IMPACT OF FOREIGN DIRECT INVESTMENT ON TOTAL FACTOR PRODUCTIVITY IN SELECTED AFRICAN COUNTRIES

By Tumiso Maitisa

INTRODUCTION AND BACKGROUND

1 Literature on the impact of FDI on TFP is scanty.

2 Study account for non-linear interactions in the analysis for Africa

We consider the influence of human capital, infrastructure and governance

3 What is the impact of FDI on TFP in Africa?
What is the minimum threshold enabling conditions (i.e., human capital, infrastructure and governance

4

- FDI play a significant role as an economic enabler of globalization
  - FDI inflows form an integral part of Africa's strategy for economic development
  - Implementations of a number of incentives (tax holidays, tax exemptions, reduced interest rates on loans, and reduced prices on land or non-financial incentives)
- SSA countries were among the top performers in implementing reforms aimed at ease of doing business (The Independent Evaluation Group (2023)
- key component of Africa's development as embedded in the New Partnership for Africa's Development (NEPAD)
  - Agenda 2063 requires a significant increase in FDI over the next four decades

Cumulative FDI inflows growth Index 1996=100 (left) and Regional FDI as a percentage of GDP 1990-2021 (Right)
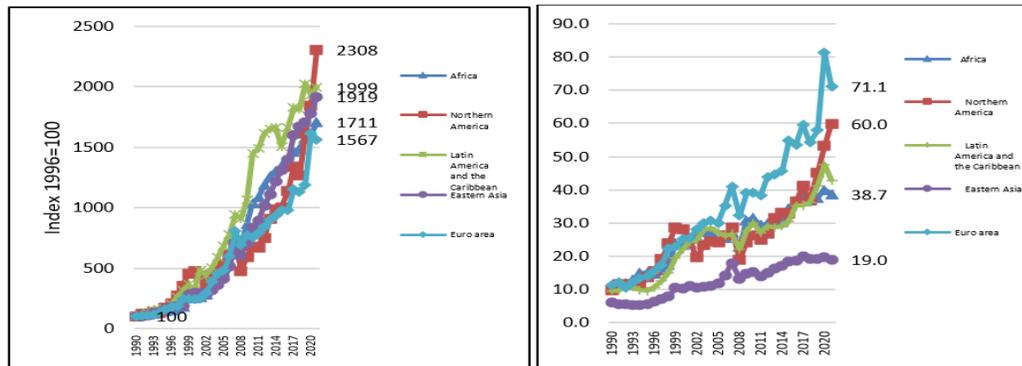
Source: UNCTAD, 2023

Inflows of FDI as a share of Gross capital formation, 2022
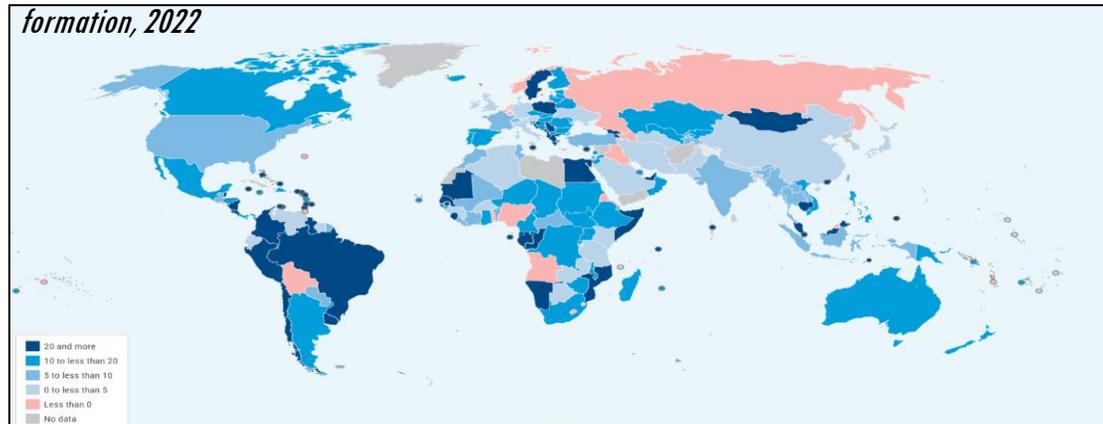
Source: UNCTAD, 2023

- TFP represents a key component of growth for several countries in the long run because TFP growth outshines other inputs' contribution towards aggregate growth irrespective of the kind of production function employed (Atesagaoglu et al., 2017)
  - TFP offers a comprehensive clarification on how the development gap between developed and developing countries could converge in the long run (Bekaert et., al 2011)
  - A number of factors can propel FDI to impact TFP growth (human capital, financial development, trade openness, institutional development, infrastructure, and investment inflows (Li and Tanna, 2019, Hu et al., 2021, Meressa, 2022)
- FDI is commonly presumed to positively influence local firms with efficiency, productivity, and competition which is transmitted through technology transfer, knowledge, skills, and effective competition (Chowdhury and Mavrotas, 2006; Farole and Winkler, 2014)
- Spillovers can at times not be harnessed by the host countries because of policy failure on FDI attraction and mechanisms at which FDI affect TFP
- Kenh and Wei (2023) highlight that for a host country to successfully harness the maximum benefits from FDI spillovers, it is dependent on the capacity of the host countries' enterprises to absorb these spillovers

① Prevailing Conditions

- Africa contains a significant portion of the world's most underdeveloped economies
  - Lowest adult literacy rates, human capital index scores, socioeconomic advancements, and infrastructure
- This market is estimated to encompass 1.38 billion people, with a gross domestic product valued at US$2.7 trillion in 2021 (World Bank, 2023)

② Inconclusive Literature

- Growth theories contends that FDI will boost growth in host nations through technology transfer and spillover effects (Ahmed and Kialashaki, 2023)
- It is far from clear from the literature whether these investments have helped to raise TFP in the host African countries
- What underlying factors determine the effectiveness of FDI in enhancing TFP in Africa?

③ Unclear Policy

- Over the past decades, developing and growing impoverished economies of African states has been a matter of serious debate and discussion among academia and policymakers
- Unclear key factors to aid in the development of African countries
  - reveals the underlying mechanisms of the relationship

④ Absorptive Capacities (Enablers)

- When absorptive capacities are improved, the host economy is more likely to draw higher quality FDI, which in turn contributes to the enabling environment capacity through training and on-the-job learning initiatives, the construction of roads, ICT networks, and other modern infrastructure undertaken by MNEs in host countries (see Sakka and Ghadi, 2023 for the case of Dubai, and Potter et al., 2023 for the case of Abu Dhabi)

⑤ Threshold model techniques

- An increase in prominence as a fresh method in analyzing FDI-Growth nexus (Ngundu & Ngepah, 2020 and Asafo-Agyei & Kodongo, 2022)
- Extends the range of threshold variables by incorporating a new crucial macroeconomic variable, namely the infrastructure index

⑥ Practical contributions

- *Helps decision-makers both in Africa and internationally to decide whether to promote more FDI for human development or not*
  - *This serves as a significant external source of knowledge and information for foreign partners as well as for the African continent*
  - *Enhances the comprehension of the effects of not-so-well-developed human capital, infrastructure, and governance on the FDI-TFP nexus*

THEORETICAL FRAMEWORK

| Theories	Description
Solow growth model	▪ **Solow (1956) growth** model introduced the measurement of the economic performance through TFP
Endogenous growth theory	▪ Proposed by Paul Romer in the 1980s. Innovation, investments in human capital, and R&D are variables that stimulate economic growth
Other theories of FDI and TFP spillovers	▪ **John Findlay in 1978-**Ideas of relative backwardness and technological 'contagion'-backward region can only learn the advanced multinational corporation's technology through imitation and also can be forced to 'try harder', relative backwardness can translate into more spillovers ▪ **Das (1987**)-suggests that the intensity and effectiveness of spillovers is dependent on the absorptive capacity of the host country ▪ **Wang and Blomström (1992)-**spillovers can occur through various channels, such as labour mobility, supplier linkages, competition and demonstration effects ▪ **Fosfuri (2001**)-Technology intensity of foreign firm's operations, the quality of local institutions, infrastructure and the degree of competition in the host country

