Theme: Anticipated impacts of climate change and the green transition on public spending and resources in the different economies of sub-Saharan Africa

By KATO-KALE KAKASI Catherine, PhD in Applied Economics
Cheikh Anta Diop University of Dakar (Dakar, Republic of Senegal)
Email: *catherinekakasi@gmail.com*
Doctor of Applied Economics from Cheikh Anta Diop University since January 13, 2024

Abstract: Following the Paris Agreement in 2015, the signatory states made a commitment to limit global warming to below 2°C by the end of the century compared to the pre-industrial era. This concerns the heads of government, who are called upon to define appropriate public policies in terms of energy, transport, housing, carbon pricing and taxation. According to the World Meteorological Organization's State of the Climate in Africa report (WHO, 2021), Africa is warming at an average rate of about +0.3o C between 1991 and 2021. This period is the third warmest recorded in the region. It accounts for 2 to 3% of global greenhouse gas emissions but suffers the consequences disproportionately.

Indeed, climate change is now more than recognized as an urgent fiscal concern. More than 40% of countries in Africa have revised their national climate plans to include greater commitments on climate change adaptation and mitigation. The severity of climate change-related disasters is driving down public revenues and requiring additional public spending, as climate change is estimated to cause an annual loss of more than 3% of GDP between 2015 and 2050 in Africa (UNDP, 2018). However, governments are aware of the situation and are committing considerable resources to address it (2 and 9% of their GDP for environmental degradation and climate-related issues), but there is still a lot of resources to be mobilized both nationally and internationally.

Additional government revenues could therefore finance other budgetary expenditures, including those related to environmental objectives to combat climate change. Thus, the aim of the research is to determine the extent to which African governments would integrate the impacts of climate change into their fiscal policies and to determine the level of annual spending that can be used to respond to the effects of climate change.

This study contributes to the overall research on climate change. It stands out from the rest in that it aims to seek more concrete solutions to respond to the effects of climate change in sub-Saharan Africa. That being said, collaboration with more senior researchers within the research community will make it possible to approach the problem from a wide variety of angles, enriching the debates in order to direct discussions towards impactful practical solutions. It will therefore contribute to meeting the challenges through this community by achieving better results.

KAKASI Catherine KATO-KALE

PhD, *Applied Economics*

Dakar, Senegal +(221) 77 797 38 17 / catherinekakasi@gmail.com/ Nationality: Congolese/ DRC

My expertise: ***Data collection, processing and analysis, economic policy analysis - Analysis of data on Stata, Eviews, R and SPSS - Presentation software (Powerpoint), Microsoft office.***

ACADEMIC EXPERIENCES

- **January 2024:** Thesis defense: Research theme: *"Mobilization of external resources and economic performance in sub-Saharan Africa: the case of the Eurobond market"*. This thesis includes three essays: (1) *Risk analysis of Eurobond issuance in sub-Saharan Africa*; (2) *Effect of Eurobond issuance on infrastructure development in sub-Saharan Africa*; (3) *Effect of Eurobond issuance on economic growth in sub-Saharan Africa.* Cheikh Anta Diop University of Dakar / Senegal.
- **August 2018***: "Foreign Direct Investment and Job Creation in the Southern African Development Community (SADC)"* : *CIEREA-PTCI, Dissertation for the Diploma of Advanced Studies in Applied Economics.* University of Abomey-Calavi; Cotonou/Benin.
- **December 2015***: "Problematic of the creation of a single currency in Africa by the African Union": Bachelor's thesis*, University of Kinshasa.
- **2013:** *"Evolution of the form of the Congolese currency from 1963 to 2014". Graduate thesis,* University of Kinshasa.

Publication:

- **May 2022:** *"Exchange Rate Volatility and Economic Growth in the Democratic Republic of Congo (DRC)": Allegra Kabamba Mbuyi, C Impact of Eurobond Issuance on Economic Growth in Sub-Saharan Africa atherine Kato-Kale Kakasi, Clément Muya Ntumba, Elvis Imbaleva Mpebale, Modern Economy Vol.13 No.5, DOI: 10.4236/me.2022.135039.*

Skills:

Data collection; Economic analysis; Participation in the drafting and formatting of reports, concept notes; Carrying out statistical and econometric work on various themes; Construction, consolidation, updating and use of macroeconomic databases; Carrying out bibliographic research and writing literature reviews/bibliographies.

CONFERENCE PROCEEDINGS - SEMINARS AND WORKSHOPS:

- **September 2024:** Conference "Dynamics of African Growth", 26/27 September 2024, organized by Sciences Po, OFCE and IFC - International Finance Corporation in Paris.
- **March – July 2018***:* Research Seminars (weekly) on Economics and Management (SEREG), FASEG/UAC, Participant as a young researcher, Benin.
- **October 14, 2017:** NPTCI Conferences, Marien N'Gouabi University (Republic of Congo/ Brazzaville). **1-Towards an Islamic macroeconomic framework. 2-Financial inclusion and consumption of poor households in Nigeria.**
- **August – October 2017:** Joint Campus of Elective Courses (CCCO), high-level research-training and specialization seminar - auditors from the 18 countries of the NPTCI, Congo-Brazzaville.

ACADEMIC TRAINING

- **2020-2024**: **PhD in Economics**, specialising **in Finance for Development**, at *the Inter-University Postgraduate Programme* (PTCI) funded by the Conference of Economic and Management Teaching and Research Institutions in Africa (CIEREA). Cheikh Anta Diop University of Dakar. *ED/JPEG, FASEG/UCAD,* Senegal.
- **2016–2018**: **Diploma of Advanced Studies in Applied Economics,** specialty: **Macroeconomics,** *Interuniversity Postgraduate Programme* (PTCI), University of Abomey-Calavi; Cotonou. *ED/FASEG/UAC,* Benin.
- **2013–2015: Bachelor's degree in Monetary Economics**, FASEG/University of Kinshasa, Democratic Republic of Congo.

CERTIFICATIONS

- **February 2024:** Monitoring and Evaluation of a development project: AFD - French Development Agency:
  Introduction to the implementation and monitoring of a development project, organization of a development project, programming of a development project, management and monitoring of a development project, financing management, risk prevention, closure of a development project and evaluation.

Skills:
Development project management, scheduling and task allocation, workload management, critical thinking, designing a project roadmap, planning project implementation, creating a project timeline

- **September 2022 – December 2022;** Dakar/Senegal: Participation in the Tekki Fi program of Singa 'Inclusive entrepreneurship in Senegal: Meun Nga Tekki Fi'.

Skills:
Market research: analysis of supply and demand; positioning strategy; marketing/communication strategy; financial analysis of the project.

PROFESSIONAL EXPERIENCE

- **Since January 2025: Academy of Sustainable Development – Institut Supérieur de Finance (A2D-ISF**) in partnership with the Center for Economic Transition Expertise CETEx / LSE - ISF. Institut Supérieur de Finance, Dakar.

Activities:
ISF Researcher: CETEx Project: Macroeconomic Impact of Climate Change and Transition in the West Africa

- **Since January 2025:** Part-time lecturer at the Higher Institute of Finance, (ISF); Dakar/Senegal.

Activities:
Teaching of the course in general economics, microeconomics, macroeconomics and introduction to research methodology.

- **Since January 2020:** Affiliation to the Laboratory of Finance for Development (LAFIDEV) at the FASEG of the Cheikh Anta Diop University of Dakar.

Activities:
Researcher, collection and analysis of statistical and econometric data, writing and presentation of scientific works.

- **January 2023 to October 2023**: Advanced internship at PYLON GROUP: Financial analysis, market research; Dakar/Senegal.

Skills:
Analytical skills: identify the needs of target customers, their criteria for choosing and their budget, identify trends and draw meaningful conclusions, data collection, interpretation of results; **Knowledge of the sectors; Communication skills;** marketing/**communication strategy; Technological skills: use of Microsoft office,**
Monitoring, response to calls for tenders: drafting of a technical offer for calls for tenders.

- **March 2019 to May 2019:** Intern at Deloitte Services, Kinshasa/Democratic Republic of Congo

Activities:
External audit: Take stock of the existing state of affairs in order to identify weak and/or non-compliant points. This is in order to subsequently carry out the appropriate actions that will make it possible to correct the discrepancies. and dysfunctions observed within companies.

