Be Nice to thy Neighbours: Spatial impact of Foreign Direct Investment on Poverty in Africa

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ABSTRACT

This study examines the spatial impact of FDI on the poverty of 44 African countries. In achieving this, the study uses the Driscoll-Kraay fixed effect instrumental variable regression, instrumental variable generalised method of moments estimator (IV-GMM), and the spatial durbin model. The empirical investigation of this study yielded four significant findings: (1) neighbouring countries' FDI has a positive and significant impact on the incidence and intensity of host country's poverty. (2) Improved institutional quality in neighbouring countries has a significant impact on FDI-poverty reduction nexus of the host country. (3) the empirical results lend support for a significant spatial spillover of poverty in the region. (4) the marginal effect results indicate that countries within the region are no longer in isolation or independent, i.e., the level of poverty in a particular country is influenced by its determinants in the neighbouring country. This result is robust to the alternative proximity matrix, which is the inverse distance. Since there is spatial interdependence among African countries, we recommend that African governments through the African Union (AU) should not only champion the institutional reform in the region, but also establish a binding mechanism to ensure reform implementation.

Keywords: FDI, Driscoll-Kraay fixed effect instrumental variable regression, IV-GMM, Spatial Durbin Model, Poverty, Institutional quality, Africa

1.0 Introduction

The United Nations' Sustainable Development Goals (SDGs) outlines seventeen goal that developing nations must meet by 2030. The achievement of these goals will aid in reducing income inequality, poverty alleviation, and the advancement of human development. However, progress made towards these goals is uneven, with some countries meeting the majority of them while others failing to fulfil any of them. Similarly, most African countries are off-track in meeting these targets

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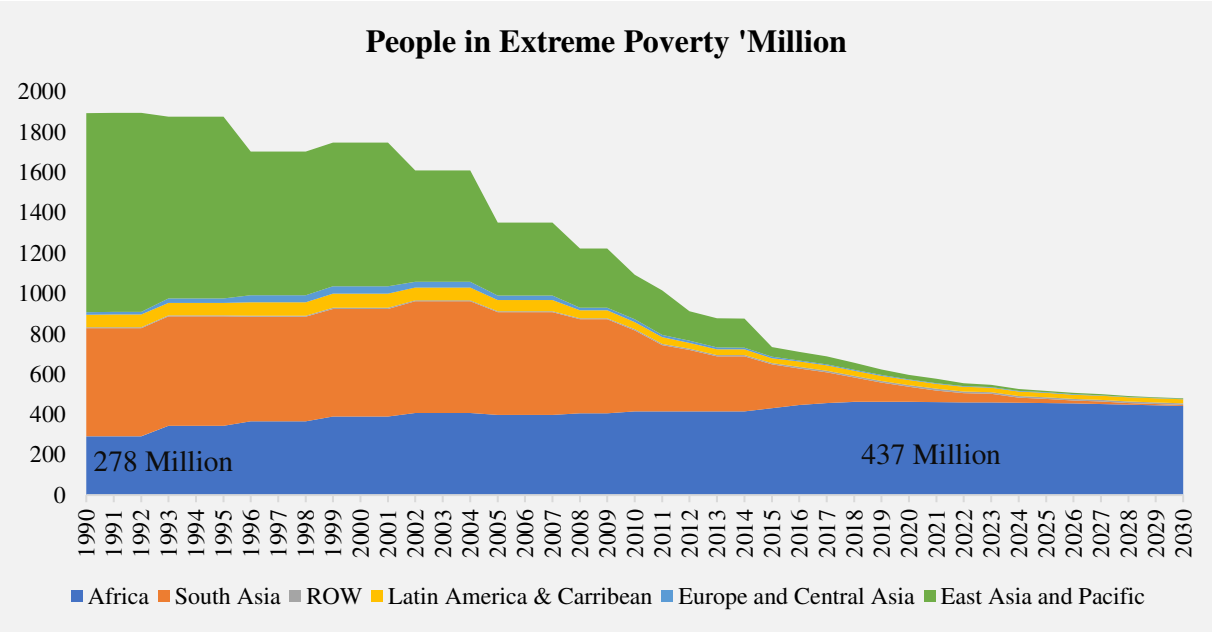
and require a significant amount of foreign capital to achieve these goals (SDG, 2019). The theoretical framework of Chenery and Stout (1966) provide the theoretical foundation on the importance of external capital flows for low-income countries. In an economy characterized by savings or foreign exchange gaps, the model claims that external finance can play a crucial role in boosting domestic resources. In achieving these SGDs goals, the importance of foreign direct investment (FDI) cannot be underestimated. This is because of its potential in transferring knowledge and technology, enhancing competition, boosting entrepreneurship and productivity, and increasing government revenue through taxes paid by foreign investors (United Nations, 2003). Many developing economies, particularly in Africa, have adopted FDI promotion policies as a result of the importance of FDI as a major source of external finance. In 2017, at least 126 investment policy actions and reforms were undertaken by about 65 economies around the world. These reforms include simplifying administrative investment procedures, liberalization of domestic markets, and establishing new special economic zones (SEZs) (for a complete description of these measures, see the 2018 World Investment Report).

Figure 1: Poverty in Sub-Saharan Africa



Source: World Bank, 2019.

This has resulted to a massive increase in FDI flow to Africa, which has increased from $59.99 billion in 1990 to $942.05 billion in 2019. (UNCTAD, 2020) Nonetheless, despite a significant rise in FDI inflows, poverty in the region continues to worsen. Figure 1 shows that the number of

people living in extreme poverty increased from 278 million in 1990 to 437 million in 2018. (World Bank 2019). According to the World Bank, extreme poverty will become a largely African problem in the following decade, with the region accounting for the lion's share of the world's impoverished by 2030. While extreme poverty is prevalent in the region, nearly half of Africa's poor people live in just five countries: Nigeria (79 million), the Democratic Republic of Congo (60 million), Tanzania (28 million), Ethiopia (26 million), and Madagascar (26 million) (20 million). These statistics even become more worrisome when compared to the level of extreme poverty in other regions (Schoch & Lakner, 2020).

The literature is replete with unremitting debate regarding the impact of FDI on poverty alleviation. While studies such as Lazrag and Zouari (2018), Soumare (2015), Bharadwaj (2014), and Fowowe and Shuaibu (2014) attest to the beneficial impact of FDI on poverty alleviation. However, some studies argue that FDI increases poverty. Their argument is that foreign investors crowd-out domestic capital and repatriate their profit to their home country (see Arabyat 2017; Rye 2016; Gohou & Soumare 2012). Recent literature has begun to examine the conditional impact of FDI on welfare measures. The level of institutional framework has been argued to be one of the most important domestic factors that will condition the impact of FDI. For example, the empirical studies by Arogundade et al. (2021), Lehnert et al. (2013) and Pérez (2015) argue that institutional quality are crucial in enhancing the beneficial impact of FDI. Other studies like Yebuoa (2020), Jude and Levieuge (2017), and Agbloyor et al. (2016) argue that a specific optimal institutional development is a precondition of the growth-enhancing effect of FDI. The reason why there are conflicting results on the impact of FDI on poverty is that majority of these neglect the importance of space in their model. Ignoring the importance of spatial interdependence in regional empirical studies may result in either inefficient or biased estimates (Anselin, 2009).

While the application of spatial econometric to FDI literature is still at the embryonic stage, a couple of empirical studies have taken into account the role of third-country effect: Gutiérrez-Portilla et al. (2019) for Spain; Do et al. (2021) for Vietnam; Madariaga and Poncet (2007) for China; Uttama (2015) for Southeast Asia. These studies conclude that FDI in neighbouring countries significantly influences the host country's economy. To the best of this author's knowledge, this study is not aware of any literature that has specifically examined the spatial impact of FDI on poverty in Africa. The closest attempt is that of Chih et al. (2021). However, this

study failed to account for the role of neighbouring countries' institutional quality on the nexus between FDI and the economy. The study also assumes that what is good for economic growth is also good for the poor. Since economic growth does not imply a reduction in poverty, it is essential we examine: (1) whether neighbouring countries' FDI matters on poverty reduction of the host country, (2) examine the spatial impact of institutional quality FDI-poverty nexus in Africa, and (3) determine whether there is a spatial spillover of poverty in Africa.

