DOES HUMAN CAPITAL MATTER FOR FDI'S EFFECT ON POVERTY? An Evidence From Nigeria

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ABSTRACT

This paper investigates the impact of foreign direct investment (FDI) on poverty given the role of human capital in Nigeria. A multidimensional poverty index (MPI) approach to measuring poverty was used in which household consumption expenditure, life expectancy and infant mortality were proxied for poverty. Human capital was measured using primary, secondary and tertiary school enrolments. The empirical analysis was done using the Autoregressive Distributed Lag (ARDL) approach, over annual time series data covering 1980-2018. Results reveal that the interaction of FDI and all the school enrolments had a significant reducing effect on poverty when household consumption expenditure was used. However, when poverty was measured by life expectancy, only the interactive terms of FDI with primary school and secondary school enrolments reduced poverty significantly, while the interaction of tertiary school enrolment and FDI did not. The effect of the interaction of FDI and the different measures of human capital on poverty was mixed and ambiguous when infant mortality was used. Based on the finding, it is evident that human capital matters for FDI's effect on poverty, and this effect is sensitive to the proxy used for poverty in Nigeria. Therefore, government should improve the quality as well as the efficiency of human capital in the country.

JEL classification: F21, J24, I32

1. Introduction

As globalization intensifies, African nations have been progressively incorporated into international economic activities, creating meaningful opportunities to address pressing social problems. After the reduction in trade barriers in the early 1980s, the debt crisis of 1988 and the removal of aid, foreign direct investment (FDI) has become a more rewarding source of investment for developing countries. This is based on the premise that FDI will build up local capital stock and, with the right policies in place, enhance productivity and accelerate development (Borensztein, Gregorio & Lee, 1998; Agarwal & Atri, 2015). The increase in FDI inflows over the last 20 years has resulted in a dramatic increase in both economic growth and human capital levels in developing countries, although human capital itself is expected to increase economic growth in less developed countries (Leeuwen & Foldvari, 2008; Azam et al., 2015). On this basis, Nigeria joined the rest of the world in drawing FDI to boost its economic growth (Ayanwale, 2007).

The growth in the rates of FDI inflows in Nigeria appears to be related to the rise in gross domestic product (GDP) and human capital, as well as poverty (NBS, various issues). Nevertheless, the rise in GDP was partly offset by rapid population growth, resulting in a lower per capita income. Similarly, Nigeria has made significant strides in the educational sector in terms of human capital growth. Current statistics from agencies such as the World Bank Development Indicators (WDI) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) suggest that the average school year, literacy rate and student enrolment have increased. Notwithstanding this, it is argued that FDI inflows to Africa, especially Nigeria, are mainly aimed at resource-rich countries and hence, might not improve the education sector of recipient economies (Ndeffo, 2010; Adefabi, 2011; Santosa, 2014). Conversely, studies such as Subbarao (2008), Gittens & Pilgrim (2013), and Azam et al (2015) have shown that multinational corporations (MNCs) have the potential to improve education, particularly tertiary education in recipient economies.

In spite of rising FDI inflows to the country and a number of government policies to combat poverty, more than half of Nigeria's population is reported to be poor (NBS, 2016). In spite of efforts to promote FDI and cooperation with global programmes to alleviate poverty, the poverty level has risen and the country still faces challenges of inadequate funds for long-term growth and

development, low capacity utilization and high unemployment. All of which have rendered it extremely impossible for the nation to pursue sustainable economic development.

Poverty is a multidimensional phenomenon, but the structure of existing literature is dominated by one-dimensional or monetary measures (Ayanwale, 2007; Posu et al., 2010; Almfraji, Almsafir & Yao, 2014; Agarwal & Atri, 2015). A one-dimensional measure of poverty may not reflect the features of economic development and can neglect the basic dimensions of social welfare. Social welfare is part of a more systemic and multi-dimensional goal of sustainable development. It would be wrong to conclude *a priori* that FDI automatically adds to poverty reduction as FDI increases average development. As Ravallion (1996) and Te Velde & Morrissey (2004) have pointed out, non-income measures may play a significant role in identifying the missing welfare features of monetary-poverty measures.

A number of important research have shown that FDI is only successful under certain conditions. The stock of human resources is considered to be the most significant of these factors. However, taking into account the current level of human capital growth in Nigeria, the extent to which FDI promotes welfare and therefore reduces poverty has not been thoroughly investigated. Two studies, Akinlo (2004) and Ayanwale (2007), looked at the effect of FDI on poverty through growth and concluded that FDI had a positive effect on growth in Nigeria. However, none of these studies investigated the direct effect of FDI on poverty or discussed the role of human capital in the relationship between FDI and poverty. Close to our study is Aminu and Bani (2017) who examined the role played by human capital in FDI's effect on economic growth in Nigeria, but our study differs in the sense that we measure poverty more directly by using the Multidimensional Poverty Index (MPI). Furthermore, unlike previous studies such as Borensztein et al. (1998) and Nunnenkamp (2002), that used primary and secondary school enrolments as a proxy for human capital, we extend the measure of human capital by including tertiary school enrolments. This is because most foreign investment flow to developing countries requires intensive skills and needs more professional, technical, and managerial skills that cannot be obtained from primary or secondary education.

Given this situation, this paper varies from other related studies in that it specifically explores the influence of FDI on poverty given the role of human

capital in Nigeria. It focuses on the more direct impact of FDI on poverty rather than deducing the effect of growth. This paper attempts to fill this gap and contribute to the existing literature on FDI, human capital, and poverty by not only disentangling the effects of FDI on poverty but also by examining this effect in the presence of human capital.

