



UNIVERSIDADE DA BEIRA INTERIOR

Ciências Sociais e Humanas

# Essays on Public Debt, Growth and Development in Africa

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Tese para obtenção do Grau de Doutor em  
Economia  
(3º ciclo de estudos)

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À minha esposa e companheira.

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## Resumo Alargado

Esta tese intitula-se "Essays on Public Debt, Economic Growth and Development in Africa" e é constituída por um conjunto de quatro ensaios, sendo três de natureza empírica. O primeiro ensaio ocupa-se da revisão da literatura sobre a dívida pública e o crescimento económico no contexto das economias africanas. A dívida pública constitui desde os princípios dos anos noventa do século passado uma verdadeira barreira para o crescimento económico das economias africanas e desde então passou a fazer parte da agenda e da preocupação dos decisores políticos, dos economistas e de uma massa crítica de investigadores cada vez mais interessada. Um manancial de estudos teóricos e empíricos foi produzido ao longo dessas décadas abordando o impacto da dívida pública no crescimento económico desses países. Os resultados são consensuais e apontam, genericamente, para uma relação inversa entre as duas variáveis ou seja a dívida pública afeta negativamente o crescimento económico a partir de um determinado nível. Krugman (1988) e Sachs (1989) concordam que níveis elevados da dívida pública hipotecam o crescimento económico dos países em vias de desenvolvimento por via do investimento. Esta posição é ainda corroborada por Mbale (2013) que referindo aos países africanos defende que a dívida pública *crowds out* o crédito destinado ao sector privado e impede a acumulação do capital e o crescimento do sector privado. Buchanan (1958) e Modigliani (1961) também partilham a opinião de que para além do efeito *crowding out*, o aumento da dívida pública influencia diretamente o aumento da taxa de juros a longo prazo. Em suma, o aumento da dívida pública afeta negativamente o crescimento económico. Fosu (1996) Irons e Bivens (2010) são decisivos em concluir que níveis elevados de dívida comprometem o crescimento económico, posição partilhada também por Ezeabasili *et al* (2011), Escobar and Mallick (2013) e Zouhaier e Fatma (2014).

Relativamente ao impacto da política fiscal no crescimento económico dos países africanos, Devarajan *et al* (1996) consideram, após análises empíricas, que um aumento das despesas públicas tem um impacto positivo e significativo no crescimento económico. Nurudeen e Usman (2010) argumentam que um incremento das despesas públicas não é imediatamente convertido em crescimento económico, enquanto Nworji *et al.* (2012) mostram que as despesas correntes e de capital não têm significativo impacto negativo no crescimento económico da Nigéria. Opinião díspar é defendida por Engen and Skinner (1997) que concluíram que as despesas públicas e a carga fiscal afetam negativamente e de forma acutilante o crescimento económico. Babadola e Aminu (2011) trazem evidências complementares e recomendam que o aumento das despesas públicas na saúde e educação promovem o crescimento.

O segundo ensaio faz uma análise empírica sobre os limites do endividamento público, o crescimento económico e a inflação nas economias africanas, partindo de uma base de dados que

cobre o período entre 1950 e 2012, envolvendo um conjunto de 52 economias, dividido em três áreas geográficas, designadamente: (1) África do Norte, (2) África Sub-Sahariana e (3) Comunidade para o Desenvolvimento da África Austral (SADC). O estudo conclui que, para o conjunto das economias africanas, as melhores *performances* em termos de taxas médias de crescimento económico (6,39%) são alcançadas quando os limites da dívida pública em percentagem do PIB se encontram entre os 30-60% do PIB e a taxa média de inflação for igual a 8.17%. Qualquer incremento da dívida pública a partir deste limite, provoca uma redução das taxas de crescimento médio das economias e um aumento das taxas médias de inflação. O ensaio traz-nos ainda uma evidência inequívoca de que existe uma relação inversa entre o crescimento económico e a inflação, em função dos níveis de endividamento. A principal conclusão do ensaio é a de que maiores taxas de crescimento médio das economias são alcançadas quando a dívida pública se encontra entre os 30 e os 60% do PIB. Se este rácio aumentar e se enquadrar entre os 60 e os 90% do PIB, as taxas médias de crescimento económico caem 1,32 pontos percentuais e 1,64 pontos percentuais quando excede os 90% do PIB. Trata-se, efetivamente, de valores inferiores aos obtidos por Reinhart e Rogoff no ensaio "*Growth in Time of Debt*" em que a dívida pública equivalente a 60% do PIB provoca uma queda do crescimento económico em cerca de 2 pontos percentuais e uma redução até 50% para valores da dívida pública superiores a 90% do PIB. Nota-se ainda que, no que diz respeito à taxa de inflação os resultados obtidos são idênticos aos de Reinhart e Rogoff "...nas economias emergentes, níveis elevados da dívida coincidem com elevadas taxas de inflação" (Reinhart and Rogoff, 2010). Um artigo resultante deste ensaio foi publicado no *South African Journal of Economics*, uma revista científica internacional pertencente ao Journal Citations Report e ao *ranking* do CEFAGE.

O terceiro ensaio, intitulado "*Explaining Growth in African Countries - What Matters?*", analisa a relação entre dívida pública, *stock* de capital, consumo público em percentagem do PIB, Formação Bruta do Capital Fixo (BCF) em percentagem do PIB e o Índice do Capital Humano enquanto determinantes do crescimento e o próprio crescimento económico em 52 economias africanas entre 1950 e 2012. Tratando-se de um conjunto preciso de países e, por conseguinte, de uma regressão limitada, utilizou-se um modelo de painel de efeito fixo. Os coeficientes heterogéneos foram estimados utilizando o Modelo de Correção de Erros, de forma a envolver as propriedades das séries temporais e a própria dinâmica dos dados em painel. O *software* utilizado para as regressões é o STATA versão 13.

O ensaio traz sólidas evidências, em todas as regressões efetuadas, de que a taxa de crescimento do *stock* de capital afeta positivamente o crescimento económico dos países africanos. Por outro lado, o capital humano manifesta uma relação positiva com o crescimento económico nas regressões que não incluem a dívida pública. No que se refere à dívida pública, o ensaio mostra

que o seu impacto no crescimento económico dos países africanos não é significativo. Testamos ainda duas *proxies* para as instituições mas os resultados não foram significativos.

O quarto ensaio dedica-se à análise exploratória dos principais determinantes económicos, sociais e institucionais de desenvolvimento em Africa, utilizando uma análise de componentes principais para dados categóricos e análise de *clusters* e tendo em conta os anos de 1996 e 2014 como ano mais antigo e mais recente, respetivamente. Esta metodologia permitiu a aglomeração dos países africanos em quatro *clusters* diferenciados, sendo os países constituintes dos clusters de 1996 distintos dos do ano 2014. Os dados foram tratados com recurso ao *software* estatístico IBM-SPSS (*Statistical Package for Social Sciences*), versão 23.0. Os resultados do ensaio apontam para uma associação positiva entre os determinantes sociais, económicos e institucionais do desenvolvimento. Esta associação traduz-se no facto de que os países com melhores performances institucionais manifestam também melhores indicadores de realização económica e social. Os resultados chamam também a atenção dos decisores políticos e dos estrategas de desenvolvimento para a necessidade de uma abordagem integrada do processo de desenvolvimento, visando uma maior e mais eficiente integração dos diferentes determinantes do desenvolvimento.

A tese está organizada em capítulos que constituíram a base para artigos científicos submetidos a revistas internacionais, daí que embora relacionados entre si nos temas abordados e tendo como fio condutor um contributo para o desenvolvimento da economias dos países de Africa, cada capítulo é autocontido, tendo também o autor optado por incluir listas bibliográficas em cada um dos capítulos.

## Abstract

This thesis is entitled “Essays on Public Debt, Growth and Development in Africa” and consists of a set of four essays, three of which are empirical. The first essay provides a literature survey on public debt and economic growth, specially focused on Africa. Since the beginning of the 1990s, public debt has been a real barrier to the economic growth of African economies and has since become part of the agenda and concern of policy makers, economists and researchers.

A considerable number of theoretical and empirical studies have been produced over decades, addressing the impact of public debt on the economic growth of these countries. The results are consensual and point generally to an inverse relationship between the two variables i.e. public debt negatively affects economic growth from a given level. Krugman (1988) and Sachs (1989) agree that high levels of public debt mitigate the economic growth of developing countries through investment.

This position is further corroborated by Mbale (2013) who referring to African countries argues that public debt crowds out credit to the private sector and constitutes a barrier to capital accumulation and private sector growth. Buchanan (1958) and Modigliani (1961) also share the view that in addition to the crowding out effect, the increase in public debt positively affects the long-term interest rate. Generally, the increase in public debt negatively affects economic growth. Fosu (1996) Irons and Bivens (2010) are decisive in concluding that high debt levels jeopardize economic growth, a position shared by Ezeabasili *et al* (2011), Escobar and Mallick (2013) and Zouhaier and Fatma (2014).

Regarding the impact of fiscal policy on the economic growth of African countries, Devarajan *et al.* (1996) consider, after empirical analysis, that an increase in public spending has a positive and significant impact on economic growth. Nurudeen and Usman (2010) argue that an increase in public spending is not immediately converted into economic growth, whereas Nworji *et al.* (2012) show that current and capital expenditures do not have a significant negative impact on Nigeria's economic growth. This view is supported by Engen and Skinner (1997) who concluded that public expenditure and the tax burden negatively and sharply affect economic growth. Babadola and Aminu (2011) provide complementary evidence and recommend that increased public spending on health and education should promote growth. The survey also highlights the inverse relationship between economic growth and government debt, compounded by the problem of debt overhang, preventing these countries from leveraging their economies. Additionally, the literature on the relationship between public deficits and economic growth is also not consensual. In fact, although the economic theory postulates that fiscal deficit contributes inevitably to debt accumulation, which through debt overhang affects negatively economic growth, there are other strings of

economic thoughts that advocate that African countries would not reach economic growth without increasing debt.

The second essay is empirical and analyzes the implications of public debt on economic growth and inflation in a group of 52 African economies between 1950 and 2012. The overall analysis was focused on the relationship between the limits of public debt as a percentage of the GDP, economic growth, and inflation. African economies achieve their highest performance in terms of average rates of economic growth (6.39%), while the limits of public debt as a percentage of the GDP are in the second intervals (30 - 60%) with an average inflation rate of 8.17%. From this limit, any increase in public debt is converted into a reduction of the average growth rates of economies and into an increase in average inflation rates. The findings show, unequivocally, that there is an inverse relationship between these two macroeconomic variables, depending on the levels of indebtedness. Briefly, the analysis concludes that the highest average growth rates are achieved when the public debt is in the second interval. When this ratio is situated in the third interval the average rates of economic growth suffer a drop of 1.32 percentage points and 1.64 percentage points when this ratio exceeds 90%. These results are much lower than those found by Reinhart and Rogoff in the essay "Growth in Time of Debt", for which an amount of debt equivalent to 60% of GDP causes a drop in the annual growth rate of around 2 percentage points.

The third essay empirically assesses the traditional determinants of economic growth in African economies over the period 1950 to 2012, using growth regression techniques in which the explanatory variables are: public debt *per capita*, investment ratio, government ratio, capital stock *per capita*, and the Human Capital Index. The method used takes into account observed and unobserved heterogeneity. The regression results show strong evidence of a positive impact of the growth rate of capital stock to economic growth of African countries. The growth rate of the government to GDP ratio is also important in all but one of the regressions in which appears, and its growth is harmful for economic growth. Human capital has a positive relationship with economic growth in regressions that don't include public debt. However, the cross country impact of these two variables on the growth rate of the economies (positive to some and negative to others) is not uniform, so that appropriate policies for one country may be seriously misguided in another. Concerning public debt, we found that it is not significant and therefore it has no impact on the economic growth of African countries. The growth rate of real GDP *per capita* also depends (negatively) on its past value, i.e., the lower the real GDP *per capita* the higher will be its growth rate. We have also tested two proxies for institutions, which did not deliver significant results. The software used for the regressions is STATA, version 13.

The fourth essay is devoted to an exploratory analysis of the main economic, social and institutional determinants of development in Africa, using a main component analysis for categorical data and cluster analysis and taking into account the years 1996 and 2014 as the oldest

and most recent, respectively. This methodology allowed the agglomeration of the African countries into four differentiated clusters, being the countries constituting the clusters of 1996 distinct from those of the year 2014. The results point out to a positive association between the social, economic and institutional determinants of development which is reflected in the fact that countries with better institutional performances also show better indicators of economic and social achievement. The results also draw the attention of policy makers and development strategists to the need for an integrated approach to the development process, in order to achieve greater and more efficient integration of the different development determinants. The software used is IBM-SPSS (Statistical Package for Social Sciences), version 23.0.

## Keywords

Public debt and its sustainability; debt overhang; debt relief; fiscal policy; public deficit; economic growth; Inflation; African Countries; determinants of economic growth; investment; capital stock, human capital, fiscal variables, observed and non-observed heterogeneity; determinants of development; Africa; institutional; social and economic dimensions; Principal Components Analysis for Categorical Data; Cluster Analysis.

JEL Codes: C00, C23, C52, E02, E31, E60, E62, F34, H50, H60, H63, O11, O40, O47, O55

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# Chapter 1:

## Public Debt and Economic Growth: A Literature Survey Specially Focused on Africa

### Abstract

In this article we surveyed the literature about the relationship between public debt and economic growth, with a special focus on African countries. The literature is not entirely conclusive regarding the relationship between economic growth and public debt, although, broadly it is accepted that there is an inverse relationship between them. For developing countries, and particularly for African countries, the inverse relationship between economic growth and government debt is also compounded by the problem of debt overhang, preventing these countries from leveraging their economies. Additionally, the literature on the relationship between public deficits and economic growth is not consensual. In fact, although the economic theory postulates that fiscal deficit contributes inevitably to debt accumulation which through debt overhang affects negatively economic growth, there are other strings of economic thoughts that advocate that African countries would not reach economic growth without increasing debt. The challenge is to define the right level of debt which leverages economic growth and reduces, in the long run, the budget deficits and consequently the debt.

*Keywords:* public debt and its sustainability, debt overhang, debt relief, fiscal policy, public deficit, economic growth.

*JEL Codes:* E60, F34, H50, H63, O40

# 1. Introduction

The debt crisis that exploded in the early 80's and seriously hit many developed and developing countries, particularly Sub-Saharan African countries (SSA), triggered the attention of world experts on the problem of public debt and its impact on economic growth. As a result, the attention of the world's leaders and decision makers turned to the need for public debt sustainability and for the importance of setting debt limits, in a context where public debt is seen as a way to expand investment, considered an essential item for sustained economic growth.

The improvement of living conditions for the populations of these countries requires sustained economic growth, which depend on the levels and quality of public and private investments, financed by both domestic and external debt.

However, in a time of global financial and economic crisis, it is certainly crucial that the debt of these countries is done judiciously, aiming at the realization of sound investments that may ensure the repayment of such debt service. The debt concern and its repayment have motivated academic researchers' interest, resulting in a variety of theoretical and empirical studies on the relationship between public debt and economic growth.

In this context, it becomes increasingly important to study and understand the levels of debt, as well as the quality of investments, that can leverage economic growth of these countries. This paper brings an updated theoretical and empirical literature survey on this theme in developing countries, particularly in Africa.

In the next section we will review the literature about the relationship between public debt and economic growth, with a special focus on African countries. We will divide our review by discussing two topics: debt overhang and economic growth and fiscal policy, public debt, and economic growth. The last section concludes.

## 2. Literature Review

### 2.1. Debt Overhang and Economic Growth

#### 2.1.1. The Relationship between Public Debt and Economic Growth

Sustainable economic growth and the associated measures of macroeconomic policy should be a priority for all countries, especially developing countries. Economic growth requires great availability of financial resources for structural investments, capable of generating new growth dynamics and creating added value. Sound public investments are, therefore, essential to support productive activities, directly or indirectly. Resources scarcity and limited financial capacity of

developing countries, particularly the poorest, requires the mobilization of resources through active expansionary fiscal policy, through contraction of domestic and/or external debt and/or through *seigniorage* (printing money), which is the revenue resulting from the difference between the face value of minted coins and the actual market value of the precious metal they contain due to the event of inflation, i.e., a way for governments to generate revenues without charging more (conventional) taxes. Public debt has been, without any doubt, the main strategy for raising these funds, particularly for smaller and more vulnerable economies. Although it is essential for economic growth, it has been also a matter of much controversy, with regard to satisfactory levels of indebtedness.

In the late 70's international trade and financial environment revealed very favourably for developing countries, with particular emphasis for the African continent countries. The increase in exports, the negative real interest rates in international capital markets and the high price level of exports, which favoured the terms of trade of these countries, were crucial to a boost of public consumption and investment, with considerable impact on the increase of public debt of these countries. A study by the World Bank (1989) argued that an exaggerated debt service for the Least Developed Indebted Countries (LDIC) is an obstacle to economic growth. The high debt hinders the negotiation process for obtaining new loans for productive investments, with severe repercussions in terms of creating future net margins to comply with its obligations toward the old debt service. The results of this study further drew international attention to the excessive indebtedness of the African continent, with particular emphasis to the SSA economies and preceded the advent of many analyses and studies on the effect that this debt could have on future economic growth.

The debt overhang concept and its negative effect on economic growth of a country, is covered by Sachs (1989), who shares with Krugman (1988), the view that this debt can negatively influence investment and, hence, economic growth. According to the latter, this concept refers to an existing "inherited", and consequently, heavy debt that some creditors do not believe possible to be fully recovered, i.e., the debt inherited by some countries is higher than the value of the transfer expected by their creditors in the future. The choice between continuity of funding to promote economic growth and debt forgiveness is a trade-off, because the funding can, when properly invested, guarantee the repayment of debt easing, thus, the country's obligations to creditors. On the other hand, the debt burden increases the difficulties in paying creditors. For these authors, economic growth in these countries can be enhanced and leveraged with debt forgiveness.

Contrarily to Paul Krugman's opinion on this issue, many authors, including Bulow and Rogoff (1991), suggest that the underdevelopment of the Highly Indebted Poor Countries (HIPC), in which many African countries are included, is more due to economic mismanagement than to

their high debt burden. Therefore, debt overhang is more a symptom than a cause of indebted countries' weak economic growth. Irons and Bivens (2010) support Krugman (1988)'s view, and argue that correlation does not mean causation. Weaker economic growth may potentiate the rise of debt/GDP and not *vice-versa*. In logical terms, a deficit does cause the decrease of GDP *via* the crowding out effect instead of the stock of debt.

In a controversial publication on debt and economic growth, Reinhart and Rogoff (2010) analysed the change in real GDP growth as the level of government debt varies in some emerging market economies including some African countries<sup>1</sup> in the period 1900 to 2009 and reached the following results: (1) the relationship between public debt and real GDP is weak for a ratio of public debt/GDP below a threshold of 90% of the GDP. Above 90%, the average growth rates fall to 1%, and the average growth drops even more; (2) emerging markets face lower thresholds for public and private external debt. When the external debt reaches 60% of GDP, the annual growth rates decline by about 2%, and as far as higher debt levels are concerned, growth rates fall about 50%; (3) there is no apparent link between inflation and public debt levels for the advanced countries as a group.<sup>2</sup> Herndon *et al.* (2013) criticize the findings of Reinhart and Rogoff (2010) and conclude that: (1) they selectively excluded years with higher record of debt and average growth; (2) the method used to assess the sample countries is non-consensual; and (3) there appears to be a coding error that excludes the highly indebted countries and those with average growth. They further argue that the average growth rate of real GDP is actually 2.2% and not -0.1% for countries with the ratio of public debt in relation to the GDP exceeding 90%. For these authors, the average GDP growth is not much different when the ratio of government debt in relation to the GDP exceeds 90 percent, than when the ratios of the debt/GDP are lower. Reinhart and Rogoff (2013) recognize the mistakes pointed out by Herndon *et al.* (2013) and present new findings according to which "the post-war mean values increase 0.3% for the debt-to-GDP above 90%. In the other debt categories, the difference between the corrected and uncorrected coding is of comparable magnitude for the short and long samples."

Pescatori *et al.* (2014) use a new empirical approach and an extensive historic dataset developed by the Fiscal Affairs of the International Monetary Fund (IMF) and conclude that, in the medium term, there is no credit limit above which the growth prospects are endangered. Despite the undeniable importance of the level of debt and growth, countries with high but declining debt have also grown rapidly. Therefore, there is no debt ceiling that compromises growth.

Regarding the empirical literature, especially about African economies, there is a generalized consensus that high debt levels undermine economic growth but also that poor countries can hardly grow without issuing debt. Cohen (1993) considers that the risk of debt rescheduling (or

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<sup>1</sup> The countries are Ghana, Kenya, Nigeria, and South Africa.

<sup>2</sup> Some countries, like the United States, have experienced higher inflation rates when the debt/GDP ratio was high.

debt crisis) significantly reduces growth in Latin America, and that this effect is particularly strong when the debt exceeds 50 percent of the GDP. Generally, there is no conclusive evidence of the effect of debt overhang on economic growth. Cohen (1997) estimates investment equations for a sample of 81 developing countries, covering the period 1965-1987, and shows that debt levels do not have much explanatory power. For this author, economic growth of African countries is fundamentally affected by poor macroeconomic management and low levels of investment. The study proves that high debt has a negative impact on growth in Latin American countries.

The issue of the relationship between the weight/volume of debt and economic growth in SSA is also analysed by Fosu (1996), using the technique of Ordinary Least Squares (OLS). Indeed, the results of the study confirm the existence of a negative relation between these two macroeconomic variables. Public debt affects economic growth directly and negatively, by reducing productivity levels. According to this author, the high public debt in these countries has an average impact of 1% reduction of the GDP *per year*. Easterly (2001) presents an empirical analysis of the debt crisis and its effect on the cooling of economic growth, using the Generalized Method of Moments (GMM) and the OLS techniques, confirming the finding of the vast majority of researchers, i.e., that the cooling of economic growth in the majority of HIPC, in recent decades and since 1975, should be attributed to the weight of public debt. This author analyses the cooling of the world economy in the period between 1975 and 1994 and considers the impact of the debt of middle-income countries in the 80's and the crisis of the HIPC. For this author, the impact was greater in poorer countries, mainly due to unadjusted macroeconomic policies.

Mbate (2013) estimates a dynamic cross-country model with System GMM, to investigate the impact of domestic (public) debt on economic growth and private sector credit in a panel of 21 SSA countries between 1985 and 2010. He found evidence of a non-linear relationship between domestic debt and economic growth and concludes that domestic debt crowds out private sector credit and deters capital accumulation and private sector growth. He underlies the importance of designing financial policies which enhance effective debt management (with a debt ceiling to improve credit availability), credit availability, stimulate fiscal discipline, and develop domestic debt markets.

Fincke and Greiner (2015) performed panel data estimations to study the relationship between public debt and economic growth for a small group of eight emerging economies which includes only one African country (South Africa). Results show a positive correlation between public debt and the growth rate of *per capita* GDP. Baaziz *et al.* (2015) investigate the dynamic relationship between accumulated public debt ratio and real GDP growth in South African between 1980 and 2014. Using the inflation rate and Openness trade as the control variables, the authors found that the relationship between public debt and real GDP growth depends upon the level of

indebtedness of the country. When the level of public debt in South Africa surpasses the limit of 31.37% of GDP it becomes an impediment to economic growth.

Kumar and Woo (2015) provide empirical evidence on the impact of a high initial debt on economic growth, based on a panel of emerging and developed economies during the period 1970 - 2007. In the regressions the authors included two African emerging economies - Egypt and South Africa. Methodologically, the study is based on an extensive empirical literature on the determinants of long run growth and on a much more limited literature related to low-income countries, and analyses the impact of high external debt on economic growth via debt overhang and crowding out. The study uses a set of econometric techniques, to get the results that suggest an inverse relationship between initial debt and economic growth. A 10% increase in the debt ratio in relation to initial GDP is associated with a slowdown in the real GDP *per capita* growth rate of about 0.25% in emerging economies, and 0.15% in developed economies. This is due to reduced levels of productivity and investments.

Megersa (2015) conducted a study based on a panel of 22 low-income Sub-Saharan African economies<sup>3</sup>, covering the time frame 1990-2011. He addresses the question of non-linearity in the long term relationship between public debt and economic growth and proves the existence of a bell-shaped relationship between economic growth and total public debt. If debt goes on increasing beyond the level where it would be sustainable, it may start to be a drag on economic growth. In fact, the paper tests the presence of a "Laffer-curve" type of relationship between public debt and economic growth, where the contribution of debt to growth is theorized to be positive at lower levels and negative at higher levels.

### 2.1.2. External Debt, Debt Overhang, Debt Relief, and Economic Growth

International debt relief continues to be a highly divisive subject. The theoretical and empirical literature, unanimously, hold that debt overhang has an impact on economic growth by reducing investment credits.

Deshpande (1997) argues that no country can leverage its economy without contracting debt, but warns of the urgent need for defining the amount of debt needed to enhance this growth. To this author, debt overhang is a concept anchored in external debt and affects economic growth via investment. As the debt grows the payment of debt service acts as a disincentive to investors and directly affects economic growth. An empirical analysis involving 13 HIPC, among which seven are Africans,<sup>4</sup> and covering the period 1971-1991, shows the disincentive effect of excessive debt on investment. For this author, the relationship between external debt and investment is always

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<sup>3</sup> The countries are Burkina Faso, Benin, Chad, Mali, Tanzania, Kenya, Niger, Uganda, Central African Republic, Comoros, Mozambique, Malawi, Togo, Rwanda, Ethiopia, Sierra Leone, Madagascar, Guinea, Gambia, Burundi, Eritrea, and Guinea-Bissau.

<sup>4</sup> The countries are Morocco, Algeria, Egypt, Kenya, Zambia, Ivory Coast, and Sierra Leone.

negative. It is necessary to reduce public deficit and implement a set of incentives to leverage their economies, within the framework of structural adjustment programs that these countries are subject to.

Based on several simulations and using econometric models of simultaneous equations, Iyoha (1999) examined the impact of external debt on economic growth in SSA, covering the period 1971-1994. Defining the full stochastic model for simultaneous equations, one for production and one for investment, and four dynamic simulation identities, namely the accumulation of debt, the debt/Gross National Product (GNP) ratio, the debt/debt service and the lagged value of *per capita* investment, this author concluded that there is a significant negative effect of debt overhang and crowding out in economic growth of SSA countries. This means that the high stock of external debt and the excessive weight of debt service had a depressing effect on investment in these countries, with direct effect in the reduction of economic growth rate. These simulations based on the reduction of the debt stock (with reductions of 5%, 10%, 20%, and 50%) significantly increase the volume of investment and GDP, although the latter is increased to a lesser extent. A reduction of 50% of the debt stock in the period 1987-1994 would lead to an increase in the gross fixed capital formation (GFCF) of about 40% and an increase in GDP of about 3% (both accumulated). Indeed, the results of this study confirm that an excessive volume of external debt has a depressing effect on investment and negatively affects economic growth. Highly indebted countries in SSA need to articulate creative strategies aimed at reducing debt. The study recommends that these countries articulate creative strategies of debt reduction so that the high stock of debt and the crushing weight of debt service do not have a negative impact on economic growth.

Gana (2002), when analysing the Nigerian economy, claimed that foreign debt is desirable and necessary to accelerate economic growth, provided it is channelled to increase the productive capacity of the economy and promote economic growth and development.

Clements *et al.* (2003) in an empirical study, using panel data and GMM techniques, about debt, public investment, and economic growth in low income countries, conclude that high levels of debt may negatively affect the growth of these countries. Debt affects growth more via the most efficient use of resources than through the depressing effect it has on private investment. For these authors, external debt has an indirect effect on growth, through public investment. While the stock of public debt does not seem to have a depressing effect on public investment, the same is not true for the debt service. They defend the relief of the external debt service as a way to provide a boost of economic growth through their effects on public investment. They also further argue that if half of the resources from the debt service relief were channelled to this purpose, without increasing the budget deficit, then growth in these countries would accelerate by about 0.5% *per year*. This argument had also been advocated by Deshpande (1997).

The relationship between debt overhang and economic growth is also approached by Adam (2004). This author analyses the sustainability of Nigeria's external debt and examines the interaction between external debt and growth, concluding that debt overhang discourages investment and has a negative impact on growth. For this same author, the excessive weight of debt service is certainly a cause of weak economic growth of SSA countries. Countries with limited resources can only grow and develop by contracting debt and, therefore, the problem arises when the accumulated debt exceeds their ability to pay, flowing thus into debt overhang. The widely diagnosed scientific evidence stresses the incompatibility between debt overhang and economic growth, and claims for the needs to identify solutions able to lift these countries out of the *status quo* of economic weakness. In this framework, the idea that debt relief for HIPC could be a springboard for economic growth has gained increasing importance in the last few decades. Cordella *et al.* (2005) analyse the debt-growth relationship using a panel of developing countries and formulating two basic questions: 1) Do the HIPC suffer from debt overhang? 2) Can debt forgiveness contribute to increase growth rates in these countries? These authors conclude that there is, in fact, a marginal negative relationship between debt and growth at the intermediate levels of debt, which does not happen at the lower levels. Countries with good governance and strong institutions do face debt overhang when debt rises above 15-30% of GDP, but the effect of debt on growth becomes irrelevant above the 70-80% interval.

In 1999 the Enhanced HIPC Initiative was initiated. The goal was to cut the Net Present Value of foreign debt of the World's poorest countries to a bearable threshold of 150% of their exports, among which there are many African countries. Using data from 18 HIPC<sup>5</sup>, covering the period from 1987 to 2007, Hussain and Gunter (2005) built a simple macroeconomic model to estimate the impact of debt relief and terms of trade shocks on growth and poverty in African countries. The economy grows, on average, 2.9% annually, resulting from the HIPC Initiative, and poverty is reduced by 2.2% annually. However, the deterioration of the terms of trade has contributed to a reduction in both economic growth and poverty reduction. Nwachukwu (2008) used a growth model with debt included to estimate if the goal of the HIPC Initiative would be concluded by 2015. Results of the simulations showed, that by 2015 foreign debt would be at least 176% of exports, using optimistic hypotheses in the projections. Simulations also stress the sensitivity of debt sustainability of HIPC countries to external shocks.

Although many HIPC have received large amounts of debt relief over the past quarter of a century, it doesn't appear to be sufficient. Dijkstra (2007) examines the impact of international debt relief efforts since 1990 to evaluate whether the various types of debt relief have boosted

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<sup>5</sup> The countries are Benin, Burkina Faso, Cameroon, Gambia, Guinea, Guinea-Bissau, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, São Tome & Príncipe, Senegal, Tanzania, Uganda, and Zambia.

economic growth in 8 highly indebted countries in Latin America and Africa<sup>6</sup>. The author argues that essential changes of the international aid and debt planning are required to halt the flow of new multilateral loans and the possible perverse impacts of conditionality.

During decades countries of Sub-Saharan Africa have, as consequence of uncontrollable budget deficits, accumulated permanent and growing debt which has led to debt overhang with very dramatic impact on economic growth. Shalishali (2008) investigates the dynamics of debt accumulation effect on income growth over the period 1981 to 2007; with focus on three different groups of countries in Sub-Saharan Africa - lower income countries, lower middle income countries, and upper income countries. Generally, he found that small levels of external debt are related with higher economic growth rates.

Ezeabasili *et al.* (2011) show, using econometric techniques such as the Johnson Cointegration and Granger causality tests, that the external debt had a negative impact on economic growth of Nigeria between 1975 and 2006. An increase of 1% in foreign debt results in a decrease of 0.027% of the GDP. On the other hand, an increase of 1% in the debt service results in a reduction of 0.034% of GDP. To soften the negative impact of the external debt on economic growth, the debts accumulated through loans to finance development projects must be synchronized with the timing of debt repayment. These authors recommend portfolio diversification of Nigeria's debt in terms of origin and types, avoiding the dangerous effects of concentration, while advising that the negotiations of future debts must be geared to the ratios external debt/GDP and debt service/GDP. They also realize that the debt burden results from the inability of this country to generate domestic savings aimed at implementing productive activities.

Ogunmuyiawa (2011), using time series on the evolution of the Nigerian economy between 1970 and 2007, applies regression equations and a set of econometric techniques, namely the Augmented Dickey Fuller (ADF) test, the Granger causality test, the co-integration test, the Johansen method and the Vector Error Correction (VEC), to examine the extent to which external debt promotes economic growth in developing countries. The empirical results do not prove the existence of causality between external debt and economic growth in Nigeria. Generically, the study does not show evidence of changes in economic growth from changes in the foreign debt.

Pattillo *et al.* (2011) evaluate the impact of external debt on economic growth from a panel of 93 developing countries including 47 African economies<sup>7</sup> for the period 1969-1998, using multivariate regression analysis. The results are diversified: 1) their external debt has a nonlinear effect on

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<sup>6</sup> The countries are Mozambique, Tanzania, Uganda, and Zambia.

<sup>7</sup> The countries are Algeria, Argentina, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Rep., Chad, Comoros, Congo Dem. Rep. of, Congo Republic of, Cote D'Ivoire, Djibouti, Egypt, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe.

economic growth; 2) the average impact of the external debt in the GDP *per capita* turns out to be negative for debt levels above 160-170% of exports and 35-40% of the GDP; 3) doubling the debt *per capita* will cool down the growth rates in about 0.5-1%. These authors also conclude that the external debt negatively affects economic growth, but not necessarily through investment. The exclusion of the investment variable from the regression analysis has no impact on the results, which prove that only a negligible part of the impact of debt on economic growth is due to reduced levels of investment.

The paradox of debt overhang in HIPC countries, particularly those belonging to the South Africa Development Community (SADC), is examined by Sichula (2012), using regression analysis, Granger causality tests, and ADF tests. This author concludes that high external debt can destroy confidence in economic reforms and thus decrease the sustainability of what could be a solid economic strategy. According to the same author, the external debt contracted through concessional loans has the ability to stimulate the external debt service of many HIPC countries. HIPC countries have suffered economic decline for years, under the impact of external debt burdens. The study recommends that SADC countries must maintain their debt at a level that guarantees the obligations of debt service. The author also argues, like the vast majority of researchers in this field, on the importance of defining debt limits that do not jeopardize economic growth.

In the context of the Nigerian economy, Oke and Sulaiman (2012) analyse the impact of external debt on investment and economic growth, for the period between 1980 and 2008, using econometric techniques and regression analysis. They conclude that there is a positive relationship between external debt, economic growth, and investment, and also that the ratio of external debt in relation to the GDP stimulates economic growth in the short run, reduces private investment, and undermines long run growth. The study recommends that the Nigerian government should adopt more appropriate measures in order to maximize the results related to the use of external resources, avoiding the erosion of private investment and, consequently, the reduction of economic growth and development.

This thesis is also supported by Escobari and Mollick (2013) for whom: "The positive effect of government activities in the production depends, in theory, on the relative efficiency of the public sector." Considering a dynamic intervention of economic agents, these authors conclude that public expenditure negatively affects growth, analysing a sample between 1970 and 2004, using GMM and OLS estimators. The external component of public debt, in turn, plays both positive and negative role on economic growth of developing countries, particularly in some African economies.<sup>8</sup>

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<sup>8</sup> The countries are Egypt, Morocco, Nigeria, South Africa, and Tunisia.

Zouhaier and Fatma (2014) chose a sample of 19 developing countries, covering the period 1990 to 2011 and use dynamic panel data techniques, to explain the relationship between external debt and growth. Generally, they concluded that external debt affects negatively economic growth. Udeh *et al.* (2016) investigate in a time-series for the period 1980-2013, the impact of external debt on economic growth in Nigeria, using OLS techniques. Their main finding is that external debt positively correlates with economic growth in the short-run, but negatively in the long run.

### 2.1.3. Investment in Public Infrastructure, Public Debt, and Economic Growth

Prominent authors, such as Sachs (2005, 2008), recommend a "*Big Push*" in investment on public infrastructure in poor countries, but also advocate that this should be funded by debt forgiveness and by a substantial increase in public support, in order to enhance growth, reduce poverty and improve these countries' quality of life.

Suma (2007) uses spatially linear regressions models for cross-sectional data of growth and investment that incorporate the influence of spatial interaction and spillover effects, to investigate the impact of external debt on economic growth and on investment in SSA countries, over the period 1980-1999. The spatial model takes the growth rate of GDP as the dependent variable, while *per capita* income, terms of trade, gross domestic investment and external debt ratios are taken as independent variables. Similarly, the spatially lagged investment model has the annual rate of public investment as a dependent variable, being the independent variables identical to those of the spatial growth model. The general conclusion is that, while the external debt service tends to have an inverse relationship with economic growth of the Economic Community of West African States (ECOWAS), the ratio of total debt stock in relation to the GDP affects the growth only initially. On the other hand, the external debt service has a negative impact on public investment in the ECOWAS. The ratio of the total debt stock in relation to the GDP negatively affects public investment and suggests that to boost growth and investment in the SSA through foreign capital can be counterproductive. The Sub-Saharan region could have better growth if its member countries could promote domestic savings and create a favourable investment environment, particularly foreign direct investment, rather than relying on external borrowing to generate economic growth and develop their economies.

Wyplosz (2007) analyses the efficiency of Debt Sustainability Analysis (DSA) models, constructed by the IMF and the linkages between public investment and growth, in the case of Cape Verde. The author argues that DSA models do not give enough importance to the links between public investment and growth. They fail to incorporate aspects related to the economic structure of the countries, such as the efficiency of public investment, the absorptive capacity of the countries, and the economic return of infrastructures.

Calderon and Serven (2008) analyse economic growth for 136 developing countries, including the SSA countries, using regression analysis based on estimates of growth of infrastructures and income inequality for the period 1960-2005. They conclude that there is strong evidence that the construction of infrastructures has a positive impact on economic growth. For these authors, the development of infrastructures accelerates the reduction of poverty levels and is associated with high levels of economic growth and inequality reduction.

The analysis of the existence of a linear or non-linear relationship between external debt and economic growth in South Africa and Nigeria was extensively developed by Ayadi and Ayadi (2008), applying neoclassical growth models and econometric techniques such as OLS and Generalized Least Squares (GLS) for the 1994-2007 period. The authors concluded that, despite the negative relationship between the debt service ratio and the GDP growth in South Africa, the stock of debt, however, has a significantly strong positive relationship with the growth of production, confirming the beneficial impact of debt. As for Nigeria, the debt service has a positive impact on the growth of production, although it is statistically not significant. With the introduction of the investment variable in the model, they also concluded that the growth of capital exerts a positive influence on the growth of production, both in Nigeria and in South Africa. The impact of the debt burden on growth is not linear in Nigeria, which is different from South Africa. The stock of debt contributes significantly to economic growth in the initial period, up to a point where further increases in debt become unsustainable, consequently hindering growth. These authors recommend that Nigeria, South Africa, and all indebted countries should resort to external borrowing only in extreme cases. The governments of these countries should make fiscal adjustments through spending cuts, in order to reduce the level of deficit financing and the consequent pressure on the exchange rates.

## 2.2. Fiscal Policy, Public Debt, and Economic Growth

Fiscal policy, defined as a government's efforts to influence the economy through changes in taxes and expenditures is increasingly a current topic. Policy makers are looking for a magic formula that answers the following question: what fiscal policy should be implemented in order to reduce the deficit and public debt but at the same time promote economic growth? Expansionary economic policies have not had the expected effects and, in some cases, have even been catastrophic. In short, social problems are increasing and the economy does not grow, i.e., fiscal pressure on economic agents is worsening and the economy is shrinking even more. The government deficit is now a fundamental concern of all countries and has been the subject of much study and analysis.

Following the work of Buchanan (1958), Modigliani (1961), unlike many authors, argues that the amount of national debt and government spending should not be allocated to future generations. Public debt transfers the burden of government spending for future generations by reducing the amount of income that occurs from the decrease of private capital stock. Apart from the crowding out effect, the author still points to the fact that the increase in public debt directly influences the rise of interest rates in the long run and reduces the volume of private investment and its marginal product. In short, the increase in public debt negatively affects economic growth. Buchanan (1999) addresses the issue of public debt, by defining the concept of debt. Governments borrow for many reasons and these operations can involve large or small amounts and can have real or monetary purposes with different effects. Therefore, before any analysis, it is relevant to list every case, separately. Thus, he presents a list of types of debt with their respective characteristics. According to this author, the classic principles of public debt impose limits to debt financing. Keynesian macroeconomics sees the budget deficit as the only way to finance deficits and overstates the exchanges between the government and financial institutions in the financing of public expenditure through debt. The author argues that even in the post-Keynesian era of the 70's and 80's, governments have supported the current public expenditure using debt, which he considers a corrosion of the value of the national capital. Therefore, the tax liability requires that the classical principles of public debt must be reviewed in order to have a widespread acceptability.

