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Are Public Private Partnerships catalysing economic growth in Sub-Saharan Africa?

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By

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ABSTRACT

Governments in Sub-Saharan Africa are experiencing increased pressure to find quick, efficient solutions to the challenge of maintaining, improving and investing in new infrastructure. A range of funding options to finance infrastructure development has been used, however fiscal capacity constraints have become a challenge. To balance availability of funding and economic development constraints, governments in Sub-Saharan Africa have had to find alternative funding methods. Public private partnerships, as an alternative method, have gained prominence in Sub-Saharan Africa. This study therefore explores the notion of the catalytic effect of public private partnerships on economic growth in Sub-Saharan Africa. This study uses unbalanced fixed panel data methodology over a cross section of infrastructure projects across Africa. Data obtained over the period 1994 – 2015 is assessed for the catalytic effects of public private partnerships on economic growth.

The results of the empirical analysis indicate that PPPs in SSA over the period tested in the study do have an influence and impact on economic growth. However, the effect of PPPs on economic growth was observed to depend on the proxy used, with significant effect only found when the number of PPPs is employed. The results of the study therefore imply that the PPPs examined here do catalyse economic growth in SSA.

Recommendations for future studies include: a further probe into which infrastructure financing method in SSA has the most positive catalytic effect in economic growth. The extent of the impact of unmitigated negative externalities created by the implementation of infrastructure projects financed by PPP arrangements.

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GLOSSARY OF TERMS

AfDB	African Development Bank
ASGISA	Accelerated and Shared Growth Initiative for South Africa
CPI	Consumer Price Index
FE	Fixed Effects
GDP	Gross Domestic Product
HDI	Human Development Index
IMF	International Monetary Fund
OECD	Organisation for Economic Cooperation and Development
PPI Database	Private Participation in Infrastructure Database
PPPs	Public Private Partnerships
RE	Random Effects
RNI	Rate of Natural Increase
SARB	South African Reserve Bank
SSA	Sub–Saharan Africa
SDG	Sustainable Development Goals
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNCTAD	United Nations Conference on Trade and Development

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2 CHAPTER ONE: INTRODUCTION

2.1 RESEARCH AREA

The quality and form of existing infrastructure in Africa is generally regarded as below the appropriate standard required in order to sustain significant economic growth in a developing continent. Several governments across the continent have prioritised stimulating economic growth. The above priority is aligned to the United Nations 2015 Sustainable Development Goals, which are focused on poverty alleviation, protecting the planet, and ensuring prosperity for all.

The African Development Bank (AfDB), whose 2013-2022 strategy makes infrastructure development one of its five operational priorities, notes that "Africa still has massive infrastructure needs" yet invests only 4% of its gross domestic product (GDP) in infrastructure, compared to China's 14% investment (Mitullah, Samson, Wambua & Balongo, 2016). Despite the high priority assigned to infrastructure development in many African countries, the results of a survey conducted by Afrobarometer indicate that the progress has been slow (Mitullah et al., 2016). Looking at challenges that face African governments, some of the contributors to slow progress could be due to limited government resources, capacity constraints and a combination of many structural legacy issues. As it stands, infrastructure built mostly in the 1960's and earlier is unable to sustain the growing demands placed on it and into the future. There has been nominal development since the 1960's and this inadequate infrastructure is struggling to keep up with the increasing demand.

According to the International Monetary Fund (IMF), the median level of government debt in Sub-Saharan Africa (SSA) will probably rise to more than 50 percent of gross domestic product in 2017 and 2018 forecast (IMF 2007). This debt level forecast will increase the strain on the financial sector and limit much needed stimulation for growth in SSA. High levels of public debt are draining to the fiscal purse. These debt-servicing costs could otherwise be focused on investments that stimulate economic growth. A combination of other factors such as country political environments, tribalism, corruption, short-termism, weak legal institutions, war and funding capacity also contribute to crippling a productive collaborative process of growing economies within the continent. However, over the past two decades, there has been robust growth in infrastructure investment on the continent. Sub-Saharan Africa is the fourth largest

recipient of Public Private Investment following 1) Latin America and the Caribbean; 2) Europe and Central Asia; 3) East Asia and Pacific (Gutman, Sy & Chattopadhyay, 2015). It is widely believed that the best strategy to boost economic activity in Africa is to improve the required investment in infrastructure.

Governments across the world understand that infrastructure development is necessary in order to provide basic services to households, key inputs to economic activity and growth (Zangoueinezhad & Azar, 2014). Furthermore, quality infrastructure provides greater benefits in producing productive and efficient output, thus has greater impacts on sustainability in economic growth (Ismail & Mayhideen 2015). In this study, economic growth is measured by looking at gross domestic product (GDP) of countries in SSA over the specified time. Gross domestic product is standardised as an economic indicator by the United Nations System of National Accounts, measuring the total output of goods and services of a state during a certain period of time (Tjukanov, 2011). It is a useful measure used to compare economic performances of countries in general terms. The effectiveness of GDP as an economic measure and alternative methods is discussed in Chapter 2.2.

Recent studies have shown that Africa remains one of the regions in the world with significant infrastructural deficit, both economic (e.g. transport, electricity and communication networks) and social (e.g. schools, hospitals), due to lack of resources to finance their construction (Mfunwa, Taylor & Kreiter, 2015). There is an urgent need to improve infrastructure on this continent, but one of the biggest challenges is limited resources to fund these projects. Governments have had to be creative and find innovative ways of balancing constrained financial resources with providing public services in an efficient manner to enable economic growth. There are numerous methods of funding these investments; one of them is through the use of Public Private Partnerships (PPPs).

The term 'public private partnerships' has gained popularity and frequent mention in academic, policy making and media forums in recent years. The public-private partnership concept has deep roots in urban economic development in the United States and had also been growing in some developing countries, becoming a worldwide phenomenon (Xie & Stough, 2002).

For the purposed of this study, PPPs are defined as any contractual arrangement between a public entity, or authority, and private entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility (Dintilhac, Ruiz-Nuñez & Wei, 2015). The private sector provides the service in exchange for specific economic

benefits over a specified period of time. Infrastructure development is also one of the key development areas stated in the United Nations (2011) Millennium Development Goals Report that outlines a framework to be used to alleviate poverty across the world. The underlying principle in accomplishing these sustainable development goals (SDG's) implies vibrant economic activity in the relevant countries. Due to limitations and constraints experienced by all stakeholders involved, it is logical why a negotiated collaboration has become a popular solution. PPPs are used as a powerful tool to address some of the funding challenges Africa has regarding infrastructure development.

There is a wide range of financing mechanisms that have been in use to fund public infrastructure going back centuries. Most infrastructure finance transactions draw on a selection of local and international funding sources. These include, but are not limited to: syndicated commercial bank loans, bond issuances, equipment leasing, multilateral and export credit agency loans or guarantees, and equity commitments by project promoters and dedicated equity funds (Dailami, 2004). Most financing structures used ought to ensure access to local and international capital markets and to enhance efficiency by reducing overall financing costs (Narayanaswamy, Blitzer & Carvajal, 2017).

The following is a brief consideration of different alternative financing methods:

Local currency bond financing:

Financing of infrastructure projects in this manner has the important advantage of avoiding the currency risk that can arise when a project generating revenues in the domestic currency has foreign currency–denominated debt service requirements (Verdouw, Uzsoki & Ordonez 2015). To minimise currency risk, one may argue that hedging can be used. However, hedging comes at a cost and could be very expensive if it has to be implemented over the long tenure of most infrastructure projects. The challenge, as seen in the Asian region, is the small size of domestic finance sectors, particularly non-bank institutional investors, relative to the needed infrastructure investment (Asian Development Bank, 2015).

Project Bonds:

This is a special type of debt issuing, to finance part or the entire project. The key difference here to a general bond is that repayments are dependent on the success of the project. This presents risks for both the issuer of the instrument and the investor. Project bonds offer

opportunities to institutional investors to participate in infrastructure projects that have a potential to yield superior risk adjusted returns. The challenge with project bonds is that they may not be attractive to investors who are risk averse, and risk is inherently higher in the construction industry. Project bonds have been widely used in America and Europe, and Africa has had three project bonds successfully implemented in Kenya, Nigeria and South Africa.

Traditional Bank Lending:

The loan markets have been slowly recovering since the 2008 financial crisis. However, Basel 111 rules are more stringent on banks, particularly around long term funding. As a result of capital adequacy and insolvency requirements imposed by Basel 111, the appetite for banks to partake in financing long term projects has diminished. Financial institutions have also become cautious when it comes to risk following the costs of the 2008 financial crisis.

Equity Finance

Equity financing means exchanging a portion of the ownership of the business for a financial investment in the business (Hofstrand, 2013). Investors are motivated to maximise total return on equity, either through dividend yield or private equity investors through their exit strategy. The key challenge in raising equity capital for infrastructure projects is the higher cost and higher risk. Project sponsors may also be reluctant to dilute their ownership in the future asset.

Hybrid Debt/Equity Instruments:

Hybrid instruments such as mezzanine finance are debt instruments with equity-like participation, thus forming a bridge between debt and equity instruments. The advantage of this type of finance is that it allows the owner seeking funding to obtain the funds required while giving up little or no ownership of the company, as long as there are sustainable cash flows to make the debt repayments timeously. The disadvantage is that the lender takes greater risk than traditional lenders with no collateral and therefore interest rates are usually much higher, as lenders seek higher returns. Also, lenders will generally seek a good track record of profitability from the project developer.

Other alternatives to private-sector involvement have been tried. Some countries have tried to ‘corporatise’ public utilities – that is make them behave like private corporations – by ending subsidies, imposing professional boards and requiring performance contracts and formal performance contracts (Farlam, 2005). These attempts have been ‘largely unsuccessful’, since

governments ‘found it difficult to both impose financial discipline on, and give financial autonomy to, public enterprises, and they continued to give multiple policy objectives to managers of these companies’ (Farlam, 2005). As discussed above, there are real limitations presented by each of the traditional funding methods.

The challenges can be also seen as motivation for PPPs as mostly the preferred choice to finance infrastructure spend. PPPs are considered to be a potential significant force for powering economic growth and development (Zangoueinezhad & Azar, 2014). Due to the above discussed traditional structuring arrangement limitations, to partner with the private sector has been seen as an attractive solution. These finance arrangements are seen as key methods that can be used to bridge the infrastructure gap. However, SSA receives only a small share of private infrastructure investment available globally. This is due to, but is not limited to, low or non-existent sovereign credit ratings, limited capacity of local financial markets, and higher risks arising from longer pay-out periods and susceptibility to political interference and regulatory risks (African Capacity Building Foundation, 2016). Over the years, more innovative financing methods and structures have been developed that include, but are not limited to: local currency infrastructure bonds, inflation linked bonds, commodity linked bonds and public private partnerships. The spend on infrastructure in Africa currently is about $30 billion annually, and only one third of this amount which finances new projects comes from domestic public sources (African Capacity Building Foundation, 2016). The balance comes from a combination of private capital together with development aid organisations like the International Monetary Fund (IMF), whose primary goal is to safeguard and stabilise international monetary systems that encourage growth. The growing private sector flows however, is not evenly balanced across all sectors that need to be developed to enhance stability and support sustainable economic growth. According to the African Capacity Building Foundation (2016), recent growing private capital flows are significantly directed towards the telecommunications sector (75 percent) while neglecting other sectors. This investment bias towards certain sectors is one of the reasons why other innovative financing methods like PPPs continue to gain traction.

According to the European Investment Bank (2010), the growth and spread of PPPs around the world is closely linked to the development of project finance, a financial technique based on lending against the cash flow of a project that is legally and economically self-contained. The recent global economic and financial crisis has also left a deep mark on the supply of infrastructure finance, which requires finance for longer maturities of these projects. Funding

difficulties in the public sector have played a major role in contributing to the inclusion of private participation. Overlaying economic challenges, constraints with traditional means of financing infrastructure projects, and recent financing trends, PPPs as a source of finance, make a significant case to be evaluated. A paper on financing infrastructure in Africa by Gutman et al. (2015) states the following facts based on data observed:

The overall numbers of external financing sources indicate four significant trends: All major sources of external financing have appreciably increased their annual commitments. From $5 billion in 2003, commitments have risen to almost $30 billion per year in 2012. ODF investments, though not as dominant a source of infrastructure financing in sub-Saharan Africa as in the 1990s, have grown appreciably since 2007 and represents 35 percent of external financing (National Treasury, 2007). Private Participation in Infrastructure (PPI) has been the largest financing source since 1999—accounting for more than 50 percent of all external financing. Its overall level has remained remarkably stable and unaffected by the recession in 2008. Official investments from China have increased from what was virtually insignificant to about 20 percent of these three main sources of external finance (Gutman, Sy & Chattopadhyay 2015).

Private investment partnering with the public sector therefore seems to be dominating recent financing trends. In 2013, PPI in all of Sub-Saharan Africa grew by 16 percent to reach $14.9 billion (from $12.8 billion in 2012), its highest level since the financial crisis in 2008 (Gutman et al., 2015). It therefore seems reasonable that financing trends are moving towards the inclusion of the private sector, given the abovementioned constraints faced by the public sector. It therefore becomes important to evaluate this trend and the impact of these partnerships as the alternative to traditional financing methods. PPP contractual agreements are highly complex, significant amounts are invested in these projects and require high levels of technical expertise. It therefore becomes pertinent to assess whether all this investment and effort facilitates the desired outcome required by governments, ultimately to stimulate economic growth. This study therefore narrowly focuses on PPPs as a financing method with the intention of facilitating sustainable economic growth. This paper does not suggest in any way that PPPs are the most suitable procurement option for all infrastructure projects. Instead, Farlam (2005) advocates for the utilisation of principles that underlie, namely affordability, value for money and risk transfer in order to stimulate economic growth. This is not a comparative study of the different financing structures available for infrastructure projects, but an analysis of how projects financed using PPP structuring arrangement can be catalysts to economic growth in Africa.

2.2 PROBLEM STATEMENT

The benefits of PPPs mentioned above have resulted in several industrialised and emerging markets such as Canada, Ireland, Netherland, United Kingdom, Brazil and South Africa using PPP arrangements. We have seen, in recent years, PPPs being the prominent structuring arrangement to deliver infrastructure around the world. There is very little empirical evidence that exhibit how the beneficiary economies respond to these infrastructure investments financed with PPP arrangements in SSA. An important question to be answered is whether this form of financing delivers the desired stimulation in economic growth in SSA. In developing countries and especially in SSA, a comprehensive infrastructure development plan is required, as it is believed to stimulate long term economic growth activity and create employment. This economic activity should address income inequality and socio-economic needs. De Haan, Romp and Sturm (2007) confirm that public capital represents the wheels, if not the engine, of economic activity.

