In Search of Fiscal Space in Africa: The Role of the Quality of Government Spending

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Abstract

Taking advantage of African experience, this paper proposes to enrich empirically the issue of fiscal space. Africa has markedly achieved significant economic progress since the 80's decade crisis. However, this progress has been proven insufficient to curb dramatically the infrastructures gap and poverty because of the shortage of funding. While several ways are being looked for creating a sustained fiscal space, this paper argues that improving the quality of public spending remains the key avenue. It then derives fiscal space by computing Data Envelopment Analysis (DEA) efficiency scores of public spending using a group of 62 African and non-African countries over the period 1980-2013. The results indicate that on average African countries are less efficient than their peers. The average efficiency score of public spending for African countries relatively to their peers is 0.585 suggesting that they could reduce their spending by 41.5% to achieve the same results. This results in a lost fiscal space of about 11.5% of GDP equivalent to 43.8% of the outlay used and 3/4 of the current level of tax revenues. However, they have achieved a substantial improvement in efficiency change over time. Moreover, the results evidence that this estimated lost fiscal space is tied to the other indicators of fiscal space. In particular, larger lost fiscal space is positively correlated with foreign aid and external debt inflows but negatively with tax capacity.

Key words

Fiscal space, Efficiency of public spending, DEA, Africa

JEL codes

C14, H40, H50, H60, H62, O1

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1 Introduction

Africa has markedly made headway since the end of the 80's decade crisis. The continent is one of the world's fastest-growing region in spite of a context of harsh global imbalances and financial crisis. Over the last decade, African economy increased by more than 5% per year. Some human development indicators have set some encouraging progress. For instance, the global infant mortality rate fell from 168.1 deaths per 1,000 live births over the period 1990-1995 to 100.6 over 2010-2015 (United Nations, 2013). The gross rate of secondary school enrollment in Sub-Saharan Africa (SSA) has doubled between 1985 to 2009[1]. According to many institutions, these results arise from better good governance and fiscal affairs management (Panel, 2014). The policies associated to the debt reduction initiatives, the increase and the improvement in aid systems have certainly released greater fiscal space. This suggests that governments have benefited from more budget room that allows them to fund their priorities without worsening their solvency and the stability of the economy (Heller, 2005).

However, the continent continues to face huge challenges. The recent Ebola outbreak has revealed that the current performances are vulnerable. The gap of infrastructures remains important and continues to retard a fair development of the different economic sectors. A study of AICD[2] reported by OECD (2012) states that the annual funding gap is estimated to US$ 93 billion. As a result, the strong growth has not generated a significant poverty reduction in the region leading it to adopt an inclusive growth (IG) agenda for 2063. Meanwhile, it has to cope with a recent emergence of terrorism to alleviate the investors' concerns.

The region therefore needs more financial resources to strengthen its recent progress and support its IG agenda. But the financial contribution of the domestic private sector is currently limited because of a low financial depth and a difficult access to the international capital markets. Creating a wider fiscal space becomes therefore inescapable. In practice, countries can expand their fiscal space by increasing tax revenues, borrowing from domestic and international markets,

[1] http://www.uis.unesco.org/Education/Documents/ged-2011-fr.pdf.pdf

[2] Africa Infrastructure Country Diagnostic (AICD). It is a project designed to expand the worlds knowledge of physical infrastructure in Africa and supported by the World Bank, the African Union, the Agence Française de Développement, the Department for International Development (U.K.), the European Union, the New Economic Partnership for Africas Development, and the Public-Private Infrastructure Advisory Facility.

seigniorage, mobilizing foreign aid, or by increasing the efficiency of their spending (Heller, 2006; Debrun et al., 2006; Melecky and Raddatz, 2015). Nevertheless, there is a strong evidence that the use of some of these instruments is limited by the potential noxious consequences they may involve. The recent sovereign debt crisis in the world and the ongoing one in Greece highlight that public debt may pose serious concerns for fiscal sustainability and economic growth, as the theories of debt overhang and intolerance predict. In Africa with a limited domestic saving, funding public spending through domestic borrowing may seriously crowd out private investment. Because potentially inflationary, seigniorage may induce huge macroeconomic uncertainties. Now, it is less used since most of the countries have adopted inflation targeting. Regarding aid, although it has been an important funding option for the continent, it has declined during the last decade. Moreover, the current tightening fiscal policies in donor countries do not guarantee a further surge in aid for next years. Aid unpredictability may also harm a good medium-term budget planning. Taxation and improving the efficiency of spending remain the two potentials to harness fully. But, despite a recent greater attention to taxation, most of the countries have difficulty in reaching the minimum level of 20% of GDP of tax revenues as recommended by the United Nations. Rather than increasing funding, fiscal space literature emphasizes that improving the quality of public spending, i.e. improving efficiency, is the best way to address the shortage of resources without compromising the sustainability of public budget. But it does not pay much attention to the estimation of this "fiscal space", i.e. here the potential progress in improving public spending (the same public service delivery with less money), assuming given revenue unchanged as the constraint.

This paper therefore estimates the fiscal space African countries could have mobilized by improving the quality of public spending. The quality of public spending is measured by computing Data Envelopment Analysis (DEA) efficiency's scores. This approach allows to estimate the amount of spending a country would have saved in order to reach the same level of output in comparison with its peers. As outputs, I use a set of human and sectoral development indicators that are close to the Millennium Development Goals (MDGs). Countries' performances are then assessed closely to their own defined objectives.

The present approach enriches the existing measures of fiscal space. Ghosh et al. (2013) propose

the gap between the observed value of debt and a potential debt limit from which fiscal solvency is of concern. Aizenman et al. (2013) refer to the number of tax-years a country would take to repay its debt. Brun et al. (2006) emphasizes on the deviation of domestic tax level from its potential. In spite of the relevance of these approaches, the inconclusiveness of the fiscal policy literature (Rogoff and Reinhart, 2010; Minea et al., 2012) is illustrative that an additional variable is necessary in assessing fiscal space. The alternative proposed in this paper is built on the meaningful assumption that inefficiency of public spending matters.

This paper is not the first to assess the efficiency of public spending in Africa. Gupta and Verhoeven (2001), Chemli and Neticha (2006) and Pang and Herrera (2005) have yet done similar exercises by focusing on some specific areas such as education and health. In contrast, the present paper clearly analyzes the challenges of the quality of public finances for building a sustainable fiscal space and poverty alleviation in African region. Moreover, it considers the two major components of public budget, investment and consumption, as inputs. Indeed, the structure of public spending is identified in literature as a starting-point of its quality; investment is typically seen as productive and consumption not. But the issue is still on debate. Some recent findings from IMF staff (Dabla-Norris et al., 2012; International Monetary Fund, 2015) indicate that high investment does not necessarily mean increased productivity. Here, I analyze investment and consumption as complements since they often need each other to be effective. In addition, the paper uses an updated dataset of 45 African countries over 1980-2013. This extensive panel data aids to catch the dynamics between countries' performances and the quality in public affairs management over comprehensive sub-periods.

The remainder of the paper is structured as follows. Section 2 defines the concept of fiscal space adopted and its measurements. Section 3 explains the methodology. Section 4 presents the results. Section 5 concludes.

2 Fiscal space and quality of budget allocations

Economists and decision-makers are increasingly paying attention to the concept of "fiscal space". Heller (2005) has defined it as room in a governments budget that allows it to provide resources for a desired purpose without jeopardizing the sustainability of its financial position or the stability of the economy. The World Bank and the International Monetary Fund have put on this definition by stating that "fiscal space exists when a government can increase expenditure without impairing its fiscal solvency, i.e. without impairing its capacity to service its debt.", (Committee et al., 2006). For Roy and Heuty (2012), this definition of fiscal space focusing on sustainability is limited by the fact it does not stress on the key actions to mobilize resources for MDGs' funding. They then define fiscal space as: "concrete policy actions for enhancing domestic resource mobilization, and the reforms necessary to secure the enabling governance, institutional and economic environment for these policy actions to be effective". The literature identifies several ways to gauge fiscal space depending on the focus of the paper.

Ghosh et al. (2013) define fiscal space as the distance between the current debt level and the debt limit beyond which fiscal solvency is in doubt. Drawing on the works of Bohn (1998, 2008) as well as those of Mendoza and Ostry (2008) and Ostry and Abiad (2005), the debt limit is determined by estimating a primary fiscal balance reaction function which uses the squared and cubic debt terms besides some other control variables. Aizenman and Jinjarak (2010) and Aizenman et al. (2013) define fiscal space, called *de facto*, as the inverse of the tax-years it would take to repay the public debt. Specifically, it measures the outstanding public debt relative to the *de facto* tax base, where the latter measures the realized tax collection, averaged across several years to smooth the business cycle fluctuations. Brun et al. (2006) adopt a tax effort approach and derive fiscal space as the ratio of the current level of revenues to potential tax revenues, based on structural indicators such as GDP per capita and sectoral values added.

In this present paper, I derive fiscal space by the quality of public spending by linking its use to its outcomes. Whatever the definition considered, the key point in fiscal space concept is how much a country can dispose some room for fiscal maneuver. This begins by improving the quality of the existing revenues in achieving the goals. The better it gets, the lower is the need

of borrowing and the risk of fiscal insolvency. Moreover, the quality of public service delivery may encourage tax compliance and consequently the domestic revenue collection.

The concept of "quality of public spending" cannot be separated from that of the whole public finance including revenues. Borrowing from Barrios and Schaechter (2008), it comprises the policies that ensure sound budgetary stances, long-sustainability and those that increase the production potential and facilitate the economy to adjust to shocks. The achievement of these outcomes requires an efficient and effective use of public revenues while creating incentives for an efficient functioning of labor, goods and services markets. The inconclusiveness of the literature on the effect of government size on growth has led to establish that this effect varies across countries and over time depending on its level and its quality. In terms of size, common thinking is that low unlike high levels of government are associated with increased sustained growth because it likely generates less tax distortion and eviction of the private sector.

This quality is approximated by two aspects: the structure and the efficiency. The structure-related-quality hypothesis distinguishes between the categories of spending that potentially promote growth from those that harm it. Thereby, government consumption and military spending are viewed as counterproductive while investment in infrastructures development, in education or in health are growth-enhancing. Nonetheless, the empirical evidence remains mixed suggesting that the composition assumption is not sufficient. The results depend on the fiscal size and the conditions (macroeconomic policies, governance, corruption etc.) under which they are spent. In the case of African countries, Devarajan et al. (2003) find that they do not suffer of any problem of underinvestment but of efficiency constraints. On the contrary, Fosu et al. (2012) show that they are hit by underinvestment. Recent findings of Dabla-Norris et al. (2012) and International Monetary Fund (2015) stress that the key point of investment's productivity is its efficiency.

