

# Online Appendix

The State of African Cities 2018



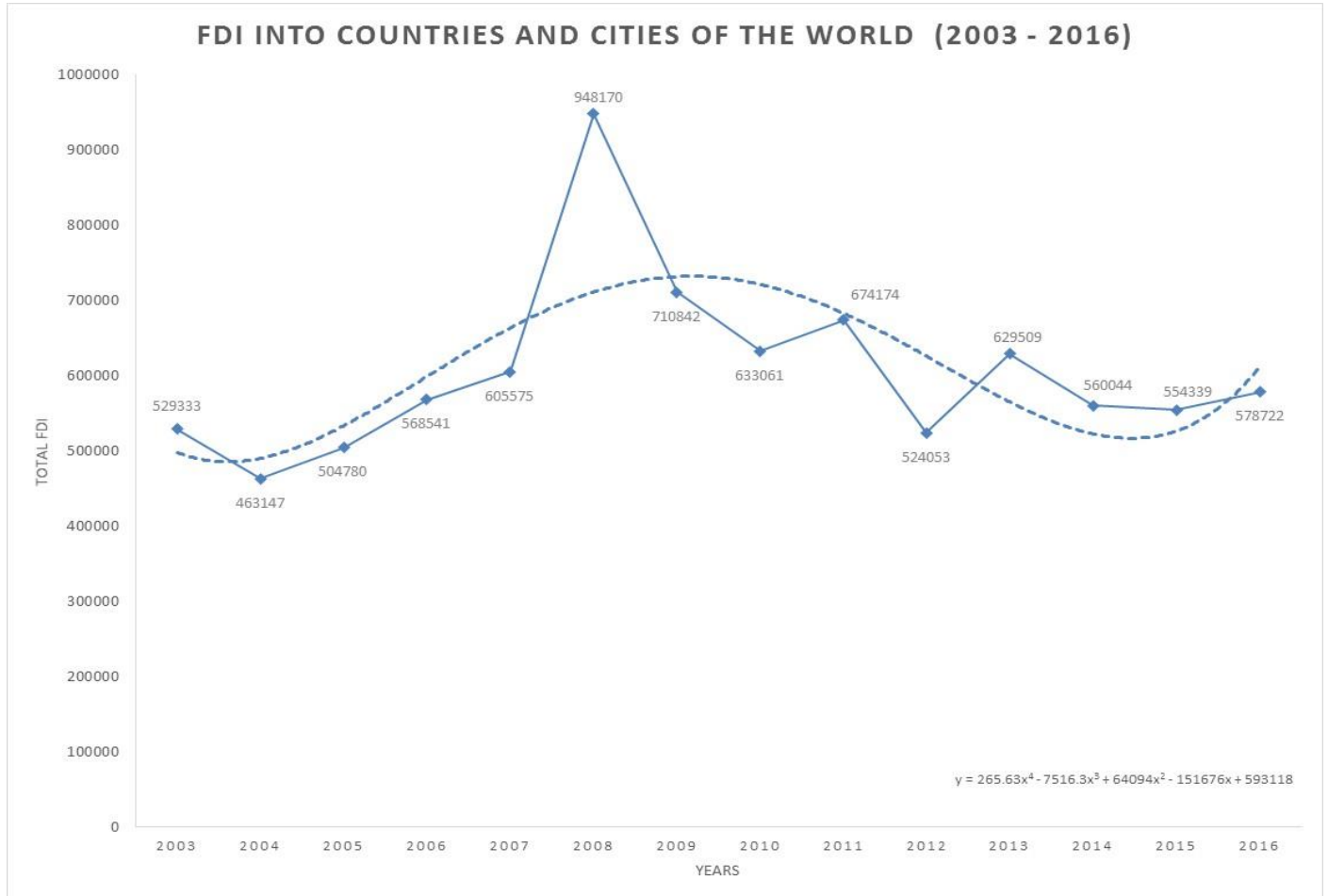
PART A

Chapter 1

The Economic Geography of African FDI

Ronald Wall

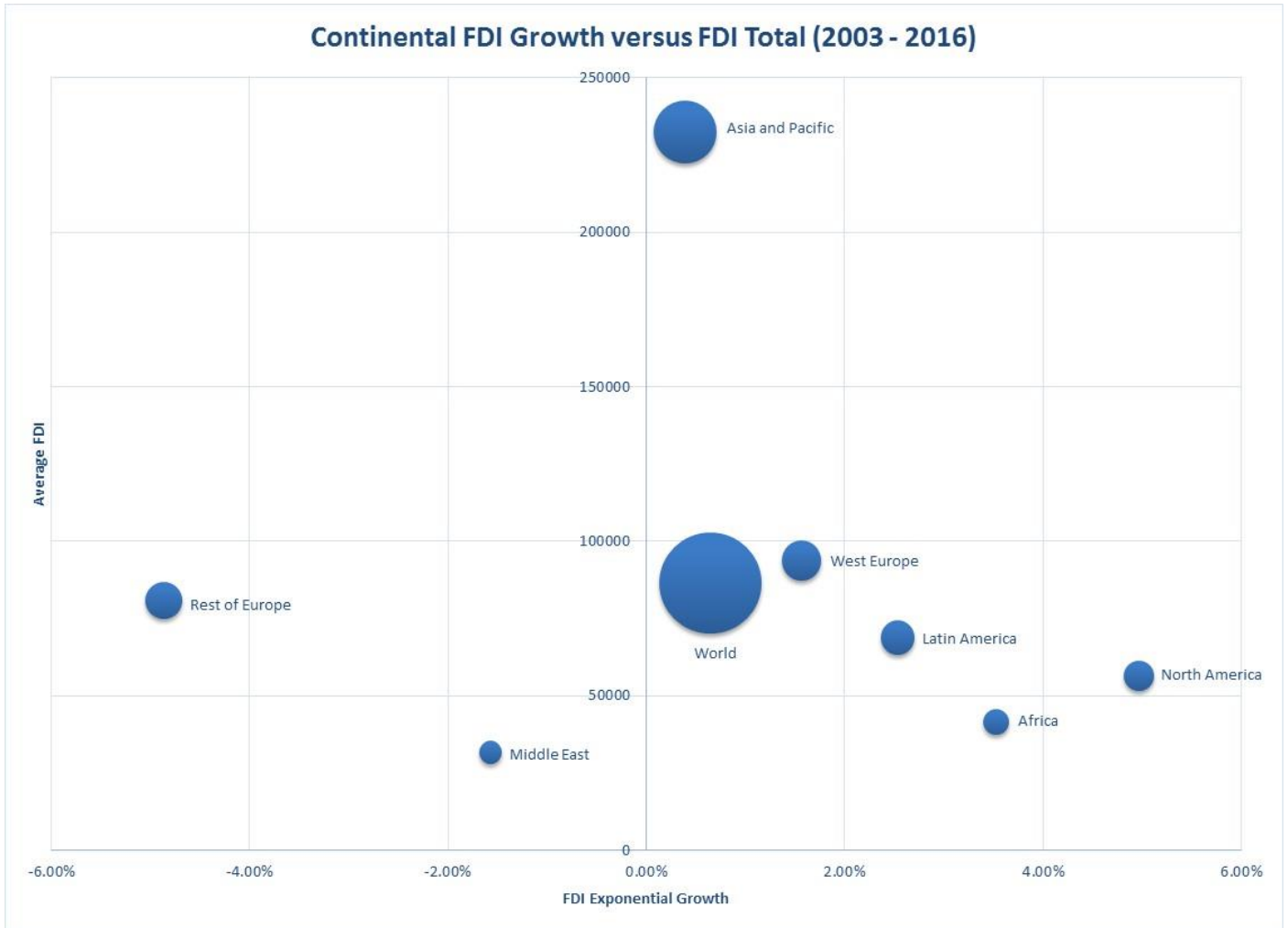
Appendix 1.1: The global trend of FDI (2003-2016)



Blue dots = FDI over time (Dollars). Blue dotted line = the trend over time.

Source: Wall, 2017, Based on FDI Markets data

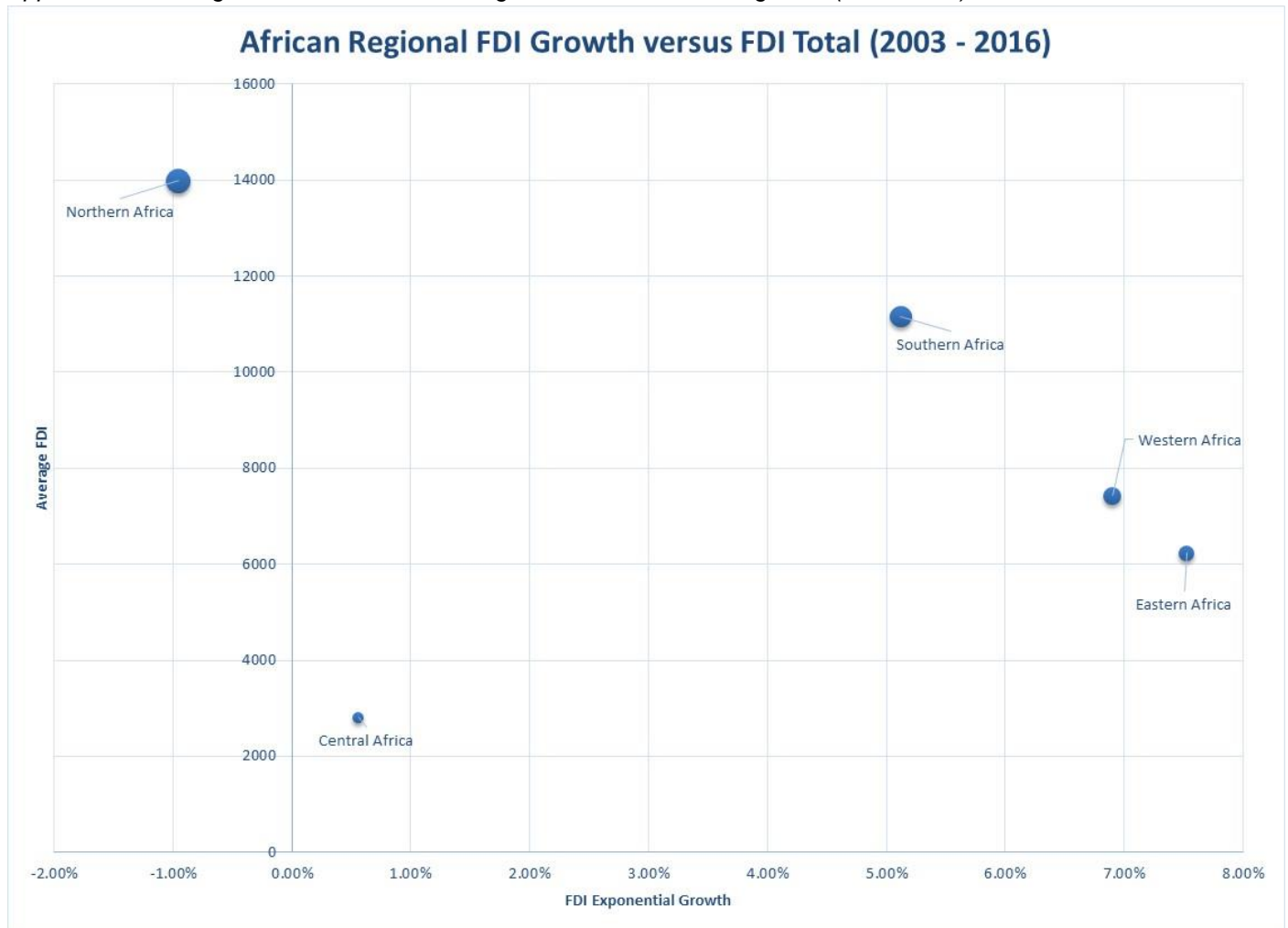
Appendix 1.2: The growth of FDI in continents versus the average FDI (2003-2016)



Blue dots = average FDI (Dollars). X-axis = positive and negative FDI growth.

Source: Wall, 2017, Based on FDI Markets data

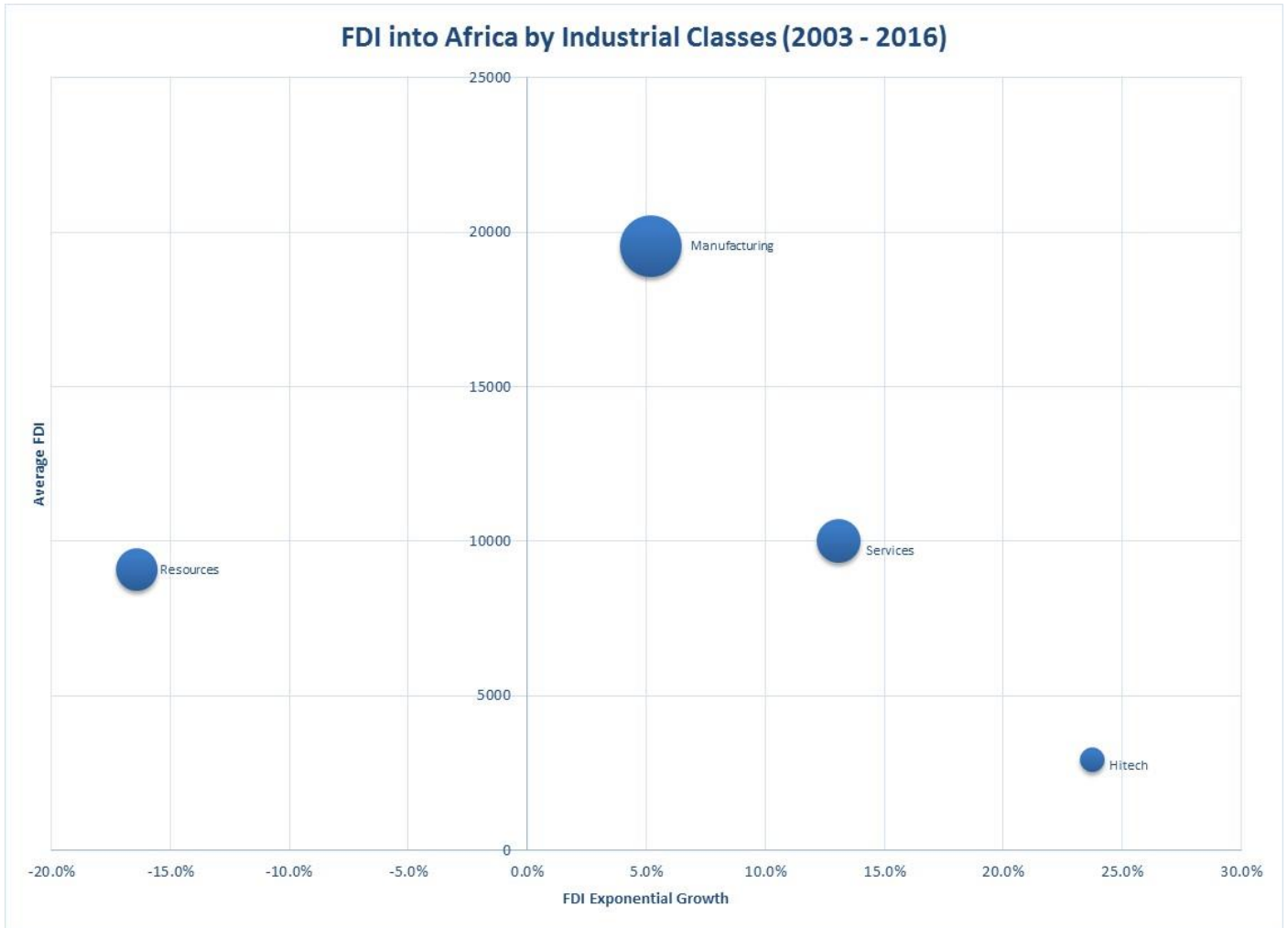
Appendix 1.3: The growth of FDI in African regions versus their average FDI (2003-2016)



Blue dots = average FDI (Dollars). X-axis = positive and negative FDI growth.

Source: Wall, 2017, Based on FDI Markets data

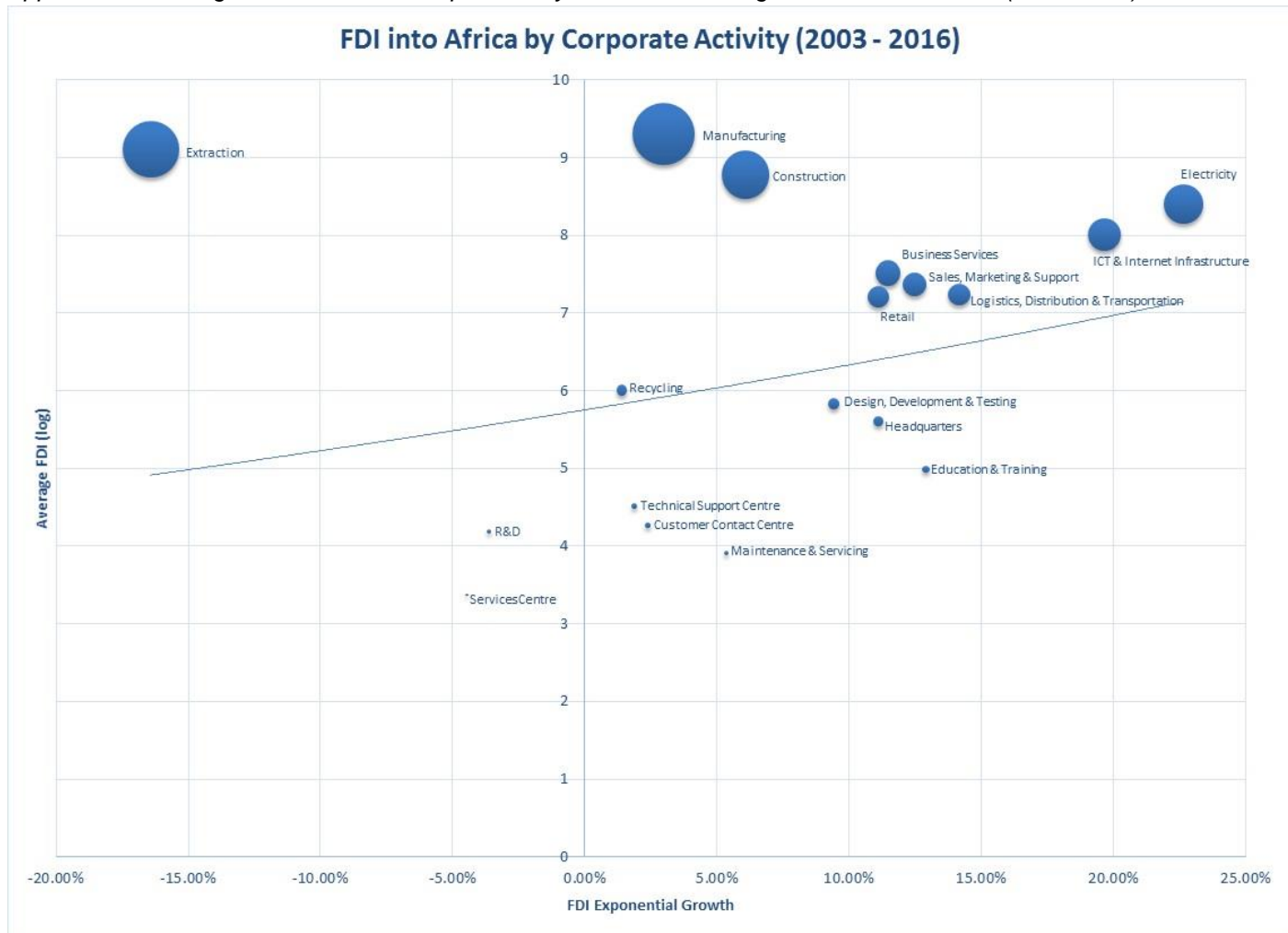
Appendix 1.4: The growth of FDI in African regions versus their average FDI (2003-2016)



Blue dots = average FDI (Dollars). X-axis = positive and negative FDI growth.

Source: Wall, 2017, Based on FDI Markets data

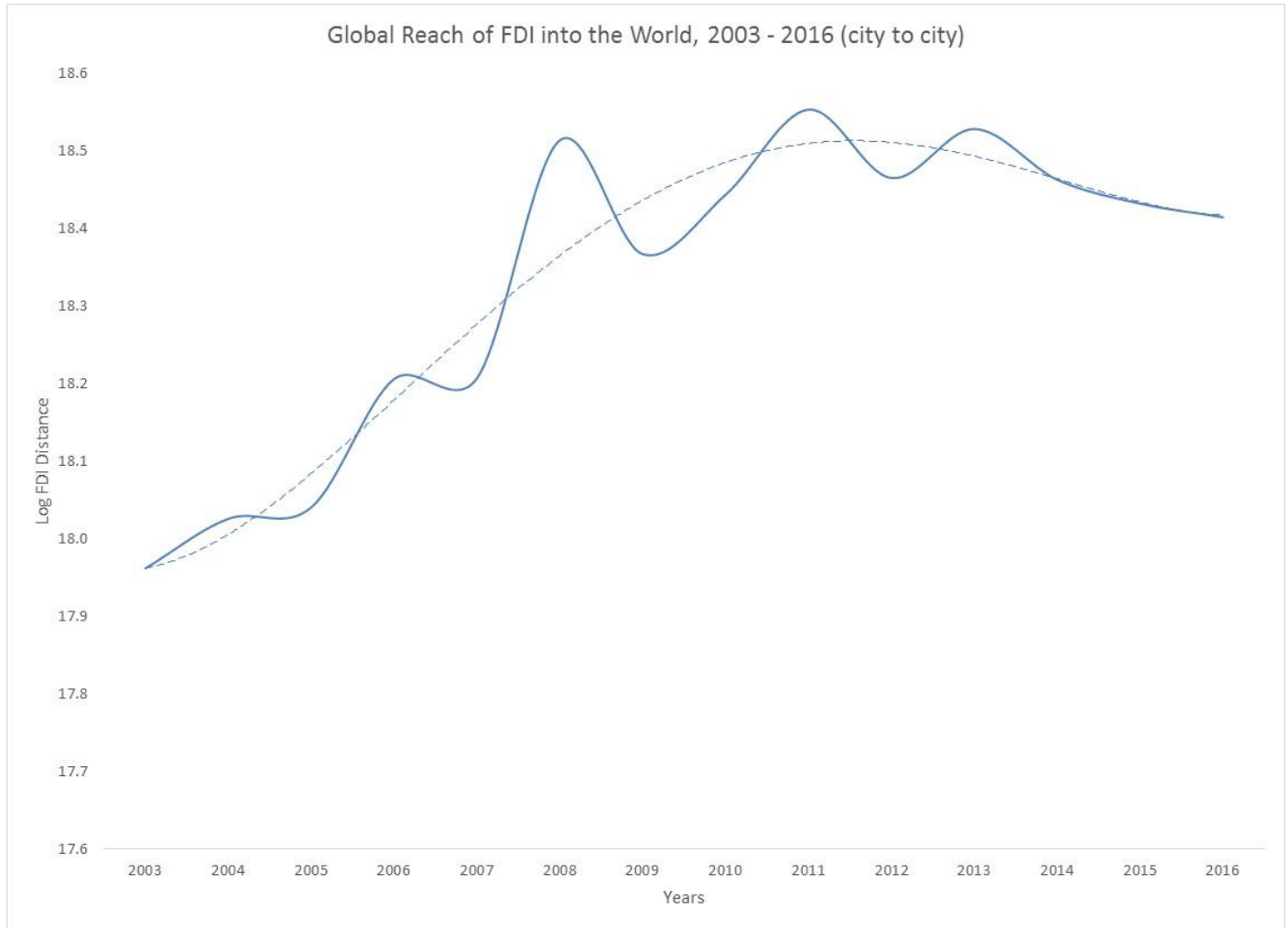
Appendix 1.5: The growth of African FDI per activity versus the average FDI of the activities (2003-2016)



Blue dots = average sectoral FDI (Dollars). X-axis = positive and negative sectoral FDI growth.

Source: Wall, 2017, Based on FDI Markets data

### Appendix 1.6: The geographic reach of FDI into the world (2003-2016)



The solid blue line = the total distance of investments (km). The dotted line = the trend over time.

Source: Wall, 2017, Based on FDI Markets data

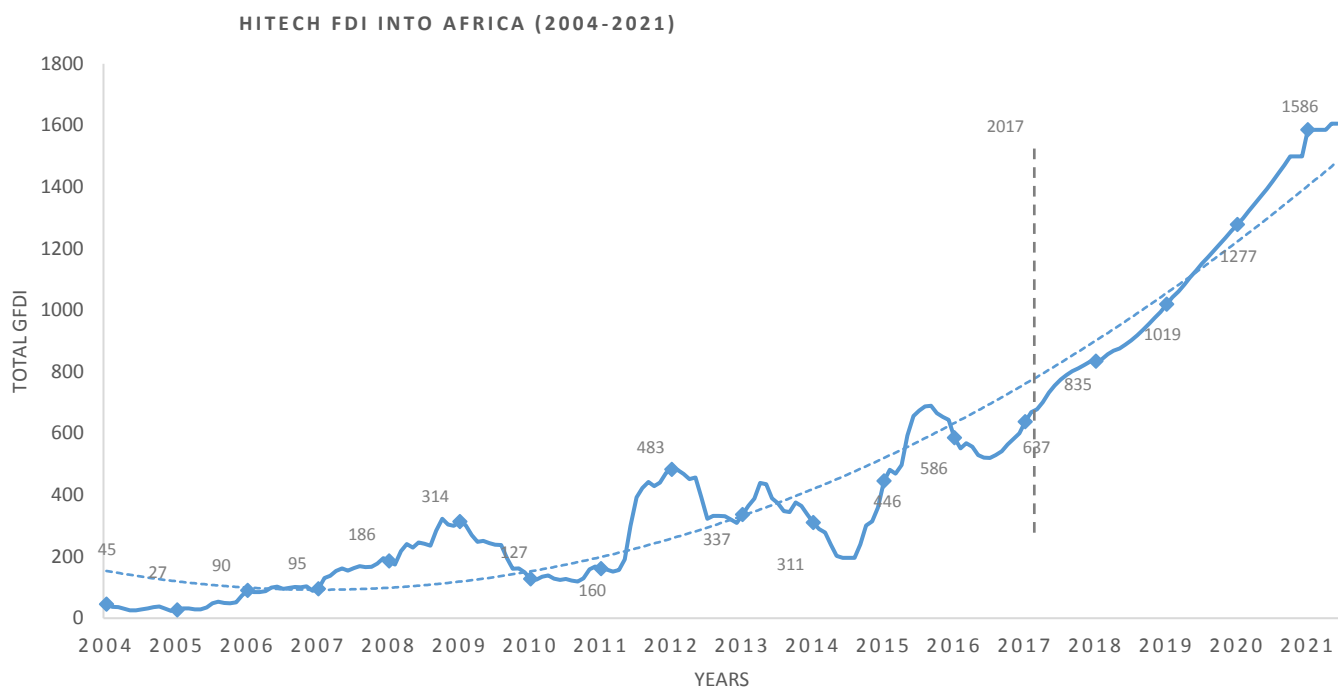
### Appendix 1.7: An explanation on forecasting and the ARIMA model.

A simple univariate model is applied to predict the future trend in GFDI. The autoregressive-integrated-moving-average (ARIMA) model is widely used in forecasting economic and financial time series such as FDI growth (McCrae et al. 2002). The model uses current and past values of the variable of interest to forecast future values. For multiple short-run forecasts the ARIMA model provides superior forecasts to more complicated econometric models that require a thorough understanding of the causal relations between macroeconomic variables and the structure of the analyzed economy (Junntila 2001; McCrae et al. 2002; Bashier and Talal 2007; Kumar and Gupta 2010). First, the trend in absolute foreign investments between 2004 and 2016 is obtained, which reveals a long term increase or decrease in investments. The ARIMA model is then fitted to the trend, after which the model is used to forecast the trend in foreign investment until 2021.

Box-Jenkins introduced the ARIMA methodology to model time series, which includes three components, the Autoregressive (AR) process, the Moving Average (MA) process and the Integration term (Box and Jenkins 1970). The AR and MA components capture the relationship between past investments and current investments, and assume that the current value of investment is the product of its past values. The AR term determines the time period over which past values influence current values, while the MA term gives the number of lags of the errors. The integration component of the model eliminates non-stationarity in the time series, because the ARIMA model assumes the time series to be stationary. The time series is said to be stationary when the mean and variance of the variable are constant over time, which can be assessed using the Augmented Dickey-Fuller (ADF) test (Dickey Fuller 1979; 1981; Bashier and Talal 2007). To select the best specification of the three ARIMA components, diagnostic testing is used to assess the distribution of the residuals approach white noise. The model should be parsimonious, meaning that an ARIMA model with a low order of parameters is preferred over a model with a high order of parameters if both perform equally well. Once a model is selected, the future values of the variable can be forecasted. A number of statistical measures is then used to assess the accuracy of the forecasting. The forecasted trend shows in which regions and sectors GFDI is expected to generally increase or decrease in the upcoming five years.

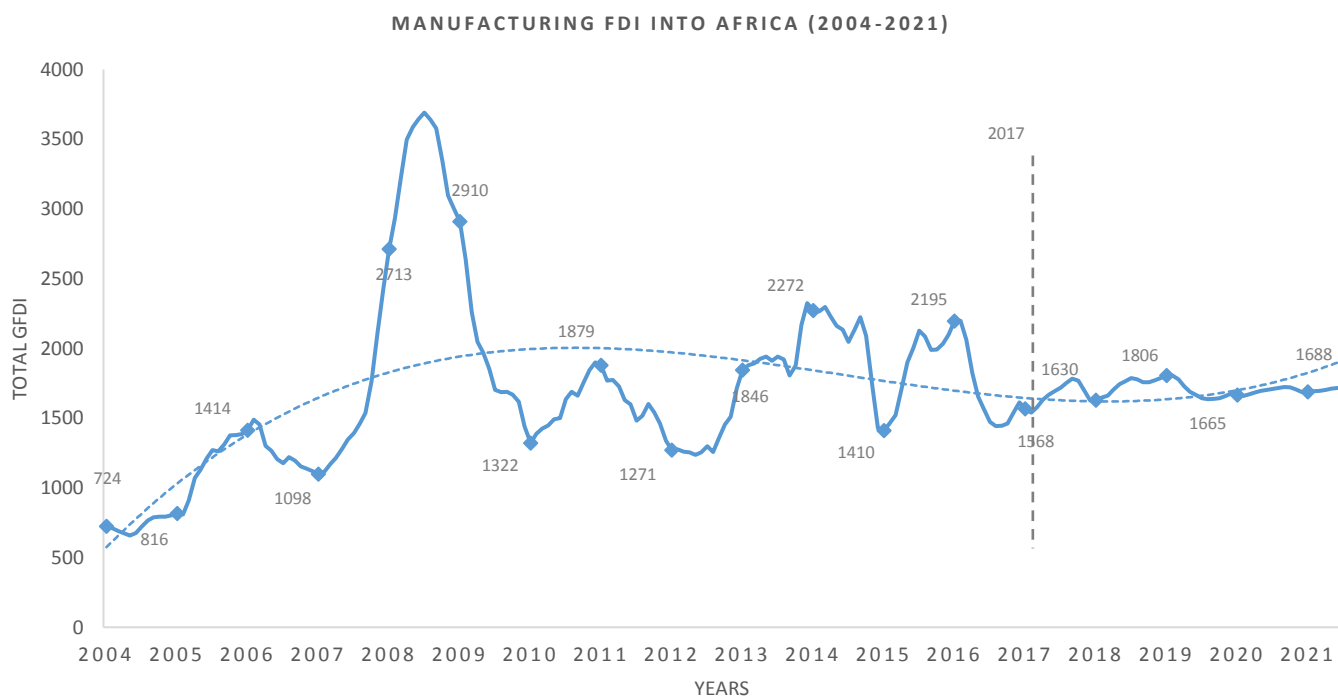
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.8: Forecast of hi-tech FDI into Africa (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

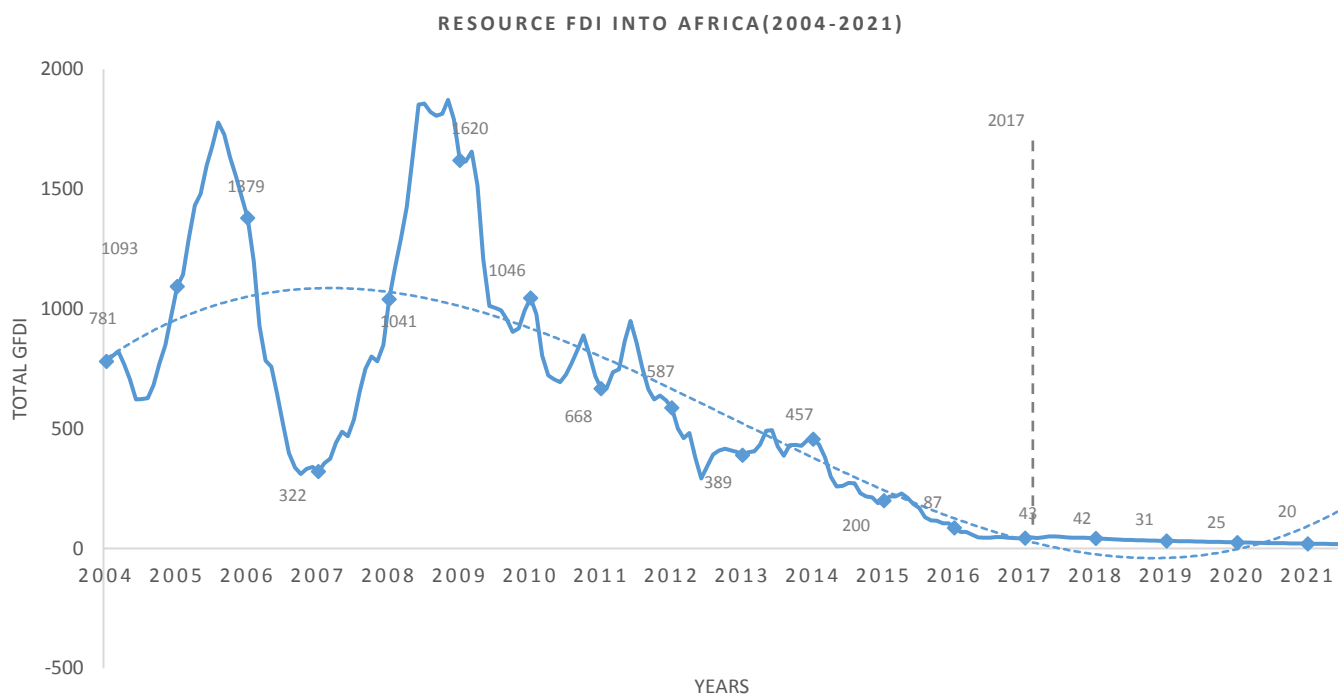
Appendix 1.9: Forecast of manufacturing FDI into Africa (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

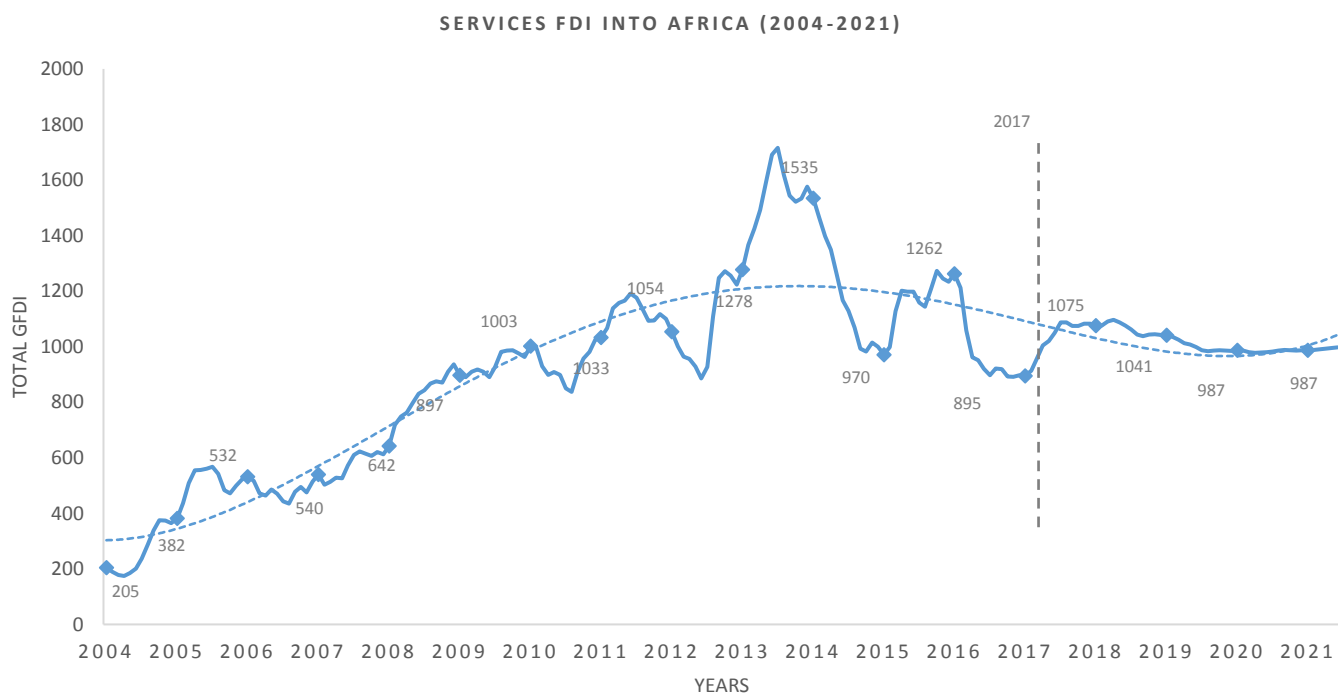


Appendix 1.10: Forecast of resource FDI into Africa (2004-2021)



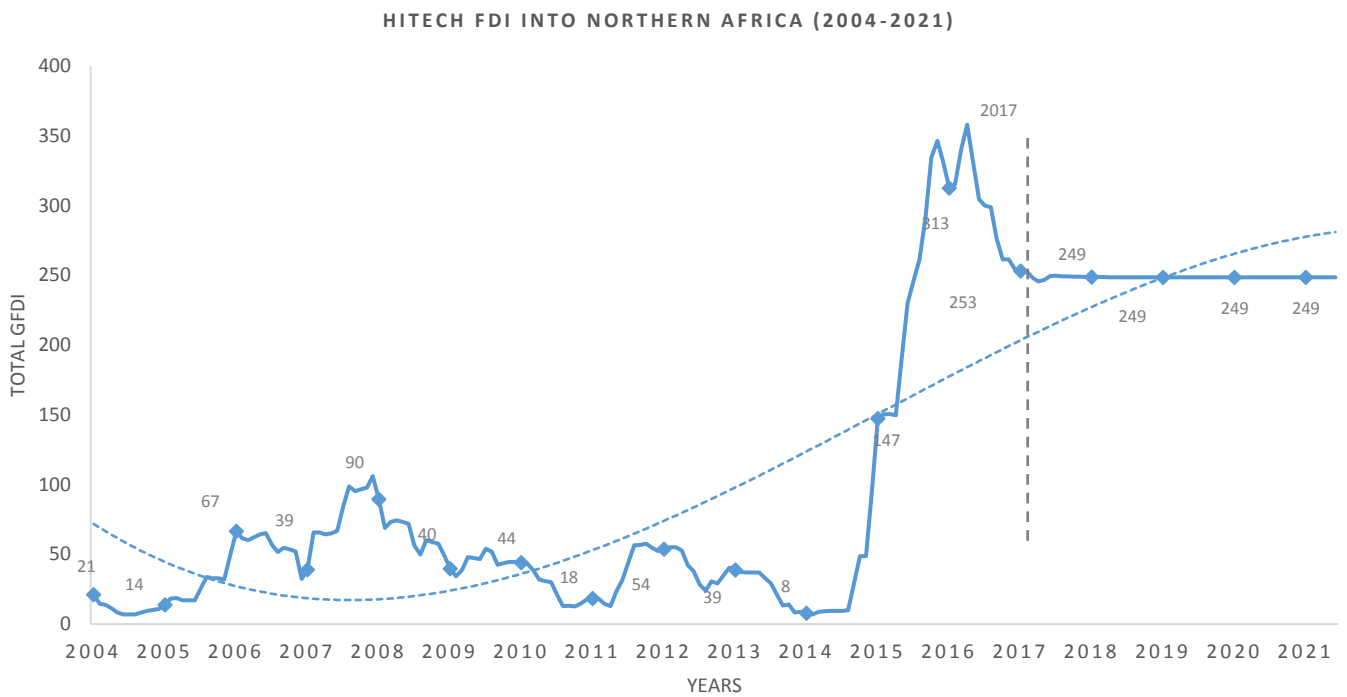
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.11: Forecast of service FDI into Africa (2004-2021)