Recent increased investment flows in Africa have generally been towards infrastructure in the energy sector, particularly electricity, followed by telecommunications, water utility infrastructure and natural gas. These investments are closely aligned with governments' priority to provide basic needs and address socio-economic gaps. The private sector is working together with governments to provide the capital required and efficient execution that these types of long term projects require. PPPs may not be appropriate in all cases of infrastructure development despite their advantages. However, without sufficient empirical evidence that evaluates the value of PPPs in an economy, it makes it difficult to assess them in a robust manner. This study seeks to empirically test the catalytic effects of PPP arrangements in SSA economies.

2.3 PURPOSE AND SIGNIFICANCE OF RESEARCH

This study seeks to understand whether the empirical evidence of numerous PPP contractual agreements in SSA, influence increased economic activity which results in economic growth. The physical infrastructure enabled by these PPP contracts is important, but what becomes critical is to demonstrate their economic impact reach. One of the reasons given by the previous South African Finance Minister, Trevor Manuel, in a working paper written in 2007, examining why use PPP contracts in South Africa was that PPPs are an important service delivery mechanism (National Treasury, 2007). They can facilitate rapid infrastructure delivery as

envisaged under the Accelerated and Shared Growth Initiative for South Africa (ASGISA) at a better value for money than traditional procurement (National Treasury, 2007). It is critical for developing countries to identify quick win factors that can be leveraged to facilitate economic growth. This study seeks to highlight the key drivers that can be tactically implemented and those that will be strategic over the long term.

For country governments to convince private sector organisations to invest with them in big infrastructure projects, they need to persuade them with valid possible economic performance indicators. Broader understanding of the catalytic effects of PPP agreements on economies provided by scholars will facilitate informed decisions by both public and private sector partners. This study seeks to contribute to the body of knowledge specific to the African region and to address the existing knowledge gap. The findings of this report would be of utmost interest to African governments whose priority is to develop lagging infrastructure in their countries as a vehicle to foster economic growth. Private investors who are interested in partnering with governments in emerging markets would appreciate insights provided by this study. Further, multinational development funding institutions like the IMF, World Bank, etc. would be interested in validating their investment decisions on capital spent already in SSA. The different professional advisors on PPP arrangements should also find value in this study, as some of the recommendations are based on empirical evidence tested. The general public with a keen interest on investment opportunities within the continent and which economies demonstrate growth and why will also be interested.

2.4 RESEARCH QUESTIONS AND SCOPE

This study assesses the catalytic effects of PPPs on economic growth in SSA. As the scope of PPP agreements has evolved over time since the first infrastructure project was implemented in Africa, the nature of catalytic effects is also expected to evolve. The impact of the catalytic effects is also noticeable at a different pace and experienced differently depending on the economic circumstance of each country. The leading research question this study seeks to answer is stated as follows:

Are Public Private Partnerships catalysing sustainable economic growth in Sub-Saharan Africa?

Given the broad scope of this question and the different approach that can be taken, the following specific research questions are answered as part of this study specific to SSA:

1. *How have PPPs evolved over time in SSA?*
2. *Do PPP financing agreements have catalytic effects on economic growth in SSA?*

The specific objectives forming the basis of this research are as follows:

1. To examine the development trend of PPPs in SSA over the study period (1994 – 2015)
2. To examine the effect of PPPs on the economic growth in SSA over the study period (1994 – 2015).

2.5 HYPOTHESIS

The study employs quantitative data and econometric techniques to answer the above questions. Following the abovementioned objectives and questions, the following research hypotheses were developed:

Null Hypothesis: *Public private partnerships have no significant catalytic effect on economic growth in SSA.*

Alternative Hypothesis*: Public private partnerships have significant catalytic effect on economic growth in SSA*

2.6 RESEARCH ASSUMPTIONS

The following assumptions have been made during the course of exploring this topic:

- This research assumes that the majority of infrastructure projects entered into in SSA using PPP contractual agreements over the past two decades have been captured by the PPI World Bank Database.
- This study includes projects with Concluded, Active, Cancelled and Distressed status. The assumption is all projects started, do make a contribution to economic growth regardless of their stage and status.

2.7 STRUCTURE AND ORGANISATION OF THE STUDY

This research paper is structured as follows, an analytical review and understanding of existing literature and body of knowledge is presented in *Chapter 2*. The body of knowledge presented mainly focuses on empirical evidence available that demonstrates a transformation of SSA

economies that have used PPPs as a financing vehicle. However, one of the challenges encountered is that very limited literature and empirical evidence exists on the impact of PPPs specifically on SSA economies. Ample studies available focus on Asia, Europe and the United States of America. These studies are included in the scope of this research as there are similarities and lessons to be learned. The following section in *Chapter 3* covers the research methodology used. The methodology approach is explained in detail, the estimation approach used to select data and the regression models used to analyse data are described. The validity and reliability of this type of study is addressed. Key limitations of the study are also highlighted and discussed. The research findings and analysis are discussed in *Chapter 4.* In closing, *Chapter 5* addresses the research conclusion and recommendations for future studies.

3 CHAPTER TWO: LITERATURE REVIEW

3.1 INTRODUCTION

Aschauer (1989) pioneered seminal work in the United States of America which found that non-military public capital stock is dramatically more important in determining productivity. His work provoked strong interest which was followed by three decades of research done on the impact of infrastructure on economic growth. The Aschauer model constitutes a classical production function approach and can be criticised as not accounting for the appropriate causalities and correlations (Röller & Waverman, 1996). The increasing attractiveness of PPPs in developing economies has made it vital for scholars to learn and discover the catalysing impact of these agreements on the affected economies. Evidence suggests that the more PPP projects launched in a nation, the higher the rate of GDP growth (Zangoueinezhad & Azar, 2014). This is expected; as such projects inject significant capital into the economy while providing long-term employment opportunities.

One of the challenges faced regarding this topic is that the majority of evaluations done on PPPs are case studies based on specific projects. This makes it difficult to generalise outcomes and results across all PPP contracts. These projects are in different geographical regions that have varied circumstances. There are numerous studies that have established a strong and positive relation between public infrastructure and economic productivity in the private sector (Zangoueinezhad & Azar, 2014). Two forms of infrastructure are the focus of this study: economic infrastructure and social or human development infrastructure. Oluwasanmi and Ogidi (2014) state that economic infrastructure consists of public utilities such as postal services, telecommunications, water supply, waste disposal, and power, public works such as roads, dams, waterway dredging, canals for farming and irrigation, and drainage; and transportation, such as road transportation, railways, seaports, and airports. Social infrastructure includes child welfare, care for the aged and disabled, healthcare delivery and education. Economic activity in a country is expected to improve the overall wellbeing of its citizens economically and socially to translate into economic growth.

This chapter follows the following sequence: PPPs are briefly introduced and the key role they play in an economy. Existing literature on the different views presented on the role played by PPPs is next. Followed by a specific sector investment analysis. Literature on PPPs is also explored including the link to economic growth. The last section is a concluding summary.

3.2 INTRODUCING PUBLIC PRIVATE PARTNERSHIPS

According to neoclassical economic theory and the theory of state failure, competitive markets are essential for efficient resource allocation and service production and for the responsiveness of urban services to consumers (Xie & Stough, 2002). This is one of the many reasons why public private partnerships were developed in urban economic development. The increased competition from the private sector encourages the public sector to adopt new technology in a timely manner and enhances the quality and efficiency of services provided.

As cited in Dintilhac et al. (2015), under the right circumstances, PPPs can mobilise additional sources of financing for infrastructure. Public sector policy makers have a tough challenge of balancing the rising demands on inadequate infrastructure, lack of capital, manpower and expertise. Various empirical research and technical evidence available concurs that indeed, better quantity and quality of infrastructure can directly raise the productivity of human and physical capital. Increased productivity translates into growth (i.e. by providing access, roads can improve education and markets for farmers' outputs, cutting costs, facilitate private investment, improve jobs and income levels for many) (Estache & Garsous, 2012). Links between infrastructure developments are well established, including the impact of infrastructure on poverty alleviation, equality, growth and specific development outcomes such as job creation, market access, health and education responsibility (Dintilhac et al., 2015).

For the purposes of this study, economic growth is defined as follows: it is the increase of GDP per capita or other measures of aggregate income, typically reported as the annual rate of change in real GDP (Zangoueinezhad & Azar, 2014). GDP is used as a proxy to identify economic growth. Economists broadly refer to three main drivers of economic growth, namely: accumulation of capital stock, increase in labour inputs such as workers or hours worked and technological advancement. Economists also distinguish between the short-term business cycle and the long run path of economic growth, the latter being the focus in this paper. Tjukanov (2011) put forward that one of the strongest arguments for using GDP is that it has been strongly adapted to our society, we know approximately what we are measuring and above all, it supports liberal goals; GDP does not guide us in what we do, but rather tells us what we can do. "It fits a liberal, pluralistic society where people have different interests, preferences and attitudes to well-being and the meaning of life" (Norberg 2010: 8).

This study looks at GDP as a measure of economic growth; it is however important to acknowledge its shortcomings. GDP only measures physical inputs and outputs and disregards

other contributing factors that fall outside the above definition. Some of the known shortcomings to be highlighted are as follows:

- GDP does not account for goods and services that do not go through the formal organised market. This is important for developing countries as most of what is consumed is home brewed by entrepreneurs in informal markets.
- GDP does not account for negative externalities that can be destructive to an economy. Examples such as pollution, etc.
- The aspects of welfare and life-satisfaction are disregarded by GDP. This is not a problem of GDP, but more in the way that it is used (Tjukanov, 2011).
- Another limitation is its inability to capture the benefits of technology and innovation. The use of technology in our day-to-day activities has increased significantly. The value of convenience, efficiency and other benefits provided by technology that is available for free cannot be captured by GDP.
- GDP does not consider income distribution in any way. GDP sees a dollar for each person the same and if one person loses his income, the GDP figure remains unchanged, if the decrease is compensated by an increase in somebody else's income (Tjukanov, 2011). This shortcoming is significant in SSA where poverty levels remain higher than other developing regions and remain highly ranked among the most unequal in the world.

It is evident therefore that GDP on its own is no longer an adequate indicator that can be used when assessing the well-being of an economy. Some of the limitations discussed above validate a need for other indicators to be developed and taken into consideration, together with GDP. There are available alternative methods that have been developed already to assess a sustainable wellbeing of an economy. Some of the alternative methods include: GDP adjusted indicator like Green GDP which takes into account environmental factors, Index of Sustainable Economic Welfare (ISEW) which indicates the link between the economy, the environment and the society (Tjukanov, 2011). ISEW is adjusted for income inequality, costs of environmental degradation, depreciation of natural capital and defensive private expenditures (Tjukanov, 2011). These alternative indicators, assessed together with GDP, should provide a better all-encompassing economic well-being measure.

One of the independent variables that is tested in this paper to capture some non-physical output and input units is one called human development index (HDI), which is discussed in *Section*

3.4.5. Human development focuses on three essential components: a long and healthy life, knowledge, and "access to resources needed for a decent standard of living" because, "If these essential choices are not available, many other opportunities remain inaccessible" (UNDP 1990). The index measures three components: life expectancy at birth, years of average schooling in the adult population and gross national income per capita. When better utilities are developed to deliver basic services that people need for everyday life, people are healthier, live longer and have a sense of fulfilment. This variable is included to ensure the impact of externalities that are not in physical input and output form are considered.

Capital constraints and the inefficiencies in the public sector are a reality in most governments. Objectives to provide public goods and services must be met in order to stimulate economic growth. Many governments have elected to utilise PPPs as one their preferred solutions, to assist in tackling the abovementioned challenges they face.

The persuasive endorsement for PPPs is their ability to pool resources while creating robust partnerships. Bovaird (2004) concurs that a strong collaborative character may be instigated as an alternative approach to make the most of existing resources and competences — or, alternatively, in order to explore the potential for innovative approaches, bringing in new resources and competences. This can also be seen as the drive to harness partnerships for the empowerment of all people associated with public services — both internal empowerment and external empowerment.

3.3 EMPIRICAL LITERATURE

In a modern day capitalist economy, one wonders whether the economic system is neither private nor public. However, the two sectors actually depend on each other and work in a connected fashion. Some of the responsibilities of the public sector are to provide public infrastructure, laws that govern a country and create an enabling environment where markets can operate. The private sector provides the production and supply of goods and services and contributes to the government's tax revenues. The co-operation between the two sectors is at the heart of public private partnerships. It was only a matter of time before a working relationship was formalised. Formal PPPs are necessary, as both parties bring different and necessary skills and the allocation of resources efficiently. Due to the bespoke nature of PPPs, they take a wide range of forms. However, they operate within commonly known principles of a partnership where co-operation and risk is shared to achieve a specific purpose. The

differences in PPPs across the world are shaped by the domestic climate, which is influenced by the political landscape, socio-economic environment and cultural dynamics in each country. This makes these finance agreements unique and difficult to compare to form a general conclusion.

It was during the classical economist era where the likes of Adam Smith, Thomas Robert Malthus and David Ricardo laid the foundation by defining distinct roles between the public and private sectors. These economists had summarised the role of government and public intervention into the following categories: 1) Public goods basis: there are various public goods valuable to the society, but it is difficult to quantify the value for good use to be paid by consumers. Once the good is provided to one, it is available to the rest of the society. This includes goods such as roads, bridges, defence services, etc. These goods are also freely available to all citizens and cannot be exclusive. 2) Market failure rationale: this was deemed necessary for government to intervene to regulate market inequality. When markets do not self-regulate whenever the allocation of goods and services is in disequilibrium, government should intervene. 3) Equity or merit good argument: where it is argued that the government has to assure all the people have access to certain basic goods and services like education and health, regardless of their ability and willingness to pay for such services at market prices (Xie & Stough, 2002).

The above arguments present the underlying grounds for public intervention and private participation in the supply of goods and services. Consequently, these arguments provide validation for public-private partnerships. As stated in Xie and Stough (2002), the provision of urban and rural services does not exclusively belong to either the public or the private sectors.

De Haan et al. (2007) found that the effect of public investment differs across countries, regions, and sectors. This result is indeed the case in SSA; countries in the continent all have different historical backgrounds, different current challenges, legal institutions at different levels of maturity and financial markets at different stages. Due to the different characteristics of these economies, their response to public and private investment will be vastly different. Capital stocks are in short supply across most sectors and existing capital stock is in very poor condition due to low maintenance, demand is far greater than what the infrastructure can supply. It is therefore expected that new investment spending in capital stock will deliver newer, better quality capital stock that will have a significant evident impact to economic growth.