The rest of this paper is organized as follows: while Section 2 provides a short review of literature on the concept of poverty, human capital and FDI, the methodology and data are presented in Section 3. Section 4 discusses the result of empirical analyses, and Section 5 gives the conclusion.

2.   Review of the Literature

2.1 Conceptual definition of poverty

Poverty may assume several distinct types, from non-monetary to monetary, such as poor health and education, to low or ineffective consumption or income. The MPI comprises a wide range of non-monetary poverty measures. Recent studies have shown that people considered poor in one dimension are often different from those found to be poor in another dimension. This paper explores how the characteristics of the MPI are close to those of the associated consumption-based indicator of poverty. Poverty is usually measured by whether a person has enough income or expenditure to meet a certain minimum level of social needs. This strategy makes it possible to represent many aspects of well-being, such as food intake, shelter, transportation, and many other elements; and also to provide socially determined weights for each element, depending on market rates. The appeal is to focus on economic relations through the simplicity of estimating the attribute of several different facets of well-being.

Another problem with this strategy is that there are non-monetary well-being components that are omitted from policies because their prices are not available, which may contribute to misinformed poverty policy discussions. Both Morrell (2011) and Alkire, Foster, Seth, Santos, Roche and Ballon (2014) demonstrate that poverty is typically a result of causes outside income or consumption. Hulme & Shepherd (2003) observed that poverty approaches that rely on non-monetary well-being components may complement monetary policies and include a broader picture of long-term poverty. Alkire & Foster (2011) have developed a now standard multidimensional poverty index (MPI) for the Oxford Poverty and Human Development Project, along with a weighted poverty index

(k) and an MPI. The availability of freely accessible knowledge, the population of interest, contexts and study problems are, in particular, the guiding forces behind the collection of these measurements and related indices of poverty (Alkire & Santos, 2010).

2.2 Survey of studies on FDI, human capital and poverty

There are ambiguities in the theoretical literature on the link between FDI and poverty. FDI advocates contend that FDI can alleviate poverty by generating employment, improving human capital, growing income, and decreasing inequalities (Hansen & Rand, 2006). In contrast to these proposals, Stiglitz (2002) predicts that FDI is susceptible to market imperfections and unequal negotiating power, which may increase poverty and hinder social benefits. It also seems that the existence and nature of the spillover consequences of FDI, and whether or not they improve health, will only be assessed through more empirical research.

The ties between FDI and the welfare dynamics are defined in the sense of neoclassical or endogenous growth theory. The main significance of the neoclassical paradigm of economic development is the reliance on exogenous technical change and the rate of growth of the population. The drawbacks of the hypothesis include the failure to justify long-term growth trends by certain causes, such as the collection of knowledge and institutional strength. A modern hypothesis, also known as the endogenous growth theory, was built based on the shortcomings of the neoclassical model of economic development. Under the endogenous theory of growth, human capital is modeled as a factor of long-term growth. According to Romer (1986), Lucas (1988), and Romer (1990), the growth rate of the economy is determined by the endogenous speed of innovation progress. Romer (1990) concluded that there are continuously marginal returns to the accumulation of development and creativity that contribute to endogenous growth.

According to endogenous growth theories, FDI, which is a form of capital, stimulates economic growth through technological diffusion and the spread of knowledge. On this basis, FDI advocates (such as Hansen & Rand, 2006) argued that the link between FDI and poverty could be either direct or indirect. FDI could have a direct impact on poverty through labour markets in terms of job creation and human capital development, in line with endogenous growth

theories. The indirect link between FDI and poverty can be attributed to increased economic activity and productivity.

Empirical evidence on the effect of FDI on poverty has been mixed. One strand of the literature has found support for the hypothesis that FDI plays a key role in combating poverty (Dollar & Kraay, 2000; Klein, Aaron & Hadjimichael, 2001; Jalilian & Weiss; 2002; Meyer & Sinani, 2009; Gohou & Soumaré, 2012; Zaman, Khan & Ahmad, 2012; Lehnert, Benmamoun & Zhao, 2013; Fowowe & Shuaibu, 2014; Shamim, Azeem & Naqvi, 2014). The other literature strand argues that FDI may not necessarily reduce poverty (Hymer, 1968; Campos & Kinoshita, 2002; Carkovic & Levine, 2002; Blomström & Kokko, 2003; Calvo & Hernandez, 2006; Elmawazini, Atallah, Nwankwo & Dissou, 2013; Huang, Teng & Tsai, 2010; Agarwal & Atri, 2015), as FDI generates market imperfections which increase the level of poverty. Apart from studies that have found either positive or negative effects of FDI on poverty, few studies like Huang, Teng and Tsai (2010), Gohou & Soumaré (2012), and Akinmulegun (2012) have found FDI to have no significant effect on poverty.

Although there is ample literature on the relationship between FDI and poverty, only a few have focused on the role of human capital in FDI's effect on poverty with inconclusive results. For example, the role of human capital in attracting FDI has been perceived as largely positive, though not by everyone. Lucas (1988), Borensztein et al. (1998), Zhang & Markusen (1999), Bengoa & Sanchez-Robles (2003), Li & Liu (2005), Vu, Gangnes & Noy (2008), and Aminu & Bani (2017) have identified human capital as an essential component for attracting FDI. However, Noorbaksh, Paloni & Youssef (2001), Almfraji et al. (2014), and Shima'a (2015) found human capital as a significant determinant of FDI using interactive terms in their chosen models. It appears that whether FDI reduces the level of poverty or not depends on the nature and extent of the spillover effect, and its veracity can only be ascertained with further empirical work.

