
MACROECONOMIC VARIABLES AND PRODUCTIVITY OF NIGERIA'S MANUFACTURING SECTOR

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ABSTRACT

This study examined the effect of macroeconomic variables (exchange rate, interest rate and inflation rate) on productivity of Nigeria's manufacturing sector. Three research hypotheses were formulated to guide the study. The used study used secondary data collected from annual time series from 1980-2020 obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin. The ordinary least squares, cointegration and regression statistics were used to analyse the data. The study found that exchange rate and interest rate has significant effect on the productivity of Nigeria's manufacturing sector; and that inflation rate has no significant effect on the productivity of Nigeria's manufacturing sector. The study thus concluded that exchange rate and interest rate are macroeconomic variables that significantly affects productivity of Nigeria's manufacturing sector; and recommends that exchange rate and interest rate should be stabilized in other to maintain steady growth and positive performance of manufacturing firms in Nigeria.

Keywords: Exchange rate, inflation rate, interest rate, manufacturing sector, productivity

INTRODUCTION

Macroeconomic variables affect productivity of the manufacturing sector in every economy; and productivity of the manufacturing sector contribute significantly to development and economic welfare of nations. The manufacturing sector is a secondary sector with the potential to boost economic growth of developing economies. A thriving manufacturing sector has been proposed seen as a propellant of economic development because it generates opportunities for increased availability of goods, increases employment and income, improves efficiency and strengthens balance of payments (Paulo et al., 2017).

The manufacturing sector is a foundation for technological advancement and the catalyst for economic growth (Ullah et al., 2020; Lawal et al., 2017). There is substantial evidence to support the idea that the manufacturing sector is important to achieving economic growth (Lawal et al.,

2018, 2019; Meier & Quaas, 2021). Given its capacity to maximize return to scale, high synergies, and linkage effects, the manufacturing sector's production structure benefits emerging nations (Arjun et al., 2020). No economy can transition from being a primary producer or crude economy to a service-oriented economy without the manufacturing sector, which acts as a conduit between crude economies and service-oriented economies (Meier & Quaas, 2021). Also, the manufacturing sector provides a platform for developing nations to close technology imbalance.

Being the guidepost for a country's economic growth, Ullah et al. (2020) and Paulo et al. (2017) argue that macroeconomic variables are crucial to predicting the behaviour of the manufacturing sector. The behavior of macroeconomic variables including inflation rate, interest rate, and exchange rate greatly impact the manufacturing sector. The manufacturing sector will always do well whenever there is a positive movement in macroeconomic variables like inflation rate, interest rate, and exchange rate (Papetti et al., 2020; Zhang et al., 2019).

Exchange rate is a macroeconomic variable that negatively affects the manufacturing sector. It increases or decreases the value of home currency of revenues and cost incurred in foreign currency. Zhang et al. (2019) maintains that exchange rate increases or decreases earnings in home currency before interest costs. Earlier, Prince and Ibrahim (2011) opines that, most stock exchange markets are not efficient; and respond to changes with a time lag. The reasons of the lag are that investors may wait until they realize the real effect of change, to understand whether they are permanent or temporary, even as some factors show their effects with a time lag.

Edward et al. (2015) explained that macroeconomic variables impact the economy of a country in aggregate terms by affecting all sectors. In portfolio risk analysis. They further advance that macroeconomic variables constitute the components of unsystematic risks since they are not firm specific; hence they cannot be diversified by combining a number of investment securities in a portfolio. When not manipulated properly, macroeconomic variables stampede smooth running of economies and hinder performance of firms. Thus, microeconomic variables have the ability to make or mar the performance of the manufacturing sector.

Modern manufacturing processes, in the view of Afolabi and Laseinde (2019) lead to execution of managerial and entrepreneurial skills, and high-technology developments that result in increased productivity and better living conditions. In Nigeria however, the manufacturing sector is declining, rather increasing and translating to positive shocks to economic growth; and this trend is blamed on dependence on the oil sector and neglect of the manufacturing sector.

