

# Effects of Public- Private Participation in infrastructure on GDP & inflation rate in Sub-Saharan Africa for the period 1990-2017

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**Abstract:** competitiveness imposed by globalization and international trade requires improvement and measurement of policies on public administration as well as private participation projects in infrastructure with measuring effects on the economic gross domestic product (GDP) & inflation rate, paper aims to Define the geographic & sectorial disruption of private participation in infrastructure projects in Sub Saharan Africa region and popular types was used for period 1990-2017. Also measuring the impact of private participation in infrastructure projects on economic gross domestic product (GDP) & inflation rate, the hypothesis supposed there is increase in investment in infrastructure with the participation of the private sector, concentrated in sectors characterized by fast easy and clear ways to recover their revenues. Also Private participation in infrastructure positively affects the gross domestic product (GDP) & inversely affects in the inflation in Sub Saharan Africa countries for period 1990-2017, Two models was used to measure the effect Private participation in infrastructure in domestic product (GDP),The second model measures on in the inflation rate for same period. Resulting to achieving completed and active projects 98% from the total projects indicates to success of experience of private participation in infrastructure in development proceed in sub Saharan Africa. Also achieving of Energy sector (electricity and gas) is 55% from total because the Energy is the mainstay of development, which is growing rapidly, followed by the transport sector (roads, railways, ports) by 31.2% Water Sewage by 1% due to the difficulty and complexity of investment risks. Strong positive and significant statistically relationship between GDP with private participation infrastructure projects and Reversible weak significant statistically relationship with inflation rate. Recommending The necessity for the participation and integration of sub-Saharan African countries together in their private sector in the work of joint infrastructure projects beyond one country, to strengthen the process of common development, also Emphasis on the provision of facilities and guarantees for the private sector to access in telecommunications and energy sector because of its high potential for investment with an attempt to overcome obstacles by providing customs and tax reliefs. Finely Create appropriate environment by strengthening the investment base to participation projects by providing a legal structure, rules, procedures, and unifying them with economic stability represented by stable rates of inflation, exchange rate, interest rate, and political security stability.

**Key word:** private participation in infrastructure, gross domestic product, Sub-Saharan Africa.

**FIRST: Introduction:** The public-private partnership (PPP) is a cooperative arrangement between two or more public and private sectors, typically of a long-term nature However, the late 20th century and early 21st century when have seen a clear trend towards governments across the globe making greater use of various PPP arrangements(Hodge, G. A and Grave, C. 2007), in fact The most important elements of the development process are spending on the build, operation, Rehabilitation of infrastructure in public service sectors, water, electricity, telecommunications, transport, road and information sectors, an important criterion for measuring the progress of countries. Public and private sector partnership is dominant phenomenon over the past ten years due to insufficient investment and increasing pressure on government budgets, as well concern about the inefficiency of services provided by Governmental institutions.

Remained mainly in the areas of economic infrastructure (such as telecommunications, energy, water, and roads). Also recently, however, social infrastructure (health, education, and other services) has been seen. It is known this kind of services were mainly provided by the public sector, because require large fund, in economic terms, it takes a long time before they start to give a return. The desire for better more efficient services, as well need for additional sources of funding, are increasingly driving governments to adopt public and private sector partnerships to deliver these services In particular the decade of globalization, which created the open

international trade, which forces countries to provide services and infrastructure at a high level of administrative and technical efficiency, leading to broad changes in policies, public administration and governance in line with them. Africa was estimated at USD 93 billion (15% of GDP), a third of which would be for operations and maintenance in various sectors (Foster and Briceno-Garmendia, 2010; AfDB, 2011). It was also estimated that annual expenditure on infrastructure going forward would range from 9% to 13% of GDP (Sachs et al., 2004; ECA, 2005).

**Objective:** paper seeking to explore and investigate the following:

Define the geographic & sectorial disruption of private participation in infrastructure projects in Sub Saharan Africa region and popular types was used. Also measuring the impact of private participation in infrastructure projects on economic gross domestic product (GDP) & inflation rate for same region for period 1990-2017.

**The Problem:** The competitiveness imposed by globalization and international trade requires constant improvement and measurement of policies on governance and public administration as well as private participation projects in infrastructure. Sub Saharan Africa countries is most of the new countries experience in this field, the research question represent what the impact of private participation in infrastructure on economic gross domestic product (GDP) & inflation rate?

**The hypotheses:** First hypothesis is there is an increase in investment in infrastructure with the participation of the private sector, concentrated in sectors characterized by fast easy and clear ways to recover their revenues. Also second hypothesis is Private participation in infrastructure positively affects the gross domestic product (GDP) in Sub Saharan Africa countries for period 1990-2017, finally third hypothesis is Private participation in infrastructure inversely affects in the inflation rate for same period.

**Empirical analysis & Research Methodology:** Analysis Two models are used to measure the effect Private participation in infrastructure in domestic product (GDP) in Sub Saharan Africa countries for period 1990-2017, The second model measures the effect Private participation in infrastructure on in the inflation rate for same period. Finally, distribute.

Data and Justification of Selection of Cases Studies Research uses the descriptive, comparative and quantitative methods of analysis and use a combination of the most suitable primary (qualitative) and secondary (quantitative) Data. The Secondary data was used for the quantitative analysis and obtained from local Institutions (e.g. governmental institutions reports..., Etc.).

