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FOREIGN DIRECT INVESTMENT, TRADE OPENNESS AND INDUSTRIAL SECTOR EMPLOYMENT IN NIGERIA

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Abstract

The study examines the employment effects of FDI and trade openness in Nigeria's industrial sector during the period 1991-2020 using the ARDL approach to cointegration and error correction modeling (ECM). It finds that FDI and trade openness adversely affect industrial sector employment in the short-and long-run. The study gives further evidences to show that industrial sector employment is adversely affected by real exchange rate appreciation. Based on the findings, the study recommends policies to enhance industrial sector employment in the country including protection of infant industries from activities of multinationals through which FDI enters the country; cautious liberalization of trade characterized by export-promotion and protection of import-competing sub-sectors of the industrial sector; use of monetary policy to control appreciation of the real effective exchange rate; and government's commitment towards industrial development to boost industrial (especially manufacturing) sector output.

Keywords: FDI, Transnational Corporation, Multinational Firms, International Trade, Capital Flows, Employment

JEL Codes: F21, F23, F66, J23, L60, L70, L80, L90, P33, P45.

1. Introduction

Trade openness and FDI flows are major elements of the current waves of economic globalization. There has been increased intensity of cross-border trade and capital flows as countries get more integrated with the global market. Trade and capital flows have had implications for the economic wellbeing of participating countries. There has been no consensus in theories and empirics on the effect of these variables on major indicators of economic performance. While the pro-globalisation theorists and institutions such as the International Monetary Fund, the World Bank and the World Trade Organisation predict favourable effects for all countries, the anti-globalisation theorist or the skeptics are of the view that uncontrolled cross-border trade and capital flows could have adverse consequences for less developed countries which may be ill-prepared for the intense competition associated with it (Stiglitz, 2002)..

Infant-industry protection theory developed by Alexander Hamilton and Friedrich List in the early 18th century is always advanced as one of the reasons for the advocacy for trade restriction in developing countries. The argument has always been that trade openness adversely affects industrial sector of developing or less developed countries. This may be attributed to the fact that liberalisation of trade is associated with increased demand for imports in the LDCs due to low volume and low quality of output and weakness of the import-competing industrial sector. Considering that industrial firms in LDCs do not have the capacity to compete with the transnational corporations or larger and stronger industrial firms based in developed countries where production costs are comparatively less, increased importation will adversely affect production and employment in domestic industries (Slaughter, 2004; Melitz, 2005)

FDI inflow which involves setting up of production plants by foreign firms in a host economy engenders increased competition between local industries and foreign firms for both resources and market share. Considering that many of the local industries do not have the capacity to withstand such competition or the absorptive capacity to copy and/or deploy foreign technologies in their operations, under this circumstance, the expected adverse results are firms' closure, and the associated loss of jobs.

However, the proponents and optimists of free trade and cross border capital flow, especially FDI flows are of the opinion that increased trade and FDI inflow opens up employment opportunities. Thus, the debate on the effects of FDI and international trade has been inconclusive.

Nigeria's economy is a small open economy, substantially integrated with the global market. Her capital account is also liberalized and this allows for free flow of capital in-and-out of the country. Though it may be argued that the country has derived some benefits from implementation of economic liberalization policies which began with the Structural Adjustment Programme of 1986, yet there also may have been some dark sides of the narrative, particularly with respect to the net effects of trade and capital flows on employment, especially industrial sector employment. The

research questions of this study are therefore: (1) Does FDI affect industrial sector employment in Nigeria? (2) Is industrial sector employment affected by trade openness in Nigeria?

Previous studies such as Inekwe (2013), Okoro and Atan (2014), Onimisi (2014), Osabohien, *et al*. (2020), examined the effects of FDI and trade openness on aggregate (un)employment in Nigeria. None to my knowledge based on a wide literature search has examined the effect of FDI and trade openness on industrial sector employment. This study intends to fill this gap. FDI is needed to complement domestic investment in the country to raise the stock of capital needed for production therein. Trade openness enhances access to foreign markets through exports channel. The import channel paves way for acquisition of foreign knowledge, skills and technologies which can be deployed to boost domestic production capacities or productivity which also engenders expansion in output, thereby leading to employment generation in the industrial sector. Slaughter (2004, p. iii) aptly noted that "… protection against trade, as well as foreign direct investment (FDI), is found to inhibit, rather than develop, the competitiveness of firms in developing countries. Exposure to global best practice induces better performance via access to technology, access to capital, and competitive pressures. The investments in capital and technology necessary for competitiveness are more likely with engagement in global product markets, especially the global production networks of multinationals". The objective of this study is to investigate the effects of FDI and trade openness on industrial sector employment in Nigeria. This underscores its novelty. The significance of the study hinges on the role of the industrial sector in economic development and the recognition of the fact that employment generation is a key macroeconomic goal of governments. This is so important that the United Nations listed achieving decent employment for all by year 2030 as one of the Sustainable Development Goals (SDGs) for all member countries (precisely the eighth goal).

2. Stylised Facts

For nearly four decades, Nigeria's industrial sector has been the second largest contributor to the country's gross domestic product (GDP), next to the services sector. During the period 1981-2019 period, average contribution of the sector to the GDP was 28.30%. For the period 1991-2019, the share was 27.06%. These were driven largely by developments in the extractive sectors (oil and gas, solid minerals sectors), and the manufacturing sector. The trends in sectoral contributions to the GDP are shown in Table 1.

Table 1: *Sectoral Contributions to GDP*.

