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ANALYZING THE NATIONAL DEBT OF SEVERAL SELECTED EAST AFRICAN COUNTRIES: AN APPLICATION OF A LONGITUDINAL PANEL DATA

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ABSTRACT

Purpose- East African countries are the fastest-growing nations in the region. These countries have membership in several well-known regional agreements such as COMESA, IGAD, and EAC. Hence, because of their impressive growth in the course of the previous years, these countries are demanding an extensive analysis from many dimensions. Consequently, this paper has an objective to inspect the national debt of 9 selected East African countries from the period 2000 to 2021.

Methodology- The paper utilized longitudinal panel data in order to evaluate the impact that the GDP, inflation rate, government spending, and trade have on the national debt of east African countries.

Findings- The findings in our fixed effect model revealed that the variables GDP, inflation rate, government spending, importation, and exportation have a significant impact on the national debt of East African countries. we perceive that an increase of 1% in GDP increases 0.557% in the East African debt. Also, the inflation rate and government spending revealed that they expand by 0.002% and 0.413% respectively the national debt of East African debt. Finally, according to table 3, the trade components have revealed distinctive effects. To start with, exportation was revealed to increase the national debt by 0.122% while importation revealed an inverse impact in which it reduces the national debt by -0.368%.

Conclusion- Finally, the study will provide evidence to the African countries especially my country Djibouti how to adjust and limit their national debt in conformity with their gross domestic product and economic capacity. Additionally, it will provide economists with a better comprehension of the economic situation in East Africa.

Keywords: GDP, inflation rate, national debt, government spending, trade, panel data.
JEL Codes: B22, C22, H11

1. INTRODUCTION

The East African Community has achieved excellent accomplishments since the nineteen and is currently appraised across Africa to act as an illustration of fruitful local coordination. A large portion of these victories are established in the community's solid past that originates before any local legislative association on the planet by the nineteen-sixties, and in the political aim that has stirred specialized endeavors around territorial joining programs since the marking of the 1999 Treaty. Boss among these accomplishments includes organization building, financial advancement coming about because of the tradition's association and the normal market, and a typical voice in the continent (Bainomugisha, 2016).

The initial ten years of the 21st century realized major subjective changes in African nations, showing the immense potential and the formative prospects arising out of them. Individual nations in the locale kept the quickest economic development in the worldwide economy while a large portion of the advanced economies experienced the economic emergency and its outcomes (Mataen, 2012).

From one viewpoint, African nations have become more significant players in the global market and business sectors. Then again, they have transformed into an essential locale for the strong nations on the planet's framework (Cargill, 2010). The region's development rate reached the midpoint of 4.9% in 2018 and 5.3% in 2019, contrasted with 3.3% and 3.4% in Africa

generally. According to the African development bank, because of the covid-19 pandemic, the development of East Africa falls down to 0.7% in 2020. Nevertheless, the region's development remained above compared to other African countries. The reason behind this stable performance was due to the region's financial incentives, broadened administration in different sectors, and supported public spending on various projects and investments in agribusiness.

Previous to realizing a financial merger, several rules of macroeconomic criteria were stated to accomplish it. These criteria have encountered many difficulties, from the discrepancies among the member nations to institutional, social, and divergent economic systems. In such a manner the involved States established a council of central bank legislative heads of separate nations, the EAC Financial Undertakings Board (EACMAC) with the order to manage, coordinate and fit the full-scale monetary strategies in the area. The other crucial expectations that they were supposed to accomplish involved; adapting the tax values with the region standards upgrading the simplicity with which one money can be changed over completely to another, introducing contemporary and coordinated installment and settlement frameworks, smooth exchange practices and mandates to make the stock trade market in the region harmonized (Law, Tee, & Ooi, 2019).

Public Debt is essentially an obligation owed to holders of Government and institutions like Treasury Bills and Treasury Bonds. Nations generally get by securities, government bonds what's more, bills. Countries often take debt for two reasons. For instance, when the expected gains are less than the planned amount for the expenditure and payback maturing loans. "Logical" amounts of taking a debt by a developed nation are probably going to improve its financial development and economic, both through capital allocation and efficiency development. Nations at the beginning phases of improvement have little supplies of capital and are probably going to have venture open doors with paces of return higher than the advanced countries. In conditions, they utilize the acquired assets for useful ventures and they don't experience the ill effects of macroeconomic precariousness, arrangements that twist economic initiatives, or sizable diverse shocks, development ought to grow and permit ideal obligation reimbursements (Pattillo, Poirson, & Ricci, 2015).

Adequate utilization of debt could prompt improved economic development and consequently, better ways of life. To make obligation powerful, there is a need for expansive changes in the executives of the public area. Generally speaking, assets from debt have not been utilized as actually, for instance, projects funded by worldwide credits have, because of the absence of satisfactory or practical preparation, not succeeded to create appropriate assets to support the debt acquired. In this manner socio-economic expansion is compromised since the public authority spends tremendous aggregates on advance reimbursements, consequently diminishing the cash it spends on schooling, well-being, and other social conveniences, which mostly focus on poor people, who consist mostly of the populace (Kendren, 2009).

Africa is famous for taking huge amounts of debt to stabilize and balance its economy. Thus, the fundamental objective of this study is to scrutinize the effects of national debt on east African countries. It also evaluates the economic growth of East Africa during the past 21 years. Accordingly, the data consist of nine East African countries which are (Djibouti, Ethiopia, Sudan, Kenya, Rwanda, Eritrea, Uganda, Tanzania, and Burundi). Additionally, the information was gathered from multiple sources such as World Bank, Statista, and economy country from the period 2000 to 2020.