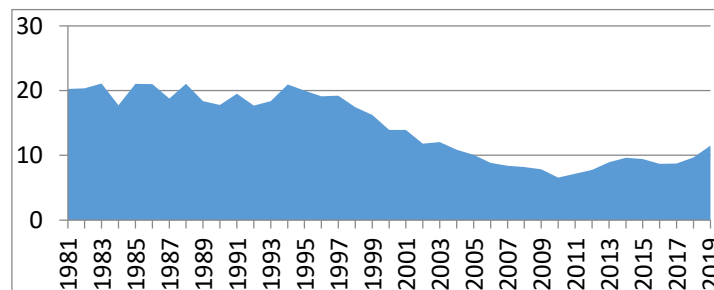


Fig. 1: Trend movement of manufacturing sector performance percentage contribution to GDP
Source: Researcher's compilation from World Bank data (2021).

Relevant deficiencies in Nigeria's economy that affect firms' productivity include hyperinflation, deflation, high interest rates, and rising exchange rates. The ability of firms to meet investment, finance, and transaction demands is constrained by their financial resources and access to capital, which can come from either debt or equity financing. Adedoyin et al. (2022) states that the manufacturing sector's capacity to maximize trade openness that will support factor inputs like machinery, raw materials, and technical transfer is affected by exchange rate regime, particularly in import-oriented nations like Nigeria. Also, access to loan and firms' productivity relates positively, as a rise in money supply promote productivity.

Prior studies show that macroeconomic variables like inflation, interest rate and exchange rate negatively affect SMEs' performance (Okeke et al., 2020). Omengbeoji et al. (2021) reports that inflation, interest rate and cooperate tax affects the agricultural sector negatively, and lowers the productivity of the sector. John (2019) showed that money supply, exchange rate and inflation affect stock market performance positively; while interest rate had a significant negative effect on stock market performance. In additional, Rasheed (2010) and Adibiyi (2001) suggests that high lending rates which results in high production costs significantly affects the growth of Nigeria's manufacturing sector.

In this study, we join the discourse on the effects of macroeconomic variables on economic growth by examining how such macroeconomic variables, such as exchange rate, interest rate and inflation affects productivity in Nigeria's manufacturing sector. The succeeding sections of this report presents review of literature, covering theoretical foundation of the study and review of literature on the focal variables of the study. This is followed by showing the methodology adopted in the study, the results obtained, discussion of findings and recommendations.

LITERATURE REVIEW

Theoretical Review

This study is anchored on Solow growth model, traditional approach (exchange rate) theory, and cost-push theory of inflation. Solow growth model is an economic growth model in which the growth of total GDP is explained by population increase, technical progress, and investment. In this model there is full employment, with an aggregate production showing constant returns to scale. In analyzing the process of economic growth Brian and Howard (2005), Solow (2002) combined the supply and demand sides of the economy together to generate economic growth.

Traditional approach theory argue that currency depreciation will result in higher exports and therefore corporate profits resulting in higher stock prices in the short run (Edward et al., 2015). This relationship is attributed to economic instability. They argued that real currency appreciation reduces companies' competitive ability to export, while real depreciation enhances their ability to export. In this study, the evaluation of the dynamic interactions between Exchange rate as macroeconomic variable and the stock price fluctuations for the case of companies quoted on the Nigerian Securities Exchange is undertaken.

Cost-push theory of inflation on the other hand suggests that rising wages fuel inflation. Incomes policies (or direct wage controls) set limits on the rate of growth of wages and have the potential to reduce cost inflation. Wage inflation normally falls when the economy is heading into

recession and unemployment starts to rise. Inflation is seen as negative news by the stock market, because it tends to curb consumer spending and therefore company earnings.

Concept of macroeconomic variables

Macroeconomic variables are indicators or main signposts that signal trends in the economy. John Maynard Keynes is credited with introducing macroeconomics (Hunjra et al, 2014). Keynes argued that by itself the market is unable to generate enough savings (capital) to sustain investment at full employment levels; and that this could be achieved only with periodic sharp increase in government spending. Like all experts, the government, in order to do a good job of macro-managing the economy, must study, analyze, and understand the major variables that determine current behavior of the macro-economy. Hence, government must understand the forces of economic growth, why and when recession or inflation occur, and anticipate these trends, as well as what mixture of policy will most effectively cure whatever ills an economy.

