Acta Universitatis Danubius
ŒCONOMICA

# Trade Openness and Manufacturing Sector Performance in Some Selected West African Countries: A Panel Study Approach

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**Abstract:** A good performance of the manufacturing sector is germane to the development of any economy. Hence, this study examined the relationships between trade openness and manufacturing sector output in 12 selected countries in West Africa. Specifically, it investigated whether trade growth, employment growth, investment growth, exchange rate growth and inflation rate impacted on manufacturing sector performance in the selected countries over the period from 1980 to 2019. Most of the earlier studies had been a time series analysis but this study differs in that the panel data series were analyzed using econometric techniques which included Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). This was to determine the magnitude of impacts of the explanatory variables on the manufacturing sector. The results of FMOLS and DOLS therefore, revealed that all the coefficients are positively associated and significant with manufacturing sector output except for trade openness that is not significant and inflation rate is negatively significant. This paper based on the findings of this study, therefore, recommends that the region needs to strengthen its involvement in trade liberalization and also sustain foreign policies that would attract more foreign direct investment (FDI) inflows.

**Keywords:** Manufacturing Sector; Trade Openness; Panel Study; Nigeria; Fully Modified OLS and Dynamic OLS

**JEL Classification Code:** F10; F41

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## 1. Introduction

The manufacturing sector is important to a country's global competitiveness and the extent of its internationalization drive. This includes their ability to provide adequate goods and services with which to compete effectively in the international market, where quality is primarily based on demand and the effectiveness of the products being sold. Kim (2014) stated that African countries' hopes should be focused on developing the light manufacturing sector, which could aid in industrialization, export diversification, and job creation. He also noted that the growth of manufacturing sector may result in the creation of about seven million new jobs on the continent, with immeasurable implications for a continent that is currently experiencing high unemployment. This has led to the reiteration that African countries should focus more on improving the manufacturing sector. West Africa has enormous trade potential, both globally and intra-regionally (for example, due to its natural resource endowment, agricultural potential, and intra-regional complementarities).

Trade openness refers to the degree to which an economy is reliant on foreign trade and financial flows (Romer, 1986) cited by Tyopev (2019). It assesses a country's international competitiveness in the global market (Gwartney, Skipton & Lawson, 2001). For many developing countries, trade openness is a significant driver of development, and the above is based on the belief that trade openness helps to boost demand, promote productivity, and lower production costs, and thus increases international confidence in an economy's market mechanism (Iyoha & Oriakhi, 2002). The flow of technology and knowledge into the market is aided by openness to trade, which helps to exploit competitive advantage by increasing exposure to competition. Trade openness is a key component of economic growth in developing and least developed countries (LDCs) (Pegkas, 2015; Hussain & Haque, 2016).

It is common knowledge that developing countries have significant limitations in terms of what they can contribute to global trade and investment. The countries of the Economic Community of Western African States (ECOWAS) export primary commodities, making them susceptible to external shocks. Inadequate infrastructure and the small size of their domestic markets frequently limit their access to foreign markets (Clark, Dollar & Micco 2004; Gulati et al. 2007). Rising trade costs, as well as limited access to technology and intermediate inputs, pose a barrier to developing-country firms' entry into global markets and participation in global value chains (Arvis et al. 2013).

Manufacturing sectors has underperformed despite trade openness in West Africa. Premature deindustrialization or non-industrialization has recently been increasingly noticeable in developing countries with a lower share of manufacturing in GDP at their peak, which they reached at a much lower level of income than the early industrializers (Dasgupta & Singh, 2006; Amirapu & Subramanian, 2015). The

manufacturing sector no longer plays the role of the engine of growth in developing countries.

More significantly, between the 1980s and the 2000s, the industrial sector's share of GDP rose in just 7 of the 15 countries, remaining at 23% on average. The main growth drivers within the sector have been extractive industries - mining and oil - which are capital-intensive but generate little employment. According to UNIDO and UNCTAD (2011), the region's manufacturing GDP share fell from 13 percent in 1972 to 5 percent in 2008 for the region as a whole. This raises questions about the relationship between trade openness and manufacturing sector performance. The relationship between trade openness and manufacturing sectors is a contentious issue in the growth and development literature, and it is far from settled. Studies such as Onakoya, Fasanya and Babalola (2012), Okon and Ekpeno (2013), have found that openness has a positive effect on manufacturing output growth. Study like Takam et al (2017) on the other hand, claimed that it is difficult to find strong positive relationships, and that they may even have a negative relationship.