Sectors	**Contributions to GDP (%)**									
	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015	2016-2019	**Average**	
									(1981-2019)	**(1991-2019**

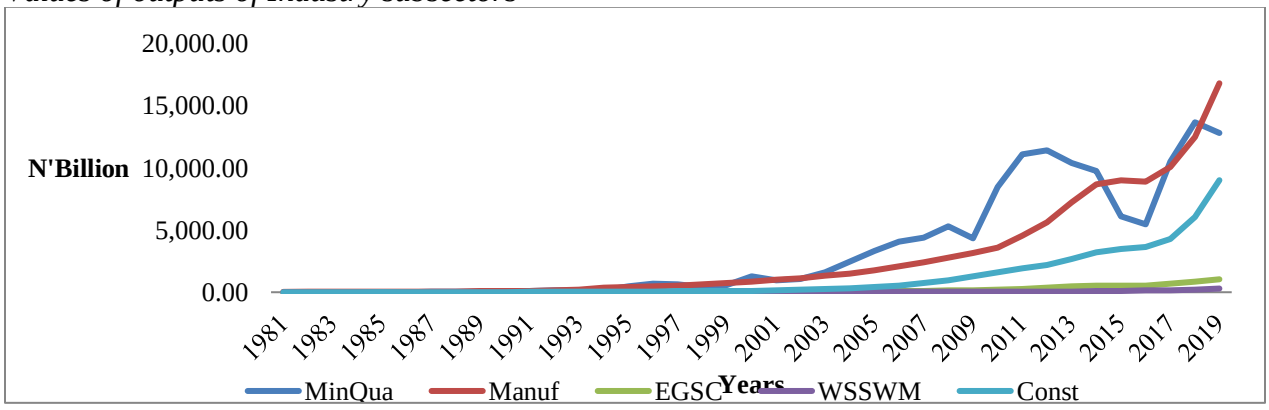
Agriculture	14.30	19.94	22.19	28.24	29.43	26.25	21.89	21.14	23.17	24.99
Industry	**32.81**	**32.00**	**34.19**	**29.61**	**26.05**	**23.23**	**26.39**	**21.83**	**28.30**	**27.06**
Services	52.90	48.06	43.62	42.15	44.52	50.52	51.71	57.03	48.54	47.96

Source: CBN (2020).

The industrial sector comprises five subsectors namely (1) mining and quarrying, (2) manufacturing, (3) electricity-gas-steam-and-air conditioners (4) water-supply, sewage and waste-management and (5) construction. The mining and quarrying subsector respectively have 4 and 13 activities subsectors, while the other subsectors stand alone as single activity sectors. Thus the country's industrial sector has a total of 16 activities sectors. This is as revealed by the CBN (2020). The trends in the value of output from the various subsectors of the industrial sector are shown in Figure 1. On average, the value of output of mining and quarrying sector exceeds those of the other sectors. This is followed by values of output of manufacturing subsector, the construction subsector, electricity gas, steam and air conditioner subsector and the water supply, sewage and waste management subsector. Thus the nation's industrial sector has been driven largely by activities in the three major industrial subsectors.

Figure 1

Values of outputs of Industry subsectors



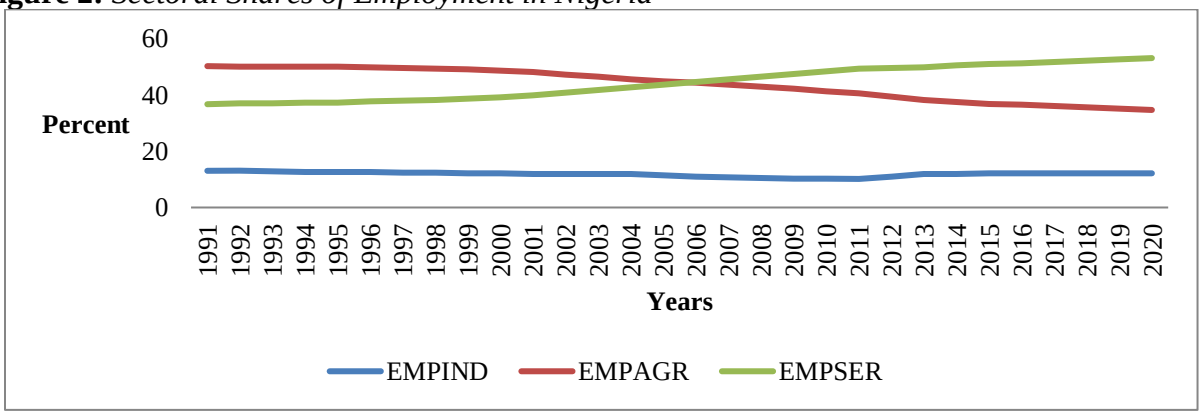
MinQua represents mining and quarrying; *Manuf* represents manufacturing; *EGSC* represents electricity gas, steam and air conditioner; *WSSWM* represents water supply, sewage and waste management; *Const* represents construction.

Source: CBN (2020).

In spite of the vastness of Nigeria's industrial sector, and its substantial contribution to the nation's GDP, employment in the sector has been quite low compared to employment in other major sectors of the economy. This is shown in Figure 2. The low share of industry employment could be attributed to the low level of industrial development in the country which may be attributed to factors such as low level of domestic investment, poorly developed infrastructure, particularly

energy and road infrastructure which tend to raise the cost of doing business in the country, high import dependence, insecurity, political and economic uncertainty, etc. The share of industry employment in total industry employment generally trended downwards between 1991 and 2010. There was however a trend reversal from 2011 due probably to export substitution effect of FDI by transnational corporations operating in the country and other factors. In spite of these, industry employment in the country has been quite low.

Figure 2: *Sectoral Shares of Employment in Nigeria*

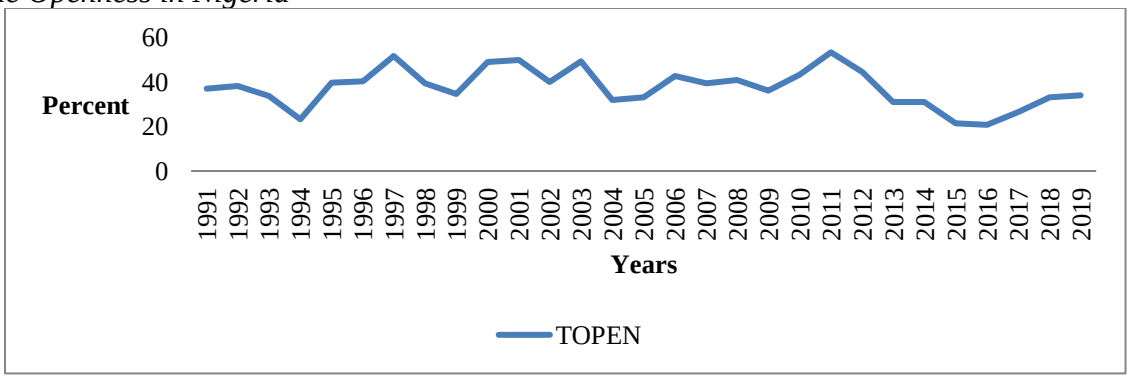


Source: WDI (2020)

Nigeria's index of trade openness[1] has been characterised by cyclical trends. This is shown in Figure 3. This implies that Nigeria's trade with the rest of the world has been quite unstable. The instability could be attributed to numerous factors, especially inconsistent trade policies, instability in prices of her exports which are dominated by primary commodities, largely responsible for her unstable exports earnings. High and unstable exchange rate of the domestic currency also contributes to high and unstable payments for imports considering that the country is highly import dependent.