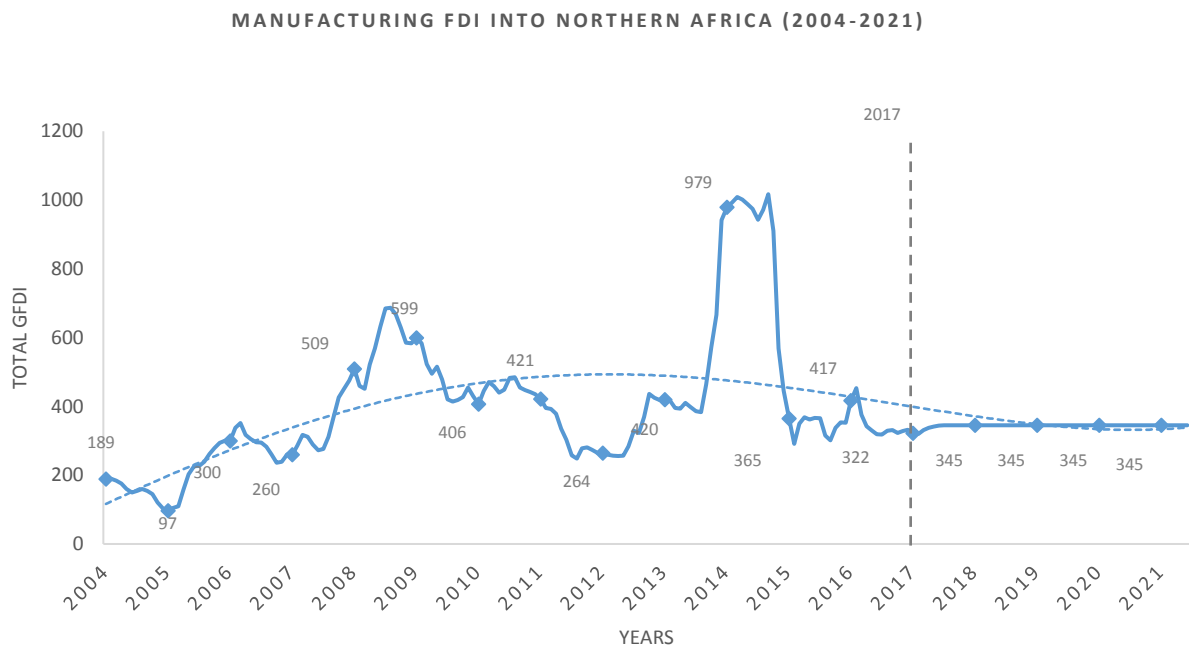
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.12: Hitech FDI into Northern Africa (2004-2021)



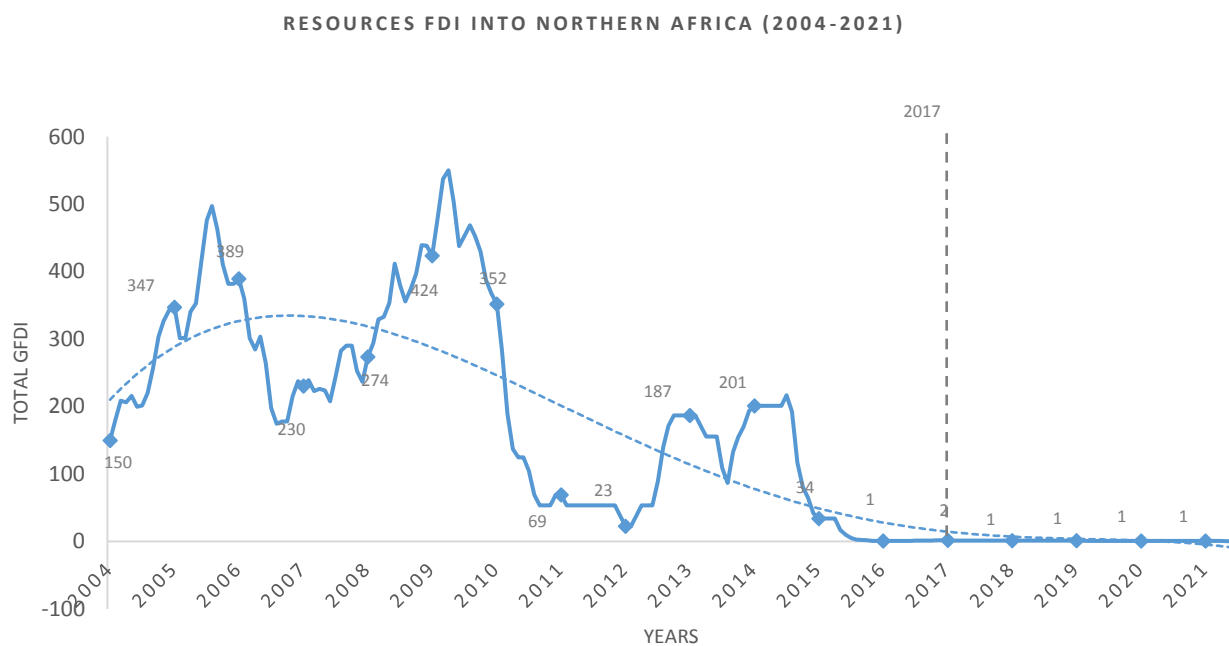
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.13: Manufacturing FDI into Northern Africa (2004-2021)



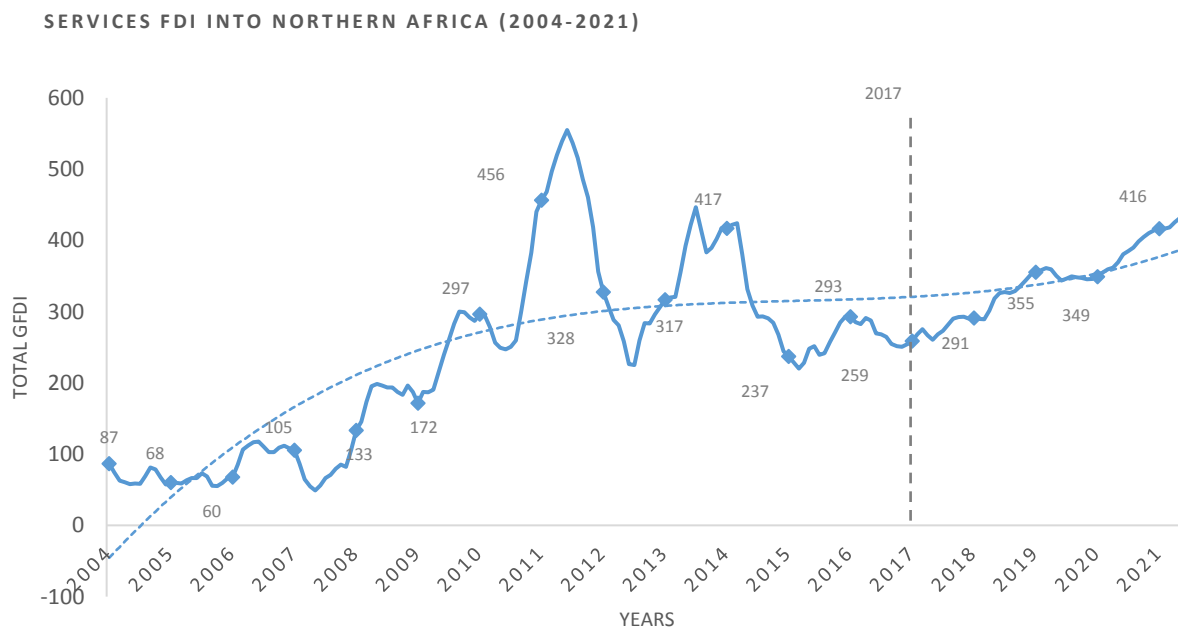
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.14: Resources FDI into Northern Africa (2004-2021)



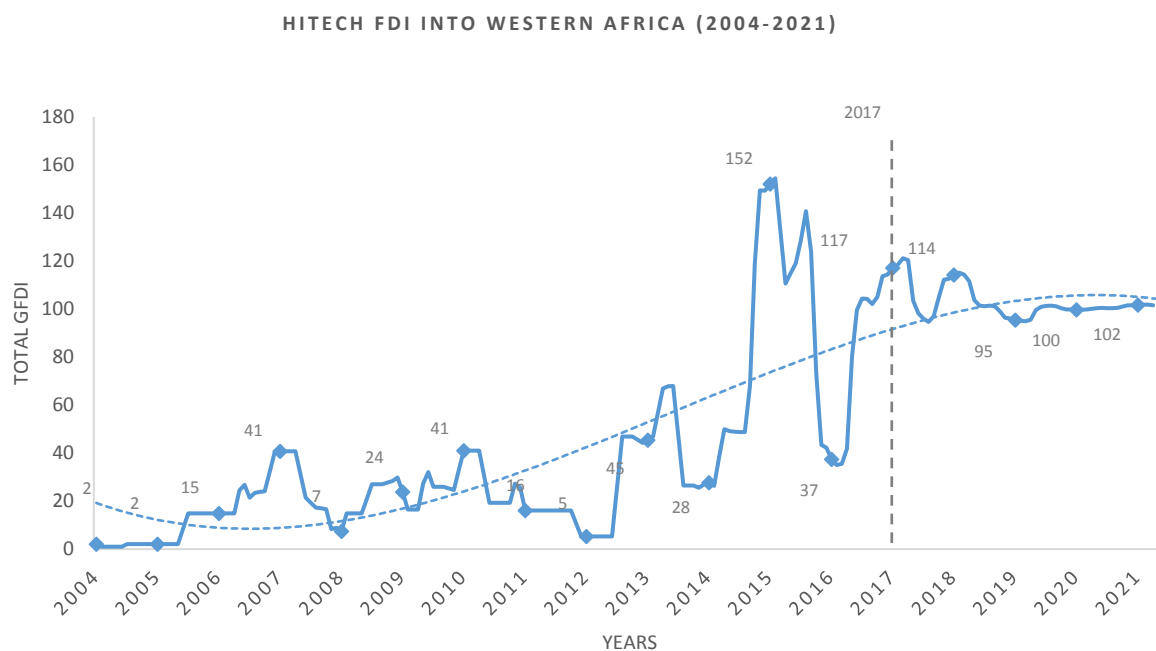
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.15: Services FDI into Northern Africa (2004-2021)



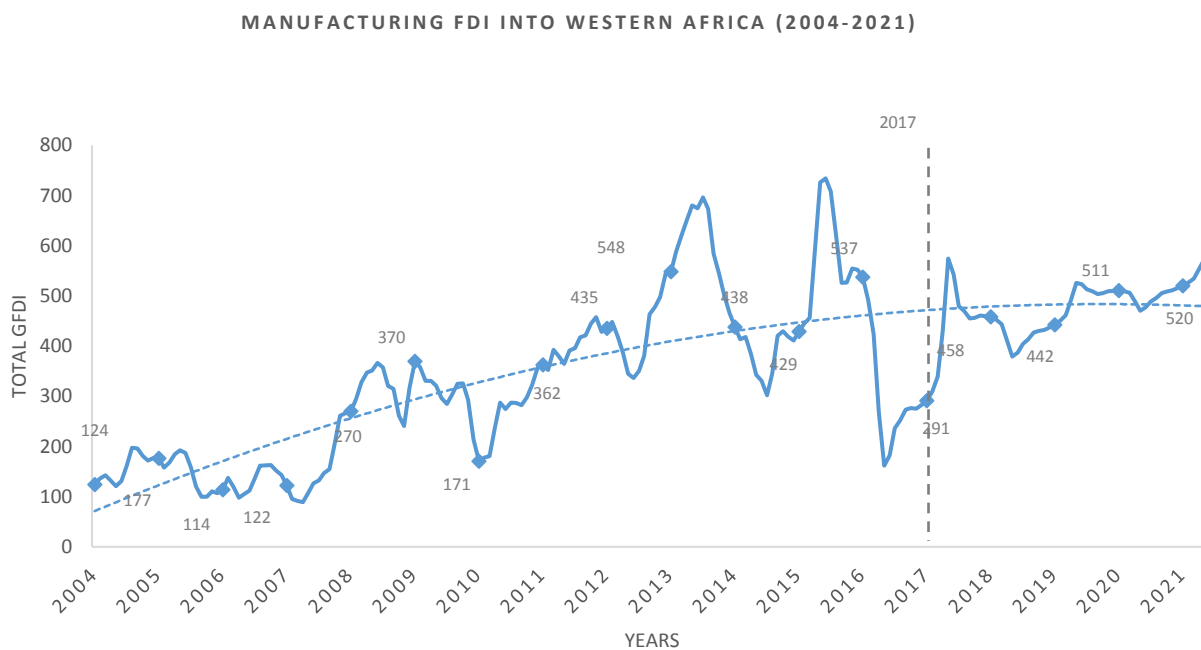
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.16: Hitech FDI into Western Africa (2004-2021)



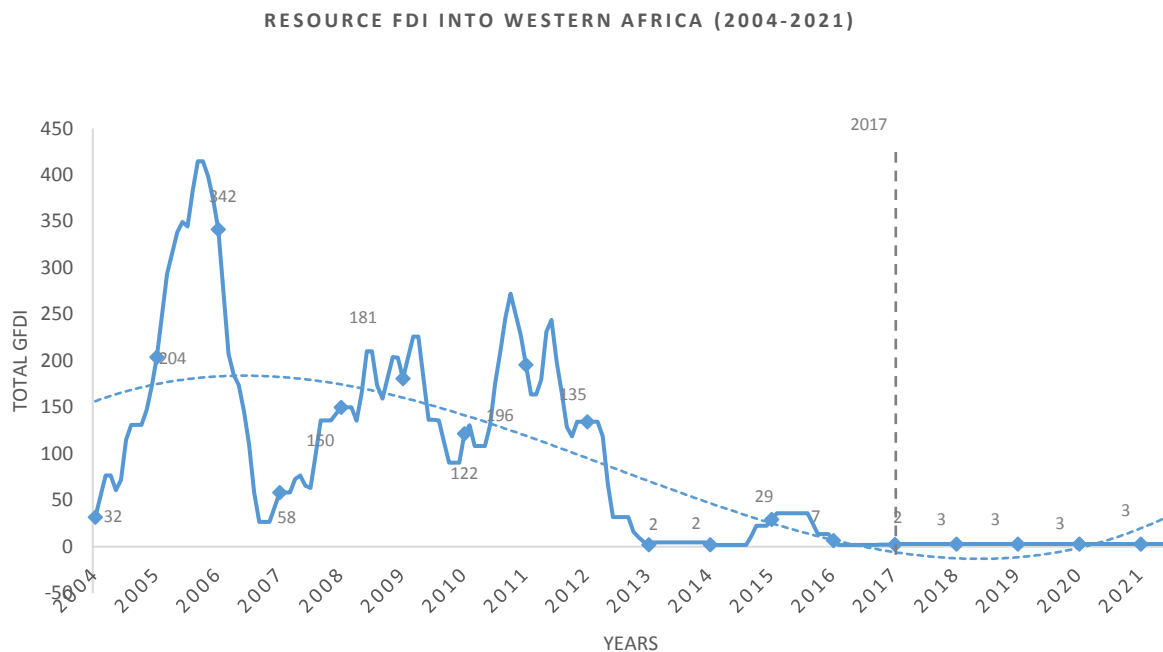
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.17: Manufacturing FDI into Western Africa (2004-2021)



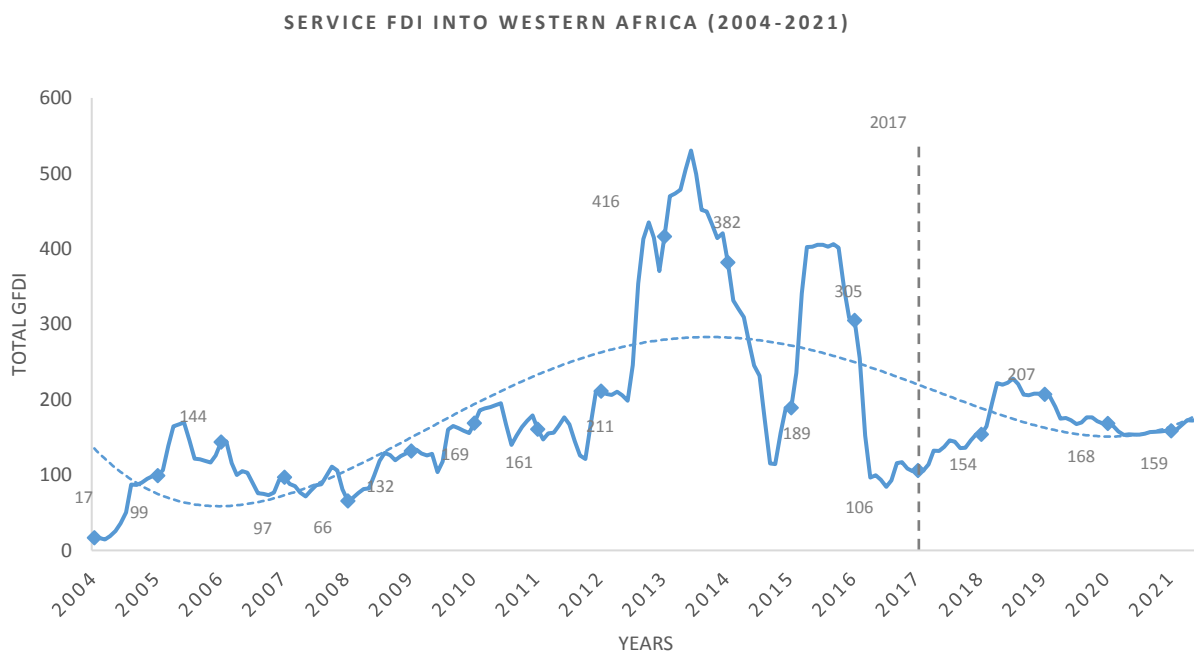
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.18: Resource FDI into Western Africa (2004-2021)



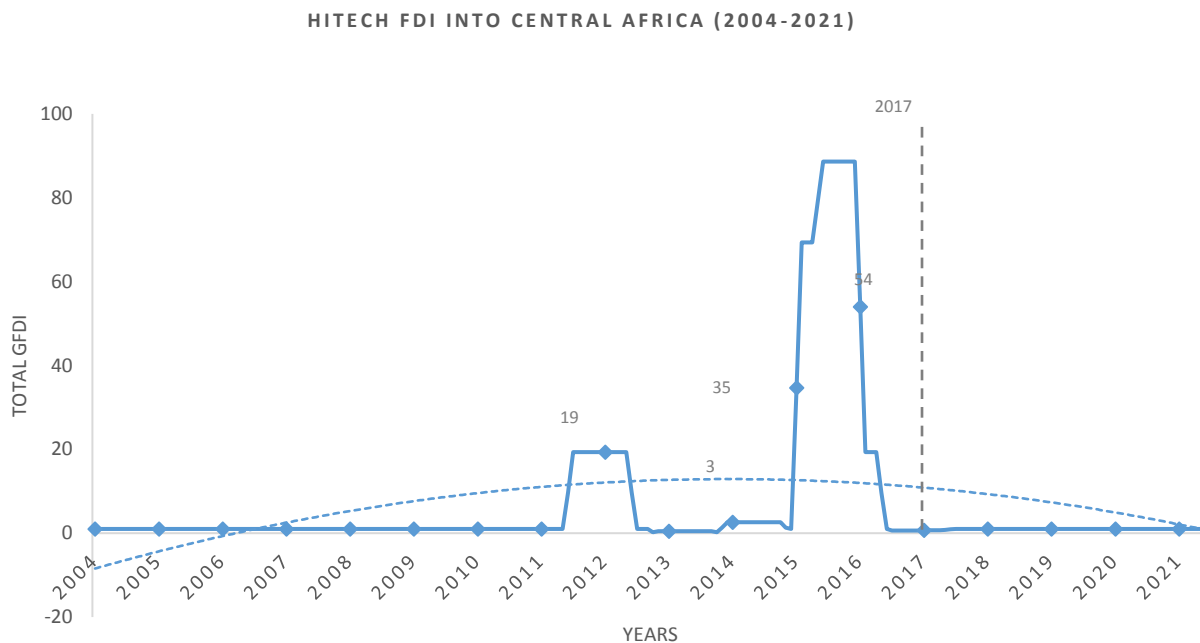
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.19: Service FDI into Western Africa (2004-2021)



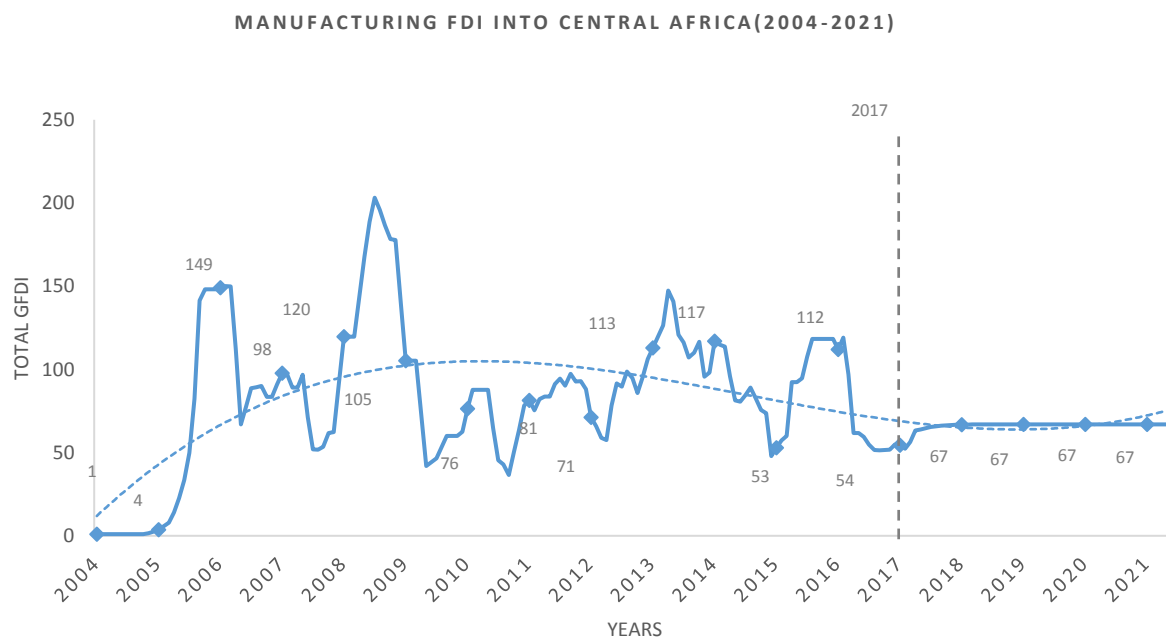
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.20: Hitech FDI into Central Africa (2004-2021)



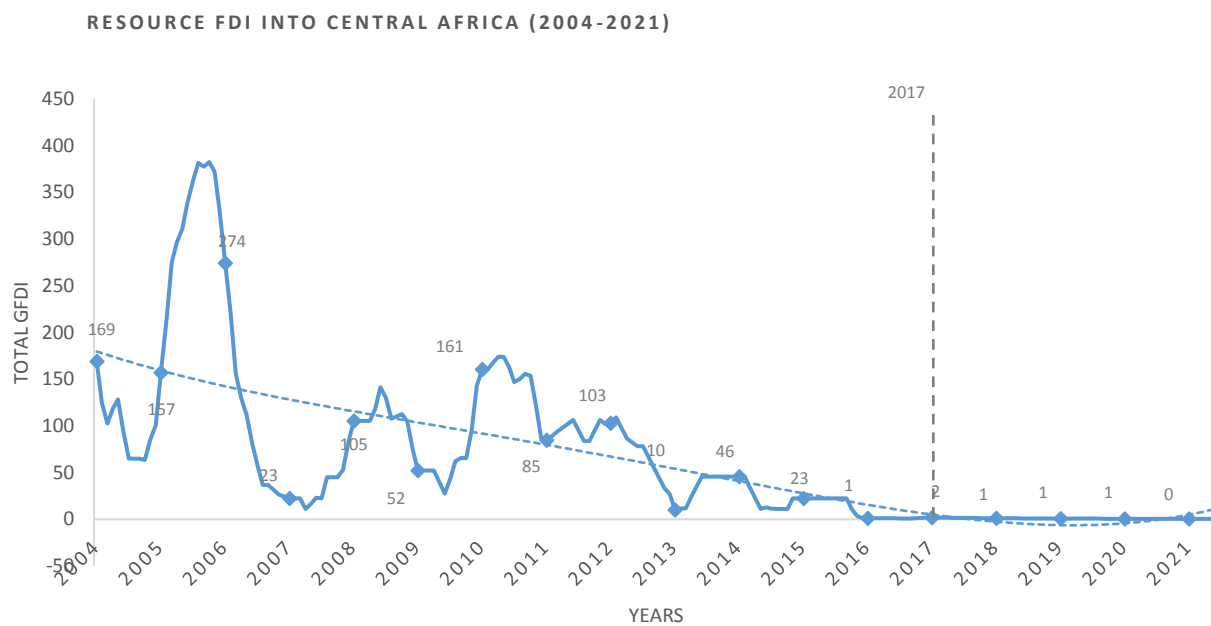
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.21: Manufacturing FDI into Central Africa (2004-2021)



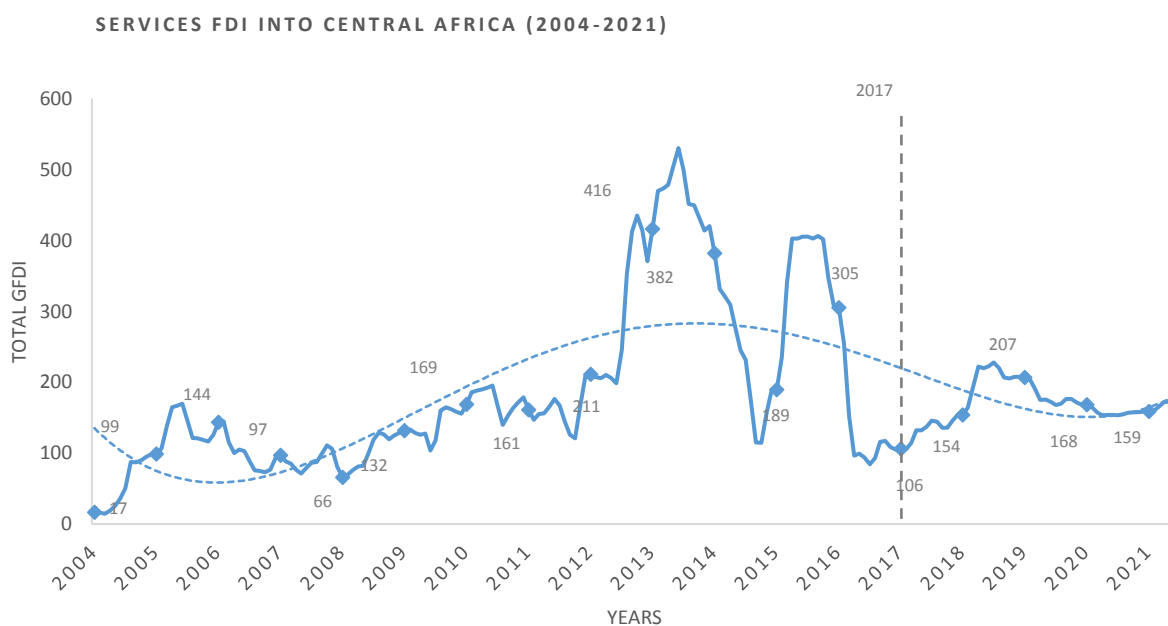
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.22: Resource FDI into Central Africa (2004-2021)



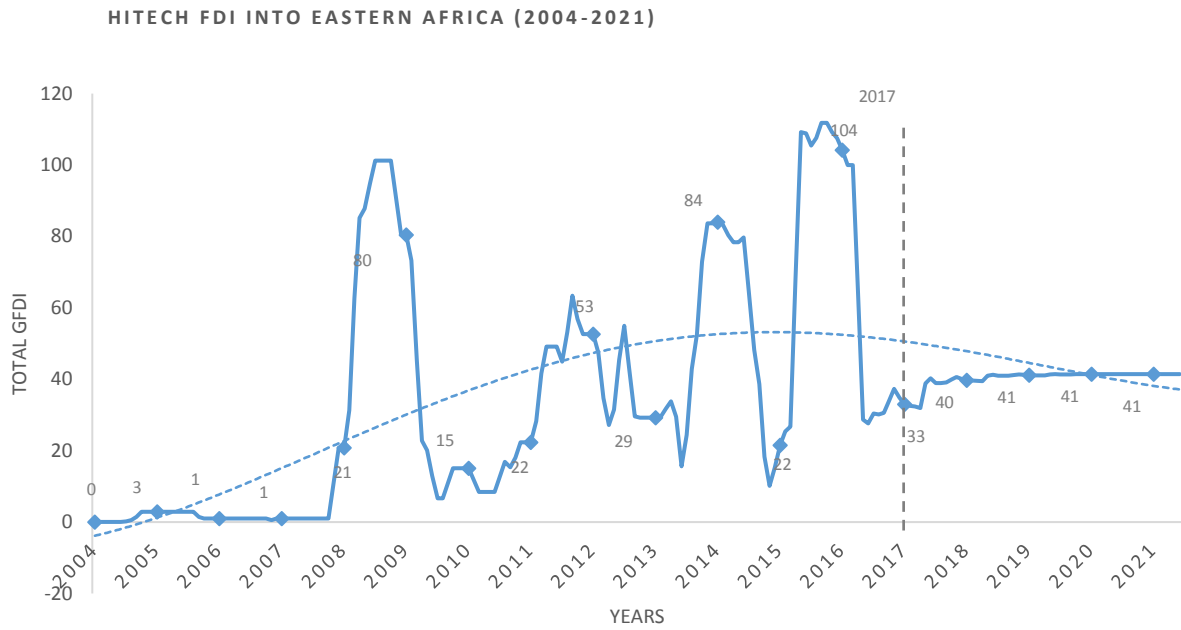
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.23: Service FDI into Central Africa (2004-2021)



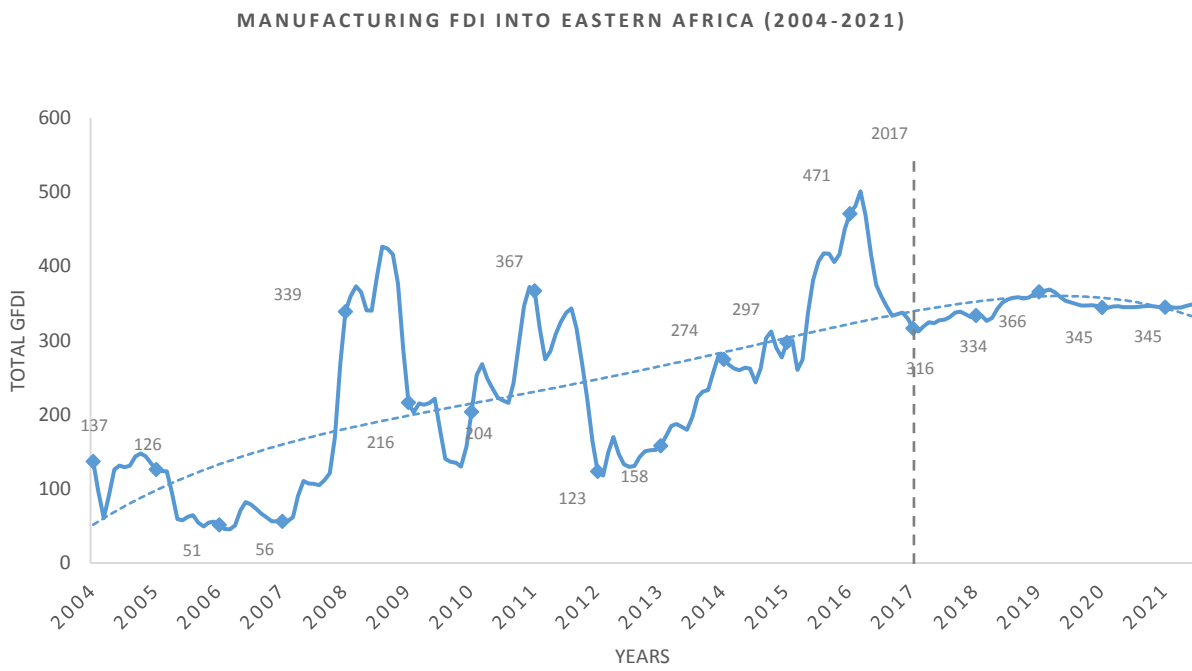
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.24: Hitech FDI into Eastern Africa (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

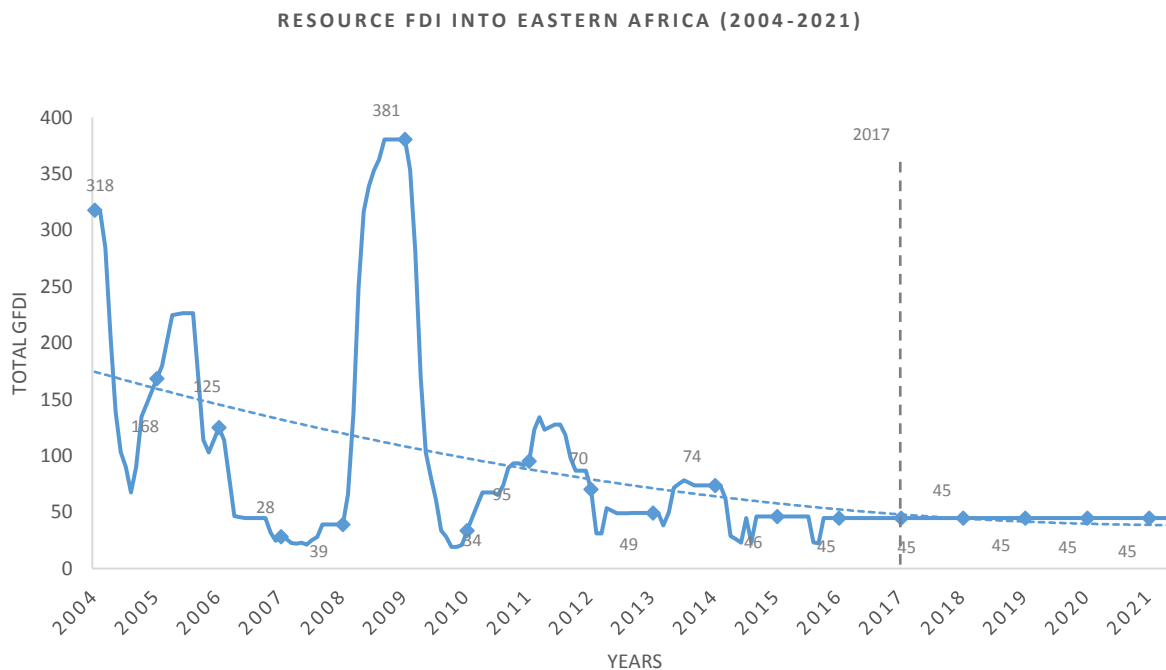
Appendix 1.25: Manufacturing FDI into Eastern Africa (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

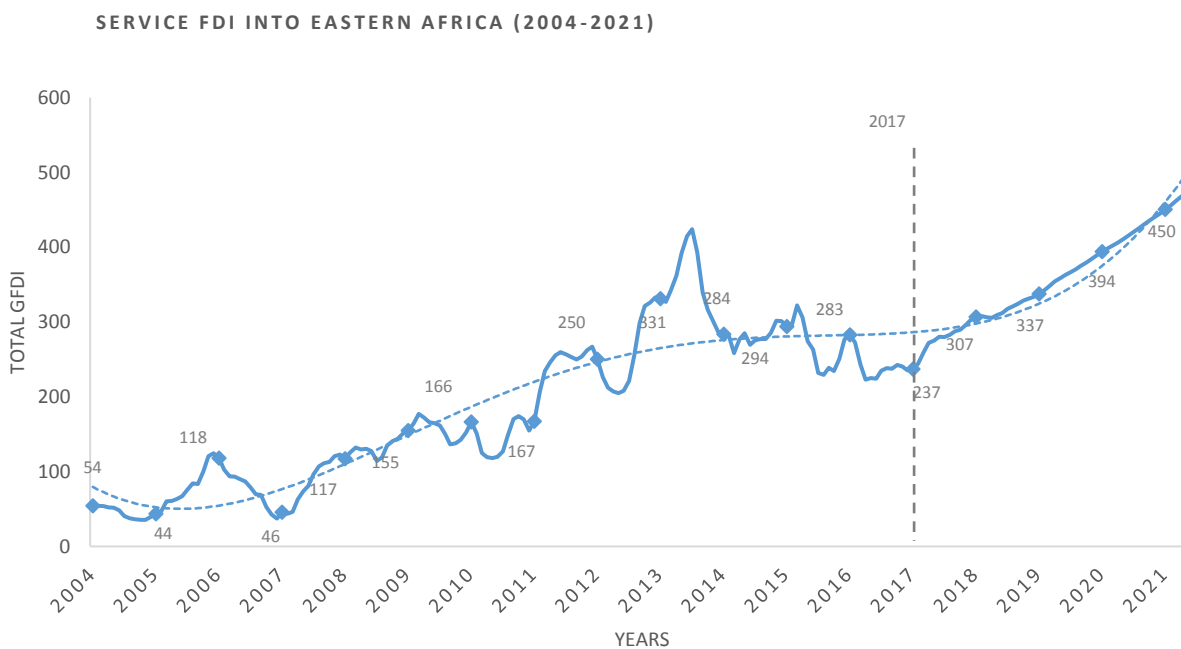


Appendix 1.26: Resource FDI into Eastern Africa (2004-2021)



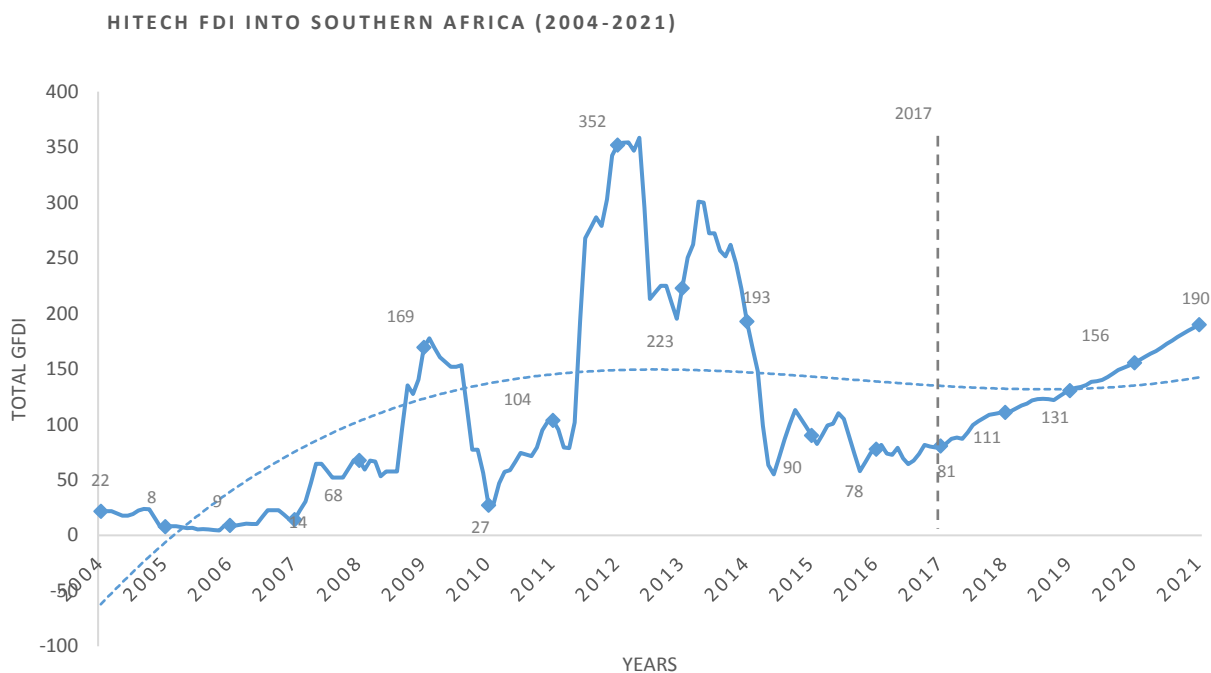
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.27: Service FDI into Eastern Africa (2004-2021)



