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Foreign Direct Investment and Inclusive Human Development in Sub-Saharan African Countries: Does local Economic Conditions Matter?

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Abstract

The controversies that trails whether FDI's impact is conditional on certain intermediating variables or not, has become a recurring discourse in the FDI-welfare literature. While the quality of institution has prominently featured as playing a vital role on the one hand, infrastructure level and economic growth have also been highlighted as good candidates on the other hand. This study examines the necessary local economic conditions required for the existence of positive spillovers from multinationals' investment in improving inclusive human development. In achieving this, a panel 28 SSA countries from 1996-2018 was explored using panel smooth transition regression model (PSTR). The results support the view that institutional quality and infrastructure are germane in enhancing 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: Inclusive Human Development, Foreign Direct Investment, Local Economic conditions, Panel Smoothening Transition Regression Model and Sub-Saharan African Countries

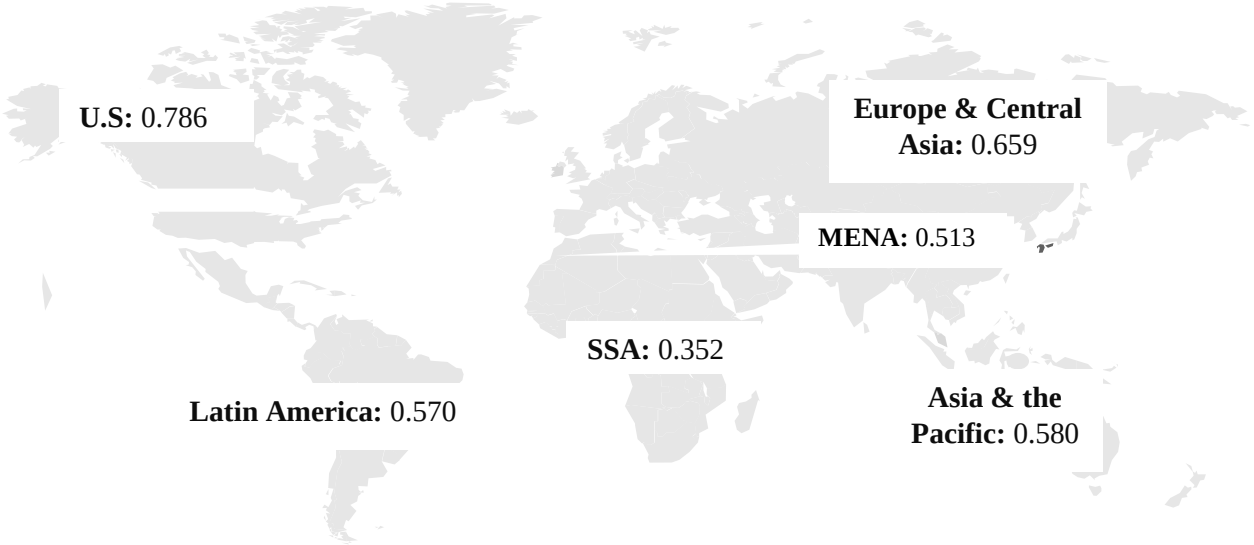
1. Introduction

The importance of foreign direct investment (FDI) to developing economies in augmenting domestic savings for investment cannot be exaggerated. This is especially the case of Sub-Saharan Africa (SSA) countries with high poverty incidence - about 42.3 percent of people living under $1.90 a day as at 2015, the ratio increases to 67.5 percent at $3.20 a day (World Bank, WDI 2016). This indicates a very low domestic capacity to mobilize savings for investment. In achieving sustainable economic development, these countries need other external sources of capital to augment domestic savings. This has hastened countries in the SSA to adopt series of FDI-friendly policies, some of which include the 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). The effect of this has substantially increased FDI to the region in the last decades,

from an average of $36.03 billion in 1990 to $610.54 billion in 2018 (UNCTAD, 2019). However, despite the improvement in foreign investment, the region only witnessed marginal improvement in inclusive human development[1]. Furthermore, inclusive human development in the region is the lowest when compared to other regions (Figure 1). This index is also below world average[2] (UNDP, 2019). The question is why has the rise in the flow of FDI not been able to significantly improve the distribution of welfare in the region?, and can it be that SSA economies don't have the necessary local economic conditions in exploring the benefit FDI can offer.