Hunjra et al. (2014) identified major variables that determine current behavior of the macro-economy, including (1) average prime rate, (2) consumer price index, (3) Dow Jones average, (4) foreign balance of payments, (5) inflation rate, (6) money supply, and (7) exchange rate. In this context, macroeconomic variables are influenced by government policies meant to control and stabilize the economy over time, that is, to reduce fluctuations in the economy through monetary policy, fiscal policy, and supply-side economies.

The major variables describing the macro-economy are the same, but the quality to which these are applied differ from one country to another. This is because the political process from which policies emerge are unique to each country. Three main differences separate micro and macroeconomics. Firstly, microeconomics studies individual components of the economy, while macroeconomics studies the economy as a whole. Secondly, controversy aside, government involvement in microeconomics is relatively small, and relegated to public goods, regulation, and welfare. But controversy notwithstanding, government involvement in macroeconomics is rather substantial, nearly total; it is only government that makes and enforces monetary and fiscal policies. And thirdly, whereas microeconomics has been around since the mid eighteenth century, macroeconomics began only as a reaction to the Great Depression of the 1930s.

Manufacturing sector productivity

Adebayo (2010) referred to manufacturing as production of products for use or for sale utilizing labor and machinery and other tools in a large-scale setting. Thus the manufacturing sector refers to active businesses in manufacturing goods. The manufacturing industry is a component of the broader industrial sector. The conversion of raw materials into finished consumer goods and intermediate items is the primary function of the manufacturing sector. Manufacturing has the same effect on employment as other industrial activities; in addition, it helps to grow agriculture, and aids in diversifying economies by providing jobs and increasing foreign exchange and local labor capacity. A robust manufacturing sector prevents a country from overreliance on international trade, while at the same time, giving the country full use of available resources (Okon & Osesie, 2017).

Productivity on the other hand is an average measure of the efficiency of production. Beckman (1973, as cited in Ateke & Amanagala, 2020) argues that productivity is relates to output and production issues, over economic resources. Productivity is calculated as the ratio of output to

inputs used in the manufacturing process. The economic value of all output and all input required to produce that output is known as productivity. For instance, manufacturing output is measured as a ratio of output per input over time. It can be measured by taking daily, monthly, or yearly fluctuations in manufacturing into account. In the case of manufacturing output, an increase is stated to occur when there is a rise in the output generated, regardless of the share of input employed in that production.

Thus, manufacturing sector productivity is a measure of the added value of manufacturing activities in relation to realized investments. It is the quantifiable value added by manufacturing, relative to resources employed (Ateke & Amangala, 2020). To remain productive and innovative, the manufacturing sector rely on higher productivity and innovation in other sectors of the economy (Maku & Amaefule, 2020). In other words, the manufacturing sector is a growth-driven sector that generate higher returns to growth, resulting in overall growth increase, which is a macroeconomic phenomenon caused by rising returns to scale (Abubakr et al., 2021).

Macroeconomic variables and Manufacturing sector productivity

Studies on determinants of manufacturing sector productivity abound in literature. Though the reports from these studies do not all converge. Lawal et al. (2022) examined the impact of macroeconomic, socio-economic and political variables on the manufacturing sub-sector of the Nigerian economy by using the autoregressive distributed lag to analyze data source from 1986 to 2019. The study noted that to achieve sustainable economic growth powered by strong manufacturing sector, there must be an alignment between macroeconomic variables and socio-political factors.

Dimas et al. (2022) employed an input-output model to quantify intangible trade and innovations, to access the impact of change in the manufacturing sector's contributions to economic growth of economies. The study noted that imported intangibles and patents are key to growth rate of the manufacturing sector. The study highlighted the role of economic growth as a key factor in driving industrialization. Relatedly, Pulicherla et al. (2022) examined the role of the manufacturing sector in transiting the Indian economy from a self-reliant economy to an export-oriented "Make-in-India" economy. The study noted that macroeconomic variables, research and development, and technology are key to achieving the objectives of the transition policy.