There are relatively few empirical studies in Africa on FDI and poverty using measures other than economic growth. Among the studies in Africa that have used the multifactor measure of poverty are Gohou & Soumaré (2012), and Magombeyi & Odhiambo (2017). Building on Magombeyi & Odhiambo (2017), we place the non-monetary indicators of poverty alongside monetary measures. This is a significant contribution to the current literature. There are various

measurements of poverty and failure to account for them may lead to an underestimation of the impact of FDI on poverty, which may have dire policy implications.

3. Methodology and Data

3.1 Model specification

In order to estimate the effect of FDI on poverty, given the role of human capital in Nigeria, we first investigate the fundamental associations between FDI, human capital and poverty. This relationship shall be specified as:

$$POV = \lambda + \alpha FDI + \vartheta HK + \gamma x + \varepsilon \tag{1}$$

where POV is measured by the MPI approach and therefore poverty is measured by three basic measures. The three indicators are: percentage of household consumption expenditure on GDP (POV_1), life expectancy (POV_2) and child mortality (POV_3). FDI is a net flow of FDI as a percentage of GDP, HK is human capital determined by primary, secondary and tertiary school enrolments, X is a vector of control variables found in the literature, and ε is an error term.

Nonetheless, considering that the study focuses primarily on the role of human capital in the effect of FDI on poverty, an interactive concept of FDI and human capital is incorporated into the model. Therefore, equation (1) is re-expressed as:

$$POV = \lambda + \alpha FDI * HK + \gamma x + \varepsilon \tag{2}$$

Equation (2) is estimated using the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001). The choice of this method is based on its advantages following: first, the ARDL is more flexible and applicable when all variables are I (0), I (1), or are mutually integrated (Pesaran et al., 2001). Second, the ARDL is robust when the sample size is small (Odhiambo, 2009; Solarin & Shahbaz, 2013). The time series length is just 38 years in this study. Third, in applying the ARDL method we cannot obtain biased estimators that cannot be obtained in the long-run model (Harris & Sollis, 2003).

The ARDL model is specified as:

$$\Delta \log Pov_1 = \alpha_0 + \alpha_{1t} + \sum_{i=0}^{n} \alpha_1 \Delta \log Pov_{t-1} + \sum_{i=0}^{n} \alpha_2 \Delta \log FDI * \sum_{i=1}^{n} HK_{t-1} +$$

$$\sum_{i=0}^{n} \alpha_3 \Delta \log CPI_{t-1} + \sum_{i=0}^{n} \alpha_4 \Delta \log INFRA_{t-1} + \sum_{i=0}^{n} \alpha_5 \Delta \log TOP_{t-1} +$$

$$\vartheta_1 \log Pov_{t-1} + \vartheta_2 \log FDI * \sum_{i=1}^{3} HK_{t-1} + \vartheta_3 \log CPI_{t-1} + \vartheta_4 \log INFRA_{t-1} +$$

$$\vartheta_5 \log TOP_{t-1}$$

$$(3a)$$

Since the ARDL also involves adjustments processed from the short-run to the long-run, then there is a need to specify the model in error correction form. Thus, the error correction model specification is given as:

$$\Delta POVSUBi = \alpha_0 + \alpha_1 \sum_{i=0}^{n} \Delta POV_{t-1} + \alpha_2 \sum_{i=0}^{n} \Delta FDI_{t-1} * \sum_{i=0}^{n} HK_{t-1} +$$

$$\alpha_3 \sum_{i=0}^{n} \Delta CPI_{t-1} + \alpha_4 \sum_{i=0}^{n} \Delta INFRA_{t-1} + \alpha_5 \sum_{i=0}^{n} \Delta TOP_{t-1} + \gamma ECM_{t-1} + \mu_t \qquad (3b)$$

The ARDL model and error correction specification are given in equations (3a) and (3b).

3.2 Variables definition

In line with the MPI framework, three dependent variables are chosen as proxy for poverty. These are household consumption expenditure, life expectancy, and infant mortality rate. The choice of these variables as measures of poverty is based on several justifications. First, the poverty measure in developing countries focuses on either income or consumption. However, in the literature, it is believed that income is earned intermittently, while consumption is smoothed over time. As a result, it is fair to assume that consumption is more directly related to the quality of life compared to income. Therefore, household consumption expenditure which includes the consumption of all kinds of

expenditure on goods and services becomes a good proxy for poverty (see Faloye & Bakare, 2015; Magombeyi & Odhiambo, 2017; Stoyanova & Tokin, 2018).

Similarly, life expectancy and infant mortality rate are robust proxies for poverty in developing countries, especially Nigeria where there is a lack of quality food and health facilities. The United Nations Children's Fund has pointed out that life expectancy and infant mortality rate are closely linked to a country's income level. Also in developing countries, as the level of life expectancy at birth increases, the higher the level of economic growth, and hence welfare improvement (Dursun & Ogunleye, 2016; Olagunju et al., 2019).

Other control variables in the model are inflation, infrastructure, GDP per capita and trade openness. Each of these variables is included in the model based on its theoretical linkage with the different measures of poverty used. The study employed annual time series data from 1980-2018. The data on school enrolments was obtained from the National Bureau of Statistics (NBS) while those for all other variables were obtained from the World Development Indicators (WDI).

4. Empirical Results and Discussion

First, the descriptive statistics of all the variables in the empirical models are presented. Then, the estimation results of unit roots and cointegration tests are presented. Finally, we follow it up with the long-run and short-run estimates of the ARDL models and the associated diagnostic tests.

4.1 Descriptive analysis

Descriptive statistics show that, generally, all variables display relative stability with small values of standard deviation (table 1). It is, therefore, appropriate to include them in the respective models.

