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POLITIQUE BUDGÉTAIRE, INÉGALITÉ DE REVENU ET CROISSANCE INCLUSIVE DANS LES PAYS EN DÉVELOPPEMENT

"FISCAL POLICY, INCOME INEQUALITY AND INCLUSIVE GROWTH IN DEVELOPING COUNTRIES"

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A mon père et ma mère,

Mes frères et sœurs,

Mon épouse Awa Sanogo,

Ma fille Aïcha Imane Bachira.

SUMMARY

The issue of inclusive development in developing countries is at the heart of this thesis. The latter revolves around four chapters on fiscal policy issues and inclusive growth-related matters. **Chapter 1** explores how government tax revenue components (value added tax, personal income tax, and corporate income tax) affect the inclusiveness of growth in developing countries. The study discusses also the role played by institutional variables qualities in the implementation of tax policy. Evidence is shown that tax policy affects significantly inclusive growth if and only if the countries have a strong institution quality like low corruption and a good bureaucratic policy. In addition, our result shows that there is an optimal tax beyond which, any increase in the personal income tax rate should have negative impact on inclusive growth. Regarding the VAT, the analysis of threshold effect shows that it is from a certain threshold that the VAT revenue positively affects inclusive growth. This highlight several problems in VAT such as numerous exonerations, and non-refunding of VAT credits making VAT little accountable. Furthermore, the analysis shows that governments tend to reduce the income tax rates in electoral periods, but not necessarily the consumption tax rates. The **Chapter 2** examines the effects of government expenditure components on both equity and growth in sub-Saharan countries, especially whether it is possible to design public spending to promote a more equitable society without sacrificing economic growth. We find evidence that investment in infrastructure (quality and stock) contributed to more inclusive growth in Sub-sub Saharan African economies than others government spending in long term. These results particularly suggest that temporary and well-targeted programs should be implemented to help those being left out by the growth process. The **Chapter 3** investigates whether or not income inequality matters in the periods of fiscal adjustments in Côte d'Ivoire over the period 1980-2014. More specifically, we observe an improvement in growth performance after fiscal consolidations episodes, but also income gap decreases in the periods ahead fiscal adjustments.

Lastly, **Chapter 4** assesses the credibility of fiscal forecasts and their social effects in CEMAC and WAEMU countries. We obtain evidence that the inefficiency of fiscal forecast occurs in most time because the forecast deviation is proportional to the forecast itself, but also because the past errors are repeated in the present. Furthermore, a part of revenue forecast errors can be explained by random shocks to the economy. Therefore, these errors in revenue forecast considered as fiscal policy shocks has a detrimental effect on inclusive growth.

Keywords: Tax policy, government spending, inclusive growth, income inequality, fiscal adjustment, fiscal forecast errors, GMM, Panel VAR, Bayesian method averaging (BMA), developing countries, sub-Saharan Africa, WAEMU, CEMAC, Côte d'Ivoire.

RESUME

La question du développement inclusif dans les pays en développement est au cœur de cette thèse. Ce dernier s'article autour de quatre chapitres sur les questions de politique fiscale et les questions liées à la croissance inclusive. Le **chapitre 1** explore comment les composantes des recettes fiscales du gouvernement (taxe sur la valeur ajoutée, impôt sur le revenu des particuliers et impôt sur les sociétés) affectent l'inclusivité de la croissance dans les pays en développement. L'étude aborde également le rôle joué par les variables institutionnelles dans la mise en œuvre de la politique fiscale. Nous observons que la politique fiscale affecte la croissance inclusive de manière significative si et seulement si les pays ont de fortes qualités institutionnelles telles qu'une faible corruption et une bonne politique bureaucratique. En outre, notre résultat montre qu'il existe un seuil optimal au-delà de laquelle toute augmentation du taux d'imposition des personnes physiques affecte négativement la croissance inclusive. En ce qui concerne la TVA, l'analyse de l'effet de seuil montre que c'est à partir d'un certain seuil que les recettes de la TVA ont une incidence positive sur la croissance inclusive. Cela met en lumière plusieurs problèmes liés à la TVA, tels que de nombreuses exonérations et le non-remboursement des crédits de TVA reduisant ainsi la rédévabilitélié à la TVA. De plus, l'analyse montre que les gouvernements ont tendance à réduire les taux d'impôt sur le revenu en période électorale, mais pas nécessairement les taux d'imposition de la consommation. Le **chapitre 2** examine les effets des composantes des dépenses publiques sur l'équité et la croissance dans les pays d'Afrique subsaharienne, notamment s'il est possible de concevoir des dépenses publiques en vue de promouvoir une société plus équitable sans sacrifier la croissance économique. Notre étude a permis de montrer que l'investissement dans l'infrastructure (qualité et stock) a contribué à une croissance plus inclusive dans les économies d'Afrique subsaharienne que d'autres dépenses gouvernementales à long terme. Ces résultats suggèrent en particulier que des programmes temporaires et bien ciblés devraient être mis en place pour aider

ceux qui sont laissés pour compte par le processus de croissance. Le **chapitre 3** cherche à savoir si les problèmes d'inégalités de revenus se sont posés ou non dans les périodes d'ajustement budgétaire en Côte d'Ivoire au cours de la période 1980-2014. Plus spécifiquement, nous observons une amélioration de la performance de croissance après les épisodes de consolidation budgétaire, mais aussi des diminutions de l'écart de revenu dans les périodes suivantes les années d'ajustements budgétaires. Enfin, le **chapitre 4** évalue la crédibilité des prévisions budgétaires et de leurs effets sur le bien-être social dans les pays de la CEMAC et de l'UEMOA. Nous sommes aboutis aux résultats que l'inefficacité des prévisions budgétaires se produit dans la plupart des cas parce que les erreurs de prévisions sont proportionnelles à la prévision elle-même, mais aussi parce que les erreurs passées sont répétées dans le temps. En outre, une partie des erreurs de prévision des recettes peut s'expliquer par des chocs aléatoires survenus dans l'économie. Par conséquent, ces erreurs dans les prévisions de revenus considérées comme des chocs de politique budgétaire ont un effet négatif sur la croissance inclusive.

Mots Clés : Politique fiscale, dépenses publiques, croissance inclusive, inégalité de revenus, ajustement budgétaire, erreurs de prévision budgétaire, GMM, panel VAR, bayesian method averaging (BMA), pays en développement, Afrique subsaharienne, UEMOA, CEMAC, Côte d'Ivoire.

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GENERAL INTRODUCTION

GENERAL INTRODUCTION

Inequality has raised in different regions of the world both in advanced and developing economies in recent decades. According to the IMF (2014) report, a range of factors are at the root of this growing inequality. Specifically, these factors include technological change, increases in labor force participation by low-skilled workers, declining top marginal income tax rates, widening inter-regional inequality within economies and globalization and liberalization of factor and product markets.

While some income inequalities are deemed necessary to provide incentives for investment and economic growth (Barro, 2000; Forbes, 2000), it is also proven that high income inequality can undermine macroeconomic stability and growth. Recent empirical work reveals that high levels of inequality impair the pace and sustainability of growth (Ostry et al., 2014). Inequality can slow down growth because it deteriorates the health status of poor and human capital (Galor and Moav, 2004); it generates political and economic instability that reduces investment (Alesina and Perotti, 1996); it hinders the social harmony needed to adapt to shocks and maintain resilience and growth (Rodrik, 1999). Others argued that growing inequality could be an important contributing factor in the global financial crisis (Mah-Hui and Khor, 2011; Goda, 2017). Therefore, many decision-makers see a more equitable distribution of income as a desirable goal, although the underlying motivations may differ. Lower income inequality is often seen as important for achieving greater equal access to economic, social and political resources. Others view it as intrinsically desirable because existing income inequality is perceived as the result of unfair access to resources and thus detrimental to social cohesion.

The issue is about which policy each country should implement to spur growth and helping to reduce both poverty level, and inequality in income distribution. This preoccupation leads us back to fiscal policy that is the key instrument for governments to allocate income and thus

achieve inclusive growth. Fiscal policy can affect the distribution of income both directly by its effect on current disposable incomes and indirectly through its effect on future earnings capacities - and thus on market income (i.e. pre-tax and transfer) of individuals. Its role is likely to vary from one economy to another, reflecting the differences between available tax instruments and social preferences regarding equity and the role of government. However, to address these major challenges due to uncertainties in obtaining external financing, it is essential for developing countries policy makers to carefully consider the fairness of fiscal policies as part of their development strategies. This would improve households' living conditions and thus reduce poverty, and finance economic investments. Fiscal policy appears to be the best instrument for influencing income distribution. It includes taxation, social transfers, provision of free public services or at reduced prices (for e.g. schooling and health) and lastly direct intervention in the goods and services market and labor market (e.g. through the fixing of minimum wage). All of these instruments support the growth process in both developed and developing countries.

What is inclusive growth?

If growth is seen as an important factor of a country's capacity to improve the life of its citizens, we should know that growth by itself has no ability to reduce poverty and improve the well-being of all. Much attention should be paid to the quality and sustainability of this growth, as well as how its profits are distributed among the different social strata. All this to reflect the equity considerations that underlie the growth process in recent years (Tandon et al., 2006; Ali, 2007, Ali and Son, 2007; Rauniyar and Kanbur, 2010; Klasen, 2010; Ianchovichina and Lundström, 2009). According to the World Bank (2008), inclusive growth contain two important notions that are the pace as well as the pattern of growth; there is a relationship between these two elements, which must therefore be analyzed together. The assumption that the pace and pattern of growth is necessary for reaching sustainable growth as well as decrease

in poverty is in line with the conclusion of the Growth Report of the Commission on Growth and Development (2008). Thereby, the inclusiveness meaning at the same time equity, equality of opportunity and job creation is a key factor of a better growth strategy.

Despite growing calls to make growth more inclusive, however, there is still no universal agreement about the definition of the notion of "inclusive growth". While growth is easier to define and measure, the specification of what makes it "inclusive" is much more controversial. There is some agreement that inclusive growth is growth for "the benefit of most and not just the poor", but ambiguities and disagreements abound beyond this general notion, and it seems that this approach has also met some of the conceptual and measurement challenges that the pro-poor-growth debates have faced before. In a more limited approach, inclusive growth can be described as "growth associated to falling disparities in incomes" (Rauniyar and Kanbur, 2010). This specification highlights that inclusive growth is close to the concept relative pro-poor growth. The difference could be that its equity aspects is quite encompassing and goes over simple definition of the poor. The non-income considerations is not account in such definition and then it is simple to measure (Klasen, 2010). On the other hand, inclusive growth can often mean "growth that benefits everyone". In this sense, the notion would indicate that growth should "benefit all segments of society, including the poor, near-poor, middle-income groups and even the wealthy"(Klasen, 2010). Such definition poses some problems and indicates not only the recipient of growth benefit, but the extent and distribution of these benefits.

Other notions of inclusive growth have focused on the non-income components of growth and considered inclusive growth as a process and not just as an outcome. In this case, the concept refers to "growth associated with equal opportunities". As a result, inclusive growth is one in which the economic opportunities created by growth are accessible to all, especially the poor

(Ali and Son, 2007). The inclusiveness of growth will only be felt when the benefits accrue to poor groups, that is social groups disadvantaged. This would lead to greater social development and enable the weaker sectors of society to access assets and opportunities. Better asset and opportunity allocation lead to sustainable economic growth and thus reduces poverty and inequality. In the same line, Ianchovichina and Lundström (2009) believe that sustainable growth should be extended to all sectors and account the broad part of the country's workforce. This notion of growth underline productive employment as a means of rising poorest groups revenue rather than direct income distribution.

For Ali and Zhuang (2007), inclusive growth should consist of strong and sustainable growth to create productive and decent jobs as well as social inclusion to ensure equal access to opportunities. from this perspective, inclusive growth is not based on a redistributive approach. In addition, the authors highlight that social inclusion can be achieved by investing in education, health and other social services to build human capacity, promote economic and social justice and provide social safety nets in order prevent acute deficiency.

Why inclusive growth matters?

The concept of inclusive growth means a better redistribution of the benefits and opportunities of economic growth. Sure, the pursuit of this goal depends primarily on country-specific conditions, but broadly linked to robust and generalize growth in all sectors, promotes productive employment in the labor market, provides equal opportunities for access markets and poor. Therefore, achieving inclusive growth should be a priority for policymakers, as the inclusiveness of growth is a key for sustainable growth and social cohesion. According to Ali and Son (2007), high and rising levels of income inequality can reduce the impact of growth on poverty reduction, with negative consequences for political stability and social cohesion, which is necessary for sustainable growth. In the same line, Alesina and Perotti (1996) and Keefer and

Knack (1997) state that inequality may generate socio-political instability. Political instability increases policy uncertainty, which has negative effects on the decisions of investment on human or physical capital. This indirectly harms the growth rate. Also, greater inequality may produce social unrest. Thereby, if inequality is accompanied by low rates of social mobility, individuals may have recourse of illegal sources of income, may be in their opinion, the regular labor market are low. Investment in human capital will therefore be deferred or substituted, which negatively affects economic growth. Stability-threatening activities therefore represent an unproductive waste of resources and reduce the overall productivity of an economy Barro (2000). Likewise, high inequalities can be harmful to the level and durability of growth itself (Ostry et al., 2014), weaken support for growth-enhancing reforms, and encourage governments to adopt populist policies, threatening economic and political stability (Rodrik, 1999).

Inequality can also affect growth through its effect on resources distribution. From this point of view, high inequality can lead to less efficient allocation of resources. In the case of the imperfection of capital markets, the poor will not be able to exploit their abilities. The rich by against, invest furthermore in their projects so that the marginal returns are relatively low. Thus, wealth distribution should affect the average productivity of physical investment in the aggregate economy, while its quantity may be relatively unaffected (Banerjee, 2004). The weakness of financial access and investment in turn can also slow down social mobility, reduce work incentives and, in turn, contribute to lower growth.

Another argument has been given by Galor and Zeira (1993) which relies on human capital investment. Poor households can stop education if they realize that they do not have sufficient means to cover the costs, even if the return is high. Thus, inequality reduces the number of households capable of investing in physical or human capital. The weakness of poor household's investments implies that overall output would be lower than in the case of perfect financial markets. Then, it follows a negative correlation between inequality and growth.

Inequality and unemployment might also affect people's capability to face risk and thereby increase macroeconomic instability. In broad unequal societies, insurance mechanisms to contain the effects of shocks on consumption are very often limited to a few people, which generates significant social costs. In addition, fragile strata of the labor market - low-skilled and temporary workers - are more vulnerable to economic shocks, making them subject to work instability.

Inequality can affect negatively growth through the channel of the fertility rate. The transmission channel is narrowly related to the human capital argument that decisions on investment in human capital and family size are linked, in accordance with the previous vision provided by Becker and Barro (1988). Households face a trade-off between the quality and quantity of their offsprings. Thus, lower-income household tend to have high fertility rates and low levels of education. For them, their best opportunity to increase family income is to have many children, which will expand the household size. Then, as the number of children per family increases, the average investment in education decreases. According to Dahan and Tsiddon (1998), in the early stage of development, fertility and inequality increase together. But at the later phases of development, fertility decreases, investment in human capital increases, and inequality declines. Perotti (1996) supports that these models can be used to generate the prediction that decrease in inequality would cause a decrease in fertility and therefore an increase in investment in human capital and growth. Inequality

The fiscal costs of poverty and inequality are enormous. Poverty is not just a cost to individuals; it is also a drain on public resources. Increasing the number of decent paying jobs reduces social assistance expenditures, increases tax revenues and reduces the demand for services. This can free up resources to invest in supporting growth rather than dealing with the consequences of

poverty. Reducing spending on preventative and proactive services that reduce poverty can be counterproductive in the long run, only increasing the fiscal cost of poverty.

Fiscal policy and inclusive growth: what do the literature tell us?

The increased income disparity has therefore given rise to greater attention to reconsidering the role of the fiscal policy components - tax and expenditure - in simultaneously achieving two countervailing goals: equity and economic growth. However, there is no consensus among economists on the signs and magnitude of the effects of fiscal policy on income inequality and economic growth. Therefore, the conventional wisdom of economic theory postulates that equity objectives can only be achieved at the cost of economic efficiency and hence the use of fiscal policy to meet this goal implies an inevitable trade-off between equity and efficiency. Among authors that investigated the distributional considerations of fiscal policy, Musgrave (1959) has shown that fiscal policy could be an important factor to achieve an equitable distribution of income among households. However, the extent of variation in income inequality across countries indicates that fiscal policy can affect income distribution (Feenberg and Poterba, 1993; Auten and Carroll, 1999; Benabou, 2000; Muinelo-Gallo and Roca-Sagales, 2011).

On the side of public expenditure, several works have proved that some kind of government spending tend to reduce income disparities in a numerous regions and countries of the world (e.g. Goñi et al. 2011; Lustig, 2011, 2016; Lustig et al., 2013; Martinez-Vazquez et al., 2012). Well-targeted public spending can improve income distribution by ensuring greater equality of access to education and health care and thus redistributing ownership of factors of production. For example, income inequality tends to be reduced by public expenditure on social transfers. Otherwise, the amplitude of the effect may change, and this is function the extent to which transfers are targeted to poor groups; In the case where a large part of the transfers are allocated

to the middle class because of the reasons of political economy, the impact on inequality can be very limited (Milanovic, 2000). However, it is also recognized that the relationship between public spending and inequality is complex, and uncertainties are growing about the efficiency of public spending as a redistributive instrument, particularly in low and middle-income countries.

With regard to tax policy, tax policy design should play a key role in not only supporting growth but also in addressing distributional concerns. Taxes affect inequality through different channels. One can groups into two aspects. The first one is the direct way in which taxes redistribute income is by narrowing the distribution of disposable income (after tax). Taxes can also reduce market income inequality (before taxes) more indirectly, for example by encouraging participation in the labor market and by encouraging people to invest in their human capital and skills or by limiting the perpetuation of income inequality across generations. Specifically, taxes raise sufficient revenues to finance public projects such namely on social programs, and those often aim to reduce inequalities. Although taxation, especially the top bracket, is presented as an impediment to growth and an inefficient tool for tax redistribution (Bird and Zolt, 2005). Bastagli and al. (2012) show that direct taxes and cash transfers have reduced disparities in income distribution by about a third in OECD countries over the period 1985-2005. The second aspect by which taxes could affect equity is through the channel of targeted spending. In this case, taxes can generate income that will improve equity even if it is not progressive. Indeed, in some cases, an increase in regressive taxes might be the best solution if they are used to finance incremental expenditures and if the costs of effective redistribution through progressive taxes are high (IMF, 2014).

Source and discussions of income inequality database

Interest in income inequality has increased in recent years for both researchers and the public. To make meaningful comparisons of levels and trends of income inequality across countries and over time, comparable data are needed. Although there is a lot of data on inequality available for cross-country analyzes and overtime, unfortunately, most of these data simply are not comparable because of differences in population covered, in terms of geography, age, and employment status; the definition of well-being used, such as market income or consumption; and the treatment of various other items, such as non-monetary income and imputed rents. The Standardized World Income Inequality Database (SWIID) was introduced in 2008 to provide researchers with data on income inequality that maximizes comparability for the widest possible sample of countries and years (Solt, 2009). The SWIID database is an attempt to address the problem of data scarcity. The data are based on extended imputations where, for countries that do not have the required data for a given year, observations from the same country in other years and other countries of the same year are used to impute both gross and net inequality indices. However, others have been very critical of the widespread use of imputations in general and the particular type of imputations used by SWIID, and caution against the use of the dataset in econometric work (see Jenkins, 2015 and Ferreira et al., 2015). All costs arising from its implementation must be considered alongside the potential benefits arising from broader coverage. The value of SWIID depends on the plausibility of the assumptions underlying the imputation model (potential bias problems) and the correct use of the multiplied-imputed data (precision problems). Even though the SWIID has some weaknesses, it is important to note that SWIID uses a transparent procedure to increase the comparability of available data on cross-national inequalities. Although it is not ideal for all research on economic inequality, its advantages over other transnational data sets will make it an

invaluable resource for those interested in ascertaining the causes and effects of income inequality cross-nationally and over time. Therefore, in this thesis, I would use the SWIID database that offers a variation of inequality between countries that no other database offers at the same level of quality.

Inclusive growth is related to managing trade-offs between equity and efficiency. Growth-enhancing fiscal reforms may have some costs in terms of meeting equity objectives, so that the fiscal design for inclusive growth requires taking into account the distributional implications of fiscal policies. In this thesis, fiscal design for inclusive growth is defined as a fiscal policy that reconciles considerations of efficiency and equity. In a clearer way, this thesis considers that inclusive growth is a growth whose benefits are equitably shared. A plausible way to know this benefit-sharing is to focus on the distribution of income across different social groups. Therefore, throughout the thesis, growth is considered as inclusive when it allows to reduce income inequality. This choice on the dimension of income distribution compared to other dimensions will allow us to be consistent in all analyzes.

Overviews of thesis and contributions

With the purposes of study, the thesis concentrates on investigating the relationship between components of fiscal policy and inclusive growth in developing countries using econometric models. The thesis has two parts and each part is composed of two chapters.

Through chapters 1 and 2, the first part deals with the evaluation of government fiscal policy effects on growth inclusiveness in developing countries. Fiscal policy concerns the taxation and public spending, which in turn influences resource allocation and income distribution. The chapter 1 is about how tax policy could be used to achieve inclusive growth in developing countries by dealing the glaring disparities between the rich and poor. The distributional effect of spending is covered in Chapter 2.

Chapter 1 examines how public tax revenue components (value added tax, personal income tax, and corporate income tax) affect the inclusiveness of growth in developing countries. The link between tax policy and inclusive growth deserves attention, as income and consumption levels are the main indicators of household well-being. So, any change in tax policy necessarily implies a change in price structure which affects consumer preferences. This change can affect households indirectly through the change in production factors cost, and thereby their income. The inclusive growth index used refers to that developed by Anand et al. (2013), which integrates both the pace and distribution of economic growth. In fact, it integrates growth and income distribution into a single measure. Thereby, it provides a framework to study equity and efficiency together. The literature found that tax variables are likely to be endogenous, due to the inverse causality - from inclusive growth to selected tax policy instruments and vice versa. In particular, countries with a low level of inclusive growth may choose to rely relatively more on direct taxation and vice versa. As a result, these regressors can be correlated with the error term. In addition to this argument for potential reverse causality, endogeneity may also occur due to omitted variables and measurement error. Finally, the presence of the lagged dependent variable inclusive (t-1) is likely to give rise to autocorrelation. To address the endogeneity problem, one would usually choose an instrumental variables approach. However, finding good instruments for all observed types of taxation is a significant challenge. Using OLS is likely to yield biased and inconsistent estimated coefficients given the presence of heterogeneity among countries. To address this problem of endogeneity, the system GMM estimator developed by Blundell and Bond (1998, 2000) is used. Unlike most authors who have worked on this issue, we introduce to our model one external instrument for tax variable. This tax instrumental variable is that developed by Martinez-Vasquez et al.(2011). The method consists to instrument the tax variable with the weighted average of the tax variable for other countries in the corresponding year. The underlying intuition for using this particular instrument is that

inclusive growth in a country relative to others generally should not have an effect on the design of the tax structure of those other countries. Also, the design of the tax structure in a country should be affected by the design of the tax structure in the neighboring countries. In other words, countries are tempted to rely on what is happening in their neighbor.

Using a database of 91 developing countries over the period 1990-2015, we show that, personal income tax (PIT) has been the best tool to affect the income distribution, leading to a more inclusive growth. The study discusses also the role played by institutional variables qualities in the implementation of tax policy. In the case of corporate income tax, the chapter provides evidence that this tax contributes to greater inclusive growth if and only if the countries have a strong institution quality like low corruption and a good bureaucratic policy. Moreover, we analyze the nonlinear effect of the taxation on inclusive growth. The specific objective is a determination of the threshold of taxation for developing countries beyond which the inclusiveness of growth declines. The result shows that there is an optimal tax beyond which, any increase in the PIT rate should have negative impact on inclusive growth. Regarding the VAT, the analysis of threshold effect shows that it is from a certain threshold that the VAT revenue positively affects inclusive growth. This highlight several problems in VAT such as numerous exonerations, and non-refunding of VAT credits making VAT little accountable. Furthermore, the chapter tried to see whether there is a politico-budgetary cycle in the effect of taxation. The analysis shows that governments tend to reduce the income tax rates in electoral periods, but not necessarily the consumption tax rates. This implies that the income tax rates have a bigger impact on voters' choices compared to consumption taxes. Finally, we examine whether the impact of tax policy on inclusive growth has been affected by great financial crisis that took place during the year 2008. We found the improvement in the effect of tax policy on inclusive growth after the financial crisis. One explanation could be developing countries have reformed their tax system in the sense of taxation in favor of pro-poor growth.

Chapter 2 evaluates the effects of government expenditure components on both equity and growth, in sub-Saharan countries. Specifically, the chapter tries to analyze whether it is possible to design public spending in order to promote a more equitable society without sacrificing economic growth. The chapter is important for countries in sub-Saharan Africa at the time when governments face many political and economic challenges such as commodity price volatility, inflation, terrorism, and poor institutional quality (corruption, poor governance). Thus, the inclusion of the growth target could only be achieved through a quality institution and productive pro-poor government expenditures in the form of broad-based spending on education, health and infrastructure. To carry out the study, a panel-data vector autoregressive (panel VAR) approach is employed on annual data of 10 sub Saharan African countries over the period 1990-2015. The Panel VAR approach combines the traditional VAR approach, treating all the variables in the system as endogenous, and the panel-data approach, allowing for unobserved individual heterogeneity by introducing fixed effects, resulting in an improved consistency of the estimation (Love and Zicchino, 2006). The major advantage of this method is that it exploits individual time series and cross-sectional variations in data and avoids biases associated with cross-sectional regressions by taking into account the country-specific fixed effect. For Canova and Ciccarelli (2013), it captures static and dynamic interdependencies. It is undoubtedly a useful tool to give some good interpretation of inclusive impacts of government fiscal expenditure without modeling the global economy. As our panel exhibits a medium temporal dimension and a relatively small number of countries (10 countries), the panel with fixed effect specification (LSDV) is the most appropriated (Bun and Kiviet, 2006) and found to be consistent (Nickell, 1997). So, the estimation and drawing Impulse Response Functions (IRFs) of different shocks were done using the Stata code (XTVAR) of Cagala and Glogowsky (2014). XTVAR estimates a panel vector autoregression, using a least square dummy variable

estimator (LSDV). The estimator fits a multivariate panel regression of each dependent variable on lags of itself and on lags of all the other dependent variables.

Our findings from impulsive response function give evidence that investment in infrastructure (quality and stock) contributed to more inclusive growth in Sub-sub Saharan African economies than others government spending in long term. This effect could be observed by an increased in GDP per capita growth and reducing in income inequality measured by Gini index. However, our results do not find evidence that public spending on education and health affect both equity and growth in Sub-Saharan Africa countries. In fact, among other reasons, these programs are in many countries located in urban areas thus not directly benefiting the rural poor or even those in the informal settlements in urban areas. Moreover, social spending in developing countries often benefits the rich and middle classes more than the poor. Therefore, a higher share of social spending on items such as health and education will not be reflected in higher incomes for the poor. These results are confirmed by the variance decomposition analysis (FEVD).

The second part of this thesis presents two essays on fiscal adjustment, fiscal forecast, and inclusive development in African countries through Chapters 3 and 4. Public finances across west and central African countries has worsened considerably. There is an increasingly growing consensus for the necessity of restoring public finances as a prerequisite for sustainable and inclusive economic growth. Restoring sustainable public finances in these countries will require the implementation of credible medium-term fiscal adjustment strategies and also requires a credible budgetary projection. However, the question is whether these fiscal austerity measures will increase inequality or contribute to a more equitable distribution of income. Another concern is whether fiscal forecast errors affect inclusive growth.

Chapter 3 explores the effects of fiscal adjustment on inclusive growth in Côte d'Ivoire over the period 1980-2014. Addressing such issue seems necessary as poor income distribution could reduce the government's political support for implementing consolidation measures, but also because high levels of inequality could hurt long-term growth. In order to measure the impact of fiscal adjustments we use the cyclically adjusted primary balance (CAPB) as the measure of the government's fiscal stance. The interest of this fiscal measure is that it isolates discretionary policy action from effects resulting from economic activity such as inflation or real interest rate changes. Especially, we use primary fiscal variables that exclude interest payments because the fluctuations in interest payments cannot be considered discretionary. To make the cyclical correction, we follow the method proposed by Alesina and Ardagna (2010) and Yang et al. (2015). According to authors, such fiscal variable is simpler and more transparent than more complicated official measures such as those of the OECD and the IMF that use estimates of potential output and fiscal multipliers. The underlying principle of this method, as mentioned Yang et al. (2015), is that since public expenditure is negatively dependent on GDP as a result of unemployment benefits, and because revenue responds positively to GDP as a result of tax revenues, changes in cyclically-adjusted fiscal variables can be calculated from the difference between the predicted current-year value (which would prevail if unemployment had not changed since the previous year) and the actual value of the previous year. However, contrary to Yang et al. (2015) that use a share price index as an additional variable determining the CAPB, we use the international price of cocoa. In fact, cocoa accounts for 15% of Côte d'Ivoire's GDP and more than 50% of its export earnings. When considering cocoa price as a business cycle factor, it would be ideal to include other types of commodity prices such as oil price and coffee price. But we use only the price of cocoa as a business cycle factor due to its particular relevance to tax revenues, and we believe this index is representative of the other commodity price movement. Therefore, a period of fiscal adjustment corresponds to a year in

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which the cyclically adjusted primary balance (CAPB) improves by at least 1 per cent of GDP. The estimation of the inclusiveness effects of fiscal consolidation in Côte d'Ivoire is made using the Bayesian Model Averaging (BMA) method developed by Magnus et al. (2010). According to the literature, there exist potentially several empirical growth models, each given by a different combination of explanatory variables and each with some probability of being the "true" model. Bayesian methods frame the problem of identifying the determinants of economic growth in terms of uncertainty about the true sets of explanatories.

Our results show that fiscal consolidations are followed by an improved in growth performance, but also income gap decreases after periods of fiscal adjustments in Côte d'Ivoire. In other words, there is no trade-off between growth and income inequality when implementing fiscal consolidations in Côte d'Ivoire. This conclusion contrasts to the results of several works that analyze the impact of fiscal consolidations on inequality at the national level. Our findings also suggest that tax-based fiscal consolidations seem to increase economic growth. However, the results did not find evidence to the expansionary effect of spending-based fiscal adjustment. These results could be explained by the fact that in developing countries, tax based-adjustment are generally a base-broadening measures. Therefore, this will contribute to strong tax revenue collections and play an important role in achieving higher, sustainable economic growth. Moreover, we find that tax revenue increases in Côte d'Ivoire were not associated with increases in inequality. Interestingly, when fiscal consolidation is achieved via revenue side, income inequality seems to be reduced further. In addition, reductions in primary expenditures do not seem to reduce the income gap.

The **last chapter** investigate the fiscal forecasts and their social effects in CEMAC and WAEMU countries. The objective of this chapter is threefold. First, it aims to assess the quality of fiscal forecasts (accuracy, rationality and unbiasedness) in these two-economics areas.

