Beyond COVID-19: How can SSA Countries leverage on Foreign Direct Investment to improve Inclusive Human Development?

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ABSTRACT

This study examines how SSA countries can leverage on foreign direct investment (FDI) as a major driver of economic recovery post COVID-19. In achieving this, the study assesses whether the impact of FDI in improving inclusive human development is conditional on certain intermediating variables or not. While the importance of institution has prominently featured as playing a vital role on the one hand, infrastructure level and economic growth have also been elected as good candidates on the other hand. This study uses panel smoothening transition regression model (PSTR) with a panel of 28 SSA countries from 1996-2018. The results support the view that institutional quality and infrastructure are germane in influencing the impact of FDI on welfare distribution. The study further suggest that higher economic growth is a necessary but not sufficient condition in facilitating the impact of FDI, as economic growth must be combined with either infrastructure or quality institution before generating the anticipated impact. This implies that the more host nations improve the conditions of their economies, the more they reap the benefit of FDI in terms of job creation, technological spillovers, and distribution of welfare. Conclusion emanating from this study is that beyond putting in place FDI's promotional policies to improve the appetite of multinational corporations, SSA countries need to further privatize, and liberalize critical sectors in their economies in order to provide needed liquidity for investment in infrastructure, growing the economy as well as public sector reform.

JEL classification: F23; I30; H54; O43

Keywords: COVID-19, Inclusive Human Development, Foreign Direct Investment, Local Economic conditions, Panel Smoothening Transition Regression Model and Sub-Saharan African Countries

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1.0 Motivations

Prior to the COVID-19 crisis, levels and trends in external flows to developing economies were already considered insufficient to support the Sustainable Development Goals (SDG). With high levels of public debt and additional pressures induced by the pandemic on all major sources of development finance, developing countries particularly Sub-Saharan African Countries (SSA) may struggle to finance their public health, social and economic responses to COVID-19. Early observations point to massive debt and equity outflows from developing economies that accompany a drop in remittances, and ripple effects on domestic finance already solicited by the unfolding public health and economic crises. According the OECD (2020) report, external private finance inflows to developing economies could drop by USD 700 billion in 2020 compared to 2019 levels, exceeding the immediate impact of the 2008 Global Financial Crisis by 60%. This exacerbates the risk of major development setbacks that would, in turn, increase our vulnerability to future pandemics, climate change and other global public bads.

Similarly, the UNDP (2020) report predicted a steep decline in human development worldwide in 2020, this is led by a massive setback in effective education because of school closures affecting almost 9 in 10 students, deep recessions in most economies (including a 4 percent drop in GNI per capita worldwide) and over-pressured health care system. The COVID-19 pandemic could also erode all the progress made in improving human development in the past thirty years (World Economic Forum, 2020). It was also predicted by the United Nation Development Programme (UNDP) that global poverty could increase for the first time since 1990, with about more than half a billion people could be pushed into poverty. As it is anticipated that there will be sharp decline in external finance, particularly Foreign Direct Investment (FDI), this study intend to contribute to recent literature on post COVID-19 economic recovery of SSA countries. This study also intend to make recommendation for SSA countries on how to take optimum advantage of the activities of multinational corporations (MNCs) in driving their economies

However, before the advent of COVID-19, many African countries have been adopting series of investment policies[2] to attract external finance, particularly, foreign direct investment (FDI). This is because of the importance of FDI in creating jobs, technological spillover and also source of

[2] This includes, establishment of new special economic zones (SEZs), simplifying administrative investment procedures, privatization of state-owned assets, and liberalization of domestic markets (see World Investment Report, 2018 for a detailed account of these measures).

government revenue. The question this study seeks to answer is that how SSA countries can leverage on FDI in proving their welfare after COVID-19? What are the key important policy channels SSA countries need to possess in exploring the positive spillovers of FDI in improving inclusive human development?

Although there is scanty literature on the impact of FDI on inclusive human development, especially in SSA. However, several attempts have been documented on the impact of FDI on human development. Some studies support the linear relationship between FDI and human development, others reject it, and argue that the impact is conditional. Studies that support the linear relationship between FDI and human development includes (Maku & Ajike, 2015; Hussen, 2014; Soumare 2015). Maku and Ajike (2015) explored the impact of capital and financial flows on human welfare in SSA between 1980 and 2012. Using fixed effect model, the results suggests that FDI has positive impact on welfare. In similar vein, Hussen (2014) examined the impact of FDI on economic growth and development in Latin America and Africa. The study uses fixed effect regression for sample of 44 African and 33 Latin American, with a time span of 1985–2011 and 2000–2011, respectively. The study concludes that FDI has significant positive impact on human development, while the impact on growth is not positive. Soumare (2015) also examined the impact of FDI on welfare of Northern African countries during the period of 1900-2011. The study explored a dynamic panel regression and concludes that FDI is beneficial to welfare improvement in the region.

However, some studies have argued that the impact of FDI on human development is either nonlinear or conditional on the economy of host county (Kaulihowa, 2017; Lehnert et, al., 2013; Pérez, 2015; Herzer et al., 2015; Reiter & Steensma, 2010). Kaulihowa (2017) examined the effect of FDI on human development, the study explores a panel of 16 African countries for the period 1980–2013. Findings from this study suggest that FDI has a positive and significant relationship with human development. The study further concludes that FDI is beneficial only until a certain stage of development. Using system GMM for sample of 175 countries, Lehnert et, al (2013) examined the role governance on the relationship between FDI and human development. Estimates from the study reveals that FDI enhances welfare of host countries with better governance. Pérez (2015) also examined the role of governance on the effect of FDI on human development. Using dynamic panel regression of 158 countries over the period of 1996-2010. The result reveals that the impact of FDI insignificant. However, the impact is positive and significant when interacted

with governance measures like voice and accountability. Similarly, Herzer et al (2015) investigates the impact of FDI on population health using panel data for up to 179 countries for the period between 1980 and 2011. The study utilized dynamic panel model and discovered that the relationship between FDI and health is non-linear, depending on the level of income. The study concludes that FDI has a positive effect on health at low levels of income, but the effect decreases with increasing income. Using fixed effect model for 49 developing countries, Reiter and Steensma (2010) examines the role of FDI policy and corruption on the impact of FDI on human development. The study concludes that FDI inflows are more beneficial when foreign investors are restricted to enter some sectors. The study further concludes that FDI is strongly positive when corruption is low.

The only documented literature on FDI and inclusive human development includes (Cao et al, 2017; Leke & Asongu, 2017; Asongu et. al., 2019). Cao et al, (2017) examines the impact of FDI on Inequality-adjusted HDI (IHDI) in 66 Asian countries, during the period of 2013-2015. Using fixed effect model, the study concludes that FDI does not significantly influence inclusive human development in Asian countries in general. Using tobit regression and GMM for a sample of 48 countries between 2000-2012, Leke and Asongu (2017) examine the impact of external flows on inclusive human development in SSA. The study concludes that remittances and FDI increase inclusive development, while foreign aids has opposite effect. Asongu et. al, (2019) evaluates the thresholds of external flows for inclusive human development in SSA for a panel of 48 countries in SSA. Foreign direct investment, remittances and foreign aids were used as measures of external flows. Using OLS, GMM and quantile regression, the study concludes external flows must reach a critical threshold in order to have positive impact on inclusive human development

This study differs from previous empirical enquiry as it succinctly identifies the degree at which the conditions of the local economy[3] can facilitate the benefit FDI can offer. Undertaking the study for the region is critical for the following reasons: (i) prior to the current COVID-19 pandemic, the region is beset with poor welfare distribution, and arguably the least in the world (ii) the prevalence of poor institutional framework, infrastructure deficit, and slow growth is an impediment to FDI spillovers in the region. Thus, attracting multinational corporations to invest

[3] Local economic conditions in this study includes, quality of institutions, level of infrastructure and economic growth

under these circumstances may not yield the anticipated results, as investment thrive in a competitive environment. This conjecture perhaps is meaningless, and hence, lack objectivity if not subjected to empirical verification. Furthermore, unlike previous studies, this study leans on panel smooth transition regression model (PSTR), as it capable of addressing cross country heterogeneity, endogeneity, and time variability issues.