Moreover, the study exercised longitudinal panel data that consisted of pooled OLS, fixed effect, and random effect models. These models were employed so that the influence of the GDP, inflation rate, government spending, and trade on the national debt of East African countries will be investigated.

The paper contributes to the large empirical findings about the economic situation of Africa. In addition, it puts light on the rapid development of East Africa. Furthermore, it provides to East African government, policymakers, and economists with insightful practical evidence about the correlation between the national debt and macroeconomic factors. The study will also offer insights into how to regulate these factors in order to decrease the national debt.

The study will be composed as follow. Section 1 will involve reviewing past literature on the topic, then in section 2, we will explore the methodology and econometric model that are employed in this study. After identifying the methodology that will be utilized. In section 3 we will apply the model and interpret the results. Finally, in Section 4 we will discuss the results and conclude the study.

2. LITERATURE REVIEW

2.1. East African Nations

Numerous countries all over the world acquire investments to fulfill their necessities and limit the spending plan shortage. In any case, homegrown resources have regularly shown deficient and perhaps obliterating in their results private investments.

(Fajana, 2003). Countries will quite often borrow debt externally in light of the fact that such sources are significantly concessional and broken down into domestic assets. (Ajisafe & Gidado, 2006) concede that countries can adapt their debt by making cash, to dodge installment of premiums. This is the way state-run administrations use to lessen interest costs which and on the off chance that frequently utilized it can prompt excessive inflation. (Mutasa, 2003) points out that the customary view that high levels of domestic obligation could restrict the private area and constrain the degree of countercyclical money-related courses of action. Consequently, could engender higher insecurity and unfavorable results for financial execution. With the rising danger of instability emerging from resource restriction and poverty, the economic situation in Africa is suffering under the unstable of the weakening macroeconomic basics. Falling product costs are similarly affecting tremendously these nations. Financial backers are opting for more risky assets and avoiding less secure spots, incited by the chance of increasing interest costs in America (Lora & Olivera, 2006). The IMF is limiting its improvement aids further diminishing income for the countries, compelling them to get more and administrate their activities less regularly. The progressing public-obligation crisis in African countries, which have experienced every one of these patterns is an indicator of what might be on the horizon.

According to (Halima, 2015), several nations in East Africa are confronted with an escalating degree of debt volumes. For example, the public debt of Tanzania reached Tshs 28 trillion at the beginning of 2015. Another money-related guess by the UK-based Oxford Financial matters, Tanzania's GDP (Gross domestic product) remained at 52 trillion at current expenses as of November 2013 (Asogwa, 2014). Obligation to-Gross domestic product extent has outperformed by 50% beating the debt to Gross domestic product extent limit specified by the IMF. In the account of Rwanda in 2013 the public authority enlisted an obligation to Gross domestic product extent of 29.42% of the nation's Gross domestic product.

In an investigation conducted by (Mukui, 2013), he stated that external public debt and debt servicing that includes (interest, principles, and late payment fees) had a deteriorating impact on the economic development of Kenya. The author additionally mentioned that inflation levels and home-based investment funds had a negative influence on economic development. Paradoxically, capital arrangement and foreign direct ventures affected positively economic development. Previous studies, that involved the economic development of 19 developing countries revealed that outer public obligations which consist of a portion of GNI and GDP had a pessimistic impact on economic growth. In parallel, external debt had a negative impact on investment (Fatma & Zouhaier, 2014).

The government obligation in Rwanda which is the total amount of debt in proportion to the gross domestic product appeared at the midpoint of 65.78% from 1995 to 2013, appearing at a high of 119.50% in 1995 and a record low of 21.27% in 2008. Rwanda's new ascent in acquisition urged the policymakers to vocalize their concerns over the nation's ability to pay the debt (Ogwuma, 2013).

Foreign debt is seen to be a significant source of funds on which nations depend to accomplish public goals. External debt is considered the appropriate alternative for developing countries to finance their industrial activities and narrow the shortage between savings and investment (Rahman, Ismail, & Ridzuan, 2019). Moreover, authors such as (Sheng & Suka, 2021) declared that in the past years' debt borrowing fall down in proportion to GDP, which is probably because of the accessibility of different types of foreign debt and sectors diversification. In spite of that, for developing economies, especially external debt is regarded as a main source of financing.

2.2. The Growth of Domestic Product

Otherwise called economic development is characterized as an ascent in financial labor and product creation relative from one-time span to another and is typically estimated with regard to the GDP of an economy. The importance of economic improvement can't be under-evaluated. Since it is verification that an economy is growing efficiently in the usage of its restricted assets. (Bhagwati, 1988) acclaimed that economic advancement works on innovative progression and abilities arrangement. the "traditional assessment" of government obligation complements the positive interest effects of public commitment in the short period and amassing out influences hosing monetary activity over the long term. In this essence, an extension in the spending plan shortfall raises nonessential house income, especially when there is a high pace of spending plan deficiency in the economy. The related expansion in pay and abundance supports the total interest for labor and products. On the other hand, Keynesian believes that the reason for the fall of public reserve and forcing nations to borrow debt is because of the expansion in the fiscal deficit. In this sense, the private investment funds that countries possess cannot cover the deficit which as a result diminishes economic growth and calls for immediate measures (Elmendorf & Mankiw, 1999).