4.2 Correlation matrix

Table 2 provides the correlation matrix of all the variables employed in this study. From rule of thumb, if the correlation coefficient is greater than 0.7, we conclude that there is multicollinearity, but if the coefficient is less than 0.7 there is no multicollinearity. Overall, the coefficients of correlation among all the

variables reveal the absence of damaging multicollinearity. This increases our confidence that the results are not distorted by spurious correlations among variables.

Table 1. Descriptive Statistics

	Mean	Median	Max	Min	Std. Dev.	Obs
POV_1	0.7905	0.7783	1.0535	0.5861	0.1262	38
POV_2	3.8626	3.8309	3.9699	3.8139	0.0500	38
POV_3	4.6566	4.7664	4.8442	4.1987	0.2098	38
FDI	2.8232	2.5341	10.8326	-1.1509	2.3464	38
CPI	2.6750	2.5028	4.2882	1.6831	0.7130	38
INFRA	0.4192	0.3319	1.1778	0.0819	0.2759	38
TOP	3.8525	3.9664	4.4044	3.0504	0.3836	38
PRY	1.9838	1.9848	2.0110	1.9548	0.0171	38
SEC	1.9010	1.9097	1.9512	1.8363	0.0296	38
TERT	1.7403	1.7800	1.8313	1.5606	0.0824	38

Source: Authors' computation.

Table 2. Correlation Matrix

	Pov_1	CPI	GDPPC capita	Infra	TOP
Pov_1	1				
CPI	0.0539	1			
GDPPC	-0.342	-0.3803	1		
INFRA	-0.0116	-0.1592	0.1815	1	
TOP	0.1244	0.1027	-0.3196	0.5391	1

	Pov_2	CPI	GDPPC	INFRA	TOP
Pov_2	1				
CPI	-0.3239	1			
GDPPC	-0.1173	-0.0035	1		
INFRA	0.152	-0.1592	-0.1495	1	
TOP	-0.3	0.1027	-0.3008	0.5391	1

	Pov_3	CPI	GDPPC	INFRA	TOP
Pov_3	1				
CPI	0.3411	1			
GDPPC	0.1108	-0.0035	1		
INFRA	-0.197	-0.1592	-0.1495	1	
TOP	0.2323	0.1027	-0.3008	0.5391	1

Source: Authors' computation.

4.3 Unit root test

Before applying the co-integration test of Pesaran et al. (2001), it is imperative to carry out the stationarity test to be sure that no variable is integrated of a higher order than 1. In this study, we used the unit root tests of Augmented Dickey-Fuller (ADF) and Phillips Perron (PP). The results presented in table 3 indicate that the variables are stationary either at their original level or at first difference.

Table 3. Unit Root Test Results

Variable	ADF			Phillips-Perron (PP)		
	Level	First Difference	I(d)	Level	First Difference	I(d)
POV 1	-3.0880**a	-8.9980***a	I(1)	-2.7510***a	-8.9565***a	I(1)
POV 2	-4.109a	-3.243***a	I(1)	-2.307a	-6.321***a	I(1)
POV 3	-3.555a	-6.531***a	I(1)	-3.301**a	-6.790***a	I(1)
FDI	-0.942a	-5.450**a	I(1)	-0.980a	-5.4470***a	I(1)
PRY	-1.180a	-5.780*a	I(1)	-1.300a	-5.8093***a	I(1)
SEC	-2.100a	-5.000**a	I(1)	-2.104a	-5.0030***a	I(1)
TERT	-1.923a	-5.660**a	I(1)	-2.600a	-5.7419***a	I(1)
CPI	-3.400**a	-6.030**a	I(0)	-3.240**a	-3.2482*a	I(0)
INFRA	-7.300***b	-4.400***a	I(0)	-1.015a	-3.8120***a	I(1)
TOP	1.740a	-4.63**b	I(1)	-1.503a	-7.490***a	I(1)

Source: Authors' computation: underlying data from WDI, CBN, and NBS database.

Note: *, ** and *** imply statistical significance at 10%, 5% and 1% levels respectively. Also, "a" denotes model with constant only, and "b" denotes model with constant and trend.

4.4 Bound test to co-integration

The results of the ARDL bound test are presented in table 4. The F-statistics in all the models are higher than the upper critical values at 1, 5 and 10 percent level of significance. Therefore, the null hypothesis (H_0) assumption of absence of co-integration is rejected, which implies that there is a long-run relationship between the dependent variables and the explanatory variables in the three models.

Table 4. Cointegration Results and Critical Values

Model	F-statistics	Critical Values	[I_O]	[I_1]	Co-Integration Status
1	6.921	1%	3.74	5.08	
		5%	2.78	4.09	Co-integrated
		10%	2.43	4.25	
2	12.981	1%	3.66	5.16	
		5%	2.67	4.02	Co-integrated
		10%	2.12	3.65	
3	5.867	1%	3.56	5.03	
		5%	2.78	4.03	Co-integrated
		10%	3.23	4.89	

Source: Authors' computation.

Note: *, ** and *** denote statistical significance at 10%, 5% and 1% levels respectively.

Since the ARDL bound test established that all the ARDL models are cointegrated, the next step in the estimation process is the optimal lag length selection for all models. We make use of Akaike Information Criteria (AIC) to select the optimal lag length. The ARDL (2 2 0 1 1), ARDL (2 2 0 1 1), ARDL (2 2 0 2 2) are, respectively, selected for models (1), (2), and (3).

