Journal of Social Sciences *Vol. VII, no. 1 (2024), pp. 35 - 47*
Fascicle *Social Science* *ISSN 2587-3490*
Topic *Economics and Management* *eISSN 2587-3504*

https://doi.org/10.52326/jss.utm.2024.7(1).03
UDC 658:338.5:621.31(669)

EFFECTS OF INTEREST RATE STRUCTURE AND ENERGY PRICES ON MANUFACTURING OUTPUT IN NIGERIA

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Received: 02. 22. 2024
Accepted: 03. 23. 2024

Abstract. Until recent years, the performance of the Nigeria's manufacturing sector has been characterized by downward pressures. Given the present shocks in the global energy markets and upward review of borrowing costs by the Central Bank of Nigeria, the historical developments around the manufacturing output appear to be subject to renewal. Consequently, this study investigates the impact of interest rate structure and energy pricing on the Nigerian manufacturing output from 1980 to 2021. Secondary data obtained from World Development Indicators and the CBN's Statistical Bulletins were anchored by an autoregressive distributed lag (ARDL) model and error correction modelling. The findings revealed that manufacturing output is inelastic in its response to changes in interest rate while it is elastic in its response to energy price. This is less puzzling as the Nigerian manufacturers seem to favour availability of credit facilities over low interest rates. Also, productive activities respond immediately to a given shock in the energy price, especially the price of diesel. On this basis, this paper concludes that energy pricing is a strong predictor of Nigeria's manufacturing output. Consequently, policy makers should institute a preferential treatment on energy distribution towards the manufacturers. This would make production more attractive, thereby boosting their capacity utilization.

Keywords: *interest rate, energy pricing, manufacturing output, ARDL, Nigeria.*

Rezumat. Până în ultimii ani, sectorul de producție din Nigeria a fost caracterizat de presiuni în scădere. Având în vedere șocurile actuale de pe piețele globale de energie și revizuirea ascendentă a costurilor îndatorării de către Banca Centrală a Nigeriei, evoluțiile istorice din jurul producției par să fie supuse reînnoirii. Acest studiu investighează impactul structurii ratei dobânzii și al prețului energiei asupra producției nigeriene din 1980 până în 2021. Datele secundare obținute din indicatorii de dezvoltare mondială și Buletinele statistice ale CBN au fost ancorate de un model de întârziere distribuită autoregressiv (ARDL) și de corecție a erorilor de modelare. Rezultatele au arătat, că producția de producție este neelastică în răspuns la modificările ratei dobânzii, dar elastică în răspuns la prețul energiei. Acest lucru este mai puțin surprinzător, deoarece producătorii nigerieni par

să favorizeze disponibilitatea facilităților de credit în detrimentul ratelor scăzute ale dobânzii. De asemenea, activitățile productive răspund imediat la un șoc al prețului energiei, în special al prețului motorinei. Lucrarea concluzionează, că prețul energiei este un predictor puternic al producției în Nigeria. În consecință, factorii de decizie politică ar trebui să instituie un tratament preferențial privind distribuția energiei față de producători. Acest lucru ar face producția mai atractivă, sporind astfel utilizarea capacității acestora.

Cuvinte cheie: *rata dobânzii, prețul energiei, producția de producție, ARDL, Nigeria.*

1. Introduction

The output of the Nigerian manufacturing sector is currently on an increasing trajectory. With average growth of 10.07% in the last twenty years [1], the sector appears to be experiencing long-term booms, having recorded downward pressures for most of the last two decades of the nineteenth century. However, there was a downturn in the Nigerian manufacturing sector in the periods 2008-2009 and 2015-2017. The former period was associated with the spillover effects of the global financial crash [1], while the latter was connected with the contagious consequence of fall in oil prices [2]. Figure 1 contains these stylized facts.