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. While Maku and Ajike (2015); Hussen (2015); Soumare (2015) support the direct channel of FDI-led human development hypothesis. Kaulihowa (2017); Lehnert et al., (2013); Pérez (2015); Herzer et al., (2015); Reiter and Steensma, (2010) argue that the impact of FDI is either nonlinear or conditional on host economies. The only literatures linking FDI with inclusive human development are Cao et al., (2017); Leke and Asongu, (2017); Asongu et al., (2019). These studies were either done out of the context of SSA or did not consider the role of local economic conditions on FDI-inclusive human development nexus.

FIGURE 1: GLOBAL PICTURE OF INCLUSIVE HUMAN DEVELOPMENT[3]



Source: UNDP, 2019

This study differs from previous empirical enquiry as it succinctly identifies the degree at which the conditions of the local economy[4] can facilitate the benefit FDI can offer. Conducting this study for the region is critical for the following reasons: (i) the region is plagued with poor welfare

[1]The inequality adjusted human development index moved from 0.323 in 2010 to 0.376 in 2018
[2] SSA's Inequality human development index's average from 2010 till date is 0.352, while world average is 0.559
[3] Average inequality adjusted human development index from 2010-2018
[4] Local economic conditions in this study includes, quality of institutions, level of infrastructure and economic growth

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

The rest of this paper is structured as follows. Section 2 briefly discusses the related literature on FDI and inclusive human development. The discussion on the methodology and the estimation techniques is presented in section 3. Section 4 presents and discusses the empirical estimation, whilst section 5 concludes and provides the key policy implication.

2. Literature review

The theoretical foundation on the importance of external capital flows in augmenting domestic capital can be linked to the two-gap model of Chenery and Stout (1966). This model argues that external finance can play a critical role in augmenting domestic resources in order to mitigate savings or foreign exchange bottlenecks. The two-gap model argues that most developing economies, especially in Africa are plagued with either insufficient domestic savings in driving investment or inadequate foreign exchange in financing capital and intermediate goods import. The implication of the model is that one of the two gaps will be "binding" at a given point in time for any developing economy. If for instance, growth is constrained by domestic investment, it indicates that the savings gap is dominant. Hence foreign savings may be used to support inadequate domestic savings. However, if the foreign exchange gap is binding, this indicates excess of import over export in financing investment, capital, and goods required for growth and development. In achieving the targeted growth and development, external finance, like FDI is therefore critical in overcoming either savings or the foreign exchange constraint. This two-gap model is mathematized in equation (1):

$$E - Y \equiv I - S \equiv M - X \equiv F \tag{1}$$

Where E is national expenditure, Y is national output and income, I is investment, S is savings, M is import, X is export, and F represents external finance. When the aggregate expenditure E is more than aggregate output Y, then the economic needs external source of finance F in order to meet up with income shortage. The disequilibrium in national income could be from saving gap $(I - S)$ or foreign exchange gap $(M - X)$.

2.1. Theoretical framework of local economic conditions and FDI- welfare nexus

It has generally been argued from empirical enquiry that with the suitable host-country policies and basic level of economic development, benefits that might accrue from FDI include creation of employment, human capital development through training of employee by Multinational corporations (MNCs), increased tax revenues from MNCs' profit, and creation of a more competitive business environment (Tambunan, 2005). The following section evaluates the theoretical underpinning of economic growth, institutional quality and infrastructure in defining the FDI-inclusive human development nexus.

2.1.1. Growth Channel

The growth channel of FDI spillover on welfare is explained within the framework of neoclassical or endogenous growth theory. The theory argues that an increase in productivity and economic growth will improve welfare. The proponents of this view posit that a rise in national income has the tendency of benefitting the poorest population, especially for countries with low income inequality (Solow, 1956; Koopmans, 1965; Lucas, 1988; Romer, 1990). According to Tambunan, (2005), the degree and nature of the welfare impact of FDI through economic growth depends on the number of jobs this growth has created in host countries. The employment impact of FDI is categorized into direct (number of jobs created from the establishment of the multinational corporations) and indirect effects (backward and forward production linkages with domestic industries and other sectors). Some studies (Klein *et al*, 2000; Borenzstein *et al* 1998) also argue that the welfare impact of FDI depends on diffusion of new technologies, innovations, and knowledge. The diffusion of all these technologies will increase productivity, efficiency, income per worker, and hence improves poverty reduction and welfare.

