DETERMINANTS OF PUBLIC-PRIVATE PARTNERSHIP ACTIVITY IN SUB-SAHARAN AFRICA

by

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DECLARATION

I, ***Tebello Motsoane (200302541)***, hereby declare that except where otherwise indicated and acknowledged in the text, footnotes, tables, figures, and appendices, the thesis is based on my original work. I also acknowledge that it has not been previously or concurrently submitted for any other degree at NUL or other institutions.

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Date: 17th June 2022

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Lastly, I would like to express my appreciation to my family. Your love and support saw me through the hardships of this journey. Thank you.

DEDICATION

This work is dedicated to my loving family and to myself.

ABSTRACT

Public-Private Partnerships are seen as an alternative for infrastructure development in the face of financial constraints in many developing countries. Using panel data from 36 selected Sub-Saharan African countries from 1996 to 2019, the study uses both the Pooled OLS and Negative Binomial regressions to determine the drivers of PPP activity in the medium term. PPP activity, the dependent variable, is measured in two ways: average total investments and; as the total number of PPP projects.

The results of the study show favorable market conditions, as proxied by population and GDP per capita, to be the most significant determinants of PPP activity as they represent demand and affordability respectively. For macroeconomic conditions, the results show that money supply and high debt levels are also key in determining PPP activity. Though some of the results on governance are inconsistent with expectations while others are not significant, improvement of overall governance conditions leads to increased PPP investments. In order to attract the required levels of PPP investment to bridge the infrastructure gap, the study recommends that SSA regions formulate policies that will improve market conditions and strengthen governance and accountability systems.

Keywords: Public-Private Partnerships, Infrastructure, Sub-Saharan Africa, private sector participation, developing countries.

ACRONYMS

DB	Design-Build
DBF	Design-Build and Finance
DBFO	Design Build Finance and Operate
FDI	Foreign Direct Investment
FE	Fixed Effects
GDP	Gross Domestic Product
GIC	Global Investment Competitiveness
ICT	Information and Communications Technology
ICA	Infrastructure Consortium for Africa
IMF	International Monetary Fund
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PPA	Power Purchase Agreement
PPI	Private Participation in Infrastructure
PPP	Public-Private Partnership
PSP	Private Sector Participation
RE	Random Effects
SSA	Sub-Saharan Africa
UK	United Kingdom
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
VIF	Variance Inflation Factor
WBG	World Bank Group

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CHAPTER 1

INTRODUCTION AND OVERVIEW OF THE STUDY

1.1 Background

The health and wealth of a country's population and the economy is determined by access to affordable and good quality infrastructure and services as infrastructure is a key ingredient for economic development (Calderón & Servén, 2008). However, there are obvious infrastructure gaps that stem from a lack of necessary financial resources and high national debt in developing and emerging economies that necessitate alternative sources of funding (Basilio, 2017; Yurdakul et al., 2021). Sub-Saharan Africa (SSA) ranks below all developing regions in terms of infrastructure performance (Calderón & Servén, 2008). Forty-six percent of SSA population had no access to electricity in 2019 (Blankeship & Golubski, 2021), while only 24% have access to safe drinking water and 28% have access to basic sanitation facilities (UN, 2019) with national debt at around half of the region's Gross Domestic Product (GDP) for the same year (Mukhopadhyay, 2022).

This infrastructure gap can be bridged by private sector participation in infrastructure and service development. "…there is widespread recognition that greater private involvement in infrastructure is needed, as governments can hardly bridge the growing infrastructure gap through tax revenues and aid alone" (Saussier & de Brux, 2018 p. 2). In an attempt to bridge this gap, private services in education, health, etc., are growing exponentially risking widening the inequalities in the developing and emerging economies (Mo Ibrahin Foundation, 2018). One way the private sector can participate is through Public-Private Partnerships (PPPs). There is literature in support of the notion that PPPs have a positive effect on output (The Netherlands Ministry of Foreign Affairs, 2013).

The adoption of private sector engagement in the provision of public goods dates as far back as the 16th century when King of France Henry IV authorized the construction of a large water pump known as the Pompe de la Samaritaine. The water pump was designed, constructed, and managed by the private sector while payments were through user fees (Saussier & de Brux, 2018). Other literature however cites the adoption of Private Participation in Infrastructure (PPI) to have started in the 18th century (Nirupama, 2009). SSA has been engaging in PPPs since the 1990s, with South Africa taking the lead.[1] Figure 1.1 shows that SSA countries differ

[1] Private Participation in Infrastructure: 2020 Annual Report by the World Bank

in ability to attract PPP investments. As mentioned, South Africa (upper middle income) has attracted the most PPP investment in terms of both total investment and number of projects followed by Nigeria (lower middle income) then Ghana (lower middle income). Most of the countries with the least PPP activity are classified as low-income countries, for example Burundi and Sudan.

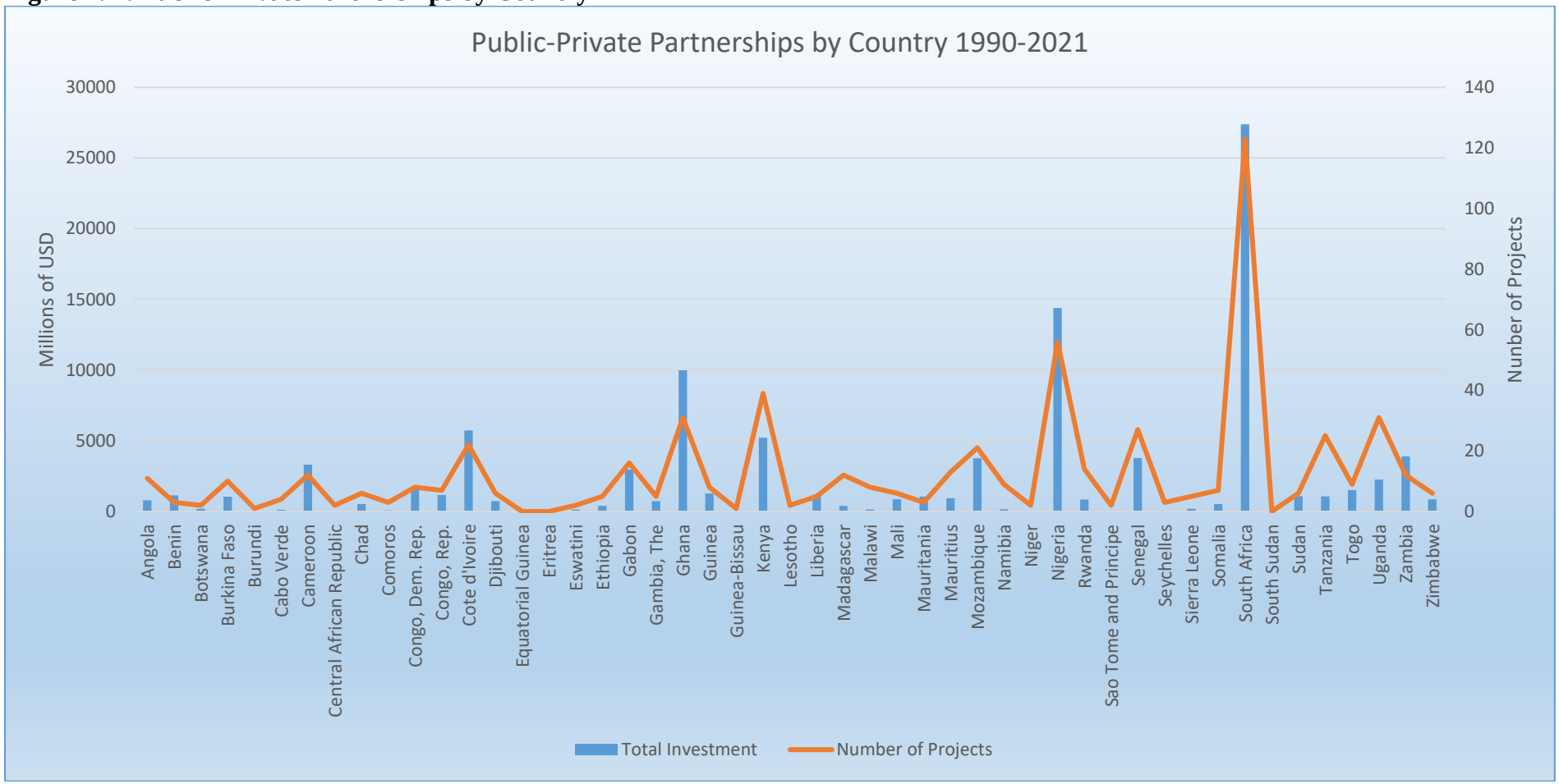
Figure 1.2, which shows trends in PPP over the period 1990 to 2021 portray some inconsistency. The year 2012 recorded both the highest total investment and number of projects for the region. Most of the investments were in the South African energy sector. PPI have been increasing significantly in the region with a 14 percent increase from the five-year average recording total investment of US$ 6.3 billion across 24 projects in 2020 (World Bank, 2020). Despite this increased investment, most of the developing countries experience budgetary constraints hence fail to deliver the required infrastructure and/ or services. Yescombe (2017) states budgetary and borrowing constraints as one of the major reasons governments engage in PPPs (Yescombe, 2017).

The private sector is not only relevant in the provision of public goods and services for bridging the financing gap. Since they are profit-driven, the private sector also offers efficiency and improved quality of service (Mengistu, 2018; Saussier & de Brux, 2018) which is mandatory as remuneration is performance based. While bringing the business efficiency to delivery of public services, PPPs also avoid the politically contentious aspects of full privatisation, which is associated with high unemployment, higher prices and corruption, and allow governments to ultimately retain full ownership (Farlam, 2005) at the end of the contract term or at contract termination.

PPPs are not without limitations. Big government contracts are often complex and prone to abuse (Farlam, 2005). PPPs' success depends on careful analysis of both the long-term development objectives and risk sharing between the private and public sectors.[2] PPPs require disciplined and transparent procedures to curb corrupt behavior of individuals, firms and politicians. Clear legal frameworks supplemented by credible and efficient dispute resolution mechanisms (Cangiano et al., 2006) can help deal with some of the outlined limitations.

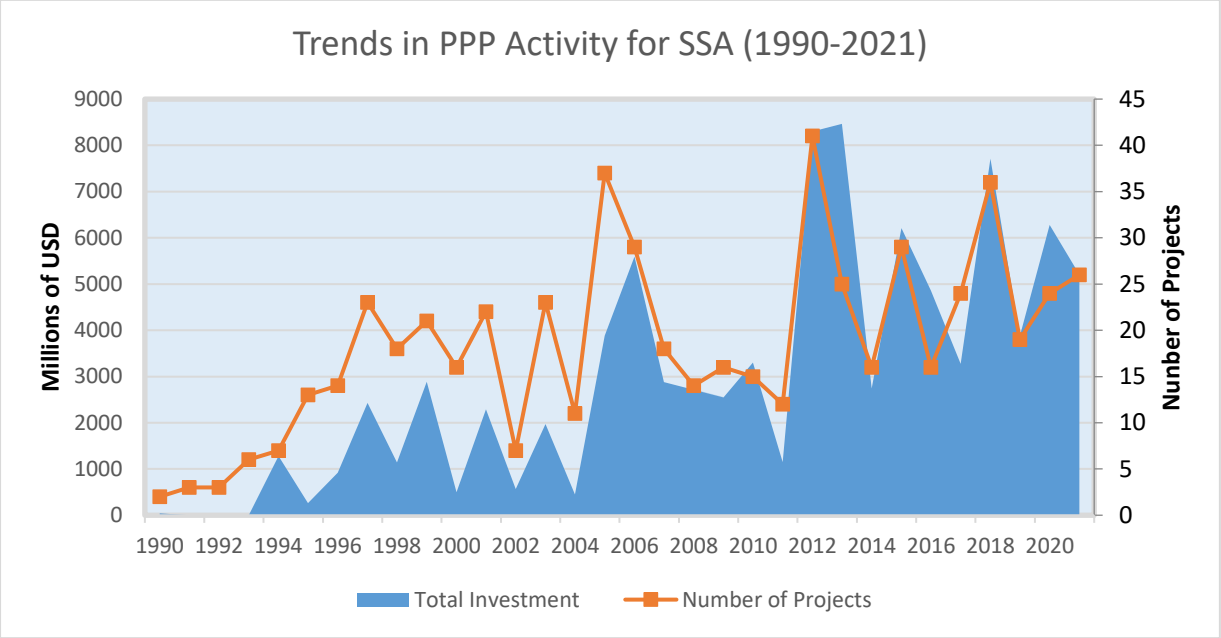
[2] PPP Knowledge Lab

Figure 1. 1: Public-Private Partnerships by Country



Source: Author's computation using data from the PPI database

Figure 1. 2: Trends in PPP for SSA (1990-20021)



Source: Author's computation using data from the PPI database

1.2 Objectives and Research Question

This study seeks to analyse factors determining PPP investment in SSA from 1996 to 2019. Specifically, the study seeks to answer the following questions:

- What effect do macroeconomic factors have on Public-Private Partnership investments in Sub-Saharan Africa?
- What effect does quality of governance have on Public-Private Partnership investments in Sub-Saharan Africa?

1.3 Contribution and Significance of the Study

Although a number of studies have been conducted on the determinants of PPPs for developing countries, the SSA region, in isolation, remains under-researched. Studies conducted found conflicting results on population size, debt burden, GDP per capita, and governance. According to Hammami et al. (2006); Kwame (2017); Mengistu (2018), population size has a positive and significant effect on PPP investment, while Basilio (2017) finds it to be insignificant. Hammami et.al (2006) finds debt burden to be positively and significantly related to PPP investment while Basilio (2017) and Kwame (2017) find it to be negatively related. Results on GDP per capita are found to be positive and significant (Mengistu, 2017), negative and significant (Yurdakul et al., 2021) and insignificant (Cann-Tamakloe, 2008). The results on the

countries' legal system are similar to those on GDP per capita according to Banerjee (2006), Mengistu (2018) and Basilio (2017) respectively. These conflicting results necessitate further studying the determinants of PPP while covering a broader period.

Due to their complex nature and huge financial demand, it is not feasible for most countries to engage in PPP projects year after year. This also relates to the long-term that both the public and private sector commits to the PPP contracts. PPP projects also take a long time to reach financial closure because of the complex procurement process. To the best of the researcher's knowledge, no study has attempted to determine the effects of both macroeconomic and governance conditions in the medium term. The main contribution of the study is hence to determine what effect these conditions have on PPP activity in the medium term.