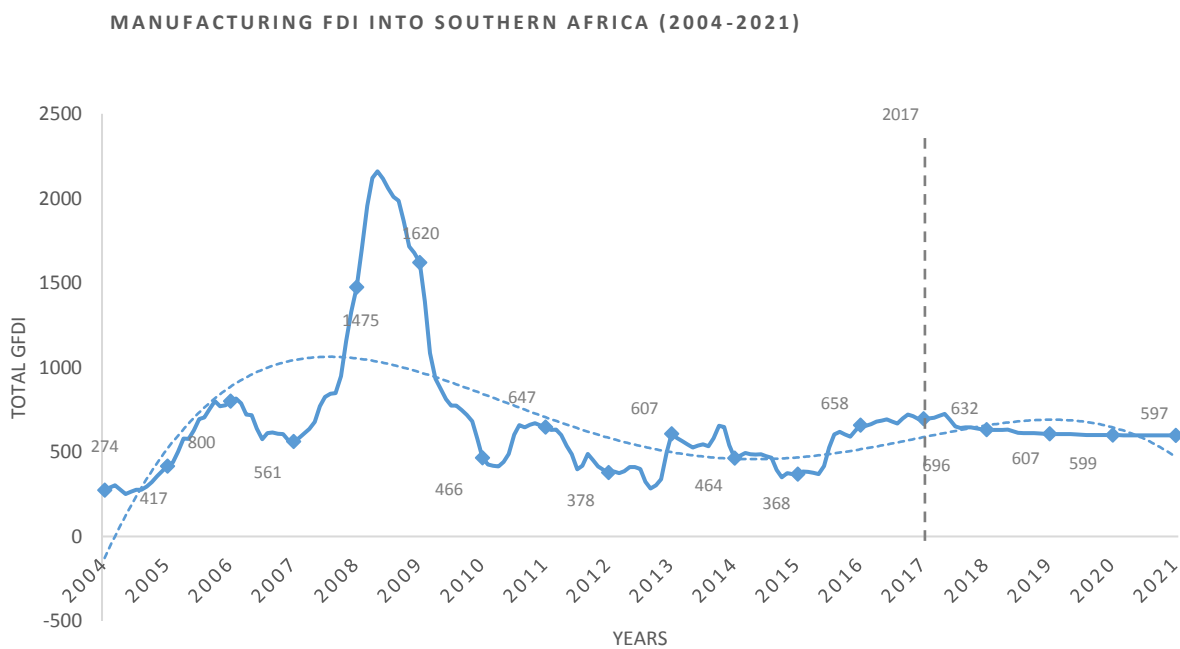
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.28: Hitech FDI into Southern Africa (2004-2021)



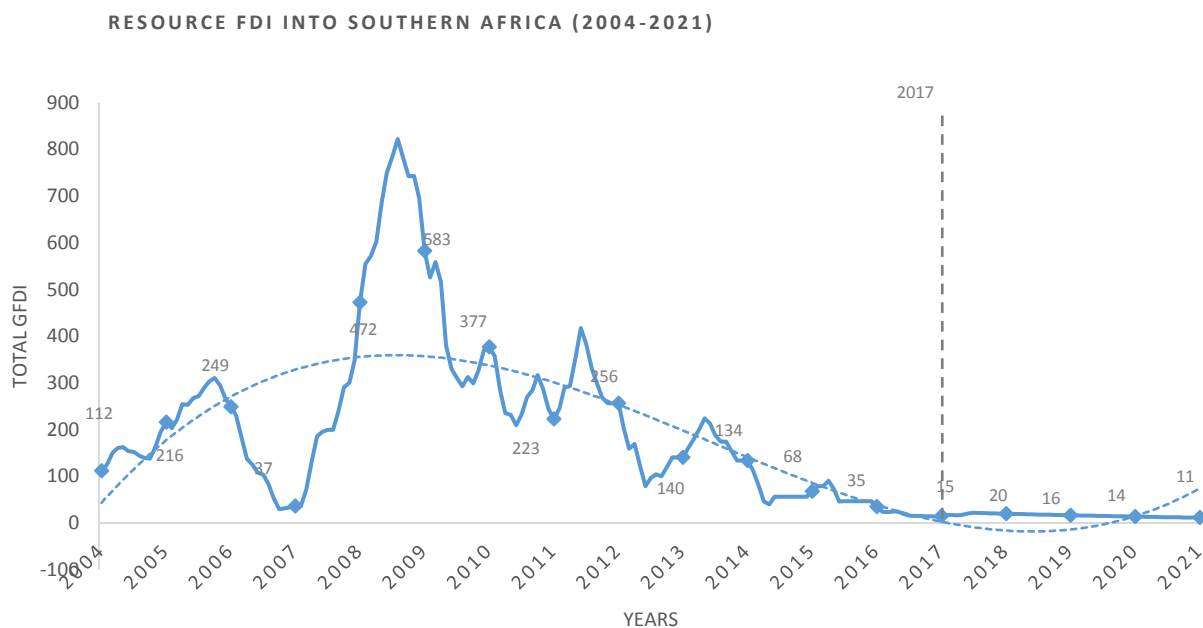
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.29: Manufacturing FDI into Southern Africa (2004-2021)



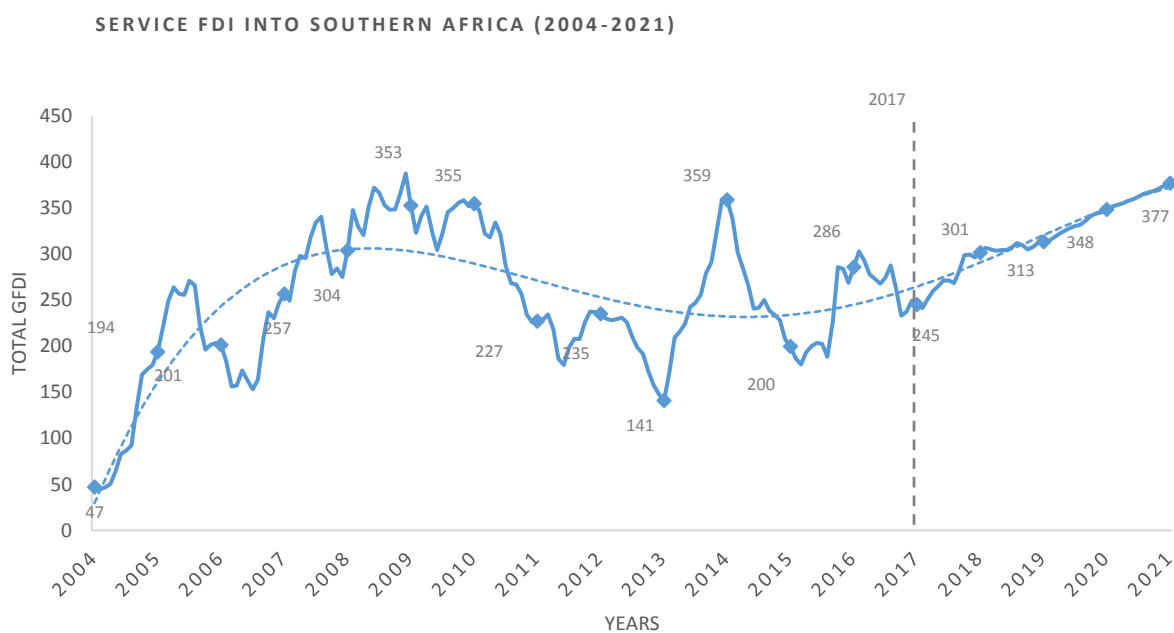
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.30: Resource FDI into Southern Africa (2004-2021)



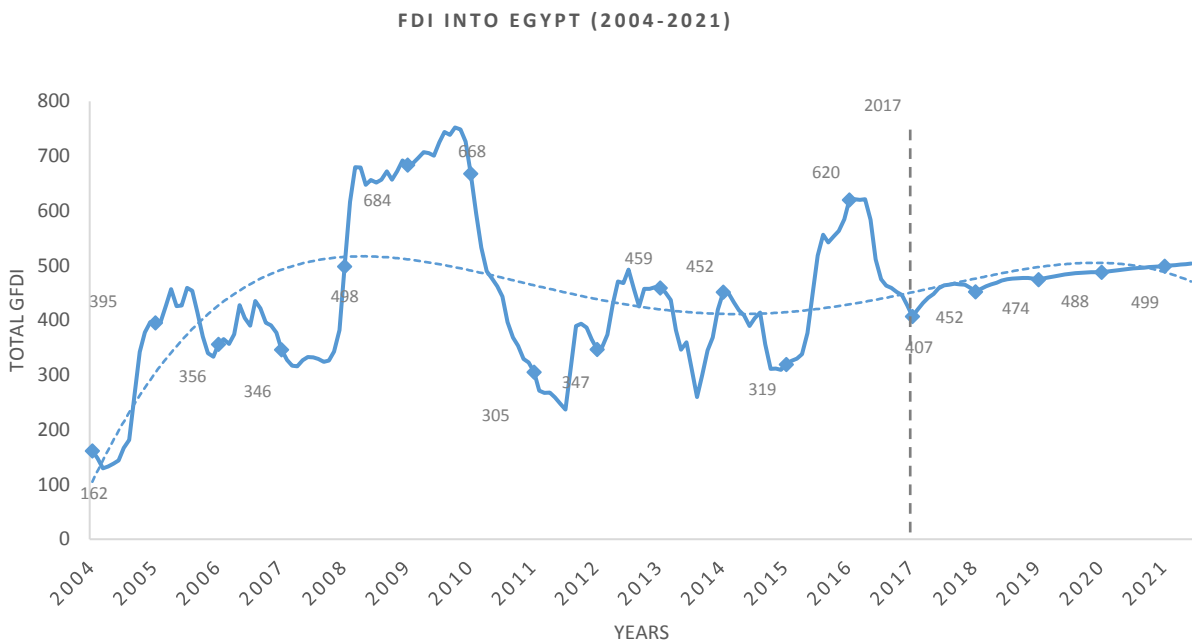
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.31: Service FDI into Southern Africa (2004-2021)



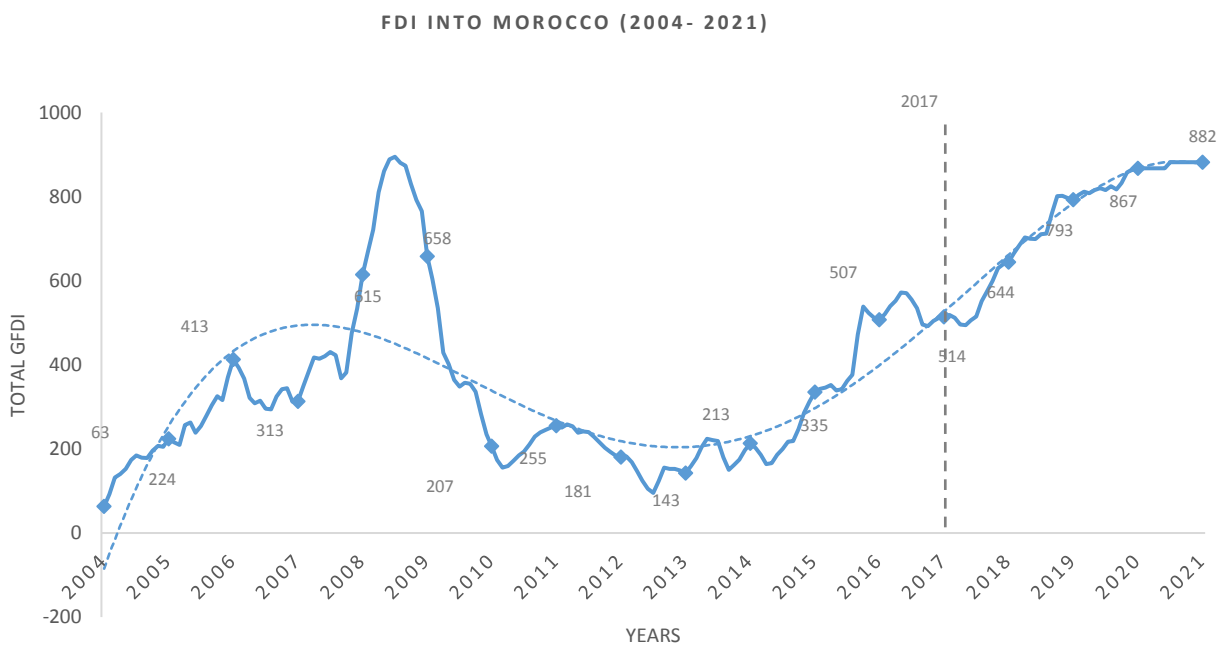
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.32: FDI into Egypt (2004-2021)



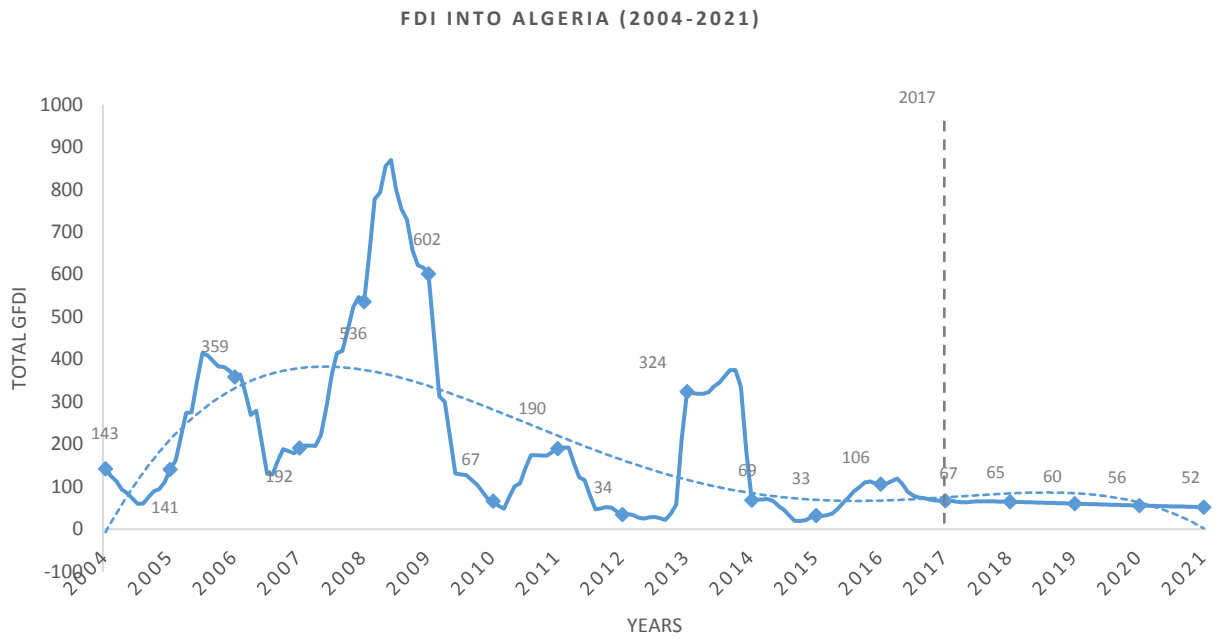
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.33: FDI into Morocco (2004-2021)



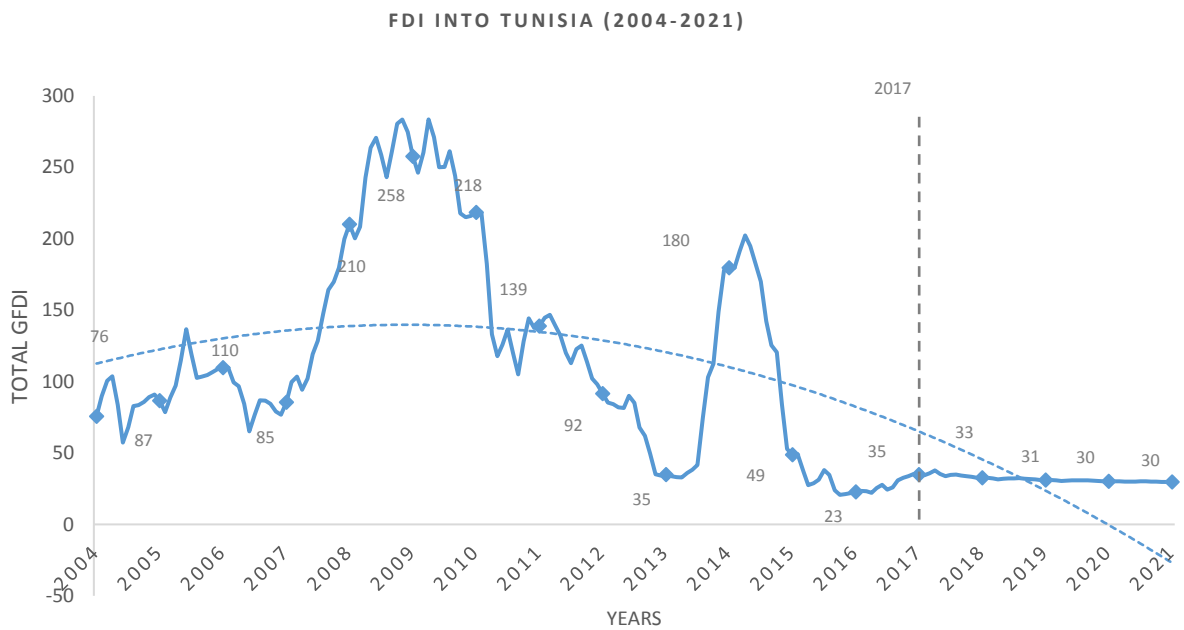
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.34: FDI into Algeria (2004-2021)



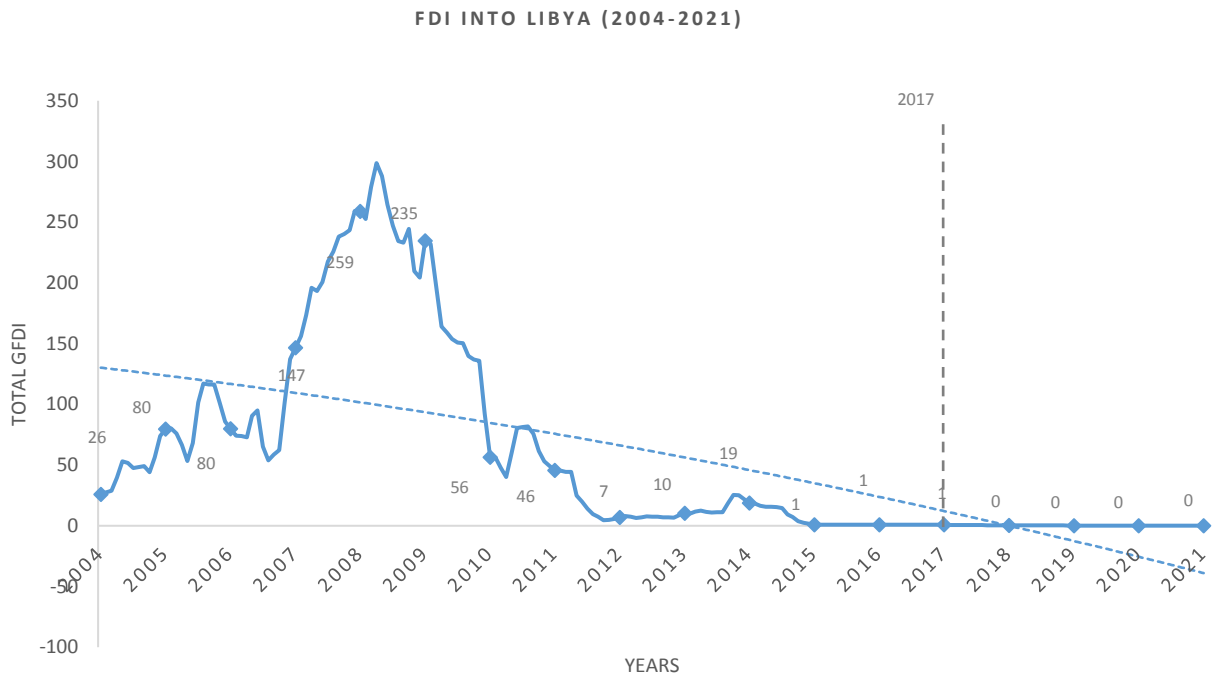
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.35: FDI into Tunisia (2004-2021)



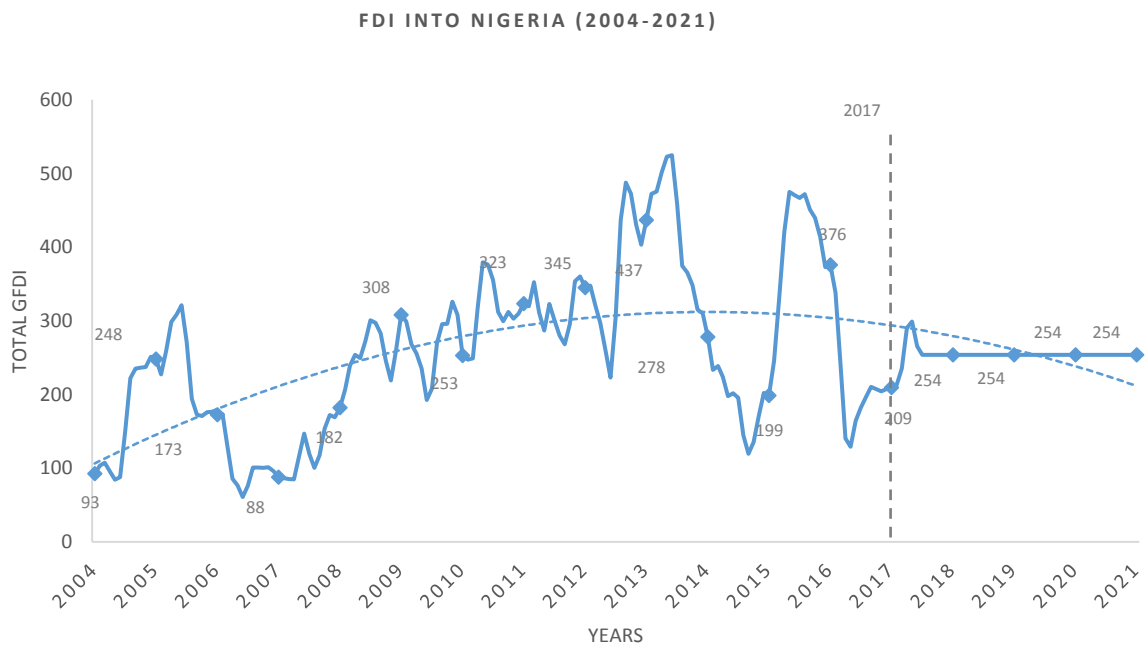
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.36: FDI into Libya (2004-2021)



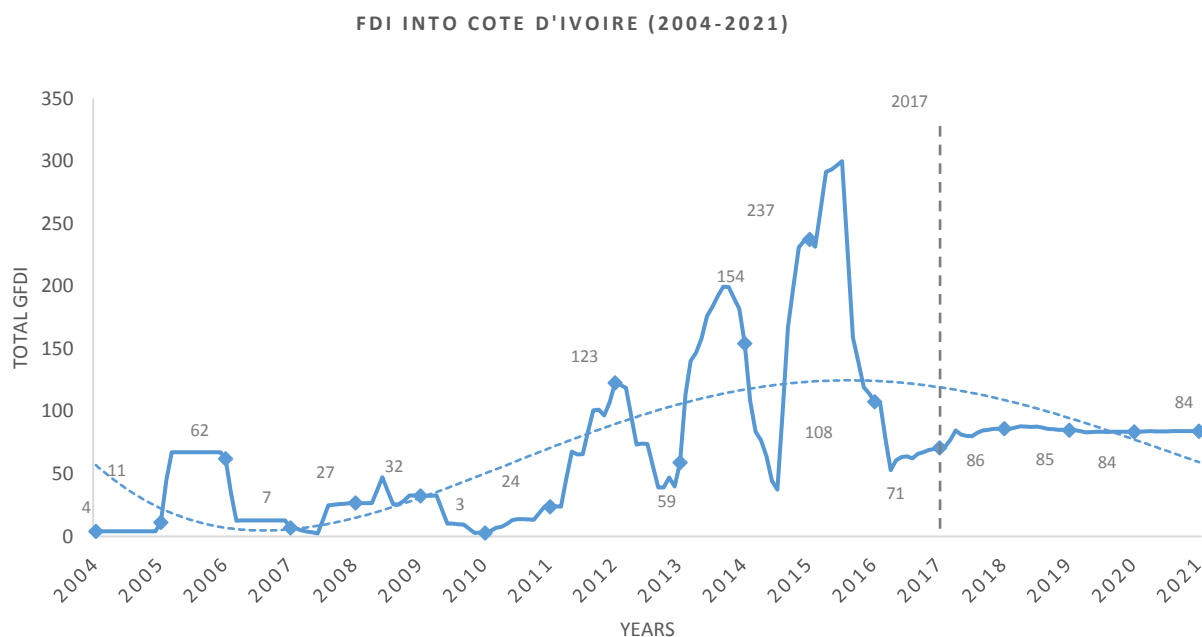
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.37: FDI into Nigeria (2004-2021)



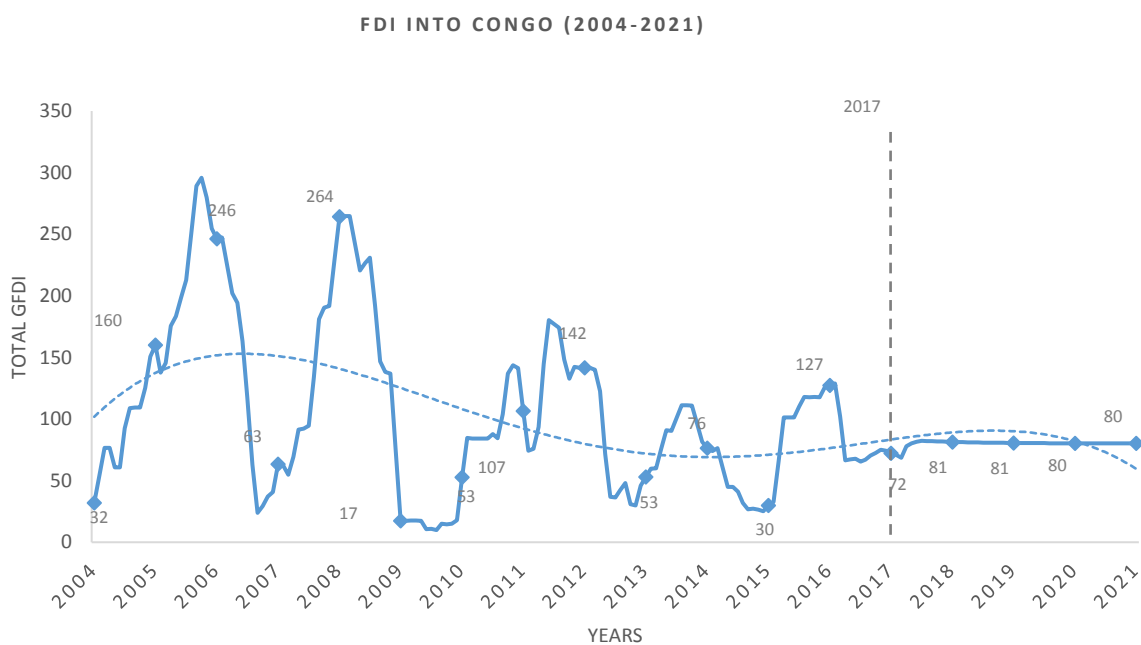
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.38: FDI into Cote d'Ivoire (2004-2021)



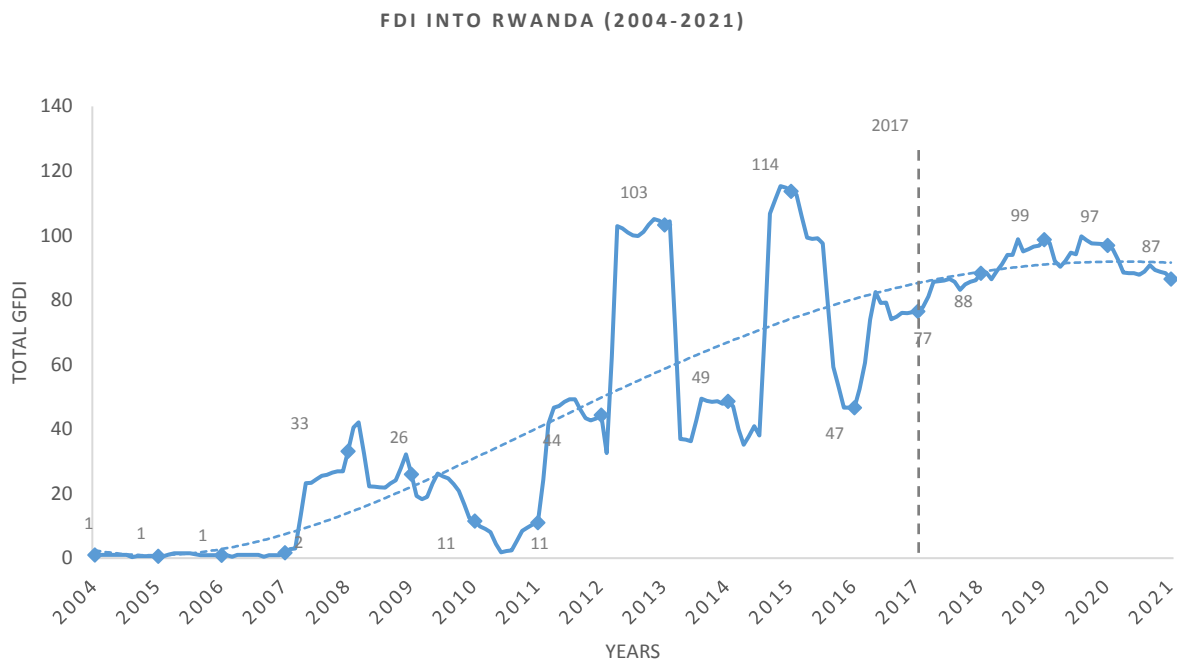
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.39: FDI into Congo (2004-2021)



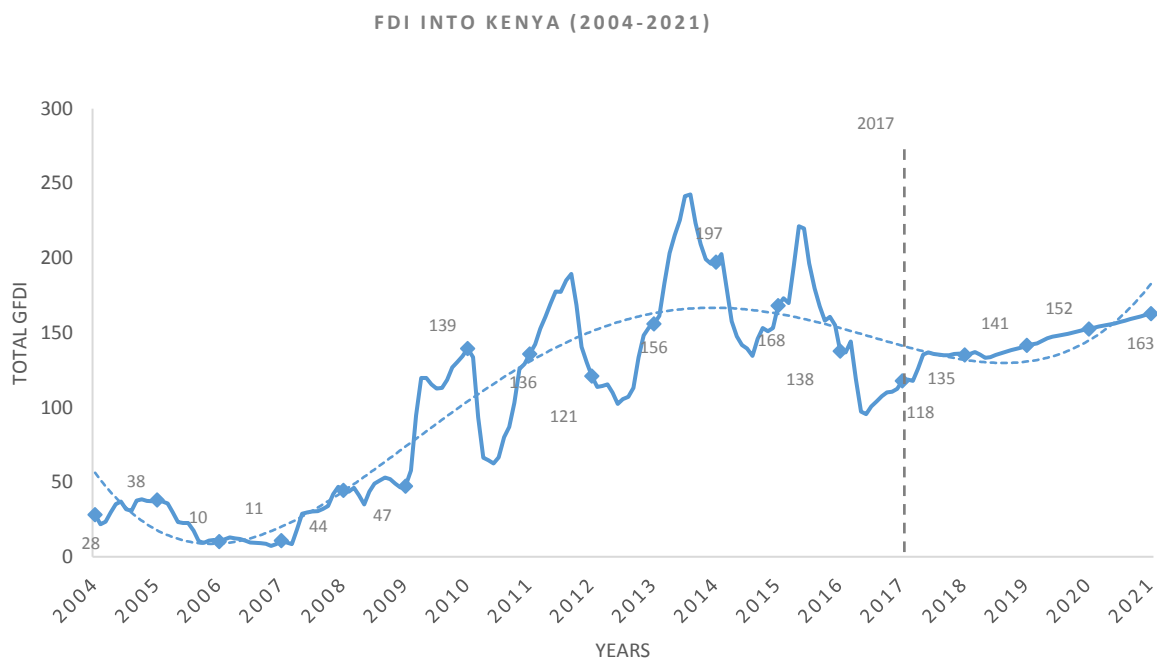
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.40: FDI into Rwanda (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

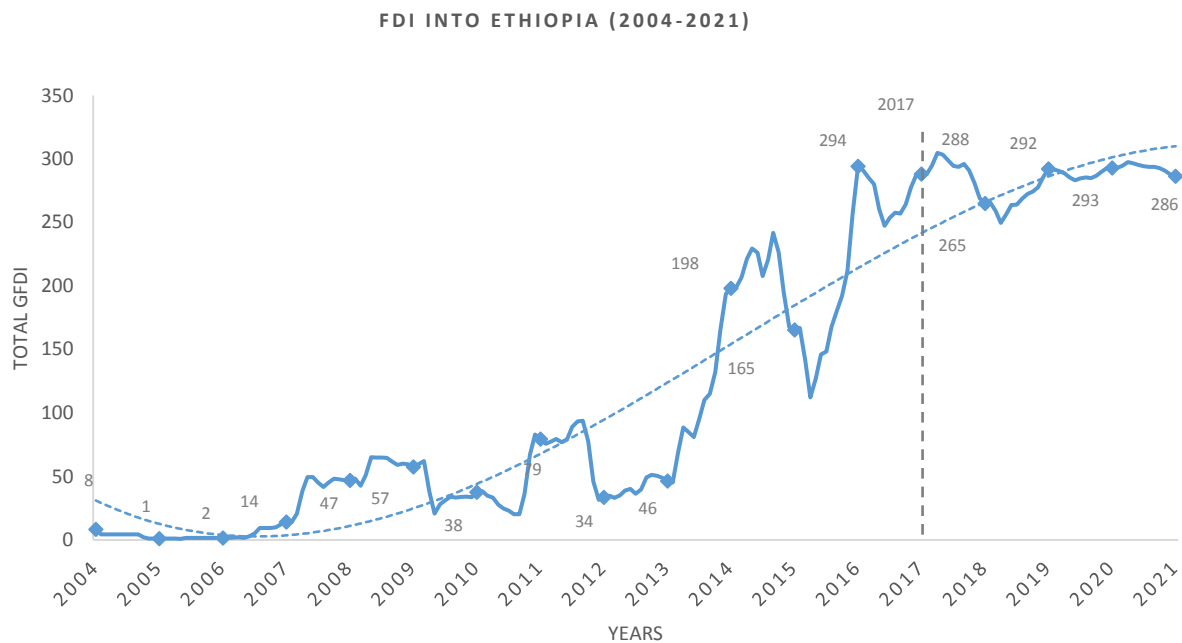
Appendix 1.41: FDI into Kenya (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

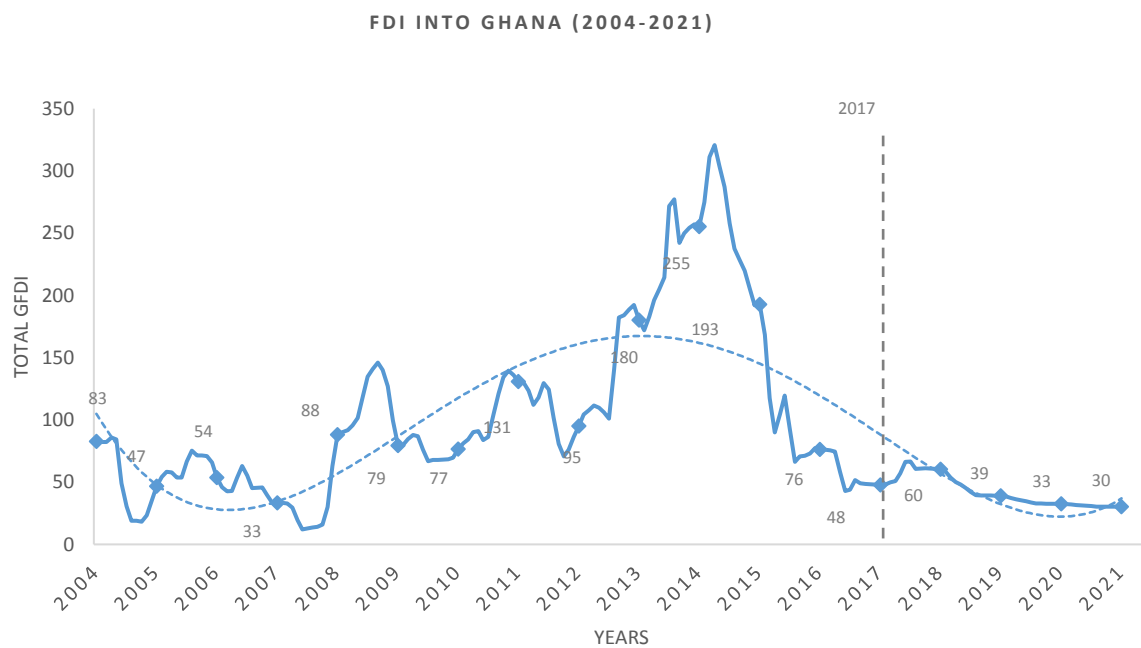


Appendix 1.42: FDI into Ethiopia (2004-2021)



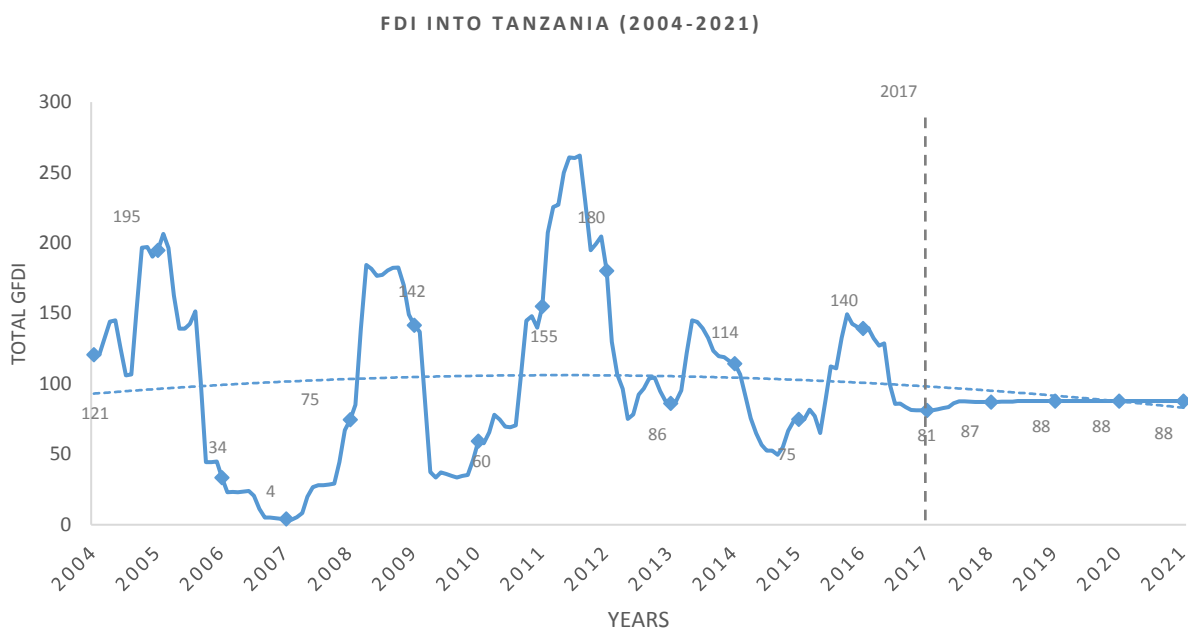
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.43: FDI into Ghana (2004-2021)



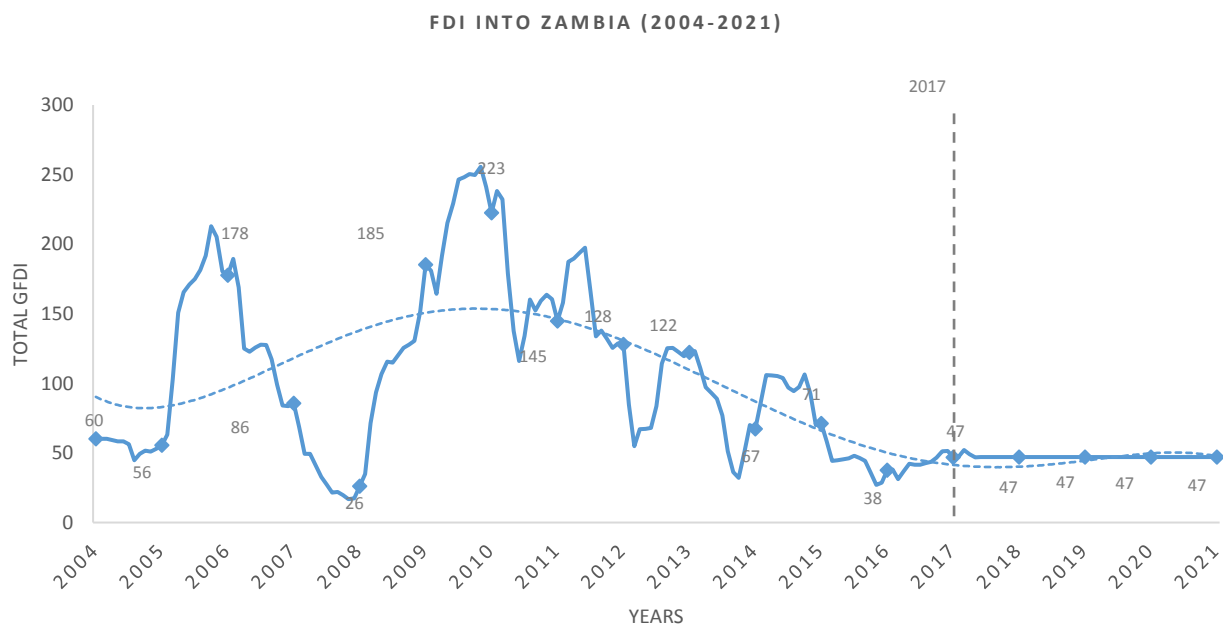
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.44: FDI into Tanzania (2004-2021)