The rest of this paper is structured as follows: The discussion on the methodology and the estimation techniques is discussed section 3. Section 4 presents and discusses the empirical estimation, whilst section 5 concludes and provides the key policy implications.

3.0 Methodology and Data

3.1 Methodology

This study uses PSTR model developed by Gonzalez et al. (2005) and Fok et al. (2004). This model is not only capable of allowing parameters to vary across countries (heterogeneity issues), but also time variability of the coefficients, since these parameters change smoothly as a function of threshold variables (Lin et al., 2014; Jude & Levieuge, 2016; Fouquau et al., 2008). Another appeal of this model is that it allows an endogenous determination of the thresholds. This study assumes a two-regime PSTR model for simplicity as espoused by (Kaulihowa, 2017; Fouquau et al. 2008; Yeboua, 2019; Markabi & Turcu, 2016; Yeboua, 2020).

$$IHDI_{it} = \beta_0 FDI_{it} + \beta_1 FDI_{it}\, g(q_{it}\,;\gamma, c) + \varphi_0 X_{it} + \varphi_1 X_{it} g(q_{it}\,;\gamma, c) + \mu_i + \varepsilon_{it} \quad (1)$$

Despite assurance that the PSTR model endogenously analyze the nonlinear relationship of a model, this study further controls for any potential endogeneity by using the first lag of both the threshold variables (q_{it-1}) and explanatory variables including FDI (FDI_{it-1})[4]. $IHDI_{it}$ is the inequality adjusted human development index, and FDI_{it} is foreign direct investment at for country i at time t. X_{it} is the vector of control variables often used in the welfare model; μ_i is individual fixed effect, while ε_{it} is the well-behaved error term. $g(q_{it}\,;y, c)$ in equation 1 is the transition function which is continuous, and it is bounded between $0\ and\ 1$; q_{it} is the transition variable which is economic growth, institutional quality, and level of infrastructure in this study. According to Gonzalez et al. (2015), and Fouquau et al. (2008), the transition function $g(.)$ is specified as the following logistics functions.

[4] See (Yeboua, 2019; Yeboua, 2020; Jude and Levieuge, 2016) for similar approach

$$g(q_{it}\,;\gamma,c) = \frac{1}{1+exp[-\gamma(q_{it}-c)]} \quad (2)$$

Where $\gamma > 0$, represents the slope parameters, and the speed of transition from one regime to another. The threshold parameter is c. The transition function becomes an indicator function when $\gamma \to \infty$, which means that $g(q_{it}\,;\gamma,c) = 0\ if\ q_{it} < c$ and $g(q_{it}\,;\gamma,c) = 1\ if\ q_{it} \geq c$. However, the transition function becomes a constant, and the model becomes a linear fixed effect regression model when $\gamma \to 0$. The coefficient of FDI in equation (2) is β_0 when $g(q_{it}\,;\gamma,c\,)$ approaches 0, and $\beta_0 + \beta_1$ when $g(q_{it}\,;\gamma,c\,)$ is towards 1. The sensitivity of inclusive human development to FDI is obtained between these two extremes with weighted average of parameters β_0 and β_1. The values of the parameters β_0 and β_1 are not directly interpretable, as in logit or probit model. Only their signs are interpreted to indicate the effect of FDI on inclusive human development depending on the value of the transition variable. The FDI coefficient for country i at time t for a given transition variable q_{it} is denoted thus as:

$$\frac{\partial IHDI_{it}}{\partial FDI_{it}} = \beta_0 + \beta_1 \times g(q_{it}\,;\gamma,c) \quad (3)$$

This study also adapted a three-step process in estimating the parameters of the PSTR model based on (Colletaz & Hurlin, 2006; Fouquau et al, 2008). The first test is the linearity test, which entails testing if the relationship between FDI and inclusive human development can be captured by homogenous linear panel model or PSTR model. Accordingly, the null hypothesis of the linear model (H_0) is examined against the alternative hypothesis (H_1) of PSTR model with at least one threshold or two regimes. This test is performed by using the Fisher LM test, Wald test, and the likelihood ratio test which are specified respectively as follows:

The Fisher LM test: $LM_f = (SSR_0 - SSR_1)/[SSR_0/\,(TN - N - K)]$ (4)

SSR_0 denotes the sum of squared residuals under H_0 (linear panel model with individual effects). SSR_1 also denotes the sum of squared residuals under H_1 (PSTR model with one threshold or two regimes). The fisher LM test LM_f has an approximate $F(K,\ TN - N - K)$ distribution, K, N, T represents the number of explanatory variables, number of countries and years respectively. If linearity is rejected, then there is a nonlinear relationship between FDI and inclusive human development. Test of no remaining nonlinearity is the second step. This consists of testing whether a PSTR model with one threshold or two regimes is enough to capture the nonlinearity between FDI and inclusive human development. Once the number of thresholds and the number of regimes

is selected, the final step is to apply the Nonlinear Least Squares (NLS) method to estimate the parameters.

3.2 Data

This study explores an unbalanced panel dataset of 28 countries in SSA[5], with an annual data over the period of 1996-2018. The choice of countries and period were contingent on data availability. With reference to the variables used, the study used log of inequality adjusted human development index as the measure of inclusive human development (*In tandem with recent inclusive human development literature, the inequality adjusted human development index[6] (IHDI) is employed to capture welfare distribution*), the variable is sourced from the United Nations Development Programme Database (UNDP, 2019). Concerning the explanatory variables, FDI is the major variable of interest. Since the impact of FDI on inclusive human development may not yield instant impact, the study uses inward FDI stock (% GDP) from UNCTAD. The institutional quality indicators of control of corruption and political stability were sourced from World Governance Indicator (WGI, 2019). Following (Okada, 2013; Slesman, et al., 2015) that aggregate measure of institutional quality indicator may fail to capture properly the effect of institutions, hence this study used control of corruption and political stability index. These indexes range from –2.5 (weak) to 2.5 (strong). Mobile phone subscription per/100 people and Access to electricity (% of population) were used as measure of infrastructure. Growth of real GDP per capita was used as proxy for economic growth.

The control variables are those that are usually used in welfare model, namely, population growth (POPGR), credit to the private sector (% GDP), initial level of inclusive human development, which is measured by logarithm of IHDI at the beginning of each year. Data for the control variables are sourced from World Development Indicators (World Bank). Since several studies have found direct effect of the threshold variables, economic growth, (Moser & Ichida, 2001), institutional quality (Sanjeev, 2017; Edinaldo & Ramesh, 2010), and infrastructure (Sapkota,

[5]**West Africa**: Benin, Burkina Faso, Cote'divore, Gambia, Ghana, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Siera Leone, Togo.
Southern Africa: Angola, Lesotho, South Africa, Zambia, Zimbabwe.
East Africa: Burundi, Kenya, Mauritius, Mozambique, Rwanda.
Central Africa: Cameroon, Central African Republic, Congo Democratic Republic, Congo Republic, Gabon.

[6] The IHDI which is a better proxy for sustainable development covers not only the human development in general, but also the equality in human development. The new measures consider the way which the three underlying achievements are distributed within the population.

2014) on human development. It is important to use these threshold variables as explanatory variable for all the tests and estimations to avoid erroneous switching (see, for example, Fouquau et al., 2008, p. 291).

4.0 Empirical results and Discussions

4.1 Descriptive Analysis

This section discusses descriptive statistics characteristics of the variables used in the model over the period of 1996-2018. Among the statistics examines are the averages, maximum, minimum values of the pooled sample.