Relationship between FDI and TFP (Theories)
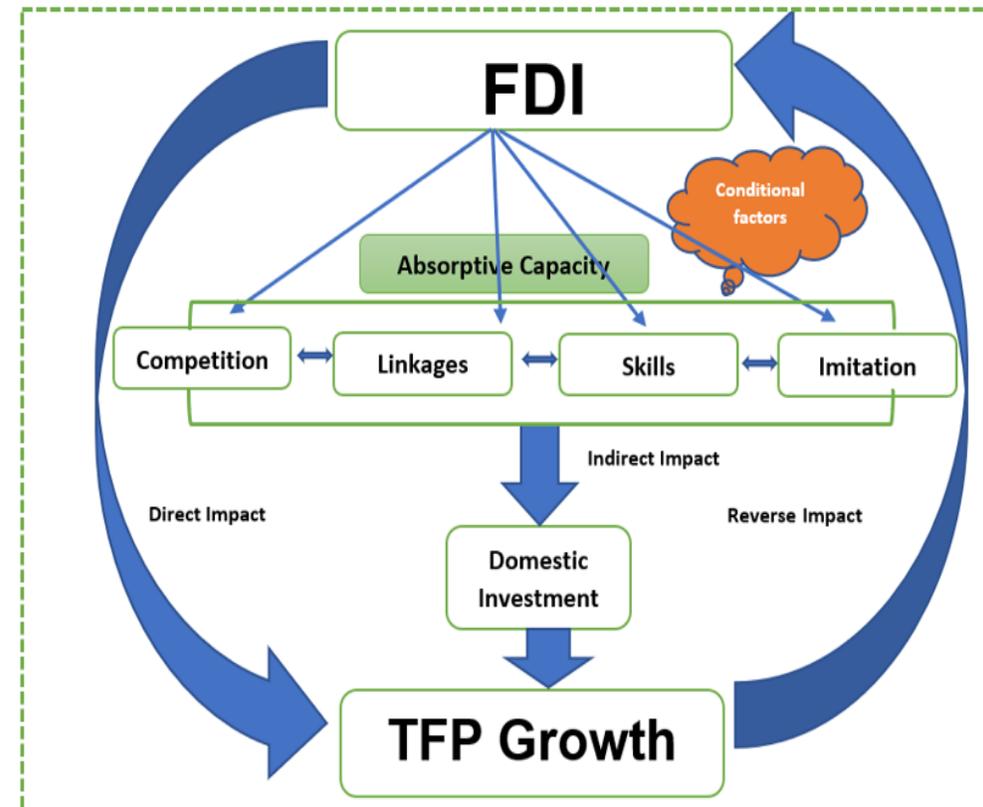
Source: Author

EMPIRICAL LITERATURE

| Theme	Description
Absorptive capacities and thresholds	▪ Scarcity of literature on FDI-TFP in Africa (see Malikane and Chitambara, 2018; Li and Tanna (2019); Okunade and Ajisafe, (2022); Kariuki and Kaburu (2022); Meniago and Lartey (2020) Zidouemba and Elikcha (2018) and Asongu and Odhiambo (2022) ▪ The empirical research seems to converge to the conclusion that the effect of FDI on economic growth is conditional on several local circumstances
Causal relationships	▪ Causation between FDI and TFP in Africa is minimal. for instance, Ng (2007), Senbeta (2008) and Meniago and Lartey (2021) ▪ (Seyoum et al, 2015; Ng, 2007; Seetanah and Khadaroo, 2007; Esso, 2010; Fedderke and Room, 2006; Frimpong and Oteng-Abayie, 2006) focused on GDP growth
Asymmetric effects	▪ There are hardly any empirical studies that looked at how FDI shocks, whether positive or negative, would impact TFP for Africa ▪ there aren't many country-level studies for Africa (i.e. Worku, 2023 for Ethiopia and Obiakor et al., 2022 for Nigeria) and one panel study focusing on SSA (i.e. Joshua et al., 2021) ▪ None of this studies focused on TFP but rather on GDP growth
Spatial spillover	▪ Studies on regional spillovers in the FDI-TFP nexus are not only few, but rarely exist for African countries ▪ Ouyang and Fu (2012), Hong and Sun (2011), Hu et al., (2021) and Chih et al., (2022) are close studies that analysed the spatial concentration of FDI in the growth literature using spatial econometric models

GAPS

▪ Available studies does not take into cognisance the role played by human capital, infrastructure and governance despite the literature highlighting the importance of this variables as constructed in this study

▪ The role of space has not yet been explored in Africa on FDI-TFP nexus

EMPIRICAL LITERATURE

Figure: Highlights of Key literature review on FDI-TFP in Africa
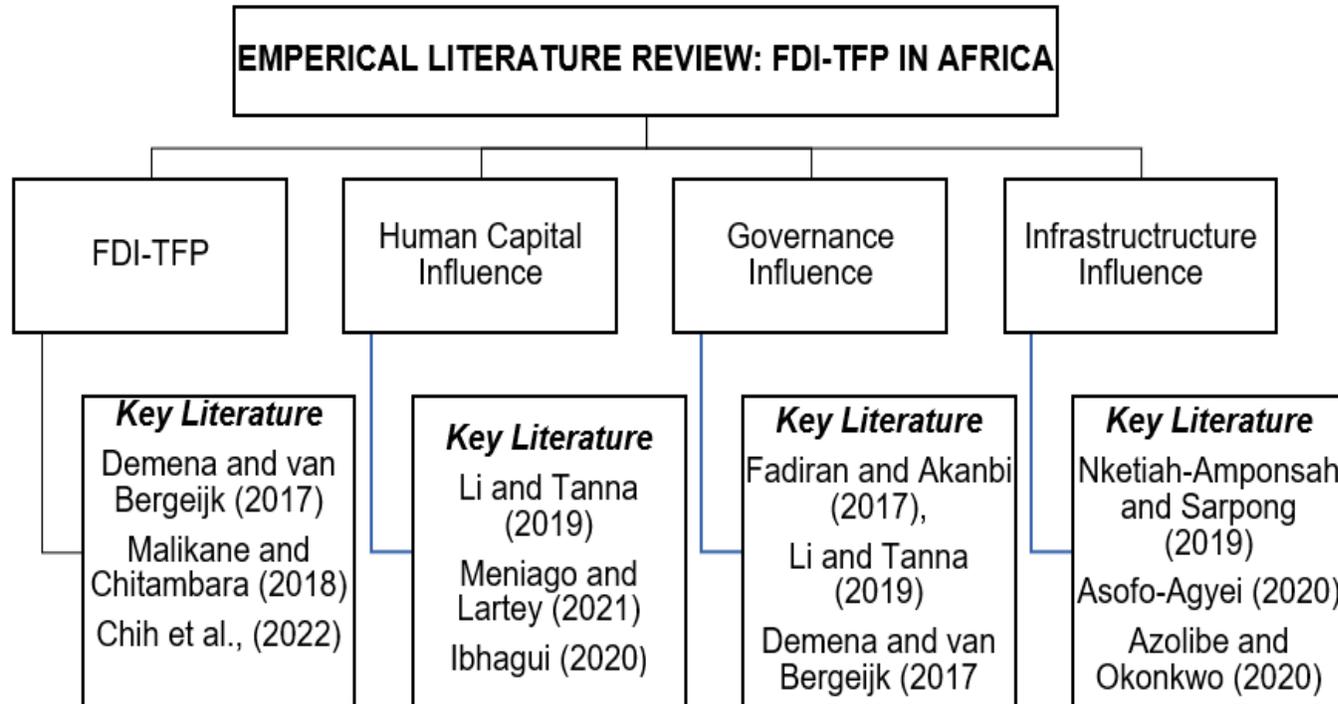
DATA

