Private Financing for Infrastructural Development: A Search for Determinants in Public–Private Partnerships in SSA

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Abstract: Understanding the determinants of Public-Private Partnerships remains a priority for policy makers in sub-Saharan Africa as leveraging on private sector resources and expertise to deliver public infrastructure projects is gaining appeal. However, due to uncertainty and ambiguity surrounding empirical approaches to private sector investments, public-private partnerships determinants in the region are still poorly understood. The study applies Extreme Bounds Analysis and Logit regressions to identify critical determinants of public-private partnerships using unbalanced panel data covering 40 sub-Saharan African countries from 1995 to 2020. Regression results identify five key variables (Regulatory Quality, Population, Gross Domestic Product, Foreign Direct Investment, and Government Spending) as positive significant determinants of infrastructure investments flows in sub-Saharan Africa. The implications of these results indicate ardent need for sub-Saharan African countries to promote prudent policies around these key drivers to promote private sector investments in the region.

Keywords: Public-private Partnerships; private sector; infrastructure; investment; Sub-Saharan Africa

JEL classification: E22; G32; G34; O16

1. Introduction

Sub-Saharan African countries are exposed to the global megatrends of growing populations and rapid urbanization, which create an ever-increasing need for infrastructure planning and investment. Governments are increasingly strained for resources and conventional methods of funding infrastructure have not been sufficient leaving substantial amounts of African infrastructure in a dilapidated condition. The infrastructure investments play key role in stimulating economic growth (Achour & Belloumi, 2016).

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Limited progress in creating and expanding infrastructure in Sub-Saharan African (SSA) region caused by overreliance of traditional sources of finance which are not adequate to meet the demand of infrastructure (African Development Bank [AfDB], 2016). For many years SSA financed infrastructure development from various tax sources and external financing sources such as official development assistance, Chinese finance and borrowing using various instruments which were not adequate, thereby causing a huge financing gap for infrastructure (Bas, 2014). It has been estimated that the infrastructure needs of SSA is above US$93 billion per year for the next 10 years (Lossa & Martimort, 2015). Currently, the funds set aside for infrastructure financing is approximately US$45 billion per year and more than half of the amount is funded by the public sector. Furthermore, most governments are making effort towards fiscal discipline and this has caused persistent decline in infrastructure investments across SSA region and other developing countries.

As the governments in the region failed to raise adequate resources to finance provision of quality infrastructure due to a number of constraints and they find it optimal to focus on policy formulation which enables resource mobilisation from the private sector rather than the actual provision of infrastructure. This pushed the region to prioritise PPPs models which are innovative and sustainable models for public and private sectors to collaborate in delivering quality infrastructure (Hellowell, 2019). A PPP is a contractual arrangement between the public sector and private entity to deliver infrastructure projects on behalf of the government or to support broad initiatives by the government. These contractual agreements enable the private sector to take responsibility of delivering the service in an efficient manner (Yescome, 2017). Furthermore, Wang, Xiong, Guangdong and Zhu (2018) revealed that the agreement between the public entity and private entity should be based on sharing critical skills to enhance efficiency in the delivery of the project. The private sector assumes significant portion of financial risk which is an incentive to meet the expected quality standards so as to achieve acceptable returns on investment (ICA, 2019).

However, PPP investments in SSA are low, as investments are concentrated on few countries. Theoretical and empirical literature reveals tension in unpacking the influence of political, economic and demand-driven factors in adoption of different types of PPPs, highlighting the need for study on the determinants of PPP investments in SSA. The study focuses on sub-Saharan Africa because the literature suggest that PPP investments more urgent in this region than any other comparable regions. The remainder of the paper is structured as follows. Section 2 provides an overview of PPP infrastructure investments in sub-Saharan Africa. This is followed by a review of existing literature that identifies determinants of PPP investments. A description of data and empirical model used follows. The paper concludes with the discussion of findings and conclusion.