4.5 Effect of interaction of FDI and human capital on poverty

The regression results are presented in Appendix 1. Panel A shows the long-run estimation results of the effect of the interactive terms of FDI and human capital on poverty, while Panel B indicates the short-run estimation results. The results indicate that when poverty is measured by household consumption expenditure, the interaction of FDI with all the school enrolments has a positive and significant relationship with consumption expenditure. By implication, an increase in the interactive terms of FDI and school enrolments will increase household consumption and thus, reduce poverty. This also indicates that FDI and human capital have emerged as major factors in poverty reduction in Nigeria. However, when poverty is measured by life expectancy, the relationship between life expectancy and the interactive terms of FDI and primary enrolment, as well as secondary enrolment is significantly positive. Conversely, the interactive term of FDI and tertiary school enrolment has an insignificant negative relationship with life expectancy. This indicates that both primary and

secondary enrolments aid FDI in raising life expectancy which is an indication of improved welfare, and therefore, matters for FDI effect on poverty. Furthermore, when poverty is proxied by infant mortality, the interaction effect of FDI and human capital is ambiguous. The results show that the effect of the interaction of primary school enrolment and FDI is positive and significant, but the effects of the interaction of secondary school enrolment and that of tertiary school enrolment and FDI are negative and insignificant. This implies that a combination of FDI inflow with a high level of human capital (education) leads to a reduction in infant mortality rate which indicates an improvement in welfare, hence a reduction in poverty, whereas FDI with a low level of human capital has no effect on poverty.

In the long run, the result shows that FDI and human capital are emerging as significant factors in poverty reduction in Nigeria. This result contradicts Magombeyi & Odhiambo (2017) in their study on South Africa, which found FDI to have a significant reducing effect on poverty when proxied by infant mortality, and insignificant impact when poverty is measured by household consumption and life expectancy. Our results also contradict the findings of Nguea et al (2020) who found an insignificant association between FDI and poverty when poverty is measured by infant mortality, life expectancy and household consumption in Cameroon. However, the two studies did not examine the effect of FDI on poverty in the presence of human capital but measured poverty using the MPI framework. This study is consistent with studies such as Borensztein et al. (1998), Li & Liu (2005), and Aminu & Bani (2017), that found human capital to be an important precondition channel through which FDI could affect poverty.

The results of other variables in the models show that when poverty is proxied by household consumption, inflation and infrastructure have an insignificant effect, while trade openness has a significant positive effect. The ECM coefficient (0.63442) validates the long-term relationship between the variables and indicates that the level of convergence of the model from short-term to long-term equilibrium is approximately 63 percent. This indicates that the speed of change is slow in the event of any shock. The recorded F-statistics values, adjusted R-square, and the Durbin-Watson statistic imply that the model is a good fit.

Furthermore, when poverty is measured by life expectancy rate, the results show that infrastructure and trade openness lead to a significant improvement in life expectancy, while inflation worsens it. The ECM coefficient (0.6946) validates the long-term relationship between the variables and indicates that the speed of adjustment of the model from short-term to long-term equilibrium is approximately 69%. This shows that the speed of change is strong in the event of any shock. The recorded F-statistics values, adjusted R-square, and the Durbin-Watson statistic imply that the model is a good fit.

Finally, when poverty is measured by infant mortality rate, the result shows that inflation, trade openness and infrastructure do not have any significant effect on poverty. The ECM coefficient (0.6471) establishes the long-term relationship between the variables and shows that the speed of convergence of the model from short-term to long-term equilibrium is approximately 65 percent. It indicates that the level of change of the model is strong in the event of some shock. The recorded F-statistics values, adjusted R-square, and the Durbin-Watson statistic imply that the model is a good fit.

4.6 Diagnostic test

The robustness of the three models was revealed by various diagnostic tests (table 5).

Table 5. Diagnostic Test Results

Tests	Model 1	Model 2	Model 3
Breusch-Godfrey	1.884	4.401	4.494
	[0.884]	[0.265]	[0.124]
Heteroskedasticity Test	[0.411]	[0.409]	[0.409]
Normality Test	1.386	0.4452	0.452
	[0.502]	[0.800]	[0.002]
Ramsey Test	1.301	0.93	0.62
	[0.322]	[0.476]	[0.705]
CUSUM	Stable	Stable	Stable
CUSUMQ	Stable	Stable	Stable

Source: Authors' computation.

The LM test for serial correlation confirmed that the three models have no serial correlation problem. The White test confirmed the absence of heteroskedasticity of the residual whereas the Jarque-Bera test showed that among the three models, models 1 and 2 followed a normal distribution, while model 3 did not follow a normal distribution. The Ramsey test showed no evidence of missing variables and functional form in the three models. The CUSUM and CUSUMQ tests revealed that the specified models were consistent, reliable and stable.

5.   Conclusion

This paper investigated the relationship between FDI and poverty given the role played by human capital in Nigeria during the period 1980-2018. To achieve this goal, the study employed the Autoregressive Distributed Lags (ARDL) bounds testing approach and measured poverty using the newly-introduced multidimensional poverty index (MPI). To capture poverty from the MPI framework, three proxies of poverty were explored: household consumption expenditure, infant mortality rate and life expectancy.

The results indicate that when poverty is measured by household consumption expenditure, the interaction of FDI and all school enrolments has a significant reducing effect on poverty. When poverty is measured by life expectancy, the interactive terms of primary and secondary school enrolments with FDI improve life expectancy, and hence reduce poverty; however, the interaction of FDI and tertiary school enrolment has no significant effect. Finally, when poverty is measured by infant mortality, the result is ambiguous. The effect of the interaction of primary school enrolment and FDI on infant mortality rate poverty is significantly positive, while the effect of interaction secondary school enrolment and that of tertiary school enrolment with FDI is not significant.