Table 1: Descriptive Statistics

Variable(s)	Nos.	Mean	Min	Max
FDI stock inward ($, Billion)	644	9.01	-0.316	179.56
Population Growth, %	644	2.652	-0.617	8.118
Credit to Private Sector,% of GDP	642	27.60	0.491	2,564.49
Inequality Adjusted Human Development Index	252	0.459	0.198	0.690
Per Capita Income Growth (%)	644	1.562	-36.557	21.028
Institutional Quality (Control of corruption)	644	-0.683	-1.723	0.762
Institutional Quality (Political Stability)	644	-0.594	-2.844	1.118
Infrastructure (Mobile telephony)	636	38.43	0.001	158.883
Infrastructure (Access to Electricity, % of Population)	585	35.108	0.408	100

Source: Authors' computation based on WDI Database, WGI, UNCTAD and UNDP(2019)

The descriptive outcomes in table 1 shows that the average value of inequality adjusted human development index, from 1996 to 2018, and across the 28 countries stood at 0.459. Mauritius has the highest value of the overall index. This country has been able to achieve this feat due to the implementation of series of programmes and policies aimed at making education accessible for all, free health services, relative political stability, and welfare transfer. However, Central African Republic has the least index for the overall inequality human development index, as this coincide with year 2011. The average value of FDI inward stock in the review period was $9.01 billion. Gabon has the lowest, with an outflow of $316.49 million. This period coincides with the first

Ebola haemorrhagic fever pandemic in the country. However, South Africa has the highest FDI inward stock, with a value of $179.56 billion in 2010. The index of political stability and control of corruption ranges from +2.5 and -2.5, the average of these two variables in the region is -0.594 and -0.683 respectively, the overall summary statistics show poor institutional quality across SSA countries. Infrastructure (mobile telephony and access to electricity) have an average of 38.43 mobile subscribers, and 35.1% respectively. The average of GDP per capita growth among the selected sample in the region is 1.56%.

4.2 Linearity Test and Final PSTR Model

This section verifies if the relationship between FDI and inclusive human development can be captured by a linear or non-linear panel model. As earlier mentioned, a three-step approach was adopted. The first step is the linearity test. The second step, if the null hypothesis of the linearity is rejected is the test of no remaining nonlinearity. This includes testing whether one threshold or two regimes is enough to capture the nonlinearity. The final step is to apply the Nonlinear Least Squares (NLS) method to estimate the parameters based on the choice of (m, r).

Table 2 : LMF Tests for Remaining Nonlinearity

Model	Inclusive Human Development Index Model						
Threshold Variable(s)	Per capita Income		Infrastructure		Institutional quality		
No. of Location Parameters	$m = 1$	$m = 2$	$m = 1$	$m = 2$	$m = 1$	$m = 2$	$m = 3$
$H_0: r = 0$ vs $H_0: r = 1$	4.432 (0.001)	3.195 (0.001)	4.948 (0.000)	2.892 (0.002)	1.901 (0.095)	3.321 (0.000)	3.840 (0.000)
$H_0: r = 1$ vs $H_0: r = 2$	2.300 (0.046)	2.138* (0.023)	3.320* (0.007)	1.005 (0.440)	1.441 (0.211)	0.911 (0.524)	2.487* (0.002)
$H_0: r = 2$ vs $H_0: r = 3$	_	1.281 (0.243)	2.859 (0.016)	_	_	_	0.324 (0.992)
Model	Inclusive Human Development Index Model						
Threshold Variable(s)	Per capita Income*Institutional quality				Infrastructure*Per capita Income		
No. of Location Parameters	$m = 1$	$m = 2$			$m = 1$	$m = 2$	
$H_0: r = 0$ vs $H_0: r = 1$	4.049* (0.002)	2.777 (0.003)			2.130 (0.063)	3.446* (0.000)	
$H_0: r = 1$ vs $H_0: r = 2$	1.929 (0.091)	2.677 (0.004)			1.884 (0.098)	1.969 (0.038)	

Source: Authors' computation using data from UNDP, WDI, UNCTAD and WGI

Notes: For each threshold model, the testing process is done by examining a linear model with at least one threshold variable (r = 1): The single threshold model is tested against a double threshold model (r = 2), If the null hypothesis is rejected. This process continues until the hypothesis of no additional threshold accepted.

The first step as earlier noted is testing the inclusive human development models against a specification with threshold effect of economic growth, infrastructure, and institutional quality. It will be pertinent to determine the number of transitions functions needed to capture all the non-linearity of the inclusive human development models, if the linearity hypothesis is rejected. This study adopted LMF statistics for nonlinearity test $H_0: r = 0$ against $H_1: r = 1$ and test of no remaining nonlinearity $H_0: r = \alpha$ against $H_1: r = \alpha + 1$, since past literatures have argued that the F-version of the test has better size properties in small sample than the asymptotic X^2 based statistic. The linearity tests clearly lead to the rejection[7] of the null hypothesis of linearity in all the five models of inclusive human development. The result is in similitude with other test statistics[8] though not reported. This result that the relationship between FDI and inclusive human development is nonlinear. This result is in tandem with the findings of (Lehnert et, al., 2013; Pérez, 2015; Herzer et al., 2015; Reiter & Steensma, 2010) that the impact of FDI on human development is conditional on some certain local economic conditions.

Table 3: Determination of the Number of Location Parameters

Model	Inclusive Human Development Index Model					
Threshold Variable(s)	Per capita Income		Infrastructure		Quality of Institution	
Number of Location Parameters	$m = 1$	$m = 2$	$m = 1$	$m = 2$	$m = 1$	$m = 2$
Optimal Number of Transition Functions $r*(m)$	1	2	1	2	1	2
Residual Sum of Squares	0.671	0.640	0.389	0.373	0.707	0.703
AIC Criterion	-6.762	-6.766	-7.307	-7.344	-6.709	-6.711
Schwarz Criterion	-6.676	-6.615	-7.221	-7.251	-6.623	-6.617

Model	Inclusive Human Development Index Model			
Threshold Variable(s)	Per capita Income* Quality of Institution		Infrastructure* Per Capita Income	
Number of Location Parameters	$m = 1$	$m = 2$	$m = 1$	$m = 2$
Optimal Number of Transition Functions $r*(m)$	1	2	1	2
Residual Sum of Squares	0.681	0.585	0.724	0.724
AIC Criterion	-6.747	-6.855	-6.681	-6.681
Schwarz Criterion	-6.661	-6.704	-6.588	-6.588

Source: Authors' computation using data from UNDP, WDI, UNCTAD and WGI.

Notes: The optimal location parameters for each model in the transitions functions is obtained according to a sequential procedure based on LM_F statistics of non-remaining nonlinearity. Thus, for each value of m, the corresponding optimal number of thresholds $r*(m)$ is determined.

[7] Except for the model of infrastructure and combination of economic growth and institution that were rejected when location parameter $m = 1$, others were rejected at $m = 2\ and\ 3$.

[8] The results of other test statistics, which includes Wald and LRT test. The reports are available on request

This study follows Granger and Teräsvirta (1993) testing procedure for the determining m. The corresponding optimal number of transition function is reported for each value of m in the LMF test of remaining nonlinearity. In the PSTR model, variable that yield the strongest rejection of linearity is considered. For example, $(2,2)$ is chosen for economic growth, $(1,2)$ for infrastructure threshold, $(3,2)$[9] for institutional quality(Control of corruption), $(2,1)$ for the combination of income and infrastructure, $(1,1)$ for the combination of income and institutional quality.

Table 4 contains the final PSTR estimate of the model, as earlier noted that estimated parameters β_0 and β_1 in equation (1) cannot be directly interpreted as elasticities, as their signs are only interpreted based on probit or logit models (Fouquauet al., 2008). The slope parameter of transition function γ_j, which is the speed of adjustment from a low regime to high are relatively high for all the threshold models. This means that the transition function is sharp[10]. However, when the combination of income growth and institution is used as threshold, the transition between extreme regimes is smooth.