Variable	Expected sign	Source
Total Factor Productivity (TFP)	Dependent variable	PWT 10.1, 2023 Edition
Foreign Direct Investment (FDI)	**+**	UNCTAD, 2023
Human capital (HC)	**+**	PWT 10.1, 2023
Infrastructure (INFRA)	**+**	WB, WDI, 2023.
Good Governance (GOV)	**+**	WB, WGI, 2023
Trade Openness (TRADE)	**+**	WB, WDI, 2023
Financial Development (FINDEV)	**+**	IMF, 2023.
Government Consumption (GOVEXP) as a percentage of GDP	**+**	WB, WDI, 2023.
Domestic Investment (GFCF) as a percentage of GDP	**+**	WB, WDI, 2023.
Inflation Rate (INFL)	**-**	IMF, 2023.
Population Growth (POPG)	**+**	UN, 2023

MODEL SPECIFICATION

|		Key equations
1	**Static and baseline Models**	■ Model specified based on the literature on FDI-TFP nexus or growth (see Li and Tanna, 2019; Kariuki and Kabaru, 2022) $\therefore TFP_{it} = f(FDI_{it}, \varepsilon_{it})$ ■ Introducing the time and country-specific effect and the logarithms on both sides $\therefore lnTFP_{it} = \beta_0 + \beta_1 lnFDI_{it} + \eta_{it} + \gamma_{it} + \varepsilon_{it}$ ■ Incorporating control variables $\therefore TFP_{it} = \beta_1 FDI_{it} + \beta_2 HC_{it} + \beta_3 INFRA_{it} + \beta_4 GOV_{i,} + \beta_5 INFL_{it} + \beta_6 GOVEXP_{it} + \beta_7 FINDEV_{it} + \beta_8 GFCF_{it} + \beta_9 TRADE_{it} + \beta_{10} POPG_{it} + \eta_i + \gamma_t + \varepsilon_{it}$
2	**Moderating effect**	■ Accounting for moderating factors $\therefore TFP_{i,t} = \beta_1 FDI_{i,t} + \beta_2 HC_{i,t} + \beta_3 INFRA_{i,t} + \beta_4 GOV_{i,t} + \beta_5 INFL_{i,t} + \beta_6 GOVEXP_{i,t} + \beta_7 FINDEV_{i,t} + \beta_8 GFCF_{i,t} + \beta_9 TRADE_{i,t} + \beta_{10} POPG_{i,t} + \beta_{11} FDI * HC_{i,t+} + \beta_{12} FDI * INFRA_{i,t+} + \beta_{13} FDI * GOV_{i,t+} + \eta_i + \gamma_t + \varepsilon_{i,t}$
3	**Threshold Model**	■ This study considered the model developed by Kremer, Bick & Nautz (2013) and introduced a dynamic panel threshold model to examine the moderating effect of human capital, infrastructure and governance. Therefore, the panel threshold is specified as follows: ■ $TFP_{i,t} = \eta_i + \beta_1' FDI_{i,t} I(q_{it} \leq \gamma) + \beta_2' FDI_{i,t} I(q_{it} > \gamma) + \varepsilon_{i,t}$
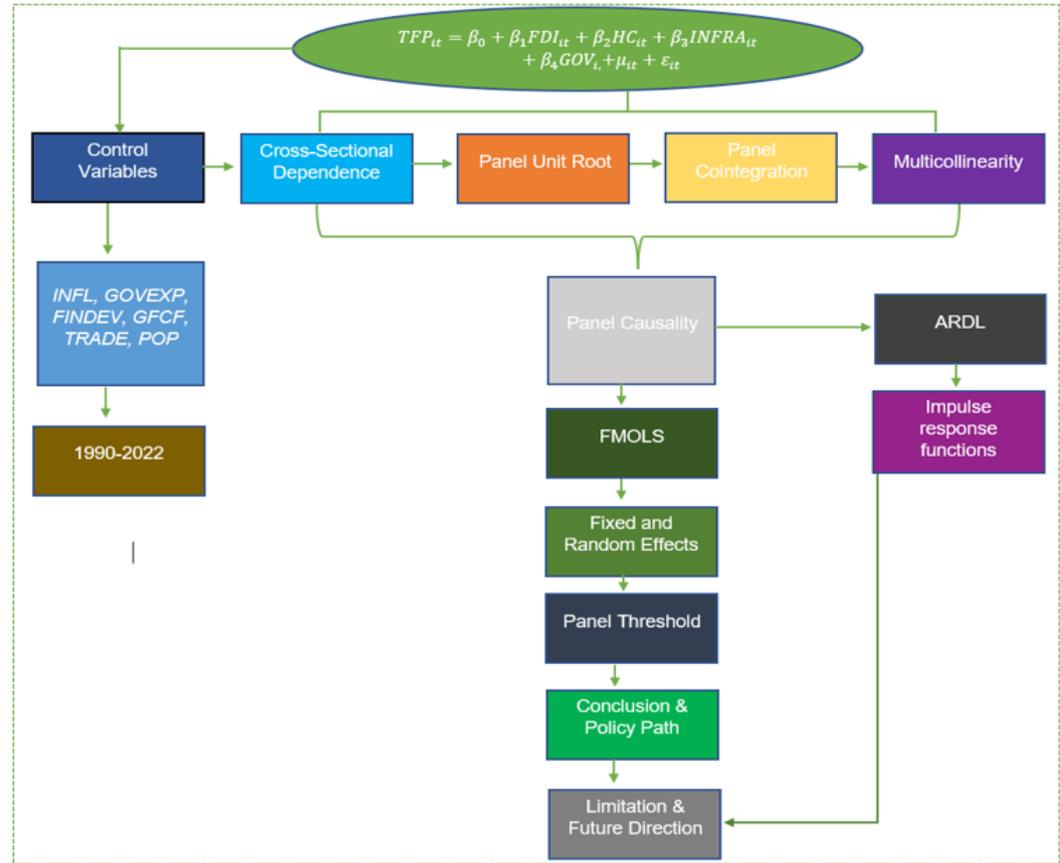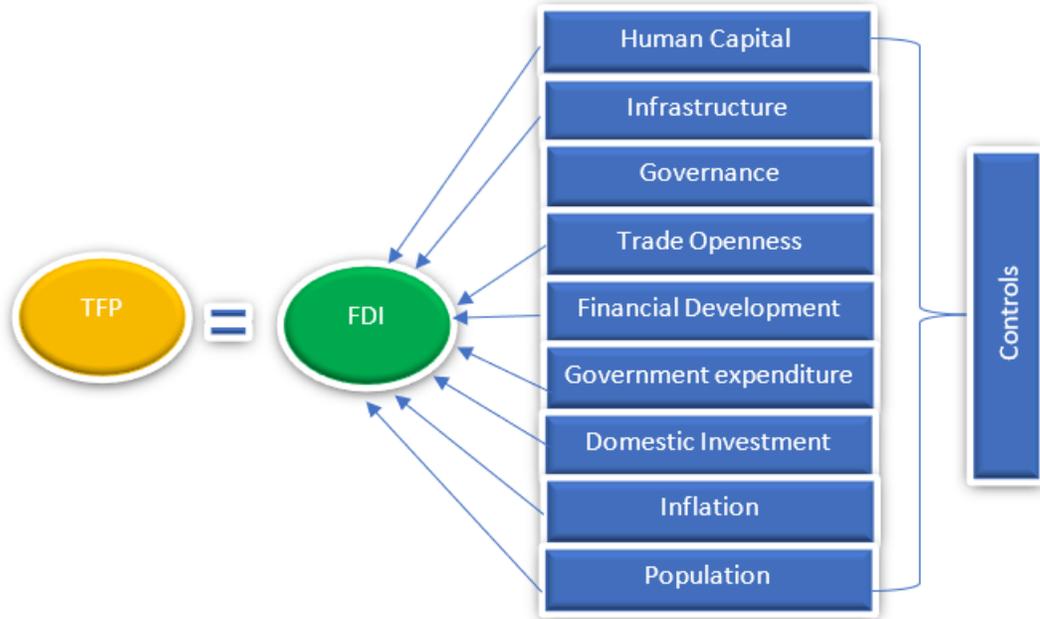
ESTIMATION TECHNIQUES