As indicated by (Ighodalo, Omankhanlen, Osagie, & Iwiyisi, 2020), external debt has no noticeable impact on economic development. Nonetheless, in their viewpoint, home-based debt has a considerable impact on economic development by 3.3% for each increment. Another paper by, (Kumar & Woo, 2010) contradicts this statement and mentions that a negative relationship subsides between the debt acquired by the government and the real GDP per capita. Notwithstanding, the previous authors appropriately stated that this link disregards possible endogeneity among growth and public debt: the public obligation to-Gross domestic product proportion and results of economic development might not be entirely set in stone by external factors.

(Jacobs, Ogawa, Sterken, & Tokutsu, 2020) expressed that national debt is a crucial source for the nations to fund public spending and narrow the disparity in the public spending plan. There are various resorts of public debts like treasury and depository bills, obsolete government securities, outer help, and short periods borrowings. These quantities of funds are acquired by the public authority to meet the required objective of its financial plan. Additionally, these funds can be utilized to perform developing and valuable projects in terms of social and economic. Along these lines, public debt increases investment speculations, business activities, employment, and the performance of all the different sectors. Accordingly, the expanded acquirement of public debt is an incredible instrument to achieve improvement in the real gross domestic rate.

The previous examination (Esteve & Tamarit, 2018) dissected how the development and execution of nations' approaches with respect to credits influence their financial plan and economic development in the worldwide market. This examination sets that when the public authority has an adaptable credit strategy and can get cash from the overall population whenever when required, it has the likelihood to prompt more productive economical activities and employment opportunities. All of these policies empower the country to accomplish higher Gross domestic product and accomplish a superior place in the global market.

(Wairimu & Gitundu, 2017) adopt another strategy to look at the effect of government obligation by observing the effect of outside obligation on Kenya's Gross domestic product from 1970 to 2010. Alongside this, several factors such as inflation, workforce, investment, interest rate, and financial services were employed. As a result, a pessimistic connection which is negative has been discovered.

2.3. Government Spending

The economic hypothesis doesn't consequently create solid decisions about the effect of a nation's spending on economic development. Without a doubt, many economic experts would agree that there are situations in which lower levels of government expenditure would improve economic growth and contrary various circumstances in which more significant levels of government spending would be appealing. In the case nation's spending is zero, likely there will be unremarkable economic development considering the way that approving agreements, getting property, and cultivating a structure would unquestionably be challenging. As such, some government spending is important for the effective activity of law and order (Mitchell, 2005).

Starting around 1959, when Richard Musgrave (1989) distributed The Theory of Public Finance, it has been considered a custom for economic specialists to organize administrative capacities in the three classes of allocations, stabilization, and redistribution as proposed by the author Musgrave. The quest for the other three capacities was accepted to naturally create a characteristic long-run pace of development. Anyway, in late many years, development has obtained extraordinary conspicuousness in numerous nations. As a result, different approaches that don't effortlessly fit into Musgrave's classes have been presented. The time has finally come to perceive economic development as an unequivocal, fourth goal to be added to Musgrave's triplet (Musgrave & Peggy, 1989).

For sure, if properly administrated and used, government spending has a noteworthy positive impact on real GDP development, particularly in underdeveloped nations also, immature infrastructural facilities, and where the private area isn't sufficiently mature to participate in the anticipated part of the economy. The government's activity in economic development might be useful and simultaneously be impeding. The advantageous side of government activity can bring about: The utilization of monetary arrangements like pay duties and move installments which can prompt more evenhanded reallocation of pay; The supply of unadulterated public merchandise which might comprise a sizeable part of total interest; Government frequently behave as a facilitator in the business sectors with awry and flawed data (Husnain et al., 2011).

Conviction of a complete government spending budget and it is framework is complicated and may incorporate a large number of factors, like monetary circumstances and political, social, demographic, and financial elements. Most nations have kept on depending on outside help to back a portion of their public uses. A more grounded relationship of help with higher government utilization instead of with public venture would recommend both a "flypaper impact" and fungibility. This might

infer that aid beneficiary governments consider aid and debt like any other wellspring of income and thusly use it for expanded utilization, charge decreases, or diminished monetary shortages (future expense commitments) (Hindriks, 2004).

2.4. Inflation Rate and Debt

Accomplishing reasonable economic development and improvement is a main pressing issue for all nations (Shabbir, 2009). Numerous world economies are described by low capital development and a deficiency of assets to meet expanding public uses (Aluko & Arowolo, 2010). With persistent expansions in open consumption and extending monetary shortages, the greater part is compelled to seek domestic and foreign debt to stop monetary deficiencies and asset advancement (Saheed & Idakwoji, 2015). Moreover, nations can raise finances through tax assessment, production, or internal obligation, with money least favored due to the apprehension about fueling inflation.

Outer debt involves the outside money-related obligation commitments, including ensuring responsibilities by the government to non-occupants in different monetary standards, ordinarily in US dollars. Adapted to outer commitment, external currency debt includes; public and openly ensured debt, short and long-haul (longer than one year) debt, for example, bilateral and multilateral debt as well as business advances and credits. It additionally involves transient obligation (short of one year) from institutional moneylenders, private non-ensured obligation, IMF obligation, and obligation commitment to foreign exchange currency.