Twenty-five percent of divestments in developing countries are due to irregular government conduct (World Bank Group, 2019) as the most important and consistent constraint for Foreign Direct Investment (FDI) is political risk. According to the WBG Global Investment Competitiveness (GIC) survey of 2017, political stability and security, large domestic market, as well as business-friendly legal and regulatory environment are considered the most important factors in investment decisions (World Bank Group, 2019). Gil et al. (2019) also state that strengthening of governance institutions and regulatory reform should be prioritized for infrastructure development (OECD/ACET, 2020).

According to the Infrastructure Consortium for Africa (ICA) (2018) report, commitments for Africa's infrastructure reached a record high of $100.8 billion in 2018, a 33% increase from the 2015-2017 average, representing only 25.7% from the private sector. This significant increase however still had a financing gap of between $53 billion and $93 billion per year (The Infrastructure Consortium for Africa, 2018). Infrastructure maintenance is another great concern for SSA, making it hard to fill the infrastructure gap even with somewhat high incomes in the region. In 2016, SSA received $4.18billion, a 63% decline in PPP infrastructure investments from $11.4 billion in 2013. This decline could be alluded to the political risks because of general elections that took place for some SSA countries (African Development Bank, 2018).

It is with this background on the importance of governance and statistics showing the effects of governance on investment that the second contribution of the study focuses on studying the effects of governance on PPP investments. Some of the studies undertaken for developing countries do not look into the importance of the regulatory and political environment in

attracting private sector investment, (e.g Basilio, 2017). Mengistu (2018), Hammami et al. (2006) and Kwame (2017) have shown the most significant determinants of PPP activity to include favorable market and macroeconomic conditions, as well as quality institutions. These studies focus on the property rights and corruption indices, number of opposition parties, government stability index and, law and order index respectively as proxies for quality governance. The study contributes to existing literature by using six aggregated indicators from the Worldwide Governance Indicators (WGI) to measure quality of governance. These aggregated governance indicators include: voice of accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law; and control of corruption.

The governance indicators employed in the study differ from those used by previous studies as they summarise individual perceptions by aggregating "…several hundred variables obtained from 31 different data sources, capturing governance perceptions as reported by survey respondents, nongovernmental organizations, commercial business information providers, and public sector organizations worldwide" (Kaufmann et al. (2010) p. 1). The WGI also allow for cross-country and overtime comparisons (Kaufmann et al., 2010).

To the best of the researcher's knowledge, previous studies on determinants of PPP investments, which focused on the investment amount or level covered the period up to 2014. The latest study by Chikaza and Simatele (2021) focuses on whether there are PPP investments and not the level or amount of the investment. This approach however does not answer the question of what should be done in order to increase PPP investment level as low private investment levels are the problem faced by most developing countries. There have been some structural changes post 2014 that may be relevant in explaining the persistent infrastructure gap for SSA. The United Nations (UN) projects population to double for 26 African countries between 2017 and 2050, following the same growth rate for 28 African countries between 1990 and 2015 (UNDESA, 2019). The SSA region has the highest population growth rates[3]. These population trends make it even harder to bridge the infrastructure gap as demand for services is continuously increasing.

Besides the growth in population, the debt to GDP ratio has been increasing in SSA. In 2020 the debt to GDP ratio was 63%, which was a 40% increase from the 23% recorded in 2008.

[3] According to the World Population Prospects 2019, number live births per women in SSA was 4.6 in 2019 and projected to be 3.1 by 2020 compared to Northern Africa and Southern Asia which has 2.9 and 2.2 respectively

The ratio was 55% in 2019, 46% in 2017, and 35% in 2014, (World Economic Forum, 2019; Heitzig et al., 2021). These figures show significant increases post 2014. The increasing debt poses a threat to countries in SSA as the debt servicing costs become substantial leading to public spending being diverted from infrastructure development. Government policy-makers may resort to raising taxes in order to collect enough revenues for their spending (World Economic Forum, 2019). These significant changes in population growth rates, debt to GDP ratio, political risks as well as PPP investment amounts warrant revisiting the effects that these macroeconomic and governance factors have on PPP investment.

1.4 Research Structure

This study is structured as follows: the next section (Chapter 2) explores the theoretical literature, definition and key characteristics of PPPs, and reviews the empirical literature to identify the determinants of private sector engagement; Chapter 3 describes the data and methodology employed in the study, the preliminary tests and the descriptive statistics; Chapter 4 gives the main results and analyses them and; Chapter 5 concludes, giving policy recommendations and highlighting the limitations of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter looks at the theoretical literature backing PPPs and the empirical studies on what determines Private Sector Participation (PSP) in developing countries. The theories included in this study are the Neoclassical theory of investment and the Agency theory. The chapter also gives a brief description of PPPs, public goods and their characteristics.

2.2 Theoretical Literature

One way of viewing PPPs is to see them as private investment decisions. Theories that can be used to explain PPPs and their determinants are hence investment and partnership theories. To better understand what drives PPP activity, the study looks into the Neoclassical theory of investment and the Agency theory.

For investment, the focus is on the Neoclassical model of investment, over other investment theories because it is said to best explain the investment behavior of individual firms (Jorgenson, 1971). This notion is supported by Jorgenson and Siebert (1968). According to Jorgenson (1971), The Jorgenson-Stephenson model is famously known as Neoclassical II as it uses a neoclassical production function and some of the standard assumptions of the Neoclassicals. In the model, capital gains are regarded as transitory such that capital gains are excluded in the calculation of returns to equity (Jorgenson, 1971). Investment is said to be driven by the desired stock of capital and as a result, the determinants of investment will be synonymous with those of capital stock. Investment depends on the level of output (which is the national income in the case of whole economies) and the real rental cost of capital. The rental cost of capital is determined by the price of capital goods, rate of interest, depreciation rate, expected inflation and the tax structure (Asante, 2000). The neoclassical investment function takes the form:

$$I_t = F(Y^e, i_t, d, \pi^e, t_c, K_{t-1})$$

This shows that net investment at a given time (I_t) is a function of expected output (Y^e), interest rate (i_t), depreciation (d), expected rate of inflation (π^e), corporate income tax (t_c) and the existing stock of capital (K_{t-1}). Given the existing stock of capital, expected output (Y^e), expected rate of inflation (π^e) and the investment tax credit will be positively correlated with

investment. On the other hand, nominal rate of interest (i_t) and the corporate income tax will be negatively correlated with investment.

First developed by Jensen and Meckling (1976) the agency theory combines the disciplines of economics and institutional theory. It is defined as a "Theory of interaction between an agent and the principal for whom they act, the point being to structure incentives so that the agent will act to benefit the principal" (Gauld, 2016). In the case of PPPs, the public sector (principal) engages the private sector (agent) for the provision of public goods and services, and remuneration is performance-based to ensure that the private sector acts to benefit the public. According to Saussier & de Brux (2018), the private party acts as the project manager and acts on behalf of the public sector for the design, execution, operations, maintenance, and financing with remuneration being in the form of rent by the public sector or user fees (Saussier & de Brux, 2018). But because of misaligned interests or conflicting priorities, there often arise conflicts referred to as the principal-agent problem. Mechanisms used to curb the principal-agent problem include performance-based compensation and having monitoring and compliance tools in place (Jensen & Meckling, 1976). Failure to meet performance standards leads to penalties structured according to the nature and phase of the contract (Saussier & de Brux, 2018).

In order to attract private investors, there should be good governance in a country as this increases investor confidence. Liu et.al., (2014) states that the successful implementation and management of PPPs is dependent on good governance of the institutions and organisations involved, while (Liu et.al., 2016) finds governance structures to be one of the critical factors in implementing the PPP tendering process. According to (Brinkerhoff & Brinkerhoff, 2011), developing countries lack good governance and this compromises the ability of PPPs to yield good outcomes.

It is evident from the theories that both macroeconomic and governance factors are vital for attracting private participation hence increasing PPP investments. What remains to be answered is to what extend does these factors influence PPP activity and what policies can be put in place to ensure increased PPP activity.

2.3 Public-Private Partnerships (PPPs)

Public-Private Partnerships (PPPs) can be defined as long-term contractual relationship between the private party and public entity for the provision of a public asset or service, in

which the private party bears most of the risk and management responsibility through the life of the contract and remuneration is performance-based[4]. Such risk could either be financial, operational, or market risk and it is transferred to the party that is better placed to manage it. PPPs can take on many forms: development and management of new infrastructure; significant upgrade and management of existing infrastructure; as well as management of existing infrastructure. They can also be classified as user pays: where payments are based on charges to the user; or government pays: where funding of payments comes from the government budget (APMG International, 2016). PPPs are mostly used in the following sectors: transport; water and waste; energy; information and communication technology (ICT); health and; education[5]. It should be noted that PPPs are not privatisation as privatisation involves the permanent transfer of an asset or responsibility for service delivery to the private sector. Contracts in the form of design-build (DB) or design-build and finance (DBF) are also not regarded as PPPs as they lack a natural incentive for quality construction and the long-term nature.

There are different definitions of PPPs that exist in the literature. One of the most comprehensive definitions is the one adopted by the United Kingdom (UK) local government procurement agency, as cited by Skietrys et al. (2008) which takes PPPs to be a generic term for the relationships formed between the private sector and public bodies often with the aim of introducing private sector resources and/or expertise in order to help provide and deliver public sector assets and services. This includes a wide variety of working arrangements from loose, informal and strategic partnerships to design build finance and operate (DBFO) type service contracts and formal joint venture companies.

The Organization for Economic Co-operation and Development (OECD, 2008) defines a PPP as an agreement between the government and one or more private partners for the delivery of services, in alignment with profit objectives of the private partners and the effectiveness of the alignment depends on sufficient risk being transferred to the private partners. This definition is similar to that of the International Monetary Fund (IMF) although the IMF puts emphasis on infrastructure assists and services having been traditionally provided by government. On the other hand, the World Bank (2021), defines PPPs as a mechanism for government to procure

[4] https://pppknowledgelab.org/guide/sections/3-what-is-a-ppp-defining-public-private-partnership
[5] The APMG Public-Private Partnership (PPP) Certification Guide; Foundations Course

and implement public infrastructure and/ or services using resources and expertise of the private sector. PPPs can also be seen as an intermediate variant between traditional public procurement through public institutions (Skietrys et al., 2008). This collaboration can be seen as a cooperative business venture built on long-term contracts with delivery of public services based on clearly defined public needs (Gerrard, 2001).

It should be noted that there is no universally accepted definition for PPP concept as the term can sometimes be used in reference to any association between the public and private sector for achieving a common goal (APMG International, 2016). However, for the purpose of this study, PPPs definition will be adopted from APMG International (2016) as "long term contract between a public party and a private party for the development (or significant upgrade or renovation) and management of a public asset (including potentially the management of a related public service), in which the private party bears significant risk and management responsibility throughout the life of the contract, provides a significant portion of the finance at its own risk, and remuneration is significantly linked to performance and/or the demand or use of the asset or service so as to align the interests of both parties".

One of the main benefits of PPPs is the transfer of significant risk to the private sector. Engaging in PPPs should only be done if the private sector can manage the risk and there is cost effectiveness in risk transfer (Yescombe, 2017). Risks involved in PPPs include the following:

- *Construction risks*. The risk that a project may not be completed on time, on budget and to the required specification.
- *Usage risk*. The risk that the project is not used to the extent projected.
- *Revenue risk*. The risk that a project's revenue is lower than projected
- *Operating risk*. The risk that the project does not perform as expected or that O&M costs are higher than projected.
- *Macro-economic risks.* Risks such as currency exchange-rate movements (where a project has revenues in one currency but debt in another), interest-rate fluctuations, or inflation.
- *Regulatory risk*. The risk that there may be a change in law or regulations that affect the project's viability.
- *Political risk*. The risk of inappropriate government interference with the project, or of civil unrest or war. (Yescombe, 2017 p.13-14)

Management of these risks by either the public or private sector could determine the willingness of both parties to engage in PPPs.

The length of the PPP contract is highly dependent on the type of project being undertaken and the affordability of the government or users to reimburse the private sector. Since PPPs involve transferring significant risk and management of a public asset to the private sector, as well as bundling of different project phases together, they are long-term in nature. The duration is also dependent on the adopted financial structure (APMG International, 2016) and is normally between 15 and 30 years (Yescombe, 2017) for projects entailing construction and could be less otherwise. Some examples of PPP contracts and their duration in SSA are: A 30-year Power Purchase Agreement (PPA) in Uganda for the Bujagali Hydropower; a 25-year availability payments contract in South Africa for DTI Campus; a 30-year toll-road concession in Nigeria for Lekki Expressway; a 30-year concession in South Africa for Mbombela Water; a 25-year concession in Kenya and Uganda for Rift Valley Railways; and an 18-year availability based (re hospital building) plus medical services contract in Lesotho for Tsepong (Yescombe, 2017).

2.4 Public Goods and Infrastructure

A public good is a commodity that once provided has no additional costs to other people consuming it (non-rival) and prevention of its consumption by others is either impossible or very expensive (non-excludable). According to Rosen & Gayer (2013), public goods can be classified as pure and impure. An impure public good is either rival, excludable or both to some extend. It is hence the responsibility of governments to provide public goods as they are prone to the free-rider problem. Infrastructure on the other hand can be defined as "basic systems and services that are necessary for a country or an organisation to run smoothly, for example buildings, transport and water and power supplies"[6].

Although all infrastructure are platforms for providing public goods and or services, they can be classified into either economic or social infrastructure. Economic infrastructure is that which facilitates economic activity, while social infrastructure accommodates public services (APMG International, 2016). PPPs are an alternative method for accelerated provision of infrastructure as the main reasons for existing infrastructure gaps are budgetary constraints and lack of public

[6] A widely used definition of infrastructure as per the Oxford English Dictionary

sector efficiency. In PPPs, economic infrastructure, which includes transportation, energy, information and communication technologies, and water and sanitation, are mostly linked to user-pays mode of reimbursement. This mode of payment puts less burden on the budgetary constraints of governments though sometimes governments have to bridge the viability gap where user fees are insufficient.

Social infrastructure in PPPs takes the form of government pays (APMG International, 2016). This arrangement puts more burden on the governments' budget though it is over a longer period as payments are distributed over the project life. Improvements in infrastructure, economic or social, is vital for the overall development of the country as both economic and human development can be achieved.

As cited by Calderón & Servén, (2008), the empirical literature on the development impact of infrastructure in SSA concludes that improvements in infrastructure contribute significantly to long-run growth and equity. Engaging the private sector has already been identified as crucial for the financing of infrastructure, and PPPs are said to improve efficiency and provide value for money. Studying the determinants of PPPs will go a long way in creating an enabling environment for PSP and successful implementation of PPPs and hence bridge the infrastructure gap, leading to long-run economic growth for the region.