The efficiency-related-quality hypothesis looks for the way resources are used to reach their goals. The latter definition also makes a crucial distinction between 'effectiveness' and 'efficiency'. Public spending is effective if it reaches its outcome independently of how much is invested. In contrast, efficiency questions whether countries could achieve better outcomes at current levels

of spending (Verhoeven et al., 2007) or whether the same outcomes could be obtained with lower levels of spending. In that case, efficiency is superior than effectiveness to the extent that it includes the latter. The current paper considers quality of public spending as good if the latter is efficient.

Efficiency is generally measured as the distance to a production frontier through non-parametric and parametric methods. The non-parametric approaches are the Free Disposal Hull (FDH) and the Data Envelopment Analysis (DEA). They relate multiple inputs and outputs to account for the gap between potential output allowed by given quantities of inputs and the level of output currently achieved with the same quantities. Each country's efficiency is therefore evaluated relative to its peers distinguishing best practices from lower ones. Countries that are efficient than others get a score of one whereas the less efficient ones are rated lower. For instance, an input efficiency of 0.7 for a country means that the latter could reduce the level of input by 30% to get the same level of output or to be efficient. Thus, the non-parametric approaches allow for estimating the level of wasted resources of the producer.

The parametric methods consist in estimating a stochastic efficiency frontier assuming a functional form of production such as Cobb-Douglass or translog (Barrios and Schaechter, 2008). Unlike non-parametric approaches, parametric ones dissociate the exogenous effects from the efficiency ones by decomposing the residual into two components: a random error term and an inefficiency term. They also allow to test the standard statistical properties. Parametric approach allows to correct the sensitivity of the results to the existence of outliers. However, they require strong assumptions and a large number of observations. Especially, they outperform non parametric approaches only when the estimated stochastic frontier is close to the assumed technology (Rayp and Van De Sijpe, 2007). Moreover they are usually suitable for micro-level data whereas some authors question their ability to effectively decompose noise and inefficiency (Banker et al., 1993; Ruggiero, 1999; Rayp and Van De Sijpe, 2007).

A number of studies use the non-parametric approaches to compare the performances of public spending among countries. Thus, Gupta and Verhoeven (2001) resort to FDH to assess the efficiency of public expenditure on education and health of 37 African countries relative to each

other and also to Asia and the Western Hemisphere over the period 1984-1995. Their findings indicate that on average African countries are less efficient than the latter regions although their efficiency has been improved during this period. They also find that among African countries, the least performant ones (like Cote d'Ivoire and Botswana) record better income distribution than the most efficient ones like Ethiopia and Lesotho. According to these authors, inefficiency is caused by high wages practices in the education sector and intra-sectoral misallocation of resources. Chemli and Neticha (2006) use DEA approach to calculate the scores of efficiency of public spending in education and health of 45 developing countries including African countries over the period 1990-2002. Their calculations show a weak efficiency about 30%. Further regressions point out that these spendings do not support economic growth due to the low level of their quality. Pang and Herrera (2005) using FDH and DEA techniques in a sample of 140 developing countries over the period 1996-2002 come to similar conclusion. Countries with larger size of government and in particular with larger share of wage bill of the total budget are less efficient. Furthermore, Afonso et al. (2005) find, from DEA approach, that the most efficient members of OECD spend on average 30% less than their European partners to achieve the same performances. Afonso et al. (2010) analyze public sector efficiency in the new EU member states compared relative to emerging markets. DEA computations show that expenditure efficiency across the former as compared to the group of top performing of the emerging market in Asia is diverse.

3 Methodology

3.1 The public spending efficiency scores

Building on Afonso et al. (2010), the general relationship that I am testing can be given by the following function for each country i :

$$Y_i = f(X_i), i = 1...n \tag{1}$$

where Y_i is a composite indicator reflecting the output measure; X_i denotes the different components of public spending or inputs in country i. For an actual output $Y < f(X_i)$, country i exhibits inefficiency. For the observed input level, the actual output is smaller than the best attainable one and inefficiency can then be measured by computing the distance to the theoretical efficiency frontier.

Following the common practice in macroeconomic literature (Barrios and Schaechter, 2008), the efficiency scores will be computed by a DEA approach originating from the seminal work of Farrell (1957) and popularized by Charnes et al. (1978) (Afonso et al., 2010). This preference relatively to the stochastic approach is grounded in the difficulty to determine the a priori technological function of the government at macroeconomic level. As stated before, DEA is a non-parametric mathematical programming approach which calculates efficiency in production. It constructs an envelopment frontier over the data points such that all the observations lie on or below the production frontier (Coelli, 1996). The program is computed under the assumption of constant return scale (CRS) or variable return scale (VRS). Unlike CRS, VRS is convenient when the Decision Making Units (DMU's) are operating at a non-optimal scale environment (Coelli, 1996). Due to constraints on resources, difficulties to access to international funding in particular to the private one, I can assume that African countries are not operating at an optimal scale environment. So, VRS is the appropriate hypothesis to hold in this work.

Choosing input or output orientation is another assumption when computing DEA. The input orientation aims at determining how much input quantities (spending) can be proportionally reduced without changing the quantities of the output produced. In contrast, the output orientation maintains unchanged the input and looks for the maximum output to attain. Since the rationale of the paper is to measure the amount of fiscal room countries can free up to support their progress, I use the former orientation. Another reason in favor of the input-orientation is that governments have most control over their spending than the outputs. Program (2) is that

of VRS with an input-orientation.

$$\begin{cases} Min_{\theta\lambda} & \theta & \\ \text{st} & -y_i + Y\lambda & \geq 0 \\ & \theta xi - X\lambda & \geq 0 \\ & N1'\lambda & = 1 \\ & \lambda & \geq 0 \end{cases} \tag{2}$$

where $Y(M^*N)$ is the matrix of outputs and $X(K^*N)$ is that of inputs. K, M are respectively the number of the inputs and outputs. N is the number of the decision making units i (DMUs, countries). θ is a scalar and measures the efficiency score. It must satisfy $\theta \geq 1$. For $\theta = 1$, the country is on the frontier and hence technically efficient while $(1 - \theta)$ is the level of public spending which would be reduced to achieve the same efficiency without changing the output. λ is a N^*1 vector of constants that measures the weights used to compute the location of an inefficient country if it were to become efficient. The inefficient country would be projected on the production frontier as a linear combination of those weights, related to the peers of the inefficient country. $N1$ is an n-dimensional vector of ones.

With a panel data, it is interesting to measure the productivity change and its main driver in a particular period. This is possible via a Malmquist total factor productivity (TFP) index. It decomposes the TFP index into technical change and technical efficiency change. Clearly, a positive technical efficiency change means that the efficiency improvement results from a better management of the resources with the current technology over a period of time. A positive technical change suggests that the efficiency improvement results from innovation (new scientific and technical knowledge, products and techniques in the provision of the output services (Kirigia et al., 2011)).

$$m_o(y_{t+1}, x_{t+1}, y_t, x_t) = \left[\frac{d_o^t(x_{t+1}, y_{t+1})}{d_o^t(x_t, y_t)} \times \frac{d_o^{t+1}(x_{t+1}, y_{t+1})}{d_o^{t+1}(x_t, y_t)} \right]^{1/2} \tag{3}$$

A m_o index greater than one indicates positive TFP growth from period t to period $t + 1$. An index inferior to 1 means a decrease. When equal to 1, there is no change. The four component

distance functions $d_o^{t+a}; a = 0...n$ are linear programs problems like that of the program (2) (see Coelli (1996) for an extensive development). Programs (2) and (3) must be jointly solved N times once for each country in the sample.

3.2 Data

I use a panel of 45 African countries over the period 1980-2013. However, the effects of some public choices may be perceptible over more than a year later. For instance, the building of infrastructures like roads and bridges, health and school infrastructures is often made over several years. In order to circumvent a such "annual bias", I average data over five years with the exception of the last period 2010-2013 which is four years average. This also helps to circumvent the data unavailability on some years for some countries. Let's us mind one that DEAP is applicable only for a balanced panel data. In addition, DEA approach compares countries of the same sample. Since, this may lead one to conclude that a potentially-inefficient country is efficient, I tried to include a large set of non-African emerging and developing economies following IMF's classification. But, due to data availability and quality I limit the number of non-African countries to 17. The empirical studies are very often bound to such a limited sample because of data limitations (see for instance Rayp and Van De Sijpe (2007) and Rahmayantia and Hornb (2011)). However, this approach is also relevant to compare where African countries are ranked and/or progressed relatively to the other countries. In fact, in the light of the considerable progress of Brazil, Russia, India, China and South Africa, most of the African countries have recently and increasingly targeted "emergence". In terms of economic policy, this is equivalent to manage public affairs so as to create at least the same performances or progress of these countries. I do not consider developed countries because of significant differences with developing countries. Especially, the outputs indicators for developed countries vary little and are close to the maximum while their priorities are different with those of less developed ones. Finally, in terms of policy implications, it seems more relevant for a developing country to target closed performers rather than pursuing unrealistic goals.

Using a fine decomposition of public spending would have been interesting to link each sector

to the corresponding outputs indicators as it is often done for the education and health sectors. Unfortunately, there is not such a comprehensive dataset on public spending for our sample. I then use two major components of public spending as inputs: the share of public investment in GDP and the share of general government final consumption expenditure in GDP. Although the analysis of discretionary choices of a government tends to oppose the growth-enhancing effects of public investment to the retarding-effects of public consumption, there are some advantages to use these expenditures. The trade-off between investment and consumption cannot be reduced to a perfect substitution. As stated before, the composition of public expenditure matters for the efficiency of a type and the whole of expenditure. Specifically, spending in infrastructures may require some given amount of government consumption components to be effective and *vice versa*. For example, building new hospitals and schools will be effective if there is a sufficient and appropriate number of nurses, doctors and teachers and working material. In many cases, this may involve a recruitment of new employees, new salaries, wages' increase and new public purchases. Using public investment and consumption allows to include both the consumption and the infrastructures of the set of sectors. I then account for the phenomena of composition and complementarity in explaining public efficiency.