The estimated slope parameters show that FDI has a positive and significant impact on inclusive human development in low regime of economic growth β_0. However, as countries transit to high regime of economic growth β_1 and β_2, the impact of FDI becomes negative and statistically significant. This result is consistent with the findings of Herzer et al (2015) that high level of income has the tendency of deteriorating the impact of FDI on welfare. This is also consistent with (Meier, 2001; Ribeiro & Comim, 2008; Ravallion & Datt, 2002), who stress the importance of equitable distribution of income and resources in promoting human development. These studies argue that economic growth is not a sufficient condition for welfare improvement, and several other variables can influence the convertibility of economic growth to human development. The threshold of economic growth is 0.59% (*see list of countries above the threshold in in the appendix A3*). The average elasticity of FDI-inclusive human development nexus for each country (reported in *appendix A2),* suggests that the elasticity are quite at variance from country to country: the average estimate is 0.062% for Kenya, 0.076% for South Africa, 0.068% for Nigeria.

[9] Beyond the criteria of strongest rejection, the author also uses overall significance of the model to determine the optimum combination of $r * m$ for institutional quality model

[10] This means that any effort aimed at improving the level of the income by a country which is located close to the threshold will quickly enhance the benefit of FDI in improving inclusive education and overall inclusive human development.

Table 4: Final PSTR Estimates of FDI and Inclusive Human Development in SSA

Specification		Inclusive Human Development Model				
Threshold Variable(s) (m, r^*)		Economic growth $(2,2)$	Infrastructure $(1,2)$	Quality of Institution $(3,2)$	Economic growth* Infrastructure $(2,1)$	Economic growth* Institutional quality $(1,1)$
Parameters $\psi_0 = (\alpha_0, \beta_0, \theta_0, \eta_0)$						
Foreign Direct Investment	α_0	0.0010***	-0.0040***	0.0005	0.0006***	0.0005***
		(4.3104)	(-5.1268)	(1.5092)	(4.2276)	(3.6694)
Population Growth	β_0	-0.1537***	-0.0593***	-0.0535	-0.0768***	-0.0999***
		(-3.6986)	(-2.2466)	(-1.6508)	(-2.9459)	(-3.6566)
Credit to Private sector	θ_0	0.0043***	-0.0057**	0.0113***	0.0001***	0.0047***
		(4.8498)	(-2.0539)	(5.4124)	(4.8987)	(4.5460)
Parameters $\psi_1 = (\alpha_1, \beta_1, \theta_1, \eta_1)$						
Foreign Direct Investment	α_1	-0.0001	0.0048***	0.0004	0.0002	0.0001
		(-0.6399)	(5.5215)	(1.0444)	(1.4331)	(1.1763)
Population Growth	β_1	0.0503**	0.1049***	0.1572***	0.0229***	0.0219
		(3.6932)	(5.9317)	(6.5222)	(2.2380)	(1.7217)
Credit to Private Sector	θ_1	-0.0043***	0.0323***	0.0060	0.0002	-0.0047***
		(-4.9442)	(8.9308)	(5.5691)	(0.7458)	(-4.5108)
Parameters $\psi_2 = (\alpha_2, \beta_2, \theta_2, \eta_2)$						
Foreign Direct Investment	α_2	-0.0004***	-0.0001	0.0000		
		(-2.1471)	(-1.0362)	(0.0262)		
Population	β_2	0.0538***	-0.1435***	-0.1124***		
		(2.7967)	(-4.0596)	(-3.6454)		
Credit to Private Sector	θ_2	0.0001	-0.0266***	-0.0122***		
		(0.4987)	(-7.1262)	(-5.4230)		
Location Parameters	c_j					
First Transition Fn.		[2.0790; 5.0800]	[27.7100; 30.8111]	[0.0542; -1.3140]	[-73.3568; 283.6810]	-1.2787
Second Transition Fn.		[-5.3767; 0.5877]	-	[-1.1022; -0.0934]		
Third Transition Fn.		-	-	[-1.0743; -0.0943]		
Slopes Parameters	γ_j	[84.8621; 0.3384]	[400.8014; 1.0147]	[14.7558; 22.9349]	0.5230	14623
Number of Countries		28	28	28	28	28

**** denotes significance at 1 %, ** at 5 % and * at 10%. Test statistics in parenthesis are corrected for heteroskedasticity. For each model and each value of m the number of transition functions r is determined by a sequential testing procedure (see Table 2). The PSTR parameters cannot be directly interpreted as elasticities. The coefficient of Initial inclusive human development and threshold variables for each model are available on request.*

The results buttress the heterogeneity inherent in the impact of FDI in the region. As shown in the slope of the logistic function (*see appendix, figure1A*), countries with economic growth close to the threshold, would witness a decline in the elasticity of inclusive human development with respect to FDI from 0.072% to 0.062%. The time varying elasticity of FDI-inclusive human development nexus for individual countries (*see full details in the appendix, figure 2A*) suggests time variability on the elasticity of Nigeria, South Africa, and Kenya. However, Kenya has the least elasticity when compared with Nigeria and South Africa in years under review.

At high level of infrastructure, FDI has two opposite effect[11] on inclusive human development. This finding is in conformity with (Jahan & Mcleery, 2005; Ozturk, 2007; Kinishita & Lu, 2006; Bernstein, 2000; Lumbila, 2005) that heterogeneity in the level of infrastructure is strongly associated with variations in the spillover of FDI across countries. The minimum level of infrastructure above which the impact of FDI will be beneficial on inclusive human development is 29.26 mobile telephony per 100 population (*see list of countries above and below the threshold in appendix, table A2*). Average corresponding elasticity differs from country to country: the average estimate is 0.0362% for Kenya, 0.0362% for south Africa, 0.0362% for Nigeria. The logistic slope function (*see appendix, figure1A*) reveals that countries with level of infrastructure within the threshold would experience an increase in the elasticity of inclusive human development with respect to FDI from -0.2% to -0.07%. The individual country time varying elasticity under this threshold of mobile telephony suggests that (*see full details in the appendix, figure 2B*) both Nigeria and Kenya exhibit time instability in the elasticity of FDI, however, the coefficient of South Africa is constant through the review period. The same result is obtained (*see appendix, table 1A*) when access to electricity (% of population) is used as proxy for infrastructure, the impact of FDI on inclusive human development is negative and statistical significant when access to electricity is low, however as countries move to high level of electricity access, FDI has positive and statistical significant impact on welfare distribution.

The impact of FDI on inclusive human development is positive when there is a strong institutional quality (*measured as control of corruption*). This is consistent with (Lehnert et, al., 2013; Pérez, 2015; Reiter & Steensma, 2010) that countries with strong institutional quality have the potential

[11] According to Colletaz and Hurlin (2006), if the parameter β_1 and β_2 have two opposing effect, the result of these two effects would depend on the value of slope and location parameter. Judging from our location and slope parameters, we can conclude that the net effect of upper regime is positive

of enhancing the benefits from FDI, which can be through enhancement of spillovers, promoting healthy competition and capital accumulation. The minimum threshold of institutional quality is -0.604. (*see list of countries above and below the threshold in appendix, table A2*). The corresponding elasticity varies from country to country: the average estimate is 0.069% for Kenya, 0.0697% for south Africa, 0.0702% for Nigeria. The logistic slope function (*see appendix, figure 1A*) reveals that countries with level of institution close to the threshold would witness an increase in the elasticity of inclusive human development with respect to FDI from 0.063% to 0.093%. The cross-country time varying elasticity of FDI-inclusive human development under control of corruption threshold (*see full details in the appendix, figure 2C*) suggests that instability of the elasticity over the years. However, South Africa's elasticity was more volatility than Nigeria and Kenya. This study further uses political stability as alternative measure of institutional quality, and similar result is obtained (*see appendix, table A2*). The results show that FDI has positive and significant impact on inclusive human development at high level of political stability.