Figure 3

Trade Openness in Nigeria



Source: WDI (2020)

[1] Trade openness is measured as ratio of total trade (sum of exports and imports values) to the GDP.

The trends in FDI inflow in Nigeria and in other West African countries are shown in Table 2. Though the country attracted the highest amount of FDI in West Africa between 1990 and 2019, yet FDI inflows in the country has not been evenly distributed. The bulk of it goes into few sectors such as the industrial sectors (including the extractive (oil and gas, and mining) sectors and manufacturing sectors), telecommunications sector, etc.

Table 2.
Average FDI Inflows to West African Countries

Countries	**FDI Inflows (U.S. $'Million)**					
	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019
Benin	55.16	21.44	45.14	133.12	277.11	181.34
Burkina-Faso	5.14	9.63	17.57	123.59	270.88	220.29
Cabo Verde	1.64	27.24	39.24	157.22	137.81	112.69
Côte d'Ivoire	85.74	378.37	233.67	376.17	363.55	735.27
Gambia	11.00	25.42	37.61	64.37	35.10	13.55
Ghana	83.06	143.88	102.48	1150.78	3128.30	3048.08
Guinea	15.85	24.63	44.46	202.50	374.99	529.22
Guinea-Bissau	2.73	3.54	3.46	13.30	22.68	21.89
Liberia	37.31	106.57	95.90	164.77	711.57	321.82
Mali	1.34	47.11	136.25	261.72	362.41	431.27
Mauritania	7.13	3.58	138.04	289.11	746.92	603.74
Niger	13.35	6.50	13.11	268.21	877.94	445.66
Nigeria	**1489.72**	**1498.41**	**1785.15**	**6572.19**	**6591.40**	**4157.36**
Senegal	27.43	86.19	60.49	256.00	318.99	660.21
Sierra Leone	4.80	2.08	25.80	81.40	543.22	220.96
Togo	4.77	23.24	50.30	55.18	231.21	50.01

Source: Author's computation using data from UNCTAD Handbook of Statistics (2019).

Given the foregoing discussion on background issues, and in consideration of the relevance of the industrial sector to the growth of a globally integrated economy as Nigeria, an investigation of the effect of FDI and trade openness on employment in the industrial sector is not out of place.

3. Literature Review

3.1.Theoretical Literature

The product cycle theory of FDI predicts positive effect of FDI on employment generation through the mechanism of export substitution. Foreign firms which previously exported their products to the domestic or local market in another economy may make the decision to set up production plants in the domestic market to reduce the cost of exporting to the domestic market, as well as increase their competitiveness in, and share of the domestic market. Setting up the production plant would imply demand for labour or workers to facilitate production in the industries that have been set-up. This is the mechanism for direct job-creation. The export substitution mechanism also enhances jobs creation indirectly as local distributors including exporters of the firms' output can obtain the products at lower prices, considering that the cost of importing the finished products has been eliminated. All things being equal, this translates into lower domestic prices to the final consumers; leading to improvement in aggregate demand which in turn engenders improvement in employment, as predicted by the Keynesian theory of employment.

The neoclassical growth theory predicts positive growth effect of FDI. FDI is considered a channel of transmission of foreign technology and skill (technological and managerial) which enhance the productivity of labour and boost firms' output depending on the absorptive capacities of the host countries' firms. From Microeconomic theory, assuming wage rigidities, enhanced profitability engenders improvement in profitability, especially in the short run, thereby leading to increased demand for labour (Meager & Speckesser, 2011). The Okun's law predicts inverse relationship between economic growth and unemployment. Though decrease in unemployment may not automatically translate into improvement in employment, it may be argued that economic growth could engender improvement in employment generation.

There however exists the pessimistic view on the effect of FDI inflows on employment. Considering that FDI (by transnational corporations) is a major channel for technology transfer, especially labour-saving technology, this may engender substitution of technology for labour, thereby leading to loss of jobs.

There is no consensus on the theoretical linkage between openness to international trade and employment, as the effect of trade on employment varies across countries and it is dependent on country-specific conditions (part of which are their comparative advantage, local and international competitiveness, and their learning and absorptive capacities). A joint report by the ILO and WTO (2017, p.28) noted that "the new theoretical trade literature … predicts that trade reform will trigger job creation and job destruction in all sectors, as both net-exporting and net-importing sectors will be characterized by expanding high-productivity firms and low-productivity firms that shrink or close down. The latter firms tend to be relatively small firms that do not manage to enter foreign markets and produce only for domestic consumers". Thus, trade enhances productivity growth, and firms in countries that are not well integrated with the global market will suffer low productivity and the resultant effect will be job-destruction.

While Baldwin (1994) expressed pessimism that trade affects job creation, Davidson *et al*. (1999) however noted that it is possible for trade to affect employment especially where there are labour market frictions; though this is largely an empirical issue. Mohler, *et al*. (2018) explained that an extension of the Hecksher-Ohlin trade model to allow for inflexibility in factor prices, can create a link between trade and employment as trade in this scenario engenders decrease in demand for low-skill labour in a (human) capital-rich country. The Stopler Samuelson theorem predicts that the decrease in demand for low-skilled labour causes decrease or fall in prices (wages) of same, and where this is prevented by labour market rigidities, the unemployment problem of low-skilled labour would be worsened by increased trade.