As per Nelasco (2012), outer debt acquisition has become essential in the advanced world since it supplements homegrown investment funds and permits nations to do useful operations. (Ezeabasili, 2011) and Gana, (2002) also emphasize that external debt acquisition is alluring and can give supporting importance to speed up economic development if they are diverted to expand the useful limit of the economy and advance financial development and advancement. The countries need to intensely acquire debt from other nations to make up for the deficit in the balance of payments resulting from heavy imports.

In accordance with (Mulusew, 2012), inflation is a worldwide worry that constantly compromises all economies, whether advanced or emerging, because of its unfortunate impacts. Keynesian speculations show that inflation happens when requests surpass the capability of the economy (Gebru, 2015). There are different contentions on the impact of external debt on inflation. As indicated by (Choong, 2010), since a country gets to plug its spending plan deficiencies, external debt getting is ultimately adapted and thusly impacts inflation. A country with a huge obligation level is more probable to encounter exorbitant loan costs prompting the execution of financial strategies that diminish these rates. The aftereffect of such an expansionary strategy might diminish loan costs over a shorter period of time yet lead to higher financing costs and higher inflation or unaltered over the long haul.

2.5. Trade Liberalization

Trade liberalization is a significant variable that can further develop the debt-adjusting limit of an economy, as it might cause an expansion in wellsprings of foreign trades like net commodities and foreign direct ventures. Market promotion of non-industrial nations for their items is a fundamental instrument to pay off their foreign obligations by running an exchange excess. The limitations on abroad market access can hinder the obliged nations' endeavors to acquire vital foreign exchange to support their outer obligation and try not to turn to unreasonable loans. Because of these reasons, the interlinkages between exchange transparency and outside obligation in non-industrial nations must be underlined for the obtainment of supportable answers for external debt.

In 2003 world trade organization emphasized the importance of trade among nations. According to them, trade can be helpful in several ways such as the expansion of rivalry between domestic and foreign companies, more productivity, higher revenue, the inflow of foreign currency, and more opportunities for people. Furthermore, similar benefits among countries in terms of the capital market and the financial sector generates investment. and another one is taking advantage of the financial matters of scale that would build a level of revenue and proficiency in asset assignment.

The advantages of exchange receptiveness remember an increment for improvement, redistribution of work to new exercises that need more human resources, and upgrade of the information stream between nations. Be that as it may, exchange transparency can lead to a diminishing in government income in emerging nations (Stiglitz, 2007). Accordingly, strategies and measures pointed toward encouraging macroeconomic soundness and an ideal venture environment, should go with exchange transparency.

(Sakyi, 2011) analyzed the degree of the long period link between the exchange, foreign help, and economic improvement in Ghana from the years 1984 to 2007. The results found that the long and the short run have a positive effect on trade

liberalization and outer assistance on financial improvement are diminished by their association term, and both exchange transparency and foreign help have been helpful to monetary development in Ghana, since the reception of progression strategies in 1983. Moreover, an analysis conducted during the nineteenth by (Osuji & Olowolayemo, 1998) explored the effect that liberalizing trade has on outer debt procurement for African countries. In that survey, the outside obligation is used as a dependent variable, and the extent of items and imports to Gross domestic product, terms of trade, and change scale are shown as free variables. As per the outcomes, they showed that the degree of external debt will go up whenever trade is more liberalized. Experimental results likewise reveal that an increase in homegrown imports compared with GDP will expand the external debt.

Liberalizing trade has many negative outcomes, including the risk of deindustrialization, as various African countries have now experienced. However, liberalizing trade likewise bears the bet of upsetting the outer debt issue of African/ACP countries. Consequently, an end to trade receptiveness is of identical importance from the perspective of handling the astounding issue of African/ACP countries' external debt. Without an end to trade liberalization, the answer to the external debt issue will undoubtedly stay slipper (Custers, 2006).

(Hassan, Wajid, & Kalim, 2017) investigated the long-term link between the trade deficit and its components in countries such as Bangladesh, India, and Pakistan. The results revealed that a decrease in the exchange rate significantly diminished trade. In addition, the outcomes presented that the trade deficit could be resolved by promoting capita income, exchange rate, economic activities, and cash supply. Another study, (Zahir, 2018) explored the correlation that exists between the trade imbalance, foreign direct investment, economic growth, and the external debt of Pakistan. The findings outlined that FDI and trade deficit had a positive impact however irrelevant on the debt whereas GDP has a remarkable impact on the debt with a strong association.

3. DATA AND METHODOLOGY

3.1. Data Collection

The data used in the study were gathered and extracted from various sources such as the economy country website, world bank, and Statista from the year 2000 to 2020. Generally, the data extraction focused on 9 East African countries which are (Djibouti, Ethiopia, Sudan, Rwanda, Eretria, Tanzania, Kenya, Uganda, and Burundi).

The factors employed in the model are estimated as follows: Firstly, we selected the national debt (annually) of each country as the reliant variable. Then several independent variables such as the GDP, inflation rate, government spending (the total amount of expenditure on all the sectors), importation, and exportation were adopted.