2.1.2. Institutional Channel

The institutional channel of the FDI-welfare nexus can be summarized in to three. The first channel is through knowledge spillovers. This spillover occurs through competition, mobility of skilled labour, and imitation of technology demonstrated by the MNCs (Crespo & Fontoura, 2007). Healthy competition can be promoted between domestic and foreign firms when there is sound institution like the rule of law, efficient good government, regulatory quality, and low level of corruption. The second channel through which sound institutions influence the FDI-welfare nexus is by enhancing competition. Foreign investment increases competition, which leads to innovation and efficiency in the industry (Driffield and Love 2007). Brahim and Rachdi (2014) also argued that quality institution gives incentives for competition in the market, as well as knowledge spillovers. The third channel is through accumulation of capital. While some studies (Rye 2016; Arabyat 2017; Gohou & Soumare 2012; Quiñonez et al. 2018) argue that FDI has a crowd out effect, as it has no significant impact on welfare. Others have argued that sound institutional quality would attract foreign investors as well as capital accumulation.

2.1.3. Infrastructure Channel

The theoretical linkage of infrastructure[5] channel is traced to the General Theory of Employment Interest and Money by John Maynard Keynes in 1936. The theory argues that when an economy is characterized with depression and market failure, high public expenditure is critical in adjusting the economy back to high levels of employment. This implies that high public investment in infrastructure is anticipated to increase national income, employment, and the welfare of people. According to Jahan and Mcleery (2005), the impact of infrastructure can be structured in supply and demand side impact. Infrastructure development improves the supply side of the economy through reducing of cost incurred by MNCs, improves the business climate, and makes room for better access to market opportunities. These supply-side increase employment, total factor productivity and FDI spillovers on the economy. The demand-side effect of infrastructure

[5] Infrastructure can be divided in to social (school and health) and economic (energy, water, transport, and digital communication)

development occurs when new jobs and income are generated from the implementation of new projects- such as road construction, water, electricity etc.

2.2. Empirical Review

Much of this section relies on the nexus between FDI and human development as there is scanty literature on FDI–inclusive human development nexus. 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 include (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 suggest 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 a sample of 44 African and 33 Latin American countries. 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 1990-2011, 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 a sample of 175 countries, Lehnert et, al (2013) examined the role governance on the relationship between FDI and human development. Estimates from the study reveal 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 FDI improves human development 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) examine 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) examine 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 that external flows must reach a critical threshold in order to have positive impact on inclusive human development

In light of the foregoing, this study's contribution to the existing stock of literature stems from the following: first, to understand the framework which FDI can be used as a tool for improving welfare distribution in the region. Second, estimate the local economic conditions threshold for FDI to be beneficial in improving inclusive human development in the region. Third, the author is not aware of any literature that has specifically examined the impact of local economic condition on FDI-inclusive human development nexus. The closest attempt is that of Asongu et. al, (2019), and this study examined external capital flow threshold on inclusive human development. Fourth, the use of regime switching model is another appeal of this study, as the model can address cross country heterogeneity, endogeneity, and time variability issues. Since the identification of minimum threshold has policy relevance, a new study with an improved methodology is timely. This present study uses countries in SSA to capture the unique characteristics of the region and suggest regional specific policy interventions.

3. 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).

$$IHDI_{it} = \beta_0 FDI_{it} + \beta_1 FDI_{it}\, g(q_{it}\,;\gamma, c) + \varphi_0 X_{it} + \varphi_1 X_{it} g(q_{it}\,;\gamma, c) + \mu_i + \varepsilon_{it} \quad (2)$$

Despite assurance that the PSTR model endogenously analyse 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})[6]. $IHDI_{it}$ is the inequality adjusted human development index, and FDI_{it} is foreign direct investment for country i at time t. X_{it} is the vector of control variables often used in the welfare model, this includes population growth, credit to private sector, % of GDP, institutional quality and economic growth, μ_i is individual fixed effect, while ε_{it} is the well-behaved error term. $g(q_{it}\,;y, c)$ in equation 2 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 logistic functions.