2.5 Empirical Literature

In the IMF Working Paper on Determinants of PPPs in Infrastructure, Hammami et al. (2006) attempted to answer the following questions relating to why PPPs are increasingly widespread, why some countries are able to attract more investments than others, why certain types of PPPs are found in some industries but not in others and what determines the extent of PSP in such ventures with the public sector? This was the first study to empirical attempt to analyse the determinants of PPPs in infrastructure projects using the World Bank's PPI database on projects for developing countries during 1990–2003. The determinants of PPPs are divided into government constraints, political environment, market conditions, macroeconomic stability, institutional quality, the legal system, and past experience with PPPs. The study used a number of econometric techniques: OLS; Poisson or Negative Binomial regression models; Tobit regression model and; Ordered Probit and Logit regression models. The results of the study show that countries with large markets, debt-burdened governments, stable inflation, and strong rule of law attract more investments in PPPs. In addition, past experience with PPPs affects not only the number of PPP projects but also the level of investment in these projects.

The number of opposition parties and the political environment do not seem to affect the number of PPP projects rather they affect the level of investment in PPPs.

In an analysis of how institutions affect private infrastructure investment across 40 developing economies between 1990 and 2000, Banerjee et al. (2006) used random and fixed effects models for investment amount and the Poisson model for the number of projects as the dependent variable. The study found higher effective exchange rates; higher GDP growth and higher GDP per capita attracted both a greater volume and a higher frequency of private investment. Property rights and bureaucratic quality were found to be significant in promoting private infrastructure investment, while higher levels of corruption were associated with greater investment.

Cann-Tamakloe (2008) investigated the macroeconomic and political determinants of private investment in SSA using panel data from 1993 to 2002. The study uses panel least squares, random and fixed effects models. The study finds a positive and significant relationship between private investment and growth rate of real output; credit availability and past level of private investment, a negative and significant relationship for terms of trade; external debt, conflicting results for per capita income; real interest rate; inflation; political rights and civil liberties, and insignificant relationship for public investment in GDP; credit availability; exchange rate; and geography.

Ismail (2014) investigated the factors forcing implementation of PPPs in Malaysia and compares such with the UK. The study uses primary data from 122 correspondents in Malaysia and compares with UK studies that used the same methodology. For Malaysia, the driving forces are found to be economic development pressure of demanding more facilities, private incentive and the shortage of government funding. In the comparative analysis, both countries found all factors to be importnant. However, preference for the driving force differs by country as different countries were found to have differing priorities for the driving forces.

In determining factors more relevant in explaining the degree of PSP in infrastructure PPPs in developing and emerging economies, Basilio (2017) used the fractional logit response models to test eight hypothesis relating to the explanatory variables. Cross-sectional data was sought from 45 developing and emerging markets covering 2569 projects from 2000-2014. The study finds only 6 of the 8 hypothesis tested to be significant: factors positively related to PSP in PPP included government support and underdeveloped financial systems. Participation by Multilateral Development Banks (MDBs) also participate, stronger commitments in countries

with a right wing orientation, level of debt and tax burden were found to lower the degree of PSP. The variables found to be insignificant in deterning PSP are macroeconomic stability, market size and quality of legal system. There were no particular differences in the degree of PSP between the different PPP sectors except for ICT projects. However the project type was found to be important in determining PSP. The study has excluded variables such as corruption and different government guarantees in relation to the project type.

Kwame (2017) analyzed the key determinants for private sector engagement in PPP in Sub-Saharan Africa with critical emphasis on the macroeconomic situation, favorable market conditions, governance and political climate as well as the regulatory and institutional environment as key determinants. The main contribution was extending the time period of the study up to 2014 and exploring which key factors have influenced PPP investment in the SSA region. The study used a cross-country panel data using random effects regression with the outcome variable being the total amount of investment on private participation for infrastructure (logged) from 2005 to 2014. The findings indicated that population size; purchasing power and institutional quality are significantly associated with higher PPP investments. Aid and business regulatory environment were somewhat related to PPP investments, with aid having a positive effect and business regulatory a negative one. Inflation, exchange rate stability and current account balance negatively but insignificantly influenced the amount of PPP investment received while law and order as well as government stability positively impacted the amount of PPP investment received. The study did not consider the relationship between trade and PPP and the PPP specific policies and institutions.

Mengistu (2018) empirically investigated the determinants of PPI in Low and Middle Income Countries (LMICs) and SSA. Whether SSA countries differ from LMICs in how they attract private investment in infrastructure and, if they do, what policy implications these findings entail? Using data from 1995 to 2008, the article covers 133 LMICs and 44 SSA countries with a total of 1862 projects, the study engages a cross-country regression framework using the random effects ordinary least squares (OLS). The analysis shows that for both LMICs and SSA countries, the size of the service sector in the economy is the largest predictor of the probability that a country gets PPI, with the effect being even more pronounced for SSA countries. GDP per capita, larger market, availability of domestic credit and lower tax burdens were significantly and positively associated with PPI receipts**.** SSA countries with common law legal origins are significantly more likely to get PPI compared to non-common law countries. The relationship was found to be negative for LMICs. In terms of the amounts of PPI received given

non-zero PPI, the results indicate that in both cases, more industrialized countries receive higher amounts of PPI. The separate analysis of SSA countries revealed that: Higher regulatory burden, lower government efficiency in the regulatory process, as well as higher corruption are positively (and statistically significantly) associated with amounts of PPI received. The limitation identified in the study is that the data might have missed smaller projects not reported since it was collected from major news sources, databases and governments websites.

N'gan'ga & Kisimbii (2018) in their research on determinants of private sector participation in the implementation of PPP projects in Kenya, used a descriptive research design of quantitative method of data. The study's objectives were to determine the influence of project funding, to assess the influence of technological requirements, to find out the influence of ease of doing business, to determine the influence of project period and to establish the influence of government policies as a moderating factor on private sector participation in the implementation of PPP projects in Mombasa County, Kenya. The main data collection instrument for the study was a structured questionnaire consisting of closed ended questions and Likert scales relating to the field of inquiry. Secondary data on the other hand was collected from published books, internal reports and relevant documents from 1995 to 2008. Simple random sampling was used to pick 152 respondents. The results of the study indicate a positive significant relationship between PSP and funding, technological requirements, ease of doing business, project period and government policies.

In determining factors that affect the adoption and implementation of PPP projects in developing countries, Kang et. al (2018) use a holistic case multiple design examining a sample of 19 projects. The study found credible working arrangements, effective management practices, political stability and establishment of law and regulations to be primary factors attracting private sectors to engage in PPPs. The projects used in the study were not randomly selected and the study did not explain the success of projects offering immediate financial benefits.

Song (2018) analyses drivers of PPI in Asia-Pacific using panel data of 34 countries. Random GLS and Tobit; Poisson and; Ordered Logit and Probit are used for PPI investment, number of PPI projects and extend of PPI in infrastrucutere development respectively. For PPI investments, inflation, external debt, total reserves, money supply, population, GDP per capita, government effectiveness and the sector being invested are all statistically significant. Number of PPI projects are determined by external debt, total reserves, money supply, aid, population,

GDP per capita, regulatory quality,government effectiveness, political stability, rule of law and the sector. Lastly, only total reserves, aid, population, GDP per capita, political stability and control of corruption are statistically significant in determining the extend of PPI.

Using panel data from 137 low income and developing countries encompassing 1299 projects, Yurdakul et. al (2021) used the fixed effects models to analyse the relationship between macroeconomic variables (i.e., GDP, per capita income, general government balance, total debt, inflation, money supply) and PPP activity by using World Development Indicators (WDI) and The Private Participation in Infrastructure (PPI) Project Databases for the period 1990 to 2016 (The World Bank, 2017a, 2017b). The study contributes to existing literature firstly by using an updated dataset to capture the effect of recent surge in the use of PPP in a wide spectrum of countries. To measure PPP activity, the study used both the number of PPP projects and the amount of investments in PPP projects. When using number of PPP projects as proxy for PPP activity, the findings revealed that while general government balance, population, money supply, international reserves, and share of total investment in GDP were positively associated with the number of PPP activities, real GDP per capita and share of FDI in GDP were found to have negative associations with PPP. On the other side when measuring PPP activity using amount of investment, the finding revealed general government balance, population, fuel exports, money supply and share of total investment in GDP as the determinants of PPP activities. Against the shared findings, real GDP per capita, international reserves, and share of FDI in GDP were not found to associate with PPP activities. However, there was no clear evidence for the relationship between aid per capita and PPP activity, and only a minor negative association between PPP investments and fuel exports was observed. The study only focused on the macro-economic drivers of PPP activity, ignoring other factors that might be influential on PPP activities. Factors not incorporated are macro-political factors, regulatory environment, politics, and corruption index (Yurdakul et.al 2021).

2.6 Overview of the Literature Review

The theories reviewed indicate that both macroeconomic and governance conditions impact PPP activity. From the macroeconomic perspective, investment is a function of, among others, expected output, interest rate, expected rate of inflation, and corporate tax. Good governance covers issues like control of corruption, regulation and accountability, and political stability. The empirical literature shows both alignments and contradictions with theory for both macroeconomic and governance conditions.

The empirical literature review is limited to the developing world. This is because one of the main reasons for engaging in PPPs is budgetary constraints and developed countries have both the financial muscle and capacity for infrastructure development. The author could as a result not find literature on investigating determinants of PPPs for developed countries. The review has found both alignments and contradicting results in the determinants of PPP in developing countries. Firstly, population size exerts a positive impact on PPP activity. This positive effect is confirmed by studies undertaken by Hammami et.al (2006); Kwame (2017); Mengistu (2018); Yurdakul et.al (2021). However, Basilio (2017) found results for population size to be insignificant while Cann-Tamakloe (2008) found inconclusive results. Secondly, the effect of debt burden was found to have a positive effect by Hammami et.al (2006) and a negative effect by Basilio (2017) and Kwame (2017). Thirdly, according to Mengistu (2018), the debt to GDP ratio has a positive effect on PPP investments, Yurdakul et.al (2021) find a negative effect while Cann-Tamakloe (2008) finds it to be insignificant. Lastly, we look at how governance affects PPP investment. Though proxied in different ways, most studies find good governance to positively impact PPP investments (Banerjee, 2006; Hammami et.al., 2006; Kwame, 2017; Nganga and Kisimbi, 2018. Despite these results on governance, high levels of corruption are associated with more private sector engagement (Mengistu, 2018).

Apart from the conflicting results on most of the PPP determinants, different proxies were used for the governance indicators. This study contributes to the empirical literature by using World Governance Indicators aggregated using 31 different data sources allowing for cross-country and overtime comparisons. The reviewed literature focused on either annual investments or per project investment. The study will also contribute to the literature by using three-year aggregates instead of annual data to find the determinants of PPP activity in the median term.

CHAPTER 3

DATA AND METHODOLOGY

3.1 Introduction

This section outlines the methodology employed to analyze the determinants of PPP in SSA, provide the description of the data used, data sources and the descriptive statistics. First, we look at the data, sources and descriptive statistics then explain the empirical methodology as well as present some pre-estimation tests.

3.2 Description of Data, Variables and Expectations

With reference to the reviewed literature, the study employed panel data from 36 selected SSA countries covering the period from 1996 to 2019. Appendix 1 gives a list of the countries included in the study. The period has been chosen to maximize compatibility of the different datasets. Data on PPP activity is sourced from the Private Participation in Infrastructure (PPI) database. This database is the leading source of PPI data for the developing countries covering over 6,400 infrastructure projects in 137 LMICs as per the World Bank regional classification: East Asia and the Pacific; Europe and Central Asia; Latin America and the Caribbean; the Middle East and North Africa; South Asia and Sub-Saharan Africa (World Bank, n.d.). The dataset captures project information from four sectors namely: ICT[7]; Energy[8]; Transport[9]; Water[10] and; Municipal Solid Waste[11] (MSW) with projects in MSW captured from 2008.

Projects included in the database are management or lease contracts, Brownfield projects, Greenfield projects, and divestitures. Covering the period from 1996 to 2019, the number of

[7] Including land based and submarine cables except purely private telecoms. Instead, it will track ICT backbone infrastructure (fiber optic cables etc.) that has an active government component

[8] electricity generation, transmission, and distribution; natural gas transmission and distribution

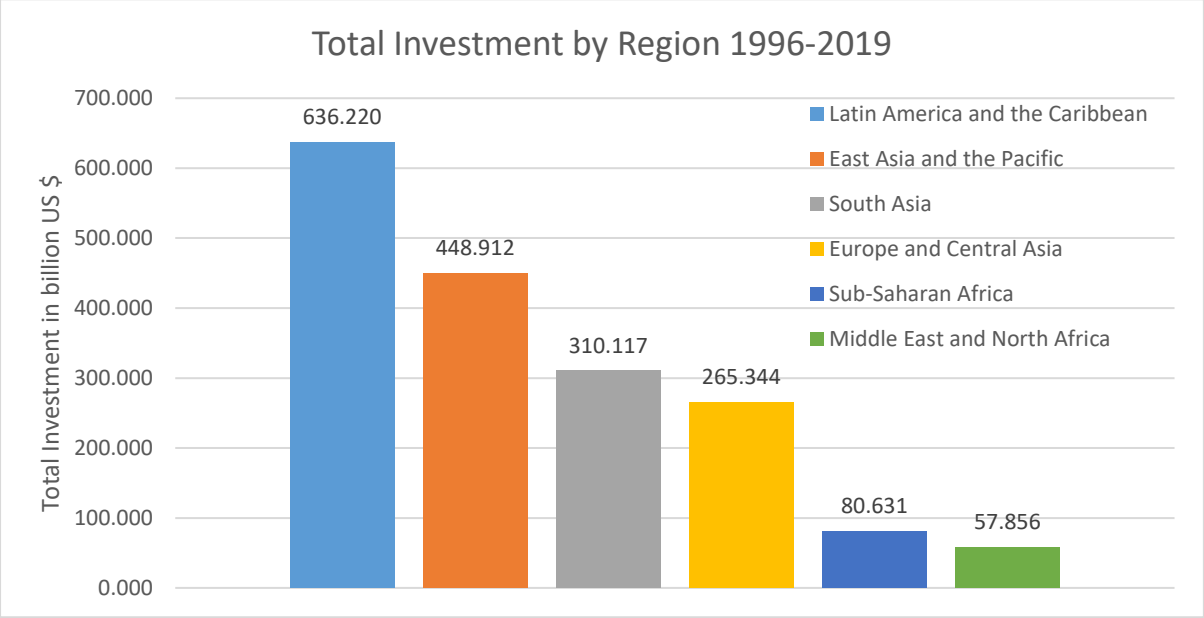
[9] airport runways and terminals; railways (including fixed assets, freight, intercity passenger, and local passenger); toll roads, bridges, highways, and tunnels; port infrastructure, superstructures, terminals, and channels

[10] potable water generation and distribution; sewerage collection and treatment

[11] Collection and Transport; Treatment/Disposal; Integrated Municipal Solid Waste

infrastructure projects captured in the database are 7,260 with an investment total of US$ 1,799.08 billion. East Asia and the Pacific accounted for the majority of the projects (33.8%), but came in second for total investment (US$ 448.912 billion) while Middle East and North Africa accounted for the least number of projects (2.96%) at a cost of US$ 57.856 billion. Latin America and the Caribbean is the second largest (in terms of number of projects but first in total investment) with total investment of US$ 636.22 billion from 27.62% of the projects, South Asia accounted for 18.82% with a cost of US$ 310.117 billion, followed by Europe and Central Asia with 9.89% of the projects at a cost of US$ 265.344 billion. In second last position is the SSA region accounting for 6.91% projects at a cost of US$80.631 billion (World Bank, n.d.). It is evident from the statistics that the regions' ability to attract private investment differs, and high investment levels do not translate to the largest number of projects.