3.2. Econometric Models

The study seeks to investigate the effect of several independent variables on the national debt during 21 years' time frame and measure any changes, trends, and correlations. Therefore, longitudinal panel data was utilized. For instance, let us observe a hypothetical data set of ***(x₁, x₂, x₃, x₄, x₅, y)***. Also, a hypothesis linear regression equation that combines both the cross-sectional and time specified for the panel.

$$Y_{it} = \beta_0 + \beta_1 x_{\text{it}} + \beta_2 x_{\text{it}} + \cdots + \beta_{\text{n}} x_{\text{it}} + u_{\text{it}} \quad (1)$$

$$\text{Debt}_{it} = \beta_0 + \beta_1 \text{GDP}_{it} + \beta_2 \text{Infla}_{it} + \beta_3 GovSp_{it} + \beta_4 \text{Import}_{it} + \beta_5 \text{Export}_{it} + \cdots + u_{\text{it}} \quad (2)$$

The equation above contains the various factors used in this paper. We have the GDP that represents the gross domestic products of East African countries, we also used Infla which is the inflation rate of each country. Then we selected GovSp which denotes the government expenditure. Finally, we have the trade balance of each country which consist of importation and exportation.

3.2.1. Fixed Effect Model

This model will help us to analyze the causes of changes within the countries. As well it alters the factors (variables) by using time as an average point. The formula is presented as the following.

In this formula a_i ($_I$ =1, n) is the unknown intercept for each entity (*n* entity-specific intercepts). Y_{it} is our dependent variable

$$Y_{it} = \beta_1 x_{it} + a_i + u_{it} \quad (3)$$

which is national debt where *I* am the entity and *t* is the time. Additionally, x_{it} stands for a one independent variable. Whereas, β_1 is considered as the main coefficient of that independent variable. Finally, we have u_{it} which implies the errors term.

$$\text{Debt}_{it} = \alpha_i + \beta_1 \text{GDP}_{it} + \beta_2 \text{Infla}_{it} + \beta_3 GovSp_{it} + \beta_4 \text{Import}_{it} + \beta_5 \text{Export}_{it} + \cdots + u_{it} \quad (4)$$

3.2.2. Random Effect Model

The thinking that the arbitrary impact model which is the random effect express is that, differently the fixed effect model, the difference across substances is believed to be sporadic and uncorrelated with the pointer or free factors associated with the model. Inside the fixed effect model, these variables are absorbed by the intercept. The equation of the random effect is as the following.

$$Y_{it} = \beta_1 x_{it} + a_i + u_{it} + \varepsilon_{it} \quad (5)$$

In this equation a_i ($_I$ =1,…,n) is the unknown intercept for each entity (*n* entity-specific intercepts). Y_{it} is our dependent variable which is national debt where *I* is the entity and *t* is the time. Additionally, x_{it} stands for one independent variable. Whereas, β_1 is considered the main coefficient of that independent variable. Also u_{it} which implies the error term. Finally, ε_{it} indicates within the entity error.

$$\text{Debt}_{it} = \alpha_i + \beta_1 \text{GDP}_{it} + \beta_2 \text{Infla}_{it} + \beta_3 GovSp_{it} + \beta_4 \text{Import}_{it} + \beta_5 \text{Export}_{it} + \cdots + u_{it} + \varepsilon_{it} \quad (6)$$

4. FINDINGS

4.1. Statistical Results

The table below encompasses all the variables investigated in this paper. Additionally, it shows the time frame and the countries analyzed.

Table 1: Variables Definitions

Name	Description
Country	9 East African countries were used.
Years	The time frame of the data consists of 2000 to 2020 (20 years).
Debt	The total amount that every East African government has borrowed.
GDP	Gross domestic product. The total amount of goods and services produced in a country.
Inflation rate	The percentage of prices increases.
Government spending	The amount spent by the government in sectors such as education, healthcare, and social protection.
Export	The goods and services are exported to other countries.
Import	The goods and services are imported from other countries.

Figure 1 which is the national debt, illustrates that from 2000 to 2016 Sudan had the largest debt among the East African countries. However, starting in 2017 their debt declined. Countries such as Ethiopia and Kenya had also a high level of national debt estimated to be billion of USD. Finally, the rest of the East African countries including Djibouti had a constant level of national debt between 2000 to 2020.

The gross domestic product in the case of Kenya and Ethiopia demonstrated remarkable growth between 2000 and 2020 with an amount estimated to be 100 billion USD. Unfortunately, Sudan had steady growth until 2016 after that its GDP started to decline. Other countries such as Tanzania, Uganda, and Rwanda revealed a growth in their GDP as well over the years. Whereas countries such as Djibouti, Eritrea, and Burundi recorded the lowest GDP growth among the 9 East African countries over the years. See figure 2.

Figure 1: National debt

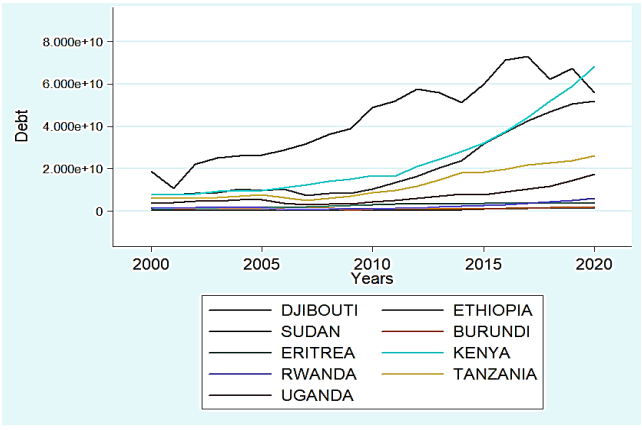
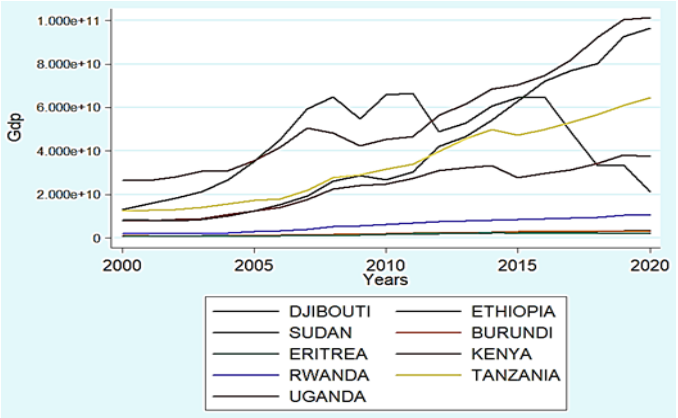