Second, it tries to analyze the determining factors of fiscal forecast deviation for CEMAC and WAEMU countries. Third, it analyzes the social effects of fiscal policy shocks through its impacts on the growth inclusiveness. Having in mind that forecasting is a complex task surrounded by huge uncertainty, we documented the statistical properties of forecast errors using data collected from national draft budgets that were made for the period 2004-2015. Three aspects are tested: accuracy, rationality and unbiasedness. Bias is a problem of direction: Forecasts are typically too low (downward bias) or typically too high (upward bias). The unbiasedness of forecasts can be analyzed through simple descriptive, the mean error (ME). Accuracy is an issue of magnitudes of deviation: Forecast errors can be too large (in either direction) using a particular forecasting technique. In practice, the accuracy of forecasts can be analyzed by either by econometric test either through simple descriptive: mean absolute error (MAE). The rationality (or efficiency) refers to how much a forecast fully exploits the information available at the time the forecast is made. The rationality can be examined regarding the information available at the time the forecast was elaborated (data, policy measures). This will allow to determine whether or not the predictions are optimal with regards to this particular information set (Wallis, 1989). Next, we performed a panel data analysis of the potential determinants of revenue forecasting errors, considering a wide set of economic, political and institutional variables. Assuming the presence of cross-sectional dependence in our model, that could be caused by the common factors which are unobserved, we resort to a Driscoll and Kraay (1998) standard errors estimation method in order to have the unbiasedness estimators.

The statistical analysis of the quality of fiscal forecast shows that only one country produces both relatively unbiased and accurate fiscal forecasts – Benin. The test of inefficiency shows that both in these two economic areas, the inefficiency of fiscal forecast occurs in most time because the forecast deviation is proportional to the forecast itself, but also because the past

errors are repeated in the present. Furthermore, the degree of cross-country heterogeneity is high in the sample. The investigation on potential determinants errors denote that a part of revenue forecast errors can be explained by random shocks to the economy like unexpected changes in the GDP growth, change, consumer price measured by inflation and the price volatility. Against our expectation, public debt/GDP ratio is associated with lower budget balance forecast error. Our study does not find evidence of the effect of election year on revenue forecasts. Finally, the good practice of PFM namely the publication by the government of a report or a chapter on fiscal risks seem relevant in reducing errors in revenue forecasting. Regarding the distributional effect of fiscal policy shocks, the results suggest that an error in revenue forecast considered as fiscal policy shocks has a detrimental effect on inclusive growth. These effects on employment and inequality are mitigated in a healthy economic environment accompanied by better institutional quality.

PART 1: FISCAL POLICY AND INCLUSIVENESS OF ECONOMIC GROWTH

CHAPTER 1: TAX POLICY FOR ACHIEVING INCLUSIVE ECONOMIC GROWTH IN DEVELOPING COUNTRIES

Abstract

This chapter assesses the impact of tax policy on inclusive growth in a panel of 91 developing countries over the period 1990-2015. To achieve our goal, we focus on three categories taxes namely the value added tax (VAT), the personal income tax (PIT), and the corporate income tax (CIT). We use the system GMM estimator to address endogeneity issues. Using the inclusive growth index developed by Anand et al. (2013), the empirical results indicate that reliance on personal income tax in developing countries has been a source of inclusive growth, confirming the progressivity of PIT, so the best tool to affect the income distribution. In the case of corporate income tax, our empirical results suggest that this tax contribute to greater inclusive growth if and only if the countries have a strong institution quality like low corruption and a good bureaucratic policy. Regarding the VAT, the analysis of threshold effect shows that it is from a certain threshold that the VAT revenue positively affects inclusive growth. This highlight several problems in VAT such as numerous exonerations, and non-refunding of VAT credits making VAT little accountable. Moreover, we found that the effect of tax on inclusive growth is affected in electoral period. Furthermore, after 2008 financial crisis, PIT and VAT have been found to have positive effect on growth inclusiveness due to tax system reform in favor of pro-poor growth.

Keywords: tax policy, inclusive growth, income inequality.

JEL code: H20, D31, I31

1.1. Introduction

The reduction of poverty and inequality has always been at the center of both policy and academic debates all over the World. Over time, government involvement has increased in absolute and relative terms, especially in developing countries due to insufficient and ineffective market force mechanism in achieving macroeconomic objectives. The efficiency in the allocation of resources was expected to benefit the aggregate economy. While advanced economies have a long history of actively using fiscal policy for redistribution, in developing countries fiscal policy has put greater emphasis on achieving growth rather than on promoting equity. The critical issue facing developing countries is how to use fiscal policy to achieve a fairer society without undermining fiscal sustainability.

The concern is what adequate policies each country should implement to spur growth and helping to reduce both poverty level, and inequality in income distribution. Kakwani and Pernia, (2000) focus in favor of direct pro-poor policies and recommend policies deliberately distorted in favor of the poor. Dollar and Kraay (2002) claim that implementing policies oriented on property rights, macroeconomic stability, fiscal discipline and international trade would be beneficial for poor much than direct pro-poor policies. In the theoretical and empirical literature, most studies emphasis the role of fiscal policy such as taxation and spending policies as main tool for enhancing economic growth, but also achieve income redistribution and poverty reduction (Canavire-bacarreza et all., 2013; Claus et all., 2012; Martinez-Vazquez et al., 2012). However, no simple answer exists concerning the relationship of fiscal policy and inclusive growth (reduction in inequality and poverty) especially in developing countries. It is noted that few researches have been conducted on how changes in fiscal policy such taxation and public spending have actually impacted income distribution, especially in less advanced economies. In developed countries, fiscal policy contributes significantly to reducing income

inequality, according to a comprehensive review by Bastagli et al. (2012). The result is mitigating in developing countries. This is due to the weakness of taxes and transfers that greatly limit the redistributive impact of developing countries fiscal policy. In the same vein, other authors have found that there is low correlation between changes in public expenditure and income inequality (Schuknecht and Tanzi, 2005), and have showed that tax policy was generally ineffective to affect the distribution of income (Harberger, 2006). However, some evidence indicates the distributional effects of tax policy in developing countries, such in the cases of Indonesia (Keuning and Thorbecke, 1989) or Latin America (Ocampo, 1998).

The impact of tax policy on inclusive growth merits attention due to the fact that when analyzing households' welfare, their income and level of consumption are the main indicators of their standard of living. Moreover, any change in tax policy necessarily implies a change in price structure which affects consumer preferences (Essama-Nssah, 2000). This change can affect households indirectly through the change in production factors cost, and thereby their income. Furthermore, the tax system could have a direct effect through households' disposable income or the price of goods and services i.e. the level of consumption. Therefore, the role of fiscal policy in developing countries should be to foster economic growth by providing macroeconomic stability, but also ensure equity. Then, if governments are to play an active role in fostering inclusive growth, fiscal policy should be put forward. The challenge is to know which aspect of fiscal policy policymakers should focus to ensure more inclusive growth leading to improve living conditions of the population through a reduction of income inequality and poverty and improving employment.

The fundamental objective of this study is to examine the relationship between tax policy and inclusive growth by highlighting in 91 developing countries by using a dynamic panel data. We consider policies that have been proven in the literature to make growth patterns more inclusive.

These policies can be grouped into various groups. As in most developing countries data is unavailable, we use two kinds of taxation (income taxes and added value tax). We organize the rest of the article as follows: the next section presents trends in income inequality while section 3 deals with the content of inclusive growth. Section 4 discusses the role of institutional variable quality on inclusive growth. Section 5 reviews the literature. In the section 6, we develop the empirical approach while section 7 displays the results of estimation. Finally, section 8 concludes the chapter.

1.2. Trends in income inequality

Income disparities are increasing in many countries, and until recently, between regions. Table (1) presents trends in the Gini coefficient for disposable income (i.e., market incomes minus direct taxes plus cash transfers) across regions over recent decades. Between 1990 and 2011, average inequality in each region changed by less than 5 percentage points. Sub-Saharan Africa and Latin America are the two most unequal regions with average inequality exceed a Gini of 44 % every year. Even though there is a slight decline in Gini coefficient in both two regions over the second sub period, the level of income inequality remains high in these two regions. In contract, Europe and Central Asia was the most equal region, and the average inequality in that region was less than 31 %, a difference of 13 percentage points.

Table 1: Gini Index by Region, 1990-2011

Region	1990	2000	2011	Change in Gini 1990-2000	Change in Gini 2000-2011	Change in Gini 1990-2011
East Asia & Pacific	35.7	38.7	39.7	2.9	1.0	3.9
Europe & Central Asia	25.8	30.5	30.5	4.7	-0.02	4.6
Latin America & Caribbean	45.2	47.9	44.2	2.6	-3.7	-1.1
Mddle East & Nrth Africa	36.6	38.0	33.9	1.3	-4.06	-2.6
North America	30.4	34.1	34.3	3.6	0.2	3.8
South Asia	36.7	41.5	37.7	4.8	-3.8	1.0
Sub-Saharan Africa	46.5	46.2	43.2	-0.2	-3.0	-3.2

Sources: Net Gini from SWIID Version 5.0; and Authors calculations.

In terms of change in Gini index, Europe and Central Asia as well as East Asia and Pacific ranked as the worst performers on average, having increased their Gini index by almost 4.7 and 4 respectively between 1990 and 2011. In the same line, we can note an increase in Gini index by about 3.9 for North America region. These results are due to the fact that these regions have previously recorded a high level of inequality over the period 1990-2000. So, they also appear as the worst performers in the short term, with increases in their Gini coefficient of 3.6 for North America, 4.7 for Europe and Central Asia, and about 3 for East Asia & Pacific. Sub-Saharan Africa, on the other hand, has made the greatest progress towards greater equality by reducing its Gini index by about 5 points on average, between 1990 and 2011. Sub-Saharan Africa is also among the best-performing nation in the short term, as its regional Gini index has fallen by some 3 between 2000 and 2011, while Middle East and North Africa as well as Latin America and the Caribbean are following it closely, having dropped their index by about 2.7 and 1.1 points on average, respectively.

1.3. Content of inclusive growth

Economic growth is an important factor in the fight against poverty. However, in many areas, the current economic growth is not generating equity. Since then, it is recognized that growth alone cannot lead to a reduction in poverty or a desired enhancement in the welfare of all. Thus, the quality of growth, its sustainability and the extent to which it benefits to broader sections of society have more and more become of interest. It's in this context that the concept of inclusive growth has been developed in the recent years as a way of addressing equity considerations underlying the process of growing. In a 2008 report, the World Bank introduced the inclusive growth concept as "growth that allows people to contribute to and benefit from". Despite the growing calls to make growth more inclusive, however, there is still no universal agreement about the definition of the notion of "inclusive growth". While growth is easier to define and measure, the specification of what makes it "inclusive" is much more controversial. There is some agreement that inclusive growth is growth for "the benefit of most and not just the poor", but ambiguities and disagreements abound beyond this general notion, and it seems that this approach has also met some of the conceptual and measurement challenges that the pro-poor-growth debates have faced before. In a more limited approach, inclusive growth can be described as "growth associated to falling disparities in incomes" (Rauniyar and Kanbur, 2010). The specification highlights that inclusive growth is close to the concept of relative pro-poor growth. The difference may be that its outlook of equity is more comprehensive and goes beyond the restricted definition of poor. The non-income considerations is not account in such definition and then it is simple to measure (Klasen, 2010). On the other hand, inclusive growth can often mean "growth that benefits everyone". In this sense, the notion would indicate that growth should "benefit all segments of society, including the poor, near-poor, middle-income groups and even the wealthy"(Klasen, 2010). Such definition indicates not only the recipient of growth benefit, but the extent and distribution of these benefits.

Other notions of inclusive growth have focused on the non-income components of growth and considered inclusive growth as a process and not just as an outcome. In this case, the concept refers to "growth associated with equal opportunities". As a result, inclusive growth is one in which the economic opportunities created by growth are accessible to all, especially the poor (Ali and Son, 2007). The inclusiveness of growth will only be felt when the benefits accrue to poor groups, that is social groups disadvantaged. This would lead to greater social development and enable the weaker sectors of society to access assets and opportunities. Better asset and opportunity allocation lead to sustainable economic growth and thus reduces poverty and inequality. In the same line, Ianchovichina and Lundström (2009) believe that sustainable growth should be extended to all sectors and account the broad part of the country's workforce. This notion of growth underline productive employment as means of rising poorest groups revenue rather than direct income distribution. For Ali and Zhuang (2007), inclusive growth should consist in strong and sustainable growth in order to create productive and decent jobs as well as social inclusion to ensure equal access to opportunities. From this perspective, inclusive growth is not based on a redistributive approach. In addition, social inclusion can be achieved by investing in education, health and other social services to build human capacity, promote economic and social justice and provide social safety nets to prevent acute deficiency. Fernando (2008) noted that the economic dimension includes both capacity and opportunities for the poor and low-income rural households to benefit from economic growth. For others, however, social and institutional aspects of growth and development are also important elements of inclusive growth package. Ali and Son (2007) used the concepts of "social inclusion" and "empowerment" to denote this dimension. Thereby, social inclusion refers to removing the institutional and policy barriers that limit economic growth. Empowerment imply the access to productive assets, capacities, and resources that will allow every person to take part in the growth process.

In short, there is no consensus strictly speaking on a universal definition that can help to implement and monitor policy for inclusive growth. Various approaches have been developed and focus on different items of concept. The close concepts highlight outcomes. In this case, inclusive growth equal to "growth plus equity". Thereby, there is better income and/or access to social goods and safety net.

1.4. The role of institutional quality

There is relevant work in the literature that address the relationship between institutional quality and inclusive growth. Two aspects – economic growth and income distribution – are key to understanding this relationship. In this section, the analysis is focused especially on corruption. Some studies show that corruption is systematically correlated with levels of human development and lower growth rates (Rothstein and Holberg, 2011). The effects of corruption on economic growth are numerous and can take various forms. Tanzi and Davoodi (1997) report four of them: higher public investment, lower quality of public infrastructure, lower public spending on education and health. Many studies have also found that corruption affects the quantity and quality of investments and reduces profitability (Mauro, 1998). Specifically, corruption reduces foreign direct investment (Zurawicki and Habib, 2010), including in the host country (Wei, 1999). Thus, a decline in the foreign direct investment affects the economic growth. Another way that corruption harms economic growth is that it undermines country's tax system and its ability to collect revenue (Nawaz, 2010). Let us add that corruption not only reduces the tax to GDP ratio, but also it increases the underground economy and weakens the tax morality of taxpayers, thus damaging the economy in the long-run (Attila, 2008; Nawaz, 2010). Corruption introduces uncertainty, introduces reputational risks and vulnerability to extortion, which is costly for companies (Chêne, 2014). According to Transparency

International (2009), corruption also undermines fair competition because it makes access to capital more expensive.

Corruption does not only affect the level of economic growth but also on how the benefits of such growth are distributed in the society. In fact, poor institutional quality has a detrimental effect on income inequality. Corruption affects negatively the distribution of income through diverse channel, namely by biased tax system, and lower levels and effectiveness of public spending. Corruption biased tax system in favor of rich people, thus creating unequal wealth distribution (Gupta et al. 2002). Corruption eases tax evasion and this have greater effect on the capability of government to mobilize high tax revenue and to fairly distribute the wealth. In addition, corruptible tax system creates a pressure on the system making the future taxation more progressive in order to offset the inequalities caused by corruption. However, such compensatory measures could encourage further influence groups to intensify their behaviors of tax evasion through political corruption and buying influences, thus creating a vicious cycle. Such situation makes the poorer more vulnerable to corruption and cannot demand accountability (Chêne, 2014). Furthermore, inequality caused by corruption impacts the position of disadvantaged groups of society by reducing the resources intended to social spending, such as education and health services. By reducing the quality of education and health care, corruption decreased human capital. Regarding the public health services, corruption could contribute to delay the provision of treatments, increasing the waiting times for patients and discouraging the use of clinics (Azfar and Gurgur, 2008).

1.5. The impact of tax policy on inclusive growth: literature review

We divided the literature into two groups, based on the definition of inclusive growth as growth that reduces inequality and poverty. Firstly, we are looking to see if tax policy leads to economic growth and secondly whether that growth reduces inequality and poverty, leading thereby to the improvement of the standard of living.

The question of whether tax policy can affect growth has been widely debated in the literature. On the link between taxation and growth, in a general way, there is considerable agreement in the literature about what are the important tax policy issues and appropriate tax policy directions for developing countries. For Fjeldstad (2013), an effective tax system plays a central role in sustainable development because it can mobilize the stable domestic revenue allowing developing countries to reduce the amount of aid or their dependency on natural resource. In order to analyze the efficiency of tax system, it is imperative to have knowledge to how tax policy undermines or promotes economic growth.

From a theoretical point of view, the literature suggests that tax structure is negatively interlinked to growth. According to Gordon and Li (2009), developing countries tax policy is disconcerting on divers dimensions, due to the opposition between these policies and those observed in developed countries and those foreseen in the optimal taxation literature. Therefore, high tax rates lower economic growth. One explanation is that higher tax rates may be distortionary and hence is correlated negatively to growth while lower tax rates can increase revenue mobilization that will be used productively. However, empirical studies on taxation that promotes economic growth gave mixed results. Generally speaking, empirical studies found that different type of tax instruments affect economic growth significantly. Some studies on developing countries found non-consensual clear relationships, namely those by Skinner (1988); Easterly and Rebelo (1993); Agell et al. (2006); Padda and Akram (2009); Ocran

(2011); Worlu and Nkoro (2012); Bujang et al. (2013); Canavire-bacarreza et al. (2013). Other investigations including Li and Sarte (2004); Arnold et al. (2011); Gemmell et al. (2011); Martinez-Vasquez et al. (2011), found strong association between tax structure and growth.

Using data from African countries, Skinner (1988) shows that PIT and CIT have negative direct effect on output growth, while trade taxes have little direct effect. The study also shows that sales and excise taxes have neutral effect on both output growth and investment. Easterly and Rebelo (1993) studies the effect of tax system on growth by using cross-section data for 100 countries and a panel of annual data for 28 countries. They applied different approaches to measure tax rates. Their results show that the effect of taxation is not easy to isolate empirically. Autors predict that taxes on income and investment have unfavorable impact on economic growth. Indeed, these taxes have a simple and direct effect on growth rate: they reduce private returns to accumulation. However, not all taxes affect the rate of growth. In the models with exogenous labor supply, the growth rate is not affected by the level of consumption taxes; thus, these taxes do not distort the relative price of consumption today compared to tomorrow, leaving unchanged the incentive to accumulate capital. Likewise, Padda and Akram (2009) investigate whether the Pakistan, India and Sri Lanka tax policies have transitory or permanent effect on economic growth over the period 1973-2008. They found that in short terms, change in tax rate has transitory and negative effects in Pakistan and India. But for Sri Lanka, the effect is positive for first year and remains negative afterwards. Li and Sarte (2004); and Martinez-Vasquez et al. (2011) found the same effect in respect of income tax. Unlike Skinner, authors found that increased use of consumer taxation has significant positive effects on economic growth. In the same line, Acosta-Ormaechea et al. (2012) found that raising consumption taxes (VAT and sales taxes) and decreasing taxes on income may be beneficial to growth. Moreover, Canavire-bacarreza et al. (2013) analyze the effect of different tax instruments of Latin American countries (such as PIT and CIT, general taxes on goods and services, including VAT

and other sales taxes, and revenues from natural resource) on economic growth. Authors found that PIT does not have the expected negative impact on growth in Latin America. They also found small negative effects of CIT on growth for individual countries, especially Argentina, Chile, and Mexico. Also, their results suggest that, in Latin America, greater reliance on consumption taxes affect significatively and positively growth. Similarly, Arnold (2008) used OCDE countries sample to show that both PIT and CIT are associated with lower economic growth relative to using consumption and property taxes. The study reveal that CIT worsen more growth than PIT. Therefore, the effect of both taxes remains the same in developing countries as well as developed countries. Bird and Zolt (2005), and Tanzi et al. (2008), argue that the restrict effects of PIT on economic growth are caused by its limited role played in developing countries tax system.

To assess the effect of tax policy on inclusive growth, it is also necessary to study its effect on income redistribution and poverty reduction.

Meltzer and Richard's (1981) are among the first to take an interest in the impact of tax structure on income redistribution. They argue that when mean income rises relative to the median income in the income distribution, a majority of low-income people will tend to support higher taxes, probably more as direct and progressive taxes rather than indirect taxes. Several studies have been done on the incidence of taxation and the allowance of tax burdens between different income groups, according to a set of conventional assumptions about the transfer of tax. Clearly, the study of incidence is relevant because the impact of taxes on income distribution and poverty is a long-term process and general impression of impact may be completely wrong.

Regarding poverty reduction, Thompson and Smeeding (2013) explored trends in inequality and poverty in the US between 2008 and 2010 using both market income, and after-tax and transfer income. The results show that the effect of fiscal policy is different according to income

groups. Poverty turn down between old people while among children it decreased slightly. However, its effect increased sharply among the working-age population. Authors found that inequality declined in the whole sample, but no change was observed in households of working age.

The CIT is ultimately "paid" by individuals either as follows: workers with lower wages; Consumers by higher prices; and/or owners of companies (shareholders) through lower profits and returns of investment. Although the objective of groups pushing for a higher CIT is to increase the tax burden on capital owners, taxes shifted to consumers or workers are clearly not paid by "corporations". Therefore, if capital owners bear a part of the burden of CIT, the reduction in the CIT rate is likely to exacerbate income inequality by increasing the income of capital holders (Ebrahimi and Vaillancourt, 2016).

Depth analyzes generally give fairly moderate conclusions about the effects of redistribution of VAT, but more can be done to identify specific spending measures to mitigate the problems that this tax may raise. To assess the redistributive effects of tax, it must be compared to other potentially applicable solutions. One possibility is that it replaces other revenue sources. Bird and Zolt (2005) showed that VAT is undoubtedly less regressive than trade taxes and excise taxes that it replaces. Furthermore, in some developing countries, it can be as progressive as the income tax. Also, if VAT is used to finance increased spending, its redistributive effects may ultimately be progressive even it has a broad base and a single rate. Indeed, preferential rates and exemptions benefit the upper classes (since they spend more on all products). Therefore, the elimination of these taxes can benefit the poor and government could use such additional tax revenue to finance targeted spending measures.

1.6. Empirical Estimation Approach

To examine the inclusiveness of economic growth in developing countries, we derive estimates based on regression of the effect of taxation on inclusive growth. This section discusses the methodology and data.

1.6.1. Empirical model

In investigating the impact of tax policy on inclusive growth, we focus on the evolution of the index build by Anand et al. (2013), which is computed on the basis of Gini coefficient and the GDP per capita growth. We want to estimate how the tax structure affects countries inclusive growth. There is no doubt that inequality and growth in a current year depend on their levels in previous years and a set of variables that is commonly used in the literature to explain income inequality and growth (see Gupta et al., 2002; Martinez-Vazquez et al., 2012). Starting from this assumption, inclusive growth is a dynamic process. Thereby, we test the overall hypothesis that tax structure is an important determinant of inclusive growth. Therefore, the model to be estimated is the following:

$$\bar{Y}_{it} = \alpha\bar{Y}_{it-1} + \gamma T_{it} + \beta X_{it} + \mu_i + \vartheta_{it} , \qquad i = 1, \dots, n; \ t = 1, \dots, T \qquad (1)$$

Where $\bar{Y}_{it}$ represents the inclusive growth index in country i in year t, $i = 1, \dots, n; \ t = 1, \dots, T$, while $\bar{Y}_{it-1}$ its value in year $t - 1$. F_{it} stands for a vector of tax variables representing tax instruments in country i in year t that can have significant differential impacts on income distribution and poverty reduction. These variables are PIT, CIT, and VAT. The vector X_{it} denotes the set of control variables that play a significant role in explaining inclusive growth in the literature. The error term u_i is individual country specific effect and the remaining disturbance, ϑ_{it}. Note that we use a 5-years panel between the years 1990-2015. Hence, each of time index of length 5 represents a 5 years period.

We must solve several econometric problems that may occur in estimating the equation (1). First, the variables representing tax instruments are likely to be endogenous, due to the inverse causality - from inclusive growth to selected tax policy instruments and vice versa. In particular, countries with low level of inclusive growth may decide to focus on direct taxation and vice versa. As a result, these regressors can be correlated with the error term. In addition to this argument for potential reverse causality, endogeneity may also occur due to omitted variables and measurement error. Finally, the presence of lagged dependent variable inclusive (t-1) is likely to give rise to autocorrelation. To solve endogeneity issue, one generally chooses an instrumental variable approach. However, finding good instruments for all types of taxes is challenging. The use of OLS is likely to produce biased and inconsistent estimates, given the heterogeneity between countries.

To address this problem of endogeneity, we resort to system GMM estimator developed by Blundell and Bond (1998, 2000). The Blundell and Bond estimator combines two equations, one in levels and one in first-differences. The equation in levels uses lagged first-differences as instruments for the endogenous variables (lagged Gini coefficients and tax variables), whereas the equation in first-differences uses lagged levels as instruments. The validity of these instruments is tested using the standard Sargan test for overidentifying restrictions. The system GMM works for unbalanced panels and for small samples (few periods and many countries), using the Windmeijer (2005) correction (two-step estimation). The estimator is consistent if the instruments are valid and there is no second order autocorrelation. In large T panels, country-specific fixed effect shock that arise in the error term decreases over time. In the same way, the correlation between lagged dependent variable and the error term is insignificant (Roodman, 2006). On the other hand, if there are few observations, the cluster-robust standard errors and the Arellano-Bond autocorrelation test may be unreliable. In these cases, it is not essential to

use the Arellano-bond estimator. The GMM estimator uses first differences to transform equation (1) into:

$$\Delta \bar{Y}_{it} = \alpha \Delta \bar{Y}_{it-1} + \gamma \Delta T_{it} + \beta \Delta X_{it} + \Delta \mu_i + \Delta \vartheta_{it}, \qquad i = 1, \dots, n; \ t = 1, \dots, T \qquad (2)$$

The autocorrelation issue is treated by instrumenting the first-differenced lagged dependent variable with its past levels.

We introduce to the model one external instrument of tax variable as developed by Martinez-Vasquez et al. (2011). In this method, we instrument the tax variable with the weighted average of tax variable for other countries in the corresponding year. The underlying intuition for using this particular instrument is that inclusive growth in a country relative to others generally should not have an effect on the design of tax structure of those other countries. Therefore, the dependent variable should not be correlated with the instrument. Also, the design of tax structure in a country should be affected by the design of tax structure in the neighboring countries. In fact, countries are tempted to rely on what is happening in their neighbor, and this effect is especially strong in the case of small countries. The weights are the inverse of the distance between the two countries. The value of the tax instrumental variable for country i in year t is calculated as follow:

$$\text{tax}\_IV_{it} = \frac{1}{\sum_{j=1}^{n} \frac{1}{d_j}} \sum_{j=1}^{n} \frac{1}{d_j} tax_{jt} \qquad i \neq j \qquad (3)$$

Where d_j is the distance between the largest cities in country i and country j and tax_{jt} is the tax variable of country j in year t.

1.6.2. Variables and Data

As previously mentioned, the chapter investigates how tax policy can better serve the goal of inclusive growth in developing countries. For that purpose, the analysis is based on annual data spanning 1990-2015, covering a panel of 91 developing countries. We use the measure of inclusive growth developed by Anand et al. (2013), which integrates both the pace and distribution of economic growth. Regarding for the pace of growth, we use the GDP per capita growth from World Development Indicator database; and for benefit sharing, the Gini coefficient is used. The Gini coefficient is from the Standardized World Income Database (SWIID) and measured the net Gini i.e. the Gini after tax and transfer.

Dependent variable: Inclusive growth index

The index of inclusive growth integrates growth and income distribution into one single measure. Therefore, it provides a framework to study equity and efficiency together. The methodology is based on social welfare function which is also known as the concentration curve. In the social welfare function, inclusive growth depends on two factors: average per capita income and distribution of income among the population.[1] Therefore, efficiency requires the overall improvement of income in a country; and equity requires this improvement in country's income should be equally distributed across various segments of the population. Growth is considered inclusive if the index if positive. The higher the index, the more growth is inclusive. Figure 1 shows the graphical representation of inclusive growth index. The graph also shows the correlation between the inclusive growth index and other indicators found in the literature that approximate the concept of inclusive growth (for instance, the quality of growth indicator (QGI)[2], the Human Development Index (HDI) from United Nations.

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[1] See Annex for more detail about the construction of index.

[2] The index is developed by Mlachilaet al. (2014). The quality of growth index (QGI) encompasses both the intrinsic nature of growth and its social dimensions. According to authors, the QGI goes beyond the well-known

The analysis of different charts shows that sub-Saharan Africa is the region with a low level of inclusive growth compared to other regions such as Latin America and MENA over the period 1990 to 2015. However, outside the period 1990-1994 when the sign of inclusive growth index was negative meaning a lack of inclusive growth, efforts are being made to improve the inclusiveness of growth. However, its level is still lower than in other regions. Latin America is the region that performs well in terms of the indicator of growth inclusiveness but also regarding the HDI and QGI. Figure 1 also shows the correlation between our inclusive growth index and HDI and QGI that can be considered as an indicator of inclusive growth. Over the period 1990 to 2011, our indicator seems to be positively correlated with HDI and QGI. By cons, over the period 2012-2015, the index of inclusive growth is negatively linked to the two others.

Human Development Index (HDI) developed by the United Nations by concentrating not just on the levels of incomes, but the very nature of growth.

Figure 1: Trends of inclusive growth index

Chart 1

Inclusive growth index

Chart 2

Quality of Growth Indicator (QGI)

Chart 3

Human Development Indicator (HDI)

Chart 4
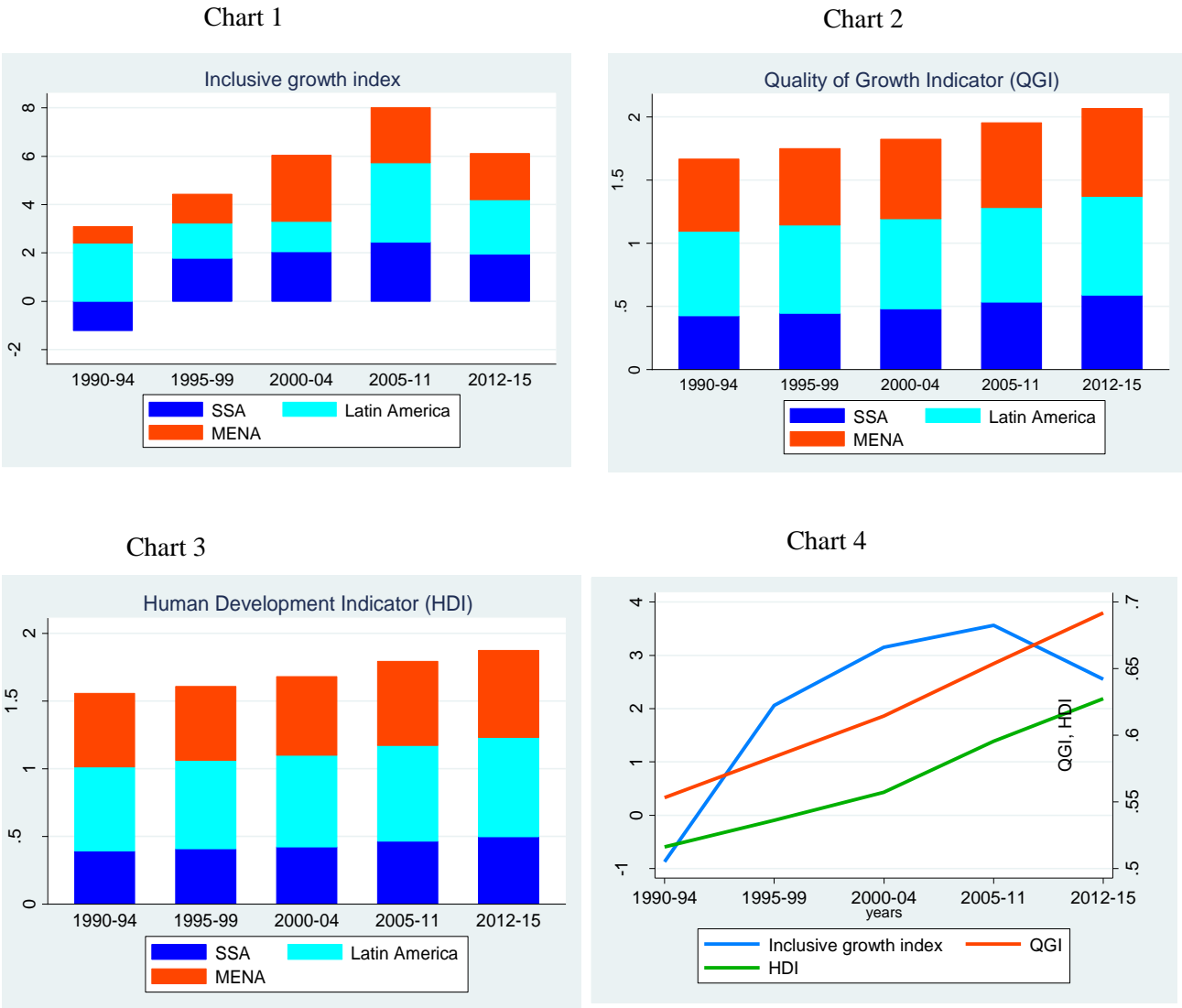
Source: Author calculation using data from WDI, HDI, and SWIID.