Figure 3. 1: Total PPP Investment by Region

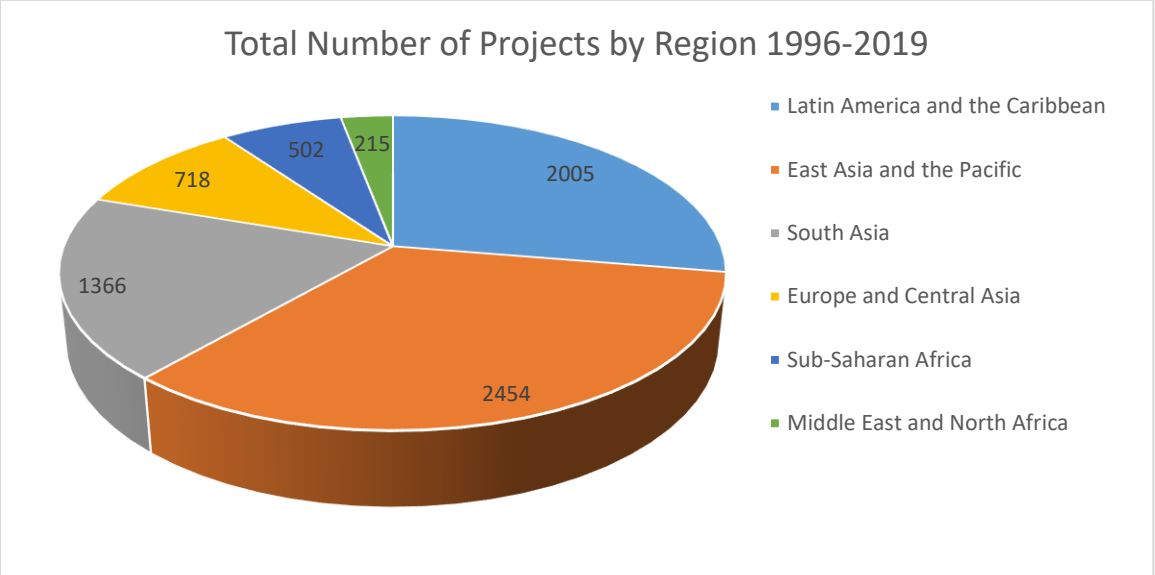


Source: Own calculations using data from the PPI database

The study excludes full divestitures and merchant projects, as even though they engage the private sector, they do not satisfy the definition of PPPs, as the public sector has ceased its involvement in such projects (Basilio, 2017). For the SSA region, the number of PPP projects recorded from 1990 to 2021 is 579 with a total investment of US $82.563 billion[12]. For the period from 1996 to 2019, which is the focus of the study, the SSA region recorded 502 projects with a total cost of US $80,631billion (World Bank, n.d.).

[12] The total investment represents only 493 projects as the other 86 projects had no data for investment amount.

Figure 3. 2: Total PPP Projects by Region



Source: Own calculations using data from the PPI database

The dependent variable, representing PPP activity, is measured in two ways: PPP investment amount in US dollars (millions); and number of PPP projects reaching financial closure in a specific year for a country. The different measures of PPP activity cater for differing needs of economies. Countries with different ethnical groups, for example, may require a large number of PPP projects to cater for individual preferences and reduce conflicts (Hammami et.al., 2006). This however puts more financial pressure on the public sector as resources cannot be pooled together for efficient provision of public goods. In line with the work of Osei & Kim (2020), in order to filter out cyclical fluctuations, cater for the complex nature of PPPs and to focus on the determinants of PPPs in the medium term, the data are averaged over three-year non-overlapping periods. Number of projects reflect the total number of PPP projects in that three-year period.

The explanatory variables of interest include both the macroeconomic and governance indicators. Following the choice of the dependent variables, the explanatory variables are also collapsed into three-year averages in order to reflect the average conditions in the medium term for a specific country. Variables to be included as macroeconomic factors are based on the reviewed literature, both theoretical and empirical. Good governance is measured using six governance indicators developed by Kaufmann et. al (2010). Below is a brief description of each explanatory variable and the expected sign of the coefficients while Table 3.1 gives a detailed description of the explanatory variables of interest and data sources.

Table 3. 1: Summary of explanatory variables

Factors	Variable	Proxy / description	Data Source
Dependent Variables	Total PPP Investment	Total amount of PPP investments between 1996 and 2019	PPI
	Number of PPP projects	Total number of PPP projects between 1996 and 2019	
Macroeconomic	GDP growth rate	Annual % growth rate of GDP	WDI
	Government debt	Stock of debt in a given year as % of GDP	IMF and WDI
	Aid per capita	Net official development assistance (ODA) received per capita (current US$)	WDI
	Population	Total population of the country	WDI
	Real GDP per capita	Gross domestic product divided by the population	WDI
	Inflation	Ratio of GDP in current local currency to GDP in constant local currency (annual %)	WDI
	Money supply	Broad money as the sum of money supply (% of GDP)	WDI
	International reserves	Total reserves in months of imports of goods and services of a country (% of GDP)	WDI
	Foreign Direct Investment	Net inflows in the reporting economy from foreign investors, divided by GDP (% of GDP)	WDI
	Real interest rate	Rate charged by financial intermediaries on borrowed funds adjusted for inflation	WDI
	Tax	Profit tax is the amount of taxes on profits paid by business (%).	WDI
Governance	Voice of accountability	Extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	WGI

(ranges approximately from -2.5 (weak) to 2.5 (strong) performance)	Political Stability/No violence	Likelihood of political instability and/ or politically motivated violence, including terrorism.	WGI
	Government Effectiveness	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.	WGI
	Regulatory Quality	Ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI
	Rule of Law	extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI
	Control of Corruption	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.	WGI

Source: Compiled by author using information from different data sources: WDI; WGI; IMF and; PPI Databases.

A number of explanatory variables are used to measure macroeconomic stability for the SSA region. Stable macroeconomic conditions are said to be vital in the implementation of economic policies to foster private investment. There is normally a problem of endogeneity when dealing with variables of investments and macroeconomics (Basilio, 2017). In order to adress this potential problem, we assume that PPP activity in the current period is influenced by macroeconomic conditions in the previous period. Following the approach by Basilio (2017) and Mosrozo et al. (2014), macroeconomic variables are lagged by one year.

- Real interest rate is the lending interest rate which has been adjusted for inflation as measured by GDP deflator, representing the user cost of capital. As lower interest rates are expected to bring in more private investment due to the low cost of capital, its coefficient is expected to be negative.
- Inflation is the annual percentage change the GDP deflator. High levels of inflation are seen to reflect macroeconomic instability as it impacts on costs of inputs hence a negative relationship can be expected between inflation and PPP investments.
- Foreign Direct Investment (FDI) is the net inflows from foreign investors divided by GDP. It is believed that investors tend to be attracted to invest in countries that already have foreign enterprises. A positive coefficient is, as a result, expected for FDI.
- Money supply is proxied by broad money. Stable money circulation gives the investors some confidence in the ability to recover their investments as increasing money supply lowers the interest rate. A positive relationship is expected.
- International reserves are the total reserves in months of imports of a country. Higher international reserves are conducive for macroeconomic stability as it symbolizes lower possible currency risk. A positive relationship between PPP activity and reserves is hence expected.
- Tax is proxied by profit tax, which is the amount of taxes on profits paid by businesses. Since a higher tax burden means less take home profits for investors, the relationship is expected to be negative.
- As proxies for market conditions, the study uses GDP per capita for consumers' ability to pay and total population for market size. Both variables are set in logarithm form to avoid scaling issues. The better the market conditions of the country, the more private investment that is attracted hence the coefficients of both variables are expected to be positive and significant.

- GDP growth rate is the comparison in the year to year change in a county's economic output as a measure of economic growth. Economies growing at faster rates attract more PPP investments as they are more open to investment with increasing demand for infrastructure. A positive relationship is expected between GDP growth rate and PPP activity
- Central government debt is the government fixed-term contractual obligations outstanding on a particular date. Countries with higher debt are not able to finance their infrastructure projects and as a result resort to PPPs. The coefficient for government debt is expected to be positive.
- The aid a country receives is proxied by Net Official Development Assistance (Net ODA) received per capita. Presence of external aid could mean the country uses such funds for infrastructure development and is less inclined to engage in PPP. The coefficient of aid is expected to be negative.

Good governance is also said to attract private investment. However, uncertainties about the regulatory quality brought about by weak institutions increase country risk and decrease the investors' incentives to participate in PPPs (Hammami, et al., 2006). The political environment of a country also has impact on whether or not investors are attracted to invest in such a country. This is because political instability poses as market risk and leave investors with uncertainties on investment returns. Also on the issue of governance is the transparency and market competitiveness for procurement processes as well as the country's ability to develop market oriented policies. Therefore, governance is hypothesized to be positively related to PPP investment. This is the expectation for both overall governance and all six governance indicators.

3.3 Model Specification

The study uses two approaches to measure PPP activity. The first approach uses the mean of total PPP investment in US dollars for a specific country in a three-year period, while the second approach uses total number of PPP projects as an estimate for PPP activity.

3.3.1 Model Specification for Total Investment

When PPP activity is measured as mean of total investment, the study proposes to use one of the following; the pooled Ordinary Least Squares (OLS), the fixed effect or the random effect model to statistically estimate the regression coefficients. These models are appropriate because of the time series cross-section nature of the proposed data (Banerjee et al., (2006). The decision criteria for model selection is outlined below and will depend on the nature and characteristics of the unobservable time invariant individual specific effects. The model is specified as:

$$y_{i,t} = \alpha_i + \boldsymbol{\beta}' \boldsymbol{X_{it}} + u_{it} \qquad (1)$$

where $\boldsymbol{X_{it}}$ is a k×1 vector of observed individual specific regressors on the $i\ th$ cross-sectional unit at time t, u_{it} is the error term, $\boldsymbol{\beta}$ is a k-dimensional vector of unknown parameters, and α_i denotes an unobservable, unit-specific effect. Note that α_i is time-invariant, and it accounts for any individual-specific effect that is not included in the regression (Pesaran, 2015).

In this model, $E[u_{it}|\boldsymbol{X_{it}}] = 0$. The regressors are strictly exogenous. The difference in models in this section is the assumption made about α_i.

Pooled OLS Estimator

The model to be estimated is:

$$y_{i,t} = \alpha + \boldsymbol{\beta}' \boldsymbol{X_{it}} + u_{it} \qquad (2)$$

This estimator assumes that the intercepts are homogeneous, namely $\alpha_i = \alpha$, for all i; and α and β can be estimated by the OLS procedure. The pooled OLS estimator is unbiased and consistent as long as the regressors are strictly exogenous, the errors are cross-sectionally uncorrelated, the individual effects, α_i, are uncorrelated with the errors and the regressors, and T is fixed as $N \rightarrow \infty$, or if N and $T \rightarrow \infty$, jointly in any order .

Fixed Effects Specification

Under the fixed-effects (FE) specification, α_i are treated as free parameters which are incidental to the analysis, with $\boldsymbol{\beta}$ being the focus of interest. The only restriction imposed on α_i is boundedness. Otherwise, α_i is allowed to have any degree of dependence on the regressors, $\boldsymbol{X_{it}}$ or the error term, u_{it}. Under the FE specification, we assume that conditional on the individual effects, α_i, the regressors, $\boldsymbol{X_{it}}$, are strictly exogenous, but do not impose any restrictions on the fixed-effects.

The basic idea behind FE estimation is to estimate $\boldsymbol{\beta}$ after eliminating the individual effects, α_i. Averaging over time equation (1) yields:

$$\overline{y_i} = \alpha_i + \boldsymbol{\beta}' \overline{x_i} + \overline{u_i} \tag{3}$$

Differencing (3) from (1) gives

$$y_{i,t} - \overline{y_i} = \boldsymbol{\beta}' \left(x_{i,t} - \overline{x_i}\right) + (u_{i,t} - \overline{u_i}) \tag{4}$$

Where equation (4) is known as FE, or within transformation. $\boldsymbol{\beta}$ is now estimated by OLS to the above transformed relations.

Using the FE approach, we can only estimate the effects of time varying regressors. The effects of non-time varying regressors (such as sex or race) will be unidentified under the within or the FE transformation

The consistency of $\boldsymbol{\beta}$ crucially depends on the assumption of strict exogeneity of the explanatory variables. $\boldsymbol{\beta}$ is biased in small samples and is often not fully efficient since it ignores variation across individuals in the sample.

Random Effect Specification

The random effects (RE) approach assumes that α_i are realizations from a probability distribution function with a fixed number of parameters, distributed independently of the regressors.

$E[\,\alpha_i | \boldsymbol{X_{it}}] = 0$ for all i and t.