**Literature:** It should be noted that there is a lack of studies and literature that directly study the subject of PPP infrastructure in the in Sub Saharan Africa countries.

- 1- **Study of Richaud, C. Sekkat, K. & Varoudakis, A. (1999)** paper presented proofs on growth spillovers across African economies and examines the specific role of infrastructure in their transmission. The results proposed that enhance infrastructure in a given country raises the profitability of domestic and foreign investment, therefore raising investment ratios and boosting growth in per capita income. Expansion in one country raises the profitability of investment in neighboring countries, as it creates a wider market and improves opportunities for export. This, in turn, feeds back and further enhances growth in the initially expanding economy. Owing to such externalities, investment in infrastructure carried out at the national level is likely to be sub-optimal. These results suggest that external aid, aimed at financing infrastructure in Africa, might be better provided at a regional than at a national level. This would help better internalize the benefits accruing to individual countries and would lead to a better allocation of investment outlays.
- 2- **Study of Saghir, J. (2017).** Discussed issues affecting sustainable infrastructure development in Sub-Saharan Africa (SSA) countries including challenges, opportunities, and investment options facing SSA countries. Results Governments in SSA are not investing enough in sustainable infrastructure where there are tremendous needs. Investment is currently at 2%-3% of GDP. Under-investment in infrastructure will have a negative impact on potential economic growth, living standards, and private sector development. At the same time, the private sector has not been able to fill the investment gap. The private sector continues to be a very important contributor to SSA infrastructure development. In addition, new modalities of private investment—especially from local and, international neighboring country investors, local currency financial intermediaries, and investment and pension funds—are emerging. In general, private sector discipline and financing have had a positive impact on infrastructure service delivery in SSA, and much more is needed to sustain economic growth.
- 3- **Robert Osei – Kyei & Albert P.C. Chan (2016)** the paper therefore aimed to examine the project experiences (success and failure factors) of three highly profiled transport PPP projects, namely the Lekki toll road concession project (Nigeria), N4 toll road (South Africa/Mozambique) and Port of Maputo (Mozambique) in order to develop policy measures for effective future implementation. The experiences of the three projects show that transport PPP policy is indeed feasible in SSA. However, to realize its full applicability, proper policy actions and measures must be carefully observed and these include effective and efficient stakeholder management, transparent and competitive tendering process, high participation of local investors, stable macro-economic conditions and strong government commitment and regulatory framework. The projects

experiences and policy actions developed are impactful in accelerating transport infrastructure development through PPP approach in SSA. Hence, it is hoped that policy-makers and practitioners would be informed on the key strategies to employ in implementing future projects.

- 4- **a study of Estache and Saussier (2014)** argue that the available empirical evidence confirms that PPI can lead to improvements in efficiency, but do not necessarily do so. The econometric evaluation of various types of PPI experiences indeed shows that the careful choice of control variables, the proper framing of the institutional and sectorial context and the careful avoidance of selection biases in sample choices matter to the conclusions reached by empirical tests. Based on an empirical analysis using time series data (1995-2006) in 32 countries of LAC conclude that there is a positive and significant impact of private sector participation in the coverage, quality of service and labor productivity of the analyzed utilities, especially when regulation is strong. The report does not distinguish among management and lease contracts concessions, Greenfield projects, and divestitures. The terms “private participation in infrastructure” and “privatization” are used interchangeably to cover all four types of private sector participation (PSP). In this report, the author used information on 181 firms in electricity distribution, telecommunication and water distribution that went through privatization in the 1990s as well as the LAC electricity-benchmarking database (World Bank, 2008) which contains annual information of 250 private and state-owned utilities.
- 5- **Kodongo, Odongo & Ojah, Kalu. (2017)**.they used System GMM to estimate a model of economic growth augmented by an infrastructure variable, for a panel of 45 Sub-Saharan African countries, over the period 2000–2011. they found that it is the spending on infrastructure and increments in the access to infrastructure that influences economic growth and development in Sub-Saharan Africa. Interestingly, these significant associations, especially those of infrastructure spending, are more important for lesser developed economies of the region than for the relatively more developed economies, which uncommonly have better than near-zero access to infrastructure. In addition to these robust direct links between the target variables, they find important that infrastructure access, and quality, also relate to economic growth indirectly via export diversification (trade competitiveness), and cross-border capital flows and trade competitiveness, respectively. Among other important policy derivatives of our findings, we emphasize that efforts aimed at reversing Africa's pervasive infrastructure deficit, in ways that enable economic growth and development, must be carefully nuanced.
- 6- **Estache, Antonio & Speciale, Biagio & Veredas, David. (2005)**. paper provided the first systematic quantitative assessment of the importance for Sub-Saharan Africa's growth of investment in the various infrastructure sub-sectors by relies on an augmented Solow growth model and on a recently updated World Bank indicators database to demonstrate the importance of infrastructure stocks for Africa. It provides additional insights on the argued differences in the relative importance for the effectiveness of infrastructure activities of geography (coastal vs. landlocked countries) as well as of the legal tradition of the country (Anglophone vs. nonAnglophone countries). It concludes with a test of the growth effects of the adoption of infrastructure “privatization” policies. Throughout the empirical Section of the paper, the information generated by the models testing the importance of the various infrastructure subsectors is compared to the information generated by a Solow model accounting for human capital exclusively.