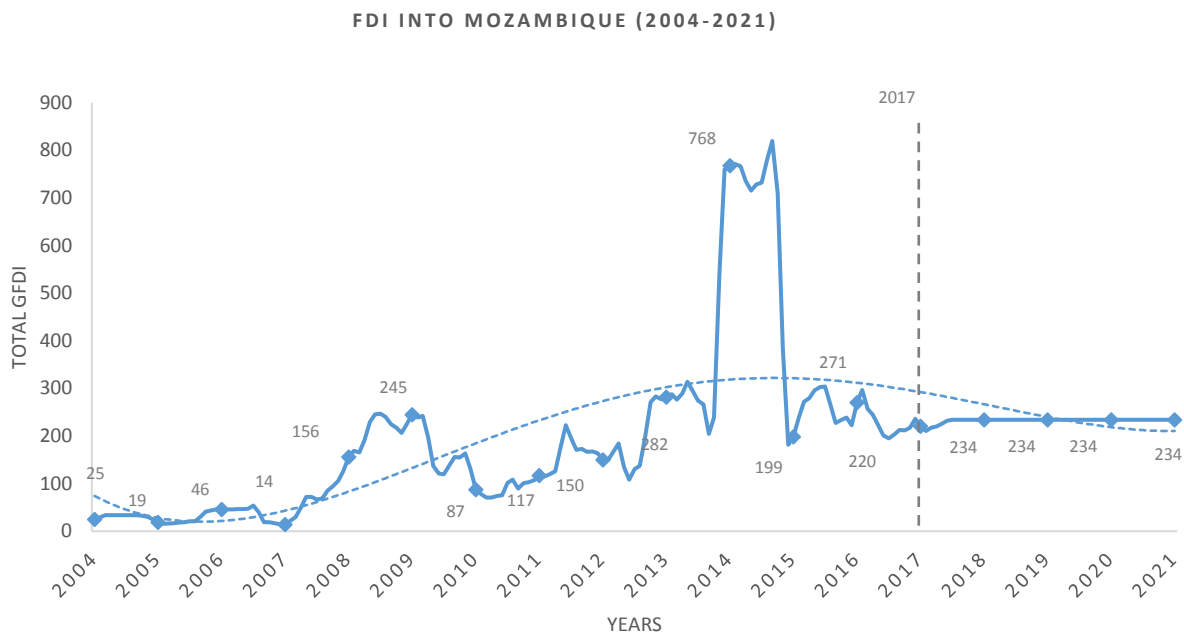
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.45: FDI into Zambia (2004-2021)



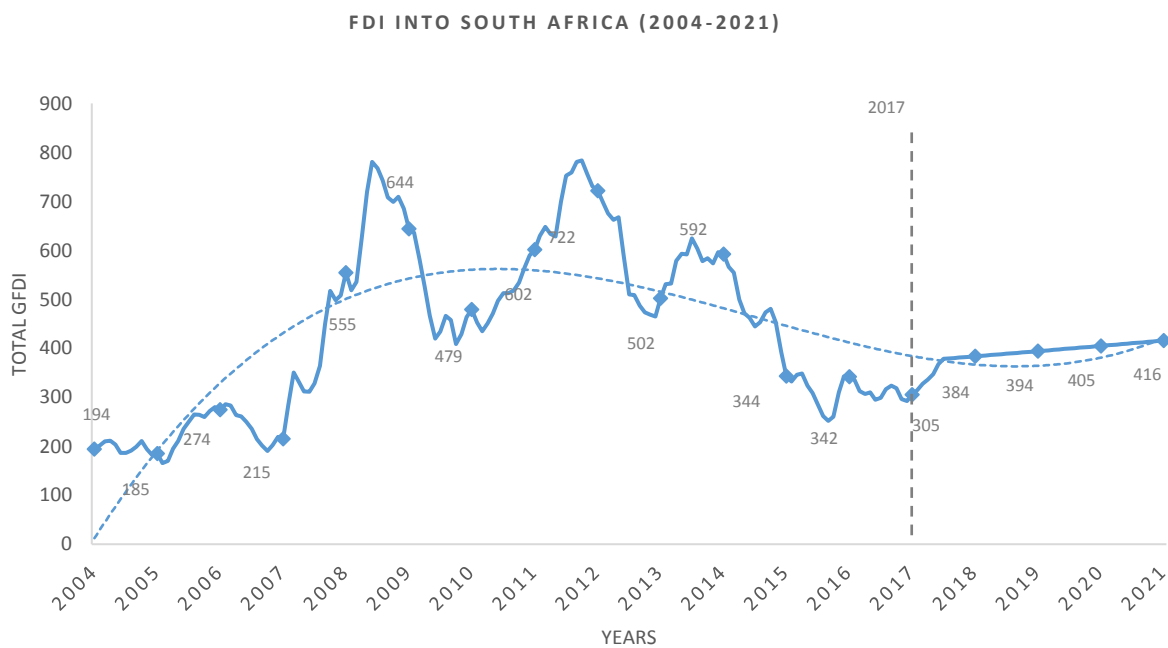
Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.46: FDI into Mozambique (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

Appendix 1.47: FDI into South Africa (2004-2021)



Source: Rutten and Wall, 2017, Based on FDI Markets data

[https://www.researchgate.net/publication/301285189\\_Measuring\\_Urban\\_Competition\\_on\\_the\\_Basis\\_of\\_Flows\\_between\\_Cities\\_Some\\_Evidence\\_from\\_the\\_World\\_City\\_Network](https://www.researchgate.net/publication/301285189_Measuring_Urban_Competition_on_the_Basis_of_Flows_between_Cities_Some_Evidence_from_the_World_City_Network)

Appendix 1.49: Data and statistical methods for Johannesburg FDI and location factor analysis (2003-2016)

This study assesses if city district characteristics influence the level of foreign direct investment in Johannesburg. Four districts that received significant levels of foreign direct investment between 2003 and 2014 are included: district Midrand and Diepsloot, district Randburg and Rosebank, district Sandton and Alexandra, and the inner city and Southern Joburg district. Districts that received no FDI were excluded from the analysis. The count of FDI per year is the dependent variable. Explanatory variables on crime, demographics, development, economy, household structure, income and expenditure, international trade, labour market and tourism are included in the analysis (see table 1). Controls for the size of the district (either the total population or the area surface size) are included to correct for the size of each district. Five models are used to estimate the effects of district development, economic activity per sector, district trade flows and the local labour market respectively on FDI. The final model includes all variables that are found to be significant predictors of FDI to assess their combined effect.

*Descriptive statistics of the variables included in the analysis (N= 46)*

	Mean	Standard deviation	Minimum	Maximum
Count of foreign direct investment	7.21	6.27	0.00	24.00
Size of the region's area in km <sup>2</sup>	220.10	60.26	149.10	313.50
Total population	4.51E+05	1.21E+05	2.70E+05	7.16E+05
Number of postgraduates	1.81E+04	5.15E+03	8.09E+03	2.77E+04
Number of tourists visiting the district	5.32E+05	1.57E+05	2.85E+05	8.43E+05
Gross value added real estate sector in thousands	3.10E+06	1.23E+06	1.49E+06	7.59E+06
Gross value added electronics sector in thousands	2.93E+05	9.62E+04	1.58E+05	5.87E+05
Exports to the African region in thousands	7.93E+09	4.24E+09	1.72E+09	2.01E+10
Exports to the Atlantic region in thousands	1.24E+06	1.42E+06	5.13E+04	7.84E+06
Exports to Central American region in thousands	2.05E+08	2.94E+08	3.18E+06	1.35E+09
Number of formally employed agriculture sector	3.33E+03	1.02E+03	1.65E+03	5.46E+03
Number of formally employed finance sector	8.27E+04	3.07E+04	4.15E+04	1.34E+05
Number of formally employed mining sector	4.12E+03	2.54E+03	1.45E+03	9.91E+03

*Methods*

The panel data set on the districts of Johannesburg includes two types of variation: interregional variation in the variable's average value across districts, and intraregional variation within each district over time. For example, FDI has varied between districts and over the years. Panel data sets are frequently used in applied statistical work, because they control for unobserved heterogeneity: the effect of omitted relevant variables variable that are time invariant (Baltagi 2005, Dougherty 2011). They are therefore superior to simple cross-sectional datasets. To estimate both types of variation across and within districts, two types of models can be used: fixed effects or random effects. Fixed effects control for all time-invariant differences (for example: local culture) that are difficult to observe between the districts of Johannesburg. If controlled for, the omitted district characteristics no longer bias the estimates of the observed independent variables. The effects of the independent variables on the dependent variable are thus mediated by the differences across the districts. Fixed effects models cannot estimate the effect of a time-invariant variable (for example: size of the district) on the dependent variable. It is assumed that variation in FDI can only be explained by variables that have varied over time. Variables should therefore vary both across regions and time. Random effects does allow for the inclusion of time-invariant variables. Random effects assume that the variation in the dependent variable (FDI) is influenced by the unobserved differences across districts (for example: cultural habits): the variation across districts in count of FDI is not fully explained by variation in the independent variables. If variations across districts are expected to influence the dependent variable, random effects models should be selected instead of the fixed effects model. To select between fixed or random effects model, the Durbin–Wu–Hausman test (or Hausman test) is used (Hausman 1978). The test assesses whether the errors of the model are correlated to the independent variables. If the test indicates that correlations are significant, the fixed effects model should be used. All models were tested for outliers, heteroscedasticity (variance in the errors of the model), multicollinearity (correlation between independent variables causing the overestimation of the effect of individual variables), and the presence of time fixed effects (to assess if effects change over time) to reduce biases in the model estimators.

Appendix 1.50: African FDI Classes and Sectors – Direct Employment by Growth and Volume (various periods)

Classes of Employment	Rank	Employment Volume 2003-2016	Employment Growth 2003-2016	Employment Growth 2003-2009	Employment Growth 2010-2016
Hitech	1	3.5	11.5%	18.7%	12.5%
Services	2	20.0	9.8%	18.2%	2.2%
Manufacturing	3	62.3	4.8%	17.4%	0.4%
Resources	4	14.3	-12.6%	-4.9%	-23.3%
Total		100	3.4%	12.2%	-0.6%

Sectors of Employment	Rank	Employment Volume 2003-2016	Employment Growth 2003-2016	Employment Growth 2003-2009	Employment Growth 2010-2016
Industrial Machinery	1	1.94	24.2%	87.2%	10.6%
Renewable energy	2	1.01	23.8%	43.2%	40.4%
Warehousing & Storage	3	1.29	20.3%	80.7%	68.6%
Building & Construction	4	3.12	13.3%	58.8%	3.8%
Electronic Components	5	1.09	12.9%	31.2%	15.0%
Automotive Components	6	3.21	12.8%	32.0%	-0.9%
Consumer Products	7	1.76	12.6%	26.5%	4.7%
Real Estate	8	11.78	12.0%	79.8%	29.1%
Pharmaceuticals	9	1.57	11.9%	-3.8%	4.5%
Business Services	10	2.82	11.8%	10.3%	7.2%
Transportation	11	1.38	11.7%	2.8%	46.8%
Consumer Electronics	12	1.30	10.7%	-8.6%	-0.3%
Engines & Turbines	13	0.05	10.0%	-0.2%	6.2%
Healthcare	14	0.30	9.4%	26.5%	-20.1%
Food	15	8.56	9.1%	18.5%	-3.5%
Financial Services	16	2.31	7.8%	29.1%	-11.0%
Textiles	17	7.13	7.3%	-11.2%	11.4%
Plastics	18	0.92	7.0%	-40.4%	-28.5%
Communications	19	3.50	6.4%	2.3%	-7.7%
Automotive OEM	20	8.92	6.0%	12.1%	1.8%
Non-Automotive Transport	21	0.64	6.0%	-8.1%	-12.6%
Aerospace	22	0.85	5.6%	39.5%	-5.9%
Chemicals	23	1.84	5.5%	18.2%	-6.0%
Software & IT services	24	1.98	5.3%	27.5%	-10.0%
Wood Products	25	0.55	3.7%	11.2%	-8.8%
Ceramics & Glass	26	0.31	3.6%	11.6%	-27.7%
Rubber	27	0.62	3.3%	4.7%	-23.8%
Medical Devices	28	0.07	1.8%	7.0%	9.2%
Beverages	29	1.22	-0.9%	1.0%	-28.5%
Biotechnology	30	0.03	-1.3%	-8.7%	57.2%
Business Machines	31	0.56	-5.0%	25.3%	-24.3%
Space & Defence	32	0.07	-5.5%	-16.9%	-8.6%
Semiconductors	33	0.10	-5.8%	-19.2%	-16.0%
Coal, Oil and Natural Gas	34	5.16	-6.5%	2.6%	-5.7%
Minerals	35	1.99	-6.9%	1.8%	-6.0%
Metals	36	15.99	-8.5%	-4.1%	-22.2%
Paper, Printing & Packaging	37	0.57	-12.6%	-17.3%	-25.5%
Leisure & Entertainment	38	0.37	-14.0%	-1.8%	7.8%
Hotels & Tourism	39	3.10	-14.0%	17.3%	-20.8%
Total		100	3.4%	12.2%	-0.6%

Source: Wall, 2017, Based on FDI Markets data

Appendix 1.51: Source FDI of African cities.

Rank	Row Labels	2010	2011	2012	2013	2014	2015	2016	FDI total (million US \$)	FDI growth (million US \$)
1	Johannesburg	845	1457	626	3408	3648	1242	733	20096	4%
2	Casablanca	6	26	949	678	993	1894	949	5315	133%
3	Cairo	413	27	34	112	29	36	63	5155	-17%
4	Lagos	314	360	63	213	106	274	194	3154	-5%
5	Nairobi	99	165	305	274	416	585	146	2993	15%
6	Cape Town	293	125	91	88	94	83	188	2354	-7%
7	Port Louis	87	213	161	1220	22	288	25	1728	-17%
8	Lome	48	240	44	188	71	100	11	810	-19%
9	Dar es Salaam	30	34	7	130	269	26	19	552	6%
10	Luanda	33	88	309	64	22	11	88	531	-13%
11	Tunis	44	14	62	165	29	75	43	525	9%
12	Durban	92	158	38	64	31	62	4	425	-33%

Source: Wall 2017, based on FDI Markets data

## Chapter 2

### China's Outward Foreign Direct Investments in Africa

*Canfei He and Shengjun Zhu*

Appendix 2.1: Variables and definitions

Variables	Definition	Data Source
Dependent Variable	Number of Chinese enterprises investing in a specific African country	MOFCOM dataset
Independent variables to capture the characteristics of host countries		
<i>POL</i>	World Bank's <b>political stability</b> index	
<i>DEM</i>	World Bank's <b>democracy</b> index	
<i>RES</i>	total exports of fuels, ores, and minerals of a host country ( <b>resource-seeking motive</b> )	
<i>GDP</i>	A host country's GDP as a proxy of market size ( <b>market-seeking motive</b> )	World Bank
<i>PAT</i>	Number of patents of a host country ( <b>asset-seeking motive</b> )	
<i>IFDI</i>	ratio of inward FDI to GDP ( <b>economic openness</b> )	
<i>INF</i>	Inflation rate ( <b>economic stability</b> )	
Independent variables to measure the distance between China and African countries		
<i>EPROX</i>	total imports and exports between China and the host country ( <b>economic proximity</b> )	General Administration of Customs of China
<i>GPROX</i>	number of flights between China and a specific host country ( <b>geographical proximity</b> )	Skyscanner
<i>PPROX</i>	Each diplomatic event between China and the host country is assigned a score. A weighted sum value is calculated to measure the <b>political proximity</b> .	Ministry of Foreign Affairs of China

Source: He and Zhu, 2017, based on Peking University data

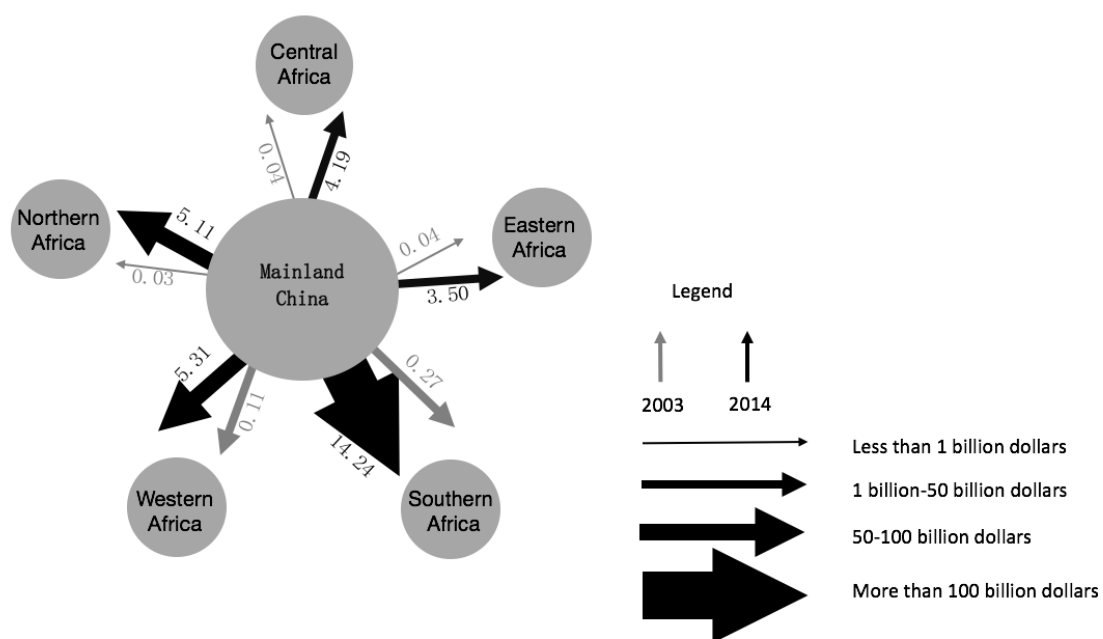
Appendix 2.2: Table 1 Regression results (TOBIT)

	2003-2014	2003-2007	2008-2014
<i>POL</i>	-2.97**	-2.38**	-1.85**
<i>DEM</i>	2.54**	2.68***	1.28
<i>LnRES</i>	0.88	1.62**	1.9
<i>LnGDP</i>	3.75***	3.23***	4.48***
<i>PAT</i>	1.13	0.66	-1.04
<i>IFDI</i>	0.68	-0.32	-0.3
<i>INF</i>	-0.98	0.48	0.59
<i>PPROX</i>	4.03***	3.58***	2.45***\
<i>LnEPROX</i>	5.55***	3.32***	2.31**
<i>LnGPROX</i>	0.56	0.01	-0.95
No. of Observation	648	270	378
Log likelihood	-1266.5837	-547.6416	-574.8648
Prob>chi <sup>2</sup>	0.0000	0.0000	0.0000
Wald chi <sup>2</sup> (10)	81.22	50.69	48.49

Note: \* $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Source: He and Zhu, 2017, based on Peking University data

Appendix 2.3 Figure 8 China OFDI stocks in five big regions in Africa



Source: He and Zhu, 2017, based on Peking University data

## PART B: THEMATIC STUDIES

### Chapter 1

#### The Impact of FDI on Income Inequality in Africa

*Rupinder Kaur, Ronald Wall and Jan Fransen*

#### Appendices

##### *Appendix 1.1: Methodology*

The methodology used in this study is broadly divided into descriptive and inferential statistics;

Descriptive statistics:

Gini coefficient: Gini coefficient is used to measure the income inequality in African countries.

Income distribution according to deciles: To understand the distribution of income in the society, income distribution according to deciles have been analysed and the ratio of 1st and 10th decile has been used to represent the income gap between poorest and richest 10 % household. Network analysis: To analyse the spatial pattern of distribution of FDI, a network analysis has been performed using Gephi software. Thematic maps: Thematic maps are prepared in Arc GIS to show the spatial pattern of income inequality and FDI across African countries.

P2 Distance: The moderator indicators absorptive capacity, human capital, quality of institutions and technology and innovation in host country are four indices calculated using P2 distance index in R software. P2 distance combines group of indicators into a single index.

Inferential statistics: For the purpose of present research, the inferential statistics has been done in two stages. First panel regression has been used to test the impact of FDI on income inequality and its variation across geographical region. To increase the robustness of analysis the regressions have been done using four different dependent variables which represent income inequality. These are Gini coefficient, growth of Gini coefficient, growth of average income in lowest income decile and growth of income in highest income decile. Following, Panel regression with interaction terms has been employed to find out the factors which determine effect of FDI on income inequality in African countries. Panel regression with interaction terms has been done using two dependent variables namely, Gini coefficient and growth of Gini coefficient. Furthermore, four moderator variables are used in the panel regression with interaction terms; absorptive capacity, human capital and level of technology and quality of institutions as well six control variables; trade, initial per capital GDP growth rate, total population of the country, size of the country and distance from the equator.

##### *Appendix 1.2: Number of jobs generated by FDI (per million USD) by sector and region in Africa*

Region	Hitech	Manufacturing	Resource	Services	Total FDI
Northern Africa	6.42	5.13	0.74	2.53	2.92
Central Africa	4.25	6.63	1.56	2.88	3.93
Eastern Africa	3.83	7.97	3.62	2.00	3.36
Western Africa	5.09	4.23	2.49	1.94	2.69
Southern Africa	5.17	5.85	2.40	2.22	3.30
Africa	5.15	5.96	2.25	2.23	3.17

*Source: Kaur, Wall and Fransen 2017, based on FDI Markets and various additional data sources*

##### *Appendix 1.3: Factors that determine the relationship between FDI and growth of income inequality*

Variables	Total FDI	Hitech FDI	Manufacturing FDI	Resources FDI	Services FDI
Absorptive capacity			---	---	
FDI # Absorptive capacity	-	---		-	
FDI share # Quality of Institutions	++	+++	+	++	
Human capital		--		---	
FDI # Human capital		+		++	
FDI # Technology & Innovation		++	++		
Total Population	++	+++	++	++	++
Initial per capita GDP growth rate		-			



Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
-	not significant but negative relation	

Source: Kaur, Wall and Fransen 2017, based on FDI Markets and various additional data sources

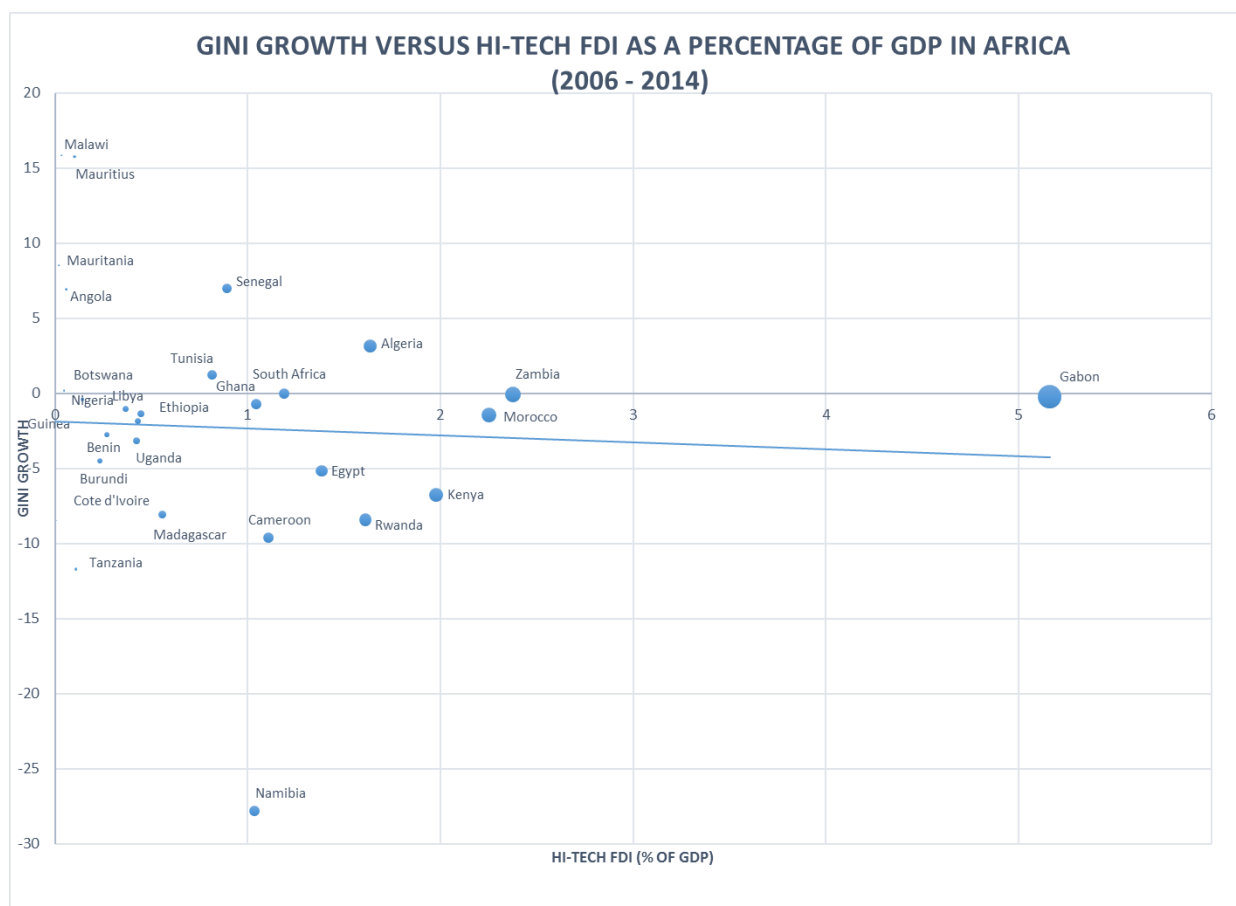
Appendix 1.4: Moderating factors determining the relationship between FDI and growth of income inequality

Variables	Total FDI	Hitech FDI	Manufacturing FDI	Resources FDI	Services FDI
Absorptive capacity					
Air infrastructure		++	+		
Electricity consumption	---	---		---	
Quality of electricity supply	++	+++	+++	+++	++
Mobile subscription	-	--	-		-
Human capital					
Human capital	--	---	--	--	--
Technology diffusion					
Availability of latest technology	--	--	--	--	--
Distance from equator				--	
Quality of institutions					
Strength of auditing and reporting standards	-		-	-	-
Strength of investor protection	+	++	+	+	++

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
-	not significant but negative relation	

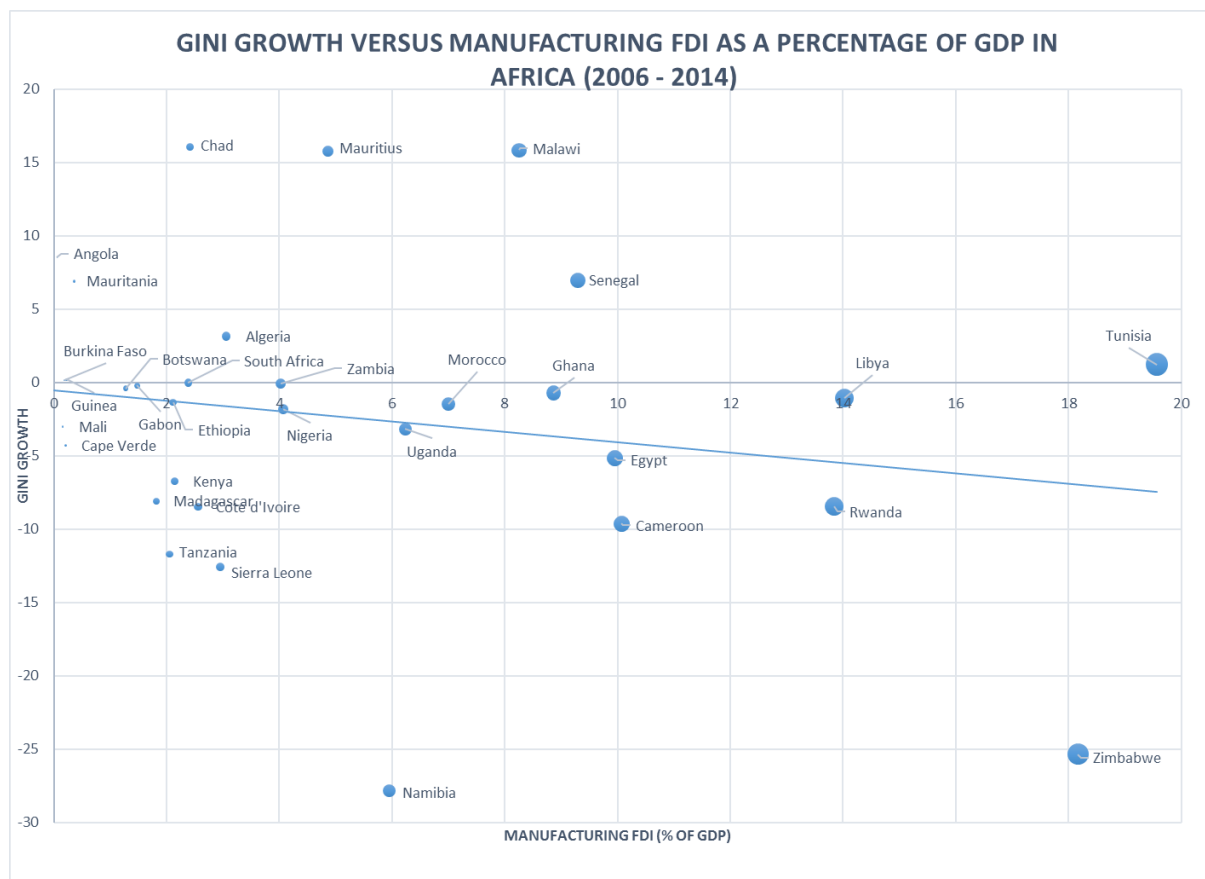
Source: Kaur, Wall and Fransen 2017, based on FDI Markets and various additional data sources

Appendix 1.5: Growth of Gini Coefficient and FDI in Hi-tech sector in Africa (2006-2014)



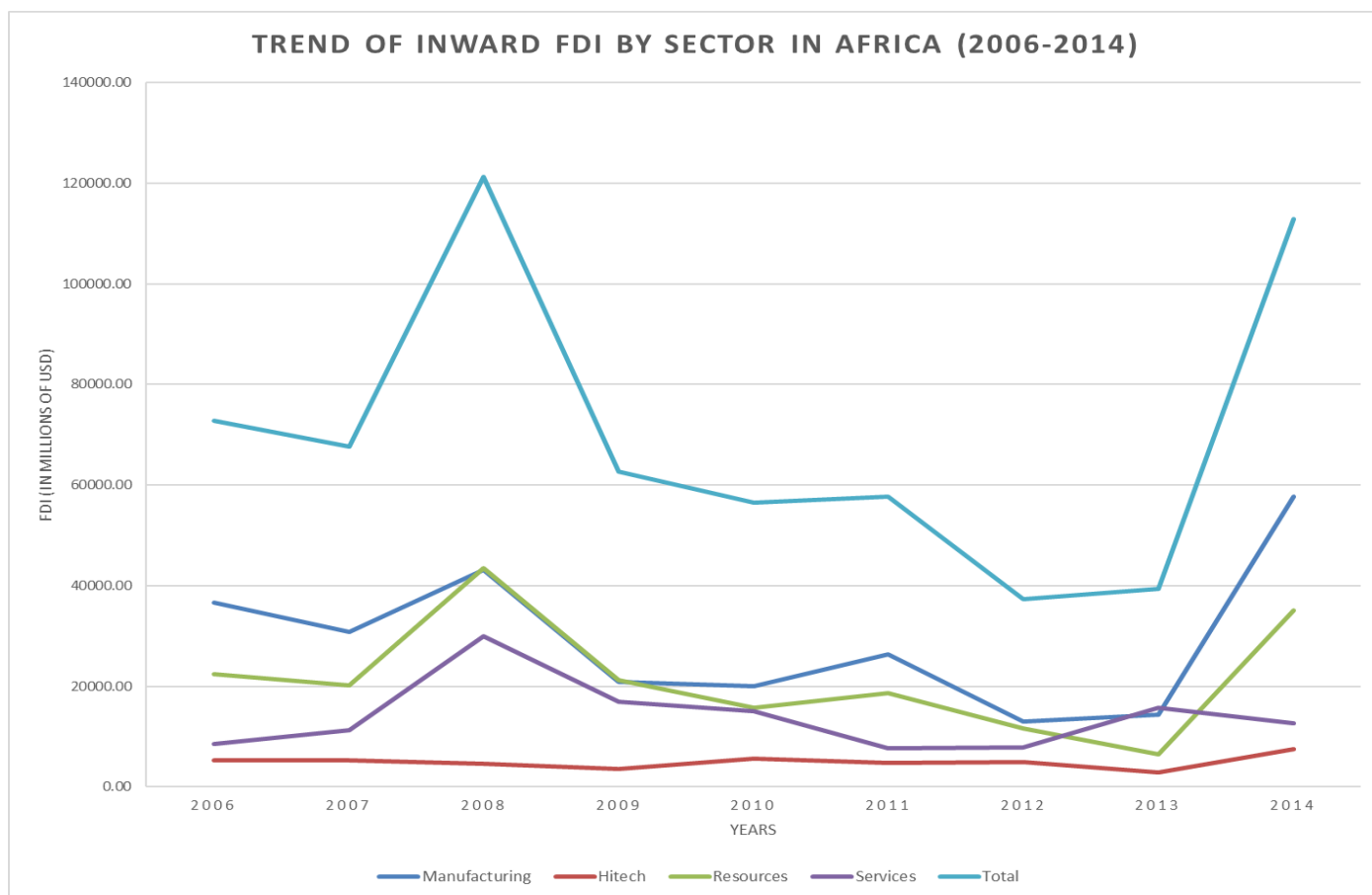
Source: Kaur, Wall and Fransen 2017, Based on FDI Markets and Oxford Economics

Appendix 1.6: Growth of Gini Coefficient and FDI in manufacturing sector in Africa (2006-2014)



Source: Kaur, Wall and Fransen 2017, based on FDI Markets and Oxford Economics

## Appendix 1.7: Trend of inward FDI by sector in Africa (2006-2014)



Source: Kaur, Wall and Franssen 2016, based on FDI Markets

## Chapter 2

### Impact of Foreign Direct Investment on Employment in Africa

Ronald Wall and Poonam Mehta

#### Appendix 2.1: Methodology

This research uses desk research method and panel data analysis for arriving at the answers of the research question. The research methodology involves descriptive as well as inferential statistics as discussed below:

**Descriptive statistics:** The descriptive analysis of the dependent and independent variables has been carried out with relevant tables, bar charts, line graphs and pie charts with the help of Microsoft Office Excel. Wherever necessary, geographic information system (GIS) is resorted to so as to support, strengthen and clarify the analysis.

**Inferential statistics:** The present research uses the panel regression models based on the panel data mentioned earlier. Though the data is sourced from authentic sources, to reduce the drawbacks of panel data, either FEM or REM is used with due consideration of the result of the Hausman test, for each panel regression model. The research also used interaction model using interaction between GDP and HDP to avoid multicollinearity as the GDP is one indicator used for the index of HDI.

The study estimates five main models of panel data regression, either FEM or REM, respective to each research sub-question. Each model differs in the indicator of dependent variable and the indicator of independent variable used according to the context of the research sub-question. Within each of the five main model, there are different sub-models concerning either particular spatial or sectoral aspect. Apart from the independent variables mentioned herein, two groups of control variables are used for the analysis. One group is representing the economic factors of each country such as gross domestic product (GDP) growth, government expenditure and inflation. The second group of control related to demographic and policy of aspects and the control variables are human development index, population growth in each country and the level of trade openness exhibited by the sum of exports and imports for each country, mobile connections as an indicator of infrastructure, connectivity and information accessibility and international country risk guide. In the case of cities, an attempt has been made to collect data for similar control variables, however a few different variables had to be selected as per the availability of data. Thus the control variables used for city are GDP growth, inflation rate, attainment of higher education, mobile phone connections per 1000 persons and population growth.

The above mentioned five main regression models are as follows:

1. In the first main model estimated to answer the first research sub-question has different spatial components i.e. continent of Africa, the five regions and seven major cities of Africa. The dependent variable is overall employment to population rate for each country and the independent variable is aggregate inward FDI per country. The same dependent and independent variables are used for the city level analysis.
2. The second main model takes into consideration the quality of employment index as the independent variable and aggregate inward FDI as independent variable.
3. The third main model estimates the dependent variable for each sector in each sub-model i.e. employment in agriculture, employment in industry and employment in services.
4. The fourth main model estimates separately the overall employment as an indicator of the dependent variable with four different sectors of inward FDI i.e. hi-tech, manufacturing, resource and services as indicator of independent variable in four different sub-models.