1.1. Status of Infrastructure Development in SSA

The infrastructure status in sub-Saharan Africa is poor on average as compared with other regions despite efforts by governments to mobilise resources for infrastructure development (OECD, 2019). According to Chingwete and Carolyn (2019), the estimated annual infrastructure expenditure of the region is 9 to 15 percent of the sub-Saharan Africa's GDP for the next 10 years. The major challenge being faced by governments are budget constraints and few countries are able to allocate adequate resources for infrastructure development. Most of the infrastructure in sub-Saharan Africa was built in 1960s and it is insufficient to support economic growth and as at today, the stock of infrastructure is not at optimal level which has resulted in adverse impact on development efforts in the region (Cantu, 2017). The infrastructure deficit was worsened by the recurrent fiscal crises resulting mainly from poor economic performance of the sub-Saharan African countries. These crises led to cuts of public expenditures, reduced amounts for maintenance of existing infrastructure and under investment of new hard or soft infrastructure (Alesina & Alberto, 2013).

The sub-Saharan Africa region has almost one-seventh of the world's population and has a score of approximately 2.91 of infrastructure category in the World Economic Forum (WEF) Global Competiveness. The score indicates a critical infrastructure bottlenecks which need urgent attention to address the backlog. There is great need for infrastructure in the region due to some inherent characteristics notably the remoteness of the region from the global markets and considerable number of countries which are landlocked with about 40% of the region's population (Calderon, Cesar, Cantu, Catalina, Chuhan-Pole & Punam, 2018). The region trailed behind much of the other developing world in terms of all dimensions of infrastructure as shown in Table 1.

Table 1. SSA's Infrastructure Deficit

	Low Income	Lower-Middle Income	Upper-Middle Income	SSA Region	South Asia	East Africa & Pacific	Europe & Central Africa	Latin America & Caribbean	Middle East & North Africa
Road density (Km/1,000 km2)	137	215	293	152	306	237	576	740	599
Paved road density (Km/1,000 km2)	31	94	238	49	148	59	335	418	482
Fixed line telephone density (Subscribers per 1,000 people)	10	106	120	11	39	90	261	197	100
Mobile telephone density (Subscribers per 1,000 people)	55	201	422	101	86	208	489	350	224
Internet density (Subscribers per 1,000 people)	2.0	5.1	10.3	2.8	1.7	6.6	16.4	14.1	10.1
Electricity generation capacity (MW per 1 million people)	37	256	246	70	154	231	970	464	496
Electricity coverage (Percentage of households with access)	16	35	28	18	44	57	-	79	88
Clean water (Percentage of households with access)	60	75	90	63	72	75	87	90	85
Sanitation (Percentage of households with access)	34	48	39	35	48	60	78	77	77

Note: Km = kilometre; MW = megawatt.
Source: AfDB (2016)

As shown in Table 1, some of the critical physical infrastructure indicators which include internet and mobile telephone access have fairly improved some over time in SSA region. However, core infrastructure sectors such as transportation, provision of energy, clean water and sanitation remains abysmal when compared with other regions. Looking at transportation, telecommunication and energy sectors, SSA falls behind other developing regions with fixed-line telephone coverage remained constant over time at fewer than 0.5 lines. Power generation and transmission seems to be the worst performing infrastructure sector in the region and road access rate is only 34 percent, compared with 50 percent in other parts of the developing world and transport costs are 100 percent higher than any other region (African Union, 2014). Divergent explanations had been put forward as to why the sub-Saharan Africa is unable to attract private capital for infrastructure development.

1.2. Public Private Partnerships in sub-Saharan Africa

Facing shortage of infrastructure funding, an increasing number of developing countries are turning to public private partnerships to finance infrastructure. Although PPPs cannot entirely solve of infrastructure financing, they however provide significant financing where the projects are viable. According to AfDB (2016), PPPs in sub-Saharan Africa started as early as 1970s as privatization before they became fully public private partnerships. Many countries in sub-Saharan Africa are seeking to establish procurement of new infrastructure through public-private-partnerships (PPPs). However, the PPP market is still very small in the region with only 502 projects implemented through PPPs which constitute about 8 percent of the total projects implemented in developing countries (Romero, 2015).

Furthermore, there were 502 PPPs projects implemented in the region which constitutes 8 percent of the total projects in developing region from 1990 to 2015 (Ruiz Nuñes, 2017). The development of PPPs started as early as 1990s with initial projects in South Africa and Côte d'Ivoire and later they spread to other 41 countries in SSA. According to World Bank's Private Participation in Infrastructure (PPI) database (2020), there are only 335 projects with financial closure in the region and countries such as Burundi, Eritrea, Equatorial Guinea, Mauritania, Seychelles, South Sudan and Swaziland did not have any PPP investment since 1990. Furthermore, 9 countries in the region have only produced one PPP project in the last 25 years.