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

$$g(q_{it};\gamma,c) = \frac{1}{1+exp[-\gamma(q_{it}-c)]} \quad (3)$$

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:

$$\frac{\partial IHDI_{it}}{\partial FDI_{it}} = \beta_0 + \beta_1 \times g(q_{it};\gamma,c) \quad (4)$$

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: $LM_f = (SSR_0 - SSR_1)/[SSR_0/(TN - N - K)]$ (5)

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[7], 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[8] (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) and 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). Following Fouquau et al. (2008), we include the threshold variables as explanatory variable in the model. This is to avoid erroneous switching.

4. Empirical results and Discussions

4.1. Descriptive Analysis

This section discusses descriptive statistics of the variables used in the model over the period of 1996-2018. Among the statistics examined 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

[7]**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.

[8] 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.

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 show that the average value of inequality adjusted human development index, from 1996 to 2018, and across the 28 countries stood at 0.459. The maximum value of this index is 0.690, while the minimum is 0.198. The average value of FDI inward stock in the review period was $9.01 billion. The minimum value is an outflow of $316.49 million, while the maximum value in the review period is $179.56 billion. 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 value 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*	2.777	2.130	3.446*
	(0.002)	(0.003)	(0.063)	(0.000)
$H_0: r = 1$ vs $H_0: r = 2$	1.929	2.677	1.884	1.969
	(0.091)	(0.004)	(0.098)	(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 adopts 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[9] of the null hypothesis of linearity in all the five models of inclusive human development. The result is in similitude with other test statistics[10] though not reported. This result suggests 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), and Reiter and 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

[9] 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.

[10] The results of other test statistics, which includes Wald and LRT tests are available on request

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.

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)[11] 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[12]. 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; Tochetto et., 2004; 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 is quite at variance from country to country: the average estimate is 0.062% for Kenya, 0.076% for South Africa, 0.068% for Nigeria. 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.

[11] 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

[12] This means countries whose economic growth is located close to the threshold, will quickly enhance the benefit of FDI in improving human development.

At high level of infrastructure, FDI has two opposite effect[13] 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 statistically significant when access to electricity is low, however as countries move to high level of electricity access, FDI has positive and statistically significant impact on welfare distribution.

[13] 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

TABLE 4: FINAL PSTR ESTIMATES OF FDI AND INCLUSIVE HUMAN DEVELOPMENT IN SSA

Specification		Inclusive Human Development Model (IHDI)				
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

Source: Authors' computation using data from UNDP, WDI, UNCTAD and WGI. *** denotes significance at 1 %, ** at 5 % and * at 10%. Test statistics in parenthesis are corrected for heteroskedasticity. The optimal transition function r is determined by a sequential testing procedure (see Table 2) for each model. The coefficient of Initial IHDI and threshold variables for each model are not included in this table due to brevity, though available on request.

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), and Reiter and Steensma (2010) that countries with strong institutional quality have the potential of enhancing the benefits from FDI. 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 unstable 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. The results suggest a cross country heterogeneity in the elasticity of FDI for combination of infrastructure and economic growth. 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. Summary and Conclusion

This study examines how the effect of FDI on inclusive human development varies across SSA countries depending on their level of infrastructure, institution, and economic growth. Using PSTR model, there is enough evidence to prove that the impact of FDI on inclusive human development is non-linear. 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. Recent trajectory of human development in SSA offers hope that there is improvement, however, there is much work still to be done. The UNDP 2019 report suggests that 32% of SSA's human development is lost due to inequality, suggesting that unequal distribution of access to education, health and basic services are major impediments to achieving universal human development. It is important to know that SSA countries can leverage on foreign direct investment as a tool for improving 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.

This study recommends that SSA governments should further liberalize 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. SSA Countries can also learn from the success story of Singapore. The country which was an undeveloped country in the 1960s is now one of the fastest-growing economies in the world. A country with few natural resources was able to achieve this feat by embracing globalization, free-market capitalism, huge investment in education, and pragmatic policies.