The fifth model takes into consideration the three sectors of employment and the four sectors of inward FDI. Sectoral employment as an indicator of dependent variable and the four sectors of FDI independently regressed as independent variable in four sub-models. Based on the results of assumption tests, logarithm of the control variables GDP growth, government expenditure, inflation and population growth is calculated to enhance linearity among the variables. In line with the results of the Hausman test and the homoscedasticity test, FEM robust panel regression model is estimated

*Appendix 2.2: Total inward FDI, total employment, employment ratio and quality of employment.*

Country	Total FDI (2003-2014)	FDI Ranking	Total Employment (2014)	Total Employment Ranking	Employment Ratio (2014)	Employment Ratio Ranking	Quality of Employment	Quality of Employment Ranking
Egypt	146705.0008	1	26707.3284	4	42.86	43	1.068331326	52
Nigeria	114214.457	2	61155.49392	1	53.48	35	1.976995699	42
Angola	71307.89	3	8197.840623	15	63.22	25	2.995617895	14
South Africa	61100.4854	4	15146.5	7	39.59	47	4.278848295	4
Morocco	49139.75031	5	10813.1494	12	44.2	41	1.561556205	47
Algeria	44290.804	6	11166.02266	11	38.95	48	1.74377972	45
Tunisia	35491.27854	7	3483.371038	29	40.37	46	2.194303557	37
Libya	33200.69	8	1733.799062	34	42.43	44	2.683804279	26
Mozambique	30410.696	9	11495.18079	10	61.42	27	3.127329764	8
Ghana	22928.862	10	10567.17303	13	72.3	15	2.872298421	18
Uganda	15992.21	11	14420.17253	8	81.71	4	3.077824237	11
Kenya	13530.59084	12	15806.73839	6	60.75	28	2.320006015	36
Zambia	11460.27	13	5665.556705	22	68.04	19	2.779690686	23
Zimbabwe	10348.65	14	7729.733687	17	72.98	13	2.882694674	17
Tanzania	9961.64	15	24257.11544	5	76.17	9	2.769000216	24

Source: Wall and Mehta, 2016. Based on FDI Markets, Oxford and ILO Database

*Appendix 2.3: Number of jobs generated by FDI (per million USD) by sector and region in Africa*

Region	Hitech	Manufacturing	Resource	Services	Total FDI
Northern Africa	6.42	5.13	0.74	2.53	2.92
Central Africa	4.25	6.63	1.56	2.88	3.93
Eastern Africa	3.83	7.97	3.62	2.00	3.36
Western Africa	5.09	4.23	2.49	1.94	2.69
Southern Africa	5.17	5.85	2.40	2.22	3.30
Africa	5.15	5.96	2.25	2.23	3.17

Source: Wall and Mehta, 2016, Calculation based on FDI Markets (2006-2014)

Appendix 2.4: Descriptive statistics

Descriptive Statistics					
Variable	Obs	Mean	Std. Dev.	Min	Max
Total Employment	420	8977.023	10926.9	241.5977	61155.49
Employment in Agriculture	420	4962.952	6455.929	42.90335	31590.06
Employment in Manufacturing	420	1000.818	1503.634	23.40115	7609.526
Employment in Services	432	2929.551	4211.247	0	29312.27
Total FDI	432	1717.994	4247.79	0	57557.76
Hi-tech FDI	432	116.3125	411.9993	0	5530.4
Manufacturing FDI	432	670.735	2757.915	0	43598.76
Resources FDI	432	606.3161	1659.593	0	16000
Services FDI	432	324.6307	783.169	0	7529.7
Inflation	432	8.422775	12.31707	0.048	156.964
Mobile Phone Subscribers (%)	428	52.85643	42.87392	0.0712936	214.75
Population	420	56.73153	6.130547	47.91473	71.02494
International Country Risk Guide	360	0.3421296	0.1237745	0	0.666667
Trade Openness	339	31895.71	47569.7	456.0259	250018.7
Human Development Index	360	0.5198167	0.127594	0.262	0.795

Source: Wall and Mehta, 2016, based on data from different sources

Appendix 2.5: Statistical results employment in agriculture

Variables	Employment in Agriculture	Employment in Agriculture	Employment in Agriculture
FDI Greenfield	+		
FDI Flows		+	
FDI Stock			+
Human Development Index	+++	+++	+++
Inflation	-	-	-
International Country Risk Guide	--	-	-
Mobile Phone Subscribers (%)	+++	+++	+++
Trade Openness	+++	+	++
Mobile Phone Subscribers (%) & Trade Openness	---	---	---

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
-	not significant but negative relation	

Source: Wall and Mehta, 2016, based on data from different sources

Appendix 2.6: Statistical results on employment in manufacturing sector

Variables	Employment in Manufacturing	Employment in Manufacturing	Employment in Manufacturing
FDI Greenfield (UNCTAD)	+		
FDI Flows		++	
FDI Stock			+++
Human Development Index	+++	+++	+++
Mobile Phone Subscribers(%)	+	+	+
Trade Openness	-	+	-
Mobile Phone Subscribers (%) & Trade Openness	-	-	-
Inflation	-	-	-
International Country Risk Guide	+	-	+

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation

--	more significant and negative relation
-	significant and negative relation
+	not significant but positive relation
-	not significant but negative relation

Source: Wall and Mehta, 2016, based on data from different sources

Appendix 2.7: Statistical results employment in services

Variables	Employment in Services	Employment in Services	Employment in Services
FDI Greenfield	+		
FDI Flows		++	
FDI Stock			+++
Trade Openness	+++	+++	+++
Mobile Phone Subscribers (%)	+++	+++	+++
Mobile Phone Subscribers (%) & Trade Openness	---	---	---
International Country Risk Guide	--	-	-
Working Population (15-64)	+	++	+
Inflation	-	-	-
Working Population (15-64) & Inflation	+	+	+

Explanation significance and sign

+++	very significant and positive relation
++	more significant and positive relation
+	significant and positive relation
---	very significant and negative relation
--	more significant and negative relation
-	significant and negative relation
+	not significant but positive relation
-	not significant but negative relation

Source: Wall and Mehta, 2016, based on data from different sources

Appendix 2.8: Statistical results employment in agriculture

Variables	Employment in Agriculture	Employment in Agriculture	Employment in Agriculture	Employment in Agriculture
Hi-tech FDI	+			
Manufacturing FDI		+		
Services FDI			+	
Resources FDI				-
Hi-tech & Mobile Phone Subscribers (%)	-			
Trade Openness & Population	-			
Human Development Index	+++	+	+	
Inflation	-	-	-	-
International Country Risk Guide	--	-	-	-
Mobile Phone Subscribers (%)	--	++	+	+++
Trade Openness	+	+	+++	+
Population	+	+++	+++	+++
Trade Openness & Mobile Phone Subscribers (%)		---	-	---
Trade Openness & International Country Risk Guide				+

Explanation significance and sign

+++	very significant and positive relation
++	more significant and positive relation
+	significant and positive relation
---	very significant and negative relation
--	more significant and negative relation
-	significant and negative relation
+	not significant but positive relation
-	not significant but negative relation

Source: Wall and Mehta, 2016, based on data from different sources

Appendix 2.9: Statistical results employment in manufacturing

Variables	Employment in Manufacturing	Employment in Manufacturing	Employment in Manufacturing	Employment in Manufacturing
Hi-tech FDI	+			
Manufacturing FDI		+++		
Services FDI			+	
Resources FDI				-
Human Development Index	+	++	+	+
Inflation	-	-	-	-
Population	+++	+	+++	+
International Country Risk Guide	-	-	-	-
Trade Openness	+++	-	+++	+++
Mobile Phone Subscribers (%)	+++		+++	+++
Mobile Phone Subscribers (%) & Trade Openness	---		---	---
Inflation & International Country Risk Guide	+		+	
Inflation & Trade Openness		-		
Human Development Index & International Risk			-	

	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
Explanation significance and sign	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
	-	not significant but negative relation

Source: Wall and Mehta, 2016, based on data from different sources

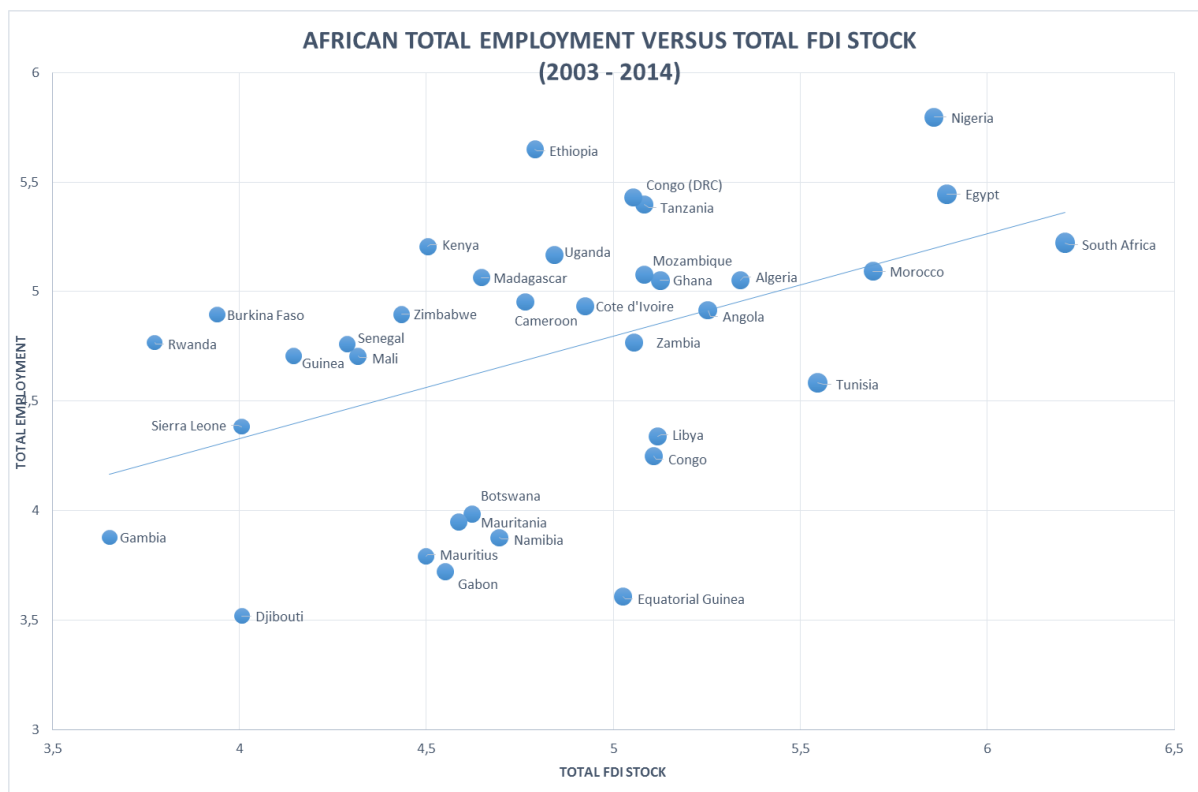
Appendix 2.10: Statistical results employment in services

Variables	Employment in Services	Employment in Services	Employment in Services	Employment in Services
Hi-tech FDI	++			
Hi-tech FDI & Population	--			
Manufacturing FDI		++		
Manufacturing FDI & Population		--		
Services FDI			++	
Services FDI & Human Development Index			--	
Resources FDI				+
Resources FDI & Trade Openness				-
Trade Openness	+++	+++	+++	+
Population	+	+++	+++	
Inflation	-	-		-
Population & Inflation				+
Mobile Phone Subscribers (%)	+++			++
International Country Risk Guide	-		-	-
Inflation & International Country Risk Guide	+	+		
Mobile Phone Subscribers (%) & Trade Openness		-		
Mobile Phone Subscribers & Inflation			+++	
Human Development Index			+++	+
Mobile Phone Subscribers (%) & International Country Risk Guide				+

	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
Explanation significance and sign	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
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	-	not significant but negative relation

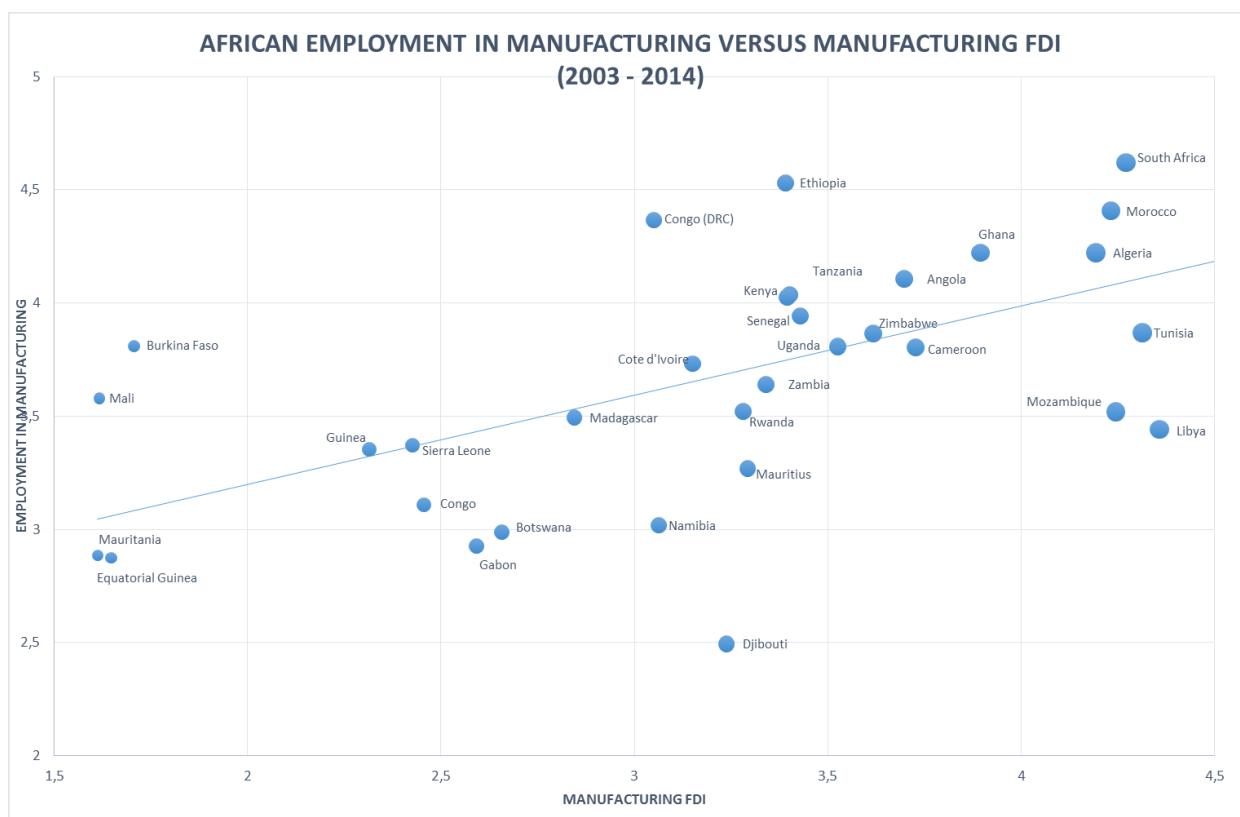
Source: Wall and Mehta, 2016, based on data from different sources

Appendix 2.11: Effect of FDI stock on total employment



Source: Wall and Mehta, 2016, based on FDI Markets and ILO

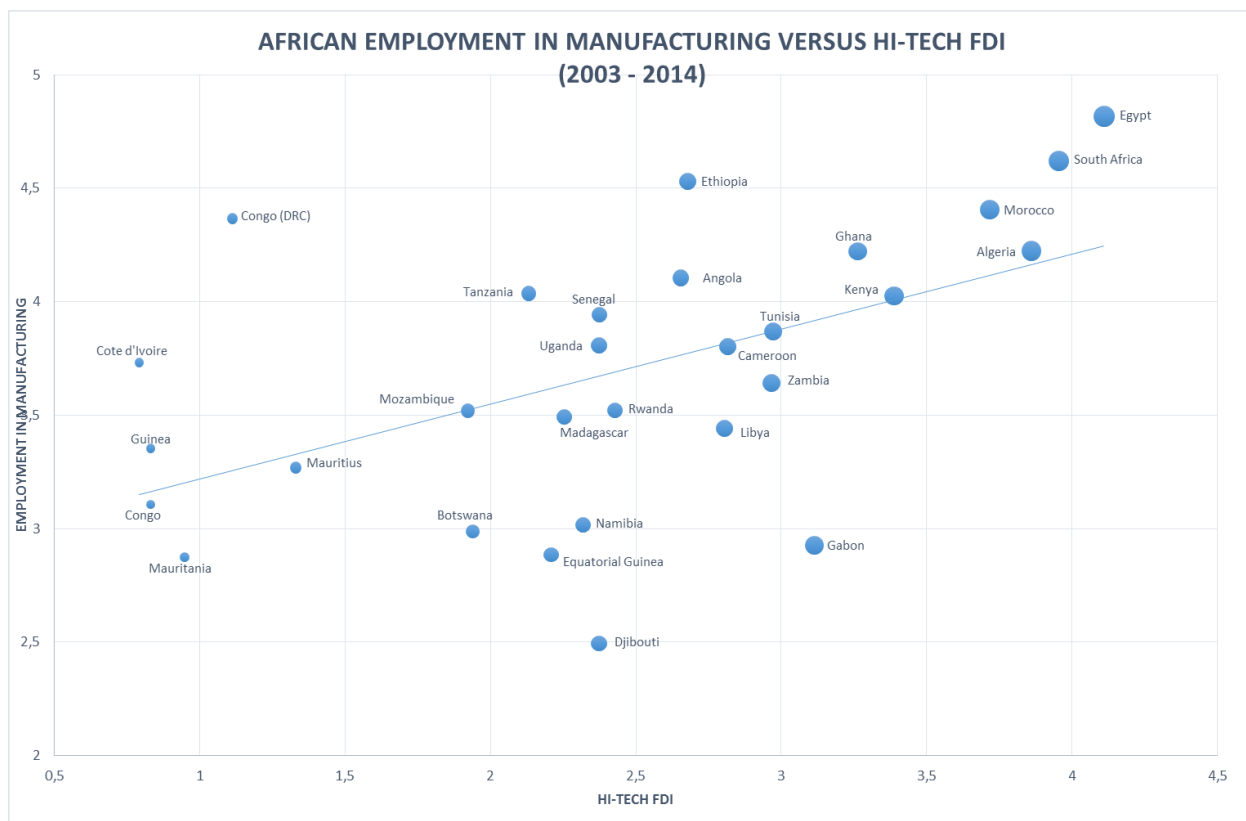
Appendix 2.12: Effect of manufacturing FDI on employment in manufacturing sector



Source: Wall and Mehta, 2016. Based on FDI Markets and Oxford Economic

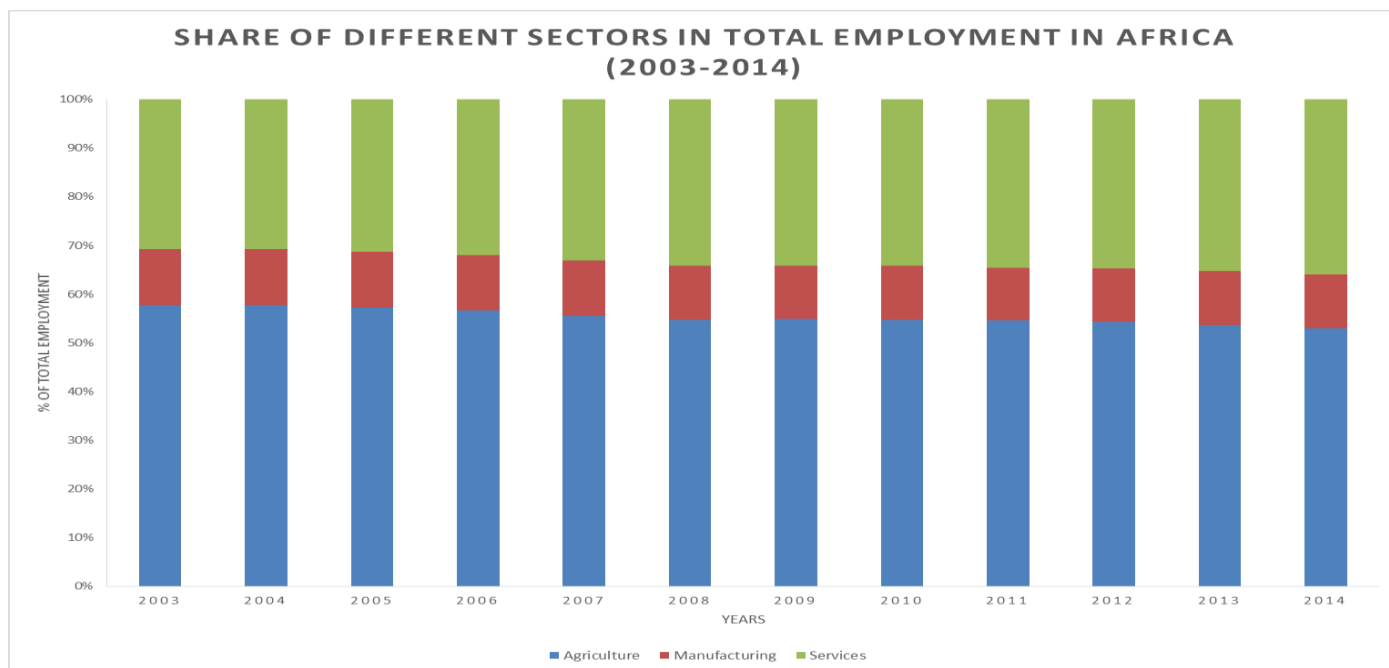


Appendix 2.13: Effect of hi-tech FDI on employment in manufacturing sector



Source: Wall and Mehta, 2016. Based on FDI Markets and Oxford Economics

Appendix 2.14: Sectoral composition of employment in Africa (2003-2014)



Source: Wall and Mehta, 2016, based on Oxford Economics

## Chapter 3

### Do Sub-Saharan Cities with Lower Labour Cost Attract Greater FDI Inflow?

*Addisu Lashitew and Ronald Wall*

#### Appendix 3.1: Methodology

Our research goal is to investigate the extent to which labour costs and other city characteristics drive investment inflows in Africa. We estimate the following cross-section econometric model:

$$(1) \quad FDI_{rc} = \alpha(Wage_{rc}) + \beta(CapitalCity_{rc}) + \gamma(PROD_{rc}) + \delta(X_c) + \theta(R) + (\varepsilon_{rc}),$$

where the subscript  $r$  denotes the city and  $c$  is the country of its location. The dependent variable  $FDI$  is one of our two measures of FDI inflow: (the log) of the value of FDI inflow to cities, or the share cities' FDI inflow in the national FDI inflow. Our independent variable is  $Wage$ , which provides an indicative measure of labour cost at city level.  $CapitalCity$  is a dummy variable that gets a value of one when the city is a capital city and zero otherwise.  $PROD$  is a control variable that measures the level of productivity in a city. Since cities with greater productivity are also likely to pay greater wages, it is important to control for productivity differences in order to identify the effect of labour costs on FDI inflows. As described in the next section, both  $Wage$  and  $PROD$  are measured using the labour cost and productivity of firms operating in those cities.

$X$  is a vector of country-level control variables which includes total GDP, GDP per capita, GDP growth rate, and an indicator of the ease of doing business. These four control variables are expected to account for country-level 'pull factors' that affect FDI inflows. For example, GDP variables are important control variables since research has shown that the market size of the home country is an important determinant of market seeking FDI (Bellak et al, 2008). The regression also includes  $R$ , a vector of dummy variables which indicate the continental region where the city is located (Eastern, Western, Central, Northern or Southern Africa). These dummies capture the effects of cultural or institutional homogeneities across countries within these five continental regions. Finally,  $\varepsilon$  is the error term of the regression model. The cross-sectional model provided above forms our baseline analysis since it is likely to yield robust results and is less demanding in terms of data requirement. However, this model could lead to misspecification if labour costs (and productivity) affect FDI inflows with a time lag. Since implementing physical investments takes time to materialize (Kydland & Prescott, 1982), what is relevant for FDI at time  $t$  could be labour cost (and productivity) the year before ( $t-1$ ) rather than on the same year ( $t$ ). While this may not be a major issue if labour costs change slowly, it is likely that wage rates in African cities rose rapidly given the continent's fast pace of economic growth in recent years. Therefore, we estimate a panel model that accounts for the effect of lagged wages ( $L\_Wage$ ) and productivity ( $L\_PROD$ ) on current investment:

$$(2) \quad FDI_{rc} = \alpha_1(Wage_{rc}) + \alpha_2(L\_Wage_{rc}) + \beta(CapitalCity_{rc}) + \gamma_1(PROD_{rc}) + \gamma_2(L\_PROD_{rc}) + \delta(X_c) + \theta(R) + (\varepsilon_{rc}),$$

We report results from OLS and random effects estimations for these models. In all regressions, we use clustered the standard errors by province, which accounts for the possibility that cities operating in the same administrative region (or province) could share other unobserved characteristics. Compared to many cross-country studies that fail to account for geographic heterogeneities within countries (Bellak et al, 2008; Herzer et al, 2008; Görg and Greenway, 2005), our analysis provides improved estimates that will alleviate omitted variable and other forms of bias. Moreover, our panel analysis will account for time-varying confounding variables such as labour productivity, thus reducing possibilities of endogeneity bias for our coefficient for wages (i.e.  $\alpha$  in model 1 and  $\alpha_1$  and  $\alpha_2$  in model 2). Whereas it is possible that FDI could also affect labour costs, this is not likely to happen contemporaneously but rather with time lag considering that wages tend to be sticky and need time to adjust (Bewley, 2009). Therefore, the coefficients for wages are unlikely to be affected by endogeneity bias related to reverse causation.

#### Appendix 3.2: List of countries covered in analysis and number of cities per country

Country	Freq.	Percent
1. Angola	10	3.77
2. Benin	1	0.38
3. Botswana	3	1.13
4. Burkina Faso	2	0.75
5. Burundi	1	0.38
6. Cameroon	4	1.51
7. Cape Verde	4	1.51
8. Central African Republic	1	0.38
9. Chad	1	0.38

10. Congo	2	0.75
11. DRC	13	4.91
12. Ethiopia	14	5.28
13. Gabon	3	1.13
14. Gambia	2	0.75
15. Ghana	11	4.15
16. Guinea	2	0.75
17. Ivory Coast	7	2.64
18. Kenya	19	7.17
19. Liberia	2	0.75
20. Madagascar	8	3.02
21. Malawi	5	1.89
22. Mali	3	1.13
23. Mauritania	2	0.75
24. Mauritius	3	1.13
25. Mozambique	9	3.4
26. Namibia	8	3.02
27. Niger	2	0.75
28. Nigeria	27	10.19
29. Rwanda	7	2.64
30. Senegal	6	2.26
31. Sierra Leone	5	1.89
32. South Africa	33	12.45
33. Sudan	2	0.75
34. Swaziland	2	0.75
35. Tanzania	8	3.02
36. Togo	4	1.51
37. Uganda	17	6.42
38. Zambia	12	4.53

Source: Lashitew and Wall, 2017, based on FDI Markets and various sources of data

### Appendix 3.3: Descriptive statistics

Statistics	FDI	FDI Share	Wage	Productivity	Ease of business	GDP growth	GDP per capita
<b>Observations</b>	265	263	265	265	265	265	265
<b>Mean</b>	39.85	4.0%	1,961	51,693	131	5.58	2,331
<b>Median</b>	8.71	0.8%	960	8,057	139	5.76	1,186
<b>Std. Dev.</b>	95.10	8.2%	2,071	202,386	38	2.06	2,557
<b>Min</b>	0.00	0.0%	124	465	42	-0.73	214
<b>Max</b>	943.61	59.7%	7,617	1,123,543	186	10.47	9,767

Notes: FDI is measured in millions of USD, and FDI share indicates the average share of cities' FDI inflows in the national total. Both measures of FDI inflow were calculated as averages over the years 2003 to 2016. Wage rate and productivity were calculated as averages over the years 2006 to 2016. The variable 'ease of doing business' shows the favorability of the regulatory environment for doing business, and provides the country's international ranking (where 1 is the most business friendly regulatory environment). GDP and GDP per capita were calculated as averages over the years 2006 to 2016, and GDP per capita was measured in 2010 constant prices. Data for GDP and ease of doing business was taken from the World Bank's World Development Indicators database.

Source: Lashitew and Wall, 2017, based on FDI Markets and various sources of data

Appendix 3.4: Correlations among variables

	1	2	3	4	5	6	7	8	9
1. FDI (log)	1								
2. FDI Share	0.54	1							
3. Wage rate (log)	0	0.02	1						
4. Productivity (log)	-0.11	-0.73	0.75	1					
5. Capital city dummy	0.04	0.02	0	0.05	1				
6. Doing business rank	-0.52	-0.7	-0.28	-0.4	0.07	1			
7. GDP growth	0	0.09	-0.57	-0.18	0	-0.23	0.31	1	
8. GDP per capita (log)	-0.94	-0.13	0	0	-0.13	0	-0.46	-0.46	1
9. Total GDP (in log)	0.13	-0.07	0.71	0.51	-0.05	-0.48	0	0	0.59
	-0.03	-0.26	0	0	-0.39	0	0	0	0
	0.15	-0.18	0.34	0.19	-0.25	-0.15	-0.11	0.59	1
	-0.01	0	0	0	0	-0.02	-0.09	0	0

Source: Lashitew and Wall, 2017, based on FDI Markets and various sources of data

Appendix 3.5: OLS regression results for investment to African cities

	Dependent: FDI (log)			Dependent: Share of FDI		
	(1)	(2)	(3)	(4)	(5)	(6)
Wages (in log)	0.19 (0.21)	0.06 (0.21)	0.17 (0.34)	0.01 (0.01)	0.00 (0.01)	0.03 (0.02)
Productivity (in log)	-0.18** (0.09)	-0.18** (0.08)	-0.29* (0.15)	0.00 (0.00)	0.00 (0.00)	-0.01 (0.01)
Capital city dummy		1.85*** (0.34)	2.25*** (0.31)		0.12*** (0.02)	0.11*** (0.02)
Doing business rank			0.00 (0.01)			0.00 (0.00)
GDP growth			0.18*** (0.07)			0.00 (0.00)
GDP per capita (in log)			0.13 (0.22)			0.00 (0.01)
Total GDP (in log)			0.27*** (0.09)			-0.01* (0.00)
Eastern Africa	-1.40*** (0.47)	-1.04** (0.43)	-1.34** (0.51)	-0.03 (0.03)	-0.01 (0.02)	-0.01 (0.02)
Northern Africa	-0.01 (0.42)	-0.32 (0.73)	-0.15 (0.89)	-0.04 (0.03)	-0.06 (0.05)	-0.08 (0.05)
Southern Africa	-0.26 (0.51)	0.18 (0.48)	-0.28 (0.56)	-0.05 (0.04)	-0.02 (0.03)	-0.02 (0.03)
Western Africa	-0.99** (0.48)	-0.81* (0.44)	-1.10** (0.47)	-0.01 (0.03)	-0.00 (0.02)	0.00 (0.03)
Constant	3.14** (1.49)	3.40** (1.46)	-4.50* (2.58)	-0.02 (0.05)	-0.00 (0.04)	-0.01 (0.08)
Observations		265	265	263	263	263
R-squared		0.06	0.16	0.03	0.27	0.28

Notes: Standard errors given in parenthesis are corrected for clustering within the administrative regions of the cities. Year dummies are included in all regressions but are not reported. The asterisks indicate level of significance of the coefficients: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Lashitew and Wall, 2017, based on FDI Markets and various sources of data

Appendix 3.6: OLS and random effects estimation results for investment to African cities

	Dependent: FDI (log)			Dependent: Share of FDI		
	(1)	(2)	(3)	(4)	(5)	(6)
Wages (in log)	-0.63 (0.83)	-0.69 (1.04)	5.00 (3.12)	0.01 (0.01)	0.01 (0.01)	-0.03 (0.07)
Lag_Wages (in log)			-6.38* (3.76)			0.04 (0.07)
Capital city dummy	9.62*** (0.52)	9.70*** (0.58)	9.32*** (0.48)	0.21*** (0.02)	0.21*** (0.02)	0.25*** (0.02)
Productivity (in log)	-0.95* (0.47)	-0.81 (0.63)	-0.48 (2.42)	-0.01 (0.01)	-0.01 (0.01)	-0.06 (0.08)
Lag_Productivity (in log)			-0.15 (2.80)			0.05 (0.09)
Doing business rank	-0.00 (0.01)	0.00 (0.02)	0.01 (0.02)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
GDP growth	0.06 (0.04)	0.05 (0.03)	0.03 (0.05)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
GDP per capita (in log)	1.51** (0.56)	1.46** (0.64)	1.79*** (0.58)	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)
Total GDP (in log)	-0.80** (0.29)	-0.72** (0.31)	-0.76*** (0.29)	-0.03* (0.02)	-0.03* (0.02)	-0.03* (0.02)
Eastern Africa	-1.26 (0.97)	-1.30 (1.02)	0.09 (1.19)	-0.06** (0.02)	-0.06*** (0.02)	-0.04 (0.03)
Southern Africa	-1.90 (1.22)	-1.80 (1.29)	-0.59 (1.59)	-0.08* (0.04)	-0.08** (0.04)	-0.05 (0.04)
Western Africa	-0.89 (0.90)	-0.86 (0.96)	-0.02 (0.88)	-0.01 (0.02)	-0.01 (0.02)	0.03 (0.03)
Constant	16.78** (7.93)	14.49 (9.85)	15.31 (9.62)	0.69** (0.30)	0.69** (0.30)	0.73** (0.35)
Observations	538	538	483	538	538	483
Number of Cities	55	55	55	55	55	55
R-squared	0.14			0.15		
Estimator	OLS	RE	RE	OLS	RE	RE

Notes; Standard errors given in parenthesis are corrected for clustering within the administrative regions of the cities. Year dummies are included in all regressions but are not reported. The asterisks indicate level of significance of the coefficients: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Source: Lashitew and Wall, 2017, based on FDI Markets and various sources of data

## Chapter 4

### Determinants of Foreign Direct Investment into Africa's Knowledge-based Industries

*Ronald Wall, Dorcas Nyamai and Colin McAweeney*

#### Appendices

##### Appendix 4.1: Methodology

Looking at the nature and objective of the research questions the research uses desk research method. The analysis will be done at two levels ie. Country and city levels using different indicators. At the country level, non-African country data will be analyzed to create a benchmark for African countries. The benchmarking analysis will include 30 countries and their annual KFDI inflow from 2006 to 2014. Since the African city database of KFDI is very representative of the overall KFDI activity at the city level, African country totals will be aggregated from the city totals. This will result in 27 countries being analyzed. As represented in the Table 7, the independent variables that will be used for the country level model come from the World Economic Forum's Global Competitiveness Index.

Similar to the country analysis, the city level model will include a benchmarking analysis of non-African cities. The benchmarking model will include the top 50 cities receiving the most KFDI in the Euromonitor International database. This analysis will be conducted using data from 2005 to 2014. The benchmarking is necessary for comparison and for future policy recommendations. In the African city model seven African cities: Cairo (Egypt), Nairobi (Kenya),

Casablanca (Morocco), Lagos (Nigeria), Cape Town (South Africa), Johannesburg (South Africa), and Tunis (Tunisia) will be analyzed. Although the city model is smaller than the country level analysis all the regions in Africa are represented and the seven cities selected are leading centers of growth.

In order to identify location factors which determine KFDI in African countries and cities, an OLS Fixed/Random Effect Model has been employed. The Fixed/Random Effect Model is used for panel data that is clustered into groupings. In this study the clusters are either the countries or cities being analyzed. Analyzing the model in clusters limits the effect of residuals over time. Through this process unknown and unmeasured characteristics within the cluster can be accounted for resulting in a more robust analysis of the independent variables. At the beginning of each analysis all the indicators will be included in the model. A step by step process of calculating the correlation between the indicators and removing those with high correlation will result in a model for each analysis that will have only several independent indicators. This process is similar to a stepwise analysis, however, in the study the variables are examined and removed by hand.

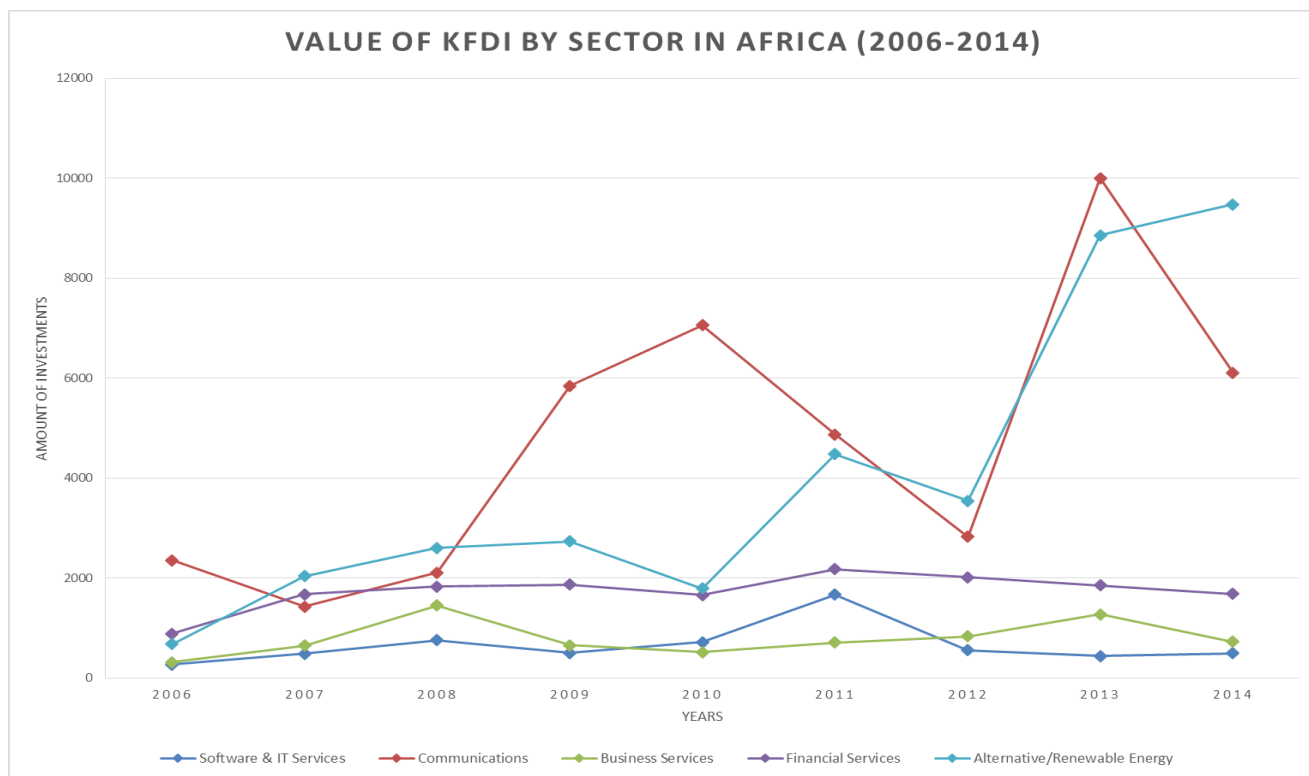
The study will utilize the statistical analysis computing program Stata for testing, transforming, and modeling. The models to be statistically regressed are:

$$KFDIDollar = C + \beta_1GGov + \beta_2HumCap + \beta_3Infra + \beta_4IBEnviro + \epsilon$$

$$KFDICount = C + \beta_1GGov + \beta_2HumCap + \beta_3Infra + \beta_4IBEnviro + \epsilon$$

Where *GGov* refers to the indicators used to proxy Good Governance, *HumCap* for Human Capital, *Infra* for Digital Infrastructure, and *IBEnviro* for Innovation and Environment. The corresponding for each variable is the resulting coefficient from the Stata regression. In the analysis, for indicators to be statistically significant they must at least have a 95 percent confidence that the coefficient's value represents the relationship between the indicator and the dependent variable. The constant in the equation is labelled as *C* and the error term is  $\epsilon$ .