RESULTS (DESCRIPTIVE)

List of Countries and Descriptive Statistics

Summary Statistics

List of Countries	TFP	FDI	HC	INFRA	GOV	INFL	POP	GFCF	GOVEXP	TRADE	FINDEV
Country Name	mean	mean	mean	mean	mean	mean	mean	mean	mean	mean	mean
Zimbabwe	0.5440	13.4745	2.2433	0.0021	-2.3183	12.1952	1.2209	12.2278	18.5674	67.5087	20.9609
Zambia	0.2663	74.8017	2.2070	0.0021	0.3868	34.0772	2.7530	10.6787	10.6954	58.2482	8.7424
South Africa	0.6962	30.5860	2.3327	1.6822	2.5072	6.5346	1.5993	18.2681	19.5066	54.1518	65.2300
Tanzania	0.2939	20.0658	1.5307	-0.3132	0.2461	12.3670	2.8849	25.0963	11.8140	40.3492	9.3156
Togo	0.7067	61.7018	2.0699	1.2934	1.1611	4.2492	1.2407	23.0391	17.5208	93.5882	54.7119
Eswatini	0.2348	19.5599	1.7038	-0.3159	-0.9673	3.8670	2.6239	19.7005	13.2495	80.8225	23.6479
Sierra Leone	0.3967	26.2532	1.4309	-0.4124	-0.9115	36.5767	2.0262	12.2145	10.4818	55.0807	4.1204
Senegal	0.5336	9.3339	1.1335	0.1707	1.0778	2.5329	2.6753	21.9112	13.0248	60.6702	19.0538
Sudan	6.9674	18.5098	1.4402	-0.2425	-2.7934	37.5433	2.5433	2.5341	6.7376	25.9789	6.9674
Rwanda	0.3021	7.5911	1.5025	-0.4128	0.2289	9.3340	1.8371	17.4874	16.2818	36.9676	12.0810
Nigeria	0.3325	22.5500	1.5954	-0.1719	-1.5716	18.2583	2.5760	28.1372	4.3261	37.2732	10.0330
Niger	0.2619	21.2102	1.1400	-.8004	-0.3182	2.6898	3.6578	18.9587	17.5063	37.5953	7.1460
Mauritius	1.2088	19.4396	2.3592	2.6832	3.7035	5.5098	0.6473	23.2509	13.9103	116.9349	69.006
Mauritania	0.4372	5.9335	1.5713	0.2103	-0.2806	5.4427	2.7524	38.0864	17.0579	76.0306	10.7720
Mozambique	0.4183	71.7158	1.1592	-0.5430	0.1739	17.4062	2.8781	18.0899	18.3765	69.3830	15.1739
Morocco	0.5959	33.4053	1.6364	0.9632	0.8300	2.4985	1.4359	27.6805	17.4755	66.6563	47.0970
Lesotho	0.3837	25.5881	1.1977	-0.0044	0.9977	7.8619	0.8104	12.2602	35.0617	61.8709	14.8549
Kenya	0.3872	9.6195	2.0333	-0.1258	-0.3031	11.8031	2.7652	18.4229	13.6538	53.8555	26.8760
Gabon	0.5827	20.2389	2.2881	0.0558	-0.0646	2.6326	2.8509	25.5228	15.627	85.5210	10.7982
Egypt	1.1349	30.2336	2.1577	0.3628	-0.2179	10.3405	2.0185	19.2090	10.6902	48.5804	36.8458
Cameroon	0.4397	10.7288	1.7667	-0.5447	-1.2062	3.3398	2.7249	21.3448	11.0120	47.1407	11.4569
Cote d'Ivoire	0.7135	21.7818	1.4683	-0.3780	-1.0469	3.5502	2.6865	12.7990	14.2105	74.2640	18.8475
Central African Republic	0.3512	17.9293	1.4203	-0.9819	-2.3645	3.9463	1.8236	4.0254	17.5395	43.9387	7.5234
Botswana	0.7338	24.9424	2.5416	0.4165	3.5294	8.1221	2.0527	29.2851	22.7464	94.7464	21.3713
Burkina Faso	0.4366	5.5232	1.1283	-0.6859	0.4753	2.7682	2.8742	19.1904	15.7831	42.8539	15.0210
Benin	0.3703	7.7602	1.5217	-0.5725	0.6537	3.8915	3.0105	17.4905	15.6715	53.0616	11.7448
Burundi	0.1946	4.3366	1.2566	-0.9253	-2.0436	10.5285	2.5865	11.0647	16.9464	34.7460	15.6537
Angola	0.2895	37.6373	1.3358	-0.7788	-1.8251	317.7758	3.4062	17.5322	23.9181	64.4849	9.2867

Notes: The yearly data used to calculate the summary statistics in this table covers the years 1996 to 2019.
Source: Author's computations

RESULTS (BASELINE MODEL)

Variables	Pooled OLS	Fixed Effect	Random Effect	Driscoll and Kraay standard errors Fixed Effects
FDI	-0.0012***	-0.0008***	-0.0008***	-0.0008***
	(0.0003)	(0.0001)	(0.0001)	(0.0002)
HC	0.0833***	-0.0555*	-0.0038	-0.0555
	(0.0215)	(0.0296)	(0.1213)	(0.0417)
INFRA	-0.0088	-0.0070	-0.0100**	-0.0070
	(0.0139)	(0.0104)	(0.0049)	(0.0061)
GOV	0 .0236***	0.0058**	0.0071***	0.0058**
	(0.0041)	(0.0052)	(0.0025)	(0.0025)
INFL	0.0000	-0.0000	-0.0000	-0.0000**
	(0.0000)	(0.0075)	(0.0000)	(0.0000)
POP	0.0016***	0.0070***	0.0058***	0.0070***
	(0.0003)	(0.0005)	(0.0005)	(0.0012)
GFCF	-0.0052***	0.0010*	0.0005	0.0009
	(0.0010)	(0.0005)	(0.0158)	(0.0006)
GOVEXP	-0.0056***	0.0002	0.0007	0.0002***
	(0.0013)	(0.0009)	(0.0009)	(0.0010)
TRADE	0.0030***	-0.0001	0.0001	-0.0001
	(0.0003)	(0.0002)	(0.0002)	(0.0001)
FINDEV	0.0051***	-0.0009***	-0.0006	-0.0009**
	(0.0006)	(0.0004)	(0.0005)	(0.0004)
Constant	0.2358***	0.4789***	0.3917***	-1.6446***
	(0.1299)	(0.1231)	(0.0690)	(0.1823)
Observations	719	719	719	719
R-squared	0.4736	0.2670	0.2609	0.2670
Number of States	30	30	30	30

FDI and TFP in Africa: Results of the pooled, fixed, random and Driscoll and Kraay standard errors Fixed Effects

Standard errors in parentheses, the star point '***', '**' and '*' indicate p value<0.01); 5 level (p value <0.05); % and 10% level (p value <0.1) level of significance respectively.
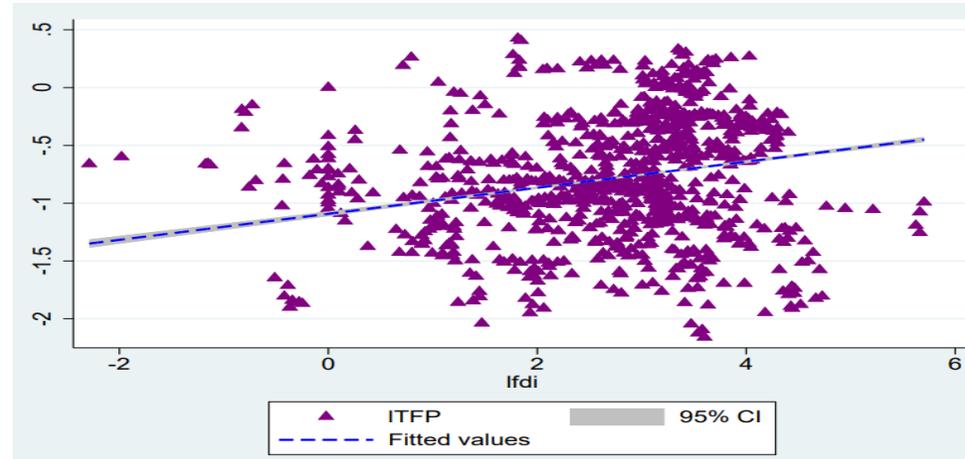Source: Author's computations