Variables of Interest: Taxes

To evaluate tax policy impact on inclusive growth in the study, we consider the following tax variables: PIT, CIT and VAT, all measured as a percentage of GDP. These tax variables are from the IMF Fiscal Affairs Department (FAD).

In general, PIT is considered progressive. The purpose of progressive taxation is to redistribute wealth from the richest to the poorest in order to reduce poverty and inequality. PIT has long

been considered as one of the most effective tax instruments. In addition to being used as a means of equalizing income, it has the advantage of countercyclical flexibility, and it is easy to be adjusted to account family size and other considerations related to taxable capacity. However, the top PIT rate needs to be addressed with caution. If it is too high, taxpayers will find ways to avoid or evade the tax and a higher rate can no longer generate additional revenue. Thus, to achieve both goals of equity and growth, it would be ideal that PIT keep a significant average rate, which increases tax revenue, but also a low marginal rate to avoid wrong economic decisions which has an excessive cost. Several works found the significant and positive effect of PIT on reducing income inequality (Martinez-Vazquez et al., 2012).

The reduction of tax on corporate might encourage governments to redirect tax burdens on less mobile tax bases (i.e. labor) and consumption to cover the deficits of tax revenue from corporate and maintain the level of public expenditure. Low-income households in developing countries allocate a large share of their income on goods. Therefore, any raising of taxes in consumption associated with an increase in labor taxes would exacerbate poverty and inequality. In general, there is agreement that the burden of taxes on corporate profits is transfert to workers' wages, especially in open economies where capital is mobile and tax-sensitive. This may be due on the one hand to short-term adjustments or, more likely, the rate of increase in wages at the time wages are fixed. On the other hand, long-term adjustments that reduce labor productivity and therefore wages when capital (investment) declines in high-tax regions or sectors. This wage differentiation hampers the inclusiveness of growth.

Since VAT is applied on all goods and services, it could not be considered as a fair tax; it is different from income tax which is progressive. When VAT is fixed on certain goods, the price will increase, and the quantity of goods bought and sold by the consumer will fall. On the other hand, the VAT assessment will affect the distribution of the consumer's household income,

which means that the VAT assessment will reduce the consumer's income, as it will affect the consumption pattern. However, the application of reduced VAT rates to goods that account larger share of total expenditure of poorer households than the richest makes VAT more progressive than it would be in the case of uniform rate. The recent studies of the incidence of taxes on consumption suggest that they are significantly less regressive than those examined in previous works. The transition from import taxes to sales taxes largely caused by trade liberalization has probably made the tax effect slightly more progressive in most developing countries (Gemmell and Morrissey, 2003). In the same vein, Shah and Whalley (1991) argue that VAT may sometimes be almost as progressive as the income tax. Thus, taxes on consumption allow economic growth couple with reduction of income inequality thereby leading to inclusive growth.

Control Variables

Education is measured by the index of Human Capital per Person from the Penn World Table (PWT) 8.0 Dataset. The variable is based on the average years of schooling, linearly interpolated from Barro and Lee (2013), and an assumed rate of return for primary, secondary and tertiary education. Education is a major component of well-being and is usually used in the measure of the economic development and quality of life. A higher level of education is expected to increase the income of households and individuals and should reduce income inequality.

Financial Development Index measures and analyses the factors enabling the development of financial systems among different economies. It provides a comprehensive means for economies to compare various aspects of their financial systems. This wide-ranging index takes into account the quality of each country's financial laws and regulations, the business environment, and the likelihood of a financial crisis, among other things. Financial development

can improve access of credit to the poor, alleviated extreme inequality and consequently improved welfare without distorting economic efficiency (Meyer Bittencourt, 2006). For instance, as the share of the income held by the poor grows, they may increase their demands for financial services, which may drive the positive association between finance and growth. On the other hand, by increasing growth, finance may contribute to increasing the incomes of the poor.

The personal remittances database is from the World Bank Indicator and are expressed as percentage of GDP. It includes personal transfers and compensation of employees.[3] Remittances can increase household spending power. But also, their effects go beyond simply increasing purchasing power: they can alter behaviour in other social spheres as well, for example, by changing attitudes to gender, education or participation in the labour market. These changes can also potentially contribute to reduction in poverty and income inequality, whence fostering inclusive growth. The Real GDP per capita is included to the analysis to control the effect of economic growth. In fact, the previous works found that income distribution is strongly connected to economic development. The coefficient on GDP per capita is expected to be positive, because lower inequality and poverty are associated with a higher income level, so higher inclusive growth.

To assess the effect of trade liberalization, we include trade open and stock of FDI, and terms of trade that are considered as globalization variable. According to Stolper-Samuelson theorem, in a two-factor framework of two countries, increased trade openness (through tariff reduction) in a developing country with low skilled labor would increase wages for low-skilled workers

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[3] Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households. Personal transfers thus include all current transfers between resident and nonresident individuals. Compensation of employees refers to the income of border, seasonal, and other short-term workers who are employed in an economy where they are not resident and of residents employed by nonresident entities.

and reduce compensation of high-level skill workers, resulting in reduced income inequality (see Stolper and Samuelson, 1941).

There is a debate about the effect of FDI on the distribution of income. Pan-Long (1995) shows that the expansion of FDI leads to a more uneven distribution of income in Asian developing countries. Mah (2002) found the same result that increase of FDI deteriorates income distribution. Indeed, FDI, as measure of globalization is a factor that affect negatively labor income, thus becoming an important factor that worse income distribution.

In the recipient countries having good institutions, foreign Aid can promote growth and reduce inequality. Aid could have direct impact in reducing inequality in three ways by focusing: on the most vulnerable groups (by providing grants or microcredit); on the poorest areas of the recipient country; on sectors that strongly impact the social field such as water, sanitation, education and health (Feeny, 2003). In this line, Gomanee et al. (2005) showed that when aid is channeled through public spending and directed towards the social sectors (education, health and sanitation), it is likely to have a positive impact on development indicators such as the index of Human Development and infant mortality rates. Thereby, the positive effect of Aid on inclusive growth is expected.

It is important to note that the quality of institution is notably substantial in our analysis because it influences resource redistribution. It is widely believed that poor institutional quality has a detrimental effect on income inequality. For example, corruption can alter the composition of social spending in favor of the rich at the expense of the poor, leading to higher inequality. Similarly, corruption fuels biased tax system for rich and lobby groups, thus making the effective tax system regressive (Hindriks et al., 1999). In this case, tax system burden drops disproportionately on the poor. Thus, it is not profitable for low income groups. We measured corruption with the International Country Risk Guide's (ICRG) valuation of corruption within

the political system. This variable takes values from 0 to 6, with a higher value indicating low risk of corruption.

Before proceeding with the estimations, it is important to analyze the quality of our data. Therefore, the next section presents the descriptive statistics.

Descriptive statistics

Table (2) suggests while the maximum of government revenue generated from VAT during the period from 1990 to 2015 was 13.23% of GDP, its minimum revenue is close to zero. Thereby the average VAT revenue was 5.03 % of GDP. This shows as there was a huge fluctuation with the VAT revenue among different countries and years. Furthermore, the advanced analysis reveals that Moldova was the country which recorded the highest income from VAT during the period 2005-2011, while Swaziland register the minimum revenue between 2005 and 2011. This analysis looks identical to that of CIT and PIT. However, China and Paraguay remain those that mobilize lowest income from PIT and CIT respectively, whereas South Africa has had a maximum PIT revenue and Algeria a maximum revenue from CIT.

Table 2: Descriptive statistic

Variables	Obs	Mean	Std. Dev.	Min	Max
Inclusive growth index	397	2.141	3.702	-23.970	14.218
GDP pc growth	419	2.270	4.555	-24.214	51.466
Education	384	.479	.168	.083	.8766
Trade open	412	72.76	39.29	14.38	440.74
Remittance	411	4.402	7.465	.001	63.294
Terme of trade (log)	238	13.790	9.460	2.995	32.559
FDI	358	3.263	4.906	-4.172	62.263
Aid (log)	406	19.82	1.12	15.78	22.16
Fiancial Development Index	417	.190	.132	0	.684
Corruption	295	20.57	222.83	0	3192.5
Education spending	320	4.032	2.143	.271	17.65
Health spending	307	2.404	1.461	.185	7.530
Personal Income Tax (PIT)	291	2.062	1.851	.001	10.00
Corporate Income Tax (CIT)	318	2.692	2.065	.01	17.279
Value Add Tax (VAT)	297	5.038	2.437	1.64e-07	13.253

Source: Author calculation using data from IMF, WDI, PWT, and ICRG.

1.7. Empirical results

This section discusses the estimation results obtained by using the system GMM.

1.7.1. Taxation and inclusive growth

Columns (2) to (4) of Table (3) report the estimated impact of taxation on inclusive growth by including each tax instrument.

As the results in column (2) suggest, PIT is positively and significantly correlated on inclusive growth index. This result suggests that increase in collection of PIT increases the inclusiveness of growth. A one-point increase in PIT increase inclusive growth by around 0.005 points. This finding confirms the progressivity of PIT, suggesting that PIT might be the best tool to affect income distribution. However, our finding is opposed to that of Bird and Zolt (2005) which reported that PIT has had a very limited, and even insignificant effect in reducing income inequality in developing countries. They argue that tax system is less progressive, and the costs are excessive and the gains too low.

Column (3) presents the results obtained by focusing on the effect of CIT on inclusive growth. Taking account CIT revenue in the estimation suggests that taxing corporate income hampers the inclusiveness of growth in the sample. A one percentage point increase in CIT reduces inclusive growth by around 0.002 percentage points.

As the results in the column (4) of Table (3) suggest, VAT is negatively correlated to the index of inclusive growth suggesting that VAT makes the growth less inclusive. For example, one-point increase in the share of VAT in GDP results in a 0.004 percentage points reducing in inclusive growth. Poorest households spend a greater share of their income on consumption. Therefore, they are likely to pay higher average tax relative to higher income groups. However, there is a litlle empirical works that have tested this general conjecture.

Assessing the impact of control variables on inclusive growth

Column (1) presents the basic results obtained by including only control variables. Most of control variables are statistically significant and have the predicted sign as discussed in the literature. The results suggest that several macroeconomic fundamentals and structural factors are drivers of inclusive growth. The results support the hypothesis that education affect inclusiveness of growth. The positive and significant coefficient of education means that better educated workforce plays a positive role in fostering inclusive growth. The GDP per capita is found associated to higher inclusive growth. In fact, economic growth is often interlinked positively with higher investment, higher job-creation processes, resulting in greater access to jobs and income for more people. Greater open countries, as expected, seem to experience larger inclusive growth, which corresponds to the findings in the literature. However, the analysis does not focus solely on the effect of open trade, but also to other aspects of trade dynamics. Specifically, it examines the effect of globalization measured by FDI and terms of trade and support the hypothesis that these two components have the opposite effect on

inclusive growth. As expected, the improvement of the terms of trade increase inclusive growth while FDI stock reduce inclusive growth by increasing income inequality. In addition, higher aid level implies higher economic growth and more equal income distribution so greater inclusive growth. Against the expectation, financial development and personal remittances were found to harm growth inclusiveness in the sample.

Although remittances are expected to reduce the severity of poverty, there are some shortcomings, such as increased pressure on shippers, a growing culture of dependency in developing countries that undermines the motivation of recipients at work, an increase in the beneficiaries' consumption expenditure and an increase in inequality (between recipients and non-recipients, rural and urban areas). Also, the economic behavior of the beneficiary households tends to increase the prices of goods and services in the local domestic market, which could affect the entire community, including non-beneficiary households. The results are consistent with those found by Mishra (2007) who point out that migration and remittances deepen inequalities within countries of origin and between peripheral and central regions. Thus, remittances do not necessarily imply a financial benefit for all the poorest people.

Regarding the financial development, its negative effect on inclusive growth could be explained by the fact that in the initial steps of financial development, poorer segments of the population may find it difficult to access credit from financial institutions due to the lack of collateral and financial literacy (Beck et al., 2004). These results are also in line with those of Claessens and Perotti (2007) who have shown that thanks to the low education level of poor, their can not obtain loans from the formal financial sector. Also, there is a dualism in the provision of financial services by financial sector. In such situations, the poor are unable to break the cycle of income inequality and, at the end, income inequality increases more in transition countries than in developed countries. Furthermore, Tan and Law (2012) provide support to the existence

of a U-shaped relationship between financial deepening and income distribution for developing economies. This further implies that financial markets are inefficient in improving income distribution in these countries.

Including the initial level of inclusive growth index at the beginning of the observation period as one of the explanatory variables allows to capture country's initial conditions. The result suggests that the initial level of inclusive growth which captures the conditional convergence has a strong negative effect on observed inclusive growth.

Table 3: Empirical results

VARIABLES	(1)	(2)	(3)	(4)
Inclusive (t-1)	-0.004***	-0.004***	-0.007***	-0.003***
	(0.001)	(0.000)	(0.001)	(0.000)
GDP pc growth	0.992***	0.994***	0.993***	0.994***
	(0.002)	(0.001)	(0.001)	(0.001)
Education	0.304***	0.302***	0.358***	0.283***
	(0.049)	(0.040)	(0.039)	(0.030)
Trade open	0.022	0.019	0.026***	0.035***
	(0.017)	(0.012)	(0.008)	(0.011)
Remittances	-0.002**	-0.002**	-0.002***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Terms of trade	0.003***	0.002***	0.002***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI	-0.004**	-0.001	-0.0002	-0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Aid	0.030***	0.027***	0.041***	0.025***
	(0.005)	(0.004)	(0.006)	(0.004)
Fiancial Development	-0.113***	-0.120***	-0.106***	-0.145***
	(0.027)	(0.030)	(0.023)	(0.019)
PIT		0.005**		
		(0.002)		
CIT			-0.002***	
			(0.001)	
VAT				-0.004***
				(0.001)
Constant	-0.800***	-0.731***	-1.052***	-0.732***
	(0.120)	(0.122)	(0.140)	(0.128)
Observations	136	100	103	105
Number of Countries	74	61	63	64
AR(2): P-value	0.123	0.294	0.358	0.260
Hansen test, p-value	0.590	0.763	0.775	0.817
Nb instruments	29	35	35	35

Dependent variable is inclusive growth index
Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$;

1.7.2. The role of institutional quality in the implementation of tax policy for achieving inclusive growth

We now examine the inclusive growth effects of tax policy according to the institutional quality of the countries. Inclusive economic growth also depends on governance in terms of quality of the control of corruption. Table (4) presents the results obtained by including corruption in each tax specification.

Regarding the role of institutions in the effect of tax policy on inclusive growth, equation 2 to 4 in Table (4) show the positive sign of corruption index, which correspond to a good control of corruption. The result implies that less corrupt governments are more able to efficiently collect tax and better redistribute it through financing pro-poor spending. Thereby, good institution quality helps government to control corruption, and sequentially eliminates tax evasion. As a result, governments with more proficient institutions certainly have better policies on rebalancing the incomes of the richest and most deprived citizens, which obviously can improve inclusive growth.

In economic system with control of corruption, we note an improvement in the effect of the PIT on inclusive growth. Thus, one percentage point increase in PIT increase growth inclusiveness by 0.009 percentage points and against 0.005 percentage points in absence institution. A major observation is on the effect of the CIT, which becomes positive with the consideration of control of corruption. In the presence of strong institution, national authorities may mobilize high revenue from corporate taxation by reducing exemptions, tax evasion (mainly due to informality), and generally low tax rates.

VAT remains significant and negatively correlated to inclusive growth in the sample. VAT is generally considered to be regressive. It put more pressure on the low-income groups in society and create unequal distribution conditions. The results obtained in column (4) of Table 4

provide support to that hypothesis. An increase of one percentage point in the share of VAT in GDP reduces inclusive growth by around 0.012 percentage points. However, it could be less regressive in the case of good institution. Otherwise, there is a lack in VAT policy in developing countries. Among them, it may be noted the incorrect design and implementation that undermine the effectiveness of VAT in many developing countries. Common challenges include: low thresholds; extensive exemptions and zero rating (creating classification conflicts and increasing compliance costs); inadequate preparations and public sensitization (making resistance more likely). The significant delays in the reimbursement of credits of VAT are commonplace in developing countries and an important business complaint. All these factors affect VAT revenues, which account for a large share of the income of developing countries.

To sum up, good institutional quality is therefore potentially an important factor allowing to improve inclusive growth through tax policy. It allows a principle of impartiality in maintaining the liability of democratic procedures and prevents bureaucrats more effectively to pursue their private interests, and this in turn leads to a downward pressure of income inequality.

Table 4: Effects of institutional variables

VARIABLES	(1)	(2)	(3)	(4)
Inclusive (t-1)	-0.005***	-0.003***	-0.006***	-0.003***
	(0.001)	(0.001)	(0.000)	(0.000)
GDP pc growth	0.993***	1.000***	1.001***	0.996***
	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.243***	0.132***	0.162***	0.267***
	(0.042)	(0.031)	(0.015)	(0.031)
Trade open	0.046**	0.000	0.016**	0.008
	(0.019)	(0.010)	(0.007)	(0.013)
Remittances	-0.001	0.0002	-0.0001	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Terms of trade	0.003***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI	-0.006***	0.001	-0.003**	-0.002**
	(0.002)	(0.002)	(0.001)	(0.001)
Aid	0.025***	0.015***	0.021***	0.016***
	(0.005)	(0.002)	(0.003)	(0.005)
Fiancial Development	-0.120***	-0.161***	-0.183***	-0.128***
	(0.031)	(0.022)	(0.023)	(0.020)
Corruption	0.006	0.036***	0.049***	0.015
	(0.012)	(0.007)	(0.005)	(0.009)
PIT		0.009***		
		(0.002)		
CIT			0.005***	
			(0.001)	
VAT				-0.012***
				(0.002)
Constant	-0.768***	-0.404***	-0.588***	-0.399**
	(0.128)	(0.0765)	(0.0855)	(0.159)
Observations	113	87	90	92
Number of Countries	61	52	54	53
AR(2): P-value	0.265	0.314	0.306	0.349
Hansen test, p-value	0.510	0.416	0.573	0.660
Nb instruments	27	37	37	34

Dependent variable is inclusive growth index
Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$;

1.7.3. Does the effect of taxation influence by the level of pro-poor government spending (health and education)?

We now look to the results obtained on the effect of public spending on inclusive growth. The main goal of this analysis is to look whether the effect of taxation is influenced by the level of pro-poor government spending. We focus on two types of social spending; namely, public expenditures on education and health. We first estimate the model (2) by introducing separately the different categories of expenditures, and then we estimate the model by including all two expenditure together. The results are reported in Table (5). As shown column 2 of Table (5), the estimates suggest that a one percentage point increase in education spending raises inclusive growth by 0.008 percentage points. The effect of PIT remains almost the same as in the case when government spending is not considered. We estimate the similar effect for expenditures on education in column 3. Estimated effects of expenditure on health are higher compared to that of educational spending. Therefore, one-point increase in health expenditure result in rising inclusive growth by 0.167 percentage point. Such expenditure leads to an increase in the effect of the PIT on inclusive growth from 0.009 to 0.010 percentage points. Finally, when all two expenditure components are included in the model (column 4), all two keep their expected sign, with only spending on health remaining statistically significant. The results from column 4 provide further support to the finding that PIT may have positive impact on inclusive growth. Furthermore, the effect of PIT with considering expenditure is about 1.6 times higher than in the exclusion of expenses. This result allows us to confirm that the effect of PIT on inclusive growth seems to be influenced by the level of pro-poor government spending in education and health.

Table 5: Effects of pro-poor government spending

VARIABLES	(1)	(2)	(3)	(4)
Inclusive (t-1)	-0.005***	-0.007***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc growth	0.996***	0.992***	0.996***	0.998***
	(0.002)	(0.002)	(0.002)	(0.001)
Education	0.221***	0.180***	0.109**	0.033
	(0.039)	(0.048)	(0.049)	(0.057)
Trade open	0.003	-0.010	-0.010	-0.011
	(0.014)	(0.013)	(0.017)	(0.021)
Remittances	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)
Terms of trade	0.003***	0.001	0.003***	0.002***
	(0.000)	(0.001)	(0.001)	(0.000)
FDI	0.001	-0.001	0.003	0.002
	(0.002)	(0.002)	(0.002)	(0.003)
Aid	0.021***	0.027***	0.024***	0.008**
	(0.004)	(0.005)	(0.004)	(0.003)
Fiancial Development	-0.152***	-0.166***	-0.227***	-0.223***
	(0.038)	(0.045)	(0.040)	(0.061)
Corruption	0.011	0.020*	0.027**	0.037**
	(0.011)	(0.011)	(0.013)	(0.016)
PIT	0.009**	0.008**	0.010**	0.015***
	(0.003)	(0.003)	(0.004)	(0.005)
Education Spending		0.090**		0.062
		(0.044)		(0.052)
Health Spending			0.167***	0.134*
			(0.050)	(0.072)
Constant	-0.533***	-0.614***	-0.628***	-0.527***
	(0.139)	(0.128)	(0.138)	(0.119)
Observations	90	90	90	90
Number of Countries	54	54	54	54
AR(2): P-value	0.266	0.304	0.218	0.285
Hansen test, p-value	0.757	0.785	0.675	0.640
Nb instruments	35	32	32	30

Dependent variable is inclusive growth index
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1;

1.7.4. A threshold effect of taxation

Here, we will assess the nonlinear effects of the three components of taxation on inclusive growth. The specific objective is the determination of the threshold of taxation for developing countries beyond which the inclusiveness of growth declines. The reason for this is that a high tax threshold could be distorted and thus affecting negatively inclusive growth while weak taxation rate can generate returns that are invested in the production. Therefore, we include in the model, each tax variable in level and its corresponding tax square. The result from Table (6) suggests a non-linear impact of PIT as well as VAT on inclusive growth. While there is evidence of a positive effect of PIT variable, the square of this variable has a negative effect on inclusive growth. Both variables are significant at all conventional levels of significance. This result means that there is an optimal tax beyond which, any increase in PIT rate should have negative impact on inclusive growth. The finding is in line with Laffer (2004) optimal taxation hypothesis. According to this hypothesis, the higher the income taxes, the more people lose their incentives to gain more taxable income, which results in a lower tax base. This in turn leads to lower tax revenue because even though taxes are higher, there are fewer people paying these taxes.

Concerning VAT, results show again the presence of nonlinear relationship between VAT and inclusive growth in the sample. However, the relationship is opposed to that of PIT. VAT is found to have negative sign while VAT square have positive effect on inclusive growth. We can see that it is from a certain threshold that the VAT revenue positively affects inclusive growth. This result can be explained by the fact that in many developing countries, VAT does not meet the criteria of a normal VAT. Governments in these countries grant numerous exonerations, and there is non-refunding of VAT credits. Therefore, VAT is little accountable and thus can affect the quality of public expenditure contrary to the income tax. But once

countries improve their tax efforts by increasing tax revenues, this promotes the funding of inclusive growth.

Regarding the CIT, based on the resulting model, the study found that when CIT and CIT square are introduced in the model, such variable both in level and square has a negative and insignificant effect on growth inclusiveness. This means that the study does not find evidence of non-linear effect of CIT on inclusive growth. The non-linearity allows us to see whether the effect of the CIT on inclusive growth changes with different levels of the variable CIT. Thus, the finding shows that whatever the level of CIT revenues, this tax is not conducive to inclusive growth.

Table 6: Threshold effect of taxation

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Inclusive (t-1)	-0.005***	-0.005***	-0.007***	-0.008***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
GDP pc growth	0.996***	0.996***	0.996***	0.997***	0.995***	0.993***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Education	0.221***	0.196***	0.276***	0.233***	0.266***	0.289***
	(0.039)	(0.047)	(0.045)	(0.051)	(0.030)	(0.035)
Trade open	0.003	-0.002	0.028***	0.032***	0.016	0.011
	(0.014)	(0.019)	(0.007)	(0.009)	(0.012)	(0.015)
Remittances	-0.001	-0.0008	-0.001	-0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Terms of trade	0.003***	0.002***	0.003***	0.003***	0.002***	0.002***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
FDI	0.001	0.001	0.0008	0.001	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Aid	0.021***	0.026***	0.032***	0.033***	0.017***	0.018***
	(0.004)	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)
Fiancial Development	-0.152***	-0.175***	-0.137***	-0.070**	-0.129***	-0.055***
	(0.038)	(0.044)	(0.029)	(0.030)	(0.016)	(0.020)
Corruption	0.011	0.019	0.023**	0.039***	-0.013	0.005
	(0.011)	(0.015)	(0.009)	(0.012)	(0.012)	(0.015)
PIT	0.009**	0.027***				
	(0.003)	(0.006)				
PIT square		-0.015***				
		(0.004)				
CIT			-0.0002	0.002		
			(0.001)	(0.002)		
CIT square				-0.003		
				(0.003)		
VAT					-0.011***	-0.030***
					(0.002)	(0.005)
VAT square						0.035***
						(0.012)
Constant	-0.533***	-0.624***	-0.890***	-0.941***	-0.443***	-0.495***
	(0.139)	(0.204)	(0.143)	(0.127)	(0.161)	(0.167)
Observations	90	90	93	93	95	95
Number of Countries	54	54	56	56	56	56
AR(2): P-value	0.266	0.354	0.466	0.345	0.356	0.284
Hansen test, p-value	0.757	0.737	0.865	0.724	0.878	0.869
Nb instruments	35	33	35	39	35	35

Dependent variable is inclusive growth index
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1;

1.7.5. Existence of a politico-budgetary cycle in the effect of taxation

This section examines whether the electoral cycle affects the impact of tax policy on inclusive growth. The question is whether the government mobilizes a significant tax resource during the election period, enabling it to finance growth. The literature has documented a negative effect of electoral periods on taxation (see e.g. Kneebone and McKenzie, 2001) which is coherent with the implications of the theoretical literature on political economic cycles, i.e. that policymakers try to reduce tax burden before the elections in order to increase their likelihood of being re-elected at top of the state (see e.g. Lindbeck, 1976 and Rogoff, 1990). Therefore, it is useful to examine whether PIT, CIT or VAT affect more inclusive growth in electoral periods. Table (7) presents results using election variable. In order to capture the effect of electoral periods in the analysis, we introduce into the model the cross-product of the election variable and the tax variable.

Column 1 shows that PIT contributes to inclusive growth and the coefficient of the cross-product of election variable and PIT is positive. This means that in electoral periods, PIT remains a direct tax instrument promoting inclusive growth. A major finding concerns the result of CIT. In fact, the coefficient of CIT is negative while that of (Election * CIT) is positive. The result suggests that in electoral periods, CIT contributes to inclusive growth. In fact, governments tend to reduce the tax burden on corporates in electoral periods. High level of tax raises the production cost, which means higher costs for goods and services. This reduces the amount of goods that firms are ready to provide. By reducing taxes, firms have more capital to invest in project that will generate additional growth. This causes a positive spiral upward demand, and in turn new jobs. From the point of view of consumer spending, by lowering taxes, individuals will keep more of their net salary. This boosts their disposable income and increase income distribution, which improve the inclusiveness of growth in the economy. As far as VAT is concerned, there is no evidence that the effect such tax on inclusive growth is affected during

the electoral periods. To sum up this subsection, the governments tend to decrease the income tax rates in electoral periods, but not necessarily the consumption tax rates. This implies that income tax rates have bigger impact on voters' choices compared to consumption taxes.

Table 7: Politico-budgetary cycle in the effect of taxation

VARIABLES	(1)	(2)	(3)	(4)
Inclusive (t-1)	-0.005***	-0.004***	-0.007***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
GDP pc growth	0.991***	0.995***	0.996***	0.995***
	(0.002)	(0.001)	(0.002)	(0.001)
Education	0.252***	0.252***	0.229***	0.362***
	(0.046)	(0.052)	(0.079)	(0.055)
Trade open	0.045**	0.002	0.019	0.017
	(0.018)	(0.016)	(0.012)	(0.018)
Remittances	-0.001	-0.0007	-0.0002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Terms of trade	0.003***	0.003***	0.003***	0.002***
	(0.001)	(0.000)	(0.001)	(0.000)
FDI	-0.006***	-0.003	-0.001	-0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Aid	0.026***	0.014***	0.030***	0.019***
	(0.006)	(0.004)	(0.006)	(0.005)
Fiancial Development	-0.123***	-0.191***	-0.098**	-0.145***
	(0.025)	(0.049)	(0.040)	(0.025)
Corruption	0.031	0.019*	0.027*	0.016
	(0.023)	(0.011)	(0.014)	(0.020)
PIT		0.005**		
		(0.002)		
Election* PIT		0.031**		
		(0.014)		
CIT			-0.004***	
			(0.001)	
Election * CIT			0.031**	
			(0.015)	
VAT				-0.017***
				(0.004)
Election * VAT				-0.009
				(0.00969)
Constant	-0.815***	-0.397***	-0.792***	-0.501***
	(0.146)	(0.137)	(0.148)	(0.187)
Observations	117	90	93	95
Number of Countries	63	54	56	56
AR(2): P-value	0.288	0.288	0.364	0.385
Hansen test, p-value	0.753	0.857	0.829	0.879
Nb instruments	29	31	31	35

Dependent variable is inclusive growth index
Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$;

1.7.6. Effect of taxation before / after the recent financial crisis[4] (1990-2008 versus 2008-2015)

In this part, we examine the impact of 2008 financial crises on inclusive growth in the sample. Thus, we analyze the effect of tax policy before and after the great financial crisis which took place during the year 2008. The results from Table (8) show that before the financial crisis, that is over the period 1990-2008, tax policy was an obstacle to inclusive growth. Indeed, all three tax variables are negatively associated to the index of inclusive growth. Contrariwise, after the financial crisis, the finding approved an improvement in the effect of tax policy on inclusive growth. Therefore, it can be seen that PIT and VAT have positive effects on inclusive growth. However, only the effect of PIT remains statistically significant. As for CIT, its effect remains negative but not significant. This result could be explained by the fact that the States reformed their tax system in the sense of taxation in favor of pro-poor growth. Most post-crisis public aid is allocated to public finance reform, particularly tax system reform. With an efficient tax regime, developing countries would have increased capacity to mobilize their own resources to finance public tasks. At the same time, this would increase the accountability of governments to their citizens, as well as their commitment to good governance, to finance education and health spending to improve the lives of the poorest.

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[4] The financial crisis of 2007–2008, also known as the global financial crisis and the 2008 financial crisis, is considered by many economists to have been the worst financial crisis since the Great Depression of the 1930s. It began in 2007 with a crisis in the subprime mortgage market in the US and developed into a full-blown international banking crisis with the collapse of the investment bank Lehman Brothers on September 15, 2008. Excessive risk-taking by banks such as Lehman Brothers helped to magnify the financial impact globally. Massive bail-outs of financial institutions and other palliative monetary and fiscal policies were employed to prevent a possible collapse of the world financial system. The crisis was nonetheless followed by a global economic downturn, the Great Recession.