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.

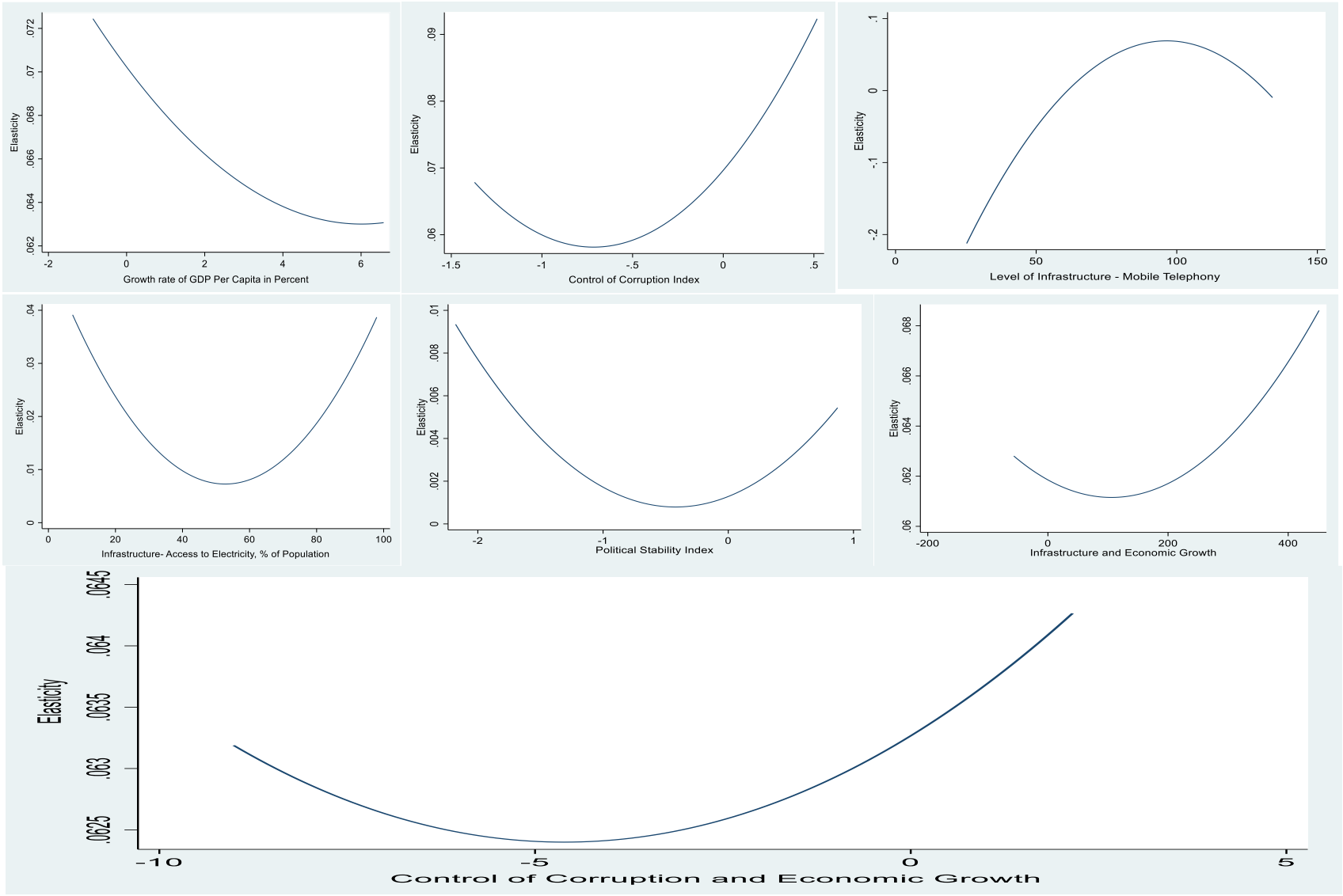
TABLE A2: COUNTRY-LEVEL ELASTICITY OF FDI-INCLUSIVE HUMAN DEVELOPMENT