Appendix 4.2: Trend of KFDI by sector in Africa (2006-2014)



Source: Source: Wall, Nyamai and McAweeney, 2017, bases on FDI Markets

Appendix 4.3: Descriptive statistics of African Countries

Descriptive Statistics					
Variable	Observations	Mean	Std. Dev.	Min	Max
Knowledge Intensive FDI	252	4.454285	1.781532	-0.3566749	8.772982
Global Competitiveness Index	269	18.33201	2.547631	13.85095	50.35467
Basic Requirements	269	17.40714	2.558048	13.04118	49.90166
Efficiency Enhancers	269	16.27515	1.740621	12.10482	23.80293
Innovation and Sophistication Factors	269	5.182814	0.6386755	3.468936	6.871736
Financial Market Development	269	3.809191	0.9523199	2.13392	6.262101
Technological Readiness	269	3.099628	0.6640828	1.349577	4.603447
Market Size	269	3.707584	0.7441096	1.647342	5.454387
Population	333	2.32E+07	3.07E+07	84600	1.77E+08

Source: Source: Wall, Nyamai and McAweeney, 2017

Appendix 4.4: Descriptive statistics of African cities

Descriptive Statistics					
Variable	Observations	Mean	Std. Dev.	Min	Max
Knowledge Intensive FDI	59	5.191219	0.887181	3.594569	7.195937
Broadband Access	59	2.396972	1.316289	-0.10536	4.309456
Mobile Phone Subscription	59	4.41397	0.219947	3.621671	4.60417
Tax Balance	59	7.141101	0.871771	4.939497	8.494735
Employment Rate	59	46.89492	5.445448	37.8	57.9

Source: Source: Wall, Nyamai and McAweeney, 2017

Appendix 4.5: KFDI determinants of African Cities

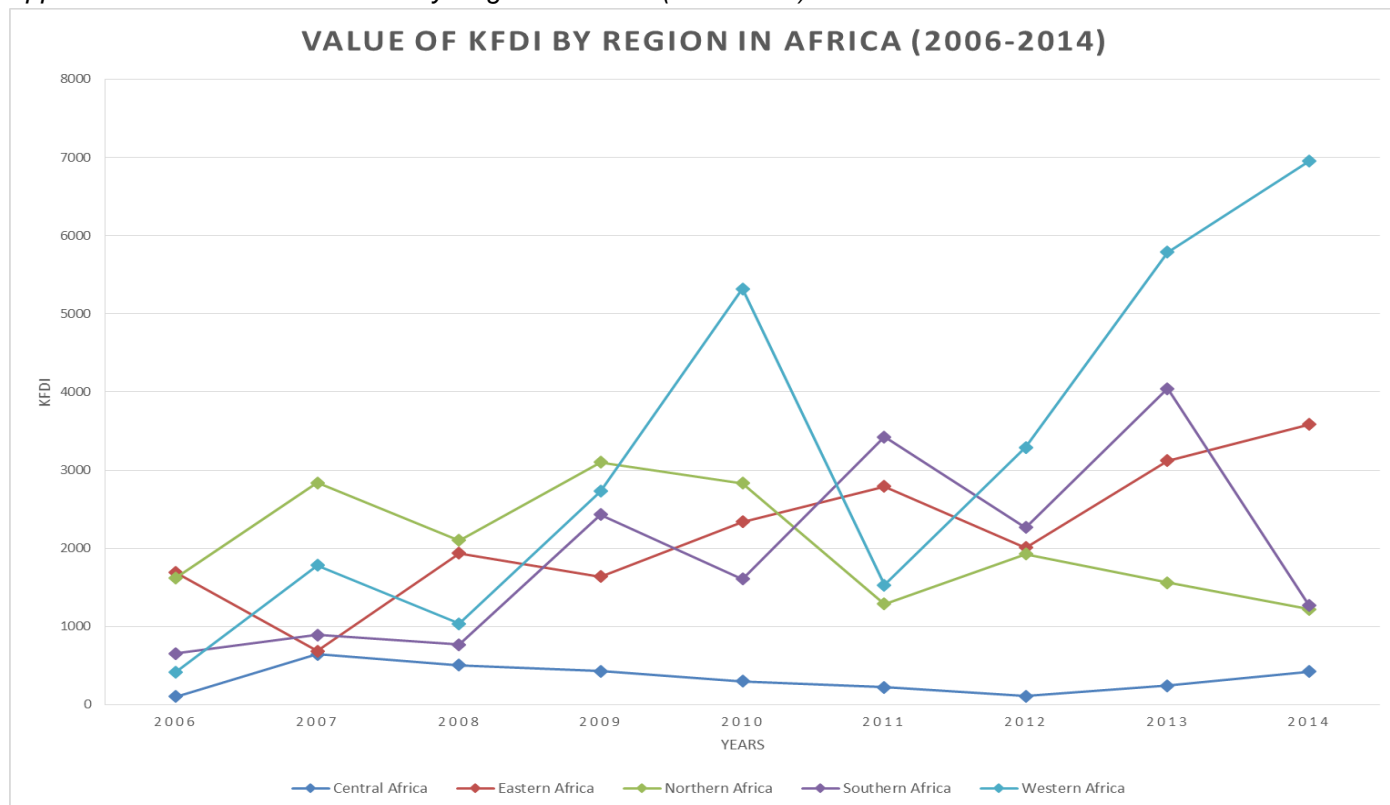
Statistical Results KFDI Determinants-Cities	
Variables	Knowledge-Intensive FDI
Broadband Access	+++
Mobile Phone Subscription	++
Broadband Access # Mobile Phone Subscription	---
Tax Balance	-
Employment Rate	+
Technology Incubators	+++

Explanation significance and sign

+++
++
+
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-
+
-

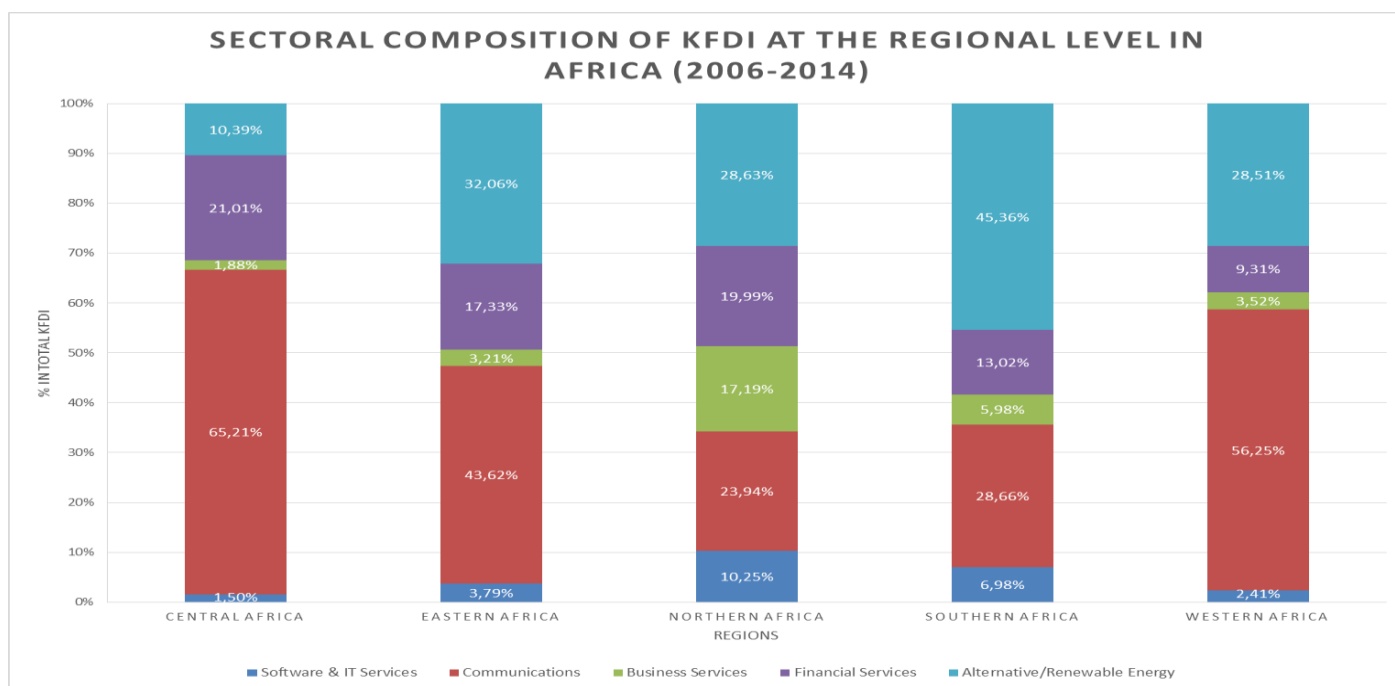
Source: Source: Wall, Nyamai and McAweeney, 2017

Appendix 4.6: Distribution of KFDI by Regions in Africa (2006-2014)



Source: Source: Wall, Nyamai and McAweeney, 2017, Based on fDi Markets

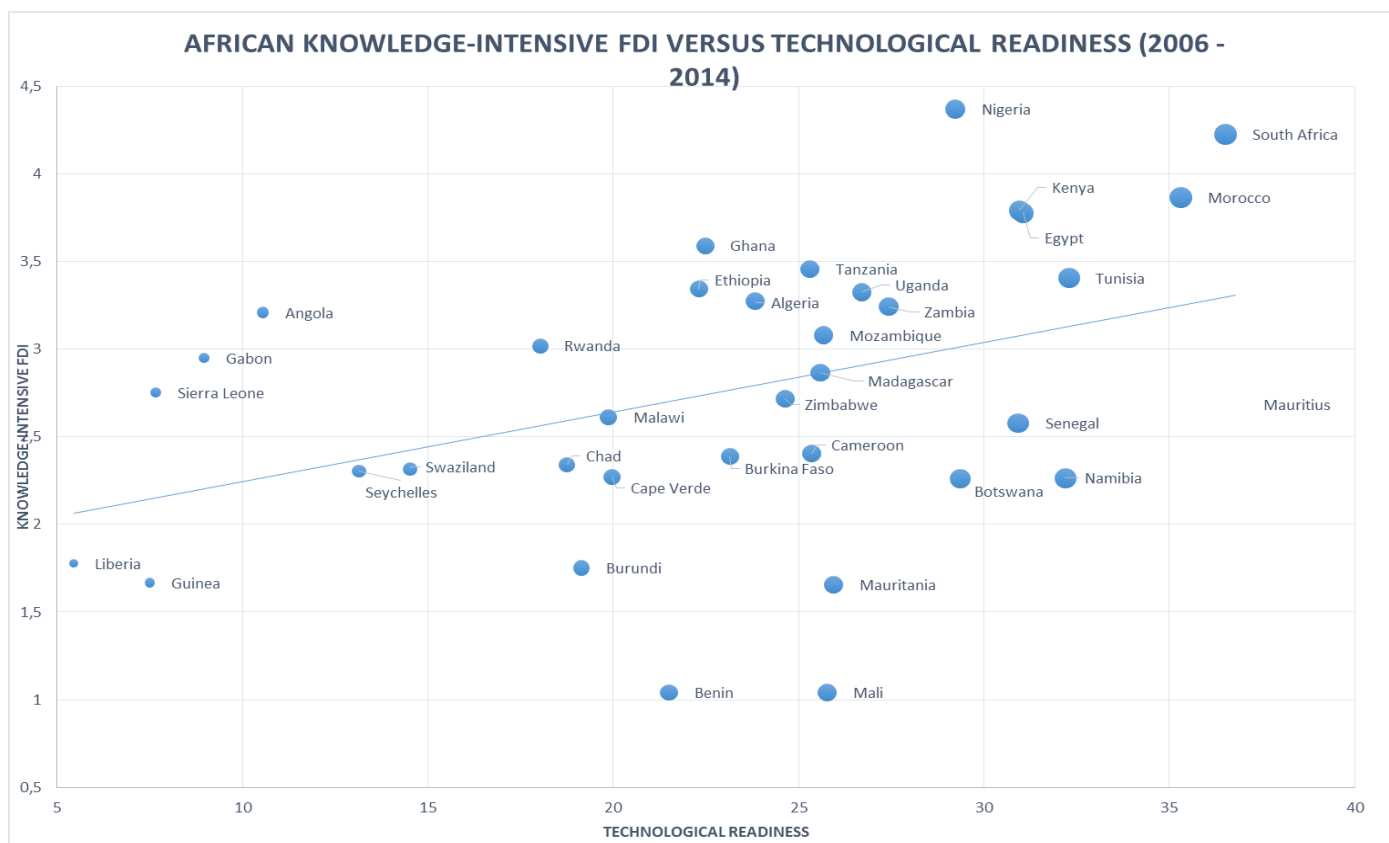
Appendix 4.7: Sectoral composition of KFDI in African regions (2006-2014)



Source: Source: Wall, Nyamai and McAweeney, 2017, Based on fDi Markets

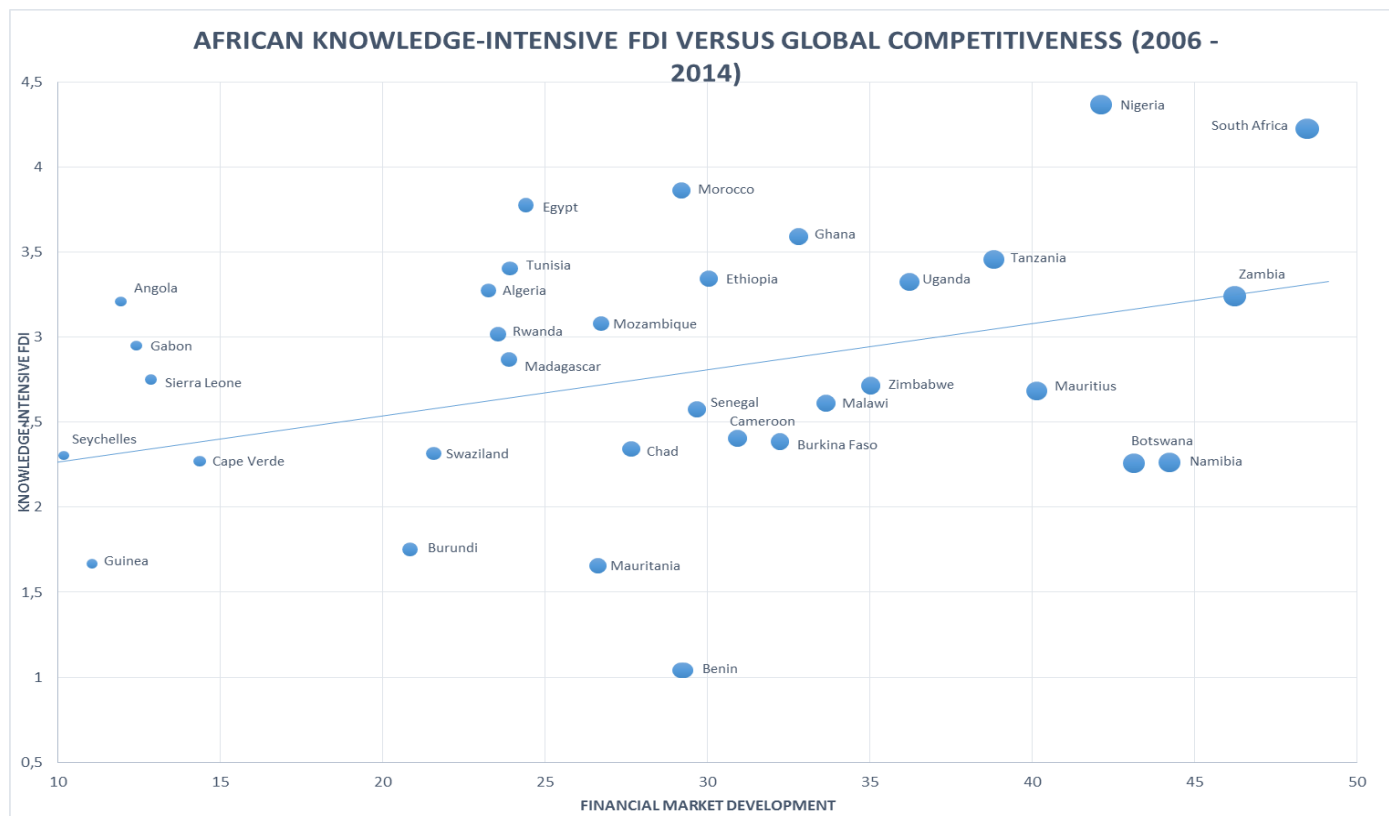


Appendix 4.8: KFDI and Technological Readiness in Africa (2006-2014)



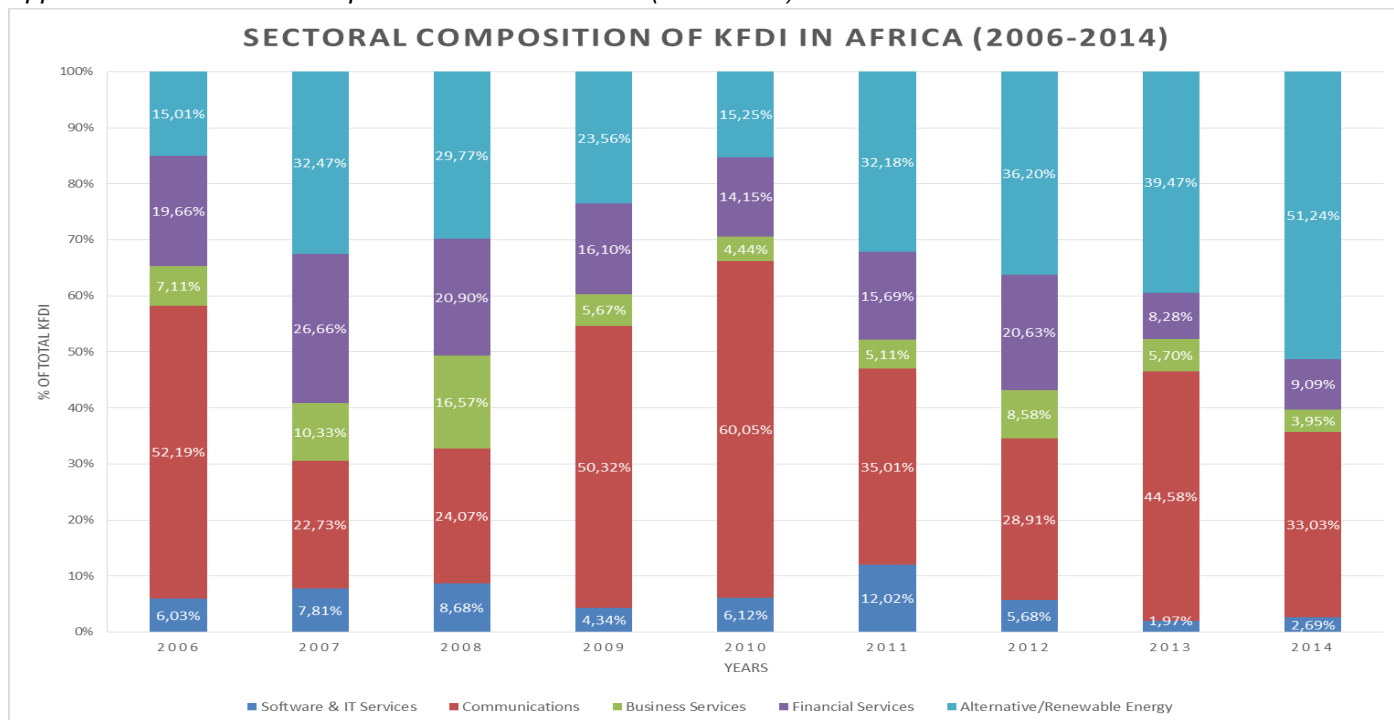
Source: Source: Wall, Nyamai and McAweeney, 2017, based on FDI Markets and GCI.

Appendix 4.9: KFDI and Financial Market Development in Africa (2006-2014)



Source: Source: Wall, Nyamai and McAweeney, 2017, based on FDI Markets and GCI

Appendix 4.10: Sectoral composition of KFDI in Africa (2006-2014)



Source: Source: Wall, Nyamai and McAweeney, 2017, based on FDI Markets

## Chapter 5

### Infrastructure Networks and FDI: Hard Connectivity of Lagos – Abidjan Economic Corridor

Ronald Wall, Lynda Bitrus Elesu and Taslim Alade

#### Appendix 5.1: Methodology

The research strategy is a combination of empirical desk research and primary quantitative approach of generating new variables. There are primarily three categories of research methods which are used in this research: spatial analysis, space syntax analysis and quantitative analysis. The choice of this strategy based on the broad geographical scope of the study which explains the relationship of infrastructure network and FDI for a large sample size. The choice of the two corridors was based on deviant case purposive selection of cases (Thiel, Sandra van 2014). This represents extremes examples (cases) of contrasting phenomenon of interest (infrastructure networks and Greenfield FDI) with the European corridor as a modern corridor with countries ranking high in infrastructure index of the GCR while the African corridor has a poor quality of infrastructure with low ranks.

The causal relationship between infrastructure networks and Greenfield FDI inflow is tested by OLS regression using a balanced panel data. The choice of a balanced panel data is preferred over unbalanced since it is proficient and the workload is minimal compared to unbalanced panel data which requires several mathematical computations and test. The dependent variable, Global Economic Integration (measured as Foreign Direct Investment (FDI) inflow) and independent or predictor variable, measures of infrastructure as well as the other location factors and competitiveness factors were chosen based on empirical and theoretical studies. Panel data controls for variables that cannot be observed or measured. It also controls for variables that change over time but not across entities, thereby accounting for the heterogeneity of the entity. The analysis was carried out using the random Effect Technique. The model also controls for other instrument variables that may influence the inflow of FDI such as GDP, Macro- Economic Environment catalyst, Total Population, Market Size amongst and others this constitute the internal validity.

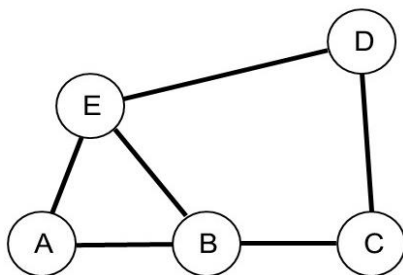
#### Appendix 5.2: A brief explanation of the “closeness” measure

In the Figure below we see a hypothetical model of five cities (A, B, C, D and E) connected to each other by roads. It is of interest to know which cities are most connected to all other cities. This is calculated by counting the number of linkages on the shortest path between two nodes (cities). By shortest path, it is meant that in the case of node A to D, there are three possible options of reaching city D from city A. This is either from A to B to E to D, A to B to C to D, or A to E to D. The latter is the shortest path, so we only count for this path that there are two road linkages - and we note this in the list (see A to D =2). Similarly, for node A to B, there is only one path, and only one link to count. Therefore we note that A to B has one link. For node A to C, the shortest path gives us two road links. This is also noted. The procedure is done for all node combinations and noted similarly in the list below. In the case of node combinations B to D, C to E, D to B and E to C, it is seen that there are always two equal shortest paths. In these cases, each path counts as a half-

point, together making 1. Once the list is completed for all node combinations, the next thing to do is to add the links (roads) that are shown in red. For instance, in the case of node A, we add 1 + 2 + 2 + 1 = 6 links. For node B it is 1 + 1 + 0.5 + 0.5 + 1 = 4 .... and so forth. The inverse of these scores is used for closeness, i.e. for node A this is 1 / 6 = 0.16. These scores are seen in the bottom list. In this list nodes B and E have the highest closeness value, which means that they are the most connected to all other nodes in the network. This is a simple model, but reveals the concept behind the analysis. Obviously, the real data on African city road networks concerns the combinations of thousands of cities in Africa. To calculate the complex closeness of these, required the use of "space syntax software. In this study we are not only interested in the road connectivity of cities in countries, but more importantly the degree to which this measure explains a country's ability to attract FDI. It is important to note that the closeness measure is calculated using inter-city road connections. However, these city measures had to be aggregated (added up) to county level, so as to make statistical comparisons to other country indicators e.g. FDI, which were only available at that level.

**Closeness Measure**

- A -> B: 1
  - A -> C: 2
  - A -> D: 2
  - A -> E: 1
  - B -> A: 1
  - B -> C: 1
  - B -> D: 0.5 or 0.5
  - B -> E: 1
  - C -> A: 2
  - C -> B: 1
  - C -> D: 1
  - C -> E: 0.5 or 0.5
  - D -> A: 2
  - D -> B: 0.5 or 0.5
  - D -> C: 1
  - D -> E: 1
  - E -> A: 1
  - E -> B: 1
  - E -> C: 0.5 or 0.5
  - E -> D: 1
- When several shortest routes, count half points*



Betweenness centrality scores

- A: 1 / 6 = 0.16
- B: 1 / 4 = 0.25
- C: 1 / 5 = 0.20
- D: 1 / 5 = 0.20
- E: 1 / 4 = 0.25

Closeness = 1 / sum of counted values (red)

For standardization, the denominator is (n-1)(n-2)/2.  
In this case divide the scores by (5-1)(5-2)/2 = 6

Source: Wall, Elesa and Alade, 2016

**Appendix 5.3: Descriptive statistics**

Descriptive Statistics					
Variable	Observations	Mean	Std. Dev.	Min	Max
Total FDI	78	5.376149	2.170951	-0.1053605	10.16924
FDI Stock	99	7.606562	1.505616	5.133176	11.36988
FDI Inflows	98	5.795402	1.589548	-0.2324331	9.095478
Integration (Closeness-N-km Radius)	108	0.041875	0.0771129	0.012	0.296
Integration (Closeness-30km Radius)	108	0.2563333	0.0502035	0.24	0.422
Integration (Closeness-3km Radius)	108	0.81625	0.1355606	0.369	0.867
Global Competitiveness Index	76	17.71279	1.090069	15.34449	20.04353
Population	108	2.10E+07	3.85E+07	1233996	1.77E+08
Market Size	76	3.430209	0.7534111	2.177215	5.454387
Higher Education	76	4.127173	0.6220963	2.745608	5.26773

Source: Wall, Elesa and Alade, 2016, based on various sources

Appendix 5.4: Correlation between Greenfield FDI sectors

Correlation Table-Greenfield FDI Sectors	
Integration (Closeness-N km Radius)	1
Hi-Tech FDI	-0.2484
Manufacturing FDI	-0.7677
Resources FDI	-0.3755
Services FDI	-0.7205

Source: Wall, Elessa and Alade, 2016, FDI Markets, space syntax

Appendix 5.5: FDI and integration

Variables	Greenfield FDI	FDI Stock	FDI Flows	Greenfield FDI	FDI Stock	FDI Flows	Greenfield FDI	FDI Stock	FDI Flows
Integration (Closeness-N-km Radius)	---	---	---						
Integration (Closeness-30km Radius)				---	---	---			
Integration (Closeness-3km Radius)							+++	+++	+++

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
	-	not significant but negative relation

Source: Wall, Elessa and Alade, 2016

Appendix 5.6: FDI, Integration and Global Competitiveness index pillars

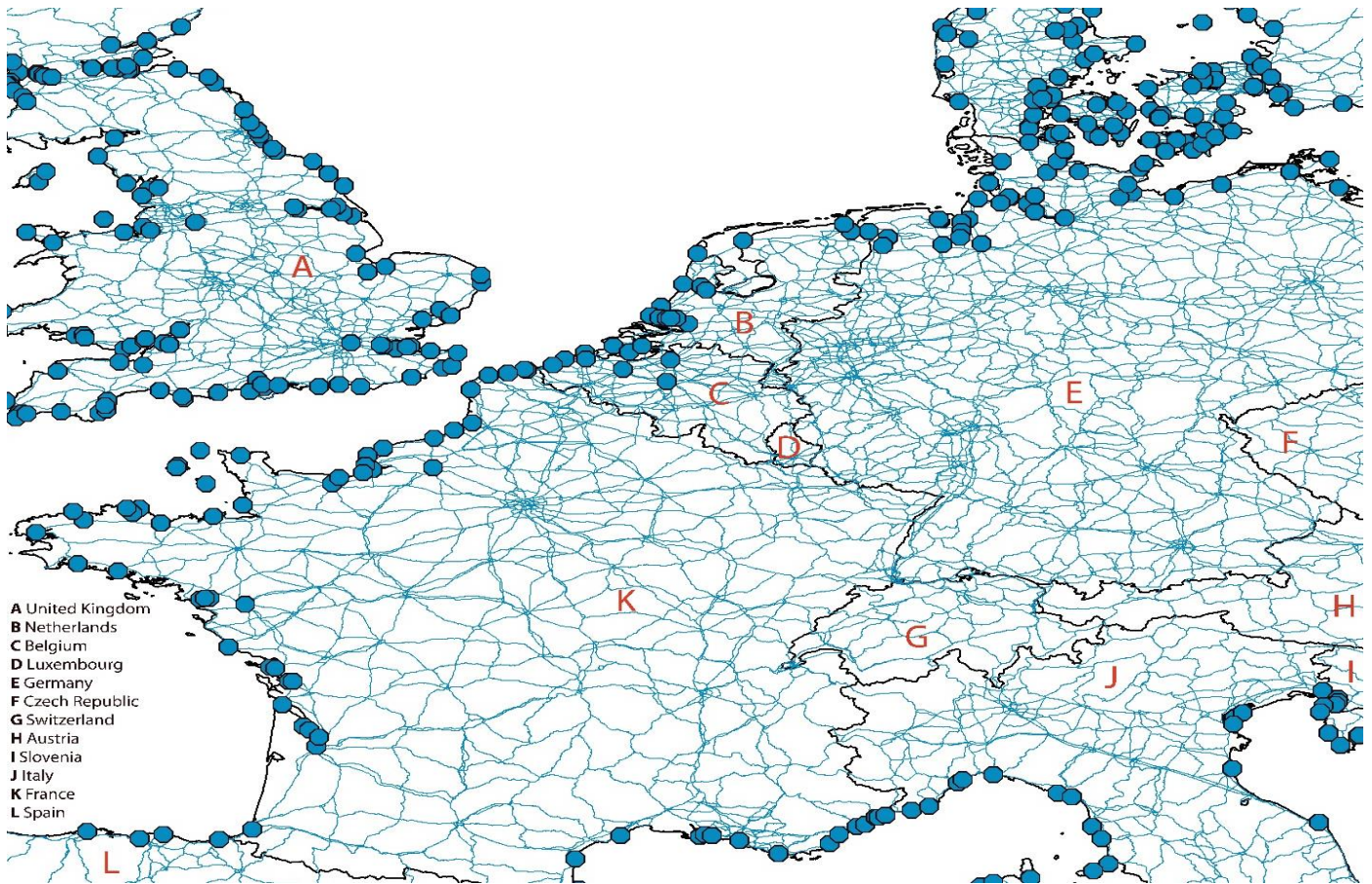
Variables	Greenfield FDI	FDI Stock	FDI Flows	Greenfield FDI	FDI Stock	FDI Flows	Greenfield FDI	FDI Stock	FDI Flows
Integration (Closeness-N-km Radius)	---	---	---						
Integration (Closeness-30km Radius)				---	---	---			
Integration (Closeness-3km Radius)							+++	+++	+++
Total Population	+	+	+++	+	+++	+++	+	+	+++
Market Size	+	+++	+++	++	+++	+++	++	+++	+++
Higher Education	+	+	+	++	+	+	++	+	+

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation

--	more significant and negative relation
-	significant and negative relation
+	not significant but positive relation
-	not significant but negative relation

Source: Wall, Eleso and Alade, 2016, based on ESRI

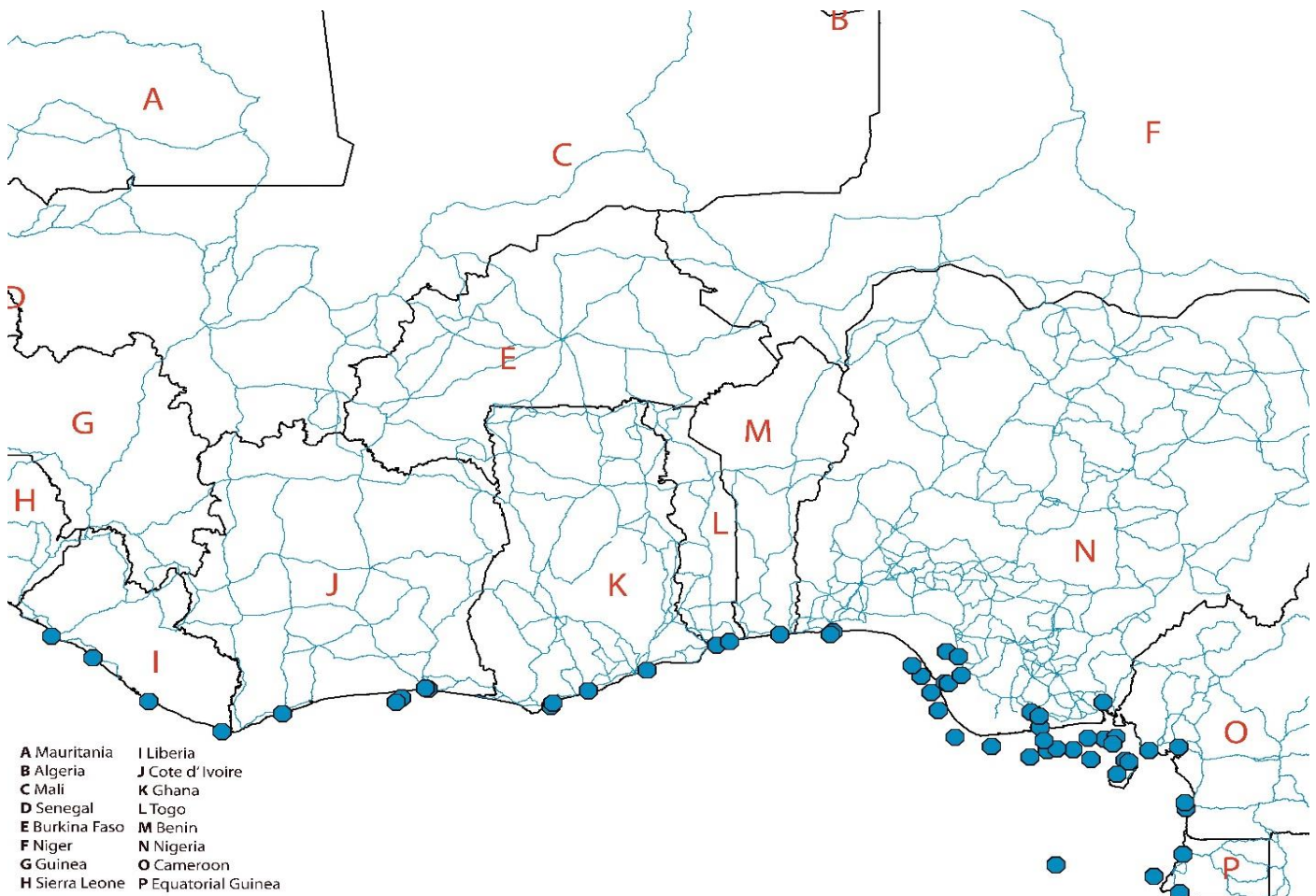
Appendix 5.7: Road network and ports in NS-M corridor in Europe (2016)



Source: Wall, Eleso and Alade, 2017, based on ESRI data



Appendix 5.8: Road network and ports in L-A corridor in Western Africa



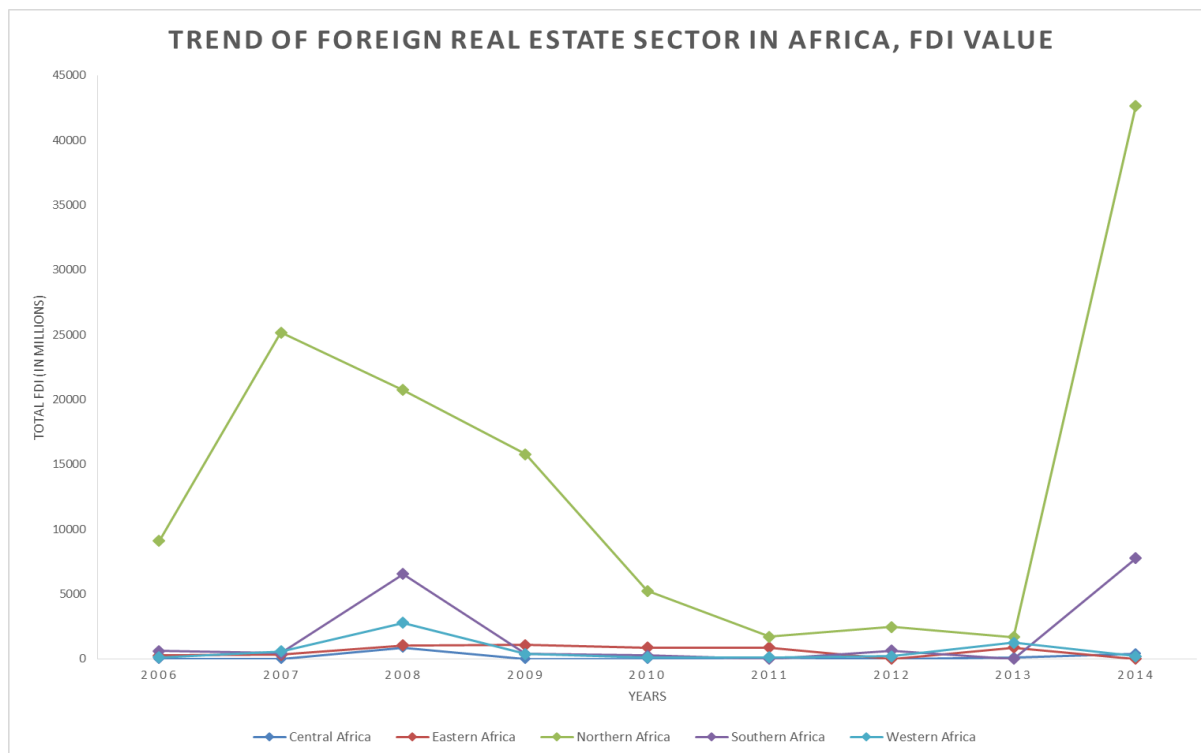
Source: Wall, Eles and Alade, 2016, based on ESRI data

## Chapter 6

### The Attraction of Direct Greenfield Foreign Real Estate Investments into Sub-Saharan Africa: Do Urban Planning Regulations Matter?

M.M. van Gils; J. van Haaren; R.S. Wall

Appendix 6.1: Trend of FREI across African regions (2006-2014)



Source: Van

Gils, Van Haaren and Wall, 2017, FDI Markets

Appendix 6.2: Determinants of FREI at the global level

Statistical Results ZINB regressions 1

Variables	APAP Number of FREIs	APAP+UPR  Number of FREIs	ACAP Number of FREIs	ACAP+UPR Number of FREIs
UPR_Regulatory Quality	-	-	-	-
UPR_Freehold landownership possibility	+	+	+	+
UPR_Population Density (people/km2)	---	---	--	---
INST_Control of Corruption	---	--	---	--
INST_Political Stability	+++	++	+++	+++
INT_Number of FDIs (excluding FREIs)	+++	+++	+++	+++
LOC_Population Size	-	+	+	+
MACRO_GDP / Capita	-	-	-	-
UPR_Days to obtain Building Permit		+		-
UPR_Days to Register Property		+		-
INT_Trade Barriers			-	-
INT_Trade Sector / GDP			-	-
INT_Airpassengers			-	-
LOC_Housing Expenditure			+	-
LOC_Infra Santation			+	++
LOC_Infra Internet			-	-
MACRO_Inflation			+	-
INST_Financial Depth				--
<b>Inflate</b>				
UPR_Regulatory Quality	-	-	-	---
UPR_Freehold landownership possibility	++	++	+++	++
UPR_Population Density (people/km2)	+	++	+	+
INST_Control of Corruption	-	-	-	-
INST_Political Stability	+	++	++	+
INT_Number of FDIs (excluding FREIs)	-	---	---	--
LOC_Population Size	+	++	+	+
MACRO_GDP / Capita	-	-	---	---
UPR_Days to obtain Building Permit		-		-
UPR_Days to Register Property		---		-

INT_Trade Barriers			+	-
INT_Trade Sector / GDP			+	++
INT_Airpassengers			-	+
LOC_Housing Expenditure			-	-
LOC_Infra Santation			---	---
LOC_Infra Internet			+++	+
MACRO_Inflation			-	-
INST_Financial Depth				-

Explanation significance and sign

+++	very significant and positive relation
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-	significant and negative relation
+	not significant but positive relation
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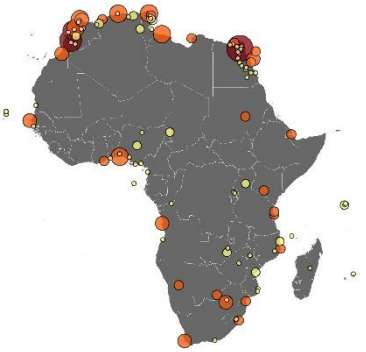
Source: Van Gils, Van Haaren and Wall, 2017, based on FDI Markets and various sources of indicators

Appendix 6.3. FREI by total capital (\$ value) and by number of investments (count) (2006-2014).

### Capital attraction



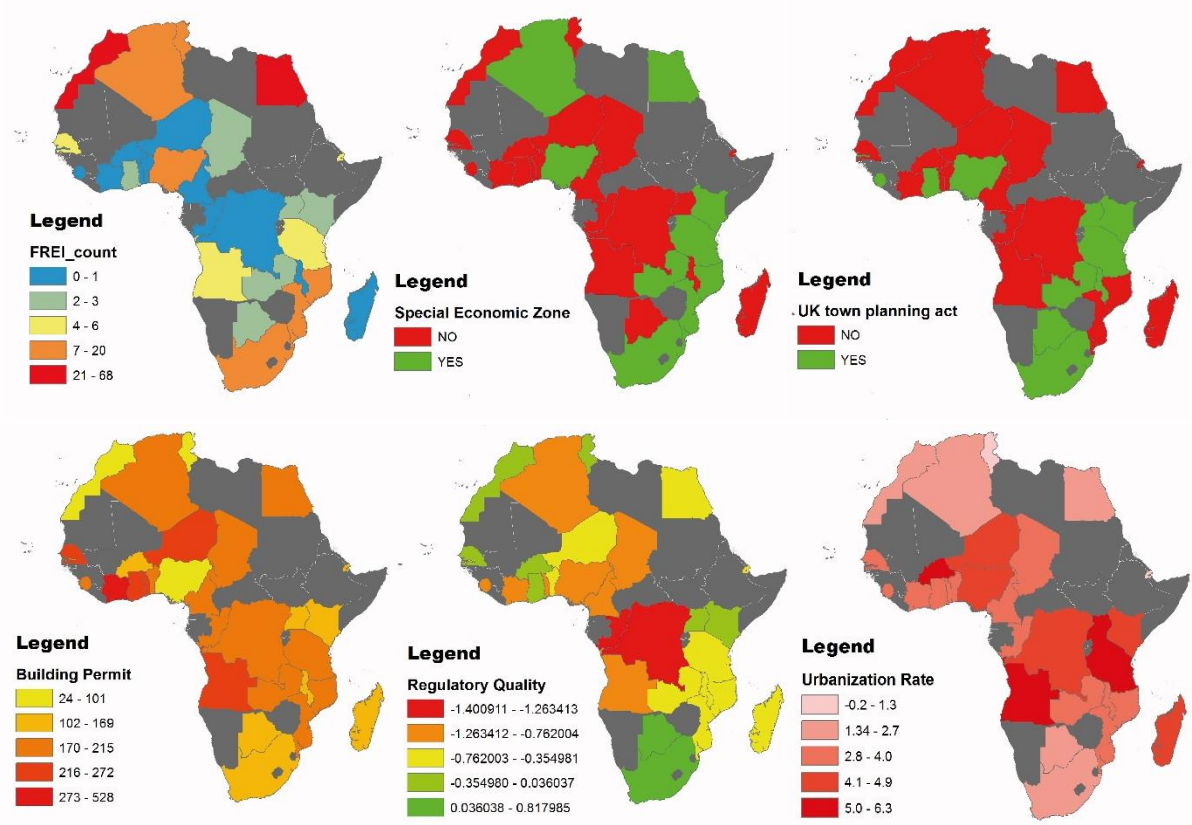
### Number of FREIs



Source: Van Gils, Van Haaren and Wall, 2017, FDI Markets and WB World Development Indicators

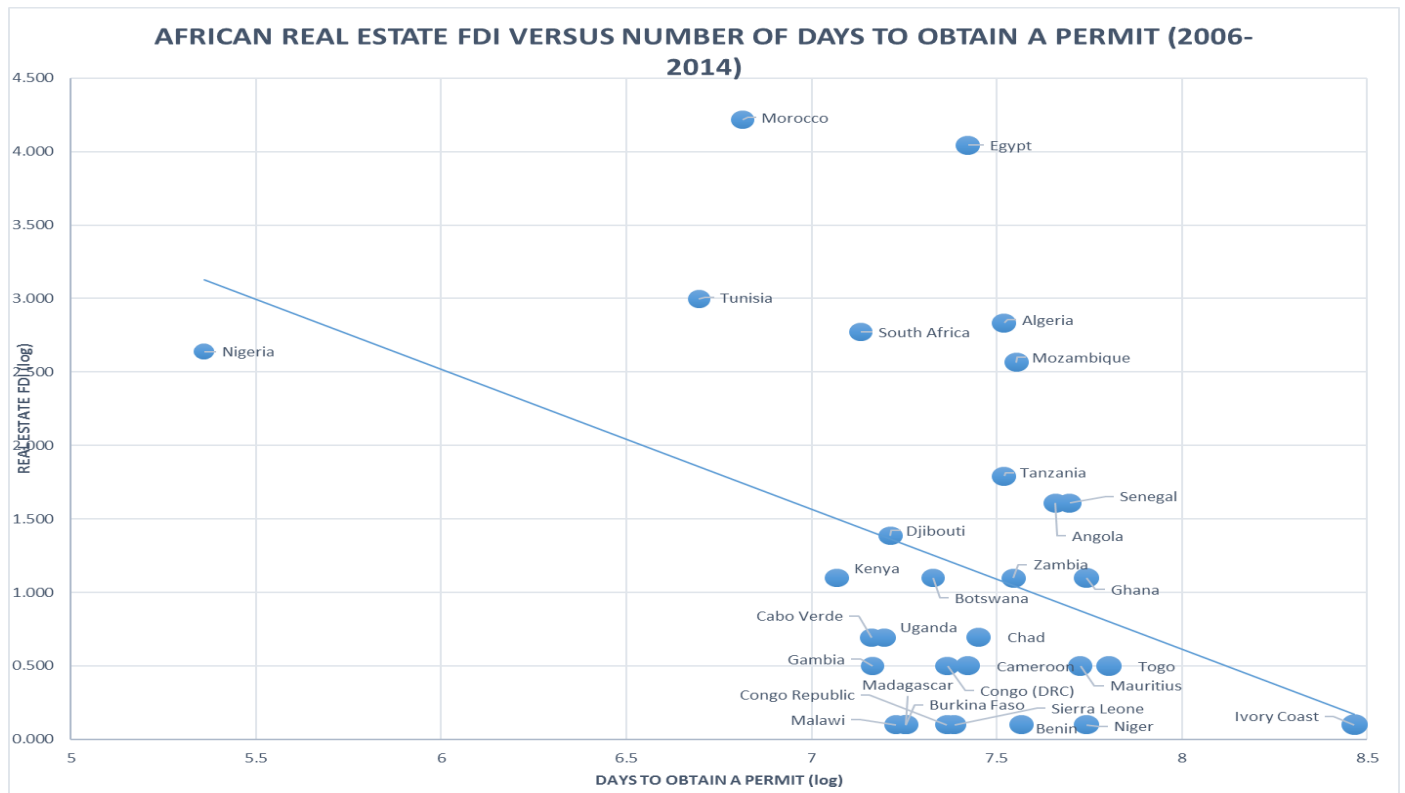


Appendix 6.4. Determinants of FREI in Africa (2006-2014)



Source: Van Gils, Van Haaren and Wall, 2017, FDI Markets and WB World Development Indicators

Appendix 6.5. FREI and days to obtain permit in Africa (2006-2014)



Source: Van Gils, Van Haaren and Wall, 2017, FDI Markets and WB World Development Indicators

## Chapter 7

### The Impact of Greenfield FDI on Food Security in Africa

*Ronald Wall, Dorcas Nyamai and Akua Asubonteng*

#### Appendix 7.1: Methodology

To estimate and predict the relationship between food security (as dependent variable) and FDI (as the independent variable), an Ordinary Least Square (OLS) linear regression analysis with interaction terms is conducted with panel data available for 3 years. Random effects models were used based on the Hausman test. The scope of the analysis spans from a global, continental and then national level. The effect of the total Greenfield FDI on food security, is regressed at the global level (i.e. consisting of top 28 countries) as well as Africa (31 countries).