First, infrastructure matters to growth however infrastructure are looked at. Second, sanitation is an exception to this first conclusion. It appears to have very little to do with growth in Africa, at least at the current stage of development, irrespective of the geographical or legal characteristics considered. Third, the legal origin of the country is generally a more important determinant of the variance of the elasticity than the geographical characteristics. Accounting for legal heritage indeed leads to different elasticities in 3 of the 5 sectors (telecoms, roads and water). In the three cases, investment in these sectors has a higher growth payoff in countries under common law over the last 35 years or so than in the rest of SSA. results hide some additional interesting facts. First, telecoms, roads and water affect GDP differently if the country has British legal heritage. For telecoms and roads, increases in the explained variance are close to 20% while for water it is of about 8%. Second, the fact that the country is landlocked or coastal is innocuous to the effect of infrastructure on GDP except for roads where the effect is higher if the country is coastal the result is surprising in light of ongoing a priori policy debates in Africa

## SECOND: Theoretical framework:

Public-Private Partnership (PPP) can be broadly defined as a contractual agreement between the Government and a private firm targeted towards financing, designing, implementing and operating infrastructure facilities and services that were traditionally provided by the public sector. It embodies optimal risk allocation between the parties – minimizing cost while realizing project developmental objectives. Thus, the project is to be structured in such a way that the private sector gets a reasonable rate of return on its investment. (PPPC, 2019), also public-private partnership (PPP, 3P or P3) is a cooperative arrangement between two or more public and private sectors, typically of a long-term nature. Governments have used such a mix of public and private endeavors throughout history. However, the late 20th century and early 21st century[when?] have seen a clear trend towards governments across the globe making greater use of various PPP arrangements.(Hodge, G. A and Greve, C. 2007)

PPPs are best seen as a special kind of contract involved in infrastructure provision, such as the building and equipping of schools, hospitals, transport systems, water and sewerage systems .( Bovaird, Tony.2015)

Although concession contracts have been used for many centuries, notably in Europe, the first reference to the term “Public-Private Partnership” dates from the 1950s in the United States and was originally applied to joint ventures between the public sector and not-for-profit organizations in educational and urban renewal programs ,The term PPP found wider application in 1997 under the new Labor government in the UK ,also Other terms are being used internationally to represent the partnership between the public and private sectors embodied in the PPP approach. Related terms include: (PPIAF,2009)

- Private Participation in Infrastructure (PPI), used by the World Bank (data base) and within the development-financing sector; also adopted for the South Korean PPI program.
- Private-Sector Participation (PSP), also used within the development-financing sector.
- P3, used in North America.
- Privately-Financed Projects (PFP), used in Australia.
- P-P Partnership (to avoid confusion with the term “purchasing power parity”, a method of comparing currency exchange rates, and also referred to as( PPP).
- Private Finance Initiative (PFI), originating in UK but now also used in Japan and Malaysia.

### Types of public-private partnership:

There are several different types of public-private partnership contracts (often known as PPPs and P3s), or in the UK, Private Finance Initiative, or PFIs) depending on the type of project (for example, a road or a prison), level of risk transfer, investment level and the desired outcome:.(SWG,2019)

- **Build – Operate – Transfer (BOT)** :A BOT model is generally used to develop a discrete asset rather than a whole network, for example a toll road. This simple structure provides the most freedom for the private sector partner during construction and the public sector bears the equity risk.
- **Build – Own – Operate (BOO)**: This is a similar structure to BOOT (below), but the facility is not transferred to the public sector partner. A BOO transaction may qualify for tax exempt status and is often used for water treatment or power plants.
- **Build – Own – Operate – Transfer (BOOT)** : The private sector builds and owns the facility for the duration of the contract, with the primary goal of recouping construction costs (and more) during the operational phase. At the end of the contract the facility is handed back to the government. This structure is suitable when the government has a large infrastructure financing gap as the equity and commercial risk stays with the private sector for the length of the contract. This model is often used for school and hospital contracts.
- **Design – Build**: The contract is awarded to a private partner to both design and build a facility or a piece of infrastructure that delivers the performance specification in the PPP contract. This type of partnership can reduce time, save money, provide stronger guarantees (as the work is with a single entity rather than a consortium) and allocate additional project risk to the private sector
- **Design – Build – Finance**: The private sector constructs an asset and finances the capital cost during the construction period only.
- **Design – Build – Finance – Operate (DBFO)**
- **Design – Build – Finance – Maintain (DBFM)**
- **Design – Build – Finance – Maintain – Operate (DBMFO)** : Similar to BOOT, DBFO (and its variations) is more used in the UK for PFI (Private Finance Initiative) projects. The private sector designs, builds, finances, operates an asset, then leases it back to the government, typically over a 25 – 30 year period. Public sector long-term risk is reduced and the regular payments make it an attractive option to the private sector.
- **Design – Construct – Maintain – Finance (DCMF)**: Design, Construct, Maintain and Finance is very similar to DBFM. The private entity creates the facility based on specifications from the government body and leases it back to them. This is generally the convention for PPP prison projects.
- **O & M (Operation & Maintenance)** : In an O&M contract, a private operator operates and maintains the asset for the public partner, usually to an agreed level with specified obligations. The work is often sub-contracted to specialist maintenance companies. The payment for this contract is either via a fixed fee, where a lump sum is given to the private partner, or more commonly a performance-based fee. In this situation, performance is incentivized using a pain share / gain share mechanism, which rewards the private partner for over-performance (according to the agreed SLAs) or induces a penalty payment for work which has fallen short.