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

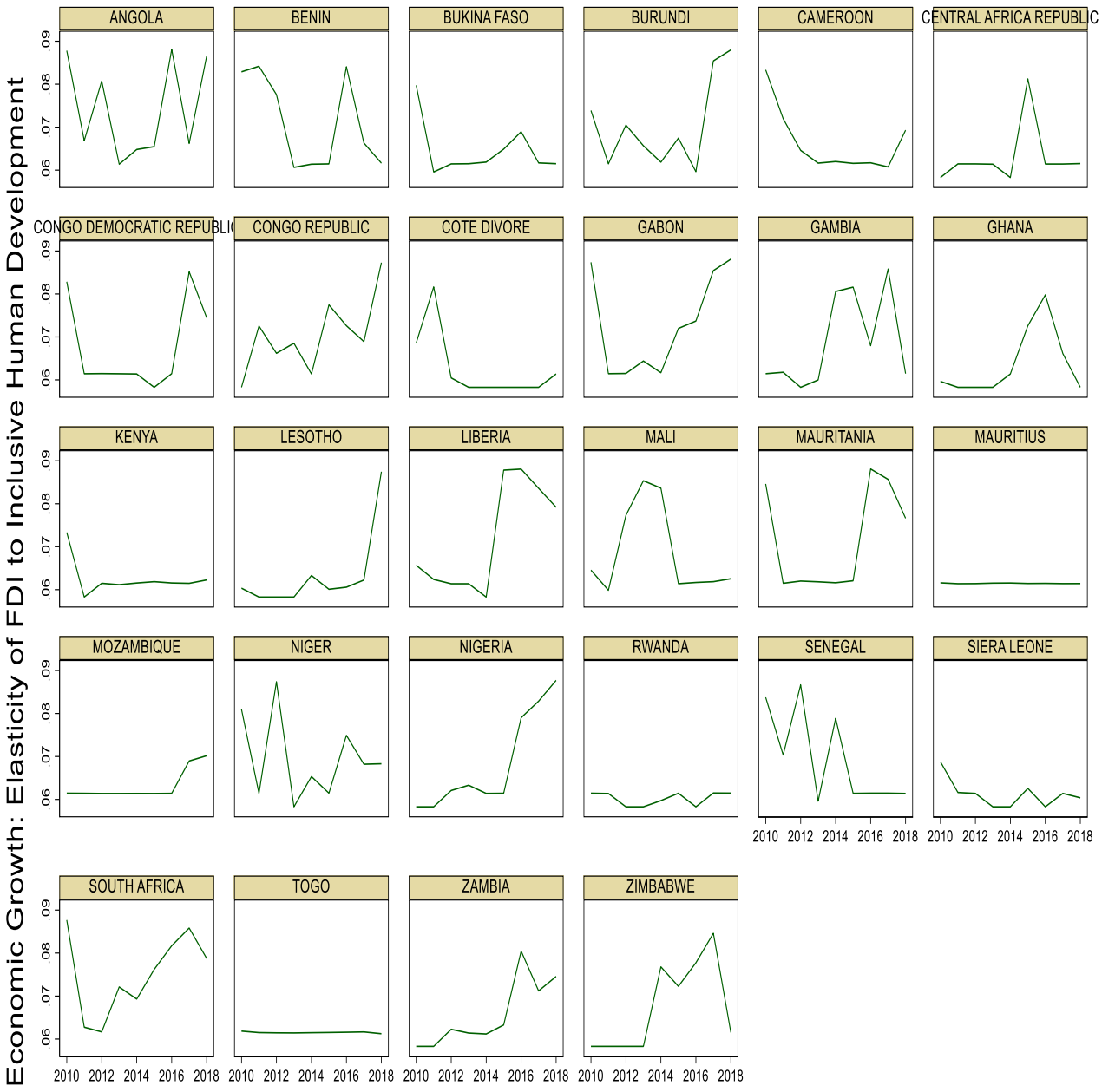


FIGURE 2B: ESTIMATED TIME VARYING PARAMETERS OF INDIVIDUAL COUNTRIES- CONTROL OF CORRUPTION