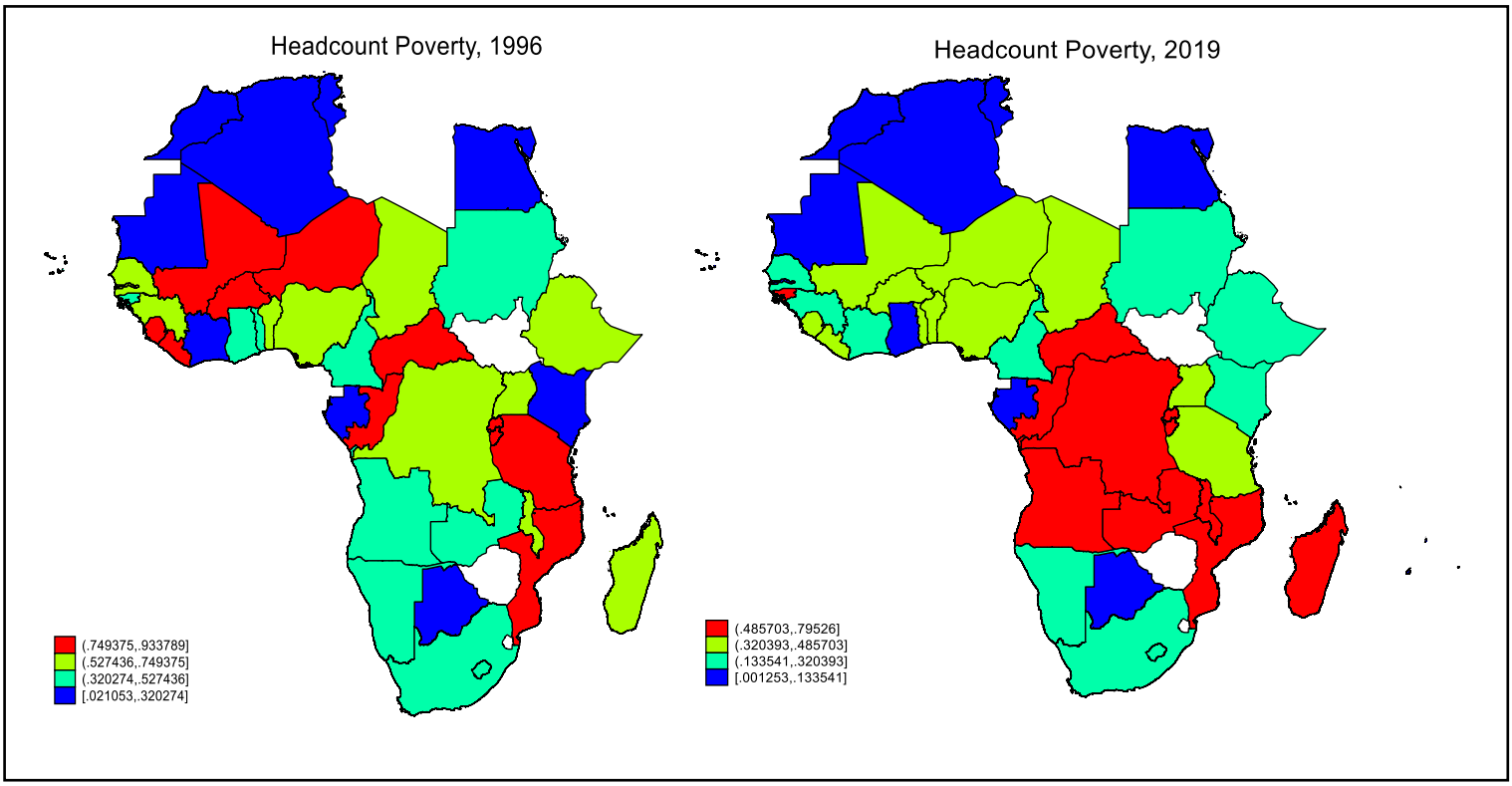
Doing this study for Africa is vital for the following reasons: (i) the region is challenged with poor welfare, and often termed world capital of poverty, (ii) The positive spillover of FDI in the region may be hampered by a poor institutional environment. As a result, attracting multinational corporations to invest in these conditions may not produce the desired benefits, as investment flourishes in a competitive atmosphere, and (iii) since countries in this region belong to a regional organization designed to encourage mutual economic development among member countries, the level of economic activity in one member state may influence economic activity of another country.

This study examines the spatial impact of FDI on poverty in Africa. The empirical findings from the spatial durbin model indicate a significant spatial spillover of FDI on the incidence and intensity of poverty in Africa. The results further provide support for the significant role of institutional quality on the nexus between FDI and poverty reduction. Furthermore, the marginal effect results suggest that countries in Africa are not in isolation, i.e., the level of poverty in a particular country is influenced by its determinants in the neighbouring country. This call for a coordinated policy towards eradicating poverty and establishing institutional reform. The rest of this paper is structured as follows: Section 2.0 provides stylized facts on FDI and the spatial pattern of poverty in Africa. Section 3 houses the methodology and estimation techniques. The presentation and discussion of the empirical results is discussed in section 4, while section 5 concludes and provides critical policy implications.

2.0 African Poverty in Space

This section provides key stylized fact that motivates this study. Figure 2 presents the contour map of headcount poverty across the 47 selected African countries. The map displays spatial clustering of poverty in 1996 and 2019. As shown in the map, there is evidence of higher clustering of poverty in 2019 compared to 1996.

Figure 2: Spatial Pattern of Poverty in Africa



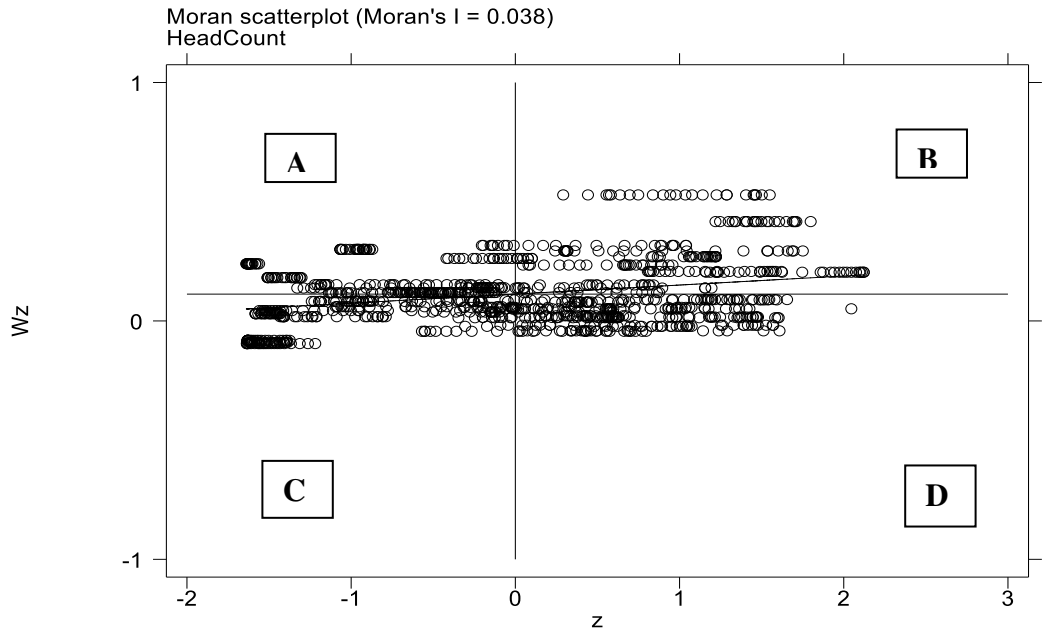
Source: Author's calculation using data from the World Bank database

The plots also show that countries such as the Democratic Republic of Congo, Central Africa Republic, Congo Republic, Angola, Zambia, Malawi, Mozambique, Rwanda, Burundi, and Madagascar are epicentres of poverty incidence in Africa in 2019. While countries such as Botswana, Gabon, Ghana, Mauritania, Algeria, Morocco, Tunisia, and Egypt have low poverty rate. In determining whether the incidence of poverty in one country influences the poverty incidence of other proximate countries, this study conducts the local and global spatial autocorrelation tests. The former test, which is based on a specific Moran's I statistic, identifies local "hot spots," or in other words, the countries where strong spatial correlations exist. The latter

test is based on the Moran's (1950) I spatial autocorrelation statistic; this test determines whether poverty incidence globally observed depends on geographical distribution.

The null hypotheses of these tests suggest that poverty incidence in different countries is considered to be spatially independent. The p-value of the global autocorrelation test is significant, indicating the existence of spatial dependence (see Appendix 1). Similarly, the Local Indicators of Spatial Association (LISA) test identifies countries with strong spatial correlations in poverty incidence (see Appendix 1 for more). In addition to this, figure 3 presents the univariate Global Moran's I statistic calculated from headcount poverty over the period of 1996-2019 for each country.