- **June 2015 - July 2015 / October 2013 - November 2013**: Academic internship at the Central Bank of Congo, Kinshasa/ Democratic Republic of Congo; Directorate of Economic Analyses.

Competencies: Macroeconomic policy analysis; data collection, data analysis, problem-solving skills, communication and writing skills; knowledge of social sciences, proficiency in computer science and statistics; analytical skills; ability to synthesize, research and analyze.

OTHER SKILLS

- **Language skills and competencies**
  - French (mother tongue)
  - English (Notions)
  - Swahili (Advanced Level)
- **Social and organizational skills and competencies**
  - Team Player: Collaborates and is willing to learn from others – Ability to put the team's interests first – Work in a multicultural environment.
  - Planning and organizing: Ability to take into account risks and contingencies –Ability to make the most of the time required –Ability to communicate and organize, creativity.
- **Technical and Computer Skills and Competencies**
  - Professionalism: Ability to work in a stressful environment, perseverance – Knowledge of grassroots development policy-making.
- **Other Skills and Competencies**
  - Communication: Public Speaking and Public Speaking – Listening Skills
  - Writing skills: minutes, summary of reports.

⇒ ***Hobbies: Discovery, reading, internet, music.***

REFERENCES

- **Babacar SENE:** Full Professor, Faculty of Economics and Management (FASEG) - Cheikh Anta Diop University (UCAD), Dakar/Senegal; babacar.sene@gmail.com; +221 78 462 83 24.

- **Pape DIALLO**: Director General of the Institut Supérieur de Finance (ISF) ; papediallo12@yahoo.fr; +221 77 396 06 30.

- **Tito Nestor TIEHI**, Full Professor, Associate Professor of Economics and Management / UFR of Economics and Management – University of Cocody-Abidjan-FHB; Director of the *Inter-University Postgraduate Programme* (PTCI) funded by the Conference of Economic and Management Teaching and Research Institutions in Africa (CIEREA); tito.tiehi@cierea-ptci.com – titotiehi@gmail.com; +225 09 07 10 10.

I certify on my honour the accuracy of the above information
KATO-KALE KAKASI Catherine, PhD



In terms of recent publication, I am in the early stages of my career and in the process of writing the papers from my doctoral thesis in order to submit them to appropriate journals.
As an example, you will find an article on "the effects of Eurobonds on economic growth" submitted a week ago and awaiting a response from readers.

Effect of Eurobonds on economic growth in sub-Saharan African countries

Kakasi Catherine KATO-KALE, PhD in Economics. catherinekakasi@gmail.com
Babacar SENE, Full Professor of Universities. babacarsene@gmail.com
Faculty of Economics and Management, University of Cheikh Anta Diop of Dakar, Senegal

Summary

For the past decade, sub-Saharan African countries have been entering the international bond markets to finance large-scale projects through the issuance of "Eurobonds". However, despite the resources mobilized, the infrastructure gap in sub-Saharan Africa remains significant. This has an impact on economic growth in terms of the relationship between infrastructure and economic growth. The objective of this article is to measure the effect of the mobilization of external resources in the form of Eurobonds on the economic growth of sub-Saharan African countries from 2008 to 2023. The study was conducted using the dynamic least squares method (DOLS). The results of the analysis show that Eurobonds make a positive contribution to economic growth. We recommend that policymakers improve institutional governance to improve public financial management and investment effectiveness.

***Keywords*:** Economic growth, public debt, Eurobond, Infrastructure

Effet des Eurobonds sur la croissance économique dans les pays de l'Afrique subsaharienne

Kakasi Catherine KATO-KALE, PhD en économie. *catherinekakasi@gmail.com*
Babacar SENE, Professeur Titulaire des universités. *babacarsene@gmail.com*
Faculty of Economics and Management, University of Cheikh Anta Diop of Dakar, Senegal

Résumé

Depuis une décennie, les pays d'Afrique subsaharienne font leur entrée sur les marchés obligataires internationaux pour financer des projets de grande envergure par l'émission des « *eurobonds* ». Cependant, malgré les ressources mobilisées, le déficit d'infrastructures en Afrique subsaharienne reste important. Cela a un impact sur la croissance économique en termes de relation entre l'infrastructure et la croissance économique. L'objectif de cet article est de mesurer l'effet de la mobilisation de ressources extérieures sous forme d'euro-obligations la croissance économique des pays d'Afrique subsaharienne de 2008 à 2023. L'étude a été réalisée à l'aide de la méthode des moindres carrés dynamiques (DOLS). Les résultats de l'analyse montrent que les euro-obligations apportent une contribution positive à la croissance économique. Nous recommandons aux décideurs politiques d'améliorer la gouvernance des institutions afin d'améliorer la gestion des finances publiques et l'efficacité des investissements.

***Keywords*:** croissance économique, dette publique, Eurobond, Infrastructure,

Introduction

To finance its expenditures, the government uses two methods of financing: domestic financing, which consists of mobilizing resources either by increasing taxes or reducing spending; and financing from abroad, either by borrowing from international institutions such as the World Bank, the IMF or other countries, or by issuing bonds called ***Eurobonds***.

According to Chauvin and Golitin, (2010), African countries have three main sources of external financing, namely: Foreign Direct Investment, Remittances from Migrants, and External Debt. Of these three sources, external debt plays an important role in the financing of government spending, the objectives of which are to fill deficits and finance the investments necessary for sustained economic growth (WB, 2020).

However, the contribution of domestic financing to government spending in developing countries in particular remains mixed. As a percentage of GDP, Ferry and *al.*, (2021) show that domestic public debt represents 25% of GDP in 2019 in contrast to external public debt which represents 32% of GDP. Statistical data from the World Bank (2020) show that the share of domestic financing in sub-Saharan African countries, for example, was 40% in 2019, compared to external financing, which represents 60% before Covid-19.

To alleviate the debt of these countries, several initiatives have been put in place by international organizations (IMF and World Bank): they have launched the Heavily Indebted Poor Countries Initiative (HIPC) and the Multilateral Debt Cancellation Initiative (MDRI), in order to ensure that none of the countries is confronted with a debt burden that it cannot manage. As a result of these initiatives, sub-Saharan African countries have reduced their debt burdens, which had a debt ratio of only about 40 per cent of GDP in 2005. On the eve of the Covid-19 pandemic, the level of debt in developing countries had fallen from 27.88% in 2009 to around 57% in 2020 following the lack of compensation for GDP growth (IMF, 2021). Although sub-Saharan African countries benefited from debt relief measures through the Debt Service Suspension Initiative (DSSI), the debt ratio was still high: 68% of GDP in 2021 and 65% of GDP in 2022 (AfDB, 2023). Only external debt is equivalent to 24.5% of GDP (IDS- One DATA, 2024.)

The 2008 financial crisis, which was followed by an economic depression in some developed countries, amplified the external debt of African countries, following the

collapse of the economic fabric caused by the fall in the price of natural resources. Hence the need for these countries to mobilise external resources through the issuance of ***Eurobonds***.

Thus, the resources mobilized on the bond market were currently estimated at more than 155 billion dollars. Of these issuances, between 2008 and 2018, the average public debt in relation to GDP in Africa rose from 38% to 56% in 2019. Following Covid-19 in 2020 and the invasion of Ukraine, African countries had to take on more debt. Some countries have had a debt ratio that exceeds 60% of GDP and other countries whose ratio has exceeded 100% of GDP. Examples include the Republic of Congo 103%, Eritrea 179.66%, Mozambique 106%, Angola 86%, Sao Tome and Principe 81%, The Gambia 85%, Ghana 82%, Senegal 73.16%, Sierra Leone 79% and Zambia 119% (Country economy.com; 2021). After the Covid-19 pandemic, the public debt of sub-Saharan African countries rose from 57.2% in 2020 to more than 60% of GDP in 2021 (AfDB 2020).