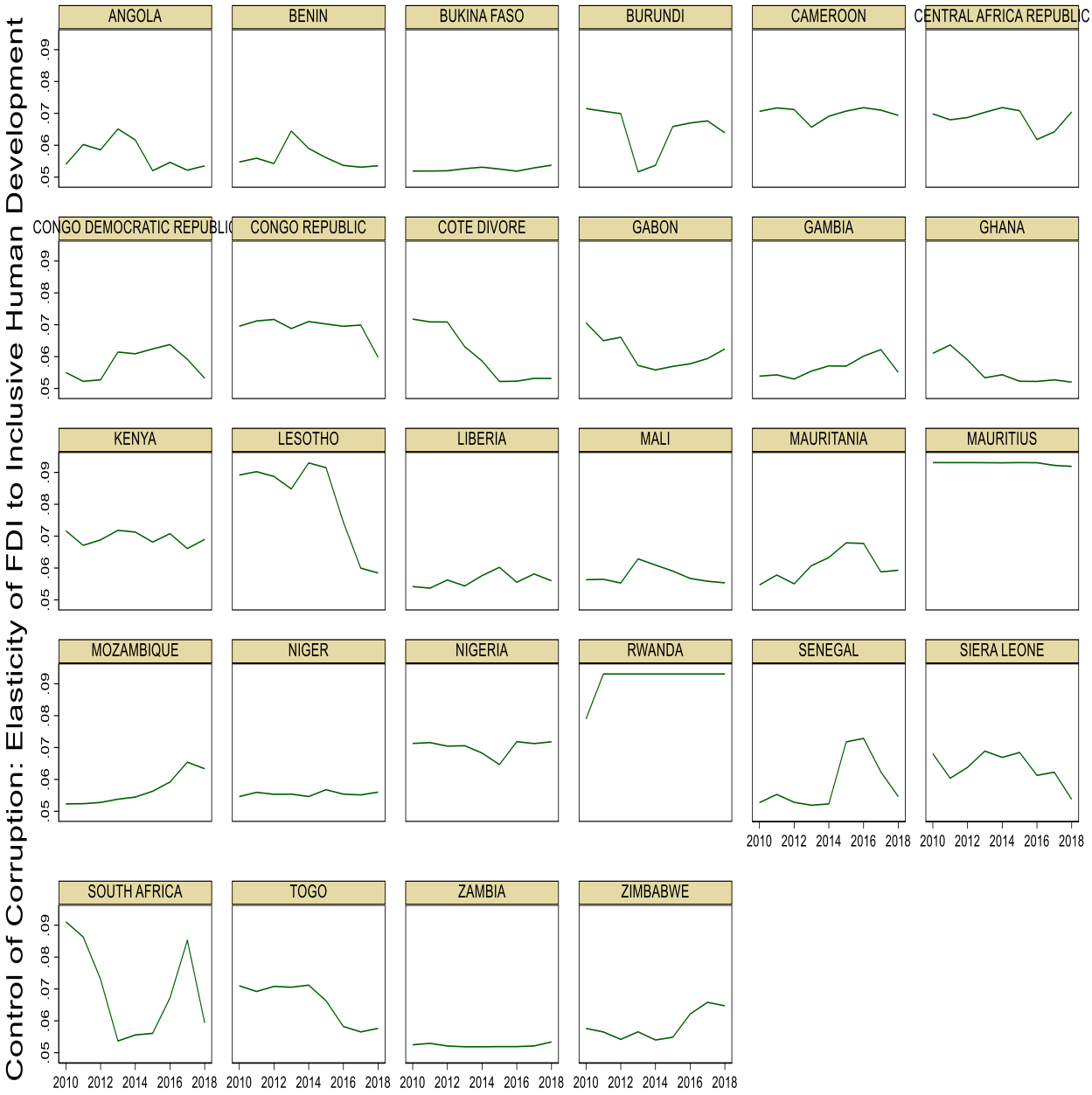


FIGURE 2C: ESTIMATED TIME VARYING PARAMETERS OF INDIVIDUAL COUNTRIES- MOBILE TELEPHONY

FIGURE 2D: ESTIMATED TIME VARYING PARAMETERS OF INDIVIDUAL