Figure 2: GDP



As expressed in figure 3 The overall inflation level is quite moderate among the East African countries. However, Sudan displayed a high rate of 150% of inflation in 2020. While Ethiopia was the second country in the 9 East African countries that showed inflation above 10%. Finally, there are Eritrea and Burundi which manifested a negative inflation rate. Whereas the inflation of Djibouti was not that significant.

The expenditure of the government is often considered as the total money injected into the different public sectors, such as health care, education, and social protection. In accordance with the figure, we can perceive that the Kenyan and Ethiopian governments spend the most among the 9 East African countries with an amount estimated at 15 billion and 25 billion USD consecutively. Simultaneously, Tanzania and Uganda spent a noteworthy budget on the public sector while Sudan's spending decreased over the years. Finally, we can discern that in 2020 Rwanda and Djibouti spent a similar amount of 5 billion USD on the public sector. See figure 4.

Figure 3: Inflation rate

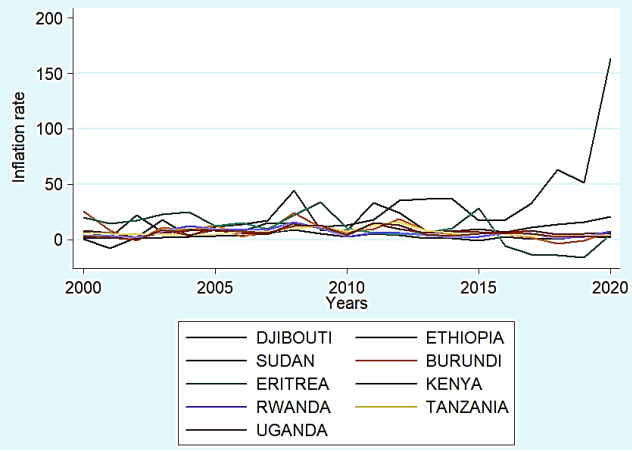
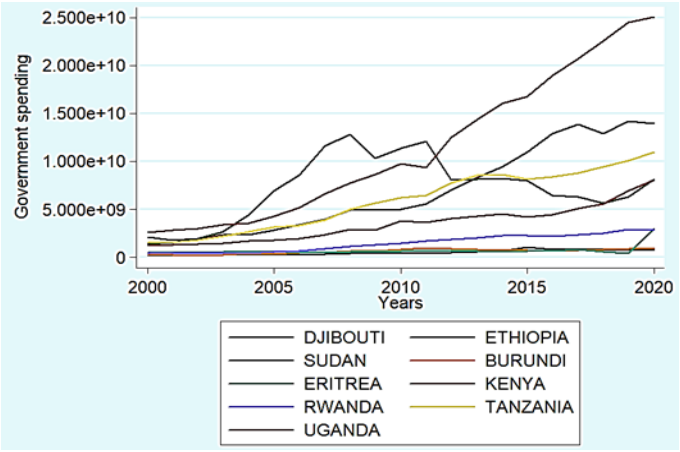


Figure 4: Government spending



In relevance to the exportation strangely Sudan had the highest level of exportation between the years 2000 to 2012 but the amount exported declined after that because the country was divided at that period of time. Interestingly, Djibouti demonstrated a high level of exportation between 2016 to 2020 ranking third place among the 9 African countries with an exporting amount reaching 5 billion USD. Overall, countries such as Kenya, Tanzania, Ethiopia, and Uganda expressed a similarly high level of exportation marking their positions in East Africa. See figure 5.

According to the importation figure, Kenya, Ethiopia, Tanzania, and Sudan displayed the highest rate of importation with an amount varied between 15 billion to 20 billion USD. Whereas, Uganda, Djibouti, and Rwanda presented a moderate level of importation with an amount of 5 billion USD. Finally, Eritrea and Burundi recorded the lowest level of importation among the East African countries. See figure 6.