Figure 3: Global Moran's I spatial autocorrelation statistic



Source: Author's computation using data from the World Bank database

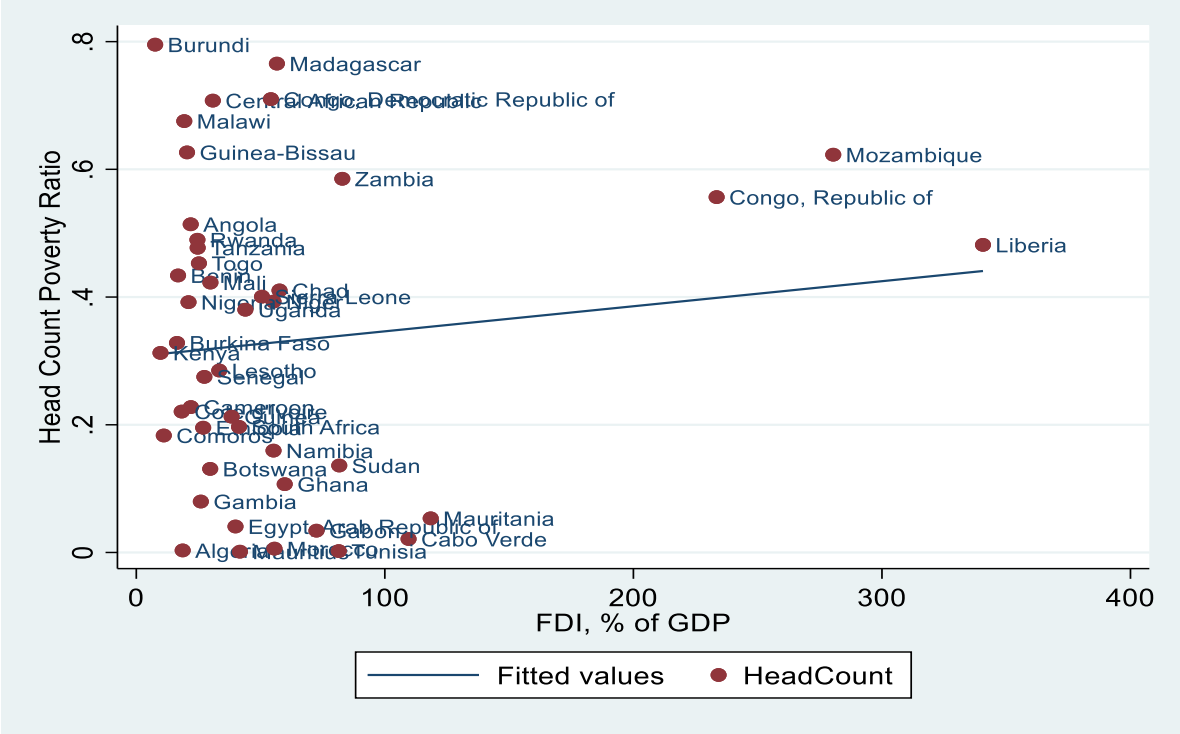
The Moran's I correlation test, which indicates the degree of spatial autocorrelation suggests a positive spatial clustering of poverty incidence[2]. Thus, we can conclude that there is spatial

[2] Quadrant A in figure 3 are countries with negative spatial clustering of low poverty incidence, while B indicates countries with positive spatial clustering of high poverty incidence, C indicates positive spatial cluster of countries with low poverty incidence, D is negative spatial cluster of high poverty incidence.

dependence of poverty incidence across African countries from 1996 to 2019. This evidence provide impetus for the inclusion of space in this study.

Figure 4 shows a scatter plot of FDI and the incidence of poverty in Africa. The plot reveals that countries with relatively high FDI inflows are characterized with high incidence of poverty. However, countries with low FDI inflows are associated with low poverty rate. This indicates that the level of a countries' foreign investment is positively correlated with the poverty rate. This is also consistent with the argument of Rye (2016) and Arabyat (2017) who argue that foreign investment increases poverty due to their crowd-out effect on domestic capital. This conjecture perhaps is meaningless, and hence, lack objectivity if not subjected to empirical verification.

Figure 4: Scatter plot of FDI and Poverty in Africa



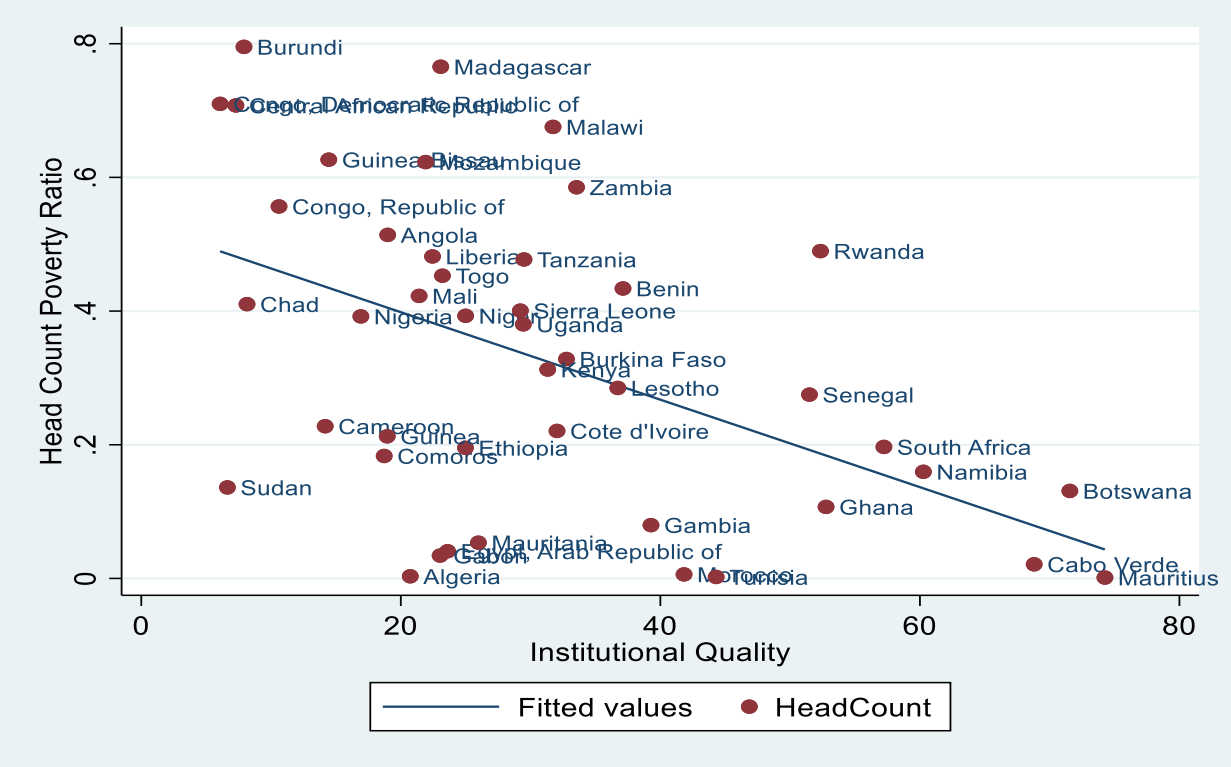
Source: Author's computation from World Bank PovcalNet and UNCTAD database.

The scatter plot of the institution quality[3] and poverty rate[4] is presented in figure 5. The figure reveals that countries with relatively high poverty incidence are characterised by poor institutional framework. However, countries with a robust institutional framework have relatively low poverty rate. Countries with sound institutions, such as efficient and good governance, low corruption, rule

[3] measured by the average of the six dimensions of institutional quality in 2019
[4] measured by head count poverty as a percentage of population in 2019

of law, and property rights, tend to improve the process of technology spillovers to local enterprises. Countries with weak institutions, on the other hand, may prevent indigenous enterprises from benefiting from multinational corporation (MNC) knowledge and technology spillovers (Agbloyor et al., 2016; Brahim & Rachidi 2014). Hence, the impact of FDI on poverty reduction is expected to vary between countries and regions with varying level of institutional quality.

Figure 5: Scatter plot of Institutional Quality and Poverty in Africa



Source: Author's computation based on World Governance Indicator and World Bank Povcal database (2019).

3.0 Data and Methodology

3.1 Data

This study employs a panel dataset of 44 African countries, with annual data over the period of 1996-2019. The choice of period and countries (see appendix 1) were dictated on the availability of data. In this study's analysis, we follow Gnangnon (2020), Agarwal et al. (2017), and Perera and Lee (2013) by using headcount ratio, which is a measure of the incidence of poverty and poverty gap index, which measures the intensity of poverty. Both headcount and poverty gap indexes are measured using the international poverty line of $1.90 per day. This study follows

Arogundade et al. (2021) and Nunnenkamp (2004) by measuring FDI as FDI inward stock as a percentage of GDP. The problem of endogeneity biases linked with the FDI-welfare nexus is also mitigated by using FDI stock (Nunnenkamp, 2004). We used the International Monetary Fund's newly constructed aggregate financial development index to measure financial development. Other metrics such as credit to the private sector, stock market capitalization, and monetary aggregates have flaws in that they do not capture the financial system's multidimensionality, which is why this index was created. See Arogundade et al. (2021) for similar approach. Institutional quality is measured using the average of the six indicators (voice and accountability, the rule of law, regulatory quality, control of corruption, government effectiveness, and political stability. These indexes range from 0 (weak) to 100 (strong). See Peres et al. (2018), Utesch-Xiong and Kambhampati (2021), and Ajide and Raheem (2016) for a similar approach. In measuring infrastructure, we used mobile telephone subscribers (per 100 people). We use the growth rate of GDP per capita as a proxy for economic growth and the total active labor force as a proxy for labor, as Kaulihowa (2017) suggests.