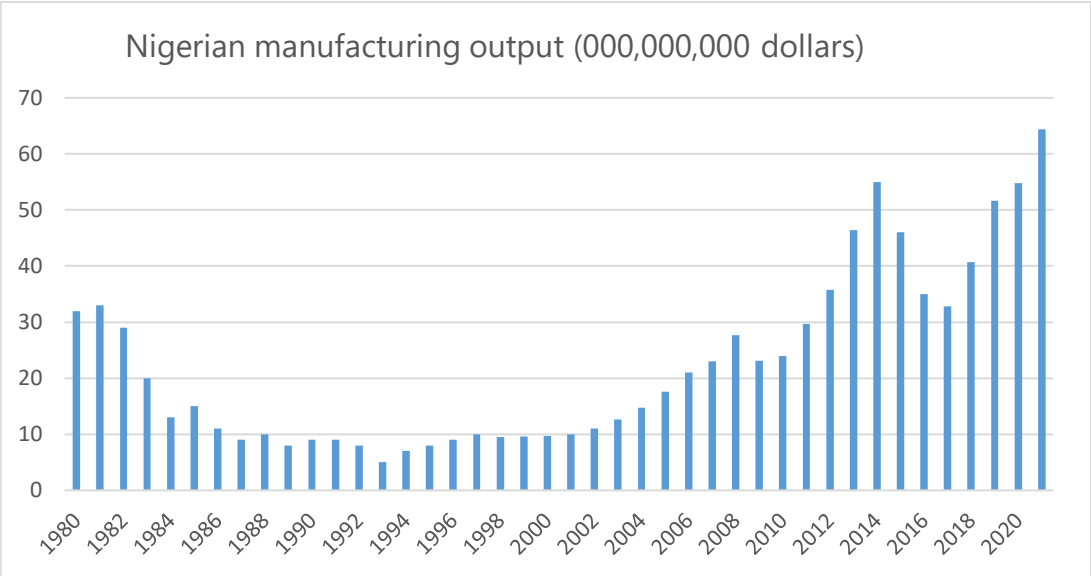

Figure 1. Trend of Nigerian manufacturing output, 1980-2021.
Note: Y-axis: Manufacturing Output; X-axis: Year. Source: CBN Statistical Bulletin, 2021.

The manufacturing sector plays a significant role in economic development, given its pivotal role in accelerating the rate of structural transformation and economic diversification [3]. According to [4], a country's optimal use of its factor endowment and minimal dependence on manufactured import depends on how well it prioritises its manufacturing sector. Accordingly, the Nigerian government has engaged in concerted efforts towards augmentation and sustenance of productivity of the manufacturing sector [1]. Nevertheless, empirical evidences are not robust enough to credit the governments' efforts [2].

The economy-wide interest rate has remained a subject for critical argument especially owing to its influences on savings mobilization and encouragement of investment. Generally, interest rates are the lenders reward for lending and the borrowers'

prices for utilizing credit [5]. The Central Bank of Nigeria (CBN) minimum rediscount rate (MRR) now monetary policy rate (MPR) is the official yardstick which guides all other interest rates in the financial markets and the general economy at large [6]. In 1987, the CBN adopted the fixed interest rate regime which was eventually modified in 1989 by amending required spreads between deposit and lending rates [7].

Year 1991 and 1993 were characterized by Nigerian government's prescription of maximum margin between bank's average cost of funds and its maximum lending rates, announcement of savings deposit rate and maximum lending rate; and removal of maximum lending rate ceiling in a bid to curb rising inflation rate [8]. However, direct interest rate control was restored in 1994. Given the undesirable economic effect of subsequent controls in 1994 and 1995, total deregulation of inter was readopted in 1996. However, since the beginning of the twenty-first century, the CBN has chosen to peg the interest rates through its Monetary Policy Committee who meet at least four times in a year [9].

Given the use of sophisticated machines in manufacturing, industrial production often requires substantial energy usage [3]. This implies that manufacturing increases demand for energy which in turn calls for the need to match energy supply with energy demand. Furthermore, this implies that energy is an input in production. According to [10], absence of energy implies manual production. A problem in the Nigerian manufacturing sector is inadequate energy supply [11]. Although successive Nigerian governments appear to have made efforts towards development of a competitive and strong manufacturing sector, the intention behind these efforts have not been sincere in that employment generation, poverty reduction, inequality reduction and improved standard of living are prioritized over industrialization [12]. The focus of the Nigerian authorities should rather be on energy pricing as instituting favourable pricing of energy promises to accelerate the growth of industries and increase their sectoral contribution to the GDP [1].

Given historical developments of the Nigeria's secondary sector, interest rate structure and energy pricing seem to be major determinants of fluctuations around the sectoral contribution of the sector. Consequently, this study intends to investigate the impact of interest rate and energy pricing on the manufacturing output in Nigeria. Following this introduction, the following sections respectively focus on literature review; methodology and analytical framework; results and discussion; and conclusion, implications and recommendations.

2. Literature Review

2.1 Theoretical Review

The loanable funds theory, which was mostly credited to [13], was built on the classical assumption that investment flows are tilted by changes in the interest rate. According to the loanable funds theory the price of loanable funds rate while loanable funds emanate from savings. Supply of money through bank credit creation and incentive to save determines the supply funds available for lending (credit) [14], while demand for loanable funds is determined by demand for investment expenditure and the demand for holding money [15].