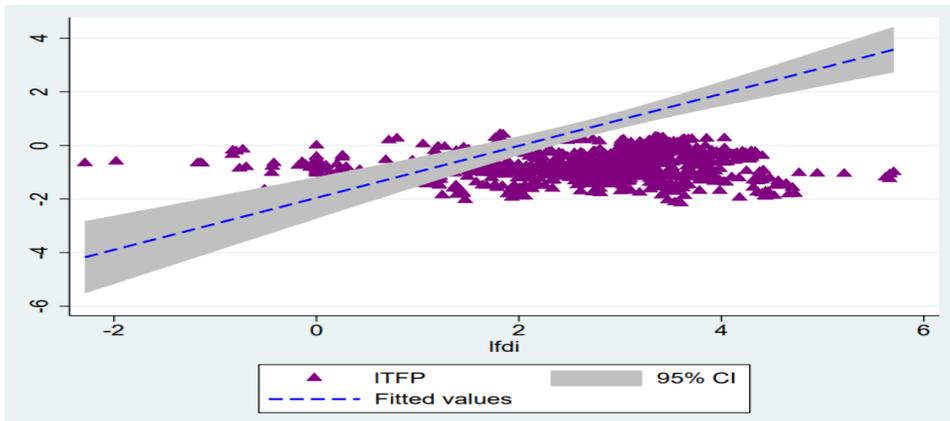# RESULTS(BASELINE MODEL AND INTERACTION)

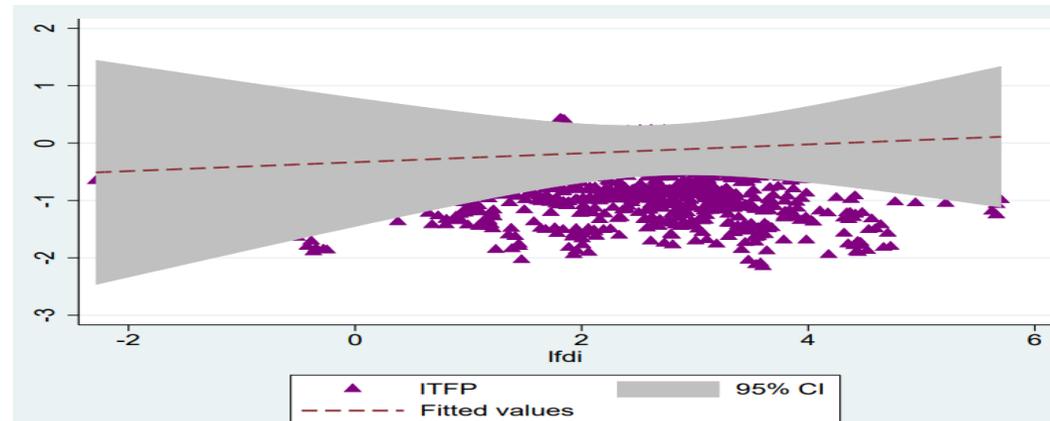Distribution of FDI and TFP
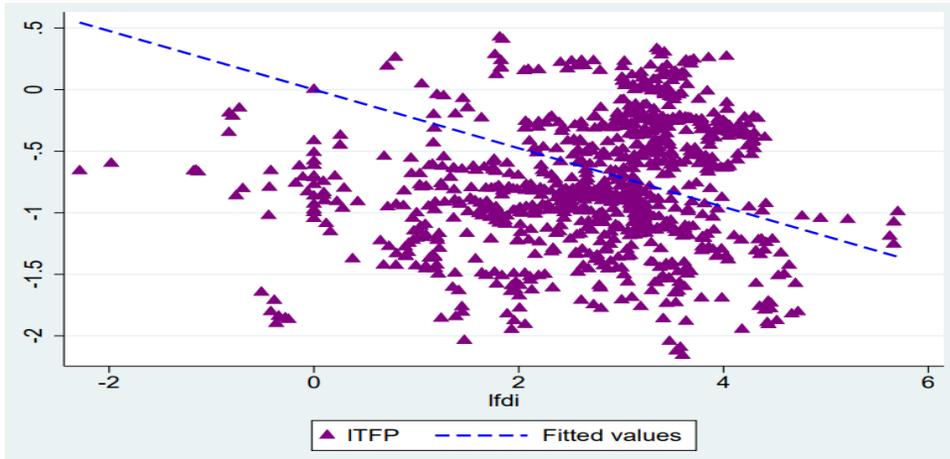
Distribution of TFP and FDI-human capital

Distribution of TFP and FDI-infrastructure

Distribution of TFP and FDI-governance

RESULTS (MODERATING FACTORS)

FDI and TFP: Interaction effect of human capital, governance and infrastructure

Variables	Interaction Effect of Human Capital	Interaction Effect of Governance	Interaction Effect of Infrastructure
FDI	-0.0011***	-0.0007***	-0.0008***
	(0.0002)	(0.0152)	(0.0002)
HC		-0.0627	-0.1054
		(0.0406)	(0.0650)
INFRA	-0.0148**	-0.0074	
	(0.00605)	(0.0061)	
GOV	0.0063**		0.0056**
	(0.00779)		(0.0026)
INFL	-0.0000	-0.0000	-0.0004*
	(0.0000)	(0.0000)	(0.0000)
POP	0.0068***	0.0070***	0.0069***
	(0.0010)	(0.0012)	(0.0012)
GFCF	0.0009*	0.0011*	0.0008
	(0.0006)	(0.0006)	(0.0005)
GOVEXP	0.0004	0.0003	0.0001
	(0.0010)	(0.0009)	(0.0011)
TRADE	0.0000	-0.0001	-0.0001*
	(0.0001)	(0.0001)	(0.0001)
FINDEV	0.0007	-0.0009**	0.0014***
	(0.0004)	(0.0004)	(0.0003)
FDI*HC	0.0002		
	(0.002)		
FDI*GOV		0.0007**	
		(0.0000)	
FDI*INFRA			0.0001**
			(0.0001)
Constant	0.3678***	0.4893***	0.5929***
	0.0513	(0.0556)	(0.0835)
Observations	719	719	719
R-squared	0.2640	0.2619	0.2668
Number of States	30	30	30

Standard errors in parentheses, the star point '***', '**' and '*' indicate p value<0.01); 5 level (p value <0.05);% and 10% level (p value <0.1) level of significance respectively.