3.1.1 Descriptive statistics of the variables

Table 1 shows the descriptive statistics of the variables used in this study. From 1996 to 2019, and among the 44 countries, the average values for poverty headcount and poverty gap were 41.6 percent and 17.4 percent for poverty headcount and poverty gap, respectively. Ghana has the minimum level of headcount and poverty gap rate, with 0.13% and 0.015% respectively of her population. However, the Congo Democratic Republic has the highest headcount and poverty gap at 95.3 and 66.5% respectively. For FDI inward stock, the average is 39.23%, with a minimum of 0.224 and a maximum of 1,039%. Institutional quality ranged from 77.40 to 1.182, with an average of 31.87. Congo Democratic republic has the least institutional score, while Mauritius has the highest. The pairwise correlation measures the relative association among the dependent variables and regressors. The results indicate that except for labour (L), all the variables have statistically significant relationships with the poverty rate. However, the signs vary. A cursory look at Table 2 also indicates that all correlation statistics are below 0.80. Hence, no evidence of multicollinearity among the covariates.

Table 1: Summary Statistics

Variables	N	Mean	Min	Max	Data Sources
Headcount Ratio (% of Pop.)	1,056	0.416	0.00125	0.953	W/B, Povcalnet
Poverty Gap (% of Pop.)	1,056	0.174	0.000151	0.665	W/B, Povcalnet
FDI Inward Stock (% of GDP)	1,056	39.23	0.224	1,039	UNCTAD
Financial Development Index	1,056	0.141	0.0173	0.646	IMF
Economic Growth	1,056	1.847	-36.56	28.68	W/B, WDI
Infrastructure	1,056	40.54	0	165.6	W/B, WDI
Institutional Quality	1,056	31.87	1.182	77.40	WGI
Labour Force '000	1,056	8041880	113492	6.32e+07	W/B, WDI

NB: United Nations Conference on Trade and Development (UNCTAD), World Bank World Development Indicator (W/B, WDI), International Monetary fund (IMF) database, and World Governance Indicator (WGI).

Table 2: Pairwise Correlation

	HC	PG	FDI	FD	GDPC	L	Inst	Infra
HC	1							
PG	0.958***	1						
FDI	0.0694*	0.0581	1					
FD	-0.473***	-0.421***	0.0591	1				
GDPC	-0.669***	-0.574***	-0.0506	0.667***	1			
L	0.0338	0.0177	-0.0896**	0.163***	-0.0412	1		
Inst	-0.395***	-0.380***	-0.119***	0.609***	0.501***	-0.196***	1	
Infra	-0.509***	-0.479***	0.0441	0.432***	0.478***	0.0366	0.249***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. HC= Headcount poverty, PG= Poverty gap, FDI= foreign direxT investment, FD=financial development, GDPC=Gross domestic product per capita, L= labour force, Inst=institutional quality, Infra=infrastructure.

3.2 Methodology

This study follows other spatial studies like Uttama (2015), Do et al. (2021), and Chih et al. (2021) by initially using simple regression model as the benchmark model. The Driscoll and Kraay (1998) robust standard errors-type approach, which accounts for heteroskedasticity, autocorrelation, and cross-sectional dependence is used in this study. This is nested into the fixed effect instrumental variable regression model (FE-2SLS). The choice of the instrument (Lagged FDI) used in this study is based on the instrument relevance and exogeneity conditions. The empirical form of the model without spatial interaction is given as follows:

$$FDI_{i,t} = \emptyset + X^*_{i,t}\gamma + \tau_t + \varphi_i + v_{i,t} \quad (1.0)$$

$$Pov_{i,t} = \beta_0 + \beta_1 FDI_{i,t} + \beta_2 FDI_{i,t} \times inst_{i,t} + \beta_3 X_{i,t} + \varphi_i + \mu_{i,t} \quad (1.1)$$

Where $Pov_{i,t}$ is poverty rate in country i at period t. $FDI_{i,t}$ is FDI inward stock as a percentage of GDP in country i at period t. $X_{i,t}$ is the vector control variables which includes GDP growth, labour, institutional quality, financial development, and infrastructure. φ_i is country-specific effect that is time-invariant, and $\mu_{i,t}$ is the error term. Equation (1.0) is the first stage of the FE-2SLS model, while equation (1.1) is the second stage. This study uses the probability value of the F-test in equation (1.0) as instrument relevance test. $FDI_{i,t} * inst_{i,t}$ in equation (1.1) is the interaction term of FDI with institutional quality. We included both FDI and institutional quality in equation (1.1) to ensure that the interaction term does not proxy for either FDI or the $inst$. If $\beta_1 > 0$ and $\beta_2 < 0$, it infers that FDI reduce poverty at high level of institutional quality. For robustness of our empirical estimate, we used the instrumental variables techniques nested within the generalised method of moments (IV-GMM) framework by Baum et al. (2007b, 2007a).

Since the estimate of equation (1.1) is inconsistent and biased due to the possibility of spatial interdependence that exists in the independent(s) or dependent variable (Anselin, 2009), we augment equation (1.1) with spatial characteristics as shown in equation (5a) – (5b). Spatial interdependence can be introduced into a simple regression model in three ways: as an additional covariate referred to as spatial autoregressive (SAR) ($W_{ij}Pov_{j,t}$) or spatial durbin model (SDM) ($W_{ij}FDI_{j,t}; W_{ij}FDI * inst_{j,t}$) or through the error structure known as the spatial error model (SEM) ($E[\varepsilon_i \varepsilon_j] \neq 0$). The Wald and likelihood ratio test is used to determine the choice of the spatial autoregressive models, since the models are estimated using maximum likelihood (Anselin 1988; Anselin & Bera 1998). We follow LeSage and Pace (2009) by using two different hypotheses. The first is $H_0: \theta = 0$. This hypothesis examines whether equation (5a) – (5b) can be reduced to a SAR model. The second hypothesis is $H_0: \theta + \rho\beta_2 = 0$, which suggests whether equation (5a) – (5b) can be reduced to a SEM model. We further use the likelihood ratio (LR), which was initially proposed by Burridge (1980) to determine between the SAR and SDM model. According to Hao et al. (2020), if both the Wald and LR test are rejected, this suggest that the best model for the data is SDM.

$$Pov_{i,t} = \beta_0 + \beta_1 X_{i,t} + \rho \sum_{j=i}^{N} W_{ij} Pov_{j,t} + \theta \sum_{j=i}^{N} W_{ij} FDI_{j,t} + ב \sum_{j=i}^{N} W_{ij} FDI_{i,t} \times inst_{j,t} + \gamma_t + \lambda \sum_{j=i}^{N} \mu_{i,t} + \varepsilon_{i,t} \quad (5a)$$

Where $\mu_{it} = \lambda \sum_{j=i}^{N} \mu_{i,t} + \varepsilon_{i,t}$ (5b)

Where W_{ij} is a non-negative 44×44 matrix describing the spatial arrangement or configuration of the units in the sample. Parameter ρ in equation (5a) measured the impact of the neighbouring countries' poverty on host country poverty. θ is the elasticity of neighbouring countries FDI on the host country poverty. ב is the mediating impact of neighbouring countries' institutional quality on FDI-poverty nexus. λ is spatial error parameter, and $\sum_{j=i}^{N} \mu_{i,t}$ interaction effects among the disturbance term of the different spatial units, ε is a stochastic disturbance with $\varepsilon \sim N(0, \sigma^2 I)$. According to Anselin and LeGallo (2006), one of the major problems of fixed effect spatial lag model is the possibility of endogeneity of the spatial lag ($W_{ij} Pov_{j,t}$) which violates the assumption of standard regression models $E\left[\left(W_{ij} Pov_{j,t}\right)\mu_{i,t}\right] = 0$. In addressing this simultaneity bias, this study uses the maximum likelihood estimation[5].

3.2.1 Direct, Indirect and Total Effects

Interpretation of models containing spatial lags of the dependents or explanatory variables becomes more complicated and richer. However, several research have claimed that models with spatial lag in the dependent variable necessitate a different interpretation of the parameters. These studies further posit that utilizing point estimation methods to analyse spatial spillover effects might lead to incorrect findings, and that partial differential approaches can explain the impacts of variable changes in the model. (LeSage & Pace, 2010; Anselin & LeGallo, 2006; Kelejian et al., 2006). The specification of the spatial spillover effect is specified thus as:

$$Y = (1 - \rho W)^{-1} + (1 - \rho W)^{-1} (X\beta + WX\theta ב) + (1 - \rho W)^{-1} \varepsilon \quad (6)$$

The direct effect should be quantified using the arithmetic mean of the elements on the matrix's main diagonal, while the indirect effect should be measured using the mean value of the elements on the non-diagonal line (LeSage & Pace, 2010).