The indicators used in panel regression are described below:

**Dependent variable (Global Food Security Index):** This data gathered by the Economist Intelligence Unit is a Global Food Security Index (GFSI) of normalised scores on 28 unique indicators using 3 categories; availability, affordability, and quality of food. Each category score is a weighted mean of the underlying indicators' scores and the overall index is a weighted mean of the combined categories scores. The weights are allocated depending on an indicator's or category's assumed 'relevance' to food security. For instance, to make the total 100%; Availability weighs - 44%, Affordability – 40% and Quality – 16%.

Index has been constructed using P2 distance calculation, a synthetic index that combines all of these indicators into a single value. Selection of the indicators is based on theory and the P2 computation (Perez- Luque et al, 2015) is not affected by the categories used to group the index and sub-indices.

**Independent variable:** The FDI data comprise of general inflows globally for total and particularly for food-FDI.

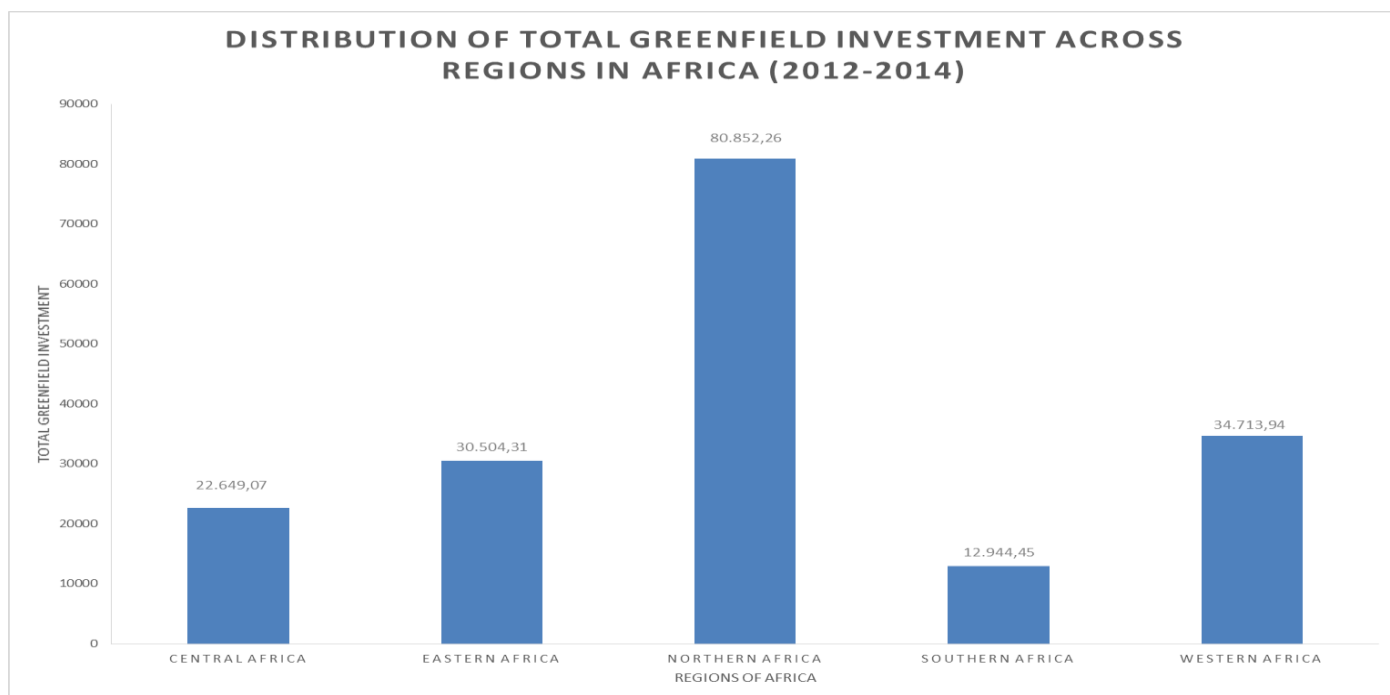
#### Appendix 7.2: The relationship between FDI and global food security

Variables	Food Security Index	Food Security Index	Affordability	Affordability	Availability	Availability	Quality and Safety	Quality and Safety
Total FDI	+		+		+		+	
Food FDI		+		-		-		+
Improved Sanitation Facilities	+++	+++	+	+	++	+	+++	+++
Agricultural Import Tariffs	+++	+++	+++	+++	-	-	+	+
Food Production Index	-	-	-	-	-	-	+	+
Agricultural Exports	---	---	-	--	--	-	---	---

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
-	not significant but negative relation	

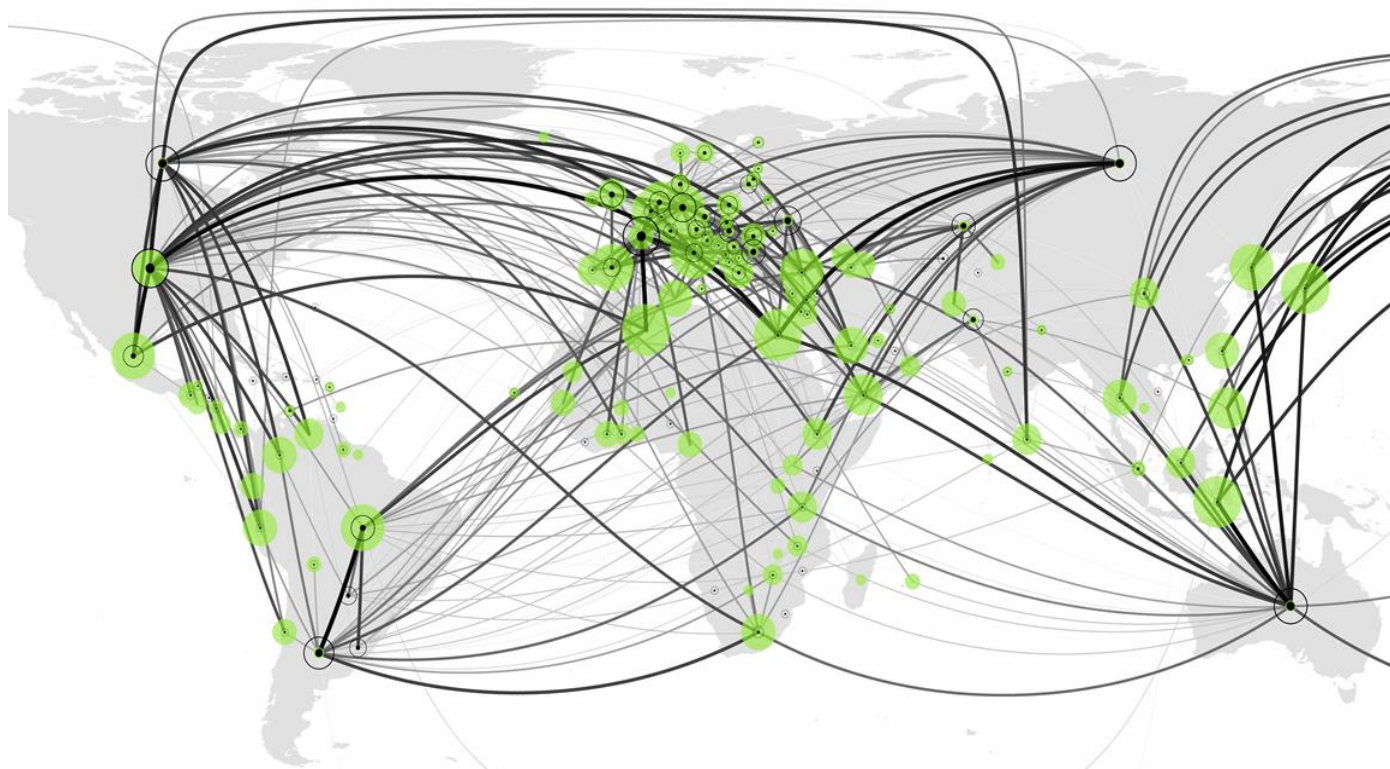
Source: Wall, Nyamai and Asubonteng (2016)

Appendix 7.3: Overall Greenfield investment flows (2012-2014)



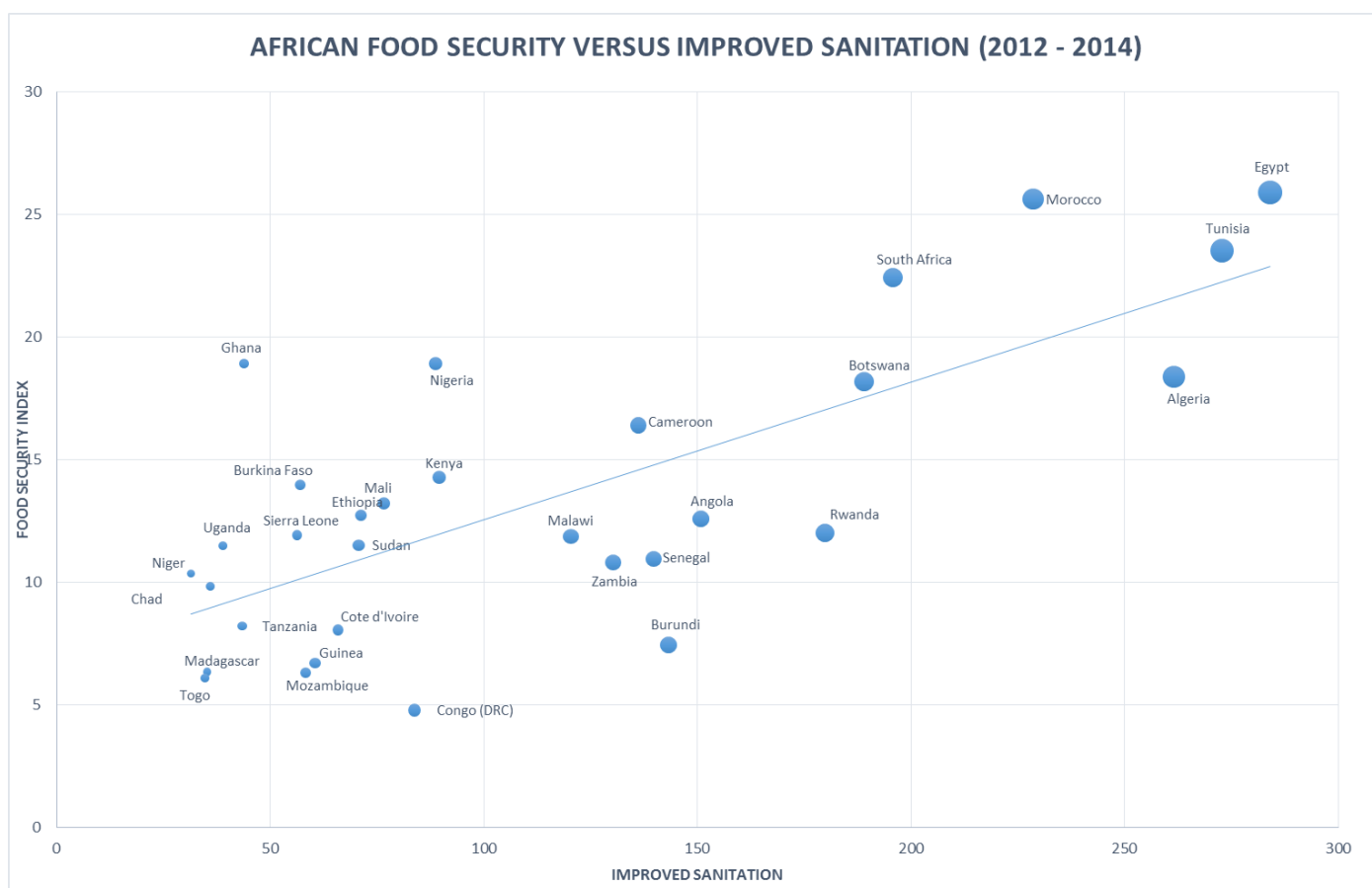
Source: Wall, Nyamai and Asubonteng (2017), based on FDI Markets

Appendix 7.4: The geography of wheat imports and exports (2007 - 2011)



Green nodes = wheat imports. Black nodes = wheat exports. Black linkages = wheat bilateral flows

Source: Wall and Tsui, (2015), based on FAO data



Source: Wall, Nyamai and Asubonteng (2017), based on FAO

## Chapter 8

### Which Policy Instruments attract Foreign Direct Investments (FDI) in Renewable Energy?

Ronald Wall, Stelios Grafikos, Alberto Gianoli, Spiros Stavropoulos

#### Appendix 8.1: Methods and Data

The data used in this research span a period from 2005 until 2014 for a variety of countries worldwide (see table 1). We collected the data from three main sources. The financial Times FDI markets provided the individual investments with additional info such as the source country, the destination country, the date of the investment took place and the sector of clean energy. We reformed this set of data to fit a panel data structure on an annual level by aggregating the FDI of each country for each year. In addition, we dropped cases of countries that had more than four (out of ten) missing values also in line with Polzin et al. (2015). Moreover, we obtained the policy indicators over the years described in the previous section, from the IEA\IRENA Policy database. We represented the policy indicators over the years in the model by dummy variables that take the value one if the policy was present at the specific year and zero otherwise. Finally, we further added several macroeconomic variables in the regression model. They served the role of control variables and captured the effect of macroeconomic movements on FDI. These variables are the *real interest rate*<sup>1</sup>, the *GDP PPP*<sup>2</sup>,

<sup>1</sup> **Real interest rate:** Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. The terms and conditions attached to lending rates differ by country, however, limiting their comparability. Source: International Monetary Fund, International Financial Statistics and data files using World Bank data on the GDP deflator.

<sup>2</sup> **GDP PPP:** GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2011 international dollars. Source: World Bank, International Comparison Program database.

$CO_2$  emissions<sup>3</sup> and net energy imports<sup>4</sup> of each country per year. Consequently, the design of the research requires longitudinal data analysis, which is based on panel data and enables us to capture possible dynamic relationships. On the other hand, because of the more complex structure and the fact that we follow the subjects over time, the non-response percentage is higher. The dependent variable FDI is the only variable that included many missing values. We decided to follow an interpolation approach that was based on the average percentage difference of the sum of FDI per year applied on an individual level.

The following tables provide a general picture of the renewable FDI throughout the years. A first remark is that renewable FDI grew steadily until the crisis of 2008-2009. After the crisis, there is a sharp decrease of the renewables attractiveness that is explained by the global decline in the financial activities, the uncertainty of future financial conditions and reduced liquidity. However, between the years 2010 and 2014, the aggregated amount of foreign direct investments remains at a steady level. At a sector level, over the period 2004 – 2014 the FDI in the Wind sector has changed dramatically. In the years 2008 and 2009, the Wind sector consists of more than the 50% of total FDI on the renewables, however, the following years it declined more than fourfold till 2014. On the other hand, the FDI in the solar sector had risen significantly from 1.6 billion dollars in 2006 to 25.1 billion dollars in 2014 counting for more than the 50% of the total. At a country level, the countries listed in table 1 have the leadership in attracting renewable FDI with USA and UK being the main largest markets.

#### Appendix 8.2: Country selection

Countries Included in the regression			Number
Total	OECD	Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Japan, Latvia, Mexico, Netherlands, Poland, Portugal, Spain, United Kingdom, United States of America,	23
	Non-OECD	Argentina, Brazil, Bulgaria, China, Colombia, Croatia, Guatemala, India, Indonesia, Kenya, Lithuania, Malaysia, Montenegro, Nigeria, Panama, Peru, Philippines, Romania, Serbia, Singapore, South Africa, Thailand, Ukraine, Uruguay, Vietnam	25
Wind		Australia, Brazil, Bulgaria, Canada, Chile, China, Czech Republic, France, Germany, Greece, Hungary, India, Italy, Mexico, Netherlands, Panama, Poland, Portugal, Romania, Serbia, South Africa, Spain, United Kingdom, United States of America, Uruguay	25
Solar		Australia, Bulgaria, Canada, Chile, China, Czech Republic, France, Germany, Greece, India, Italy, Japan, Mexico, Romania, Serbia, South Africa, Spain, Thailand, United Kingdom, United States of America	21
Biomass		Belgium, Brazil, Bulgaria, Canada, China, Colombia, Croatia, Czech Republic, Denmark, France, Germany, Hungary, India, Indonesia, Italy, Lithuania, Malaysia, Netherlands, Peru, Philippines, Poland, Romania, Serbia, Singapore, South Africa, Spain, Ukraine, United Kingdom, United States of America, Vietnam	30

<sup>3</sup> **CO<sub>2</sub> emissions:** Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. Source organization: Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States.

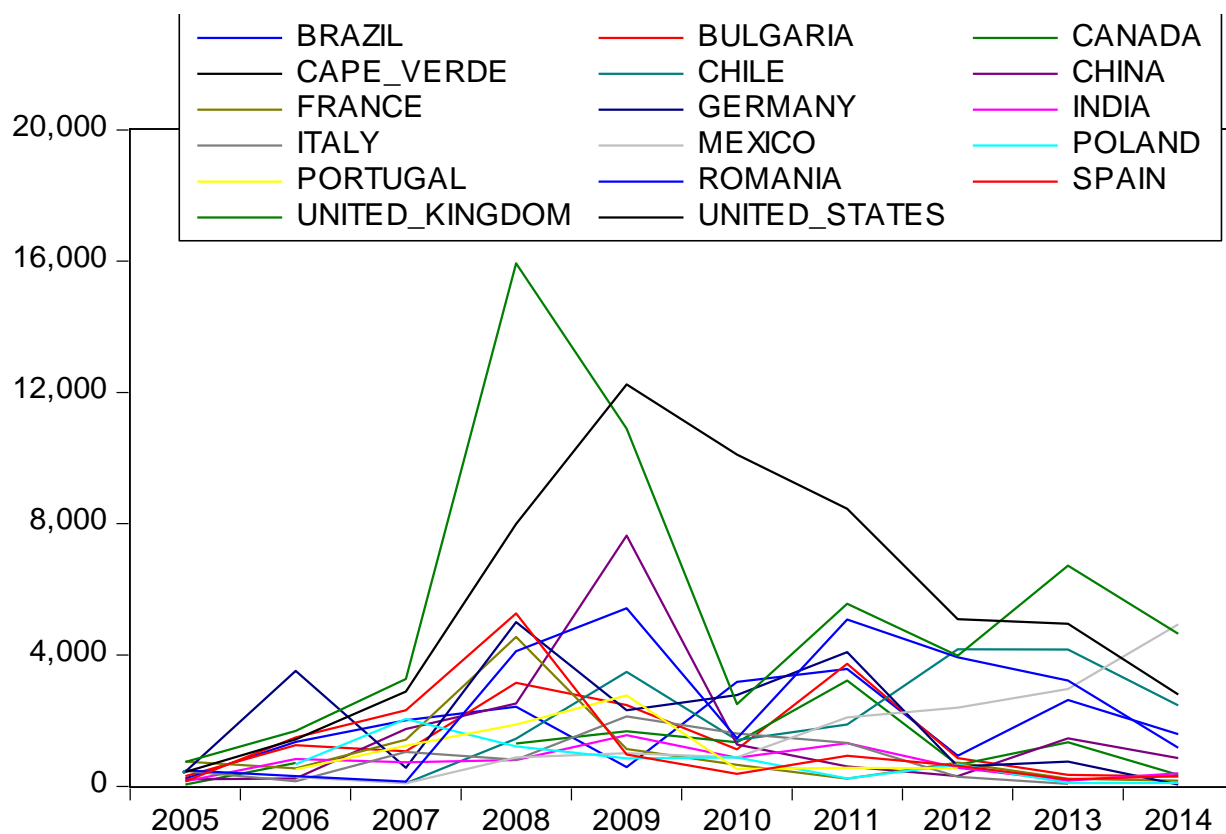
<sup>4</sup> **Net energy imports:** Net energy imports are estimated as energy use less production, both measured in oil equivalents. A negative value indicates that the country is a net exporter. Energy use refers to use of primary energy before transformation to other end-use fuels, which is equal to indigenous production plus imports and stock changes, minus exports and fuels supplied to ships and aircraft engaged in international transport. Source: IEA Statistics © OECD/IEA 2014 (<http://www.iea.org/stats/index.asp>), subject to <https://www.iea.org/t&c/termsandconditions/>

Appendix 8.3: Ranking of countries based on GFDI attractiveness

Country	No. of Investments	Aggregated amount of FDI
United states	483	56408
UK	161	55951
Spain	98	12656
Romania	86	25356
France	80	10424
Bulgaria	78	14623
Italy	71	7902
Chile	60	19535
Brazil	60	18526
India	59	7401
China	54	16879
Canada	54	106510
Mexico	49	15535
Germany	46	20122
Poland	44	6787

Source Wall, Grafakos, Gianoli and Stavropoulos

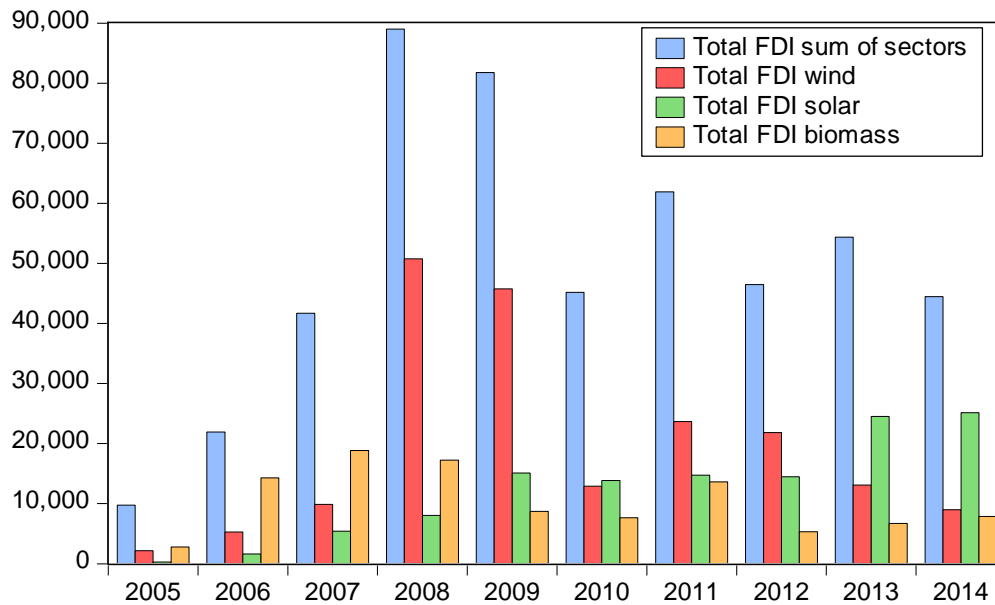
Appendix 8.4: Graph of total GFDI for selected countries across the years



Source Wall, Grafakos, Gianoli and Stavropoulos



## Appendix 8.5: Total investments per sector



Source Wall, Grafakos, Gianoli and Stavropoulos

## Appendix 8.6: Statistical techniques

### Fixed-Effects model

We estimate the coefficients of the panel data by using least squares with fixed-effects estimation. The choice of fixed-effects instead of random-effects is based on the intention to avoid bias in the estimation of the coefficients, as it is common in the random-effects model. In addition to that, applying Hausman test suggests the absence of random-effects. The following formula displays the fixed-effect model.

$$y_{it} = a_i + \beta_1 X_{it,1} + \beta_2 X_{it,2} + \dots + \beta_k X_{it,k} + \gamma_1 C_{it,1} + \dots + \gamma_j C_{it,j} + \varepsilon_{it}$$

Where  $y_{it}$  denotes *FDI* (log-transformed),  $X_{it,k}$  denotes the dummy variable that take one if the policy instrument is valid at year  $t$  or zero otherwise,  $C_{it,j}$  represents the *macroeconomic variables* and  $a_i$  is the country specific fixed-effect.

### Log-transformation

In order to fulfill the assumption of the least square model, we log-transformed the dependent variable to correct for its skewness and partially make their distribution to the desirable normality. For the same reason, we also applied a logarithmic transformation to the GDP variable.

### Controls

Apparently, the attraction of FDI in each country depends on a uncountable number of factors and not only to the policy instruments. Concerning the omitted variables bias, we want a complete model but yet parsimonious. Hence, we add the following variables that are the *real interest rate*, the *GDP PPP*, the *net energy imports* and the *CO<sub>2</sub> emissions*. In this particular investigation, we are not interested in these effects, but it is important to include them to account the effect of macroeconomic movements and create more precise estimation results. The intuition behind choosing these variables relies on the idea that the real interest rate variable is closely connected with the global investments as a temporary finance of projects. The GDP resembles the economic growth which subsequently will attract investments. The net energy reports depict the country's demand for energy and finally the *CO<sub>2</sub> emissions* will give an indication about the development of clean energy in the country, in the essence that more *CO<sub>2</sub> emissions* mean less clean energy development, which in turn gives space for attracting more FDI.

### Lag structure

We assume that the policies do not affect the FDI immediately but with some delay. On the one hand, the investors are a priori informed about an introduction of a policy and they are already prepared, and on the other hand, some investments have longer establishing processes such as building a wind or solar park. Consequently, we added a lag of each policy from one to 3 years and applied variable selection procedures based on the Akaike Information Criterion in order to conclude whether and which lag is necessary.

## Further adjustments

Finally yet importantly, after observing that heteroskedasticity is present across section rather than across period, we used white-cross section standard errors for a further more robust estimation of the standard errors of the regression.

Appendix 8.7: Correlation matrix of the policy indicators

	<i>FIT</i>	<i>REC</i>	<i>RPS</i>	<i>NEMET</i>	<i>FS</i>	<i>FM</i>	<i>EPP</i>	<i>TEN</i>	<i>PUBLIC</i>	<i>ETS</i>	<i>CarbTax</i>
<i>FIT</i>	1.00	0.24	0.25	0.24	0.29	0.32	0.33	0.31	0.34	0.23	0.19
<i>REC</i>	0.24	1.00	0.38	0.25	0.42	0.17	0.18	0.07	0.22	0.51	0.21
<i>RPS</i>	0.25	0.38	1.00	0.47	0.50	0.28	0.22	0.32	0.38	0.02	0.32
<i>NEMET</i>	0.24	0.25	0.47	1.00	0.33	0.27	0.17	0.31	0.31	0.13	0.19
<i>FS</i>	0.29	0.42	0.50	0.33	1.00	0.37	0.18	0.16	0.37	0.36	0.19
<i>FM</i>	0.32	0.17	0.28	0.27	0.37	1.00	0.23	0.34	0.36	0.25	0.12
<i>EPP</i>	0.33	0.18	0.22	0.17	0.18	0.23	1.00	0.34	0.14	-0.04	0.34
<i>TEN</i>	0.31	0.07	0.32	0.31	0.16	0.34	0.34	1.00	0.34	-0.13	0.23
<i>PUBLIC</i>	0.34	0.22	0.38	0.31	0.37	0.36	0.14	0.34	1.00	0.14	0.15
<i>ETS</i>	0.23	0.51	0.02	0.13	0.36	0.25	-0.04	-0.13	0.14	1	0.003
<i>CT</i>	0.19	0.21	0.32	0.19	0.19	0.12	0.34	0.23	0.15	0.003	1

Source Wall, Grafakos, Gianoli and Stavropoulos

Appendix 8.8: Policy instruments included in the study

Policy instruments	Abbreviation	Policy Category
Renewable Portfolio Standard	<i>RPS</i>	Regulatory Policies
Net Metering	<i>NEMET</i>	Regulatory Policies
Feed-In tariffs	<i>FIT</i>	Fiscal Measures
Financial Support	<i>FS</i>	Fiscal Measures
Fiscal Measures	<i>FM</i>	Fiscal Measures
Energy production payment	<i>EPP</i>	Fiscal Measures
Carbon Tax	<i>Carbon Tax</i>	Fiscal Measures
Renewable Energy (Tradable) Certificates	<i>REC</i>	Market based
Emissions Trading Schemes	<i>ETS</i>	Market based
Tendering	<i>TEND</i>	Public Financing
Public Investment, Loans, and Grands	<i>PUBLIC</i>	Public Financing

Source Wall, Grafakos, Gianoli and Stavropoulos

Appendix 8.9: Policy's effect on the attraction of different modes of renewable energy GFDI (2005-2014)

	Total		Wind		Solar		Biomass	
	<i>Coeff.</i>	<i>S.E.</i>	<i>Coeff.</i>	<i>S.E.</i>	<i>Coeff.</i>	<i>S.E.</i>	<i>Coeff.</i>	<i>S.E.</i>
<i>Const.</i>	7.04***	2.05	9.34	10.44	19.9**	10.09	6.68***	2.6
<i>FIT</i>	0.67**	0.25	0.61**	0.30	0.33*	0.20	0.67***	0.22
<i>REC</i>	n.s.	n.s.	n.s.	n.s.	-0.44*	0.24	n.s.	n.s.



<i>RPS</i>	0.59**	0.26	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
<i>NEMET</i>	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-0.66**	0.21
<i>FS</i>	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	0.55*	0.31
<i>FM</i>	0.33*	0.20	n.s.	n.s.	0.66**	0.25	n.s.	n.s.
<i>EPP</i>	-1.18***	0.37	-1.22**	0.50	n.s.	n.s.	n.s.	n.s.
<i>TEND</i>	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
<i>PUBLIC</i>	-0.61*	0.29	n.s.	n.s.	n.s.	n.s.	-1.03**	0.42
<i>ETS</i>	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	0.97**	0.48
<i>CT</i>	0.97***	0.25	n.s.	n.s.	1.04***	0.32	0.76**	0.34
<i>R-Sq</i>	0.57		0.42		0.44		0.48	
<i>AIC</i>	3.26		3.08		3.17		3.21	
<i>No of Countries</i>	48		25		21		30	

**Notes: Significance levels: \*\*\* a<0.001, \*\*a<0.05, \* a<0.1; n.s.: not significant**

*Source Wall, Grafakos, Gianoli and Stavropoulos*

*Appendix 8.10: Policy's effect on attraction of renewables GFDI in OECD/non-OECD countries (2005-2014)*

	Total FDI - OECD		Total FDI – Non-OECD	
	<i>Coeff.</i>	<i>S.E.</i>	<i>Coeff.</i>	<i>S.E.</i>
<i>Const.</i>	11.46*	7.26	9.04***	3.31
<i>FIT</i>	1.11***	0.52	0.80**	0.20
<i>REC</i>	n.s.	n.s.	n.s.	n.s.
<i>RPS</i>	1.65***	0.54	n.s.	n.s.
<i>NEMET</i>	n.s.	n.s.	-0.37*	0.21
<i>FS</i>	n.s.	n.s.	n.s.	n.s.
<i>FM</i>	n.s.	n.s.	n.s.	n.s.
<i>EPP</i>	n.s.	n.s.	-0.61***	0.27
<i>TEND</i>	n.s.	n.s.	n.s.	n.s.
<i>PUBLIC</i>	-1.03**	0.33	n.s.	n.s.
<i>ETS</i>	n.s.	n.s.	0.99***	0.29
<i>CT</i>	1.23***	0.28	n.s.	n.s.
<i>R-Sq</i>	0.65		0.54	
<i>AIC</i>	3.24		3.02	
<i>No of countries</i>	23		25	

Notes: Significance levels: \*\*\* a<0.001, \*\*a<0.05, \* a<0.1; n.s.: not significant

*Source Wall, Grafakos, Gianoli and Stavropoulos*

Variables	Total FDI OECD		Total FDI non-OECD	
	M1.	S.E.	M2.	S.E.
FIT	+++	+	++	+
REC				
RPS	+++	+		
NEMET			-	+
FS				
FM				
EPP			---	+
TEND				
PUBLIC	--	+		
ETS			+++	+
CT	+++	+		

Explanation significance and sign	+++	very significant and positive relation
	++	more significant and positive relation
	+	significant and positive relation
	---	very significant and negative relation
	--	more significant and negative relation
	-	significant and negative relation
	+	not significant but positive relation
-	not significant but negative relation	

source: Wall, Grafikos, Gianoli, Stavropoulos, 2017, based on FDI Markets and various sources of policy data.

## Chapter 9

### Effect of Green-Competitiveness on Foreign Direct Investment (FDI) representing Global Economic Integration (GEI)

Ronald Wall, Dorcas Nyamai and Meera Malegaonkar

#### Appendix 9.1: Methodology

This research adopts quantitative research methods and statistical inferential analysis using secondary data. The methodology adopted for inferential analysis is provided in the following section. Descriptive statistical analysis is done to support the inferential analysis. The variables were constructed using secondary data. The study includes analysis for groups like world, developed world, developing world and Africa. The importance of variables required to attract FDI may vary for global competition than the competition within the peer group i.e. developed, developing or Africa. As such cities and countries need to attend the parameters for global and peer competition both. The sample for 'FDI-total, country-analysis' includes 132 countries across 5 regions viz. Africa (32), Asia-Pacific (18), Latin America (26), Europe & North America (45) and Middle East (11). The data is available for ten years, from 2005 to 2014. The countries are grouped according to economic status in two groups, developing and developed based on OECD membership (OECD 2016). The sample includes 98 countries from developing world and 34 countries from developed world. The sample for sectoral FDI includes 75 countries.

#### Data Analysis Methods:

The method chosen for this study is quantitative research using secondary data with help of analytical software viz. Arc-GIS and STATA. The geographical distribution of variables is visualized using Arc-GIS. The relationship between dependent and independent variables is analyzed with help of regression in statistical software, STATA, models used are OLS (Ordinary least square method), Fixed & random panel effect, with and without interactions. The study includes analysis for world, developed world and developing world as well as sectors for FDI. The analysis is done separately for 'cities, countries and Africa' in four levels based on hierarchy of constituents of G-comp variables. 1. Green-competitiveness; 2. Unbundled elements viz. Greenness and Competitiveness; 3. 4Es viz. Enablers, Economy, Equity and Environment; 4. Variables of 4Es. The regression models used in this research is discussed below:

OLS (Ordinary least squares) regression

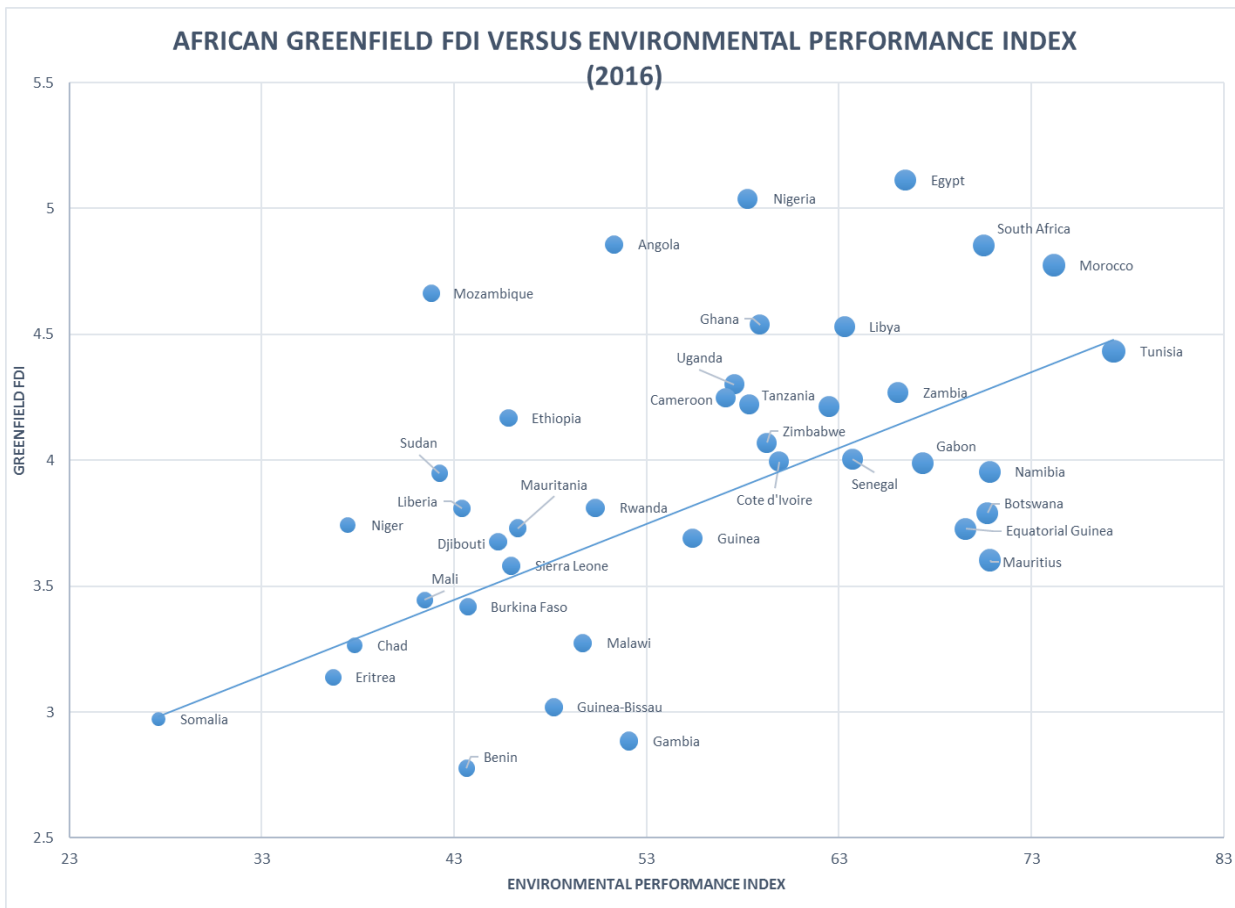
In this study, green-city/growth is the independent variables, inward Greenfield FDI being the dependent variable. The methodology of analysis includes choosing appropriate statistical model for analysis. As a first choice, OLS regression model is tested for goodness of fit. Panel data with Fixed/random effect. As the data is in panel form, fixed/random effect model is the most appropriate choice for analysis. The geographic regions, economic status etc. may or may not affect the relationship between dependable and independent variables. With panel data, multilevel analysis is possible, as such groups like economic status (developed and developing), geographic regions (Africa, Asia...etc.) are introduced in form of dummy variables. The choice between fixed and random effect model depends upon Hausman test.