Source: Author's computations

RESULTS (MODERATING FACTORS)

Threshold estimates effect of FDI on TFP

| Variables	Threshold: Human capital		Threshold: Infrastructure		Threshold: Good governance	
	FDI is exogenous	FDI is endogenous	FDI is exogenous	FDI is endogenous	FDI is exogenous	FDI is endogenous
Threshold estimates						
$\hat{\gamma}$	1.551	1.551	0.267	0.267	1.116	1.116
	[1.520, 1.566]	[1.521, 1566]	[-1.290, 0.656]	[1.290, 0.656]	[-3.041, 2.098]	[-3.041, 2.098]
Impact of FDI						
Below the threshold ($\hat{\beta}_1$)	0.0002	-0.0003*	-0.0002**	-0.0002*	-0.0001	-0.0002**
	(0.0004)	(0.0007)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Above the threshold ($\hat{\beta}_2$)	0.0002	0.0005*	0.0005	0.0001	0.0003	0.0002
	(0.0002)	(0.0003)	(0.0001)	(0.0001)	(0.0003)	(0.0002)
Impact of covariates						
TFP_{t-1}	0.8454***	0.8343	0.8291***	0.8320***	0.8328***	0.8352***
	(0.0163)	(0.0071)	(0.0136)	(0.0108)	(0.0102)	(0.0103)
GFCF	-0.0008	0.0090*	-0.0017***	-0.0017***	0.0009	0.0007
	(0.0006)	(0.0050)	(0.0006)	(0.0006)	(0.0006)	(0.006)
INFL	-0.0001*	-0.0001**	-0.0001*	-0.0001***	-0.0001	-0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	0.0001
TRADE	0.0005***	0.0005***	0.0007***	0.0007***	0.0006***	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)***	(0.0001)	(0.0001)
POP	0.0003***	0.0003***	0.0004***	0.0004***	0.0003***	0.0002***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
GOVEXP	-0.0010**	-0.0008***	-0.0011***	-0.0009***	-0.0013***	-0.0003***
	(0.0004)	(0.0004)	(0.0002)	(0.0002)	(0.0003)	(0.0002)
FINDEV	-0.0007***	0.0006***	0.0009***	0.0009***	0.0007	0.0007***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0002)	(0.0001)
Constant	0.0468***	0.0507***	0.0002***	0.0609***	0.05428***	0.0542***
	(0.01388)	(0.0120)	(0.0002)	(0.0099)	(0.0093)	(0.0090)
Observations	689	689	689	689	689	689
Number of countries	30	30	30	30	30	30

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1 imply 1%, 5% and 10% level of significance, respectively.

RESULTS(HUMAN CAPITAL THRESHOLD LEVELS)