Consequently, if money demand rises, supply of loanable funds will fall, as the market-determined interest rates have fallen. In contrast, an increase in liquidity preference causes the supply of loanable funds to increase to accommodate the resulting increase in

the interest rates. Equilibrium is achieved when demand for loanable funds equates supply of loanable funds [13].

Instead of treating the interest rate as exogenous variable, the Keynesian theory of interest rate considers the rate of interest as an endogenous variable. In the Keynesian theory, the interest rate is taken as the reward for lending money for a specified period [16, 17]. Individuals decide the portion of their income to consume and to save in cash or bank. Consumers' decision to hold money as cash or saving in bank is termed 'liquidity preference' [17]. The crux of Keynesian liquidity preference theory is the integration of monetary theory and value theory [18], on the one hand, and the theory of output and employment through the rate of interest, on the other hand [19]. Thus, when the money supply rises; interest falls; aggregate investment and demand rises as output and employment also rise. It can thus be argued that the Keynesian theory of interest rate is much relevant in decomposing the impact of interest rate changes on output performance of manufacturing companies.

2.2 Empirical Review

Countries emphasize the role of capital accumulation due to the role of capital in production and the growth process. In simpler terms, increasing investment is directly proportional to increasing output [20]. This connection explains the attention paid to interest rate regimes by users of capital (including manufacturers). In this vein industrialization necessitates substantial investments funded via capital accumulation. But capital accumulation is influenced by fluctuations around the lending rate [6]. Thus, changes in interest rate affect the manufacturing output through their effect on capital accumulation [11].

The study on the effect of bank lending rate and growth of the manufacturing sector in Nigeria from 1973 to 2009 conducted by [20] found that capacity utilization and bank lending rates influence manufacturing output. Noting the importance of good interest rate management, the paper urged the CBN to consider the impact of its monetary policy on capacity utilization of manufacturers. An extension of the study by [20] was carried out by [21] who reported results similar to findings of [20]. Similarly, another study by [11] analyzed similar variables as [21] and also concluded that capacity utilization of manufacturers and real investors respond to the prevailing interest rate decisions of the CBN.

Based on the axiom that interest rate regimes and manufacturing output have bivariate relationships, the study by [22] explored the impact of interest rate regimes on the Nigerian manufacturing output by separating the impact of interest rate regimes on the Nigerian manufacturing output in the pre-SAP and post-SAP periods. Findings reveal that interest rate has a long-run impact on manufacturing output in Nigeria. More specifically, a 1% rise in the borrowing cost leads to a 3% fall in the industrial output. This finding has attracted many other researchers to investigate similar relationship. The study by [22] was replicated by [23] but using additional explanatory variables (such as exchange rate and banking reforms). Findings from the study of [23] echoed what as already obtained in the literature. Also, other studies discovered results not different from earlier findings in the literature [24, 9].

The study performed by [25], analyzed the role of energy supply on the industrial sector of Nigeria. The paper submitted that the Nigerian manufacturing sector was performing below expectation due to inadequate infrastructure especially epileptic energy

supply. The submission of [25] has triggered other researchers to see into the validity of the paper's claim [26, 27, 28, 2]; however, none of the later studies has refuted the claim of [25]. The study by [29] was more particular about the impact of energy prices and the findings further established that availability and prices of energy determine the manufacturing performance in Nigeria.

Elsewhere, the study conducted by [30] investigated the effect of energy consumption and growth of manufacturing sector in Malaysia, using the time series data between 1980 and 2010. The study found a strong, positive relationship between energy supply and real industrial output. Earlier, studies examined the relationship between disaggregated energy consumption and manufacturing growth in Turkey, United States and South Africa. These studies pointed to the variation in energy pricing as a significant determinant of industrial performance [31, 32, 33].

2.3 Methodological Review

In the literature, the most common analytical techniques adopted by many studies to investigate the impact of interest rate structure and/or energy pricing on manufacturing output is the Autoregressive Distributed Lag (ARDL) and the Error Correction Model (ECM). Such studies include [6, 11, 20, 22, 23, 32]. According to [34], the popularity of the ARDL/ECM technique is hinged on their robustness in showcasing the short-run and long-run dynamics of the interest rate and energy supply changes. According to [11], ARDL is the most appropriate technique for studies involving variables that are prone to short-run shocks.

Another common estimation framework is the Ordinary Least Squares (OLS) as used by [10, 21, 35]. Yet, some other studies favoured the use of vector autoregression (VAR). [9], for example, proposed that interest rate structure and banking reforms are important variables that can explain variations in manufacturing output. However, both variables influence each other and thus are best treated as both dependent and independent variables. Thus, VAR becomes the most applicable technique when the regressors have the tendency to affect each other.