And the model to be estimated is

$$y_{i,t} = \boldsymbol{\beta}' \boldsymbol{X_{it}} + (\varepsilon + \alpha_i) + u_{it} \tag{5}$$

The RE estimator is obtained by a quasi-time demeaning (or quasi-differencing) data: rather than removing the time average from the explanatory and dependent variables at each t as in the FE approach, the RE approach removes a fraction (θ) of the time average. Where the fraction (θ) is calculated using Generalized Least Squares (GLS). If the fraction is close to one, the random effects and fixed-effects estimates tend to be close. The RE estimator is obtained by applying the pooled OLS estimator to the transformed equation.

$$y_{i,t} - \theta\overline{y_i} = \boldsymbol{\beta}'\left(x_{i,t} - \theta\overline{x_i}\right) + (u_{i,t} - \theta\overline{u_i}) \quad (6)$$

The RE specification allows the derivation of efficient estimators which, as seen above, make use of both within- and between-group variations. Contrary to the FE, it is possible to estimate the impact of time-invariant variables. The disadvantage is that one has to specify a conditional density of $[\alpha_i|\boldsymbol{X_{it}}]$ which needs to be independent of the explanatory variables. If such an independence assumption does not hold, then the RE estimator would be inconsistent.

Tests for the Best Model for the Data

Testing the Significance of the Group Effects (Pooled Vs FE)

The F-test (Chow test) is used to test the poolability of the constant term: under the null hypothesis of equality, the efficient estimator is pooled least squares;

$$Test\ Statistic: F = \frac{(R^2{}_{LSDV} - R^2{}_{POOLED})/(n-1)}{1 - R^2{}_{LSDV}/(nT - n - K)} \quad (7)$$

Rejection of the null hypothesis here means that, fixed effects are a better model specification (Green, 2018).

Testing for Random Effects (Pooled Vs RE)

The Breusch-Pagan LM test is used: the result of the test is to reject the null hypothesis in favor of the random effects model;

For $H_0: \sigma^2{}_{\alpha} = 0$ vs $H_1: \sigma^2{}_{\alpha} \neq 0$

$$Test\ Statistic: LM = \frac{nT}{2(T-1)}\left[\frac{\sum(T\overline{e_i})^2}{\sum\sum e_{it}^2} - 1\right]^2 \quad (8)$$

Under the null hypothesis, LM is distributed as chi-squared with one degree of freedom. Rejection of the Null hypothesis means that the classical regression model with a single constant term is inappropriate for the data. The result of the test is to reject the null hypothesis in favor of the random effects model (Green, 2018).

Hausman test: RE vs FE

Under the hypothesis of no correlation, both FE and RE are consistent, but FE is inefficient. The test has an asymptotic χ^2 distribution with degrees of freedom equivalent to the number of regressors in the model. The chi-square test is based on the Wald criterion

$$W = \chi^2 \, [\mathrm{K} - 1] = \left[b - \hat{\beta}\right]' \widehat{\Psi}^{-1} \left[b - \hat{\beta}\right] \qquad (9)$$

Under the null hypothesis, W has a limiting chi-squared distribution with K-1 degrees of freedom. If the chi-square value exceeds the critical chi-square value for given degrees of freedom and significance level, RE is not appropriate as the random error term might be correlated with one of the regressors, in which case the FE would be preferred.

3.3.2 Model Specification for Total Number of Projects

In the second model, the study uses total number of projects in three-year periods per country as a proxy for PPP activity. When PPP activity is measured by the frequency of projects, the study uses a Poisson regression (log linear model) or the negative binomial regression adopted from Banerjee, Oetzel, and Ranganathan (2006), depending on whether there is overdispersion or not. First we assume that Y (number of PPP projects) follows a Poisson distribution with the probability density function (PDF) given by

$$f(Y/y_i) = \Pr(Y = y_i) = \frac{e^{-\lambda_i} \lambda_i y_i}{y_i!} \, , y_i = 0,1,2, \ldots \qquad (10)$$

Where $f(Y/y_i)$ denotes the probability that the descrete random variable Y takes non-negative interger value y_i and λ is the parameter of the Poisson distribution. Poisson distribution is unique in that both the mean and variance of the Poisson distributed variable are similar, i.e

$$E(y_i) = \lambda_i \qquad (11)$$

$$var(y_i) = \lambda_i \qquad (12)$$

The Poisson regression model can then be written as

$$y_i = E(y_i) + u_i = \lambda_i + u_i \qquad (13)$$

Where the ys are independently distributed Poisson random variables with mean λ_i for each country expressed as :

$$\lambda_{it} = \exp(X_{it}\beta) \qquad (14)$$

Where λ_{it} is the number of PPP projects concluded in a three-year period within a specific country

X_{it} is a vector of explanatory variables

The Poisson's main limitation is assuming that the mean and variance are equal. This is because in practice, the variance of count variables is greater that the mean, this property is known as overdispersion. Owing to the limitations of the Poisson model, the study shall also explore the Negative Binomial if the data indicates that the mean and variance are not similar, i.e

$$var(y_i) = \mu + \alpha\mu^2 \quad (15)$$

Where μ is the mean and α is the overdispersion parameter. In order to choose from the two count data models, a negative binomial regression is estimated, which includes the overdispersion parameter α and the following hypothesis is used as a dicission criteria

$H_o: \alpha = 0$ there is no overdispersion and Poisson is appropriate.

Total number of PPP projects model is specified as follows:

$$NumberProjects_{it} = \exp(\beta_0 + \beta_1 X_{it} + \beta_2 W_{it} + \varepsilon_i) \quad (16)$$

Where $NumberProjects_{it}$ is the number of PPP projects concluded in a given three-year period within a specific country

X_{it} is a vector of macroeconomic explanatory variables

W_{it} is a vector of governance explanatory variables

3.3.3 Overall Governance Using Principal Component Analysis

To measure the influence of governance on PPP activity, two approaches are used: the disaggregated governance indicators are included in the models as individual variables, and second the study introduces a composite governance variable by means of a principal composite analysis (PCA). This is used to measure the influence of overall governance on PPP activity.

Principal Component Analysis is a technique used to reduce dimensionality of datasets, increase interpretability while minimizing information loss (Jolliffe & Cadima, 2016). The PCA is computed using the following five steps:

Step 1: Transformation of data to comparable scales through standardizing the range of the continuous initial variables to ensure equal contribution to the analysis.

Step 2: Computation of the correlation matrix to see if the variables are positively or inversely correlated.

Step 3: Computation of the eigenvectors and eigenvalues of the covariance matrix in order to identify the principal components.

Step 4: Creating a feature vector to determine which components to keep.

Step 5: Recasting data along the principal components axis.

The variable created through PCA reflecting overall governance is given as:

$$Overallgov = featurevector^T * standardizeddata^T$$

Table 3.2 below shows the correlation matrix used in the computation of the overall governance. The first part of the table gives the eigenvalues, their forward differences, the proportion of their variation and their cumulative proportions respectively. In the results only the first component has an eigenvalue greater than one, explaining 83.6% of the variation in the data. The second section of the table gives the linear combinations of the original variables that account for variance in the data. The eigenvectors are comprised of coefficients that correspond to each of the six governance variables with the coefficients indicating relative weights of each variable in the component. The first component has large positive associations with rule of law, government effectiveness and regulatory quality which can be seen to represent government quality. The second component has the largest positive association with political stability while the third component has large negative associations with voice of accountability.

To further explain the computation of overall governance, the study uses a scree plot. The scree plot shows the components used to compute the overall governance. The eigenvalues start to form a straight line after the first principal component, meaning that all other components account for a very small variation. The computed overall governance will be included in the two models of mean of total PPP investment and number of projects.

Table 3. 2 Eigen Analysis of the Correlation Matrix

Eigenvalues

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	5.0167900	4.6246000	0.8361	0.8361
Comp2	0.392185	0.1556240	0.0654	0.9015
Comp3	0.2365610	0.0257581	0.0394	0.9409
Comp4	0.210803	0.1323440	0.0351	0.9761
Comp5	0.0784590	0.0132555	0.0131	0.9891
Comp6	0.0652036	.	0.0109	1

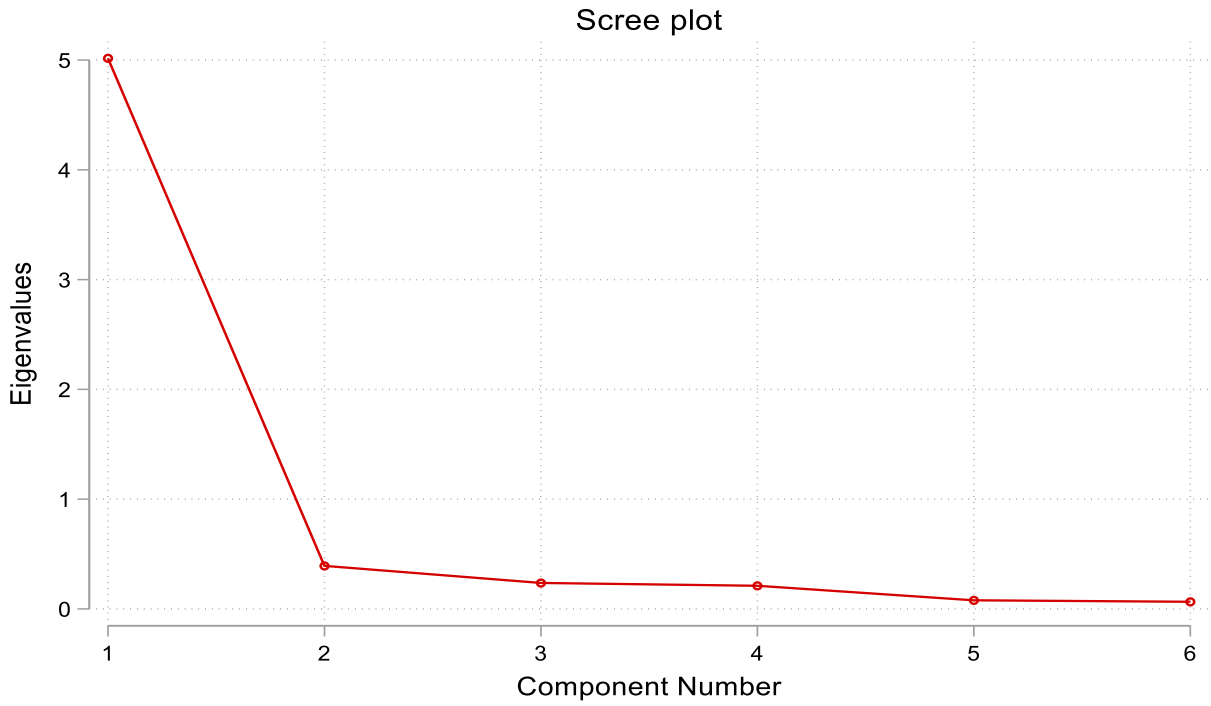
Eigenvectors (component loadings)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
Control of Corruption	0.4091	-0.1731	-0.2814	0.7489	-0.3063	0.2625	0
Gov. Effectiveness	0.4157	-0.4419	0.2124	0.0218	0.7578	0.1103	0
Political Stability	0.3760	0.7816	0.4375	0.1151	0.0969	0.1833	0
Regulatory Quality	0.4123	-0.3217	0.3508	-0.4856	-0.5387	0.2783	0
Rule of Law	0.4343	-0.0112	0.0387	0.0348	-0.1270	-0.8902	0
Voice of Accountability	0.3998	0.2453	-0.7481	-0.4341	0.1278	0.1243	0

Source: Own calculations using data from the WGI database

Using both the scree plot and the Kaiser rule, component 1 is chosen to show overall governance. The Kaiser rule states that any principal component with an eigenvalue less than 1 contains less information than one of the original variables and so is not worth retaining. The scree plot involves looking at a plot of eigenvalues against component number and deciding at what component number the slopes of lines joining the plotted points are ‘steep’ to the left of that component number, and ‘not steep’ to the right. The scree plot looks at the break in the graph (Jolliffe I. , 2002)

Figure 3. 3: Scree Plot of Eigenvalues



Source: Own calculations using data from the WGI database

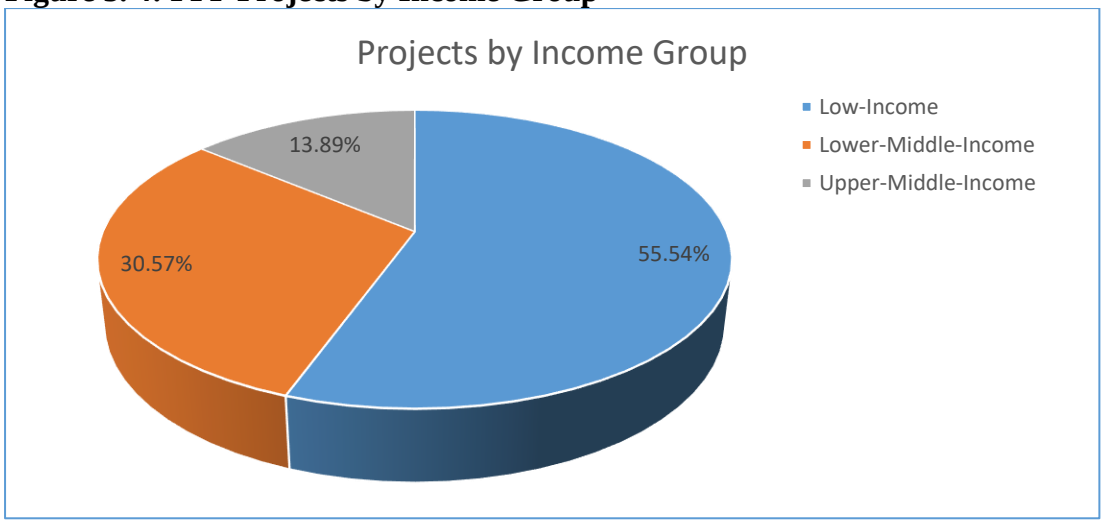
3.4 Descriptive Statistics

The analysis of the data starts with the computation of the summary statistics and the correlation between the variables; tables 3.3 and 3.4 respectively. With reference to the variables on both the total investment and number of projects, it can be deduced from Table 3.3 that SSA countries average total investments US$420.23million in PPP projects per year with the range of US$0.5 million and US$5648.61 million with a standard deviation of 808.28 from 1996 to 2020. The mean total investment of US$420.23 is about half the standard deviation showing that SSA countries have different capacities in attracting PPP investments.

The highest average investment value was recorded by South Africa (US$3229.1million) for the period 2011-2013 while quite a number of countries that were not able to record any PPP project for any three-year period recorded the lowest average investment value. The mean number of projects reaching financial closure for a country is two projects with standard deviation of 4.018; this goes further to show the difference in capacity of SSA countries to attract PPPs. The lowest number of projects (0) was recorded by most of the countries in different years and has the highest frequency (134 observations), while the highest number of projects was recorded by South Africa (44) in the period 2011-2013, which parallels the high

average total investment. The graphical presentation of the total number of projects' distribution is shown in Appendix 1. Of the 288 PPP projects that were recorded for the period under review, 55.6% were in low-income countries, 30.6% in lower middle income countries while only 13.9% were in upper middle-income countries, visualized in Figure 3.2.