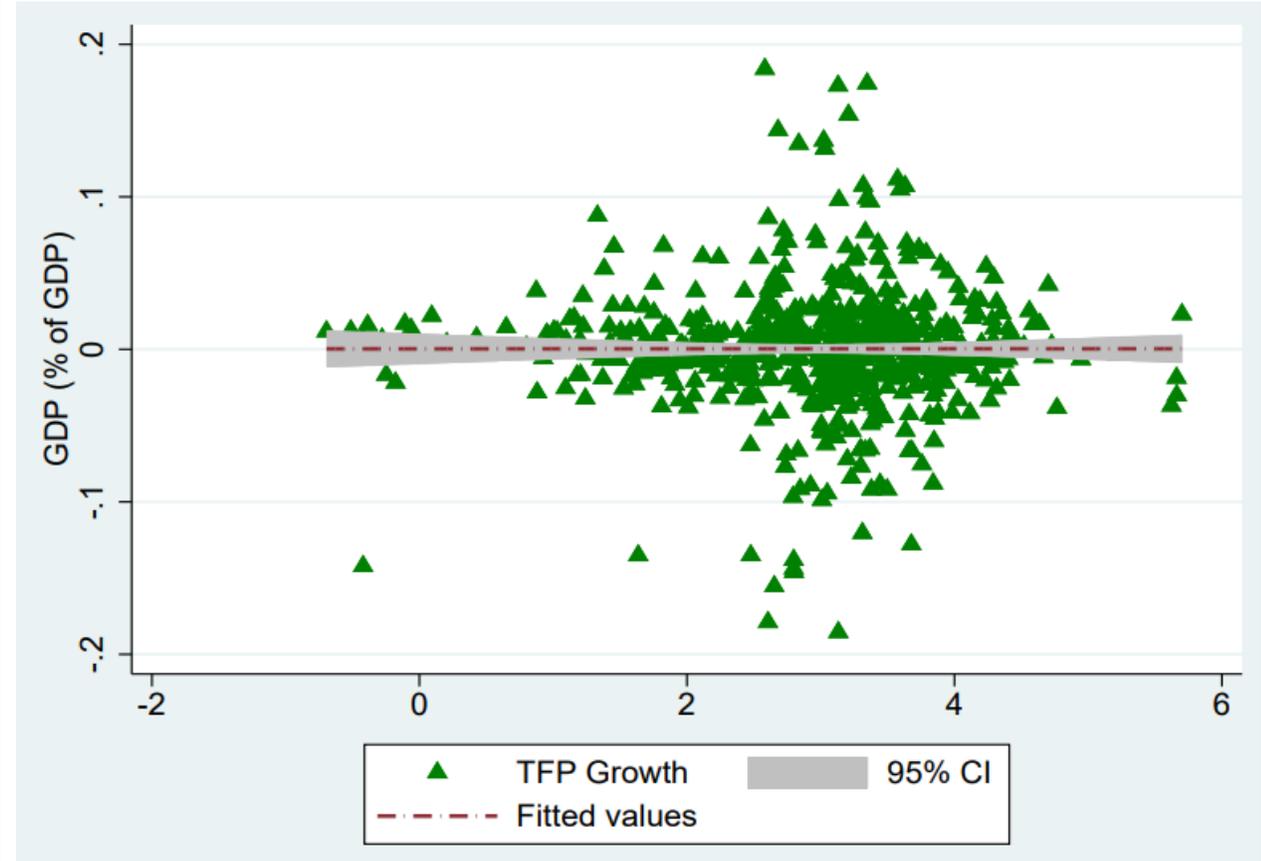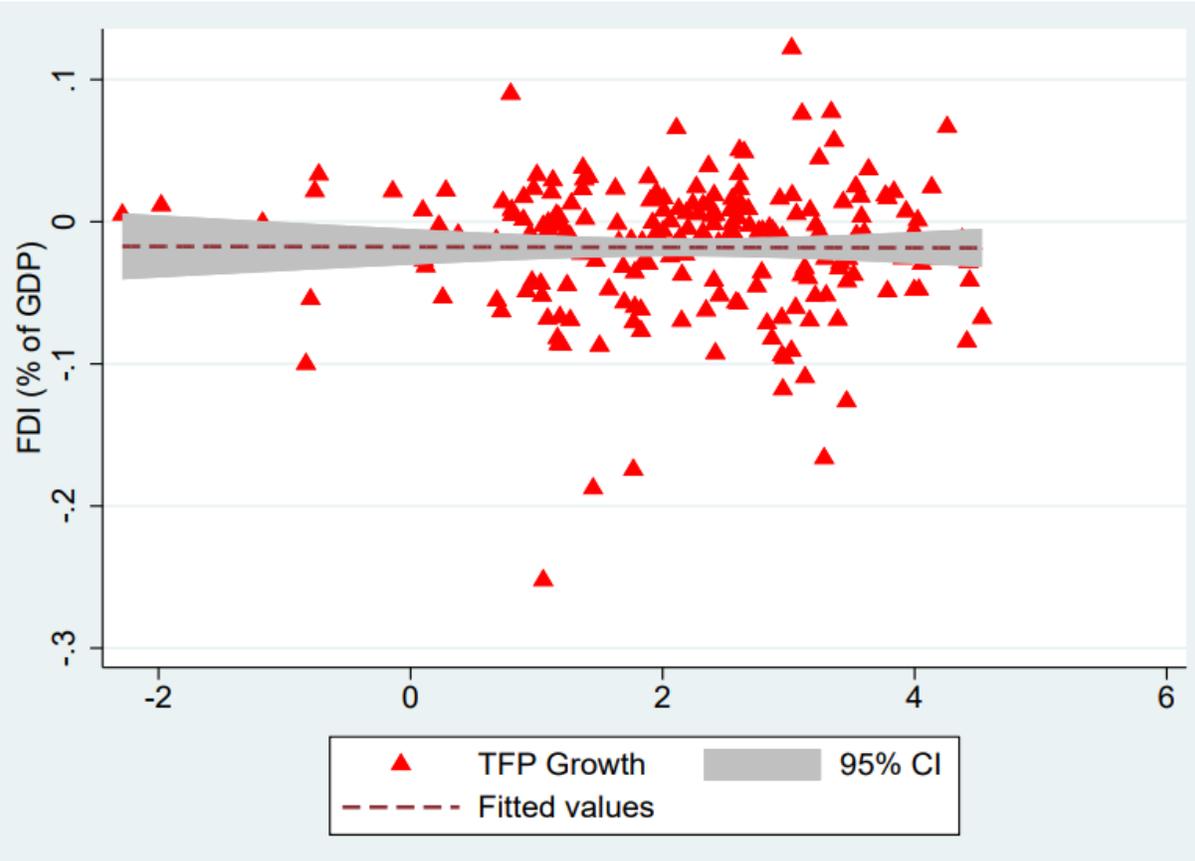FDI-TFP nexus with human capital below the threshold levels
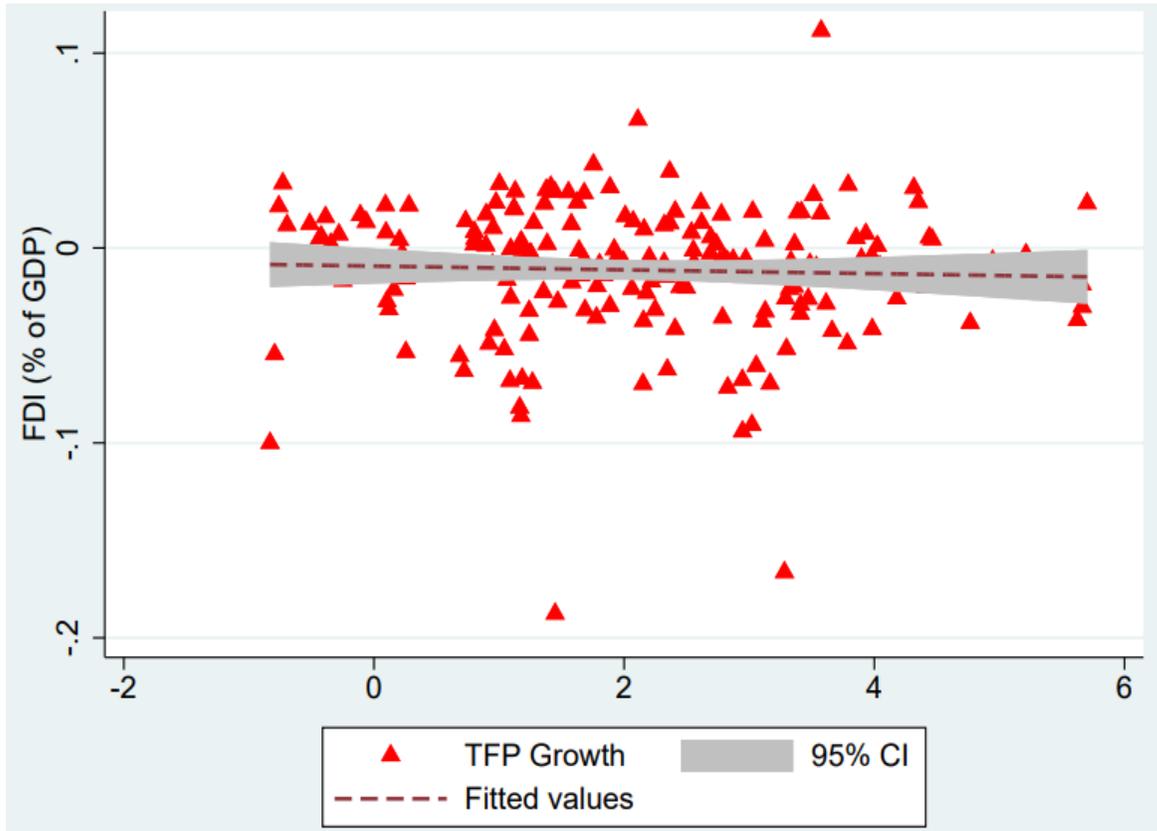
FDI-TFP nexus with human capital above the threshold levels
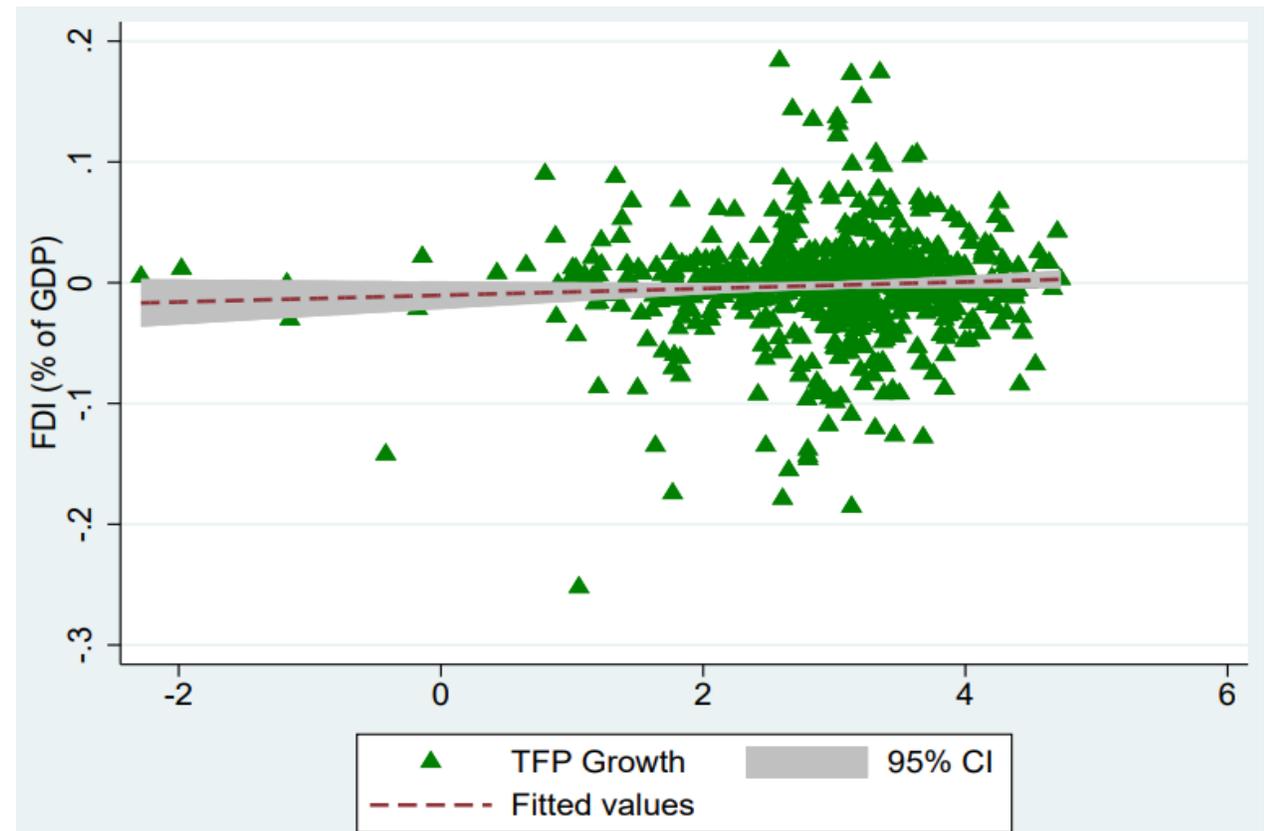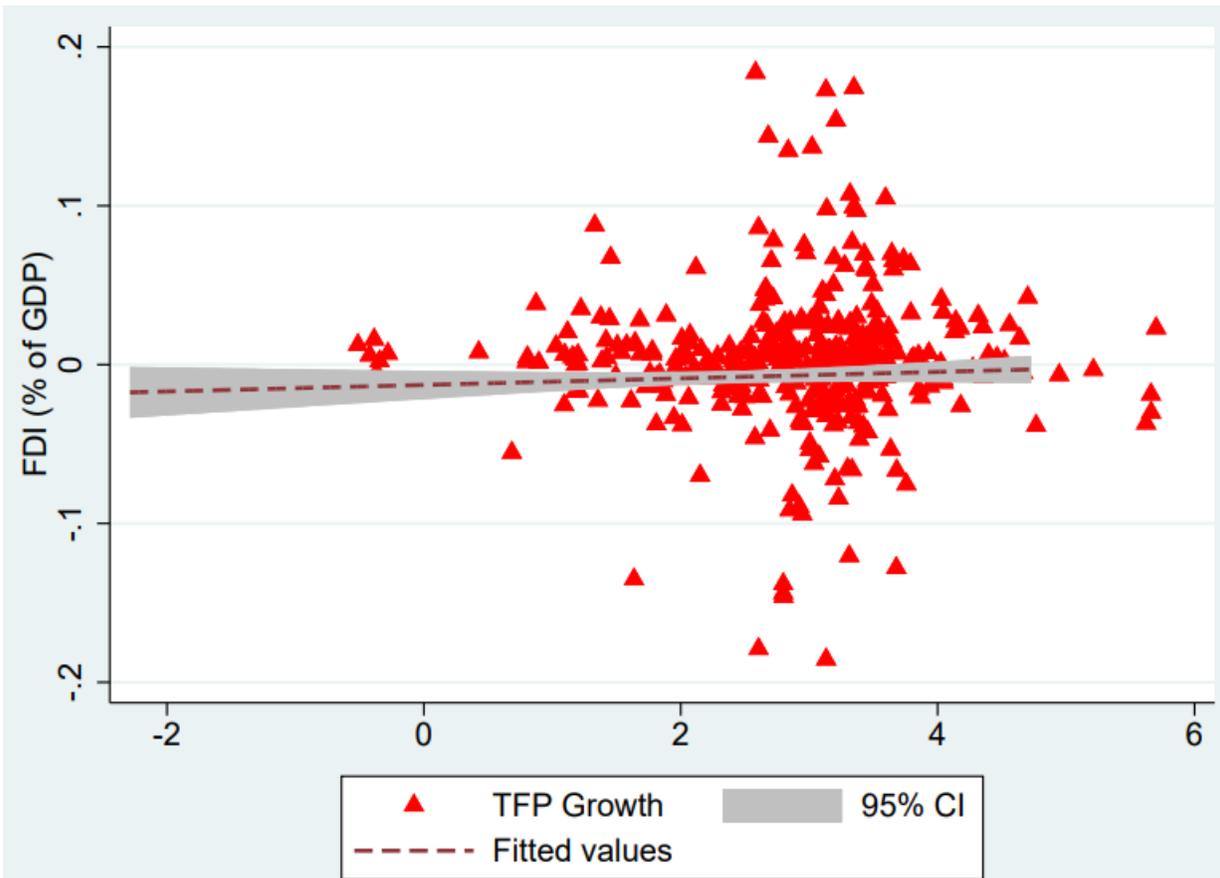
RESULTS(INFRASTRUCTURE THRESHOLD LEVELS)