3. Materials and Methods

3.1 Model Specification

This study employed the ARDL methodology in the estimation procedure. This analytical approach enabled us to measure the fluctuations around interest rate and energy pricing as they might impact manufacturing output. The model proceeds as follows.

We begin by specifying the general model as contained in equation 1. This follows [6] who submitted that performance of manufacturing companies in Nigeria is determined principally by the interest rate regime as well as the energy prices. Also, [36] gave a theoretical assertion that real investors decide where to mobilize their resources depending on expected returns which in turn are shaped by interest rate fluctuations and the conditions of energy markets.

$$manout = f(intrat, enepri), \tag{1}$$

where: $manout$ is manufacturing output, $intrate$ is the interest rate and $enepri$ is energy price. In econometric terms and within the auspices of ARDL technique, we specify the following model. Again, the justification for the inclusion of the variables is derived from the empirical work of [37].

$$\Delta manout_t = \alpha_0 + \alpha_1 intrat_{t-1} + \alpha_2 enepri_{t-1} + \sum_{i=1}^{\rho} \beta_i \Delta manout_{t-1} + \sum_{i=1}^{q} \varphi_i \Delta intrat_{t-1} + \sum_{i=1}^{r} \phi_i \Delta enepri_{t-1} + e_t, \ldots\ldots \quad (2)$$

where: αs are long-run coefficients, $\beta s, \varphi s \; and \; \emptyset s$ are short-run coefficients, ρ , q and r, are all optimal lags. Δ is a notation for change. e is stochastic error term distributed with constant mean and zero variance. All the variables are in log form.

3.2 A priori Expectation

We hypothesize that $\alpha_1 < 0 \; and \; \alpha_2 < 0$ in the long run. Generally, interest rate is supposed to have negative effect on the manufacturing output. A higher interest rate is a discouragement to manufacturers of goods and services. By similar argument, higher energy price is a disincentive on the manufacturers to produce more output

3.3 Data Requirements and Sources

This study uses time series annual data sourced from the World Development Indicators (WDI) of the World Bank and the Statistical Bulletins of the Central Bank of Nigeria (CBN). In particular, information on energy price comes from WDI while that on each of interest rate and manufacturing output are obtained from the CBN. Given the important role of diesel in the production process of manufacturers, diesel price is taken as proxy for energy price in this study. Interest rate is as represented by the monetary policy rate of the CBN. Finally, manufacturing output is the contribution of the manufacturing sector to the total GDP.

3.4 Estimation Technique

This study adopted the autoregressive distributed lag (ARDL) estimation approach which assumes that series are either integrated of order one or order zero. The ARDL approach involves bounds testing used to determine long run relationship among variables under study. Long run relationship is confirmed if the F-statistic is greater than the upper-bound critical value at the chosen level of significance while Short run relationship is confirmed if the F-statistic is less than the lower-bound critical value at the chosen level of significance. Having ascertained long run relationship, the error correction model is specified and estimated as

$$\Delta manout_t = \alpha_0 + \sum_{i=1}^{\rho} \beta_i \Delta manout_{t-1} + \sum_{i=1}^{q} \varphi_i \Delta intrat_{t-1} + \sum_{i=1}^{r} \phi_i \Delta enepri_{t-1} + \xi ECM_{t-1} + e_{t,} \quad (3)$$

where: ξ is the speed of adjustment co-efficient, measuring how much deviation from the long-run will be restored within the time period (in this case one year). ξ is expected to be negative and statistically significant to support the cointegrating relationship. While equation 2 includes both long- and short-run dynamics of the variables in a single model, equation 3 contains the short-run representation and a component to measure the deviation of the short run from the long run form. This study estimates equation 3 to follow contemporary studies of [11] and [34]. All other variables are as defined above.

4. Results and Discussion

4.1 Descriptive Analysis

Table 1 presents the estimated descriptive statistics of variables in the ARDL model. The mean interest rate for the forty-two year period (1980-2021) is 16.6%. With this average rate being higher than the rates in recent years, it goes that the Central Bank of Nigeria has historically been setting high borrowing costs to influence financial transactions within the Nigerian economy. In addition, the average rate lies roughly at midpoint of minimum rate (7.75%) and maximum rate (31.65%), suggesting that the bank rate in Nigeria is subject to high volatilities. This is upheld by standard deviation of 5.1%. The time series of interest rate is positively skewed, meaning that its distribution has long right tail. Also, with a threshold of 3, the kurtosis of interest rate shows that it is leptokurtic, implying that its distribution is fat-tailed as there are many outliers in the series.