On the relationship between public capital and economic growth, there is evidence for reverse causality, hence not only might public investment stimulate growth, higher growth also often leads to higher demand for infrastructure (de Haan et al., 2007). This confirms the increasing trend of multiple PPP infrastructure projects in select countries in Sub-Saharan Africa. Private investors look for investment opportunities where other investors have gone before, and governments use existing projects as a tool to mobilise more private funds for increased infrastructure demand. Countries around the world have taken lessons from countries that have gone first in using PPPs for economic development. The urban revitalisation in the United States of America (USA) is regarded as an exemplary model. Successful examples of implemented PPPs were seen in the model developed in the United States which laid the foundations of incentives that encouraged the private sector to rebuild parts of Baltimore, Boston, Minneapolis and other cities (Xie & Stough, 2002).

One of the attributes of PPP contracts is the long-term investment period. This then requires that assets in question are adequately maintained to ensure their sustainability in offering the services required. Regular maintenance ensures job opportunities and providers contracted have job security over the contract period. To reduce transportation and transaction costs, it makes economic logic to employ domestic communities that reside around the construction site or area. Unemployment is therefore reduced, and income can be attributed to households that previously did not partake in economic activities. A research study conducted by Gassner, Popov and Pushak (2009) reinforces that there is higher labour productivity and operational efficiency in contracts where the private sector is involved, far outperforming public sector only delivery. Improvement in unemployment is one of the variables that contribute to a change in economic growth. The expectation is that a growing economy increases capacity to take in more people who are able and willing to work. This translates to increased production output and consumption, this activity has a direct positive effect on economic growth.

However, a different point of view from Gassner et al. (2009) argues that the labour productivity gains are linked to a reduction in staff numbers in both water and electricity infrastructure projects done using PPP contractual agreements. This observable fact is demonstrated in a specific case in Latin America (Estache, 2003) where economic reformers (government policy makers) should be more knowledgeable about the poor they seek to help. Once they understand who the poor are and the extent of their poverty, there is broader scope for winning decisions in infrastructure reform and many beneficial ways in which both the public and private sectors can co-operate. In developing countries, this is a delicate issue that often provokes resistance from politicians whose rhetoric is solutions for the poor. There needs

to be a careful balance in ensuring PPP contracts accommodate short term mitigating plans to protect the poor in the process of stimulating economic growth in order to create more employment. Even though staff reductions are over several years, less active participants in an economy would contribute negatively to the GDP growth over the same period. Despite the trend of staff reductions often introduced by the private sector, in the long-term it could be balanced by an increased number and value of PPP contractual investments in a specific economy over the same period of time. The Dintilhac et al. (2015) study is in agreement that the negative employment effects may be offset in the long term by increased employment among subcontractors to the utility (as services are contracted out), or because of faster sectoral growth triggered by reforms that trigger rapid market expansion.

The idea of private investment in public infrastructure could be seen as a conflict of mandate for the two partners (public and private). Theoretically, as governments maintain monopoly over public goods such as transport, water, energy and telecoms, they can take advantage of economies of scale, thereby reducing the cost to the public (Shediac, Abouchakra, Hammami & Najjar, 2008). However, due to social unrest, a shortage of skills in the public sector to manage and run big projects effectively, corruption, obsolete government technology and a myriad other inefficiencies; governments have had to find alternative effective funding mechanisms. The World Bank estimated that in the early 1990's, annual losses due to inefficiencies and unsustainable pricing policies were nearly equal to the annual investment in infrastructure in developing countries (Shediac et al., 2008). In fact, these partnerships can improve overall governance and operational efficiency. Shediac et al. (2008) mention the following benefits that can be expected with private sector involvement: 1) the introduction of private-sector governing principles minimises mispricing, cost overruns and lack of transparency; 2) the private sector's sustainable pricing policies and financial discipline provide for a larger pool of investment funds, thus eliminating the financial constraints that hamstring government entities; 3) more robust investment sources enable partners to meet increased demand and channel resources to previously underserved consumers; 4) private sector organisations can attract and offer new services based on their technical expertise and business development savvy.

The literature reviewed examined whether a relationship exists between the public and private sector, particularly relating to PPPs in SSA. A short background summary was given looking at why the public and private sector exist. Literature that gives an understanding of the

collaborative manner in which these two sectors operate was also presented. The formation and existences of PPPs is warranted. Literature looking at successfully implemented PPPs overseas is presented. The above presented literature outline confirms that the introduction of private sector governing principles to public sector processes results in overall efficiencies in delivering infrastructure projects. Literature on the impact of specific sectors to the economy is presented in the next section.

3.3.1 EMPIRICAL APPROACHES BY SIMILAR STUDIES

This section summarises the diversity of methodologies that have been in similar studies conducted across the world.

An empirical study conducted in Portugal was reviewed and it tests the macroeconomic impact of investment in public-private partnerships, public and private investment. The following methods are used: a VAR model with four variables: public and private investment, PPP investment and GDP, in the period 1998- 2013 (Pimentel et al., 2016). The results of this study found that investment in PPP leads to a crowding-out effect both in private and public investment and has a negative impact on GDP (Pimentel et al., 2016).

In another study conducted in the United States of America, the State of West Virginia, assessed the economic and environmental benefits of using PPPs to facilitate the development of the I-73/74 Corridor (Chi et al., 2012). This study used a Regional Economic Impact Model (REMI), a widely used tool for regional impact analyses; REMI can analyse complex scenarios that are beyond the capacity of a normal input-output analysis (Chi et al., 2012). The empirical results of this study found that the State of West Virginia is in a position to reap the economic and environmental benefits of using P3s to facilitate the development of the I-73/74 Corridor (Chi et al., 2012).

The methodology used in another study conducted to assess the economic impact of PPP projects in Canada was also reviewed. This study classified impact into three components: direct, indirect and induced impact (InterVISTAS, 2014). InterVISTAS (2014) applied economic multipliers based on Statistics Canada's economic multipliers from the 2009 Interprovincial Input-Output model, the most recent available, to estimate direct, indirect and induced employment, income/wages and benefits and GDP generated by each dollar of spending. This study concluded that a variety of economic sectors benefit from the impact of

capital cost of infrastructure of PPP projects. The economic impact included employment, income/wages benefits, GDP and total economic output (InterVISTAS, 2014).

As can be seen, there is a wide variety of methods used by different studies based on the suitability of the method and objectives of the study. There is no standard method or most suitable to use when assessing the economic impact of PPPs. They are all valid and all contribute various insights to the body of knowledge that already exists. A different methodology to the abovementioned methods is utilised in this study. The suitability and merits of the methodology selected is discussed in detail in Chapter 3.

3.4 SECTOR ANALYSIS

It is a complex exercise to directly attribute the impact of PPPs on overall economic growth in SSA, especially since these arrangements are relatively new in the continent. Adequate empirical evidence is expected to accumulate over time as this financing structure matures in SSA, as more countries adopt it and there is more awareness. What has been evident is that the private sector prefers to invest in specific sectors steered by their risk appetite and returns expected. Public sector investment is driven by promoting development and, in the case of most SSA governments, providing basic services.

There is a general notion that exists in SSA which assumes that investment in specific sectors leads to greater infrastructure project growth within that sector. This view could be driven by the fact that investors follow the same path of first adopters where there are successful projects. Due to the early stages of these arrangements in SSA relative to the rest of the world, investors are risk averse to venture into untouched sectors. What seems to be still up for debate is the concurrence by scholars on which infrastructure subsector is the most productive in developing countries. According to the data tracked by the PPI database, the transport sector has the longest record of PPP projects with the most investment going towards roads. However, investment growth has been the strongest in the energy sector providing electricity (Mfunwa et al., 2015). As can be seen from the graph in Figure 1, the information and communication and technology sector has had the most consistent investment over the past two decades, followed by the energy sector, transport and then water and sewerage.

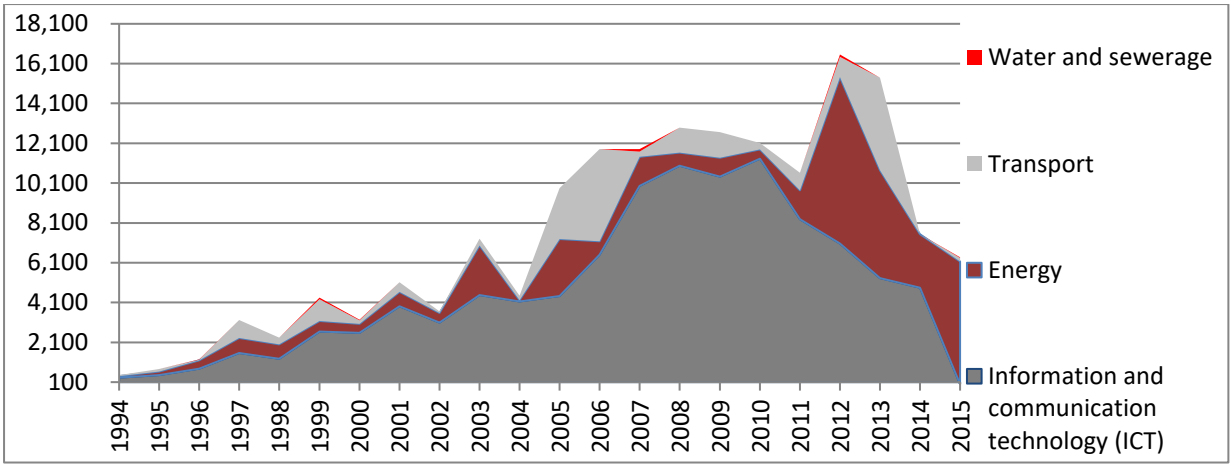

Figure 1: PPI Infrastructure Investment Commitments in Sub-Saharan Africa, by Sub-sector, 1994-2015, in US$ Millions

Source: own calculations using PPI World Bank Database

Discussed below is the contribution of selected sectors to economic growth and consideration of existing literature.

3.4.1 Energy:

In the effort of promoting private sector investments through PPPs, the United Nations Economic Commission for Africa (UNECA) selected energy as a sector of first priority (United Nations Economic Commission for Africa, 2011). The results of this high priority sector are evidenced in Mfunwa et al. (2015) where it is stated that in the Southern African sub-region, the energy sector has led the way in terms of the number of projects and in terms of investment commitments telecoms was leading (between 1993 – 2013). The Dintilhac et al. (2015) study concurs that there is positive impact on output/growth from energy infrastructure development. The attraction to invest in this sector is logical, as energy services enable basic human needs such as food and shelter, to be met. This sector also contributes to both economic transformation and social development by promoting manufacturing, improving education and public health. Without substantially increased investment in energy, the Sustainable Development Goals (UN 2015) will be difficult to achieve within the set timelines, particularly in rural Sub-Saharan Africa, where the majority of the poor reside (United Nations Organisation, 2011). Seminal contributor, Dinkelman (2010), emphasises the importance of measuring employment effects on infrastructure evaluations. Dinkelman's (2010) paper focuses specifically on South Africa and demonstrates that employment grows in places that get new access to electricity. The importance of electricity to all aspects of human development

cannot be amplified enough, especially for developing countries. Consistent with expectations, literature suggests that energy is indeed a catalyst into all the other infrastructure sectors.

3.4.2 Telecommunications:

Empirical studies have found that telecommunications infrastructure has a positive impact on GDP and economic growth. In countries like Nigeria where telecoms companies have been investing heavily, in the year 2013, telecoms alone represent 8.68 percent of rebased GDP such that GDP increased from $262 billion to $510 billion in that year (Anochiwa & Maduka, 2014). Mobile networks have expanded rapidly in Africa, with improved coverage and internet connections. According to ITU (2014), more than 4 billion people worldwide, the majority of whom live in developing countries, do not yet have access to the internet (African Capacity Building Foundation, 2016).

Greater access to information and opportunities for collaboration can create job opportunities, transfer of skills, and greater efficiency and transparency in politics and business (Qiang, Pitt & Ayers, 2004). Telecommunications is a conduit sector of significance in any economy. Access to information could be very expensive and inhibiting to do business if the infrastructure channels of communication are not there. High transaction costs of obtaining relevant information that enables quick and informed businesses decision making could have a negative impact on businesses and the economy as well. A simple telephone system improves the time it takes to obtain and collect information, real time decisions and the costs of doing business fall and productivity improves.

Telecommunications infrastructure investment and the derived services provide major benefits; their presence allows productive units to produce more efficiently (Röller & Waverman, 1996). A valid argument raised by different scholars is that investment in telecommunications infrastructure can lead to direct and indirect benefits in various sectors which result in economic growth. This argument is grounded on the insight that investment in telecommunications results in significant positive externalities in different sectors. Williams (2012) supports the above argument that the following positive externalities could be the outcome of investment in telecommunications:

(1) The generation of many investments in other sectors of the economy

(2) The reduction of transaction costs in the economy as a whole

(3) The indirect improvement of human capital and productivity

3.4.3 Transport:

Underdeveloped infrastructure in SSA is possibly the most critical impediment to economic development and poverty alleviation**.** The growth potential and opportunities linked to the development of this sector in developing countries are of utmost importance. Due to historical under-investment, issues of instability in existing infrastructure and poor maintenance; infrastructure expenditure required is significant. Transport networks improve access to different regions by means of road, sea, and rail and by air across the continent and the globe. Transport infrastructure networks open up new trade regions with huge opportunity to impact economic growth. The African Capacity Building Foundation (2016) paper confirms that: transport is a cost-effective way to expand Africa's power generation capacity, and to pool primary energy resources across national boundaries through regional trade. Connectivity through transport across the continent facilitates a positive contribution to the regional economies. New opportunities to cross border and regional trade opportunities follow.

Any strategic infrastructure development plan in SSA should be focused on building transport networks that will create inclusion of the poor communities in rural areas. These communities have been previously isolated from economic opportunities and employment. The recent government programmes are focused on rural development by creating economic hubs where communities are situated. This two-pronged strategy addresses the rapid rate of urban migration that is currently resulting in over-populated urban cities, and also addresses rural community challenges. These rural programmes will not be effective if rural communities are not enabled with access to markets by transport. In 2015, the World Bank estimated that the rural population in SSA accounts for 62% of the population. Adequate transport networks would address socio-economic challenges in rural communities such as access to healthcare, access to education, access to trade networks for agricultural produce, urbanisation and high unemployment levels. The Dintilhac et al. (2015) study agrees that rural roads have a larger impact on poverty reduction than other types of roads.

Various studies have reviewed the estimated growth effects of transport investments, and the impact has been understood to not be significant in developed countries. This is consistent with the reasonable basis that developed countries have efficient and fully developed transport networks that are fully connected to the economic eco-system. Positive benefits to economic growth in developed countries can possibly be observed in improving quality and relieving bottlenecks experienced in existing transport networks (Estache & Garsous, 2012). When a connecting road is built between two previously unconnected centres of economic activity, positive benefits to economic growth can be reasonably expected (Perkins, 2011). However,

linking two uninhabited areas with no prospects for economic development would simply be wasteful. In other words, the growth-enhancing effects of economic infrastructure are not automatic; they must be considered with care in each situation, and weighed against the costs (Perkins, 2011).