Barro (1974) strongly opposes the opinion of Modigliani, opposing the idea that the burden of public debt is transferable to future generations. According to this author, thanks to intergenerational altruism, the entire increase in public debt generates an increase in savings for the payment of future taxes related to the debt service. The author further argues that the financing of government spending through public debt would not have the stimulating impact defended by the Keynesian models in the post-war, because the increase in government spending would be compensated by the increase in private savings, which are needed to provide resources for the future debt service. This thought is an updated complement of the Ricardian equivalence<sup>9</sup> made by Barro (1974). The whole theorem is closely linked to the concept of expectations. If the government reduces tax rates and issues debt to finance the deficit, the economic agents will interpret this decision as a fiscal contraction or postponement, *i.e.*, reduction of their wealth as tax increases in the future. In this circumstance, the economic agents tend to revise their propensity to consumption and increase their savings for future consumption. Tax cuts may not stimulate increases in consumption. Rather, the reduction of public expenditure would lead people to expect a reduction of future taxes and thus increase their present consumption.

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<sup>9</sup> This theorem was first presented by the English economist David Ricardo in 1820.

According to the Ricardian equivalence theorem, the amount of public spending has an effect equivalent to taxes on the economy.

Barro (1979) goes deeper and reviews again the Ricardian equivalence theorem. He states that for a given amount of public expenditure, the choice between debt and taxes is irrelevant and has no effect on the aggregate demand or in the interest rate. The author develops a theory of public finance which identifies some factors that influence the choice between tax and debt, and argues that the growth rate of debt does not depend on the debt-income ratio. He finally concludes that temporary increases in government spending positively affect public debt. Public debt can, over time, move to the tax area, leading to higher taxation and reducing the production potential. Indeed, the well-known theorem of Barro on the Ricardian equivalence has been subject to extensive debate.

Roubini and Sala-i-Martin (1991) analyse the impact of contractionary fiscal policy on economic growth rate. In this study, they argue that the set of measures used by governments to reduce the debt itself reduces the growth rate of the economy. From empirical evidence based on a large sample of countries, being the Sub-Saharan African countries<sup>10</sup> introduced in the panel as a dummy variable, they analyse the relationship between the trade regime, the contraction of fiscal policy and economic growth, and conclude that there is a negative relationship between the distortions in the trade regime and growth, confirming the theoretical arguments that: 1) a contractionary fiscal policy affects growth negatively; 2) inflation rates and growth rates are positively related; and 3) high reserves of commercial banks are negatively related to economic growth.

Barro and Sala-i-Martin (1992) share the opinion that the most recent models of endogenous growth try to explain the different levels of economic growth among countries, particularly the models that emphasize the influence of fiscal policy and public expenditure in the long run economic growth. They analyse the role of fiscal policies in several models of endogenous economic growth and conclude that tax policies that encourage investment can be facilitators of economic growth, since the social rate of return exceeds the private rate of return. A social rate of return greater than the private rate of return causes "learning-by-doing" and "spillover effects". If the private rate of return is identical to the social rate of return there will be no need for fiscal incentive to investments.

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<sup>10</sup> The countries are Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Congo, Ivory Coast, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Gambia, Togo, Uganda, Zaire, Zambia, and Zimbabwe.

Easterly and Rebelo (1993) use cross-sectional data for public investments, involving 125 economies, from Africa<sup>11</sup> and from the rest of the world, and span the years 1970 to 1988, to analyse and describe the relationship between fiscal policy variables, the development level, and the growth rate and conclude: 1) there is a strong association between development levels and the tax structure; 2) tax policy is influenced by the size of economies and the population base; 3) the investments in transport and communications are very significantly correlated with economic growth; 4) the effects of taxation are empirically very difficult to isolate.

Devarajan *et al.* (1996) analyse the problem of the weight of public expenditure and its effect on economic growth in 43 countries (20 Africans) over the period 1970 - 1990.<sup>12</sup> Indeed, there is much controversy about which components of public spending are productive and unproductive, and which components of public spending should be subject to cuts at the expense of others, such as health, education, infrastructure, defence etc. According to these authors, the solution involves the analysis and understanding of the effect of each one of these components on economic growth. The study shows that the increase in the proportion of current expenditure has positive and significant effects on economic growth.

Engen and Skinner (1997) developed a model that incorporates the effects of government spending and the effects of taxation on growth, using a sample of over 100 countries between 1960 and 1995. The authors conclude that there is a strong negative effect of both government spending and taxation on economic growth. An increase in government spending and taxation of 10% causes a decrease of growth rates by 1.4% in the long run. They defend that the administrative structure of the tax system and the size of the tax base are relevant to assess the impact of taxation on the product level. They also give examples of African countries that adopted a low tax base and high tax rates to achieve high levels of tax revenue, but the distortions are still considerable. This is totally different from developed countries, where a high tax burden is distributed by the different sectors with small efficiency losses at the inter-sectorial level. These authors unveil the curtain on what is one of the major constraints on the efficiency of economic policies in developing countries, particularly in African countries: the weight of the informal and underground economies.

The conventional theory on public debt by Elmendorf and Mankiw (1999) draws particular attention to aggregate demand in the short run and the crowding out effect in the long run. The

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<sup>11</sup> The countries are Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Comoros, Congo, Ivory Coast, Egypt, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Lybia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Niger, Nigeria, Rwanda, Sao Tome e Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Gambia, Togo, Tunisia, Uganda, Zaire, Zambia, and Zimbabwe.

<sup>12</sup> The countries are Burkina Faso, Cameroon, Egypt, Ethiopia, Kenya, Liberia, Malawi, Mali, Mauritania, Mauritius, Morocco, Nigeria, Rwanda, Senegal, Sudan, Tanzania, Togo, Zaire, Zambia, and Zimbabwe.

analysis performed by these authors assumes that, in the short run, the government runs a budget deficit situation, keeping unchanged government spending and reducing tax revenues. The immediate result of this policy is the increase of households disposable income with a positive impact on their level of consumption and therefore on their aggregate demand for goods and services. In the Keynesian conventional short run approach, the increase of any determinant of aggregate demand requires an increase in national income. This Keynesian analysis provides a justification for the tax reduction policy or increasing government spending (deficit) in situations of recession. These authors argue that the decrease in public saving caused by a higher budget deficit is not fully matched by an increase in private savings. This situation leads to a decrease in national savings and, hence, a slowdown in overall investment both internally and externally. But, the low level of domestic investment reduces the capital stock, increases the interest rate, and reduces labour productivity, with a negative effect on GDP. On the other hand, a reduction on the level of external investment has a negative impact on the performance of external capital, thereby, reducing the country's GDP in the future.

Giavazzi *et al.* (2000) use data sets from the OECD member countries and from the World Bank (in this case for developing countries) to analyse the circumstances that associate the non-linear response of national savings to persistent fiscal impulses. Concerning OECD data, the authors found that a non-linear response from national savings is more likely when fiscal impulses are more persistent. Using data from the World Bank (developed and developing economies), they concluded that the situations for which the trend of national savings is nonlinear seem to be more frequent. In fact, they do not occur only in the case of large fiscal contractions but also in large fiscal expansions and whenever the country is accumulating debt.

An empirical analysis between fiscal deficit and economic growth is made by Adam and Bevan (2005), using panel data for 45 developing countries, which includes several African economies such as: Cameroon, Egypt, Ghana, Kenya, Lesotho, Mali, Mauritius, Morocco, Senegal, South Africa, Togo, Tunisia, Zambia, and Zimbabwe over the period 1970-1999. The authors conclude that the fiscal deficit can boost economic growth, if it is financed by a limited level of *seigniorage*. They further argue that the deficit may inhibit economic growth if it is financed by domestic debt, although it can also generate an inverse effect, even if it is funded by external borrowing (at the market rate). There are also studies with partially opposed conclusions. This is the case of Bose *et al.* (2007), who, using panel data, examined the effects of budget deficits on economic growth of thirty developing countries, (sixteen of which are from Sub-Saharan Africa<sup>13</sup>) between 1970 and 1980 and concluded that the budget deficit helps economies to grow, since resources are used in productive investments such as education, health, and infrastructures.

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<sup>13</sup> The countries are Botswana, Burundi, Congo, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mauritius, Nigeria, Rwanda, Sierra Leone, Sudan, Tanzania, Zaire, and Zambia.

Frankel *et al.* (2008) defend the idea that macroeconomic policies for South Africa should be built on the control of inflation and rigorous counter-cyclical fiscal policy as the axes for the stabilization of the output, consolidating, in the long run, the macroeconomic stability and fostering economic growth.

Phiri and Tchereni (2007) use the random effects method and a sample of 26 HIPC countries from the Sub-Saharan Africa over the period 1980 to 2006, to study the relationship between foreign aid and growth. They found evidence of a positive impact of aid intensity on economic growth. However, this direct impact is small in comparison with the impact exercised by investment and government size on economic growth.

The development of external debt is caused by the need of governments to finance the budget deficits. Osinubi *et al.* (2010) studied the reasons for which the budget deficit, as an instrument of stabilization, leads to the accumulation of foreign debt, with visible effects on economic growth of Nigeria in the period between 1970 and 2003, using OLS. The authors show the implications on economic growth resulting from an implemented fiscal policy in the context of stability and debt sustainability, through an analysis of the relationship between the budget deficit and the foreign debt. The results of the econometric analysis confirm the existence of the designated "Laffer curve" and the nonlinear effect of external debt on economic growth of Nigeria. According to the Laffer's curve, the increase of income tax rates beyond certain levels may raise tax revenues. An increase in tax rates above its optimal rate can reduce state revenues. The "Laffer curve" suggests the existence of a limit to tax revenues and reflects a policy that induces economic growth: higher income taxes tend to discourage the activity of economic agents and hence economic growth beyond a certain tax rate. The "Laffer curve" shows that an exaggerated taxation turns out to be ineffective in terms of tax revenue. The study indicates that, whenever the budget deficit is financed through debt, in order to stabilize the debt ratio at the optimal and sustainable level, the overhang problem should be avoided and the benefits of international loans maximized.

Working with time series between 1980 and 2005, Keho (2010) studies the causal relationship between the budget deficit and economic growth of seven member countries of the West Africa Economic and Monetary Union (WAEMU), applying the Granger causality test and obtain differentiated results. The absence of causality, for three of the WAEMU countries (Ivory Coast, Senegal, and Togo), may be due to the existence of a nonlinear relationship.

Studying the Nigerian economy, Nurudeen and Usman (2010) argue that increases in government spending have not been converted to economic growth, using a sample between 1970 and 2008 and cointegration and error correction methods. These authors show that the government total capital expenditures, the total current expenditure, and the education expenditure affect negatively economic growth. On the other hand, the study also shows that increased government

spending on transport and health were crucial to the country's growth. They recommend a careful management of capital and current expenditures in order to increase the country's productive capacity and, through this, accelerate economic growth. In addition, the government should encourage investment in the transport and communication sectors, leading to a reduction of the effective costs of doing business and improving the profitability of companies. They still advocate the need for greater incentives for the education and health sectors, through an active financing policy for the engaged companies. The impact of fiscal policy on economic growth in Nigeria is also studied by Medee and Nenbee (2011), who use VAR techniques and Vector Error Correction Mechanisms (VECM) to overcome the stationarity problem, usually associated with time series. The study concludes that an increase in expenditure of the Nigerian federal government by 1% does not have, in the short run, any impact on economic growth and therefore, no impact on the GDP in the long run. Overall, the authors conclude that in the long run, there is a sensible equilibrium between economic growth and fiscal policy variables. They recommend that the government should formulate viable fiscal policies to stabilize the economy, achievable through government decentralization and through fiscal federalism in Nigeria. Sharing the idea of Medee and Nenbee (2011), the impact of fiscal policy on economic growth in Nigeria is also studied by Ezeabasili *et al.* (2012). In an empirical study, they examine the controversial relationship between these two variables, using data the period 1970-2006. Techniques of co-integration and structural analysis show the following conclusions: 1) the fiscal deficit affects negatively economic growth; 2) an increase of 1% in the fiscal deficit could reduce economic growth by about 0.023%; 3) there is a strong negative association between government spending and economic growth.

Babadola and Aminu (2011) also studied the effects of fiscal policy on economic growth in Nigeria, based on time series data for the period 1977-2009. They examined the unit root of the data series using the Engle-Granger method and the Dickey-Fuller test, followed by the co-integration test. To analyse the short run dynamics, the authors used VECM. The results indicate that productive public expenditure, particularly on health and education, have, in the long run, a positive impact on economic growth, as confirmed by the co-integration test. The authors recommend increasing government spending on health and education, as a way to boost economic growth. Fiscal deficits and economic growth in Nigeria are deeply studied by Maji and Achegbulu (2012). Analysing a time series from 1970 to 2009 and using the OLS method, the authors test the relationship between these two variables and their degree of significance. The results point to a positive impact of fiscal deficit on economic growth and recommend that government spending should be concentrated in the productive sectors of the economy and that appropriate monetary policies are defined in terms of the role that money supply plays in both the budget deficit and the inflation rate. With the purpose of studying the effect of public

expenditure on economic growth in Nigeria, Nworji *et al.* (2012) examined a time series data of forty years (1970-2009) related to variables such as current and capital expenditures on social and community services and capital expenditures on transfers using a model estimated by OLS multiple regression. Results show that current and capital expenditures have no significant negative effects on economic growth, as opposed to capital expenditure transfers that have significant positive effects. On the other hand, the current and capital expenditures on social and community services and current expenditures on transfers have a positive effect on economic growth. This study weaves several recommendations including: 1) current and capital expenditures should be directed primarily to the productive economic activities encouraging them and, thus, reversing the negative effect on economic growth; 2) the proportion of the total government expenditures channelled to finance current and capital expenditures should be increased, since these components have a positive effect on the economy. Similarly, the share of the current expenditures on transfers must be increased since it also has a positive effect on economic growth; 3) since the current and capital expenditures on social and community services have a more positive effect on economic growth than the other components, the authors require more favourable attention in the allocation of government spending. Agu *et al.* (2015) investigate the relationship between fiscal policy and economic growth in Nigeria, using OLS and found a positive correlation between government expenditures and government revenue as well as between government expenditure and economic growth. They also defend that a good performance of the private sector should be highly motivated through public incentives. A well-structured incentive framework ends up by crowding-in private investment, instead of crowding-out.

To analyse the relationship between fiscal policy and economic growth in South Africa, covering the period 1990 to 2004, Ocran (2011) uses Vector Auto Regression (VAR) models to estimate individual effects of government consumption, investment expenditure, deficits, and tax revenues on economic growth. Results support the following general conclusions: 1) the state expenditures have a significant positive effect on economic growth; 2) the government GFCF also has a positive impact on GDP growth, but this impact is less than that achieved by state spending, 3) tax revenues also have a positive effect on GDP growth; 4) the size of the deficit does not appear to have a significant impact on growth. It is important to note that the results of this study contradict almost all previous studies on developed economies, with regard to the effect of government size on economic growth, according to which there is an inverse relationship between these two variables. Gadinabokao and Daw (2013), using OLS, examined the causal relationship between government expenditure and economic growth in South Africa between 1980 and 2011. Results confirm a positive long-run relationship between government expenditure and economic growth. Additionally, gross capital formation granger causes economic

growth and increased government spending will boost economic growth. The relationship between government spending and economic growth is also investigated by Odhiambo (2015) using data from South Africa during the period 1994-2013. The author concluded that economic growth Granger-causes government expenditure and found also evidence of causality from government expenditure to economic growth in the short run. Burger and Calitz (2015) recognize the difficult economic situation inherited by democratic South Africa from Apartheid, characterized, namely, by a ratio of public debt to GDP of around 50% and exhibiting an increasing trend. The authors evaluate the government hard work to put together fiscal sustainability and sustainable development. They concluded that economic growth was threatened during years by a low level of public investment, affecting thus fiscal and development sustainability.

To assess the problem of public investment, economic growth and debt sustainability in Cabo Verde, Mu (2012) creates a dynamic general equilibrium model of a small open economy with two sectors. He argues that, with the rise of Cape Verde to a middle income country in 2008, donors and development partners approved a transition period of five years during which the country continued to enjoy the concessional loans. This feature was interpreted as an opportunity to carry out an ambitious program of public investment, with immediate consequences in increasing public debt, which had an increase of 20% of the GDP in just four years.

There is some caution in approaching the problem of financing investments in public infrastructure. The evaluation reports of the IMF and the econometric studies conducted under the auspices of this institution, consider the Cape Verdean debt as acceptable (Mu, 2012). However, they advise great caution in the management of public debt, in a very severe international economic and financial environment. Mendes (2015) investigates the sustainability of fiscal policies in Cabo Verde over the period 1990-2013, using a time series approach. He introduces in the analysis two case scenarios by using the potential cointegration between the government expenditures and revenues a) with or b) without donations from international partners. Results prove the unsustainability of fiscal policies when donations are excluded from the government's revenues.

Akosah (2013) examines the threshold effect of budget deficit on economic growth in Ghana, using quarterly data from 2000-2012 and found an inverse long run relationship between budget deficit and economic growth, particularly when the deficits are used to finance recurrent expenditures.

With the aim of explaining debt sustainability in low-income countries, Buffie *et al.* (2012) have developed a dynamic model that mixes concessional, external commercial and domestic debt, while also taking into consideration the impact of public investment on growth, as well as constraints on the speed and magnitude of fiscal adjustment. The authors put particular

attention on SSA countries by analysing debt-led public investment. The overall conclusion of this paper, concerning debt sustainability, is centred on the structure of government investment that should be oriented towards the construction of physical infrastructures, as well as on human capital investments. Adam and Bevan (2015) extended the theoretical model by Buffie *et al.* (2012), to explore the impact of public investment and fiscal reforms in a scenario of a distortionary tax system. The authors found strong theoretical support to the point that distortionary tax and public expenditure structures bring significant costs for growth and debt sustainability in African economies.

In a recent case study, concerning SSA countries, Magazzino (2013) uses time series between 1980 and 2011 for 15 countries, to analyse the relationship between some fiscal variables and economic growth, applying co-integration analysis and the Granger causality test. The co-integration tests show a weak long run relationship between public spending and revenue from WAMZ's countries. On the other hand, Granger causality tests show diverse results, among which we highlight the fact that in four of the six member countries (Gambia, Liberia, Nigeria, and Sierra Leone) the hypothesis "tax-and-spend" is tested, which, according to Friedman (1978), theorizes the causal relationship between revenue and spending, i.e., public revenues determine the levels of public spending, unlike the hypothesis "spend-and-tax", where revenues are determined by the volume of expenditures.

High budget deficit, originated by recurrent expenditures, slows down economic growth.

Bi *et al.* (2014) share the opinion that fiscal consolidation has a negative effect on production. They reinforce the importance of the effects of fiscal policy in developing countries, by analysing two tax issues, namely fiscal consolidation and the effects of public spending, and taking into account different values for the ratio of public debt. For this purpose, they design and implement a dynamic stochastic general equilibrium model of a small open economy expressed in real terms, with two production sectors (tradable and non-tradable). According to them, the increase in public spending in heavily indebted countries drives economies to operate very closely to their fiscal limits, with direct consequences on public debt. In this case, the expansionary effect is weaker in economies with higher levels of debt.

Ncube and Brixiová (2015) use the 'stabilizing primary balance' approach to study the impact of the increased public debt in the economies of African countries<sup>14</sup> over the period 2007- 2012. They found evidences that current (mid-2015) Africa's public debt-to-GDP is still lower than it

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<sup>14</sup> The countries are Algeria, Angola, Cameroon, Chad, Republic of Congo, DRC, Cote d'Ivoire, Gabon, Libya, Nigeria, Sudan, Benin, Botswana, Burkina Faso, Cameroon, Cabo Verde, Egypt, Ghana, Kenya, Lesotho, Mauritius, Morocco, Mozambique, Namibia, Senegal, Seychelles, South Africa, Rwanda, Tanzania, Tunisia, Uganda, Zambia, Burundi, Central African Republic, Eritrea, Guinea, Guinea-Bissau, Liberia, Mali, Sierra Leone, Togo, Zimbabwe, Comoros, Djibouti, Ethiopia, Gambia, Madagascar, Malawi, Mauritania, Niger, Sao Tome and Principe, and Swaziland.

was decades ago and that the overall fiscal policies are sustainable. The debt level is also comparable to other developing countries and well below that of some advanced economies. The debt-to-GDP ratio decline was to a large extent due to favourable (and in many countries negative) real interest rate and growth differential. In contrast, fiscal policy contributed to the decline of debt only in oil exporting economies. At the same time, as excess demand and encouraging terms of Africa's sovereign bonds have shown, the continent has gained the attention of international investors, which has broadened up its credit markets.

### 3. Conclusion

The theoretical and empirical literature surveyed in this review is not entirely conclusive regarding the relationship between economic growth and public debt. In a broad way, there is an inverse relationship between them, i.e., higher levels of public debt decrease economic growth. It is generally agreed that the increase in public debt absorbs a large proportion of existing funds in the markets, hurting business financing and leading to the contraction of private investment, i.e., the crowding-out effect, reducing thus the growth potential of the economy in the long run. For developing countries, and particularly for African countries, the inverse relationship between economic growth and government debt is also compounded by the problem of debt overhang. The reviewed literature points out to the fact that debt overhang constitutes a serious problem for these countries, preventing or hindering them to leverage their economies.

The government deficit is another important concern for all countries and has been the subject of much study and analysis. Increase in government spending leads to budget deficit and to the increase of public debt, but can also lead to economic growth. The literature on the relationship between public deficit and economic growth is not consensual. Results for most theoretical and empirical studies are opposing. For instance, Buchanan (1958), Modigliani (1961), Engen and Skinner (1997), Fosu (1996), Clemens *et al.* (2003), Nurudeen and Usman (2010), Medee and Nenbee (2011), Ezeabasili *et al.* (2012), and Akosah (2013) defend the negative relationship between public deficit and growth. Different conclusions have been reached by Devarajan *et al.* (1996), Bose *et al.* (2007), Maji and Achegbulu (2012), Babadola and Amin (2011), Ocran (2011), Fincke and Greiner (2015), Agu *et al.* (2015) and Gadinabokao and Daw (2013), to whom, public deficits affect growth positively. Their conclusions are consentaneous with the Keynesian fiscal policy theory that supports that public expenditures contribute to the increase of the economic growth rate. Government spending should be positioned to the sectors of education, health, and infrastructures.

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# Chapter 2:

## Public Debt, Economic Growth and Inflation in African Economies

### Abstract

We analyse the relationship between public debt, economic growth and inflation in a group of 52 African economies between 1950 and 2012. The results indicate that the limits of public debt are negatively related to economic growth and exhibit, from a given level of debt, an inverted U behaviour regarding the relationship between economic growth and public debt. Briefly, the high levels of public debt are coincident with reduced rates of economic growth and rising levels of inflation. Our results for three specific geographical areas resemble those of the overall analysis, despite some differences. In North African countries, the growth rates of the gross domestic product (GDP) and inflation also show an inverted U behaviour as the ratio of public debt/GDP increases. The highest rate of economic growth is recorded when the ratio of public debt/GDP is below 30% of GDP and corresponds to an average inflation rate of 5.33%. An identical behaviour of the GDP growth rates and inflation also appears in Sub-Saharan countries until the third interval (60-90%). However, the highest growth rate of the GDP and GDP *per capita* is registered when the public debt/GDP ratio is in the second interval (30-60%). For the countries of the Southern Africa Development Community, the highest average rate of economic growth (6.8%) is similar to North African countries, when the ratio public debt/GDP is below 30% of GDP, with an average inflation rate of 11%. A number of robustness analyses were performed and the great majority of them confirm the general analysis.

*JEL Classification: E31, E62, H63, O40*

*Keywords: Public debt, economic growth, inflation, African countries*

# 1. Introduction

Public debt in African countries is an issue of global concern. The burden of public debt and widespread indebtedness of these economies has been the subject of spirited debate among economists, academics, policy makers and the general public. The public debt issue and its burden started in the late 1970s when the international trade and financial environment manifested very favourably for developing countries, with particular emphasis for the African countries. The increase in exports, the negative real interest rates in international capital markets and the high price levels of export markets, which favoured the terms of trade of these countries, were crucial to an explosion of public consumption and investment, with considerable impact on the increase of public debt of these countries. In this context, the debt of African countries has rapidly grown and culminated in the debt crisis of the 1980s and 1990s with negative impact on their growth.

In fact, as very well stated by Tarp (1993), for many decades the performance of African economies has been disappointing. The average annual gross domestic product (GDP) growth rate, which reached a level of 5% from 1965 to 1973, declined to only 3.2% during the later part of the 1970s. This growth rate further dropped to 2.1% in 1980. With a rapidly growing population, the real GDP per capita fell by 1.1% during the 1980s.

The UNCTAD (2004) states that "Africa's external debt burden increased significantly between 1970 and 1999. From just over \$11 billion in 1970, Africa had accumulated over \$120 billion of external debt in the midst of the external shocks of the early 1980s. Total external debt then worsened significantly during the period of structural adjustment in the 1980s and early 1990s, reaching a peak of about \$340 billion in 1995. Overall, Africa's external debt averaged \$39 billion during the 1970s, before ballooning to just over \$317 billion in the late 1990s. Over the same period, total debt service paid by the continent increased from about \$3.5 billion to a peak of \$26 billion." The situation became unsustainable, and it was clear that these countries would not be able to repay their debt and that a solution was needed. The negotiation of a debt reduction programme started with the Paris Club in the early 1990s and assumed a more solid structure in 1996 with the Highly Indebted Poor Countries (HIPC) Initiative, launched by the World Bank and the International Monetary Fund (IMF). The purpose of this initiative is to reduce the debt burden of poor countries to sustainable levels in order to ensure that no country faces a debt burden that it cannot manage. It is designed to help those countries that cannot reach a sustainable debt burden through traditional mechanisms of rescheduling and debt reduction. These countries must follow the IMF- and World Bank-supported adjustment programmes and must implement a poverty reduction strategy.

The public debt crisis and the inherent fiscal deficit constitute a big issue in African economies, particularly in Sub-Saharan Africa where fiscal deficit is a common phenomenon due to high level of public expenditures. As stated by Collier (1996), the ratio of Sub-Saharan Africa fiscal deficits to GDP reached an average rate of 4.33% between 1985 and 1994, which indicates that the ratio of public investment in Sub-Saharan Africa has not only been consistently higher compared with other regions but also the low returns on the public investment were responsible for the decline in growth performance. However, in a recent paper, Marcelino and Hakobyan (2014) discuss the effects of the HIPC Initiative on growth and conclude that this programme was beneficial to growth. Generally, the fiscal policy measures adopted seeking to increase the state revenues and reverse the course of growing national debt have not produced the desired results, and the socio-economic conditions of the citizens have not improved. The uncontrolled proliferation of small informal economic activities as a source of livelihood and survival of many families affects the mechanism of effective taxation and defeats the purpose of the fiscal policy measures.

In this situation, countries are obliged to borrow more money to fill in the gap between the expenditures and the revenues during fiscal periods. The internal and external loans are, thus, a common option for covering the primary deficit, and amount to a strategic plan of governments to make new investments, ensuring the improvement of the socio-economic conditions of the citizens. However, excessive debt and weak capacity of return of investments are a vicious cycle that tends to deteriorate the situation. In short, public debt is an issue of major concern, related to the inability of countries to self-finance their economies. This situation of imbalanced budget and increasing financial obligations to third parties has forced these countries to continuously search for models and policy measures that might lead to steady economic growth within a consistent inflationary trend. It is, however, a fact that in the last decade African economies have continuously grown. Data analysis from the African Economic Outlook allows us to conclude that the average annual growth rate of real output increased from 1.8% in the period of 1980-1989 to 2.6% in 1990-2000, and 5.3% in the period 2000-2013. In this latter period, African economic growth is only surpassed by Asian and Eastern Asian economies. Nevertheless, African economies still anchor their economic growth in public debt. Recently, the issue of public debt and economic growth was examined in a polemical article by Reinhart and Rogoff (2010). Their findings indicate the following: (i) The relationship between government debt and real GDP growth is weak for the debt/GDP ratio below a threshold of 90% of the GDP. Above 90%, the average growth rates fall by about one percentage point. (ii) Emerging markets face lower thresholds for both public and private external debt. When the external debt reaches 60% of the GDP, annual growth declines by about two percentage points. At higher debt levels, growth rates decrease 50%. (iii) There is no apparent link between inflation and public debt levels for the advanced countries as a group (some countries, such as the United States, experienced higher

inflation when the ratio of debt/GDP was high). One contradictory reaction to this article is based on the argument that low economic growth can cause high levels of public debt (Krugman, 1988). Our work aims to study the relationship between the limits of public indebtedness, economic growth and inflation in African countries, as in the work of Reinhart and Rogoff (2010). Using a time series of historical data from 1950 until 2012, it contributes to a better understanding of the implications of debt levels in the macroeconomic performance of African countries. Our contribution is thus twofold: (i) construct the largest database to date relating those variables in African countries, achieving the highest possible coverage for the continent; and (ii) relate those variables in a comprehensive way and draw prospects of future research in an important issue for the African continent. This work is divided into five sections. Section 2 reviews the recent literature studying the relationship between public debt and economic growth and public debt and inflation in African countries. The third section addresses the issue of data collection and methodology, *i.e.* the various sources used and the constraints encountered in the process, while the fourth and the fifth sections present the results of the analysis and conclusions, respectively.

## 2. Literature Review

### 2.1. Public Debt and Economic Growth

Public debt arises as a result of budget deficit and the failure of tax revenues to cover projected expenses, and is an instrument used to cover those budget deficits. As old as the origin of the state, public debt is understood as a set of state obligations to third parties, and is classified as internal when the debt is issued on the domestic market and external when it is sold to the foreign market, regardless of the currency and the nationality of the creditors. It is extremely important not to overlook the fact that the internal public debt at the level of developing countries, particularly African countries, is quantitatively much less significant than the external public debt. Pianizza (2008) states that, traditionally, developing countries rely on domestic debt only when the access to external resources is blocked. However, this does not mean that domestic public debt is negligible. Christensen (2005) shows that there is a tradition of domestic public debt in poor or low-income countries. For this author, the domestic public debt in 1980 represented about 10% of the GDP in Sub-Saharan African countries and was contracted at commercial banks. Public debt has, therefore, been a path followed by many countries for maximising their development. Sustainable economic growth is a priority for all countries and is an important goal for macroeconomic policy. Obviously, such growth requires financial resources that should ultimately be converted into investments that generate internal and external dynamics of value creation. Public investment supports for productive activities are essential.

The scarcity of resources and reduced financial capacity of countries, particularly the poorest ones, require the mobilisation of resources, through active expansionary fiscal policy to reduce domestic and/or external debt.

Public debt has undoubtedly been the most frequent strategy for raising these funds. But if on the one hand public debt is essential to the goals of governments, even in the pursuit of their main functions such as promoting fairness in its role in countercyclical policies in times of recession, on the other it is a matter of much controversy with regard to satisfactory levels of debt. In the late 1970s, the financial and international environment was manifestly favourable for developing countries, especially in Africa. The increase in exports, the negative real interest rates in international capital markets and the high levels of export prices were crucial to an explosion of public consumption and investment, with direct impact on the considerable increase of public debt in these countries, according to the World Bank (1989). This study argues that an exaggerated debt service by indebted and least developed countries was a barrier to economic growth. High debt hinders the negotiation process for obtaining new loans for new productive investments, with severe repercussions in terms of generation of future net margins necessary to fulfill the obligations related to old debt service. The steep increase in public debt negatively affects economic growth. For Iyoha (1999), the effect of debt overhang and crowding-out on economic growth of Sub-Saharan countries is significant. This means that the high stock of external debt and the excessive burden of debt service had a depressing effect on investment in these countries, with direct effect in reducing the rate of economic growth. The concept of debt overhang, as such, and its negative effect on the economic growth of countries, is also discussed by Sachs (1989), who shares with Krugman (1988) the view that foreign debt can have a negative impact on the levels of investments and consequently on economic growth through debt overhang. According to the latter, this concept refers to an existing "inherited" and sufficiently heavy debt that lenders fear will not be fully recovered, i.e. the debt inherited by some countries is greater than the value of the transfer resources expected by their creditors in the future. The choice between continuity of funding aimed at economic growth and debt forgiveness is a trade-off because the funding can, if well invested, guarantee the repayment of debt and ease the country's obligations to creditors. Moreover, the debt burden increases the difficulties in payment to creditors. For these authors, the economic growth in these countries can be enhanced and leveraged with debt forgiveness. Fiscal policy is, certainly, an important determinant of growth. Easterly and Rebelo (1993) defend a strong relationship between development level and fiscal structure. Using cross-section regression and historical data, they concluded that poor countries are highly dependent on international trade taxes, while developed economies rely on income tax. Using a macroeconomic model to simulate the effect of external debt on economic growth in Sub-Saharan Africa, Iyoha (1999) performs a sensitivity

analysis based on the reduction of the debt stock (5%, 10%, 20% and 50%). The model is inspired by Solow's production function (1957) and assumes that the output depends on the working factor and per capita investment. The study concludes that the simulations have contributed significantly to the increase in the volume of investment and in the GDP, although much slower in the latter. A reduction of 50% in the debt stock during the period 1987-1994 led to an increase in the formation of gross fixed capital of about 40% and increased GDP by about 3%. The study also shows that debt forgiveness is a powerful stimulus to the recovery of investment and economic growth in Sub-Saharan African countries, and recommends the heavily indebted countries of Sub-Saharan Africa to articulate creative strategies for debt reduction, avoiding the negative impact on economic growth as a result of high stock of debt and the crushing burden of debt service.

In a different perspective, Ogunmuyiwa (2011) examines how the external public debt leverages the growth in developing countries, particularly in Nigeria, using a time series from 1970 to 2007 and various econometric methods, namely the augmented Dickey-Fuller test, the Granger causality test and Johansen cointegration, among others. The results show that the causality between external debt and economic growth in Nigeria is imperceptible. The weight/volume of debt also negatively affects the economic growth in Sub-Saharan Africa by reducing productivity levels (Fosu, 1996). The study estimates the effect of external debt on economic growth in Sub-Saharan Africa during the 1980s, when the debt was a heavy burden. Using World Bank data for the period 1980-1990 relating to 35 countries in Sub-Saharan Africa, the author notes that the net debt is detrimental to economic growth for given levels of production factors, and that the economic growth of these countries would have been 50% greater without foreign loans. When relating the public debt with the dynamics of public investment and its impact on economic growth in low-income countries, Clements et al. (2003) conclude that high levels of public debt may affect the growth of these countries negatively. Debt affects growth more via the most efficient use of resources than through the depressing effect it has on private investment. For these authors, external debt has an indirect effect on growth through public investment. While the stock of public debt seems to have a depressing effect on public investment, the same is not true for debt service. According to these authors, the relief of the external public debt service could boost economic growth through its effects on public investment. They further argue that if half of all the resources from debt service relief were channelled to this purpose, without increasing the budget deficit, growth in these countries would accelerate by about 0.5% per year. Moreover, this argument is strongly defended by Deshpande (1997), who explores the issue of debt overhang, examining empirically the investment experiences of 13 highly indebted countries. He concludes that the relationship between external debt and investment is negative and consistent. In a general perspective, using the method of ordinary least squares in a panel of 79 developing countries and a time series of 1970-2002, Cordella et al. (2005) conclude that

there is a marginal negative relationship between debt and growth at intermediate levels of debt, which does not happen at the lower levels. Countries with good governance and strong institutions face debt overhang when debt rises above 15-30% of the GDP, but the marginal effect of debt on growth becomes irrelevant above 70-80%. In countries with inadequate policies and poor institutions, debt overhang and the limits of irrelevance seem to be lower. Bhalla (2007), Gala (2007) and Rodrik (2008) defend that just as overvaluation hurts growth, undervaluation facilitates it. For most countries, high-growth periods are associated with undervalued currencies. In fact, there is little evidence of non-linearity in the relationship between a country's (real) exchange rate and its economic growth. An increase in undervaluation boosts economic growth just as well as a decrease in overvaluation. But this relationship holds only for developing countries; it disappears when we limit the sample to richer countries. Weak governance cannot deliver a strong fiscal policy. Rena and Kefela (2011) consider that fiscal deficit is a constant in a great majority of African economies, and it constitutes serious constraints to economic growth. These authors suggest three approaches to address this problem, namely increase in revenue, reduction in expenditure or a combination of both. Akosah (2013) examines the threshold effect of budget deficit on economic growth in Ghana, using quarterly data from 2000 to 2012 and found an inverse long-run relationship between budget deficit and economic growth, particularly when the deficits are used to finance recurrent expenditures. He concludes that high budget deficit, originated by recurrent expenditures, slows down economic growth. Bi *et al.* (2014) reinforce the importance of the effects of fiscal policy in developing countries by analysing two tax issues, namely the fiscal consolidation and the effects of public spending, and taking into account different values for the ratio of public debt. For this purpose, they design and implement a dynamic stochastic general equilibrium model of a small open economy expressed in real terms, with two production sectors (tradable and non-tradable). The authors conclude that fiscal consolidation has a negative effect on production. The increase in public spending in heavily indebted countries pushes economies to operate very closely to their fiscal limits, with direct consequences on public debt. In this case, the expansionary effect is weaker in economies with higher levels of debt.

The efficient use of public debt resources is crucial. Therefore, the analysis should be focused on how this debt is used. Georgiev (2012) argues that the importance of the impact of public debt on economic growth depends especially on the skill and competence demonstrated by governments in managing their resources. Public debt can be beneficial for countries if it is channelled to research and development (R&D), education, training, and investments that promote growth. Mismanagement of public debt causes adverse and negative effects on economic growth. A similar opinion is shared by Escobari and Mollick (2013), for whom: "the positive effect of government activities in the production depends, in theory, on the relative efficiency of public

sector." Considering a dynamic intervention of economic agents, these authors conclude that public expenditure, scheduled or not, affects growth negatively, although to a lesser extent when not scheduled. Their study was based on the Solow growth model applied to a sample of 56 industrial and emerging countries, covering a period from 1970 to 2004. In a recent essay on public debt and economic growth, following the publication of "Growth in a Time of Debt" by Reinhart and Rogoff (2010), Pescatori *et al.* (2014) question whether there is, effectively, a public debt limit above which the prospects of economic growth are compromised in the long term. Analysing long historical series from a database developed by the department for tax affairs of the IMF, and using regression analysis between the stock of public debt and GDP growth, they conclude that there is no solid evidence to prove that high debts adversely affect economic growth. For these authors, this issue should not be neglected, as high debt levels may be associated with sporadic and volatile economic growth, although the relationship is very weak. Very recently, Eberhardt and Presbitero (2014) studied the long-term relationship between debt and growth in a large panel of countries. They investigated the problem of public debt limit using empirical models and dynamic time series, and presented important inputs to enrich the ongoing debate about public debt and growth initiated by the work of Reinhart and Rogoff (2010). The results suggest that the relationship between public debt and economic growth differs between countries and that there is some support for a non-linear relationship in the long term, but no evidence of a threshold of common debt for countries over time. The authors concluded that the controversial limit of 90% of the debt can be due to a poor empirical specification or a misinterpretation of results.