Zhenhui and Pal (2022) employed a number of econometric techniques to analyze a panel of India's registered manufacturing firms and economy-wide and firm level financial data in order to examine the nature of the relationship between financial liberalization and productivity of the Indian manufacturing sector. The study noted that financial liberalization significantly impacted manufacturing throughout the studied period - 1990 to 2000.

Doytch and Narayan (2021) calibrated the role of renewable energy and the nexus between the manufacturing sector and economic growth on the one hand, and between the service sector and economic growth on the other hand. The study examined these relationships within the endogenous growth model and noted that renewable energy facilitates growth in the high growth sector with great effects driven by industrial energy consumption, rather than residential.

Lin and Zhu (2020) investigated that construction firms play crucial roles not only in achieving economic growth in China but also aid in achieving green growth as it helps in reducing carbon

emission. The study employed some estimation techniques ranging from structural production layer difference (SPLD), and structural decomposition analysis (SDA) to analysis of data generating set sourced from 1992 to 2017 with the supply chain framework.

Moutinho et al. (2020) examined the nexus between economic and environmental drivers of sustainable economic growth. The study employed econometric techniques including pool mean group, mean group, and dynamic fixed effect techniques and reported that the contribution of manufacturing sector to the economy is significant. In their own study, Zuhaib and Nizam (2015) found that inflation rate positively impact return on equity, and interest rate had significant positive impact on return on equity.

In view of the foregoing reports, the study hypothesizes as follows:

H₀₁: Exchange rate has no significant effect on productivity of Nigeria's manufacturing sector.

H₀₂: Interest rate has no significant effect on productivity of Nigeria's manufacturing sector.

H₀₃: Inflation rate has no significant effect on productivity of Nigeria's manufacturing sector.

METHODOLOGY

Macro-economic modeling is generally motivated by two objectives: forecasting and more significantly, policy analysis. In pursuit of these objectives, every model should ideally satisfy four (4) criteria. First, it must fit into a theoretical framework, second, the specification of the model must reflect a clear understanding of the conceptual framework within which policies are formulated and executed along with an envisaged process of adjustment. Third, it is essential that the model is built on a firm and rich data base and finally, the estimated structural model must adequately utilize the rigors and sophistication of econometric methodology.

Model Specification

The model for this study is anchored on managerial theory of firms developed by Bumole (1967) in his book titled "Business Behavior, Value and Growth." This theory is based on the complex nature of the modern manufacturing sector. It theory states that the reason managers are hired is for revenue maximization and not for profit maximization. This theory believes that for the economy to grow faster through industrialization, the country needs to increase its public expenditure so as to facilitate the developmental processes of their economies (Sangosanya, 2011). The theory emphasizes that a firm's decisions whether to grow or not depends on the level of fiscal policy and macroeconomic variables because the firm grow through government policy on industrialization. The model construction for this study is therefore fashioned according to the work of Lawal et al. (2022) below:

$$\ln MANU_t = \beta_0 + \beta_1 \Delta \ln RGDP_{t-1} + \beta_2 \Delta \ln M2_{t-1} + \beta_3 \Delta \ln INF_{t-1} + \beta_4 \Delta \ln INT_{t-1} + \beta_5 \Delta \ln REER_{t-1} + \beta_6 \Delta \ln SER_{t-1} + \beta_7 \Delta \ln FD_{t-1} + \beta_8 \Delta \ln END_{t-1} + \beta_9 \Delta \ln TECH_{t-1} + \beta_{10} \Delta \ln EDU_{t-1} + \mu \dots (1)$$

To modify the model in order to capture the objectives of the study, the model is explicitly stated as follows:

$$\ln MSVA = F(\text{UNEMPR, GCXP_GDP, CRPS_GDP, INFR, LINT}) \dots \dots \dots \text{equation (2)}$$

This study will employ ordinary least square (OLS) model to capture the objectives of the research to estimate effect of macroeconomic variables on manufacturing sector productivity in Nigeria. The Econometric specification of the OLS is given thus:

$$\ln\text{MSVA}_t = \beta_0 + \beta_1\text{EXCR}_t + \beta_2\text{LINTR}_t + \beta_3\text{INFR}_t + \mu_t$$

Where:

$\ln\text{MSVA}$ = Manufacturing Sector Value Added proxy for manufacturing sector performance.