Table 1

Descriptive Statistics of Variables

	Mean	Std. dev	Min	Max	Skewness	Kurtosis
Intrat (%)	16.64	5.11	7.75	31.65	0.58	3.21
Enepri ($)	0.42	0.47	0.01	1.67	0.97	2.94
Manout ($)	2.29E+10	1.58E+10	5.10E+09	6.44e+10	0.96	2.88

Source: Authors' computation.

The average energy price is $0.42. With this figure being far from the maximum price ($1.67) coupled with the fact that the highest price was recorded only in 2021, it explains that high energy pricing in the Nigerian manufacturing sector is a recent phenomenon. The standard deviation of 0.47, which is more than the mean value, is a reflection of high fluctuations of energy price. This poses little surprise as the downstream oil and gas sector in Nigeria is deregulated and prices are allowed to tour round the market until it settles at where the market thinks a sense of decorum. Like those of interest rate, the distributions of the energy price are also positively skewed. However, they are platykurtic, indicating that they are thin-tailed with only a few outliers. The behaviour of energy pricing regarding skewness and kurtosis has similar rhetoric as those of manufacturing output. More similarly, the standard deviation $15.8 billion is relatively not distant from the mean manufacturing output $22.9 billion.

4.2 Correlation Analysis

The stylized facts on functional relationships that exist among the variables are indicated by correlation coefficients. Table 2 presents these coefficients. The correlation between interest rate and energy price is -0.35. This is pro-intuitive. Higher borrowing costs might imply less credit for the manufacturers, which in turn leads to less demand for energy products. And the basic demand theory predicts that a depressed demand generates a downward pressure on price. The negative association between interest rate and manufacturing output (-0.64) also follows the standard theoretical proposition. Monetary tightening reduces aggregate demand, which in turn reduces investment activities of firms. Furthermore, the negative relationship between energy price and manufacturing output is self-instructive. Higher price of an energy product should amount to less demand for such product and thus less output. The available data appear to support this basic principle. The regression analysis later in this section sheds more educative light on these correlation coefficients.

Table 2

Correlation Coefficients

	Intrat	Enepri	Manout
Intrat	1.00		
Enepri	-0.35	1.00	
Manout	-0.64	-0.79	1.00

Source: Authors' computation.

4.3 Stationarity Analysis

Tables 3a and 3b respectively presents computed values of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) statistic of each of the variables using both constant only and constant and trend specifications. The fact that the computed ADF and PP statistic values in Table 3a exceed critical values in table 3b only at first difference shows that the series are not stationary at levels, but are all stationary at first differences. It goes that the series are all I(1). That the series are not I(0) lends credibility to the use of ARDL as the analytical technique used in this study.

Table 3a

Unit Root Tests

Variables	Form of test	Constant		Constant and Linear Trend		Order of Integration
		Levels	First Differences	Levels	First Differences	
Intrat	ADF	-0.8865	-7.0880	-1.0662	-7.0314	I(1)
	PP	-0.7054	-7.0511	-1.8831	-7.0159	I(1)
Enepri	ADF	-1.1176	-6.1160	-1.5469	-6.1291	I(1)
	PP	-1.0938	-6.1353	-1.7042	-6.1329	I(1)
Manout	ADF	-0.4591	-6.4631	-2.7033	-6.3628	I(1)
	PP	-0.3171	-7.3301	-2.7033	-7.2652	I(1)

Note: ADF-Augmented Dickey Fuller; PP- Philips-Perron. *Source: Authors' computations.*

Table 3b

Asymptotic Critical Values of ADF and PP

		Constant		Constant and Linear Trend	
		Levels	First Differences	Levels	First Differences
1%	ADF	-3.6463	-3.6463	-4.2528	-4.2627
	PP	-3.6394	-3.6463	-4.2529	-4.2627
5%	ADF	-2.9540	-2.9540	-3.5485	-3.5530
	PP	-2.9511	-2.9540	-3.5485	-3.5530
10%	ADF	-2.6158	-2.6158	-3.2071	-3.2096
	PP	-2.6143	-2.6158	-3.2071	-3.2096

Note: ADF-Augmented Dickey Fuller; PP- Philips-Perron. *Source: Authors' computations.*

4.4 Bounds Test

Table 4 presents the result of the bounds test for cointegration. The fact that the computed bounds F-statistic (8.238) is exceeds both lower and upper limits of the critical values at 10%, 5% and 1% shows that both short-run and long-run relationships among interest rate, energy price and manufacturing output can be determined empirically and thus inferences can be generated from them.

Table 4

Bounds Test for Cointegration

H_0: No Long run Relationship
F Statistic: 8.238

Critical Bound's Values			
	10%	5%	1%
Lower Bound I(0)	3.17	3.79	4.41
Upper Bound I(1)	4.14	4.85	5.82

Source: Authors' computations.