## 2.2. Public Debt and Inflation

Price stability is one of the expedients to better economic performance and one of governments' concerns regarding macroeconomic management. Inflation is defined as a general and persistent increase in prices of goods and services, and is related with erosion and reduction of purchasing power of money. Moreover, as a tool used by governments to finance the budget deficit, public debt must be used efficiently in order to expand production capacity in the country. Kwon *et al.* (2006) corroborate the thesis defended by Sargent and Wallace (1981) that an increase in public debt is typically inflationary in highly indebted countries. Based on an empirical analysis of panel data, these authors demonstrate that the relationship between public debt and inflation is much more intense in the highly indebted countries and almost non-existent in developed economies. They also claim that the relationship between inflation and debt is weak in inflexible exchange rate regimes. The results underline the importance of institutional and structural factors in the relationship between fiscal policy and inflation. Bildirici and Ersin (2007) investigate the

relationship between public debt and inflation in countries with high rates of inflation and conclude that inflation is fed with the rising costs of domestic public debt. These authors argue that the increase in debt to the GDP ratio has led countries to get loans at higher cost and low maturity. Obi and Nurudeen (2009) analyse the effects of fiscal deficits and public debt on interest rates in Nigeria using vector autoregressive methods for the period 1981-2006. Considering the interest rate as an intrinsic variable to the model and as fiscal deficit and public debt function, they conclude that fiscal deficits and public debt have a positive impact on interest rates. They also suggest that the government should increase revenues and reduce unnecessary spending. Budget deficits and the consequent accumulation of debt and interest are barriers to the financing of economic growth through expansionary fiscal policies. Luporini (2004) shows that the issue of sustainability of public debt becomes relevant in the context of the unpleasant monetarist arithmetic of Sargent and Wallace (1981), according to which the growing indebtedness associated with an unsustainable fiscal policy will eventually generate an inflationary process. He argues that it is difficult to establish a relationship between budget deficits and inflation. Yet inflation has failed to establish a systematic relationship between fiscal deficits and inflation rates. The reduction or total elimination of budget deficits can be considered a stylised fact of stabilisation programmes that have been successful. Muhammad et al. (2012) consider inflation as a major problem for many countries. They analysed the impact of domestic public debt in Pakistan for the period 1972-2009 and concluded that the volume of domestic public debt and related debt service tend to push up price levels. The floating debt, *i.e.* treasury bills, makes up the largest proportion of domestic public debt whose return or interest rate is very high. This helps to increase the efficiency of institutions and families, and to increase the aggregate demand and price levels. For these authors, debt service resulting from the internal public debt is one of the causes of the budget deficit in Pakistan, and hence inflation. Pelesai and Oyinpreye (2013) empirically investigate the relationship between the budget deficit and inflation in 15 ECOWAS countries between 1980 and 2011 using cointegration analysis.<sup>1</sup> The results show strong evidence that financing a budget deficit by increasing the money supply causes a general increase in price levels. The authors conclude that the relationship between budget deficit and inflation is positive and significant in most countries in the long run.

### **3. Data and Analysis**

Time series for the variables used in this study differ from country to country. For the variables real GDP, real GDP per capita and population, time series cover the period between 1950 and 2012. Although there are longer time series for some countries, we have attempted to have a

similar temporal coverage for all countries. For the variables inflation rate and public debt in percentage of GDP (public debt/GDP), the time series used vary greatly, as shown in Appendix 1. The database of reference used herein was the web site "This Time Is Different" by Carmen Reinhart and Kenneth Rogoff. Due to the lack of a complete dataset on this site for all African countries (until 2012), alternative databases such as the World Bank (World Development Indicators or WDI) and the IMF (World Economic Outlook or WEO) were used. Data for real GDP until 2008 are expressed in Geary-Khamis international dollars at 1990 prices, and the source is the Conference Board Total Economy Database (which Reinhart and Rogoff used). From 2009 until 2012, the update of the real GDP for certain countries is made from the growth rates of real GDP obtained from the database of the IMF (WEO), starting from 2008 as a reference year.

The source used for the data on the ratio of public debt to GDP until 2010 is the above-mentioned web site of Reinhart and Rogoff. For other countries, and until 2012, the source used was the IMF (WEO). Public debt in our dataset includes both national and external public debt. The per capita GDP and its growth rate have been calculated by the authors using the real GDP data from the above-mentioned database and the data on population from the United Nations Department of Economic and Social Affairs - Population Division. Based on these different data sources, the authors built up a particular database that incorporates the following macroeconomic variables - debt/GDP, inflation, real GDP and per capita GDP - which suit the purpose of this work. The average values of the last groups of variables are analysed in accordance with the four intervals of public debt/GDP of Reinhart and Rogoff. Analysis of all 52 African economies was also performed based on the division of the continent into three geographical areas: (i) North Africa, (ii) Sub-Saharan Africa and (iii) Southern Africa Development Community (SADC) countries. A detailed description of all countries is in Appendix B. In the context of this work, the division of the continent in three geographical areas above is due, basically, to the specific characteristics of each one. The African continent is divided by the Sahara desert into two main geographical areas, North Africa and Sub-Saharan Africa. From the latter, we separated a set of countries that are members of SADC to make up the third geographical area. North Africa includes the countries that fundamentally base their growth strategies on the production and export of oil, gas and tourism, and some of them have reached levels of development among the highest on the continent. The SADC countries are on the whole major producers and exporters of oil, diamonds, gold, iron, coal, etc., and are the richest on the continent. Of the three geographical areas, Sub-Saharan Africa has faced the greatest difficulties to leverage its economies, despite their high agricultural potential.

## 4. Results

### 4.1. Public Debt in Africa

The average ratio of public debt to GDP in all African economies and in the three different geographical areas taken into account is large, although differing, as we can see in Fig. 1. The highest average belongs to the set of 31 countries that form the Sub-Saharan African area (98.83%), followed by six North African countries (77.38%). The lowest levels belong to the group of countries in the SADC countries, with 67.91%. The average ratio of public debt for the 52 African economies is 81.37% of their GDP.

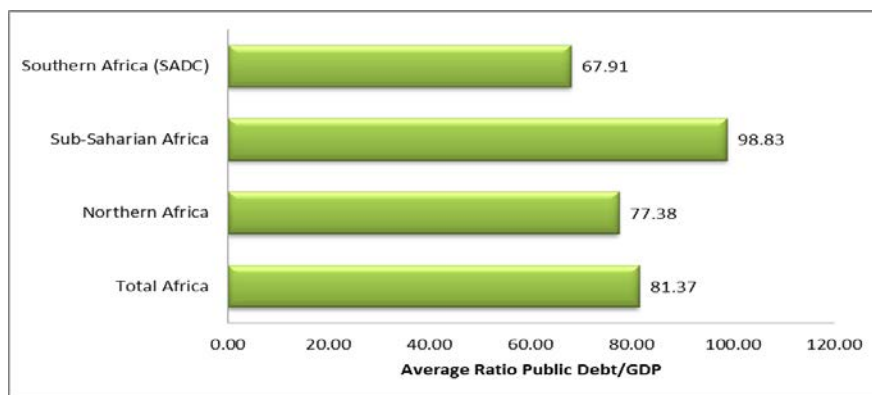


Figure 1. Ratio of Public Debt to GDP for African Economies by Geographic Areas

### 4.2. Public Debt, Economic Growth, and Inflation

The vast majority of the African countries analysed in this article have been buffeted by political and social instability that affected the development of their economies, particularly over the past two decades. The tables and figures below show an integrated and relational analysis of different levels of debt, economic growth and inflation in a number of African economies. This pooled analysis of 52 economies is also sectioned into three geographical areas, namely North Africa, Sub-Saharan Africa and the SADC countries.

#### 4.2.1. Benchmark Analysis

The economic growth trend analysis of 52 African economies, according to the various intervals of the ratio debt/GDP and for time series from 1950 to 2012, was based on calculations found in Tables 1 and 2. Similarly, we performed the analysis of inflation growth trends with different levels of public debt as a percentage of the GDP (Table 2). Reading and joint analysis of Tables 1

and 2 are made with support of Fig. 2. As seen in Fig. 2, a public debt that is less than 30% of the GDP (first interval) is associated with an economic growth of 5.72%. The increase in debt in the second interval (30-60% of the GDP) continues to enhance the growth of economies, providing an average rate of 6.39%, which corresponds to an increase of 11.71%. With an increase of public debt for the third interval (60-90% of the GDP) and fourth interval (>90%), the economies are still growing but with decreasing average rates. The transition of the volume of public debt to the third interval results in a decrease of average economic growth rate of 1.31 percentage points (from 6.39% to 5.08%), equivalent to a change of -20.54%. At levels of public debt above 90% of the GDP, the average economic growth rate drops to 3.44%, *i.e.* a GDP decrease of -32.28% over the previous interval and -46.17% over the second interval. We conclude, therefore, that African economies grow more when the public debt falls within the second interval, *i.e.* 30-60% of the GDP, thus exhibiting an inverted U relationship between economic growth and public debt. Moreover, the interpretation of Fig. 2 allows us to confirm the existence of an inverse proportionality between the average growth of the economies at different intervals of public debt/GDP and the average rates of corresponding inflation. The average inflation rate, which is associated with a higher economic growth (6.39%), is about 8% and falls within the interval 30-60% of the public debt/GDP ratio. The difference of the average growth of the economies between the first and second interval is 0.67 percentage points (from 5.72% to 6.39%), equivalent to an increase of 11.71%. This is related to a decrease in the average inflation rate to 1.4%, corresponding to a variation of 14.1%. From the second to the last interval, the average growth rate will decrease much faster.

From the second to the third interval, the average inflation rate increases from 8.17% to 10.72%, *i.e.* a positive change of 31.21%, while between the third and fourth interval.

Table 1. GDP Growth as Public Debt in Percentage of GDP Changes

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
Algeria	1964 - 2012	4.26	5.61	4.62	3.15
Angola	2000 - 2012	17.25	9.23	8.92	3.08
Benin	2000 - 2012	4.01	4.07	-	-
Botswana	1998 - 2012	4.21	-	-	-
Burkina Faso	2002 - 2012	5.60	6.33	-	-
Burundi	2000 - 2012	-	3.86	-	2.69
Cameroon	2000 - 2012	3.31	2.30	4.08	-
Cape Verde	2002 - 2012	-	-	6.00	4.66
Central African Republic	2000 - 2012	2.38	3.71	2.56	-0.06
Chad	1999 - 2012	0.00	9.29	4.40	-
Comoros Islands	2000 - 2012	-	1.91	2.46	-1.18
Côte d'Ivoire	1970 - 2012	6.10	8.78	0.98	1.15
Democratic Republic of Congo (Brazzaville)	2000 - 2012	-	7.05	-	4.23
Djibouti	2003 - 2012	-	4.29	-	-
Egypt	1970 - 2012	3.80	6.71	5.66	4.33
Equatorial Guinea	1980 - 2012	12.02	43.68	31.70	7.52
Eritrea	2000 - 2012	-	-	-	2.36
Ethiopia	1992 - 2012	8.14	11.51	0.81	6.68
Gabon	1990 - 2012	3.88	3.88	-0.10	2.86
Gambia	2000 - 2012	-	-	4.17	4.82
Ghana	1952 - 2012	-1.20	3.60	5.18	4.78
Guinea	1990 - 2012	-	3.94	3.01	3.40
Guinea Bissau	2000 - 2012	-	2.45	-	1.91
Kenya	1963 - 2012	6.27	4.33	3.08	1.22
Lesotho	1988 - 2012	8.09	4.75	5.14	2.14
Liberia	2000 - 2012	8.12	6.12	-	1.47
Libya	1990 - 2012	10.15	3.36	-1.48	-0.79
Madagascar	1990 - 2012	-	2.63	4.60	2.00
Malawi	2002 - 2012	-	5.96	-	3.83
Mali	2000 - 2012	4.96	3.64	4.29	-
Mauritania	2000 - 2012	-	-	8.87	3.70
Mauritius	1970 - 2012	9.05	4.57	4.42	-
Morocco	1965 - 2012	4.92	4.48	4.05	5.82
Mozambique	1999 - 2012	-	7.29	8.00	7.38
Namibia	1993 - 2012	3.69	-	-	-
Niger	1995 - 2012	5.06	11.24	4.88	2.93
Nigeria	1970 - 2012	5.80	8.38	3.73	2.54
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	5.34	7.47	6.15	-1.33
Rwanda	1995 - 2012	7.97	-	9.96	10.31
São Tomé and Príncipe	2001 - 2012	-	5.88	4.37	5.71
Senegal	2000 - 2012	3.69	4.40	2.81	-
Seychelles	1990 - 2012	-	-	5.18	1.45
Sierra Leone	2000 - 2012	-	7.69	-	10.90
South Africa	1950 - 2012	2.55	3.41	-	-
Sudan	1992 - 2012	-	-	5.37	10.75
Swaziland	1993 - 2012	2.44	-	-	-
Tanzania	2002 - 2012	7.29	6.93	-	-
Togo	2001 - 2012	-	4.63	1.94	-
Tunisia	1990 - 2012	-	4.22	4.56	-
Uganda	1997 - 2012	7.23	4.62	6.88	7.10
Zambia	1990 - 2012	6.61	-	5.34	1.81
Zimbabwe	1965 - 2012	-	3.95	1.31	-7.99
<b>Average</b>		<b>5.72</b>	<b>6.39</b>	<b>5.08</b>	<b>3.44</b>
<b>Median</b>		<b>5.20</b>	<b>4.62</b>	<b>4.42</b>	<b>3.08</b>
<b>Observations</b>	<b>1142</b>	<b>235</b>	<b>337</b>	<b>233</b>	<b>337</b>

Note: Similarly, we performed the analysis of inflation growth trends with different levels of public debt as a percentage of the GDP (Table 2).

the average rate of inflation confirms its growing trend from 10.72% to 17.53%, corresponding to a variation of 63.53%. The behaviour of GDP per capita for different intervals of the ratio public debt/GDP expresses the same trend as the GDP shown above. The calculations performed, which also served as the basis for Fig. 2 above, are shown in Table D 2 in Supporting Information Appendix D1.

Table 2. Inflation as Public Debt in Percentage of GDP Changes

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
Algeria	1964 - 2012	9.97	6.67	7.47	10.68
Angola	2000 - 2012	11.95	20.11	103.62	238.81
Benin	2000 - 2012	3.35	3.34	-	-
Botswana	1998 - 2012	8.31	-	-	-
Burkina Faso	2002 - 2012	3.03	2.56	-	-
Burundi	2000 - 2012	-	11.28	-	11.07
Cameroon	2000 - 2012	3.09	1.99	1.79	-
Cape Verde	2002 - 2012	-	-	2.59	2.23
Central African Republic	2000 - 2012	2.51	3.21	4.47	2.97
Chad	1999 - 2012	0.45	3.06	2.60	-
Comoros Islands	2000 - 2012	-	5.25	4.03	5.90
Côte d'Ivoire	1970 - 2012	10.94	5.06	4.06	5.06
Democratic Republic of Congo (Brazzaville)	2000 - 2012	-	4.99	-	6.13
Djibouti	2003 - 2012	-	4.30	-	-
Egypt	1970 - 2012	4.83	16.15	11.85	6.53
Equatorial Guinea	1980 - 2012	5.57	3.93	4.15	18.20
Eritrea	2000 - 2012	-	-	-	17.49
Ethiopia	1992 - 2012	18.15	24.65	6.69	3.57
Gabon	1990 - 2012	2.51	2.83	5.54	-2.30
Gambia	2000 - 2012	-	4.89	-	7.44
Ghana	1952 - 2012	76.95	22.08	14.12	16.00
Guinea	1990 - 2012	-	15.23	15.24	12.49
Guinea Bissau	2000 - 2012	-	2.78	-	2.99
Kenya	1963 - 2012	6.70	9.25	11.55	37.40
Lesotho	1988 - 2012	13.94	6.27	9.04	8.39
Liberia	2000 - 2012	7.66	7.29	-	9.83
Libya	1990 - 2012	4.74	-3.21	7.16	2.46
Madagascar	1990 - 2012	-	9.19	18.51	14.71
Malawi	2002 - 2012	-	10.76	-	12.80
Mali	2000 - 2012	3.12	2.56	-	2.22
Mauritania	2000 - 2012	-	-	5.57	6.21
Mauritius	1970 - 2012	18.94	8.12	9.27	-
Morocco	1965 - 2012	1.78	5.31	4.30	7.92
Mozambique	1999 - 2012	-	8.59	12.32	8.22
Namibia	1993 - 2012	10.50	-	-	-
Niger	1995 - 2012	2.61	0.47	2.15	3.86
Nigeria	1970 - 2012	13.64	15.07	16.65	32.82
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	3.92	4.34	6.02	5.55
Rwanda	1995 - 2012	8.28	-	9.22	10.99
São Tomé and Príncipe	2001 - 2012	-	31.99	13.81	14.46
Senegal	2000 - 2012	4.58	1.03	2.01	-
Seychelles	1990 - 2012	-	-	2.54	6.51
Sierra Leone	2000 - 2012	-	14.30	-	5.91
South Africa	1950 - 2012	8.57	7.78	-	-
Sudan	1992 - 2012	-	-	12.68	46.58
Swaziland	1993 - 2012	8.25	-	-	-
Tanzania	2002 - 2012	8.65	8.30	-	-
Togo	2001 - 2012	-	2.68	6.27	1.60
Tunisia	1990 - 2012	-	4.17	3.97	-
Uganda	1997 - 2012	8.79	16.40	4.93	4.21
Zambia	1990 - 2012	9.89	-	18.33	58.26
Zimbabwe	1965 - 2012	-	22.61	2346.82	176.08
Average		9.57	8.17	10.72	17.53
Median		7.96	5.79	6.69	7.92
Observations	1142	235	337	233	337

Note: Reading and joint analysis of Tables 1 and 2 are made with support of Fig. 2.

We note that the growth rate of the GDP per capita from the second interval falls at a much faster pace than the growth rate of the GDP. One cause for this is, of course, the fact that the growth rates of population are higher than the rates of GDP growth, with consequent deterioration of socio-economic conditions of the population. The percentage change of the differential between the growth rates of the GDP and per capita GDP is very strong between the intervals of the public debt/GDP ratio.

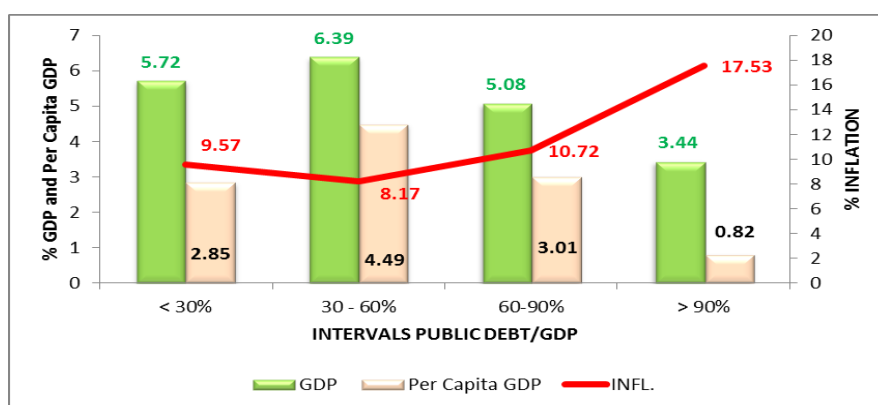


Figure 2. Real GDP, GDP *per capita* and Inflation as Public Debt/GDP Changes

The greatest variation is between the third and the fourth intervals, which is 26.69%. The calculations performed show that as the public debt/GDP ratio increases, this differential also increases at an accelerating pace from the second interval. In conclusive terms, the greatest growth of African economies occurs when debt levels are in the second interval. As debt levels increase, the growth of these economies decreases. The results show an inverted U relationship between economic growth and public debt. There are, however, opposing trends in the relationship between inflation and debt levels. High levels of indebtedness are related with high rates of inflation, *i.e.* the average inflation rates increase with increasing levels of public debt. A clearer and more comprehensive view of the time periods for the different variables (real GDP, inflation and public debt/GDP ratio), for all countries, is summarized in Appendix A.

#### 4.2.2. Analysis by Geographical Areas

An analysis of all 52 African economies based on the division of the continent into three geographical areas was also performed - (i) North Africa, (ii) Sub-Saharan Africa and (iii) SADC countries - with the purpose of a more nuanced view of the continent. The analysis shows that there are significant differences between these three geographical areas. The results of the calculations for GDP per capita, GDP and inflation with varying levels of public debt in the three geographical areas are in Tables D1-D3 in Supporting Information Appendix D1.

(a) North Africa

For all the observations concerning this geographical area, it is clear that the average growth rate of the economy for all the intervals of public debt/GDP ratio is positive, although decreasing, as can be read in Fig. 3. The average rates of economic growth are differentiated for all the intervals of the public debt/GDP ratio. The largest economic growth of these economies (5.78%) occurs when the ratio is below 30%, which contradicts the results of the overall analysis performed above. The transition of debt limits for the following intervals results in reductions in the average rates of economic growth. From the first to the second, the decline in the average growth rate is 0.9 percentage points, corresponding to a change of -15.77%. When the ratio of public debt/GDP is between 60% and 90%, the decrease in the economic growth rate corresponds to a change of -10.25%. This change is much higher (-26.03%) when debt limits are over 90% of the GDP. Regarding the behaviour of inflation for the four intervals of the public debt/GDP ratio, it appears that the average rate of inflation increases with the ratio of public debt/GDP. For these North African countries, the average inflation rate associated with the highest average rate of economic growth (5.78%) is 5.33% and is equivalent to an interval of the public debt/GDP ratio below 30%. As the debt ratio increases, the average inflation rates also increase faster. Between the first and the last interval, a variation of the average inflation rate of 26.79% is negatively correlated with economic growth, corresponding to a change of -43.91%.

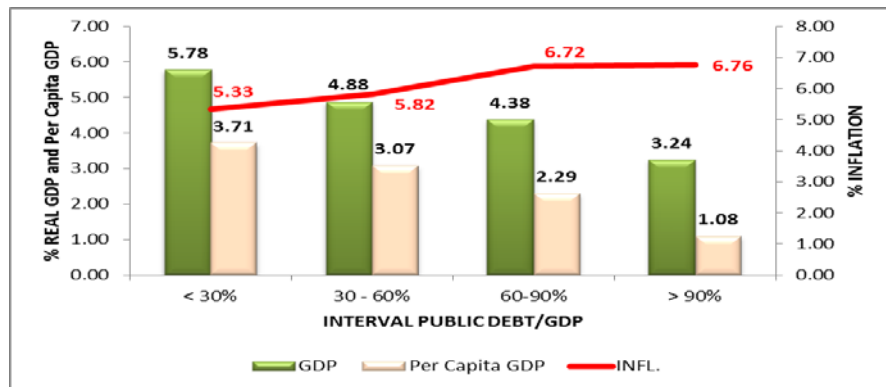


Figure 3. Real GDP, GDP *per capita* and Inflation as Public Debt Changes (North Africa)

The comparative analysis between the GDP and *per capita* GDP growth rate for the group of countries in the North African area differs slightly from the overall analysis only in the first interval. In other intervals, the trend is very similar. The differential between the GDP and *per capita* GDP growth rate is significant between the various ratios of public debt/GDP. Note that this variation decreases 12.78% between the first and second interval. The biggest change in the differential is seen when there is a change from the second to the third interval (15.91%). In

conclusive terms, the highest rate of economic growth is recorded in the interval lower than 30%, corresponding to an average inflation rate of 5.33%. The behaviour of the GDP growth rates and inflation are negative as the public debt/GDP ratio increases. Regarding the behaviour of the GDP and the per capita growth rate, it is clear that they are decreasing over all intervals of the public debt/GDP ratio and at a faster pace. This may be related to the reduction of economic performance (GDP) due to the increase in the public debt/GDP ratio and to a population growth rate which is higher than the real GDP growth rate.

(b) Sub-Saharan African countries excluding SADC

In this group, 31 countries were analysed. Sub-Saharan African countries obtain higher average rates of economic growth (7%), when the limit of public debt/GDP is in the second interval. In the third interval, the average rate of economic growth slows to 16.5%, *i.e.* it varies  $-26.26\%$ . When the public debt exceeds 90% of the GDP, the average rate of economic growth falls to 4.5%, corresponding to a change of  $-21.51\%$ .

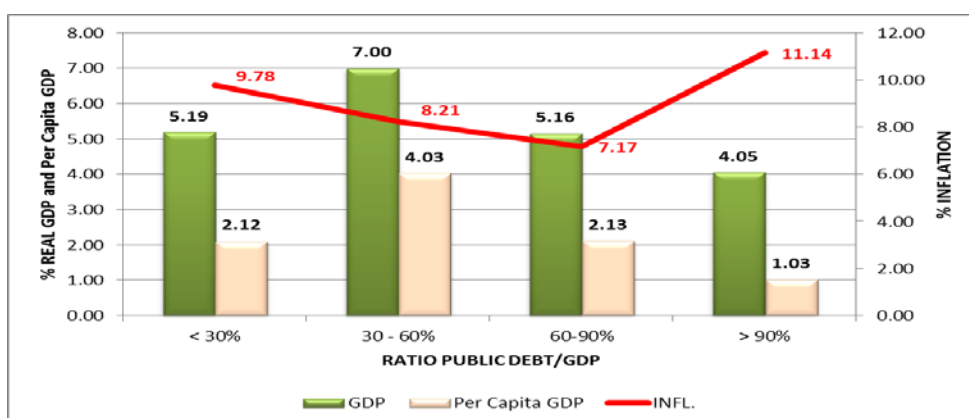


Figure 4. Real GDP, GDP *per capita* and Inflation as Public Debt/GDP Changes (Sub-Saharan Africa)

The evolution of the per capita GDP growth rate follows the same overall trend. The rate of growth of the per capita GDP reaches its highest level in the second interval of the public debt/GDP ratio, and decreases significantly in the third and fourth intervals. The calculations indicate a change in the differential between the growth rate of the GDP and the GDP *per capita* of  $-3.35\%$  in the second interval of the public debt/GDP ratio. In the third interval, the variation of the differential undergoes a slight increase to  $1.93\%$ , falling back to  $-0.31\%$  in the fourth interval. Fig. 4 illustrates the trend analysis. We therefore conclude that the growth rate of the GDP and GDP *per capita* reach their highest point in the second interval and from there both decrease, although the per capita GDP does so at a much faster rate, with particular emphasis on the fourth interval, where the ratio of public debt/GDP is higher than 90%. With regard to the

inflation rate, the growth trends show patterns of behaviour that are contrary to the overall trends already observed. Increased public debt in the third interval adversely affects the inflation rate, *i.e.* as the public debt as a percentage of the GDP increases, the inflation rate decreases, contrary to the overall conclusion. This trend is reversed in the fourth interval in which the public debt exceeds 90% of the GDP.

(c) SADC countries

The Southern African Development Community encompasses a set of 15 states. As can be seen in Fig. 5, the highest average rate of economic growth (6.8%) is recorded when the ratio of public debt/GDP falls in the first interval, with an average inflation rate of 11%. For debt ratios in the following three intervals, we found that the average rates of economic growth are decreasing, especially in the fourth interval. Meanwhile, the average rate of economic growth shows a variation of -62.85% compared with the previous interval, and -70.69% with the first interval. The same trend can be seen in the average rate of inflation, which grows exponentially from the second interval.

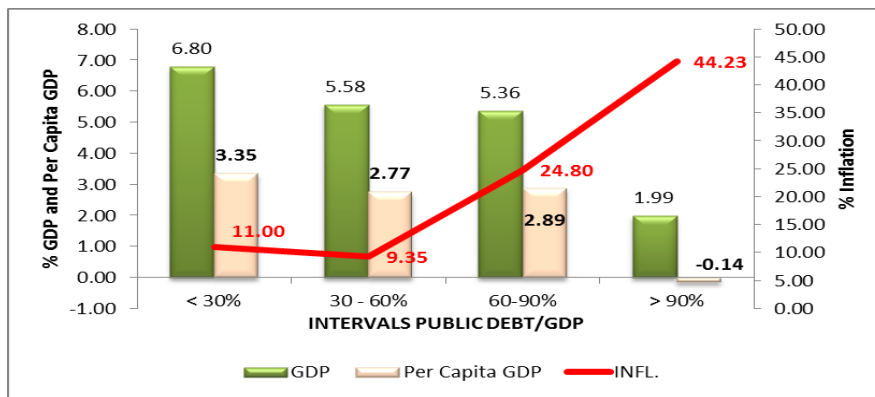


Figure 5. Real GDP, GDP *per capita* and Inflation as Public Debt/GDP Changes (SADC Countries)

Between the second and last intervals, the average rate of inflation increases from 9.35% to 44.23%, which corresponds to a variation of 373%. On the other hand, the trends in the per capita GDP growth rate are completely different from the trend of the same variable for the entire continent and for the other geographical areas, namely North and Sub-Saharan Africa, with particular emphasis on the fourth interval, where it obtains negative values.

4.2.3. Analysis by Income Level

The classification of African economies by their level of income, in this essay, follows the World Bank definition, which uses gross national income (GNI) *per capita* as the determinant for the separation of income levels. According to this definition, (i) low-income economies are those with a GNI *per capita* of \$1,045; (ii) middle-income economies are those with a GNI *per capita* of

more than \$1,045 but less than \$12,746; and (iii) high-income economies are those with a GNI *per capita* of \$12,746 or more. For the classification of African economies by level of incomes, we use the GDP per capita (Geary-Khamis dollars), instead of the GNI per capita, and 2008 as the reference year. The distribution of African economies by their level of income, according to our calculations, is presented in Appendix B. Detailed results of the figures presented below can be seen in Tables D4 and D5 in Supporting Information Appendix D1.

(a) Low-income countries

The joint analysis of real GDP per capita and inflation in low-income African economies is presented in Fig. 6. In these economies, the average rate of per capita economic growth is higher in the first two intervals of public debt/GDP, with emphasis to the second interval where it reaches 2.94%. This growth is followed by an increase in the average rate of inflation from 6.83% to 9.29%. In the third and fourth intervals, the real GDP per capita growth rate decreases by much in relation to the first intervals. From the figure, it can also be noticed that when the ratio of public debt/GDP is higher than 90%, the average GDP per capita growth rate turns negative, relative to the previous interval. Contrarily, the average rate of inflation grows from 7.02% to 19.41%. The growth performance of these economies is higher when the ratio of public debt/GDP is between 30% and 60%, and the average inflation rate is around 9.29%.

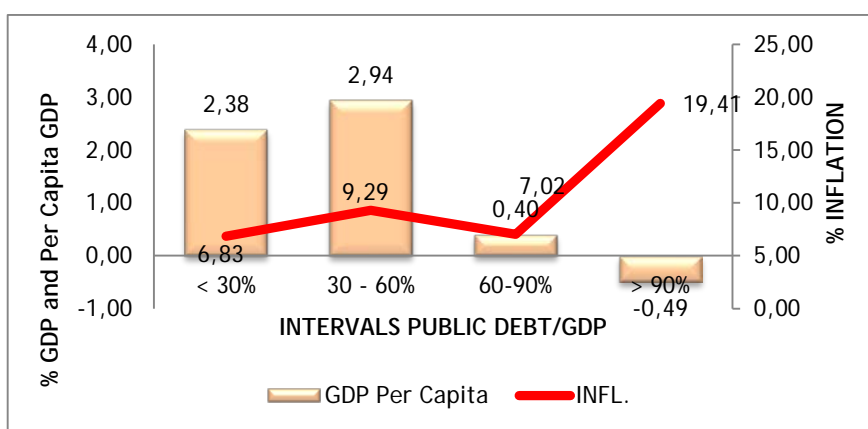


Figure 6. GDP *per capita* Growth Rate and Inflation in Low-Income African Countries

(b) Middle-income countries

Similar analysis is made for the middle-income African economies, and the main findings are presented in Fig. 7. In the first three intervals, the average real *per capita* GDP growth rate increases continuously, reaching 3.06% in the third interval, while in the fourth interval it decreases to 2.98%. The average inflation rate presents a nonmonotonous behaviour. The middle-income African economies grow faster when their public debt is between 60% and 90% of GDP, and the average rate of inflation is around 7.83%.

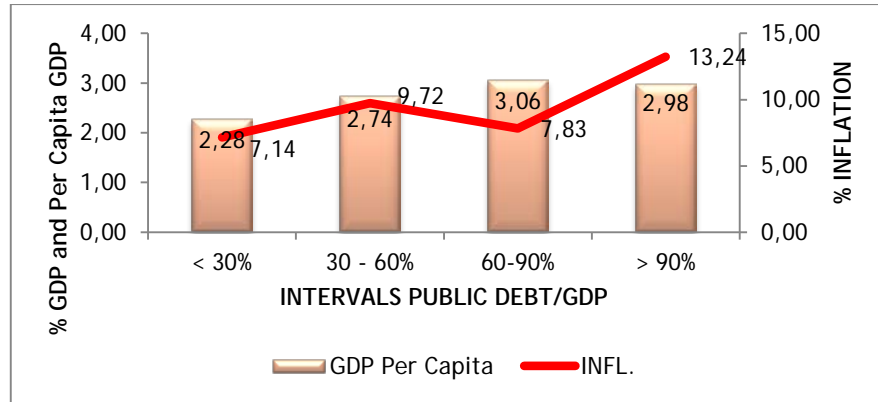


Figure 7. GDP *per capita* Growth Rate and Inflation in Middle-Income African Countries

c) High-income countries

In this category, there are only two countries, namely Equatorial Guinea and Mauritius. The trends of the macroeconomic variables (real *per capita* GDP growth and inflation rate) in these two high-income economies is analysed in Fig. 8. The *per capita* economic growth in the high-income economies boosts when the ratio of public debt in relation to GDP is between 30% and 60% from 8.06% to 21.31%, in relation to the first interval. This unusual increase is due particularly to the real *per capita* GDP growth rate of Equatorial Guinea. From this interval, the *per capita* GDP growth rate decreases continuously until the last interval. The average rate of inflation keeps its rising trend from 6.71% in the third interval to 18.2% in the last interval. The inflation behaviour is inversely related to the behaviour of *per capita* GDP growth rate. The growth performance of these economies is more robust in the second interval, where the *per capita* GDP is 21.31% and the average inflation rate is lower (6.02%). This group of countries exhibits an inverted U relationship.

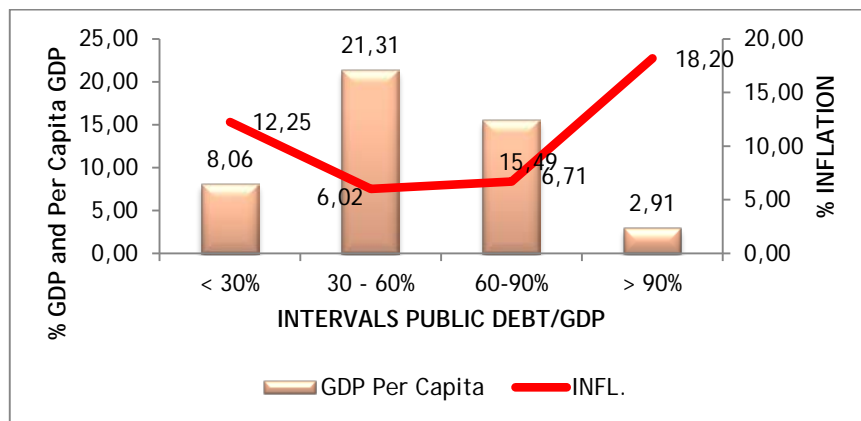


Figure 8. GDP *per Capita* Growth Rate and Inflation in High-Income African Countries

#### 4.2.4. Analysis by Income Level without Outliers

In this section we have performed the same analysis as in the previous section, but removing the outliers. A detailed explanation of the methodology and results will be presented below. Tables D6 and D7 in Supporting Information Appendix D1 show detailed results of the figures presented below.

##### (a) Methodology

To remove the outliers from our analysis, we first had to define the outliers. Our definition of outlier was the following: an observation that falls more than 1.5 times the interquartile range (IQR) above Q3 (quartile 3) or below Q1 (quartile 1). The IQR is defined as:  $IQR = Q3 - Q1$ . We applied this rule to the growth rate of real per capita GDP. A given growth rate  $g$  is an outlier if  $g > Q3 + 1.5(IQR)$  or  $g < Q1 - 1.5(IQR)$ . From the 3,182 original observations, we have removed 855 outliers.

##### (b) Low-income countries

The trend of real *per capita* GDP growth is proportionally inverse to the ratio of public debt/GDP. With inflation happens the opposite. The negative slope of real *per capita* GDP growth is very pronounced in Fig. 9. From Fig. 9 we can state that in those economies, higher real *per capita* GDP growth is verified in the first interval of public debt/GDP (<30%). As this ratio increases, real *per capita* GDP growth falls. On the contrary, the average rate of inflation is constantly increasing from the first to the last interval. Conclusively, we can state that there is a very pronounced inverted relationship between real *per capita* GDP growth and inflation.

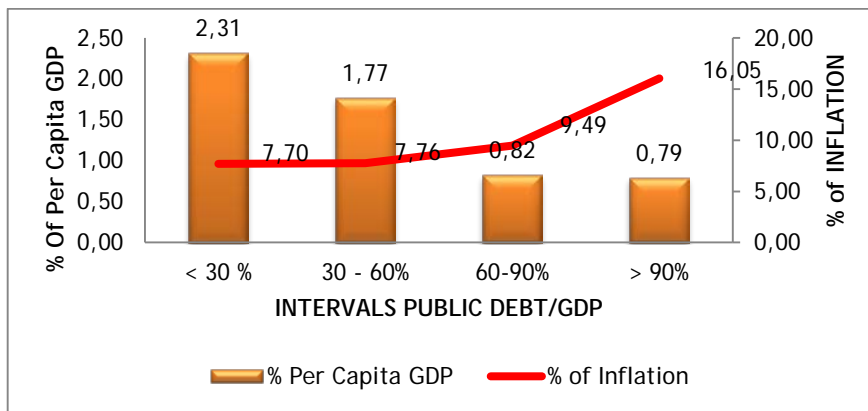


Figure 9. GDP *per capita* Growth Rate and Inflation on Low-Income African Economies

(c) Middle-income countries

In Fig. 10 we can see an inverted U relationship between the real per capita GDP growth rate and average inflation. The analysis of Fig. 10 also allows us to draw the conclusion that middle-income African economies perform better when their ratio of public debt is between 30% and 60% of GDP, and their average inflation is about 6.91%.

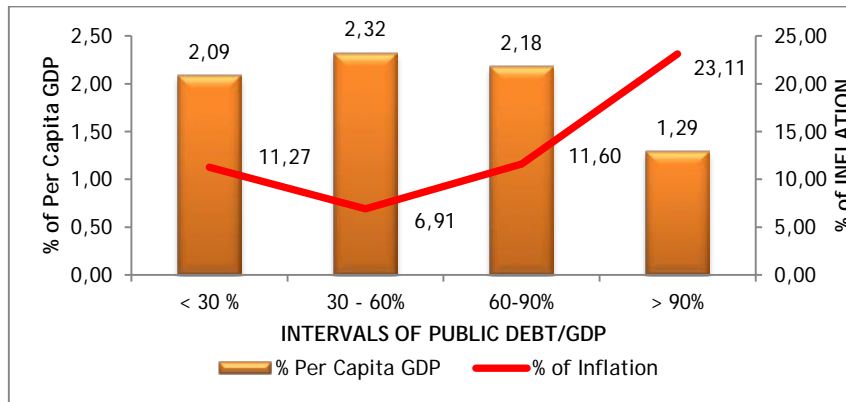


Figure 10. GDP *per capita* Growth Rate and Inflation in Middle-Income African Economies

(d) High-income countries

Fig. 11 shows the evolution of real *per capita* GDP growth and inflation. Inflation shows an atypical behaviour. The per capita GDP growth rate reaches its maximum value in the second interval of the debt to GDP ratio and then decreases very rapidly. The concluding analysis of Fig. 11 shows that the high-income African economies are most successful when the ratio of public debt/GDP is between 30% and 60%, corresponding to a *per capita* growth rate of 3.18% and an inflation rate of 7.27%.

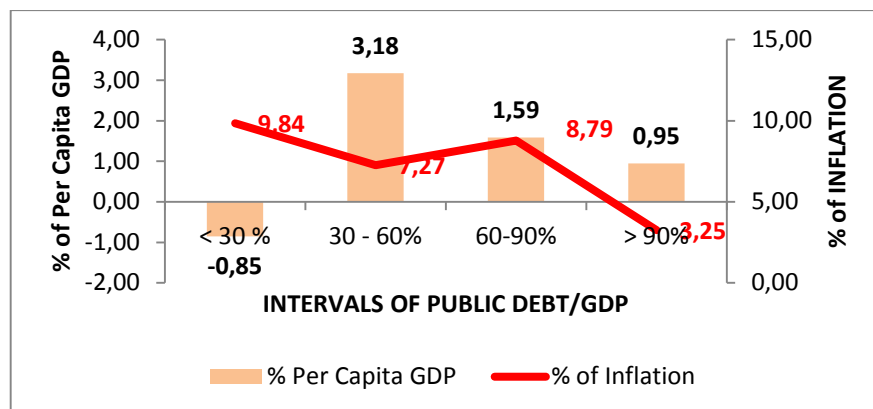


Figure 11. GDP *per capita* Growth Rate and Inflation in High-Income African Economies

4.2.5. Analysis of External Debt for African Countries

In this section we will analyse external debt, which includes both private and public debt. Data for this analysis were taken from the WDI of the World Bank, for the period between 1972 and

2012. External debt is in percentage of the GNI. We have data for all African countries, with the exception of Equatorial Guinea, Libya and Namibia. Tables D8-D10 in Supporting Information Appendix D1 show the detailed results.