3.4.4 Water and Sanitation:

This is one of the sectors where the economic benefits and impact in most instances is very difficult to directly attribute to economic growth. The evidence of its impact is also less documented in academic literature than other developing sectors in SSA. PPPs have not had much success in Africa's water sector. Evidence presented by existing case studies on water privatisation offer mixed reviews with some improvements in reliability and quality of services and product provided. There have been instances of much higher water charges and bouts of public opposition which have led to schemes being cancelled (Farlam, 2005).

Water is life; it is the foundation for maintaining good health. Health drives labour productivity which drives growth. The link between water and growth does not seem to spring to mind to most researchers or at least, not as strongly as for the other sectors (Estache & Garsous, 2012). The World Health Organisation is of the view that the cost of poor sanitation is inequitably distributed with the highest economic burden falling disproportionately on the poorest (Water and Sanitation Program, 2012). For the poorest therefore, poverty is a double-edged sword – not only are they more likely to have poor sanitation, but they have to pay proportionately more for the negative effects it has (Water and Sanitation Program, 2012). Failure to invest in water and sanitation has considerable adverse health effects and adverse environmental impacts that have a ripple effect on other sectors like agriculture and tourism in a developing country. A number of PPP projects in the water and sewerage sector have been implemented over the past couple of decades, however, public opposition over user fees and operational difficulties have often plagued their implementation (Mfunwa et al., 2015).

For a developing region seeking economic growth, SSA cannot afford to neglect water and sanitation infrastructure, as the cost of neglect is counterproductive to the objective of economic growth. It also has been found that PPPs in this sector can be used as a form of abuse where monopoly concessions are used to overcharge customers (Hall, 2015). The researcher makes reference to an example in France where a comprehensive study of water was conducted. About three-quarters of the service is delivered by the private sector, the study found that in 2004, after making allowance for all other factors, the price of water is 16.6 per

cent higher than in places where municipalities provide the service (Hall, 2015). In instances like these, it costs the tax payer more to fund these projects and also to pay for the services. It is therefore unclear if the direct net benefit to the economy is negative or positive.

3.5 PUBLIC PRIVATE PARTNERSHIPS AND ECONOMIC GROWTH

In simple terms, economic growth can be understood as how much more an economy is producing in terms of goods and services now compared to a prior period. Growth in an economy is measured by the rate of change in the GDP of a country. Some countries in Sub-Saharan Africa were the fastest growing in the world at the turn of the millennium due to mainly agriculture and commodity exports. This growth has not been sustainable as it was mostly driven by commodity exports, which are vulnerable to price fluctuations on the world market. Extraction of fuels and minerals also does not usually require a highly-skilled workforce, however it allows an extensive labour force to be employed. Without an increase in the manufacturing share in many African countries, fewer jobs have been created, at least in the formal sector, and the populations may not have always profited from the economic growth (Zamfir, 2016). Owing to known benefits of infrastructure development to an economy, it is clear why the two are positively correlated. The United Nations Conference on Trade and Development (UNCTAD) estimates that the African continent loses 1 percent a year in per capita growth owing to rundown or lack of infrastructure (Mfunwa et al., 2015). A recent study has updated this statistic, stating that the poor state of infrastructure in SSA cuts economic growth by 2% every year and reduces productivity by 40% (Zamfir, 2016). These statistics further affirm the importance of infrastructure development to stimulate economic growth.

Typically, one would expect a net positive relationship between PPP investments in certain sectors and economic growth. A study conducted in Canada that looked at the impact of PPP projects closed from 2003 – 2012, agrees with the finding that PPPs have a positive economic impact (InterVISTAS, 2014). These partnerships have facilitated infrastructure development in Canada that has contributed both economic and social benefits. What is also interesting to note in a study by Khan and Reinhart (1990), the results show that private investment has a larger direct effect on growth than does public investment. However, there have been positive lessons for both public and private sector. Due to synergies between these partnerships and the lessons learned, the projects implemented from these partnerships have become more effective and efficient.

As seen over recent years, PPPs are often promoted as a solution for countries under fiscal constraints; the evidence suggests rather that they worsen fiscal problems. This has led to mixed reviews on the impact of PPPs to an economy. According to the European Investment Bank (2010), the six countries which have made the greatest use of PPPs in recent years are Cyprus, Greece, Ireland, Portugal, Spain and the UK (Hall, 2015). These countries are now subject to rescue packages or face great fiscal difficulties and economies that have low or negative growth. However, these challenged economies still have to solve for funding constraints. The challenges faced by the above countries however, cannot be entirely isolated to these partnerships, as the way the countries' fiscal problem was managed needs to be considered. The consideration of contributing factors to the above economies is beyond the scope of this study. Industrialised and emerging countries are therefore rapidly catching on to PPPs as the preferred mechanism to provide infrastructure. The World Bank estimates that in developing countries, the private sector financed about 22 percent of infrastructure investment alone – amounting to over US$350 billion between 2000 and 2005 (Mfunwa et al., 2015).

Economic growth is driven by investment and increases in productive output. For output per worker to grow, countries need a bigger factory, more machines, new technologies; new ways of organising production, a more qualified labour force (Fatas & Mihov, 2009). All this comes from investment: in infrastructure, in human capital, in knowledge, in equipment (Fatas & Mihov, 2009).

When an economy can continue to produce more, large medium and small businesses are able to make more profits. These profits are either invested in the business to expand its operations or distributed to shareholders who can also further invest in other profit generating assets. Additional jobs created result in more consumers who have disposable income to spend on goods and services. All countries strive for this outcome.

One of the selling points of PPPs in an economy is the idea of furthering local enterprise development and strengthening of local and cross border trade between nations. Once these big projects are complete, there could also be opportunity to develop international trade, depending on what type of services and products can be produced. These projects also attract and promote foreign direct investment participation. All of the abovementioned factors stimulate economic activity and therefore have a positive effect on macro-economic variables that are inputs to how economic growth is measured.

3.6 SUMMARY

The literature review in this chapter was to establish what existing literature has said about the relationship between economic growth and the investment on infrastructure projects funded using PPP structuring arrangements. A brief background introducing PPPs was presented. The overview of PPPs and the relationship it has on influencing selected economic growth variables was presented. As a starting point of analysis on studies of this nature, a panel study has been chosen, which is discussed in *Chapter 3*. The choice of methodology assists in identifying an overall impact of infrastructure investment via PPPs on an economy. The results are largely dependent on the specific conditions of each country, i.e. existing capital stock, type of infrastructure developed, the time frames applicable, etc. The results of this study could provide the basis and a guide for future country-by-country studies. Various empirical studies have found a positive relationship between infrastructure development and economic growth (de Haan et al., 2007). These studies provide the groundwork to further interrogate this positive relationship, as done I n this paper.

What existing literature does not give direction on is whether there is an efficient funding method of infrastructure development that results in the most positive impact on economic growth. The comparison of the impact of different funding methods is beyond the scope of this study.

Table 1: Literature Review Summary Matrix

		DEPENDENT VARIABLE *ECONOMIC GROWTH (GDP)*		
		Positive	***Negative***	***Not Definite wthout limitations***
INDEPENDENT VARIABLES	Public Private Patnership projects	A. Z. A.Azar, (2014) J.Haan *et al., (2007)* L.H. Röller (1996).	Mfunwa *et al*., (2015) P. Farlam (2005) D. Hall, (2015) L.Zamfir, (2016)	R. Shediac *et al.,* (2008) L.H. Röller (1996).
	Unemployment rate	K. Gassner *et al.,* (2009) A. Fatas and I. Mihov (2009)	Estache *et al.,* (2008)	A. Estache & G. Garsous, (2012)
	Interest rates	G. Jelilov, (2016),		G. Jelilov, (2016),
	Openness to trade	Newberry *et.al.,* (1981)	Cavallo *et al.*, (2007),	Newberry *et.al.,* (1981)
	Human Development Index	A. Estache & G. Garsous, (2012)		
	Population Growth		Asoka *et. Al.,* (2013)	

4 CHAPTER THREE: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This section outlines the research approach adopted, explaining the viewpoint from which the research was conducted. A quantitative approach underlies this study and provides details of the overall research design and methods used.

4.2 DATA COLLECTION, FREQUENCY AND CHOICE OF DATA

Data of public private partnership infrastructure projects was obtained from the private participation infrastructure (PPI) database of the World Bank. This source of data has been chosen due to the availability of historical data, its reliability and the integrity of the data can be trusted. It is also one of the few sources that collate data by country and sector in one database in a transparent and consistent manner. The data consists of infrastructure projects in Sub-Saharan Africa across different sectors, amounts invested, private and public partners involved. The project total investment represents the amount of public and private financing invested at the time of financial close (i.e. date on which financing agreements relating to the PPP are signed).

As previously stated, the economic indicator that was used to determine the impact of PPP infrastructure spend on economic growth is Gross Domestic Product Per Capita. GDP per capita is a measure of a country's economic output that accounts for its number of people. It divides the country’s gross domestic product by its total population. This makes it one of the available measures of a country's standard of living. GDP per capita is an important indicator of economic performance and a useful unit to make cross-country comparisons of average living standards and economic well-being (Son 2009). GDP per capita is the dependent variable. The data was obtained from the World Bank World Development Indicator Database.

4.3 SAMPLING

The empirical testing was performed on date obtained from PPI World Bank Database, which consists of projects funded using public private partnerships in Sub-Saharan Africa. Due to the long gestation period of infrastructure investment, together with the lumpy nature of these investments, it is necessary to look at trends over long periods of time. Project investment over

a period of 21 years from 1994 – 2015 has been selected. The data of countries over this period consists of 47 SSA countries and 2248 project investments. However, the final sample used for the regression analysis was reduced to 35 countries due the large number of missing values for 12 countries. The summary of the variables examined by country is included in the **Appendices**. The status of these projects was divided into four categories, namely: active, concluded, distressed and cancelled. No data was removed from this panel data. The data was divided into the following primary sector classifications: energy, information and technology, transport, water and sewerage. All analysis and relationship inferences were limited to the data at hand and did not necessarily apply to the market at large. One of the limitations of this sample data was that it lacked comparability with other data sources, so as to obtain an independent and unbiased conclusion. However, the fact that this date is internationally recognised and widely accepted as not aligned or influenced by any country or sector mitigates the risk of bias.

4.4 REGRESSION MODEL

In examining the catalytic effect of PPPs on economic growth in SSA, this study adopted the empirical model of several authors (Baltagi, 2005; Wooldridge, 2009; Hsiao, C. 1986).

$$Y_{i,t} = \beta_0 + \beta_1 PPP_{i,t} + \beta_2 TRADE_{i,t} + \beta_3 POPG_{i,t} + \beta_4 HDI_{i,t} + \beta_5 IR_{i,t} + \beta_6 UNEMP_{i,t} + \varepsilon_{i,t}$$

Where $\boldsymbol{i}$ and , $\boldsymbol{t}$ denotes country and year respectively; PPP refers to the two proxies for public private partnerships measured as the number of PPPs and the value of PPPs; $TRADE$ is the proxy for trade openness; $POPG$ indicates population growth; HDI is the human development index; IR denotes interest rates and $UNEMP$ is the unemployment rate. $\boldsymbol{\varepsilon_{i,t}}$ is the two-sided error term.

4.5 DISCUSSION OF VARIABLES

Sources used for GDP ratio as the **dependent variable** are from the World Bank (2017). In order to have a clear understanding and measure the impact of policies implemented to improve the economic and social well-being of people, performance indicators have been developed. Reflecting a growing recognition of the importance of macro-indicators, countries like Canada have adopted the reporting of trends in social and economic development. The Organisation

for Economic Co-operation and Development's (OECD) motivation for developing social indicators is two-fold. First, to identify what have been the major social developments in OECD countries. Second and more challenging, is to ascertain which societal responses are effective in altering social outcomes (Sharpe, 2004). The UK government developed a way of measuring progress by way of indicators. One of the three pillars broadly assessing sustainable development looks at economic growth (Sharpe, 2004). Economic growth measures output, investment, and employment (Sharpe, 2004). Variables in Finland's indicators for sustainable development under economic issues include: GDP, current account surplus, state financial assets and liabilities and inflation (Sharpe, 2004).

Roux and Ismail (2004) argue that a reduction in interest rates increases liquidity, lowers the cost of consumption, and induces an increase in aggregate demand. The expectation is this demand expansion should lead to secondary effects such as accelerated investment and employment growth, so inducing a multiplier process in the economy. It is important therefore to consider the impact of interest rates on the economy. Interest rates impact sector earnings and share prices. The assessment of their impact on the economy is therefore important. Roux and Ismail (2004) suggest that it is essential to accommodate the changes in productivity or profitability that could result from a change in interest rates. As a reference point, the South African Reserve Bank (SARB) has a responsibility to formulate and largely implement monetary policy. One of the SARB's objectives is to achieve and maintain price stability in the interest of sustainable and balanced economic development and growth (www.resbank.co.za). Stability of prices is critical for investors as it reduces uncertainty in the economy and therefore, enables a conducive environment for growth and employment creation. The SARB uses short term interest rates as one of the instruments to affect the supply of money.

The above literature summarises the background of why the following **Independent variables** were selected. For this study, the lead indicators selected to measure economic growth were grouped into two categories: ***macroeconomic performance indicators*** (number of PPPs and value of PPP investment, openness to trade, interest rates, unemployment rate);
human/social development indicators (population growth, human development index (HDI)). Each independent variable is briefly discussed and the data was sourced from the World Bank and International Monetary Fund Data. The data obtained was integrated to moderate against bias and ensure robust analysis.

4.5.1 Number of PPPs

It is reasonable to assume that where investors keep coming back, risk and returns must be acceptable to them. The expectation is that as more and more infrastructure projects are funded using PPPs, development in that economy should improve. An increase in the number of PPP agreements in an economy could be an indication of how stable that economy is perceived to be and its conducive development environment.

However, it is difficult to generalise about the impact of the increase in the number of PPPs on job creation and economic output, partly because the structural adjustments are varied for measurement. An acceptable trend in mature economies is that the increase in the number of PPPs is less likely to create new employment opportunities. What has been noted around the world are the right-sizing organisations in developed economies which were dramatically over-staffed before privatisation led to severe job losses (DBSA Paper). In developing economies however, where populations are still experiencing rapid growth rates and severe service backlogs, PPPs result in further recruitment in the long-term to keep up with the demand for services and the expansion of infrastructure.