4.5 Short-run Dynamics

As Table 5 presents, the past values of the manufacturing output have positive impact on the present values. That is, a period of boom in the industrial sector is likely to have extensive impact over succeeding period. In similar vein, a period of output contraction may also be long lasting. Over the short run, output produced by the manufacturing firms is impacted by the structure of the interest rate. However, this impact is weak. More interestingly, past values of the interest rate are statistically insignificant in affecting fluctuations around the manufacturing output. It goes that the Nigerian manufacturers are not adaptive in considering previous episodes of the CBN's monetary policy rate while making output decisions. In contrast, the responsiveness of industrial output with respect to both present and previous values of the energy price is inverse, strong and statistically significant. The error correction term (ECM) is negative and statistically significant. This supports the results of the bounds testing of existence of long-run relationships among the variables. In specific terms, about 59% of the previous year's deviation from long-run equilibrium will be restored within one year – this is indicated by the ECM component.

Table 5

Short-run Estimates

Dependent Variable:
manout
Optimal Lag: 3,4,3
Lag Selection Criteria: Schwarz Bayesian Criterion

Variable	**Coefficient**	**t-statistic**
Δ[manout(-1)]	0.16**	8.96
Δ[manout(-2)]	0.38**	-4.53
Δ[intrat]	-0.08*	2.87
Δ[intrat(-1)]	-0.07***	-1.01
Δ[intrat(-2)]	-0.04***	1.67
Δ[intrat(-3)]	0.55***	-0.08
Δ[enepri]	-1.46*	-5.89

Continuation Table 5

Δ[enepri(-1)]	-1.34**	4.23
Δ[enepri(-2)]	2.33**	-7.11
ECT(-1)	-0.59*	-4.04
R^2	0.78	
F-stat	2438 (0.00)	

Note: variables in log form; *, **, *** indicates significance at 5%, 10%, insignificance. *Source: Authors' computation.*

4.6 Long-run Dynamics

Table 6 presents estimates of the long-run coefficients. The elasticity of the manufacturing output with respect to interest rate is -0.06. This shows a weak impact of interest rate on the manufacturing output. However, the elasticity of the manufacturing output with respect to energy price is 1.34. This suggests that energy price has a strong impact on manufacturing output. More specifically, increasing the interest rate by 100 basis points leads to a fall in manufacturing output by only 6%. Whereas, a fall in energy price by 1% enables the industrial output to rise by 1.34%. Furthermore, manufacturing output can be said to be interest rate inelastic while it is energy price elastic.

Table 6

Long-run Estimates

Variable	Coefficient	t-statistic
Intrat	-0.06**	-5.27
Enepri	-1.34*	8.36
R^2	0.81	
F-stat	2871 (0.00)	

Note: *, ** indicates significance at 5% and 10%. *Source: Authors' computation.*

5. Conclusions, Implications and Recommendations

This study investigated the impact of interest rate structure and energy pricing on the Nigeria's manufacturing output. Having obtained descriptive and correlation statistics on the data, stationarity and bounds tests were also carried out to ascertain the statistical properties of the data. Given that the data were well-behaved, further inferences were generated with the aid of ARDL as estimation technique. It was found that interest rate is statistically significant, but weak predictor of manufacturing output. This finding is perhaps hinged on the premise that the Nigerian manufacturers pay little attention on the decision of the Monetary Policy Committee of the CBN with regard to interest rate policy. Rather, availability of credit is likely the main determinant of the manufacturer's propensities to finance production by borrowing. The Nigerian businesspeople appear adapted to high interest rate regimes in the financial sector. So it is hardly a shock that the CBN reviews the monetary policy rate upward or downward. What seems important to the Nigerian businesspeople is the ease of accessing the credit.

On the other hand, energy pricing, represented in this study by the dollar price of diesel, is a strong factor determining the industrial output. The regression results pointed that output is energy price elastic, indicating that a small change in the price of energy elicits more than proportionate change in the manufacturing output. This finding is markedly straightforward. Manufacturing companies mainly use diesel to power their plants and generators. So a shock in the price of diesel will expectedly be felt hard by them. This

makes them respond almost instantly to a given change in diesel price (especially when it is reviewed upward by marketers). It goes without saying that the outrageous price of diesel in Nigeria has dragged production in many firms, while making business unattractive to many others.