Our results indicate that human capital is important to the effect of FDI on poverty, and the effects of FDI on poverty are sensitive to the proxy of poverty used. In line with our results, human capital exerted important influence on FDI's effect on poverty. Therefore, to boost the quality of life in Nigeria, government should be interested in the quantity and efficiency of human capital, while striving to attract FDI.

Based on the above, the following guidelines are provided as a policy and decision-making guide: the Nigerian government should develop a policy structure that would provide an acceptable climate for FDI inflows and enable international companies to fund the economy. In turn, the government should improve the primary and secondary levels of education to ensure that secondary school leavers who are unable to gain admission to higher education institutions should have gained adequate intellectual and technical know-how to be able to participate in one type of economic activity or another.

References

Adefabi, R.A. (2011). Effects of FDI and human capital on economic growth in sub-Saharan Africa. *Pakistan Journal of Social Sciences*, 8(1), 32-38.

Agarwal, M. & Atri, P. (2015). Foreign direct investment and poverty reduction: India in a regional context. *Research and Information System for Developing Countries Discussion Paper*. RIS-DP # 200. New Delhi: RIS.

Akinlo, A.E. (2004). Foreign direct investment and growth in Nigeria: An empirical investigation. *Journal of Policy Modelling,* 26: 627–39.

Akinmulegun, S.O. (2012). Foreign direct investment and standard of living in Nigeria. *Journal of Applied Finance and Banking*, 2(3), 295-309.

Alkire, S., & Foster, J. (2011). Counting and multidimensional poverty measurement, *Journal of Public Economics*, 95(7-8), 476.

Alkire, S., & Santos, M. (2010). Acute mulitdimensional poverty: A new index for developing countries. OPHI Working Paper no. 38. Oxford, UK: Oxford Poverty and Human Development Initiative.

Alkire, S., Foster, J., Seth, S., Santos, M., Roche, J., & Ballon, P. (2014). *Multidimensional poverty measurement and analysis: Chapter 1 - Introduction*. Oxford, United Kingdom: Oxford Poverty and Human Development Initiative.

Almfraji, M.A., Almsafir, M.K. & Yao, L. (2014). Economic growth and foreign direct investment inflows: The case of Qatar. *Procedia–Social and Behavioral Sciences*, 109: 1040-1045.

Aminu, A.M., & Bani, N.Y (2017). FDI, human capital and economic growth: evidence from Nigeria.In: *Global Conference on Business and Economics Research (GCBER)*, 14-15; Aug. 2017, Universiti Putra Malaysia, Serdang, Selangor. (pp. 413-419).

Ayanwale, A. B. (2007). FDI and economic growth: Evidence from Nigeria*, Africa Economic Research Consortium Research Paper 165 Nairobi.*

Azam, M., Khan, S., Zainal, Z., Karuppiah, N. & Khan, F. (2015). Foreign direct investment and human capital: Evidence from developing countries. *Investment Management and Financial Innovations*, 12(3), 155-162.

Bengoa, M., & Sanchez-Robles, B. (2003). Foreign direct investment, economic freedom and growth: new evidence from Latin America. *European Journal of Political Economy*, 19(3), 529–545.

Blomström, M., & Kokko, A. (2003). The economics of foreign direct investment incentives. *NBER Working Paper, No. 9489*. Cambridge, MA: National Bureau of Economic Research.

Borensztein, E., De Gregorio. J., & Lee J. W. (1998). How does foreign direct investment affect growth?' *Journal of International Economics*,45, 115–135.

Calvo, C., & Hernandez, M. A. (2006). Foreign direct investment and poverty in Latin America. Paper presented at the Globalisation and Economic Policy Fifth Annual Postgraduate Conference, Nottingham, 21–22 April.

Campos, N.F. & Kinoshita, Y. (2002). Foreign direct investment as technology transferred: Some panel evidence from the transition economies. *William Davidson Institute Working Paper No. 438*. Ann Arbor, MI: William Davidson Institute.

Carkovic, M., & Levine, R. (2002). Does foreign direct investment accelerate economic growth? *University of Minnesota Discussion Paper*.

Dollar, D., & Kraay, A. (2000). Growth is good for the poor. *Development Research Group Papers*. Washington, DC: World Bank.

Dursun, G., & Ogunleye, B. (2016). Economic growth, employment and poverty reduction: The case of West African countries, *American Journal of Economics*, 6(1), 50–60.

Elmawazini, K., Atallah, G., Nwankwo, S., & Dissou, Y. (2013). US foreign affiliates, technology diffusion and host country human development: Human development index versus human capital. *Industry and Innovation*, 20(1), 6991.

Faloye, O., & Bakare, A. M. (2015). An empirical assessment of economic growth on poverty reduction in Nigeria, *American Journal of Economics* (2015), 5(6), 565-573.

Fowowe, B., & Shuaibu, MI. (2014). Is foreign direct investment good for the poor? New evidence from African Countries. *Eco Change Restruct*. 47, 321-339.

Gittens, D., & Pilgrim, S. (2013). Foreign direct investment and human capital: A dynamic paradox for developing countries. *Journal of Finance, Accounting, and Management*, 4(2): 26-49.

Gohou, G., & Soumaré, I. (2012). Does foreign direct investment reduce poverty in Africa and are there regional differences? *World Development*, 40(1), 75-95.

Hansen, H., & Rand, J. (2006). On the causal links between FDI and growth in developing countries. *The World Economy*, 29(1), 21-41.

Harris R., & Sollis, R. (2003). *Applied Time Series Modelling and Forecasting*. West Sussex: Wiley.

Huang, C., Teng, K., & Tsai, P. (2010). Inward and outward foreign direct investment and poverty reduction: East Asia versus Latin America. *Review of World Economics*, 146 (4), 763-779.