Public investment is proxied by the gross fixed capital formation expenditure of the public sector. I had three possibilities. Indeed, The World Bank Group has developed a dataset of public gross fixed capital formation expenditure for African Economies through African Development Indicators (ADI) while the African Development Bank (AfDB hereafter) reports two datasets using the World Development Indicators (WDI) of the former institution and the World Economic Outlook (WEO) of the International Monetary Fund (IMF). The three datasets show a slight difference for most of the countries but with some huge differences for few countries. In order to allow a more consistent comparison among countries both African and non-African, I subtract the gross fixed capital formation expenditure of the private sector from the total one using WDI. The resulted dataset is also close to the three former ones. Where data are missing, I complete with the three latter by using the one which presents the same figures with the calculated existing ones for each country. For minor cases, I do not have any possibility of using the above construction.

So I use data from the articles IV of IMF[3]. Data on government consumption are from UN Database.

Regarding outputs, in line with the common practice in the related literature, I consider human capital indicators. They comprise two indicators of health: the five-year infant mortality and the undernourished prevalence indexes and two education indicators: the gross secondary enrollment and the literacy indexes from the Foundation for International Development Study and Research (FERDI) (Closset et al., 2014). The higher the value of each index, the higher the quality of human capital. In addition, I account for the sectoral economy productivity since there is a strong evidence that too high government size may harm economic performances. However, the African governments through the Poverty Reduction Strategy Papers have engaged to promote an harmonious economic sectoral development including agriculture, industry and infrastructures. The reforms undertaken might reduce the threat of "too" government size. Hence, I use the US$ real per capita values added of agriculture, manufacture, construction, transport and the wholesale and retail trade as additional outputs. I do not use the global industry value added which includes mining sector since the resources from the latter are unstable and may suddenly overestimate the country performances. My concern is clearly to look for the sustainable efficiency of the countries in close with their engagements. In order to avoid a "measurement bias" among the outputs which may influence the scores, I normalize these last outputs indicators by using a Max-Min formula in such a way that the higher the value the higher the performance. Data on these indicators derive from the United Nations database. This database provides data on former Ethiopia and Ethiopia respectively including and excluding Eritrea since the independence of the latter in 1993. It also separates Zanzibar from Tanzania. In both cases, I consider a single country in order to stay coherent with the other datasets. Ethiopia includes the former and Ethiopia excluding Eritrea since 1993. I add data for Zanzibar to those of Tanzania since the former is still considered as a region of the latter.

Despite the fact that DEA is an interesting tool to assess countries performances, it imposes some constraints to be efficient. Its discriminatory power is weak in the case of a large number of inputs and/or outputs. For instance, drawing from Simar and Wilson (2000) and Groskopff

[3]The different datasets are available upon request.

(1996), Pang and Herrera (2005) note that too many outputs may biase efficiency scores towards one, increase the variance of the estimators and reduce their speed of convergence to the true efficiency estimators. This problem can be overcome by using the variables that provide essential component of production eliminating one of the pair of factors that shows a strong positive correlation. Some authors estimate different scores alternating the number, the quality of inputs and/or outputs. This generally yields contrasting results with a difficulty in interpreting the discrepancies in scores and ranks. I use here a simple and meaningful approach by summarizing the nine outputs in two single indexes applying a Principal Component Analysis (PCA). The human capital indicators constitute the first index (HAI-Human Asset Index) while the production indicators form the second index (PI-Production Index). Each index is obtained by carrying all of the correspondent variables weighted by the associated coefficients of the first PCA component. Details are in appendix. Furthermore, it is worth noting that this approach is more relevant than estimating scores separately since the same inputs are used for producing the outputs at the same period. Otherwise, one should face an overestimation or underestimation of the scores. Finally, I augment the input ratios by 1 because of the null values of the investment ratio for some countries. This affine transformation on inputs does not affect the results since the individual performances are gauged relatively to the peers.

Table 1 reports the average levels of the public expenditure composition and the constructed indexes across the sample countries over the covered period. Countries tend to spend much in consumption than in investment, with three exceptions including Bangladesh, Egypt and Equatorial Guinea. Consumption is on average twice greater than investment. Africa reports the highest ratios both of consumption and investment. Public investment in this continent is on average 8.9% of GDP against 17.2% of GDP for consumption expenditure. The sub-Saharan region, with shares of 7.8 and 16.5% in GDP respectively of investment and consumption, spends less than the Maghreb with respectively 9.9% and 17.9%. Meanwhile the share of investment in GDP in non-African countries is on average 5.7% against 12.6% for consumption. Moreover, the disparities in expenditure ratios among countries are huge ranking from 2.4% to 17.3% for investment and from 4.8% to 31% for consumption. In terms of investment, the head of the most spending countries quantile are constituted of Equatorial Guinea (17.3%), Lesotho (15%), Burundi (13.9%),

Libya (13%) and Egypt (12.9%) while Brazil (2.4%), Zimbabwe(2.8%), Guatemala (2.9%), Bulgaria(3.8%), Uruguay (4%) are the five least invest-involved countries. At the consumption side, the most spending countries are Angola (31%), Lesotho (30.8%), Seychelles (29.2%), Namibia (26.5%) and Libya (23.9%) while the relative least spending countries are Bangladesh (4.9%), Guatemala (7.9%), Nepal(9%), Sierra Leone (9.6%) and Guinea (9.7%)

Regarding the output indexes, the picture is quite different. The non-African countries show highest levels for both outputs indexes. They report 139.4 for HAI and 36.7 for Production Index while Africa reports respectively 105.6 and 28.3. The bad performances in Africa are mainly drawn by those of sub-Saharan region with 79.5 for HAI and 21.8 for PI. The five highest ranked countries in terms of HAI are Bulgaria (185.7), Uruguay (183.9), Seychelles (183.8), Fiji (174.8) and Libya (172.52) whereas Chad (23.1), Burkina Faso (33.9), Burundi (33.9) Ethiopia (34.3), Mozambique (37.3) show the lowest levels. For the PI, Seychelles and South Africa are the only African countries among the best five rated countries.

In short, the table shows that African countries tend to have relative higher government size than the other economies but have lowest economic performances. But, this conclusion is not always true in the light of the case of Seychelles. The next section provides estimates of the DEA efficiency scores.

4 Results

4.1 Efficiency scores and the lost fiscal space

Table 2 reports the efficiency scores of the VRS analysis for the whole of the seven periods for each country and group of countries. It also reports the average of efficiency scores (Average) over the period and the number of times (Times) the country has been on the frontier as well as the average of the resources level that would be saved if the country were efficient.

The results indicate that African countries on average are not efficient in comparison with the

Table 1: Output Indexes and Public expenditure (% of GDP) in sample countries

Country	HAI Index	Product Index	Public Investment	Public Consumption	Total expenditure
Bangladesh	84.902	6.885	5.972	4.873	10.845
Brazil	163.429	64.397	2.375	17.264	19.640
Bulgaria	185.724	61.938	3.831	16.864	20.694
Fiji	174.795	61.804	6.571	16.883	23.453
Guatemala	110.067	42.005	2.868	7.913	10.781
Honduras	133.893	26.914	6.441	13.684	20.124
India	100.882	12.393	8.735	11.440	20.175
Iran, Islamic Rep.	147.649	34.677	9.282	14.175	23.457
Jordan	170.030	27.646	8.084	23.665	31.749
Nepal	83.812	6.303	5.921	9.037	14.958
Pakistan	78.423	14.323	6.738	11.190	17.928
Peru	149.954	42.091	4.780	9.719	14.498
Philippines	156.692	24.582	4.127	9.891	14.018
Sri Lanka	159.790	23.211	4.479	11.402	15.881
Thailand	146.011	49.048	7.439	11.598	19.036
Uruguay	183.860	88.901	3.963	12.616	16.579
Non-African	**139.370**	**36.695**	**5.725**	**12.638**	**18.364**
Algeria	141.189	35.555	11.567	16.307	27.874
Egypt, Arab Rep.	137.002	21.703	12.943	12.760	25.704
Libya	172.528	48.720	12.985	23.924	36.909
Mauritania	78.979	19.650	8.979	20.670	29.650
Morocco	114.689	35.536	5.217	17.457	22.675
Tunisia	145.795	48.238	7.873	16.402	24.274
Arab Maghreb Union	**131.697**	**34.900**	**9.927**	**17.920**	**27.847**
Angola	48.871	21.433	7.154	31.004	38.158
Benin	61.615	11.988	7.834	13.000	20.834
Botswana	127.232	38.693	10.786	23.401	34.187
Burkina Faso	33.855	7.766	9.787	19.782	29.570
Burundi	33.874	3.752	13.893	17.441	31.333
Cabo Verde	134.761	40.448	7.935	20.054	27.989
Cameroon	76.922	19.692	4.370	11.191	15.561
Central African Republic	37.822	10.283	5.461	12.926	18.387
Chad	23.149	7.507	6.852	16.125	22.977
Comoros	70.670	23.841	9.825	20.459	30.284
Congo, Rep.	93.187	19.912	11.768	16.724	28.492
Cote d'Ivoire	70.392	21.706	4.941	11.737	16.678
Equatorial Guinea	89.847	24.359	17.253	16.726	33.979
Ethiopia	34.333	2.385	8.256	11.058	19.314
Gabon	128.048	58.798	6.763	14.317	21.079
Gambia, The	69.028	9.993	8.739	15.756	24.495
Ghana	98.895	21.502	8.092	11.119	19.211
Guinea	48.735	3.368	5.825	9.695	15.520
Kenya	100.716	11.781	7.084	17.128	24.213
Lesotho	104.064	7.519	14.992	30.755	45.748
Malawi	67.075	5.726	9.054	16.686	25.740
Mali	40.849	10.216	8.881	12.181	21.062
Mauritius	164.129	70.425	7.462	13.497	20.960
Mozambique	37.302	4.451	11.314	11.659	22.973
Namibia	119.857	47.784	7.859	26.521	34.380
Niger	37.387	6.147	5.392	13.865	19.257
Nigeria	71.097	24.068	6.731	15.935	22.666
Rwanda	57.792	5.952	8.147	11.630	19.778
Senegal	66.787	12.369	4.886	15.885	20.771
Seychelles	183.809	116.389	10.039	29.181	39.219
Sierra Leone	39.994	11.227	4.799	9.642	14.441
South Africa	158.900	64.344	4.861	19.105	23.967
Swaziland	111.704	37.396	6.424	17.639	24.063
Tanzania	67.427	8.887	6.714	14.385	21.098
Togo	76.281	9.801	6.173	12.810	18.983
Uganda	66.575	7.487	4.756	11.330	16.086
Zambia	62.466	13.471	6.049	18.381	24.430
Zimbabwe	107.362	4.423	2.835	18.011	20.846
Sub-Saharan Africa	**79.548**	**21.771**	**7.894**	**16.546**	**24.440**
Overall Africa	**105.622**	**28.336**	**8.911**	**17.233**	**26.144**
Overall sample	**116.871**	**31.122**	**7.849**	**15.701**	**23.550**
Max	**185.724**	**116.389**	**17.253**	**31.004**	**45.748**
Min	**23.149**	**2.385**	**2.375**	**4.873**	**10.781**

Source: Author's construction, FERDI, World Bank, IMF and UNDATABASE.