Figure 3. 4: PPP Projects by Income Group



Source: Author's calculation using data from the PPI database

Referring to the variables for macroeconomic conditions, the average mean inflation for the SSA region is 21.31%. The lowest average inflation rate (-9.197) was recorded by Congo, Republic in the period 2014 to 2016, while the highest (1645.115) was recorded by Angola in the period 1996-1998. The mean GDP growth rate is 4.57% and varies from a low of -10.566% and high of 18.947% with standard deviation of 3.374. Zimbabwe experienced the lowest average growth rate in 2002 to 2004, which was a result of the disorderly implementation of the land reform program leading to a reduction in agricultural production while Chad experienced the highest average growth rate in the same period because of the discovered oil reserves.

Table 3. 3: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Log Total Investment	288	8.692	9.036	0	21.895
Number of Projects	288	1.733	4.018	0	44
Log of population	288	16.172	1.326	12.909	19.093
Log of inflation	253	.537	.629	-2.531	2.002
GDP Growth	286	4.57	3.374	-10.566	18.947
FDI to GDP	282	4.159	6.892	-5.67	77.548
Total Reserves	206	3.398	2.134	.045	16.033
Money Supply	272	27.859	19.608	3.456	116.77
Profit tax	277	18.879	11.271	0	58.9
Central Gov. Debt	262	60.498	59.633	8.448	561.996
Real Interest Rate	223	8.609	10.074	-46.131	47.966
Net ODA	288	59.124	60.101	1.345	509.828
Control of Corruption	288	-.674	.574	-1.775	.919
Gov. Effectiveness	288	-.746	.613	-2.28	1.02
Political Stability	288	-.607	.923	-3.242	1.119
Regulatory Quality	288	-.67	.631	-2.53	1.083
Rule of Law	288	-.717	.668	-2.487	1.044
Voice of Accountability	288	-.566	.716	-2.129	.96
Overall governance	288	0	1	-2.503	2.884
Income_Group	.	.	.	.	.
Low Income	288	.556	.498	0	1
Lower Middle Income	288	.306	.461	0	1
Upper Middle Income	288	.139	.346	0	1

Source: Own computations based on data from World Bank databases

Note: Income Group denotes the income group classification of each country within SSA. Each income group takes the value of 1 if a country is classified such income group and zero otherwise.

The summary statistics also show population with a mean of 16.172 with standard deviation of 1.326. The country recording the lowest average population is Cape Verde (404098) in 1996 to 1998 and largest average population is Nigeria (195,900,000) in 2017 to 2019. The average per capita income is $1,490.38 ranging from an average of $121.64 to $10,930.14 with standard deviation of 1,920.879. The highest average per capita GDP was recorded by Mauritius in 2017 to 2019 while the lowest was recorded by Ethiopia in 1999 to 2001. Both population and GDP per capita have very high standard deviations showing an uneven distribution as countries differ in both size and economic development. Net ODA has a standard deviation of 60.101with mean 59.124 ranging from 1.345 (Nigeria 1999 to 2001) and 509.828 (Cape Verde in 2008 to 2010) also showing uneven distribution as a result of differences in ability to pay and total assistance provided. Also reflected in the summary statistics are total reserves and the percentage of FDI to GDP. The mean total reserves are 3.398 with standard deviation of 2.134 while mean FDI

to GDP is 4.159 with standard deviation of 6.892. These statistics show that there is not much variance in the SSA region.

Table 3.2 also gives summary statistics on interest rate, money supply, profit tax and central government debt. Real interest rate has a mean of 8.609 with standard deviation 10.074. The average lowest interest rate is -46.164 and highest is 47.966 recorded by Angola in 1999 to 2001 and Madagascar in 2014 to 2016 respectively. Money supply has an average minimum value of 3.456% (DRC 1999 to 2001) and maximum of 116.77% (Mauritius 2017 to 2019), with standard deviation of 19.608 and mean of 27.859%. Profit tax ranges from 0 to 58.9 with a standard deviation of 11.271. Central government debt ranges from an average of 8.448% to 561.996% of GDP. The standard deviation of 59.633 shows how countries vary in terms of debt. The country with the lowest central government debt as a percentage of GDP is Nigeria in 2008 to 2010 while the highest is Liberia in 2002 to 2004.

The index for the governance indicators ranges from -2.5 to 2.5 (poor to good). The mean values for all governance indicators are negative with standard deviation ranging between 0.574 and 0.923. This shows a below average performance of SSA in relation to good governance and explains why the region lags behind in attracting private sector engagement. Somalia has the lowest average index for political stability (-3.242) in the period 2008 to 2010 which is also below the World Bank provided range. This, however, does not come as a surprise as Somalia had experienced "two decades of state collapse, warlordism and weak transitional government" (Desai, 2019). The highest average index is recorded by Cape Verde (1.119) for political stability in the period 1999 to 2001. On overall governance, the lowest average index (-2.503) was recorded by Somalia for the period 2008 to 2010 while the highest was from Mauritius in 2014 to 2016.

Table 3.4 provides the correlation matrix between both the dependent and explanatory variables. The two measures of PPP activity show a correlation of 0.439 which is to be expected as a high number of PPP projects can sometimes translate to high total investment. The explanatory variables with high correlation with the explained variables are population, Central government debt, political stability and government effectiveness. There is also high correlation of above 0.8 between some of the explanatory variables which could lead to problems of multicollinearity making the coefficient estimates and p-values in the regression output to be unreliable. To further test for multicollinearity and identify which variables could be highly correlated with other explanatory variables, the Variance Inflation Factor (VIF) is

used. This test of multicollinearity produces a VIF value for each explanatory variable which can easily be interpreted. The results are presented in Table 3.5

Table 3. 4: Correlation Matrix

	TI	NP	POP	GDPGR	INF	NODA	RIR	CGD	TAX	FDI	MS	TR	GDPPC	CC	GE	PS	RQ	RL	VC
TI	1																		
NP	0.447	1																	
POP	0.461	0.345	1																
GDPGR	0.157	0.002	0.192	1															
INF	0.200	0.062	0.350	0.168	1														
NODA	-0.109	-0.166	-0.500	-0.013	-0.323	1													
RIR	-0.103	-0.094	-0.076	-0.206	-0.336	-0.036	1												
CGD	-0.035	-0.055	-0.160	-0.001	0.082	0.166	-0.088	1											
TAX	0.089	0.145	0.324	0.020	-0.106	-0.153	-0.141	-0.342	1										
FDI	-0.040	-0.099	-0.100	0.178	0.084	0.321	-0.132	0.100	-0.158	1									
MS	-0.021	0.143	-0.281	-0.131	-0.252	0.264	-0.118	-0.155	0.000	-0.034	1								
TR	0.157	0.115	0.049	-0.106	-0.164	-0.102	0.028	-0.268	0.193	-0.183	-0.038	1							
GDPPC	0.112	0.219	-0.228	-0.096	-0.237	0.162	-0.129	-0.322	-0.022	-0.082	0.697	0.085	1						
CC	-0.055	0.034	-0.432	-0.108	-0.229	0.433	0.032	-0.089	-0.104	-0.026	0.666	-0.152	0.487	1					
GE	0.112	0.204	-0.120	-0.062	-0.172	0.107	-0.009	-0.227	0.009	-0.189	0.777	-0.135	0.570	0.813	1				
PS	-0.239	-0.146	-0.646	-0.115	-0.226	0.358	0.215	-0.052	-0.213	0.002	0.481	-0.179	0.434	0.688	0.537	1			
RQ	0.143	0.193	-0.126	-0.131	-0.171	0.070	0.155	-0.270	-0.034	-0.133	0.689	-0.066	0.518	0.754	0.925	0.530	1		
RL	-0.050	0.068	-0.371	-0.111	-0.180	0.275	0.114	-0.187	-0.106	-0.103	0.745	-0.088	0.522	0.880	0.888	0.725	0.871	1	
VC	0.041	0.152	-0.315	-0.182	-0.153	0.335	0.051	-0.085	-0.038	0.021	0.718	-0.059	0.579	0.720	0.672	0.621	0.685	0.788	1

Notes: TI is Total Investment, NP is Number of Projects, POP is Population, GDPGR is GDP Growth Rate, INF is Inflation, NODA is Net ODA, RIR is Real Interest Rate, CGD is Central Government Debt, FDI is FDI to GDP, MS is Money Supply, TR is Total Reserves, GDPPC is GDP per Capita, CC is Control of Corruption, GE is Government Effectiveness, PS is Political Stability, RQ is Regulatory Quality, RL is Rule of Law, and VC is Voice of Accountability. Variables have been written in short for table to fit on page.
Source: Own computations based on data from World Bank databases

Table 3. 5: VIF Results

Explanatory Variables	VIF	1/VIF
log population	3.736	.268
Lag of GDP Growth	1.234	.811
Lag of logged inflation	2.197	.455
Lag of Net ODA	2.999	.333
Lag Real Interest Rate	2.317	.432
Lag Central Gov. Debt	1.743	.574
Lag Profit tax	1.666	.6
Lag FDI to GDP	1.613	.62
Lag Money Supply	5.096	.196
Lag Total Reserves	1.476	.677
Lag of logged GDP Per Capita	5.666	.176
Control of Corruption	7.305	.137
Gov. Effectiveness	23.59	.042
Political Stability	4.354	.23
Regulatory Quality	11.921	.084
Rule of Law	16.273	.061
Voice of Accountability	4.191	.239
1.IncomeGroup	2.204	.454
2.IncomeGroup	7.016	.143
Mean VIF	5.61	.

Source: Own computations based on data from World Bank databases

The value of VIF ranges from zero and has no upper limit. Interpretation of VIFs follows a general rule of thumb whereby: the value of 1 indicates no correlation between a given explanatory variable and other explanatory variables in the model; a value between 1 and 5 indicates moderate correlation between a given explanatory variable and other explanatory variables in the model, though not severe enough to require attention; a value greater than 5 indicates potentially severe correlation between a given explanatory variable and other explanatory variables in the model.

According to the VIF results and in line with the correlation matrix, government effectiveness, control of corruption, rule of law and regulatory quality may potentiality have severe correlation.

In order to deal with this problem, two approaches are used: (i) omit some of the highly correlated explanatory variables from the regression and (ii) use the PCA for all the governance indicators as it is designed for analysis of highly correlated variables. As per the first solution, both government effectiveness and rule of law have been omitted in the regression as they have the highest frequency of correlation with other explanatory variables. When the two governance variables are omitted from the regression, the VIF values are all below ten. The same results are realized when regression is run using the overallgov variable that is computed using PCA.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This section presents the regression results in Tables 4.2 to 4.3. As earlier indicated, the macroeconomic explanatory variables are used in all model specifications, while individual and overall governance indicators are each used in only two specifications. The section proceeds by discussing the regression results in line with the objective of the study, the diagnostic test results then conclude by discussing such results.

4.2 Total Investments in PPPs

Results in Table 4.2 present estimations of the effects of macroeconomic and governance conditions on average investments in PPP for the SSA region for the period 1996 to 2019. In selecting the appropriate model for the estimation, Pooled OLS was selected over the Random Effects and Fixed Effects models using both the F-test and the Breusch-Pagan tests. The results are presented in Table 4.1 below:

Table 4. 1: Results of the Chow and Breusch-Pagan tests

Test	Test-statistic	p-value
Chow test	1.00478	0.464961
Breusch-Pagan test	2.94056	0.0863808

Source: Own calculations using data from the World Bank databases

The Chow test is used to test the poolability of the constant term which would determine between Pooled OLS and FE. The null hypothesis states that the constant term is the same across sections and since the p-value > 0.05 we fail to reject the null hypothesis and conclude that the Pooled OLS is more appropriate than FE. Secondly, the Breusch-Pagan LM test is used to choose between Pooled OLS and RE. Since the p-value > 0.05, we fail to reject the null hypothesis that the residuals are distributed with equal variance and conclude that Pooled OLS is more appropriate than RE. Since both the F-test and LM test favor the Pooled OLS, the results presented below are of the Pooled OLS regression. Column 2 gives the results of the model with individual governance

indicators while column 3 gives results of the model estimated using the aggregated governance indicator, overallgov.

R-squared shows that the estimated model explains 42% of the variation in average investments. The findings generally suggest that inflation, central government debt, money supply, total reserves, population, GDP per capita, regulatory quality, overall governance, and the country's income group are all statistically significant in determining total PPP investment. The signs of the coefficients are as expected except for inflation, tax, aid, control of corruption, and political stability. Since both the dependent and explanatory variables are averages, the interpretation of the results reflects the effect of average on average and assumes the ceteris paribus condition.

Table 4. 2: Pooled OLS Estimation Regression Results

Pooled OLS Estimation Results				
Variables	**Individual Governance**		**Overall Governance**	
laggdpgrowth	0.2682	(0.2631)	0.1811	(0.2573)
laginflation	3.1455*	(1.9891)	3.5811**	(1.8465)
lagnetoda	0.0143	(0.0161)	0.0068	(0.0149)
lagrealinterestrate	-0.0721	(0.1074)	-0.0130	(0.0995)
lagcentralgovdebt	0.0461***	(0.0136)	0.0458***	(0.0125)
lagprofittax	0.0260	(0.0848)	0.0306	(0.0862)
lagfditogdp	0.0012	(0.0943)	0.0652	(0.1025)
lagmoneysupply	-0.1072**	(0.0610)	-0.1092**	(0.0601)
lagtotalreserves	0.6893**	(0.3455)	0.8824**	(0.3834)
logpopulation	2.7587***	(0.7934)	2.8269***	(0.6227)
loglagGDPPerCapita	4.5396***	(1.2092)	4.4593***	(1.2526)
ControlofCorruption	-1.4688	(2.2977)		
PoliticalStability	-0.7326	(1.7358)		
RegulatoryQuality	7.0071***	(2.5648)		
VoiceofAccountability	0.7020	(2.0117)		
overallgov			3.5479***	(1.1614)
Income Group				
Lower Middle Income	-0.8208	(2.3581)	0.3916	(2.3922)
Upper Middle Income	-6.7960**	(4.0579)	-6.7355*	(4.2084)
const	-67.2124***	-15.1061	-72.4972***	(11.7157)
R-squared		0.4205		0.4007
F(17, 100) / F(14,103)		10.1600		12.3500
P-value(F)		0.0000		0.0000

Note: Robust standard errors in parentheses; *, **, *** denote the level of statistical significance at 10%, 5% and 1% respectively.
Source: Author's computations using data from the World Bank

According to the Pooled OLS, first the regression results indicate that inflation is statistically significant in explaining total PPP investment, at 10% and 5% levels of significance for individual and overall governance models respectively, with a positive relationship that is not in line with expectations. A percentage change in inflation leads to the same direction, 3.15% (for the individual governance model) and 3.58% (for the overall governance model) change in the total investment. These findings are in line with the findings of Song (2018); Yurdakul et al. (2021); Cann-Tamakloe (2008). Though against the Neoclassical investment theory, the positive relationship may be explained by the lower cost of borrowing as inflation lowers real interest rate.