EXCR = Exchange Rate

LINTR = Lending Interest Rate

INFR = Inflation Rate

α_1 to α_4 are parameters to be estimated; μ = Stochastic error term; t = Time period

RESULTS

Unit Root Analysis

In order to eliminate inaccuracy, the variable in the regression model and the error term should be subjected to a stationarity test. For this purpose, the Augmented Dickey Fuller (ADF) test was used to test the stationarity of the data. The result of this test is shown in the table below:

Table 1: Unit Root Test Result

Variables	ADF Statistics	5% Critical Value	Order of Integration
$\ln\text{MSVA}$	57.60139	- 2.957110	I(0)
EXCHR	- 4.257645	- 2.936942	I(1)
INTR	- 2.078551	- 2.936942	I(1)
INFR	- 5.910430	- 2.936942	I(1)

The results of the unit root test for stationarity of the individual time series reported in table 4.1 above shows that EXCHR , INTR and INFR are integrated of order one i.e I(1) at 5% level of significance. Since our variables of interest are not co-integrated of the same order, the study cannot use Engle and granger 2 step methods to test for long run relationships between macroeconomic variables and productivity of Nigeria's manufacturing sector. Therefore, due to the inability to perform any co-integration test, we simply take the first difference of those variables that are non-stationary at levels and use the differenced variables to conduct a multiple regression analysis using OLS.

Co-integration Analysis

As a necessary but not sufficient condition for co-integration, each of the variables must be integrated of the same order, where the order of integration must be greater than zero. Having examined and established the order of integration, we proceed to investigate the existence of any unique equilibrium relationship among the stationary variables of the same order of integration. This is examined by the use of Johansen Co-integration test. This test is robust to various departures from normality. It allows any variables in the model to be used as dependent variable while still maintaining the same co-integration results. The results are presented in table two below.

Table 2: Result of Co-integration

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.487289	74.54140	47.85613	0.0000
At most 1 *	0.439167	48.48774	29.79707	0.0001
At most 2 *	0.373008	25.93282	15.49471	0.0010
At most 3 *	0.179730	7.726765	3.841466	0.0054

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The co-integration test was done on the variables in the study using Johansen co-integration test. The result showed that EXCHR, INTR, INFR and manufacturing sector productivity are co-integrated hence, it was deduced that there is a long run relationship between macroeconomic variables and the performance of firms in Nigeria.

Table 3: Regression Result for model 1

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	-2249588.	1118968.	-2.010412	0.0517
EXCHR	4898.817	2642.761	1.853674	0.0418
INFR	-800.0673	25495.25	-0.031381	0.9751
INTR	94192.26	48739.09	1.932581	0.0010

$R^2 = 0.8150$ Adjusted $R^2 = 0.7513$ F-Statistics = 3.3775 DW = 2.4822

The fitted multiple regression model is given by equation 4.1

$$RGDP = -2249588.0 + 4898.817EXCHR - 800.0673INFR + 94192.26INTR$$

The model above shows that there is a decrease in Nigeria's manufacturing sector productivity by 2249588.0 as a result of increase in EXCHR and INTR by 4898.817 and 800.0673 respectively and decrease in INFR by 800.0673 within the years under review.

The value of 0.8150 for R-square implies that 81.50% of variations seen in manufacturing sector productivity is explained by regressors (EXCHR, INTR and INFR) but after adjusting the degrees of freedom, the variation reduced to 75.13%. The test for overall significant of the model $\beta_0 = \beta_1 = \beta_2 = \beta_3 = 0$ (all the partial regression coefficients are not equal to zero) is rejected meaning that there is significant influence of macroeconomic variables (EXCHR, INTR and INFR) on Nigeria's manufacturing sector productivity.