3.2.Empirical Literature Review

Empirical studies on the effects of FDI and trade openness on employment are reviewed in this section. For clarity of presentation, the reviewed is presented in two separate level subsections. The first is on the relationship between FDI and employment. This is followed by the review on the relationship between trade openness and employment.

3.2.1. FDI and Employment

Empirical studies on the effect of FDI on employment have been inconclusive. The inconclusiveness may have been due to the methodologies employed, country-and region-specific characteristics and nature of data analysed. Some of the empirical studies are reviewed hereunder.

Abor and Harvey (2008) investigated the effects of FDI on employment and wages in Ghana using a system of panel simultaneous equations estimated with the IV-2SLS technique. The study found that the employment effect of FDI was positive and significant, while the wage effect of FDI was not significant. Based on the evidence, the researchers recommended that FDI inflow be given due consideration in formulation of development-targeted policies in the country.

Rizvi and Nishat (2009) examined the effect of FDI on employment in China, India and Pakistan during the 1985-2008 period in a panel data study using the seemingly unrelated regression technique. The study found that the effect of FDI on employment in the countries was not significant. In view of this, it was recommended that FDI policies be supplemented with other employment enhancing policies.

Salami and Oyewale (2013) examined the effect of FDI on employment in Nigeria during the 1990-2010 period, using the OLS technique. The study found *inter alia*, that the effect of FDI on employment was positive, but not statistically significant. No justification was provided for the use of OLS technique as the stationarity properties of the variables were not tested before the methodology was implemented.

Inekwe (2013) employed the methodology of vector error correction to investigate the effect of FDI on aggregate employment rate in Nigeria during the 1990-2009 period. The study found that FDI in manufacturing sector was favourable to employment, while FDI in services sector adversely affect employment. This calls for design of policies and implementation of programmes aimed at attracting FDI to the manufacturing sector to enhance employment generation.

Onimisi (2014) also examined the effect of FDI on aggregate employment rate in Nigeria during the 2002-2012 period. The study employed the least squares estimator to estimate a multiple linear regression model. It reported a negative and significant effect of FDI on employment in the country. However, the study did not present results of unit root test to justify the methodology. Moreover, the short study period calls for caution in adopting the conclusion and the recommendations of the study.

Brincikova and Darmo (2014) examined the effect of FDI on unemployment in the Visegrade 4 (V4) countries which include Czech Republic, Hungary, Poland and Slovakia. Both static and dynamic fixed effect model were estimated for the analysis. The study found no significant FDI effect of employment in the V4 countries. This suggests that FDI inflow to the V4 does not enhance demand for labour.

Jude and Silaghi (2016) examined the employment effect of FDI in 20 Central and Eastern European countries (CEE). The study period was 1995-2012. A dynamic panel model was estimated using both fixed effect and system generalized method of moments (GMM) to account for endogeneity. The study found that though the contemporaneous effect of FDI on employment was adverse, its one-year lagged effect was however positive and highly significant. Further evidence from the study are that human capital and improvement in exports enhance the effect of FDI on labour demand, while increase in imports adversely affect the effect of FDI on labour demand.

Ajayi, *et al*. (2019) estimated a system of VAR model to examine the relationships among FDI, employment and unemployment in Nigeria during the 1960-2014 period. The analysis revealed positive and significant effect of FDI on employment rate in the country. The Granger causality test results also indicated bidirectional causality between FDI and (un)employment. However, caution must be exercised in accepting some of the conclusions of the study as the test for stability of the VAR model reveals the model to be unstable.

Osabohien, *et al*. (2020) employed the FMOLS technique to examine the effect of FDI on employment in Nigeria during the period 1991-2017. According to the authors, the FDI positively and significantly affect employment in the country. However, a weakness of the study is that erroneous interpretation of the results as the reported results actually shows positive and non-significant effect of FDI on employment in the country. Moreover the study focused on the aggregate employment in the country, ignoring the sectoral employment effect of FDI inflows.

3.2.2. Trade and Employment

The effect of international trade on employment has been investigated in quite a number of studies. Most of the studies focused on aggregate employment effects of international trade, with little or no consideration of sectoral employment effects. The studies have been inconclusive, as the results from the various studies have been missed. In this subsection some of the studies are reviewed.

Felbermayr, *et al*. (2010) investigated the effect of trade on unemployment using panel dataset on 20 OECD countries and cross-sectional data on larger number of countries. The panel OLS, IV and system GMM techniques were employed for the analysis. The study found that trade was associated with significant reduction in unemployment.

Nwaka, *et al*. (2015) investigated the effect of trade openness on unemployment in Nigeria during the period 1970-2010 using the VECM technique. It was found that trade openness worsens the unemployment problem in the country in the long run. Further findings were that real GDP and per capita income were associated with significant decline in the unemployment rate.

Raju, *et al*. (2016) examined the effect of trade on employment in India's manufacturing sector during the period before the global financial meltdown (2004-2007) and the period after the meltdown (2008-2011). The methodology involved growth accounting approach and panel data regression analysis. The results revealed that during the 2004-2007 period, exports was favourable to demand for labour in the sector, while increased import penetration engendered job losses or decrease in manufacturing sector employment. Industrial output was also found to be positively and significantly related to employment. The effect of trade liberalization on employment was not significant during the 2008-2011 period probably due to the effect of the global financial crisis.

Asalaeye, *et al*. (2017) employed vector error correction modeling (VECM) for analysis of time series data spanning the period from 1981 to 2014, on relevant variables in a study to examine the effect of trade openness on aggregate employment in Nigeria. Amongst other findings, the study found that trade openness adversely affected employment in the country in the long run Nwaka, *et al*. (2015), Asalaeye, *et al*. (2017).

Awad-Warrad (2018) examined the effect of trade openness and other trade variables including exports and imports on unemployment in seven selected countries in the Arab Region. The weighted least squares (WLS) technique was employed for estimation of panel model specified for the analysis. The study found that unemployment was significantly reduced by trade openness (total trade share of GDP), exports and economic growth (increase in real GDP). Thus openness to trade characterized by export expansion helped to reduce the unemployment problem in the countries collectively. The issue with the study is that though the methodology took care of the problem associated with cross sectional heterogeneity, the conclusion or/and the recommendation may not be applicable to all countries in the Arab region.