Table 2: Summary of DEA scores and average lost fiscal space (waste)

Country	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	2010-13	Average	Times	Lost Fiscal sp
Bangladesh	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	7.000	0.000
Brazil	1.000	1.000	0.752	1.000	1.000	1.000	1.000	0.965	6.000	0.756
Bulgaria	1.000	1.000	1.000	1.000	0.866	0.751	0.944	0.937	4.000	1.390
Fiji	0.651	0.703	0.661	0.689	0.681	0.979	0.982	0.764	0.000	5.947
Guatemala	0.940	1.000	1.000	1.000	1.000	1.000	1.000	0.991	6.000	0.114
Honduras	0.585	0.585	0.673	0.778	0.668	0.649	0.769	0.672	0.000	6.670
India	0.582	0.506	0.522	0.502	0.642	0.618	0.651	0.575	0.000	8.643
Iran, Islamic Rep.	0.405	0.514	0.667	0.691	0.754	0.746	0.951	0.675	0.000	8.333
Jordan	0.394	0.435	0.483	0.456	0.585	0.605	0.745	0.529	0.000	15.562
Mexico	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	7.000	0.000
Nepal	0.650	0.634	0.680	0.615	0.886	0.788	0.834	0.727	0.000	4.220
Pakistan	0.530	0.479	0.464	0.513	0.851	0.774	0.895	0.644	0.000	7.041
Peru	0.766	0.816	1.000	0.895	1.000	1.000	1.000	0.925	4.000	1.227
Philippines	0.974	1.000	0.943	0.809	0.956	1.000	1.000	0.955	2.000	0.711
Sri Lanka	1.000	0.870	0.994	0.955	0.993	0.686	0.738	0.891	1.000	2.089
Thailand	0.619	0.679	0.798	0.846	0.860	0.805	0.814	0.774	0.000	4.327
Uruguay	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	7.000	0.000
Non-African	**0.770**	**0.778**	**0.802**	**0.809**	**0.867**	**0.847**	**0.901**	**0.825**	**72.131**	**3.943**
Algeria	0.473	0.428	0.522	0.515	0.626	0.697	0.507	0.538	0.000	13.005
Egypt, Arab Rep.	0.398	0.497	0.747	0.783	0.782	0.731	0.813	0.679	0.000	9.259
Libya	0.405	0.327	0.452	0.496	0.668	1.000	0.417	0.538	1.000	18.231
Mauritania	0.196	0.418	0.658	0.834	0.415	0.495	0.583	0.514	0.000	16.781
Morocco	0.432	0.599	0.594	0.685	0.571	0.612	0.578	0.582	0.000	9.595
Tunisia	0.484	0.458	0.516	0.571	0.725	0.893	1.000	0.664	0.000	9.078
Maghreb	**0.398**	**0.454**	**0.581**	**0.647**	**0.631**	**0.738**	**0.650**	**0.586**	**1.639**	**12.658**
Angola	0.373	0.597	0.429	0.325	0.398	0.422	0.458	0.429	0.000	22.077
Benin	0.488	0.499	0.606	0.558	0.594	0.563	0.580	0.555	0.000	9.302
Botswana	0.359	0.345	0.309	0.272	0.394	0.452	0.530	0.380	0.000	21.498
Burkina Faso	0.497	0.383	0.301	0.340	0.400	0.350	0.471	0.392	0.000	18.228
Burundi	0.579	0.501	0.392	0.313	0.454	0.294	0.292	0.404	0.000	19.425
Cabo Verde	0.410	0.722	0.548	0.548	0.506	0.517	0.520	0.539	0.000	13.016
Cameroon	0.749	0.567	0.759	1.000	0.963	0.703	0.649	0.770	1.000	3.968
Central African R.	0.507	0.489	0.431	0.548	0.687	0.785	0.919	0.624	0.000	7.546
Chad	0.798	0.609	0.501	0.404	0.279	0.810	0.643	0.578	0.000	11.367
Comoros	0.232	0.279	0.386	0.486	0.588	0.567	0.563	0.443	0.000	18.380
Congo, Rep.	0.499	0.375	0.845	0.500	0.514	0.514	0.595	0.549	0.000	13.104
Cote d'Ivoire	0.423	0.663	0.679	0.674	1.000	0.923	0.870	0.747	1.000	5.127
Equatorial Guinea	0.209	0.271	0.313	0.704	1.000	1.000	1.000	0.642	3.000	16.057
Ethiopia	1.000	0.894	0.751	0.546	0.442	0.501	0.679	0.688	1.000	7.084
Gabon	0.594	0.576	0.648	0.634	0.891	0.824	0.528	0.671	0.000	7.517
Gambia, The	0.199	0.448	0.502	0.518	0.669	0.731	0.621	0.527	0.000	13.451
Ghana	1.000	0.637	0.496	0.480	0.596	0.574	0.626	0.630	1.000	7.819
Guinea	0.589	0.608	0.580	0.766	0.920	0.869	0.702	0.719	0.000	4.733
Kenya	0.434	0.449	0.407	0.454	0.478	0.526	0.558	0.472	0.000	12.831
Lesotho	0.432	0.282	0.227	0.209	0.277	0.298	0.286	0.287	0.000	33.062
Malawi	0.379	0.439	0.378	0.402	0.522	0.454	0.478	0.436	0.000	14.573
Mali	0.527	0.469	0.457	0.466	0.716	0.536	0.613	0.541	0.000	9.865
Mauritius	0.711	0.761	0.738	0.739	0.765	0.791	0.853	0.765	0.000	4.956
Mozambique	0.416	0.524	0.461	0.653	0.589	0.515	0.465	0.518	0.000	11.279
Namibia	0.326	0.439	0.346	0.379	0.543	0.591	0.439	0.438	0.000	19.841
Niger	0.685	1.000	0.513	0.532	0.567	0.486	0.602	0.626	1.000	7.568
Nigeria	0.465	1.000	0.622	0.480	0.386	0.499	0.501	0.565	1.000	10.569
Rwanda	0.509	0.551	0.515	0.523	0.576	0.604	0.654	0.562	0.000	8.654
Senegal	0.430	0.733	0.632	0.604	0.622	0.553	0.577	0.593	0.000	8.544
Seychelles	0.431	0.511	1.000	1.000	1.000	1.000	1.000	0.849	5.000	6.562
Sierra Leone	0.779	0.983	0.671	0.849	0.636	0.757	0.643	0.760	0.000	3.747
South Africa	0.685	0.719	0.756	0.907	0.725	0.589	0.556	0.705	0.000	7.289
Swaziland	0.359	0.516	0.514	0.609	0.545	0.610	0.622	0.539	0.000	11.406
Tanzania	0.564	0.559	0.375	0.776	0.635	0.445	0.512	0.552	0.000	9.928
Togo	0.352	0.442	0.651	0.783	1.000	0.729	0.690	0.664	1.000	7.588
Uganda	0.794	0.778	0.616	0.642	0.550	0.616	0.797	0.685	0.000	5.290
Zambia	0.397	0.609	0.479	0.430	0.523	0.491	0.594	0.503	0.000	12.240
Zimbabwe	0.602	1.000	0.666	0.926	0.816	1.000	0.522	0.790	2.000	4.911
SSA	**0.521**	**0.585**	**0.539**	**0.578**	**0.625**	**0.618**	**0.611**	**0.583**		**11.326**
Overall Africa	**0.504**	**0.567**	**0.545**	**0.588**	**0.626**	**0.634**	**0.616**	**0.583**	**0.356**	**11.508**
Overall sample	**0.575**	**0.624**	**0.619**	**0.652**	**0.695**	**0.694**	**0.697**	**0.651**	**0.968**	**9.397**

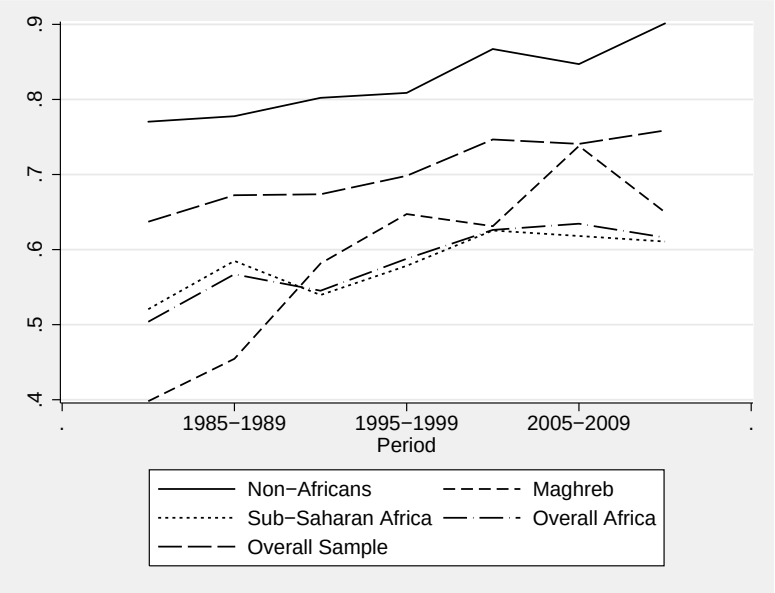
Source: Author's estimations using FERDI, World Bank, IMF and UN databases.

non-African countries. The average efficiency score of public spending for African countries over the span of the study is 0.585 against 0.825 for the non-African. This implies that on average African countries should reduce their spending by 41.5% to achieve the same performances whereas non-African countries should reduce theirs by 17.5%. The results also show that there is no discrepancy in efficiency among Maghreb and sub-Saharan African regions. Indeed, both record the same efficiency score. The analysis of figure 1 shows that there is no significant shift in the trend of the efficiency scores. Efficiency has steadily increased from 0.575 to 0.697 for the whole sample. This upward tendency is mainly due to that of the non-African countries yet retarded by the slight progress of African performances. Taking African economies specifically, the results evidence that the sub-Saharan region is the main driver of the African tendency. The North region presents an evolution by jerks and jumps. The breaking in the increase tendency in Sub-Saharan Africa over the two last periods may be explained by the recent food prices crisis that has caused a significant increase in public spending to mitigate its consequences but with low amelioration in the outputs indicators. Thus, the results do not show a significant change in the quality of public spending in Africa and particularly in sub-Saharan Africa suggesting that the claim of expansion of public spending to boost progress in the frame of the Millennium Development Goals' launch does not necessary create a sustained fiscal space.