The most important advantages of PPP projects for the state are (Valdimarsson,2007):

- Transfer of risks is the most important driver when the state looks at the advantages of PPP projects. In PPP projects, there is a possibility to transfer most or all of the risks to the private entity (for a price). Risk and opportunity go hand in hand. The private entities can and want to explore opportunities, even though they involve risks.
- Minimizing the government by outsourcing non-core activities is another important advantage. One of the state's objectives is to reduce the government and move as much as possible of its tasks over to the private sector.
- Possibility for multiple uses of the facilities. The state is not stimulated to explore this possibility, since it does not compete on the market. The possibility for the private sector to use the facilities in multiple ways represents another advantage of PPP.
- Constant cash flow. The state budget is formed of fixed budgets for each ministry. Major investments are temporary modifications of the budget of a ministry, and this problem can be difficult to deal with within the budgetary process. Avoiding major investments by having a constant cash flow is an important driver when the state looks at the advantages of PPP.
- Quicker execution of a project (once contract is signed). The advantages and risks of PPPs projects can be synthesized as follows:

**Table 1: Advantages and risks of PPP**

| Advantages  | Risks   |
|---|---|
| Possibility for smaller investments                 | Limited influence of public authority over the investment         |
| Possibility for conducting other public investments | Increase of the prices charged to the users of the infrastructure |
| Savings to the budget                               | Reduction of bargaining position of public authorities            |
| Transfer of new technologies                        | High transaction costs  |
| Sharing the risk                                    | Poorer quality of the services                                    |
| More competition on market                          | Limited accessibility to services                                 |
| More competition on market                          | Decrease of employment in the public sector                       |
| Guarantee of the services for a longer term         | Financial risk for public partner                                 |
| Decrease of the political influence in economy      | Opportunity risk for public partner                               |
| More transparency in the economy                    | Political risk for private partner                                |
| Possibility for smaller investments                 | Limited influence of public authority over the investment         |
| Possibility for conducting other public investments | Increase of the prices charged to the users of the infrastructure |
| Savings to the budget                               | Reduction of bargaining position of public authorities            |

Source: Brzozowska, 2006, p. 24

**Geographically & sectorial distribution of Private Participation in Infrastructure (PPI) in sub-Saharan Africa:**

Geographically, the sub-Saharan Africa region, according to the United Nations, is composed of all the group countries that fall entirely or partially sub-Saharan Africa. The United Nations Development Program (UNDP) shows 46 out of 54 countries in Africa as sub-Saharan Africa, with the exception of Algeria, Djibouti, Egypt, Libya, Morocco, Somalia, Tunisia and Sudan after the break-up followed North African countries (Wikipedia. Sub Saharan Africa)

**Table 1 Investment value of PPI projects during 1990-2017 - million USD**

| Year | amount   | accumulated amount | Year | amount    | accumulated amount |
|------|----------|--------------------|------|-----------|--------------------|
| 1990 | 39.60    | 39.60              | 2004 | 450.70    | 12,418.09          |
| 1991 | 0.00     | 39.60              | 2005 | 3,730.00  | 16,148.09          |
| 1992 | 0.00     | 39.60              | 2006 | 5,994.00  | 22,142.09          |
| 1993 | 0.00     | 39.60              | 2007 | 2,589.00  | 24,731.09          |
| 1994 | 446.60   | 486.20             | 2008 | 2,824.00  | 27,555.09          |
| 1995 | 368.50   | 854.70             | 2009 | 2,623.00  | 30,178.09          |
| 1996 | 921.20   | 1,775.90           | 2010 | 1,770.00  | 31,948.09          |
| 1997 | 2,426.00 | 4,201.90           | 2011 | 2,285.00  | 34,233.09          |
| 1998 | 1,126.00 | 5,327.90           | 2012 | 10,200.00 | 44,433.09          |
| 1999 | 1,843.00 | 7,170.90           | 2013 | 10,412.00 | 54,845.09          |

|             |          |                  |             |          |                  |
|-------------|----------|------------------|-------------|----------|------------------|
| <b>2000</b> | 499.29   | <b>7,670.19</b>  | <b>2014</b> | 2,684.00 | <b>57,529.09</b> |
| <b>2001</b> | 1,826.00 | <b>9,496.19</b>  | <b>2015</b> | 6,008.00 | <b>63,537.09</b> |
| <b>2002</b> | 586.20   | <b>10,082.39</b> | <b>2016</b> | 4.73     | <b>63,541.82</b> |
| <b>2003</b> | 1,885.00 | <b>11,967.39</b> | <b>2017</b> | 2,606.00 | <b>66,147.82</b> |

Source: Prepared from World Bank website, Perception, PPI.

The previous table shows the total amount invested in infrastructure by private sector participation, which in 1990 amounted to 39.6 million dollars, the first project in the state of Ivory Coast in the field of electricity worth 39.6 million dollars in terms of leasing, operation and conversion, and then escalated to \$ 921.2 million in 1996, To \$ 1.7 billion. Most of these investments were in the telecommunications field. These countries launched telecommunications services.