The findings of this study shed light on the priority of the Nigerian government if it is serious with increasing manufacturing output in Nigeria. The decision to fully deregulate the energy market in Nigeria might require a revision. This is because diesel price, a major energy product used by manufacturers, is at all-time high at the detriment of industrial production. Against this backdrop, the following are recommended to guide the policy and decisions of the government and the CBN towards bolstering the level of manufacturing output in Nigeria:

- Government should review the price of diesel downward. This should be done to make production more attractive to manufacturers
- Government should institute a framework of treating manufacturers differently from other users of energy. The framework should be one that encourages production
- The CBN should consider instructing banks and other financial institutions to make credit available to manufacturers
- The CBN should ensure timely provision of foreign exchange to manufacturers that import materials
- Government should announce disciplinary measures for any marketer that hoards diesel supply to manufacturers

In this study, interest rate and energy price were taken as independent variables while manufacturing output is dependent variable. The study is limited in that it uses only secondary (aggregate) data on these three variables. Future researchers may consider looking into firm-specific data and see if similar conclusions can be obtained. While the study establishes that energy price is a strong determinant of manufacturing output, similar conclusion cannot be said of interest rate. However, the researcher has a suspicion that availability of credit may be considered as more important than interest rate by the Nigerian manufacturers. This generates the room for future research on exploring the statistical relevance of credit flows as a factor affecting manufacturing output.

Conflicts of Interest: We declare no conflict of interest.

References

1. Asaleye, A.J.; Lawal, A. I.; Inegbedion, H. E.; Oladipo A. O.; Owolabi A. O.; Samuel, O. M.; Igbolekwu, C. O. Electricity consumption and manufacturing sector performance: evidence from Nigeria. *International Journal of Energy Economics and Policy* 2021, 11(4), pp. 195-201.
2. Quadri, S.T.; Bukola, M.O. Impact of Electricity Consumption on Manufacturing Output in Nigeria, 1980–2021. *Research Square* 2022, 1, pp. 1-20. Available online: https://assets.researchsquare.com/files/rs-2134279/v1/a51dfef9-d23e-46e0-8273-6cd9bbeb1dec.pdf?c=1665163620 (accessed on 05/01/2024)
3. Maji, I. K. Does clean energy contribute to economic growth? Evidence from Nigeria. *Energy Reports* 2015, 1(2015), pp. 145-150.
4. Owodunni, O. Awareness of energy consumption in manufacturing processes. *Procedia Manufacturing* 2017, 8(17), pp. 152-159
5. Asaleye, A.J.; Adama, J.I.; Ogunjobi, J.O. Financial sector and manufacturing sector performance: evidence from Nigeria. *Investment Management and Financial Innovations* 2018, 15(3), pp. 35-48
6. Udoka, C.O.; Roland, A. The effect of interest rate fluctuation on the economic growth of Nigeria, 1970-2010. *International Journal of Business and Social Science* 2012, 3(20), pp. 295–302.