Several studies on trade openness, both theoretical and empirical, have focused on trade openness and the manufacturing sector in Nigeria, with examples including Okon and Ekpeno (2013), and Onakoya et.al (2012). However, only limited studies explicitly examined the relationship between manufacturing sector performances and openness in West Africa, most of the studies focused on individual countries, hence, this study seeks to investigate the influence of trade openness on manufacturing sectors performance in West Africa. The study adds to our understanding of role and impact of trade openness on manufacturing sector performance in West Africa.

## 2. Literature Review

### 2.1. Theoretical Literature Review

There exist vast numbers of theories on trade openness and manufacturing sectors. From the Mercantilist trade theory down to the Classical theories of Adam Smith and David Ricardo. They have emphasized the need for every country to export the commodities it produced more efficaciously because the absolute labour required per unit was less than that of the prospective trading partners. (Appleyard & Field, 1998). Furthermore, Heckscher-Ohlin theory seeks to provide an explanation for the pattern of international trade as decided through the relativeness of manufacturing existing in countries. This concept postulates that, change arises from variations in comparative costs which in turn arise from inter-country variations in relative element endowments. It is the belief of many economists that Heckscher-Ohlin mannequin is an improvement on the Ricardian idea of comparative advantage (Jhingnn, 2006).

The Ricardian and Heckscher-Ohlin theories are primarily based on the assumption that technology is identical in all trading countries, as such, they do not analyse the impact of technological trade on trade. According to According to (Posner, 1961) in Adedapo and Osman (2019), the impact of technological know-how on trade is manifested in the continuous technique by which technological changes influences the sample of international trade. A technological innovation in the structure of manufacturing of a new good in one country leads to the imitation gap and the demand gap in the other country. The extent to which change will take location between the two nations depends on the net impact of the demand lag and the imitation gap.

The imitation gap theory explains the sequence of innovation and imitation however as it affects the pattern of exchange when a firm innovates in the form of a new product which becomes profitable in the domestic market, it enjoys a transient monopoly. As it exports the product to foreign market and has an absolute benefit in this product. After some time, the income of the innovating firm encourages imitation in the other country. But it will proceed to export the product and have a comparative advantage in its manufacturing till the importing country learns the new process, trade plant, equipment, etc. in order to produce it, this is the imitation gap.

### 2.2. The Empirical Literature Review

Some studies have examined the relationship between manufacturing sectors performance and trade openness and they found the relationship to be positive. For instance, Umoh and Effiong (2013) examined the impact of trade openness on the performance of the manufacturing sub-sector in Nigeria employing time series data from 1970 to 2008.They employed the cointegration technique( ARDL bounds test) to determine whether a long run relationship exists between the manufacturing index of production, interest rate spread, exchange rate and openness to trade. Their findings revealed that trade openness has a significant positive impact on manufacturing productivity in Nigeria both in the short and long run. Also, studies from Onakoya et al (2012); Chete and Adenikinju (2002); Dodzin and Vamvakidis (2004) and Paus et al. (2003) corroborated the evidence of a positive relationship between trade and productivity measures.

On the other hand, some studies have found a negative relationship between trade openness and manufacturing performance. For example, Emerenini and Ohadinma (2018) investigated the impact of trade liberalization on the manufacturing sector of the Nigerian economy spanning 1980 to 2016 using the Error Correction Model (ECM) approach was used to analyze the data. The researchers tested the impact of trade openness, exchange rate, volume of exports/imports and balance of payment on manufacturing sector output. Their result pointed out that the short run effect of trade openness, exports and balance of payment have negative relationships with

manufacturing output while the short run effects of exchange rate and imports exerts positive relationship with manufacturing output with only imports and exports being significant.