Since higher economic growth is not sufficient in facilitating the positive spillover of FDI, and following Ravallion and Datt, (2002) proposition that the convertibility of economic growth to human development depends on the level of infrastructure. It is in this spirit that this study further interacts economic growth with either institution or infrastructure, to see if the result would behave differently. The result suggests that when quality institution is combined with economic growth, the impact of FDI on inclusive human development is positive even at low regime. Similar results are obtained when infrastructure is combined with economic growth. Though the impact of the duo are not significant at high level. There is cross country heterogeneity in the elasticity of FDI. for combination of infrastructure and income, : the average estimate is 0.0587% for Kenya, 0.0604% for south Africa, 0.0638% for Nigeria. While there is homogeneity in the country level estimates of the combination of quality institution and income estimate. The average elasticity is 0.063% for (*Nigeria, Kenya, and South Africa*). The time varying elasticity of individual countries are obtained in the appendix (*see full details in the appendix, figure 2D &E*).

5.0 Summary and Conclusion

This study examines how SSA countries can leverage on the potency of FDI in enhancing speedy recovery of their economies post COVID-19. In achieving this, the study examines the impact of FDI on inclusive human development conditional on level of infrastructure, institution quality, and

economic growth. Using PSTR model, there is enough evidence to prove that the impact of FDI on inclusive human development is non-linear i.e. the impact of FDI in improving the distribution of welfare in SSA is conditional on some intermediate variables. The welfare-enhancing effect of FDI is only feasible for countries that have reached a certain level of infrastructure and institutional quality threshold. This implies that the more host nations improve their level of infrastructure and institutions, the more they reap the benefit of FDI in terms of job creation, technological spillovers. Empirical estimation of the growth channel suggests that SSA countries did not obtain anticipated impact of FDI as their economies grow. This means that welfare benefit of economic growth has not been achieved in the region, albeit a jobless growth. However, when economic growth is combined with either quality institution or infrastructure, SSA countries were able to explore the benefit of FDI. This suggests that attaining economy growth is necessary, but not a sufficient condition is exploiting the benefit from MNCs investment

Improved welfare distribution promised to be a critical driver of SSA development, the importance of access to education, health and income is evident as the region continues to witness booming population and increased urbanization. The impact of the COVID-19 is anticipated to take a massive toll on human development, particularly in SSA. It is important to know that SSA countries can leverage on foreign direct investment as a tool for improving human development and welfare distribution. This can be done if they are able to give more attention to their local economic conditions, which include improving their economy, strengthening their institution, and reducing infrastructure deficit. Beyond putting in place promotional policies to attract MNCs. This study recommends that SSA governments should further liberalize securitize and private critical sectors, such as infrastructure. It is also important to embark on public sector reform, as investment would not thrive when level of corruption or political instability is high. Doing this would enable healthy competition for private investment to prosper, and as such reap the benefit of FDI, inspite of the economic challenges COVID-19 presents.

Notes:

1. Future studies can consider other policy channels for enhancing the impact of FDI on welfare distribution.

2. Though, the PSTR model can address both time variability issues and cross- country heterogeneity biases. However, country-specific studies are important for more targeted policy implications.
3. The author calculated the average of location and slope parameters, when either $m > 1$ or $r > 1$.

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Appendix

Table A1.0 : LMF Tests for Remaining Nonlinearity

Model	Inclusive Human Development Index Model			
Threshold Variable(s)	Infrastructure (*Access to Electricity*)		Institutional Quality (*Political Stability*)	
No. of Location Parameters	$m = 1$	$m = 2$	$m = 1$	$m = 2$
$H_0: r = 0$ vs $H_0: r = 1$	2.698 (0.022)	3.147 (0.001)	1.711 (0.133)	5.728 (0.000)
$H_0: r = 1$ vs $H_0: r = 2$	3.432 (0.005)	3.129* (0.001)	-	3.608* (0.000)
$H_0: r = 2$ vs $H_0: r = 3$	-	-		1.354 (0.204)
Model	Inclusive Human Development Index Model			
Threshold Variable(s)	Infrastructure (*Access to Electricity*)		Institutional Quality (*Political Stability*)	
Number of Location Parameters	$m = 1$	$m = 2$	$m = 1$	$m = 2$
Optimal Number of Transition Functions $r * (m)$	1	2	1	2
Residual Sum of Squares	0.426	0.346	0.678	0.491
AIC Criterion	-7.216	-7.379	-6.752	-7.029
Schwarz Criterion	-7.130	-7.229	-6.666	-6.879

Notes: The optimal location parameters for each model in the transitions functions is determined according to a sequential procedure based on LM_F statistics of non-remaining nonlinearity. Thus, for each value of m, the corresponding optimal number of threshold r*(m) is determined.

Table A1.1: Robustness check on alternative measure of institutional quality and infrastructure

Specification	Inclusive Human Development Model	
Threshold Variable(s)	Quality of Institution *(Political stability)*	Infrastructure (*Access to Electricity*)
(m, r^*)	$(2, 2)$	$(2, 2)$
Parameters $\psi_0 = (\alpha_0, \beta_0, \theta_0, \eta_0)$		
Foreign Direct Investment α_0	-0.0000***	-0.0003
	(-5.8754)	(-1.5779)
Population Growth β_0	-0.0008***	0.1173***
	(-3.3249)	(5.0381)
Credit to Private sector θ_0	0.0001***	0.0016
	(5.1766)	(1.3674)
Parameters $\psi_1 = (\alpha_1, \beta_1, \theta_1, \eta_1)$		
Foreign Direct Investment α_1	0.0512***	0.0002***
	(5.8517)	(1.8246)
Population Growth β_1	0.3118**	-0.0687
	(1.0104)	(-8.9447)
Credit to Private Sector θ_1	-0.0943***	0.0018***
	(-5.2063)	(2.0029)
Parameters $\psi_2 = (\alpha_2, \beta_2, \theta_2, \eta_2)$		
Foreign Direct Investment α_2	-0.0511***	0.0005***
	(-5.8515)	(3.4582)
Population β_2	-0.3110***	-0.1124**
	(-1.0086)	(-5.2448)
Credit to Private Sector θ_2	0.0942	-0.0016***
	(5.2063)	(-5.9339)
Location Parameters c_j		
First Transition Fn.	[-0.2551; -0.3298]	[15.7093; 32.0861]
Second Transition Fn.	[-0.3390; -0.2459]	[41.4738; 62.5737]
Slopes Parameters γ_j	[1.6434; 1.6446]	[349.2100;32.3020]
Number of Countries	28	28

*** denotes significance at 1 %, ** at 5 % and * at 10%. Test statistics in parenthesis are corrected for heteroskedasticity. For each model and each value of m the number of transition functions r is determined by a sequential testing procedure (see Table A1.1). The PSTR parameters cannot be directly interpreted as elasticities. The coefficient of Initial inclusive human development and threshold variables for each model are available on request.