Table 8: Effects of crisis

VARIABLES	Before 2008 financial crisis			After 2008 financial crisis		
	(1)	(2)	(3)	(4)	(5)	(6)
Inclusive (t-1)	-0.004***	-0.007***	-0.004***	-0.005***	-0.007***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
GDP pc growth	0.996***	0.996***	0.994***	0.995***	0.997***	0.997***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Education	0.251***	0.270***	0.298***	0.276***	0.257***	0.226***
	(0.045)	(0.055)	(0.032)	(0.049)	(0.057)	(0.035)
Trade open	0.014	0.044***	0.044***	0.032***	0.034**	0.022**
	(0.012)	(0.010)	(0.009)	(0.010)	(0.015)	(0.010)
Remittances	-0.001	-0.001	-0.001*	-0.002	-0.001	-0.002**
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Terms of trade	0.003***	0.003***	0.004***	0.004***	0.003***	0.004***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
FDI	0.002	-0.004	-0.006***	-0.006*	-0.0004	-0.002
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)
Aid	0.028***	0.031***	0.028***	0.024***	0.031***	0.020***
	(0.005)	(0.007)	(0.004)	(0.006)	(0.006)	(0.004)
Fiancial Development	-0.135***	-0.134***	-0.160***	-0.177***	-0.125***	-0.144***
	(0.036)	(0.034)	(0.023)	(0.037)	(0.033)	(0.032)
Corruption	0.009	0.030**	0.004	0.031**	0.016	-0.024
	(0.017)	(0.012)	(0.015)	(0.015)	(0.013)	(0.015)
PIT	0.002			0.019***		
	(0.003)			(0.005)		
CIT		-0.003**			0.001	
		(0.001)			(0.002)	
VAT			-0.006***			0.002
			(0.001)			(0.002)
Constant	-0.741***	-0.926***	-0.856***	-0.749***	-0.888***	-0.572***
	(0.133)	(0.183)	(0.117)	(0.140)	(0.184)	(0.127)
Observations	90	93	95	90	93	95
Number of Countries	54	56	56	54	56	56
AR(2): P-value	0.217	0.272	0.372	0.256	0.395	0.417
Hansen test, p-value	0.672	0.707	0.771	0.806	0.690	0.895
Nb instruments	31	31	31	31	30	31

Dependent variable is inclusive growth index
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1;

1.7.7. Using alternative growth inclusiveness index: The quality of growth index (QGI)

Here we use an alternative index of inclusive growth namely the quality of growth index (QGI) developed by Mlachila et al. (2017). The index is a composite (arithmetic mean) index capturing the "growth nature" aspect and the "desirable social outcomes" aspect. In other words, the index encompasses both the intrinsic nature and social dimensions of growth. The approach is based on the fact that growth is not always the same in terms of social outcomes and how to reaches an income level is important for various theoretical and empirical reasons. Thus, we test whether the results are robust to alternative measure of inclusive growth. The estimation results are reported in Table (9). Regarding the interest variables (tax variables), PIT and CIT keep their sign and remain significant. In other words, here also, PIT contributed to greater inclusive growth while CIT lower the inclusiveness of growth. The major change is in the effect of VAT. The results using the quality of growth index show that VAT is a source of inclusive growth in developing countries. Observing the controls variables shows that most of these variables keep the right signs and remain significant. The changes can be observed at the level of the globalization variables and the delayed variables of the dependent variables. We can conclude that our findings are qualitatively the same confirming the robustness of our results.

Table 9: Alternative measure of inclusive growth

VARIABLES	(1)	(3)	(4)	(5)
QGI (t-1)	0.729***	0.911***	0.948***	0.865***
	(0.065)	(0.110)	(0.041)	(0.047)
GDP pc growth	0.004***	0.004***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Education	0.126***	0.017	0.014	-0.040
	(0.039)	(0.073)	(0.030)	(0.026)
Trade open	-0.0002	-0.033***	-0.009**	-0.006
	(0.004)	(0.010)	(0.005)	(0.006)
Remittances	-0.0002	0.0001	-0.001**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Terms of trade	-0.0003	-0.001***	-0.001***	-0.0004***
	(0.000)	(0.000)	(0.000)	(0.000)
FDI	0.0002	-0.004***	0.001	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Aid	0.005**	-0.004	0.007***	0.004***
	(0.002)	(0.004)	(0.002)	(0.001)
Fiancial Development	0.036	-0.046	-0.023	-0.015
	(0.025)	(0.040)	(0.017)	(0.023)
Corruption	0.015**	-0.005	-0.004	-0.005
	(0.006)	(0.013)	(0.005)	(0.006)
PIT		0.011***		
		(0.004)		
CIT			-0.002*	
			(0.001)	
VAT				0.008***
				(0.002)
Constant	0.020	0.301***	-0.023	0.054
	(0.053)	(0.093)	(0.055)	(0.043)
Observations	126	93	96	98
Number of Countries	67	56	58	58
AR(2): P-value	0.326	0.166	0.176	0.458
Hansen test, p-value	0.130	0.871	0.734	0.491
Nb instruments	28	31	34	34

Dependent variable is inclusive growth index
Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$;

1.8. Conclusion and policy implication

This chapter investigates the effect of tax policy on inclusive growth in developing countries. To achieve our goal, we focus on three categories of taxes namely VAT, PIT, and CIT. We use the system GMM estimator to address endogeneity issues. Using the inclusive growth index developed by Anand et al. (2013) the empirical results indicate that reliance on PIT in developing countries has been a source of inclusive growth, confirming the progressivity of such tax, so the best tool to affect the income distribution. In the case of CIT, the empirical results suggest that this tax contribute to greater inclusive growth if and only if the countries have a strong institution quality like good control of corruption. Regarding the VAT, the analysis of threshold effect shows that it is from a certain threshold that the VAT revenue positively affects inclusive growth. This highlight several problems in VAT such as numerous exonerations, and non-refunding of VAT credits making VAT little accountable.

The analysis of politico-budgetary cycle shows that in electoral periods, income tax both PIT and CIT tend to promote inclusive growth. In fact, during electoral period, governments tend to reduce the tax burden on individuals and corporates. This implies that the income tax rates have a bigger impact on voters' choices compared to consumption taxes. Moreover, we found evidence that the effect of PIT and VAT on growth inclusiveness have been improved after the 2008 financial crisis. This result could be explained by the fact that the States reformed their tax system in the sense of taxation in favor of pro-poor growth.

For policy makers and government practitioners, the results stress that tax policy can be used to conduct inclusive growth in developing countries. Even though greater reliance on indirect taxation has been found to have adverse effect on income redistribution and poverty reduction in some studies based on developed countries, this tax has an important place in developing countries tax system. Several works found that developing economies should rely on indirect

taxation for achieve their goal of redistribution and poverty reduction. We invite for adoption of inclusive growth strategies in developing countries that focus on the effective management of revenues from indirect taxes including VAT given its dominance in their tax system.

1.9. Appendices

Inclusive growth index

we use the measure of inclusive growth developed by Anand et al. (2013), which integrates both the pace and distribution of economic growth. Their idea of inclusiveness measurement is based on generalized concentration curves, which is constructed from social mobility curves[5].

A social mobility curve is defined as:

$$S \equiv \{y_i\}_{i=1}^n$$

Where numbers 1 to n represent poorest to the richest people in the population. The measure of inclusiveness developed by Anand et al. (2013) is based on a generalized concentrations curve, which is defined as cumulative distribution of social mobility curve as follows:

$$S^c \equiv \{\bar{y}_i\}_{i=1}^n$$

With $\qquad \bar{y}_i \equiv \sum_{k=1}^i y_k / i$

The arguments $(\bar{y}_i)$ of generalized concentration curve (S^c) denote the average income of the bottom i percent of population, therefore $\bar{y}_n$ represents average income in the population, where the index "i" represents quintiles.

Figure 4 shows various generalized concentration curves that can be considered as the shift of the social mobility curve. Let's assume that curve AB represents a social mobility curve discussed above, and denote the area under the curve as:

$$\bar{y}^* = \int_0^{100} \bar{y}_i$$

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[5] See Kakwani (1980), Ali and Son (2007) for details of concentration curves, and Anand et al. (2013) for social mobility curves

Note that the greater the $\bar{y}^*$, the greater is the income. If everybody in the population have the same income (i.e. in the case of completely equitable distribution of income) then $\bar{y}^*$ will be equal to $\bar{y}$. However, if $\bar{y}^*$ is lower than $\bar{y}$, the income is concentrated in the higher income groups. Hence, the distribution of income is inequitable. Thereby, the deviation of $\bar{y}^*$ from $\bar{y}$ is an indication of inequality in income distribution. Ali and Son (2007) propose an income equity index (IEI) from the feature of $\bar{y}^*$:

$$\omega = \frac{\bar{y}^*}{\bar{y}}$$

One can rearrange and differentiate the above equation as follows:

$$\bar{y}^* = \omega * \bar{y} \qquad (1)$$

$$d\bar{y}^* = \omega * d\bar{y} + d\omega * \bar{y} \qquad (2)$$

$$d\bar{y}^*/\bar{y}^* = d\bar{y}/\bar{y} + d\omega/\omega \qquad (3)$$

This is the fundamental relation integrating growth and equity into one measure of inclusive growth. The formulation allows the decomposition of inclusive growth in terms of efficiency (per capita GDP, $\bar{y}$) and percentage change in equity (distribution, ω). The link between the value of changes in $\bar{y}$ and ω, and inclusiveness can be summarized as follows: first, if change in both $\bar{y}$ and ω are positive, then the movement is certainly inclusive. If $\bar{y}$ increases and ω decreases, higher per capita income is reached at the cost of higher inequality. Whether it is an inclusive movement or not depends on the relative change in two dimensions. If ω increases and $\bar{y}$ decreases, higher equality is reached at the cost of lower per capita income. Inclusiveness of this type of movement again depends on the relative change in the two dimensions. If both $\bar{y}$ and ω decrease, then the movement is certainly non-inclusive. See Figure 4 for illustration of each case with examples.

Figure 4: Concentration Curve and Inclusiveness

Income per capita (y)

$d\bar{y} > 0, d\omega > 0$: AB→A1B1
$d\bar{y} > 0, d\omega < 0$: AB→A2B2
$d\bar{y} < 0, d\omega > 0$: AB→A3B3
$d\bar{y} < 0, d\omega < 0$: AB→A4B4

Cumulative share of
population, $0 \leq i \leq 1$

$i = 100$ (when the entire population is
covered)
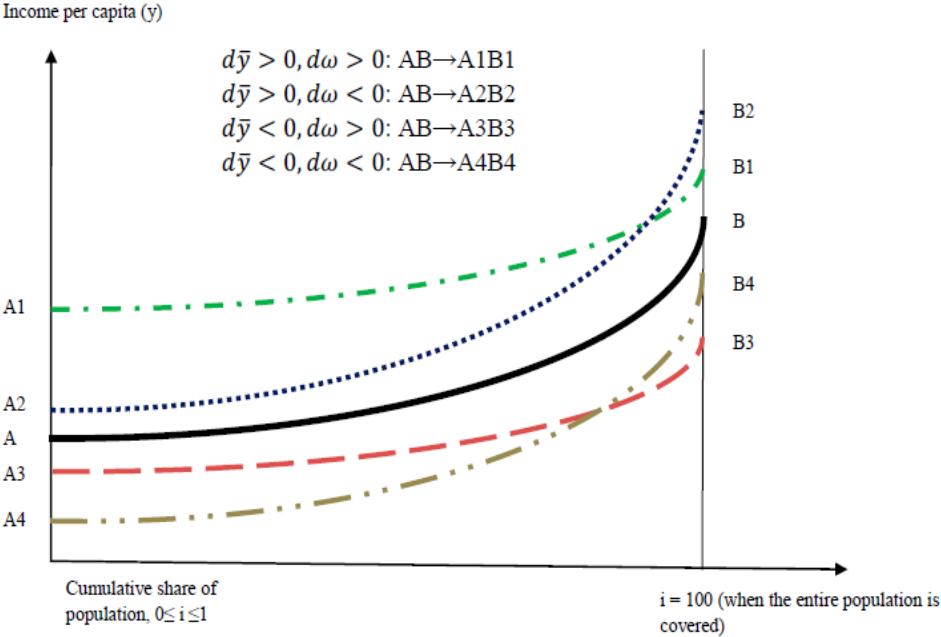
Source: Anand and al. (2013)

Intuitively, the index is a weighted average of growth in average income and of the change in an index which takes into account income distribution. The equity index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) between households or individuals within an economy deviates from a perfectly equal distribution. Thus, this index ranges between zero and one, with zero representing perfectly equitable income distribution and one representing perfect inequality. This measure of inclusive correspond to the average income growth in the hypothetical case of growth which leaves unchanged the distribution of income but deviates the increase (decrease) from growth in average income, when growth is achieving by giving back the distribution of income more equal (uneven). In other words, the inclusive growth index that we use in this chapter can be interpreted as a measure of growth in average income "corrected" for the equity incidence (Aoyagi and al., 2015).

List of countries

Albania	Central African Rep.	Gabon	Latvia	Nicaragua	Sudan
Algeria	Chad	Gambia, The	Lesotho	Niger	Swaziland
Argentina	Chile	Georgia	Lithuania	Nigeria	Syrian Arab Republic
Armenia	China	Ghana	Madagascar	Pakistan	Tajikistan
Azerbaijan, Rep. of	Colombia	Guatemala	Malawi	Panama	Tanzania
Bangladesh	Congo, Dem. Rep. of	Guinea	Malaysia	Paraguay	Thailand
Belarus	Congo, Republic of	Honduras	Mali	Peru	Togo
Benin	Costa Rica	India	Mauritania	Philippines	Tunisia
Bolivia	Cote d'Ivoire	Indonesia	Mexico	Poland	Turkey
Botswana	Djibouti	Iran, I.R. of	Moldova	Russian Federation	Uganda
Brazil	Ecuador	Jordan	Mongolia	Rwanda	Uruguay
Bulgaria	Egypt	Kazakhstan	Morocco	Senegal	Uzbekistan
Burkina Faso	El Salvador	Kenya	Mozambique	Sierra Leone	Venezuela, Rep. Bol.
Burundi	Equatorial Guinea	Kyrgyz Republic	Namibia	South Africa	Vietnam
Cameroon	Ethiopia	Lao People's Dem.Rep	Nepal	Sri Lanka	Yemen, Republic of
					Zambia

CHAPTER 2: GOVERNMENT SPENDING AND INCLUSIVE GROWTH IN
SUB-SAHARAN AFRICA: A PANEL VAR ANALYSIS

Abstract

This chapter assesses the effects of government expenditure components on both equity and growth, especially whether it is possible to design public spending to promote a more equitable society without sacrificing economic growth. We employ a panel VAR technique to use a large annual dataset on 10 sub-Saharan African countries over the period 1990-2015. The VAR approach addresses the problem of endogeneity by allowing endogenous interaction between system variables. As our panel exhibits a medium temporal dimension and a relatively small number of countries, the panel with fixed effect specification (LSDV) is the most appropriated. The estimation and drawing Impulse Response Functions (IRFs) of different shocks were done using the Stata code (XTVAR). Our findings from impulsive response function give evidence that investment in infrastructure (quality and stock) contributed to more inclusive growth in sub-Saharan African economies than others government spending in long term. Moreover, social spending in developing countries often benefits the rich and middle classes more than the poor. Therefore, a higher share of social spending on items such as health and education will not be reflected in higher incomes for the poor. These results are confirmed by the variance decomposition analysis (FEVD).

2.1. Introduction

Achieving inclusive growth has become the most significant long-term strategic challenge for many policymakers for decades. Development policymakers are interested not only in economic growth per se, but also in how the gain from that growth is distributed. As pointed out by García-Peñalosa (2008), understanding economic growth and inequality is both important and controversial; it is important because policy makers need to understand the way in which the increase in output will be shared among heterogeneous agents within an economy, and the constraints that this sharing may put on future growth. Its controversy stems from the fact that it was difficult to reconcile different theories, especially since the empirical evidence has been largely inconclusive. Beginning with Arrow and Kurz (1970) and Barro (1990), the relationship between public investment and growth has been widely studied, and most results have shown that public spending on infrastructure, education, and health can generate productivity and growth benefits. At the same time, by influencing the factors productivity and thus the relative return of factors, public spending also plays a key role in the evolution of wealth and income distribution as the economy grows with time. This brings us to the question of the potential relationship between growth and inequality generated by public spending, although the nature of this relationship is not "a priori" clear.

The economy of sub-Saharan Africa has grown at an exceptional pace over the last decade. However, growth has been concentrated in particular sectors of the economy and specific geographical areas within countries. The benefits of this growth have not been widely shared and have left out large segments of the population. Poverty has not fallen as much as expected and economic inequalities have remained high. The percentage of those living in poverty rose from 36% of the population in 1970 to 50% in 2010. There are, of course, significant differences between the countries in the region and their trends of inequality. The World Bank (2016) report on poverty in Africa shows for example that seven out of the world's 10 most unequal countries

are African, their Gini indexes ranging from 0.31 (Niger) to 0.63 (South Africa) (with zero implying perfect equality and one, perfect inequality).

In Sub-Saharan Africa, there have been fewer attempts to understand the causes of high levels of inequality measured in many African societies. On the other hand, there is much less agreement on the extent to which efforts to address inequalities need or should be part of strategies to reduce poverty in the region.

Since the early 2000s, while efforts have been made to reduce income gaps, some countries in the region have experienced growing income disparities, which explains their low record of equitable growth, especially in sub-Saharan African countries (Figure 1 & 2). Over the two sub-periods, several countries recorded a decline in their level of inequality, which is designated by a negative change in Gini coefficient. Countries that outstandingly achieved such achievements are Mali, Sierra Leone and Zimbabwe. However, some countries have seen their level of inequality increased over the two sub-periods considered. Thereby, Togo and Ethiopia are those that register accentuate deterioration in the repartition of income. Countries such as Tanzania and South Africa have also made efforts to reduce income inequality. This justifies the shift from a positive change (increase in inequality) that can be observed in Chart 1 to a negative change (decrease in inequalities) in the Gini coefficient as shown the Chart 2.

Nevertheless, the level of inequality observed remains high in the region. This disparity in income distribution certainly has consequences and therefore is worrying for two reasons. First, recent literature has revealed that high levels of inequality are detrimental to the pace and sustainability of growth (Ostry et al., 2014). In particular, they can lead to sub-optimal investments in health and education, which hamper growth. Also, the growing inequality can also undermine growth-enhancing reforms and encourage governments to adopt populist policies and intensify instability in politic. Second, in sub-Saharan Africa, the impact of growth

on poverty reduction has been limited due to high level of income inequality in the region. In addition to income inequality, Sub-Saharan Africa, in line with other regions, faces a considerable inequality in opportunities.

Figure 1: Selected Sub-Saharan Africa: change in income inequality, 2000-2008 [6]
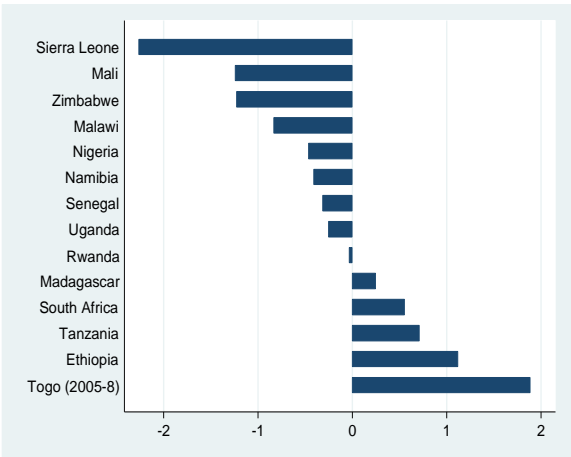
Figure 2: Selected Sub-Saharan Africa: change in income inequality, 2008-Latest

Sources: Net Gini from SWIID Version 5.0; and Authors calculations.
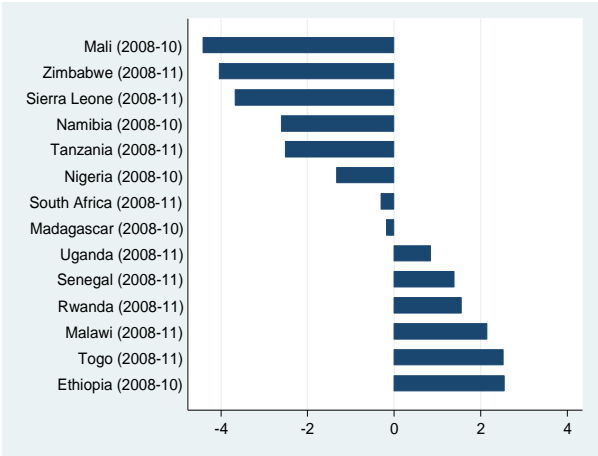
Sources: Net Gini from SWIID Version 5.0; and Authors calculations.

The widening of the income gap in sub-Saharan Africa reinforces the arguments for a government response. Therefore, a several countries have placed the issue of inclusive growth at the center of their national objectives and in a number of cases explicitly in their development plans. Governments can, in principle, play an important role in creating a more equitable society that offers opportunities for all and distributes more widely the fruits of growth. Fiscal policy is one of the most appropriate instruments for direct government intervention to fight against inequality and poverty. In fact, there is now great interest in taking advantage of tax policy to promote inclusive growth in sub-Saharan Africa. However, unlike advanced economies with long histories of using fiscal policy to redistribute income, sub-Saharan Africa has limited experience in this area. To some extent, this is due to the large gap between the two regions and, consequently, the difference in the relative importance of growth over redistribution.

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[6] Change in Gini coefficient for Togo is calculated between 2005 and 2008

Public expenditures are likely to be endogenous, due to reverse causality. Countries with higher income inequality may choose to rely relatively more on public expenditures, and vice versa. As a result, these regressors may be correlated with the error term. Some empirical articles solve this endogeneity issue using Instrumental Variables. However, finding good instruments for all observed types of public expenditures is a significant challenge. For example, Martinez-Vasquez et al. (2011) address the endogeneity of their fiscal measure by using an instrumental variable corresponding to the fiscal measures from neighboring countries weighted by the distance between the two countries. The use of MCO is likely to generate bias and inconsistent estimate coefficients due to the presence of heterogeneity among countries. However, using a fixed effect estimate to account for this heterogeneity is questionable given the small variation in Gini coefficients for a large part of the sample. This chapter is linked to the vast literature on growth inclusiveness impact of fiscal policy. Specifically, the work is in line with previous studies on the endogenous interaction between government expenditure and inclusive growth in developing countries. The chapter contributes to the existing literature on the effect of government spending on growth and income inequality by using a panel vector autoregression (panel VAR) approach. This method addresses the endogeneity problem by enabling the variable in system to interact endogenously between them. In other words, the VAR approach takes into account the fact that public spending can have an impact on the growth inclusiveness; at the same time, public spending can be influenced by the inclusive growth. Our work is relatively close to that of Hur (2014) that employs this methodology to examine the effect of government spending and inclusive growth in Asian developing countries.

The main objective of the study is to analyze the impact of public expenditure in the social sectors (infrastructure, health and education) on inclusive growth in the context of the sub-Saharan African economy. The results of this chapter should better indicate targets for which the quality of public spending should be improved to ensure sustainable and inclusive growth.

The study of this chapter is important for countries in sub-Saharan Africa at the time when governments face many political and economic challenges such as commodity price volatility, inflation, terrorism, and poor institutional quality (corruption, poor governance). Thus, the inclusion of the growth target could only be achieved through a quality institution and productive pro-poor government expenditures in the form of broad-based spending on education, health and infrastructure. As a result, this study provides relevant policy recommendations that would rise awareness of policymakers about the need to address some of the issues that are detrimental to inclusive growth in sub-Saharan Africa.

The rest of the chapter is structured as follows. In section two we take a preliminary look at the data on the share of government expenditure to GDP over the 1994 -2016 period. Section three reviews the empirical literature. In section four we develop our empirical approach. Section five describes the data that are used in the empirical investigation. Section six details the empirical results and their interpretation. Finally, Section seven concludes.

2.2. Public spending for inclusive growth

Public spending is one of the central instruments through which governments influence economic trends. Though some spending's do not have a significant effect on the economic situation, increasing the right type affects long term growth. In the developing countries, the variation in public expenditure is not only to ensure economic stability but also to generate and accelerate economic growth and to promote employment opportunities. Public expenditure can also be used to improve income distribution, to alleviate mass poverty, to direct the allocation of resources in desired lined, and to influence the composition of national product.

Figure (3) plots the average public expenditure expressed as percentage of GDP across different regions. In average, government spending in sub-Saharan Africa are substantially less than those in the Middle East or North Africa or East Asia and Pacific over the period 1995-2016.

However, they are almost similar to those in the Latin American region. In a certain way, this result reflects the implementation of austerity measures by the institutions, which is causing fiscal prudence in developing countries. In other words, the governments of sub-Saharan African countries should avoid spending largely beyond their public resources.

Figure 3: Ratio of government expenditures to GDP by region over the period 1994-2016
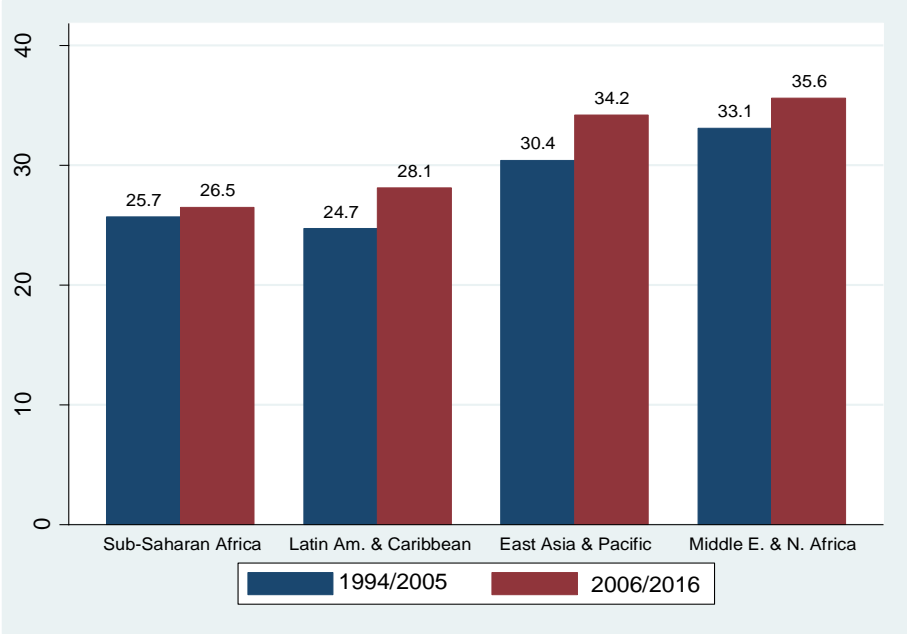
Source: Author estimates based on data from IMF World Economic Outlook database
NB: Countries classification by income according to World Bank in 2016 are used

In modern times, the government is changing the free functioning of the market mechanism with respect to income distribution, not only through the development of an appropriate tax structure but also through various forms of public expenditure. However, the appropriate role of government spending in fostering economic growth and equity remains an element of policy debate in the literature. Beyond their macroeconomic impact, expenditure policies can affect growth through several channels, including their effects on the development of physical and human capital. Thereby, a more efficient public spending on human capital and infrastructure is crucial to promote growth and equity in sub-Saharan Africa. The region faces significant challenges in terms of development outcomes: growth performance has been low; inequality

has increased; and progress in achieving the Millennium Development Goals (MDGs) in education and health is under threat. There is evidence that gaps in the provision of basic education, health and infrastructure have adversely affected education and health outcomes and as well as investment and competitiveness. In addition, human capital and infrastructure must be provided efficiently and effectively to address the current global financial crisis, protect the poor, and lay the foundation for a return to vigorous growth.

Figure (4) plots the share of government expenditure on education and health in GDP over the period 2010-2016. Public spending on education averages 4.2% of GDP in East Asia and Pacific and 4.9% in Latin America while it is 4.4% in sub-Saharan Africa (Figure 4). The gap is large enough for public spending on health care which stands at only 2.9% of GDP in sub-Saharan Africa compared with 3.7% in Latin America and 5% for East Asia and Pacific. It is clear that sub-Saharan Africa governments must do more to promote inclusive growth by directing expenditure policy towards the promotion of greater equity.

Although government fiscal policy can reduce poverty and income inequality from spending or revenue side, evidence suggest that social indicators including health and education have gained large interest in the literature of inclusive growth. According to Barro and Sala-i-Martin (1997) and Pritchett and Summers (1996), there exists positive relationship between health care and economic growth. Whereas Barro and Lee (1997) stressed the positive impact of education on the latter growth. In particular, it improves social mobility, productivity, the distribution of benefits and enhances social participation in decision-making. Brenneman and Kerf (2002) emphasized on the development of infrastructures that lead to access to high quality of education and health and also improves people's general living conditions. Studies conducted by Claus et al. (2012) for Asian developing countries confirmed that public expenditures, rather than taxation, offer the most effective tools for reducing inequalities and that education and

health are best able to reach this goal. Their analysis shows that despite progressive tax systems, public spending was more effective in reducing inequality. The government's social spending policies have distributional implications not only because they can offer immediate benefits (eg health and education), but also because they affect the distribution of the earning capacities of individuals and households and thus allowing the distribution of market incomes over time. Some social expenditures like expenditure on primary schooling can affect income distribution with a long-time lag.

F igure 4: Share of government expenditure on education and health in GDP (2010-2016)
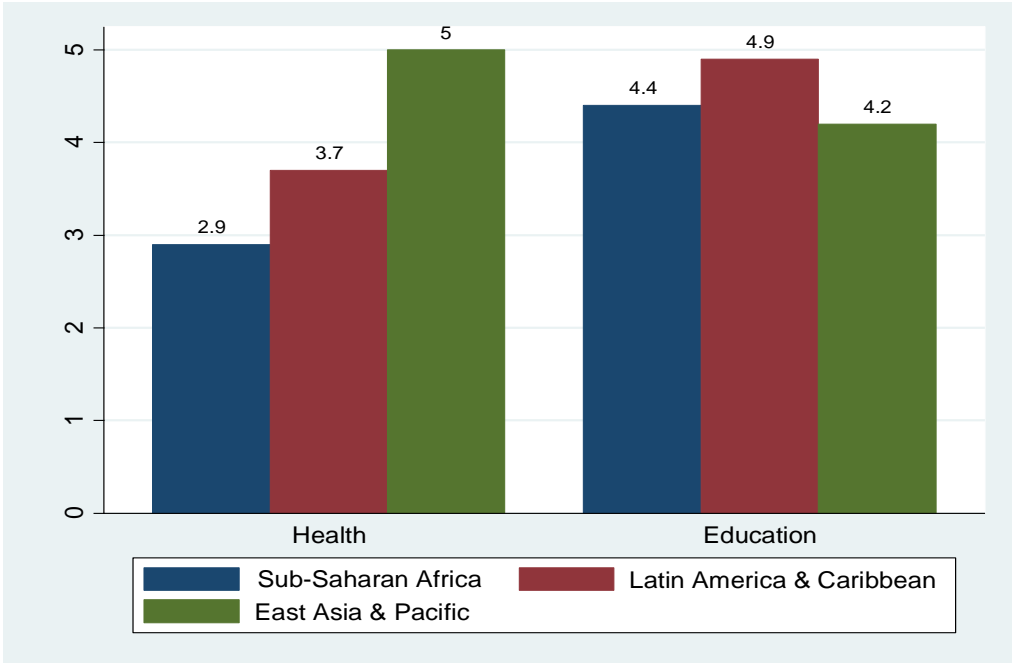
Source: Author estimates based on data from IMF World Economic Outlook database
NB: Countries classification by income according to World Bank in 2016 are used

Moreover, recent studies in most developing countries have often stated that their allocation of public expenditure on human capital development is often considered unfair and ineffective. Creating human capital involves training with formal education systems and good health care systems. Low levels of education and rates of return to school are the factors that explain why developing country governments continue to spend to improve the quality of schools.