Hulme, D., & Shepherd, A. (2003). Conceptualizing chronic poverty, *World Development*, 31(3), 403.

Hymer, S.H. (1968). The large multinational corporation, in Casson, M. (ed.). *Multinational Corporations*. London: Edward Elgar, 6-31.

Jalilian, H. & Weiss, J. (2002*). Foreign direct investment and poverty in the ASEAN region, *ASEAN Economic Bulletin*, No. 19(3).

Klein, M., Aaron, C., & Hadjimichael, B. (2001). Foreign direct investment and poverty reduction. *World Bank Policy Research Working Paper* No. 2613. Washington, DC: World Bank.

Leeuwen, B., & Foldvari, P. (2008). Human capital and economic growth in Asia (1980-2000): A Time Series Analysis, *Asian Economics Journal*, 22, 225-240 doi: 10.1111/j.1467-8381.2008.00276. *Leverhulme Centre for Research on Globalisation and Economic Policy*, University of Nottingham.

Lehnert, K., Benmamoun, M., & Zhao, H.(2013). FDI inflow and human development: Analysis of FDI's impact in host countries' social welfare and infrastructure. Thunderbird: *International Business Review*, 55(3): 285-298.

Li, X., & Liu, X. (2005). Foreign direct investment and economic growth: An increasingly endogenous relationship. *World Development*, 33(3), 393-407.

Lucas, R.E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22: 3-42.

Magombeyi, M.T., & Odhiambo, N.M. (2017). Dynamic impact of FDI inflows on poverty reduction: Empirical evidence from South Africa, *UNISA Economic Research Working Paper*, No. 3/2017.

Meyer, K.E., & Sinani, E. (2009). When and where does foreign direct investment generate positive spillovers? A meta-analysis. *Journal of International Business Studies*, 40(7): 1075-1094.

Morrell, D. (2011). Who is poor? *Harvard Magazine*, 2011 (Jan-Feb). 9 10. Retrieved on April 1, 2017, from: http://harvardmag.com/pdf/2011/01-pdfs/0111-9.pdf.

NBS (2016). Nigeria poverty report 2016'. Available at: http://www.nigerianstat.gov. ng/pdfuploads/Nigeria%20Poverty%20Profile%202016.pdf (accessed on 20 October 2017).

Ndeffo, L.N. (2010). Foreign direct investment and human capital development in Sub-Saharan Africa. *Economics and Applied Informatics*, 16(2), 37-50.

Nguea, S. M., Noumba, I., & Noula, A. G. (2020). Does Foreign Direct Investment contribute to poverty reduction in Cameroon? An ARDL-Bounds Testing Approach. https://halshs.archives-ouvertes.fr/halshs-02570072.

Noorbaksh, F., Paloni, A., & Youssef, A. (2001). Human capital and FDI inflows to developing countries: New empirical evidence. *World Development*, 29, 1593-1610. Retrieved from

http://econpapers.repec.org/article/eeewdevel/default29.htm

Nunnenkamp, P. (2002). Shooting the messenger of good news: A critical look at the World Bank's success story of effective aid. *Kiel Working Papers*, 1103, Institute for World Economics, Kiel.

Odhiambo, N.M. (2009). Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. *Energy Policy* 37, 617-622.

Olagunju, K,O., Ogunniyi, A, I., Oguntegbe, K, F., Raji, I, O., & Ogundari, K. (2019) Welfare Impact of Globalization in Developing Countries: Examining the Mediating Role of Human Capital, *Economies*, 7, 84; doi: 10.3390/economies7030084.

Pesaran, M.H., Shin, Y., & Smith, R. (2001). Bounds testing approaches to the analysis of level relationship. *Journal of Applied Econometrics*, 16(3), 174-189.

Posu, S.M.A., Soile, O.I., Sangosanya, A. and Amaghionyeodiwe, A.L. (2010). Foreign direct investment and Nigeria's economic growth: a sectoral analysis. *Philippine Review of Economics*, 44(2), 173-196.

Ravallion, M. (1996). Issues in measuring and modeling poverty. *World Bank Policy Research Working Paper*, No. 1615. Washington, DC: World Bank.

Romer, P. (1990). Endogenous technological changes. *Journal of Political Economy*. 98(5): S71-S102.

Romer, P.M. (1986). Increasing returns and long-run growth. *Journal of Political Economy*, 94(5): 1002-1037.

Santosa, W. (2014). Analysis of the impact of foreign direct investment on social development in Indonesia and other ASEAN countries. Paper presented at the 2nd IBEA International Conference on Business, Economics and Accounting, Hong Kong, 26–28 March.

Shamim, A., Azeem, P., & Naqvi, M.A. (2014). Impact of foreign direct investment on poverty reduction in Pakistan. *International Journal of Academic Research in Business and Social Sciences*, 4(10), 465-490.

Shima'a, H. (2015). Sectoral FDI and economic growth: Evidence from Egyptian governorates, *Joint Discussion Paper Series in Economics*, No. 37-2015, Philipps-University Marburg, School of Business and Economics, Marburg.

Solarin, S, A., & Shahbaz, M. (2013). Trivariate causality between economic growth, urbanization and electricity consumption in Angola: Cointegration and causality analysis, *Energy Policy*, 60, 876–884. doi:10.1016/j.enpol.2013.05.058.

Stiglitz, J.E. (2002). *Globalization and its discontents*. London: Allen Lane.

Stoyanova, S., & Tonkin. R. (2018). An expenditure-based approach to poverty in the UK. Paper prepared for the *35th IARIW General Conference.*

Subbarao, P.S. (2008). FDI and human capital development. *Working paper No. 2008- 02-01*. Ahmedabad: Indian Institute of Management.