4.5.2 Investment Value of PPPs

In a discussion paper by the World Bank Group (2016), the evidence shows that there is a positive and significant impact of private sector participation in access, quality of services, labour productivity, and reduction in technical losses. The magnitude of the impact varies by sector and size of the project and with the context, especially as it relates to the institutional and regulatory environment. The empirical evidence also indicates that the distributional impact varied, but the effects were largely positive (Ruiz-Nuñez, 2016). What is apparent is the fact that the medium to long term impact of the increase in value of infrastructure investment using PPPs is difficult to isolate. The economic output measured could be a combination of many factors. The expectation is that an increase in value of PPP investment circulated into the economy means an increase in resources available that can be used to create more jobs. As more people work, there should be an increase in economic output and therefore, an increase in economic growth over time.

4.5.3 Trade in services as a % of GDP (Openness to trade)

An open economy refers to one that has trading activity between the domestic community and with communities outside the domestic borders with minimal or no restrictions. Physical infrastructure opens up trade corridors with regional countries and facilitates regional

development across borders. Access to new markets is enabled and this increases trading activity and trading volumes. However, there is no consensus theoretically and empirically amongst scholars on the impact of openness to trade on an economy. Many scholars have presented empirical evidence that suggests that openness to trade leads to higher GDP volatility and sudden shocks to an economy (Newbery & Stiglitz, 1981).

An opposing view from Cavallo and Frankel (2007) states that economies that trade less with other countries are more prone to sudden stops and currency crashes. The study also found that more openness reduces the output costs associated with a crisis. The effect of openness to trade is measured by a trade potential index that quantifies potential gains from trade as a simple function of data (Waugh & Ravikumar, 2016). In simple terms, trade in services as a percentage of GDP is measured. Infrastructure facilitating open trade is expected to increase trade volumes and diversification of goods and services. The increased volumes and activity is expected to have a positive effect on GPD.

4.5.4 Population Growth

Growth of people living in cities is inevitable. Urbanisation in SSA has been on a rapid increase over the past decade, as people look for better work opportunities in the cities. If there is no continuous investment in inadequate infrastructure, countries in SSA cannot sustain the rate of population growth with the existing infrastructure.

Population growth is measured by the rate of natural increase (RNI). This explains the annual percentage growth of a population, which is the difference between the number of births and deaths in a population. In a study by Asoka, Thuo and Bunyasi (2013), findings state that 90% of the basic infrastructure and services have been negatively affected by population growth. This is the expected relationship impact which will negatively impact economic growth. In a capital poor continent like SSA, unplanned population growth reduces output by lowering per capita capital. A growing population also increases investment requirements. Governments are faced with a challenge of managing the imbalance between demand for investment in infrastructure and availability of funds. A rapid population growth also aggravates the rising unemployment rates in the continent, making it even harder for economic development to catch up.

4.5.5 Human Development Index (HDI)

Probably the best-known composite index of social and economic well-being is the Human Development Index (HDI), developed by the United Nations Development Programme (UNDP) (Sharpe, 2004). As stated by Stanton (2007), the human development process is one

of enlarging people's choices. Human development focuses on three essential components: a long and healthy life, knowledge, and "access to resources needed for a decent standard of living" because, "If these essential choices are not available, many other opportunities remain inaccessible" (UNDP 1990) In the words of Paul Streeten (1994: 232): The human development index pioneered by Mahbub ul Haq (Stanton, 2007) has been in use since 1990.
The HDI uses a simple framework for identifying what constitutes human development, namely income, health and education, which is intuitive and easy to understand (Sharpe, 2004). The index is measured as a composite statistic of three components: life expectancy at birth, years of average schooling in the adult population and gross national income per capita.
When better utilities are developed to deliver basic services that people need for everyday life, people are healthier, live longer and have a sense of fulfilment. A country scores higher HDI when the life expectancy at birth is longer, the average schooling period is longer and the income per capita is higher. Infrastructure development financed using PPPs therefore is expected to have a positive relationship between increased infrastructure development and improvement in this index over time. The expected result is due to the fact that new infrastructure broadens peoples' choices and improves their overall standard of living. When people have access to better resources, access to education, their quality of life is improved significantly. Improved quality of life extends the average period a person can expect to live in good health.

4.5.6 Interest Rates

The expectation from the investing community is a high return on their investment. Economies with high interest rates, all other things being equal, should in theory attract more investment. On the other hand, SSA central banks have adopted an expansionary monetary policy in order to boost economic activity. This means lowering interest rates will tend to not be attractive to private investors and will slow down investment through PPPs. During contractionary monetary policy periods where interest rates are high, bullish investors will tend to favour investing. However, a tight monetary environment increases the cost of borrowing which slows down government spending and economic growth. One would expect that government fiscal policy priorities on capital spending are closely correlated to monetary policy. There is another view from Jelilov (2016), which points out that the supply of capital depends upon savings rather than upon the will to save and the power to save of the community. There are those people that will save irrespective of the rate. There are others who save because the current rate of interest encourages them to save and reduce savings when the rates are low. The higher the

rate of interest, the larger the community savings and more will be the supply of funds (Jelilov, 2016).

We can appreciate that interest rates are a key and powerful tool used by most central banks to manipulate economic growth. The expectation is that interest rates influence when and how public and private investors invest. When interest rates are low, cost of borrowing is lower and therefore investments using PPPs are expected to increase and vice versa. Lower interest rates also stimulate economic growth as governments are able to fund their economic development plans at a lower cost of funds.

4.5.7 Unemployment Rate (youth as a % of labour force)

The expectation generally is that infrastructure investment should result in direct and indirect local job opportunities. Infrastructure development usually requires skilled and unskilled labour. The arrangement encourages that local labourers should be hired, unless there is a shortage of required skills in the country at hand. The result of more jobs created over long periods of construction in theory should reduce unemployment. According to Estache and Garsous (2012), there is a school of thought that in the short term, a significant share of efficiency gains achieved through PPPs comes from employment reductions.

Unemployment in an economy is measured by looking at the number of jobless or actively looking for a job as a percentage of the total labour force. This is one of the measures closely watched by economic development policy makers in government as an indication that economic activity is stimulated. Over the last ten years, over 500 000 cumulative full time equivalent jobs have been created; 291 000 of them through direct employment, by InterVISTAS (2014). This is according to a study conducted on the impact of PPP projects in Canada over the period 2003 - 2012. The other economic benefit aspect highlighted in the Canadian study is the contribution to federal and provincial governments from taxes paid by employers and employees.

In theory, economic growth translates to new jobs created to absorb the jobless who are actively looking and unemployment is reduced. The expected outcome of this study is that PPPs are a catalyst in enabling job opportunities via active infrastructure projects. Certain industries are known to be more efficient at creating job opportunities than others, i.e. the construction and manufacturing industry.

4.6 ESTIMATION APPROACH

The empirical estimation method used for this study was **unbalanced fixed effects panel data** (Wooldridge, 2009). When you have data where variables have been measured for the same subjects (or countries, or companies, or whatever) at multiple points in time, it is referred to as Panel Data or as Cross-Sectional Time Series Data (Williams, 2015). This is a well-established econometrics analysis method widely used in development economics. This method was selected due to its benefit of allowing you to control for variables that cannot be observed or measured and variables that change over time, but not across all the different countries. Some examples of these variables are different cultural factors, economic policies, regulatory framework, international trade agreements, political climate, etc. This is all in order to account for any possible heterogeneity (Torres-Reyna, 2007). Panel studies tolerate different variables at different levels of analysis (Torres-Reyna, 2007); this gives a good reason to use this analyses method. This modelling technique is referred to as unbalanced due to the fact that PPP data might be missing for some countries in certain periods, as investment in selected countries will not occur every year over the selected period described hereinafter. It is referred to as fixed because the data is observed for the same countries selected over the same period of 1994 – 2015.

Consistent with the literature, the panel data models are commonly estimated by either the Fixed Effects (FE) or Random Effects (RE) techniques. The FE explores the relationship between the predictors and the outcome variables within an entity. Each country has its own individual characteristics that may or may not influence the predictor variables (Torres-Reyna, 2007). FE is more robust that RE, with RE selection must be assumed uncorrelated with heterogeneity as well as idiosyncratic shocks (Wooldridge, 2013). FE model also allows for endogeneity of all the regressors and the individual effects (Baltagi, 2005). The FE regression model is represented by the following equation:

$$\mathbf{Y}_{i,t} = \boldsymbol{\alpha} + \boldsymbol{X}_{i,t}\boldsymbol{\beta} + \boldsymbol{u}_{i\underline{t}}$$

Notation:

$\mathbf{Y}_{it}$**:** dependent variable for country = ***i*** and time = ***t***

$\boldsymbol{\alpha}$**:** the intercept for n country specific intercept where ***i* = 1....n**

$\mathbf{X}_{it}$**:** one independent variable

β: coefficient of the independent variable

$\boldsymbol{u}_{i\underline{t}}$**:** disturbance term, a composite of two error components (***between entity error)***

This model assumes that the disturbance term u_{it} is fixed and independent.

Unlike the FE model, the RE models' underling basis is that the variation across entities is assumed to be random and uncorrelated with the independent variables (Torres-Reyna, 2007). The key advantage of the RE model is that it tolerates the inclusion of time invariant variables like SSA region, while in the FE model the intercept is used to absorb these variables (Torres-Reyna, 2007).

Individual effects are part of the disturbance term uncorrelated with the regressors. The null hypothesis is that the random effect estimates are consistent, which mean the disturbances and X's are independent.

The RE regression model is represented by the below equation:

$$\mathbf{Y}_{i,t} = \alpha + X_{i,t}\beta + u_{it} + \varepsilon_{it}$$

Notation:

ε_{it}**:** remainder components error term **(*within entity error*)**

where $\mathbf{x}_{it}$ can generally include a fully set of time dummies, or other aggregate time variables.

To decide which of the above effects is relevant as a regression model in analysing the relationship between PPP financed assets and economic growth in SSA, we conducted a Hausman test. This tests whether the unique errors u_{it} is correlated with the regressors. The null hypothesis is that the preferred model is RE over FE. The null hypothesis is not rejected (Torres-Reyna, 2007).

4.7 RESEARCH RELIABILITY AND VALIDITY

Golafshani (2003) defines reliability as: The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. Reliability concerns the extent to which a measuring procedure yields the same result on repeated trials. There will always be a degree of random and non–random measurement error.

Golafshani (2003) states that validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit "the bull's eye" of your research object? Validity is the extent to which any measuring instrument measures what it is intended to measure. One validates the interpretation of data arising from a specified procedure.

5 CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION

5.1 INTRODUCTION

This chapter discusses the results of this study. An exploration of the data showed the charts which show the variables for each country over the period under review. Regression tables are shown and charts are shown in appendices. Lastly, the interpretation of key findings is presented.

5.2 EVOLUTION OF PPPs IN SSA

A trend analysis graph (Figure 2) displays how PPPs have evolved over the period 1994-2015.

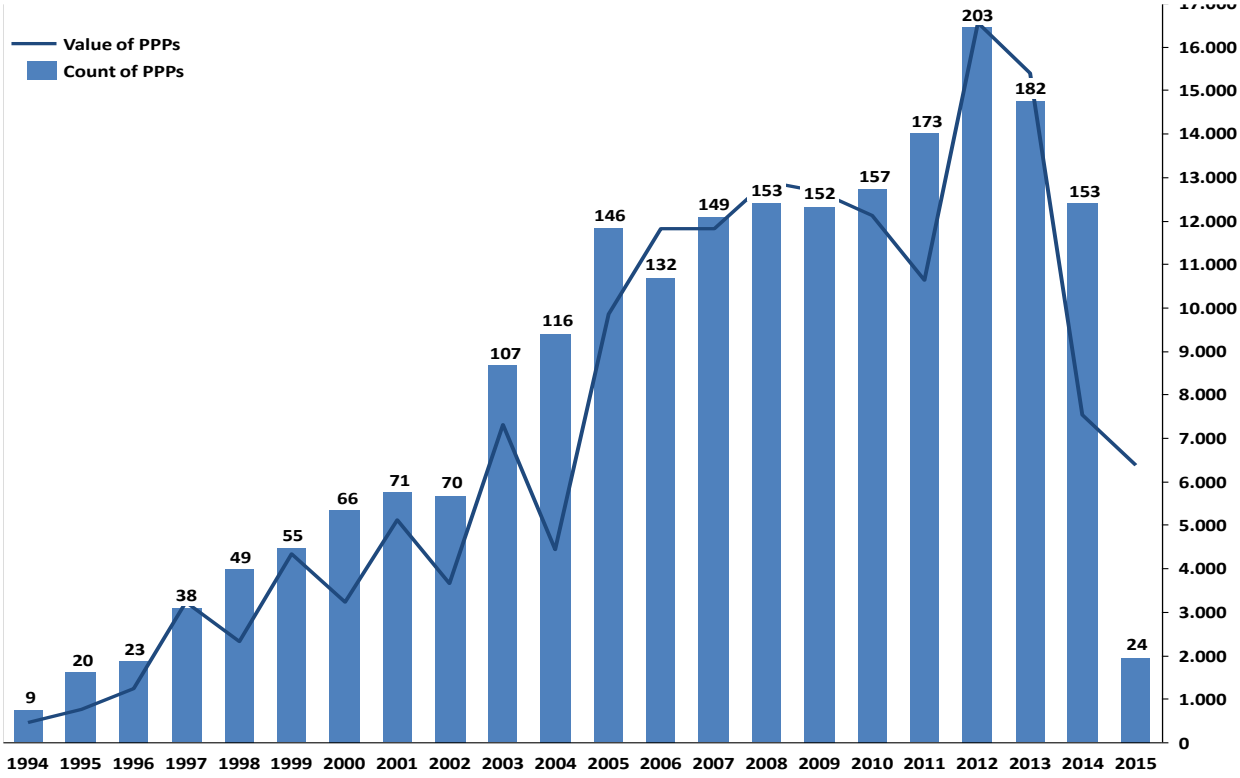

Figure 2: Trend analysis of PPPs (1994 to 2015): ***Source: Author's estimate from research data***

The graph (Figure 2) shows how PPPs have evolved over the selected period in SSA. PPPs have been on an increasing trend, particularly in the last ten years on the graph. The number and value of PPP investment was at its peak from 2011 – 2013 and started declining significantly from 2014. The declining trend at the end of the selected period is beyond the scope of this study. The countries with the most PPP projects over the peak period were South Africa, Somalia and

Uganda. Investment in these three countries was specifically in the energy and information, communications and technology sectors. In response to the global financial crisis of 2008-09, most governments worldwide increased fiscal spending through focused stimulus packages on infrastructure development in order to stimulate economic growth. The above noted trend further confirms that PPPs are viewed as one of the alternative financing methods considered to enable economic activity that will stimulate growth.