The effect of trade openness on youth employment in Africa was investigated by Kpognon, *et al*. (2020) using panel data for the 2002-2017 period on 41 sub-Saharan African countries. The methodology employed was the OLS and IV-2SLS techniques. The study found that youth

employment was positively affected by trade openness, though the effect was negative and significant in more rigid labour markets.

Aigheyisi (2019) investigated the effect of Import competition on unemployment in Nigeria during the period 1981-2017. The methodology involved ARDL based ECM and cointegration analysis. The study found that import competition reduces unemployment in the short run, but worsens the unemployment problem in the long run. This suggests that import competition is associated with job losses in the long run in the country.

Most of the previous studies particularly those on Nigeria focused on aggregate employment or unemployment effects of FDI and trade. Little or nothing based on empirical evidence is known about the effect of FDI and trade openness on industrial sector employment in Nigeria. This study therefore adopts a novel approach to investigating the effects by focusing on Nigeria's industrial sector which is a key sector of her economy.

4. Methodology

The methods used for analysis of the data with a view to achieving the objectives of the study are discussed in this section. The section begins with the theoretical framework, and then proceeded to the model specification and estimation procedure. The pre-estimation tests and the post estimation test are discussed thereafter. The section ends with a brief discussion of data issues.

4.1.Theoretical Framework

The endogenous growth theory identifies FDI and international trade as some of the determinants of economic growth. FDI is expected to contribute to the stock of capital in the economy, where it complements domestic investment. Various theories identify capital as a major growth-determinant. Baldwin and Forslid (2000) describe investment as the heart of every growth model. In view of this, FDI could be seen as an important growth determinant. If economic growth engenders employment generation as posited by the Keynesian expenditure theory and the Okun's Law, it follows therefore that FDI enters the narrative as a potential influencer of job creation especially in the industrial sector where the bulk of production takes place by complementing domestic investment therein. Through the channel of export substitution by transnational corporation or foreign firms (which are the medium through FDI enters a host economy), jobs are also created in the host economy as predicted by the product cycle theory of FDI.

The endogenous growth theories predict positive effect of trade openness on economic growth (Baldwin & Forslid, 2000), though Rodriguez and Rodrik (2000) expressed reservations on the validity of the prediction of endogenous growth model. However, if trade results in expansion of

output and real aggregated demand, and there is appreciable improvement in exports without any contraction in the import-competing sectors of the economy, then employment could be generated.

4.2.**Model**

Based on the foregoing theoretic discourse, we specify an industry-employment model incorporating our variables of interest which are FDI and trade openness. Other variables presumed (based on theories) to affect industry demand for labour in Nigeria are also incorporated as control variables. The model is specified functionally as:

$$\text{EMPIND} = \text{f}(\text{FDIY}, \text{TOPEN}, \text{REXRT}, \text{INDGDP}) \qquad [1]$$

Where EMPIND represents industry employment share of total employment; FDIY = net FDI as a percentage of GDP; TOPEN = Trade openness (measured as total trade percentage share of GDP); REXRT represents real effective exchange rate defined by the World Bank (2020a, para. 1) as "the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator"; INDGDP represents industrial sector output share of GDP.

The study employed the Autoregressive distributed Lag (ARDL) approach to cointegration and ECM developed by Pesaran, *et al*. (2001) for analysis of the data utilized. The methodology was chosen for several reasons which make it suited for this study. First is that it can be applied in cases of data series that are of different (or mixed) order of integration such as 1 and 0 (excluding order-2 in which case it breaks down). In this study, the variables were I(0) and I(1). Second reason is that it can be applied in cases of small, finite datasets. This also makes it suited for this study (with a sample size of 30: 1991-2020). Previous studies such as those of Akbota and Baek (2018) and Bhuyan and Oh (2021) which used sample sizes of 24 and 25 respectively employed this methodology. Third is that it is designed to yield consistent and efficient long run estimates with valid t-ratios even if there is regressors' endogeneity (Harris & Sollis, 2003).

The procedure involves application of the least squares technique to estimate an unrestricted ECM version of ARDL model (UECM-ARDL) specified as:

$$\Delta\text{EMPIND}_\text{t} = \gamma_0 + \sum_{\text{d}=1}^{\text{n1}}(\Psi_{1\text{d}}\Delta\text{EMPIND}_{\text{t}-\text{d}}) + \sum_{\text{d}=0}^{\text{n2}}(\Psi_{2\text{d}}\Delta\text{FDIY}_{\text{t}-\text{d}}) + \sum_{\text{d}=0}^{\text{n3}}(\Psi_{3\text{d}}\Delta\text{TOPEN}_{\text{t}-\text{d}}) + \sum_{\text{d}=0}^{\text{n4}}(\Psi_{4\text{d}}\Delta\text{LREXRT}_{\text{t}-\text{d}}) + \sum_{\text{d}=0}^{\text{n5}}(\Psi_{5\text{d}}\Delta\text{INDGDP}_{\text{t}-\text{d}}) + \delta_1\text{FDIY}_{\text{t}-1} + \delta_2\text{TOPEN}_{\text{t}-1} + \delta_3\text{REXRT}_{\text{t}-1} + \delta_4\text{INDGDP}_{\text{t}-1} + \xi_t \qquad [2]$$

The variables are as defined previously. The Ψs relate to the short run effects of the explanatory variables on the dependent variable, while the δs relate to the long run relationships. To test for cointegration, the Wald's F-test is used to test the joint significance of the parameters of the model. The null hypothesis to be tested is ($\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$) which implies "No long-run relationships exist". This is tested against the alternative hypothesis of existence of long run relations among the variables ($\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$).