Second, a percentage point increase in government debt leads to a 0.05% increase in the total investment, in line with the findings of Hammami et al. (2006). This result is statistically significant at 1% level of significance and in line with expectations formed from the reviewed literature. Third, a percentage point increase in the money supply leads to an 0.11% decline in investment. The result is statistically significant at 5% and 10% levels for individual and overall governance models respectively. This finding corroborates Song (2018) and Hammami et al. (2006). This result is against expectation as increase in money supply lowers interest rate, making cost of capital affordable hence increase in investment.

Furthermore, the results of the study indicate that reserves as measured by the imports of goods and services of a country, is positively and significantly related to total PPP investment. A percentage point increase in international reserves leads to a 0.69% and 0.88% increase in total investment for individual and overall governance models respectively. For market conditions, the study uses population to measure market size and GDP per capita to measure a country's purchasing power. A percentage increase in population and GDP per capita translates to 2.8% and 4.5% increases in PPP investments respectively. This positive relationship is statistically significant at 1%, in line with expectation and consistent with the findings of Hammami et al. (2006), Banerjee et al. (2006), Mengistu (2018), Song (2018) and Yurdakul et al. (2021).

The results also indicate that of the six individual governance indicators, only regulatory quality is statistically significant in explaining total PPP investments, however, the overall governance is also significant at 5% level. A unit improvement in regulatory quality index causes a 7% increase in investment while the same change in overall governance causes investment to increase by 3.5%. This could be alluded to the fact that, of the six governance indicators, regulatory quality relates directly to promotion of private sector development (Kaufmann et al., 2010). In addition, regulatory quality is the dominating component in the overall governance index as it has the highest eigenvector (0.4123) for the chosen component (component 1). These results support the agency theory by Jensen and Meckling (1976). Song (2018) empirically supports the positive relationship between governance and investment. The results for control of corruption and political stability are not only statistically insignificant, but also go against expectations formed from the literature. Upper middle-income countries are associated with 6.8% lower investment relative to

low-income countries. This result is significant at 5% level. Though statistically insignificant, lower middle-income countries attract 0.82% less investment than low-income countries.

4.3 Number of PPP Projects

Table 4.2 presents the results of the effects of average macroeconomic and governance conditions on the total number of PPP projects carried out in SSA for the period 1996 to 2019. In selecting the appropriate model for the estimation, Negative Binomial model was estimated in order to get the dispersion parameter, alpha. The null hypothesis was stated as:

$$H_0: \alpha = 0 \quad No\ overdispersion\ in\ the\ data$$

The alternative is that the data are over dispersed and Negative Binomial is a better estimation technique. Since the alpha parameter has p-value < 0.05, we reject the null hypotheses and conclude that the data are over dispersed and better estimated using the Negative Binomial model than the Poisson model. Column 2 gives the results of the model with individual governance indicators while column 3 gives results of the model estimated using the aggregated governance indicator, overallgov.

Table 4. 3: Negative Binomial Estimation Regression Results

Negative Binomial Estimation Results

Variables	Individual Governance		Overall Governance	
laggdpgrowth	0.0678*	(0.0399)	0.0542	(0.0410)
laginflation	0.1423	(0.2865)	0.2383	(0.3065)
lagnetoda	0.0009	(0.0030)	−0.0012	(0.0026)
lagrealinterestrate	−0.0056	(0.0132)	0.0103	(0.0125)
lagcentralgovdebt	0.0092***	(0.0019)	0.0094***	(0.0018)
lagprofittax	0.0165	(0.0147)	0.0193	(0.0155)
lagfditogdp	−0.0022	(0.0132)	0.0144	(0.0146)
lagmoneysupply	−0.0162*	(0.0098)	−0.0171*	(0.0093)
lagtotalreserves	0.5694	(0.0644)	0.1184*	(0715)
logpopulation	0.5803***	(0.1679)	0.5956***	(0.1361)
loglagGDPPerCapita	0.4331*	(0.2462)	0.3396	(0.2051)
ControlofCorruption	−0.3558	(0.3833)		
PoliticalStability	−0.1774	(0.2691)		
RegulatoryQuality	1.6829***	(0.4767)		
VoiceofAccountability	0.0937	(0.3198)		
overallgov			0.8788***	(0.2251)
Income Group				
Lower Middle Income	0.1757	(0.3524)	0.5031	(0.3783)
Upper Middle Income	0.1443	(0.6737)	0.1886	(0.7281)
const	−12.6142***	(2.8587)	−13.4499***	(2.2816)
alpha	0.7376***	(0.1511)	0.7873***	(0.1568)
Pseudo R-squared		0.1741		0.1642
Chi-square(17) / (14)		90.1700		77.0800
p-value		0.0000		0.0000
Log-likelihood		(192.7153)		(195.0239)

Note: Robust standard errors in parentheses; *, **, *** denote the level of statistical significance at 10%, 5% and 1% respectively.
Source: Author's computations using data from the World Bank

The findings suggest that GDP growth (only for the individual governance model), government debt, money supply, population, GDP per capita, regulatory quality and overall governance are all statistically significant in determining total number of PPP projects in a given medium term, from 1996 to 2019 in SSA. When testing for model fit, the likelihood ratio (LR) statistic is used. Its value of 90.94 and 77.73 for individual and overall governance models respectively shows high significance because the p-value is zero. The indication here is that the explanatory variables are

collectively important in explaining the conditional mean of the PPP projects. The interpretation of the coefficients caters for the independent variable being total number of PPP projects, the explanatory variables being three-year averages and considers the ceteris paribus condition.

According to the Negative Binomial, first the regression results indicate that a percentage point increase in GDP growth leads to 0.07% and 0.05% increase in total number of PPP projects for individual and overall governance models respectively. Though statistically insignificant for overallgov, the positive relationship is as expected and supports the Neoclassical theory of investment and findings of Banerjee et.al (2006). Second, a percentage point increase in government debt leads to a 0.01% increase in the number of projects, in line with the findings of Hammami et al. (2006) and Yurdakul et al. (2021). This result is statistically significant at 1% level of significance and in line with expectations formed from the reviewed literature. The results also show that a percentage point increase in the money supply leads to a 0.02% decline in projects. The result is statistically significant at 10% level. This finding corroborates Song (2018).

For market conditions, the study uses population to measure market size and GDP per capita to measure individuals' purchasing power in a country. A percentage increase in population and GDP per capita translates to 0.6% and 0.43% (for individual governance model) increases in PPP projects respectively. This positive relationship is statistically significant at 1%, in line with expectation, corroborating the results of Hammami et al. (2006) and Yurdakul et al. (2021) on population. The result for GDP per capita is statistically significant for individual governance and insignificant for the overall governance model, supporting the findings of Song (2018), Hammami et al. (2006) and Banerjee et al. (2006).

The results also indicate that of the six individual governance indicators, only regulatory quality is statistically significant in explaining total number PPP projects in SSA. However, the overall governance is also significant at 1% level. A unit improvement in regulatory quality index causes a 1.7% increase in number of projects while the same change in overall governance causes number of projects to increase by 0.9%. Regulatory quality relates directly to implementation of policies that promote private sector development (Kaufmann et al., 2010). In addition, regulatory quality is the dominating component in the overall governance index as it has the highest eigenvector (0.4123) for the chosen component (component 1). These results support the agency theory by Jensen and Meckling (1976). The results for control of corruption and political stability are not

only statistically insignificant, but also go against expectations formed from the literature. The result of control of corruption is similar to the findings of Banerjee et.al (2006). Results for income group are insignificant and go against literature expectations.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This section summarises the findings of the study and gives conclusions drawn from the results. Based on the results, the chapter also provides policy recommendations on how SSA can attract more private sector participation in infrastructure development. The section also highlights the main limitations of the study.

5.2 Conclusions

Infrastructure is seen as a key ingredient for economic growth yet SSA lags behind in infrastructure development. The region is characterized by high debts and budget deficits, which act as a constraint to the development of the required infrastructure. The increasing demand for infrastructure seen through rapid increase in population has worsened the situation. An alternative financing tool for infrastructure development has been identified as the engagement of the private sector in the form of PPPs. In order for the region to attract the private sector, favorable investment conditions should first be realized.

The main objective of the study is to determine which macroeconomic variables and governance indicators drive PPP activity in SSA for the period between 1996 and 2019. Using panel data from 36 selected SSA countries, the study employs the Pooled OLS and Negative Binomial regressions for the three-year average investments and total number of PPP projects respectively. To the best of the researcher's knowledge, no study has attempted to investigate the determinants of PPP activity in the medium term while also using aggregated governance indicators for SSA. Since PPP are large long-term investments, it is not feasible to have year to year commitments, hence the study significantly extents knowledge and existing literature in the determinants of PPP activity in SSA.

The results of the study indicate that debt, money supply, international reserves, GDP per capita, population, regulatory quality and overall governance are all statistically significant determinants of PPP activity. The variables of FDI, GDP growth rate, real interest rate and voice of

accountability, though statistically insignificant, had the expected correlation with PPP investments. Favorable market conditions as well as overall governance are found to be the most significant determinants of PPP activity for the SSA region. The favorable market conditions are proxied by population size, indicating demand, and GDP per capita, indicating purchasing power or affordability for goods and services. An increase in the variables of favorable market conditions leads to increases in the mean total investment and total number of projects. Favorable market conditions lower investor risk as there is certainty for both demand and affordability.

The disaggregated governance indicators provide somewhat conflicting results with control of corruption and political stability being negatively correlated with PPP investments, while regulatory quality and voice of accountability have a positive correlation. Despite this conflict, overall governance is found to have an expected positive relationship. A unit increase in the overall governance index in the medium term leads to 3.5% increase in average investment and 0.9% increase in total number of projects. This is because improvement of governance creates investor confidence. Also key in determining PPP activity for the SSA region is government debt. High levels of debt lead to higher private sector engagement as governments are bound to resort to other forms of financing for infrastructure development.

5.3 Recommendations

Based on the findings of the study, there is a need to formulate policies that will improve market conditions and improve the overall quality of governance for countries within the SSA region to improve the efficiency to attract PPP investments. The improvement in the regulatory quality is particularly key as it relates to the governments' ability to not only formulate but also implement policies and regulations that promote private sector development. To improve quality of governance, governments should: foster transparency and accountability which can be primarily achieved through data availability and usability; setting up official monitoring institutions that are inclusive; engaging both the general public and civil society in decision making.

In improving market conditions, it is important to consider that GDP per capita is also a function of economic growth. Governments in SSA should implement policies that also foster economic growth, like reduction in the tax rate (both business and personal income tax) to increase the savings rate leading to increased aggregate supply hence real output growth. High debt levels are

seen to lead to more PPP investment since governments cannot afford to invest in infrastructure, hence resort to PPPs for infrastructure development. The debt levels should be treated with caution as beyond certain debt level, more debt will be detrimental to economic growth.

5.4 Study Limitations

Finally, we acknowledge that there are some limitations to this study, especially in relation to the data. The World Bank PPI database collects data from major news sources, databases, and government websites and this may not capture projects not reported in these sources leading to omission of some observations. Also, there are data gaps for the total investment amounts which led to underestimation of total investments in some periods. However, this database is the most comprehensive source of PPI data for developing countries. The determinants of PPP activity are not limited to those addressed in the study. Due to the nature of the available data, the study could not include project specific explanatory variables, and this could be a direction for future research.

References

African Development Bank. (2018). *African Economic Outlook: Macroeconomic Development and Structural Change: Infrastructure and its Financing.* Abidjan.

Akitoby, B. (2005). Empirical Evidence of the Sources of Hyperinflation and Falling Currency. In J. A. Clement, *Postconflict Economics in Sub-Saharan Africa, Lessons from The Democratic Republic of Congo* (pp. 226-235). International Monetary Fund. Retrieved from https://www.elibrary.imf.org/view/books/071/05359-9781589062528-en/ch09.xml?tabs=fulltext

APMG International. (2016). The APMG Public Private Participation (PPP) Certification Guide. Washington DC: World Bank Group. Retrieved December 02, 2021, from https://ppp-certification.com/sites/www.ppp-certification.com/files/documents/chapter-1-ppp-introduction-and-overview.pdf

Asante, Y. (2000). Determinants of Private Investment Behaviour. *No. 100*. Nairobi, Kenya: African Economic Research Consortium.

Banerjee, S. G., Oetzel, J. M., & Ranganathan, R. (2006). Private Provision of Infrastructure in Emerging Markets: Do Institutions Matter? *Development Policy Review, 24*(2), 175-202.

Banerjee, S., Wodon, Q., Diallo, A., Pushak, T., Uddin, H., Tsimpo, C., & Foster, V. (2008). *Access, Affordability, and Alternatives : Modern Infrastructure Services in Africa.* Washington DC: World Bank. Retrieved from https://openknowledge.worldbank.org/handle/10986/12558

Basilio, M. (2017). The Degree of Private Participation in PPPs: Evidence from Developing and Emerging Economies. *The Emerald Handbook of Public -Private Partnerships in Developing and Emerging Economies*, 81-111.

Blankeship, M., & Golubski, C. (2021, June 18). Figure of the Week: Increasing Access to Electricity in Sub-Saharan Africa. *Tracking SDG 7: The Energy Progress Report*. Retrieved from https://www.brookings.edu/blog/africa-in-focus/2021/06/18/figure-of-the-week-increasing-access-to-electricity-in-sub-saharan-africa/

Brinkerhoff, D., & Brinkerhoff, J. (2011). Public-Private Partnerships: Perspectives on Purposes, Publicness, and Good Governance. *Public Administration and Development, 31*(1), 2-14.

Calderón, C., & Servén, L. (2008). *Infrastructure and Economic Development in Sub-Saharan Africa.* Washington, DC: The World Bank.