Appendix 9.2: Global Greenfield FDI versus green competitiveness (2016)



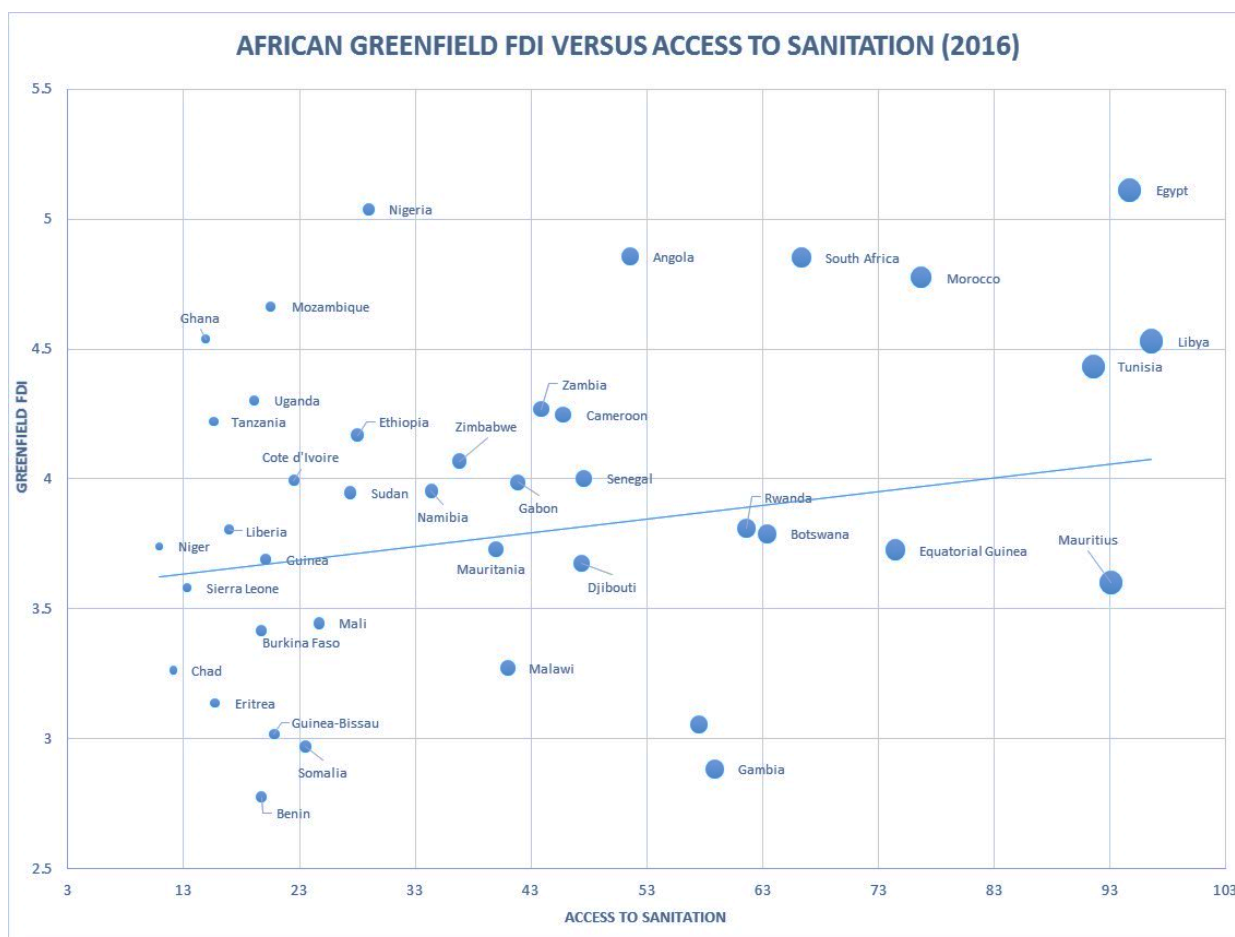
Source: Wall and Nyamai, 2017, based on FDI Markets, World Economic Forum and Yale University data

Appendix 9.3: FDI versus Environmental Performance Index (EPI) in Africa (2016)



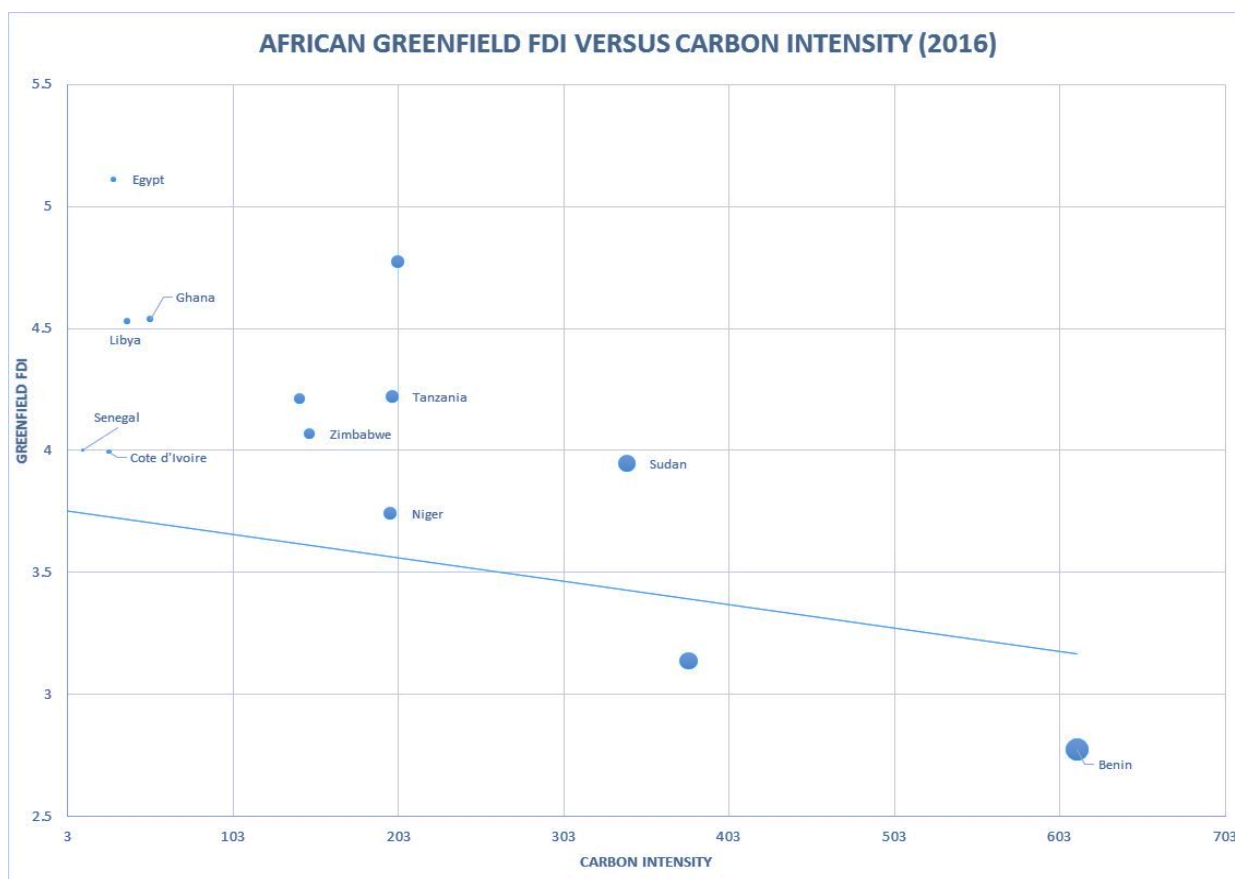
Source: Wall and Nyamai, 2017, based on FDI Markets and Yale University data

Appendix 9.4: African Greenfield FDI versus access to sanitation (2016)



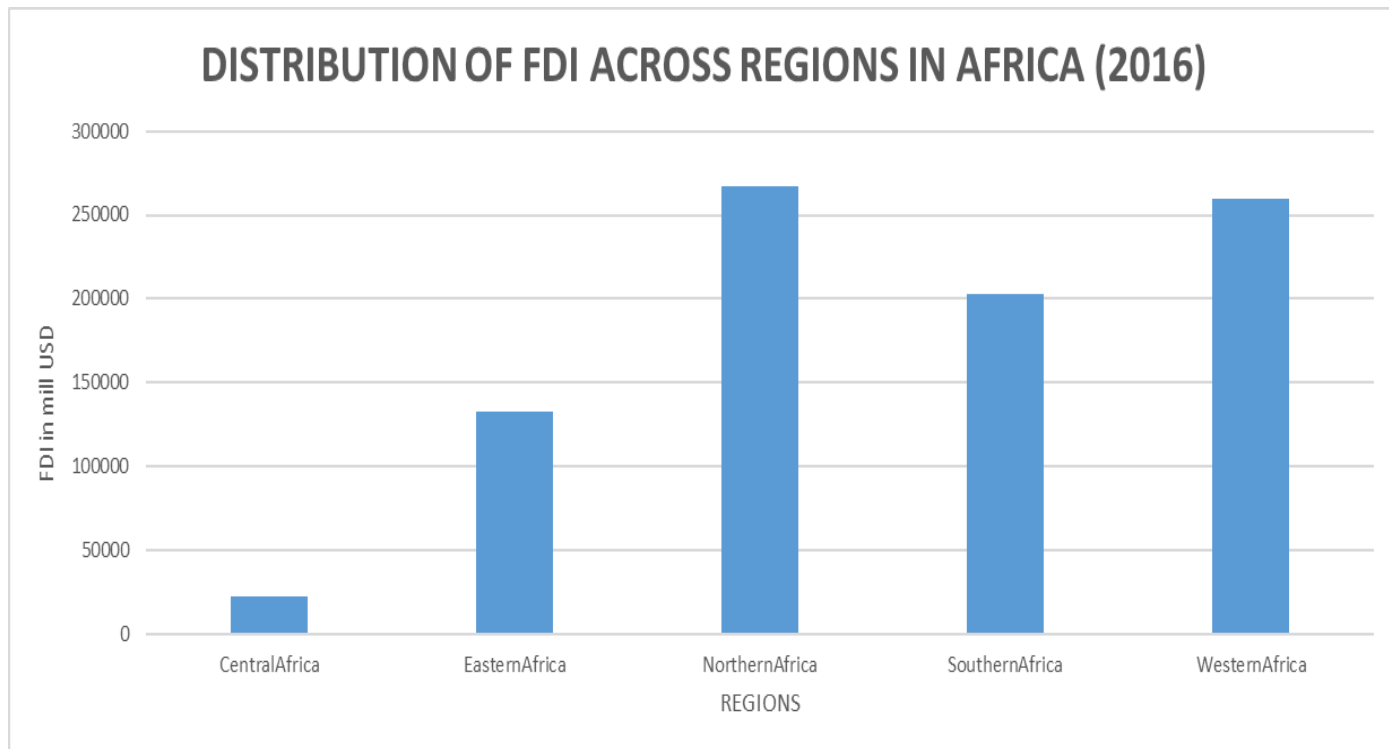
Source: Wall and Nyamai, 2017, based on FDI Markets and Yale University data

Appendix 9.5: African Greenfield FDI versus carbon intensity (CO2 emissions) (2016)



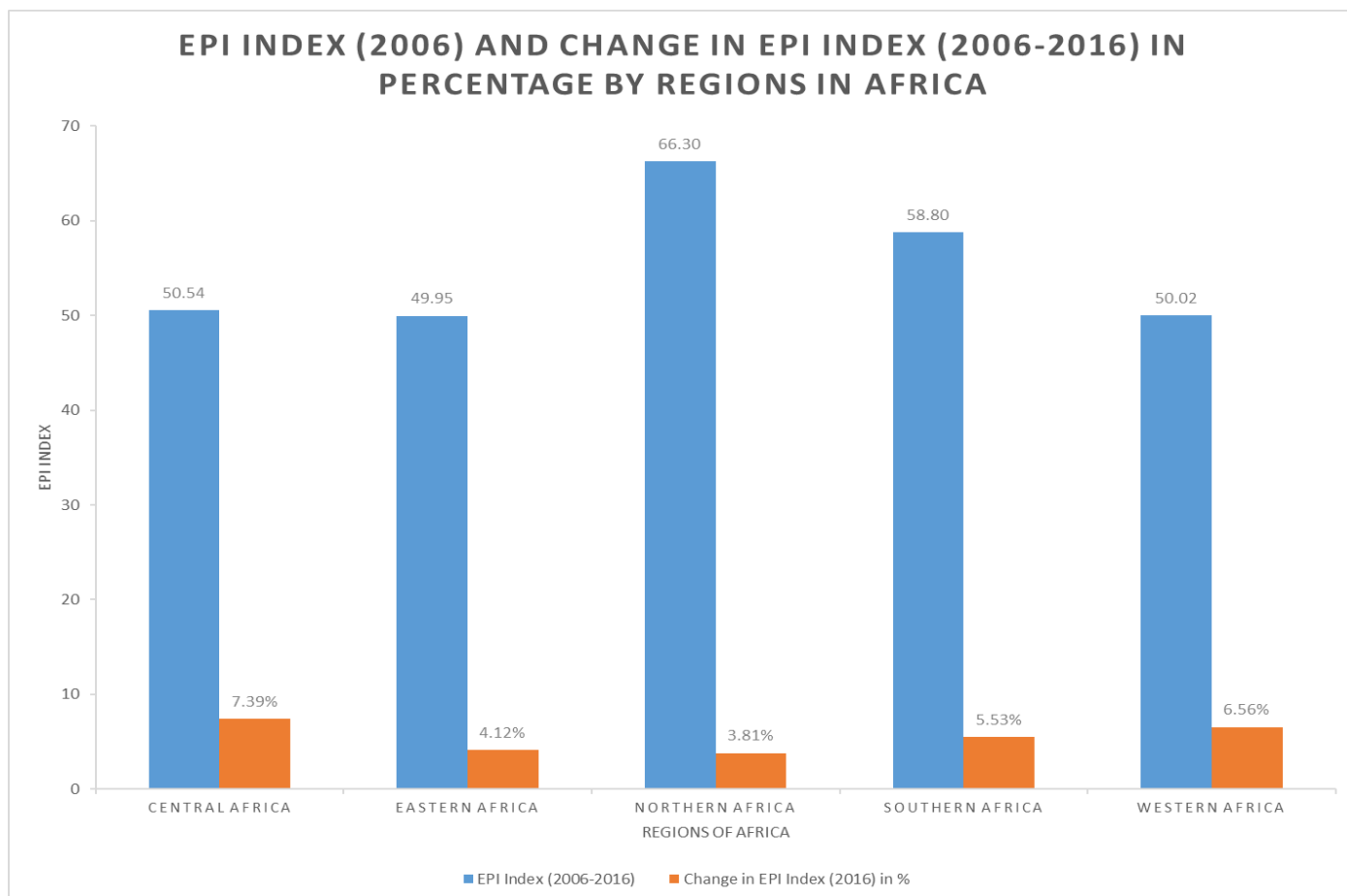
Source: Wall and Nyamai, 2017, based on FDI Markets and Yale University data

Appendix 9.6: Distribution of FDI across regions in Africa (2016)



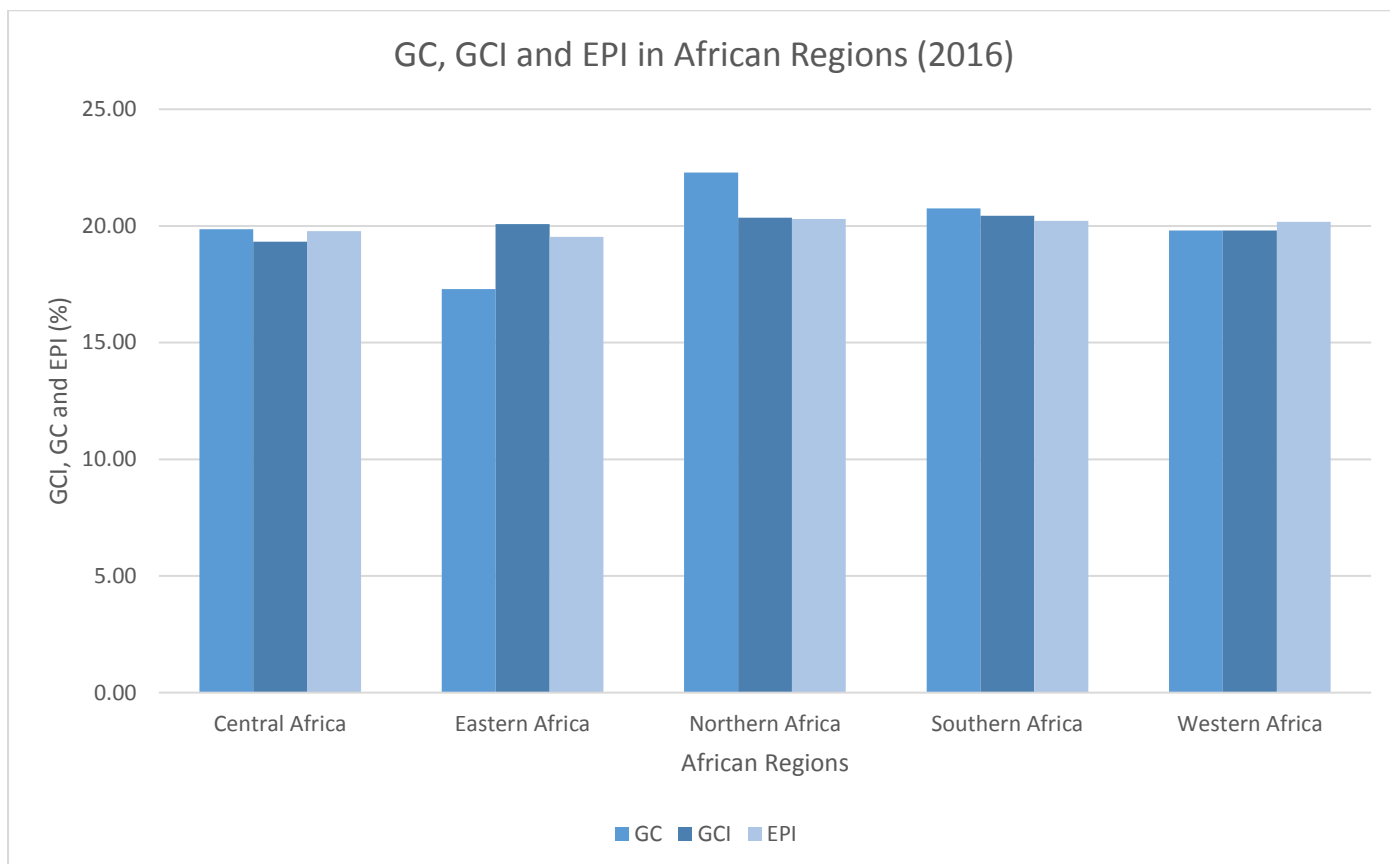
Source: Wall and Nyamai, 2017, based on FDI Markets data

Appendix 9.7: Environmental Performance Index across African regions



Source: Wall and Nyamai, 2017, based on Yale University data

Appendix 9.8: Figure 1: GC, GCI and EPI scores across regions in Africa (2016)



Source: Wall and Nyamai, 2017, based on FDI Markets, World Economic Forum and Yale University data

Appendix 9.9: FDI and Green-Competitiveness at the global scale, excluding Africa (2016)

Variables	Model 1 Greenfield FDI	Model 2 Greenfield FDI	Model 3 Greenfield FDI	Model 4 Greenfield FDI
Green-Competitiveness (GC)	+++			
Global Competitiveness Index (GCI)		+++		
Environmental Performance Index (EPI)			+++	
Access to Sanitation				+++
Carbon Intensity				---
Population	+++	+++	+++	+++

Explanation significance and sign	Significance and Sign	Description
+++	+++	very significant and positive relation
++	++	more significant and positive relation
+	+	significant and positive relation
---	---	very significant and negative relation
--	--	more significant and negative relation
-	-	significant and negative relation
+		not significant but positive relation
-		not significant but negative relation

Source: Wall and Nyamai, 2017, based on FDI Markets, World Economic Forum and Yale University data

## Chapter 10

### Smart cities within world city networks.

Ronald Wall and S. Stavropoulos

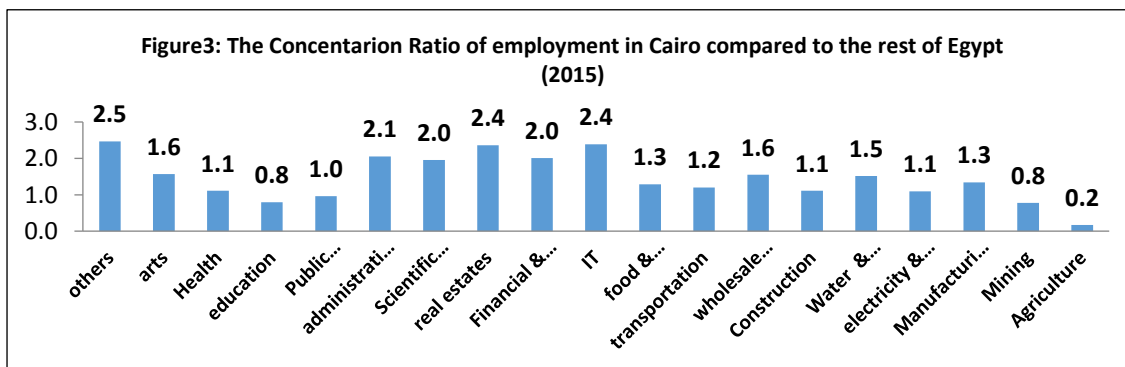
#### Appendix 10.1: Descriptive statistics

	mean	sd	min	max
Cities Groups	2.17	0.94	1	4
Betweenness	563.06	1666.88	0	14627
Inwards Distance	2.55	4.02	0	34
Outdegree	44.44	55.78	0	411
Indegree	45.23	91.44	0	753
Population	15.06	1.14	12	17
GDP	10.91	1.29	7	14
Strength of Legal Rights	6.01	2.48	0	12
Gini Index	40.69	8.05	24	69
Openness	9.34	1.30	5	12
Area(km2)	1381.13	1752.80	54	11642
Unemployment Rate	8.29	6.82	0	59

### PART C: Chapter 2: The State of African Cities: Cairo: A vibrant City

Alia El Mahdi, Anwar El Nakeeb, Dalia Barakat

#### Appendix 2.1: The concentration ratio of employment in Cairo compared to the rest of Egypt (2015)



Source: Mahdi, Nakeeb and Barakat, 2017, based on the data from CAPMAS, Statistical year Book- Population, 2015

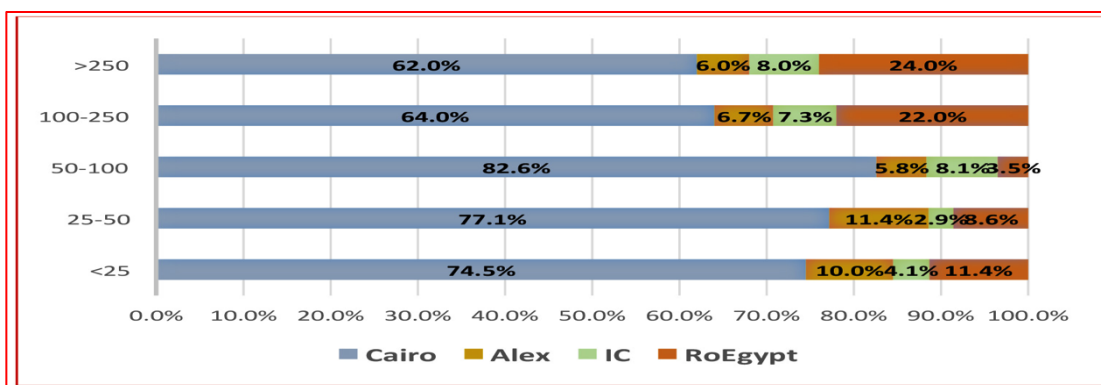
#### Figure 2.2: FDI companies' distribution according to location in Egypt (% of companies)



Source: Mahdi, Nakeeb and Barakat, 2017

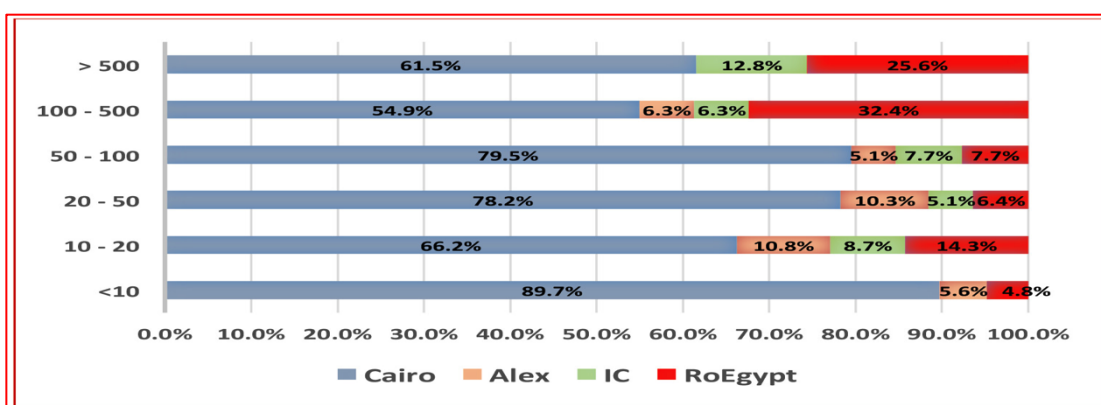


Appendix 2.3: FDI companies' distribution according to destination and the number of workers



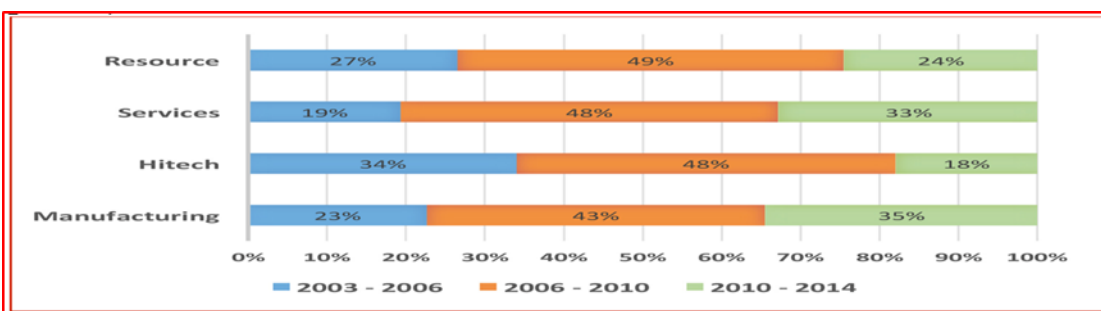
Source: Mahdi, Nakeeb and Barakat, 2017

Appendix 2.4: FDI distribution according to destination and invested capital (US \$ million)



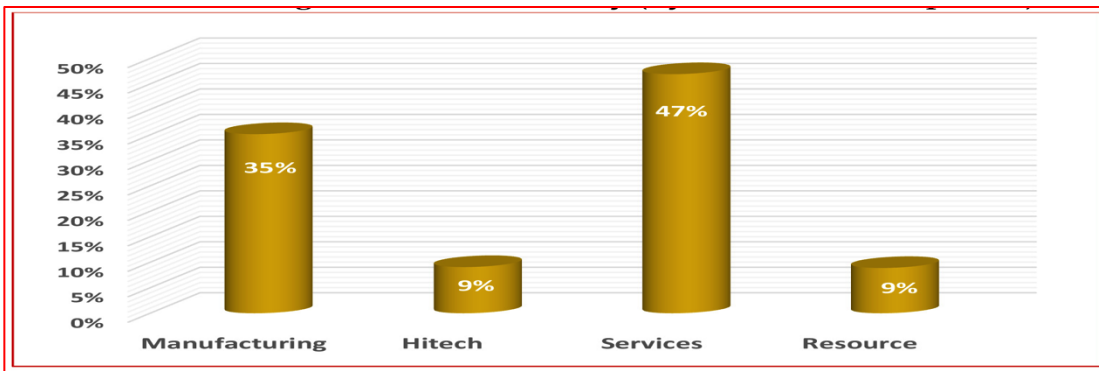
Source: Mahdi, Nakeeb and Barakat,

Appendix 2.5: FDI distributed by economic activity & establishment year in Cairo-Alex corridor



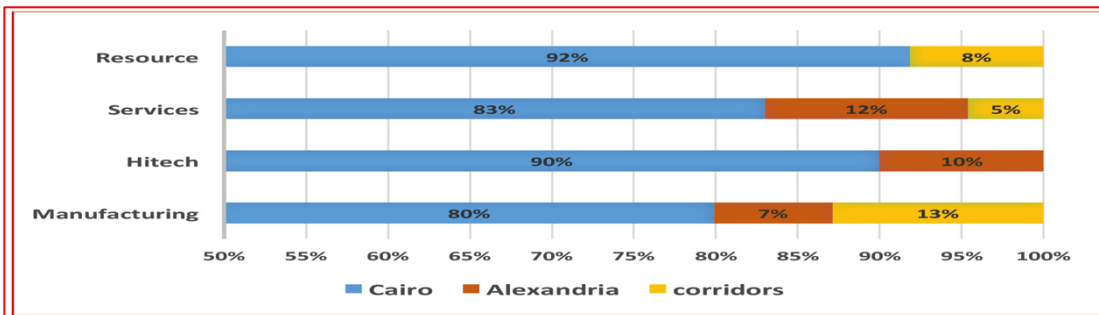
Source: Mahdi, Nakeeb and Barakat, 2017

Appendix 2.6: FDI distribution according to economic activity (% of companies)



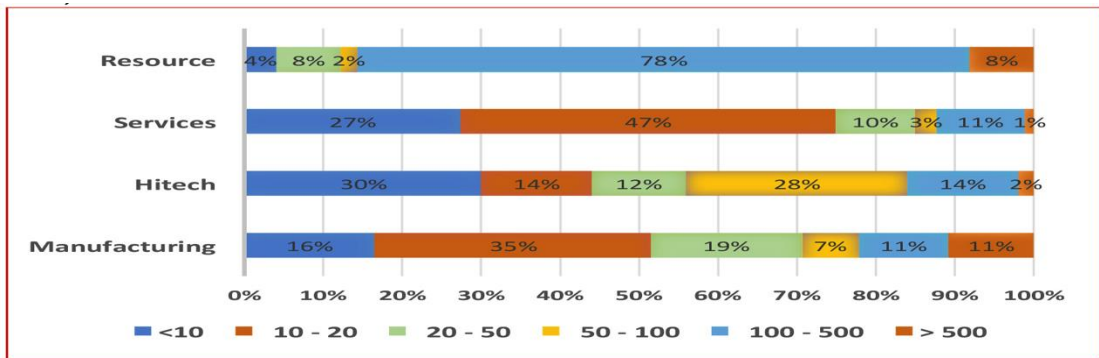
Source: Mahdi, Nakeeb and Barakat, 2017

Appendix 2.7: FDI companies distributed according to economic activity and destination



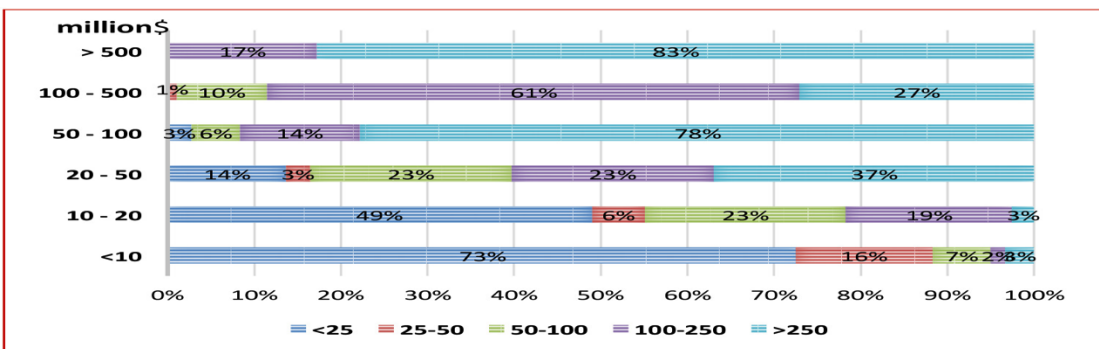
Source: Mahdi, Nakeeb and Barakat, 2017

Appendix 2.8: FDI companies distributed according to Economic Activities and Invested Capital



Source: Mahdi, Nakeeb and Barakat, 2017

Appendix 2.9: FDI companies distributed according to invested capital and number of workers



Source: Mahdi, Nakeeb and Barakat, 2017

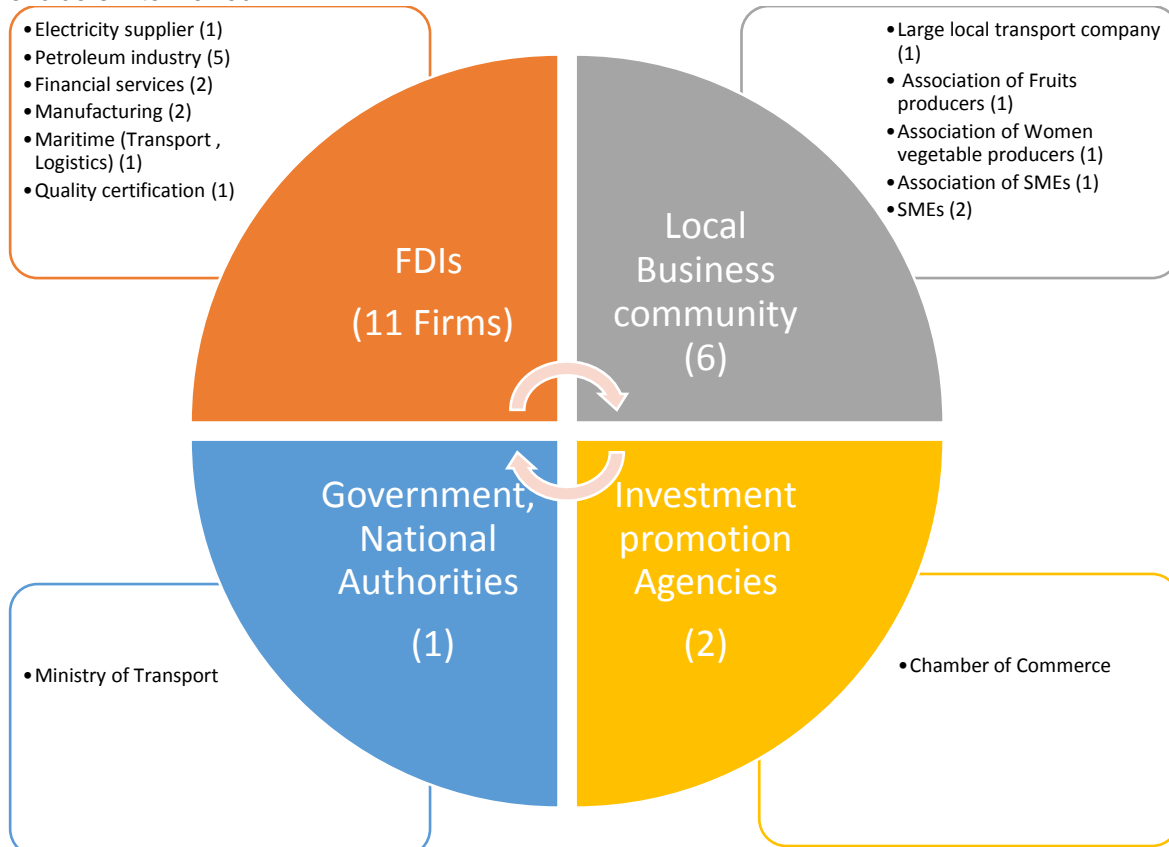
Appendix 3.1: Methodology

For the study, 100 invitations were sent out to the stakeholders based on the categories identified. Only one-fifth responded. The large difference between the actual respondents and the number of invitations sent is explained by the skepticism of invitees. For example, 3/4<sup>th</sup> of non-respondents were reluctant to break their confidentiality. The remaining were constrained by time.

There was few respondent at government level due to the nature of the questions and their implications. It necessitates proper instructions for the very top management.

When the question was asked to investment promotion agencies about the presence of FDIs in the country, the following sectors were identified: Agroindustry, Construction, Energy, ICT Telecommunication, Financial services, Mining, Transport, and Tourism. With regards to the population (Figure 1), the researcher esteems that the respondents are very representative of the current investors in the country.

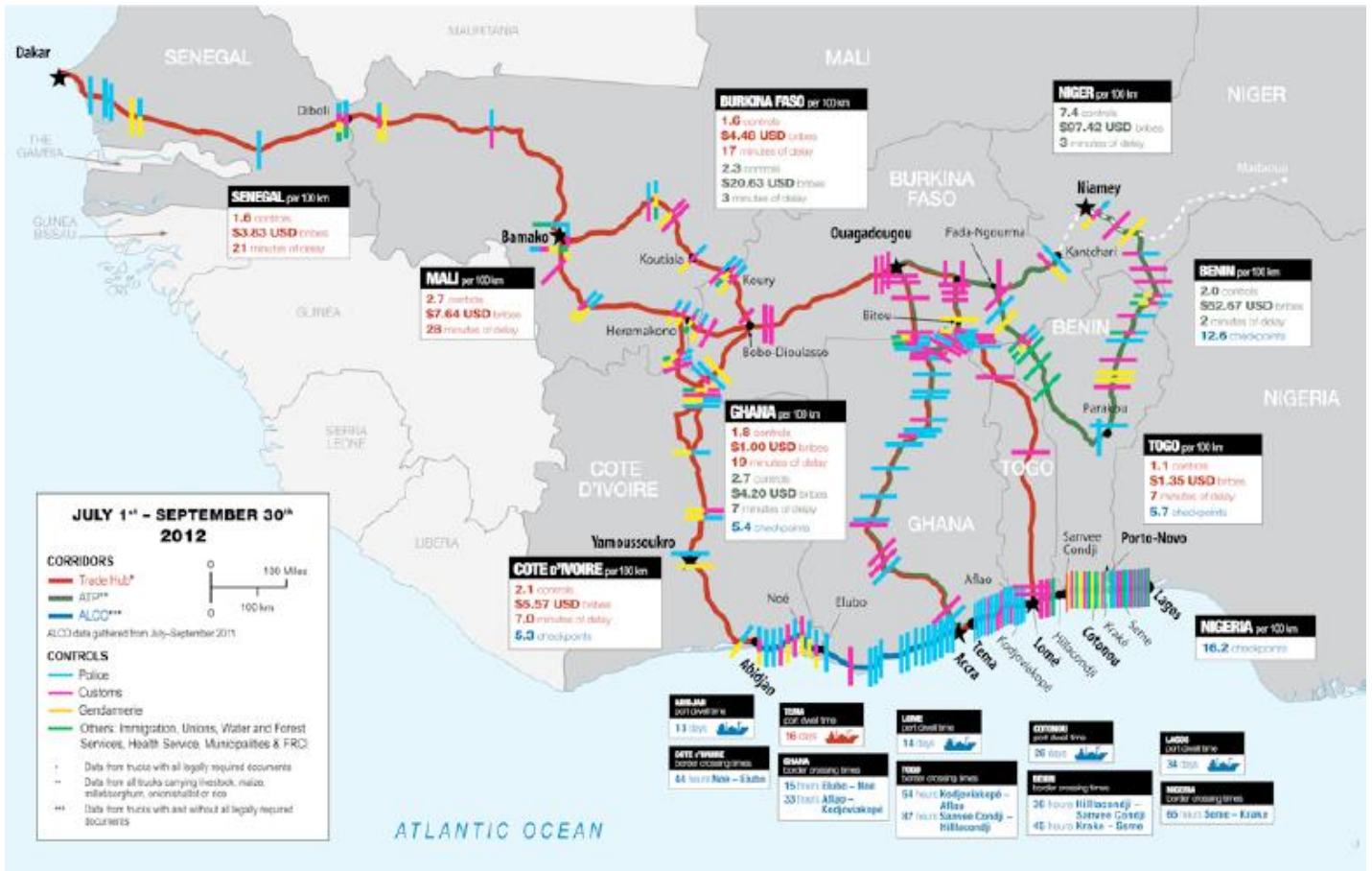
Stakeholders Interviewed



Source: Rodrigue Majoie ABO; State of African Cities Report, 2017

Source: CILSS, 2013

Appendix 3.4: Road harassment on West African corridors covered by WAEMU / USAID



Source : (OPA, 2012) [www.borderlesswa.com/](http://www.borderlesswa.com/)

Appendix 3.5: Development at Port of San-Pedro

Taken from the National Development Plan NDP 2016 – 2020 Public Private Partnerships, available at (<http://www.ppp.gouv.ci/groupeconsultatif/Catalogue-des-projets.pdf>)

- Project 44:** Move and expand the Container Terminal at Port of San-Pedro. Investment needed is 395 M Euros
- Project 45:** Viability, development and operation of a logistical platform and industrial zone of 150 hectares at Port of San-Pedro. Investment needed is 130 M Euros
- Project 46:** Development and operation of a commercial multipurpose terminal at the Port of San Pedro. Investment needed is 7.5 M Euros.
- Project 47:** Construction of a polyvalent industrial terminal at the Port of San-Pedro. Investment needed is 30 M Euros
- Project 48:** Financing, construction and operation of cereal terminal at Port of San-Pedro. Investment needed is 53.3 M Euros.

Appendix 3.6: Abidjan to Lagos Transport Corridor



Source: Atlas. Media, 2016

