The Durbin Watson statistics of 2.03 shows that there is no serial correlation problem associated with the estimated

Table 2: Johansen Cointegration Test result

Rank	Max. Eigen value	Trace statistics
r = 0	0.81*	180.52*
r = 1	0.75*	116.54*
r = 2	0.53	63.41
r = 3	0.37	35.03
r = 4	0.22	16.94
r = 5	0.11	7.45
r = 6	0.07**	3.15**

*, **Indicate 1 and 5% level of significance, respectively

Table 3: VAR System Maximum Lag Test

Lags	Loglik	P(LR)	AIC	BIC	HQC
1	-1342.81		75.61	78.05*	76.47*
2	-1289.26	0.000	75.36*	79.93	76.97

AIC = Akaike Info Criterion; BIC = Scwartz Bayesian Criterion; HQC = Hannan-Quinn Criterion; *Best (minimized) values. The Akaike Information Criterion (AIC) is used to determine the optimal lag length of the VAR Model. The AIC criterion is minimized for order 2. This implies that for this study, the optimal lag length is 2

Table 4: VAR estimation result

Variables	Coefficients	t-ration	Other statistics
constant	0.5500	2.01**	$R^2 = 0.72$
con (-1)	0.6100	3.07*	F-stat = 3.96*
con (-2)	-0.1200	-0.56	DW-stat = 2.03
sfd (-1)	0.0040	0.15	-
sfd (-2)	-0.0001	-0.77	-
brs (-1)	0.0020	2.26*	-
brs (-2)	-0.0002	-1.79***	-
ftw (-1)	-0.0017	-0.078	-
ftw (-2)	-0.0061	-0.32	-
cmt (-1)	-0.0100	-1.72***	-
cmt (-2)	0.0020	0.26	-
spd (-1)	0.0010	1.32	-
spd (-2)	-0.0070	-0.93	-
pgdp (-1)	0.0045	1.35	-
pdgp (-2)	-0.0640	-1.56***	-

*, **, ***Represent 1, 5 and 10% significant level; Doornik_Hasen Multivariate Normality Test = 56.86*; Dependant variable: con

household consumption model. Researchers also employed the Doornik Hasen Multivariate Normality test which is significant indicates that the error is normally distributed. A cursory look at the result in Table 4 shows that a previous (1 year lag) household consumption pattern affect positively contemporary household consumption. Bear and stout manufacturing output was found to positively influence household consumption in Nigeria and this is significant at 1% level. This implies that increased output from bear and stout manufacturing leads to a higher household consumption. A 2 years lag of bear and stout manufacturing output was however found to have a significantly negative effect on household consumption. Cement manufacturing output was found to negatively and significant influence household consumption in Nigeria. Soft-drink manufacturing output and soap and detergent manufacturing were found to positive affect household consumption, however 2 years lag of them negatively influenced household consumption in Nigeria though they were not significant.

Per capita GDP influence household consumption positively though not significant while its 2 years lag had a significantly negative effect on household consumption in Nigeria.

Variance decomposition: The variance decomposition result for household consumption (con) only is shown in Table 5. This is because household consumption is the main issue of concern in this study. The essence of the variance decomposition is to measure the proportion of forecast error variance in one variable explained by innovations from it and other variables.

In Table 5, the household consumption variance decomposition analysis reveals that the largest share of shock to household consumption is the manufacturing of bear and stout manufacturing which accounted for about 15% in 10 years. The next is per capita GDP which amount to a shock of 7% in the same 10th year. This is followed by soap and detergent manufacturing and cement manufacturing accounting for shocks of about 3% each in the year. Foot wear and soft-drink manufacturing were found to have the least shocks to household consumption accounting about for about 2%.

Table 5: Variance decomposition for household consumption (con)

con	sfd	brs	ftw	cmt	spd	pgdp
100.00	0.00	0.00	0.00	0.00	0.00	0.00
79.9	0.62	12.64	0.16	2.02	1.70	2.95
79.22	0.53	12.98	0.57	1.77	2.33	2.58
78.57	0.51	12.19	0.66	2.21	3.42	2.43
78.09	0.95	11.98	0.65	2.26	3.61	2.86
76.9	1.29	11.96	1.10	2.23	3.56	2.87
75.21	1.79	11.88	1.68	2.40	3.47	3.55
72.83	1.93	12.58	1.97	2.59	3.34	4.74
70.10	1.97	13.94	2.13	2.67	3.19	5.98
67.32	2.05	15.14	2.29	2.75	3.04	7.39

CONCLUSION

This study attempts to examine the effect of manufacturing output composition on household consumption in Nigeria for the period 1970-2008. The study employed a Vector Autoregressive (VAR) Modeling Technique for the analysis. Manufacturing output composition variables of interest used for the study are soft-drink manufacturing, bear and stout manufacturing, foot wear manufacturing, cement manufacturing and soap and detergent manufacturing. The study first undertake to examine the stationarity staus of the variables with the ADF and PP-test, the result revealed that all the variables became stationary after first difference. Researchers then proceeded to use the Johansen cointegration test to establish long run relationship. The estimation results indicate that bear and stout manufacturing had the highest shock to household consumption in Nigeria followed by per capita GDP. Cement manufacturing was found to have negative effect on household consumption while bear and stout manufacturing had positive effect on household consumption.

RECOMMENDATIONS

The study therefore recommends that policies aimed at increasing per capita income and equal distribution of income be put in place and there is also need to boast manufacturing output besides bear and stout to make the sector attractive as it could serve as the engine of the diversification of the economy that will save the economy from the shadows of mono-product based economy.

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