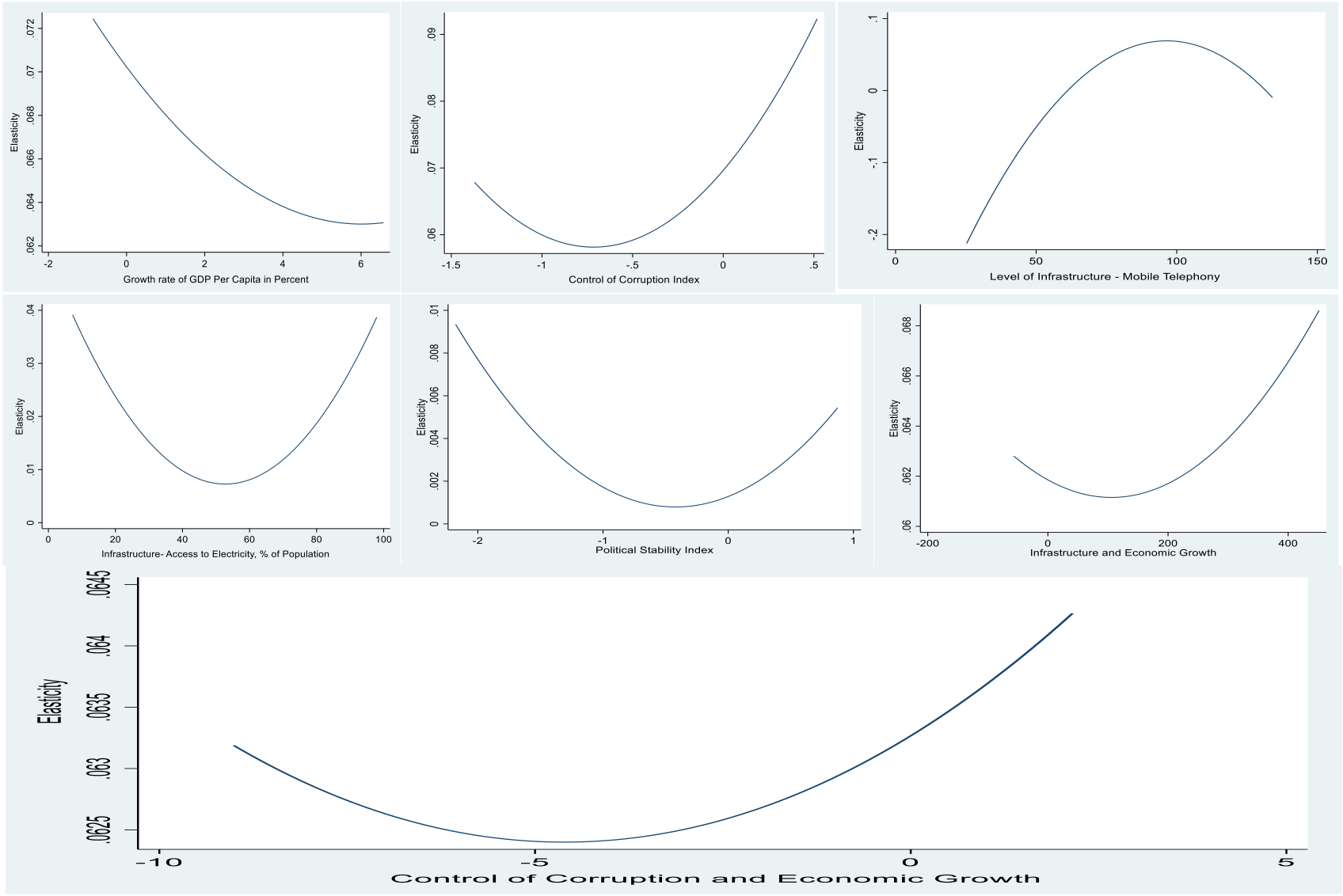
Table A2: Country-level Elasticity of FDI-Inclusive human Development

Threshold Variable(s)	PCI	COC	PS	MT	AC	PCI*MT	PCI*COC
Angola	0.0745	0.0569	0.0699	0.0362	0.0216	0.0638	0.0636
	(0.0142)	(0.0047)	(0.0071)	(0.0000)	(0.0199)	(0.0081)	(0.0000)
Benin	0.0722	0.0561	0.2198	0.0362	0.0318	0.0604	0.0636
	(0.0138)	(0.0036)	(0.0509)	(0.0000)	(0.0055)	(0.0068)	(0.0000)
Bukina Faso	0.0650	0.0525	0.0950	-0.0162	0.0262	0.0587	0.0636
	(0.0074)	(0.0007)	(0.0339)	(0.1573)	(0.0088)	(0.0051)	(0.0000)
Burundi	0.0691	0.0674	0.5148	-0.2257	0.0336	0.0621	0.0617
	(0.0138)	(0.0072)	(0.3091)	(0.2489)	(0.0000)	(0.0077)	(0.0046)
Cameroon	0.0652	0.0701	0.0784	0.0362	-0.0122	0.0570	0.0636

	(0.0100)	(0.0019)	(0.0083)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
CAR	0.0628	0.0684	0.8036	-0.3826	0.0225	0.0587	0.0636
	(0.0092)	(0.0033)	(0.1064)	(0.1539)	(0.0083)	(0.0051)	(0.0000)
Congo Dem.	0.0686	0.0579	0.9177	-0.1200	0.0281	0.0587	0.0636
	(0.0126)	(0.0046)	(0.0332)	(0.2367)	(0.0083)	(0.0051)	(0.0000)
Congo Republic	0.0708	0.0691	0.0688	0.0362	-0.0020	0.0655	0.0620
	(0.0110)	(0.0036)	(0.0056)	(0.0000)	(0.0202)	(0.0081)	(0.0043)
Cote Divore	0.0601	0.0607	0.1538	0.0362	0.0031	0.0689	0.0636
	(0.0108)	(0.0086)	(0.1156)	(0.0000)	(0.0229)	(0.0068)	(0.0000)
Gabon	0.0733	0.0613	0.2115	0.0362	0.0336	0.0655	0.0636
	(0.0141)	(0.0051)	(0.0587)	(0.0000)	(0.0000)	(0.0081)	(0.0000)
Gambia	0.0694	0.0565	0.1490	0.0362	-0.0122	0.0621	0.0636
	(0.0138)	(0.0030)	(0.0438)	(0.0000)	(0.0000)	(0.0077)	(0.0000)
Ghana	0.0624	0.0556	0.1730	0.0362	0.0285	0.0655	0.0636
	(0.0105)	(0.0044)	(0.0379)	(0.0000)	(0.0153)	(0.0081)	(0.0000)
Kenya	0.0619	0.0694	0.1408	0.0362	0.0197	0.0587	0.0636
	(0.0058)	(0.0021)	(0.0529)	(0.0000)	(0.0000)	(0.0051)	(0.0000)
Lesotho	0.0600	0.0811	0.1836	0.0363	0.0207	0.0638	0.0636
	(0.0118)	(0.0136)	(0.0974)	(0.0003)	(0.0073)	(0.0081)	(0.0000)
Liberia	0.0729	0.0562	0.0705	0.0373	0.0281	0.0638	0.0636
	(0.0151)	(0.0021)	(0.0093)	(0.0031)	(0.0083)	(0.0081)	(0.0000)
Mali	0.0700	0.0577	0.4634	0.0369	0.0211	0.0655	0.0636
	(0.0124)	(0.0027)	(0.2934)	(0.0020)	(0.0150)	(0.0081)	(0.0000)
Mauritania	0.0721	0.0606	0.0835	0.0362	0.0232	0.0655	0.0636
	(0.0150)	(0.0049)	(0.0081)	(0.0000)	(0.0173)	(0.0081)	(0.0000)
Mauritius	0.0620	0.0928	0.4350	0.0362	0.0336	0.0706	0.0636
	(0.0000)	(0.0004)	(0.1001)	(0.0000)	(0.0000)	(0.0051)	(0.0000)
Mozambique	0.0634	0.0567	0.1660	-0.0154	0.0188	0.0587	0.0636
	(0.0030)	(0.0049)	(0.1001)	(0.0000)	(0.0055)	(0.0051)	(0.0000)
Niger	0.0696	0.0555	0.1035	-0.0825	0.0266	0.0570	0.0636
	(0.0124)	(0.0007)	(0.0266)	(0.2049)	(0.0084)	(0.0000)	(0.0000)
Nigeria	0.0683	0.0702	0.8497	0.0362	-0.0122	0.0638	0.0636
	(0.0147)	(0.0024)	(0.0566)	(0.0000)	(0.0000)	(0.0081)	(0.0000)
Rwanda	0.0594	0.0915	0.1146	-0.0162	0.0262	0.0604	0.0636
	(0.0040)	(0.0047)	(0.0459)	(0.1573)	(0.0088)	(0.0068)	(0.0000)
Senegal	0.0713	0.0585	0.1048	0.0362	-0.0071	0.0655	0.0636
	(0.0132)	(0.0084)	(0.0276)	(0.0000)	(0.0153)	(0.0081)	(0.0000)
Siera Leone	0.0592	0.0638	0.1050	-0.0154	0.0244	0.0638	0.0636
	(0.0049)	(0.0050)	(0.0242)	(0.1576)	(0.0088)	(0.0081)	(0.0000)
South Africa	0.0761	0.0697	0.1257	0.0362	0.0336	0.0604	0.0636
	(0.0130)	(0.0148)	(0.0315)	(0.0000)	(0.0000)	(0.0068)	(0.0000)
Togo	0.0613	0.0657	0.0912	0.0363	0.0114	0.0570	0.0523
	(0.0020)	(0.0064)	(0.0156)	(0.0001)	(0.000)	(0.0000)	(0.0000)
Zambia	0.0645	0.0523	0.2546	0.0363	0.0207	0.0604	0.0636
	(0.0110)	(0.0005)	(0.0347)	(0.0003)	(0.0073)	(0.0068)	(0.0000)
Zimbabwe	0.0669	0.0585	0.0830	0.0365	0.0234	0.0655	0.0636
	(0.0141)	(0.0046)	(0.0068)	(0.0009)	(0.0202)	(0.0081)	(0.0000)

Notes: For each country, the average elasticity and standard deviation (in percentages) of the individual Inclusive human development elasticity are reported. PCI-Economic growth, COC-Control of corruption index, PS-Political stability index, MT-Mobile telephony, AC-Access to electricity, % of population, PCI*MT-combination of income and mobile telephony, PCI*COC-combination of income growth and control of corruption.