However, despite this rise in international bonds amplifying the level of debt by sub-Saharan African countries, the level of growth in African countries remains low. Between 2004 and 2008, the average economic growth rate for sub-Saharan African countries was 6.8% and fell to 4.1% in 2009 following the 2008 financial and economic crisis (IMF, 2015). The African Development Bank (AfDB, 2021) report notes a decline in the GDP growth rate of 3.9% in 2020 and 2022 for all sub-Saharan African countries. With the Covid-19 situation, in all sub-regions of Africa, the level of growth fell in 2020. South Africa by 7%; Central Africa 2.7%; West Africa by 1.5%; North Africa 1.1% and East Africa 0.7% (AfDB, 2021).

The effect of external debt on economic growth has been the subject of several studies in sub-Saharan Africa and around the world. Balago, (2014) has shown that external debt has a positive effect on economic growth in the short term and a negative effect on long-term economic growth. Mohsin and *al.* (2021) have shown that in several South Asian countries, external debt has a positive impact in some countries and a negative impact in others. For some countries, it is the total external debt and for others the stock of external debt. On the other hand Ayadi and Ayadi, (2008) compared South Africa and Nigeria, these authors conclude that external debt has a negative impact on the economic growth of these countries. For Nigeria, on the other hand, external debt contributes positively to growth up to a threshold beyond which it becomes negative. Malik and *al.* (2010) explained that any

increase in external debt, all other things being equal, leads to a reduction in GDP and thus a slowdown in economic growth. Checherita-Westphal and Rother, (2012) talk to us about a threshold effect. According to them, external debt weakens the pace of growth when it reaches a certain threshold (90% to 100% of GDP) but that this effect could already start from the threshold of 70 to 80% of GDP in European countries. Cecchetti, (2011) sets this threshold at 85% of GDP in OECD countries. Khanfir, (2019) sets this threshold at 42.8% of GDP, beyond which public debt negatively affects economic growth in the four North African countries, namely Tunisia, Algeria, Morocco and Egypt.

Other authors have focused in their studies on other sources of financing such as foreign direct investment, remittances from migrants (Abdelmalki and *al*., 2012 ; Minea and Villieu, 2008), rather than on the emissions of *Eurobonds*. It is in the light of all these studies and analyses Contrasting that we have decided to analyse the mobilisation of external resources on the economic growth of the SSA countries in a context of the issuance of *Eurobonds*. How do the *Eurobonds* affect economic growth? What is the effect of the emissions of *Eurobonds* on economic growth? This is of great interest in view of the importance of the abundance of external resources mobilized by our States for economic development.

This study differs from the existing empirical literature by using a model that allows us to assess the direct effects of Eurobond issuances on economic growth and allows us to study the two-way relationship between these issuances and economic growth. It also stands out for the fact that it captures public investment through the Infrastructure Development Index (AIDI).

The rest of this essay is structured as follows: the second section presents the state of public debt in sub-Saharan Africa. The third is devoted to literature reviews; the fourth section presents the methodology and data; the fifth the results and finally the conclusion in the sixth.

1. Literature Review

We are seeing a massive recourse by States to the outside world in search of financing to finance deficits and major projects. Thus, the level of indebtedness of countries is blamed for being the cause of macroeconomic imbalances, including the current account deficit, the deterioration of the terms of trade, the low persistence of savings, the stunted economic growth, etc.

1.1. A brief theoretical overview of the link between external debt and economic growth

This section is not specifically limited to Eurobond issuances but highlights studies that have been carried out on external debt in general. In the economic literature, the issue of external debt and its impact on macroeconomic aggregates dates back to 1974. The problem of external debt has been analysed by several schools of thought. If debt allows countries to mobilize resources, then it is supposed to generate growth and development.

According to the classics, public debt does not promote the accumulation of capital and the consumption of future generations. For Adam Smith (1759) and Jean Baptiste Say (1799), it was necessary to limit the public external debt, because it pushed the government to make unnecessary expenditures that would have a negative impact on economic activity since it would subsequently require the payment of interest. For Ricardo (1817), economic agents behave in such a way that they have subsequent taxes to repay. This leads agents to increase their savings for the benefit of consumption to protect themselves against future taxes, which will negatively affect production and therefore a decline in economic activity. For Barro (1989), public debt has no impact on economic activity insofar as economic agents are not victims of fiscal illusion. The intertemporal budgetary constraint means that the decrease in tax burdens leads to an increase in future taxes. The behaviour of the agents is therefore guided by an anticipation of taxes in the future, intended to repay the loan.

For the neoclassicists, debt is not used to finance economic activities, but to increase the burden of debt, and the revenues will be used to pay the debt burden (Hayek, 1989). Debt should be a tool for balancing revenue and expenditure in the short term, not an investment tool. State intervention is ineffective, it must simply carry out its sovereign mission from the resources generated by itself.

In the conventional approach or Keynesian analysis, public debt leads to an increase in demand which, through an accelerating effect, causes a more than proportional increase in investment and the latter improves economic activity. Thus, production then allows the state to be able to repay its surplus debt. Keynes, (1936) emphasizes that the principle of budgetary balance must not always be respected. When justified and controlled, it can help revive the economy and generate jobs.

The theory of over-indebtedness: the proponents of the latter have merged the points of the classics and the Keynesians. Indeed, they develop a non-linear model of the relationship between debt and economic growth. Cohen and Sachs (1986) present growth models in which capital accumulation is the only engine of growth. In the event that the country's potential exceeds its ability to repay the debt, economic agents therefore anticipate an increase in taxes that will be intended to pay for debt service. This slows down investment (Krugman, 1988). In this theory, when debt is high, it is difficult to repay.

It is in this context that Clements and *al.* (2003) spoke of the importance of a debt threshold, as public debt has a positive impact on economic growth. Above this threshold, it becomes negative. This external financing, according to Berg and *al.* (2012) is beneficial if it is used for high-return, productive investments. Indeed, debt as such is not an economic problem. The Debt Problem Appears following its mismanagement. Good debt management helps to establish fiscal discipline. The government can continue to take on debt as long as the flow of debt can sustain economic growth (Manasse, 2015). According to Daniel and Shiamptanis, (2012), determining a public debt threshold would allow countries to improve their fiscal discipline and make fiscal policies effective.

1.2. Empirical Review

The effects of external debt on economic growth have been the subject of particular attention in the economic literature. The debate on external debt on economic growth is not unanimous among the authors. Some argue that debt has a positive effect on economic growth. Mahmoud, (2015) studies the case of Mauritania between 1975 and 2005. The OLS result shows a positive relationship between external debt and GDP and a negative relationship between debt service and GDP.

Al-qudah, (2016) analyzes the relationship between external debt, domestic debt and economic growth in Jordan. Using the error correction method, they find that debt has

contributed positively to growth. They use VAR to achieve their goal, through unit root, cointegration, and causality testing. The results show that external debt has a positive impact on growth while domestic debt has a negative impact on growth. Mohanty and Mishra, (2016) conduct their study on a panel of 14 states in India for the period from 1980 to 2013 and from 2013 to 2014. After establishing a long-term relationship using the method of least dynamic ordinary squares and the modified ordinary least squares method (DOLS and FMOLS), the results showed a positive relationship between public debt and economic growth, also a two-way causality between these two economic quantities. They therefore consider that debt is not a burden for this country. Concerning Mohamed, (2018) who is conducting his study in Sudan over the period from 1969 to 2015, the error correction method (VECM) allowed him to find a positive impact of the ratio of external debt to exports. He therefore suggests that for this economy, the government needs to ensure macroeconomic stability and maintain access to foreign loans to supplement domestic savings to ensure long-term stability.

While some argue that debt can help countries strengthen growth, other authors have argued that debt inhibits economic growth. Clements and *al*., (2003) conclude that a decrease in the stock of external debt leads to an increase in economic growth.

Presbitero, (2010) examines the impact of public debt on economic growth in 92 low- and middle-income countries from 1990 to 2007 using the GMM technique, and finds a negative impact at the threshold of 90% of GDP beyond which debt no longer has an impact. Panizza and Presbitero, (2014) through the GMM, they find that public debt is negatively causing economic growth in some OECD countries. Ijirshar and *al.*, (2016) find a negative relationship by doing their analysis in Nigeria, over the period from 1981 to 2014. This negative impact is the result of debt servicing, but the external debt stock itself has a positive impact on growth. Estimates are made using the Johansen cointegration equation.