Current studies have shown that, especially in sub-Saharan Africa, school enrollment is low, mediocre and combines with the increasing level of child labor; often at the expense of inadequate health, education and good nutrition; although the government spends a lot on the human capital development programs (education and health) in these countries.

Infrastructure status

Infrastructure spendings, by their nature, affect the economy of each country differently and can be used to facilitate the infrastructure that is best suited to growth.

For inclusive growth, infrastructure is the key to delivering a number of essential services. It provides a basis for much of the vision of SDGs for inclusive growth. The infrastructure is directly addressed in SDG, which require resilient infrastructure and sustainable industrialization. Several other objectives, for example, on clean water, sanitation, and on affordable, reliable, sustainable and modern energy for all, are essential. These core components, in turn, enable to achieve sustainable and inclusive economic growth, full and productive employment and decent work for all. On the growth side, increasing investments in sustainable infrastructure can boost demand at a time when many economies are in trouble. The IMF (2014) estimates that for advanced economies, investing 1% of additional GDP in infrastructure will result in, on average, 1.5% increase in GDP in four years. According to the same study, for emerging and developing economies, where infrastructure is often inadequate, there is a need for structural reform. Therefore, the benefits of productivity and growth in these countries can be even greater, especially if investments are accompanied by reforms that strengthen the institutional capacity for better planning and budget processes and more rigorous rules to guide public spending. Above the immediate boom in growth, investments in sustainable infrastructure can drive innovation and efficiency in key systems such as logistics, and mobility.

Figure 5 describes the evolution of indicators for the provision of infrastructure such as energy, water and transport. The graph shows that electricity production (measure by electric power consumption) in sub-Saharan Africa remains very low compared to that of other economic zones over the period 1990-2013. In sub-Saharan Africa, the average annual consumption is about 488 kWh per capita, equivalent to about 5% of U.S. per capita consumption (World Bank, 2014)[7]. This average is driven by high rates of access to electricity in South Africa. When South Africa is excluded, annual electricity consumption is only 150 kWh per capita. However, these estimates may be conservative due to the latent demand that remains unsatisfied with the lack of access to the network in rural areas and unreliable networks and epileptic power supply in areas linked to the urban network. In addition to this low output, sub-Saharan Africa is experiencing a large loss in the distribution of electricity between sources of supply and distribution points and in the distribution to consumers. This is due to poor infrastructure network. The relatively low transmission costs (which do not reflect the market) and high amount of maintenance costs (at least to secure existing capacity) do not support new investments in transmission lines infrastructure.

Although access to water and sanitation in sub-Saharan Africa has improved steadily over the past two decades, the region is still lagging behind all other developing regions. Access to improved water supply has increased from 56% in 1990 to 72% in 2013. However, sub-Saharan Africa is unlikely to achieve the Millennium Development Goals of halving the proportion of people without access to safe drinking water and sanitation between 1990 and 2015. Indeed, there are still large disparities between countries and between urban and rural areas. Africa lags far behind the rest of the world in all aspects of infrastructure (quantity, quality, cost and

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[7] World Bank. (2014). Electric power consumption (kWh per capita).
http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC

access). While the construction efforts on trans-African highways are going on, the quality of existing roads is deteriorating. In some countries, the parts of the network are currently not operational, either due to war damage, natural disasters, general negligence or lack of funds. In many countries, the roads are concentrated in urban areas or around sea ports (they were built during the colonial era to ship agricultural products abroad). Roads linking neighboring countries within a regional road network are much smaller. Due to insufficient infrastructure, the freight transport costs in Africa are among the highest in the world. African products are therefore less competitive than those in other regions.

Figure 5: Evolution of infrastructure indicators[8]

Electric power consumption (kWh per capita)

Electric power transmission and distribution losses (% of output)

Improved water source (% of population with access)

Rail lines (total route-km)
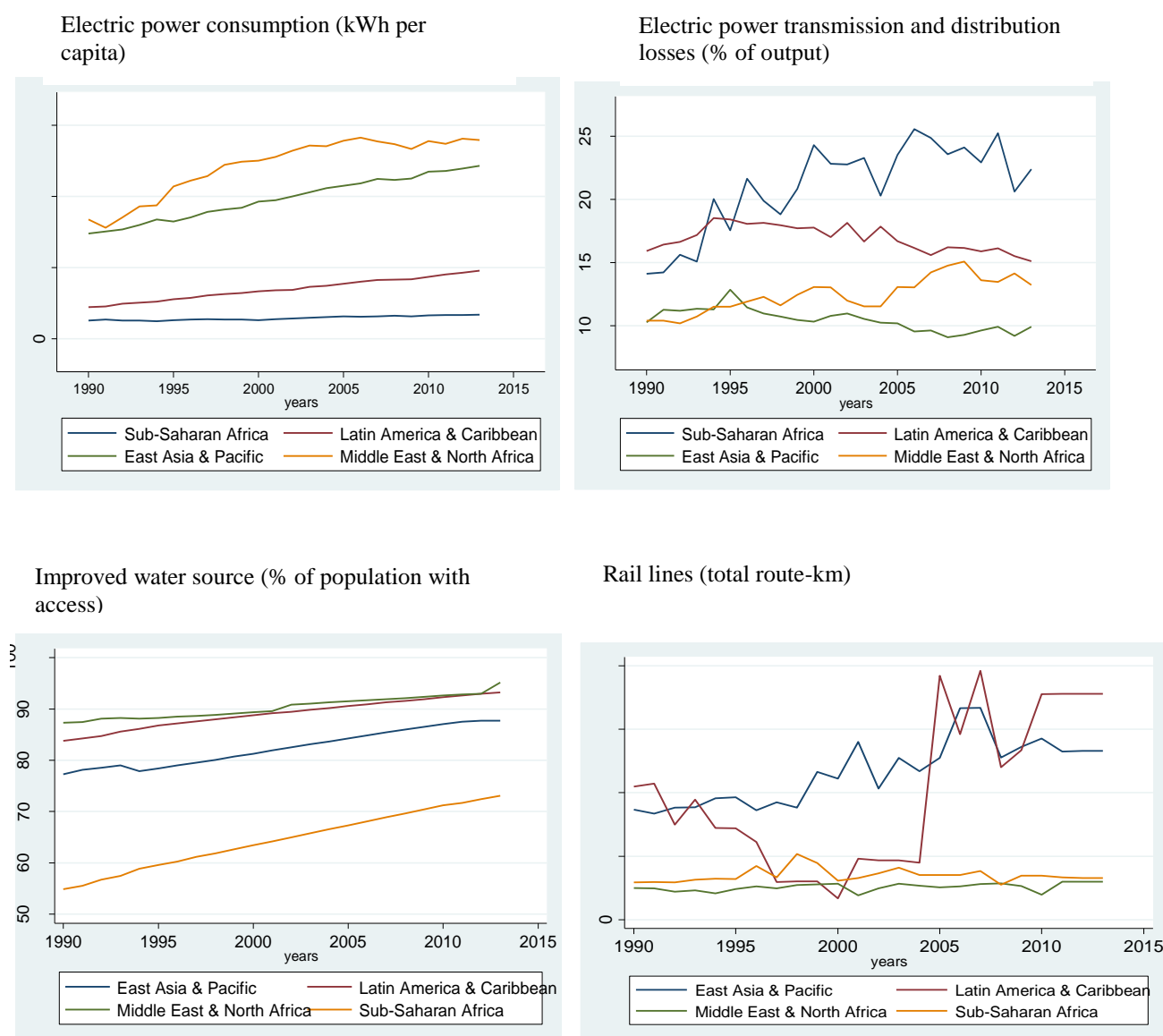
Source: Author estimates based on data from World Bank database

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[8] ***Electric power transmission and distribution losses*** include losses in transmission between sources of supply and points of distribution and in the distribution to consumers, including pilferage.
Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.

2.3. A survey of the literature

Several previous studies have shown that some types of government spending tend to reduce income inequality in many countries and regions of the world (Goñi et al., 2011; Lustig, 2016 ; Lustig et al., 2013 ; Martinez-Vazquez et al., 2012). However, it is also recognized that the relationship between public expenditure and inequality is complex and many doubts have been raised about the effectiveness of public spending as a policy instrument for redistribution, particularly in low and middle-income countries. In this literature survey we focus on three types of public expenditure: education, health and infrastructure.

Public education spending and income inequality

Policymakers usually emphasize education as one of the major factors affecting the degree of income inequality. However, some theoretical studies suggest that the relationship between education and income redistribution is not always clear. For example, the human capital model of income distribution, derived from the work of Mincer (1958), Schultz (1961) and Becker (1962) implies that the distribution of income is determined by the level and distribution of schooling across the population. While the model predicts an unambiguous positive association between educational inequality and income inequality, the effect of increasing average schooling on income inequality may be positive or negative depending on changes in rates of return to education. According to Knight and Sabot (1990), the impact of educational level on income inequality depends on the balance between the "composition" and the "wage compression" effect. Regarding the "composition" effect, an increase in tertiary education tends, at least initially, to increase income inequality. With regard to the "wage compression" effect, over time education leads to a decrease in income inequality.

Contrariwise, for several authors, education must be considered as a determining factor in the fight against poverty. Referring to the particular case of education Musgrave and Musgrave

(1973) stated that the public sector had technical reasons for participating in education, if not through a direct offer, at least through a procurement subsidy of the private sector. With regard to income and wealth distribution, education policy could reduce inequalities in their distribution since they are strongly correlated with inequalities in education spending. Although education is not seen as a typical public good but is valued as a mixed asset, education spending generates positive social gains and market failures may occur, as in the case of credit markets, which can lead to under-investment in human capital by the private sector and the informal sector. A more even distribution of education can reduce private earnings differentials. In terms of stabilization and growth, public spending on education will generate tangible social and economic benefits such as the ability to add new knowledge, generate and disseminate technological change and innovations in general, to promote economic structural changes, to induce productivity gains, more diffuse and intangible gains concerning the extra-economic environmental aspects. For Tinbergen (1977), an increase in tertiary education reduces the wages of highly skilled workers, and simultaneously enhances the wages of less educated workers. As a result, more educated labor is likely to increase competition for positions requiring advanced degrees and should therefore narrow the income gap between the highly educated and the less educated.

Studies suggest that the allocation of public investment for human capital development in many developing countries is often inefficient and inequitable. There is consensus that expanding knowledge in the skills and capabilities of individuals, increasing human capital is essential to economic growth and poverty reduction. Education with formal education systems and health care plays a key role in the creation of human capital. The human capital theory predicts that more educated individuals are more productive, and a good childhood education improves cognitive functions and reduces future poverty. As a result, children with better education can be expected to be more productive in the future and to get higher income. In addition, educated

people would have more incentives to invest in their children's future education and training and to contribute to society as a whole Suhrcke et al. (2005). A notable feature of the role of education in reducing poverty is the direct linear relationship between education and earnings. Education does not only increase the likelihood of being employed. Once in employment, better educated individuals earn much more than the less educated. From an economic point of view, this result is not surprising and has been supported by numerous studies. Njong (2010) investigated the impact of different levels of education upon poverty in Cameroon. The results showed that educational level affect negatively poverty. Another interesting result is that individuals tend to move away from poverty as education levels progress. This means that the higher the educational attainment, the lower the probability of a person becoming poor. Achieving education improves the income potential of individuals and, therefore, will help them out of poverty. According to Krueger (2009), the economic growth is seen as the main policy to significantly reduce poverty. However, to emphasize the effect of growth on poverty reduction, the poor need to have access to social and economic services that enable them to become more productive. Furthermore, it also involves concentration on policies that will allow most of the society's citizens to become more productive (pro growth). Pro-growth policies are implemented with particular attention to poverty alleviation through education, health care and provision of means to increase productivity.

Public health spending and poverty

Regarding at the health level, economists have argued that poor health leads to poverty and have shown that ill health has a negative impact on household income and economic growth rate (Barro, 1996, Mayer et al, 2001, Bhargava et al., 2001). Poor health would reduce a household's ability to earn income and accumulate wealth by limiting work, increasing medical costs and reducing savings. In addition, economists, especially those working in the theory of sustainable economic growth, have increasingly recognized health as a form of human capital.

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Thus, better health increases the productivity of other forms of capital and contributes to economic growth. Healthier children have higher enrollment ratios and better cognitive development, resulting in a higher rate of return to education and making investment in education more attractive. The thought of retirement planning occurs only when individuals expect to live long enough for retirement to be a realistic prospect. Increasing longevity motivates the current generation to save - an incentive that has dramatic effects on national saving and subsequent economic growth (Bloom et al., 2004). It is estimated that a 10% increase in life expectancy at birth leads to a 0.35% increase in the annual growth rate of per capita income (Arora, 2001). The impact of such a rate of economic growth as a result of better health over time is quite significant.

It is recognized that the primary goal of a country with respect to its citizens concerning the delivery of health services is to provide better security for the poor through easy access to health care, to ensure good and regulate health systems. Low income households are subject to serious impoverishment and when they are victims of serious illness, these poor households have no safety net. To do this, public health spending should be primarily and firstly directed towards interventions with public goods characteristics. The strong positive externalities should be directed towards the poor (Roberts, 2003). Gupta et al. (2003) found that the poor have a significantly worse health status in developing and transition economies; and if the poor are more heavily affected by public spending than the non-poor, increasing public spending will not guarantee improved health. The consensus is that the increase in public spending alone is insufficient to improve the health status of the poor. Health services depend on a variety of variables or factors and some of these factors include; environmental, cultural, social, economic, geographical, as well as interventions in the sector. In the same line, Kristjanson et al. (2010) found that more households fall into poverty because of poor health than those ones who escaped from it through employment due to formal education. Specifically, 40 percent of

households sampled across Kenya fell into poverty due to poor health and debilitating health care expenses. Drought, political instability, economic shocks like high inflation and health related shocks considerably affect incomes of the poor and may not have enough or no means to smooth their consumption. Odior (2015) shows that the re-allocation of public spending to the health sector appears to have contributed significantly to the reduction of poverty. The implication of the result is that allocating more public fund towards improving basic health services will reduce the level of poverty in Nigeria. Although, there will be a decrease in poverty level in terms of good health services, the base scenario results show that Nigeria will not achieve its Millennium Development Goal (MDG) of improving health service by 2015. The findings recommend that for Nigeria to achieve this goal in terms of reduction in poverty by 2015, the government should double its spending on health care and equally ready to maintain the existing public health services in the future. These will drastically reduce poverty at the national, urban and rural level.

While most studies have shown that public spending on health can reduce poverty, others, on the contrary, lead to the conclusion that rising public spending on health care increases or has no effect on poverty. Asghar et al. (2012) studied the long run impact of government spending in various sectors on poverty reduction in Pakistan for the period of 1972-2008 applying cointegration and Error Correction Mechanism (ECM). The study found that the coefficient for government spending on health was insignificant. A similar study conducted for Lao PDR by Sourya et al. (2014) using panel regression analysis found domestic health funding to have a positive and significant coefficient meaning that poverty increased with spending on health sector.

Infrastructure and inclusive growth

The recent literature examination indicated that infrastructure development can have a positive effect on the income and welfare of the poor. Taking into account the impact of both quantity and quality of infrastructure on income distribution, Calderón and Chong (2004) provide evidence of a negative and statistically significant link between those from 1960 to 1997. That is, infrastructure development is associated with an improvement in the distribution of income. This result is due to the use of a purely cross-country or a panel approach. In his seminal paper, Lopez (2004) uses telephone density as a proxy of infrastructure while Calderón and Servén (2008) use synthetic index of infrastructure quantity and quality. In both cases, the result shows that infrastructure reduces income inequality. Therefore, this finding combined with the idea that infrastructure enhances economic growth can be a powerful tool for poverty reduction. Khandker et al. (2006) sought to determine if the infrastructure development fostered economic growth and poverty reduction in the context of Bangladesh. From an analysis of household panel data and using quantile regression techniques, their results suggest that growth in overall income indeed led to a significant reduction in poverty and had a significantly higher impact on the households at the poorest end of the distribution. While those pure growth effects on household poverty incidence were not very large, authors found that income growth through certain policies (that is proximity to roads, electrification, and commercial bank penetration) could lead to substantial reductions in overall poverty in the sample. Therefore, investment in specific infrastructure can improve welfare and enhance distributional effect compared to pure growth.

Seneviratne and Sun (2013) investigated the relationships between infrastructure and income distribution in ASEAN-5 countries. They based on regressions covering 76 advanced and emerging market economies for the time period between 1980 and 2010 and using a set of pooled ordinary least squares (OLS). They conclude that better infrastructure, both quality wise

and quantity wise, promote income equality, but it is not the same for investment. In fact, they found the weak link between investment and income distribution. For them, if not supported by enhancement in efficiency and institutions, an increase in infrastructure investment may lead to large waste that has little impact on equitable growth. The study suggests that infrastructure development can have double effects on poverty reduction and inclusive growth. For the ASEAN-5 countries, removing infrastructure gaps could raise potential growth, and also shared the benefits of growth more evenly. Zheng and Kuroda (2013) emphasize the role of two public infrastructure, transportation and knowledge infrastructure, on industrial geography, regional income disparities, and growth across 286 cities in China. The study found that an improvement in transportation infrastructure reduced trade costs, increased growth, and decreased the income gap but at the expense of increasing industrial agglomeration between cities. Authors suggested that knowledge infrastructure increases growth but also decreases income gap as well as industrial agglomeration. Moreover, the impact of knowledge infrastructure is found to be larger in the case of high labor mobility.

For Jahan and McCleery (2005), the infrastructure development can contribute to reduce poverty directly or indirectly. In fact, it directly affects poverty by improving people's access to health and education services. Through the indirect channel, investment in infrastructure influences poverty by increasing workers productivity, reducing transport costs, and by generating further employment, thereby leading to growth. Therefore, the infrastructure development can affect economically and socially the lives of the population. Jahan and McCleery (2005) also claim that investment in infrastructure affects growth and poverty reduction in several manners. They identified the first-round effects followed by subsequent impacts. In the first instance, the infrastructure development could lead to poverty reduction through economic growth. This can be done through the supply and demand side. Through supply, the infrastructure development is impacting the economy in terms of reducing costs,

improving the business climate and creating new opportunities. These supply-side effects entail the attraction of foreign and domestic investment that can foster industrial growth, increase employment and domestic production. Regarding the demand side, the actual effect of the demand for infrastructure development is expected when employment and revenues are generated by project implementation. The social dimension of good infrastructure corresponds to increases access to basic social services such as transportation and power. This would improve the living standards of the poor.

Anderson et al. (2006) argue that there are two main effects whereby public infrastructure might affect the economy. They distinguish the macro from the micro effects. According to these authors, the macroeconomic effects focus on the potential impact of public investment on growth, investment and aggregate productivity. Regarding the microeconomic effects, public investment has both, quantity and price effect. The quality and quantity of public goods and services raise with the increasing in public investment in infrastructure. The quantity of public goods is initially rationed by firms and households because they are produced exclusively by the government. However, the quality and quantity of this rationed good raise if government make additional investment in infrastructure, therefore benefiting both firms and households in the process. In this case, much public infrastructure provides direct welfare benefits in the form of increased quality and quantity of final goods and services. Ogun (2010) studied the impact of physical and social infrastructure on living standard or poverty in Nigeria. The study showed that infrastructure development more to poverty reduction. These results also contributed showed that while infrastructure reduces poverty, specifically social infrastructure explains a greater part of the forecast error in poverty indicators relative to physical infrastructure. This suggests that massive investment in social infrastructure in cities would reduce poverty significantly in urban areas.

2.4. Econometric methodology

This study employs panel-data vector autoregressive (panel VAR) method developed by Love and Zicchino (2006) to examine the government spending effect on inclusive growth by modeling the endogenous behavior between growth, income inequality and government spending. The specificity of the Panel VAR approach it combines two things together. On the one hand, it uses the traditional VAR approach, by treating the variables in the system as endogenous. On the other hand, it uses the panel-data method, enabling for unobserved individual heterogeneity by introducing fixed effects, resulting in an improved consistency of the estimation (Love and Zicchino, 2006). According to Martinez et al. (2012) public spending, are likely to be endogenous, due to reverse causality– from income inequality to select the instruments of expenditure policy and vice versa. Specifically, countries with higher unequal revenue distribution may decide to rely relatively more on public expenditures, and vice versa. Therefore, since government expenditure responds to underlying exogenous shocks, conventional econometrics methods that treat government spending as exogenous variable may be biased. The panel VAR approach is particularly interesting as it overcomes usual econometric limitations. Moreover, the panel VAR procedure also has the advantage from panel-data framework to allow unobserved individual heterogeneity for all the variables by introducing fixed effects which enhances the consistency of the estimation. We utilize a panel vector autoregressive (VAR) model to identify the possible causal relationship between the variables. The key benefit of this method is to exploit the individual time series and the cross-sectional variations of the data and to avoid the bias associated with the cross-sectional regressions by considering the country-specific fixed effect. For Canova and Ciccarelli (2013), it captures static and dynamic interdependencies. It is undoubtedly a useful tool to give some good interpretation of inclusive impacts of government fiscal expenditure without modeling the

global economy. This setup also allows us to study the Impulse Response Functions (IRFs) of different shocks and how these affect other imbalances.

The first step of the empirical analysis was to choose the optimal lag order in panel VAR and the moment condition. According to Andrews and Lu (2001) consistent moment and model selection criteria (MMSC) are based on Hansen's (1982) statistic of over-identifying restrictions. Therefore, according to three model selection criteria by Andrews and Lu (2001), the preferred model in our case was the first-order Panel VAR. This panel VAR model can be specified as follows:

$$Y_{it} = A(L)Y_{it} + \mu_i + \varepsilon_{it}, \qquad (1)$$

$$Y_{it} \equiv \begin{bmatrix} growth \\ gini_{it} \\ B_{it} \end{bmatrix}$$

where Y_{it} is a $(1 * k)$ dimension vector containing all stationary variables. $A(L)$ is a matrix polynomial in the lag operator with $A(L) = A_1 L^1 + A_2 L^2 + \cdots + A_p L^p$, μ_i is a vector of country specific effects and ε_{it} is a vector of idiosyncratic errors. B_{it} is a vector or scalar of public expenditure in education, health and infrastructure index.

In the Panel VAR framework, it is important to impose some restrictions to make sure that the underlying structure is the same for all the cross-sectional members. In practice, such constraints are likely to not be respected; one can resolve this problem by using fixed effects denoted by μ_i in equation (1) to allow for individual heterogeneity in all the variables. However, the conventional approach of average differentiation, commonly used to remove fixed effects, can lead to biased coefficients because the fixed effect hypothesis means that the individual specific effect is correlated with the independent variables. Therefore, to overcome this problem we use forward mean-differencing, also known as the Helmert procedure (Arellano and Bover,

1995). In this procedure, to remove the fixed effects, all variables in the model are transformed

in deviations from forward means. Let $\bar{y}_{it}^m = \sum_{s=t+1}^{T_i} y_{is}^m /(T_i - t)$ denotes the means obtained

from the future values of y_{it}^m, a variable in the vector $Y_{it} = (y_{it}^1, y_{it}^2, \dots, y_{it}^M)'$, where T_i denotes

the last period of data available for a given countries series. Let $\bar{\varepsilon}_{it}^m$ denotes the same

transformation of ε_{it}^m, where $\varepsilon_{it} = (\varepsilon_{it}^1, \varepsilon_{it}^2, \dots, \varepsilon_{it}^M)'$. Hence, we get transformed variables:

$$\tilde{y}_{it}^m = \delta_{it}(y_{it}^m - \bar{y}_{it}^m) \qquad (2)$$

And

$$\tilde{\varepsilon}_{it}^m = \delta_{it}(\varepsilon_{it}^m - \bar{\varepsilon}_{it}^m) \qquad (3)$$

where $\delta_{it} = \sqrt{(T_i - t)/(T_i - t + 1)}$.

This procedure gives more weight to data from the early period and allows no transformation

on the last one since no future observation is available. The same transformation is applied on

the error vector; indeed, given the assumptions of neither auto-correlation nor

homoscedasticity, the procedure does not alter its characteristics. The final transformed model

is thus given by:

$$\tilde{Y}_{it} = A(L)\tilde{Y}_{it} + \tilde{\varepsilon}_{it} \qquad\qquad\qquad (4)$$

where $\tilde{Y}_{it} = (\tilde{y}_{it}^1, \tilde{y}_{it}^2, \dots, \tilde{y}_{it}^M)'$, and $\tilde{\varepsilon}_{it} = (\tilde{\varepsilon}_{it}^1, \tilde{\varepsilon}_{it}^2, \dots, \tilde{\varepsilon}_{it}^M)'$, and $Y_{it} \equiv \begin{bmatrix} growth \\ gini_{it} \\ B_{it} \end{bmatrix}$

Moreover, the differencing could also result from a simultaneity problem since the lagged

regressors are correlated with the differenced error term. In addition, heteroscedasticity may

also exist due to the presence of heterogeneous errors with different countries in the panel.

Accordingly, after eliminating the fixed effects by differencing, the generalized method of

moments estimator (GMM) using lagged regressors as instruments is applied to estimate the coefficients more consistently.

In our model, we assumed that the residuals vector (ε_{it}) was independent and identically distributed. However, this assumption typically fails in practice, as the concrete variance-covariance matrix of errors is unlikely to be diagonal. Thus, to isolate the shocks on one of the VAR errors, it is necessary to decompose the residuals so that they become orthogonal. According to Sims (1980), the variables in VAR should have a recurrent causal order based on their degree of exogeneity. This procedure is also known as the Cholesky decomposition of the variance-covariance matrix of residuals and ensures the orthogonalization of the shocks. In other words, the variables that come earlier in the order affect the subsequent variables at the same time and with a lag, whereas the variables that come later only affect the previous variables with a lag (Love and Zicchino, 2006).

As our panel exhibits a medium temporal dimension and a relatively small number of countries (10 countries), the panel with fixed effect specification (LSDV) is the most appropriated (Bun and Kiviet, 2006) and found to be consistent (Nickell, 1997). So Estimating equation (4) and drawing impulse response functions was done using the Stata code (XTVAR) of (Cagala and Glogowsky, 2014). XTVAR estimates a panel vector autoregression by employing a least square dummy variable estimator (LSDV). The estimator fits a multivariate panel regression of each dependent variable on lags of itself and all the other dependent variables.

The key element in the use of VAR is the possibility to draw the impulse response function (IRF) and the variance decomposition of the error (FEVD)[9] to identify the shocks. The impulse response functions (IRFs) are calculated by counting on the Cholesky decomposition. They

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[9] Impulse response functions describe the response of an endogenous variable over time to a shock in another variable in the system. Variance decompositions measure the contributions of each source of shock to the (forecast error) variance of each endogenous variable, at a given forecast horizon.

describe one variable's reaction in reply to changes in another variable in the system, as all other shocks are held equal to zero. However, to isolate shocks to one of the variables in the system, it is essential to decompose the residuals using a method by which they turn into orthogonal, because the actual variance-covariance matrix of the errors is unlikely to be diagonal. The usual convention is adopting a particular ordering, and then any correlation between the residuals of any two elements is allocated to the variable that is coming first. The identifying assumption is that the following variables are affected simultaneously by the variables that appear earlier in the ordering, as well as with a lag, whereas the variables coming later affect the preceding variables only with a lag. That is to say, in the system, the variables coming earlier are more exogenous, while the variables coming later are more endogenous. Finally, to analyze the impulse response functions an estimation of their confidence intervals is needed. The standard errors of the impulse response functions need to be considered, because the matrix of IRFs is built from the estimated VAR coefficients. Consequently, the standard errors of the impulse response functions and the confidence intervals are generated by use of Monte Carlo simulations (Garita, 2011).

2.5. Data and empirical investigation

2.5.1. Data and variables

To investigate the effect of public expenditure component on inclusive growth, we use annual observations from 1990 to 2015 for 10 Sub-Saharan African countries. The sample does not include early years because of the scarcity of fiscal data in macro level for Sub-Saharan African countries. We focus on three kinds on spending variables (education, health, and infrastructure) because according to the literature, these expenditures account for a major part of public expenditure in different countries. Also, the distributive nature of these expenses has been debated at length.

To carry out the study, we analyze the effect of these public expenditures on GDP per capita growth and Gini index. The fiscal variables (spending on health and education) are expressed in percentage of GDP.

The Gini coefficients are from the Standardized World Income Database (SWIID) and measured the net Gini i.e., the Gini after tax and transfer. By maximizing comparability for the largest possible sample of countries and years, the SWIID is better suited to broadly cross-national research on income inequality than previously available sources: it offers coverage double that of the next largest income inequality dataset, and its record of comparability is three to eight times better than those of alternate datasets (Solt, 2016). The Gini coefficient is used to assess the distributional effect of growth, which is an important aspect of inclusive growth. The other data are from World Development Indicators (World Bank) and World Economic Outlook Database (IMF). Due to the lack of infrastructure spending in the countries used in this study, we are building an infrastructure indicator. For the construction of our indices of infrastructure which takes into account both quantity and quality, we follow (Calderon and Serven, 2014). We use the principal component analysis to construct synthetic indices that capture information in two core infrastructure sectors – transport and power- which play a major role in economic development. The aggregate Index of infrastructure stocks is the first component of two variables: air transport, freight and improve water source (% of population with access).

*Infrastructure Index= 0.7071 *Transport + 0.7071 * Improve water*

The variables used in this study and their descriptive statistics are shown in Table 1.

Table 1: Description Statistics for variables

Variables	Observation	Mean	Std. Dev.	Min	Max
GDPpc growth	311	1.06	4.05	-15.28	15.65
Net Gini	237	40.8	7.51	31	58.8
Investment	312	20.32	9.48	4.30	61.46
Education spending	312	3.67	1.56	.11	8.65
Health spending	312	2.38	1.24	.02	6.93
Infrastructure	260	2.44	1.3	0.04	6.93

Source: Author calculation using data from WDI and SWIID database.

2.5.2. Panel unit root test and cointegration analysis

The aim is to establish the dynamic properties of the effect of government expenditures composition on both equity and economic growth in Sub-Saharan Africa countries over the 1990-2015 period. In particular, we are interested in the following questions: are government expenditures linked to economic growth and income inequality by a stable long-run relationship? Which component of public spending has a more significant effect on economic activities and equity? Are these relations robust over time?

To overcome the issue of spurious regression that characterized earlier studies on the relation between government expenditure and growth and equity due to the neglect of time series properties, we follow the now standard approaching consisting of (i) assessing the stationarity of the time series, (ii) in the case the variables are not stationary, checking whether they are characterized by a cointegration relationship, (iii) in case cointegration holds, estimating error correction mechanism (ECM), which permits to analyze the long-run relationship between the variables jointly with the short-term adjustment towards the long-run equilibrium.

Table 2 presents the results of unit root tests of IPS, ADF, and PP for the variables in the system. At the 5% level of significance, the results show that GDP per capita growth and net Gini are

stationary in levels. By against, the results find that time series variables, such as investment, public spending in education, spending in health and infrastructure are having unit roots at the level data. This is because the estimated unit root test statistics cannot reject the null hypothesis of non-stationarity at 5% level of significance. However, they are stationary at the first difference level, as the null hypothesis of non-stationarity is rejected at 5% level of significance (see Table 3). This confirms that these variables are integrated of order one, 1 (1).