5.3 DESCRIPTIVE STATISTICS

The summary statistics for the dependent variable and each of the independent variables are displayed in table 4.2.2. The population panel data was unbalanced with observations of the variables ranging from 720 to 1056 observations based on availability of data over the period tested.

Table 2: Descriptive Statistics

	Mean	Median	Std. Dev	Min	Max	N
GDPPC	1770.985	601.350	3307.570	108.070	30408.460	967
PPP_N	2.129	2.000	2.559	0.000	34.000	1056
PPP_V	155.013	7.000	534.942	0.000	6921.000	1056
trade	21.844	15.200	22.865	3.640	225.960	363
POPG	2.452	2.650	1.177	-7.320	10.800	967
HDI	0.456	0.440	0.110	0.190	0.780	904
IR	21.828	16.940	34.278	4.460	578.960	720
UNEMP	17.038	11.570	13.585	0.740	59.910	1012

Note: GDPPC=GDP per capita; PPP_N=Number of PPPs; PPP_V=Value of PPP investments in US$; Trade=; POPG=Population growth; HDI=Human development index; IR=Interest rate; UNEMP=Unemployment;

The average number of PPP projects in a country is two, with a maximum of 34 projects. The above statistics also indicate that on average, PPP projects enable 21, 8% of trade within the country and with newly opened outside markets. This would indicate that PPPs do foster a positive contribution towards economic growth. It is also noted that the human development index of a country improves on average by 0.45% due to infrastructure development financed using PPPs. Unemployment is noted to reduce on average by 17, 0% with a maximum impact of 59, 9%.

5.4 CORRELATION MATRIX

The correlation matrix is used to examine whether there is no dependence between the independent variables. Positive values can be understood to mean an increase in the value of

the independent variable will result in a corresponding increase in the value of the dependent variable. Negative values, on the other hand, mean that an increase in the value of the independent variable will result in a corresponding decrease in the dependent variable, and vice versa. A value closer to zero can be interpreted as no relationship exists between the variables. The closer the value is to one, the higher the probability of a correlation or relationship between the dependent and independent variables.

Table 3: Correlation Matrix

	GDPPC	**PPP_N**	**VPPP_V**	**TRADE**	**POP**	**HDI**	**IR**	**UMEP**
GDPPC	1.000							
PPP_N	0.105***	1.000						
VPPP_V	0.189***	0.612***	1.000					
trade	0.131**	-0.037	-0.241***	1.000				
POP	-0.292***	0.059*	0.052	-0.229***	1.000			
HDI	0.870***	0.110***	0.170***	0.230***	-0.268***	1.000		
IR	-0.143***	-0.058	-0.087**	-0.066	-0.050	-0.105***	1.000	
UNEMP	0.515***	-0.102***	0.013	-0.023	-0.245***	0.478***	-0.085**	1.000

*Note: GDPPC=GDP per capita; PPP_N=Number of PPPs; PPP_V=Value of PPP investments in US$; Trade=; POPG=Population growth; HDI=Human development index; IR=Interest rate; UNEMP=Unemployment; ***, ** and * denotes significance at 1%, 5% and 10% respectively.*

As can be seen from table 4.2.3 the number of PPPs, value of PPPs, population growth, HDI, interest rates and unemployment are all significant at 1% significance level with GDP per capita as the dependent variable. Consistent with expectation, there is a very close correlation between HDI and GDP per capita. The index is made up of education levels, life expectancy and gross national income. Subdued PPP investment is expected to have a negative impact on economic growth, and therefore no increase in gross domestic income per capita. If there is no increased income there will be no excess income available to spend on education and other necessary wellness measures that increase life expectancy. PPP arrangements are expected to provide employment opportunities.

As a measure of performance of economies in SSA, GDP per capita and unemployment are expected to be correlated. Reasonable logic says that an increase in PPPs in countries with high unemployment is likely to lower levels of unemployment. Economic output should increase in these countries resulting in economic growth.

However, based on the parameters defined above, there is not enough evidence at a 1%, 5% and 10% significance level to infer the above independent variables are linearly related to economic growth in SSA.

5.5 REGRESSION ANALYSIS

In examining the effect of the proxies for PPPs (PPP_N and PPP_V) on economic growth, the study employed two regression estimation techniques, namely the fixed effects (FE) model and random effects (RE) model. Under each technique, two separate models were estimated using PPP_N and PPP_V interchangeably. In each estimation, trade in services as % of GDP, unemployment rate, interest rates, population growth, and HDI were employed as control variables. The results are shown in the table above and interpretations below. The results are presented in Table 4.

Table 4: FE & RE Model

	DEPENDENT VARIABLE: GDP Per Capita			
	FEM	**REM**	**FEM**	**REM**
	Coef.	**Coef.**	**Coef.**	**Coef.**
Constant	4.388***	4.408***	4.413***	4.430***
	(0.225)	(0.233)	(0.227)	(0.234)
PPP_N	**0.021****	**0.019****		
	(0.009)	**(0.009)**		
PPP_V			**0.0001**	**0.0001**
			(0.000)	**(0.000)**
Trade	-0.002**	-0.002**	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
POPG	-0.022	-0.023	-0.023	-0.023
	(0.017)	(0.018)	(0.017)	(0.018)
HDI	3.223***	6.058***	3.338***	6.178***
	(0.760)	(0.594)	(0.771)	(0.595)
IR	-0.014***	-0.014***	-0.014***	-0.014***
	(0.001)	(0.001)	(0.001)	(0.001)
UNEMP	-0.003	0.006**	-0.003	0.006**
	(0.004)	(0.003)	(0.004)	(0.003)
F/Wald test	90.74	704.95	88.12	696.21
Prob > F	0.000	0.000	0.0000	0.0000
R-squared	0.7342	0.7997	0.7284	0.8032
Hausman χ^2	48.82		42.09	
Prob > χ^2	0.000		0.0000	
Countries	35	35	35	35
Observations	272	272	272	272

*Note: GDPPC=GDP per capita; PPP_N=Number of PPPs; PPP_V=Value of PPP investments in US$; Trade=; POPG=Population growth; HDI=Human development index; IR=Interest rate; UNEMP=Unemployment; Robust standard errors in parentheses; ***, ** and * denotes significance at 1%, 5% and 10% respectively.*

Table 4. indicates standardised coefficients and how much the dependent variable (GDP per capita) will change with a corresponding increase in independent variables by one unit. In practical terms, the GDP growth of countries that participate in PPP arrangements in SSA is likely to increase as one of the above independent variables moves up or down by one unit.

The fixed effects model, Prob > F (0.000) p-value is less than 0.05 and therefore coefficients are significant at 1%, 5% and 10% significance level. The overall model is significant and there is insufficient evidence to reject the null hypothesis. The null hypothesis is favoured over the alternative.

5.6 HAUSMAN TEST

A **Hausman test** was conducted to determine whether to use the Random effects (RE) model or the Fixed effects (FE) model. The null hypothesis is that the preferred model is random effects against the alternative model that the fixed effect is the most appropriate. A p-value less than 0.05) is an indication that the FE model is the best option while a p-value greater than 0.05, is an indication that the random effects model is the best option. The results are shown below. The results show that the P-value for the Hausman test Prob > χ^2 = **0.000** was less than 0.05; the null hypothesis is rejected in favour of alternative hypothesis. Thus, from these results, the **fixed effects** mode is the most appropriate option. Hence, the discussion of the regression results is based on the FE results.

5.7 SIGNIFICANT VARIABLES

5.7.1 Number of PPPS:

Per the results in the table above, the coefficient proxy number of PPPs in the FE model was significant at 5% significance level. This result is in fact consistent with the theory that an increase in the number of investments in PPP funded projects results in an increase in economic growth. Countries in SSA that have an increase in the number of PPPs over the study period are expected to show an improvement in their GDP per capita. The significant impact of these projects is due to their nature and the size of investment injected into the economy.

5.7.2 Trade:

The results of the FE model show that the coefficient of trade was significant -0.002 at 5% significance level. This indicates that a change in one unit in the standard deviation of Trade increases the impact on economic growth by 0.002 standard deviations. Without PPP investment into a country, new markets do not open up and therefore there will be no corresponding increase in GDP per capita.

5.7.3 HDI:

The results per the table above indicate that the coefficient of HDI was significant (FEM: 0.760) at 1% significant level. As mentioned above, the index tracks an overall improvement in the quality of an average person's life. It is therefore reasonable to assume considerations encompassed in HDI have a significant influence in country decisions when it comes to stimulating economic growth using PPP financing. Amongst other factors, PPPs are validated by the fact that they are supposed to provide employment opportunities. Consistent with the UNDP (1990) paper, that if essential choices are not available due to lack of employment, many other opportunities remain inaccessible.

5.7.4 Interest Rates:

The results above also indicate that the coefficient of interest rates was significant at -0.014 at 1% significant level. This result is consistent with the basis that economies with lower interest rates will see an increase in infrastructure investment via PPPs, as cost of borrowing is lower. An increase in investment will result in an increase in GDP per capita.

Also looking at the R-squared value that is 0.7342 (73.42%) confirms that the independent variables explain a significant portion (73%) of the variance in economic growth using the FE model.

5.8 ASSESSMENT OF HYPOTHESIS AND OBJECTIVES

Results pertaining to the hypothesis defined in chapter 1 are discussed below.

Null Hypothesis: *Public private partnerships have no significant catalytic effect on economic growth in SSA.*

Alternative Hypothesis*: Public private partnerships have significant catalytic effect on economic growth in SSA*

Results: The null hypothesis is rejected when the number of PPP projects (PPP_N) was used a proxy for PPPs at 5% significance level. However, the effect of investment values of PPPs (PPP_V) was found to be insignificant. Hence, it can be concluded the effect of Public private partnerships on economic growth is sensitive to the proxy for PPPs.

The results per the table above indicate that the coefficient of the number of PPPs in a country was significant (FEM: 0.021) at 5% significant level. An increase in the number of PPP investments in a country does influence GDP per capita in SSA.

Out of the **35** countries in the panel data tested, only five countries had muted growth of PPP contracts. The five countries are the following: Comoros, Eritrea, Ethiopia, São Tomé and Principe and South Sudan. All other countries in the panel had increasing PPP contracts since their first PPP investment. No further investigation was done to establish the reasons for the declining muted trend, which is different to all the other countries. It appears the other 30 countries have had growth of their PPP contracts over the selected period. At face value, the trend over the years suggests that successful implementation of PPP contracts in these countries has resulted in further PPP investment.

5.9 SUMMARY

This section discussed findings used to draw conclusions on the results testing whether public private partnerships had any catalytic effects to economic growth in Sub-Saharan countries. The independent variables selected were examined for their impact on each other and on the dependent variable. The results examined above indicate that economic infrastructure financed through public private partnership is significant and does influence economic growth in SSA. Overall there is insufficient evidence to demonstrate that there is no relationship between economic and social infrastructure financed through PPPs in SSA. However, based on the number of PPP financed infrastructure projects in SSA, there seems to be an upward pattern in the number of projects in most countries that had investment already. The impact of the increasing number of PPP projects in countries with previous investment however is not tested in detail in this paper.

6 CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This study sought answers to the question: are public private partnerships catalysing sustainable economic growth in Sub-Saharan Africa. This study looked at PPP projects in 35 countries across SSA over the period 1994–2015. There have been numerous studies that have looked at whether PPPs are efficient and effective in stimulating economic growth. Most of these studies have been conducted outside the African continent and mostly in developed countries. Very limited empirical evidence focuses specifically on SSA economies. This study seeks to contribute to knowledge about Sub-Saharan Africa and the development trend of PPPs over the years.

6.2 SUMMARY AND CONLCUSION OF THE STUDY

This paper examined the data comprising 35 countries in Sub-Saharan Africa that have participated in public private partnership financing arrangements between 1994 and 2015 to analyse the effect of PPPs on the economic growth in SSA.

The methodology used in this study is unbalanced fixed panel data to test the panel data of selected African countries. A trend analysis of the evolution of PPPs in SSA was observed in trying to understand their impact on economic growth. The impact on each economy in SSA will be different depending on many factors that are specific to each country. Based on the infrastructure development needs of SSA as an emerging market, PPPs have a positive role to play in stimulating economic growth. Noted from the growing trend in the number of PPPs from nine projects in 1994 to, on average, at least twenty projects a year until 2015, the demand was high. The results presented in Chapter 4 also further confirm that PPPs do create catalytic effects to enable economic growth.

6.3 CONTRIBUTIONS OF THE STUDY

Numerous studies have been conducted to determine the determinants of PPP arrangements and why they work or do not work in many countries. There is consensus around the world that it is a combination of general and specific circumstances pertaining to each country that enables the success of PPP arrangements. Where there is no clear consensus is on their impact on economic growth, especially in SSA. This study contributes firstly to the available body of literature that seeks to unpack the effects of PPPs in SSA. Based on the sample examined, this study contributes to the policy decision making process in understanding the impact on a country's fiscal situation.

It is of vital importance that the effects of public private partnerships are fully understood and their catalytic effects, whether positive or negative. PPPs are elaborate arrangements and the ramifications of not fully understanding their complexities could be significant. This is why this study has deposited contributions to the available body of knowledge. Public officials that enter into these agreements with the private sector will be empowered in trying to understand the macro-economic implications of their decisions.

6.4 LIMITATIONS OF THE STUDY

A total of **35** countries in Sub-Saharan Africa financed infrastructure projects using public private partnership arrangements between the periods 1994 and 2015. The data tested included all these countries with a total of 2 248 PPP contracts. Within the panel data tested, 165 PPP contracts over the selected period were either cancelled or distressed. This makes up 7% of the entire panel data selected and spans 28 countries out of the total of 35 selected. What this study did not explore is the impact of the cancelled or distressed projects on the economic growth of the specific SSA countries over the selected period. These projects could possibly be connected to the performance of the concluded or active projects that have been selected. It is beyond the scope of this study to isolate the impact on the country economies of these contracts.

The study also did not take into account the impact of each type of project that was financed: Greenfield, Brownfield, divestiture and management and lease contract. What would be interesting is assessing the impact of each type of project in catalysing economic growth.

Another aspect that was challenging was obtaining relevant and reputable data to use across the countries and all the above variables used. Different types of sources had to be explored

and verified for dependability. The considerable amount of time and effort was spent in cleaning and formatting data in order to prepare for the analysis on the statistical tool used called STATA. Data preparation is one of the cons of using panel data.

6.5 RECOMMENDATIONS FOR FUTURE RESEARCH

This study has addressed the questions posed at the beginning of this study. During the research process, there were additional issues discovered to be explored further in future studies.