According to the World Bank (2020), low investments of private sector investments in infrastructure is mainly due to small economies of some countries and conflict in some countries. As it stands, SSA region has small proportion of PPP projects to the total number of projects in Emerging Markets and Developing Economies (EMDE).

Although there is a steady increase of PPP investments as shown in Figure 1, the region is lagging behind other developing regions in terms of PPP investments. Furthermore, there are number of countries in the region which have not received any PPP investment after completing the first one. This explains why PPP infrastructure projects in the region are very low as compared to other comparable developing economies and the projects account for 2-10% of all PPP commitments in developing countries.
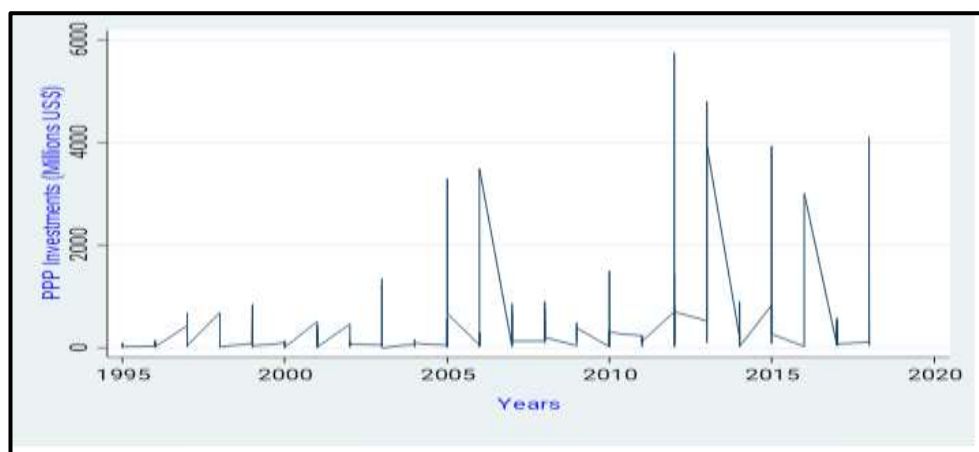

Figure 1. A Trend Analysis of how PPPs Have Evolved over the Period 1995-2020 (Millions UD$)
Source: World Bank PPI Database (1995-2020).

2. Literature Review

Private sector 's involvement in financing infrastructure has increased significantly over the past two decades as a solution to the growing gap between government financial capacity and infrastructure needs (International Finance Corporation [IFC], 2018). Developing countries are now considering public-private partnerships as mechanism of harnessing private sector resources to develop costly and complex projects.

Mwangi (2016) shows that an effective agreement between the public entity and private entity should be based on sharing critical skills to enhance efficiency in the delivery of the project. This is supported by the findings in Harris (2003) and Boyer (2013) who show that availability of skills to manage PPP investments plays a significant role in a government's choice to enter into a PPP. Moreover, the financial capacity of the government is very important in determining the success of long term projects. The commitment made by the public sector to meet financial liabilities of a project with a horizon of 20 to 30 years and its ability to attract additional resources when they are needed is important in attracting the funding from the private funding (Buso & Tran, 2017). The advantage of PPPs is that the private sector assumes significant portion of financial risk resulting in improved quality standards and acceptable returns on investment (World Bank, 2018).

Lamech and Saed (2013), reveal that private investors commit funding in markets with effective regulatory framework that defines the investor's rights and responsibilities. This is in line with findings in Boyer and Scheller (2018), who indicate that adequate regulatory framework provides a sound foundation upon which the contracting parties can structure a contractual vehicle which is compatible with the country's laws. Furthermore, countries with high ethnical fractionalization and unstable political environment struggle to attract private investments in infrastructure (Yehoue, 2013).

Ba and Farid (2010) revealed that, well developed capital markets with high levels of depth and liquidity is a major determinant of the private sector investments in power projects. Similar findings by Wang and Zhao (2014), revealed that the growth of real credit in the economy is an important determinant of private sector investments in developing countries. The study by Sharma (2012) also indicated that governance indictors such as quality of regulation, control of corruption and rule of law attract infrastructure investments in developing countries. This is in line with findings of Briceño-Garmendia (2010) who found out that, countries which are politically unstable usually attract less private capital into the development of infrastructure as compared to countries with stable political environment. The business environment in the country should transparent to facilitate private sector financing (Boyer & Scheller, 2018).