(a) Low-income countries

Fig. 12 illustrates similar trends both for real GDP and for real per capita GDP growth rate as the ratio of external debt/GNI increases. In the first interval of the ratio of external debt/GNI, the average real GDP and the GDP per capita reach their higher values corresponding to 4.26% and 1.60%, respectively. From this interval to the last, these values continuously drop, reaching their minimum values. Not surprisingly, these trends are followed by an almost exponential increase of the rate of inflation throughout the intervals. The low-income African economies grow faster when the ratio of external debt/GNI is lower and the burden of debt service is not substantial. This faster growth of real GDP is followed by a low inflation rate. The increase of the ratio of external debt/GNI seems to have a direct relationship with the level of inflation and a negative relationship with the average real GDP and average real per capita GDP. The steep increase of public debt (domestic and external), as shown in Fig. 12, may negatively affect the level of investments and consequently economic growth through debt overhang and crowding out (Krugman, 1988; Sachs, 1989; Iyoha, 1999), or by reducing productivity levels (Fosu, 1996).

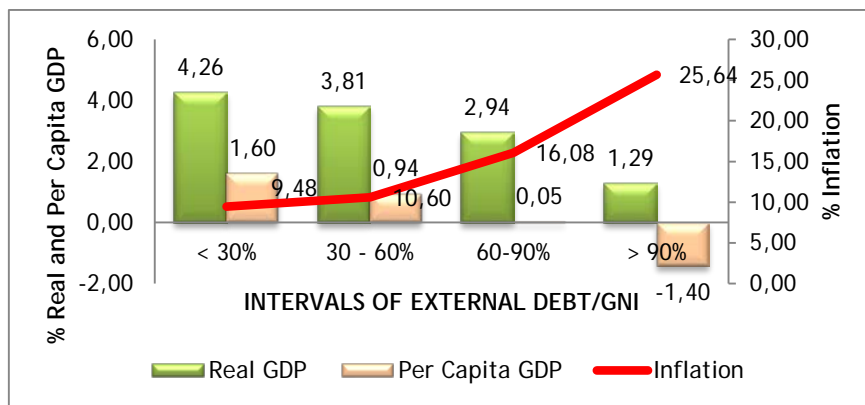


Figure 12. GDP *per capita* Growth Rate and Inflation in Low-Income African Economies

b) Middle-income countries

The pattern of the average of real GDP and real per capita GDP growth rates in the three first intervals of the ratio of external debt/GNI in middle-income economies is quite the opposite to the one verified in low-income economies. The average rate of real GDP is higher in the third interval (3.98%), with an average inflation rate of 10.73%. When the ratio of external debt/GNI is beyond 90%, the middle-income African economies break down. The average of real GDP and of the real per capita GDP growth rates become negative, and the rate of inflation increases to 24.14%. Fig. 13 reveals this pattern. The middle-income economies grow faster (3.98%) in the

third interval when the ratio of external debt is between 60% and 90% of GNI. This could be explained by better transparencies in the use of resources and by the skill and competence demonstrated by governments in managing their resources. Public debt can be beneficial for countries if it is channelled to R&D, education, training and investments that promote growth (Georgiev, 2012), or by the relative efficiency of public sector (Escobari and Mollick, 2013).

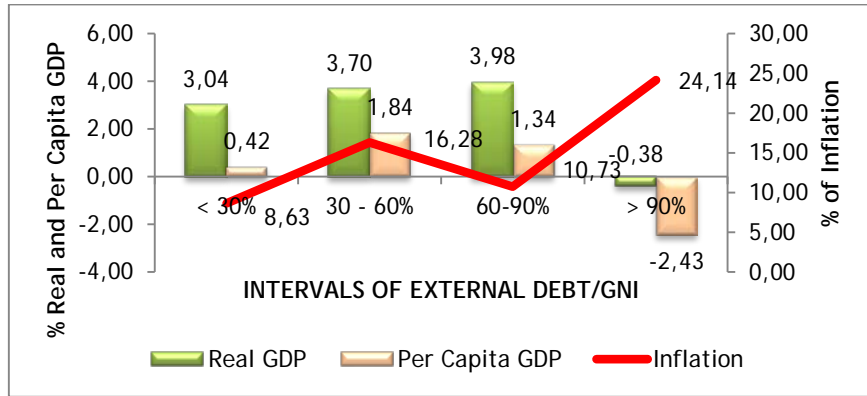


Figure 13. GDP *per capita* Growth Rate and Inflation in Middle-Income African Economies

(c) High-income countries

In this class of high-income African economies, there are only two countries: Equatorial Guinea and Mauritius. Fig. 14 represents an analysis of Mauritius due to the inexistence of data for Equatorial Guinea.

This figure shows a solid growth of real GDP and real per capita GDP in the two first intervals, being this growth higher when the ratio of external debt/GNI is lesser than 30%. Even in Mauritius, the general rule is observed. The real and the real per capita GDP decrease when the ratio of external debt/GNI increases.

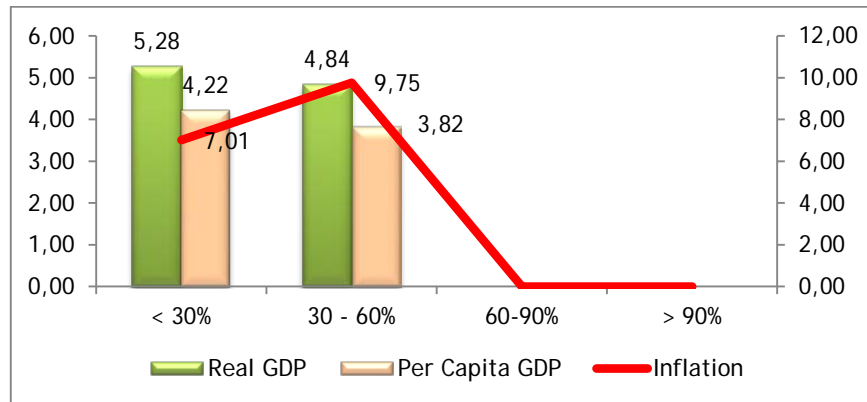


Figure 14. GDP *per capita* Growth Rate and Inflation in High-Income African Economies

### 4.3 Public Debt/GDP and Per Capita Growth - A Lagged Analysis

The trend of these variables is analysed through a five-year lagged relationship between the different intervals of the ratio of public debt/GDP and the subsequent five-year evolution of the real per capita GDP growth rate. This analysis intends to show a flavour of causality, showing how the public debt/GDP ratio in the previous five years affects the real per capita economic growth rate in the subsequent five years.

#### 4.3.1. Public Debt/GDP (1990-1994) vs. *Per Capita* GDP Growth Rate (1995-1999)

An analysis of the figure shows that countries with a higher ratio of debt/GDP in the period 1990-1994 (>90%) achieve in the subsequent five years (1995-1999) the highest level of per capita economic growth, 3.81% (Fig. 15). The per capita economic growth shows a growing trend as the ratio of public debt/GDP increases, according to the regression equation.

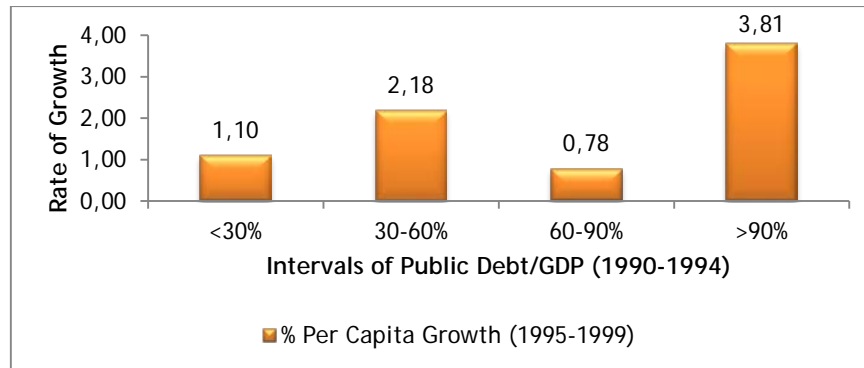


Figure 15. Relationship Between the Ratio of Public Debt/GDP (1990-1994) and *per capita* Economic Growth (1995-1999)

#### 4.3.2. Relationship between the Ratio of Public Debt/GDP (1995-1999) and *Per Capita* Economic Growth (2000-2004)

A lagged relationship between the ratio of public debt/GDP (1995-1999) and per capita economic growth (2000-2004) shows that the per capita economic growth is higher in the second interval of the public debt/GDP ratio, reaching 3.24%. The trend line and its regression equation show that, generally, the per capita GDP growth decreases with an increase in the ratio of public debt/GDP (Fig. 16).

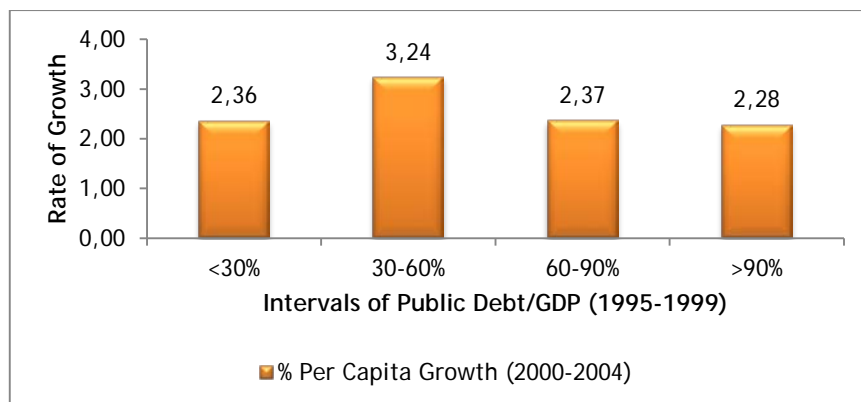


Figure 16. Relationship Between the Ratio of Public Debt/GDP (1995-1999) and *per capita* Economic Growth (2000-2004)

#### 4.3.3. Public Debt/GDP (2000-2004) vs. Per Capita GDP (2005-2010)

In relation to the ratio of public debt/GDP (2000-2004) and per capita economic growth for the period (2005-2010), it reaches its highest value (7.61%) in the third interval (60-90%), as can be seen in Fig. 17.

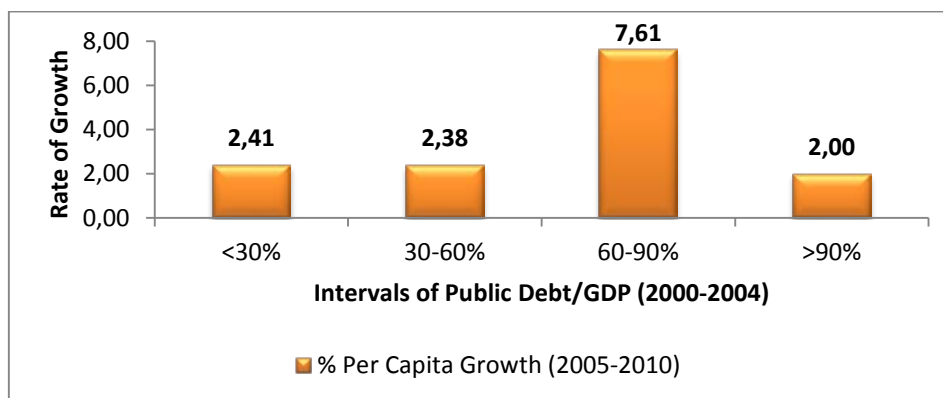


Figure 17. Relationship Between the Ratio of Public Debt/GDP (2000-2004) and *per capita* Economic Growth (2005-2010)

Overall, the results also show an inverted U-shaped relationship between public debt and economic growth, although not exactly with the same pattern as the general analysis and with the exception of the period 1990/1994-1995/1999, as in this relationship countries with 90% public debt/GDP or higher showed indeed a good growth performance.

#### 4.4. Robustness Analysis

We draw special attention to the fact that in order to test the consistency and quality of our results we performed our analysis using an alternative database, the Penn World Tables (PWT). The calculations for the whole of Africa and those concerning the division of its economies in the

three geographical areas, using the PWT, version 8, are shown in Tables D11-D14 in Supporting Information Appendix D2. Although data from PWT 8 includes only 48 countries and also contain a number of observations far below our original database, the comparative analysis of the results shows the following:

- The relationship of the GDP and per capita GDP growth rates and the public debt/GDP ratio is similar, although it displays some quantitative differences.
- The analysis by geographical areas also follows the above-mentioned trend, except for the geographical area corresponding to North Africa, where the trends of the variables are very different.
- Regarding the Sub-Saharan African geographical area, the results of data analysis from PWT 8 indicate negative per capita GDP growth rates in the fourth interval of the debt/GDP ratio, which is contrary to the reference database, although the pattern is the same.
- For the geographical area of Southern Africa (SADC), the per capita GDP growth rates are overall negative for all the intervals, although the trends are similar to the reference database.

## 5. Conclusion

Our analysis involving 52 African economies was focused on the relationship between the limits of public debt as a percentage of the GDP and economic growth and inflation. Overall, African economies achieve their highest performance in terms of average rates of economic growth (6.39%), while the limits of public debt as a percentage of the GDP are in the second intervals with an average inflation rate of 8.17%. From this limit, any increase in public debt is converted into a reduction of the average growth rates of economies and into an increase in average inflation rates. The findings show that there is an inverse relationship between these two macroeconomic variables, depending on the levels of indebtedness. Briefly, we can conclude that the highest average growth rates are achieved when the public debt is in the second interval. When this ratio is situated in the third interval, the average rates of economic growth suffer a drop of 1.32 percentage points and 1.64 percentage points when this ratio exceeds 90%. On the other hand, the growth rate of the per capita GDP shows a trend similar to that of the real GDP in relation to public debt, although their rhythms are more accelerated. The average growth rate of the per capita GDP is higher when the level of the public debt is in the second interval. The increase in public debt in the third interval results in a decrease of the average growth rate of the per capita GDP of 1.48%, rising to 2.19%, when the public debt exceeds 90%. The same analysis by geographical areas reaches similar conclusions regarding the behaviour of economic growth and inflation in the limits of public debt. Partial analyses dividing the African continent by geographical areas show that the three variables analysed as a function of the public debt/GDP ratio for Sub-Saharan Africa manifest trends and behaviours similar to the overall

analysis. It should be noted, however, that for all the countries of North and Southern Africa (SADC), the highest levels of average growth rates of the economies are observed when the levels of public debt are in the first interval and an average inflation rate is between 9.78% and 11%. Results using the PWT share a similar pattern, except for North Africa. The analysis of the African economies by level of income, made in accordance with the World Bank's criteria, does not show a standard pattern of real per capita GDP growth for low-, middle- and high-income economies. In fact, it seems that as countries get richer (from low to middle, and then to high income), the correlation between high public debts and low growth decreases, being stronger for the low-income countries. Concerning the average rate of inflation, the trend does not differ from the overall analysis, increasing as the ratio of public debt/GDP increases. An analysis without outliers was also made by income level. Findings from this analysis without outliers are very similar to the general analysis. For low-income economies, the real per capita GDP decreases as the ratio of public debt/GDP increases. In the first interval (90%). In the middle-income economies, the trend of real per capita GDP growth is very similar. It reaches its maximum value (2.32%) in the second interval, after which it decreases to 1.29% in the last interval. Regarding the high-income economies, the behaviour of real per capita GDP growth is identical to the one of middle-income economies. The average rate of inflation increases as public debt increases, both in low- and in middle-income economies. For the high-income economies, the pattern of inflation differs from the general trend. Inflation decreases as the ratio of public debt/GDP increases. Results concerning the ratio of external debt/GNI were also calculated by income levels. Regarding the behaviour of the real GDP and real per capita GDP growth rates, they are similar in low- and high-income countries, presenting a downward trend, while for middle-income countries they present an inverted U shape, being higher in the third interval (60-90% of external debt/GNI). Regarding inflation, low-income countries have always an upward trend, while middle- and high-income economies share a somewhat cyclical pattern. Finally, the results from the lagged analysis between public debt/GDP and real per capita GDP growth also show an inverted U-shaped relationship between public debt and economic growth, although not exactly with the same pattern as the general analysis and with the exception of the period 1990/1994-1995/1999, as in this relationship countries with 90% public debt/GDP or higher showed indeed a good growth performance. This article presents the largest database to date for African countries covering variables such as public debt, economic growth, inflation and external debt, and relate those variables. In general, a general trend of low growth above a certain debt level can be retrieved, an issue particularly evident in the lowest income countries. However, taking reverse causality into account can at least change the level of debt above which growth is lower. Prospects for future research that takes causality and heterogeneity into account in African countries are open.

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APPENDIX A. TEMPORAL DIMENSION OF VARIABLES FOR AFRICAN ECONOMIES

COUNTRIES	PERIOD		
	GDP	% INFLATION	DEBT/GDP
Algeria	1950 -2012	1950 -2012	1964 -2012
Angola	1950 -2012	1950 -2012	2000 - 2012
Benin	1950 -2012	1980 - 2012	2000 - 2012
Botswana	1950 -2012	1975 -2012	1998 -2012
Burkina Faso	1950 -2012	1961 - 2012	2002 - 2012
Burundi	1950 -2012	1966 - 2012	2000 - 2012
Cameroon	1950 -2012	1980 - 2012	2000 - 2012
Cape Verde	1950 -2012	1980 - 2012	2002 - 2012
Central African Republic	1950 -2012	1957 - 2012	2000 - 2012
Chad	1950 -2012	1980 - 2012	1999 - 2012
Comoros Islands	1950 -2012	1980 - 2012	2000 - 2012
Democratic Republic of Congo (Brazzaville)	1950 -2012	1961 - 2012	1970 - 2012
Republic of Congo (Ex-Zaire - Kinshasa)	1950 -2012	1980 - 2012	2000 - 2012
Côte d'Ivoire	1950 -2012	1952 - 2012	2003 - 2012
Djibouti	1950 -2012	1992 -2012	1970 -2012
Egypt	1950 -2012	1950 - 2012	1980 - 2012
Equatorial Guinea	1950 -2012	1981 - 2012	2000 - 2012
Eritrea	1992 -2012	1993 - 2012	1992 - 2012
Ethiopia	1950 -2012	1966 - 2012	1990 - 2012
Gabon	1950 -2012	1963 - 2012	2000 - 2012
Gambia	1950 -2012	1962 - 2012	1952 - 2012
Ghana	1950 -2012	1950 - 2012	1990 - 2012
Guinea	1950 -2012	1980 - 2012	2000 - 2012
Guinea Bissau	1950 -2012	1980 - 2012	1963 - 2012
Kenya	1950 -2012	1950 - 2012	1988 - 2012
Lesotho	1950 -2012	1980 - 2012	2000 - 2012
Liberia	1950 -2012	2000 - 2012	1990 - 2012
Libya	1950 -2012	1965 - 2012	1990 - 2012
Madagascar	1950 -2012	1965 - 2012	2002 - 2012
Malawi	1950 -2012	1980- 2012	2000- 2012
Mali	1950 -2012	1980 - 2012	2000 - 2012
Mauritania	1950 -2012	1980 - 2012	1970 - 2012
Mauritius	1950 -2012	1950 - 2012	1965 - 2012
Morocco	1950 -2012	1999 - 2012	1999 - 2012
Mozambique	1950 -2012	1980 - 2012	1993 - 2012
Namibia	1950 -2012	1991 - 2012	1995 - 2012
Niger	1950 -2012	1980 - 2012	1970 - 2012
Nigeria	1950 -2012	1954 - 2012	1990 - 2012
Rwanda	1950 -2012	1980 - 2012	1995 - 2012
São Tomé and Príncipe	1950 -2012	1980 - 2012	2001 - 2012
Senegal	1950 -2012	1968 - 2012	2000 - 2012
Seychelles	1950 -2012	1971 - 2012	1990 - 2012
Sierra Leone	1950 -2012	1980 - 2012	2000 - 2012
South Africa	1950 -2012	1950 - 2012	1950 - 2012
Sudan	1950 -2012	1961 - 2012	1992 - 2012
Swaziland	1950 -2012	1966 - 2012	1993 - 2012
Tanzania	1950 -2012	1966 - 2012	2002 - 2012
Togo	1950 -2012	1967 - 2012	2001- 2012
Tunisia	1950 -2012	1950 - 2012	1990 - 2012
Uganda	1950 -2012	1980 - 2012	1997 - 2012
Zambia	1950 -2012	1950 - 2012	1990 - 2012
Zimbabwe	1950 -2012	1950 - 2012	1965 - 2012

APPENDIX B. DISTRIBUTION OF AFRICAN COUNTRIES BY GEOGRAPHIC AREAS

GEOGRAPHIC AREAS	COUNTRIES
North Africa	Algeria, Egypt, Libya, Tunisia, Morocco, Mauritania.
Sub-Saharan Africa (Excluding SADC)	Benin, Burkina Faso, Burundi, Cameroon, Cabo Verde, Central African Republic, Chad, Comoros, Republic of Congo (Ex-Zaire - Kinshasa), Cote d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Liberia, Mali, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Sudan, Togo, Uganda.
Southern Africa Development Community (SADC)	Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

APPENDIX C. DISTRIBUTION OF AFRICAN COUNTRIES BY LEVEL OF INCOME (GDP PER CAPITA FOR 2008  
(THOUSANDS OF GEARY-KHAMIS DOLLARS))

	Countries	GDPpc
	<b>Low-Income</b>	
1	Democratic Republic of Congo (Brazzaville)	143.30
2	Burundi	482.80
3	Niger	504.10
4	Central African Republic	568.90
5	Zimbabwe	586.60
6	Togo	592.60
7	Guinea	596.70
8	Guinea Bissau	611.10
9	Comoros Islands	619.10
10	Eritrea	622.60
11	Chad	646.90
12	Malawi	684.30
13	Liberia	727.80
14	Madagascar	734.10
15	Tanzania	752.90
16	Zambia	763.00
17	Sierra Leone	781.10
18	Djibouti	783.90
19	Ethiopia	887.60
	<b>Middle-Income</b>	
20	Mali	1012.50
21	Rwanda	1016.30
22	Uganda	1067.60
23	Kenya	1105.60
24	Cameroon	1106.40
25	Gambia	1147.00
26	Mauritania	1159.50
27	Angola	1229.70
28	Burkina Faso	1230.90
29	Côte d'Ivoire	1297.20
30	Benin	1325.40
31	Senegal	1554.60
32	Ghana	1730.50
33	Nigeria	1734.60
34	São Tomé and Príncipe	1818.70
35	Lesotho	2106.30
36	Mozambique	2203.90
37	Cape Verde	2410.00
38	Swaziland	3081.60
39	Libya	3144.70
40	Algeria	3327.20
41	Sudan	3503.10
42	Gabon	3819.00
43	Morocco	3896.20
44	Republic of Congo (Ex-Zaire - Kinshasa)	4239.70
45	Egypt	4266.30
46	Namibia	4522.90
47	Botswana	4814.00
48	South Africa	4899.00
49	Seychelles	5884.20
50	Tunisia	6075.40
	<b>High-Income</b>	
51	Mauritius	15133.20
52	Equatorial Guinea	20655.80

SUPPORTING INFORMATION

APPENDIX D1 - TABLES FROM THE ORIGINAL DATABASE

Table D 1. GDP Growth as Public Debt Changes, by Geographic Areas

COUNTRIES	PERIOD	PUBLIC DEBT / DGP			
		< 30%	30 - 60%	60-90%	> 90%
<b>Northern Africa</b>					
Algeria	1964 - 2012	4.26	5.61	4.62	3.15
Egypt	1970 - 2012	3.80	6.71	5.66	4.33
Libya	1990 - 2012	10.15	3.36	-1.48	-0.79
Morocco	1965 - 2012	4.92	4.48	4.05	5.82
Tunisia	1990 - 2012	-	4.22	4.56	-
Mauritania	2000 - 2012	-	-	8.87	3.70
<b>Average</b>		<b>5.78</b>	<b>4.88</b>	<b>4.38</b>	<b>3.24</b>
<b>Median</b>		<b>4.59</b>	<b>4.48</b>	<b>4.59</b>	<b>3.70</b>
<b>Observations</b>	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>Sub-Saharan Africa excluding SADC</b>					
Benin	2000 - 2012	4.01	4.07	-	-
Burkina Faso	2002 - 2012	5.60	6.33	-	-
Burundi	2000 - 2012	-	3.86	-	2.69
Cameroon	2000 - 2012	3.31	2.30	4.08	-
Cape Verde	2002 - 2012	-	-	6.00	4.66
Central African Republic	2000 - 2012	2.38	3.71	2.56	-0.06
Chad	1999 - 2012	0.00	9.29	4.40	-
Comoros Islands	2000 - 2012	-	1.91	2.46	-1.18
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	5.34	7.47	6.15	-1.33
Côte d'Ivoire	1970 - 2012	6.10	8.78	0.98	1.15
Djibouti	2003 - 2012	-	4.29	-	-
Equatorial Guinea	1980 - 2012	12.02	43.68	31.70	7.52
Eritrea	2000 - 2012	-	-	-	2.36
Ethiopia	1992 - 2012	8.14	11.51	0.81	6.68
Gabon	1990 - 2012	3.88	3.88	-0.10	2.86
Gambia	2000 - 2012	-	-	4.17	4.82
Ghana	1952 - 2012	-1.20	3.60	5.18	4.78
Guinea	1990 - 2012	-	3.94	3.01	3.40
Guinea Bissau	2000 - 2012	-	2.45	-	1.91
Kenya	1963 - 2012	6.27	4.33	3.08	1.22
Liberia	2000 - 2012	8.12	6.12	-	1.47
Mali	2000 - 2012	4.96	3.64	4.29	-
Niger	1995 - 2012	5.06	11.24	4.88	2.93
Nigeria	1970 - 2012	5.80	8.38	3.73	2.54
Rwanda	1995 - 2012	7.97	-	9.96	10.31
São Tomé and Príncipe	2001 - 2012	-	5.88	4.37	5.71
Senegal	2000 - 2012	3.69	4.40	2.81	-
Sierra Leone	2000 - 2012	-	7.69	-	10.90
Sudan	1992 - 2012	-	-	5.37	10.75
Togo	2001 - 2012	-	4.63	1.94	-
Uganda	1997 - 2012	7.23	4.62	6.88	7.10
<b>Average</b>		<b>5.19</b>	<b>7.00</b>	<b>5.16</b>	<b>4.05</b>
<b>Median</b>		<b>5.34</b>	<b>4.51</b>	<b>4.17</b>	<b>2.93</b>
<b>Observations</b>	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>SADC</b>					
Angola	2000 - 2012	17.25	9.23	8.92	3.08
Botswana	1998 - 2012	4.21	-	-	-
Democratic Republic of Congo	2000 - 2012	-	7.05	-	4.23
Lesoto	1988 - 2012	8.09	4.75	5.14	2.14
Madagascar	1990 - 2012	-	2.63	4.60	2.00
Malawi	2002 - 2012	-	5.96	-	3.83
Mauricias	1970 - 2012	9.05	4.57	4.42	-
Mocambique	1999 - 2012	-	7.29	8.00	7.38
Namibia	1993 - 2012	3.69	-	-	-
Seycheles	1990 - 2012	-	-	5.18	1.45
South Africa	1950 - 2012	2.55	3.41	-	-
Swazilandia	1993 - 2012	2.44	-	-	-
Tanzania	2002 - 2012	7.29	6.93	-	-
Zambia	1990 - 2012	6.61	-	5.34	1.81
Zimbabwe	1965 - 2012	-	3.95	1.31	-7.99
<b>Average</b>		<b>6.80</b>	<b>5.58</b>	<b>5.36</b>	<b>1.99</b>
<b>Median</b>		<b>6.61</b>	<b>5.35</b>	<b>5.16</b>	<b>2.14</b>
<b>Observations</b>	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 2. GDP *per capita* Growth as Public Debt Changes, by Geographic Areas

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>Northern Africa</b>					
Algeria	1964 - 2012	2.18	3.17	1.90	0.67
Egypt	1970 - 2012	1.59	4.38	3.73	2.67
Libya	1990 - 2012	8.62	1.79	-3.48	-2.25
Morocco	1965 - 2012	2.46	2.98	2.56	3.54
Tunisia	1990 - 2012	-	3.03	3.04	-
Mauritania	2000 - 2012	-	-	5.99	0.77
Average		<b>3.71</b>	<b>3.07</b>	<b>2.29</b>	<b>1.08</b>
Median		<b>2.32</b>	<b>3.03</b>	<b>2.80</b>	<b>0.77</b>
Observations	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>Sub-Saharan Africa excluding SADC</b>					
Benin	2000 - 2012	0.90	0.91	-	-
Burkina Faso	2002 - 2012	2.56	3.27	-	-
Burundi	2000 - 2012	-	0.47	-	-0.42
Cameroon	2000 - 2012	0.70	-0.31	1.40	-
Cape Verde	2002 - 2012	-	-	5.22	3.30
Central African Republic	2000 - 2012	0.42	1.68	0.65	-1.76
Chad	1999 - 2012	-3.10	5.64	0.65	-
Comoros Islands	2000 - 2012	-	-0.62	-0.15	-3.66
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	2.49	4.28	2.93	-3.94
Côte d'Ivoire	1970 - 2012	1.34	5.23	-1.56	-1.69
Djibouti	2003 - 2012	-	2.80	-	-
Equatorial Guinea	1980 - 2012	8.78	39.18	27.59	2.91
Eritrea	2000 - 2012	-	-	-	-1.35
Ethiopia	1992 - 2012	5.34	8.52	-2.19	3.48
Gabon	1990 - 2012	1.41	1.38	-2.53	0.18
Gambia	2000 - 2012	-	-	0.94	1.62
Ghana	1952 - 2012	-3.82	0.98	2.36	1.94
Guinea	1990 - 2012	-	1.31	-0.46	0.43
Guinea Bissau	2000 - 2012	-	0.09	-	-0.30
Kenya	1963 - 2012	2.64	1.30	-0.20	-1.86
Liberia	2000 - 2012	5.08	2.45	-	-1.90
Mali	2000 - 2012	1.70	0.53	-	1.35
Niger	1995 - 2012	1.19	7.05	1.13	-0.72
Nigeria	1970 - 2012	3.01	5.59	1.15	-0.05
Rwanda	1995 - 2012	5.01	-	2.59	6.57
São Tomé and Príncipe	2001 - 2012	-	2.82	1.50	3.34
Senegal	2000 - 2012	0.88	1.51	0.20	-
Sierra Leone	2000 - 2012	-	5.49	-	6.68
Sudan	1992 - 2012	-	-	2.89	7.62
Togo	2001 - 2012	-	1.94	-0.67	0.43
Uganda	1997 - 2012	3.69	1.17	3.43	3.55
Average		<b>2.12</b>	<b>4.03</b>	<b>2.13</b>	<b>1.03</b>
Median		<b>1.70</b>	<b>1.81</b>	<b>1.03</b>	<b>0.43</b>
Observations	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>SADC</b>					
Angola	2000 - 2012	2.18	3.17	1.90	0.67
Botswana	1998 - 2012	2.90	-	-	-
Democratic Republic of Congo	2000 - 2012	-	4.14	-	1.40
Lesoto	1988 - 2012	6.26	3.80	3.77	1.22
Madagascar	1990 - 2012	-	-0.23	1.59	-1.08
Malawi	2002 - 2012	-	2.86	-	1.11
Mauritius	1970 - 2012	7.35	3.43	3.40	-
Mocambique	1999 - 2012	-	4.54	5.02	4.58
Namibia	1993 - 2012	1.64	-	-	-
Seycheles	1990 - 2012	-	-	4.85	0.09
South Africa	1950 - 2012	1.20	1.20	-	-
Swazilandia	1993 - 2012	0.90	-	-	-
Tanzania	2002 - 2012	4.19	3.93	-	-
Zambia	1990 - 2012	3.54	-	2.63	-0.74
Zimbabwe	1965 - 2012	-	0.84	-0.01	-8.53
Average		<b>3.35</b>	<b>2.77</b>	<b>2.89</b>	<b>-0.14</b>
Median		<b>2.90</b>	<b>3.30</b>	<b>3.01</b>	<b>0.67</b>
Observations	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 3. Inflation as Public Debt Changes, by Geographic Areas

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>Northern Africa</b>					
Algeria	1964 - 2012	9.97	6.67	7.47	10.68
Egypt	1970 - 2012	4.83	16.15	11.85	6.53
Libya	1990 - 2012	4.74	-3.21	7.16	2.46
Morocco	1965 - 2012	1.78	5.31	4.30	7.92
Tunisia	1990 - 2012	-	4.17	3.97	-
Mauritania	2000 - 2012	-	-	5.57	6.21
Average		<b>5.33</b>	<b>5.82</b>	<b>6.72</b>	<b>6.76</b>
Median		<b>4.79</b>	<b>5.31</b>	<b>6.36</b>	<b>6.53</b>
Observations	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>Sub-Saharan Africa excluding SADC</b>					
Benin	2000 - 2012	3.35	3.34	-	-
Burkina Faso	2002 - 2012	3.03	2.56	-	-
Burundi	2000 - 2012	-	11.28	-	11.07
Cameroon	2000 - 2012	3.09	1.99	1.79	-
Cape Verde	2002 - 2012	-	-	2.59	2.23
Central African Republic	2000 - 2012	2.51	3.21	4.47	2.97
Chad	1999 - 2012	0.45	3.06	2.60	-
Comoros Islands	2000 - 2012	-	5.25	4.03	5.90
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	3.92	4.34	6.02	5.55
Côte d'Ivoire	1970 - 2012	10.94	5.06	4.06	5.06
Djibouti	2003 - 2012	-	4.30	-	-
Equatorial Guinea	1980 - 2012	5.57	3.93	4.15	18.20
Eritrea	2000 - 2012	-	-	-	17.49
Ethiopia	1992 - 2012	18.15	24.65	6.69	3.57
Gabon	1990 - 2012	2.51	2.83	5.54	-2.30
Gambia	2000 - 2012	-	4.89	-	7.44
Ghana	1952 - 2012	76.95	22.08	14.12	16.00
Guinea	1990 - 2012	-	15.23	15.24	12.49
Guinea Bissau	2000 - 2012	-	2.78	-	2.99
Kenya	1963 - 2012	6.70	9.25	11.55	37.40
Liberia	2000 - 2012	7.66	7.29	-	9.83
Mali	2000 - 2012	3.12	2.56	-	2.22
Niger	1995 - 2012	2.61	0.47	2.15	3.86
Nigeria	1970 - 2012	13.64	15.07	16.65	32.82
Rwanda	1995 - 2012	8.28	-	9.22	10.99
São Tomé and Príncipe	2001 - 2012	-	31.99	13.81	14.46
Senegal	2000 - 2012	4.58	1.03	2.01	-
Sierra Leone	2000 - 2012	-	14.30	-	5.91
Sudan	1992 - 2012	-	-	12.68	46.58
Togo	2001 - 2012	-	2.68	6.27	1.60
Uganda	1997 - 2012	8.79	16.40	4.93	4.21
Average		<b>9.78</b>	<b>8.21</b>	<b>7.17</b>	<b>11.14</b>
Median		<b>4.58</b>	<b>4.34</b>	<b>5.54</b>	<b>5.91</b>
Observations	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>SADC</b>					
Angola	2000 - 2012	11.95	20.11	103.62	238.81
Botswana	1998 - 2012	8.31	-	-	-
Democratic Republic of Congo	2000 - 2012	-	4.99	-	6.13
Lesoto	1988 - 2012	13.94	6.27	9.04	8.39
Madagascar	1990 - 2012	-	9.19	18.51	14.71
Malawi	2002 - 2012	-	10.76	-	12.80
Mauritias	1970 - 2012	18.94	8.12	9.27	-
Mocambique	1999 - 2012	-	8.59	12.32	8.22
Namibia	1993 - 2012	10.50	-	-	-
Seychelles	1990 - 2012	-	-	2.54	6.51
South Africa	1950 - 2012	8.57	7.78	-	-
Swazilandia	1993 - 2012	8.25	-	-	-
Tanzania	2002 - 2012	8.65	8.30	-	-
Zambia	1990 - 2012	9.89	-	18.33	58.26
Zimbabwe	1965 - 2012	-	22.61	2346.82	176.08
Average		<b>11.00</b>	<b>9.35</b>	<b>24.80</b>	<b>44.23</b>
Median		<b>9.89</b>	<b>8.44</b>	<b>15.32</b>	<b>12.80</b>
Observations	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 4. GDP *per capita* Growth as Public Debt Changes, by Income Level of African Economies

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>LOW-INCOME COUNTRIES</b>					
Democratic Republic of Congo (Kinshasa)	2000 - 2012		4.14		1.40
Burundi	2000 - 2012		0.47		-0.42
Central African Republic	2000 - 2012	0.42	1.68	0.65	-1.76
Chad	1999 - 2012	-3.10	5.64	0.65	
Comoros Islands	2000 - 2012		-0.62	-0.15	-3.66
Djibouti	2003 - 2012		2.80		
Eritrea	2000 - 2012				-1.35
Ethiopia	1992 - 2012	5.34	8.52	-2.19	3.48
Guinea	1990 - 2012				
Guinea Bissau	2000 - 2012		0.09		-0.30
Liberia	2000 - 2012	5.08	2.45		-1.90
Madagascar	1990 - 2012		-0.23	1.59	-1.08
Malawi	2002 - 2012		2.86		1.11
Niger	1995 - 2012	1.19	7.05	1.13	-0.72
Sierra Leone	2000 - 2012		5.49		6.68
Tanzania	2002 - 2012	4.19	3.93		
Togo	2001 - 2012		1.94	-0.67	0.43
Zambia	1990 - 2012	3.54		2.63	-0.74
Zimbabwe	1965 - 2012		0.84	-0.01	-8.53
<b>Average</b>		<b>2.38</b>	<b>2.94</b>	<b>0.40</b>	<b>-0.49</b>
<b>Median</b>		<b>3.54</b>	<b>2.63</b>	<b>0.65</b>	<b>-0.72</b>
<b>Observations</b>	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>MIDDLE-INCOME ECONOMIES</b>					
Algeria	1964 - 2012	2.18	3.17	1.90	0.67
Angola	2000 - 2012	13.42	5.63	5.20	-0.11
Benin	2000 - 2012	0.90	0.91		
Botswana	1998 - 2012	2.90			
Burkina Faso	2002 - 2012	2.56	3.27		
Cameroon	2000 - 2012	0.70	-0.31	1.40	
Cape Verde	2002 - 2012			5.22	3.30
Côte d'Ivoire	1970 - 2012	1.34	5.23	-1.56	-1.69
Egypt	1970 - 2012	1.59	4.38	3.73	2.67
Gabon	1990 - 2012	1.41	1.38	-2.53	0.18
Gambia	2000 - 2012			0.94	1.62
Ghana	1952 - 2012	-3.82	0.98	2.36	1.94
Kenya	1963 - 2012	2.64	1.30	-0.20	-1.86
Lesotho	1988 - 2012	6.26	3.80	3.77	1.22
Libya	1990 - 2012	8.62	1.79	-3.48	-2.25
Mali	2000 - 2012	1.70	0.53		1.35
Mauritania	2000 - 2012			5.99	0.77
Morocco	1965 - 2012	2.46	2.98	2.56	3.54
Mozambique	1999 - 2012		4.54	5.02	4.58
Namibia	1993 - 2012	1.64			
Nigeria	1970 - 2012	3.01	5.59	1.15	-0.05
Republic of Congo (Brazzaville)	1990 - 2012		4.14		1.40
Rwanda	1995 - 2012	5.01	2.59		6.57
São Tomé and Príncipe	2001 - 2012		2.82	1.50	3.34
Senegal	2000 - 2012	0.88	1.51	0.20	
Seychelles	1990 - 2012			4.85	0.09
South Africa	1950 - 2012	1.20	1.20		
Sudan	1992 - 2012			2.89	7.62
Swaziland	1993 - 2012	0.90			
Tunisia	1990 - 2012		3.03	3.04	
Uganda	1997 - 2012	3.69	1.17	3.43	3.55
<b>Average</b>		<b>2.28</b>	<b>2.74</b>	<b>3.06</b>	<b>2.98</b>
<b>Median</b>		<b>1.70</b>	<b>2.82</b>	<b>2.96</b>	<b>3.34</b>
<b>Observations</b>	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>HIGH-INCOME ECONOMIES</b>					
Equatorial Guinea	1980 - 2012	8.78	39.18	27.59	2.91
Mauritius	1970 - 2012	7.35	3.43	3.40	
<b>Average</b>		<b>8.06</b>	<b>21.31</b>	<b>15.49</b>	<b>2.91</b>
<b>Median</b>		<b>8.06</b>	<b>21.31</b>	<b>15.49</b>	<b>2.91</b>
<b>Observations</b>	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 5. Inflation Growth as Public Debt Changes, by Income Level of African Economies