Cangiano, M., Anderson, B., Allier, M., Petrie, M., & Hemming, R. (2006). *Public-Private Partnerships, Government Guarantees, and Fiscal Risk.* International Monetary Fund.

Cann-Tamakloe, R. (2008). An Empirical Analysis of Macroeconomic and Political Determinants of Private Investment in Sub-Saharan Africa. *Doctor of Philosophy (PhD), desertation*. Old Dominion University .

Chikaza, Z., & Simatele, M. (2021). Private Financing for Infrastructural Development: A Search for Determinants in Public-Private Partnerships in SSA. *Acta Universitatis Danubius Oeconomica, 17*(6), 107-188.

Desai, R. M. (2019). Somalia's path to stability. *Future Development*. Brookings.

Farlam, P. (2005). *Assessing Public Private Partnershps in Africa.* South African Institute of International Affairs.

Gauld, R. (2016). Principal-Agent Theory of Organizations. (A. Farazmand, Ed.) *Global Encyclopedia of Public Administration, Public Policy, and Governance*. Retrieved from https://doi.org/10.1007/978-3-319-31816-5_72-1

Gerrard, M. B. (2001). Public Private Partnerships: What are Public Private Partnernerships and How Do They Differ from Privatization. *Finance and Development, 38*(3), 441-451. Retrieved 1 14, 2022, from https://www.elibrary.imf.org/configurable/content/journals$002f022$002f0038$002f003$002farticle-A014-en.xml?t:ac=journals%24002f022%24002f0038%24002f003%24002farticle-A014-en.xml

Gil, N., Stafford, A., & Musonda, I. (2019). *Duality by Design: The Global Race to Build Africa's Infrastructure.* Cambridge University Press.

Green. (2018). *Econometric Analysis* (8th ed.). New York: Pearson Education.

Hammami, M., Ruhashyankiko, J. F., & Yehoue, E. B. (2006). Determinants of Public-Private-Partnerships in Infrastructure. *IMF Working Paper*. Roland Daumont.

Heitzig, C., Ordu, A. U., & Senbet, L. (2021). *Sub_Saharan Africa's Debt Problem: Mapping the Pandemic's Effect and the Way Forward.* Africa Growth Initiative at Brookings.

Ismail, S. (2014). Driving Forces for Public Private Partnerships in Malaysia and a Comparison with the United Kingdom. *Journal of Economic and Administrative Sciences, 30*(2), 82-95.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial behaviors, agency costs and agency structure. *Journal of Financial Economics, 3*(4), 305-360.

Jolliffe, I. (2002). *Principal Component Analysis Second Edition.* New York: Springer-Verlag.

Jolliffe, I. T., & Cadima, J. (2016). Principal Component Analysis: a review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 374*(2065). Retrieved from https://royalsocietypublishing.org/doi/pdf/10.1098/rsta.2015.0202

Jorgenson, D. W. (1971). Econometric Studies of Investment Bebavior: A Survey. *Journal of Economic Literature, 9*(4), 1111-1147. Retrieved from http://www.jstor.org/stable/2721137

Kang, S., Mulaphong, D., Hwang, E., & Chang, C. (2018). Public Private Partnerships in Developing Countries: Factors for Successful Adoption and Implementation. *International Journal of Public Sector Management, 32*(4), 334-351.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). *"The Worldwide Governance Indicators : A Summary of Methodology, Data and Analytical Issues". World Bank Policy Research Working Paper No. 5430.* Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130

Kwame, B. A. (2017). Public-Private Partnerships in Infrastructure Provision: Key Determinants for Private Sector Engagement in Sub-Saharan Africa (SSA). KDI School of Public Policy and Management.

Leibenstein, H. (1966). Allocative Efficiency vs "X-Efficiency". *American Economic Review, 56*(3), 392-415.

Liu, J., Love, P. E., J, S., Regand, M., & Davis, P. R. (2014). Life Cycle Critical Success Factors for Public-Private Partnership Infrastructure Projects. *Journal of Management in Engineering, 31*(5).

Liu, T., Wang, Y., & Wilkinson, S. (2016). Identifying Critical Factors Affecting the Effectiveness and Efficiency of Tendering Processes in Public-Private Partnerships (PPPs): A Comparative Analysis of Australia and China. *International Journal of Project Management, 34*(4), 701-716.

Mengistu, T. (2018). Determinants of Private Participation in Infrastructure in Low and Middle Income Countries (LMICs). Doctoral Fellow: Pardee RAND Graduate School. Retrieved from http://www.umdcipe.org/conferences/GovernmentCollaborationShanghai/Submitted_Papers/Mengistu_Fellow_Paper.pdf

Mo Ibrahin Foundation. (2018). *Public Service in Africa.*

Mosrozo, M., Araya, G., Ruiz-Nunez, F., & Schwartz, J. (2014). Institutional and Political Determinants of Private Participation in Infrastructure. *Discussion Paper 2014-15. International Transport Forum. OECD/ITF 2014*. Washington D.C: Word Bank.

Mukhopadhyay, A. (2022, February). The Search for Sustainable Solutions to Debt Accumulation in Sub-Saharan Africa. *ORF Occasional Paper*(349).

N'gan'ga, N. W., & Kisimbii, J. B. (2018). Determinants of Private Sector Participation in the implementation of public private partnerships projects in Kenya: A survey of public-private partnerships based in Mombasa County. *International Academic Journal of Information Sciences and Project Management, 3*(2), 137-157.

Ngoma, G., Bonga, W. G., & Nyoni, T. (2019). Macroeconomic Deternimants of Private Investment in Sub-Saharan Africa. *Journal of Economics and Finance, 4*(3), 01-08.

Nirupama, K. (2009). A Survey of Payment Mechanisms for Public-Private-Partnership Transportation Projects: Comparisons of the US, India, and Mexico. *The Leonard N. Stern School of Business*. New York: Glucksman Institute for Research in Securities Markets.

OECD. (2006). Madagascar. *African Economic Outlook*, p. 311.

OECD. (2008, May 21). *OECDiLibrary*. Retrieved January 14, 2022, from https://www.oecd-ilibrary.org/governance/public-private-partnerships_9789264046733-en

OECD/ACET. (2020). *Quality Infrastructure in 21st Century Africa: Accelerating and Scaling up in the Context of Pida (2021-30).*

Osei, M. J., & Kim, J. (2020). Foreign Direct Investment and Economic Growth: Is More Financial Development better? *Economic Modelling, 93*, 154-161.

Pesaran, M. H. (2015). *Time Series and Panel Data Econometrics.* Oxford: Oxford University Press.

Prats, J., Harris, H., & Paez, J. A. (2021). Political Determinants of Public-Private Partnrships. Inter-American Development Bank. Retrieved from https://publications.iadb.org/publications/english/document/Political-Determinants-of-Public-Private-Partnerships.pdf

Rosen, H., & Gayer, T. (2013). *Public Finance* (9th ed.). New York: Irwin/McGrow-Hill.

Saussier, S., & de Brux, J. (2018). *The Economics of Public-Private Partnerships: Theoretical and Empirical Developments.* Switzerland: Springer.

Skietrys, E., Raipa, A., & Bartkus, E. V. (2008). Dimensions of the Efficiency of Public-Private Partnership. *Engineering Economics, No 3*(58), 45-50.

Song, J. Y. (2018). The Determinant of Private Sector Participation in Infrastructure Development: A Study of the Region of Asia-Pacific. *Ph.D Thesis, University of Turin, Italy*. Retrieved from Song, Judy Yueh Ling, The Determinant of Private Sector Participation in Infrastructure Development: A Study of the Region of Asia-Pacific (Decemhttp://dx.doi.org/10.2139/ssrn.3320522

The Infrastructure Consortium for Africa. (2018). *ICA Report-2018: Infrastructure Financing Trends in Africa.* Cote d'Ivoire. Retrieved from https://www.icafrica.org/fileadmin/documents/IFT_2018/ICA_Infrastructure_Financing_Trends_in_Africa_-_2018_Final_En.pdf

UN. (2019, March 19). UN World Water Development Report 2019: 'Leaving no one behind'. Retrieved from https://www.unwater.org/world-water-development-report-2019-leaving-no-one-behind/#:~:text=Wide%20disparities%20between%20the%20rich%20and%20the%20poor&text=In%20Sub%2DSaharan%20Africa%2C%20only,the%20rich%20and%20the%20poor.

UNDESA. (2019). *World Population Prospects.* New York: United Nations. Retrieved from https://population.un.org/wpp/Publications/Files/WPP2019_Highlights.pdf

World Bank. (2020). *Private Participation in Infrastructure: 2020 Annual Report.* The World Bank. Retrieved December 02, 2021, from https://ppi.worldbank.org/content/dam/PPI/documents/PPI_2020_AnnualReport.pdf

World Bank. (2021, April). About Public Private Partnerships. Retrieved December 02, 2021, from https://ppp.worldbank.org/public-private-partnership/about-us/about-public-private-partnerships

World Bank Group. (2019). *Retension and Expansion of Foreign Direct Investment: Political Risk and Policy Responses.* Washington DC. Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/33082/Political-Risk-and-Policy-Responses.pdf?sequence=1&isAllowed=y

World Bank. (n.d.). *Infrastructure Finance, PPPs and Guarantees: Private Participation in Infrastructure (PPI) - World Bank Group*. Retrieved February 10, 2022, from https://ppi.worldbank.org/en/ppidata

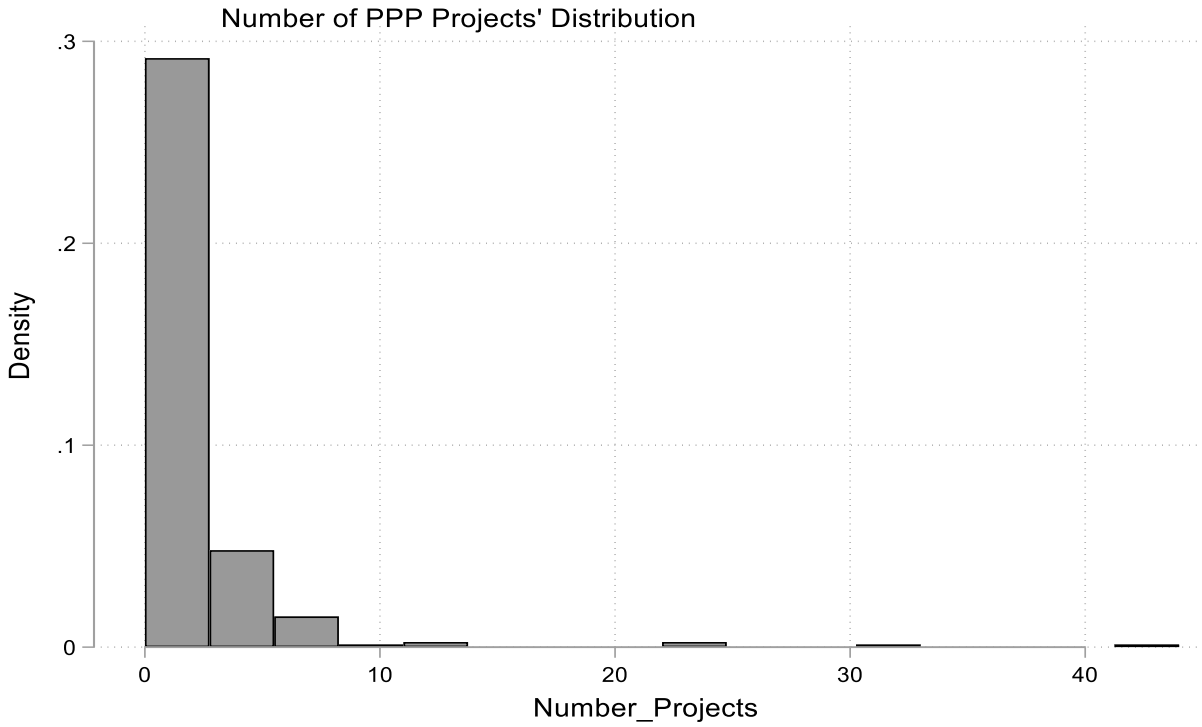
World Economic Forum. (2019). *The Sub-Saharan Africa Risks Landscape.* Switzerland. Retrieved from https://www3.weforum.org/docs/WEF_The_Sub-Saharan_Africa_Risks_Landscape_report.pdf

Yescombe, E. R. (2017). *Public-Private Partnerships in Sub-Saharan Africa: Case Studies for Policy Makers.* Dar es Salaam: UONGOZI Institute.

Yurdakul, H., Kamas, R., & Yazar Oztu, T. (2021). Macroeconomic drivers of Public Private Partnership (PPP) projects in low income and developing countries: A panel data analysis. *Borsa Istanbul Review*. Retrieved from https://doi.org/10.1016/j.bir.2021.01.002

Appendices

Appendix 1: Distribution of Number of Projects



Source: Own calculations using data from the PPI database

Appendix 2: List of Countries Included in the Study

Country	Income Group	Region
Chad	Low Income	Central Africa
Sudan	Lower Middle Income	East Africa
Comoros	Low Income	East Africa
Ethiopia	Low Income	East Africa
Kenya	Lower Middle Income	East Africa
Madagascar	Low Income	East Africa
Mauritius	Upper Middle Income	East Africa
Mozambique	Low Income	East Africa
Rwanda	Low Income	East Africa
Somalia	Low Income	East Africa
Tanzania	Low Income	East Africa
Uganda	Low Income	East Africa
Malawi	Low Income	Southern Africa
Namibia	Upper Middle Income	Southern Africa
South Africa	Upper Middle Income	Southern Africa
Zambia	Lower Middle Income	Southern Africa
Zimbabwe	Low Income	Southern Africa
Angola	Upper Middle Income	South-Western Africa
Benin	Low Income	West Africa
Burkina Faso	Low Income	West Africa
Cameroon	Lower Middle Income	West Africa
Cape Verde	Lower Middle Income	West Africa
Congo, Dem. Rep.	Low Income	West Africa
Congo, Rep.	Lower Middle Income	West Africa
Cote d'Ivore	Lower Middle Income	West Africa
Gabon	Upper Middle Income	West Africa
Gambia, The	Low Income	West Africa
Ghana	Lower Middle Income	West Africa
Guinea	Low Income	West Africa
Liberia	Low Income	West Africa
Mali	Low Income	West Africa
Mauritania	Lower Middle Income	West Africa
Nigeria	Lower Middle Income	West Africa
Senegal	Lower Middle Income	West Africa
Sierra Leone	Low Income	West Africa
Togo	Low Income	West Africa