Table 2: Results of Panel Unit Root Tests (in levels)

Variables	Im, Pesaran and Shin	ADF-Fisher	PP-Fisher	Level of Integration
GDP pc growth	-3.805	-4.053	-11.412	I(0)
	(0.000)	(0.000)	(0.000)	
Net Gini	-1.908	-1.894	-1.681	I(0)
	(0.028)	(0.029)	(0.046)	
Investment	0.933	1.445	0.220	I(1)
	(0.824)	(0.926)	(0.587)	
Education spending	2.118	2.241	1.831	I(1)
	(0.983)	(0.987)	(0.966)	
Health spending	-1.617	-1.492	-2.123	I(1)
	(0.053)	(0.068)	(0.017)	
Infrastructure	6.500	6.089	3.304	I(1)
	(1.000)	(1.000)	(0.999)	

P values shown below test statistics. The null hypothesis for all test is a unit root (assumes individual unit root process). Two lags are introduced to allow for serial correlation in the errors.

Table 3: Panel Unit Root Tests (At First difference)

Variables	Im, Pesaran and Shin	ADF-Fisher	PP-Fisher
Investment	-6.149	-6.7257	-16.871
	(0.000)	(0.000)	(0.000)
Education spending	-3.297	-3.499	-8.956
	(0.001)	(0.000)	(0.000)
Health spending	-2.146	-2.130	-8.709
	(0.016)	(0.017)	(0.000)
Infrastructure	-4.075	-4.317	-14.192
	(0.000)	(0.000)	(0.000)

P values shown below test statistics. The null hypothesis for all test is a unit root (assumes individual unit root process). Two lags are introduced to allow for serial correlation in the errors.

Cointegration test

Once the stationarity order is defined, our next step is to apply panel cointegration test. Granger (1988) showed that when the time series become stationary only after being differentiated once, they might have linear combinations that are stationary without differencing. These series are generally called cointegrated. If the integration of order one is implied, the next step is to use the cointegration analysis to determine whether there is a long-term relationship between the set of integrated variables. Panel cointegration tests are improved aiming to analyze long-term relation-ships between panel series after advances in panel unit root tests. The most important cointegration tests in econometric literature are these: 1995, 1999 and, 2004. Mccoskey and Kao (1998), Kao (1999), Larsson et al. (2001), Mark and Sul (2003), Guitierrez (2005).

In this investigation, Westerlund (2007) cointegration test is deployed to test the existence of long run equilibrium relationship between public expenditure and inclusive growth. Westerlund (2007) implements the four error-correction-based panel cointegration tests which are general enough to allow a large degree of heterogeneity, both in the short-run dynamics and, in the long-run cointegration relationship and dependence across as well as within the cross-sectional units. The underlying idea is to test for the absence of cointegration by establishing if the individual members of panel are error-correcting or not. Consider that we have a process of generating data in the form:

$$\Delta y_{it} = \delta_i' d_t + \alpha_i \big(y_{i,t-1} - \beta_i' x_{i,t-1}\big) + \sum_{j=1}^{P_i} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{P_i} \gamma_{ij} \Delta x_{i,t-j} + e_{it} \quad (3.11)$$

Where $i = 1, \dots, N$ and $t = 1, \dots, T$ design cross-sectional units and the time-series, respectively, while, d_t contains the deterministic components, for which there are three cases. In the first case, $d_t = 0$ so (3.11) has no deterministic terms; in the second case, $d_t = 1$ so Δy_{it} is generated with a constant; and in the third case, $d_t = (1, t)'$, so Δy_{it} is generated with both a constant and a trend. The parameter α_i measures the speed of adjustment, that is, the speed at

which the system returns to its equilibrium relationship $y_{i,t-1} - \beta_i' x_{i,t-1}$ after a sudden shock in one of the model variables. If $\alpha_i < 0$, then there is error correction which implies that y_{it} and x_{it} are cointegrated; if $\alpha_i = 0$, there is absence of error correction and, thus absence of cointegration. Thus, we can formulate the null hypothesis of absence of cointegration as $H_0: \alpha_i = 0$ for all i. The alternative hypothesis depends on what is supposed about the homogeneity of α_i. Two of the tests, called group-means tests, do not require the α_i coefficients to be equal, which means that H_0 is tested versus $H_1: \alpha_i < 0$ for at least one i. The second pair of tests, called panel test, assume that α_i is equal for all i.

Westerlund (2007) computes the group-mean tests in three steps. The first step consists in the estimation of equation (3.11) by least squares for each unit i. Having obtained e_{it} and γ_{ij}, the second step is the computation of $\hat{u}_{it}$ and then of $\hat{\alpha}_i$. The third step is the calculation of the group-mean tests in the following way:

$$G_T = \frac{1}{N} \sum_{i=1}^{N} \frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)}$$

$$G_a = \frac{1}{N} \sum_{i=1}^{N} \frac{T\hat{\alpha}_i}{\hat{\alpha}_i}$$

Similarly, the panel test is computed in three steps. The first test is the same as for the group-mean tests and involves regressing Δy_{it} and $y_{i,t-1}$ on d_t, the lags of Δy_{it}, and the contemporaneous and lagged values of Δx_{it}. Then, the second step focuses on the estimation of the common error correction parameter, $\hat{\alpha}$, and its standard error, SE. Finally, the panel statistics are given by:

$$P_T = \frac{\hat{\alpha}}{SE(\hat{\alpha})}$$

$$P_T = T\hat{\alpha}$$

The above cointegration tests, proposed by Westerlund (2007) can be executed using command called "xtwest", which can be used in Stata software.

Table 4 reports the results of panel cointegration tests developed by Westerlund (2007). The G_T and G_a statistics test whether cointegration exists for at least one individual. The P_T and P_a statistics pool information over all the individual series to test whether cointegration exists for the panel as a whole. As shown by the robust p-value, for models with dependent variables Gini, the null hypothesis of no cointegration cannot be rejected by all the four tests. Regarding the model that have GDPpc growth as dependent variable, the statistic G_a and P_a does not allow to reject the null hypothesis of no cointegration. Therefore, the empirical properties of the variables examined require estimation of the VAR in first differences, since no cointegration relationships exist between the (non-stationary) variables (in level).

Table 4: Panel cointegration tests

Dependent variable: GDPpc growth		
Statistic	Value	P-value
Gt	-2.780	0.004
Ga	-8.635	0.728
Pt	-8.647	0.008
Pa	-8.954	0.089

Dependent variable: Net Gini		
Statistic	Value	P-value
Gt	-1.069	0.999
Ga	-0.932	1.000
Pt	-2.470	0.993
Pa	-0.574	0.996

The Westerlund and Edgerton (2007) tests take no cointegration as the null, and
P-values are robust critical values obtained through one lag.

2.6. Empirical results

This section presents the impulse response functions and the variance decomposition from the panel VAR. Each of these IRFs is generated by Monte Carlo simulations with 200 repetitions. Areas between the upper and lower lines have a 95% confidence interval for IRFs over the next 10 years. The four-variable XTVARs consist of investment, government spending on education and health as well as net Gini and GDP per capita growth.

The impulse response functions in Figure 6 show that GDP per capita responds negatively to public spending on education, before having a positive but low impact. Reaching its minimum level in the first period, the increase in growth level appears nearly about 0.06 %. This positive response of income conserves its statistical meaningfulness from the 4th period. However, increases in government spending on education are likely to have a negative effect on the Gini coefficient. Figure 6 also shows that public investment reacts positively and significantly to government expenditure on education. These results indicated that the economic impact of public expenditure on education might be positive but limited in the case of growth in Sub-Saharan African countries, whereas educational spending is likely to reduce income inequality slightly.

These results are in line with some previous studies including Afzal and al. (2012) and Hanushek and Woessmann (2008) that report a significant and positive relationship between government expenditure on education and growth. Higher education always leads to quality labour supply, thus increase in total factor productivity and growth towards equilibrium output. Also, education promotes the innovative techniques, which encourages growth. The findings do not corroborate the results of Martinez et al. (2012) who find that government spending (education, health, and housing) tend to have greater effects on reducing income inequality than other spending items. This difference in results can be explained by the difference in samples

(time period and number of countries) or methodology used in these studies. On the other hand, the difficulty in targeting the poor with regular education spending in developing countries might explain the limited effect of government spending on education on Gini coefficient. In fact, among other reasons, these programs are in many countries targeting in urban areas, thus does not directly benefit the poor in rural areas or even those live in informal neighborhoods in urban areas. Thereby, given that inclusive growth implies there is an increase in economic growth on the one hand an equitable redistribution of the fruits of this growth on the other hand, our results show that a shock of public spending on education affects both aspects of inclusive growth but with minimal effect.

Figure 6: Impulse response functions – public expenditure on education
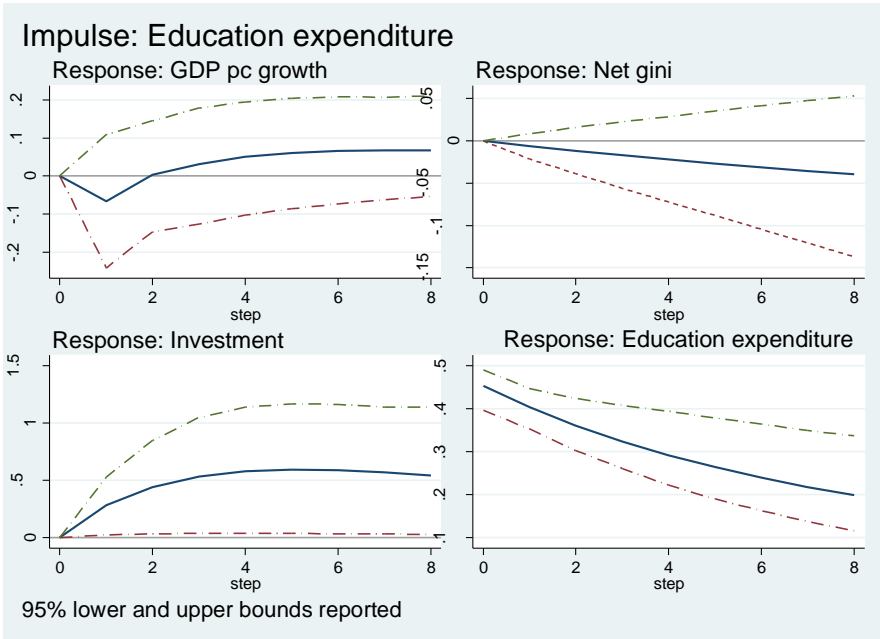
Source: Author's estimates using XTVAR code.

According to impulsive response functions obtained from public spending on health (Figure 7), the reaction of GDP per capita in response to an impulse given to government health expenditure is positive and significant during the entire period. However, after five periods, economic effects of an increase in health expenditure are likely to decrease. A plausible

explanation is that in developing countries, a large share of health spending is allocated to operating expenditure rather than funding medical equipment. These expenditures have little impact on the population's health, especially those living in rural areas. Thus, unhealthy individuals are less fit both physically and mentally, they are expected to disrupt production and decrease productivity and tend to reduce economic growth.

The response of net Gini coefficient, which measures the degree of inequality in the distribution of income in a country, is positive during the entire period. These results indicate that the public spending on health seems to increase the income gap between rich and poor in the countries used in this study. The finding confirms those found by Dollar and Kraay (2002). In fact, they have attempted to address how certain components of public policies like public spending on health and education impact poverty. They find that many supposedly "pro-poor" policies that direct investment in health and education do not have any significant impact on the income of the poor. They argue, however, that social spending in developing countries often benefits the rich and middle classes more than the poor. Therefore, a higher share of social spending on items such as health and education will not be reflected in higher incomes for the poor. Unlike to the education, health expenditure in sub-Saharan Africa appears to make it possible to reach only one aspect of inclusive growth (i.e. economic growth).

Figure 7: Impulse response functions – public expenditure on health
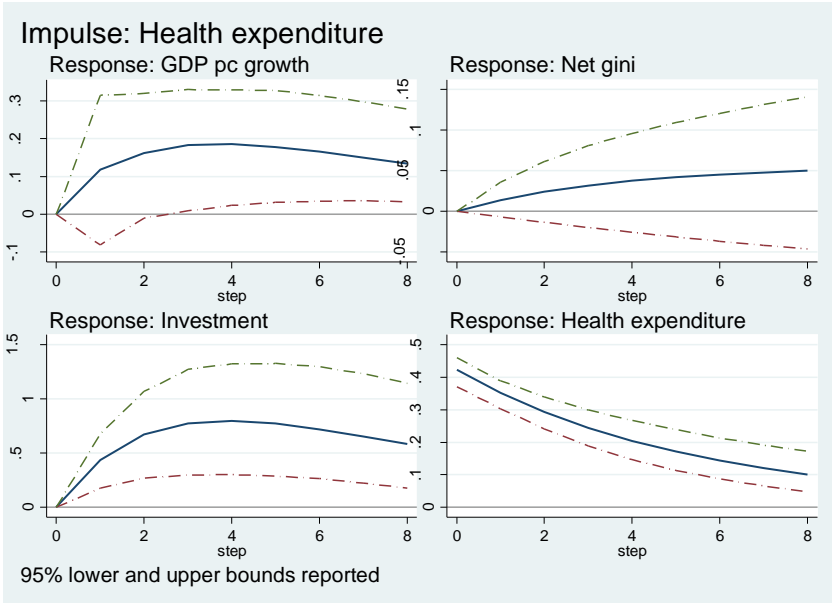
Source: Author's estimates using XTVAR code.

Figure 8 draws the impulsive response function for infrastructure. The effect from a change in infrastructure is different to public education expenditure and public health spending. An expansion in infrastructure has a positive effect on growth and allows a reduction of the income gap between rich and poor (negative curve of Gini). Compared to the previous two cases for public expenditure on health and education which do not or have little growth inclusiveness effect, this result shows an increase in infrastructure has a long-term effect in achieving economic growth and in reduction of income inequality. This leads to an inclusion of growth in Sub-Saharan Africa.

Figure 8: Impulse response functions – infrastructure
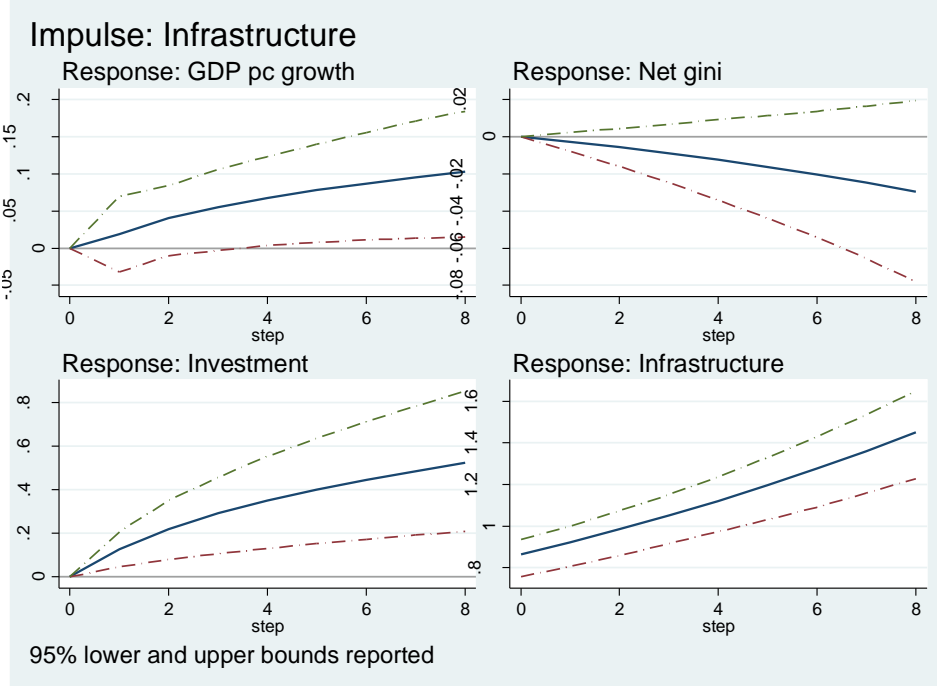
Source: Author's estimates using XTVAR code.

Although the impulsive responses provide information about the effect of changes in one variable on another, they do not show how important shocks on one variable are in explaining fluctuations in other variables. To assess the importance of changes in one variable in explaining the shifts in other variables, we perform a variance decomposition. The variance decompositions display the proportion of movements in the dependent variables that are due to their own shocks versus shocks to the other variables. Table (5) reports the variance decomposition analysis derived from the orthogonalized impulse–response coefficient matrices. The variance decomposition in Table (5) clarifies how government spending on education and health and infrastructure index affect each component of inclusive growth (income inequality and economic growth) in the sample used in this study. The variance decomposition shows that public education expenditure explains approximately 0.14% and 0.31% of the fluctuations of GDP per capita growth and Gini coefficient respectively. Health expenditure explains approximately 0.48% of changes in GDP per capita growth and 2.01% of

Gini index. The results in Table (5) also indicate that infrastructure shocks are essential to explain the inclusiveness of growth. Infrastructure explains 1.96% of the variation in growth and 0.20% of the change in net Gini.

Table 5: Variance decomposition analysis

Variation in the row variable explained by column variable (in %, 8 periods ahead)			
Model 1 (Education)			
	GDPpc growth	Net Gini	Investment	Education spending
GDPpc growth	81.83	0.26	17.77	0.14
Net Gini	1.21	96.83	1.65	0.31
Investment	.84	1.18	96.28	1.70
Education spending	1.83	0.24	0.26	97.66
Model 2 (Health)			
	GDPpc growth	Net Gini	Investment	Health spending
GDPpc growth	82.82	0.45	16.25	0.48
Net Gini	1.21	96.23	0.55	2.01
Investment	0.47	3.03	93.38	3.12
Health spending	0.87	21.60	0.61	76.92
Model 3 (Infrastructure)			
	GDPpc growth	Net Gini	Investment	Infrastructure
GDPpc growth	80.48	0.25	17.31	1.96
Net Gini	1.70	96.42	1.68	0.20
Investment	0.41	1.55	97.72	0.31
Infrastructure	0.02	0.30	0.21	99.47

Source: Author estimation. Numbers are expressed in percentage of the total variance; Projection: 8 periods ahead; Columns explain lines.

To summarize, from impulsive response function and variance decomposition results, we find evidence that improving the infrastructure quality and stock has a major impact on the inclusiveness of growth in long term. This effect could be observed by an increase in GDP per capita growth and a reduction on income inequality measured by Gini index. However, public expenditure on education and health do not allow at the same time to increase the growth on the one hand and reduce income inequality in the other hand. In other words, our results do not find evidence that these two kinds of public spending affect the inclusiveness of growth in Sub-Saharan Africa countries.

Firstly, these results can be explained by the fact that in many developing countries, a large part of public health budgets is allocated to hospital services, usually located in urban areas. These services are difficult or not at all accessible to large parts of the population living in rural areas and have high mortality rates caused by diseases. Besides, good governance is important in the delivery of health care, and returns on investment in health are low in poor governance environment (Lewis, 2006). Consequently, the allocation of funds to the health sector in the context of poor governance may be insufficient to improve health outcomes. Indeed, poor intra-sectoral distribution, inadequate targeting, and inefficient delivery also explains the low impact of public spending on health. Some authors like Ugur and Dasgupta (2011) suggested that governance affects health through two main channels: its indirect effect on national income (corruption reduces economic growth) and thus on household income, and the determinants of health and directly on the health sector. In more developed countries, good governance in the health sector has a positive effect on health, while in less developed countries good governance affects it mainly through its indirect impact on income.

Second, the limited effect of public expenditure on education in achieving inclusive growth can be explained by the fact that there may be variations in individual choice and parental human capital. In such a case, public spending on education does not reduce the income gap between the rich and the poor, even if everyone has equal access to education (Glomm and Ravikumar, 2003). Moreover, expansion of education would not benefit the poor if they did not have enough resources to attend school, especially if they are taxed to generate revenue to finance education (Sylwester, 2000).

Finally, several reasons support the view that infrastructure investment boosts inclusive growth, especially in developing countries with low infrastructure stocks (Easterly and Rebelo, 1993, and Arslanalp et al., 2010). A good road network or reliable electricity supply raises

productivity across industries and firms, and hence, the economy as a whole. Calderón and Servén (2010) found that both the quantity and quality of roads, telephones, and electricity had a significant beneficial effect on both growth and inequality. By cons, Estache and Fay (2007) showed that access to infrastructure was highly distorted against the poor. This reflects the lack of physical access and limited accessibility. Therefore, maximizing the inclusive impact of infrastructure requires expanding access to and affordability for the poor.

2.7. Robustness Check

Another estimator (PVAR)

In this part, we focus on another panel VAR model estimator developed by Abrigo and Love (2016) which use the Stata code (PVAR). The method allows us to examine the dynamic relationship between governments spending and inclusive growth over time. The PVAR methodology treats all variables as endogenous and interdependent, so all the feedback effects are included explicitly in the model. In fact, the PVAR estimator uses the lagged values of regressors as instruments and estimates the coefficients by the generalized method of moment (GMM). Thus, it is a methodology that is well-suited to the questions this study aims to address. Figure 9, 10 and 11 (see Appendix) impulsive response function (IRF) for public expenditure on education, health, and infrastructure index respectively. First, the IRFs of education spending shows that the effect GDP per capita growth and net Gini have practically the same tendency as in the case of XTVAR estimator to a shock on public spending on education. However, the magnitude of the curves remains slightly higher in the case of the GMM method used by the PVAR estimator than the LSDV method. Second, given an impulse of public spending on health, the results are qualitatively the same as the case of XTVAR. Except that here, there is a considerable drop in the GINI index, which is even negative, indicating a decrease in income inequality. Third, according to figure 11, investment in infrastructure seems to have a positive

effect on growth even if this effect decreases other times. In the case of income inequality, a shock on investment in infrastructure is likely to lower the Gini coefficient up to the 7th period beyond which effect becomes positive and this is not significant.

Overall, the inclusiveness of growth in African countries in the south of Sahara seems to be mainly driven by infrastructure. This finding is closed to the previous results using the LSDV estimator. The difference is being felt in the magnitude of the effect.

Sub-panel

The main goal of this part is to focus more precisely on a sample consisting essentially of countries in West Africa. A specific attention is paid to the six following countries: Côte d'Ivoire, Ghana, Guinea, Mali, Niger, and Senegal. The aim here is to check whether our results are not affected when we are specifically interested in countries operating in the same geographical space. These countries all belong to ECOWAS, thus sharing the same trade policy aimed at increasing intra-regional trade to promote the harmonious integration of the region into the world economy and stimulate economic activities in the region and also contribute to the improvement of the economic welfare of the citizens. The results represented in Figure 12, 13 and 14 (see Appendix) confirmed that our results are quite similar to those obtained with the whole sample, the difference being that in the reduced sample, education spending does not affect income inequality.

2.8. Conclusion and policy implication

This chapter examines empirically the effect of government expenditure policy on two critical aspects of inclusive growth that are economic growth and income inequality. The study is conducted using a panel VAR approach using data from 10 sub Saharan African countries over the period 1990 to 2015. The results are as follows:

- Public health spending and infrastructure investment have significant positive effects on economic growth.

- Public spending on education has a temporary negative effect before having a positive but limited effect on GDP per capita growth.

- Educational spending and infrastructure investment seem to alleviate income inequality significantly.

- The effects of public health spending items on the Gini coefficient are positive and significant during the entire period, denoting an increase of income gap between rich and poor in the studied countries.

These findings imply that investment in infrastructure may contribute to more inclusive growth in Sub-sub Saharan African economies than other government spending. Based on these results, we recommend that the following measures should be implemented to create government expenditures policies that will support the successful implementation of inclusive growth. In order to make growth more inclusive, temporary and well-targeted programs could be considered to help those being left out by the growth process. Governments of sub Saharan African countries should direct their policies strategies on increasing productive public expenditure on health, education, and infrastructure.

First, an increase in government spending on education would result in improved primary and secondary school enrollment, academic excellence, research and development, human capital

development, as well as skilled and productive work. Therefore, this would greatly contribute to inclusive growth in the country.

Second, if governments increase their expenditure on health by providing quality medicines, skilled health personnel, a clean and supportive environment, significant progress will be made to reduce waterborne illness, sexually transmitted diseases, malaria, poliomyelitis, etc. Above all, infant and maternal mortality would decline across the country.

Last, since the use of public resources as infrastructure has led to inclusive growth, governments could improve further their productivity by providing infrastructural facilities such as good roads, electricity, water supply, communication, school and hospital buildings. In fact, good roads will have the effect of lowering the price of products and therefore increasing household consumption. Concerning investment in electrical infrastructure, they guarantee a constant power supply to households and industries. A steady power supply would help to reduce production costs and prices, but with significant output across sectors of the economy. Finally, water infrastructure would improve the supply of potable water, thereby eradicating the health risk associated with water consumption from unsafe sources. In short, the provision of infrastructure would necessarily create more jobs which, in turn, would translate to economic growth and social well-being.

2.9. Appendices

Figure 9: Impulse response functions – public expenditure on education
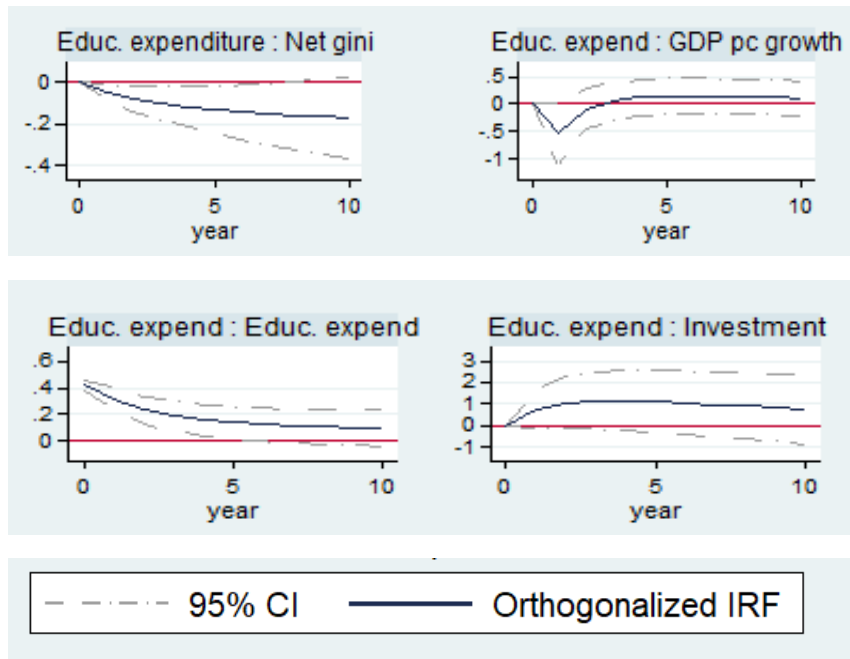
Figure 10: Impulse response functions – public expenditure on health
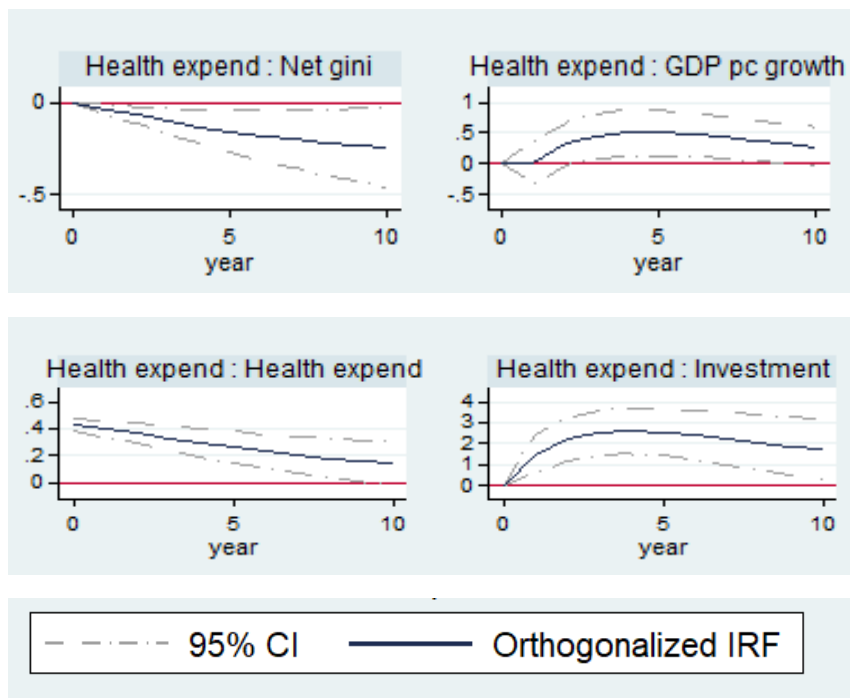
Figure 11 Impulse response functions – infrastructure
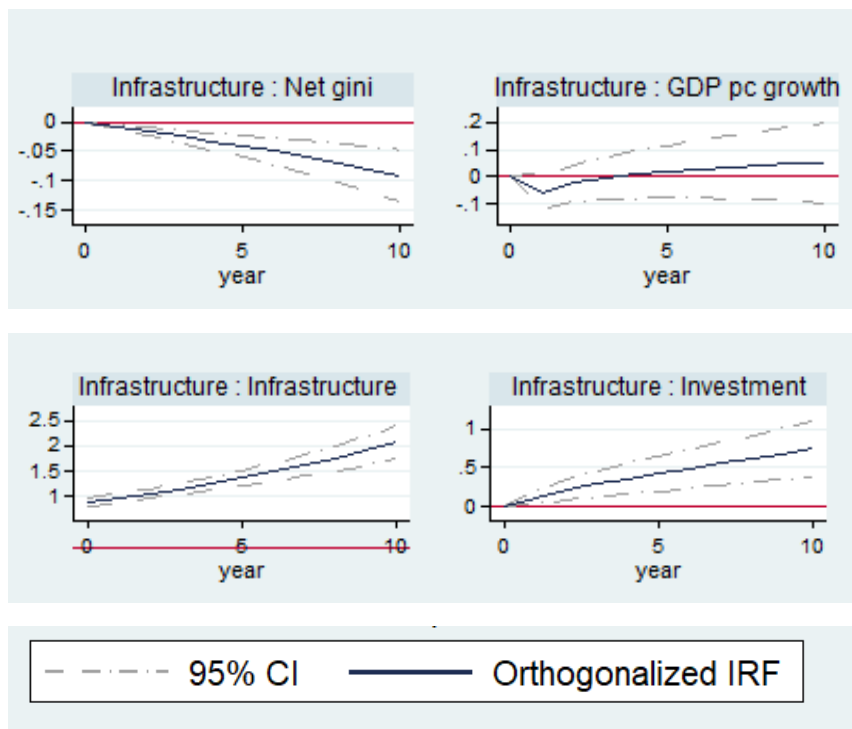
Robustness 2