The individual analysis of the countries shows that only a few African countries have been situated on the frontier at least once. Seychelles is the best ranked African country in terms of the number of times to reach the efficiency frontier. It has reached the frontier five times consecutively since the 1990's. It is followed by Equatorial Guinea, three 3 times, since 2000's and Zimbabwe over 1985-1989 and 2005-2009. Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Libya, Niger, Nigeria and Togo achieve this performance only once. On the contrary, the group of non-African countries provides the most efficient countries. Bangladesh, Mexico and Uruguay have always been on the frontier while Brazil and Guatemala present inefficiency only once. Peru is efficient since 2000's, Philippines since the period of 2005-2009 while Sri Lanka met efficiency over 1980-1984's period.

Nevertheless, the ranking according to the number of times may hide some heterogeneities in efficiency progress of certain countries. The ranking according to the average level of efficiency's

Figure 1: Evolution of Efficiency scores in group of countries

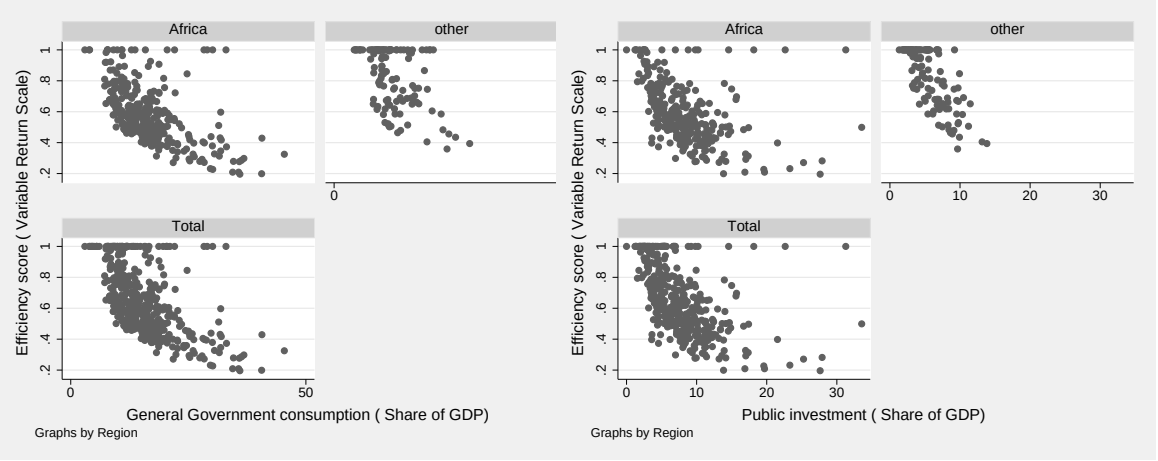


Source: Author's estimations

score does not always follow the same path as the former particularly in the case of Africa. With an average score of 0.849, Seychelles remains the most African efficient economy. It is followed by Zimbabwe (0.79), Cameroon (0.77), Mauritius (0.765), Sierra Leone (0.76). The recent progress of Equatorial Guinea is balanced by the inefficiency of the four first periods leading to a rank of 15th with an average score of 0.642 while Nigeria is now ranked 22th with a score of 0.565. The difference in the two rankings suggests that over time some countries become more efficient and others did not. The less five efficient countries are Angola (0.429), Burundi (0.404), Burkina Faso (0.392) Botswana (0.38) and Lesotho (0.287). South Africa as the most advanced African economy is ranked 8th. Figure 2 depicts the correlation between the efficiency scores and the ratio of public spending across the main group countries. The correlation is negative suggesting that larger public spending does not provide returns irrespective the region considered and the type of public spending. This finding is in line with a number of studies investigating the efficiency of public spending (Gupta and Verhoeven, 2001; Pang and Herrera, 2005; Afonso et al., 2005; Chemli and Neticha, 2006; Verhoeven et al., 2007; Afonso et al., 2010; Vierstraete, 2012).

As suggested before, loss in efficiency creates loss in public resources. The lost of fiscal space

Figure 2: Efficiency scores and the level of public spending



Source: Author's estimations, WDI and WEO. Notes: Other and Total correspond respectively to the non-African group and the overall sample.

computed through table 2 has been generated by multiplying the level of resources used by the difference between the maximum efficiency score (1) and the estimated efficiency score (θ). Let's remind that $(1-\theta)$ corresponds to the proportion of the used resources a country should reduce in order to realize the same amount of outputs, i.e. to be efficient. Then, a country's loss of fiscal space is estimated relatively to the efficiency of the peers of a country. The lost fiscal space when a country is efficient is zero. Thus, the loss in fiscal space created by the inefficiency of public spending in Africa is about 11.5% of GDP equivalent to 43.8% of the outlay used. It is 11.3% of GDP, about 46.3% of the allocated resources for SSA and 45.4% for the Maghreb. Rationally, non-African countries exhibit less lost fiscal resources. The leakage for the non-Africans is around four times less than that of the African region. An insight in individual countries shows that how much the country is hit by the inefficiency depends on the level of outlays confirming the premise that larger public sector is more harmful when efficiency is missed. For instance, Seychelles loses much room (6.56%) than Cameroon (3.97%), Mauritius (4.96%), Zimbabwe (4.91%) and Uganda (5.29%) although it has the best practice in Africa because it spends much. The efficiency of Seychelles is then explained by the fact it outperforms in terms of outputs. With a high government size but low level outputs, the inefficiency of Lesotho translates into the highest loss estimated up to 33.06%.

Until now, the findings are analyzed in a static way considering whether a country becomes closer to or farther away from the efficiency frontier (Aubyn et al., 2009). Let's now examine the efficiency in a dynamic way assuming that the frontier itself is not static since I am dealing with panel data. My concern is to determine how productivity has grown and what drives this improvement: amelioration in the quality of public management (change in technical efficiency) or a movement of the production frontier (technological change). For that, I use Malmquist index to decompose the total factor productivity (Tfpch) into its efficiency (EFFCH) and technological (techch) components over time. This exercise is important since almost all African countries record a steady growth of some indicators especially those of human capital while those of non-African economies tend to stagnate at high levels. This may suggest that African countries have grown fast and substantially relatively to non-African ones although they are inefficient. Table 3 sums up these indexes, more details are provided in table 8 of appendix.

The analysis of the two tables shows that on average for the full sample, total factor productivity improves substantially. The change is equal to 1.165 suggesting a rise in TFP by 16.5%. This increase results mainly from that in efficiency which rises by 12.2% whereas technology change improves slowly by 4%. African regions record the biggest amelioration due to a significant increase in efficiency by 14.1% and a slight increase in technology by 4.1%. This result suggests that the improvement in the quality of public resources management is the main driver of TFP by up to more 75%. In addition to this analysis, I spur my curiosity to see how this improvement in efficiency is correlated with the waste of resources. Trivially, the negative correlation in figure 3 supports the idea that better quality of fiscal management throughout time helps country to create more resources.

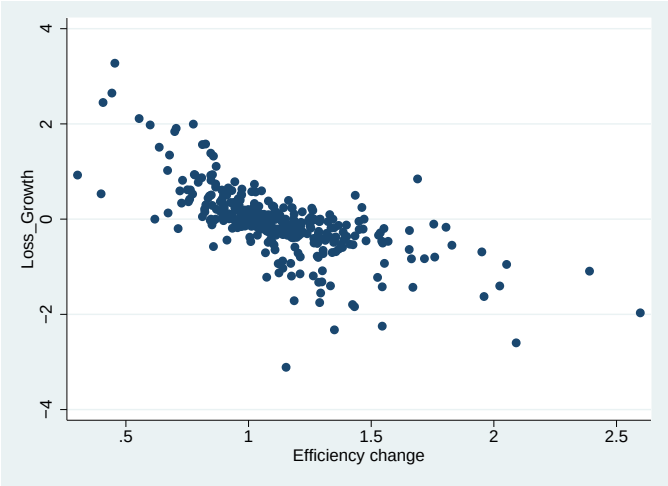
A striking outperformance of 4.42 is noted by Chad over 2005-2009 after a decrease in the previous period due to a significant fall in public spending ratio over 2005-2009. However, as demonstrated by figure 3, the exclusion of this value from the data does not affect the negative correlation between efficiency change and unsaved fiscal space. On average, the African countries that have decreased in efficiency improvement are Angola, Gabon, Ghana, Lesotho, South Africa and Zimbabwe. However Angola, Ghana and partially Lesotho have recorded significant progress to become productive while the more recent decline in Gabon and South Africa points some