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>LOW INCOME COUNTRIES</b>					
Democratic Republic of Congo (Kinshasa)	2000 - 2012		4.99		6.13
Burundi	2000 - 2012		11.28		-0.42
Central African Republic	2000 - 2012	0.42	1.68	0.65	-1.76
Chad	1999 - 2012	0.45	3.06	2.60	
Comoros Islands	2000 - 2012		5.25	4.03	5.90
Djibouti	2003 - 2012		4.30		
Eritrea	2000 - 2012				-1.35
Ethiopia	1992 - 2012	18.15	24.65	6.69	3.57
Guinea	1990 - 2012		15.23	15.24	12.49
Guinea Bissau	2000 - 2012		2.78		2.99
Liberia	2000 - 2012	7.66	7.29		9.83
Madagascar	1990 - 2012		9.19	18.51	14.71
Malawi	2002 - 2012		10.76		12.80
Niger	1995 - 2012	2.61	0.47	2.15	3.86
Sierra Leone	2000 - 2012		14.30		5.91
Tanzania	2002 - 2012	8.65	8.30		
Togo	2001 - 2012		2.68	6.27	1.60
Zambia	1990 - 2012	9.89	18.33		58.26
Zimbabwe	1965 - 2012		22.61	2346.82	176.08
<b>Average</b>		<b>6.83</b>	<b>9.29</b>	<b>7.02</b>	<b>19.41</b>
<b>Median</b>		<b>7.66</b>	<b>7.79</b>	<b>6.27</b>	<b>5.91</b>
<b>Observations</b>	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>MIDDLE INCOME ECONOMIES</b>					
Algeria	1964 - 2012	9.97	6.67	7.47	10.68
Angola	2000 - 2012	11.95	20.11	103.62	238.81
Benin	2000 - 2012	3.35	3.34		
Botswana	1998 - 2012	8.31			
Burkina Faso	2002 - 2012	3.03	2.56		
Cameroon	2000 - 2012	3.09	1.99	1.79	
Cape Verde	2002 - 2012		2.59	2.23	
Côte d'Ivoire	1970 - 2012	10.94	5.06	4.06	5.06
Egypt	1970 - 2012	4.83	16.15	11.85	6.53
Gabon	1990 - 2012	2.51	2.83	5.54	-2.30
Gambia	2000 - 2012			4.89	7.44
Ghana	1952 - 2012	76.95	22.08	14.12	16.00
Kenya	1963 - 2012	6.70	9.25	11.55	37.40
Lesotho	1988 - 2012	13.94	6.27	9.04	8.39
Libya	1990 - 2012	4.74	-3.21	7.16	2.46
Mali	2000 - 2012	3.12	2.56		2.22
Mauritania	2000 - 2012			5.57	6.21
Morocco	1965 - 2012	1.78	5.31	4.30	7.92
Mozambique	1999 - 2012		8.59	12.32	8.22
Namibia	1993 - 2012	10.50			
Nigeria	1970 - 2012	13.64	15.07	16.65	32.82
Republic of Congo (Brazzaville)	1990 - 2012	3.92	4.34	6.02	5.55
Rwanda	1995 - 2012	8.28		9.22	10.99
São Tomé and Príncipe	2001 - 2012		31.99	13.81	14.46
Senegal	2000 - 2012	4.58	1.03	2.01	
Seychelles	1990 - 2012			2.54	6.51
South Africa	1950 - 2012	8.57	7.78		
Sudan	1992 - 2012			12.68	46.58
Swaziland	1993 - 2012	8.25			
Tunisia	1990 - 2012		4.17	3.97	
Uganda	1997 - 2012	8.79	16.40	4.93	4.21
<b>Average</b>		<b>7.14</b>	<b>9.72</b>	<b>7.83</b>	<b>13.24</b>
<b>Median</b>		<b>8.27</b>	<b>6.55</b>	<b>5.80</b>	<b>7.92</b>
<b>Observations</b>	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>HIGH INCOME ECONOMIES</b>					
Equatorial Guinea	1980 - 2012	5.57	3.93	4.15	18.20
Mauritius	1970 - 2012	18.94	8.12	9.27	
<b>Average</b>		<b>12.25</b>	<b>6.02</b>	<b>6.71</b>	<b>18.20</b>
<b>Median</b>		<b>12.25</b>	<b>6.02</b>	<b>6.71</b>	<b>18.20</b>
<b>Observations</b>	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 6. GDP *per capita* Growth as Public Debt Changes, by Income Levels of African Economies and Without Outliers

COUNTRIES	PERIOD	DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>Low-Income Economies</b>					
Democratic Republic of Congo (Brazaville)	2000 - 2012		4.14		2.03
Burundi	2000 - 2012		0.47		0.06
Niger	1995 - 2012	1.31		3.87	0.29
Central African Republic	2000 - 2012	0.42	1.68	0.65	-0.29
Zimbabwe	1965 - 2012		0.82	-0.47	1.13
Togo	2001 - 2012		1.94	-0.67	0.43
Guinea	1990 - 2012		1.31	-0.46	0.43
Guinea Bissau	2000 - 2012		0.09		-0.30
Comoros Islands	2000 - 2012		-0.62	-0.15	
Eritrea	2000 - 2012				1.23
Chad	1999 - 2012	-3.10	1.25	0.65	
Malawi	2002 - 2012		2.29		1.11
Liberia	2000 - 2012	5.08	2.45		2.14
Madagascar	1990 - 2012		0.86	1.59	0.11
Tanzania	2002 - 2012	4.19	3.93		
Zambia	1990 - 2012	3.54		2.63	-0.74
Sierra Leone	2000 - 2012		3.09		2.21
Djibouti	2003 - 2012		2.80		
Ethiopia	1992 - 2012	4.74		0.52	1.98
<b>Average</b>		<b>2.31</b>	<b>1.77</b>	<b>0.82</b>	<b>0.79</b>
<b>Median</b>		<b>3.54</b>	<b>1.68</b>	<b>0.58</b>	<b>0.43</b>
<b>Observations</b>	<b>1142</b>	<b>235</b>	<b>337</b>	<b>233</b>	<b>337</b>
<b>Middle-Income Economies</b>					
Mali	2000 - 2012	1.70	1.46		
Rwanda	1995 - 2012	4.51		2.59	0.32
Uganda	1997 - 2012	3.54		2.63	0.70
Kenya	1963 - 2012	2.35	1.30	0.07	-1.86
Cameroon	2000 - 2012	0.70	-0.31	1.40	
Gambia	2000 - 2012			2.58	2.91
Mauritania	2000 - 2012			3.74	1.24
Angola	2000 - 2012	5.08	-0.04	5.20	-0.11
Burkina Faso	2002 - 2012	2.56	3.27		
Côte d'Ivoire	1970 - 2012	1.39	3.11	0.22	-0.19
Benin	2000 - 2012	0.90	0.91		
Senegal	2000 - 2012	0.88	1.51	0.20	
Ghana	1952 - 2012	-2.70	2.06	1.85	1.94
Nigeria	1970 - 2012	2.90	4.57	1.77	-0.48
São Tomé and Príncipe	2001 - 2012			1.76	3.34
Lesotho	1988 - 2012	2.39	3.80	1.67	2.53
Mozambique	1999 - 2012		4.54	4.62	2.26
Cape Verde	2002 - 2012			4.21	3.30
Swaziland	1993 - 2012	0.90			
Libya	1990 - 2012	4.02	1.79	0.83	-2.25
Algeria	1964 - 2012	1.06	3.19	1.45	0.86
Sudan	1992 - 2012			0.91	2.26
Gabon	1990 - 2012	3.07	1.38	0.07	1.68
Morocco	1965 - 2012	2.46	2.98	1.87	2.01
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	2.49	4.28	2.93	2.41
Egypt	1970 - 2012	1.59	2.07	3.07	2.67
Namibia	1993 - 2012	1.98			
Botswana	1998 - 2012	3.02			
South Africa	1950 - 2012	1.20	1.57		
Seychelles	1990 - 2012			3.67	1.56
Tunisia	1990 - 2012		3.03	3.04	
<b>Average</b>		<b>2.09</b>	<b>2.32</b>	<b>2.18</b>	<b>1.29</b>
<b>Median</b>		<b>2.35</b>	<b>2.06</b>	<b>1.86</b>	<b>1.68</b>
<b>Observations</b>	<b>1142</b>	<b>235.00</b>	<b>337.00</b>	<b>233.00</b>	<b>337.00</b>
<b>High-Income Economies</b>					
Mauritius	1970 - 2012	-1.45	3.18	1.59	
Equatorial Guinea	1980 - 2012	-0.25			0.95
<b>Average</b>		<b>-0.85</b>	<b>3.18</b>	<b>1.59</b>	<b>0.95</b>
<b>Median</b>		<b>-0.85</b>	<b>3.18</b>	<b>1.59</b>	<b>0.95</b>
<b>Observations</b>	<b>1142</b>	<b>235.00</b>	<b>337.00</b>	<b>233.00</b>	<b>337.00</b>

Table D 7. Inflation as Public Debt Changes, by Income Levels of African Economies Without Outliers

COUNTRIES	PERIOD	DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>Low-Income Economies</b>					
Democratic Republic of Congo (Brazzaville)	2000 - 2012		4.99		6.02
Burundi	2000 - 2012		11.28		11.10
Niger	1995 - 2012	3.40		3.87	0.29
Central African Republic	2000 - 2012	2.51	3.21		4.47
Zimbabwe	1965 - 2012		11.02	19.17	76.71
Togo	2001 - 2012		2.68	6.27	1.60
Guinea	1990 - 2012		15.23	15.24	12.49
Guinea Bissau	2000 - 2012		2.78		2.99
Comoros Islands	2000 - 2012		5.25	4.03	
Eritrea	2000 - 2012				17.21
Chad	1999 - 2012	0.45	5.23	2.60	
Malawi	2002 - 2012		11.23		12.80
Liberia	2000 - 2012	7.66	7.29		10.34
Madagascar	1990 - 2012		9.23	18.51	16.44
Tanzania	2002 - 2012	8.65	8.30		
Zambia	1990 - 2012	9.89		18.33	58.26
Sierra Leone	2000 - 2012		14.39		8.49
Djibouti	2003 - 2012		4.30		
Ethiopia	1992 - 2012	21.38		2.40	3.27
<b>Average</b>		<b>7.70</b>	<b>7.76</b>	<b>9.49</b>	<b>16.05</b>
<b>Median</b>		<b>7.66</b>	<b>7.29</b>	<b>5.37</b>	<b>10.34</b>
<b>Observations</b>	<b>1142</b>	<b>235</b>	<b>337</b>	<b>233</b>	<b>337</b>
<b>Middle-Income Economies</b>					
Mali	2000 - 2012	3.12	2.01		
Rwanda	1995 - 2012	7.09		9.22	4.85
Uganda	1997 - 2012	3.54		2.63	0.70
Kenya	1963 - 2012	6.49	9.25	10.50	37.40
Cameroon	2000 - 2012	3.09	1.99	1.79	
Gambia	2000 - 2012			4.90	7.25
Mauritania	2000 - 2012			4.90	6.62
Angola	2000 - 2012	10.28	13.90	103.62	238.81
Burkina Faso	2002 - 2012	3.03	2.56		
Côte d'Ivoire	1970 - 2012	10.67	8.81	3.38	6.34
Benin	2000 - 2012	3.35	3.34		
Senegal	2000 - 2012	4.58	1.03	2.01	
Ghana	1952 - 2012	116.50	21.01	21.29	16.00
Nigeria	1970 - 2012	10.04	13.13	14.48	35.01
São Tomé and Príncipe	2001 - 2012			17.45	14.46
Lesotho	1988 - 2012	14.66	6.27	9.33	8.54
Mozambique	1999 - 2012		8.59	10.84	7.79
Cape Verde	2002 - 2012			2.01	2.23
Swaziland	1993 - 2012	8.25			
Libya	1990 - 2012	2.74	-3.21	4.94	2.46
Algeria	1964 - 2012	10.89	7.36	7.03	19.81
Sudan	1992 - 2012			12.93	50.65
Gabon	1990 - 2012	2.66	2.83	7.32	-0.49
Morocco	1965 - 2012	1.78	5.31	4.55	7.18
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	3.92	4.34	6.02	3.48
Egypt	1970 - 2012	4.83	18.26	11.01	6.53
Namibia	1993 - 2012	10.60			
Botswana	1998 - 2012	8.42			
South Africa	1950 - 2012	8.57	7.30		
Seychelles	1990 - 2012			2.26	9.64
Tunisia	1990 - 2012		4.17	3.97	
<b>Average</b>		<b>11.27</b>	<b>6.91</b>	<b>11.60</b>	<b>23.11</b>
<b>Median</b>		<b>6.49</b>	<b>5.79</b>	<b>6.53</b>	<b>7.25</b>
<b>Observations</b>	<b>1142</b>	<b>235.00</b>	<b>337.00</b>	<b>233.00</b>	<b>337.00</b>
<b>High-Income Economies</b>					
Mauritius	1970 - 2012	14.76	7.27	8.79	
Equatorial Guinea	1980 - 2012	4.92			3.25
<b>Average</b>		<b>9.84</b>	<b>7.27</b>	<b>8.79</b>	<b>3.25</b>
<b>Median</b>		<b>9.84</b>	<b>7.27</b>	<b>8.79</b>	<b>3.25</b>
<b>Observations</b>	<b>1142</b>	<b>235.00</b>	<b>337.00</b>	<b>233.00</b>	<b>337.00</b>

Table D 8. Real GDP Growth as External Debt Changes, by Income Levels of African Economies

COUNTRIES	PERIOD	EXTERNAL DEBT/GNI			
		< 30%	30 - 60%	60-90%	> 90%
<b>LOW INCOME COUNTRIES</b>					
Democratic Republic of Congo (Brazzaville)	1972 - 2012	6.13	7.94	6.39	1.79
Burundi	1972 - 2012	3.39	4.53	3.71	-0.05
Central African Republic	1972 - 2012	1.53	1.08	2.31	0.10
Chad	1972 - 2012	3.29	3.88	6.78	
Comoros Islands	1972 - 2012	-4.69	1.26	2.82	1.67
Djibouti	1991 - 2005		-0.20	4.20	
Eritrea	1994 - 2012	10.41	3.45	1.16	
Ethiopia	1981 - 2012	8.64	2.11	3.44	3.82
Guinea	1986 - 2012	3.94		2.98	3.59
Guinea Bissau	1975 - 2012	2.74	4.54		1.41
Liberia	1997 - 2012		7.45		1.37
Madagascar	1972 - 2012	2.85	-0.38	2.07	1.87
Malawi	1972 - 2012	6.63	6.17	4.41	2.41
Niger	1972 - 2012	1.86	5.04	1.00	0.96
Sierra Leone	1972 - 2012	6.72	3.07	0.30	0.34
Tanzania	1988 - 2012	7.09	6.70	5.93	2.82
Togo	1972 - 2012	2.15	2.52	1.06	1.61
Zambia	1972 - 2012	6.65	5.69	2.45	1.29
Zimbabwe	1972 - 2012	3.08	3.69	-0.99	-4.40
<b>Average</b>		<b>4.26</b>	<b>3.81</b>	<b>2.94</b>	<b>1.29</b>
<b>Median</b>		<b>3.39</b>	<b>3.78</b>	<b>2.82</b>	<b>1.51</b>
<b>Observations</b>	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>MIDDLE INCOME ECONOMIES</b>					
Algeria	1972 - 2011	5.25	3.44	3.47	
Angola	1989 - 2012	10.76	15.90	3.31	3.01
Benin	1972 - 2012	3.37	5.01	3.61	
Botswana	1972 - 2012	6.72	13.32		
Burkina Faso	1972 - 2012	2.60	6.64	1.32	
Cameroon	1972 - 2012	3.38	3.71	0.76	3.67
Cape Verde	1981 - 2012	9.02	5.43	5.62	
Côte d'Ivoire	1972 - 2012		4.55	2.88	1.06
Egypt	1972 - 2012	4.36	6.31	5.45	5.51
Gabon	1972 - 2012	3.82	7.17	-1.63	0.21
Gambia	1972 - 2012	5.26	3.51	4.25	3.36
Ghana	1972 - 2012	3.53	1.88	4.83	4.38
Kenya	1972 - 2012	4.75	3.89	4.01	1.26
Lesotho	1972 - 2012	7.30	4.67		
Libya	1972 - 2012				
Mali	1972 - 2012	4.59	4.21	2.36	3.67
Mauritania	1972 - 2012	1.29	2.04	4.42	3.06
Morocco	1972 - 2012	4.55	4.97	3.02	3.97
Mozambique	1984 - 2012		6.04	1.84	6.49
Namibia	1972 - 2012				
Nigeria	1972 - 2012	4.35	8.84	3.52	2.75
Republic of Congo (Kinshasa)	1972 - 2012	5.34	0.31	4.13	-0.46
Rwanda	1972 - 2012	5.38	0.30	10.52	-50.19
São Tomé and Príncipe	2000 - 2012	4.64			5.26
Senegal	1972 - 2012	3.21	2.33	3.64	1.88
Seychelles	1980 - 2012	-6.77	2.55	2.07	3.25
South Africa	1994 - 2012	3.29	2.55		
Sudan	1972 - 2012	-0.04	4.95	1.66	10.22
Swaziland	1990 - 2012	2.89			
Tunisia	1972 - 2012	7.70	4.92	3.95	
Uganda	1972 - 2012	2.11	4.05	6.58	5.51
<b>Average</b>		<b>3.04</b>	<b>3.70</b>	<b>3.98</b>	<b>-0.38</b>
<b>Median</b>		<b>3.82</b>	<b>4.05</b>	<b>3.58</b>	<b>3.46</b>
<b>Observations</b>	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>HIGH INCOME ECONOMIES</b>					
Equatorial Guinea	1972 - 2012				
Mauritius	1976 - 2012	5.28	4.84		
<b>Average</b>		<b>5.28</b>	<b>4.84</b>		
<b>Median</b>		<b>5.28</b>	<b>4.84</b>		
<b>Observations</b>	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 9. Real GDP *per capita* Growth as External Debt Changes, by Income Levels of African Economies

COUNTRIES	PERIOD	EXTERNAL DEBT/GNI			
		< 30%	30 - 60%	60-90%	> 90%
<b>LOW INCOME COUNTRIES</b>					
Democratic Republic of Congo (Brazzaville)	1972 - 2012	3.28	5.04	3.65	-1.12
Burundi	1972 - 2012	1.11	1.16	0.52	-2.35
Central African Republic	1972 - 2012	-0.62	-1.25	0.23	-1.78
Chad	1972 - 2012	0.63	0.55	2.99	
Comoros Islands	1972 - 2012	-6.95	-1.84	0.20	-0.91
Djibouti	1991 - 2005		-2.08	1.39	
Eritrea	1994 - 2012	8.43	-0.06	-2.70	
Ethiopia	1981 - 2012	5.82	-0.89	0.30	0.52
Guinea	1986 - 2012	1.31		-0.67	0.71
Guinea Bissau	1975 - 2012	0.97	3.25		-0.77
Liberia	1997 - 2012		4.20		-2.87
Madagascar	1972 - 2012	-0.04	-3.12	-0.80	-1.16
Malawi	1972 - 2012	3.50	2.84	1.68	-0.75
Niger	1972 - 2012	-1.39	1.81	-2.27	-2.49
Sierra Leone	1972 - 2012	4.44	0.76	-2.34	-1.57
Tanzania	1988 - 2012	4.03	3.56	3.23	-0.29
Togo	1972 - 2012	-0.37	0.10	-1.57	-1.23
Zambia	1972 - 2012	3.57	2.28	-0.68	-1.48
Zimbabwe	1972 - 2012	-0.47	0.56	-2.33	-4.82
<b>Average</b>		<b>1.60</b>	<b>0.94</b>	<b>0.05</b>	<b>-1.40</b>
<b>Median</b>		<b>1.11</b>	<b>0.66</b>	<b>0.20</b>	<b>-1.20</b>
<b>Observations</b>	<b>190</b>	<b>32</b>	<b>49</b>	<b>69</b>	<b>40</b>
<b>MIDDLE INCOME ECONOMIES</b>					
Algeria	1972 - 2011	3.26	0.80	1.43	
Angola	1989 - 2012	7.17	11.90	-0.27	-0.02
Benin	1972 - 2012	0.63	1.79	0.46	
Botswana	1972 - 2012	4.33	9.45		
Burkina Faso	1972 - 2012	0.14	3.74	-1.41	
Cameroon	1972 - 2012	0.70	0.70	-1.98	0.92
Cape Verde	1981 - 2012	8.00	3.81	3.94	
Côte d'Ivoire	1972 - 2012		0.71	0.79	-2.04
Egypt	1972 - 2012	2.54	4.54	3.46	3.14
Gabon	1972 - 2012	1.30	4.83	-4.11	-2.32
Gambia	1972 - 2012	2.14	0.42	1.11	-0.50
Ghana	1972 - 2012	1.00	-0.79	2.14	1.79
Kenya	1972 - 2012	1.83	0.63	0.46	-1.90
Lesotho	1972 - 2012	4.96	3.33		
Libya	1972 - 2012				
Mali	1972 - 2012	1.36	2.34	-0.24	1.40
Mauritania	1972 - 2012	-1.62	-0.83	1.69	0.14
Morocco	1972 - 2012	3.08	3.33	1.23	1.75
Mozambique	1984 - 2012		3.44	0.02	4.04
Namibia	1972 - 2012				
Nigeria	1972 - 2012	1.54	6.10	0.94	0.16
Republic of Congo (Kinshasa)	1972 - 2012	2.49	-2.68	1.06	-3.16
Rwanda	1972 - 2012	2.50	4.18	5.51	-47.25
São Tomé and Príncipe	2000 - 2012			1.71	2.87
Senegal	1972 - 2012	0.34	-0.42	0.77	-1.08
Seychelles	1980 - 2012	-8.11	1.32	1.20	3.16
South Africa	1994 - 2012	1.91	1.34		
Sudan	1972 - 2012	-3.29	2.01	-1.55	6.87
Swaziland	1990 - 2012	1.06			
Tunisia	1972 - 2012	5.25	3.12	2.01	
Uganda	1972 - 2012	-0.99	0.71	3.10	1.99
<b>Average</b>		<b>0.42</b>	<b>1.84</b>	<b>1.34</b>	<b>-2.43</b>
<b>Median</b>		<b>1.36</b>	<b>2.01</b>	<b>1.20</b>	<b>1.58</b>
<b>Observations</b>	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>HIGH INCOME ECONOMIES</b>					
Equatorial Guinea	1972 - 2012				
Mauritius	1976 - 2012	4.22	3.82		
<b>Average</b>		<b>4.22</b>	<b>3.82</b>		
<b>Median</b>		<b>4.22</b>	<b>3.82</b>		
<b>Observations</b>	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

Table D 10. Inflation Growth as External Debt Changes, by Income Levels of African Economies

COUNTRIES	PERIOD	EXTERNAL DEBT/GNI			
		< 30%	30 - 60%	60-90%	> 90%
<b>LOW INCOME COUNTRIES</b>					
Democratic Republic of Congo (Brazzaville)	1972 - 2012	10.27	10.63	11.53	9.55
Burundi	1972 - 2012	12.27	7.44	10.56	12.16
Central African Republic	1972 - 2012	7.33	3.70	2.85	7.65
Chad	1972 - 2012	4.81	0.96	8.30	
Comoros Islands	1972 - 2012		6.58	3.54	3.98
Djibouti	1991 - 2005		2.78	3.12	
Eritrea	1994 - 2012	9.72	16.33	17.35	
Ethiopia	1981 - 2012	19.08	9.13	5.55	3.78
Guinea	1986 - 2012	15.23		13.01	18.52
Guinea Bissau	1975 - 2012	5.06	2.22		32.80
Liberia	1997 - 2012	7.54			9.83
Madagascar	1972 - 2012	8.77	14.46	14.06	14.88
Malawi	1972 - 2012	9.01	21.27	14.02	26.65
Niger	1972 - 2012	2.54	7.84	0.97	12.71
Sierra Leone	1972 - 2012	13.43	25.03	51.55	42.29
Tanzania	1988 - 2012	8.76	10.81	6.52	26.73
Togo	1972 - 2012	8.06	11.15	1.91	5.91
Zambia	1972 - 2012	9.31	8.25	15.75	47.12
Zimbabwe	1972 - 2012	9.89	21.55	92.71	135.73
<b>Average</b>		<b>9.48</b>	<b>10.60</b>	<b>16.08</b>	<b>25.64</b>
<b>Median</b>		<b>9.01</b>	<b>9.13</b>	<b>10.56</b>	<b>13.79</b>
<b>Observations</b>	<b>645</b>				
<b>MIDDLE INCOME ECONOMIES</b>					
Algeria	1972 - 2011	9.54	10.21	15.79	
Angola	1989 - 2012	12.86	33.26	98.34	891.29
Benin	1972 - 2012	3.58	3.31	5.75	
Botswana	1972 - 2012	9.97	10.80		
Burkina Faso	1972 - 2012	6.46	2.30	25.18	
Cameroon	1972 - 2012	3.09	5.80	1.07	6.78
Cape Verde	1981 - 2012	20.68	6.37	3.78	
Côte d'Ivoire	1972 - 2012		11.33	3.25	5.33
Egypt	1972 - 2012	8.08	6.72	14.91	16.61
Gabon	1972 - 2012	4.26	10.97	1.00	7.18
Gambia	1972 - 2012	12.72	5.01	3.77	15.08
Ghana	1972 - 2012	19.09	54.72	26.77	24.88
Kenya	1972 - 2012	7.86	11.31	10.98	31.30
Lesotho	1972 - 2012	11.68	9.99		
Libya	1972 - 2012				
Mali	1972 - 2012	3.11	12.76	3.56	3.42
Mauritania	1972 - 2012		6.98	4.75	7.13
Morocco	1972 - 2012	4.55	5.20	6.10	6.17
Mozambique	1984 - 2012		11.27	22.79	38.31
Namibia	1972 - 2012				
Nigeria	1972 - 2012	13.46	16.04	14.54	32.53
Republic of Congo (Kinshasa)	1972 - 2012	3.92		3.71	3.91
Rwanda	1972 - 2012	6.24	13.28	10.64	47.35
São Tomé and Príncipe	2000 - 2012			19.86	13.99
Senegal	1972 - 2012	9.08	4.00	2.98	22.65
Seychelles	1980 - 2012	10.58	3.25	1.51	11.57
South Africa	1994 - 2012	6.45	5.65		
Sudan	1972 - 2012	18.33	17.47	31.61	55.22
Swaziland	1990 - 2012	8.34			
Tunisia	1972 - 2012	8.76	10.81	6.52	26.73
Uganda	1972 - 2012	10.74	88.66	10.87	44.87
<b>Average</b>		<b>8.63</b>	<b>16.28</b>	<b>10.73</b>	<b>24.14</b>
<b>Median</b>		<b>8.55</b>	<b>11.04</b>	<b>6.52</b>	<b>22.65</b>
<b>Observations</b>	<b>599</b>	<b>126</b>	<b>126</b>	<b>124</b>	<b>223</b>
<b>HIGH INCOME ECONOMIES</b>					
Equatorial Guinea	1972 - 2012				
Mauritius	1976 - 2012	7.01	9.75		
<b>Average</b>		<b>7.01</b>	<b>9.75</b>		
<b>Median</b>		<b>7.01</b>	<b>9.75</b>		
<b>Observations</b>	<b>353</b>	<b>77</b>	<b>162</b>	<b>40</b>	<b>74</b>

APPENDIX D 2 - TABLES AND CALCULATIONS FROM PWT 8 DATABASE

Table D 11. GDP Growth (PWT 8) as Public Debt Changes

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
Angola	2000 - 2011	16.79	12.63	11.67	-12.63
Benin	2000 - 2011	3.77	3.79		
Botswana	1998 -2011	5.42			
Burkina Faso	2002 - 2011	5.20	6.33		
Burundi	2000 - 2011		-0.05		4.56
Cameroon	2000 - 2011	3.50	-0.47	0.95	
Cape Verde	2002 - 2011			7.05	5.76
Central African Republic	2000 - 2011	2.06	4.01	4.16	-0.44
Chad	1999 - 2011	1.92	15.79	3.18	
Comoros Islands	2000 - 2011		1.82	2.24	0.46
Côte d'Ivoire	1970 - 2011	8.28	-20.07	2.71	1.03
Democratic Republic of Congo (Brazzaville)	2000 - 2011		17.33		8.96
Djibouti	2003 - 2011		6.46		
Egypt	1970 -2011	6.62	5.93	6.61	7.37
Equatorial Guinea	1980 - 2011	18.72	89.69	24.48	8.73
Ethiopia	1992 - 2011	8.91	12.21	1.82	2.39
Gabon	1990 - 2011	7.45	5.78	8.18	-2.14
Gambia	2000 - 2011			3.95	3.64
Ghana	1952 - 2011	-4.13	4.16	4.49	3.60
Guinea	1990 - 2011			1.19	-0.72
Guinea Bissau	2000 - 2011		3.19		3.36
Kenya	1963 - 2011	5.11	2.46	2.20	5.38
Lesotho	1988 - 2011	5.59	5.05	3.68	5.08
Liberia	2000 - 2011	8.27	6.98		5.37
Madagascar	1990 - 2011		3.10	1.65	1.67
Malawi	2002 - 2011		10.07		3.43
Mali	2000-2011	6.16	1.97		3.74
Mauritania	2000 - 2011			35.82	6.07
Mauritius	1970 - 2011	10.03	2.12	5.78	
Morocco	1965 - 2011	2.54	4.54	1.76	3.29
Mozambique	1999 - 2011		7.93	9.89	5.31
Niger	1995 - 2011	3.47		2.20	3.71
Nigeria	1970 - 2011	4.22	18.91	17.36	-12.95
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2011	11.08	-0.76	-3.43	-1.52
Rwanda	1995 - 2011	8.47		11.51	9.19
Senegal	2000 - 2011	2.02	2.78	-0.96	
Sierra Leone	2000 - 2011		5.61		6.09
South Africa	1950 - 2011	2.73	3.80		
Sudan	1992 - 2011			7.39	5.96
Swaziland	1993 - 2011	7.12			
Tanzania	2002 - 2011	7.90	8.01		
Togo	2001- 2011		6.52	0.54	4.62
Tunisia	1990 - 2011		3.04	3.32	
Uganda	1997 - 2011	6.95	4.32	6.29	4.27
Zambia	1990 - 2011	14.59		4.71	2.71
Zimbabwe	1965 - 2011		6.15	5.75	-5.03
<b>Average</b>		<b>6.58</b>	<b>7.53</b>	<b>6.19</b>	<b>2.66</b>
<b>Median</b>		<b>6.16</b>	<b>4.80</b>	<b>4.06</b>	<b>3.68</b>
Observations					

Table D 12. GDP *per capita* Growth (PWT 8) as Public Debt Changes

COUNTRIES	PERIOD	PUBLIC DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
Algeria	1964 - 2012				
Angola	2000 - 2012	13.43	8.29	4.81	-11.99
Benin	2000 - 2012	0.72	0.67		
Botswana	1998 - 2012	3.92			
Burkina Faso	2002 - 2012	3.64	3.34		
Burundi	2000 - 2012		-2.55		1.86
Cameroon	2000 - 2012	1.25	-2.68	-1.32	
Cape Verde	2002 - 2012			5.86	3.97
Central African Republic	2000 - 2012	-1.61	2.02	2.26	-2.08
Chad	1999 - 2012	-0.84	12.23	-0.28	
Comoros Islands	2000 - 2012		-0.82	-0.47	-2.14
Côte d'Ivoire	1970 - 2012	3.43	-23.58	-0.02	-1.82
Democratic Republic of Congo (Brazzaville)	2000 - 2012		14.47		6.23
Djibouti	2003 - 2012		4.49		
Egypt	1970 - 2012	4.37	3.53	4.52	5.49
Equatorial Guinea	1980 - 2012	15.23	83.65	20.53	4.10
Eritrea	2000 - 2012				
Ethiopia	1992 - 2012	6.60	9.71	-1.00	-0.45
Gabon	1990 - 2012	5.46	3.62	5.57	-5.13
Gambia	2000 - 2012			1.12	0.65
Ghana	1952 - 2012	-6.71	1.62		
Guinea	1990 - 2012			-1.89	-3.45
Guinea Bissau	2000 - 2012		1.07		1.33
Kenya	1963 - 2012	8.76	10.16	-1.18	2.10
Lesotho	1988 - 2012	3.65	4.01	2.16	3.51
Liberia	2000 - 2012	4.75	2.75		1.65
Libya	1990 - 2012				
Madagascar	1990 - 2012		0.13	-1.35	-1.40
Malawi	2002 - 2012		6.78		0.71
Mali	2000 - 2012	2.94	-1.13		0.70
Mauritania	2000 - 2012			32.23	3.22
Mauritius	1970 - 2012	8.34	0.95	4.70	
Morocco	1965 - 2012	0.03	2.95	0.22	0.92
Mozambique	1999 - 2012		5.41	7.03	2.62
Namibia	1993 - 2012				
Niger	1995 - 2012	-0.13		-1.30	0.18
Nigeria	1970 - 2012	12.12	90.25	14.58	-15.07
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	8.83	-3.43	-6.06	-4.45
Rwanda	1995 - 2012	5.38		4.34	5.54
São Tomé and Príncipe	2001 - 2012				
Senegal	2000 - 2012	-0.69	0.06	-3.52	
Seychelles	1990 - 2012				
Sierra Leone	2000 - 2012		3.14		1.95
South Africa	1950 - 2012	1.74	1.51		
Sudan	1992 - 2012			4.65	3.37
Swaziland	1993 - 2012	5.56			
Tanzania	2002 - 2012	4.82	5.06		
Togo	2001 - 2012		4.31	-1.63	2.17
Tunisia	1990 - 2012		1.82	1.98	
Uganda	1997 - 2012	3.55	1.05	3.03	0.95
Zambia	1990 - 2012	11.55		2.24	0.13
Zimbabwe	1965 - 2012		2.97	4.94	-5.43
Average		<b>4.49</b>	<b>7.16</b>	<b>3.44</b>	<b>0.00</b>
Median		<b>3.92</b>	<b>2.96</b>	<b>2.16</b>	<b>0.92</b>
Observations					

Table D 13. GDP Growth (PWT 8) as Public Debt Changes, by Geographic Areas

COUNTRIES	PERIOD	DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>North Africa</b>					
Algeria	1964 - 2012				
Egypt	1970 - 2012	6.62	5.93	6.61	7.37
Libya	1990 - 2012				
Morocco	1965 - 2012	2.54	4.54	1.76	3.29
Tunisia	1990 - 2012		3.04	3.32	
Mauritania	2000 - 2012			35.82	6.07
Average		4.58	4.50	11.88	5.58
Median		4.58	4.54	4.97	6.07
<b>Observations</b>					
<b>Sub-Saharan Countries</b>					
Benin	2000 - 2012	3.77	3.79		
Burkina Faso	2002 - 2012	5.20	6.33		
Burundi	2000 - 2012		-0.05		4.56
Cameroun	2000 - 2012	3.50	-0.47	0.95	
Cape Verde	2002 - 2012			7.05	5.76
Central African Republic	2000 - 2012	2.06	4.01	4.16	-0.44
Chad	1999 - 2012	1.92	15.79	3.18	
Comoros Islands	2000 - 2012		1.82	2.24	0.46
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	11.08	-0.76	-3.43	-1.52
Côte d'Ivoire	1970 - 2012	8.28	-20.07	2.71	1.03
Djibouti	2003 - 2012		6.46		
Equatorial Guinea	1980 - 2012	18.72	89.69	24.48	8.73
Eritrea	2000 - 2012				
Ethiopia	1992 - 2012	8.91	12.21	1.82	2.39
Gabon	1990 - 2012	7.45	5.78	8.18	-2.14
Gambia	2000 - 2012			3.95	3.64
Ghana	1952 - 2012	-4.13	4.16	4.49	3.60
Guinea	1990 - 2012			1.19	-0.72
Guinea Bissau	2000 - 2012		3.19		3.36
Kenya	1963 - 2012	5.11	2.46	2.20	5.38
Liberia	2000 - 2012	8.27	6.98		5.37
Mali	2000 - 2012	6.16	1.97		3.74
Niger	1995 - 2012	3.47		2.20	3.71
Nigeria	1970 - 2012	4.22	18.91	17.36	-12.95
Rwanda	1995 - 2012	8.47		11.51	9.19
São Tomé and Príncipe	2001 - 2012				
Senegal	2000 - 2012	2.02	2.78	-0.96	
Sierra Leone	2000 - 2012		5.61		6.09
Sudan	1992 - 2012			7.39	5.96
Togo	2001 - 2012		6.52	0.54	4.62
Uganda	1997 - 2012	6.95	4.32	6.29	4.27
Average		5.86	7.89	5.12	2.79
Median		5.20	4.16	3.18	3.71
<b>Observations</b>					
<b>SADC</b>					
Angola	2000 - 2012	16.79	12.63	11.67	-12.63
Botswana	1998 - 2012	5.42			
Democratic Republic of Congo	2000 - 2012		17.33		8.96
Lesoto	1988 - 2012	5.59	5.05	3.68	5.08
Madagascar	1990 - 2012		3.10	1.65	1.67
Malawi	2002 - 2012		10.07		3.43
Mauricias	1970 - 2012	10.03	2.12	5.78	
Mocambique	1999 - 2012		7.93	9.89	5.31
Namibia	1993 - 2012				
Seycheles	1990 - 2012				
South Africa	1950 - 2012	2.73	3.80		
Swazilandia	1993 - 2012	7.12			
Tanzania	2002 - 2012	7.90	8.01		
Zambia	1990 - 2012	14.59		4.71	2.71
Zimbabwe	1965 - 2012		6.15	5.75	-5.03
Average		8.77	7.62	6.16	1.19
Median		7.51	7.04	5.75	3.07
<b>Observations</b>					

Table D 14. GDP *per capita* Growth (PWT 8) as Public Debt Changes, by Geographic Areas

COUNTRIES	PERIOD	DEBT/GDP			
		< 30%	30 - 60%	60-90%	> 90%
<b>North Africa</b>					
Algeria	1964 - 2012				
Egypt	1970 - 2012	4.37	3.53	4.52	5.49
Libya	1990 - 2012				
Morocco	1965 - 2012	0.03	2.95	0.22	0.92
Tunisia	1990 - 2012		1.82	1.98	
Mauritania	2000 - 2012			32.23	3.22
Average		2.20	2.77	9.74	3.21
Median		2.20	2.95	3.25	3.22
<b>Observations</b>					
<b>Sub-Sahara</b>					
Benin	2000 - 2012	0.72	0.67		
Burkina Faso	2002 - 2012	3.64	3.34		
Burundi	2000 - 2012		-2.55		1.86
Cameroon	2000 - 2012	1.25	-2.68	-1.32	
Cape Verde	2002 - 2012			5.86	3.97
Central African Republic	2000 - 2012	-1.61	2.02	2.26	-2.08
Chad	1999 - 2012	-0.84	12.23	-0.28	
Comoros Islands	2000 - 2012		-0.82	-0.47	-2.14
Republic of Congo (Ex-Zaire - Kinshasa)	1990 - 2012	8.83	-3.43	-6.06	-4.45
Côte d'Ivoire	1970 - 2012	3.43	-23.58	-0.02	-1.82
Djibouti	2003 - 2012		4.49		
Equatorial Guinea	1980 - 2012	15.23	83.65	20.53	4.10
Eritrea	2000 - 2012				
Ethiopia	1992 - 2012	6.60	9.71	-1.00	-0.45
Gabon	1990 - 2012	5.46	3.62	5.57	-5.13
Gambia	2000 - 2012			1.12	0.65
Ghana	1952 - 2012	-6.71	1.62		
Guinea	1990 - 2012			-1.89	-3.45
Guinea Bissau	2000 - 2012		1.07		1.33
Kenya	1963 - 2012	8.76	10.16	-1.18	2.10
Liberia	2000 - 2012	4.75	2.75		1.65
Mali	2000 - 2012	2.94	-1.13		0.70
Niger	1995 - 2012	-0.13		-1.30	0.18
Nigeria	1970 - 2012	12.12	90.25	14.58	-15.07
Rwanda	1995 - 2012	5.38		4.34	5.54
São Tomé and Príncipe	2001 - 2012				
Senegal	2000 - 2012	-0.69	0.06	-3.52	
Sierra Leone	2000 - 2012		3.14		1.95
Sudan	1992 - 2012			4.65	3.37
Togo	2001 - 2012		4.31	-1.63	2.17
Uganda	1997 - 2012	3.55	1.05	3.03	0.95
Average		3.82	8.69	2.17	-0.18
Median		3.55	2.02	-0.15	0.83
<b>Observations</b>					
<b>SADC</b>					
Angola	2000 - 2012	2.18	3.17	1.90	0.67
Botswana	1998 - 2012	2.90	-	-	-
Democratic Republic of Congo	2000 - 2012	-	4.14	-	1.40
Lesoto	1988 - 2012	6.26	3.80	3.77	1.22
Madagascar	1990 - 2012	-	-0.23	1.59	-1.08
Malawi	2002 - 2012	-	2.86	-	1.11
Mauricias	1970 - 2012	7.35	3.43	3.40	
Mocambique	1999 - 2012	-	4.54	5.02	4.58
Namibia	1993 - 2012	1.64	-	-	-
Seychelles	1990 - 2012	-	-	4.85	0.09
South Africa	1950 - 2012	1.20	1.20	-	-
Swazilandia	1993 - 2012	0.90		-	-
Tanzania	2002 - 2012	4.19	3.93	-	-
Zambia	1990 - 2012	3.54	-	2.63	-0.74
Zimbabwe	1965 - 2012	-	0.84	-0.01	-8.53
Average		3.35	2.77	2.89	-0.14
Median		2.90	3.30	3.01	0.67
Observations	353	77	162	40	74

# Chapter 3:

## Explaining Growth in African Countries - What Matters?

### Abstract

In this work we analyze the role of the traditional determinants of economic growth, pointed by the literature, in African countries in the period between 1950 and 2012, using growth regressions. Due to the specificity and the single nature of each one of these countries, methods that take into account observed and unobserved heterogeneity are used. Results highlight the relevance of the growth rate of the capital stock to economic growth in African countries, which is significant in all regressions. The growth rate of the government to GDP ratio is also important in all but one of the regressions in which appears, and its growth is harmful for economic growth. On the other hand, variables related to the public debt do not present any relationship with economic growth. Human capital has a positive relationship with economic growth in regressions that don't include public debt. The growth rate of real GDP *per capita* also depends (negatively) on its past value, *i.e.*, the lower the real GDP *per capita* the higher will be its growth rate.