Figure 12: Education

Figure 13: Health

Impulse: Health expenditure
95% lower and upper bounds reported
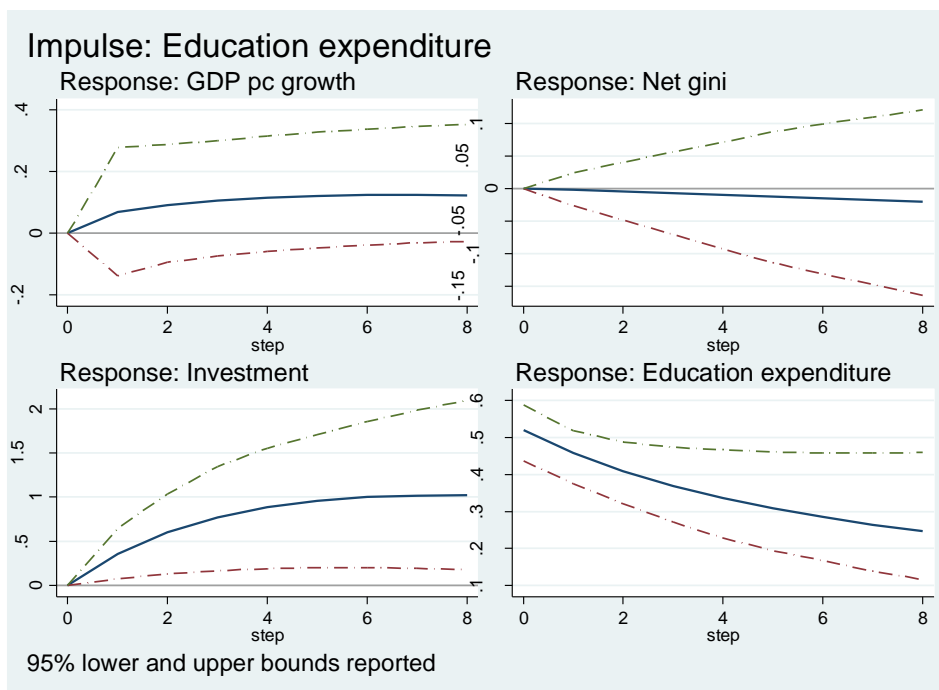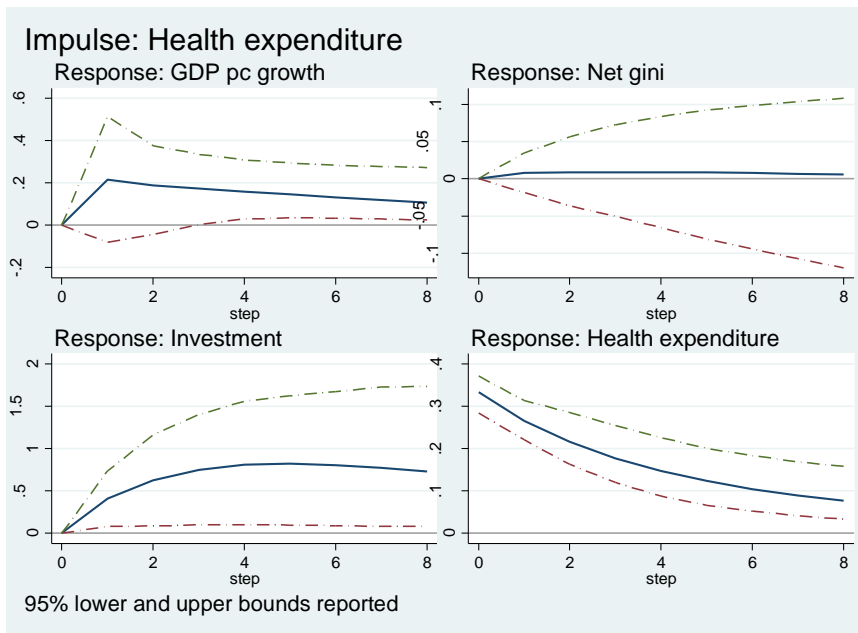
Figure 14: Infrastructure

Impulse: Infrastructure
95% lower and upper bounds reported
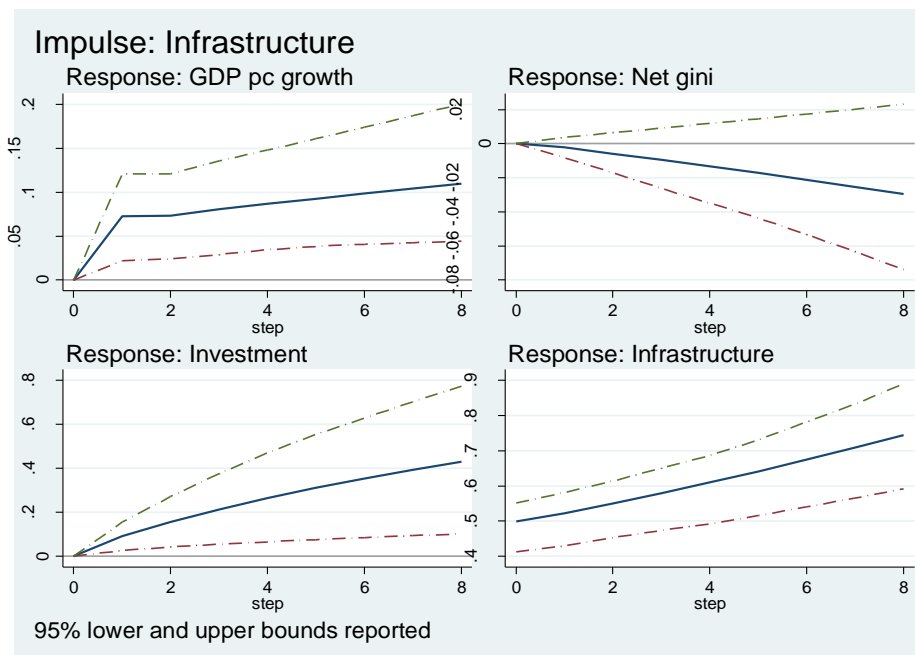
Table 6: Variance decomposition analysis using PVAR estimator

Variation in the row variable explained by column variable (in %, 10 periods ahead)			
Model 1 (Education)			
	GDPpc growth	Net Gini	Investment	Education spending
GDPpc growth	88.35	0.53	10.0	1.12
Net Gini	0.96	93.46	1.64	3.94
Investment	0.56	3.70	77.12	18.62
Education spending	4.87	1.03	2.66	91.44
Model 2 (Health)			
	GDPpc growth	Net Gini	Investment	Health spending
GDPpc growth	86.26	3.50	5.73	4.51
Net Gini	4.37	67.76	16.51	11.36
Investment	0.63	3.42	89.48	6.48
Health spending	4.37	30.72	41.81	23.09
Model 3 (Infrastructure)			
	GDPpc growth	Net Gini	Investment	Infrastructure
GDPpc growth	80.13	2.03	16.48	1.36
Net Gini	10.48	27.07	46.59	15.86
Investment	0.66	1.55	95.52	2.27
Infrastructure	10.24	18.18	37.66	33.92

Countries

Côte d'Ivoire	Mali
Ghana	Mauritania
Guinea	Niger
Malawi	Senegal
South Africa	Zambia

Model selection criteria: Lag-order selection statistics for panel VAR estimated

Lag	CD	J	J pvalue	MBIC	MAIC	MQIC
1	.999963	143.0066	.0135994	-421.9531	-72.9934	-214.392
2	.9999982	73.83436	.4179817	-302.8055	-70.16564	-164.4314
3	.9999964	33.7613	.5755131	-154.5586	-38.2387	-85.37158

Based on the three model selection criteria by Andrews and Lu (2001) and the over-all coefficient of determination (CD), first-order panel VAR is the preferred model, since this has the smallest MBIC, MAIC and MQIC.

Panel VAR-Granger causality Wald test

Ha: Excluded variable Granger-causes Equation variable
Ho: Excluded variable does not Granger-cause Equation variable

Equation \ Excluded	chi2	df	Prob>chi2
GDP pc growth			
Net gini	35.298	1	0.000
Investment	119.264	1	0.000
Education	71.680	1	0.000
Health	25.722	1	0.000
Infrastructure	97.763	1	0.000
ALL	155.581	5	0.000
Net gini			
GDP pc growth	5.033	1	0.025
Investment	0.024	1	0.878
Education	9.047	1	0.003
Health	3.277	1	0.070
Infrastructure	10.775	1	0.001
ALL	37.066	5	0.000
Investment			
GDP pc growth	0.032	1	0.859
Net gini	9.147	1	0.002
Education	7.562	1	0.006
Health	4.132	1	0.042
Infrastructure	52.138	1	0.000
ALL	62.141	5	0.000
Education			
GDP pc growth	25.970	1	0.000
Net gini	7.700	1	0.006
Investment	10.012	1	0.002
Health	17.035	1	0.000
Infrastructure	28.887	1	0.000
ALL	99.493	5	0.000
Health			
GDP pc growth	7.166	1	0.007
Net gini	5.878	1	0.015
Investment	0.888	1	0.346
Education	0.060	1	0.806
Infrastructure	11.201	1	0.001
ALL	23.478	5	0.000
Infrastructure			
GDP pc growth	1.315	1	0.002
Net gini	117.126	1	0.000
Investment	0.355	1	0.002
Education	1.236	1	0.266
Health	9.571	1	0.002
ALL	147.425	5	0.000

Stability test

Model 1: with education

Eigenvalue		
Real	Imaginary	Modulus
.8695113	0	.8695113
.7425849	0	.7425849
.5494624	0	.5494624
.0364844	0	.0364844

All the eigenvalues lie inside the unit circle.
Panel VAR satisfies stability condition.
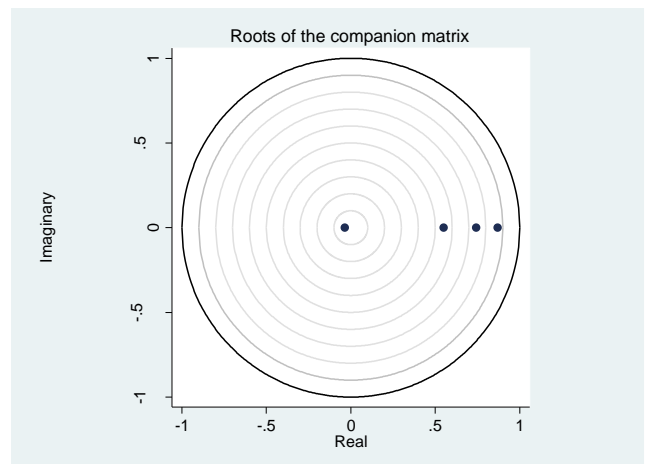
Model 2: with health

Eigenvalue		
Real	Imaginary	Modulus
.933654	0	.933654
.5644591	.158592	.5863151
.5644591	-.158592	.5863151
.1943048	0	.1943048

All the eigenvalues lie inside the unit circle.
Panel VAR satisfies stability condition.
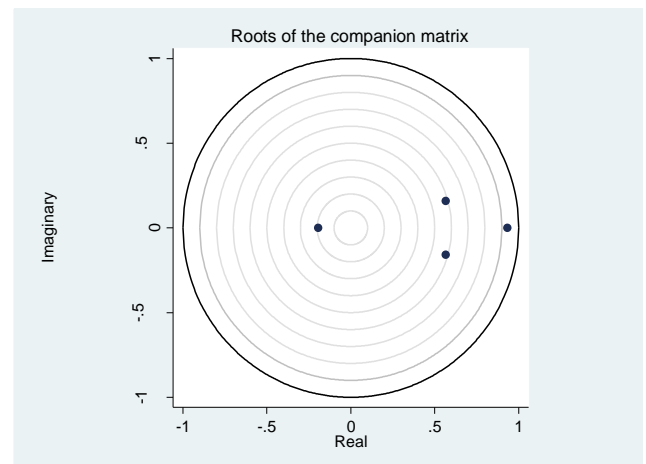
Model 3: with infrastructure

Eigenvalue		
Real	Imaginary	Modulus
.8378146	.4656283	.9585109
.8378146	-.4656283	.9585109
.9381855	0	.9381855
.2383254	0	.2383254

All the eigenvalues lie inside the unit circle.
Panel VAR satisfies stability condition.
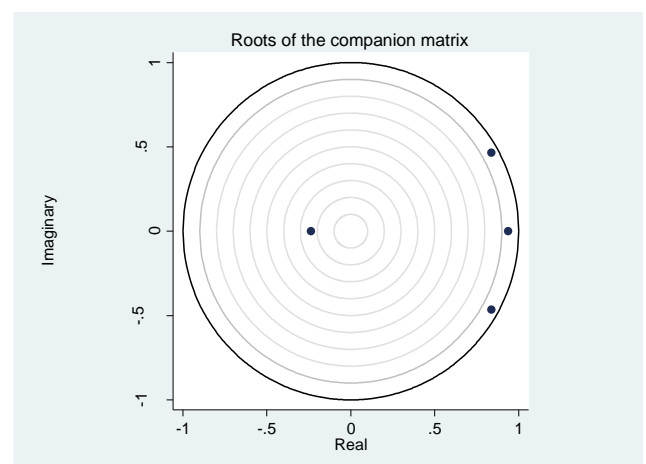
PART 2: FISCAL ADJUSTMENT, FISCAL FORECAST AND INCLUSIVE DEVELOPMENT

CHAPTER 3: DOES FISCAL ADJUSTMENT AFFECT THE INCLUSIVENESS OF ECONOMIC GROWTH IN CÔTE D'IVOIRE?

Abstract

This chapter examines the inclusiveness effects of fiscal consolidation in Côte d'Ivoire, using Bayesian Model Averaging method. Using a tighter fiscal stance, measured by changes in the cyclically-adjusted primary balance (CAPB), over the period 1980-2014, The results show that fiscal consolidations are followed by an improved in growth performance, but also income gap decreases after periods of fiscal adjustments in Côte d'Ivoire. In other words, there is no trade-off between growth and income inequality when implementing fiscal consolidations in Côte d'Ivoire. This conclusion contrasts the results of several papers that analyze the impact of fiscal consolidations on inequality at the national level. The findings also suggest that tax-based fiscal consolidations seem to increase economic growth. However, the results did not find evidence to the expansionary effect of spending-based fiscal adjustment. These results could be explained by the fact that in developing countries, tax based-adjustment are generally a base-broadening measures. Therefore, this will contribute to strong tax revenue collections and play an important role in achieving higher, sustainable economic growth. Moreover, we find that tax revenue increases in Côte d'Ivoire is not associated with increases in inequality. Interestingly, when fiscal consolidation is achieved via revenue side, income inequality seems to be reduced further. In addition, reductions in primary expenditures do not seem to reduce the income gap.

Keywords: Fiscal consolidation, income inequality, growth, inclusive growth, Bayesian Model Averaging (BMA), incidence curve.

JEL Classification Numbers: E62, D31, O47, I31, C11, H22

3.1. Introduction

The redistributive consequences of economic adjustment following the great recession of 2007/09 have been at the center of policy discussions in advanced and emerging economies as well as in developing countries. Social unrest has begun to be felt, even in those economies that have achieved positive results in terms of sustained growth and the reduction of poverty and inequality. In this context, there has been increased policy interest in the macroeconomic effects of inclusive growth and, in particular, the link between inequality and fiscal policy. While the empirical literature on the microeconomic determinants of inequality and growth is vast, especially in Côte d'Ivoire, much less attention has been paid to the underlying macroeconomic setting. This chapter attempts to bridge this gap by using fiscal data at the state level for Côte d'Ivoire to assess the links between national fiscal policy and inclusive growth. The developing countries experiences have shown that the simple expansion of output in the form of increase in gross domestic product (GDP) is not a sufficient condition for economic development, reduction of poverty and inequality. The trickle-down theorist's development (Kuznets, 1955) thinks that the reduction of inequality and poverty arises from the growth process. But for those of pro-poor growth, growth is not a sufficient condition, and therefore it is necessary to distinguish a "growth effect" and "inequality effect"[10] (Bourguignon, 2003; Dollar & Kraay, 2002; Ravallion & Chen, 2003). In order that increase in GDP leads economic development, it should be accompanied by institutional and attitudinal changes. Therefore, there is a lot of work to be done to make economic development more significant in Africa especially in Côte d'Ivoire. The French Institute for International and Strategic Affairs (IRIS), throught its Observatory of Humanitarian Prospective report in 2015[11] shows that in Côte d'Ivoire there is

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[10] According to pro-poor growth theory, the reduction of poverty goes through a "growth effect" (which measures the impact of an improvement in average income in the absence of changes in its distribution) and "inequality effect "(resulting from a change in the distribution of income in the absence of any change in the average income).

[11] Observatoire de la Prospective Humanitaire : Analyse prospective Côte d'Ivoire 2020 Une période décisive.

a consensus on the fact that economic growth has failed to be inclusive, that is, reduce in poverty and inequality. This result is valid for the pre or post-crisis period. Thus, the poverty rate (proportion of people below the accepted threshold of human development) in Côte d'Ivoire reached 48.9 % in 2008, putting the country at the 171 [nd] rank of 187 countries. The poverty rate was already high during the decade 1990: 32.3% in 1993 and 36.8% in 1995. But also, poverty has sharply worsened in the post-crisis period. Poverty has sharply worsened before the post-crisis period to nearly in 2015 almost 46.3% of which 56.8 are in rural areas against 35.9% in urban areas. Noting the magnitude of the problem, the need to make growth inclusive in both social and economic dimensions should become the major concern of government. Growth is usually considered inclusive if its benefits are widely shared across the population. Although there is no commonly accepted definition, inclusive growth usually refers to the goal of fostering high growth. It provides productive employment and equal opportunities. Thereby, all segments of society can share in the growth and employment. In other word, it aims towards productive employment generation and fruits of growth are equitably distributed among the less privileged segment of the society. Inclusive growth then redress inequalities in outcomes, especially those experienced by the poor (IMF, 2013). For analytical goals, growth is usually considered inclusive if it is sustained over time, and broad based across sector; creates productive employment opportunities and includes a large part of a country's labor force. Additional dimensions of inclusive growth include gender, regional diversification, and empowerment of the poor, including through inclusive institutions. We focus in the chapter only on the distributional characteristics of growth. Therefore, in this work growth is considered inclusive if it helps improve equity.

The perception of inclusive growth gained significant importance due increasing poverty and income inequality. Policies for inclusive growth are important components of most government reform agenda for sustainable growth. For instance, a country that register rapid growth over a

decade, but has not seen substantial reduction in poverty and inequality may need to refocus specifically on the inclusiveness of its growth strategy. This strategy should include the equality of opportunity for individuals and firms. In addition to poverty and inequality, social indicators including health and education have also acquired incomparable interest in the literature of inclusive growth. According to Ravallion (1995) and Pritchett and Summers (1996), there exists positive relationship between health services and economic growth. Whereas, Barro & Lee (1997) highlighted positive effect of education on economic growth. Especially, education and health endowments of individuals are important components of human capital that enhance productivity, social mobility and improves social participation in decision making and raise the standard of living or reduce poverty.

Sometimes growth theory can support the choice of specific variables, but the inclusion or exclusion of most variables is generally arbitrary, a phenomenon termed the "open-mindedness" of growth theory (Brock and Durlauf, 2001). Moreover, while theory can provide general qualitative variables (such as human capital), it does not tell us how these variables should be specified or measured. So, we are confronted with (at least) two types of uncertainty, which leads to uncertainty in the model. Since there is a wide range of possible model specifications, we often find contradictory conclusions. To make matters worse, the results of the estimate are often not robust to small changes in the specification of the model, making credible interpretations of the results dangerous. Appropriate treatment of the uncertainty of the model is clearly important. Such a treatment is the model averaging, where the goal of the investigator is not to find the best possible model but rather to find the best possible estimates. Each model contributes to the information on the parameters of interest and all this information is combined taking into account the confidence we have in each model, based on our prior beliefs and data (Magnus et al. , 2010). In order to combine the selection of the model and the estimation, the Bayesian method offers a natural framework.

This chapter defines a BMA approach to assess the effect of fiscal adjustment on the inclusive growth in Côte d'Ivoire over the period 1980-2014. The chapter also contributes to basic knowledge of the structural determinants of inclusive growth by analyzing an expanded set of determinants of inclusive growth, namely factors related to economic, social, and institutional influence. The further contents of the chapter can therefore be summarized as follows. Section 2 examines the literature review, section 3 presents the historical and regional perspectives of growth and poverty in Côte d'Ivoire, while section 4 exposes some stylized facts. Section 5 discusses the method, sources of data and measurement of variables while section 6 discusses the empirical estimates of the effects of fiscal adjustment on inclusive growth in Côte d'Ivoire. Section 7 Conclude and presents policy recommendation.

3.2. Growth, inequality and fiscal Consolidation: Relation to the literature

There is a relatively large number of studies on the potential impact of fiscal consolidation on economy. Guajardo et al. (2014) investigates the short term effects of fiscal consolidation on economic activity in OECD countries, using the narrative approach of Ramey and Shapiro, 1998) and Ramey (2011). The finding suggest that fiscal consolidation has contractionary effects on private domestic demand and GDP. Thereby, a 1 percent of fiscal consolidation leads to real GDP declines by 0.62 percent and reduces real private consumption by 0.75 percent. Yang, et al. (2015) focus also on the short-term effects of fiscal adjustment on economic activity in 20 OECD countries from 1970 to 2009. They compare two approaches: the traditional approach based on changes in cyclically adjusted primary balance (CAPB) and the narrative approach based on historical records. Their finding highlights that fiscal adjustments always have contractionary effects on economic activity in the short term: a 1% increase in fiscal consolidation leads to a fall of 0.3% in output. Moreover, it follows that spending-based fiscal adjustments lead to smaller output losses than tax-based fiscal adjustment.

McDermott and Wescott (1996) argue that the success of debt ratio reduction depends on the size and composition of fiscal adjustment. They show that fiscal adjustments based on spending cuts are more likely to succeed than taxes. In addition, the larger the size of fiscal adjustment, the more likely it is to succeed. On the other hand, they show that fiscal adjustments are more likely to fail during a global recession. Alesina et al. (2015) support previous conclusions, noting that tax adjustments produce deeper and longer recessions than those based on expenditures. Pappa et al. (2015) study the impacts of fiscal consolidation in an environment of corruption and tax evasion and find that fiscal consolidation leads to significant losses in output and welfare and that much of the welfare loss is due to increases in taxes that create the incentives to produce in the less productive shadow sector.

Afonso et al. (2006) assess fiscal consolidations in Central and Eastern European countries and suggest that expenditure-based adjustments have been more successful. Giudice et al. (2007) conclude that fiscal consolidation is more likely to foster economic growth during periods of below potential output and when fiscal adjustment is based on spending cuts. (Romei, 2015) studies the issue of the optimal speed and composition of a fiscal consolidation, evaluating the impact of different speeds of adjustment and of variations in several fiscal instruments on aggregate welfare. The main finding of this work is that a fiscal consolidation should be done quickly and by cutting public expenditure.

It should be noted that most of the existing studies on the economic effects of fiscal consolidation have focused on the effects of fiscal adjustments on economic growth; the distributive effects of austerity have benefited relatively less from research efforts. Almost of the studies on the redistributive effect of fiscal consolidation are conducted on a sample of OCDE countries or a set of advanced countries. Mulas-Granados (2005) studies the short-term economic impact of alternative fiscal adjustment strategies, with an especial focus on their

effect on economic growth and income distribution. Using a sample of 53 adjustment episodes occurred in the fifteen EU Member States over the period 1960-2000, the result presents very strong empirical evidence pointing to the existence of a trade-off between growth and equality, mediated by fiscal consolidations. More specifically, while expenditure-based adjustments are more effective in terms of subsequent economic growth than revenue-based adjustments, they do so at the expense of increasing income inequality. Therefore, according to author, inequality during fiscal adjustment rises especially when the latter is based on a retrenchment of spending, and even more so in the case of cuts in social spending. Tax-based consolidations that rely more on indirect taxes overall tend to worsen inequality, while this is not the case when indirect tax increases are combined with offsetting measures, such as direct measures targeted at poor households.

Agnello (2012) study the effects of fiscal consolidation on income distribution in a sample of 18 OECD countries over the period 1970-2010. Their results support an equalizing effect of austerity measures. They find that "successful" fiscal adjustments tend to be strongly beneficial at achieving a more equal income distribution. In fact, the net income Gini index falls in statistically significant manner by when the fiscal consolidation succeeded in bringing public debt back to a lower level. Rawdanowicz et al. (2013) point out that fiscal consolidations could increase income inequality through multiple channels. An important channel could be an increase in unemployment that widens disparities in market incomes; Moreover, reductions in social transfers can affect households in the lower parts of the income distribution, and a decline in public programs benefiting the poor might also increase inequality in disposable income.

Azevedo et al. (2014) assess the links between sub-national fiscal policy and income inequality in Brazil over the period 1995-2011, using state-level fiscal data with household survey data. The results indicate that a tighter fiscal stance at the sub-national level is not associated with a

deterioration in inequality measures. In addition, the results suggest that revenue increases in Brazilian states were not associated with increases in inequality. Moreover, reductions in primary expenditures do not seem to have had deleterious impacts on inequality measures. This finding contrasts with the conclusions of several papers in the burgeoning literature on the effects of fiscal consolidation on inequality using national data for OECD economies.

3.3. Côte d'Ivoire's growth and poverty from historical and regional perspectives

Côte d'Ivoire, from the early 1960s focuses its development policy on the expansion of commodity exports and the import substitution based on a few industries. Strong growth is recorded and the structural changes taking place without proper internal and external imbalances. The average growth rate is still high (over 8%) during the first fifteen years of independence of the country (1960-1975). This period is qualified as "Ivorian miracle". However, corruption related to the implementation of projects financed by the European Union and the debt payment arrears incurred in international institutions, leading, in 1998, they break-up their partnership with Côte d'Ivoire. The negative impact of this situation on economy is exacerbated by the military coup of December 1999 and the political instability that results. In September 2002, the armed conflict has led to the discontinuance of several development projects and the decline in activity in the various economics sectors. During this crisis, economic activity fell by an average of -1% over the period 2000-2004. The recovery that started in 2004, with a 1.5% growth rate, allowed the real GDP to progress an average of 1.9% between 2005 and 2009. In 2009, despite the international financial crisis, the real GDP growth rate reached 3.8%, against 2.3% in 2008. Due to the post-election crisis, the growth rate for 2010 was 2.4% instead of 3% initially projected to drop to -4.7% in 2011 and rise to 9.8% in 2012. In total over the period 2000-2009 real GDP per capita declined by 1.2% in annual

average highlighting the decline of -0.2% previously observed over the period 1990-1999. To address poverty, Côte d'Ivoire has launched the implementation of its Poverty Reduction Strategy Paper (PRSP) for the period 2009-2013. The PRSP establishment should also help to achieve the Millennium Development Goals. However, the situation in post-election crisis that just experienced Côte d'Ivoire has affected these efforts, pushing down real GDP by 4.7% in 2011. The recovery has proved stronger in 2012 with a rate of 10.7%.

Macroeconomic indicators confirm the spectacular recovery in Côte d'Ivoire, which is being carried out along the trajectory desired by the government from the National Development Plan 2012-2015. Growth is projected to increase by 9.3% from 2012 to 2014, with an expected 9.8% increase in 2016 due to strong public and private investment and very wise inflation. Cote d'Ivoire in peace benefits fully from its position as a regional hub and generates a trade surplus thanks to fairly diversified agricultural exports (cocoa, coffee, cashew nuts, hevea ...). Faced with this revival, the country did not remain without initiative. Reforms in public finance and tax administration, as well as greater fiscal discipline, including deficits, have led to a credible debt reduction as a percentage of GDP. Governmental voluntarism has manifested itself on all fronts. In food-producing agriculture, where rice production has increased by almost half compared to 2012. In mines, where gold has almost doubled in the same period. While drawing up this list, analysts point out that it does not greatly improve the daily lives of households and businesses. Microeconomics is still suffering. Poverty hardly decreases, and subsidy cuts have boosted electricity prices, leading social unrest in all countries. In fact, although effort made by government to improve public infrastructure, the quantitative and qualitative deficit in basic social infrastructure (education, health, housing, energy) does not allow the poor to improve the quality of their human capital. They are harmed from the start and have difficulty subsequently improving their standard of living. This situation keeps the Ivorian's in the vicious circle of poverty. The economic growth in Côte d'Ivoire is also encouraged by the gross

exploitation of raw materials, which has little impact on employment due to the low processing of products from the primary sector. As evidence, according to UN Comtrade statistics, manufactures account for less than 10% of Côte d'Ivoire's total exports. As a result, raw materials are exported unprocessed, so the local population does not feel the benefits in terms of employment. Moreover, the lack of integration of the Ivorian economy leads to the weakness of intermediate trade between the different sectors. This lack of complementarity or integration does not favor the creation of indirect jobs in other sectors. For example, low trade and interactions between agriculture and industry imply that an agricultural enterprise will have little impact on an industrial enterprise. This limits opportunities for wealth creation and jobs. There can be no poverty reduction without wealth creation and jobs. Moreover, Ivorian taxation remains too complex and credit is still scarce, especially for Small and medium-sized enterprises (SMEs). As a result, wage employment, up by 25% in four years, does not appear to exceed the 10% share of the total labor market, with the vast majority of positions remaining in the informal sector without pension or social protection.

Corruption and poor governance are also the major source of poverty in Cote d'Ivoire because they promote unequal allocation of resources. The poor are far removed from the spheres of decision making, making it easier to divert resources intended for them. Poor targeting of the poor enables the rich to benefit more from social transfer policies such as subsidies, subsidies, etc. This prevents channeling the fruits of growth to the most deprived. Racket contributes to the burden of the most deprived. For example, rackets set up by the syndicates in the public transport sector lead to an increase in the price of public transport. Corruption, racketeering, bad governance contributes to the rising cost of living.

In Côte d'Ivoire, Income share held by richest 10% in 2008, was 32.8% of total revenue against 30.4% for the 60% poorest. As shown the Table 1, only the share of the richest 10% decreased

compared to their situation in 2002. Overall, the household income declined between 2002 and 2008 and this decline is even more important the household income is high. This can be explained by the departure of many of the wealthy outside the country at the height of the crisis, the relocation of some large companies and seats of institutions like the African Development Bank (ADB). In addition, several companies have stopped their activities consecutively to the slowness of the business environment observed following the events of March and November 2004.

In 2015, on the basis of the human development indicator (HDI), this giant of the West Africa Economic and Monetary Union (WAEMU) ranked 172 out of 188. furthermore, the Human Poverty Index (HDI) which takes into account the deficit registered in three main fields of human existence (life expectancy, level of education, living condition), states that a ratio of 46.2% of the Ivorian population is affected by the different forms of poverty. This inventory of fixtures reveals a lot about the difficult socioeconomic situation in which Cote d'Ivoire is since the last decades. The country recorded a slight improvement on the poverty reduction side and the achievement of some MDGs. However, efforts are still needed. The poverty rate decreased from 48.9% in 2008 to 46.3% in 2015. Poverty in Côte d'Ivoire remains fundamentally a rural challenge, with almost 56.8% of the rural population living under the poverty line, against 35.9% living in urban areas in 2015. The political crisis seriously aggravated an already precarious humanitarian situation.

Figure 1: Evolution of GDP and GDP Per Capita growth rate in Côte d'Ivoire
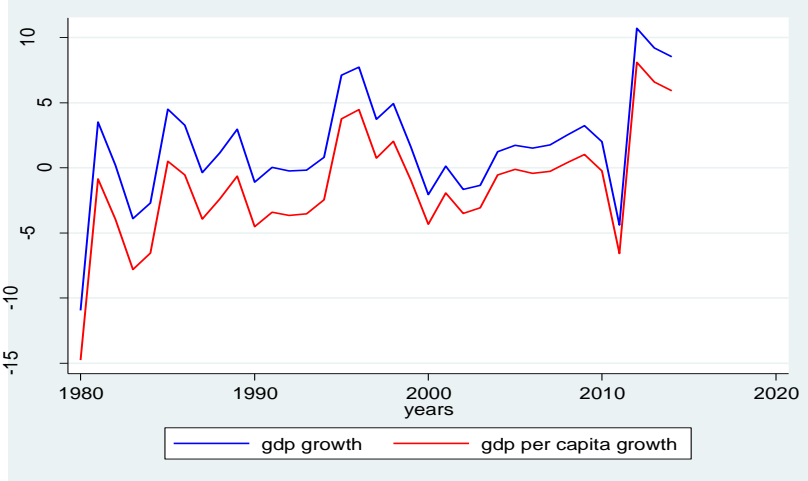
Source: Author, from World Development Indicators, World Bank.

Figure 2 shows the progression of poverty headcount rate depending on the availability of data in Côte d'Ivoire between 1985 and 2008. We are witnessing a growing poverty rate overs year. In 2008, more than 29.02 percentage of the population in Côte d'Ivoire were living on less than $1.90 a day at 2011 international prices. The percentage of people living below the poverty line, that is, $ 1.90 was less than 10% before the year 1988. With population growth, poverty has experienced an upward trend reaching about 19% in 1995 before rising to 26% in 1998. The poverty level remained consistently high until 2008 with a rate of 29% due to successive socio-political and military crises.