3. Methodology

This article seeks to examine the determinants of public private partnerships investments in sub-Saharan Africa. In this study, unbalanced data for 40 sub-Saharan Africa was obtained from World Bank PPI Database, World Bank Governance Indicators and World Bank Development Indicators for the period 1995 to 2020. The main data source for PPP projects in SSA countries is the World Bank database on PPI, which records projects based on publicly available sources. The variables used in the regression model and their explanations are shown in Appendix 1.

3.1. Models Specification

Two models were employed in this study namely Extreme Bound analysis (EBA) and Logit Cross Country Regression. The Sala-i-Martin's extreme bounds analysis approach was used to determine robust variables to include in the final panel regressions. LOGIT cross country panel regression model was then employed to determine the determinants of PPP investments in sub Saharan Africa.

3.1.1. Sala-i-Martin's Extreme Bound Analysis (EBA)

EBA approach was employed to counter the problem of long list of potential predictor variables which will seem to be reasonable given the data, but provide different suppositions about the variable of interest when used in different models (Sturm and Haan, 2002). Therefore, EBA was used to select variables to be included in the final estimation model suitable for panel data. To find out whether a focus variable $v \in X$ is robustly correlated with the dependent variable y, a set of regression models of the following form are estimated:

$$y = \alpha_j + \beta_{jv} + \gamma j F + \delta_j D_j + \epsilon \tag{1}$$

Where y is the dependent variable PPI, j indexes regression models, F is the full set of free variables that will be included in every regression model, D_j is a vector of k variables taken from the set X of doubtful variables, and ε is the error term. Variables having the entire distribution of regression coefficients either side of 0 will be classified as free variables and the remaining variables as doubtful. Thus the approach regards a variable as more robust if a greater size of its regression coefficient estimates lies on the same side of zero (Zeileis, 2006; Hlavac, 2016). These robust variables were used in the logistic regressions for further analysis of the determinants of PPP investments.

3.1.2. LOGIT Cross Country Regression Model

Prominent studies in determinants of PPP investments such as Banerjee (2006) and Foster and Briceño-Garmendia (2010) used LOGIT cross country panel regression. Therefore, following the literature of Banerjee (2006) and Foster and Briceño-Garmendia (2010), this study will adopt the LOGIT cross country regression in the following form:

$$log\ log\ \left(\frac{\pi}{1-\pi}\right) = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_n X_{nit} \qquad (2)$$

Where: π indicates the probability of an event (in this case investment in PPPs), and βi are the regression coefficients associated with the reference group (no PPIs) and $X_1 \ldots X_n$ are a set of explanatory variables. The dependent variable PPI, is a binary variable taking a value of 1 if the private investment in infrastructure is > 0, otherwise the value of will be 0).

3.2. Analysis

3.2.1. Variable Selection using EBA

Results from Sala-i-Martin's EBA approach as shown in Table 2, shows that 11 variables had more than 80% of the cumulative distribution of coefficients either side of zero in the 1470 regressions estimated and other 11 variables were fragile. The coefficient for the regulatory quality, GDP growth, FDI, government spending, industry and total population, was consistently positive in over 80% of the 1470 regressions. Also the coefficients of political stability, ODA, corruption and agriculture, are consistently negative in over 80% of the regressions as shown in Table 2. These variables, are considered robust determinants of public private investment and thus worth to be included in the logit regression model among other variables.

Table 2. EBA Regression Results

Variable	Type	CDF(beta <= 0)	CDF(beta > 0)
Regulatory Quality	Free	0.002	99.998
GDP Growth	Free	0.339	99.661
FDI	Free	0.444	99.556
Government Spending	Free	0.587	99.413
Industry to GDP	Focus	1.464	98.536
Total Population	Free	1.540	98.46
Business Freedom	Free	19.627	80.373
Political Stability	Focus	86.984	13.016
Agriculture to GDP	Focus	87.401	12.599

ODA	Free	88.515	11.485
Corruption	Focus	99.473	0.527

Source: Author Compilation (2021)

This approach however follows a pooled regression methodology and the researcher had to additionally use panel data specific logistic regression techniques for further analysis.

3.3. Logistic Regression

3.3.1. Pre- Estimation Diagnostic Tests

Table presents pre-estimation diagnostics tests which include correlation analysis, multicollinearity and heteroscedasticity.