Ashamu and Abiola (2014) investigated the impact of International trade on Nigerian Manufacturing sector growth. They employed the cointegration and error- correction modeling techniques to explore the long-run dynamic relationship between some proxies of international trade on one hand, and Nigeria's manufacturing sector growth on the other. Their study showed that there is a long-run relationship between the two. Also, they found that despite the positive relationship between, exports imports and the Nigerian manufacturing sector's growth, both exports and imports do not have significant impact on the Nigerian manufacturing sector's growth. Their findings further revealed that Nigeria's manufacturing sector has not been benefiting from trade liberalization as the coefficient of trade openness is negative.

Nevertheless, some studies have revealed mixed findings on the relationship between trade openness and manufacturing sectors performance. In order to study the role of trade liberalization in the growth of manufacturing output in Nigeria, Ogu, Aniebo and Elekwa (2016) focused on the short to medium term period while not ignoring the very important long term on which most studies have focused.. Trade liberalization was found to hurt manufacturing output in the short run although it showed a real potential to boost it in the long term. An overhaul of competition policy was recommended with a view to establishing Neutral Status in manufacturing export trade. Also, Takam et al (2017) examined the effect of trade openness on manufacturing growth in Economic and Monetary Community of Central Africa (EMCCA) countries with the use of panel data covering the period from 1984 to 2014. The estimation technique was panel cointegration as well as Dynamic Ordinary Least Square method. Their results signified two effects. Firstly, there is a positive and significant effect of Foreign Direct Investment and investment on manufacturing growth. Secondly, there is an ambiguous effect of trade openness on manufacturing growth. They pointed out that Indeed, trade openness affects either negatively the manufacturing growth or has no effect on manufacturing growth in EMCCA countries.

From the above, it can be observed that the debate is still on-going on the relationship between trade openness and the manufacturing sector performance hence, this study.

## 3. Methodology and Theoretical Framework

The theoretical framework for this study rests on the Heckscher – Ohlin model. This theory is a general equilibrium mathematical model of international trade. The theory has built on both the Adam Smith's and David Ricardo's theory. It opined that no country possesses all the factor resources needed for production and therefore the

need to trade and exchange with other countries becomes paramount. Thus, according to Heckscher and Ohlin model countries and regions should specialise and export those goods that they use their abundant and cheap factors of production resources and import goods that use the countries/regions scarce economic factor resources. This study is based on the assumptions of this model. Assuming and relying on a traditional Cobb-Douglas production function type that reflect real production of a given industry with a constant returns to scale, we specify the Heckscher-Ohlin production function as follows:

Suppose $Q(t) = f(L(t), K(t))$, we derive and express the Cobb-Douglas production form and type as follows:

$$Y(t) = A(t)L(t)^{\alpha}K(t)^{1-a} \quad (1)$$

Where all the inputs enter the model multiplicatively Y(t) = is the output level at time t, A(t) = is the technical efficiency parameter of the sector at time t i.e. the technological progress, L(t) = is the number of workers, i.e. the labour force (input) employed in production in this sector at time t, and K(t) = is the stock of capital input employed by this sector in production at time t. Thus, since the Heckscher-Ohlin theory is based on the assumption of open economy, implying that countries must trade and export goods requiring abundant cheap factors and import goods with scarce factors with the external sector. The analysis in equation (1) is further extended and modified to incorporate trade variable impact as they affect manufacturing sector output growth. Thus, the production function becomes:

$$Y(t) = A(t)L(t)^{\alpha}K(t)^{\beta}T(t)^{\theta} \quad (2)$$

Thus, since the production function exhibits a constant returns to scale (CRS), we expect the sum of the parameters of the inputs to be equal to one, that is, $\alpha + \beta + \theta = 1$. As such logging both sides of equation (2) we have:

$$lnY(t) = lnA(t) + \alpha lnL(t) + \beta lnK(t) + \theta lnT(t) \quad (3).$$

This model in equation (3) above focuses on four variables: Output (Y), Capital (K), labour (L), and "Trade" (T). This implies that at any point, the economy has some amount of capital, labour and trade that are often combined to produce output. Therefore, the extended version of the Heckscher – Ohlin model indicates the presence of trade variables indicator (T) as the key determinants of the manufacturing sector output growth and development.