[5] See Elhorst (2014) for more on the mathematical derivation

3.2.2 Spatial Weight Matrix

The spatial weight matrix (W) signifies the strength of the interaction or similarity between spatial units, i.e., country i and j. This study specifies two proximity weight matrices for the spatial model. This includes contiguity and inverse distance. In creating the spatial weight matrix W, we follow other spatial studies by normalizing the matrix such that each row sums to unity. The weighting matrix (W) for contiguity is defined as:

$$W_{ij} = \begin{cases} 1 \; if \; i \; and \; j \; share \; land \; and \; or \; maritime \; boundaries \\ 0 \; otherwise \end{cases} \tag{7}$$

This study employs the inverse-distance spatial weighting matrix as an alternative measure of spatial weight matrix. The inverse distance is made up of weights that are inversely proportional to the unit distances. This is specified thus as:

$$W_y(d_{ij}) = \frac{1}{(d_{ij})} \;\; \forall \; i \neq j \tag{8}$$

$W_y(d_{ij})$ explains the functional form of the weights between any two host nations i and j. The spatial weighting matrix (W) for the inverse distance is a block diagonal, with each block representing a single year of observation. For any year, $y \epsilon \; [1996, 2000 \ldots]$, W_y is defined as:

$$W_{FDI} = \begin{bmatrix} 0 & W_y(d_{ij}) & W_y(d_{ik}) \\ W_y(d_{ji}) & 0 & W_y(d_{jk}) \\ W_y(d_{ki}) & W_y(d_{kj}) & 0 \end{bmatrix} \tag{9}$$

d_{ij} is the distance between host i and j. The diagonal elements of W_y are set to zero since no spatial unit can be its own neighbour. This approach allows all countries to affect each other.

3.2.3 Spatial autocorrelation test

The main variable should be investigated to discover the spatial dependence before using the spatial econometric model. Moran's I is a technique for determining whether a variable is spatially dependent. The following is the formula:

$$\text{Moran's I} \; = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \tag{10}$$

The Moran's I value ranges between −1 and 1; a negative Moran's I denotes a negative correlation, while a positive value indicates a positive spatial correlation.

4.0 Empirical Results and Discussion

4.1 Baseline Results

The baseline results on the direct impact of FDI on poverty in Africa is presented in Table 3. The coefficient of financial development indicates that financial development has a positive and significant impact on the incidence and intensity of poverty. This finding aligns with Rewilak (2017)'s empirical outcome, which argues that financial development increases the incidence of poverty. However, the result of the IV-GMM suggests that financial development has a negative and statistical impact on the incidence and intensity of poverty. This aligns with the findings of Donou-Adonsou and Sylwester (2016) and Jalilian and Kirkpatrick (2002), who argue that an economy characterised by a developed financial system can mobilise savings for investment, and as such, reduce poverty. The significance and positive sign of infrastructure across models indicate that infrastructure availability is vital to Africa's poverty reduction. Studies such as Seetanah et al. (2009) and Anyanwu and Erhijakpor (2009) reached a similar conclusion.

Furthermore, the impact of labour on poverty is mixed, while the negative and significant coefficient in the FE-2SLS model is in tandem with Colen et al. (2008)'s argument that a rising active labour force reduces unemployment rate and poverty. The positive impact of coefficients of active in the IV-GMM model indicates that a growing labour force can increase the number of poor people and their intensity. This is conceivable since Africa's labour force is largely made up of young people, with a high proportion of them unemployed. Poverty reduction is also influenced by the rate of economic growth; as claimed by the estimates, Growth in GDP per capita has a negative and statistically significant impact on poverty in Africa. This is in line with the findings of Kare and Drueta (2016), Son and Kakwani (2004), who claim that increasing economic activity through aggregate demand, factor productivity lower unemployment rates and poverty alleviation.

Additionally, the impact of institutional quality on poverty is also mixed. The results of the FE-2SLS model indicates that institutional quality has a negative and significant relationship with poverty. This demonstrates that countries with strong institutional quality systems may boost economic growth, reduce income inequality, and reduce poverty. This is in consistent with the study of (Tebaldi & Mohan 2010; Sobhee 2017; Perera & Lee 2013). However, estimates from the IV-GMM indicates that institutional quality increases poverty, which is at odd with empirical

literature. The impact of FDI on the incidence and intensity of poverty is positively significant, indicating that FDI exacerbate poverty situations of African countries. This finding is in line with Quionez et al. (2018), Arabyat (2017), Rye (2016), and Gohou and Soumare (2012) who attribute profit repatriation by multinational companies, the crowding-out effect of foreign investment on domestic capital, and a low level of host absorptive capacity as factors causing FDI to exacerbate poverty in the region.

Table 3: Baseline Results: Non-Spatial Model

VARIABLES	(1) Headcount	(2) Povgap	(3) Headcount	(4) Povgap
	Fixed effect IV		IV-GMM	
Financial Devt.	0.0727	0.131**	-0.545***	-0.197***
	(0.0762)	(0.0561)	(0.0856)	(0.0394)
Infrastructure	-0.000798***	-0.000447***	-0.00281***	-0.00137***
	(8.80e-05)	(5.83e-05)	(0.000187)	(9.22e-05)
Labour Force	-0.153***	-0.0704***	0.0337***	0.0123***
	(0.0199)	(0.0139)	(0.00578)	(0.00304)
Institutional Quality	-0.000549*	-0.000908***	0.00144**	9.59e-05
	(0.000290)	(0.000244)	(0.000654)	(0.000350)
Economic growth	-0.00205***	-0.00112**	-0.00710***	-0.00378***
	(0.000611)	(0.000395)	(0.00140)	(0.000813)
FDI	0.000699***	0.000375***	0.000997***	0.000322***
	(0.000173)	(0.000103)	(0.000180)	(9.24e-05)
FDI × Inst	-2.42e-05**	-1.46e-05***	-2.99e-05***	-8.66e-06**
	(8.59e-06)	(4.67e-06)	(7.74e-06)	(4.13e-06)
Constant	2.779***	1.265***	0.0814	0.0772
	(0.413)	(0.293)	(0.0958)	(0.0495)
Observations	704	704	704	704
Hansen J statistic	-	-	0.8016	0.5324
Instrument relevance	0.0000	0.0000	-	-
R-squared	0.424	0.275	0.467	0.395
Prob > χ^2	40212.36***	12801.22***	833.64***	646.17
Number of Countries	44	44	44	44

Driscoll-Kraay standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. All regressions are estimated using the fixed-effect instrumental regression and the IV-GMM estimator. We used the lag of FDI as instruments. The instrument relevance test is the probability value of the F-test in the reduced model. Hansen J statistic provide strong evidence for the validity of the instruments used.

The interaction of FDI and institutional quality reveals a negative and statistically significant impact on the poverty measures. This infers that an increase in institution quality has a favorable and significant impact on the FDI-poverty reduction nexus in Africa. This finding is consistent

with the findings of Hayat (2019), Jilenga and Helian (2017), and Agbloyor et al. (2016), who found that countries with high institutional quality have the potential to reap the benefits of FDI through healthy competition, improved spillovers, and capital accumulation.

4.2 Spatial Pre-estimation Test

In this section, we examine whether spatial dependence exists in the model specified in Eq. (1.1). This test is based on the residuals of the non-spatial results of the pooled regression, which is not reported in this study but available on request. The Moran's I test results shown in Table 4, indicates a rejection of the null hypothesis of no spatial interdependence. In addition to this, the results of the Lagrange Multiplier and Robust Lagrange Multiplier (RLM) suggest rejection of the null hypothesis of no spatial lag as against the alternative hypothesis of spatial error and spatial lag dependence. Following the general-to-specific approach, the SDM is the appropriate specification if the spatial error effect and spatial lag are detected. The Geary C test also demonstrate the existence of global spatial autocorrelation as the null hypothesis that "there is no global spatial autocorrelation is rejected. The validity of the SDM should be confirmed with the Wald test and likelihood ratio (Do et al., 2021; Ragoubi & El Harbi., 2018).