The below gaps were noted and could be further probed:

- Testing in detail whether Sub-Saharan countries with previous PPP arrangements to finance infrastructure attract more PPP investment Also, examine the impact of the increasing number of PPP projects on economic growth
- A further probe into which infrastructure financing method in SSA has the most positive catalytic effect in economic growth would be interesting
- Micro–level research on the impact of infrastructure investment done with PPP contracts and the indirect impact of these projects on sectors other than the sector of primary investment.
- The extent of the impact of unmitigated negative externalities created by the implementation of infrastructure project financed by PPPs arrangements.
- Which is the most productive subsector to invest in using PPP contractual agreements that is also a catalyst in other sectors, in order to achieve accelerated economic growth?
- An aspect that has also not been quantified is the financial impact on the economy of negative externalities experienced throughout and long after the project has been completed, and whether these outweigh the overall benefits expected on the project

Public private partnerships are still relatively new in Sub-Saharan Africa compared to the rest of the world. The discussion explored on this paper is a small contribution to the body of knowledge that is out there. There is still much more to uncover and learn about the impact of PPPs in SSA.

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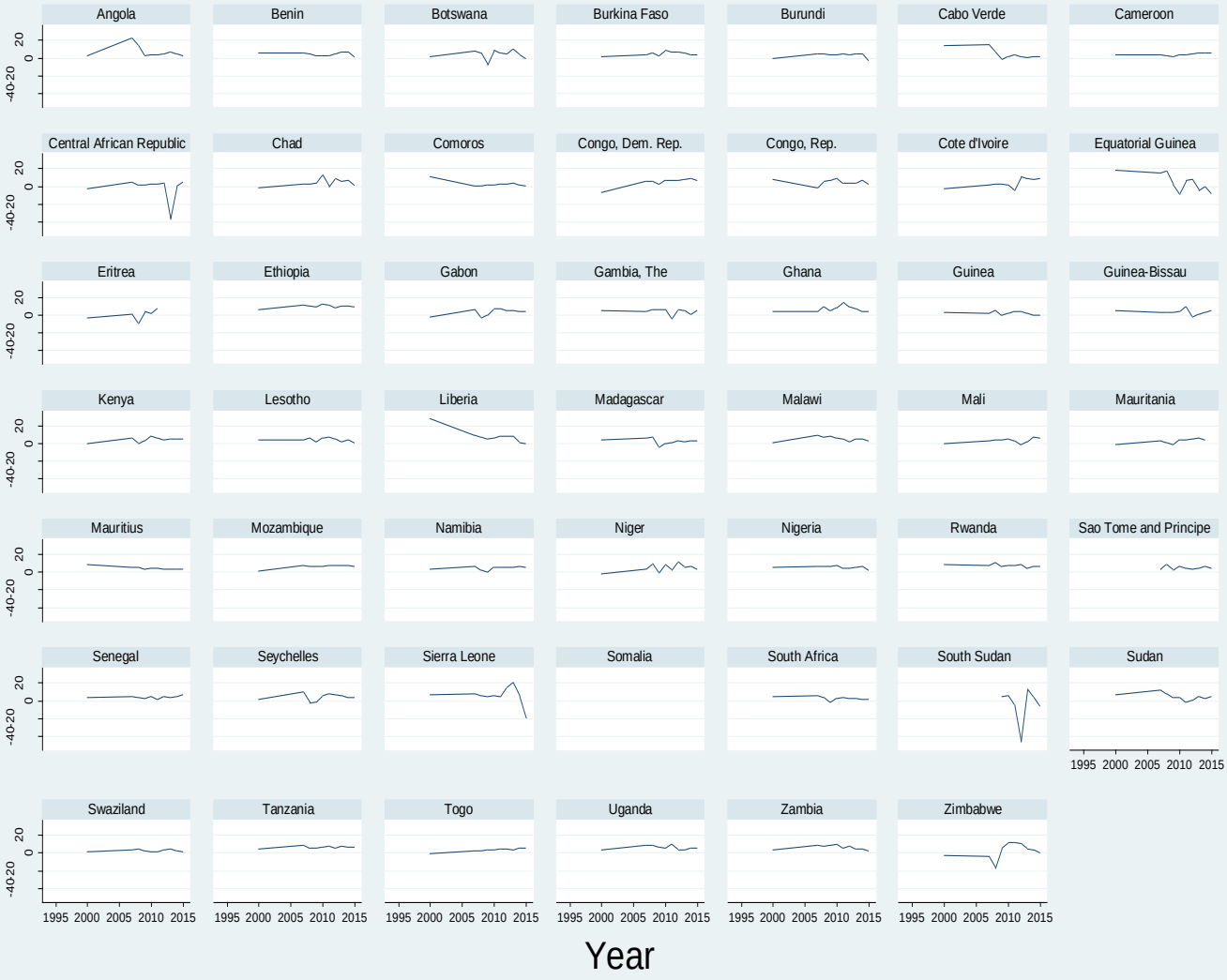
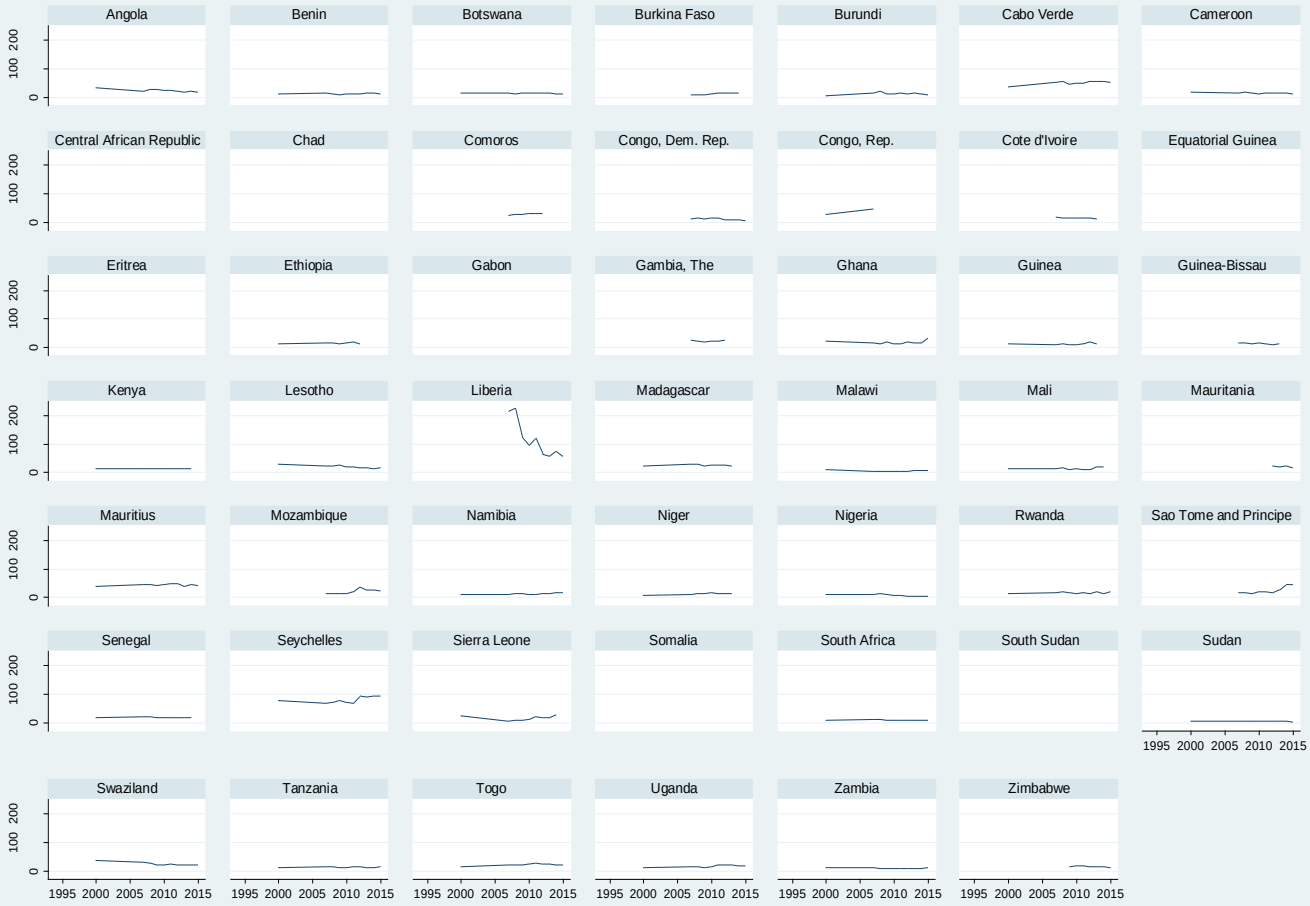
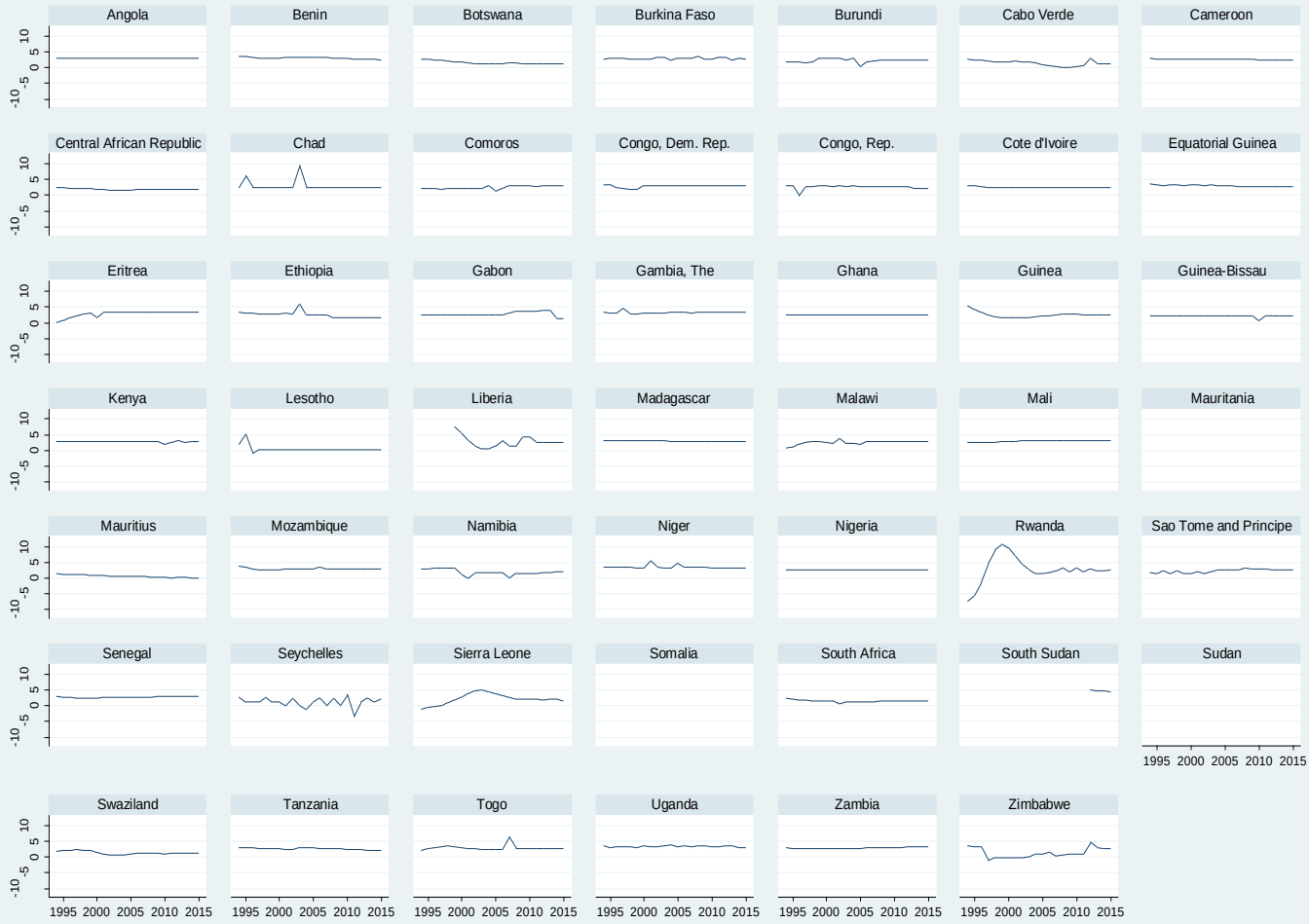
APPENDICES

PANEL DATA VARIABLES:





Graphs by Country



Graphs by Country


HDI
Angola
Benin
Botswana
Burkina Faso
Burundi
Cabo Verde
Cameroon
Central African Republic
Chad
Comoros
Congo, Dem. Rep.
Congo, Rep.
Cote d'Ivoire
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia, The
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
South Sudan
Sudan
Swaziland
Tanzania
Togo
Uganda
Zambia
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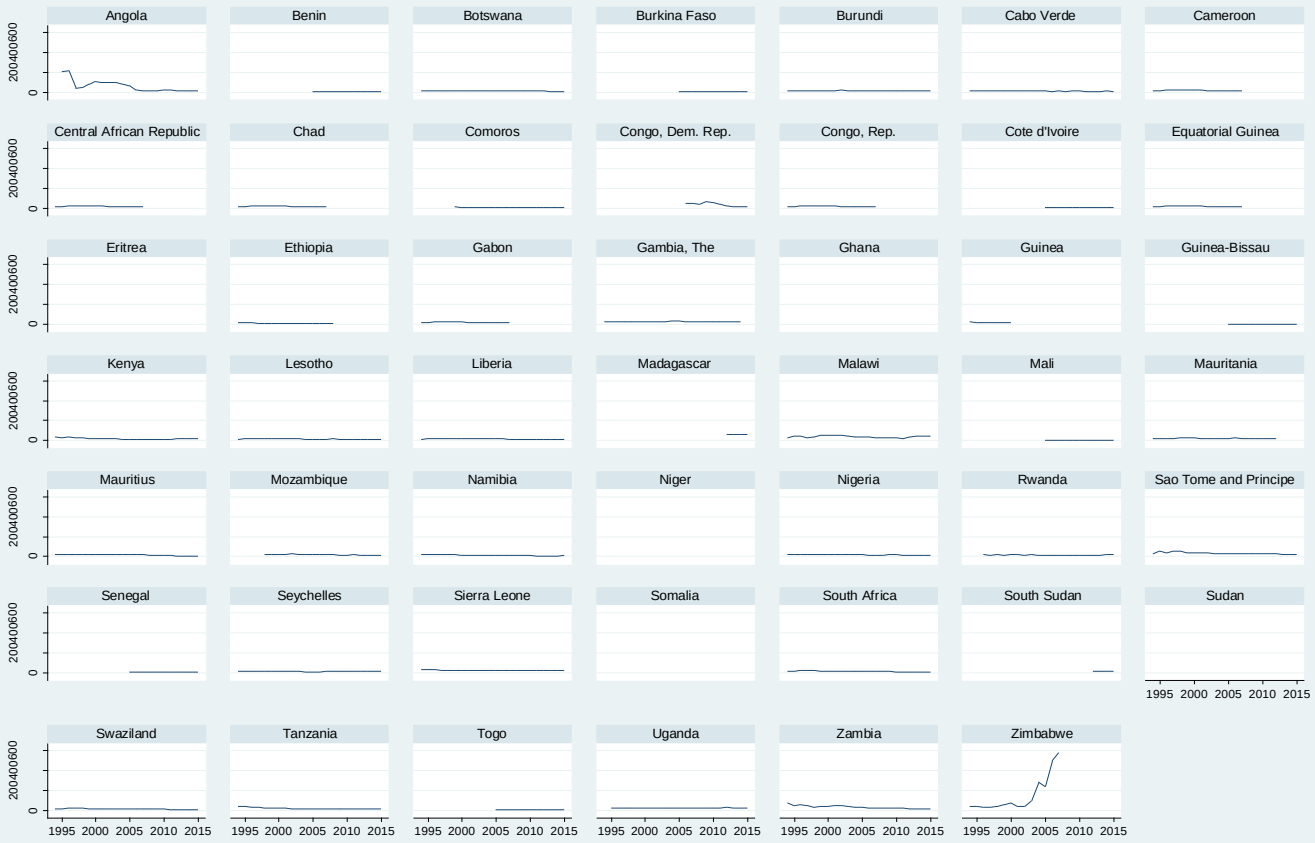
Year
Graphs by Country