Table 3: Malmquist index summary of countries means

Country	Effch	Techch	Pech	Sech	Tfpch	Country	Effch	Techch	Pech	Sech	Tfpch
Bangladesh	1.132	1.047	1.000	1.132	1.186	Comoros	1.216	1.037	1.160	1.049	1.261
Brazil	0.973	1.060	1.000	0.973	1.031	Congo, Rep.	1.031	1.071	1.030	1.001	1.105
Bulgaria	0.999	1.044	0.990	1.009	1.043	Cote d'Ivoire	1.148	1.055	1.128	1.018	1.211
Fiji	1.073	1.042	1.071	1.002	1.119	Equatorial Guinea	1.418	1.065	1.298	1.093	1.511
Guatemala	1.068	1.030	1.010	1.057	1.101	Ethiopia	1.124	1.026	0.937	1.199	1.153
Honduras	1.075	1.034	1.047	1.027	1.112	Gabon	0.992	1.039	0.981	1.012	1.031
India	1.072	1.025	1.019	1.052	1.099	Gambia, The	1.410	1.038	1.209	1.166	1.463
Iran, Islamic Rep.	1.180	1.034	1.153	1.024	1.220	Ghana	0.951	1.029	0.925	1.029	0.979
Jordan	1.117	1.031	1.112	1.005	1.152	Guinea	1.096	1.026	1.030	1.064	1.124
Mexico	1.000	1.031	1.000	1.000	1.031	Kenya	1.046	1.025	1.043	1.003	1.072
Nepal	1.178	1.022	1.042	1.130	1.203	Lesotho	0.936	1.014	0.934	1.003	0.949
Pakistan	1.127	1.020	1.091	1.033	1.150	Malawi	1.098	1.029	1.039	1.057	1.131
Peru	1.061	1.033	1.045	1.015	1.096	Mali	1.148	1.032	1.026	1.119	1.185
Philippines	1.006	1.025	1.004	1.002	1.031	Mauritius	1.034	1.030	1.031	1.003	1.065
Sri Lanka	0.947	1.010	0.951	0.996	0.957	Mozambique	1.219	1.046	1.019	1.196	1.274
Thailand	1.063	1.030	1.047	1.015	1.095	Namibia	1.054	1.051	1.051	1.003	1.108
Uruguay	1.022	1.041	1.000	1.022	1.063	Niger	1.112	1.045	0.979	1.136	1.162
Non-Africans	1.079	1.036			1.115						
						Nigeria	1.072	1.039	1.012	1.059	1.114
Algeria	1.040	1.028	1.011	1.028	1.069	Rwanda	1.205	1.037	1.043	1.156	1.249
Egypt, Arab Rep.	1.168	1.036	1.126	1.037	1.210	Senegal	1.104	1.046	1.050	1.052	1.155
Libya	1.002	1.025	1.005	0.997	1.027	Seychelles	1.082	1.073	1.150	0.941	1.161
Mauritania	1.219	1.053	1.199	1.016	1.284	Sierra Leone	1.040	1.050	0.968	1.074	1.092
Morocco	1.103	1.037	1.050	1.050	1.143	South Africa	0.972	1.028	0.966	1.006	0.999
Tunisia	1.158	1.035	1.128	1.027	1.199	Swaziland	1.085	1.033	1.096	0.990	1.121
Maghreb	1.148	1.037			1.191						
						Tanzania	1.045	1.022	0.984	1.062	1.068
Angola	0.964	1.034	1.035	0.932	0.997	Togo	1.206	1.031	1.118	1.078	1.243
Benin	1.131	1.044	1.029	1.099	1.181	Uganda	1.025	1.024	1.001	1.025	1.050
Botswana	1.092	1.031	1.067	1.024	1.126	Zambia	1.027	1.024	1.069	0.961	1.052
Burkina Faso	1.121	1.029	0.991	1.131	1.153	Zimbabwe	0.967	1.072	0.977	0.990	1.037
Burundi	1.050	1.038	0.892	1.177	1.090	SSA	1.140	1.042			1.185
Cabo Verde	1.078	1.075	1.040	1.036	1.158	Mean	1.085	1.037	1.038	1.045	1.125
Cameroon	1.017	1.031	0.976	1.042	1.048						
Central African Rep.	1.170	1.030	1.104	1.059	1.205						
Chad	1.122	1.033	0.965	1.163	1.158						

Note: All Malmquist index averages are geometric means

Figure 3: Loss growth and Efficiency change



Source: Author's estimations. $Lossgrowth = ln(loss + 1) - l.ln(loss + 1)$. The value of Chad over 2005-2009 has been dropped without changing the original trend. Loss growth=growth of lost fiscal space.

governance concerns. For example, Ghana records productivity since the mid of 1990's. Many countries such as Mauritius, Rwanda, Burkina Faso, Equatorial Guinea have also improved over time while some others have declined like Cote d'Ivoire, Zimbabwe. For example, the performance of Zimbabwe has substantially declined from a gain of 96% over 2005-2009 to a loss of 56% over 2010-2013. The begun boom of Equatorial Guinea since the mid of 1990's has blurred in the two last periods.

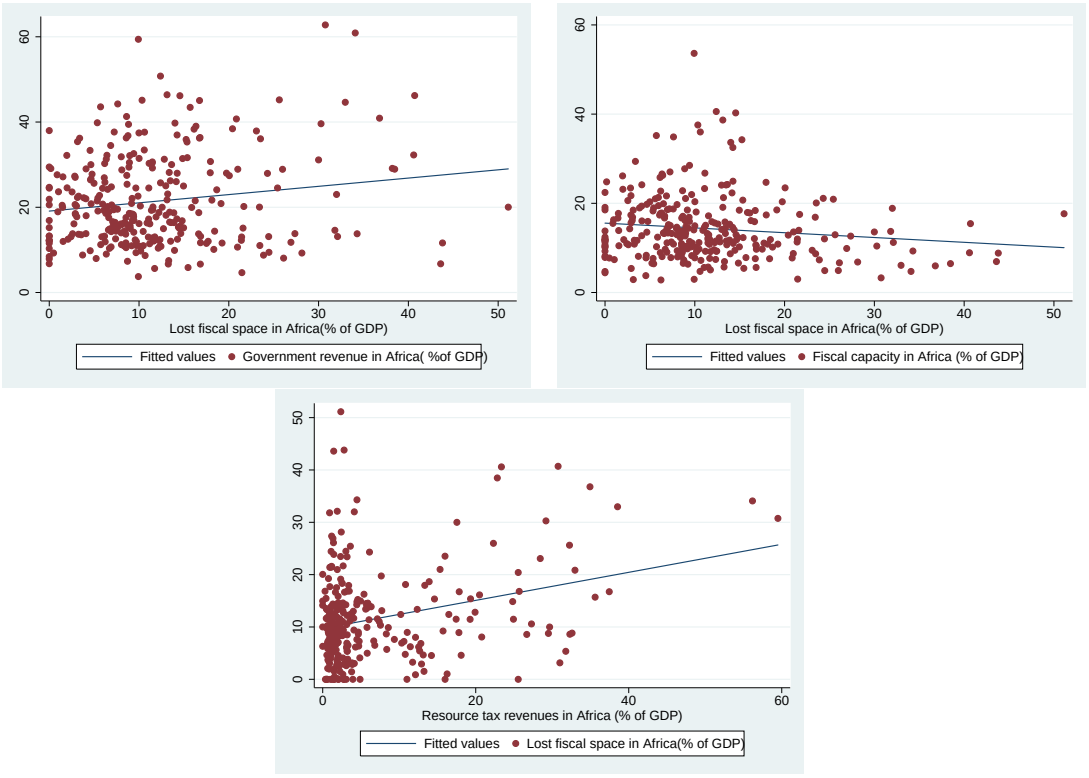
In general quality of public spending has been thus improved in Africa but with some disparities among countries and over time. This stage of my results does not confirm those of Gupta and Verhoeven (2001) who find that increase in the productivity in Africa is driven by outward shifts in the efficiency frontier. This progress may be attributed to the Public Finance Management Reforms undertaken under the donor pressures in the frame of Structural Adjustment Programs and strengthened in the frame of the Heavily Indebted Poor Countries (HIPC) initiatives. However, the fact that they are still inefficient involves other critical challenges in terms of ensuring a sustainable fiscal space for poverty reduction.

4.2 Rebranding quality of public spending and fiscal building for better performances

This section depicts how the unsaved fiscal space is connected to other aspects of fiscal space. The three first are interesting in the relationship between waste and tax capacity building using Dataset on government revenues from International Center for taxation and Development (ICTD) (Prichard et al., 2014). Building a sustainable taxation in developing countries like Africa is doubly important. It would serve not only for curbing the shortage of poverty alleviation funding but also to leave the fragility in which they are. Domestic taxation has clearly been identified as a certain way to induce much broader improvements in state administrations capacity (Brautigam et al., 2008; Prichard and Leonard, 2010). Moreover, reliance on domestic taxes instead of foreign assistance is pro-governance by generating incentives to build strong social contract and accountability between state and its citizens (Moore, 1998; Knack, 2009). This implies in some extent a high degree of tax compliance. The first three figures intend for showing that poor quality management of existing resources is one of the engines of the weak results of taxation reforms in Africa. When citizens are sure that their efforts are poorly managed and find difficult to be provided good public services, their trust in government reduces and they become less encouraged to pay taxes. The social bargaining therefore weakens and the level of the collected taxes remains structurally low. Tax capacity is often measured by the level of the potential stable domestic revenues, i.e. excluding resources revenues. When considering the first figure, a positive correlation between overall government revenues and waste in public outlays surprisingly seems to exist. But, the decomposition into non resource tax revenues and resource tax revenues provides a different picture. Tax capacity ratio is negatively associated with waste in public spending. In contrast, there is a positive correlation between waste in public spending and resource revenues suggesting the well-documented problem of "resource curse".

Low levels of domestic tax capacity and resource curse induced by poor quality of public resources are conducive to foreign assistance dependence and concerns on fiscal sustainability. Figure 5 shows that the inability of governments to create room by improving efficiency of spending is negatively related to domestic saving. When domestic saving is low, prospects of economic growth become pessimistic and incentives to invest decline compromising future rebuilding of saving. To

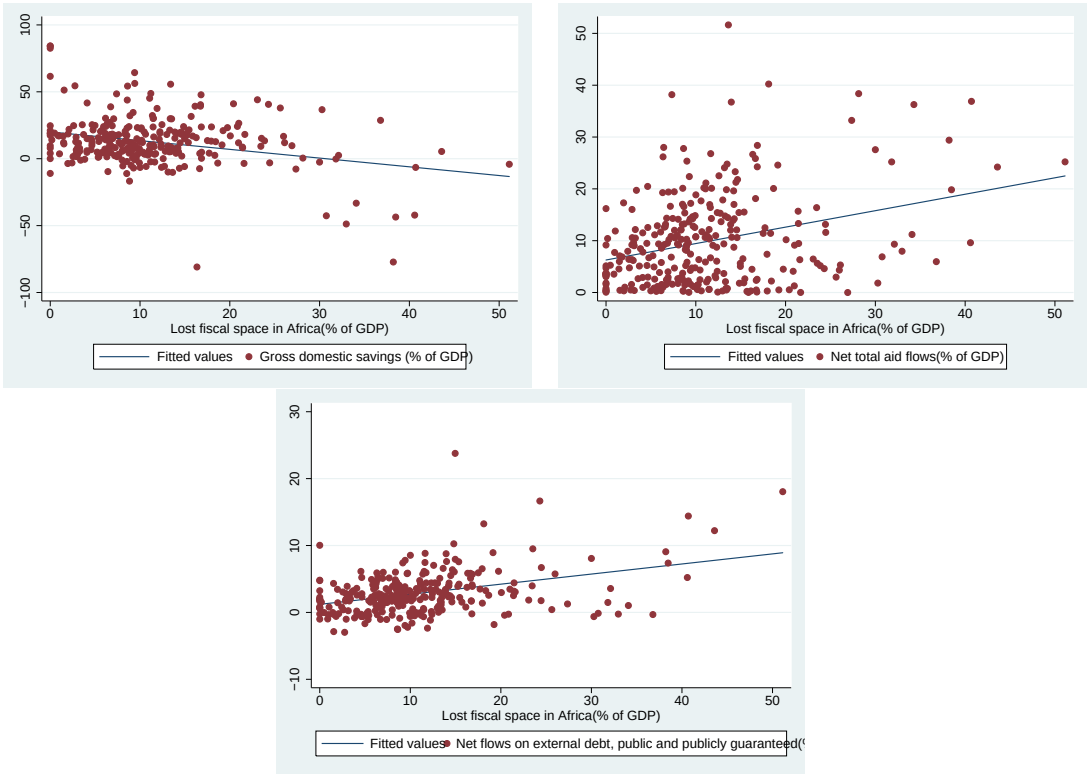
Figure 4: Lost fiscal space and tax capacity development in Africa



Source: Author's estimations, World Bank and ICTD.