*Keywords:* determinants of economic growth, African countries, investment and capital stock, human capital, fiscal variables, observed and non-observed heterogeneity

*JEL Codes:* C23, C52, E62, H60, O11, O47

# 1. Introduction

Since the end of colonialism, African countries struggle for the growth of their economies and for the increase of living standards of the population. The difficulties are enormous and the results have not been the expected. Most of the African economies are amongst the poorest of the world, despite their natural resources endowment, their young and growing population and, of course, the large potential market of the whole continent. This is, in fact, a development paradox for the continent which has been called the “*African Tragedy*”.

Nevertheless, substantial changes and considerable improvement in Africa’s growth performance have begun with the new millennium. Various are the reasons for these economic changes. Most of the countries introduced deep changes in the domestic environment through the adoption and implementation of economic policy reforms and improvement of macroeconomic management such as greater fiscal discipline, privatization, investments in infrastructures and in human capital, as well as the adherence to the principles of democracy for most of the African countries which has contributed to the reduction of conflicts incidence and consequently to the increase of stability. At the same time, the growing need of capital to support the enormous investments, has led to the boom of public debt of African countries. Africa needs to find a new paradigm of growth grounded on a sustainable basis and capable to maintain or increase the rate of economic growth, creating resources to address poverty, inequality and unemployment. There is, however, a long way to go and the path differs from country to country.

The purpose of this paper is to analyze the determinants of growth in 52 African countries in the period ranging between 1950 and 2012, such as public debt, the capital stock, the government ratio, the investment ratio, the human capital index, and two measures that proxy the institutional environment of countries, which are recognized by many authors as factors that contribute positively to improve the growth performance and to launch most of the African economies on the path of economic growth and social progress (Barro, 1999; Devarajan *et al.*, 1996; Calderon, and Servén, 2008). We try to shed some lights on the role of the above mentioned determinants for the economic growth of African countries. Additionally, we add some originality in our econometric method, since we use recently developed methods for panel data, adapted from the time-series literature, which account for non-linearity and heterogeneity in the data (Eberhardt and Presbitero, 2015), to empirically explain: (a) the long-run relationship between some determinants of growth and the economic growth of African countries and (b) the growth heterogeneity across these countries.

Our work is organized as follows: Section 2 reviews the existing theoretical and empirical literature on the determinants of economic growth that we use in this work, specially focusing on the African Continent. Section 3 identifies all the data and the corresponding sources. In Section 4

we perform an evaluation of our data and identify the estimation techniques and methods. Sections 5 and 6 address the empirical results and the conclusions, respectively.

## 2. Literature Review

In this paper we make a review of some determinants of growth in African economies, such as: public debt, the capital stock, the government ratio, the investment ratio, and the human capital index. There exists a plethora of studies and evidence on how these variables affect economic growth particularly of African economies. The issue of economic growth in African countries has been investigated by a wide range of studies, using different conceptual and methodological viewpoints and emphasising a different set of explanatory parameters.

After the Second World War, the increasing need for financial resources for the reconstruction and for building new production capacity to feed Europe and the World, led many countries to incur in deep debt. Public debt began to be a concern of many economists and scholars. Buchanan (1958) and Meade (1958) argued that the national debt is a burden for the next generations, which in the long term reduces the flow of income and crowds out the stock of private capital.

Particularly on the public debt/growth nexus, a substantial bulk of literature has been produced. For instance Pattillo *et al.* (2002), Clemens *et al.* (2003), Reinhart and Rogoff (2010a,b), Vanlaer *et al.* (2015), and Eberhardt and Presbitero (2015) worked on the debt-growth relationship and found different levels of negative correlations between them. Although the existing view, among policy makers at least, that public debt is necessary to induce economic growth, in particular for poorer economies; in the last decade a growing discussion is being made in the circle of economic researchers and decision makers on the level of public debt above which economic growth is negatively affected (Reinhart and Rogoff 2010a, b and Panizza and Presbitero, 2013).

Additionally, other determinants of economic growth and how can they affect economic growth have been discussed (Hossain and Mitra, 2013 and Anyanwou, 2014).

The general idea that the stock of public capital and infrastructure will boost economic growth constitutes a prominent feature of government economic programs across the world.

The importance of infrastructure as an input of the capital stock and its relationship with economic growth is studied by Agénor and Moreno-Dodson (2006), who identified two main channels through which infrastructure may affect growth: (1) the promotion of growth through private capital formation. It is based on the principle that public infrastructure raises the marginal productivity of private inputs with repercussion on the increase of the rate of return of private capital and also on the increase of private sector demand for physical capital; (2) crowding-out which is based on the idea that, in the short-run, an increase in public capital stocks may crowd-out private investment. This negative crowding-out effect of infrastructure

may turn into a long-term negative effect if the decrease in private capital formation persists over time. Boopen (2006) defends that investments in quality infrastructure are the foundation and a pre-requisite for growth and development in Africa. He analyses the contribution of transport capital for economic growth for two different data sets, namely for a sample of Sub Saharan African (SSA) countries and also for Small Island Developing States (SIDS), over the period 1980-2000, using both cross sectional and panel data analysis. The author concludes, in both cases, that economic growth in Africa has been triggered by the transport capital and recommends that governments should develop a social, economic and environmentally sustainable transport system with a greater engagement of all the stakeholders. The public-private partnership shall be considered as part of the solution.

Calderon and Sérvén (2008) analyse the economic growth of about 100 developing countries, including Sub-Saharan African countries, using regression analysis based on estimates of growth of infrastructure and income inequality, for the period 1960-2005. For the Sub-Saharan African countries they conclude that there is strong evidence that investment on infrastructure has a positive impact on economic growth. For these authors, the development of infrastructure accelerates the reduction of poverty levels and is associated with high levels of economic growth. Finally, they found strong evidence that an improvement in the quality of infrastructure services has a positive impact on long run growth and a negative impact on income inequality. Calderon (2008) applies a set of econometric estimates for a sample of 136 countries over the period 1960-2005, to evaluate the impact on growth *per capita* caused by a faster accumulation of infrastructure stocks and a better quality of infrastructure services, using three key infrastructure sectors: telecommunications, electricity, and roads. African countries would increase their economic growth by increasing their investment effort on infrastructure.

Cheteni (2013) examines the impact of transport infrastructure investment and transport sector productivity on South African economic growth for the period 1975-2011, using a Vector Error Correction Model (VECM) and a Bayesian Vector Autoregressive (BVAR) model as empirical tools. The results of this paper suggest that the inflation rate, the real exchange rate, and real domestic gross fixed transport investment have a positive impact on economic growth and productivity. To increase the growth and productivity level, the government should increase investment in transportation and maintain the inflation rate low. The study recommends the South African government to address labour concerns at the earliest time possible to avoid a decline in economic growth and productivity that would be mainly felt by the poor, who are the majority in the country. Ghazanchyan and Stotsky (2013) used a panel data for 42 Sub-Saharan countries, divided between oil exporters and non-oil exporting countries, during the period 1999-2011, and different methodologies, to analyse the correlation between growth experiences and some determinants of growth such as: private and public investment, government consumption,

and the exchange rate. The results show that the share of private investment in GDP is an important element for growth when oil-exporting African countries are comprised in the sample. When oil exporters are excluded, the authors found more limited evidence for a positive effect of private investment on growth, however they did find some evidence of a positive effect of public investment on growth. The study shows also evidence that the exchange rate is not a strong determinant of growth. It seems to be a consensual argument that investment in public infrastructures has a strong growth-promoting effect through their strong positive effect on the productivity of private inputs and on return on private investment in African countries. Besides from the positive role of infrastructures on economic growth, there are many others determinants of growth. Barro (1991) brings to the growth equation the human capital variable and points out that the growth rate of real *per capita* GDP for the period 1960 to 1985 is positively related to initial human capital (proxied by 1960 school enrolment rates) and negatively related to the initial (1960) level of real *per capita* GDP, when the measures of initial human are held constant. Using growth regression techniques for 98 countries in the period 1960-1985, the author studies the relationship between growth, fertility, and human capital investment. If the level of initial *per capita* GDP is given, its growth rate is positively related to the initial level of human capital. He shares the idea inherent to the neoclassical growth model that poor countries tend to grow faster than rich countries ( $\beta$ -convergence), particularly, when they have high human capital *per capita*. The study reaches also the following conclusions: (1) countries with high human capital have low fertility rates and high ratios of physical investment to GDP. (2) *Per capita* growth and the ratio of private investment to GDP are negatively related to the ratio of government expenditure to GDP, due to the distortion introduced by government consumption. (3) Measures of political instability (proxied by figures on revolutions, coups, assassinations) are inversely related to growth and investment. The role of human capital in the growth process of any nation is crucial particularly in the less developed nations. It principally refers to the workers' acquisition of skills and know-how through education and training. Evidence from empirical studies suggests that educated population is a key determinant of economic growth (Barro and Sala-i-Martin, 1995; Brunetti et al, 1998). Ahmed *et al.* (2013) investigate the impact of human capital on economic growth in Sudan for the period between 1982 and 2009, by using a simultaneous equation model that links human capital (school attainment); and investment in education, and an health variable, to economic growth, total productivity, foreign direct investment, and the human development index. The authors conclude that the quality of education has a determinant role in economic growth.

Kumar (2006) suggests that the negative impact of human capital investment does not mean that the role of human capital in growth process for African economies is marginal. Sacerdoti *et al.* (1998) conclude that human capital does not appear to have a significant contribution to the

economic growth of West African countries, due to the inexistence of structural reforms. They recommend the creation of an economic environment that stimulates a strong private intervention, promoting the introduction of new technology and the openness of the economy to competition and to export activities. Ndambiri *et al.* (2012) studied the determinants of economic growth in 19 Sub-Saharan African countries over the period 1982-2000, using the Generalized Methods of Moments (GMM) approach and concluded that human capital is important for growth and should merit a particular attention from governments.

The level of output *per* worker in the long run varies from country to country and depends on different factors such as the rate of investment on physical capital and human capital. Hall and Jones (1996) conducted empirical analysis and suggested that, in the long run, a country's economic performance is determined primarily by the institutions and government policies that make up the economic environment within which individuals and firms make investments, create and transfer ideas, and produce goods and services. Their main findings are focused in the following: (1) the large variation in output *per* worker across countries is only partially explained by differences in physical capital and educational attainment; (2) differences in social infrastructure (institutions) across countries cause large differences in capital accumulation, educational attainment, and productivity, and therefore large differences in income across countries. Tahari *et al.* (2004) examine the sources of growth in Sub-Saharan African countries using the growth accounting framework. The results of the analysis show that during 1960-2002 the Technical Factor Productivity (TFP) has no significant influence on the average real GDP growth. To increase the performance of those economies, it is needed a significant boost and improvement of TFP as well as on the investment/GDP ratio and the consequent diversification of the economic base. The authors also defend the need to impede the regional conflicts in order to build the path of economic growth in peaceful environment. Badunenko *et al.* (2010) use the production frontier approach and data on 35 African economies from 1970-2007, to show that efficiency losses have constrained growth in Africa, while technological progress has played a marginal role in enhancing growth in the region. They analyse labour productivity growth, considering physical and human capital accumulation efficiency and technological changes. The physical and human capital accumulations are, at the end, the factors responsible for productivity growth for all countries considered.

There are numerous studies that bring strong evidence that a large government sector negatively affects economic growth worldwide (e.g., Barro (1991), Engen and Skinner (1992), Hansson and Henrekson (1994), Gwartney *et al.* (1998), Fölster and Henrekson (2001). For Africa, Egbetunde and Fasanya (2013) analyse the long-run and short-run relationship between public expenditure and economic growth in Nigeria, and find that the impact of total public spending on growth to be negative, which is consistent with other past studies. Recurrent expenditure however was

found to have little significant positive impact on growth. Therefore, the Nigeria government should increase its spending on infrastructure, social, and economic activities. Other factors such as institutional ones have been discussed. Based on a cross-country regression model, Sachs and Warner (1997) analyse the sources of slow economic growth in Sub-Saharan Africa with a time span ranging from 1950 to 1990. According to these authors, apart from the well-known causes of slow growth of African economies, which also refers to other developing countries, namely, colonial legacy, and ethnic division etc., poor choices of economic policy are the main responsible for the slow growth in Africa. Their regression analysis shows that the geographical and natural factors are partially responsible for slow growth and conclude that some indicators of economic policy, such as the openness ratio, the market supporting institutions, government spending, and savings have larger quantitative impacts. They also estimate that Sub-Saharan African economies could have *per capita* growth at over 4% per year, with appropriate policies regardless of the natural constraints. Easterly and Levine (1997) argue that Africa's poor growth and low level of *per capita* income are associated with low schooling, political instability, underdeveloped financial systems, distorted foreign exchange markets, high government deficits, and insufficient infrastructure. The ethnic diversity factor is closely related to poor growth of African economies and it explains the cross-country differences in public policies and political stability. Mathew and Adegboye (2014) apply econometric techniques such as Panel Unit Root, Least Square Dummy Variables (LSDV) and GMM for the period 1985-2012 on thirty selected Sub-Saharan African Countries to examine the influence of trade openness and institutions on economic growth. The main findings are: (1) institutions have significant positive impact on economic growth; (2) The significance of trade impact on economic growth is not relevant; (3) the process of trade liberalization through stronger institution should be a target.

Our work will contribute further for the understanding of the determinants of economic growth in Africa, using a panel data set for 52 African countries, for the period between 1950 and 2012, using (simultaneously) the variables that we have referred above.

### 3. Sources and Data

Our data set comprises 52 African countries with a time span ranging from 1950 to 2012. We have used several data sources in our work, which we select, based on the literature review that we have done. Below we make a description of each one of the variable used and their data source. The time dimension for each variable and each country can be found in Appendix E, Table E(1).

- *rgdp\_pc* - stands for the Real Gross Domestic Product (GDP) *per capita* and represents the measurement of the total wealth of a country divided by the total population and adjusted for

inflation. The source of the data is the Conference Board Total Economy Database, calculated in 1990 US\$ (converted at Geary Khamis Purchasing Parity Power (PPPs)).

- *pc\_pub\_debt* - Is the entire stock of direct government fixed term contractual obligations to others, outstanding on a particular date divided by the total population. It includes domestic and foreign liabilities, such as currency and money deposits, securities, and other shares and loans. It is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government divided by the total population, i.e., public debt *per capita*. The source is the World Bank Data database.

The following variables were taken from the Penn World Tables, version 8.0 (Feenstra *et al.*, 2015). The GDPs and the capital stocks were divided by the population to convert to *per capita* values.

- *rgdpe\_pc\_pwt* - stands for expenditure-side real GDP *per capita*, calculated in 2005 US\$ at chained PPPs.
- *rgdp\_pc\_na\_pwt* - stands for real GDP *per capita* at constant (2005) national prices.
- *inv\_ratio* - is defined as the share of output-based real GDP that is represented by gross capital formation (investment), at current purchasing power parities (PPPs).
- *gov\_ratio* - stands for the share of output-based real GDP that is represented by government consumption at current purchasing power parities (PPPs).
- *hc\_ind* - represents the index of human capital, which is related to the average years of schooling and the returns to education.
- *pc\_cap\_stock* - Capital stock *per capita* at constant 2005 national prices (in mil. 2005US\$) - is the total quantity of capital used in the production of goods and services, including factories, buildings, equipment, tools, and machinery divided by the total population.

We have also used the variables *S18F2* and *BMERP* as proxies for the institutional environment, taken from the Databanks International database. Their definitions are presented below:

- *S18F2* - Weighted Conflict Index - The weighted conflict index is calculated in the following manner: Multiply the value of the number of Assassinations by 24, General Strikes by 43, Guerrilla Warfare by 46, Government Crises by 48, Purges by 86, Riots by 102, Revolutions by 148, Anti-Government Demonstrations by 200. Sum the 8 weighted values and divide by 9. The result is the value (with decimal) stored as the Weighted Conflict Index.
- *BMERP* - (*S16F7/S16F6*) - Percentage difference between the black market rate for foreign currency and the pegged official exchange rate.

The descriptive statistics (Means, Standard Deviations, Minimum, and Maximum) for the variables included in the analysis are incorporated in Table 3. The number of observations is different for each one of the variables; hence our panel is going to be unbalanced.

Table 3. Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
rgdp_pc	3,234	1,718.64	2,116.78	81.26	20,655.75
rgdpe_pc_pwt	2,556	1,896.58	1,955.43	153.15	15,067.31
rgdp_pc_na_pwt	2,556	1,963.73	2,532.41	145.51	28,425.58
pc_pub_debt	1,157	153.07	186.64	1.61	1,386.24
pc_cap_stock	2,536	5.95	7.93	0.14	62.74
inv_ratio	2,556	0.18	0.14	0.01	1.4
gov_ratio	2,556	0.21	0.14	0.01	1.44
hc_ind	1,888	1.56	0.4	1.03	2.85
S18F2	2,126	1,493.64	4,120.90	0	94,325.00
BMERP	997	1.99	6.4	0.52	125

Notes: Due to the higher number of observations relative to the other 2 variables that represent GDPs, we opted for *rgdp\_pc* instead of *rgdpe\_pc\_pwt* or *rgdp\_pc\_na\_pwt*, for the regression estimations.

#### 4. Estimation and Methods

This paper analyzes the behavior of economic growth in 52 African economies, based on the traditional determinants of economic growth. The specificity and the single nature of each one of these countries bring to the analysis the question of observed and unobserved heterogeneity.

Our baseline specification is as follows:

$$y_{it} = \alpha_i + \beta_1 \text{PcPD}_{it} + \phi_1 \text{IR}_{it} + \omega_1 \text{GR}_{it} + \varphi_1 \text{PcCS} + \delta_1 \text{HCI}_{it} + \lambda'_i f_t + \varepsilon_{it} \quad (1)$$

Where  $y_{it}$  is the real GDP *per capita*,  $\text{PcPD}_{it}$  is public debt *per capita*, IR is the investment ratio, GR is the government ratio, PcCS is the capital stock *per capita*, and HCI represents the Human Capital Index. All these explanatory variables are defined in the previous section. The situational and non-observed variables that can globally affect all the African economies are considered as common factors and they are presented as  $f_t$ .  $\alpha_i$  is the country-specific intercepts,  $\lambda'_i$  is the country specific factor loadings associated to the common factors, and  $\varepsilon_{it}$  is the stochastic error term.

The Common Correlated Effects (CCE) approach adopted in this work is, according to Pesaran and Tosetti (2011), robust to non-stationarity in both observables and non-observables and works well in the presence of weak and/or strong cross sectionally correlated errors. To perform the estimation we used lagged/lead and differentiated cross-section averages to augment the CCE method, following the statement of Chudik and Pesaran (2015) that CCE-type estimators once augmented with a sufficient number of lags/leads and cross-sectional averages perform well,

even in the case of dynamic models with weakly exogenous regressors. We apply an error correction-model (ECM) representation of the equation above to take into consideration the time series properties and dynamics in macro panels. The ECM allows us to distinguish between the short and the long-run.

#### 4.1. Cross-Section Dependence and Stationarity Tests

Interdependencies between African economies may occur after common shocks with a heterogeneous impact across countries. To this end, we apply the Pesaran (2004) to test the null hypothesis of no cross-section dependence across panel members. The results of the test are presented in Table 4 below.

Table 4. Cross-Section Dependence Test

Variable	CD-test	p-value	corr	abs(corr)
rgdp_pc	64.05***	0.000	0.218	0.505
pc_pub_debt	47.89***	0.000	0.349	0.554
inv_ratio	25.68***	0.000	0.105	0.363
gov_ratio	47.62***	0.000	0.199	0.443
hc_Ind	165.37***	0.000	0.948	0.948
pc_cap_stock	17.35***	0.000	0.072	0.545

Notes: Level of significance: \*\*\* for p-value < 0.01. Null hypothesis: There is no cross-sectional dependence between the variables.

The Pesaran (2004) CD test assumes significant values between 17.35 and 165.37 for the capital stock *per capita* and the human capital index, respectively. There is evidence of cross-sectional dependence (CSD) between panel members. Empirically it shows that any structural shock that occurs in one of the panel members (country) will affect positive or negatively the remaining countries. An empirical work based on time series assumes, necessarily, a long-run stationarity of the series, avoiding the non-stationarity, which invalidates the classic econometric assumptions and generates spurious relations between the series. As defended by Gujarati (2008): "a process is stationary if their means and variances are constant over time and the value of the covariance between two time periods depends only on the distance or lag between the two periods and not on the effective time period in which the covariance is calculated." The stationarity of the time series is used to test the presence of a unit root. In our study we use a second generation panel unit root test Pesaran (2007), also known as the Pesaran CIPS test, with and without trend, and considering three lags. In this test we assume as the null hypothesis that every individual time

series has a unit root and is therefore non-stationary and the alternative hypothesis is that the time series is stationary. Table 5 below shows the results of this test.

Table 5. Panel Unit Root Test

Variable	Lags	1	2	3	4	5	6
		pc_rgdg	pc_pub_debt	inv_ratio	gov_ratio	pc_cap_stock	hc_ind
Pesaran (2007) Test Without Trend							
Zt - stat.	0	4.626	-0.699	0.560	-1.472	10.100	10.631
p-values		1.000	0.244	0.712	0.071(**)	1.000	1.000
Zt - stat.	1	2.553	0.243	1.485	-1.401	4.108	0.086
p-values		0.995	0.596	0.931	0.081(**)	1.000	0.534
Zt - stat.	2	3.045	4.208	3.493	-1.156	6.067	0.099
p-values		0.999	1.000	1.000	0.124	1.000	0.540
Zt - stat.	3	2.418		4.177	-0.294	5.511	-0.299
p-values		0.992		1.000	0.384	1.000	0.382
Pesaran (2007) Test With Trend							
Zt - stat.	0	5.088	0.310	-1.600	-3.075	12.020	11.584
p-values		1.000	0.622	0.055(**)	0.001(*)	1.000	1.000
Zt - stat.	1	2.435	0.689	-0.594	-3.553	6.396	3.459
p-values		0.993	0.755	0.276	0.000(*)	1.000	1.000
Zt - stat.	2	2.883	3.893	1.505	-3.472	8.008	4.042
p-values		0.998	1.000	0.934	0.000(*)	1.000	1.000
Zt - stat.	3	2.183		1.879	-3.700	6.586	4.202
p-values		0.985		0.970	0.000(*)	1.000	1.000
Number of Countries		52	52	48	48	48	35
Number of Observations		3234	1157	2156	2556	2536	1588
Avr. N. of Observations		62.73	3024	53.82	53.82	53.43	54.42

Notes: Null hypothesis: The time series are non-stationary. (\*\*) Stationary at 5% significance level and (\*) at 10% significance level. The remaining time series are non-stationary. The CIPS test assumes that cross-section dependence is in the form of a single unobserved common factor.

Results show that in general all variables are non-stationary. The p-values for the  $Z_t$  statistics for all three lags do not reject the null hypothesis (in levels) as they are very high. The panel unit root test for public debt *per capita* is determined only for two lags, due to the insufficient number of observation required for the CIPS test with three lags. The non-stationary issue will be corrected by the ECM regressions.

#### 4.2. Causality

In order to test the long-run relationship between the variables included in the estimations, we used a second generation panel co-integration test developed by Westerlund (2007) which provides four test statistics:  $G\tau$ ,  $G\alpha$ ,  $P\tau$  and  $P\alpha$ , described below. The co-integration test was

made for the relationship between real GDP *per capita* with the following variables: public debt *per capita*, the investment ratio, the government ratio, capital stock *per capita*, and the human capital index.<sup>15</sup>

The four tests determine whether there is an error correction for individual panel members or for the panel as a whole. The  $G\alpha$  and  $G\tau$  statistics test for co-integration of at least one of the panel's countries, and the  $P\alpha$  and  $P\tau$  statistics perform the test for the whole panel. In other words, the  $G\tau$  and  $G\alpha$  test statistics, test the null hypothesis of no co-integration for all cross-sectional units against the alternative that there is co-integration for at least one cross-sectional unit (i.e.  $H_0 : \rho_i = 0$  for all  $i$  versus  $H_1: \rho_i < 0$  for at least one  $i$ ). Rejection of the null should therefore be taken as evidence of co-integration of at least one of the cross-sectional units. The  $P\tau$  and  $P\alpha$  test statistics pool information over all the cross-sectional units to test the null of no co-integration for all cross-sectional units against the alternative of co-integration for all cross-sectional units (i.e.  $H_0: \rho_i = 0$  versus  $H_1: \rho_i = \rho < 0$  for all  $i$ ). Rejection of the null should therefore be taken as evidence of co-integration for the panel as a whole.

Table 6. Westerlund (2007) Panel Cointegration Test

Statistics	Lags	pc_pub_debt (a)		inv_rat		gov_rat		pc_cap_stock		hc_ind	
		p-values		p-values		p-values		p-values		p-values	
		C/Trend	S/Trend	C/Trend	S/Trend	C/Trend	S/Trend	C/Trend	S/Trend	C/Trend	S/Trend
Test $G\tau$	1			0.998	1.000	1.000	1.000	0.948	1.000	0.967	0.797
	2			1.000	1.000	1.000	1.000	0.999	1.000	0.985	0.602
Test $G\alpha$	1			1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.999
	2			1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.999
Test $P\tau$	1			1.000	1.000	0.169	1.000	0.993	0.062	0.008(*)	1.000
	2			1.000	1.000	0.107	1.000	1.000	0.78	0.004(*)	0.993
Test $P\alpha$	1			1.000	1.000	0.996	1.000	0.986	0.113	0.938	0.993
	2			1.000	1.000	0.997	0.999	1.000	0.809	0.989	0.978

Notes: (a) Time series is not continuous. Null hypothesis: There is no co-integration between the variables. Levels of significance: (\*) for  $p < 0.01$ .

The results summarized in Table 6 suggest that the no co-integration hypothesis cannot be rejected both for the panel as whole ( $P\tau$  and  $P\alpha$ ), and for the group-mean tests ( $G\alpha$  and  $G\tau$ ). Some exception is made for human capital index with trend for which the null hypothesis can be rejected in lag 1 and 2, at 5% significance level for the whole panel.

## 5. Empirical Results

In this section we present our empirical estimates. We have run a set of growth regressions having as the dependent variable  $D1rgdp_{pc}$ , which is the change in real GDP *per capita*, i.e., the growth

<sup>15</sup> Regarding public debt *per capita*, the test could not be done due to the insufficient number of observations.

rate of real GDP *per capita*. Our best estimates are presented in Table 7.<sup>16</sup> All the regressions pass the Wald test for joint significance at 1%. On the other hand, in all regressions presented in Table 7, we note that the values for the Root Mean Squared Error are very low - between 0.0118 and 0.0184 -, meaning that the coefficients for predicted values are close to the observed data values, *i.e.*, the deviation is small.

Results from Table 7 highlight the relevance of the growth rate of the capital stock (D1pc\_cap\_stock) to economic growth in African countries, which is significant in all regressions. This is in line with findings by Artelaris *et al.* (2007) and Calderon (2008) who noted that physical capital formation was a fundamental determinant of economic growth. The growth rate of the government ratio (D1gov\_ratio) is also important in all but one of the regressions in which appears, and its growth is harmful for economic growth. On the other hand, variables related to the public debt do not present any relationship with economic growth. Human capital has a positive relationship with economic growth in regressions that don't include public debt. The growth rate of real GDP *per capita* also depends (negatively) on its past value, *i.e.*, the lower the real GDP *per capita* the higher will be its growth rate.

The variability of effects across countries can be observed by the count of significant (positive or negative) effects by country in Table 7. While the results for real GDP *per capita* in the previous period and the growth rate of the capital stock *per capita* remain very consistent, variables like the government ratio and human capital present significant positive and negative coefficients, indicating a great irregularity between these variables and the growth rate of real GDP *per capita* between countries.

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<sup>16</sup> We have tried estimations using the investment to GDP ratio and also the two proxies for institutions - S18F2 and BMERP -, but they were not significant.

Table 7. Growth Regressions

Dependent Variable: $D1rgdp\_pc_t$	(1)	(2)	(3)	(4)	(5)
<i>constant</i>	2.195***	1.826***	2.627***	1.487	4.598***
	-0.001	-0.009	-0.01	-0.109	0.000
<i>rgdp_pc</i> <sub>t-1</sub>	-0.389***	-2.662**	-0.442***	-0.154**	-0.592***
	-0.002	-0.041	0.000	-0.045	0.000
<i>pc_pub_debt</i> <sub>t-1</sub>	0.007	0.005	0.011	-	-
	-0.785	-0.785	-0.845		
<i>D1pc_pub_debt</i>	0.01	0.001	0.002	-	-
	-0.803	-0.967	-0.93		
<i>pc_cap_stock</i> <sub>t-1</sub>	0.187	0.057	0.284	0.05	0.134
	-0.231	-0.543	-0.106	-0.103	-0.142
<i>D1pc_cap_stock</i>	1.506***	1.509***	1.114***	1.320***	0.949**
	0.000	0.000	0.000	0.000	-0.037
<i>gov_ratio</i> <sub>t-1</sub>	-	-0.354	-0.011	-0.016	-0.080*
		-0.483	-0.767	-0.686	-0.067
<i>D1gov_ratio</i>	-	-0.055**	-0.065**	-0.076**	-0.061
		-0.038	-0.017	-0.025	-0.414
<i>hc_ind</i> <sub>t-1</sub>	-	-	0.329	-	0.259**
			-0.115		-0.017
<i>D1hc_ind</i>	-	-	0.643	-	2.076
			-0.459		-0.138
Number of observations	328	308	221	328	308
Avg Nr. Observ.	36.4	38.5	44.2	36.4	38.5
Min-Max	20-58	28-58	32-58	20-58	28-58
Number of countries	9	8	5	9	8
Wald	59.34***	97.81***	402.9***	79.74***	55.47***
Root Mean Square Error	0.0184	0.0145	0.0118	0.0177	0.0134
CD-test (res)	0.12	2.31**	-1.49	1.99**	0.35
	-0.906	-0.021	-0.137	-0.047	-0.73
Stat-test (res)	Rejects I(1)	Rejects I(1)	Rejects I(1)	Rejects I(1)	Rejects I(1)
sig. signs/countries for <i>rgdp_pc</i> t-1	4 (-)	4(-)	3(-)	6(-)	8(-)
sig. signs/countries for <i>pc_pub_debt</i> t-1	1(+)/1(-)	1(+)	1(+)	-	-
sig. signs/countries for <i>D1pc_pub_debt</i>	2(+)	1(+)	-	-	-
sig. signs/countries for <i>pc_cap_stock</i> t-1	4(+)	3(+)/1(-)	2(+)	3(+)/1(-)	3(+)/1(-)
sig. signs/ countries for <i>D1pc_cap_stock</i>	7(+)	6(+)	3(+)	7(+)	3(+)
sig. signs/ countries for <i>gov_ratio</i> t-1	-	2(-)	1(-)	1(+)/3(-)	1(+)/2(-)
sig. signs/countries for <i>D1gov_ratio</i>	-	2(-)	-	2(-)	1(+)/2(-)
sig. signs/countries for <i>hc_ind</i> <sub>t-1</sub>	-	-	-	-	3(+)/1(-)
sig.signs/countries for <i>D1hc_ind</i>	-	-	-	-	1(+)

Notes: Values between parentheses below coefficients are p-values from robust (clustered) standard errors. Level of significance: \*\*\* for p-value<0.01; \*\*for p-value<0.05; \* for p-value<0.1. Wald test is a joint significance test for the regressors.

## 6. Conclusions

This paper empirically assesses the traditional determinants of economic growth, as defined by the literature, in African economies over the period 1950 to 2012, using growth regression techniques. The method that we use takes into account observed and unobserved heterogeneity. We found strong evidence of a positive impact of the growth rate of capital stock to economic growth for African countries, which is significant in all regressions. The growth rate of the government to GDP ratio is also important in all but one of the regressions in which appears, and its growth is harmful for economic growth. Human capital has a positive relationship with economic growth in regressions that don't include public debt. However, the cross country impact of these two variables on the growth rate of the economies (positive to some and negative to others) is not uniform, so that appropriate policies for one country may be seriously misguided in another. Concerning public debt, we found that it is not significant and therefore it has no impact on the economic growth of African countries. The growth rate of real GDP *per capita* also depends (negatively) on its past value, *i.e.*, the lower the real GDP *per capita* the higher will be its growth rate. We have also tested two proxies for institutions, which did not deliver significant results. The investment to GDP ratio is also not significant.

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APPENDIX E. VARIABLES FOR EACH AFRICAN COUNTRIES  
Table E 1. Time Dimensions of Variables for Each African Country

TIME DIMENSION OF VARIABLES										
country_name	rgdp_pc	rgdpe_pc_pwt	rgdp_pc_na_pwt	Inv_ratio	pc_Pub_Debt	Gov_ratio	HC_Ind	S18F2	BMERP	pc_Cap_Stock
Algeria	1950 - 2012	n/a	n/a	n/a	1964 - 2012	n/a	n/a	1967-2004	1962-1985	n/a
Angola	1950 - 2012	1970 - 2011	1970 - 2011	1970 - 2011	2000 - 2012	1970 - 2011	n/a	1975-2005	1975-1977 ; 1982-1985	1970-2011
Benin	1950 - 2012	1959 - 2011	1959 - 2011	1959 - 2011	2000 - 2012	1959 - 2011	1959 - 2011	1960-2005	1960-1985	1959-2011
Botswana	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1998 - 2012	1960 - 2011	1960 - 2011	1967-2005	1966-1985	1960-2011
Burkina Faso	1950 - 2012	1959 - 2011	1959 - 2011	1959 - 2011	2002 - 2012	1959 - 2011	n/a	1960-2005	1960-1985	1959-2011
Burundi	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1967-2005	1971-1985	1960-2011
Cameroon	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Cape Verde	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2002 - 2012	1960 - 2011	n/a	1975-2005	1979-1984	1960-2011
Central African Republic	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Chad	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1999 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Comoros Islands	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	n/a	1975-2005	1975-1985	1960-2011
Côte d'Ivoire	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1980 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Democratic Republic of Congo (Kinshasa)	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Djibouti	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2003 - 2012	1960 - 2011	n/a	1978-2005	1977-1985	1970-2011
Egypt	1950 - 2012	1950-2011	1950-2011	1950-2011	1970 - 2012	1950 - 2011	1950 - 2011	1953-2005	1951-1985	1950-2011
Equatorial Guinea	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1980 - 2012	1960 - 2011	n/a	1968-2005	1968-1969	1960-2011
Eritrea	1950 - 2012	n/a	n/a	n/a	2000 - 2012	n/a	n/a	n/a	n/a	n/a
Ethiopia	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1992 - 2012	1950 - 2011	n/a	1950-2005	1970-1985	1960-2011
Gabon	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1990 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Gambia	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1967-2005	1976-1985	1960-2011
Ghana	1950 - 2012	1955 - 2011	1955 - 2011	1955 - 2011	1952 - 2012	1955 - 2011	1955 - 2011	1960-2005	1962-1985	1955-2011
Guinea	1950 - 2012	1959 - 2011	1959 - 2011	1959 - 2011	1990 - 2012	1959 - 2011	n/a	1960-2013	1970-1985	1959-2011
Guinea Bissau	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	n/a	1975-2005	1976-1984	1960-2011
Kenya	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1960 - 2012	1950 - 2011	1950 - 2011	1967-2005	1970-1985	1950-2011
Lesotho	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1988 - 2012	1960 - 2011	1960 - 2011	1967-2005	1966-1985	1960-2011
Liberia	1950 - 2012	1964 - 2011	1964 - 2011	1964 - 2011	2000 - 2012	1964 - 2011	1964 - 2011	1950-2005	1950-1985	1964-2011
Libya	1950 - 2012	n/a	n/a	n/a	1990 - 2012	n/a	n/a	1953-2005	1952-1985	
Madagascar	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1990 - 2012	1960 - 2011	n/a	1960-2005	1960-1985	1960-2011
Malawi	1950 - 2012	1954 - 2011	1954 - 2011	1954 - 2011	2002 - 2012	1954 - 2011	1954 - 2011	1967-2005	1970-1985	1954-2011
Mali	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1965 ; 1968-1985	1960-2011
Mauritania	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Mauritius	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1970 - 2012	1950 - 2011	1950 - 2011	1968-2005	1976-1985	1950-2011
Morocco	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1965 - 2012	1950 - 2011	1950 - 2011	1956-2005	1956-1985	1950-2011
Mozambique	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1999 - 2012	1960 - 2011	1960 - 2011	1975-2005	1975-1985	1960-2011
Namibia	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1993 - 2012	1960 - 2011	1960 - 2011	1978-2005	1978-1985	1960-2011
Niger	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1995 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Nigeria	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1970 - 2012	1950 - 2011	n/a	1960-2005	1970-1985	1950-2011
Republic of Congo (Brazzaville)	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1990 - 2012	1950 - 2011	1950 - 2011	1960-2005	1964-1985	1970-2011
Rwanda	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1995 - 2012	1960 - 2011	1960 - 2011	1967-2005	1975-1985	1960-2011
São Tomé and Príncipe	1950 - 2012	1970 - 2011	1970 - 2011	1970 - 2011	2001 - 2012	1970 - 2011	n/a	1975-2005	1979-1984	1970-2011
Senegal	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2000 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Seychelles	1950 - 2012	n/a	n/a	n/a	1990 - 2012	n/a	n/a	1976-2005	1976-1985	
Sierra Leone	1950 - 2012	1961 - 2011	1961 - 2011	1961 - 2011	2000 - 2012	1961 - 2011	1961 - 2011	1967-2005	1976-1985	1961-2011
South Africa	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1950 - 2012	1950 - 2011	1950 - 2011	1950-2005	1950-1985	1950-2011
Sudan	1950 - 2012	1970 - 2011	1970 - 2011	1970 - 2011	1992 - 2012	1970 - 2011	1970 - 2011	1956-2005	1956 ; 1961-1985	1970-2011
Swaziland	1950 - 2012	1970 - 2011	1970 - 2011	1970 - 2011	1993 - 2012	1970 - 2011	1970 - 2011	1968-2005	1968-1985	1970-2011
Tanzania	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2002 - 2012	1960 - 2011	1960 - 2011	1961-2005	1970-1985	1960-2011
Togo	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	2001 - 2012	1960 - 2011	1960 - 2011	1960-2005	1960-1985	1960-2011
Tunisia	1950 - 2012	1960 - 2011	1960 - 2011	1960 - 2011	1990 - 2012	1960 - 2011	1960 - 2011	1956-2005	1956; 1960-1985	1960-2011
Uganda	1950 - 2012	1950 - 2011	1950 - 2011	1950 - 2011	1997 - 2012	1950 - 2011	1950 - 2011	1967-2005	1970-1985	1950-2011
Zambia	1950 - 2012	1955 - 2011	1955 - 2011	1955 - 2011	1990 - 2012	1955 - 2011	1955 - 2011	1967-2005	1970-1985	1955-2011
Zimbabwe	1950 - 2012	1954 - 2011	1954 - 2011	1954 - 2011	1965 - 2012	1954 - 2011	1954 - 2011	1965-2005	1965-1985	1954-2011

# Chapter 4:

## Determinants of Africa's Development: An Exploratory Study

### Abstract

We analyze the main economic, social, and institutional determinants of development for the African countries for the years 1996 and 2014. We want to assess which of these determinants matters the most for these countries and if there are any similarities among countries and also the evolution between the eldest and most recent year. We achieve this purpose through a principal components analysis for categorical data and cluster analysis. Results indicate a positive association between institutional, economic, and social determinants of development, which means that countries that exhibit a good performance in institutional indicators will also have a good performance in economic and social indicators, although results are not as clear cut in 2014 as they are in 1996. Additionally, a higher concentration of countries in the two clusters where these three indicators are better in 2014 (31 countries in 1996 and 49 countries in 2014), seem to indicate a positive evolution for development of African countries from 1996 to 2014. Results show that policy makers should take an integrated view in what concerns development policies.