The study of Senadza and *al*., (2017) through the GMM indicates a negative relationship between external debt and economic growth in 39 economies between 1990 and 2013. Asafo, (2019) on a panel of 48 countries in sub-Saharan Africa, using the two-step GMM technique, arrive at the same result by emphasizing that the negative impact of external debt on growth does not exclude poor or rich countries. Moh'd AL-Tamimi and Jaradat, (2019) are limited to a study of the relationship between external debt and economic growth

and find a negative relationship in Jordan over the period from 2010 to 2017. Guei, (2019) analysis of 13 emerging countries between 1990 and 2016 using the ARDL model. The results indicate that there is a negative effect between external debt and economic growth, but that there is no long-term relationship. Eberhardt and Presbitero, (2015) also note that public debt has a negative impact on long-term economic growth. Kharusi and Ada, (2018) used the ARDL approach in Oman over the period 1990 to 2015. This same approach has been used by Dey and Tareque, (2020) in Bangladesh for the period 1998 to 2017. The results showed a negative relationship of external debt on economic growth that can therefore be mitigated by or cancelled out by sound macroeconomic policies.

Some authors in their research highlight a causal relationship in one direction only, other authors establish causality in both directions. Owusu-Nantwi and Erickson, (2016) This paper examines the causality between public debt and economic growth and the long-term relationship in Ghana from 1970 to 2012. Johansen cointegration and the error-corrected vector model have shown that there is a positive long-run relationship between public debt and economic growth and bidirectional causality.

However Saad, (2012) in his study on Lebanon, uses the VECM and Granger's causality to show that there is indeed a short- and long-term relationship between the different variables studied, that there is also a two-way causality between GDP and external debt service. Egbetunde, (2012) supports the same thesis for Nigeria, these two variables are positively linked in the long term if and only if the state uses these funds for development purposes only for their own personal interest. His analysis is done on a VAR in the period from 1970 to 2010. Gómez-Puig and Sosvilla-Rivero, (2015) study some countries of the European Economic and Monetary Union between 1980 and 2013 by testing the two-way Granger causality between public debt and economic growth. Public debt has a negative effect on some countries such as Belgium, Italy, Greece and the Netherlands when it reaches a debt threshold between 56% and 103%.

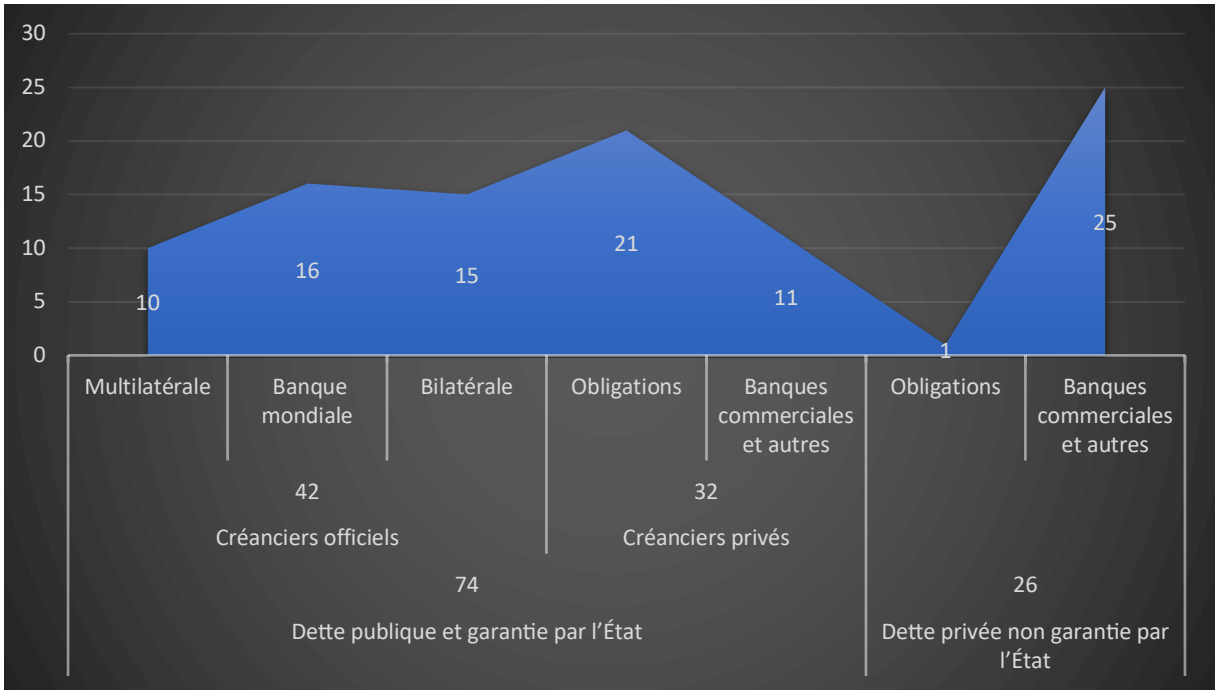
In the light of the above, we can conclude that poor external debt management leads to negative consequences for developing countries on economic growth. It is therefore recommended to maintain a healthy level of external debt; use savings and reserves wisely.

2. Analysis of stylized facts

2.1. Composition of public and private external debt

Sub-Saharan African countries have two sources of financing: domestic and external. The debt of sub-Saharan African countries is mainly held by external creditors. This debt is composed of 26% of private debt and 74% of public debt, of which 42% is from official creditors and 32% from private creditors (IDS, 2024). We see that both private and public bonds outperform other debt over time and account for 22% of total external debt. The main donor to African countries remains China, whose commitments to Africa are estimated at 25% of external debt service. Its commitments to Angola, for example, represent 45% of GDP, Ethiopia 32% and Kenya 22% (Infrastructure Consortium for Africa-ICA).

Figure 1 : Composition of public and private external debt by creditor in 2023



Source: International Debt Statistics (IDS, 2024).

Several initiatives have been taken to support the debt of developing countries. This is the Heavily Indebted Poor Countries Initiative (HIPC) created in 1996 and replaced by the Multilateral Debt Relief Initiative (MDRI) in 2005.

These initiatives of the World Bank (WB) and the International Monetary Fund (IMF) have as their main objectives to relieve the debt burden of member countries in a first phase, then to cancel all the debts of multilateral institutions to three (3) institutions, which are the IMF, the International Development Association (WB) and the African Development Fund

(ADF). and, finally, to help recipient countries make progress towards the Millennium Development Goals (MDGs) (IMF, 2005).

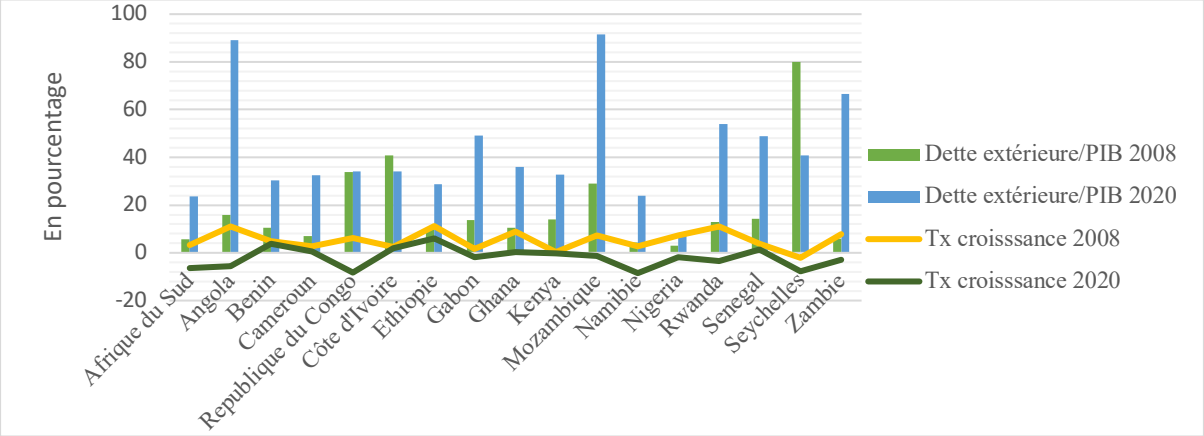
2.2. Public external debt and economic growth