Angola
Benin
Botswana
Burkina Faso
Burundi
Cabo Verde
Cameroon
Central African Republic
Chad
Comoros
Congo, Dem. Rep.
Congo, Rep.
Cote d'Ivoire
Equatorial Guinea
Eritrea
Ethiopia
Gabon
Gambia, The
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
South Sudan
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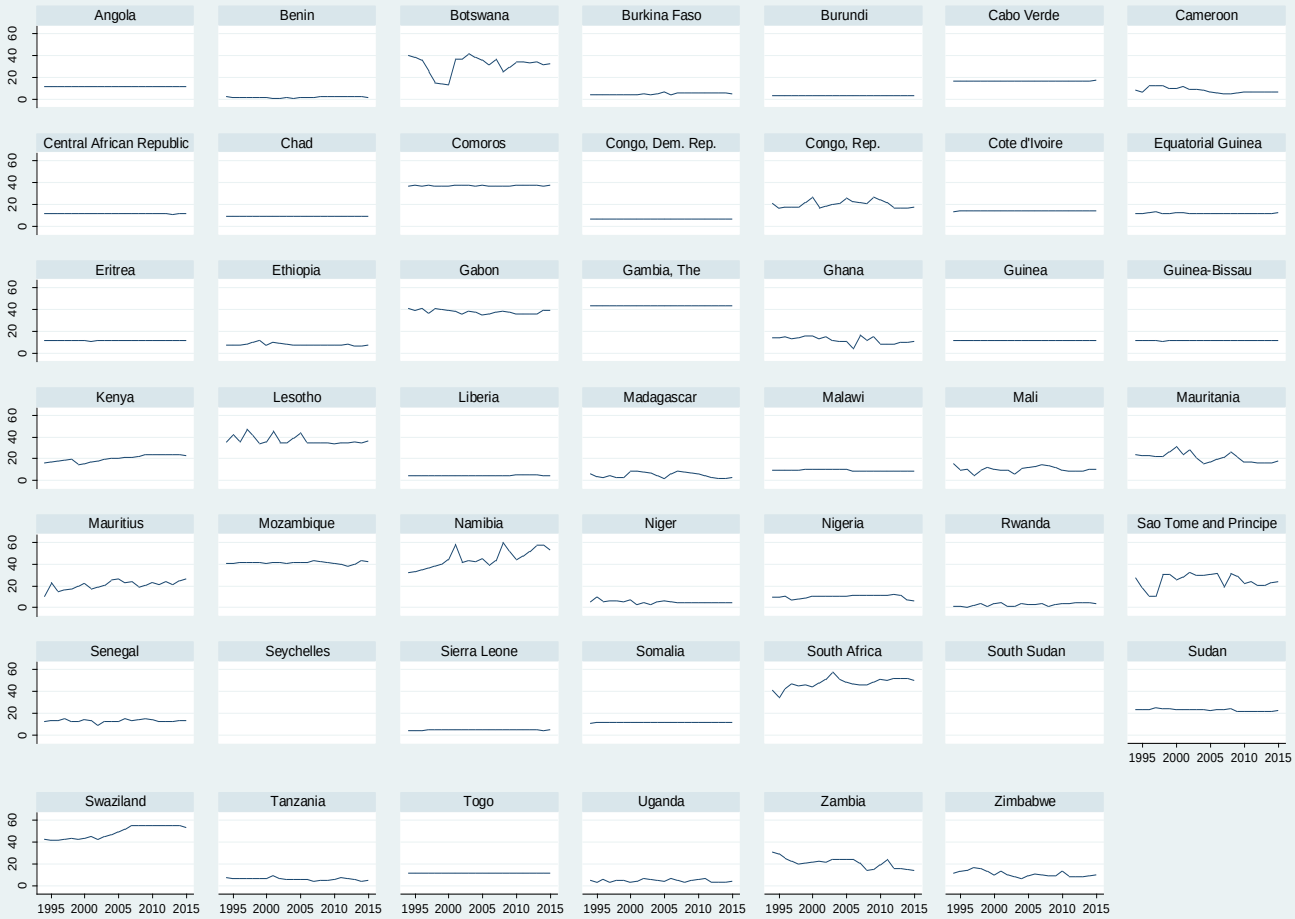
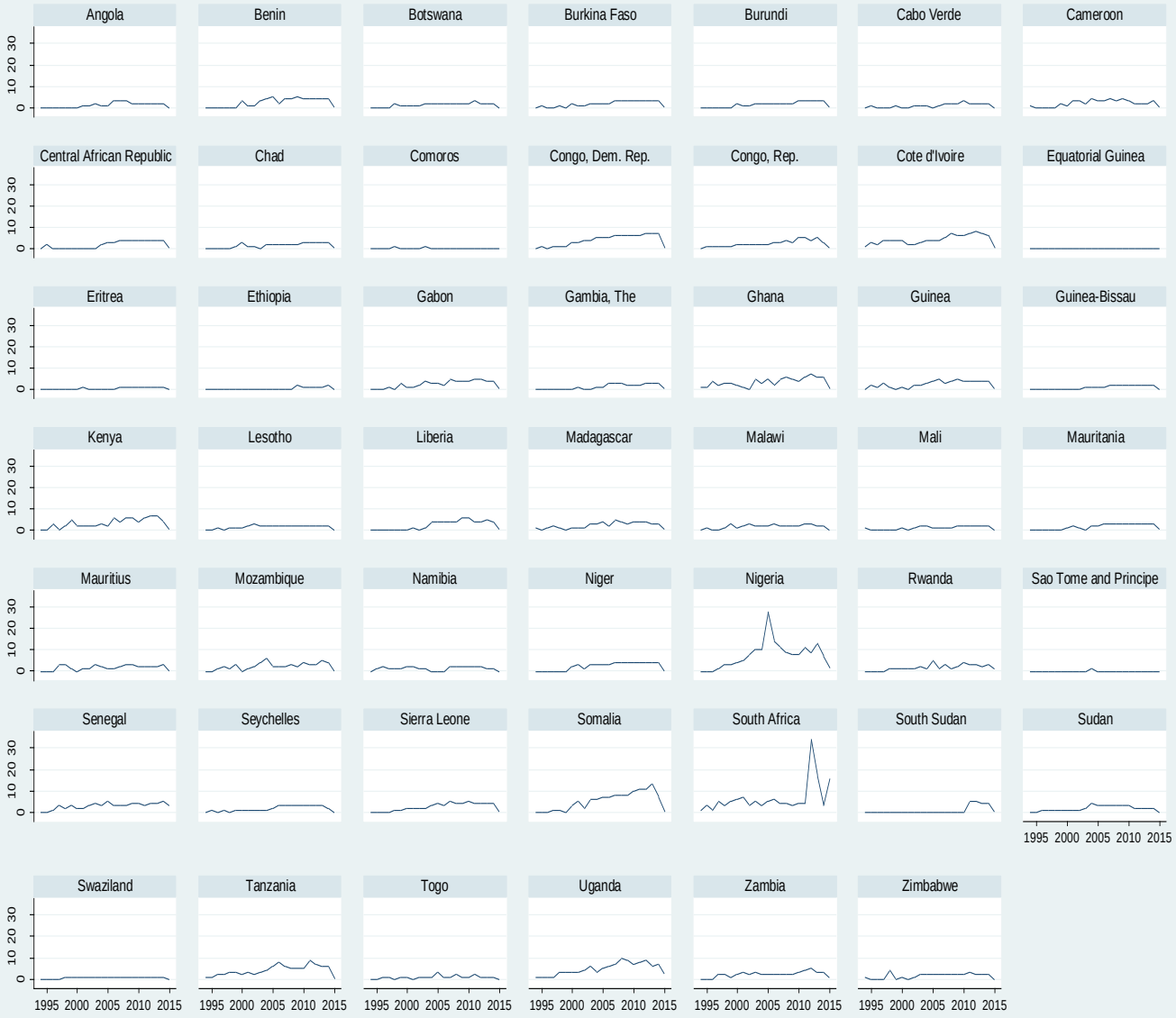
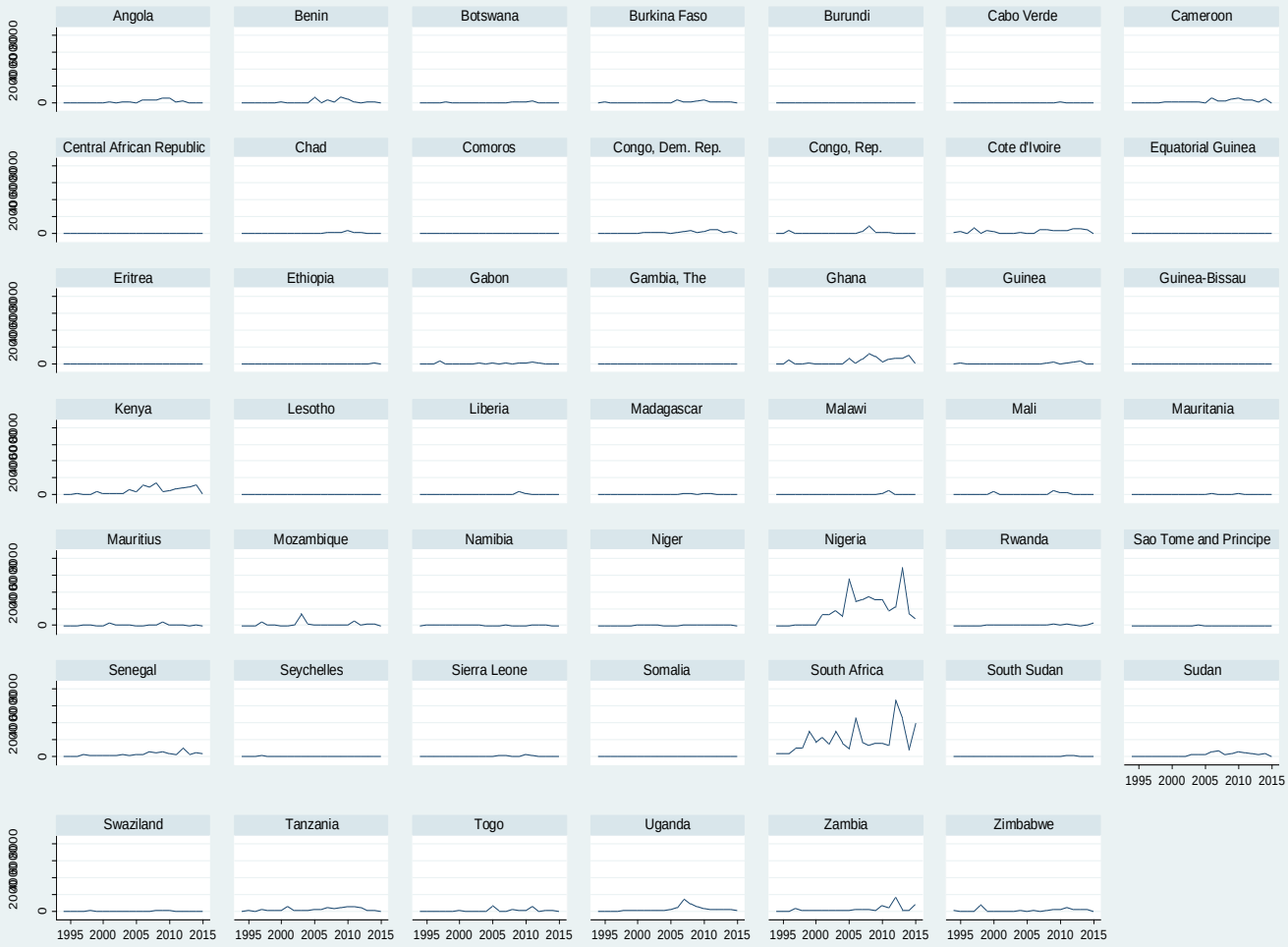
Graphs by Countr



Graphs by Country



Graphs by Country



Graphs by Country

REGRESSION ANALYSIS SAMPLE:

Sample Included in regression analysis				Sample Excluded	
1	Angola	19	Madagascar	1	Cabo Verde
2	Benin	20	Malawi	2	Central African Republic
3	Botswana	21	Mali	3	Chad
4	Burkina Faso	22	Mauritius	4	Equatorial Guinea
5	Burundi	23	Mozambique	5	Eritrea
6	Cameroon	24	Namibia	6	Ghana
7	Comoros	25	Nigeria	7	Mauritania
8	Congo, Dem. Rep.	26	Rwanda	8	Niger
9	Congo, Rep.	27	Sao Tome and Principe	9	Seychelles
10	Cote d'Ivoire	28	Senegal	10	South Sudan
11	Ethiopia	29	Sierra Leone	11	Sudan
12	Gabon	30	Somalia	12	Zimbabwe
13	Gambia, The	31	South Africa	13	Somalia
14	Guinea	32	Swaziland		
15	Guinea-Bissau	33	Tanzania		
16	Kenya	34	Togo		
17	Lesotho	35	Uganda		
18	Liberia	36	Zambia		