Furthermore, the relationship between manufacturing sector performance (MSO) proxied by manufacturing sector output growth and trade openness proxied by volume of trade (imports + exports) divided by GDP became implicitly expressed as follows based on the model of Sinha and Sinha (2000) we adopted which emphasised the three components of GDP growth which are trade growth, labour growth and capital/investment growth:

$$MSO = f(IG, TG, PG, INFR, EXR) \quad (4)$$

Re-writing equation (4) in a linear form, we have the equation as:

$$MSOt = \beta_0 + \beta_1 IGt + \beta_2 PGt + \beta_3 TGt + \beta_4 INFt + \beta_5 EXRt + \mu_t \quad (5)$$

In order to minimize spurious results, the study therefore, converted the data of the parameters above into their natural log form. Therefore, the new equation is of the form:

$$\ln MSOt = \beta_0 + \beta_1 \ln IGt + \beta_2 \ln PGt + \beta_3 \ln TGt + \beta_4 \ln INFt + \beta_5 \ln EXRt + \mu_t \quad (6)$$

Where: MSOt = Manufacturing sector output growth; TG = is trade growth (proxy for trade openness; IG = is the investment growth proxied by FDI; PG = is the employment growth proxied by labour force participation rate in the sector; INF = is inflation rate; EXR = is the real exchange rate and $\mu_t$ is the error time. $\beta_0$ - $\beta_5$ = are the parameters to be estimated.

Thus, expressing equations (6) in panel form regression equation and taking the natural logarithm of both sides of the equation for the 12 selected West African Countries gives:

$$\ln MSO_{it} = \beta_i + \beta_1 \ln(IG_{it}) + \beta_2 \ln(PG_{it}) + \beta_3 \ln(TG_{it}) + \beta_4 \ln(INF_{it}) + \beta_5 \ln(EXR_{it}) + \mu_{it}. \quad (i = 1,\ldots, N; t = 1,\ldots, T). \quad (7)$$

Where MSO is the measure of manufacturing sector output growth rate in country i at time t; $\beta_i$ is a fixed effect reflecting time differences between countries; $\beta_1$ is the measure of investment growth in country i at time t proxied by FDI; $\beta_2$ is the measure of employment growth rate in country i at time t proxied by labour force participation rate; $\beta_3$ is the measure of trade growth in country i at time t proxy by trade openness; $\beta_4$ is the measure of inflation rate in country i at time t; $\beta_5$ is the measure of exchange rate index with respect to the US Dollar in country i at time t and $\mu_{it}$ represents the error term. In terms of a priori expectation, the measures of employment growth (LFPR), investment growth (FDI), trade growth (Trade OPN) and exchange rate (appreciation) are expected to have positive relationships and trigger the manufacturing sector output in some selected 12 West African Countries (Benin, Burkina Faso, Gambia, Guinea Bisau, Ghana, Cote d'Ivoire, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone)

The model specified in equation (6) above was estimated using the Pedroni's panel cointegration technique to examine the existence of long-run relationship, and the coefficients of the cointegration values were further examined by the method of Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) proposed by Stock and Watson, 1992 in order to examine the relationships and impacts of the variables in the 12 selected West African countries using the panel data approach. Its advantage lies in the fact that it allows us to capture

the dynamic effects and heterogeneity effects resulting from time series and cross sectional studies. It further improves the Ordinary Least Square (OLS) by coping with a small sample and dynamic sources of bias. Data were sourced from the World Development Indicator and World Bank data survey for the periods 1980 – 2019.

## 4. Empirical Results

### 4.1. Descriptive Statistics

The summary of statistics used in this study is presented in the table 1. The rule of thumb for standard deviation is that the standard deviation of any variable should be equal to zero or close to zero, which implies that the deviation from the mean must be small over time for our chosen series to be less volatile. In table 1, all the variables (real exchange rate, foreign direct investment, inflation rate, manufacturing sector output growth, exchange rate, inflation rate and literacy rate are not statistically different from zero over time with values of (3.170, 1.121, 19.983, 4.085, 2.357) thereby conforming to the rule of the thumb. Thus, the standard deviation value for inflation which stood at 19.983 constitutes the most volatile variable in the series, while labour force participation rate constitutes the least volatile series. The manufacturing sector output has the mean value of 9.390 and the mean value of exchange rate constitutes the highest value mean of 538.175, while the mean values of FDI, INF and OPN stood at (4.061, 11.553 and 55.807) respectively.