Despite these initiatives and after having benefited from them since 2005, and in the aftermath of the 2008 financial crisis, the public debt of the region as a whole has resurfaced with a debt ratio of around 40% of GDP between 2008 and 2019. The countries with the highest debt ratios in 2020 were Angola (120%), the Republic of Congo (104%), Mozambique (121%) and Zambia (120%). Only Seychelles has seen its debt outlook improve, although it also remains among the countries with high debt ratios. The economy of Seychelles is mainly based on tourism and fishing. This country had the highest GDP in Africa in 2020 at $12.3 billion, although it suffered a collapse of its economy following the Covid-19 pandemic; which pandemic has led to a decline in its growth rate from 1.92% in 2019 to -13.36% in 2020, a decline in its tourism and fishing revenues which has widened the current account deficit from 15.9% in 2019 to 32.3% in 2020, an increase in pandemic-related expenditure; a decrease in its international reserves from $580 million in 2019 to $563 million in 2020, which led to the decline in its exchange rate, i.e. the depreciation of its currency (SCR 13.8 to $1 in 2019 to SCR 21.2 to $1 in 2020); an increase in the unemployment rate from 2.3% in 2019 to 4.8% in the first quarter of 2020 (IMF, 2021).

The total public debt ratio in sub-Saharan Africa increased from 38.1% in 2005 to 57.78% in 2020. For some countries, the debt ratio has doubled, such as Angola, Mozambique and Zambia. In 2019, the public debt of African states was already growing and was close to record levels compared to previous years. With the arrival of COVID-19 in 2020, debt levels remained relatively high in all countries (see Figure 2).

The following figure shows the ratio of public external debt to GDP and the economic growth rate since the creation of the MDRI program (2008) to the period of covid-19 (2020), in some Sub-Saharan African countries issuing *Eurobonds*.

Figure 2: Public external debt as a percentage of GDP and economic growth rate



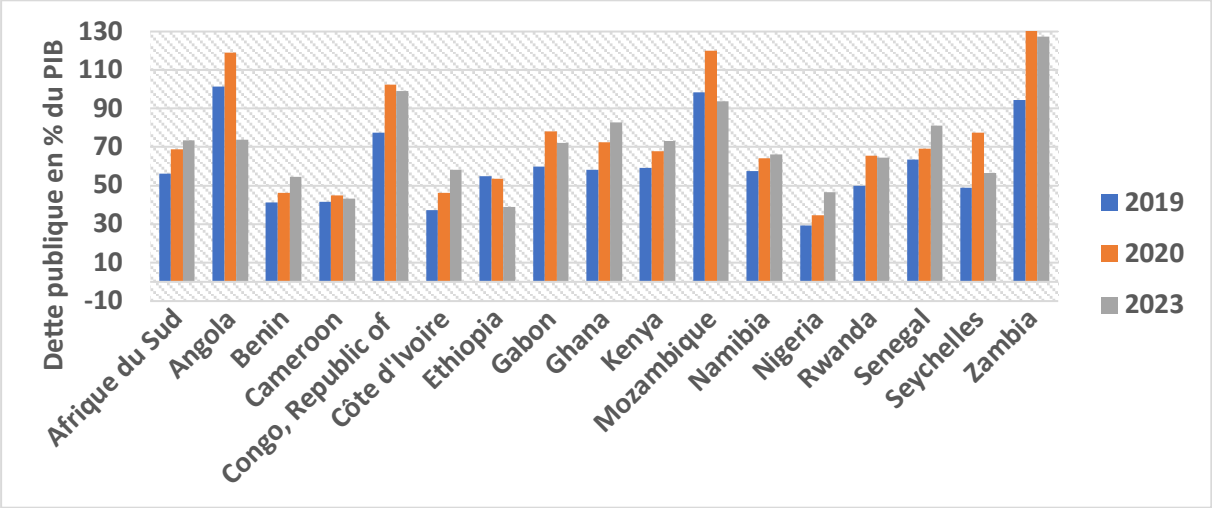
Source: IMF 2024 database

According to Figure 2 above, external debt as a percentage of GDP has consequently increased in almost all countries (Angola from 11% to 89%, Mozambique 7% to 91%, Zambia 7% to 66%, etc.) except Côte d'Ivoire (40% to 34%) and Seychelles (79% to 40%) between 2008 and 2020. Regarding economic growth, the statistics show low rates below zero for all countries in 2020 compared to 2008. All countries experienced a decline, with negative rates in some countries (-5% Angola, -8% the Republic of Congo, Namibia -8%, Seychelles -7%, etc.).

The year 2020 was an unprecedented year for the whole world, marked by the spread of the Covid-19 pandemic. This has increased the level of public debt in sub-Saharan African countries and led to an erosion of fiscal prospects due to lockdowns, border closures and a slowdown in economic activity.

In Figure 3 below, the level of total public debt as a percentage of GDP is high in all countries that issued *Eurobonds* after the pandemic in 2020.

Figure 3: Evolution of public debt before and after Covid-19

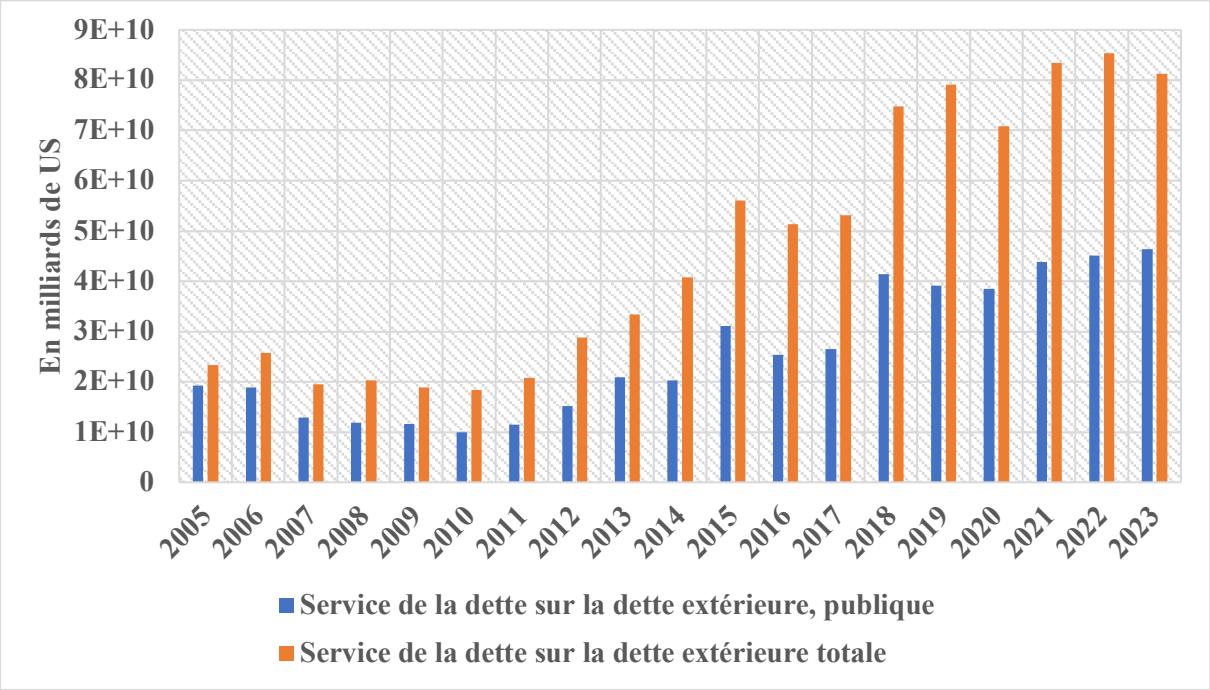


Source: IMF 2024 database.

Based on this figure, total public debt as a percentage of GDP in most Eurobond issuing countries increases from 2019 to 2023. We quote South Africa from 56% of GDP to 73% in 2023; Benin from 41% to 54%, the Republic of Congo from 78% to 99%; Côte d'Ivoire from 37% to 58%; Gabon from 60% to 72%; Ghana from 58% to 82%; Kenya from 59% to 73%; Namibia from 57% to 66%; Nigeria from 29% to 46%; Rwanda 50% to 64%; Senegal from 64% to 81%; the Seychelles from 49% to 56%; Zambia from 94% to 127%.