Figure 1A: Elasticity of inclusive human development with respect to FDI



Source: Authors' estimation from explicative elasticity

Table A3: List of Countries below and above the estimated threshold of each local economic condition variables

Economic Growth	Level of Infrastructure (Mobile Telephony)	Level of Infrastructure (Access to Electricity)	Quality of Institution (Control of Corruption)	Quality of Institution (Political Stability)
Angola	Benin	Cameroon	Benin	Benin
Benin	Cameroon	Congo Republic	Burkina Faso	Burkina Faso
Burkina Faso	Congo Republic	Cote Divoire	Gambia	Gabon
Cameroon	Cote Divoire	Gabon	Ghana	Gambia
Cote Divore	Gabon	Ghana	Lesotho	Ghana
Ghana	Gambia	Cote Divoire	Mauritania	Lesotho
Kenya	Ghana	Mauritius	Mauritius	Mauritius
Lesotho	Kenya	Nigeria	Mozambique	Mozambique
Liberia	Lesotho	Rwanda	Rwanda	South Africa
Mali	Mali	Senegal	Senegal	Zambia
Mauritania	Mauritania	South Africa	South Africa	
Mauritius	Mauritius		Zambia	Angola
Mozambique	Nigeria			Burundi
Niger	South Africa	Angola		Cameroon
Nigeria	Zambia	Benin	Angola	Central Africa Republic
Rwanda	Zimbabwe	Burkina Faso	Burundi	Congo Democratic Republic
Senegal		Burundi	Cameroon	Congo Republic
Siera leone	Angola	Central Africa Republic	Central Africa Republic	Cote Divoire
South Africa	Burkina Faso	Congo Democratic Republic	Congo Democratic Republic	Kenya
Togo	Burundi	Gambia	Congo Republic	Liberia
Zambia	Central Africa Republic	Kenya	Cote Divoire	Mali
	Congo Democratic Republic	Lesotho	Gabon	Mauritania
Burundi	Liberia	Liberia	Kenya	Niger
Central Africa Republic	Mozambique	Mali	Liberia	Nigeria
Congo Democratic Republic	Niger	Mauritania	Mali	Rwanda
Congo Republic	Rwanda	Mozambique	Nigeria	Senegal
Gabon	Senegal	Niger	Niger	Siera Leone
Gambia	Siera leone	Togo	Siera Leone	Togo
Liberia	Togo	Zambia	Togo	Zimbabwe
Zimbabwe		Zimbabwe	Zimbabwe	

Source: Authors' calculation from the PSTR estimation. Note: average of the threshold variables was calculated from 1997 till date to determine
The index of control of corruption and political stability range from -2.5(very poor) to +2.5(very good). The countries above the line indicate are countries above the estimated threshold, while those below are countries below the threshold.

Figure 2A: Estimated Time Varying parameters of Individual Countries- Economic Growth

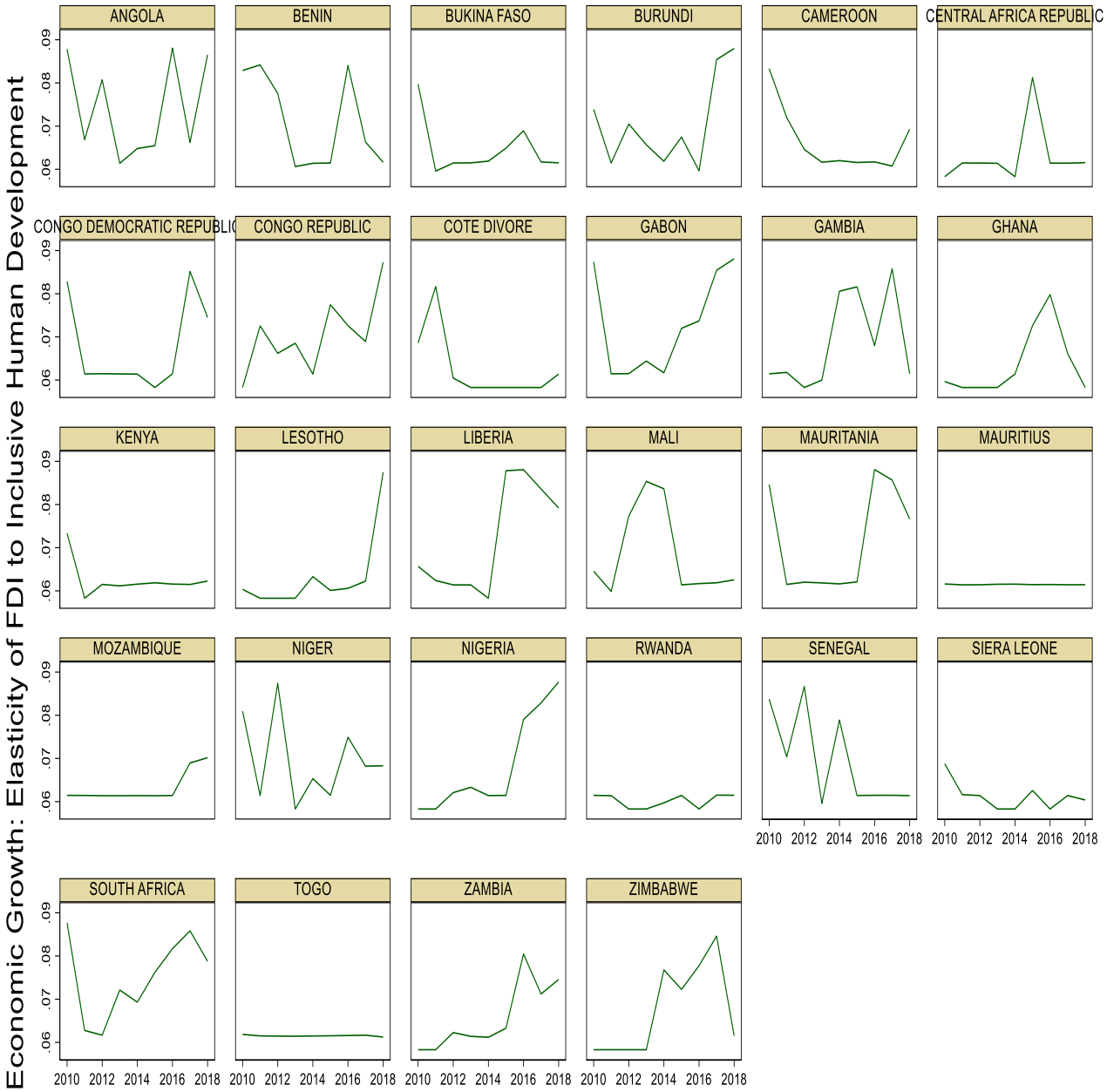


Figure 2B: Estimated Time Varying parameters of Individual Countries- Control of Corruption