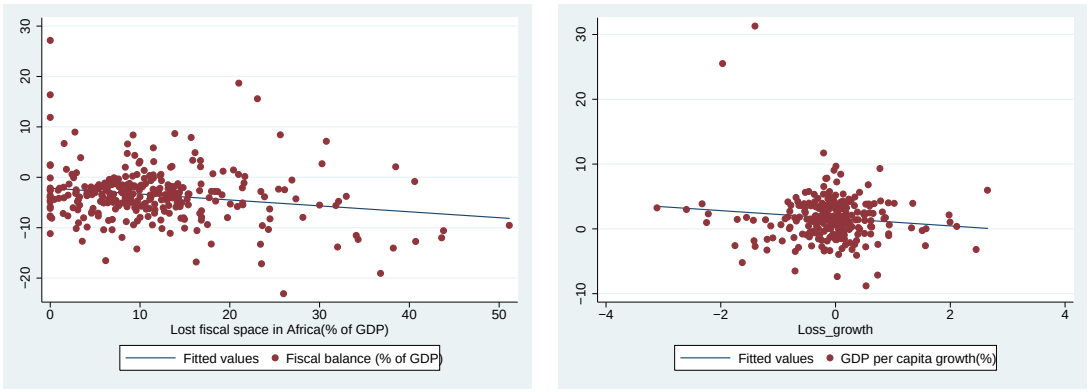
finance its activities, governments may try to create fiscal space through new borrowing or mobilization of foreign assistance (Committee et al., 2006). Figure 5 shows that the loss in fiscal space is positively associated with foreign aid and net flows on external debt in Africa. The effects of foreign aid on the recipient countries are still debatable. Although, many African countries benefit from a concessional debt, the risk of change remains prominent and may cause sovereign insolvency. With a limited room due to government inefficiency and low institutional development, the fiscal adjustment would be more disastrous. Figure 6 reconciles the fiscal space approach of IMF that emphasizes on efficiency of public spending and fiscal sustainability and that of Roy et al. (2009). As one would expect, the more a country loses because of inefficiency, the more public stance worsens, suggesting that quality of public finances is associated with fiscal sustainability. In terms of outcomes, the figure shows that economic growth is negatively correlated to the loss of fiscal space although the link seems to be weak.

Figure 5: Lost fiscal space, domestic saving and external financing in Africa



Source: Author's estimations and World Bank.

Figure 6: Lost fiscal space, fiscal balance and economic growth in Africa



Source: Author's estimations and African Development Bank and World Bank.

5 Conclusion and policy implications

The main goal of this paper is to estimate the fiscal space African countries could have mobilized by improving the quality of public spending and to examine whether the current progress does not hide some waste. The quality of public spending is gauged by the efficiency scores of Data Envelopment Analysis using a large sample of 62 countries including 17 developing and emerging countries outside Africa over the period 1980-2013. It considers two groups of outputs comprising human capital and sectoral economic development indicators and two major public expenditures components, government consumption and investment. The results indicate that the 45 African countries on average are less efficient than the non-African countries. The average efficiency score for African countries is 0.585 against 0.825 for the non-African countries. This suggests that on average African countries should reduce their spending by 41.5% to achieve their obtained results whereas non-African should reduce theirs by 17.5%. The lost fiscal space created by the inefficiency in Africa is about 11.5% of GDP equivalent to 43.8% of the outlay used. The unsaved fiscal space represents more than 3/4 of the current level of tax revenues in Africa.

However, the Malmquist index decomposition of the inefficiency shows that African countries have achieved a substantial improvement in the quality of spending in comparison with the other countries involving a reduction in the waste of revenues. But this improvement remains insufficient to become more efficient than the non-African countries. This suggests improving government management and governance remains an absolute factor of significant progress in Africa. These results urge that strengthening the good governance reforms are highly of importance in order to deepen the current progress in a sustainable way as highlighting the connection between the lost fiscal space and the other fiscal space policies. Indeed, the results show that larger waste of fiscal space is positively correlated with foreign aid, external debt flows, fiscal deficit but negatively with tax capacity. Moreover, there is a positive correlation between resource tax and the lost fiscal space while the negative correlation between African efficiency level and per capita economic growth seems to be weak.

In spite of these logical results, some cautions should be pointed in interpreting the findings. Although I have paid a great attention to the data treatment, the issue of data quality of

public spending notably of investment remains. This problem is not new but closely related to the low institutional development in developing countries. For instance, Fosu et al. (2012) have pointed this kind of problem in their study. The databases of the World Bank and the African Development Bank that I use in this study are currently the most developed ones to my knowledge. Another point due to data availability is the limitation of the sample size which may affect the respective ranks if additional countries are introduced. Moreover, the impact of government spending on some output indicators may drag on several periods so that the observed inefficiencies may be the result of the previous decision-makings (Gupta and Verhoeven, 2001). Finally, one may apply alternative methods of efficiency evaluation such as stochastic methods to provide additional robustness to the present findings.

A Composite Index construction of the outputs

Table 4: Principal components/correlation: composite index of human capital indicators

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.98287	2.3115	0.7457	0.7457
Comp2	0.671366	0.454812	0.1678	0.9136
Comp3	0.216554	0.0873408	0.0541	0.9677
Comp4	0.129213	.	0.0323	1.0000

Source: FERDI. Number of observations: 427

Table 5: Principal components (eigenvectors): HAI index

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
Under Five Mortality Index (U5M)	0.5468	-0.0936	-0.3815	-0.7394	0
Undernourished prevalence Index (U)	0.4100	0.8367	0.3630	0.0100	0
Secondary Enrollment Gross Index(SE)	0.5448	-0.0572	-0.5021	0.6692	0
Literacy Index(LR)	0.4858	-0.5366	0.6860	0.0733	0

Source: FERDI. Number of observations: 427
Index hai_acp=U5M*0.5468 +U* 0.41 +SE* 0.5448 +LR*0.4858

Table 6: Principal components/correlation: sectoral production value added index

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.39109	2.68888	0.6782	0.6782
Comp2	0.702213	0.290466	0.1404	0.8187
Comp3	0.411746	0.122879	0.0823	0.9010
Comp4	0.288868	0.0827877	0.0578	0.9588
Comp5	0.20608	.	0.0412	1.0000

Sources: UN DATABASE and World Bank. Number of observations: 427

Table 7: Principal components(eigenvectors: sectoral productive values added)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
Agriculture(agri)	0.3455	0.9026	0.2156	-0.0207	0.1381	0
Construction(constr)	0.4773	-0.1958	-0.3681	-0.5073	0.5839	0
Manufacture(manu)	0.4691	-0.0403	-0.4770	0.7401	-0.0547	0
Transports(trans)	0.4945	-0.0756	-0.0167	-0.3856	-0.7751	0
Whole and retail trade (trade)	0.4338	-0.3737	0.7682	0.2139	0.1902	0

Sources: UN DATABASE and World Bank. Number of observations: 427
Index product=Agri*0.3355+Constr*0.4773+Manu*0.4691+Trans*0.4945+Trade* 0.4338