In the wake of Covid-19, several African states have appealed to G20 leaders for an exemption from interest payments on their debt, i.e. to consider a partial cancellation of the debt of African countries in order to allow these countries to focus their resources on the fight against the pandemic and to protect the lives and livelihoods of vulnerable people (WB, 2021). Following this request by African countries, the G20 group has set up a debt suspension initiative (Debt Service Suspension Initiative, DSSI) which provides for a moratorium on bilateral debt service for these countries. This initiative has provided debt relief to more than 40 countries, totalling about $5 billion.

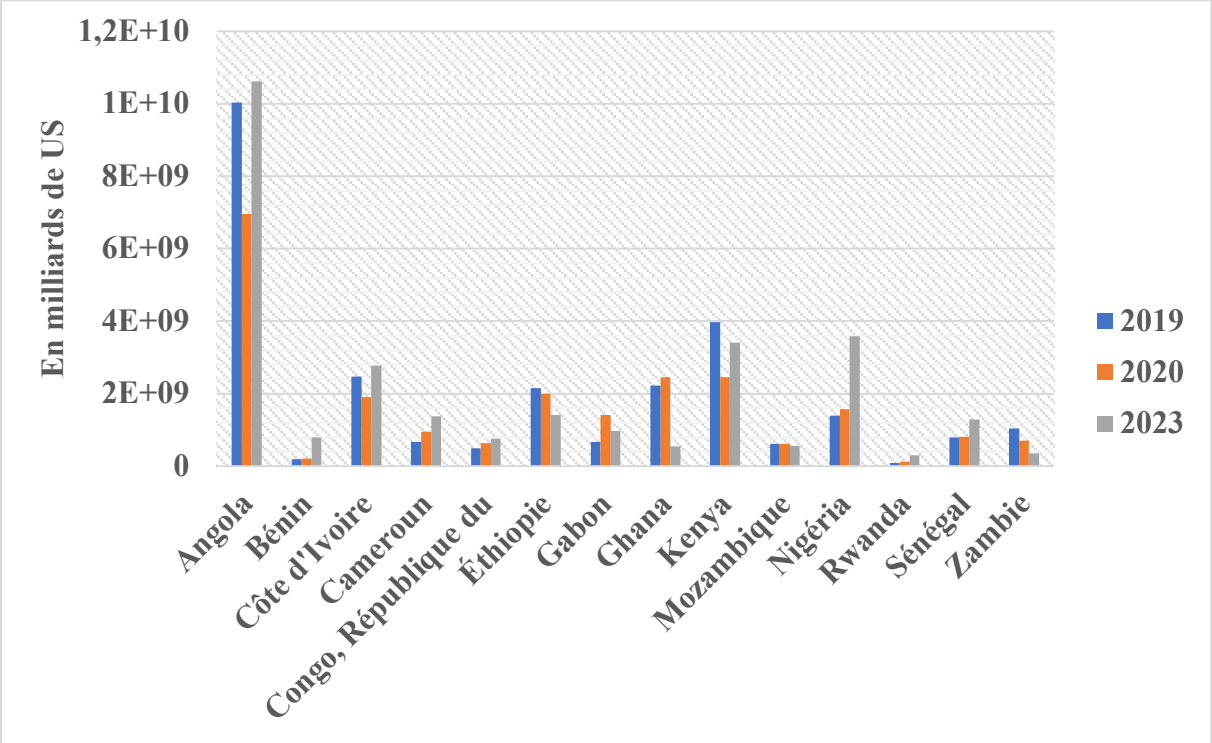
Figure 4: Evolution of total and public external debt service in SSA



Source: IDS 2024, BM

In Figure 4, we see an increasing trend in external public debt servicing in sub-Saharan African countries. This increase is mainly due to the new mode of external borrowing, in particular the issuance of *Eurobonds*, but also to the need for financing by governments to combat the global health problem. The public external debt service of sub-Saharan African countries is about $46 billion in 2023 post-COVID-19 compared to $39 billion in 2019 before COVID-19 and that of the total external debt is $81 billion in 2023 compared to $79 billion in 2019 (SDI, 2024). Among the countries that issued *Eurobonds*, South Africa, Cameroon, Ghana, Mozambique, Nigeria, the Republic of Congo, Rwanda and Senegal saw their debt service increase between 2019 and 2020, while Angola, Benin, Côte d'Ivoire, Gabon and Kenya slightly reduced their external public debt service (see Figure 5). External public debt service increased by 2.5% in 2020 compared to the previous year, and debt service on total external debt increased by 18.9% in 2020 (IDS, author's calculation). The following Figure 5 shows the external public debt service of some sub-Saharan African countries that have issued *Eurobonds*.

Figure 5: External public debt service by Eurobond issuing countries



Source: IDS 2024, BM

3. Data and Methodology

3.1. Data

We consider ten (10) countries including: Angola, Benin, Cameroon, Côte d'Ivoire, Gabon, Ghana, Kenya, Nigeria, Senegal and Zambia whose data we have from 2008 to 2023. These countries are chosen to avoid spurious regressions given that some countries have issued bonds only once. We therefore consider countries that have issued three (3) bonds or more. The choice of this period is justified by the fact that most of the shows were created in 2008.

As an Explained Variable we have the Gross Domestic Product (GDP). It is included in the model as a dependent or explained variable in order to assess how it responds to changes in the explanatory variables. The variable attempts to capture how a country's economic growth is affected by the *Eurobonds*. Like **Explanatory variables** we have: The ***Eurobonds*** or international bonds or Eurobonds are bonds offered jointly on several national markets, but excluded from the market whose currency is used as the denomination for the issue, **public investment** is measured by the Africa Infrastructure Development Index (AIDI), which measures quality and quantity. This index is the compilation of the

four (4) composite sub-indices, namely: electricity (energy), transport, information and communication technology (ICT), water and sanitation. **Employment:** Measured by the labour force participation rate of people aged 15 to 64. **Trade opening**: introduced here in the control variables to capture in terms of the volume of trade in the countries that have issued the *Eurobonds* through their trade balances, he measures the importance of trade (Wilhems, 1998). **Political stability**: reflects the extent to which the government can be destabilized as a result of violence against people and property, as well as unconstitutional interference, overthrows of government by unconstitutional means or violence, terrorism, etc. ***Controlling corruption*****:** "measures the use of public authorities for the purpose of Enrichment and the hostage taking of the state by elites and private interests." **The Exchange rate**: is the price of one currency relative to another. It is recognized as the most important macroeconomic policy variable in that it indicates a country's international competitiveness.

The data comes from the African Development Bank's World Development Indicators (WDI, 2020) (AfDB, 2020), Cbondss and Worldwide Governance Indicators (WGI, 2020) and International Debt Statistics (IDS).

Table 1: Descriptive Statistics

Variables	*Comments*	*Average*	*SD*	*Min*	*Max*
GDP	160	24.4809	1.004806	22.88708	27.07622
Eurobonds	160	19.10147	1.202198	16.65414	20.66659
Infrastructure Development Index	160	20.60345	5.848331	8.921265	32.94464
Transport	150	5.941151	3.0116	1.889808	16.10848
Energy	150	6.714733	6.134537	0.2037262	28.87364
Information and communication technology (ICT)	150	9.676361	8.576203	.0137441	43.42023
Water and sanitation	150	61.06853	11.2012	39.0135	85.58816
Commercial openness	144	25.40957	11.93736	0	53.92566
Political instability	160	-0.5492347	0.7234869	-2.211123	0.6609625
Corruption	160	-0.7138641	0.4220673	-1.48399	0.0584493
Employment	160	66.62177	10.60927	45.486	82.64
Inflation	160	7.64722	7.343519	-2.248021	38.10697
Exchange rates	160	100.1099	15.12956	66.45708	148.4745