Table 4: Spatial Pre-estimation test

Test	(1) Statistics	(2) P-value	(3) Statistics	(4) P-value
	Headcount Poverty		Poverty Gap	
Spatial Error:				
Moran's I	47.856	0.000	42.631	0.000
Lagrange multiplier	843.942	0.000	666.786	0.000
Robust Lagrange multiplier	687.404	0.000	508.755	0.000
Spatial lag:				
Lagrange multiplier	170.729	0.000	171.315	0.000
Robust Lagrange multiplier	14.191	0.000	13.283	0.000

Source: Author's computations

Table 5: Spatial impact of FDI on Poverty in Africa (Spatial Weight: Contiguity)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	SAR Model		**SDM Model**		**SEM Model**	
	Headcount	Poverty Gap	Headcount	Poverty Gap	Headcount	Poverty Gap
FDI	0.0001	0.0001	0.0001	7.23e-05	0.000116	8.67e-05
	(7.74e-05)	(5.78e-05)	(7.68e-05)	(5.67e-05)	(7.93e-05)	(5.97e-05)
Financial Devt.	0.0533	0.143**	0.0291	0.113*	0.0957	0.175***
	(0.0922)	(0.0689)	(0.0916)	(0.0676)	(0.0922)	(0.0675)
Infrastructure	-0.000607***	-0.000241***	-0.000569***	-0.000178**	-0.000715***	-0.000287***
	(0.000118)	(8.60e-05)	(0.000117)	(8.48e-05)	(0.000114)	(8.15e-05)
Labour	-0.167***	-0.138***	-0.182***	-0.147***	-0.197***	-0.156***
	(0.0236)	(0.0177)	(0.0241)	(0.0179)	(0.0212)	(0.0154)
Inst	-0.00126***	-0.00154***	-0.00101**	-0.00124***	-0.00139***	-0.00158***
	(0.000471)	(0.000351)	(0.000470)	(0.000347)	(0.000470)	(0.000348)
Economic Growth	-0.00172***	-0.00126***	-0.00162***	-0.00114***	-0.00185***	-0.00134***
	(0.000589)	(0.000440)	(0.000585)	(0.000431)	(0.000589)	(0.000433)
FDI × Inst	-5.77e-06*	-3.54e-06	-5.80e-06*	-4.20e-06*	-4.63e-06	-3.92e-06*
	(3.02e-06)	(2.24e-06)	(3.00e-06)	(2.20e-06)	(3.01e-06)	(2.25e-06)
$\boldsymbol{W * FDI}$			0.000565***	0.000529***		
			(0.000134)	(9.92e-05)		
$\boldsymbol{W *}$ **FDI × Inst**			-1.35e-05**	-2.33e-05***		
			(5.64e-06)	(4.17e-06)		
$\boldsymbol{W * Poverty}$	0.121***	0.0781*	0.0946**	0.0184		
	(0.0426)	(0.0453)	(0.0432)	(0.0461)		
Lambda (λ)					-0.0444	-0.117**
					(0.0513)	(0.0542)
Number of Countries	44	44	44	44	44	44
Pseudo R2	0.298	0.299	0.309	0.299	0.286	0.289
Prob > χ^2[b]	737.09***	480.85***	769.53***	548.67***	707.11***	537.90***
SEM Vs SDM[c]			4.29***	5.37***		
			(0.0001)	(0.0001)		
SAR vs SDM (LR test)[d]			19.17***	45.41***		

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. The Hausman test suggest fixed effect over random effect model, the report is available on request. All regressions are estimated using maximum-likelihood estimator. a: joint significant of the spatial terms. b: joint significance of all the variables. c: Wald test of spatial terms. d:Loglikelihood ratio test.

4.3 Spatial Impact of FDI on Poverty in Africa - Contiguity

As shown in Table 5, we can infer that the best model that best describes our data is the spatial durbin model (SDM), since the null hypothesis of the Wald and LR test are rejected. Furthermore, the Hausman test has confirmed the suitability of the SDM-FE model. Using the baseline proximity matrix specified in Eq. (7), the coefficient of the spatial lag of FDI is significant and positive suggesting that ignoring spatial dependence in the model would have resulted in biased estimates. The statistical significance of the weighted FDI suggests significant spillover of neighbouring countries FDI on host country poverty condition. Furthermore, the intuition of this empirical outcome is that the activity of multinational corporation in proximate countries deteriorate welfare conditions of host country. The channel of the impact could be through the crowd-out effect and profit repatriation. Similarly, the weighted coefficient of FDI interacted with institutional quality is statistically significant and negative, indicating that neighbouring countries institutional quality matters in the nexus between FDI and poverty. This call for a mutual corporation in building a robust institutional quality before African countries can reap the benefit of FDI. Our empirical results further indicate spatial spillover of incidence and intensity of poverty in the region, since the coefficient of the spatial poverty is positive. The intuition behind this positive impact is African migrants migrate to other neighbouring countries to seek greener pastures. This then has implication on the poverty conditions of the host country.

4.4 Marginal effect estimation results

This section presents the direct, indirect, total and feedback impacts of FDI on poverty in Africa. The headcount ratio is employed as a poverty measure since the goal of development specialists is to minimize the overall number of poor people (the results of the poverty gap is not reported due to brevity but available on request). The direct impact demonstrates that the change in region dependent variable (poverty) is because of the explanatory variables (FDI, financial development, infrastructure, labour, institutional quality, economic growth, and FDI*inst) of the same region. Whereas the indirect (spillover) effects capture the change in endogenous variable that is caused by the independent variables of other regions (neighbouring countries). The total impact is the sum of direct & indirect effects. Table 5 presents the estimated marginal effect using the SDM-FE model. These estimates are vital to governments of African countries since it gives them a comprehensive knowledge of how their poverty conditions could be influenced by neighbouring countries' FDI and other poverty determinants.

The direct results suggest that a one percent increase in FDI and financial development in country i increases the incidence of poverty of country i by 0.013% and 2.917%, respectively. However, the impact of infrastructure, labour, institutional quality, economic growth, and the interaction of institutional quality with FDI reduces poverty by 0.057%, 18.23, 0.101%, 0.162%, 0.001%, respectively.

The indirect estimates/spillover effect provided in column 2 suggest spillover effect in the region. The results show that a one percent increase in FDI and financial development in country i has a positive spillover effect 0.057% and 0.270%, 0.270% on the poverty rate of country j. However, the impact of other variables like infrastructure, labour, institutional quality, economic growth, and the interaction of institutional quality with FDI reduces poverty rate by 0.01%, 1.69%, 0.01%, 0.015, 0.015%, respectively. Since most of the coefficient of the indirect effect are significant, we can conclude that policies geared toward poverty reduction in African countries should not be treated in isolation, as the there is evidence of both direct and spillover effects of poverty determinant in Africa, i.e., the poverty condition of a particular country is influenced by the poverty conditions of other neighbouring countries, and its determinant.

Table 6: Marginal effect estimation results

VARIABLES	(1) Direct Effects	(2) Indirect Effects	(3) Total Effects
FDI	0.000126	0.000565**	0.000691***
	(7.73E-05)	(0.000132)	(0.000161)
Financial Development	0.029167	0.002703	0.03187
	(0.091807)	(0.008466)	(0.100178)
Infrastructure	-0.00057***	-5.3E-05**	-0.00062***
	(0.000117)	(2.57E-05)	(0.000125)
Labour	-0.18231***	-0.0169**	-0.1992***
	(0.024052)	(0.007719)	(0.024236)
Institutional Quality	-0.00101**	-9.4E-05	-0.0011***
	(0.000471)	(6.13E-05)	(0.000514)
Economic growth	-0.00162**	-0.00015*	-0.00177***
	(0.000586)	(8.96E-05)	(0.000641)
FDI $\times$ inst	-6.11E-06**	-1.4E-05**	-0.00002***
	(3.04E-06)	(5.51E-06)	(6.75E-06)
Number of Countries	44	44	44

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%.

4.5: Spatial Impact of FDI on Poverty in Africa - Distance

This study uses the inverse distance (specified in equation 8) as the alternative measure of proximity for our empirical estimation. The results presented in Appendix 3 are in similitude with that of Table 5. The only difference is that all the weighted poverty rate is negative for both incidence and intensity of poverty ($W_{ij}Pov_{j,t}$). The control variables are also generally having the expected signs and are statistically significant. The results of the cumulative marginal effect of the distance proximity matrix are also in similitude with the contiguity results presented in Table 6. However, the results are not reported in this study due to brevity, although they are available upon request.

5.0 Summary of Findings and Recommendations

In reducing the savings gap and achieving equitable and sustainable development, a large amount of quality foreign resources is required in Africa. Hence, Foreign investments, such as FDI, are seen as one of the most important drivers of economic development in the region by policymakers. However, empirical studies examining the impact of FDI on poverty have reached varying results. While some studies argue that FDI reduces poverty, some studies believe that it increases poverty. Other studies posit that FDI's impact is conditional on certain intermittent variables. The reason why there is a diverse finding on the impact of FDI is because majority of these studies neglect the role of space. In contributing to the literature, this study assesses whether spatial interdependence/third-country effects matter on the impact of FDI on the incidence and intensity of poverty in Africa. In achieving this, the study employs the spatial durbin model to quantify the impact of neighbouring countries' FDI on the poverty conditions of host country. Before accounting for space in our model, the study conducted some pre-estimation tests to determine the existence of spatial spillover on the effect of FDI. The results indicate that neighbouring countries' FDI impacts the host country's poverty. Hence, neglecting spatial interdependence in the FDI model may result to biased estimates.

This study's empirical findings are as follows: (1) neighbouring countries FDI have a significant and positive impact on the incidence and intensity of the host country, (2) neighbouring countries institutional quality matter in the nexus between FDI and poverty reduction, since the positive impact of FDI on poverty is mitigated through a robust institutional quality, (3) there is a significant spatial spillover of neighbouring countries' poverty to host country, (4) the marginal effect results indicate that countries within the region are no longer in isolation or independent, i.e., the level of poverty in a particular country is influenced by its

determinants in the neighbouring country. This result is robust to the different proximity matrix, which is the inverse distance.