Table 8: Malmquist index decomposition full results

Country Period	1984-89			1990-1994			1995-1999			2000-2004			2005-2009			2010-2013		
Country	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch	effch	techch	tfpch
Bangladesh	1.344	1.010	1.357	1.151	0.979	1.127	1.267	1.114	1.412	1.075	1.107	1.190	1.000	1.043	1.043	1.000	1.037	1.037
Brazil	1.000	0.868	0.868	0.699	1.274	0.890	1.432	0.945	1.353	1.000	1.180	1.180	1.000	1.010	1.010	0.847	1.140	0.966
Bulgaria	0.968	1.011	0.979	1.183	1.561	1.847	1.000	0.851	0.851	0.846	0.982	0.830	0.848	0.980	0.832	1.210	0.999	1.209
Fiji	1.175	1.061	1.247	0.901	1.052	0.948	0.996	1.087	1.082	1.077	0.976	1.051	1.424	1.005	1.431	0.946	1.077	1.018
Guatemala	1.189	1.105	1.314	1.292	1.039	1.343	1.000	1.105	1.105	0.866	0.978	0.847	1.033	0.957	0.989	1.080	1.006	1.086
Honduras	1.019	1.081	1.101	1.336	0.978	1.306	1.095	1.114	1.221	0.835	1.001	0.836	1.052	1.043	1.097	1.181	0.996	1.176
India	1.022	1.010	1.032	1.185	0.979	1.161	0.997	1.114	1.111	1.140	0.962	1.097	1.085	1.076	1.168	1.017	1.018	1.035
Iran, Islamic Rep.	1.347	1.071	1.442	1.396	0.984	1.374	0.947	1.114	1.056	1.142	0.992	1.132	1.022	1.050	1.072	1.299	0.997	1.295
Jordan	1.124	1.095	1.231	1.161	1.027	1.192	0.932	1.063	0.991	1.275	1.008	1.286	0.981	1.007	0.987	1.280	0.987	1.264
Mexico	1.000	1.113	1.113	1.000	0.985	0.985	1.000	0.897	0.897	1.000	1.235	1.235	1.000	1.034	1.034	1.000	0.958	0.958
Nepal	1.331	1.011	1.345	1.552	0.979	1.520	0.999	1.114	1.113	1.301	0.981	1.277	0.958	1.094	1.049	1.038	0.960	0.996
Pakistan	0.869	1.041	0.904	1.265	0.979	1.239	1.179	1.114	1.314	1.526	0.958	1.463	0.940	1.080	1.015	1.104	0.956	1.056
Peru	1.112	1.084	1.206	1.286	0.987	1.270	0.853	1.089	0.929	1.121	0.996	1.117	1.045	1.044	1.092	1.000	1.002	1.002
Philippines	1.036	1.083	1.122	0.932	0.972	0.906	0.847	1.068	0.905	1.172	1.007	1.181	1.080	1.101	1.189	1.000	0.930	0.930
Sri Lanka	0.868	1.036	0.900	1.140	0.977	1.114	0.959	1.067	1.023	1.005	1.015	1.020	0.705	1.027	0.724	1.073	0.944	1.013
Thailand	1.111	1.062	1.179	1.266	0.977	1.236	0.982	1.126	1.105	1.089	0.973	1.060	0.944	1.051	0.993	1.016	1.000	1.015
Uruguay	1.138	1.007	1.147	1.000	1.139	1.139	1.000	1.112	1.112	1.000	0.995	0.995	1.000	0.960	0.960	1.000	1.041	1.041
Non-African countries	1.097	1.044	1.146	1.161	1.051	1.212	1.029	1.064	1.093	1.086	1.020	1.106	1.007	1.033	1.040	1.064	1.003	1.065
Algeria	1.013	1.060	1.075	1.307	0.979	1.281	0.988	1.076	1.063	1.220	0.974	1.188	1.056	1.056	1.116	0.751	1.026	0.770
Egypt, Arab Rep.	1.434	1.020	1.462	1.664	0.979	1.629	0.969	1.114	1.080	1.033	1.033	1.067	0.978	1.065	1.042	1.090	1.007	1.097
Libya	0.826	1.070	0.884	1.356	0.983	1.333	1.147	1.088	1.248	1.282	0.988	1.267	1.350	1.066	1.439	0.455	0.963	0.439
Mauritania	2.052	1.031	2.116	1.554	1.199	1.863	1.202	1.050	1.261	0.636	1.003	0.638	1.205	1.092	1.317	1.117	0.960	1.073
Morocco	1.426	1.074	1.531	1.035	1.127	1.167	1.050	1.058	1.110	1.024	1.008	1.032	1.147	0.965	1.106	0.988	0.999	0.986
Tunisia	1.017	1.073	1.091	1.213	0.974	1.181	1.074	1.100	1.181	1.267	0.994	1.259	1.280	0.953	1.220	1.124	1.130	1.270
Maghreb	1.295	1.055	1.360	1.355	1.040	1.409	1.072	1.081	1.157	1.077	1.000	1.075	1.169	1.033	1.207	0.921	1.014	0.939
Angola	0.912	0.872	0.795	0.399	1.420	0.566	0.727	0.970	0.705	1.829	0.990	1.810	1.467	1.022	1.499	1.137	1.004	1.141
Benin	0.857	1.064	0.912	1.216	1.068	1.298	1.254	1.069	1.341	1.288	0.973	1.254	1.123	1.069	1.200	1.109	1.025	1.136
Botswana	0.981	1.061	1.040	1.055	0.999	1.054	0.885	1.074	0.950	1.332	0.976	1.300	1.254	1.057	1.325	1.110	1.026	1.139
Burkina Faso	0.898	1.055	0.947	1.176	0.987	1.161	0.970	1.080	1.047	1.095	0.998	1.093	1.262	1.061	1.340	1.400	0.995	1.392
Burundi	1.107	1.067	1.181	0.894	0.976	0.872	0.885	1.114	0.987	1.547	0.996	1.541	0.891	1.086	0.968	1.113	0.996	1.108
Cabo Verde	1.717	0.999	1.715	0.760	1.359	1.033	1.056	1.052	1.111	1.037	1.017	1.055	1.099	1.030	1.132	0.997	1.031	1.028
Cameroon	0.866	1.109	0.960	1.069	1.048	1.121	1.294	1.069	1.384	1.163	1.011	1.176	0.857	1.008	0.864	0.926	0.947	0.877
Central African Republic	0.822	1.040	0.855	0.919	1.022	0.939	1.283	1.075	1.379	1.313	1.006	1.320	1.543	1.021	1.576	1.304	1.019	1.329
Chad	0.670	0.881	0.591	0.755	1.193	0.901	1.186	1.111	1.318	0.795	0.996	0.792	4.421	1.009	4.462	0.944	1.032	0.974
Comoros	1.285	1.133	1.456	1.479	1.036	1.533	1.196	1.061	1.269	1.352	1.012	1.369	1.085	1.030	1.119	0.969	0.957	0.928
Congo, Rep.	0.713	1.087	0.775	1.334	1.461	1.948	0.782	0.876	0.684	1.190	0.988	1.175	1.088	1.080	1.175	1.251	1.018	1.274
Cote d'Ivoire	1.304	1.019	1.329	0.998	1.204	1.202	1.451	1.089	1.581	1.290	0.986	1.272	0.973	1.075	1.045	0.966	0.971	0.938
Equatorial Guinea	1.656	1.082	1.792	0.934	1.061	0.992	2.024	1.058	2.142	2.597	1.075	2.791	1.000	1.290	1.290	1.000	0.868	0.868
Ethiopia	0.303	0.934	0.283	0.970	1.058	1.027	1.689	1.092	1.845	1.435	1.012	1.452	1.805	1.054	1.903	1.569	1.010	1.584
Gabon	1.024	0.986	1.009	1.009	1.145	1.156	1.128	1.068	1.205	1.264	0.998	1.262	0.955	1.050	1.002	0.678	0.999	0.677
Gambia, The	2.390	1.047	2.502	1.530	0.986	1.509	1.288	1.096	1.412	1.389	1.007	1.398	1.318	1.066	1.406	0.911	1.027	0.935
Ghana	0.599	0.987	0.591	0.972	0.979	0.952	1.063	1.114	1.185	1.158	1.034	1.197	1.022	1.050	1.073	1.012	1.014	1.026
Guinea	1.004	1.061	1.065	1.219	0.979	1.194	1.139	1.114	1.269	1.356	0.974	1.321	1.178	1.091	1.285	0.779	0.948	0.738
Kenya	1.025	1.119	1.147	1.081	0.979	1.059	0.972	1.088	1.057	1.011	0.972	0.982	1.286	1.057	1.359	0.936	0.946	0.885
Lesotho	0.731	1.009	0.738	0.921	0.979	0.902	0.812	1.098	0.891	1.135	0.995	1.130	1.214	1.025	1.244	0.895	0.980	0.878
Malawi	0.955	1.071	1.023	0.991	0.982	0.973	1.367	1.105	1.510	1.386	0.966	1.339	0.984	1.083	1.066	0.995	0.979	0.975
Mali	1.103	1.051	1.159	1.100	0.972	1.069	1.014	1.123	1.139	1.759	0.986	1.735	0.917	1.054	0.966	1.155	1.015	1.172
Mauritius	1.092	1.092	1.192	0.944	0.966	0.912	0.968	1.109	1.074	1.094	1.000	1.094	1.033	1.054	1.089	1.086	0.966	1.049
Mozambique	1.284	1.015	1.304	0.962	0.979	0.942	1.951	1.114	2.174	1.042	1.086	1.132	1.258	1.046	1.316	1.036	1.039	1.075
Namibia	1.193	1.031	1.230	0.821	1.243	1.020	1.047	1.057	1.107	1.655	1.024	1.694	1.045	0.948	0.990	0.772	1.026	0.792
Niger	1.186	0.984	1.167	0.407	1.187	0.484	1.399	1.068	1.495	1.243	0.981	1.219	1.462	1.091	1.596	1.537	0.973	1.496
Nigeria	2.091	1.016	2.125	0.775	1.177	0.912	0.892	1.091	0.973	0.720	0.957	0.690	1.351	1.042	1.407	1.081	0.968	1.047
Rwanda	1.202	1.062	1.277	0.895	0.985	0.882	0.844	1.111	0.938	1.450	0.969	1.405	1.755	1.074	1.885	1.324	1.025	1.357
Senegal	1.284	0.926	1.188	0.898	1.268	1.138	0.999	1.061	1.060	1.290	0.997	1.286	1.143	1.094	1.250	1.069	0.962	1.028
Seychelles	1.081	1.025	1.108	1.153	1.103	1.272	1.137	0.996	1.132	1.471	1.185	1.742	1.247	1.094	1.364	0.618	1.046	0.646
Sierra Leone	1.175	1.113	1.307	0.812	1.005	0.816	1.108	1.088	1.206	0.846	1.003	0.849	1.378	1.089	1.500	1.029	1.007	1.036
South Africa	1.088	0.966	1.051	0.985	1.339	1.318	1.211	0.925	1.120	0.809	1.057	0.855	0.841	0.947	0.797	0.955	0.986	0.942
Swaziland	1.413	1.057	1.494	1.184	1.058	1.252	0.851	1.064	0.905	0.977	1.006	0.983	1.098	1.047	1.150	1.065	0.972	1.036
Tanzania	0.996	1.027	1.023	0.763	0.979	0.747	1.670	1.069	1.784	1.013	1.015	1.028	0.866	1.076	0.932	1.172	0.968	1.135
Togo	1.185	1.037	1.229	1.341	1.062	1.424	1.383	1.064	1.471	1.545	1.009	1.560	0.825	1.048	0.864	1.097	0.967	1.061
Uganda	0.672	1.006	0.676	1.053	0.982	1.035	0.898	1.091	0.979	1.081	1.002	1.082	1.239	1.100	1.363	1.368	0.973	1.331
Zambia	0.857	0.926	0.794	0.852	1.184	1.010	1.035	1.078	1.115	1.349	0.992	1.338	0.996	1.022	1.018	1.157	0.962	1.112
Zimbabwe	1.545	0.926	1.431	0.554	1.562	0.866	1.074	1.030	1.106	1.024	1.008	1.032	1.960	1.024	2.008	0.443	0.986	0.437
SSA	1.112	1.025	1.144	0.978	1.105	1.066	1.156	1.069	1.238	1.272	1.007	1.283	1.269	1.057	1.338	1.052	0.990	1.042
Africa	1.126	1.033	1.166	1.066	1.083	1.140	1.112	1.069	1.190	1.201	1.010	1.213	1.186	1.048	1.242	1.042	0.996	1.038
Overall	1.126	1.033	1.166	1.066	1.083	1.140	1.112	1.069	1.190	1.201	1.010	1.213	1.186	1.048	1.242	1.042	0.996	1.038

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