Investment in telecommunications expanded to \$ 2.4 billion in 1997, and the total investments accumulated since 1990 to 1997 amounted to 4.2 billion dollars Dollar R, and stepped up the value of investments in 2006, the value of \$ 5.9 billion so new that even reached the total accumulated 22.14 billion, and the continued increase in new investments annually in the fixed area between 2 to \$ 2.6 billion because of the global financial crisis, then it escalated in the year 2015 until the year 2017.

The growth in cumulative investments since 1990 to 2017 is from \$ 39.6 million to \$ 66.14 billion. It is also noted that the years 1990-2000 were slightly growing at an average of only \$ 1 billion for the entire period and doubling the average growth to 2 billion between 2000-2010 and between 2010 and 2017. This stage witnessed a significant growth in the value of investments with an average of 5 billion and is due to the years 2012 and 2013, where new investments reached a barrier of 10

This confirms the global demand for investment in the region and the continued increase in investment in infrastructure with the participation of the private sector. This is due to the continuous growth of the region according to the requirements of development and the needs of their economies.

**Analysis of PPI projects for Sub-Saharan Africa by project status:**

**Table 2 PPI projects for Sub-Saharan Africa by project status since 1990- \$ 1990 billion**

| Status            | Number     | amount         | Percent       | Upper sector       |
|-------------------|------------|----------------|---------------|--------------------|
| <b>Active</b>     | 388        | 68,776.00      | 33.8%         | Electricity        |
| <b>Ended</b>      | 38         | 130,360        | 64.2%         | Electricity        |
| <b>Distressed</b> | 38         | 2,275          | 1.1%          | Telecommunications |
| <b>Abandoned</b>  | 13         | 1,775          | 0.9%          | Railways           |
| <b>Total</b>      | <b>477</b> | <b>203,186</b> | <b>100.0%</b> | <b>Electricity</b> |

Source: Prepared from the World Bank website, Visualization, PPI.

The total number of projects with the participation of the private sector in the region reached about 477 projects with an investment value of \$ 203.1 billion. The electricity sector accounts for 243 projects worth \$ 38.3 billion, for easy access to the private sector. The projects ended 38 projects worth \$ 130.3 billion investment, 64.2%, and the active projects, which have not been canceled about 388 projects worth \$ 68.7 billion and occupy 33.8% of the total projects, namely

That the percentage of outgoing and active together exceed 98% of all, which indicates the success and strength of the general trend of countries and the private sector in sub-Saharan Africa for this type of partnerships in infrastructure, especially in the field of electricity, and the projects reached 38 projects with investment value of 2.2 billion dollars, 1.1% of Total projects, which were canceled 13 projects worth investment \$ 1.7 billion, a weak rate of 0.9% of the total projects.

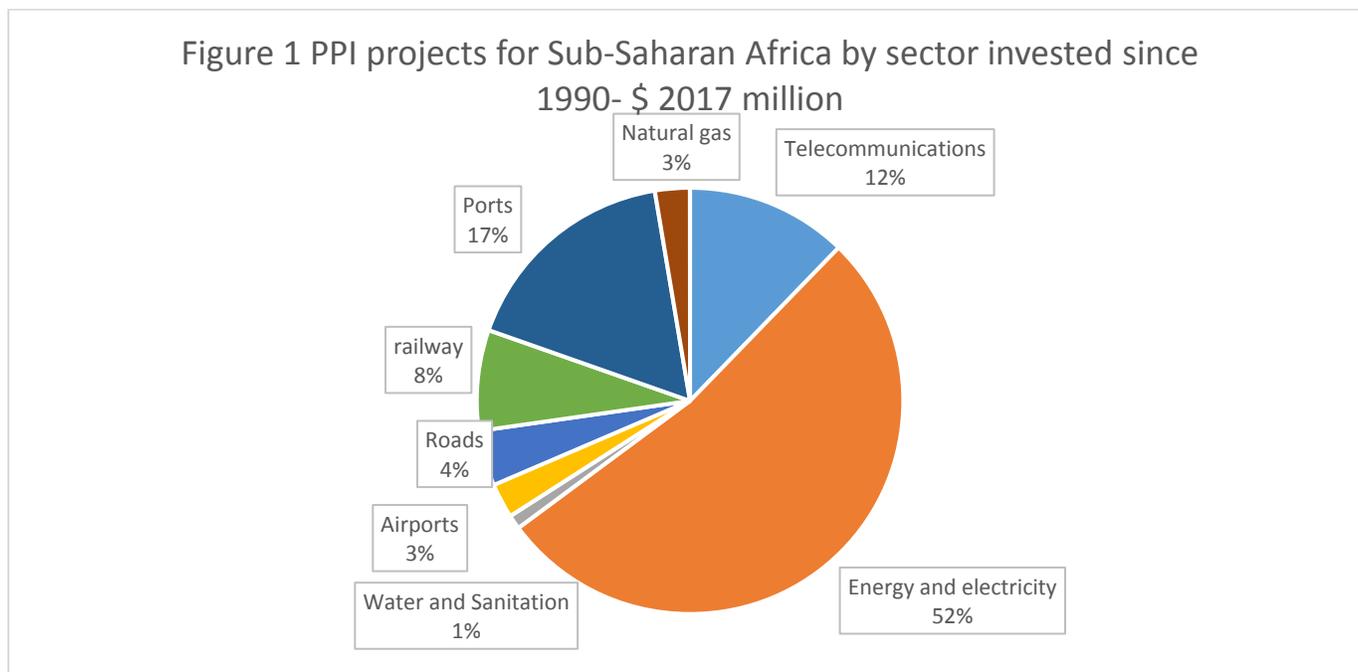
Of the above, it is clear that the total number of active and finished projects reached 199.1 billion dollars and 98.01% of total projects, while the faltering and canceled projects amounted to only 4 billion dollars and the percentage does not exceed 2% of total projects, which indicates the success, profitability and strength of the general trend of countries and the private sector towards partnerships Investment in infrastructure in sub-Saharan Africa.