Table 3. Diagnostic Tests

Multicollinearity Diagnostic Test	
Variable	**VIF**
Regulatory quality	**4.57**
Corruption	4.46
Agriculture	3.79
Political stability Index	3.20
Total Population	2.83
Industry	2.60
Property Rights Index	2.45
Business Freedom Index	2.02
Domestic credit	2.01
Trade Openness	1.82
Government Spending	1.60
Tax burden	1.35
Inflation	1.34
FDI	1.25
ODA	1.12
GDP	1.10
Mean VIF	2.34
Breuch-Pagan / Cook-Weisberg test for Heteroscedasticity H0: Constant variance	
Variables: Fitted Values of	PPI
ch2(1)	79.98
Prob > chi2	0.0000

Source: Author Compilation (2021)

The Breusch Pagan test for heteroscedasticity results produced a p-value of 0.0000. Thus the null hypothesis of homoscedasticity was not accepted. To adjust for the problem of data heteroscedasticity which can result in biased coefficient estimates, the final regression was run with robust standard errors. Multicollinearity test, using

the VIF test shows that the variable 'government effectiveness' had a VIF greater than 10 and it was thus removed from the regression model. The test for serial correlation, after removing the 'government effectiveness' variable, shows that there is no problem of serial correlation with correlation coefficients less than 0.8 for all variables combinations.

4. Discussion

The regression results are presented in Table 4. Five independent variables namely Regulatory Quality, Population, GDP Growth, FDI and Government Spending were highly significant determinants of Public Private Investments since they were statistically significant at 5% ($P < 0.05$). The results were not consistent with empirical results found in large strands of literature except three variables namely Regulatory Quality, Total Population and GDP Growth which were consistent with findings from La Porta et al. (1998); Ismail (2013); Foandster and Briceño-Garmendia (2010); Ruiters and Matji (2016); Iossa (2015); Agnieszka and Roman (2019) and Ahmad (2018).

Table 4. LOGIT Regression Results

Variable	Coeff.	Std. Error	P-value
Regulatory Quality Index	0.9967	0.328	0.002
Total Population	0.4830	0.1136	0.000
GDP Growth	0.054	0.0217	0.013
FDI	1.8364	0.9051	0.042
Government Spending	0.0185	0.0075	0.013

Source: Author Compilation (2021)

The other two significant variables (Foreign Direct Investments and Government Spending) contradict the findings of Hammami, Ruhashyankiko and Yehoue (2006); Pistor, Raiser and Gelfer (2000); Kasri and Farid (2015; Banerjee (2006) and Boyer and Scheller (2018) whose results are consistent with views of other academics that political stability and domestic credit are important for PPP inflows. The inconsistency in our results from these studies might be as a result of different time periods being covered as this study covered a long period (1995- 2020).

The results of this model might proffer important insights as to why the region is still lagging behind in attracting private investments in infrastructure. Therefore, in light of these findings, the SSA governments need to improve on the following aspects to stimulate private sector investments in infrastructure: Very few countries in SSA have legislations that govern PPP investments and there is urgent need for robust and strong regulatory framework to attract private sector investments (Boyer & Scheller, 2018). Economic growth drives private sector investments in infrastructure (Jasiukevicius & Vasiliauskaite, 2014). Africa's annual GDP growth for the past decade was 3.9% and Covid 19 induced vulnerabilities reduced the continent's GDP

to 2.5% in 2020 which is half of global average (AfDB, 2021). There is need to scale up productive transformation efforts to stimulate economic growth to attract private sector investments in infrastructure. The study also revealed that an increased PPP investment is a function of increased government expenditure and FDI. However, the African governments expenditure is limited because of depressed revenues which stand at 22.6% of GDP compared with 33.9% in other regions (ATAF, 2020). This calls for the need to promote domestic resource mobilisation through improved tax policies in line with expenditure requirements. This will help African governments to reduce debt service costs which stood at USD 100 billion in 2018 thereby building resilience to enhance economic stability (IMF, 2021). Furthermore, the continent only received 2.9% of the global FDI inflows in the period 2017 to 2019 as compared to 9.9% received by Latin America and the Caribbean. In addition, low demand for commodities caused by COVID-19 reduced FDI inflows by 39% in the continent (AUC, 2021). Therefore, African governments should promote FDI related policies by empowering national investment promotion policies agencies to attract private investments in infrastructure. Finally, the study results indicated the importance of population growth (market size) in attracting PPP investments in line with findings of Foster and Briceño-Garmendia (2010). The results have important implications for SSA countries to increase market size by improving connectivity within countries to achieve market integration as enshrined in African Union's Agenda 2063.