7. Okonkwo, O.N.; Egbulonu, K.G.; Emerenini, F.M. Monetary policy and the manufacturing sector in Nigeria. *International Journal of Economics and Management Studies* 2015, 2(1), pp. 17-25
8. Idoko, I.A.; Eche, E.; Kpeyol, K. An assessment of the impact of interest rates deregulation on economic growth in Nigeria. *International Journal of Economics* 2012, 6(2), pp. 349-362.
9. Olayemi, S. O.; Michael, O. Financial reforms and industrial productivity growth in Nigeria. *Journal of Economics and Sustainable Development* 2016, 7(7), pp. 64-70.
10. Ojo, A.S.; Ololade, O.F. An assessment of the Nigerian manufacturing sector in the era of globalization. *American Journal of Social and Management Sciences* 2014, 5(1), pp. 27-32.
11. Adeyemi, P.A.; Olufemi, O.B. The determinants of capacity utilization in the Nigerian manufacturing sector. *Journal of Economics and Sustainable Development* 2016, 7(5), pp. 20-31.
12. Oguntoye, O.; Evans, S. Framing manufacturing development in Africa and the influence of industrial sustainability. *Procedia Manufacturing* 2017, 8, pp. 75-80.
13. Hansen, A. H. Classical, loanable-fund, and Keynesian interest theories. *The Quarterly Journal of Economics* 1951, 65(3), pp. 429-432.
14. Tsiang, S. C. Liquidity preference and loanable funds theories, multiplier and velocity analyses: a synthesis. *The American Economic Review* 1956, 46(4), pp. 539-564.
15. Harris, L. *Monetary Theory* (1981). New York: McGraw-Hill 1981.
16. Keynes, J. M. The general theory of employment. *The quarterly journal of economics* 1936, 51(2), pp. 209-223.
17. Keynes, J. M. Alternative theories of the rate of interest. *The Economic Journal* 1937, 47(6), pp. 241-252.
18. Kregel, J. Irving Fisher, great-grandparent of the "General theory": money, rate of return over cost and efficiency of capital. *Papers in Political Economy* 1988, pp. 59-68.
19. Wray, L.R. *Money and Credit in Capitalist Economies: The Endogenous Money Approach*. Aldershot: Edward Elgar 1990.
20. Obamuyi, T. M.; Edun, A. T.; Kayode, O. F. Bank Lending, economic growth and the performance of the manufacturing sector in Nigeria. *European Scientific Journal* 2012, 8(3), pp. 57-78.
21. Imoughele, L. E.; Ismaila, M. Empirical investigation of the impact of monetary policy on manufacturing sector performance in Nigeria (1986 – 2012). *International Journal of Education and Research* 2014, 2(1), pp. 1-20.
22. Adebiyi, M. A.; Babatope-Obasa, B. Institutional Framework, Interest Rate Policy and the Financing of the Nigerian Manufacturing Sub-sector. African Development and Poverty Reduction: The Macro-Micro Linkage, Forum Paper, South Africa, 2004, pp. 1-37
23. Ogunleye, E. O. & Saliu, M. Long-Run Relations between the Financial Institutional Reforms and the Nigerian Manufacturing Performance (1970-2005). *Journal of Economics and Sustainable Development* 2013, 4(15), pp. 80-87
24. Gideon, O. O.; Gabriel, A. A.; Oladipo, A. O. Banking Sector Re- forms and Output Growth of Manufacturing Sector in Nigeria. *Journal of Economics and International Finance* 2015, 7(8), pp. 183-191
25. Adenikinju, A. Analysis of the cost of Infrastructure failures in a developing economy. The case of the electricity sector in Nigeria. AERC Research Paper 48 2005, Nairobi.
26. Gbadebo, O.; Okonkwo, C. Does energy consumption contribute to economic performance: Evidence from Nigeria. *Journal of Economics and Business* 2009. 12(2), pp. 43-79.
27. Akomolafe K. J.; Danladi, J. D.; Babalola, D. Electricity consumption and economic growth: A causality test in Nigeria. Proceedings of the 2012 NAEE/IAEE Conference on Energy Technology and Infrastructure for Development 2012, pp. 509-517.
28. Elijah, U.; Nsikak, J. Energy requirements and industrial Growth in Nigeria: An ARDL approach. In: *Proceedings of the NAEE/AEE conference on energy resource management in a federal system, challenges, constraint, and strategies,* Nigeria, 2013, pp. 74-96.
29. Noor, S.; Siddiqi M. Energy consumption and economic growth in South Asian countries: A co-integrated panel analysis. *International Journal of Human and Social Sciences* 2010, 5(14), pp. 921-926.
30. Shaari, M. S.; Hussain N.E.; Ismail, M. Relationship between energy consumption and economic growth: empirical evidence for Malaysia. *Business System Review* 2012, 2(1), pp. 17-28.
31. Erbaykal, E. Disaggregate energy consumption and economic growth: Evidence from Turkey. *International Research Journal of Finance and Economics* 2008, 20, pp. pp. 172-179.
32. Sari, R.; Ewing B.; Soytas U. The relationship between disaggregated energy consumption and industrial production in the United State: an ARDL approach, *Energy Economics* 2008, 30, pp. 2302-2313.

33. Ziramba, E. Disaggregated Energy consumption and Industrial Production in South Africa 1980-2005. *Energy Policy* 2009, 37(6), pp. 2214-2220
34. Ayanwale, O.J. The impact of interest rates on the development of an emerging market: empirical evidence of Nigeria. *Journal of Economics and Sustainable Development* 2013, 4(10), pp. 44-58.
35. Ogar, A.; Nkamare, S. E; Effiong, C. Commercial Bank Credit and Its contributions on manufacturing sector in Nigeria. *Journal of Finance and Accounting* 2014, 5(22), pp. 188-191
36. Fedderke, J. W. The Virtuous Imperative: Modelling Capital Flows in the Presence of Non-Linearity. *Economic Modelling* 2002, 19, pp. 445-461.
37. Ajide, K.B. The role of governance on private investment in Nigeria: A preliminary analysis. *Central Bank of Nigeria Economic and Financial Review* 2013, 51, pp. 93-119.
38. Pesaran, M. H.; Shin, Y.; Smith, R. J. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics* 2001, 16, pp. 289-326.

Citation: Oyaromade, R.; Isayomi, A.S.; Ibrahim-Ayede, S. Effects of interest rate structure and energy prices on manufacturing output in Nigeria. *Journal of Social Sciences* 2024, 7 (1), pp. 35-47. https://doi.org/10.52326/jss.utm.2024.7(1).03.

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