**Analysis of PPI Projects for Sub-Saharan Africa by Investment Sector:**

**Table 3 PPI projects for Sub-Saharan Africa by sector invested since 1990- \$ 2017 million**

| Sector                 | Number     | amount          | Percent |
|------------------------|------------|-----------------|---------|
| Telecommunications     | 88         | 8,942.0         | %12.26  |
| Energy and electricity | 243        | 38,372.0        | %52.60  |
| Water and Sanitation   | 32         | 779.3           | %1.07   |
| Airports               | 16         | 1,919.0         | %2.63   |
| Roads                  | 14         | 3,057.0         | %4.19   |
| railway                | 21         | 5,573.0         | %7.64   |
| Ports                  | 57         | 12,383.0        | %16.97  |
| Natural gas            | 6          | 1,932.0         | %2.65   |
| <b>Total</b>           | <b>477</b> | <b>72,957.3</b> |         |

Source: Prepared from the World Bank website, Visualization, PPI.



Source: Prepared from the World Bank website, Visualization, PPI.

- **Energy and Electricity Sector:** The total number of infrastructure projects reached 243 projects with investment value of 38.3 billion dollars, representing 52.6% of the total investments. It is the largest sector that has been invested for speed and clarity to recover its costs and profitability. Energy is the basis of development for the countries of the region and the public sector. Great in them.

- **Telecommunications sector:** The second highest sector was invested with the participation of the private sector with 88 projects with an investment value of 8.9 billion dollars, representing 12.2% of the total investments. The countries of the region have not entered the establishment of new telecommunication systems and mobile phones.

Its costs and profitability are high and therefore the private sector is entering it strongly from the sectors traditionally privatized.

- **Ports Sector:** The third highest sector was invested with 57 projects with investment value of 12.3 billion dollars, representing 16.9% of the total investments. This is due to important sectors in development. The country always plays a strong role.
- **Railway Sector:** Total projects amounted to 21 projects with an investment value of 5.5 billion dollars, represent of 7.6% of total investments per.
- **Roads sector:** Investment reached 14 projects worth 3 billion dollars, represent of 4% of total investments.
- **Natural gas sector:** Projects reached 6 projects worth \$ 1.93 billion, represent of 2.63% of total investments.
- **Airport sector:** Infrastructure projects reached 16 projects by \$ 1.9 billion, represent of 2.6% of total investments.
- **Water and Sanitation Sector:** Projects reached 32 projects with investment value of \$ 779 million, representing 1% of the total investments for all investments. It is one of the least invested sectors for the length of its construction and high costs. The public sector plays a major role in these projects. In addition, the private sector is afraid to invest fully in the risks associated with it.

It is important to conclude that the arrangement of the sectors is subject to the decisions of the priorities of the development process. The energy sector and the transport sector are generally considered the most important pillars. Investment in the telecommunications sector alone is second only to privatization, thus providing the possibility of high flexibility in controlling risks and returns. Clarity and guarantee of its revenues, and if we include electricity rates with natural gas to be the energy sector of a unit equivalent to 55% of investments for sub-Saharan Africa and also the integration of roads, ports, airports and railways under the name of the transport sector Of which the total investment is 31%, which makes it the second percentage after electricity in general and the second in terms of partnership with the private sector while noting that the weak sectors are the water and sanitation sector.

Description of the Standard Models: It includes the following steps (Tariq Al-Rasheed and Samia,p5-2010): Determining variables of the model / Determining the mathematical form of the model / Determining values and signals(+ or -)

**Determining Variables of the model:** - The researcher used to determine the variables of the standard model on several sources: The study is based on the measurement of Public- Private Participation in infrastructure on GDP & inflation-rate in Sub-Saharan Africa for the period 1990-2020. Therefore, the dependent variable in this study represents GDP & inflation rate, the independent variable: Private Participation in Infrastructure project in Sub-Saharan Africa all data collected from world bank and IMF The researcher relied on the method of experimentation and dissemination to reach the mathematical functions to of Public- Private Participation in infrastructure on GDP & inflation-rate in Sub-Saharan Africa for the period 1990-2020. As follows:

$$GDP = f(PPI)$$

$$INF = f(PPISSA)$$

$$GDP = (B1)C + (B2)PPISSA + U$$

$$INF = (B1)C - (B2)PPISSA + U$$

- **GDP=** Gross domestic product (GDP) is a monetary measure of the market value of all the final goods and services produced in a period of time, often annually.( Finance & Development,2019)
- **INF=** Inflation is a sustained increase in the general price level of goods and services in an economy over a period of time.(Blanchard, Olivier,2000).When the general price level rises, each unit of currency buys fewer goods and services; consequently, inflation reflects a reduction in the purchasing power per unit of money – a loss of real value in the medium of exchange and unit of account within the economy.(Paul H. Walgenbach, Norman E. Dittrich and Ernest I. Hanson, .1973) The measure of inflation is the inflation rate, the annualized percentage change in a general price index, usually the consumer price index, over time. (Mankiw, N. Gregory,2002) The opposite of inflation is deflation.
- **PPISSA=** Private Participation in Infrastructure project in Sub-Saharan Africa
- **C = constant variable**
- **U = Errors variable**