5. Conclusion

The study investigates the determinants of PPP investments using Extreme Bounds Analysis (EBA) to test the robustness of potentially important variables to be included in the LOGIT regression model for further analysis. The study employed unbalanced panel data covering 40 sub-Saharan Africa countries from 1995 to 2020. This study extends previous work of the use of panel dataset instead of cross-sectional data which previous researchers employ and the use of both EBA and LOGIT significantly extended existing literature and body of knowledge of PPP determinants in SSA. Furthermore, this research was undertaken, because of mixed results from researchers as to why PPI investments in the region remain small compared to other developing regions. The Sala-i-Martin's EBA results show that 11 variables out of 22 (regulatory quality, GDP growth, FDI, government spending, industry, total population, political stability, ODA, business freedom, corruption, agriculture) have robust relationship with PPI investments according to Sala-i-Martin's Cumulative Distribution Function (CDF) criteria. Further analysis using panel specific Logit regression reveals that 5 variables (Regulatory Quality, Population, GDP Growth, FDI and Government Spending) out of 11 robust variables from EBA regression are found to be significant determinants of Public Private Investments in SSA. This study empirically demonstrated that these variables are

key drivers of infrastructure investment flows. The findings also imply that due to strong predictive power of Logit regression model, policies aimed at promoting PPI investments should be formulated around these significant variables so as to stimulate quality PPI investments with robust regulatory framework in place. Thus, the study finds role of government policies critical in respect to regulatory quality, prudent government expenditure, economic growth, market size and growth enhancing FDI flows.

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APPENDICES

Appendix 1. Variables in the Regression

Variable Name	Description	Source
Ppi	**Public private partnerships** received in a country (expressed in millions)	World Bank PPI Database (2019)
Fdi	**Foreign direct investment** refers to direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital.	WDI (2019)
Corr	**Control of Corruption** captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	Worldwide Governance Indicators (WGI) (2019)
Gvteff	**Government Effectiveness** captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Worldwide Governance Indicators (WGI) (2019)
Ctype	Ordinal variables assigned to contract types based on 4 categories (1- Management and Lease, 2 – Greenfields, 3 - Concessions, 4 – Divestitures)	World Bank PPI Database (2019)
Oda	**Net official development assistance** (ODA) consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by	WDI (2019)

	non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. It includes loans with a grant element of at least 25 percent (calculated at a rate of discount of 10 percent).	
Prindex	Measures degree to which country protects private property rights and the degree to which its government enforces those laws. Range from 0-100, 100= private property fully protected by government.	Worldwide Governance Indicators (WGI) (2019)
Inflation	Consumer price index reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. Data are period averages.	WDI (2019)
Tropen	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WDI (2019)
Agric	Agriculture value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.	WDI (2019)
Industry	It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs	WDI (2019)
Services	Services correspond to ISIC divisions 50-99 and they include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and	WDI (2019)

	real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The industrial origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3 or 4.	
Gspending	Financial resources provided to the private sector, such as through loans, purchases of. Non equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.	WDI (2019)
Tburden	**Tax Burden** is a measure of the **tax burden** imposed by government. It includes direct taxes, in terms of the top marginal tax rates on individual and corporate incomes, and overall taxes, including all forms of direct and indirect taxation at all levels of government, as a percentage of GDP	WDI (2019)
Gdp	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP 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	WDI (2019)

	deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	
Dcredit	Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment.	WDI (2019)
Educ	**General government** expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP. It includes expenditure funded by transfers from international sources to government. General government usually refers to local, regional and central **governments.**	WDI (2019)
Inftype	Ordinal variables assigned to classes of infrastracture based on 4 categories (1- Energy, 2 – ICTs, 3 - Transport, 4 – Water and Sanitation)	WDI (2019)
Tpop	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear **estimates.**	WDI (2019)
Inftype	Ordinal variables assigned to classes of infrastracture based on 4 categories (1- Energy, 2 – ICTs, 3 - Transport, 4 – Water and Sanitation)	World Bank PPI Database (2019)
Tpop	**Total** population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates**.**	WDI (2019)