Te Velde, D.W., & Morrissey, O. (2004). Foreign direct investment, skills and wage inequality in East Asia. *Journal of the Asia Pacific Economy*, 9(3), 348-369.

Vu, T. B., Gangnes, B., & Noy, I. (2008). Is foreign direct investment good for growth? Evidence from sectoral analysis of China and Vietnam. *Journal of the Asia Pacific Economy*, 13(4), 542–562.

Zaman, K., Khan, MM., & Ahmad, M. (2012). The relationship between foreign direct investment and pro-poor growth policies in Pakistan: The new interface. *Economic Modelling,* 29, 1220-1227.

Zhang, K., & Markusen, J. (1999). Vertical Multinationals and Host-Country Characteristics, *Journal of Development Economics*, 59, 233-252. Retrieved from http://www.elsevier.com/wps/find/journaldescription.cws_home.

Appendix 1

Panel A: Long-run Estimation Result of Effect of Interaction of FDI and Human Capital on Poverty

Regressor	Pov 1: Household Consumption			Pov 2: Life Expectancy Rate			Pov 3: Infant Mortality Rate		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Constant	0.5253	0.5253	0.5253	-0.3675	-0.3675	-0.3675	0.3894	0.3891	0.3850
	[0.8678]	[0.8700]	[0.8572]	[0.8690]	[0.8690]	[0.8690]	[0.6411]	[0.6414]	[0.6469]
FDI*PRY	0.0147			0.0046			0.0110		
	[0.0105***]			[0.6480*]			[0.3823**]		
FDI*SEC		0.1059			0.0048			-0.0206	
		[0.0130]			[0.6430***]			[0.8305]	
FDI*TERT			0.1059			-0.0053			0.0007
			[0.0112***]			[0.0670]			[0.8232]
CPI	-0.00693	-0.0079	-0.0079	-0.0021	-0.0021	-0.0023	-0.0108	-0.0109	-0.0108
	[0.8275]	[0.8285]	[0.8256]	[0.8923]	[0.8924]	[0.8847]	[0.4859]	[0.4829]	[0.4843]
INFRA	0.1918	0.2151	0.2151	0.1569	0.1568	0.1579	0.0761	0.0759	0.0764
	[0.0247**]	[0.0153**]	[0.0156**]	[0.0001***]	[0.0001***]	[0.0001***]	[0.2762]	[0.2767]	[0.2787]
TOP	0.3443	0.3443	-0.3443	0.1527	0.1528	0.1535	0.0561	0.0560	0.0564
	[0.0057***]	[0.0069***]	[0.0053***]	[0.006***]	[0.006***]	[0.006***]	[0.2026]	[0.2033]	[0.2055]

Panel B: Short-run Estimation Result of Interaction of FDI and Human Capital on Poverty

	Pov 1: Household Consumption				Pov 2: Life Expectancy Rate				Pov 3: Infant Mortality Rate		
Regressor	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
D(FDI*PRY)	0.0093			D(FDI*Pry]	-0.0047			D(FDI*Pry)	0.0005		
	[0.0001***]				[0.8191]				[0.0637**]		
D(FDI*SEC)		0.0671		D(FDI*Sec)		-0.0047		D(FDI*Sec)		0.0005	
		[0.0001***]				[0.826]				[0.0633**]	
D(FDI*TERT)			0.0671	D(FDI*Tert)			-0.0055	D(FDI*Tert)			0.0005
			[0.0001***]				[0.8181]				[0.0666**]
D(CPI)	-0.2183	-0.005	-0.005	D(CPI)	-0.0086	-0.00863	-0.00857	D(CPI)	0.0018	0.0018	0.0019
	[0.8307]	[0.8302]	[0.8274]		[0.463]	[0.4599]	[0.462]		[0.1462]	[0.1458]	[0.1425]
D(INFRA -1)	0.00503	-0.1314	-0.1314	D(INFRA)	0.006	0.006	0.0061	D(INFRA)	-0.0156	-0.0156	-0.0158
	[0.2354]	[0.2323]	[0.2265]		[0.0968*]	[0.0973*]	[0.0978*]		[0.0003***]	[0.0003***]	[0.0003***]
D(TOP)	0.0671	-0.2184	-0.2184	D(TOP)	0.0001	0.0001	0.0001	D(TOP)	0.0019	0.0019	0.0018
	[0.0037***]	[0.0037***]	[0.0037***]		[0.9711]	[0.9722]	[0.968]		[0.0011***]	[0.6035]	[0.6278]
CointEq (-1)	-0.6342	-0.6342	-0.6342	CointEq (-1)	-0.6946	-0.6946	-0.6946	D(TOP(-1))	0.0121	0.0121	0.0121
	[0.0104**]	[0.0104***]	[0.0104***]		[0.062**]	[0.062**]	[0.063**]		[0.0011***]	[0.0011***]	[0.0011***]
								CointEq (-1)	-0.6471	-0.6471	-0.6471
									[0.0005***]	[0.0005***]	[0.0005***]
R-squared	0.576	0.576	0.591		0.6112	0.6772	0.609		0.6523	0.7621	0.6571
Adjusted R-squared	0.4455	0.445	0.465		0.471	0.5011	0.4691		0.498	0.505	0.519
F-Stat	4,414 [0.002]	4,410 [0.002]	4,68 [0.0017]		4.362 [0.002]	3.846 [0.0018]	4.338 [0.0021]		5.97	6.095	6.387
DW Statistics	2.5	2.49	2.49		2.5	2.49	2.49		2.466	2.463	2.49
Obs	37	37	37		37	37	37		37	37	37