FDI-TFP nexus with infrastructure below the threshold levels

FDI-TFP nexus with infrastructure above the threshold levels
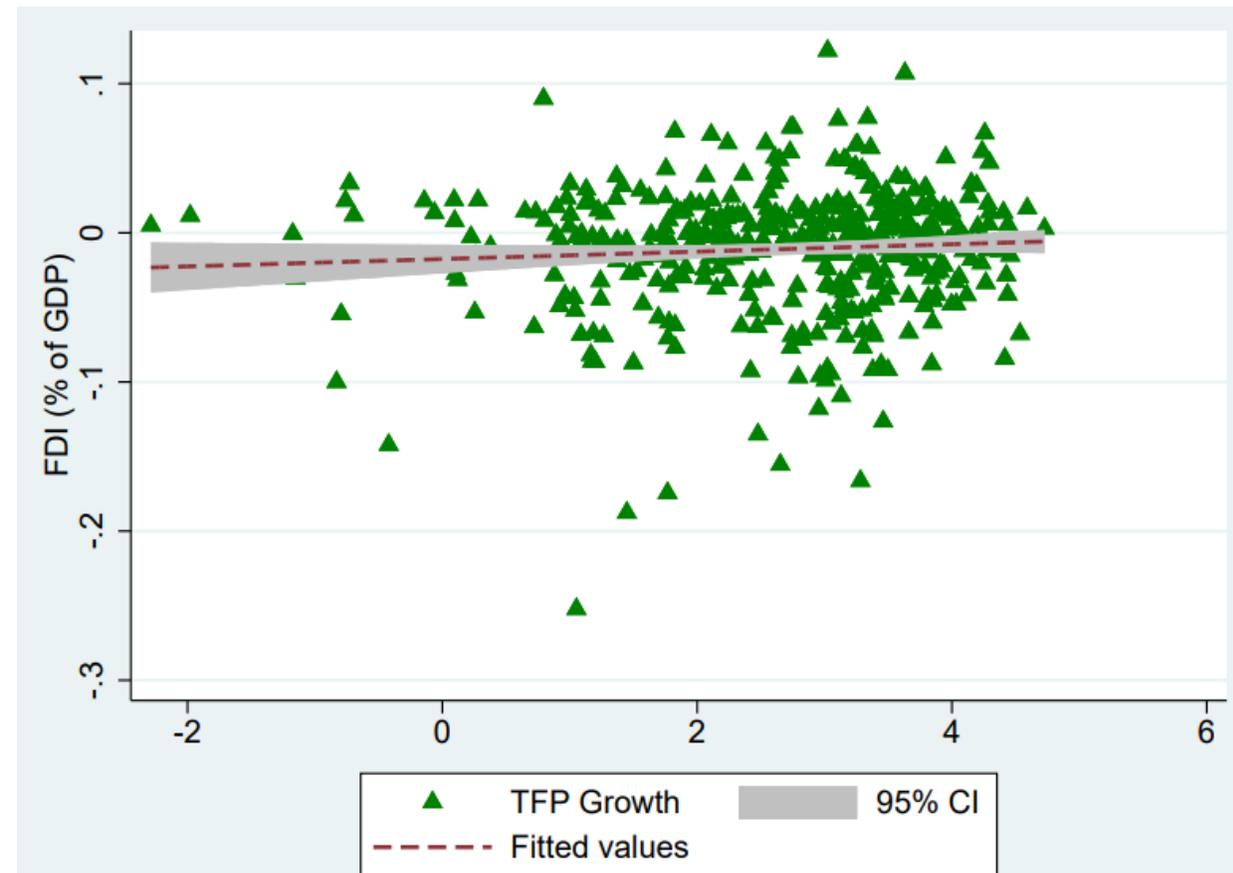
RESULTS(GOVERNANCE THRESHOLD LEVELS)

FDI-TFP nexus with governance below the threshold levels

FDI-TFP nexus with governance above the threshold levels

CONCLUSIONS

- Study makes # contributions in understanding the FDI-TFP nexus for the African continent.

  - First, the study constructed governance indicator using PCA, a way of constructing good governance indicator which is not used in the FDI-TFP nexus.

  - Secondly, the current study added an infrastructure variable which is hardly used in the growth literature as one of absorptive capacities which is also constructed using PCA method

  - . The third novelty of this study is providing evidence-based threshold analysis considerations using Kremer, Bick & Nautz (2013)

- FDI on its own has a negative relationship on TFP in Africa (linear models)

  - The non-linear models indicates that FDI on its own is negative however when interacted with human capital, infrastructure and institutions the results becomes positive

  - However, only the interaction between FDI and infrastructure as well as the interaction between FDI and governance are significant

  - Overall, this entails that African countries have to meet certain minimum level of local enabling conditions for FDI to positively impact TFP

- This study further support the findings of Li and Tanna (2019) in that improving institutions is relatively important than human capital however this study goes further to show that infrastructure development is also important relative to human capital for African countries to realize productivity gains from FDI

  - The current study goes further to show that infrastructure development is also important relative to human capital for FDI to increase productivity in African nations

  - In order of priority based on the results of this study, It is recommended that African countries first prioritize governance which appears to be the most important followed by infrastructural development.