CONCLUSION AND RECOMMENDATION

This study examined macroeconomic variables (exchange rate, interest rate and inflation rate) on the productivity of Nigeria's manufacturing sector. Based on the result of the econometric tests, which showed that exchange rate has significant effect on productivity of Nigeria's manufacturing sector. The study also found that interest rate has significant effect on the productivity of Nigeria's manufacturing sector; and that inflation rate has no significant effect on the productivity of Nigeria's manufacturing sector. The study thus concluded that exchange rate and interest rate are macroeconomic variables that significantly affects productivity of Nigeria's manufacturing sector, while inflation rate do not have significant effect on Nigeria's

manufacturing sector productivity. The study thus recommends that, since exchange rate and interest rate has significant effect on productivity manufacturing firms in Nigeria, exchange rate and interest rate should be stabilized in other to maintain steady growth and positive performance of manufacturing firms in Nigeria.

REFERENCES

- Adedoyin, I. L., Eziekel, O., Bukola, B. L., Joseph, I. O., Abiola, J. A., Henry, I., Santanu, A., Dick, T., Opeyemi, O., & Ogunwole, E. (2022). Impact of macroeconomic variables on the Nigerian manufacturing sector. *Cogent Economics & Finance*, 10(1), 2090664. <https://www.doi.org/10.1080/23322039.2022.2090664>
- Adeleye, B. N., Romanus, O. I., Isola, L. A., & De Alwis, T. (2021). Energy use and the role of per capita income on carbon emissions in African countries. *PLoS ONE*, 16(11), e0259488. <https://doi.org/10.1371/journal.pone.0259488>
- Afolabi, A., & Laseinde, O. T. (2019). Manufacturing sector performance and economic growth in Nigeria. *Journal of Physics: Conference Series*, 1378, 032067. 10.1088/1742-6596/1378/3/032067.
- Arjun, K., Sankaran, A., Kumar, S., & Das, M. (2020). Heliyon an endogenous growth approach on the role of energy, human capital, finance and technology in explaining manufacturing value-added: A multi-country analysis. Retrieved from <https://doi.org/10.1016/j.heliyon.2020.e04308>
- Ateke, B. W., & Amangala, E. A. (2020). Customer value communication and marketing productivity. *International Journal of Management and Marketing Systems*, 13(6), 94-104.
- Dan, S., & Yao, Y. (2017). Manufacturing as the key engine of economic growth for middle-income economies. *Journal of the Asia Pacific Economy*, 22(1), 7860. <https://doi.org/10.1080/13547860.2016.1261481>
- Dimas, P., Stamopoulos, D., Tsakanikas, A., & Vasileiadis, M. (2022). Global into input-output intangibles database: Industry-level data on intangibles for the EU-27 and the UK. *Data in Brief*, 41, 107932. <https://doi.org/10.1016/j.dib.2022.107932>
- Emerje, O. (2016). *Macro-economic manual of the modern developing economy*. Greenburst Publishers.
- Fashina, O. A., John A. A., Ogunjobi, O. J., & Isola L. A. (2018). Foreign aid, human capital and economic growth nexus: Evidence from Nigeria. *Journal of International Studies*, 11(2), 104–117. <https://doi.org/10.14254/2071-8330.2018/11-2/8>
- Ferreira, L., & de Santana Ribeiro, L. C. (2019). Economic growth and manufacturing: An analysis using panel VAR and intersectoral linkages. *Structural Change and Economic Dynamics*, 49, 43–61. <https://doi.org/10.1016/j.strueco.2019.03.008>
- Hunjra, A. I., Chani, M. L., Javed, S., Nacem, S., & Ijaz, M. S. (2014). Impact of micro economic variables on firm's performance. *International Journal of Economics and Empirical Research*, 2(2), 65-73.
- Lawal, A. I., Adebare, S. A., John, A. A., Oseni, E. B. Lawal-Adedoyin, B., Olatunde D. S., Oluwasola, O. E. Oyeronke, D. A., Bolatito, O. E., & Ayopo, B. A. (2022). Economic