Figure 5: Exportation

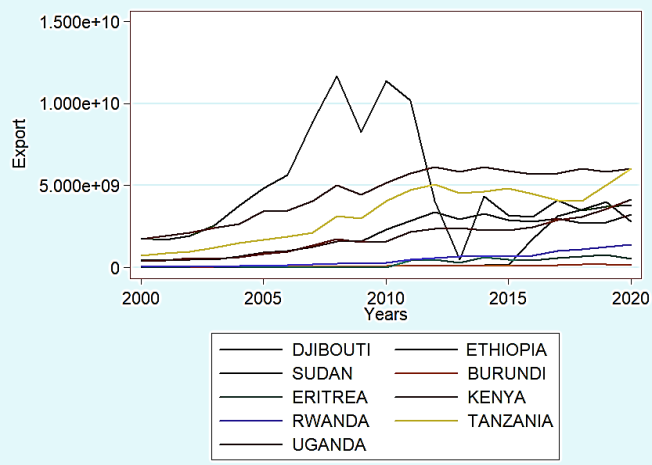
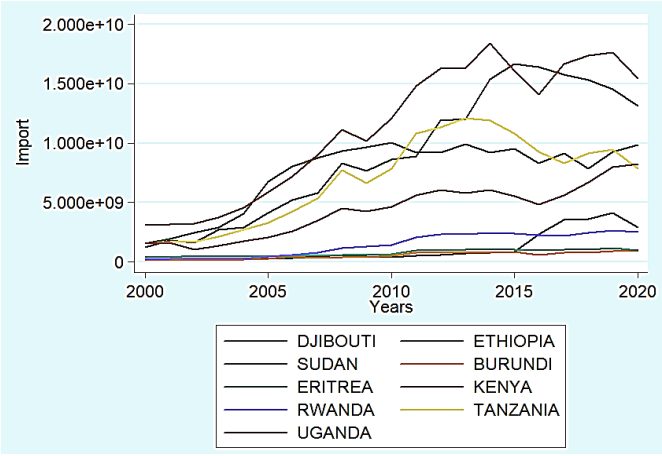


Figure 6: Importation



The table summarizes the descriptive statistics that are employed in this study. All the variables are expressed in million USD dollars but in order to facilitate the interpretation, we converted the numbers into percentages. The data are extracted from a handful of sources such as the country's economy, Statista, and the world bank from 2000 to 2020. In the table, we observe that the average national debt is 9.71 which varies between 8.50 to 10.86 million USD. The level of variability is exhibited by the standard deviation. The national debt diverges from it is normal mean value by .6209. Additionally, the GDP average is 9.97 with insignificant volatility of 0.6669. The average inflation rate stands at 9.74 and it presents a considerable amount of volatility since the standard deviation is at 14.97. Government spending displayed a mean value of 9.31 that range between 8.23 and 10.39. Finally, the trade balance which is composed of exportation and importation presented an average value of 8.84 and 9.36 respectively and inconsiderable volatility.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skew	Kurt
Debt	189	9.71	0.6209	8.50	10.86	0.024	2.059
GDP	189	9.97	0.6669	8.73	11.00	-0.209	1.644
Inflation rate	189	9.74	14.97	-16.37	163.26	6.24	60.858
Government spending	189	9.31	0.5535	8.23	10.39	-0.027	1.879
Export	189	8.84	0.8004	7.04	10.06	-0.577	2.144
Import	189	9.36	0.5901	8.11	10.26	-0.263	1.893

4.1.2. Regression Results

The table below exhibits a simple linear regression of pooled OLS. It is essential to observe the variables before opting for the fixed and random effects. As specified in the table, we can detect that GDP, inflation rate, and importation have a remarkable impact on the national debt. First, we perceive that an increase of 1% in GDP increases 0.316% the East African debt. Also, the inflation rate and government spending revealed that they expand by 0.006% and 0.825% gradually the national debt of East African debt. Finally, according to table 3, the trade components have revealed distinctive effects. To start with, exportation was revealed to increase the national debt by 0.119% while importation revealed an inverse impact in which it reduces the national debt by -0.356%.

Table 3: Pooled OLS Regression Test Result

Debt	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
GDP	0.316	0.122	2.58	0.011	0.074	0.557	**
Inflation rate	0.006	0.001	4.90	0	0.004	0.009	***
Government spending	0.825	0.166	4.98	0	0.498	1.151	***
Export	0.118	0.07	1.69	0.092	-0.019	0.255	*
Import	-0.356	0.146	-2.44	0.016	-0.644	-0.068	**
Constant	1.111	0.366	3.04	0.003	0.39	1.833	***
Mean dependent var	9.717						
Prob > F	0.000						
R-squared	0.841						
Number of obs	189						
F-test	193.455						

**** p<.01, ** p<.05, * p<.1*

Table 4 demonstrates the fixed effect coefficient of the model evaluating the impact of our opted independent variables on the national debt using the panel. According to the table, the model demonstrates that GDP, government spending, exportation, and importation are significant at a 1% level in the fixed model estimation. Whereas, the inflation rate displayed a critical value of 0.05. These results indicate that all the factors are good explanatory and determinants to assess the national debt, due to the critical value they revealed. The coefficient is negative in importation in this model as well which implies that a 1% increase in importation diminishes -0.368% of the national debt of East African countries.

Table 4: Fixed Effect Test Results

Debt	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
GDP	0.557	0.132	4.21	0	0.296	0.819	***
Inflation rate	0.002	0.001	2.09	0.038	0	0.004	**
Government spending	0.413	0.116	3.56	0	0.185	0.642	***
Export	0.122	0.047	2.60	0.01	0.03	0.215	***
Import	-0.368	0.121	-3.06	0.003	-0.606	-0.131	***
Constant	2.65	.504	5.26	0	1.656	3.644	***
Mean dependent var	9.717						
Prob > F	0.000						
Number of obs	189						
R-squared	0.596						
F-test	129.972						

**** p<.01, ** p<.05, * p<.1*

Table 5 is illustrating similar results in proportion to the fixed effect table. We can detect that all the variables have a significant value. However, the significance varies among the factors, for instance, for exportation the significance level is 5%. On the other hand, GDP, inflation rate, government spending, and importation presented a significant level of 1%. To sum up our random effect model indicate that all our variables have a noteworthy and remarkable impact on the national debt of each East African country. To conclude, the common thing between the three model is that importation presented a negative impact on the national debt of East African countries.