Propositions of the parameters: In this step, theoretical predictions of the signal and size of the parameters of the model are specified Based on what is provided by economic theory or previous sources of information. According to the standard models proposed in the This study predicts the prior sign by the nature of the relationship between the dependent variables (GDP and Inflation rate) & independent variables (Private Participation in Infrastructure project in Sub-Saharan Africa )as follows: - GDP coefficient reference In

relation to Private Participation in Infrastructure project in Sub-Saharan Africa is expected to be a positive sign due to the existence of a relationship between the GDP and Private Participation in Infrastructure project in Sub-Saharan Africa, also The reference coefficient of inflation rate in relation to Private Participation in Infrastructure project in Sub-Saharan Africa is expected to be a negative signal because of a relationship The opposite between of them,

**THIRDLY:EMPIRICAL STUDY:**

**A- Private Participation in Infrastructure project on GDP in Sub-Saharan Africa 1990-2017**

**Table 4**

Dependent Variable: GDP  
 Method: Least Squares  
 Date: 05/23/19 Time: 14:37  
 Sample: 1990 2017  
 Included observations: 28

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.    |
|--------------------|-------------|-----------------------|-------------|----------|
| C                  | 1.15E+10    | 3.30E+09              | 3.484292    | 0.0018   |
| PPISSA             | 45.35055    | 3.398312              | 13.34502    | 0.0000   |
| R-squared          | 0.872605    | Mean dependent var    |             | 4.96E+10 |
| Adjusted R-squared | 0.867705    | S.D. dependent var    |             | 2.39E+10 |
| S.E. of regression | 8.70E+09    | Akaike info criterion |             | 48.68007 |
| Sum squared resid  | 1.97E+21    | Schwarz criterion     |             | 48.77522 |
| Log likelihood     | -679.5209   | Hannan-Quinn criter.  |             | 48.70916 |
| F-statistic        | 178.0897    | Durbin-Watson stat    |             | 0.969485 |
| Prob(F-statistic)  | 0.000000    |                       |             |          |

Source: result from E-Views Program.

**First: Economic Estimates:** The criterion of economic theory: (c) consent is (1.15) is appositive sign representing the value of the dependent variable (GDP) when the values of all independent variables in the model are zero, it is value of the GDP, without any linked to the changes in the PPISSA. The (PPISSA) coefficient (45.350) is positive and this result indicates that there is an absolute correlation between the changes in the PPISSA and the change in GDP, according with economic theory.

**Second: Statistical Estimates:** T-test used to test the significance of the estimated parameters to determine the effect of the independent variables on the dependent variable. If The probability value is measured (test for the estimated parameter with 5% if the probability is bigger than 0.05) The Zero Hypothesis is accepted and therefore the parameter is statistically insignificant, but if the probability value is less than 0.05, well rejected the Zero Hypothesis and accepted the alternative hypothesis, the result is a statistically significant relationship between the independent variable and the dependent variable results estimate as follows: **(A)** Clarity significance of the constant C at the level of significance of 5%, where it is observed from the table that the probability value (P.Value of the estimated parameter 0.0018) **(B).** The significance of the coefficient of PPISSA is evident from the table, which shows that the probability value of the PPISSA coefficient (P.Value) is 0.0000 less than the significance level of 5%. This result indicates a relationship with statistical significance between the GDP and Privet Participate infrastructure project in sub-Saharan Africa (PPISSA). **(C)** Significance of a complete model determined by the value of F, where the probability value (Prob = 0.0001) is less than the significance level (5%).

**Third: Model Match Quality Test:** The interpretation of the model or the model's ability to interpret is defined as R2, and the interpretation is stronger when it is closer to number (1) in the model. From the estimation results table, R2 shows that about (87%) of the changes in GDP were explained by changes in PPISSA, also (13%) of the changes are due to the variables not included in the model. This indicates the quality of the model.

The impact of the Privet Participate infrastructure project in sub-Saharan Africa (PPISSA) on GDP, therefore can express the relationship to mathematical function as fellow:

$$GDP = (1.15) + (45.35) PPISSA + U$$

**B- Private Participation in Infrastructure project on inflation rate in Sub-Saharan Africa 1990-2017**

**Table 5**

Dependent Variable: INF  
 Method: Least Squares  
 Date: 05/26/19 Time: 13:10  
 Sample (adjusted): 1996 2017  
 Included observations: 22 after adjustments

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.    |
|--------------------|-------------|-----------------------|-------------|----------|
| C                  | 15.59182    | 2.169903              | 7.185491    | 0.0000   |
| PPISSA             | -1.45E-10   | 6.24E-11              | -2.331383   | 0.0303   |
| R-squared          | 0.213693    | Mean dependent var    |             | 11.57836 |
| Adjusted R-squared | 0.174377    | S.D. dependent var    |             | 6.818860 |
| S.E. of regression | 6.195874    | Akaike info criterion |             | 6.572152 |
| Sum squared resid  | 767.7771    | Schwarz criterion     |             | 6.671338 |
| Log likelihood     | -70.29368   | Hannan-Quinn criter.  |             | 6.595517 |
| F-statistic        | 5.435346    | Durbin-Watson stat    |             | 0.862629 |
| Prob(F-statistic)  | 0.030305    |                       |             |          |

Source: result from E-Views Program.