- growth, exchange rate and remittance Nexus: Evidence from Africa. *Journal of Risk and Financial Management*, 15(6), 235. <https://doi.org/10.390/jrfm15060235>
- Lawal, A. I., Asaleye, A. J., IseOlorunkanmi, J., & Popoola, O. R. (2018). Economic growth, agricultural output and tourism development in Nigeria: An application of the ARDL bound testing approach. *Journal of Environmental Management and Tourism*, 28(4), 786–794. [https://doi.org/10.14505/jemt.v9.4\(28\).12](https://doi.org/10.14505/jemt.v9.4(28).12)
- Lawal, A. I., Olayanju, A., Salisu, A. A., Asaleye, A. J., Dahunsi, O., Dada, O., Omoju, O. E., & Popoola, O. R. (2019). Examining rational bubbles in oil prices: Evidence from frequency domain estimates. *International Journal of Energy Economics and Policy*, 9(2), 166–173. <https://doi.org/10.32479/ijeep.7768>
- Meier, F. D., & Quaas, M. F. (2021). Booming gas: A theory of endogenous technological change in resource extraction. *Journal of Environmental Economics and Management*, 107, 102447. <https://doi.org/10.1016/j.jeem.2021.102447>
- Moutinho, V., Madaleno, M., & Elheddad, M. (2020). Determinants of the environmental kuznets curve considering economic activity sector diversification in the OPEC countries. *Journal of Cleaner Production*, 271, 122642. <https://doi.org/10.1016/j.jclepro.2020.122642>
- Nwadighoha, C. E., Tapang, A. T., & Ujah, P. I. (2016). *Information technology in accounting (1st edition)*. Ephraimites Printing and publishing Ltd.
- Okafer, M. C., Ekwe, M. C., & Jones, E. (2016). *Strategic financial management*. Jesse Printing and Publishing Co.
- Papetti, A., Menghi, R., Germani, M., Germani, M., & Marconi, M. (2020). An energy assessment method for SMEs: Case study of an Italian mechanical workshop. *Procedia Manufacturing*, 43, 56–63. <https://doi.org/10.1016/j.promfg.2020.02.107>
- Paulo, E., de Souza, K. B., & Souza, A. (2017). Decomposing Brazilian manufacturing industry dynamics in the mid-2000s: Macroeconomic factors and their sectoral impacts. *Economia*, 18(3), 411–432. <http://hdl.handle.net/10419/179658>
- Prince, F. L. & Tbrahim, B. A. (2011). The effects of macroeconomic factors on the Nigerian stock returns: A sectoral approach. *Global Journal of Management and Business Research*, 11(7), 1-8.
- Pulicherla, K. K., Adapa, V., Ghosh, M., & Ingle, P. (2022). Current efforts on sustainable green growth in the manufacturing sector to complement ‘make in India’ for making ‘self-reliant India.’ *Environmental Research*, 206, 112263. <https://doi.org/10.1016/j.envres.2021.112263>
- Saced, M. S. (2014). Bank-related, industry-related and macroeconomic factors affecting bank profitability: A case of the United Kingdom. *Research Journal of Finance and Accounting*, 5(2).
- Ukoha, O. O. (2000). Determinants of manufacturing capacity utilization in Nigeria, 1970-1988. *Nigerian Journal of Economic and Social Studies*, 42, 121-129
- Ullah, A., Pingu, C., Ullah, S., Zaman, M., & Haider, S. (2020). Heliyon the nexus between capital structure, firm-specific factors, macroeconomic factors and financial performance in the textile Sector of Pakistan. Retrieved from <https://www.doi.org/10.1016/j.heliyon.2020.e04741>
- Zhang, Y., Chen, X., Wu, Y., Shuai, C., & Shen, L. (2019). The environmental Kuznets curve of CO₂ emissions in the manufacturing and construction industries: A global empirical

analysis. *Environmental Impact Assessment Review*, 79, 106303.
<https://www.doi.org/10.1016/j.eiar.2019.106303>

Zuhaib, Z., & Nizam, U. (2015). Inflation, interest rate and firms' performance: The evidences from textile industry of Pakistan. *International Journal of Arts and Commerce*, 4(2), 111-117.