Two sets of asymptotic critical values for the F-statistic at different levels of statistical significance have been computed by Pesaran *et al*. (2001). One set comprises the lower bound critical values (LB) while the other set comprises the upper bound critical values (UB). The decision rule is:

F-statistic > UB, null hypothesis is rejected at chosen significance level
F-statistic < LB, null hypothesis is not rejected
LB < F-statistic < UB, test is inconclusive

If cointegration is confirmed, the ECM is derived as:

$$\Delta \mathrm{EMPIND}_t = \pi_0 + \sum_{j=1}^{p1} \left(\pi_{1j} \Delta \mathrm{EMPIND}_{t-j}\right) + \sum_{j=0}^{p2} \left(\pi_{2j} \Delta \mathrm{FDIY}_{t-j}\right) + \sum_{j=0}^{p3} \left(\pi_{3j} \Delta \mathrm{TOPEN}_{t-j}\right) + \sum_{j=0}^{p4} \left(\pi_{4j} \Delta \mathrm{REXRT}_{t-j}\right) + \sum_{j=0}^{p5} \left(\pi_{5j} \Delta \mathrm{INDGDP}_{t-j}\right) + \omega \mathrm{ECT}_{t-1} + \varepsilon_t \quad [3].$$

The πs measure the short run effect of the respective explanatory variables on EMPIND. ECT stands for the error correction term. Its role is to restore equilibrium in the system in the event of deviation therefrom. To play this role, its coefficient is expected to be negatively signed and statistically significant. The negative coefficient further confirms cointegration. ε represents the error term.

The long run (steady state) equation is derived as:

$$\mathrm{EMPIND}_t = \beta_0 + \beta_1 \mathrm{FDIY}_t + \beta_2 \mathrm{TOPEN}_t + \beta_3 \mathrm{REXRT}_t + \beta_4 \mathrm{INDGDP}_t + \mu_t \quad [4]$$

The βs represents the long run estimates. μ is the error term. The *a priori* expectations are $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 > 0$.

4.3.Justification of *a priori* Expectations

Based on the optimistic views, FDI is predicted to impact positively on employment generation in Nigeria's industrial sector. This is premised on the productivity-enhancement effect of FDI which engenders a boost of host country industrial output and enhances profitability assuming wage-rigidity, resulting to improvement in demand for labour. It is also premised on the export-substitution effect of FDI by foreign manufacturing firms which decide to set-up production plants in countries to which countries they hitherto exported their commodities to eliminate transport cost, enhance their competitiveness and expand their share of the host market. All things being equal, the export-substitution effect engenders improvement in demand for local labour by the foreign firms, and also engenders improvement in employment capacity of local distributors of products of the foreign firms which may have become cheaper in the domestic market, enjoying higher demand therein, leading to more demand for labour.

Though complex linkages exist between trade and employment, yet trade is expected to enhance employment in various sectors of the economy. The endogenous growth model links trade to improvement in productivity through technology diffusion, and economic growth (UNCTAD, 2013). If trade boosts productivity and engenders or enhances growth, this will lead to employment generation or reduction in unemployment as predicted by the Okun's Law.

In theory, appreciation of, or increase in real effective exchange rate is expected to reduce the cost of imports in the local market. If this transpires, then there would be increase in importation and this would adversely affect the infant industries whose products may not be able to compete with the imported items in the local (and foreign) markets. The result would be firms' closures and downsizing with the attendant loss of job and decrease in demand for labour in local industries. Moreover, the decrease in cost of importation would also encourage increase in importation of technological equipment for use in industries. This engenders increase in the capital intensity ratio, and there would be high likelihood for equipment to be substituted for labour, thereby reducing the demand for labour and adversely affecting employment in the sector (Hua, 2007).

All things being equal, and with sustained effective demand and enhanced profitability of firms, increase in industrial sector share of total output will engender increase in demand for labour in the industrial sector.

4.4.Pre-Estimation and Model Diagnostic Tests

Prior to the estimations, the pair-wise correlation analysis was performed to ensure that the independent variables are not strongly correlated with each other so as to avoid the problem of multicolinearity. Thereafter, the variables were tested for stationarity to determine the methodology to adopt. This was done using the Dickey Fuller generalized least squares (DF-GLS) test developed by Elliot *el al.* (1996). The choice was used because it is an efficient test which modifies the Dickey-Fuller test by correcting for autocorrelation in the series using a GLS procedure.

Post-estimation tests were also performed. These include the Jarque-Bera (JB) test for residual normality, the Breusch-Godfrey (BG) test for serial correlation, The Breusch-Pagan-Godfrey (BPG) test for heteroskedasticity and the Ramsey's regression equation specification error test (RESET). The study also relied on the cumulative sum of recursive residuals (CUSUM) developed by Brown *et al*. (1975) to test the stability of the model.

4.5. Data and Sources

The study employed annual time series data covering the period from 1991 to 2020. The scope was determined by availability of data from the source, which is the World Bank's WDI (2020b). Data on industry employment share of total employment, which is the dependent variable began from 1991.

5. Results and Discussions

This section presents the estimation results. It begins with the correlation analysis and discussion of the tests for stationarity and cointegration, before proceeding to the discussion of the estimated ECM and long run models. Diagnostic and stability tests are thereafter performed to ensure the analysis based on the model is reliable and fit for policy purposes.

5.1.Correlation Analysis

The pairwise correlation analysis was performed to ensure none of the explanatory variables are strongly correlated with another or explanatory others, as this may cause the problem of multicolinearity, which renders estimated models unreliable as the standard errors of the estimated parameters get inflated. The implication is that the t-ratios will be reduced, leading to erroneous inference that the affected variables are not statistically significant. The matrix of correlation coefficients is shown in Table 1. It can be seen that pairs of the explanatory or independent variables are weakly correlated. In view of this, models estimated with the variables are not expected to be plagued with the problem of multicolinearity. On the correlation between the explanatory variables and the dependent variable in the period under consideration, negative and weak correlation existed between FDIY and EMPIND, and TOPEN and EMPIND, while positive and weak correlation existed between REXRT and EMPIND, and positive and moderate correlation existed between INDGDP and EMPIND within the 1991-2020 period.

Table 3: *Correlation Matrix*

	EMPIND	FDIY	TOPEN	REXRT	INDGDP
EMPIND	1.0000				
FDIY	-0.0700	1.0000			
TOPEN	-0.3368	-0.0916	1.0000		
REXRT	0.1289	-0.4234	0.0999	1.0000	
INDGDP	0.5186	0.1539	0.3081	0.0014	1.0000

5.2.Unit Root and Cointegration Tests

The results of the unit root test and the cointegration test are presented in Table 4 and Table 5 respectively. The stationarity test results reveal that the dependent variable (EMPIND), and INDGDP are integrated of order-1 [I(1)], while the key explanatory variables of interest (FDIY and TOPEN) and REXRT are stationary at level, [I(0)]. Thus the variables are of mixed order of integration. This necessitates the use of ARDL (bounds test) approach to test for long run relationships among the variables. The result of the cointegration test shows that the F-stat > UB.