*Keywords:* determinants of development; Africa; institutional, social and economic dimensions, Principal Components Analysis for Categorical Data, Cluster Analysis.

*JEL Codes:* C00, E02, O11, O55

## 1. Introduction

In this work we study the main economic, social, and institutional determinants of development for the African Continent. We want to assess which of these determinants matters the most for these countries and if there are any similarities between African countries. We achieve this purpose through a principal components analysis for categorical data and cluster analysis, applied to the years of 1996 and 2014, to assess the dynamics of development in the Continent.

Since the mid-1990s, African economies have achieved impressive growth rates, particularly in the period after the 2008 crisis, when many world economies were in recession or struggling to achieve very low growth rates. In Sub-Saharan African countries economic growth has decreased to 3.7% in 2015, compared with 4.6% registered in 2014. However, it is expected an average growth rate of 4.4% and 4.8% in 2016 and 2017, respectively, despite the slowdown of major African economies (African Economic Outlook, 2015). This increased growth of African economies is due to many factors such as the increase in domestic demand, the increase of foreign direct investment and also the positive behaviour of external demand. Data on African economic growth show a positive inversion of growth trends for African countries. The increasing sustainability and the causes of these growth trends, provides a set of new research questions for scholars around the World. The possible determinants of this new phenomenon are usually of economic, social, and institutional nature.

The paper is organized as follows. The next section presents a review of empirical and theoretical literature on the relationship between economic, social, and institutional factors, and growth and development. Section 3 presents the data and sources and discusses conceptual issues regarding our database and also the methodology. Section 4 discusses the results and section 5 presents the conclusion and policy recommendations.

## 2. Literature Review

This section will present the theoretical and empirical evidence on the relationship between economic, social, and institutional factors and growth and development.

### 2.1. The Relationship between Economic Determinants and Development

For the purpose of our work, we review the following economic determinants and their impact on development of African countries: trade openness, foreign direct investments, infrastructure development, and monetary and fiscal issues.

### 2.1.1. Trade Openness

After the Second World War, the world production of goods increased exponentially, only interrupted by two oil crises occurred in the seventieth. During this period, the value of world trade is equivalent to more than 13 trillion US\$, which is estimated to be 42% of the world's combined gross domestic product (Buckman, 2005). Concerning the African continent, solid measures have been taken to improve trade mechanisms as a way to reach better economic performance and growth.

A plethora of studies has been elaborated on the relationship between trade openness and economic growth. The empirical studies, particularly, are not consensual regarding the real impact of international trade on economic growth and development. Frankel and Romer (1999), Irwin and Tervio (2002), and Ulasan (2012) use empirical investigation to analyse how international trade affects the living standards of populations through income. They found strong evidences of positive effects of international trade on income and growth.

Solid evidence about the positive trade-growth nexus is provided by Sachs and Warner (1995) demonstrating, empirically, that open developing economies grow 4.49% *per year*, which is 2 p.p. more than open developed economies.

Olaifa *et al.* (2013) assume OLS regression techniques to study the impact of trade liberalization on economic growth in Nigeria between 1970 and 2012 and reach a conclusion that, in a long run, trade liberalization supports economic growth. However, they also found evidence that exports are negatively correlated to growth.

The importance of trade liberalisation in 28 Sub-Saharan African countries from 1981 to 2010 is investigated by Kassim (2015) which, similarly to Santos-Paulino and Thirlwall (2004) concludes that exports growth is positively correlated with trade liberalization but also states that imports grow faster by 2 p. p. with a very negative impact on the trade balance. The analysis on the impact of trade policy on economic growth in Sub-Saharan African countries is provided by Asfaw (2015) using a panel data of 47 countries covering the period from 2000 to 2008. The general conclusion of the paper is that trade policy positively correlates with economic growth. The greater is the level of economic openness, the better it is the impact on the economic growth.

### 2.1.2. Foreign Direct Investment

African countries have a desperate need to reduce the gap, at all levels, from developed economies, focusing actively in the last few decades in the process of creating incentives to attract foreign direct investment. Numerous studies have been conducted on the impact of FDI on the economies of developing countries but evidences are not conclusive.

Lumbila (2005), Sylwester (2005), and Ndikumana and Verick (2008) agree that the impact of FDI on the economy of developing countries is significantly positive, but different opinion is shared by Fry (1993), Dutt (1997), and Hermes and Lensink (2003).

Adams (2009) suggests that the FDI impact on economic growth is not linear and that it depends on factors such as human capital development, trade openness, and institutional performance, without which the FDI spillovers as explained by Borensztein *et al.* (1998), Carkovic and Levine (2002) and Le Vu and Suruga (2005) cannot be experienced. Nevertheless, the author agrees on the importance of FDI, although it highlights that it is not sufficient for economic growth. Farole and Winkler (2014) go further and identify the following determinants of spillovers from FDI: (1) quality investment climate; (2) stable political and social conditions, (3) favourable business environment, and good access to land and infrastructure, and (4) trade openness and the absorptive capacity of the host country.

In general, the growth impact of FDI is not very pronounced as shown in a recent analysis of 38 Sub-Saharan African countries made by Calderón and Nguyen (2015). A different statement is defended by Anyanwu and Yameogo (2015) who identify a U-shaped relationship between economic development and FDI inflows to West Africa. Seiko (2016) in an empirical investigation in 14 Eastern African countries covering the period between 1980 and 2013 confirms the positive correlation, but marginally significant effect, of foreign direct investment on economic growth.

### 2.1.3. Infrastructure Development

The development gaps between African countries and the rest of the developing world is still considerable, despite of the visible increment of *per capita* income initiated in the late 90's. The international community was called for to give its contribution and put infrastructure development in the agenda as one of the priorities and a fundamental condition for growth.

In a deep literature review on the impact of infrastructure development on growth and poverty reduction in Sub-Saharan Africa, Ndulu (2006) stresses the importance of infrastructure to growth and the essential role of governments in providing public goods, supporting the provision of infrastructure, and addressing market failures.

Poor infrastructures constitute a serious constraint to growth of African countries. Ashipala and Haimbodi (2003) investigate the relationship between public investment and economic growth in South Africa, Botswana and Namibia, using the VECM methodology, reached a positive relationship. Investigating the relationship between transportation capital investment and economic growth in one of the major African economies, Nigeria, between 1977 and 2009, Seetanah (2006) uses OLS regression techniques and found evidences that although positive, the impact of transportation on growth is not significant. Calderón and Servén (2008) claim, that under the right conditions, infrastructure development can play a major role in promoting growth and equity and, through both channels, helping in reducing poverty. They conclude that roads, power, and telecommunications infrastructure are the most

important determinants of long-run growth in Africa. Siyan *et al* (2015) recommend an increment of public investment on road and railways infrastructures, seaports and airways transportation as conditions to boost growth through productivity.

#### 2.1.4. Monetary and Fiscal Issues

Economists and decision makers generally agree on the importance of monetary policy as one of the key drivers of economic growth and it represents today a priority to most governments (Nkoro, 2005). In fact, economic growth is an essential condition for the reduction of poverty and improvement of living standards which ultimately means development. Precious and Palesa (2014) use different econometric techniques to study the relationship between monetary policy and economic growth in South Africa and recommend to the government, the implementation of sound monetary policies capable of attracting investments and therefore promote growth and development.

Fiscal policy is the mean by which a government adjusts its level of expenditure, influencing the whole economy. It is therefore, essential, to understand the composition of public expenditure which can be used as a key instrument for the promotion of equitable economic development. Baldacci *et al.* (2003) developed the issue of public expenditure composition and bring a surround analysis of the effect of quality fiscal adjustments on the achievement of higher growth through the reduction of unproductive expenditures and protection of public investment. Paternostro *et al.* (2007) defend the need for an appropriate framework that should be designed exclusively to assess the impact of public spending on growth and on poverty. According to these authors, such a framework must incorporate the theoretical and empirical guidance to public spending policy.

#### 2.2. The Relationship between Institutional Determinants and Development

During decades, economists and researchers stressed the importance and the role of the so-called traditional determinants such as physical and human capital accumulation, total factor productivity, technological innovation, the process of knowledge creation and diffusion, and international economic integration on economic growth (Helpman, 2004). However, nowadays, a growing number of studies have been conducted on the importance of institutional factors such as the role of political freedom, political instability, voice and accountability on economic growth and development. Experts have increasingly recognised that politics and institutions are key to the process of economic growth by affecting the incentives to accumulate, innovate and accommodate change (Avellaneda, 2010).

Regarding institutional factors, the debate on the impact of governance and corruption on growth and development is very intensive. In the sections that follow we will discuss them.

The lack of good governance, strong institutions, and high level of corruption has been pointed as major constraints that hinder African economies to achieve higher and sustainable growth. Numerous academics and policy makers are consensual that good governance matters for development. The quality of institutions, governance, business and investment climate are essential to growth and development (World Bank Institute, 2009, pp.1).

The World Governance Indicators (WGI) composed of voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption, have been used by a number of scholars and researchers as explanatory variables to analyse the possible relationship between governance and growth. In fact, there is a broad consensus among growth economists that good governance is a *sine qua non* condition to the achievement of better living standards (Kaufmann *et al.*, 2000; Knack, 2002). Good governance is important and plays a significant role in ensuring economic development. The impact of each one of these WGI's variables in the economic development of nations has been studied by many scholars and researchers. In a broad term, the impact of good governance in economic growth is positive but there is still a growing debate whether good governance practices lead to economic growth or whether economic growth leads to good governance (Acemoglu *et al.*, 2001, Kaufmann *et al.*, 2005, Arndt and Oman, 2006). Kaufmann *et al.* (2002) in a study of the World Bank evaluate the WGI's over the period 1996 to 2002 and find a positive relationship between *per capita* income and quality of governance. Emara, N. and Jhonsa (2014) show that despite the low performance of most of Middle East and North African countries on almost all the six measures of WGI, their estimated levels of *per capita* income are relatively higher than the rest of the countries in the sample. Emara and Chiu (2015) find that *per capita* GDP would rise by 2% if the CGI (Composite Governance Index) which summarises the existing six governance measurements of the World Governance Indicators increases by one unit. The authors concluded also that the effect of improvement of governance is not responsible for higher than expected *per capita* GDP in most of the oil rich Middle Eastern North African countries.

Many other authors have also found a positive relationship between good governance and economic development such as Knack and Keefer (1995), Mauro (1995), Kaufmann *et al* (1999a, b), and Campos and Nugent (1999). For instance, Knack and Keefer (1995) find that the quality of institutions, operationalised as the security of property rights and the level of contract enforcement, is crucial to growth and investment. Fayissa and Nsiah (2010) use fixed and random effects, and Arellano-Bond models, to investigate the role of governance in explaining the sub-optimal economic growth performance of African economies and concluded that different levels of growth in African economies result largely from good governance or lack of it. The concept of good governance incorporates good corporate, economic and political governance which, in fact, constitute the very basic dimensions of economic growth and development in Africa. Mwangi and Mbaku (2011) consider that good governance, at the very least, entails: (1) transparency and accountability in both the public

and private spheres; (2) maintenance of the rule of law; (3) provision of all market participants with incentive systems that enhance their involvement in productive activities; (4) protection of the person and property of individuals; (5) enforcement of property rights and freely negotiated contracts; and (6) the maintenance of an institutional environment conducive to mutually beneficial free exchange and peaceful coexistence.

The quality of institutions alone is also an important issue. Alesina (1997) demonstrates that institutional quality, as measured by bureaucratic efficiency, absence of corruption, protection of property rights, and the rule of law, is important for growth. Acemoglu *et al.* (2000) show, in their seminal study on institutions, that economic discrepancies between countries are consequences of the quality level of the institutions: "different colonization strategies have led to different types of institutions that remained until today". Furthermore, the work of Acemoglu *et al.* (2005) concludes that differences between countries in terms of income and economic development are explained by differences in institutions. Alence (2004) analyses the impact of political institutions on governance quality in a sample of 38 sub-Saharan African countries and show that democratic institutions systematically enhance African states' performance as agents of development. Acemoglu and Robinson (2008) found a correspondence between economic prosperity of the nations and political institutions. According to their paper, better institutions would positively contribute to the poverty alleviation. The same line of thinking is followed by Chauvet and Collier (2004) defending that developing countries with poor quality of governance will lead to less economic growth.

The question of political stability and democracy is also a topic by itself. Alesina and Perotti (1994) find a significant and robust negative effect of socio-political instability on investment in a panel of countries for the period 1970-85. They confirm the causality link from income distribution to socio-political instability and from the latter to investment. Fosu *et al.* (2006) concluded that there is no doubt that politically elected governments can bring better economic performance but they are unlikely to adopt economically desirable policies that are unpopular. Such governments also tend to increase the risk of political disorder in Africa, which may in turn be growth-inhibiting. According to these authors, recent attempts by African countries to adopt more democratic governments may not lead to the expected improved growth and development outcomes unless successful attempts at minimising political disorder can be achieved. Chauvet and Collier (2004) and Nurudeen *et al.* (2015) consider that it is crucial for all African countries to promote a stable political environment through sound institutional reforms, which ensure the respect for human rights, install a respect for the rule of law, and promote political inclusion and tolerance of diversity and fight continuously against corruption.

Another dimension and pre-requisite of good governance is the rule of law which should be seen as a superstructure that represents the supremacy of law over the entire society. Additionally, the role of an effective regulatory regime in promoting economic growth and development has generated considerable interest among researchers and practitioners in

recent years. Economic regulation arises from the existence of significant market failure and consequently from the market imperfection. As stated by Stiglitz (1998), market failures and externalities are more pronounced in developing countries and this is why the needs for public regulation should be much stronger. Barro (1998) considers that some variables such as schooling and life expectancy, lower fertility rate, lower government consumption, better maintenance of the rule of law, lower inflation, and improvements in the terms of trade play a positive effect on economic growth. The author also emphasizes the weak effect of political freedom on economic growth as well as the small effect of democracy on growth. Yet, concerning the regulations, Acemoglu *et al.* (2001) and Djankov *et al.* (2002) argue that a fundamental premise of business regulations is that economic activity requires good rules. These rules establish and clarify property rights and reduce the cost of resolving disputes. They increase the predictability of economic interactions providing contractual partners with certainty and protection against abuse. As defended by Morita and Zaelke (2007) only making or drafting good laws is not the solution, in fact ensuring the implementation of these laws and rules is equally important. Glaeser *et al.* (2004) use OLS growth regressions to investigate the relationship between institutions and growth and found consistent evidences which are in line with Djankov *et al.* (2002), who state that the institutions are stronger determinants of growth as the level of human and social capital rises in the community. Cross country regression studies conducted by Djankov *et al.* (2006) and Haidar (2012) show that business regulatory procedures are negatively correlated with economic growth. Their studies assume a temporal dimension of one year, reduced number of countries and a small number of indicators. They reached a conclusion that economic growth is a function of the existing regulatory framework. Adams and Opoku (2015) study the effect of foreign direct investment (FDI) on economic growth and analyse the impact of the regulatory regime on 22 sub-Saharan African countries. They use the Generalized Methods of Moments (GMM) estimation technique and a time series from 1980-2011 and find that both FDI and regulations (total regulations, credit market regulations, business regulations and labour market regulations) do not have an independent significant effect, however, their interaction has a significant positive effect on economic growth.

Voice and accountability are also important dimensions of governance. Academics and policy makers generally agreed that governance and accountability are preconditions for successful economic development. Sen (1999) argues that "the process of expanding the real freedoms that people enjoy", constitute the capabilities that allow people to do the things that they value. Those capabilities are associated with voice and accountability that he considers as "constitutive" elements of development. He defends that poverty is the deprivation of these capabilities. Similar opinion is shared by Gloppen *et al.* (2003) to whom "poor people identify the lack of voice and accountability as central to their experience of poverty". However, Sen (1999) also argue and recognise that freedoms, including those associated with voice and accountability, is closely related to human welfare or better governance. "Increased social

opportunities such as education can lead to better economic opportunities and therefore higher incomes". According to this author, political freedoms enable citizens to articulate their needs and values through their participation in public debate.

Corruption in Africa has reached concerning proportions that affect both public and private dimensions. It is a pandemic with broad spectrum over the whole continent with very deep negative socio-economic impacts. It results in the abuse and misuse of the already scarce resources, affecting the entire economy through multiplier effects (Gray and Kaufmann, 1998). Studies on the effects of corruption on economic growth have brought divergent results. Leff (1964) and Huntington (1968) were the first to advance the view that corruption can be efficiency enhancing because it removes government-imposed rigidities that impede investment and interfere with other economic decisions favourable to growth. Other authors viewed corruption as a factor that induces a more efficient provision of government services. More recently, Acemoglu and Verdier (1998) establish that in a situation where public officials are required to uphold property rights and enforce contractual arrangements, the costs associated with ensuring that public officials are not corrupt can be too high for the prevention of all corruption to be optimal.

However, the adverse impact of corruption in the development process of African countries is recognized at the international level. It deeply affects the dynamic and the efficiency of investments. Mauro (1995) defends that corruption lowers private investments thereby reducing growth. He states that "The negative association between corruption and investment, as well as growth, is significant, both in a statistical and in an economic sense." Corruption is detrimental to growth. These opinions are also shared by Tanzi (2002), Svensson (2005); and Gyimah-Brempong (2002) defending that countries with higher levels of corruption tend to grow more slowly.

The impact of corruption in African countries is much stronger in public investments. According to Lawal (2007), corruption increases the costs of doing business, wastes resources, hence radically reducing the revenues accruing to the state. Corruption deepens poverty and makes it difficult for ordinary people to get ahead as the result of their own efforts. There is increasing evidence that the social and economic cost of corruption disproportionately affects the poor, who not only suffer from the lack of services and efficient government, but who are also powerless to resist the demands of corrupt officials. Nageri *et al* (2013) investigated the impact of corruption on economic development of Nigeria using Ordinary Least Square (OLS) regression techniques and concluded that the Corruption Perception Index (CPI) as a proxy of Corruption has a negative impact on economic growth and development. They recommend the Nigerian government to follow the anti-corruption codes as stipulated in the legislations. This is the way to increase transparency, accountability and the application of the rule of law and the adequate strategy to improve the CPI ranking, induce investment, and foster economic growth and development. Nurudeen *et al.* (2015) investigate the causal relationship among corruption, political instability and economic development in the ECOWAS using the Granger

causality test within a multivariate cointegration and error-correction framework for the 1996-2012 period. In the short term they concluded that political instability Granger-causes economic development and in the long term economic development Granger-causes corruption. They recommend to the ECOWAS government to employ sound policies to promote political stability.

### 2.3. The Relationship between Social Determinants and Development

It is unquestionable that one of the main concerns of development is to solve the numerous issues inherent to the increase of the population. To accomplish this mission, all the governments should pursue economic growth at a rate which is greater than the growth rate of the population. In Africa the population is growing at a very rapid rate, 2.55% annually between 2010 and 2015, compared with the world's 1.18% (United Nations, 2015). This trend will certainly bring accrued social difficulties for the African continent, with impact on the standards of living of the population.

Most of the studies witness a positive relationship between economic growth and poverty reduction. Particularly to Sub-Saharan African countries the evidences of positive correlation are strong (Moser and Ichida (2001)). It is consensual that growth leads to poverty reduction and that income elasticity of poverty differs from country to country as a unit increase in income leads to more or less poverty reduction. It all depends on how the national wealth is distributed. The equitable income distribution contributes to the decline of poverty (Go *et al*, 2007). The achievements, in terms of growth and poverty reduction of the last fifteen to twenty years in Sub-Saharan Africa, have been very impressive and mark a major break from the past (Mckay and Thorbecke, 2015).

A more healthy population generates a number of positive outcomes, such as a more productive workforce, while also reducing the risk of poverty traps. Health is a productive asset and therefore ill health is responsible for reduced productivity, shortened working lives and increased numbers of days lost to illness WHO (2002). As stated by Eggoh *et al*. (2015), education and health expenditures have a negative impact on economic growth for a sample of African countries due to issues of inefficiency, corruption, bureaucracy, and underinvestment. Contrarily, Gyimah-Brempong (1998), Behbudi *et al*. (2010) show a positive correlation between economic growth and the share of government budget allocated to health care in African countries.

The relationship between inequality and economic growth and development has been much discussed. Ravallion (1995) reports no systematic relationship between inequality and income growth and Deininger and Olinto (2000) find that inequality has an economically significant negative effect on growth. Focusing on agricultural asset, they defend that higher land inequality significantly lowers returns to education, thus slowing accumulation of human capital and impeding development. Barro (2000) analyses the impact of inequality on economic

growth in a panel of 146 countries and found evidences of negative correlations in poor countries with *per capita* GDP below 2070 USD and positive for countries above that threshold. Okojie and Shimeles (2006) analyse the issue of income and non-income inequalities in Sub-Saharan Africa and conclude that the efficiency in reducing the level of poverty is lesser in countries with high initial income inequality. These countries need a combination of economic growth and reductions in inequality to make a significant impact on poverty. For other countries, particularly those with the lowest *per capita* income, the effect of redistribution on poverty is smaller due to the effect of growth.

### 3. Data and Methodology

#### 3.1. Data

Our database comprises a range of economic, social, and institutional variables for 54 African countries. We have built two datasets. The first dataset is for the year 1996, designated as the oldest year and a second data set specific for the year 2014, designated as the most recent year. In the case where the years of data are different from the above, it will be indicated under the description of each variable. Our choice of the first and the last year is restricted to data availability. Below, we will detail our database, dividing it by economic, social, and institutional variables.

##### 3.1.1. Economic Variables

In this section we will describe the economic variables used in our analysis. We will divide them between quantitative and qualitative variables.

###### Quantitative Variables

- **Business Freedom** - is a composite indicator of the efficiency of government in regulating business. The indicator includes measurements such as the ease of starting, operating, and closing a business. The business freedom score for each country is a number between 0 and 100, with higher values corresponding to better outcomes. The starting year is 1997. The source is The Index of Economic Freedom from the Heritage Foundation.
- **Fiscal Freedom** - is a composite measure of the burden of taxes that includes both marginal tax rates and the overall level of taxation (direct and indirect taxes), as a percentage of GDP. It varies between 0 and 100, with higher values corresponding to

better outcomes. The source is The Index of Economic Freedom from the Heritage Foundation.

- **Investment Freedom** - The Index assesses a variety of regulatory restrictions that are normally enforced on investment. It varies between 0 and 100, with higher values corresponding to better outcomes. The starting year is 1997. The source is The Index of Economic Freedom from the Heritage Foundation.
- **Monetary Freedom** - combines a measure of price stability with a valuation of price controls, which can distort market activity. It varies between 0 and 100, with higher values corresponding to better outcomes. The starting year is 1997. The source is The Index of Economic Freedom from the Heritage Foundation.
- **Trade Freedom** is a composite measure of the extent of tariff and non-tariff barriers that affect international trade of goods and services. It varies between 0 and 100, with higher values corresponding to better outcomes. The source is The Index of Economic Freedom from the Heritage Foundation.
- **GDP Growth Rate** - Percent annual change of the Gross Domestic Product (GDP). The source is The Index of Economic Freedom from the Heritage Foundation.
- **Government Spending Score** - represents the government expenditure score in each country and is composed of government expenditures, which include consumption by the state and all transfer payments related to various entitlement programs. The scale for scoring government spending is non-linear and the minimum component score is zero. The source is The Index of Economic Freedom from the Heritage Foundation.
- **delta33** - Percent annual change of the Gross National Product (GNP) *Per Capita*. The final year is 2012. The source is the Databanks International database.

#### Qualitative Variables

- **Economic Effectiveness ("ecoeff")** - Data on real GDP *per capita*, which is coded into a five-point fragility scale. The standardized categories are as follows:
  - (0) - no fragility, greater than or equal to \$7500
  - (1) - low fragility, \$3000.00 to \$7499.99
  - (2) - medium fragility, \$1200.00 to \$2999.99
  - (3) - high fragility, \$500.00 to \$1199.99
  - (4) - extreme fragility, less than \$500

The most recent year is 2013. The source is the State Fragility Index from the Center for Systemic Peace.

- **Economic Legitimacy ("ecoleg")** - Represents the share of export trade in industrial goods. When the percentage of industrial goods is low, the country is highly

dependent on primary commodities for foreign trade. The manufacturing percentage of merchandise exports is converted to a four-point fragility score, where:

(0) - no fragility, greater than 40%

(1) - low fragility, greater than 25% and less than or equal to 40%

(2) - medium fragility, greater than 10% and less than or equal to 25%

(3) - high fragility, less than or equal to 10%

The most recent year is 2013. The source is the State Fragility Index from the Center for Systemic Peace.

### 3.1.2. Institutional Variables

In this section we will describe the institutional variables used in our analysis. We will divide them between quantitative and qualitative variables.

#### Quantitative Variables

The first six quantitative institutional variables were taken from the database *Worldwide Governance Indicators* (Kaufmann, 2010). They are expressed in percentile rank terms from 0 to 100, with higher values corresponding to better outcomes.

- **Control of corruption** - Reveals perceptions of the extent to which public power is used for private gain.
- **Government effectiveness** - Echoes opinions of the quality of public and civil services and the degree of its independence from political pressures, as well as the quality of policy making and execution, and the credibility of the government's commitment to such policies.
- **Political stability and absence of violence/terrorism** - Measures views of the probability of political uncertainty and/or politically-motivated violence, including terrorism.
- **Regulatory Quality** - Reflects opinions of the capacity of the government to frame and implement sound policies and rules that allow and stimulate private sector development.
- **Rule of law** - Reveals perceptions of the degree to which agents have trust in and stand by the rules of society, and specifically, the quality of contract enforcement, property rights, the police, and the courts, as well as the probability of crime and violence.
- **Voice and accountability** - Reflects perceptions of the extent to which a country's citizens are capable to take part in selecting their government, as well as freedom of expression, freedom of association, and free media.
- **Freedom from Corruption** - it is mostly derived from the *Transparency International's Corruption Perceptions Index* (CPI). It varies between 0 and 100, with

higher values corresponding to better outcomes. The source is The Index of Economic Freedom from the Heritage Foundation.

- **polity2** - It is a composite indicator that ranges between -10 (strongly autocratic) and 10 (strongly democratic). The source is the POLITY IV Project from the Center for Systemic Peace.
- **durable** - Is the number of years since the latest regime change or the end of a transition period defined by the absence of stable political institutions. The source is the POLITY IV Project from the Center for Systemic Peace.
- **legis07** - It is an index of seats detained by the largest party. The final year is 2013. The source is the Databanks International database.
- **legis08** - It is a measure of political polyarchy or pluralism. The final year is 2013. The source is the Databanks International database.
- **polit10** - Size of Cabinet - refers to the number of ministers of "cabinet rank". The final year is 2013. The source is the Databanks International database.
- **polit11** - Number of Major Cabinet Changes - refers to the number of time in a year that a new premier is named and/or 50% of the cabinet positions are assumed by new ministers. The final year is 2013. The source is the Databanks International database.
- **polit12** - Changes in Effective Executive - refers to the number of times in a year that actual control of executive power changes hands. Such a change entails that the new executive be independent of his predecessor. The final year is 2013. The source is the Databanks International database.
- **polit15** - Number of legislative elections - refers to the number of elections held for the lower house of a national legislature in a given year. The final year is 2013. The source is the Databanks International database.
- **S17F6/Domestic 6** - Any violent protest or clash of more than 100 citizens including the use of physical strength. The source is the Databanks International database.

#### Qualitative Variables

The source of the following variables is the State Fragility Index from the Center for Systemic Peace.

- **Security Effectiveness ("seceff")** - Measure of general security and vulnerability to political violence. The final values are converted to a four-point fragility scale:
  - (0) - 0, no fragility
  - (1) - 0.1-15, low fragility
  - (2) - 15.1-100, medium fragility
  - (3) - greater than 100, high fragility
- **Security Legitimacy ("secleg")** - It is a measure of state repression. The final values are converted to a four-point fragility scale:

- (0) - 1.0-2.0, no fragility
- (1) - 2.1-3.0, low fragility
- (2) - 3.1-4.0, medium fragility
- (3) - greater than 4.0, high fragility
- **Political Effectiveness (“poleff”)** - Measures the Regime Stability. The final values are converted to a four-point fragility scale:
  - (0) - no fragility
  - (1) - low fragility
  - (2) - medium fragility
  - (3) - high fragility
- **Political Legitimacy (“polleg”)** - Measures the Regime/Governance Inclusion. The final values are converted to a four-point fragility scale:
  - (0) - no fragility
  - (1) - low fragility
  - (2) - medium fragility
  - (3) - high fragility

The source of the following variable is the Index of Economic Freedom from the Heritage Foundation.
- **Property Rights** - It measures the extent to which a country’s laws safeguard private property rights and the degree to which those laws are respected. It is scored between 0 and 100 and the more effective the legal protection of property, the higher a country’s score. The definition of the different values is:
  - 0 - Private property is banned, and all property belongs to the state. People do not have the right to sue others and do not have access to courts. Corruption is widespread.
  - 10 - Private property is rarely protected, and nearly all property belongs to the state. Protection of property is almost impossible to impose. The judiciary is so corrupt that property is not protected successfully. Expropriation is common.
  - 20 - Private property is feebly protected. The court system is so inefficient and corrupt that outside settlement and arbitration is the custom. Property rights are problematic to enforce. Judicial corruption is widespread. Expropriation is common.
  - 30 - Property possession is weakly protected. The court system is highly inefficient. Corruption is general, and the judiciary is intensely influenced by other divisions of government. Expropriation is probable.
  - 40 - The court system is highly inefficient, and postponements are so lengthy that they discourage recourse to courts. Corruption exists, and the judiciary is influenced by other offices of government. Expropriation is possible.

50 - The court system is inefficient and subject to deferrals. Corruption may be present, and the judiciary may be biased by other branches of government. Expropriation is possible but infrequent.

60 - Implementation of property rights is sloppy and subject to delays. Corruption is probable but rare, and the judiciary may be influenced by other divisions of government. Expropriation is improbable.

70 - Private property is assured by the government. The court system is subject to delays and negligent in imposing contracts. Corruption is possible but rare, and expropriation is unlikely.

80 - Private property is guaranteed by the government. The court system imposes contracts capably but with some deferrals. Corruption is marginal, and expropriation is very unlikely.

90 - Private property is assured by the government. The court system enforces contracts efficiently. The justice system penalizes those who seize private property illegitimately. Corruption is practically nonexistent, and expropriation is highly unlikely.

100 - Private property is guaranteed by the government. The court system enforces contracts efficiently and swiftly. The justice system chastises those who confiscate private property illicitly. There is no corruption or expropriation.

The source of the following variables is the Databanks International database.

- **polit06** - Premier. The score can be:
  - (1) Formal executive is premierial, including "Chairman, Council of Ministers"
  - (2) Formal executive is non-premierial.The final year is 2013.
- **polit07** - Type of effective executive, which refers to the individual who exercises main influence in determining most major decisions affecting the nation's internal and external affairs. The score can be:
  - (1) Monarch
  - (2) President
  - (3) Premier
  - (4) Military
  - (5) OtherThe final year is 2013.
- **polit08** - Selection of effective executive- It is scored as follows:
  - (1) Direct Election
  - (2) Indirect Election
  - (3) NonelectiveThe final year is 2013.

- **polit09** - Degree of Parliamentary Responsibility refers to the extent to which a premier must be subject to the support of a majority in the lower house of a legislature to stay in office.
  - (1) Irrelevant
  - (2) Absent
  - (3) Incomplete
  - (4) Complete
 The final year is 2013.
- **polit13** - Legislative Effectiveness. It is scored as follows:
  - (1) None.
  - (2) Ineffective
  - (3) Partially Effective
  - (4) Effective
 The final year is 2013.
- **polit14** - Legislative Selection. It is scores as follows:
  - (1) None
  - (2) Nonelective
  - (3) Elective.
 The final year is 2013.

### 3.1.3. Social Variables

In this section we will describe the social variables used in our analysis. We will divide them between quantitative and qualitative variables.

#### Quantitative Variables

- **delta1** - Percent annual change of the population. The final year is 2012. . The source is the Databanks International database.
- **delta02** - Represents the annual percentage change of the number of people living *per* unit in an area (e.g. , *per* square mile); the number of people relative to the space occupied by them (density). The final year is 2012. The source is the Databanks International database.

#### Qualitative Variables

- **Social Effectiveness ("soceff")** - It is the Human Development Index (HDI), from the United National Development Report (UNDR), converted to a four-point fragility scale based on the cut-points of the lower three HDI quintiles in the baseline year, 2004. It is scored as follows:
  - (0) - no fragility, greater than 0.700
  - (1) - low fragility, greater than 0.600 and less than or equal to 0.700

(2) - medium fragility, greater than 0.400 and less than or equal to 0.600

(3) - high fragility, less than or equal to 0.400

The final year is 2013. The source is the State Fragility Index from the Fund for Peace Organization.

## 3.2. Methodology

In this section we will describe our methodologies. Firstly, a nonlinear factorial analysis - Principal Components Analysis for Categorical Data (CatPCA) - was used to examine the inter-relationships between the multiple indicators in 1996 and also in 2014 (Gifi, 1996; Heiser & Meulman 1994; Meulman, 1992). The optimal-scaling approach implemented by CatPCA allows to accommodate the nominal, the ordinal, and the quantitative input variables that we needed to analyse in this work. The use of CatPCA was also extremely important for the management of non-responses, since countries that did not have available information on certain indicators were excluded only from the optimal quantification of these indicators. As a result, 17 of the 53 countries were not eliminated. Like principal component analysis, CatPCA using an optimal scaling procedure defines a new system of orthogonal axes - dimensions (factors) - that are composed by all the active variables which contribute with a different loading. We have found 3 dimensions (see Figures F(1) and G(1) and Tables F(1) and G(1) in Appendix F and G for the two years).

Next, an agglomerative clustering algorithm was used through two different methods: Ward's method and complete linkage in order to define a typology of countries Hair *et al.*, (2010). To perform the Hierarchical Cluster Analysis (HCA) the CatPCA object scores were used as new (and multidimensional) input variables. Then the HCA was suited by a k-means algorithm and a typology of countries was identified. We have found 4 clusters (see tables F2(a), F2(b) and G2(a), G2(b) in Appendix F and G for 1996 and 2014, respectively). Data analysis was conducted in IBM-SPSS Statistics 23.0.

## 4. Results

In this section we first present our results for the years 1996 and 2014 and then make a comparison between them. For each year a 4 cluster solution was found, which describes 4 different types according to the economic, institutional, and social variables that we have in our database.

### 4.1. Results for 1996

In this section we analyse the results for the eldest year in our sample - 1996, which exhibits a 4 cluster solution. Table 8 shows the distribution of the number of countries by the 4

clusters (types). There is one type (Type 2) that only has one country - Mauritius (an island), while the type with more countries included is Type 4, with more than 50% of African countries. Table F2(a) and F2(b) in Appendix F shows which countries are in each type. There is no clear geographical concentration, although type 4 gathers more countries from the south of the continent and types 1 and 3 more countries from the north of the continent.

Table 8. Distribution of the Countries by Types (Clusters) in 1996

Typology	N	%
Type 1	7	13.2
Type 2	1	1.9
Type 3	15	28.3
Type 4	30	56.6
Total	53	100.0

Tables F(3) to F5 in Appendix F show results for institutional variables by type for 1996. Type 2 (Mauritius) is the cluster where these indicators exhibit the best performance (on average), followed by Type 4, than Type 3 and finally Type 1. An analysis of mean and median of all the thirteen qualitative institutional indicators by Type confirms higher values in Type 2 than in the others three Types (Table F(3)), followed by Type 4 and 3. Type 1 registers, in fact, a smaller value for mean and median. Regarding the qualitative institutional indicators by Type, we also confirm better performance for Type 2. For all the six qualitative indicators, excluding "Property Right", the results (100%) point out for "No fragility". In Types 1, 3, and 4 the results are scattered across various levels of performance. Type 4 shows the second best performance, followed by 3 and 1. Particular attention should be addressed to the political legitimacy indicator ("polleg") which, with the exception to Type 2 (Mauritius), exhibits significant proportion of "high fragility", respectively 71.4%, 100% and 69% for all the others Types (1, 3 and 4). Security legitimacy ("secleg") and political effectiveness ("poleff") indicators show a strong weight of "medium/high fragility" for the three Types (Table F(5)). The same happens with economic indicators, although only two indicators are considered. The indicators economic effectiveness ("ecoeff") presents a considerable weight of "high fragility" also for cluster 1 (85.7%), cluster 3 (53.8%) and cluster 4 (44.8%). Same propensity of "high fragility" is also observed for the economic legitimacy indicator ("ecoleg") with 71.4% for cluster 1, 84.6% for cluster 3 and 55.2% for cluster 4 (Tables F(6) to F(8)) and with the (qualitative) social effectiveness indicator "soceff" which denotes also "high fragility" for cluster 1 (71.4%), cluster 3 (100%) and cluster 4 (69%) (Table F(11)). Results indicate a positive association between institutional, economic, and social determinants of development.