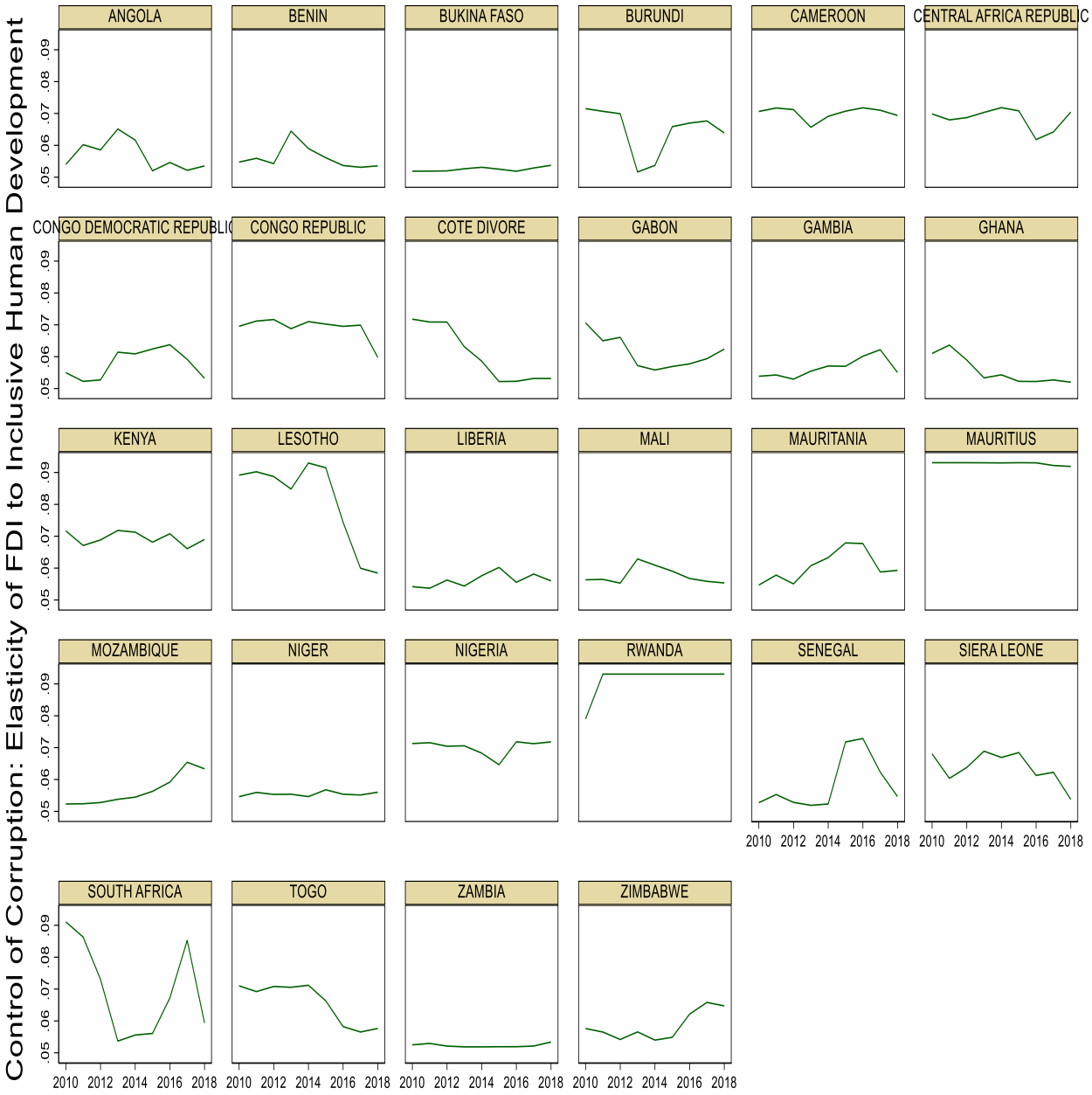


Figure 2C: Estimated Time Varying parameters of Individual Countries- Mobile Telephony

Figure 2D: Estimated Time Varying parameters of Individual Countries- Economic Growth & Infrastructure

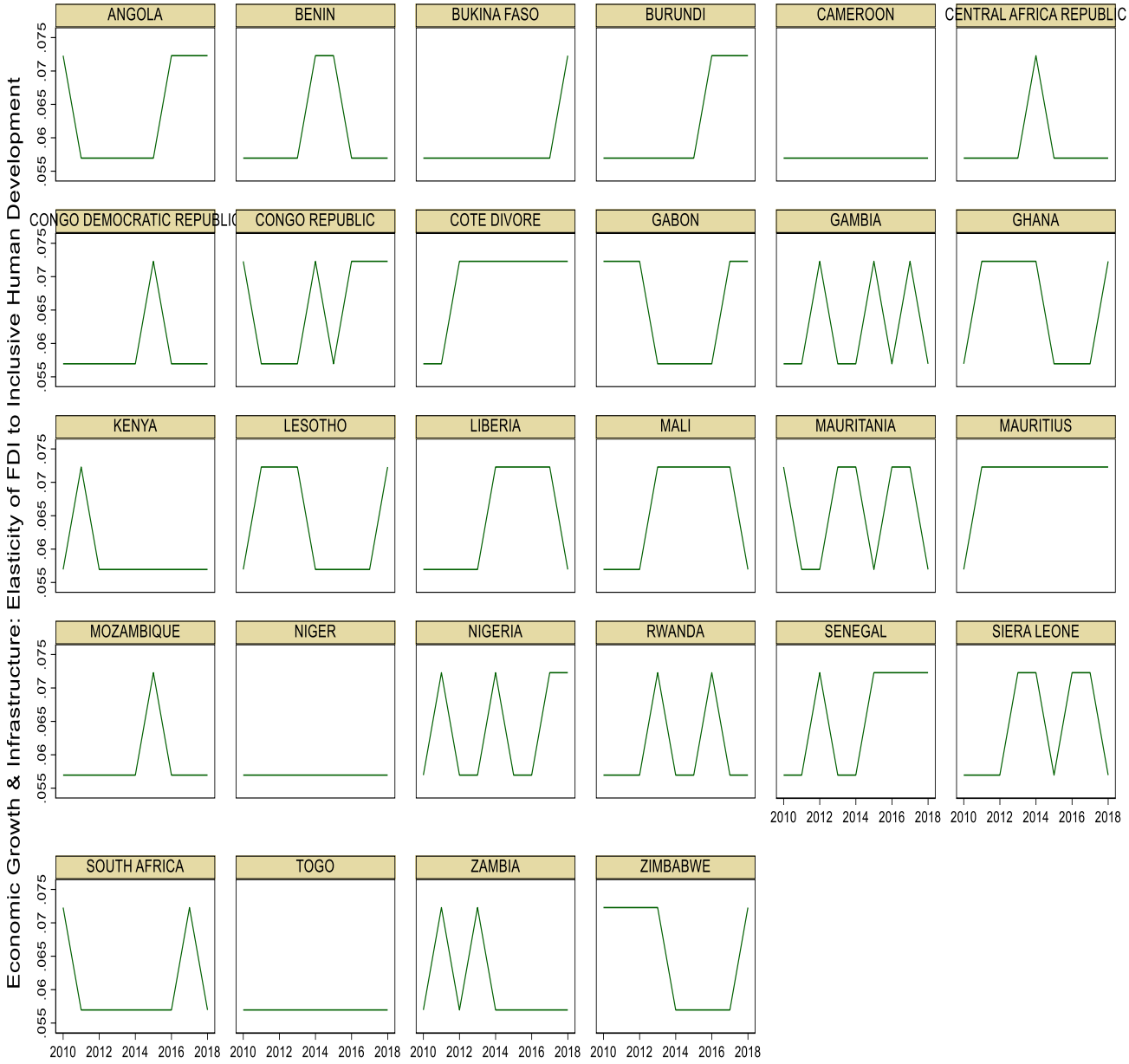


Figure 2E: Estimated Time Varying parameters of Individual Countries- Economic Growth & Control of Corruption