Source: author

Table 2 : Correlation Matrix

	lnPib	lnEuro1	AIDI	ICT Transp~t Electr~y	WSS Ouvcomen	STAP	CORR Emploien Inflat~n Tauxde~n
lnPib	1.0000						
lnEuro1	0.5634	1.0000					
AIDI	0.1224	0.0645	1.0000				
ICT	0.2727	0.1226	0.7765	1.0000			
Transport	0.2540	0.0457	0.3028	0.2141	1.0000		
Electricity	-0.2397	-0.2410	0.5839	0.2875	0.0441	1.0000	
WSS	0.0149	0.3631	0.7302	0.4602	-0.0022	0.5374	1.0000
Ouvcomen	0.0868	0.6491	0.0146	0.0089	-0.2099	-0.0092	0.4785
STAP	-0.5250	-0.3134	0.1388	-0.1016	0.0859	0.3658	0.1165
CORR	-0.2695	-0.0125	0.3367	0.1990	0.4353	-0.0143	0.2193
Emploien	0.4576	0.1577	-0.5862	-0.2277	0.0684	-0.6114	-0.5271
Inflationen	0.4498	0.2013	-0.0598	-0.0456	0.1951	-0.0084	-0.1135
Tauxdehang~n	0.3014	0.1979	-0.1825	0.0103	-0.1205	-0.1473	-0.2656

1.0000								
-0.0522	0.4672	1.0000						
0.0556	-0.3853	-0.3760	1.0000					
-0.0557	0.0888	-0.0737	0.3200	1.0000				
-0.0476	-0.3274	-0.4788	0.1755	-0.0239	1.0000			

Source: author

We see a positive correlation between Eurobonds, the Infrastructure Development Index and Gross Domestic Product.

3.2. Methodological approach and data analysis

Our study aims to determine the contribution of external financing in the form of *Eurobonds* on economic growth in sub-Saharan African countries that issued them through a regression on panel data. To do this, the specification of the linear model on panel data is as follows:

$$\boldsymbol{Y_{i,t} = \alpha + \beta X_{i,t} + \varepsilon_{i,t}} \quad \mathbf{(1)}$$

Where Y is the endogenous variable and X is the matrix of exogenous or explanatory variables.

By replacing this equation with the variables of our study, the specification of the model becomes:

$$\boldsymbol{PIB_{i,t} = \beta_0 + \beta_1 Eurobonds_{i,t} + \beta_2 AIDI_{i,t} + \beta_3 Employment_{i,t} + \beta_4 ComOp_{i,t} + \beta_5 StaPol_{i,t} + \beta_6 Corr_{i,t} + \beta_7 Tch_{i,t} + \beta_8 Infl_{i,t} + \varepsilon_{i,t}} \quad \mathbf{(2)}$$

Where GDP is considered the dependent variable. Independent variables include *Eurobonds*, the Africa Infrastructure Development Index (AIDI), trade openness (ComOp), political stability (StaPol), and the exchange rate (Tch), Inflation (Infl).

Thus, we will use the **Dynamic Ordinary Least Squares (DOLS)** method, which is an estimation technique proposed by Kao and Chiang (2001) for panel data that seeks to estimate the long-term relationship. The use of this technique has several advantages, including:

(1) That of taking into account the problem of endogeneity by taking into account the tracks and shifts of the different regressors and eliminating the biases of small samples. According to Kao and Chiang (2001), this technique introduces the shifts to deal with problems regardless of the order of integration and the existence or not of cointegration.
(2) Unlike FMOLS, which is a nonparametric approach, DOLS reduces bias better than FMOLS and also does not impose any additional requirement that all variables be integrated of the same order I (1). The FMOLS, on the other hand, requires that all variables have the same order of integration and that the regressors do not appear as co-integrated.

4. Results and discussion

The unit root test allows us to determine the order in which the set of variables is integrated. There are two types. First-generation unit root tests based on the assumption of independence between individuals and second-generation under the assumption of dependence between individuals (Hurlin and Mignon, 2005). In the case of our panel, which is heterogeneous, under the assumption of dependence between individuals, the second-generation test applied is that of Pesaran (2007).

Table 3: Unit Root Test

VARIABLES	P-Value (level)	p-value (in first difference)	cv-Threshold 5%	Level of integration
Gross domestic product	-1.542	-3.303	-2.33 (-2.4)	I(1)
Eurobonds	2.610		-2.29	I(0)
Africa Infrastructure Development Index (AIDI)	-1.710	-3.636	-2.33 (-2.4)	I(1)
Transport	-1.977	-3.388	-2.4 (-2.4)	I(1)
Electricity	-2.550		-2.4 (-2.4)	I(0)
Information and communication technology (ICT)	-2.028	-3.483	-2.4 (-2.4)	I(1)
Water and sanitation	-1.723	-3.056	-2.4 (-2.4)	I(1)
Political instability	-2.156	-4.082	-2.33 (-2.4)	I(1)
Corruption				
Commercial openness	-1.442	-3.391	-2.33 (-2.4)	I(1)
Exchange rates	-1.984	-4.088	-2.33 (-2.35)	I(1)
Employment	-2.015	-2.459	2.33 (-2.4)	I(1)
Inflation	-3.249		-2.33	I(0)

Source: Author, based on Stata 16

The unit root test shows us that the variable ***Eurobonds*** is stationary in level I (0) and the others in prime difference I (1).

Thus, the results of our estimates are presented in different methods. Table 4 presents the Dynamic Ordinary Least Squares estimation through five (5) models taking into account each infrastructure sector. Table 5 presents the generalized least squares (GCM) robustness test. This robustness test allows us to confirm the results of the estimates in Table 4.

The following table determines the effect of *Eurobonds* on economic growth in sub-Saharan Africa using the dynamic ordinary least squares (DOLS) method.

Table 4: Results of the estimates and discussion

	(1)	(2)	(3)	(4)	(5)
Variables	**Dependent variable: GDP**				
Eurobonds	0.1291*** (0.0133)	0.1209*** (0.0179)	0.1343*** (0.0179)	0.1352*** (0.0161)	0.1460*** (0.0158)
Africa Infrastructure Development Index (AIDI)	0.0345*** (0.0056)				
Transport		0.0292(0.0194)			
Electricity			0.0002(0.0152)		
Information and communication technology (ICT)				-0.0132*** (0.0042)	
Water and sanitation					0.0214*** (0.0068)
Commercial openness	-0.0108*** (0.0027)	-0.0009(0.0038)	-0.0021(0.0037)	-0.0004(0.0032)	-0.0159*** (0.0033)
Political instability	-0.4715*** (0.0792)	-0.6157*** (0.1098)	-0.5640*** (0.1129)	-0.5974*** (0.0962)	-0.4327*** (0.0975)
Corruption	0.0719(0.0889)	0.0627(0.1157)	0.1468(0.1144)	0.1443(0.1037)	-0.0179(0.1039)
Employment	0.0305*** (0.0094)	0.0107(0.0125)	0.0138(0.0126)	0.0119(0.01118)	0.0402*** (0.0111)
Inflation	0.0365*** (0.0028)	0.0540*** (0.0046)	0.0544*** (0.0046)	0.0569*** (0.0039)	0.0301*** (0.0040)
Exchange rates	0.0091*** (0.0017)	0.0058*** (0.0020)	0.0025(0.0020)	0.0002(0.0019)	0.0077*** (0.0019)

Source: Author, based on Stata 16 software. p<0.01, p <0.05**, p<0.1*, correspond to the significance of 1%, 5% and 10%, respectively.

Based on our results, we conclude that the impact of external debt on economic growth appears to be mixed, as the effect of external debt on economic growth varies across countries. The results obtained on the question of the effect of debt on economic growth confirm those of economic theory, in particular Keynesian theory, which states that public debt leads to an increase in demand which, through an accelerating effect, causes a more than proportional increase in investment and the latter improves economic activity.

Our results show that *Eurobonds* have a positive impact on growth in our sample at the one (1) % threshold. A one-point increase in *Eurobonds* translates into an increase in GDP of 0.12 points. The *Eurobonds* are a lever for increasing the level of economic growth if

resources are managed effectively and transparently. These results are in line with those of Chuku and Yenice, (2022) ; Mohamed, (2018); Al-qudah , (2016) ; Mohanty and Mishra, (2016); and Mahmoud, (2015) who found a positive impact of external debt on economic growth.