**First: Economic Estimates:** The criterion of economic theory: (c) consent is (15.5) is appositive sign representing the value of the dependent variable (INF) when the values of all independent variables in the model are zero, it is value of the INF, without any linked to the changes in the PPISSA. The (PPISSA) coefficient (-1.45) is Negative sign and this result indicates that there is an absolute Reverse correlation between the changes in the PPISSA and the change in INF, according with economic theory.

**Second: Statistical Estimates:** T-test used to test the significance of the estimated parameters to determine the effect of the independent variables on the dependent variable. If The probability value is measured (test for the estimated parameter with 5% if the probability is bigger than 0.05) The Zero Hypothesis is accepted and therefore the parameter is statistically insignificant, but if the probability value is less than 0.05, well rejected the Zero Hypothesis and accepted the alternative hypothesis, the result is a statistically significant relationship between the independent variable and the dependent variable results estimate as follows: **(A)** Clarity significance of the constant C at the level of significance of 5%, where it is observed from the table that the probability value (P.Value of the estimated parameter 0.000) **(B).** The significance of the coefficient of PPISSA is evident from the table, which shows that the probability value of the PPISSA coefficient (P.Value) is 0.0303 less than the significance level of 5%. This result indicates a relationship with statistical significance between the on inflation rate (INF) and Privet Participate infrastructure project in sub-Saharan Africa (PPISSA). **(C)** Significance of a complete model determined by the value of F, where the probability value (Prob = 0.0303) is less than the significance level (5%).

**Third: Model Match Quality Test:** The interpretation of the model or the model's ability to interpret is defined as R2, and the interpretation is stronger when it is closer to number (1) in the model. From the estimation results table, R2 shows that about (21%) of the changes in INF explained by changes in PPISSA, also (79%) of the changes are due to the variables not included in the model. This indicates the quality of the model.

The impact of the Privet Participate infrastructure project in sub-Saharan Africa (PPISSA) on inflation rate (INF), therefore can express the relationship to mathematical function as fellow:

$$GDP = (15.5) - (1.45) PPISSA + U$$

**Consolation:** Conclude that the arrangement of the sectors is subject to the decisions of the priorities of the development process. The energy sector and the transport sector are generally considered the most important pillars. Investment in the telecommunications sector alone is second only to it because it is fully privatized and thus offers the possibility of high flexibility in controlling risk reduction and profitability. And if we include electricity rates with natural gas to be the energy sector of the unit equivalent to 55% of investments for sub-Saharan Africa and also the integration of roads, ports, airports and railways under the name of the transport sector, Of the total investment in 31%, which makes the second percentage after electricity in general and the second in terms of partnership with the private sector while noting that the weak sectors are the water and sanitation sector. There is a strong positive and statistically significant relationship between GDP with private participation infrastructure projects in Sub-Saharan Africa, so any increase or decrease in the value of private participation infrastructure projects by one unit leads to the same trend in the value of

(45.3) from GDP, also a Reversible weak and statistically significant relationship between inflation rate with private participation infrastructure projects in Sub-Saharan Africa, so any increase or decrease in the value of private participation infrastructure projects by one unit leads to the Reverse trend in the value of (1.4) from inflation rate.

### **Results:**

- 1- Infrastructure projects with the participation of the private sector are in direct harmony with the development process and are increasing their strength due to globalization, privatization policies and the requirements of development at a time when government resources are unable to meet all development needs.
- 2- Achieving completed and active projects 98% from the total projects indicates to success of experience of private participation in infrastructure in development proceed with its efficiency in sub Saharan Africa.
- 3- achieving of Energy sector (electricity and gas) is 55% from total because the Energy is the mainstay of development in the of sub-Saharan Africa economies, which is growing rapidly, followed by the transport sector (roads, railways, ports) by 31.2% Water Sewage by 1% due to the difficulty and complexity of investment risks.
- 4- Strong positive and significant statistically relationship between GDP with private participation infrastructure projects in Sub-Saharan Africa.
- 5- Reversible weak and significant statistically relationship between inflation rate with private participation infrastructure projects in Sub-Saharan Africa.

### **Recommendations:**

- 1- The necessity for the participation and integration of sub-Saharan African countries together in their private sector in the work of joint infrastructure projects beyond one country, to strengthen the process of common development.
- 2- Emphasis on provision of facilities and guarantees for the private sector to access in telecommunications and energy sector because of its high potential for investment also with an attempt to overcome obstacles by providing customs and tax reliefs.
- 3- Create appropriate environment by strengthening the investment base to participation projects by providing a legal structure, rules, procedures, and unifying them with economic stability represented by stable rates of inflation, exchange rate, interest rate, and political security stability.

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