Thus the null hypothesis that "no long-run relationships exists" is rejected at the 1%, inferring that the variables are cointegrated.

Table 4: *Unit Root Tests*

DF-GLS							
Variables	**Levels**			**1st Difference**			**I(d)**
	test Stat	Critical Value (5%)	Inference	test Stat	Critical Value (5%)	Inference	
EMPIND	-1.86	-1.95	NS	-2.41	-1.95	S	1
FDIY	-3.10	-1.95	S	-	-	-	0
TOPEN	-2.61	-1.95	S	-	-	-	0
REXRT	-2.40	-1.95	S	-	-	-	0
INDGDP	-0.95	-1.95	NS	-5.97	-1.95	S	1

I(d) = order of integration
NS = Non-stationary
S = Stationary

Table 5
ARDL Bounds Test

Test stat.	Value	Critical Value Bounds (1% sig. level)	
		LB	UB
F-stat.	7.58	3.74	5.06

LB stands for Lower Bound; UB stands for Upper Bound

5.3.Model estimation results

Existence of long run relationship implies that the short run relationship can be represented with an ECM. The estimated ECM and long-run model are presented in Table 6 and Table 7 respectively.

The ECM shows that the short-run effect of FDI on industrial employment is negative and significant at the 1% level. This is contrary to *a priori* expectation. It suggests that FDI inflow to the country has had adverse effect on employment in the nation's industrial sector. Various reasons could be adduced for this. It could be due to job-displacement engendered by deployment of labour-saving technologies transmitted into the country by multinational firms through the channel of FDI. It could also be due to exposure of infant industries to competition with stronger foreign firms operating in the country. Considering that many of the local industries are unable to face the competition owing to numerous factors including inadequate (access to) finance, unfriendly production environment, government policies, etc., they are forced to shut-down production, and many jobs are lost in the process. The negative short-run contemporaneous effect of FDI on employment corroborates the evidence from Jude and Silaghi (2016) which found similar result in the CEE. The positive and significant coefficient of the lagged FDIY variable implies that there could be some short-run delay before any positive effect of FDI on employment generation in the

industrial sector materializes. However, the contemporaneous negative effect is larger and more significant than the lagged positive effect, resulting in a net short-run effect.

The effect of trade openness on industrial sector employment is negative and highly significant at the 1% level. This implies that in the short run, openness to trade engenders job-destruction in Nigeria's industrial sector. Though this may appear contrary to *a priori* expectation, yet it is not unexpected when viewed against the fact that Nigeria's economy is highly import-dependent, and uncontrolled openness to trade could engender rise in importation of industrial or final goods from highly developed or industrialised countries against which locally made industrial or finished products cannot compete. The consequence would be loss of jobs in the industrial sector. This finding, to a reasonable extent is in sync with the evidence from Nwaka, *et al*. (2015) and Asalaeye, *et al*. (2017) which found that trade openness exacerbates the unemployment problem in the Nigeria.

The short-run contemporaneous effects of real effective exchange rate on industrial sector employment are not statistically significant. This implies that the real exchange rate does not affect employment generation in the nation's industrial sector in the short-run.

The short-run contemporaneous effect of industrial output on industrial employment is positive and significant at the 1% level. This implies that expansion of industrial output is associated with demand for more labour in the sector in the same period. The observed significant and negative effect of industrial sector output could be due to delay in generating sales and profit from the output which affect demand for labour in the short run. However, considering that the contemporaneous positive effect is larger and more significant than the lagged negative effect, a net positive short-run industrial sector employment effect of industrial output can be deduced.

The error correction coefficient carries the expected negative sign, and passes the significance test at the 1% level. This further confirms existence of cointegration relationships. The low absolute value suggests slow adjustment to equilibrium in the event of deviation therefrom: about 37.7% of the deviation from equilibrium is restored annually to maintain the steady state.

The coefficient of determination (R^2) and its adjusted counterpart ($\bar{R}^2$) suggest that the model has a high goodness of fit. The R^2 implies about 97.57% of the variation in EMPIND is explained by the model. The F-stat which is highly significant at the 1% level points to joint significance of the explanatory variables in explaining variations in EMPIND. The DW-statistic of 1.9876 points to absence of problem of autocorrelation.

Table 6.
ARDL(1, 2, 1, 2, 2)-based Error Correction Model

Dependent Variable: ΔEMPIND
Sample: 1991 2020

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Δ(FDIY)	-0.2364	0.0445	-5.2925	0.0001
Δ(FDIY(-1))	0.1083	0.0416	2.6063	0.0207

Δ(TOPEN)	-0.0251	0.0054	-4.6761	0.0004
Δ(REXRT)	-0.0004	0.0011	-0.3451	0.7352
Δ(REXRT(-1))	0.0014	0.0011	1.2010	0.2497
Δ(INDGDP)	0.0688	0.0192	3.5918	0.0029
Δ(INDGDP(-1))	-0.0584	0.0168	-3.4761	0.0037
ECT(-1)	-0.3770	0.0736	-5.1220	0.0002

$R^2 = 0.9757$, $\bar{R}^2 = 0.9548$, F-stat = 46.7876 (p = 0.0000), DW stat. = 1.9876

As in the short run, FDI adversely affects employment generation in Nigeria's industrial sector in the long run. The long run industrial employment effect of trade openness is also negative and statistically significant. Thus, employment generation in the nation's industrial sector is adversely affected by these elements of globalization – FDI and international trade – in the long run.