COUNTRIES- ECONOMIC GROWTH & INFRASTRUCTURE

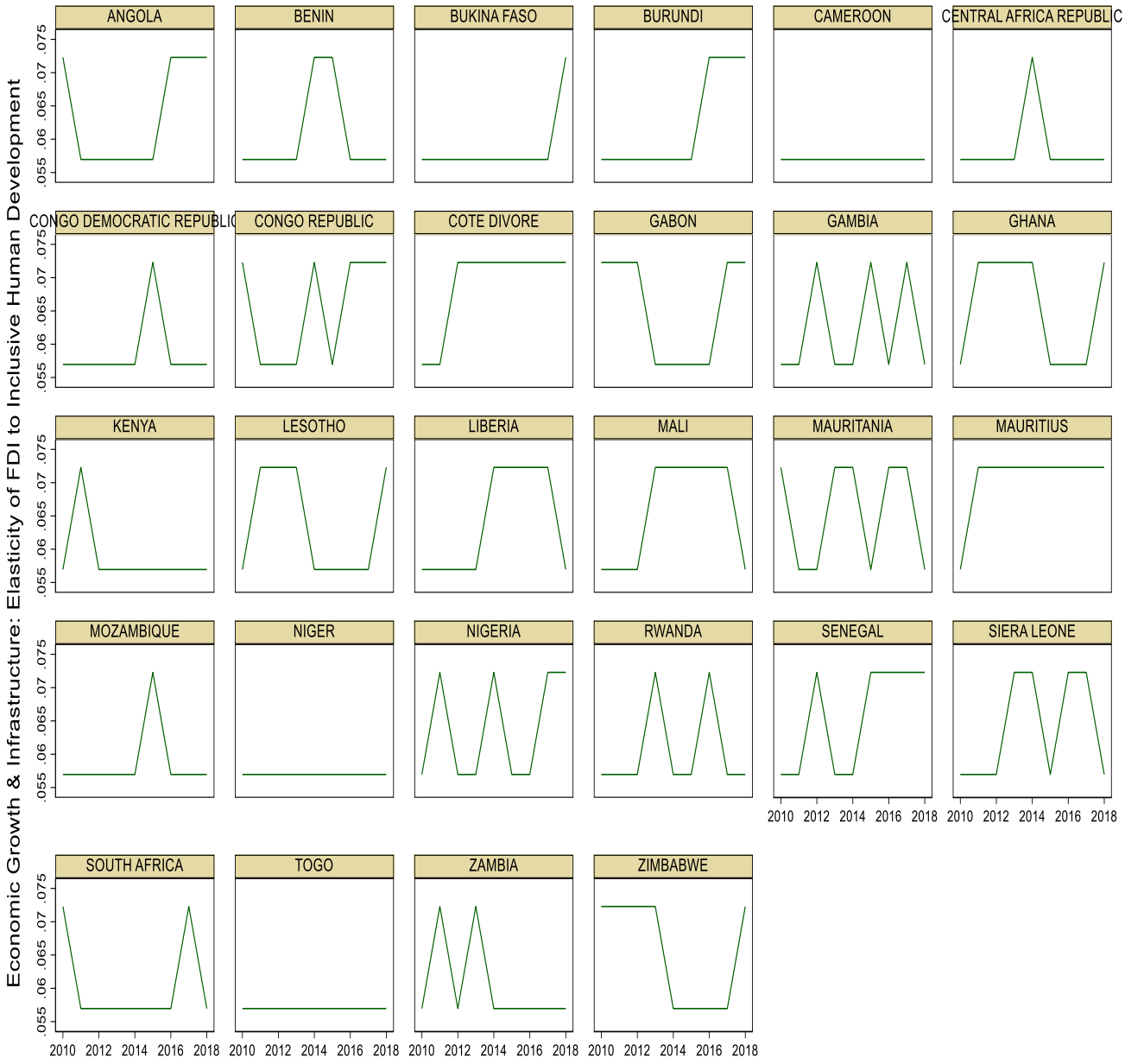


FIGURE 2E: ESTIMATED TIME VARYING PARAMETERS OF INDIVIDUAL COUNTRIES-ECONOMIC GROWTH & CONTROL OF CORRUPTION