**Table 1. Summary of Descriptive Statistics**

| | EXR | FDI | INF | MSO | OPN | LFPR |
|---|---|---|---|---|---|---|
| **Mean** | 538.175 | 4.061 | 11.553 | 9.391 | 55.807 | 12.683 |
| **Median** | 346.305 | 34.372 | 5.388 | 8.635 | 53.870 | 10.503 |
| **Maximum** | 9183.87 | 8.841 | 178.70 | 21.098 | 131.485 | 4.288 |
| **Minimum** | 0.00027 | -8.841 | -14.936 | 1.533 | 6.320 | 1.683 |
| **Std. Dev.** | 3.170 | 1.121 | 19.983 | 4.085 | 2.358 | 0.731 |
| **Skewness** | 5.431 | 4.589 | 3.603 | 0.663 | 0.6766 | 0.812 |
| **Kurtosis** | 34.327 | 27.150 | 20.438 | 3.038 | 3.717 | 2.578 |
| **Jarque-Bera** | 9.544 | 1.332 | 71.056 | 35.126 | 46.797 | 4.106 |
| **Probability** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.128 |
| **Sum** | 2586.3 | 1.955 | 5533.9 | 449.815 | 2731.65 | 93.921 |
| **Sum Sq. Dev.** | 27.262 | 5.980 | 11.043 | 7976.9 | 198.105 | 18.154 |
| **Observations** | 479 | 479 | 479 | 479 | 479 | 479 |

*Source: Author's computation.*

In table 1, all the variable series are normal and most of them are skewed positively (platykurtic), except for manufacturing sector output, trade openness and labour force participation rate that are skewed negatively mesokurtic). For the Jarque-Bera statistic values at 1%, 5% and 10% chosen significance levels, most of the computed probability values for the series in table 1 (9.544, 1.322, 71.056, 35.126 and 46.796) are greater than 1%, 5% & 10% chosen probability values. It implies that we accept the null hypothesis at 1%, 5% & 10% significant levels, meaning that all the series are normally distributed except for labour force participation rate where we reject the null hypothesis that the series are normally distributed. This implies that there is presence of unit root in the series and hence, the unit root test for the variables are presented in table 3.

### 4.2. Results of the Correlation Analysis

Table 2 presents the results of correlation analysis which is important to establish the level of association among the variables used in the panel regression analysis. The results showed that the correlation coefficients between these variables are moderate and can co-exist in the same model.

**Table 2. Correlation Results**

| | **LEXR** | **LFDI** | **LMSO** | **LINFR** | **LPFPR** | **L OPN** |
|---|---|---|---|---|---|---|
| **LEXR** | 1.000 | | | | | |
| **LFDI** | 0.347 | 1.000 | | | | |
| **LMSO** | 0.034 | 0.006 | 1.000 | | | |
| **LINFR** | 0.051 | 0.032 | 0.072 | 1.000 | | |
| **LPFPR** | 0.391 | 0.219 | 0.119 | 0.032 | 1.000 | |
| **LOPN** | 0.175 | 0.064 | 0.099 | 0.218 | 0.187 | 1.000 |

*Source: Author's computation.*

### 4.3. Result of the Unit Root Test

Unit root tests are traditionally used to check the order of integration and to confirm the stationarity of the variables. This study used Levin, Lin and Chu (2002) test (LLC) and Im, Pesaran, and Shin (2003) panel unit root test (IPS) version to guide against biased and inconsistent results. The result shows that all the variables were stationary at first difference with the exception of inflation rate (INF) that was stationary at level. Therefore, all the variables are non-stationary and integrated of level order I(0) and first difference order I(1). Having established that all variables are integrated at an order one and zero, the next step is to apply cointegration test. The Pedroni's panel cointegration technique was applied to examine the cointegration among the variables in this study.