The empirical results of this study have produced important policy implications for African governments. First, since FDI does not reduce poverty from our empirical estimation, African countries need to embark on public sector reforms, as investment would not thrive when there is high corruption, low voice and accountability, government inefficiency, poor regulatory quality, low rule of law, and political instability. Second, since the empirical results of this study provide evidence of both direct and spillover effects of poverty determinants, we recommend that African countries consider their surrounding countries' characteristics in their welfare policy formulation. The study also highlights the importance of Joint task effort toward building a strong institutional quality. This is to permit African countries to have coordinated policies towards building a robust institutional framework. African governments through the African Union (AU) or other relevant agencies are encouraged to not only develop an institutional reform for Africa, but also establish a binding mechanism to ensure reform implementation.

Limitations of the study

1. Future studies can consider mediating variables on the nexus between FDI and poverty within a spatial framework.
2. This study only uses the income measure of poverty. Future studies are encouraged to consider other non-income poverty measures.

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References

Agarwal, M., Atri, P., & Kundu, S. (2017). Foreign direct investment and poverty reduction: India in regional context. *South Asia Economic Journal*, 18(2), 135-157.

Agbloyor, E. K., Gyeke-Dako, A., Kuipo, R., & Abor, J. Y. (2016). Foreign direct investment and economic growth in SSA: The role of institutions. *Thunderbird International Business Review*, 58(5), 479-497.

Ajide, K. B., & Raheem, I. D. (2016). Institutions-FDI nexus in ECOWAS countries. *Journal of African Business*, 17(3), 319-341.

Anselin, L., 1988. Lagrange multiplier test diagnostics for spatial dependence and spatial heterogeneity. *Geographical Analysis*, 20, 1–17.

Anselin, L., 2009. Spatial regression. The SAGE handbook of spatial analysis, 1, 255-276.

Anselin, L., & Bera, A. K. (1998). Spatial dependence in linear regression models with an introduction to spatial econometrics. Statistics textbooks and monographs, 155, 237-290.

Anselin, L., & Le Gallo, J. (2006). Interpolation of air quality measures in hedonic house price models: spatial aspects. Spatial Economic Analysis, 1(1), 31-52.

Anyanwu, J. C., & Erhijakpor, A. E. (2009). The impact of road infrastructure on poverty reduction in Africa. *Poverty in Africa, Nova Science Publishers, Inc., New York*, 1-40.

Arabyat, Y. (2017). The Impact of FDI on poverty reduction in the Developing Countries. *International Finance and Banking*, 4 (2).

Arogundade, S., Biyase, M., & Eita, J. H. (2021). Foreign Direct Investment and Inclusive Human Development in Sub-Saharan African Countries: Domestic Conditions Matter. *Economia Internazionale/International Economics*, *74*(4), 463-498.

Arogundade, S., Hassan, A., & Bila, S. (2021). Diaspora Income, Financial Development and Ecological footprint in Africa.

Baum, C. F., Schaffer, M. E., & Stillman, S. (2007a). Enhanced Routines for Instrumental Variables/Generalized Method of Moments Estimation and Testing. *Stata Journal*, 7, 465-506.

Baum, C. F., Schaffer, M. E., & Stillman, S. (2007b). ivreg2: Stata Module for Extended Instrumental Variables/2SLS, GMM and AC/HAC, LIML, and k-Class Regression. Boston College Department of Economics, Statistical Software Components, S425401.

Bharadwaj, A. (2014). Reviving the globalization and poverty debate: Effects of real and financial integration on the developing world. *Advances in Economics and Business*, 2, 42-57.

Brahim, M., & Rachdi, H. (2014). Foreign direct investment, institutions and economic growth: Evidence from the MENA region. *Journal of Reviews on Global Economics*, 3, 328-339.

Burridge, P. (1980). On the Cliff-Ord test for spatial correlation. Journal of the Royal Statistical Society: Series B (Methodological), 42(1), 107-108.

Chenery, H. B., & A. Stout (1966). Foreign assistance and economic development, *American Economic Review*, 56(4), 679–733.

Chih, Y. Y., Kishan, R. P., & Ojede, A. (2021). Be good to thy neighbours: A spatial analysis of foreign direct investment and economic growth in sub-Saharan Africa. *The World Economy*.

Colen, L., Maertens, M., & Swinnen, J. (2009). Foreign direct investment as an engine for economic growth and human development: a review of the arguments and empirical evidence. Hum. Rts. & Int'l Legal Discourse, 3, 177.

Do, Q. A., Le, Q. H., Nguyen, T. D., Vu, V. A., Tran, L. H., & Nguyen, C. T. T. (2021). Spatial Impact of Foreign Direct Investment on Poverty Reduction in Vietnam. *Journal of Risk and Financial Management*, *14*(7), 292.

Donou-Adonsou, F., & Sylwester, K. (2016). Financial development and poverty reduction in developing countries: New evidence from banks and microfinance institutions. *Review of development finance*, *6*(1), 82-90.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. Review of economics and statistics, 80(4), 549-560.

Fowowe, B., & Shuaibu, M. I. (2014). Is foreign direct investment good for the poor? New evidence from African countries. Economic Change and Restructuring, 47(4), 321-339.

Gnangnon, S. K. (2020). Does Poverty deter Foreign Direct Investment flows to Developing Countries?

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

Gutiérrez-Portilla, P., Maza, A., & Villaverde, J. (2019). A spatial approach to the FDI-growth nexus in Spain: Dealing with the headquarters effect. *International Business Review*, *28*(6), 101597.

Hao, Y., Wu, Y., Wu, H., & Ren, S. (2020). How do FDI and technical innovation affect environmental quality? Evidence from China. *Environmental Science and Pollution Research*, *27*(8), 7835-7850.

Hayat, A. (2019). Foreign direct investments, institutional quality, and economic growth. The Journal of International Trade & Economic Development, 28(5), 561-579.

International Monetary Fund. (2019). Financial Development Index Database; IMF: Washington, DC, USA. Retrieved from https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Introducing-a-New-Broad-based-Index-of-Financial-Development-43621.

Jalilian, H., & Kirkpatrick, C. (2002). Financial development and poverty reduction in developing countries. *International journal of finance & economics*, *7*(2), 97-108.

Jilenga, M. T., & Helian, X. (2017). Foreign direct investment and economic growth in Sub-Saharan Africa: The role of institutions. Turkish Economic Review, 4(4), 378-387.

Jude, C., & Levieuge, G. (2017). Growth effect of foreign direct investment in developing economies: The role of institutional quality. The World Economy, 40(4), 715-742.

Kaulihowa, T. (2017) Foreign Direct Investment and Welfare Dynamics in Africa " *Doctor of Philosophy (PhD) in Development Finance, Faculty of Economic and Management Sciences at Stellenbosch University*.

Kelejian, H. H., Tavlas, G. S., & Hondroyiannis, G. (2006). A spatial modelling approach to contagion among emerging economies. Open economies review, 17(4), 423-441.

Lazreg, Marwa, & Ezzeddine Zouari. 2018. "The relationship between FDI, poverty reduction and environmental sustainability in Tunisia." *Journal of Economics and Management Sciences* 1, no. 1: 114-114.

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

LeSage, J., & Pace, R. K. (2009). Introduction to spatial econometrics. Chapman and Hall/CRC.

Madariaga, N., & Poncet, S. (2007). FDI in Chinese cities: Spillovers and impact on growth. *World Economy*, *30*(5), 837-862.

Moran, P. A. 1950. A test for the serial independence of residuals. Biometrika, 37(1/2), 178-181.

Nunnenkamp, P. (2004). To what extent can foreign direct investment help achieve international development goals?. World Economy, 27(5), 657-677.

Perera, L. D. H., & Lee, G. H. (2013). Have economic growth and institutional quality contributed to poverty and inequality reduction in Asia?. *Journal of Asian Economics*, *27*, 71-86.

Peres, M., Ameer, W., & Xu, H. (2018). The impact of institutional quality on foreign direct investment inflows: evidence for developed and developing countries. *Economic research-Ekonomska istraživanja*, *31*(1), 626-644.

Pérez-Segura, A. (2015). FDI and Human Development: What is the Role of Governance?. PhD diss., Honors Thesis, 2014.

Quinonez, P., Saenz, J., & Solorzano, J. (2018). Does foreign direct investment reduce poverty? The case of Latin America in the twenty-first century. *Business and Economic Horizons (BEH)*, 14(1232-2019-851), 488-500.

Ragoubi, H., & El Harbi, S. (2018). Entrepreneurship and income inequality: a spatial panel data analysis. *International Review of Applied Economics*, 32(3), 374-422. https://doi.org/10.2478/tekhne-2019-0012

Rewilak, J. (2017). The role of financial development in poverty reduction. *Review of development finance*, *7*(2), 169-176.