## 4.2. Results for 2014

In this section we analyse the results for the most recent year in our sample - 2014, which also exhibits a 4 cluster solution. Table 9 shows the distribution of the number of countries by the 4 clusters (types). There is one type (Type 3) that only has one country - Lybia, while the type with more countries included is Type 2, with more than 70% of African countries. Table G2 in Appendix G shows which countries are in each type. There is no clear geographical concentration, at the exception of type 1 which includes 3 countries that share borders in the north of the continent - Eritrea, Somalia, and Sudan.

Table 9. Distribution of the Countries by Types (Clusters) in 2004

Typology	N	%
Type 1	3	5.7
Type 2	38	71.7
Type 3	1	1.9
Type 4	11	20.8
Total	53	100.0

Tables G3 to G5 in Appendix G show results for institutional variables by type for 2014. Type 4 is the cluster where these indicators exhibit the best performance (on average), followed by Type 2, than Type 1, and finally Type 3 (Lybia). Between all the qualitative institutional indicators, the political legitimacy ("polleg") is the one that shows a significant proportion of "no/low fragility" for cluster 4 (88.9%), cluster 2 (68.4%) and cluster 1 (66.6%). The security effectiveness indicator ("seceff") exhibits a significant proportion of "no fragility" for cluster 4 (100%) and cluster 2 (60.5%). Generally, this trend is repeated for the others indicators. The same happens with economic indicators, particularly with quantitative indicators which express clearly, in terms of means and medians, the best performance of Type 4, followed by other clusters as above mentioned. Concerning the two qualitative economic indicators considered in the analysis ("ecoeff" and "ecoleg"), the results obtained are not so clearly accentuated in terms of the performance ranking of the different clusters (Tables G6 to G8), and with the (qualitative) social indicator (Table G11). Results indicate a positive association between institutional, economic, and social determinants of development.

## 4.3. Comparison between the Two Years

The concentration of countries in just one type is higher in 2014 (71.7%) than in 1996 (56.6%), as we could see in Tables 1 and 2. In 1996 our analysis isolated the country (Mauritius) with the best performance, while in 2014 isolated the country with the worst (Lybia). In both

years, the cluster with the second best performance is the largest, which, due to the higher concentration of countries in the largest cluster in 2014, seems to indicate that economic, institutional, and social accomplishments are improving in more countries in Africa. Additionally, a higher concentration of countries in the two clusters where these three indicators are better (31 countries in 1996 and 49 countries in 2014), seem to indicate a positive evolution for development of African countries from 1996 to 2014.

Results indicate a positive association between institutional, economic, and social determinants of development, which means that policy makers should take an integrated view in what concerns development policies, although results are not as clear cut in 2014 as they are in 1996.

## 5. Conclusions

We analyze the main economic, social, and institutional determinants of development for the African Continent, for the years 1996 and 2014, assessing which of these determinants matters the most for these countries and if there are any similarities between African countries and also the evolution between the eldest and most recent year. Firstly we have used principal components analysis for categorical data to examine the relationships between the indicators. From this analysis, results a new system of three dimensions that are composed by all the active variables. Then, a cluster analysis was done using these three dimensions, which resulted in a 4 cluster solution for both years.

Results indicate a positive association between institutional, economic, and social determinants of development, which means that countries that exhibit a good performance in institutional indicators will also have a good performance in economic and social indicators, although results are not as clear cut in 2014 as they are in 1996. Additionally, a higher concentration of countries in the two clusters where these three indicators are better in 2014 (31 countries in 1996 and 49 countries in 2014), seem to indicate a positive evolution for development of African countries from 1996 to 2014. Results show that policy makers should take an integrated view in what concerns development policies.

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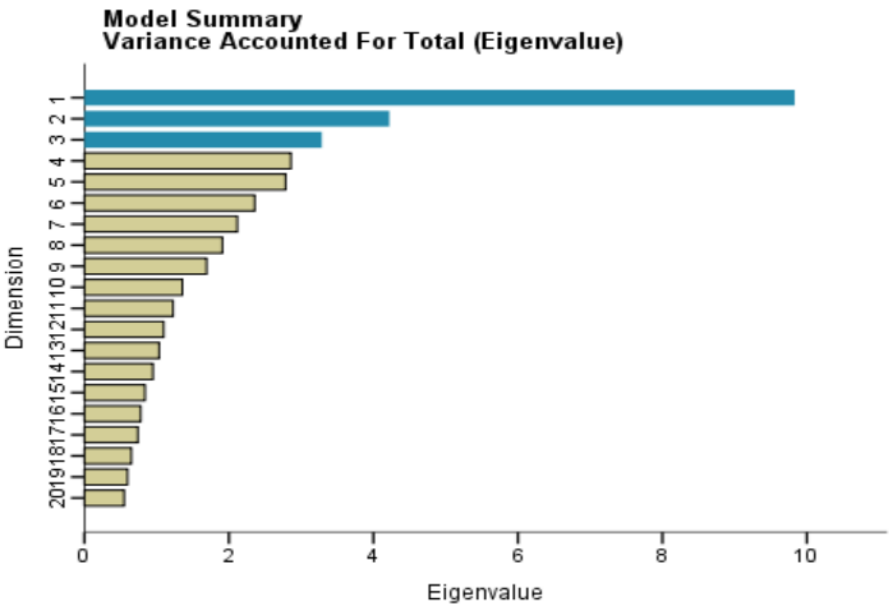


Figure F 1. Variance Accounted for by Dimension

Table F 1. Weight of the Variables by Dimensions

Component Loadings			
	Dimension		
	1	2	3
Control of Corruption Rank	<b>.836</b>	-.045	-.116
Government Effectiveness Rank	<b>.899</b>	-.020	-.172
Political Stability and Absence of Violence/terrorism Rank	<b>.871</b>	.107	.069
Regulatory Quality Rank	<b>.885</b>	.223	-.216
Rule of Law Rank	<b>.954</b>	-.009	-.129
Voice and Accountability Rank	<b>.921</b>	.137	.098
Freedom from Corruption	.251	<b>.343</b>	<b>-.377</b>
Fiscal Freedom	-.005	.210	<b>.299</b>
Monetary Freedom	<b>.450</b>	.204	-.209
Trade Freedom	.015	<b>.326</b>	-.245
GDP Growth Rate (%)	.140	-.186	<b>-.315</b>
polity2	<b>.394</b>	.116	.256
durable	<b>.431</b>	-.269	.010
delta01 (%)	-.281	<b>.671</b>	.127
delta02 (%)	-.345	<b>.577</b>	.125
delta33 (%)	<b>.242</b>	-.067	-.076
legis07	<b>.165</b>	<b>.165</b>	<b>.337</b>
Index (legis08)	<b>.543</b>	.246	<b>.500</b>
Size of Cabinet (polit10)	.095	.084	<b>.307</b>
S17F6/Domestic 6	<b>-.502</b>	-.127	.330
Security Effectiveness (Seceff)	<b>-.603</b>	-.223	.063
Security Legitimacy ("secleg")	<b>-.510</b>	<b>.505</b>	-.377
Political Effectiveness ("poleff")	<b>-.567</b>	.047	.102
Political Legitimacy ("polleg")	<b>-.571</b>	<b>.468</b>	-.052
Economic Effectiveness ("ecoeff")	<b>-.591</b>	-.051	-.071
Economic Legitimacy ("ecoleg")	<b>-.576</b>	<b>.538</b>	-.172
Social Effectiveness ("soceff")	<b>-.453</b>	<b>.573</b>	-.219
Property Right	<b>.373</b>	.141	<b>-.484</b>
Gov't Spending	<b>.240</b>	.077	-.030
Business Freedom	.229	<b>.488</b>	-.179
Investment Freedom	<b>.494</b>	.276	-.286
polit11	-.102	.158	<b>.499</b>
polit12	-.150	.206	<b>.448</b>
polit06	-.005	-.070	<b>-.543</b>
polit07	<b>-.426</b>	<b>-.624</b>	-.181
polit08	<b>-.390</b>	<b>-.529</b>	-.185
polit09	<b>.495</b>	<b>-.506</b>	.387
polit13	<b>.311</b>	.099	<b>.611</b>
polit14	<b>.432</b>	<b>.463</b>	.175
polit15	-.119	<b>.320</b>	<b>.322</b>

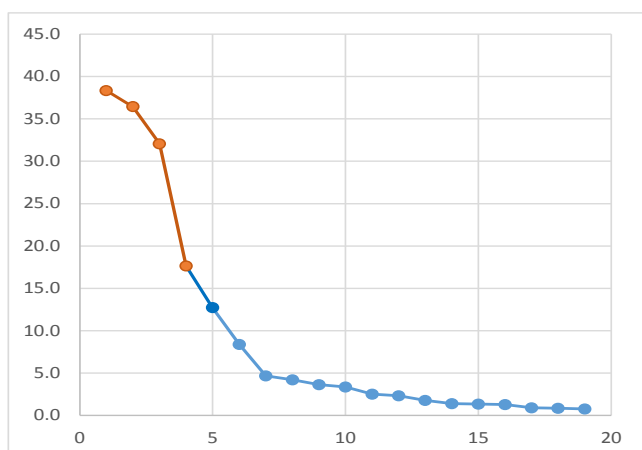


Figure F 2a. Ward Method - 1996

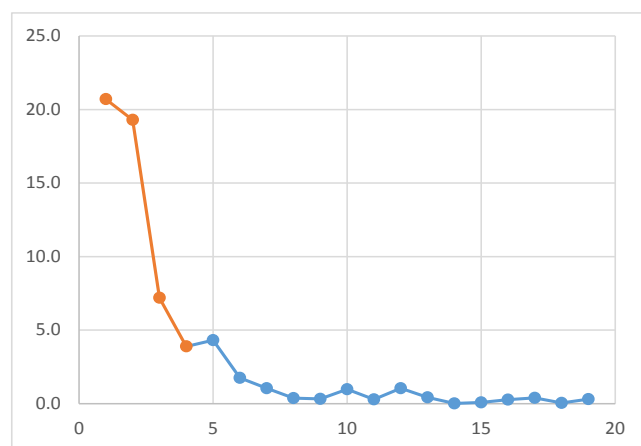


Figure F 2b. Furthest Method - 1996

Table F 2a. Distribution of the Countries by Types

Typology.1996		Country	
Type 1	1	CONGO, DEM	
	2	ERITREA	
	3	LIBERIA	
	4	LIBYA	
	5	NIGERIA	
	6	RWANDA	
	7	SOMALIA	
	Total	N	7
Type 2	1	MAURITIUS	
	Total	N	1
Type 3	1	ANGOLA	
	2	BURUNDI	
	3	CAMEROON	
	4	CENTRAL AF	
	5	COMOROS	
	6	CONGO, REP	
	7	ETHIOPIA	
	8	GUINEA	
	9	GUINEA-BIS	
	10	MADAGASCAR	
	11	MAURITANIA	
	12	NIGER	
	13	SÃO TOMÉ	
	14	SIERRA LEO	
	15	SUDAN	
	Total	N	15

Table F 2b. Distribution of the Countries by Types (Conclusion)

Type 4	1	ARGELIA	
	2	BENIN	
	3	BOTSWANA	
	4	BURKINA FA	
	5	CAPE VERDE	
	6	CHAD	
	7	CÔTE D'IV	
	8	DJIBOUTI	
	9	EGYPT, ARA	
	10	EQUATORIAL	
	11	GABON	
	12	GAMBIA, TH	
	13	GHANA	
	14	KENYA	
	15	LESOTHO	
	16	MALAWI	
	17	MALI	
	18	MOROCCO	
	19	MOZAMBIQUE	
	20	NAMIBIA	
	21	SENEGAL	
	22	SEYCHELLES	
	23	SOUTH AFRI	
	24	SWAZILAND	
	25	TANZANIA	
	26	TOGO	
	27	TUNISIA	
	28	UGANDA	
	29	ZAMBIA	
	30	ZIMBABWE	
	Total	N	30
Total	N		53

Table F 3. Distribution of the Quantitative Institutional Indicators by Type - Mean and Median

	Typology (1996)							
	Type 1		Type 2		Type 3		Type 4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Control of Corruption Rank	18,40	8,78	73,17	73,17	22,70	11,71	43,16	40,49
Government Effectiveness Rank	8,92	11,22	63,41	63,41	14,80	8,29	40,69	42,93
Political Stability and Absence of Violence/terrorism Rank	7,28	3,85	84,13	84,13	24,65	11,54	40,95	36,30
Regulatory Quality Rank	7,42	3,43	50,49	50,49	14,90	14,22	38,55	36,52
Rule of Law Rank	9,84	2,39	78,47	78,47	15,34	7,66	37,93	34,21
Voice and Accountability Rank	6,52	6,25	73,08	73,08	19,52	17,79	34,85	32,69
Freedom from Corruption	55,53	54,70	.	.	53,06	50,55	64,53	63,60
polity2	-3,57	-6,00	10,00	10,00	,14	,00	-,59	-2,00
durable	8,86	2,00	28,00	28,00	4,29	1,50	11,55	5,00
legis07	91,14	,00	110,00	110,00	177,13	161,00	141,17	132,50
Index (legis08)	2,71	2,00	10,00	10,00	7,07	7,00	6,60	8,00
Size of Cabinet (polit10)	19,43	23,00	31,00	31,00	23,93	23,00	22,97	24,50

Table F 4. Distribution of the Quantitative Institutional Indicators by Type - Minimum and Maximum

	Typology (1996)							
	Type 1		Type 2		Type 3		Type 4	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Control of Corruption Rank	,00	70,24	73,17	73,17	4,88	63,90	6,34	82,44
Government Effectiveness Rank	,49	19,02	63,41	63,41	2,93	52,20	9,27	79,02
Political Stability and Absence of Violence/terrorism Rank	,00	17,31	84,13	84,13	1,92	81,73	4,33	81,73
Regulatory Quality Rank	,00	22,55	50,49	50,49	4,41	27,45	5,88	75,00
Rule of Law Rank	,00	38,76	78,47	78,47	,96	54,55	11,00	75,60
Voice and Accountability Rank	,00	12,98	73,08	73,08	2,40	56,73	6,73	74,52
Freedom from Corruption	33,30	78,60	.	.	32,90	74,80	48,80	81,30
polity2	-7,00	,00	10,00	10,00	-7,00	9,00	-9,00	9,00
durable	,00	45,00	28,00	28,00	,00	34,00	,00	44,00
legis07	,00	538,00	110,00	110,00	,00	357,00	,00	529,00
Index (legis08)	,00	7,00	10,00	10,00	2,00	10,00	,00	10,00
Size of Cabinet (polit10)	,00	28,00	31,00	31,00	10,00	35,00	11,00	33,00

Table F 5a. Distribution of the Qualitative Institutional Indicators by Type

		Typology (1996)							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
S17F6/Domestic 6	0	3	50,0	1	100,0	7	46,7	29	96,7
	1	2	33,3	0	,0	6	40,0	1	3,3
	2	1	16,7	0	,0	2	13,3	0	,0
	Total	6	100,0	1	100,0	15	100,0	30	100,0
Security Effectiveness (Seceff)	No fragility	1	14,3	1	100,0	1	7,7	9	31,0
	Low fragility	2	28,6	0	,0	5	38,5	12	41,4
	Medium fragility	1	14,3	0	,0	2	15,4	6	20,7
	High fragility	3	42,9	0	,0	5	38,5	2	6,9
	Total	7	100,0	1	100,0	13	100,0	29	100,0
Security Legitimacy ("secleg")	No fragility	0	,0	1	100,0	0	,0	0	,0
	Low fragility	2	28,6	0	,0	0	,0	7	24,1
	Medium fragility	3	42,9	0	,0	4	30,8	10	34,5
	High fragility	2	28,6	0	,0	9	69,2	12	41,4
	Total	7	100,0	1	100,0	13	100,0	29	100,0
Political Effectiveness ("poleff")	No fragility	1	14,3	1	100,0	0	,0	11	37,9
	Low fragility	1	14,3	0	,0	3	23,1	8	27,6
	Medium fragility	4	57,1	0	,0	3	23,1	8	27,6
	High fragility	1	14,3	0	,0	7	53,8	2	6,9
	Total	7	100,0	1	100,0	13	100,0	29	100,0
Political Legitimacy ("polleg")	Low fragility	1	14,3	1	100,0	0	,0	3	10,3
	Medium fragility	1	14,3	0	,0	0	,0	6	20,7
	High fragility	5	71,4	0	,0	13	100,0	20	69,0
	Total	7	100,0	1	100,0	13	100,0	29	100,0
Property Right	10	2	66,7	0	,0	6	60,0	3	13,0
	30	0	,0	0	,0	4	40,0	8	34,8
	50	1	33,3	0	,0	0	,0	10	43,5
	70	0	,0	0	,0	0	,0	2	8,7
	Total	3	100,0	0	,0	10	100,0	23	100,0

Table F 5b. Distribution of the Qualitative Institutional Indicators by Type (Conclusion)

		Typology (1996)							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
polit06	1	3	42,9	1	100,0	14	93,3	21	70,0
	2	4	57,1	0	,0	1	6,7	9	30,0
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit07	1	0	,0	0	,0	0	,0	2	6,7
	2	2	28,6	0	,0	14	93,3	27	90,0
	3	0	,0	1	100,0	1	6,7	1	3,3
	4	1	14,3	0	,0	0	,0	0	,0
	5	4	57,1	0	,0	0	,0	0	,0
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit08	1	0	,0	0	,0	11	73,3	25	83,3
	2	0	,0	1	100,0	2	13,3	3	10,0
	3	7	100,0	0	,0	2	13,3	2	6,7
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit09	1	4	57,1	0	,0	1	6,7	9	30,0
	2	3	42,9	0	,0	9	60,0	15	50,0
	3	0	,0	0	,0	5	33,3	6	20,0
	4	0	,0	1	100,0	0	,0	0	,0
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit11	0	6	85,7	1	100,0	2	13,3	19	63,3
	1	0	,0	0	,0	7	46,7	10	33,3
	2	1	14,3	0	,0	5	33,3	0	,0
	3	0	,0	0	,0	1	6,7	1	3,3
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit12	0	6	85,7	1	100,0	10	66,7	28	93,3
	1	1	14,3	0	,0	3	20,0	2	6,7
	2	0	,0	0	,0	2	13,3	0	,0
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit13	1	2	28,6	0	,0	0	,0	3	10,0
	2	5	71,4	0	,0	11	73,3	14	46,7
	3	0	,0	1	100,0	4	26,7	12	40,0
	4	0	,0	0	,0	0	,0	1	3,3
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit14	1	2	28,6	0	,0	0	,0	3	10,0
	2	4	57,1	0	,0	0	,0	0	,0
	3	1	14,3	1	100,0	15	100,0	27	90,0
	Total	7	100,0	1	100,0	15	100,0	30	100,0
polit15	1	7	100,0	1	100,0	10	66,7	26	86,7
	2	0	,0	0	,0	5	33,3	4	13,3
	Total	7	100,0	1	100,0	15	100,0	30	100,0

Table F 6. Distribution of the Quantitative Economic Indicators by Type - Mean and Median

	Typology (1996)							
	Type 1		Type 2		Type 3		Type 4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Fiscal Freedom	56,73	73,00	.	.	74,64	87,65	70,66	74,10
Gov't Spending	50,00	55,00	.	.	58,00	55,00	61,77	55,00
Business Freedom	47,50	47,50	.	.	56,50	55,00	61,35	55,00
Monetary Freedom	38,75	46,90	.	.	54,45	58,80	64,70	65,30
Trade Freedom	35,67	34,00	.	.	41,24	44,40	50,93	53,80
Investment Freedom	35,00	30,00	.	.	37,27	30,00	54,44	50,00
GDP Growth Rate (%)	6,41	4,65	5,20	5,20	1,70	4,52	7,18	6,38
delta33 (%)	342,50	653,00	976,00	976,00	-196,79	,00	785,40	596,00

Table F 7. Distribution of the Quantitative Economic Indicators - Minimum and Maximum

	Typology (1996)							
	Type 1		Type 2		Type 3		Type 4	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Fiscal Freedom	,00	97,20	.	.	,00	92,00	30,90	90,60
Gov't Spending	40,00	55,00	.	.	40,00	70,00	40,00	85,00
Business Freedom	40,00	55,00	.	.	40,00	70,00	40,00	85,00
Monetary Freedom	,00	61,20	.	.	,00	80,30	38,60	81,40
Trade Freedom	24,00	49,00	.	.	16,20	70,20	23,60	74,00
Investment Freedom	10,00	70,00	.	.	30,00	50,00	30,00	70,00
GDP Growth Rate (%)	1,97	12,70	5,20	5,20	-24,80	20,00	-5,11	29,11
delta33 (%)	-769,00	833,00	976,00	976,00	-3415,00	1111,00	-1429,00	4167,00

Table F 8. Distribution of the Qualitative Economic Indicators by Type

		Typology (1996)							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
Economic Effectiveness ("ecoeff")	No fragility	0	,0	1	100	1	7,7	9	31,0
	Low fragility	0	,0	0	,0	2	15,4	3	10,3
	Medium fragility	1	14,3	0	,0	3	23,1	4	13,8
	High fragility	6	85,7	0	,0	7	53,8	13	44,8
	Total	7	100,0	1	100	13	100,0	29	100,0
Economic Legitimacy ("ecoleg")	No fragility	0	,0	0	,0	0	,0	0	,0
	Low fragility	1	14,3	1	100	0	,0	2	6,9
	Medium fragility	1	14,3	0	,0	2	15,4	11	37,9
	High fragility	5	71,4	0	,0	11	84,6	16	55,2
	Total	7	100,0	1	100	13	100,0	29	100,0

Table F 9. Distribution of the Qualitative Social Indicators by Type - Mean and Median

	Typology (1996)							
	Type 1		Type 2		Type 3		Type 4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
delta01 (%)	189,14	170,00	107,00	107,00	273,73	280,00	241,97	252,00
delta02 (%)	207,71	263,00	107,00	107,00	266,40	277,00	239,87	249,50

Table F 10. Distribution of the Qualitative Social Indicators by Type - Minimum and Maximum

	Typology (1996)							
	Type 1		Type 2		Type 3		Type 4	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
delta01 (%)	47,00	353,00	107,00	107,00	118,00	434,00	24,00	401,00
delta02 (%)	63,00	353,00	107,00	107,00	115,00	434,00	83,00	441,00

Table F 11. Distribution of the Qualitative Social Indicators by Type

		Typology (1996)							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
Social Effectiveness ("soceff")	No fragility	1	14,3	0	,0	0	,0	0	,0
	Low fragility	0	,0	1	100,0	0	,0	2	6,9
	Medium fragility	1	14,3	0	,0	0	,0	7	24,1
	High fragility	5	71,4	0	,0	13	100,0	20	69,0
	Total	7	100,0	1	100,0	13	100,0	29	100,0

Appendix G - RESULTS FOR 2014

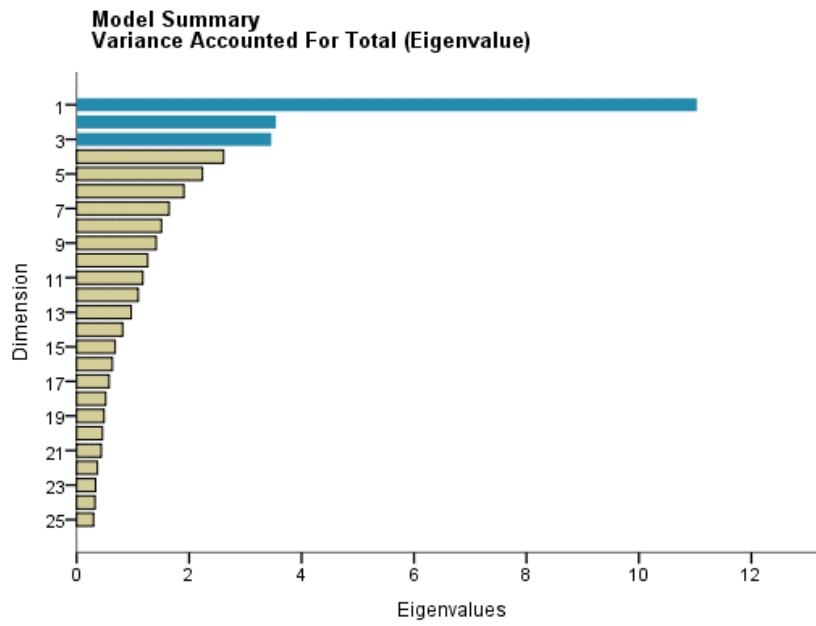


Figure G 1. Variance Accounted for by Dimension

Table G 1. Weight of the Variables in the Three Dimensions

<b>Component Loadings</b>			
	Dimension		
	1	2	3
ContrCorrup	<b>.892</b>	-.034	-.009
GovEffect	<b>.917</b>	-.021	.005
PolStab	<b>.792</b>	-.246	.072
RegQual	<b>.929</b>	.005	.169
RuleLaw	<b>.947</b>	-.008	.064
VoiceAccount	<b>.857</b>	.096	.094
FreedCorrup	<b>.927</b>	.007	.029
polity2	<b>.442</b>	.064	.007
durable	<b>.539</b>	-.287	.032
legis07	-.084	<b>.552</b>	-.170
legis08	<b>.462</b>	<b>.356</b>	.106
polit10	-.160	<b>.438</b>	.232
FisFreed	.176	<b>.381</b>	-.196
GovSpend	-.134	-.338	<b>.554</b>
BusFreed	<b>.726</b>	.124	-.197
MonFreed	.390	.116	<b>.423</b>
TradeFreed	<b>.408</b>	.070	.032
InvestFreed	<b>.672</b>	-.119	.363
GDPGR	-.147	<b>.609</b>	<b>-.405</b>
delta33	.009	<b>-.358</b>	<b>-.314</b>
delta01	<b>-.579</b>	.097	.599
delta02	<b>-.510</b>	.066	.601
S17F6	<b>-.214</b>	<b>.423</b>	-.048
Seceff	<b>-.377</b>	<b>-.307</b>	<b>-.505</b>
secleg	<b>-.484</b>	<b>-.376</b>	<b>-.457</b>
poleff	<b>-.594</b>	.185	.046
polleg	<b>-.428</b>	.265	-.156
propright	<b>.751</b>	-.199	-.204
polit11	-.162	<b>.377</b>	.288
polit12	-.200	<b>.606</b>	-.109
ecoeff	<b>-.474</b>	-.190	<b>.434</b>
ecoleg	<b>-.507</b>	.021	-.151
soceff	<b>-.463</b>	<b>-.430</b>	.117
polit06	.011	<b>-.306</b>	-.054
polit07	-.009	<b>.388</b>	-.218
polit08	.208	.060	<b>-.668</b>
polit09	.177	<b>.345</b>	-.104
polit13	<b>.443</b>	.136	.043
polit14	<b>.352</b>	<b>.511</b>	<b>.336</b>
polit15	-.189	.085	<b>.405</b>

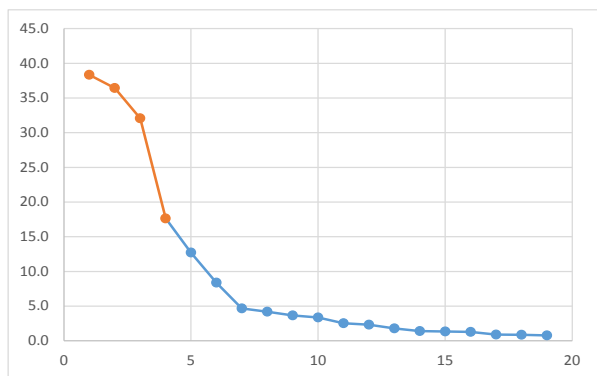


Figure G 2a. Ward Method - 2014

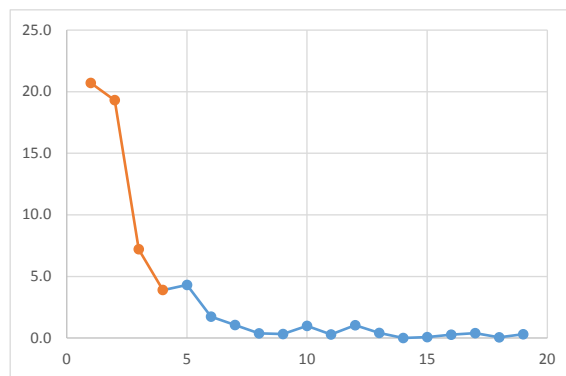


Figure G 2b. Furthest Method - 2014

Table G 2a. Distribution of the Countries by Types

Typology.2014		Country	
Type 1	1		ERITREA
	2		SOMALIA
	3		SUDAN
	Total	N	3
Type 2	1		ALGERIA
	2		ANGOLA
	3		BENIN
	4		BURKINA FASO
	5		BURUNDI
	6		CAMEROON
	7		CENTRAL AFRICAN REPUBLIC
	8		CHAD
	9		COMOROS
	10		CONGO, DEM. REP.
	11		CONGO, REP.
	12		CÔTE D'IVOIRE
	13		DJIBOUTI
	14		EGYPT, ARAB REP.
	15		EQUATORIAL GUINEA
	16		ETHIOPIA
	17		GABON
	18		GAMBIA, THE
	19		GUINEA
	20		GUINEA-BISSAU
	21		KENYA
	22		LIBERIA
	23		MADAGASCAR
	24		MALAWI

Table G 2b. Distribution of the Countries by Types (Conclusion)

25			MALI	
26			MAURITANIA	
27			MOZAMBIQUE	
	28		NIGER	
	29		NIGERIA	
	30		RWANDA	
	31		SENEGAL	
	32		SIERRA LEONE	
	33		SWAZILAND	
	34		TANZANIA	
	35		TOGO	
	36		UGANDA	
	37		ZAMBIA	
	38		ZIMBABWE	
	Total	N		38
Type 3	1		LIBYA	
	Total	N		1
Type 4	1		BOTSWANA	
	2		CAPE VERDE	
	3		GHANA	
	4		LESOTHO	
	5		MAURITIUS	
	6		MOROCCO	
	7		NAMIBIA	
	8		SÃO TOMÉ AND PRINCIPE	
	9		SEYCHELLES	
	10		SOUTH AFRICA	
	11		TUNISIA	
	Total	N		11
Total		N		53

**Table G 3. Distribution of the Quantitative Institutional Indicators by Types - Mean and Median**

	Typology.2014							
	Type 1		Type 2		Type 3		Type 4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
ContrCorrup	8,17	3,85	23,90	23,32	1,44	1,44	61,67	61,06
GovEffect	2,40	3,37	20,57	18,27	2,88	2,88	53,41	55,29
PolStab	8,74	3,88	24,90	24,27	4,37	4,37	50,84	52,91
RegQual	3,04	1,44	24,90	25,48	,48	,48	52,05	52,40
RuleLaw	4,33	3,37	25,22	23,56	2,88	2,88	59,18	62,50
VoiceAccount	1,97	1,48	26,99	23,89	16,26	16,26	58,98	61,58
FreedCorrup	12,55	9,76	25,46	25,29	18,31	18,31	44,21	41,61
polity2	-2,00	-4,00	1,95	4,00	,00	,00	6,89	8,00
durable	8,67	3,00	12,61	12,00	,00	,00	26,11	23,00
legis07	70,67	100,00	187,14	167,00	513,00	513,00	195,00	182,00
legis08	1,67	,00	4,43	4,00	5,00	5,00	5,64	5,00
polit10	20,33	19,00	27,42	27,50	28,00	28,00	23,55	24,00

**Table G 4. Distribution of the Quantitative Institutional Indicators by Type - Minimum and Maximum**

	Typology.2014							
	Type 1		Type 2		Type 3		Type 4	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
ContrCorrup	,48	20,19	,00	76,92	1,44	1,44	50,48	79,81
GovEffect	,00	3,85	1,44	56,25	2,88	2,88	18,27	82,69
PolStab	1,94	20,39	,49	55,34	4,37	4,37	15,05	85,44
RegQual	,96	6,73	2,40	58,65	,48	,48	25,48	80,77
RuleLaw	,00	9,62	1,44	61,06	2,88	2,88	19,71	78,85
VoiceAccount	,49	3,94	1,97	57,64	16,26	16,26	28,08	76,35
FreedCorrup	5,00	22,88	15,86	46,86	18,31	18,31	32,55	61,24
polity2	-7,00	5,00	-9,00	9,00	,00	,00	-4,00	10,00
durable	2,00	21,00	,00	45,00	,00	,00	,00	49,00
legis07	,00	112,00	,00	806,00	513,00	513,00	110,00	369,00
legis08	,00	5,00	,00	6,00	5,00	5,00	4,00	10,00
polit10	12,00	30,00	11,00	38,00	28,00	28,00	14,00	36,00

Table G 5a. Distribution of the Qualitative Institutional Indicators by Type

		Typology.2014							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
S17F6	0	2	66,7	16	44,4	0	,0	8	72,7
	1	0	,0	10	27,8	1	100,0	0	,0
	2	1	33,3	6	16,7	0	,0	1	9,1
	3	0	,0	1	2,8	0	,0	0	,0
	4	0	,0	2	5,6	0	,0	1	9,1
	7	0	,0	1	2,8	0	,0	0	,0
	8	0	,0	0	,0	0	,0	1	9,1
	Total	3	100,0	36	100,0	1	100,0	11	100,0
Seceff	0	1	33,3	23	60,5	0	,0	9	100,0
	1	0	,0	7	18,4	1	100,0	0	,0
	2	0	,0	7	18,4	0	,0	0	,0
	3	2	66,7	1	2,6	0	,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	9	100,0
secleg	0	0	,0	3	7,9	0	,0	5	55,6
	1	0	,0	22	57,9	0	,0	4	44,4
	2	0	,0	10	26,3	1	100,0	0	,0
	3	3	100,0	3	7,9	0	,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	9	100,0
poleff	0	0	,0	6	15,8	0	,0	5	55,6
	1	1	33,3	9	23,7	0	,0	3	33,3
	2	1	33,3	10	26,3	0	,0	1	11,1
	3	1	33,3	13	34,2	1	100,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	9	100,0
polleg	0	1	33,3	13	34,2	0	,0	7	77,8
	1	1	33,3	13	34,2	0	,0	1	11,1
	2	0	,0	5	13,2	0	,0	1	11,1
	3	1	33,3	7	18,4	1	100,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	9	100,0
propright	10	1	100,0	5	13,2	1	100,0	0	,0
	15	0	,0	2	5,3	0	,0	0	,0
	20	0	,0	6	15,8	0	,0	1	9,1
	25	0	,0	1	2,6	0	,0	0	,0
	30	0	,0	19	50,0	0	,0	1	9,1
	40	0	,0	4	10,5	0	,0	3	27,3
	45	0	,0	1	2,6	0	,0	0	,0
	50	0	,0	0	,0	0	,0	3	27,3
	65	0	,0	0	,0	0	,0	1	9,1
	70	0	,0	0	,0	0	,0	2	18,2
Total	1	100,0	38	100,0	1	100,0	11	100,0	

Table G 5b. Distribution of the Qualitative Institutional Indicators by Type (Conclusion)

		Typology.2014							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
polit06	1	1	33,3	26	68,4	1	100,0	7	63,6
	2	2	66,7	12	31,6	0	,0	4	36,4
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit07	1	0	,0	1	2,6	0	,0	1	9,1
	2	3	100,0	35	92,1	0	,0	8	72,7
	3	0	,0	1	2,6	1	100,0	2	18,2
	4	0	,0	1	2,6	0	,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit08	1	1	33,3	32	84,2	0	,0	6	54,5
	2	1	33,3	2	5,3	1	100,0	4	36,4
	3	1	33,3	4	10,5	0	,0	1	9,1
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit09	1	2	66,7	14	36,8	0	,0	4	36,4
	2	1	33,3	19	50,0	0	,0	2	18,2
	3	0	,0	5	13,2	0	,0	4	36,4
	4	0	,0	0	,0	1	100,0	1	9,1
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit11	0	3	100,0	22	57,9	0	,0	10	90,9
	1	0	,0	16	42,1	1	100,0	1	9,1
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit12	0	3	100,0	34	89,5	0	,0	11	100,0
	1	0	,0	4	10,5	1	100,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit13	1	0	,0	2	5,3	0	,0	0	,0
	2	3	100,0	23	60,5	0	,0	1	9,1
	3	0	,0	13	34,2	1	100,0	7	63,6
	4	0	,0	0	,0	0	,0	3	27,3
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit14	1	0	,0	1	2,6	0	,0	0	,0
	2	2	66,7	1	2,6	0	,0	0	,0
	3	1	33,3	36	94,7	1	100,0	11	100,0
	Total	3	100,0	38	100,0	1	100,0	11	100,0
polit15	1	3	100,0	26	68,4	1	100,0	11	100,0
	2	0	,0	12	31,6	0	,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	11	100,0

Table G 6. Distribution of the Quantitative Economic Indicators by Type - Mean and Median

	Typology.2014							
	Type 1		Type 2		Type 3		Type 4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
FisFreed	71,03	71,03	75,55	77,12	94,99	94,99	77,11	76,81
GovSpend	78,21	78,21	76,69	79,70	,00	,00	59,00	64,12
BusFreed	36,55	36,55	49,58	48,00	50,10	50,10	67,21	67,60
MonFreed	56,67	56,67	72,44	72,96	66,93	66,93	74,29	75,33
TradeFreed	62,37	62,37	66,98	66,72	.	.	69,33	69,60
InvestFreed	7,50	7,50	47,50	50,00	5,00	5,00	60,00	55,00
GDPGR	1,31	1,31	5,14	4,72	104,48	104,48	3,85	3,82
delta33	2040,50	2040,50	407,92	230,00	.	.	853,09	877,00

Table G 7. Distribution of the Quantitative Economic Indicators by Type - Minimum and Maximum

	Typology.2014							
	Type 1		Type 2		Type 3		Type 4	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
FisFreed	57,00	85,05	46,16	90,77	94,99	94,99	66,91	92,15
GovSpend	66,08	90,34	50,98	92,59	,00	,00	,00	83,28
BusFreed	18,60	54,50	24,90	69,60	50,10	50,10	52,60	80,70
MonFreed	55,77	57,56	58,99	88,32	66,93	66,93	65,81	79,08
TradeFreed	55,60	69,14	51,80	84,62	.	.	33,40	88,64
InvestFreed	,00	15,00	5,00	70,00	5,00	5,00	35,00	85,00
GDPGR	-4,40	7,02	-1,49	19,77	104,48	104,48	2,55	6,98
delta33	1500,00	2581,00	-1207,00	2553,00	.	.	-313,00	1884,00

Table G 8. Distribution of the Qualitative Economic Indicators by Type

		Typology.2014							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
ecoeff	0	0	,0	1	2,6	0	,0	0	,0
	1	0	,0	2	5,3	1	100,0	5	55,6
	2	0	,0	3	7,9	0	,0	2	22,2
	3	3	100,0	32	84,2	0	,0	2	22,2
	Total	3	100,0	38	100,0	1	100,0	9	100,0
ecoleg	0	0	,0	2	5,3	0	,0	7	77,8
	1	0	,0	5	13,2	0	,0	1	11,1
	2	1	33,3	12	31,6	0	,0	1	11,1
	3	2	66,7	19	50,0	1	100,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	9	100,0

Table G 9. Distribution of the Quantitative Social Indicators by Type - Mean and Median

	Typology.2014							
	Type 1		Type 2		Type 3		Type 4	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
delta01	196,33	188,00	256,13	260,00	201,00	201,00	103,09	105,00
delta02	190,33	179,00	256,68	259,50	202,00	202,00	118,36	112,00

Table G 10. Distribution of the Quantitative Social Indicators by Type - Minimum and Maximum

	Typology.2014							
	Type 1		Type 2		Type 3		Type 4	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
delta01	160,00	241,00	123,00	435,00	201,00	201,00	-41,00	220,00
delta02	155,00	237,00	121,00	443,00	202,00	202,00	-38,00	244,00

Table G 11. Distribution of the Qualitative Social Indicators by Type

		Typology.2014							
		Type 1		Type 2		Type 3		Type 4	
		N	%	N	%	N	%	N	%
soceff	0	0	,0	1	2,6	1	100,0	2	22,2
	1	0	,0	1	2,6	0	,0	5	55,6
	2	1	33,3	26	68,4	0	,0	2	22,2
	3	2	66,7	10	26,3	0	,0	0	,0
	Total	3	100,0	38	100,0	1	100,0	9	100,0