The long run effect of real exchange rate on industrial sector employment is negative as expected and significant at the 1% level. A unit increase in the real effective exchange rate is associated with 0.01 unit decrease in the share of industry employment in total employment. The adverse effect is not unexpected, and may be attributed to increase in importation of foreign goods which become cheaper in the domestic market as a result of a rise in the real exchange rate. The consequence is that domestic firms are exposed to foreign competition which they do not have the capacity to face or withstand due to their low competitiveness. Consequently, domestic industrial output shrinks, profit nosedives, and there will be firms' closure, downsizing and staff lay-offs. In addition, since imports become cheap as a result of increase in the real effective exchange rate, importation of foreign technologies to be utilized in the industrial sector becomes cheap. Many of these take the place of (or are substituted for) human labour, resulting in decrease in the sector's employment rate.

In the long run, expansion in industrial output will engender significant increase in employment in Nigeria's industrial sector. This conforms to *a priori* expectation. A unit rise in industrial output is associated with 0.29 unit increase in the relative share of industry employment in total employment.

Table 7

Long Run Coefficients based on ARDL(1, 2, 1, 2, 2).

Dependent Variable: EMPIND				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDIY	-1.0889	0.2112	-5.1570	0.0001
TOPEN	-0.0482	0.0128	-3.7732	0.0021
REXRT	-0.0109	0.0036	-2.9941	0.0097
INDGDP	0.2874	0.0394	7.2875	0.0000
C	9.0680	0.7538	12.0302	0.0000

5.4.Diagnostics

The reliability of the foregoing analysis depends on outcomes of a number of diagnostic tests. The results of the tests are presented in Table 8. The result of the JB test for residual normality indicates that the residuals of the model are normally distributed. There is also absence of serial correlation problem as indicated by the result of the BG LM test for serial correlation. Absence of problem of heteroskedasticity is indicated by the result of BPJ test. The RESET test indicates the model specification is accurate.

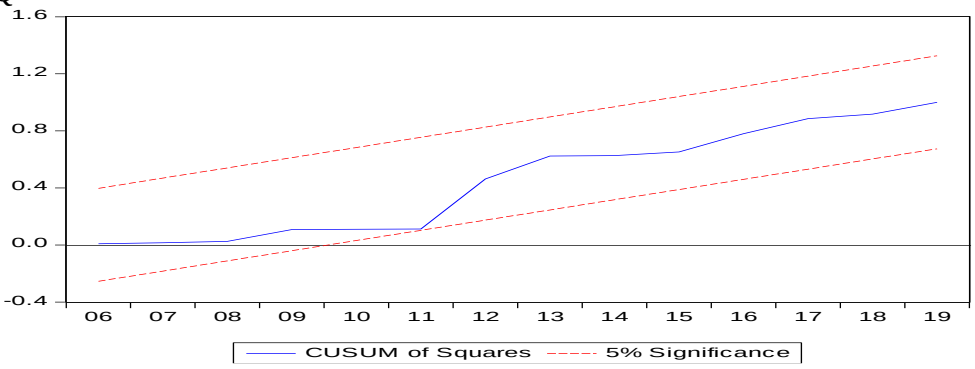
Table 8
Diagnostic Tests

Tests	Test Stat	p-value
Residual Normality (Jarque-Bera)	0.7259	0.6956
Serial Correlation (Breusch-Godfrey LM test)	0.3535	0.7093
Heteroscedasticity (Breusch-Pagan-Godfrey)	2.2286	0.0773
Ramsey RESET	1.02E-05	0.9975

5.5.Model Stability

The CUSUMSQ test proposed by Brown, *et al*. (1975) was adopted to test the stability of the model. The result is presented in Figure 4. The CUSUMSQ plot lies between the 5% critical bounds. The model is therefore stable.

Figure 4.
CUSUMSQ



6. Conclusion and Recommendations

Based on the evidence of this study, it can be concluded that FDI and trade openness adversely affect employment generation in the nation's industrial sector in the short-and long-run. The study also provides evidence that increase in real effective exchange rate adversely affect job-creation

in the nation's industrial sector. All things being equal, expansion in industrial sector output engenders employment in the industrial sector.

In view of the findings, to boost industrial sector employment in the country, the following are recommended:

i. Domestic (infant) industries should be protected against the adverse effects of competition with foreign or transnational corporations operating in the country as they constitute channels of FDI inflows. This is achievable through infrastructural development especially energy or power infrastructure, transportation infrastructure, and other policies and programmes designed to enhance the sustainability of the industrial sector and make them more competitive, productive and profitable so as to create more employment in the sector.
ii. Trade liberalization policies should be **cautiously** implemented considering that trade openness adversely affects industrial sector employment in the short-and long-run. In doing this, import-competing sub-sectors of the industrial sector should be identified and protected (through *inter alia*, imposition of higher tariffs or quotas on selected imports of manufactured/final consumer products in such a way as to avoid retaliation from trading partners), while the export sub-sectors should be incentivized, encouraged or strengthened through enhancement of export logistics and facilitation and reduction of export time and costs. These, in addition to encouraging patronage of locally-made goods, will expectedly boost domestic industrial output and enhance the sector's employment-generating capacity.
iii. There is also need for the government, through the monetary authority to wield its policy instruments to control the real effective exchange rate by preventing it from detrimental appreciation which could adversely affect industrial sector employment through its effect on imports.
iv. The government should be strongly committed to the development of the nation's industrial sector so as to boost the sector's output, particularly the manufacturing sector. There is need to urgently address factors affecting the development of the industrial sector such as infrastructural development problems including energy and transportation problems; insecurity; tax-related issues, ease of doing business issues, etc.

This study is by no means without some limitations. FDI inflows to industrial sector would have been a desirable variable in a study as this. However, as at the time the study was done, data on this variable was unavailable from the source for which data was sourced. This may be attributed to the fact that reliable official data on sectoral composition of FDI in the country are non-existent (UNCTAD, 2009). The UNCTAD reports that estimates on sector composition of FDI in Nigeria have "largely been made from alternative sources" (UNCTAD, 2009, p.11). However, considering that the nation's industrial sector attracts more FDI than other sectors, it is expected that the effect of FDI on industrial sector employment may not differ significantly from the effect of industrial sector FDI on industry employment. This is an issue that calls for empirical investigation. A motivation has therefore been created for future research, which may investigate this latter relationship. Furthermore future studies may investigate the effect of international trade on

industrial sector employment in Nigeria by examining separately, the effect of industrial goods exports and industrial import-competition on employment in the country's industrial sector.

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