Table 5: Random Effect Test Results

Debt	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
GDP	0.576	0.112	5.15	0	0.357	0.795	***
Inflation rate	0.003	0.001	3.23	0.001	0.001	0.005	***
Government spending	0.516	0.133	3.88	0	0.255	0.777	***
Export	0.124	0.054	2.29	0.022	0.018	0.231	**
Import	-0.409	0.126	-3.25	0.001	-0.655	-0.162	***
Constant	1.86	0.384	4.85	0	1.108	2.612	***

Mean dependent var	9.717
Prob > chi2	0.000
Number of obs	189
R-squared	0.591
Chi-square	614.799

**** p<.01, ** p<.05, * p<.1*

4.1.3. Specification Test and Stationarity

The decision of the model when it comes to panel data should be founded on data about the unique specific parts and the homogeneity of the factors. In accordance with the (Hausman, 1978) specification test if the P-value is less than 0.05 then we reject the null hypothesis and retain the alternative hypothesis and vice versa. In this table the P-value is clearly less than 0.05 then we select the fixed effect model as an initial and primary model for the variable's estimations (Chmelarova, 2007).

Table 6: Hausman's (1978) Specification Test

	Coef.
Chi-square test value	30.049
P-value	0

According to (Breusch, 1979), we fail to reject the alternative hypothesis since the test presents a p-value that is less than 0.05 which demonstrates the presence of heteroscedasticity. Consequently, in order to correct the heteroskedasticity, a residual variable was generated and the result revealed a value of 0.12 which is higher than the degree of freedom of 0.05.

Table 8: heteroskedasticity test

chi2(1)	Prob > chi2
2.38	0.1227

5. DISCUSSION

According to our model, several results were revealed. First of all, after running a pooled OLS regression test, we perceived that all the variables (GDP, inflation rate, government spending, exportation, and importation) have a positive impact on the national debt of East African countries. Because each one of them is demonstrating a significant p-value that ranges from 0.01% to 0.05%. Moreover, both the random and the fixed effect test displayed that all the variables have a noteworthy influence on the national debt. Therefore, since the Hausman test disclosed that the fixed effect model is our primary model for the variable's estimation we will interpret the findings based on it.

With that in mind, the variables demonstrated quite a crucial reaction to the national debt. First. Inflation has the capacity to alter the debt of a given country. This implies that a rise in inflation rise the degree of external debt. This is the case according to the fixed model. Because the 1% increase in the inflation rate rises 0.002% of the national debt. Additionally, high inflation rates influence money-related dependability which is a critical instrument in credit rating. mediocre or absence of money-related dependability prompts interest rates which eventually prompts high gathering of outer debt levels. The findings are

validated by Bhara et al (2009) who from his side revealed that there is a huge connection between a nation's loan fees, financial plan shortages, foreign and domestic debts to inflation and that outside obligation forces both inflation and interest costs higher (Aisen & Veiga, 2006).

Secondly, the findings of this paper infer that economic growth ordinarily needs aggregating total debt. In different words, economic growth is extremely challenging to accomplish when the amount of debt borrowed is diminished. At that point being, the East African countries are now intensely indebted and, thus, it appears to be possible that acquiring more debt is challenging. Subsequently, during a recession, the public sector ought to acquire in order to animate the economy and upgrade the reimbursement capacity of the private sector.

Thirdly, debt manageability has turned into an extremely dynamic issue in the ongoing scene situation with numerous industrialized nations surrendering to unreasonable spending plan deficiencies and obligation levels. Nonetheless, the approach toward execution of starkness measures is concentered on pay and expenditure cuts. Mainly public expenditure depends on the way the money is spent in accordance with the debt. For instance, the East African countries expenditure on activities that may generate revenue such as in the tourism and transportation sector may lead to a decrease in the amount of debt acquired.

Finally, liberalizing trade of the East African countries is a significant instrument that can further develop the obligation adjusting limit of their economy, as it might cause an expansion in the source of foreign trades like net commodities and foreign direct ventures. Market increase of East African nations for their goods and services is a fundamental instrument to pay off their foreign debt by running an exchange surplus.

6. CONCLUSION AND IMPLICATIONS

The paper highlighted the factors that affect the national debt of East African countries. In addition, the paper assessed the level of macroeconomic fluctuation. In order to gather the data 9 East African countries which are (Djibouti, Ethiopia, Sudan, Kenya, Rwanda, Eritrea, Uganda, Tanzania, and Burundi) between the period 2000 to 2020 were analyzed. Consequently, to analyze the relationship and the impact of the national debt several macroeconomic factors were selected such as GDP, inflation rate, government expenditure, and trade. Furthermore, longitudinal panel data that compromised Pooled Ordinary Least Square (OLS), Fixed Effects, and Random Effect tests were applied. On that account, the result illustrated all the variables have a significant impact on the East African national debt. Finally, this research contributes to the large empirical findings about the economic situation of Africa. In addition, it provides to East African government, policymakers, and economists with insightful practical evidence about the correlation between the national debt and macroeconomic factors. The study will also offer insights into how to regulate these factors in order to decrease the national debt.

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