**Table 3. Results of Panel Unit Root Tests**

| Variable | Levin, Lin and Chu (LLC) | | | Im, Pesaran, and Shin (IPS) | | | Decision |
|---|---|---|---|---|---|---|---|
| | Level | First Difference | I(d) | Level | First Difference | I(d) | |
| **LTrade OPN** | -1.6071 | -11.0713 | I(1) | -2.8404 | -13.4623 | I(1) | I(1) |
| **LMSO** | -1.9775 | -12.8120 | I(1) | -2.4050 | -12.6564 | I(1) | I(1) |
| **LFDI** | 2.3014 | -7.4010 | I(1) | -12.1011 | -6.4628 | I(1) | I(1) |
| **LINF** | -7.2920 | -15.672 | I(0) | -6.9182 | -19.567 | I(0) | I(0) |
| **LPFPR** | -3.3037 | -4.5498 | I(1) | -2.9006 | -5.5498 | I(1) | I(1) |
| **LEXR** | 2.7832 | -8.5489 | I(1) | 2.4716 | -9.6423 | I(1) | I(1) |

*Source: Authors' computation. All variables are estimated at both trend & intercept.*

### 4.4. Cointegration Analysis Result and Interpretation

The results of the panel cointegration using seven-test statistics in table 4 confirmed that there is long-run relationship among trade openness (proxy for trade growth), foreign direct investment (proxy for investment growth), labour force participation rate proxy of (employment growth), inflation rate and exchange rate index in the 12 selected West African Countries. The long-run relationship between trade openness and manufacturing sector performance has been supported by several researchers in the past studies (Onakoya, et al 2012; Khobai and Moyo, 2020; Umoh & Effiong, 2013; Adeyinka and Adegboye, 2017; Adenikinju and Chete, 1995; Adenikinju, 2005; Adofu, 2009; Daniels and VanHoose, 2013; 2017; Asongo et al, 2013).

**Table 4. Pedroni's Residual Cointegration Test**

| Test Statistic | No Trend & Intercept | Only Trend | Both Trend & Intercept |
|---|---|---|---|
| **Panel V-Statistic** | 2.105* | -0.106 | 2.203* |
| **Panel Rho-Statistic** | 2.149* | 0.532 | 0.581 |
| **Panel PP-Statistic** | -3.422* | -2.582* | -2.503* |
| **Panel ADF-Statistic** | -6.732* | -0.096 | -2.588* |
| **Group Rho-Statistic** | 0.312 | 1.201 | 1.595 |
| **Group PP-Statistic** | -2.951* | -1.512** | -2.922* |
| **Group ADF-Statistic** | -2.061* | -0.216 | -1.494* |

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

### 4.5. Fully Modified (FMOLS) and Dynamic Least Square Regression (DOLS) Analysis Result and Interpretation

Our results revealed that trade growth indeed increases manufacturing sector output in the 12 selected West African countries as shown in table 5 but not significant. We found that a one percentage change in trade openness would translate into 57% and 77% increases in manufacturing sector output in these countries based on the DOLS and FMOLS approaches. Thus, the coefficients of trade openness are 0.568 and 0.777 and are positive, thereby aligning with a priori theoretical expectation that trade openness is capable of enhancing output and productivity gains in the manufacturing sector. These findings corroborate the findings of (Khobai and Moyo, 2020; Adenikinju and Chete, 1995; Yi and Li, 2014; Onakoya et al 2012).However, it contradicts the findings of Ashamu and Abiola, 2014 and Emerenini and Ohadinma, 2018. The implication of the above findings is that trade openness is important but it does not significantly affect the growth of manufacturing sector output positively in this region of Africa majorly because manufacturers in these countries are unable to compete with better quality due to over reliance on imported products which later made imports to be costly in the region. This may be the reasons why trade openness has not been favourable in these countries despite the call for globalization.

Other factors affecting manufacturing output in the 12 selected West African countries were foreign direct investment, female labour force participation, inflation rate and exchange rate. FDI is positively signed and it impacts significantly on manufacturing output performance in the West African region of Africa. The policy implication of this result is that manufacturing output chiefly relied and depended on foreign direct investment inflow. This however, means that the achievement of sustainable development goals in this region is guaranteed when FDI driven policy initiatives are implemented and improved upon. These findings conform to earlier studies by Osidipe et al., 2013; Khobai and Moyo, 2020; Adenikinju and Chete, 1995; Yi and Li, 2014; Onakoyaet al, 2012; Umoh and Effiong, 2013; Adeyinka and Adegboye, 2017. This supports the proposition that increase in FDI flows improves and enhances economic growth and development through the increase in manufacturing productivity and contribution to GDP in this region.