The endogenous growth theory states that external debt impacts growth through public spending (Lucas., 1988; Barro., 1990). For example, Tanzi and Zee (1997) suggest that public spending affects growth through two channels. *Firstly,* by a direct effect by increasing the capital stock through public investment in infrastructure or in public enterprises (the development of infrastructure has a positive impact on growth at the 1% threshold). A one-point increase in infrastructure translates into an increase in GDP of 0.03 points). *Second,* by increasing the marginal productivity of the factors of production offered by the private sector, including education, health and other services that contribute to the accumulation of human capital. It is in this context that the countries in our sample have resorted to *Eurobonds* to finance their public deficits.

As an example, we cite Gabon, which in 2015 issued a $700 million bond to revive its economy because of the drop in the price of oil, which represents about 80% of the country's export earnings. These resources have been used to finance projects in the fields of energy, drinking water supply, education and health. Since 2013, Nigeria has issued approximately ten (10) times *Eurobonds* equivalent to $10,668 million to finance its budget with the aim of increasing its level of growth. In 2017, it planned to invest in new roads, railways, ports and energy in order to bring growth to 7% in 2020. The resources mobilized in 2017 by Côte d'Ivoire ($1,607 million) were used to finance the budget for the same year. They have also strengthened the resilience of the Ivorian economy in the context of volatility of raw materials, particularly cocoa. In 2014, Senegal raised $500 million on the international markets to invest in the agriculture, fisheries and energy sectors. In 2017, the country issued another bond of 1 billion 100 million to finance its infrastructure projects of the Emerging Senegal Plan initiated by President Macky Sall.

As far as trade openness is concerned, it is known as the exchange of goods and services between the nations of the world. Among the classicists, Smith (1776) explains that international trade makes it possible to overcome the small size of the domestic market and also to improve the competitiveness of companies between countries. It makes it possible to intensify and improve the capacities of workers, to encourage technical innovations and

capital accumulation and finally, the creation of jobs with the aim of positively impacting the growth of countries. Whereas for Adam Smith (1776) we must produce where we are better and trade with a country that has a different absolute advantage, Ricardo (1817) tells us about comparative advantage, i.e. that countries can trade even if they do not have different absolute advantages. Neoclassicists such as Hecksher (1919) and Samuelson (1948-1949) have shown that trade openness to information technology remains effective, beneficial and positive for economies. Postclassical thinkers demonstrated that international trade was very decisive for the economic progress of nations (Marshall, 1890).

As a result, several empirical studies have highlighted the importance of exports in economic growth. They provide evidence that exports lead to higher production (Agbo and *al*., 2018; Adeleye and *al*., 2015; Ehinomen and Da'silva, 2014). For them, export-oriented countries grow faster than those that are low-income, especially in low-income countries.

Our results show a negative impact of international trade on economic growth at the threshold of one percent. When trade openness increases by one-point, economic growth decreases by 0.01 point. Authors such as Ulasan, (2012) and Caleb and *al*., (2014) have shown that exports alone are not enough to explain real economic growth patterns. Factors such as the exchange rate, the quality of institutions, population heterogeneity and inflation can impede international trade and, in turn, economic growth.

The exchange rate positively affects the economy as a whole. In economic theory, Fredman (1953) and Mundell (1961) have shown that exchange rate regimes are among the main factors in economic growth. For other authors such as Edwards and Yeyati, (2005), the flexible exchange rate regime facilitates the adjustment of the economy when there is a shock. This shock is amplified in countries with more rigid exchange rate regimes. It can therefore adjust international prices and compensate for production. For Cerra and *al*., (2013), during episodes of financial crisis, countries with flexible exchange rates suffer less loss of output than countries with fixed exchange rates. Thus, according to Barguellil and *al*., (2018), the effect of exchange rate volatility on economic growth would depend on the fixed or flexible exchange rate regime and trade openness. This effect is detrimental in a flexible exchange rate regime.

Political instability has a negative impact on the economic growth of the countries studied at the 1% threshold. When instability increases by one-point, economic growth decreases

by 0.47 points. Indeed, Barro and Lee (1994) showed that political instability had a negative impact in 116 economies between 1695 and 1985. Haan and Siermann, (1996) determine the importance of political stability on economic performance by emphasizing that it is a necessary condition for the functioning of an economy. For Carmignani (2003), instability is therefore at the root of changes in public spending, changes in monetary policy, and even variations in the depth of the public deficit. It should also be noted that interest groups that support policies often lead to an economic deadlock. Political instability leads to the waste of physical and human resources as well as social capital. Uddin and *al*., (2017) in their study show that this instability affects the member countries of the Organization for Development Cooperation (OIC) more severely and low- and middle-income countries more severely. This is due to the absence of strong economic and political institutions. Several authors shared the same view, including: Khan and *al*., (2020); Nomor and Iorember, (2017); Georgiou and *al*., (2015) ; Atangana, (2013).

Robustness test

In order to test the robustness of the results obtained above, we performed a generalized least squares (GCM) regression. The results are as follows:

	(1)	(2)	(3)	(4)	(3)
Variables	**Dependent variable: GDP**				
Eurobonds	0.1196*** (0.0193)	0.1344*** (0.0210)	0.1425*** (0.0219)	0.1289*** (0.0213)	0.1448*** (0.0205)
Africa Infrastructure Development Index (AIDI)	0.0410*** (0.0064)				
Transport		0.0450*** (0.0116)			
Electricity			0.0086 (0.0074)		
Information and communication technology (ICT)				0.0145*** (0.0038)	
Water and sanitation					0.0180*** (0.0041)
Commercial openness	-0.0037(0.0027)	-0.0006 (0.0031)	-0.0033(0.0032)	-0.0029(0.0030)	-0.0128*** (0.0037)
Political instability	-0.3387*** (0.0677)	-0.4112*** (0.0737)	-0.4460*** (0.0804)	-0.3685*** (0.0751)	-0.3257*** (0.0760)
Corruption	-0.0327 (0.0873)	-0.1439 (0.1076)	0.1098(0.1144)	-0.0220(0.0975)	0.0298(0.0945)
Employment	0.0338*** (0.0042)	0.0158*** (0.0042)	0.0232*** (0.0053)	0.0220*** (0.00041)	0.0333*** (0.0051)
Inflation	0.0276*** (0.0480)	0.0316*** (0.0055)	0.0332*** (0.0058)	0.0336*** (0.0055)	0.0287*** (0.0056)
Exchange rates	0.0066*** (0.0022)	0.0038 (0.0024)	0.0050** (0.0025)	0.0405* (0.0024)	0.0070*** (0.0024)
Constant:	*18.0883*** (0.4904537)*	*19.6433*** (0.4877)*	*19.3194*** (0.5705)*	*19.5849*** (0.4885)*	*17.64191*** (0.6605888)*

Source: Author, based on Stata 16 software. p<0.01, p <0.05**, p<0.1*, correspond to the significance of 1%, 5% and 10%, respectively.

In our basic model (1), it also appears with these results that the impact of Eurobonds on the economic growth of the countries studied is positive and significant. The same is true

for the African Infrastructure Development Index (AIDI), political stability, employment, inflation and the exchange rate.

5. Conclusion and recommendation

The study is based on the observation that the countries of Sub-Saharan Africa (SSA) have recorded an increase in their debt ratio compared to the years after HIPC and MDRI following the use of *Eurobonds* on the market. Therefore, the general objective of this chapter is to analyse the effect of *Eurobonds* on economic growth in these countries. The results obtained in this research are based on the dynamic ordinary least squares (DOLS) method on a dynamic panel that can be summarized as follows: *Eurobonds* have a positive effect on economic growth, which is in line with Keynesian economic theory according to which public debt improves economic activity. A one-point increase in *Eurobonds* translates into an increase in GDP of 0.12 points. In addition, the results show that other factors such as public investment in infrastructure, employment, inflation and the exchange rate have a positive and significant impact on the economic growth of these countries. On the other hand, trade openness and political stability have a negative impact on economic growth.

Thus, the results show that it would be important to ensure the efficient use of public resources in sectors considered to be highly productive, in this case basic infrastructure (transport, water and sanitation, electrification, information and communication technology) to improve the level of growth. Designing meaningful economic policies that allow for increased exports is essential to sustainably address the economic impasse caused by the lack of foreign exchange earnings in these countries.

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