Rye, Suzanna-Zora. (2016). Foreign Direct Investment and its Effects on Income Inequality. Master's thesis at the Economics Institute. University of Oslo.

Schoch M., & Lakner C. (2020) African countries show mixed progress towards poverty reduction and half of them have an extreme poverty rate above 35%. World Bank Blogs. Available: https://blogs.worldbank.org/opendata/african-countries-show-mixed-progress-towards-poverty-reduction-and-half-them-have-extreme

Seetanah, B., Ramessur, S., & Rojid, S. (2009). Does infrastructure alleviate poverty in developing countries. *International Journal of Applied Econometrics and Quantitative Studies*, *6*(2), 31-36.

Škare, M., & Družeta, R. P. (2016). Poverty and economic growth: a review. *Technological and Economic development of Economy,* 22(1), 156-175.

Sobhee, S. K. (2017). The effects of poor institutional quality on economic growth–investigating the case of Sub-Saharan and Latin American economies prior to the world economic downturn." *Institute for Economic Research at the Bulgarian Academy of Sciences. Journal of Economic Thought* 1: 83-95.

Son, H. H., & Kakwani, N. (2004). Economic growth and poverty reduction: Initial conditions matter (No. 2).

Soumaré, I. (2015). Does FDI improve economic development in North African countries?. Applied Economics, 47(51), 5510-5533.

Sustainable Development Report (SGD), 2019. Retrieved from https://sdgindex.org/reports/sustainable-development-report-2019/

Tebaldi, E., & Mohan, R. (2010). Institutions and poverty. *The journal of development studies*, 46(6), 1047-1066.

UNCTAD Statistics. 2020. Statistical Release [online] Available: https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx

UNCTAD. 2018. World investment report, 2018: *Investment and new Industrial policies*. Geneva: United Nations.

United Nations. 2003. Financing for development. In *Monterrey Consensus of the international conference on financing for development, Mexico*. Retrieved from *http://www.un.org/esa/ffd/monterrey/MonterreyConsensus.pdf*.

Utesch-Xiong, F., & Kambhampati, U. S. (2021). Determinants of Chinese Foreign Direct Investment in Africa. Journal of African Business, 1-18.Uttama, N. P. (2015). Foreign direct investment and the poverty reduction nexus in Southeast Asia. *Poverty reduction policies and practices in developing Asia*, 281.

Yeboua, K. (2021). Foreign direct investment and economic growth in Africa: New empirical approach on the role of institutional development. Journal of African Business, 22(3), 361-378.

Appendix 1: Moran's I_i Residual of Headcount Poverty regression by Country*

Countries	I_i	$Sd(I_i)$	$Z-stat$	$P-value*$
Algeria	0.133	0.018	7.255	0.000
Angola	0.054	0.016	3.396	0.001
Benin	0.006	0.040	0.162	0.871
Botswana	-0.133	0.025	-5.351	0.000
Burkina Faso	-0.005	0.028	-0.130	0.896
Burundi	0.625	0.050	12.403	0.000
Cabo Verde	-0.067	0.024	-2.733	0.006
Cameroon	-0.088	0.020	-4.317	0.000
Central African Republic	0.103	0.017	6.180	0.000
Chad	-0.001	0.016	-0.019	0.985
Comoros	-0.276	0.023	-12.220	0.000
DRC	0.237	0.020	11.705	0.000
Republic of Congo	0.008	0.025	0.359	0.720
Cote d'Ivoire	-0.092	0.029	-3.126	0.002
Egypt	-0.045	0.015	-2.997	0.003
Ethiopia	-0.104	0.019	-5.409	0.000
Gabon	-0.274	0.026	-10.664	0.000
Gambia	-0.183	0.061	-2.985	0.003
Ghana	-0.186	0.036	-5.133	0.000
Guinea	-0.121	0.040	-3.036	0.002
Guinea-Bissau	-0.019	0.052	-0.345	0.730
Kenya	-0.107	0.025	-4.288	0.000
Lesotho	0.023	0.039	0.607	0.544
Liberia	0.013	0.033	0.422	0.673
Madagascar	0.022	0.023	1.017	0.309
Malawi	0.277	0.028	9.999	0.000
Mali	-0.001	0.023	-0.007	0.994
Mauritania	-0.025	0.023	-1.030	0.303
Mauritius	-0.393	0.023	-17.297	0.000
Morocco	0.147	0.019	7.734	0.000
Mozambique	0.170	0.028	6.130	0.000
Namibia	-0.060	0.022	-2.729	0.006
Niger	0.002	0.017	0.154	0.878
Nigeria	-0.005	0.021	-0.178	0.859
Rwanda	0.154	0.051	3.066	0.002
Senegal	-0.021	0.057	-0.349	0.727
Sierra Leone	-0.005	0.041	-0.106	0.916
South Africa	-0.072	0.039	-1.839	0.066
Sudan	-0.090	0.016	-5.675	0.000
Tanzania	0.071	0.025	2.864	0.004
Togo	0.003	0.043	0.095	0.925
Tunisia	0.156	0.017	9.286	0.000
Uganda	-0.045	0.028	-1.555	0.120
Zambia	0.157	0.021	7.418	0.000
Measures of global spatial autocorrelation				
	0.927	0.003	-21.681	0.000

*The probability level is two-tail test

NB: The LISA test of countries in the sample is estimated using year 2019, which is the end of our study period.

Appendix 2: United Nation Regional Classification

Algeria	Comoros	Guinea	Morocco	Sudan
Angola	Congo, Democratic Republic of	Guinea-Bissau	Mozambique	Tanzania
Benin	Congo, Republic of	Kenya	Namibia	Togo
Botswana	Cote d'Ivoire	Lesotho	Niger	Tunisia
Burkina Faso	Djibouti	Liberia	Nigeria	Uganda
Burundi	Egypt	Madagascar	Rwanda	Zambia
Cabo Verde	Ethiopia	Malawi	Senegal	Zimbabwe
Cameroon	Gabon	Mali	Seychelles	
Central African Republic	Gambia	Mauritania	Sierra Leone	
Chad	Ghana	Mauritius	South Africa	

Appendix 3: Spatial impact of FDI on Poverty in Africa (Spatial Weight: Distance)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	SAR Model		**SDM Model**		**SEM Model**	
	Headcount	Poverty Gap	Headcount	Poverty Gap	Headcount	Poverty Gap
FDI	0.000103	5.47e-05	0.000113	7.11e-05	0.000174**	0.000125**
	(7.78e-05)	(5.79e-05)	(7.72e-05)	(5.70e-05)	(7.85e-05)	(5.92e-05)
Financial Devt.	0.0881	0.159**	0.0473	0.105	0.115	0.155**
	(0.0920)	(0.0684)	(0.0919)	(0.0680)	(0.0893)	(0.0657)
Infrastructure	-0.000736***	-0.000262***	-0.000711***	-0.000171*	-0.000834***	-0.000313***
	(0.000133)	(9.16e-05)	(0.000136)	(9.61e-05)	(0.000101)	(7.10e-05)
Labour	-0.206***	-0.149***	-0.232***	-0.163***	-0.184***	-0.156***
	(0.0281)	(0.0210)	(0.0309)	(0.0237)	(0.0179)	(0.0128)
Inst	-0.00140***	-0.00159***	-0.00134***	-0.00161***	-0.00144***	-0.00170***
	(0.000472)	(0.000351)	(0.000469)	(0.000346)	(0.000458)	(0.000339)
Economic Growth	-0.00184***	-0.00130***	-0.00170***	-0.00120***	-0.00211***	-0.00158***
	(0.000592)	(0.000441)	(0.000588)	(0.000434)	(0.000566)	(0.000418)
$FDI \times Inst$	-4.62e-06	-3.31e-06	-4.94e-06*	-3.93e-06*	-4.62e-06	-3.54e-06
	(3.01e-06)	(2.24e-06)	(2.99e-06)	(2.21e-06)	(2.96e-06)	(2.19e-06)
$\boldsymbol{W * FDI}$			0.00169***	0.00162***		
			(0.000396)	(0.000301)		
$\boldsymbol{W * FDI \times Inst}$			-3.84e-05**	-5.99e-05***		
			(1.80e-05)	(1.33e-05)		
$\boldsymbol{W * Poverty}$	-0.0548	0.0148	-0.153	-0.221**		
	(0.0931)	(0.0983)	(0.101)	(0.111)		
Lambda (λ)					-0.597***	-0.684***
					(0.145)	(0.154)
Number of Countries	44	44	44	44	44	44
Prob > χ^2[b]	721.63***	525.77***	753.55***	525.77***	1860.49***	1356.69***
SEM Vs SDM[c]			4.26***	5.36***		
			(0.0004)	(0.0003)		
SAR vs SDM (LR test)[d]			18.12***	32.78***		

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. The Hausman test suggest fixed effect over random effect model, the report is available on request. All regressions are estimated using maximum-likelihood estimator. a: joint significant of the spatial terms. b: joint significance of all the variables. c: Wald test of spatial terms. d:Loglikelihood ratio test.