The results further suggested that exchange rate has strong positive significant effect on manufacturing sector output growth in these countries in West Africa. This result corroborates earlier findings by (Osidipe et al., 2013; Khobai and Moyo, 2020; Adenikinju and Chete, 1995; Yi and Li, 2014; Umoh and Effiong, 2013; Chanda and Manusamy, 2009; Onakoya et al, 2012) and the a priori theoretical proposition sign which states that exchange rate should be positive in value in relationship with industrial productivity. Furthermore, the result showed that there is huge negative significant impact of inflation rate on manufacturing sector output in the selected

West African countries. This finding aligns with previous studies by (Onakoyaet al, 2012; Adenikinju, 2005). This implies that an increase in general level price due to inflation enhances manufacturer's productivity via increases in profits by the manufacturers. Lastly, a unit change in labour force will bring about 33% and 1.4% increases in manufacturing sector output in this selected region. Thus, this implies that the coefficients of employment growth proxied by labour force participation rate were 0.327 and 1.439 and they are positive and significant, thereby aligning with a priori theoretical expectation that employment growth is capable of enhancing output, performance and productivity gains in the manufacturing sector. This finding further conforms to previous studies by Onakoya et al, (2012), Osidipe et al, (2013), Khobai and Moyo, (2020). All these above findings suggest that there is existence of cointegration among the variables in this study since the empirical results of Pedroni's cointegration confirmed in table 4 that there exists a long-run relationship among the variables.

**Table 5. Panel Long Run Estimates and Elasticities of FMOLS and DOLS Regressions.**

| Variables | FMOLS | FMOLS | | DOLS | DOLS | |
|---|---|---|---|---|---|---|
| | **Coefficients** | **t-values** | **Prob** | **Coefficients** | **t-values** | **Prob** |
| **LOPN** | 0.568* | 0.776 | 0.110 | 0.777* | 4.62 | 0.150 |
| **LFDI** | 0.823* | 3.96 | 0.000 | 0.298** | 2.91 | 0.000 |
| **LINFR** | - 0.218** | - 2.76 | 0.002 | - 0.529** | - 4.21 | 0.000 |
| **LFPR** | 0.327 | 4.47 | 0.221 | 1.439** | 2.69 | 0.110 |
| **LEXR** | 0.210* | -2.88 | 0.045 | 0.011* | -5.39 | 0.000 |
| **R-Squared** = 0.925 | | | | **R-Squared** = 0.985 | | |
| **Adjusted R-Squared** = 0.914 | | | | **Adjusted R-Squared** = 0.971 | | |
| **Durbin-Watson** = 1.8327 | | | | **Durbin-Watson** = 1.7827 | | |

*Source: Authors' computation. *, **and *** indicates significance at 1%, 5% and 10%.*

## 5. Conclusion

An open economy is very essential to the development of the manufacturing sector of any nation and region. Therefore this study examined the effect of trade openness on the performance of the manufacturing sector in 12 selected West African countries from 1980 to 2019. The panel data were analysed by using the Dynamic Ordinary Least Square (DOLS) and Fully Modified Ordinary Least Square (FMOLS). While the dependent variable was the manufacturing output, the explanatory variables were trade openness, exchange rate, employment, inflation and investment. The study revealed that all the coefficients are positively associated and

significant with manufacturing sector output except for trade openness that is not significant and inflation rate is negative and significant.

This study therefore, has shown that no nation or region can live in isolation if it wants to improve on its manufacturing capacity which will eventually lead to economic development. Thus, the concern should not be on how to reduce openness in this region but on how to take advantage of globalization. Though, the manufacturing sector promotion and improvement in this region have not been well approached. This could be due to weak technological base and low level of capacity utilization in these countries. Nonetheless, this study has been able to show that there are significant pay offs and prospective gains from the policy of trade and financial liberalization in this region. The current policy of trade and financial liberalization with lower tariffs and increasing openness in trade in this region of Africa should be pursued rigorously in order to enhance growth.

Finally, the governments in the West African region should consider the conditions that would ensure sustained increase and growth of the manufacturing sector with appropriate policy measures such as improved infrastructure through attraction of foreign direct investment inflows, enhanced competitiveness through export promotion and import substitution.

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