Figure 2. Percent of population below the poverty line in Côte d'Ivoire
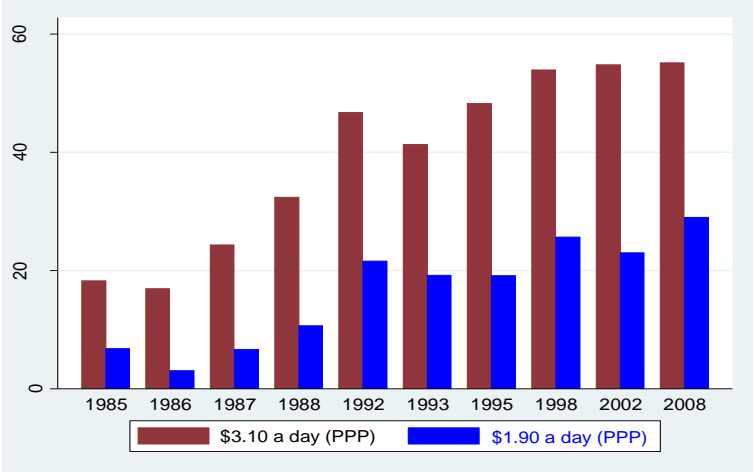
Source: Author, from World Development Indicators, World Bank.

3.4. Growth, inequality and poverty: stylized fact

3.4.1. Structure of income per decile at national level

The analysis of the income structure at the national level aims to assess the evolution of inequalities in 2015 compared to the 2002 and 2008 surveys, as well as the distribution of total consumption per decile (Table 1). The 2002 living standard survey (ENV) revealed worsening inequality between 1998 and 2002. On the other hand, the results show a less unequal distribution of income in 2015 than in 2002 and 2008. Indeed, the share of the poorest 10% in total consumption is 2.7% in 2015 against 1.7% in 2002 and 2.2% in 2008; that of the richest 10% is 28.9% in 2015 against 40.0% and 32.8% respectively in 2002 and 2008. Moreover, by 2015, the richest 10% spend on average 10.7 times more than the poorest 10%. This ratio was 23.5 in 2002 and 14.9 in 2008, which means that the income gap between the deciles is showing a downward trend and confirms an attempt to gradually reduce the inequalities since 2002. In addition, the general level of per capita consumption had declined between 2002 and 2008, improved in 2015. This average consumption increased from 461 243 FCFA in 2002 to FCFA 342,730 and FCFA 386,215 in 2015. In other word, this correspond to a decrease of 25.7% at

national level between 2002 and 2008 and an increase of 12.7% between 2008 and 2015. This increase is observed in all deciles. Therefore, this increase seems to indicate the idea that the reduction of inequalities is accompanied by an increase in household incomes.

Table 1: Per Capita Household Expenditure by decile

Decile	Per capita average expenditure in CFA			Share in total consumption, in percentage		
	2002	**2008**	**2015**	**2002**	**2008**	**2015**
1	77,947	74,428	87,708	1.7	2.2	2.7
2	128,529	121,528	145,779	2.8	3.6	4.5
3	168,076	156,155	187,017	3.6	4.6	5.5
4	208,376	189,178	224,543	4.5	5.5	6.2
5	255,048	226,375	263,711	5.5	6.6	7.4
6	313,430	270,346	313,514	6.8	7.9	8.8
7	389,117	327,177	377,575	8.4	9.5	9.4
8	506,684	401,495	460,678	11	11.7	11.6
9	719,341	537,785	605,161	15.6	15.7	15
10	1,846,614	1,123,646	1,197,906	40	32.8	28.9
whole	461,243	342,730	386,215	100	100	100

Source INS - Côte d'Ivoire, ENV 2015, P51

3.4.2. Growth Incidence Curves (GIC)

Growth incidence curves are increasingly used to describe the distributional effects of growth. It is a useful tool to examine the interaction between growth, poverty and inequality. Specifically, growth incidence curves measure how consumption growth differed across groups compared to the average and the mean consumption growth. In plotting growth incidence curves, the vertical axis reports the growth rate of consumption expenditure, and the horizontal axis reports consumption expenditure percentiles (Foster et al., 2013). The part of the curve above zero points at the deciles that benefit from growth, and the part below zero points at the deciles that lost because of growth. The part of the curve that is above its own mean points at the deciles of the population that benefit from growth relatively more than an average household. The part of the curve below the mean, but still above zero, points at the deciles that also benefit from growth but less than an average household. A negatively sloping growth incidence curve suggests that income or spending of the poorer deciles of the population grows

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faster than income or spending of the richer deciles. Because in this case the poorer groups of the population are catching up with the richer, a negatively sloping growth incidence curve can be viewed as one of the indications of inclusiveness of growth.

We use household consumption expenditure per capita as the welfare measure to graph the growth incidence curves for the period 2002-2015 (Figure 3). Several reasons explain our choice of household expenditure as measure of welfare relative to their income. First, income tends to be more volatile than consumption and certain types of income (such as income from self-employment) tend to be under-reported in surveys. Second, it is common for consumption to be more evenly distributed among households than income because wealthier households tend to save a larger part of their income, which could bias estimates of inequality downward.

The great interest of a GIC is that it makes it possible to evaluate the appropriateness of changes in a given indicator of well-being according to different normative approaches. The growth in the average value of an indicator will indicate the direction and magnitude of the change in social well-being (assuming other indicators remain constant) only if a utilitarian approach is used (in which the utility of losses or gains for all individuals are weighted equally). Also, under some quite specific assumptions about the relationship between the observed indicator and unobserved well-being. On the other hand, a GIC can indicate the direction and extent of social welfare if a broader welfarist approach is used, in which case the change in social welfare is deducted from a weighted average of Growth at each quantile of the indicator. It can also show the direction and greatness or size when a Rawlsian approach is used, in which case the variation in social welfare is deduced from the quantity of growth at the lowest quantile.

A GIC can also be used to calculate the average growth rate of the poor, which is the definition of pro-poor growth from the "absolute" point of view proposed by Ravallion and Chen (2003). A policymakers or donor wanting to alleviate or eradicate poverty could legitimately view this

definition of pro-poor growth as the ultimate standard by which policy interventions should be judged. It is possible to obtain the GIC by a simple plot of growth between two years at each quantile.

Figure 3: Growth Incidence Curves for per Capita Household Expenditures between 2002 and 2008; and between 2008 and 2015

Chart 1   **Chart 2**
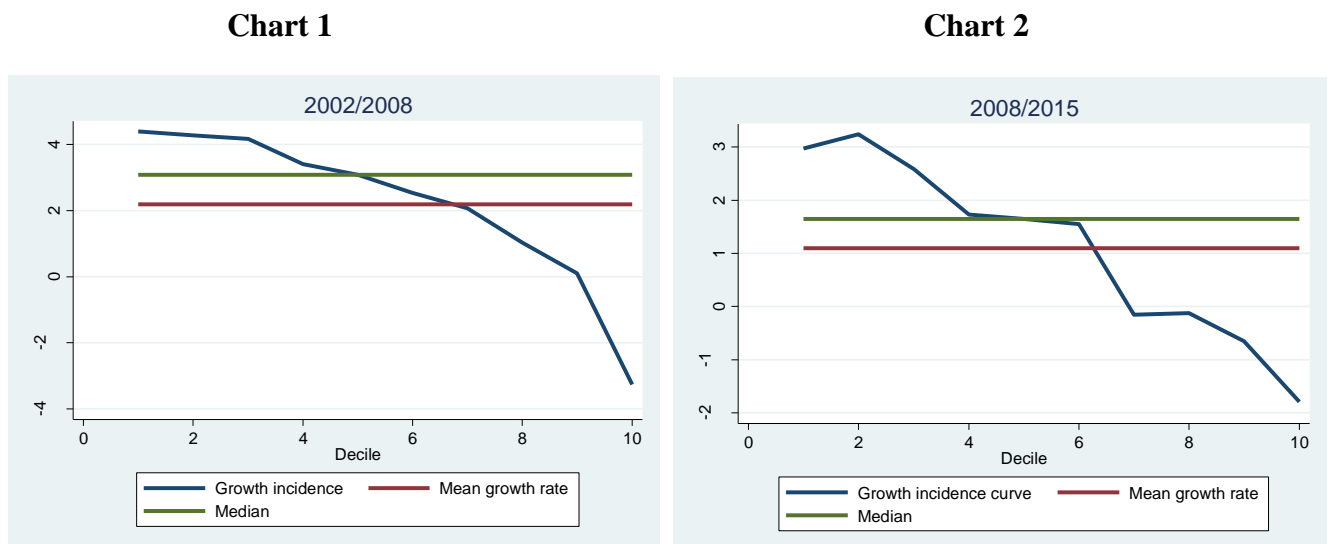
Sources: Authors' estimates using data from INS - Côte d'Ivoire, ENV 2015 Surveys.

As depicted Chart 1 and 2 in Figure 3, in Côte d'Ivoire growth in expenditure per capita in real terms of the households at the bottom of the income distribution was significantly higher than those at the top between the period 2002 and 2015. When regarding Chart 1 of the growth incidence curve 2002/2008, except the top 10 deciles, all groups of households experienced growth well. However, only the poorest deciles (that is 1 to 5 deciles) registered growth above the mean growth rates and median. Furthermore, when comparing the 2008 survey with the 2015 survey (Chart 2), over this later period poorer groups have experienced higher growth in expenditures while richer groups displayed a decrease. Overall, over the two sub-periods 2002-2008 and 2008-2015, the growth incidence curves slope is negative, that is downward-sloping. It shows that in Côte d'Ivoire, the distribution of income seems to become more and more equal between the different income groups.

3.5. Data and Methodological Approach

3.5.1. Data

The dependent variables used in the regressions are: (i) The Gini coefficient for disposable income taken from the SWIID database. (ii) Real GDP per capita growth rate as measure of economic growth, in line with previous literature.

Definition of fiscal adjustments

In order to measure the impact of fiscal adjustments we use the cyclically adjusted primary balance (CAPB) as the measure of the government's fiscal stance. The interest of this fiscal measure is that it isolates discretionary policy action from effects resulting from economic activity such as inflation or real interest rate changes. Especially, we use primary fiscal variables that exclude interest payments because the fluctuations in interest payments cannot be considered discretionary. To make the cyclical correction, we follow the method proposed by Alesina and Ardagna (2010) and Yang et al. (2015). According to authors, such fiscal variable is simpler and more transparent than more complicated official measures such as those of the OECD and the IMF that use estimates of potential output and fiscal multipliers. The underlying principle of this method, as mentioned Yang et al. (2015), is that since public expenditure is negatively dependent on GDP as a result of unemployment benefits, and because revenue responds positively to GDP as a result of tax revenues, changes in cyclically-adjusted fiscal variables can be calculated from the difference between the predicted current-year value (which would prevail if unemployment had not changed since the previous year) and the actual value of the previous year.

Although CAPB is used to measure fiscal consolidations in several studies, however, this is not a perfect measure and can lead to biased results (Romer and Romer, 2010). CAPB may consider non-policy factors that are correlated with exogenous variables affecting inequality or growth.

For example, a boom in the stock market leads to higher incomes and therefore higher tax revenues. This translates into an improvement in CAPB, although not being in response to fiscal adjustments. In addition, this will likely affect other variables, such as higher consumption and investment. Therefore, the correlation between an increase in CAPB and the error term is likely to be positive. This can lead to an upward biased estimate (IMF, 2011). CAPB may also suffer from measurement error if it omits periods in which fiscal adjustments have been accompanied by countervailing negative shocks.

The CAPB, however, can also be affected crucially by the commodity price volatility. Tax receipts in developing countries increase with rising prices for imported or exported products (Ehrhart and Guerineau, 2013). For imported products, this increase in tax revenues is due to the fact that more tariffs being collected but, because of the numerous tax exemptions granted in times of high prices, the positive impact on tax revenues may not always occur. For large commodity-exporting economies, the increases in tax revenues due to soaring export prices come from an increase in profit tax and non-tax revenues, such as dividends or royalties levied on companies, which produce primary products. Then, commodity price instability, both for imported and exported products has an adverse effect on fiscal balance in developing countries.

Therefore, contrary to Yang et al. (2015) that use a share price index as an additional variable determining the CAPB, we use the international price of cocoa. In fact, cocoa accounts for 15% of Côte d'Ivoire's GDP and more than 50% of its export earnings. When considering cocoa price as a business cycle factor, it would be ideal to include other types of commodity prices such as oil price and coffee price. But we use only the price of cocoa as a business cycle factor due to its particular relevance to tax revenues, and we believe this index is representative of the other commodity price movement.

Our measure of the changes in the CAPB is constructed following Yang el al. (2015). First, to get the cyclically adjusted spending as a ratio to GDP, we regress primary spending on a time trend and the unemployment rate (U_t) for the country:

$$D_t = \gamma_0 + \gamma_1 Trend + \gamma_2 U_t + e_t \tag{1}$$

Then, with the estimated coefficients ($\hat{\gamma}_1, \hat{\gamma}_2$) and the preceding-year unemployment rate (U_{t-1}), we calculate the value of primary spending adjusted for changes in unemployment:

$$D_t^*(U_{t-1}) = \hat{\gamma}_0 + \hat{\gamma}_1 Trend + \hat{\gamma}_2 U_{t-1} \tag{2}$$

The changes in discretionary spending are calculated as: $D_t^*(U_{t-1}) - D_{t-1}$. A similar procedure is applied to compute the cyclically adjusted revenues. However, in this step, the cocoa price index is added to the regression.

$$R_t = \varphi_0 + \varphi_1 Trend + \varphi_2 U_t + \varphi_3 Cocoa\_price_t + \epsilon_t \tag{3}$$

$$R_t^*\left(U_{t-1}, Cocoa_{price_{t-1}}\right) = \hat{\varphi}_0 + \hat{\varphi}_1 Trend + \hat{\varphi}_2 U_{t-1} + \hat{\varphi}_3 Cocoa\_price_{t-1} \tag{4}$$

Finally, the changes in discretionary fiscal policy are obtained as follows

$$\Delta CAPB = [R_t^* - R_{t-1}] - [D_t^* - D_{t-1}] \tag{5}$$

The literature identifies fiscal adjustment episodes as important and sustained changes in CAPB. The size and persistence criteria differ considerably from one study to the next. For instance, Alesina and Ardagna (2010) consider a period of fiscal consolidation when the change in CAPB is at least 1.5% p of GDP in 1 year. While for Giavazzi and Pagano (1996), the cumulative change is at least 5, 4, 3% p of GDP in respectively 4, 3, or 2 consecutive years, or 3% p in 1 year. Another example is the criteria defined by Alesina and Ardagna (2013) that deem the period of fiscal adjustment correspond at the time that the cumulative change in CABP

is at least 2% p of GDP in 2 consecutive years and at least 3% p of GDP in 3 or more years with the improvement of each year.

The fiscal adjustment episodes considered in our study can be defined as follows:

A period of *fiscal adjustment* is a year in which the cyclically adjusted primary balance (CAPB) improves by at least 1 per cent of GDP.

This allows us to ignore all periods where the change in CAPB is likely to be due to exogenous changes in other variables instead of policy changes. We do not aim to distinguish between discretionary and non-discretionary policies, and assume firms and households react to both in a similar way.

A tax-based fiscal adjustment is a period where CAPB improves by 1% or more and government revenues as % of GDP increase by 0.5% or more.

A spending-based fiscal adjustment is a period where CAPB improves by 1% or more and government spending as % of GDP decreases by 0.5% or more.

Other variables are included in the baseline specifications. The institutional quality data are from ICRG. Fiscal Variables for the calculation of CAPB are from BCEAO online database. All other data are obtained from World Bank database. Each variables of model have been presented briefly in Table (2). In advance we concisely explain about some variables of this model.

It has been argued that inflation generally worsens poverty and income inequality. First, inflation can reduce real income. Second, worker's real income will decline if their nominal wages increase less than the price of goods that they consume. Inflation lowers the overall purchasing power of households and tends to raise poverty (Agénor, 2005). Romer and Romer (1998) studied the incomes of the poor and show that in the short run, higher inflation when

following economic growth can sustain the incomes of the poor. However, in the long term, taking into account the economic uncertainty, it can harm both incomes and the incomes of the poor. Using large sample of household survey, Easterly and Fischer (2001) found that the poor were more likely than the rich to mention inflation as a problem, and that inflation compromise the welfare of poor more than it does that of the rich. In the same line, Ferreira and Litchfield (2001) found in the case of Brazil that higher inflation leads to a lower share of income held by the poorest income group.

The population growth is expected worsen inclusive growth as faster growing societies experience faster growing demand for public services. This increases difficulty of governments to provide those services. Therefore, high population growth puts a considerable break on per capita growth prospects. It also contributes significantly to low achievement in poverty reduction and is associated with households moving into poverty.

The quality of institutions is very important. For example, the good socioeconomic conditions that is an assessment of the socioeconomic pressures at work in society that could constrain government action can contribute to better redistribution in income. By against, the weakness in institutional quality such as corruption is clearly a very serious problem that is detrimental to inclusive growth. Corruption robs the poor most of all and deprives people of access to service and of the opportunity to earn living. In some countries, it is a major obstacle to economic growth.

Another important variable that can affect the inclusiveness of growth are, public investment, trade open and inflation. We use dummy variable in the model in order to consider the effect of war in Côte d'Ivoire (2002-2007; 2010-2011) on inclusive growth. We consider the period from 2002 to 2007 as a period of crisis since the actual stability of the socio-economic situation

performed with the signing of the Ouagadougou political agreement of March 2007. This dummy variable adopts one for war years and zero for other years.

Descriptive statistic of variables

The Table below provides a summary of the descriptive statistics analysis of the variables in our model.

Table 2: Descriptive statistic

Variables	Obs	Mean	Std. Dev.	Min	Max
Net Gini	24	42.1644	3.622694	37.4207	46.99839
GDP pc growth	35	-1.354963	4.315795	-14.76217	8.091487
ΔCAPB	33	.2727273	.452267	0	1
Inflation	34	4.935162	5.139015	-.8058797	26.08157
Public investment	34	12.42278	4.14792	8.253466	24.36938
Population growth	34	2.956777	.8426052	1.762252	4.366627
Trade open	34	76.45967	11.50552	55.34852	95.06973
Corruption	30	2.647222	.8013797	1.5	4
External conflic	30	9.576389	.8953961	8.083333	12
Military in politics	30	3.031944	1.68736	.1666667	5
Crisis (dummy)	35	.2285714	.426043	0	1

Source: Author, using data from BCEAO, WDI, ICRG

Generally, one can note that standard deviations are low meaning that the variances are minimal between the variable values.

3.5.2. Methodology of estimation: Bayesian model averaging (BMA)

A standard representation of the economic growth regression is:

$$Y = \theta X + \varepsilon \qquad (6)$$

Where Y represents the vector of growth rates and X is a set of growth determinants. In the literature, there exist potentially several empirical growth models, each given by a different combination of explanatory variables and each with some probability of being the "true" model. In other words, Bayesian methods frame the problem of identifying the determinants of

economic growth in terms of uncertainty about the true sets of explanatory variables (model uncertainty). This is the starting point of the BMA methodology. The Bayesian model averaging (BMA) use in this study was introduced by Magnus et al. (2010) to fit a classical linear regression model with uncertainty about the choice of explanatory variables. The Bayesian approach to model uncertainty is to first attach prior probabilities to alternative sets of explanatory variables and then update these probabilities using data. The statistical framework is a classical linear regression model with two subsets of explanatory variables. The focus regressors contain explanatory variables that we want in the model because of theoretical reasons or other considerations about the phenomenon under investigation. The auxiliary regressors contain additional explanatory variables of which we are less certain. In fact, the problem of model uncertainty arises because different subsets of auxiliary regressors could be excluded from the model to improve, in the mean squared error sense, the unrestricted ordinary least-squares estimator of the focus parameters. When there are k2 auxiliary regressors, the number of possible models to be considered is $= 2^{k2}$. BMA runs many regressions with different subsets of the explanatory variables on the right-hand side and then constructs a weighted average over these regressions. Detailed discussions of application of BMA in economics can be found, for instance, in Fernández et al. (2001), Sala-i-Martin et al. (2004), and Moral-Benito (2012). For more detail, see Feldkircher and Zeugner (2009). In our study, we only give intuition for the technical terms needed for the evaluation of the results. The weights used in the BMA estimation are called posterior model probabilities and capture how well individual regressions fit the data – thus the weights are analogous to adjusted R-squares or information criteria used in frequentist econometrics. For each variable, the sum of the posterior probabilities of models in which the variable is included indicates the so-called posterior inclusion probability (i.e. the posterior probability that a variable is included in the model), which is analogous to statistical significance. If the posterior inclusion probability of a

variable is close to one, almost all models that are effective in explaining the variance in the reported "Inclusive growth" include that variable. BMA provides for each variable the posterior coefficient distribution. The posterior coefficient distribution gives us the posterior mean (analogous to the estimated coefficients), t-ratios, and two standard error bands. An auxiliary regressor is considered to be robustly correlated with the outcome if either the t-ratio on its coefficient is greater than one in absolute value or, equivalently, the corresponding two-standard error band does not include zero.

In order to estimate the distributional impact of fiscal consolidation episodes, we estimate the following equation:

$$Y_t = \beta_0 + \beta_1 FA_t + \beta_2 X_t + \varepsilon_t \qquad (7)$$

where Y denotes, one of our dependent variables (Inclusive growth index, Gini coefficient, or GDP per capita growth rate). FA represents the changes in the CAPB in percent of GDP in periods of fiscal adjustment and zero otherwise; X is a vector of control variables and ε_t is the error term.

3.6. Empirical results

One of the most important privileges about BMA analyzing is the high level of trust in coefficients estimated in explanatory variables. Because these coefficients are not estimated based on just one model, but they are derived from averaging model of estimated coefficients in every single variable with many recapitulations or effective samplings. The coefficient for each of BMA estimates is calculated in this way:

$$\hat{\beta}_1 = \sum_{i=1}^{l} \lambda_i \, \hat{\beta}_{1i}$$

$\hat{\beta}_{1i}$ is the possibility of "i" numbers of model and is an estimation of which is gained in case of M_i model being. The t-ratio is used to determine whether the coefficients are statistically significant. The estimation result can be seen in Table (3) that gives the t-ratio and the posterior inclusion probability (pip) for each of the BMA estimation. In the case where Bayesian Model Approach is used, the criteria of significance of explanatory variables is usually considered $t \geq 2$ for the large number of observations. For example, the studies using panel data considered the criteria $t \geq 2$. But in the studies with few data available like time series, the criteria $t \geq 1$ is used (see Mohsen, 2015). In this circumstance we can be less strict about statistical significance. Thus, we regard $t \geq 1$ for robustness of regressor to explain the results of Table (3).

Table (3) presents the estimated coefficients of the changes in the CAPB on the inclusive growth, and more specifically on both equity measure by Gini index and economic growth in our baseline model. Estimates in column (1) show that fiscal consolidations in previous years have a statistically significant positive effect on a current GDP per capita growth. This result is consistent to the literature so-called non-Keynesian effects of fiscal policy generated by authors such as Cour et al. (1996), Miller, and Russek (2003) and Alesina and Ardagna (2010). According to this literature, there is an improvement in growth after periods of fiscal adjustment, which is interpreted as evidence of non-Keynesian effects during fiscal consolidation episodes.

Regarding the effect of fiscal adjustment on income inequality, estimates suggest that an improvement of 1% in previous years CAPB reduce income inequality in current period (Column 2), with an overall impact of 0.062 on the Gini coefficient. This means that income gap decreases after periods of fiscal consolidation. The result is in line to those obtained by Azevedo et al. (2014). Their found a negative and significant relationship between in cyclically

adjusted-primary balances and Gini coefficient, meaning that a tighter fiscal stance in Brazilian states does not seem to increase inequality over the period of study. These results are contrary to those of several studies that have studied the impact of fiscal consolidations on inequality at the national level for OECD countries.

Table (3): Effect of fiscal adjustment on growth and income inequality

VARIABLES	GDP per capita growth (1) All adjust.	Gini coefficient (2) All adjust.
ΔCAPB (t-1)	2.074*	-0.062*
	(1.325)	(0.036)
Inflation (t-1)	0.189*	-0.002
	(0.125)	(0.002)
Public investment (t-1)	-0.112	0.022**
	(0.327)	(0.009)
Trade openness (t-1)	0.265**	-0.004**
	(0.085)	(0.002)
Population growth (t-1)	-0.214	-0.0231
	(0.760)	(0.035)
Corruption (t-1)	0.544	-0.034*
	(1.199)	(0.018)
External conflic (t-1)	0.069	0.008*
	(0.409)	(0.013)
Military in politics (t-1)	-0.086	-0.024
	(0.316)	(0.016)
Crisis (dummy)	-4.393**	0.059*
	(1.678)	(0.042)
Constant	-21.03*	3.949***
	(10.24)	(0.228)
Observations	30	24

Notes: Our dependent variables are Gini index, and GDP per capita growth

Spending versus taxes-based consolidation effect on equity and growth

Does the composition of fiscal consolidation (spending versus taxes-based) matter for growth inequality? The literature suggests that evidence of expansionary effects is strongest for fiscal adjustments implemented mainly by cutting government spending rather than by increasing taxes. Therefore, in this section, we investigate what role the composition of fiscal adjustment plays in the response of economic growth and income inequality. In particular, we re-estimate our baseline specification for two types of fiscal adjustments. As mention above, the first type, denoted as "tax-based fiscal adjustment" is a period where CAPB improves by 1% or more and government revenues as % of GDP increase by 0.5% or more. The second type denoted as "spending-based fiscal adjustment" corresponds to years where CAPB improves by 1% or more and government spending as % of GDP decreases by 0.5% or more. The results are reported in Table (4).

Regarding tax-based adjustments, column (1) reports that growth responds positively to the year ahead tax-based fiscal consolidations episode. One explanation is that in developing countries and especially in Cote d'Ivoire, tax based-adjustment are generally a base-broadening measures that could take several forms; eliminating or curbing tax expenditures such as deductions, exclusions, credits, exemptions, property tax, and preferential treatment of capital income over labor income. Therefore, broadening of tax base will contribute to strong tax revenue collections and play an important role in achieving higher, sustainable and inclusive economic growth. However, our result did not find evidence to the expansionary effect of spending-based fiscal adjustment (column 2).

Moreover, the evidence suggests that fiscal adjustments that are driven by the spending cuts seem to not help reducing the income gap (Column 4). Interestingly, when fiscal consolidation is achieved via revenue side, income inequality seems to be reduced further (Column 3). These

results are close to those obtained by Agnello and Sousa (2012). According to these authors, while fiscal adjustments following the reduction of public expenditure seem to hurt income distribution, the increase in tax seems to reduce income inequality. This evidence suggests that policymakers could achieve their goal of equal income distribution from a properly designed tax-based consolidation plan. Furthermore, fiscal adjustment focusing on indirect taxes may improve equity (Ciminelli et al., 2017). For authors, this outcome may be partly explained by the operation of a positive labor supply channel. Authors think that individual are more incentives to take part in the labor market with the establishment of indirect taxes. One explanation is that indirect taxes raise the price of consumer goods, leading to a negative income effect. Additionally and in line with Bastagli et al. (2012), in developing economies, consolidation policies can be put in place to mitigate its negative impact on income redistribution. However, this must be accompanied by an improvement in the progressiveness of the tax and transfer systems of the global economy. Given that a large share of public spending in developing economies is not progressive, the spending cuts implemented during the fiscal adjustment can actually improve equity, depending on where consolidation is concentrated. Similarly, the government can improve its ability to protect poor households during adjustment periods by the reinforcement of social safety nets. However, to be sustainable, fiscal adjustment in developing economies is likely to require revenue measures (Bevan, 2010; Gupta et al., 2005). Any adverse impact of tax measures on inequality can be mitigated if they are accompanied by tax reforms that enhance the efficiency and fairness of the tax system, such as a greater reliance on progressive income taxation combined with removing opportunities for tax avoidance and tax evasion.

Table (4): Spending and tax-based adjustment effect on growth and income inequality

VARIABLES	GDP per capita growth		Gini coefficient	
	(1) Tax-based	(2) Spend.-based	(3) Tax-based	(4) Spend.-based
ΔCAPB (t-1)	2.157*	0.492	-1.468*	0.116
	(1.621)	(2.029)	(1.378)	(1.354)
Inflation (t-1)	0.249*	0.195*	-0.218**	-0.132*
	(0.134)	(0.134)	(0.088)	(0.088)
Public investment (t-1)	-0.050	-0.220	1.300**	1.374***
	(0.353)	(0.357)	(0.444)	(0.324)
Trade open (t-1)	0.207**	0.242**	-0.077*	-0.132*
	(0.087)	(0.091)	(0.068)	(0.073)
Population growth (t-1)	-0.213	-0.239	-0.604	-0.169
	(0.770)	(0.822)	(1.414)	(0.957)
Corruption (t-1)	0.118	0.454	-0.055	-1.342
	(1.240)	(1.266)	(1.402)	(0.861)
External conflic (t-1)	0.081	0.152	0.213	0.302
	(0.427)	(0.521)	(0.649)	(0.576)
Military in politics (t-1)	-0.093	-0.097	-1.323*	-1.513**
	(0.328)	(0.350)	(0.694)	(0.557)
Crisis (dummy)	-3.917**	-5.082**	2.864*	3.713**
	(1.872)	(1.719)	(2.294)	(1.667)
Constant	-16.34	-17.83	38.28***	42.76***
	(10.08)	(11.40)	(9.298)	(8.783)
Observations	30	30	24	24

Notes: Our dependent variables are Gini index, and GDP per capita growth

3.7. Robustness check

In order to further test the robustness of the baseline results reported in the previous section, we perform several robustness checks, as calculating an alternative measure of fiscal consolidation as well as adding other control variables. For the construction of the new fiscal consolidation variable, we follow the same procedure developed above, but here, we use the output gap as a proxy for business cycle fluctuations instead of unemployment to cyclically adjust government spending and revenue. This allows us to calculate the alternative CAPB measure. Next we follow Alesina and Ardagna (1998), Giudice and Alessandro (2007), Ardagna (2004) in order

to define definition of fiscal adjustment. Therefore, fiscal adjustment corresponds to period where the change in CAPB is at least 2% p of GDP in 1 year or at least 1.5% p of GDP per year in both 2 consecutive years.

Table (5) shows that the baseline results (columns 1-2) are robust to alternative CAPB definitions (columns 3-4) and alternative criteria for the definition of fiscal adjustment (columns 5-6) and also. In each case, fiscal adjustment has a similarly sized positive effect on growth, while it is a negatively links to inequality meaning that after a period of fiscal austerity, growth improves, and income inequality decreases. These two effects contribute to more inclusive growth. In addition, all variables keep the right sign and their level of significance.

Table 5: Effects of fiscal adjustment on equity and growth: alternative measures

	Baseline result		Alternative CAPB definitions		Alternative criteria for fiscal adjust.	
	GDP pc grth	Gini coef.	GDP pc grth	Gini coef.	GDP pc grth	Gini coef.
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	All adjust.	All adjust.	All adjust.	All adjust.	All adjust.	All adjust.
ΔCAPB (t-1)	2.074*	-0.0621*	3.561**	-2.564*	2.074*	-0.062*
	(1.325)	(0.036)	(1.202)	(1.310)	(1.325)	(0.036)
Inflation (t-1)	0.189*	-0.002	0.271**	-0.158*	0.189*	-0.002
	(0.125)	(0.002)	(0.113)	(0.081)	(0.125)	(0.002)
Public investment (t-1)	-0.112	0.022**	0.062	1.152***	-0.112	0.022**
	(0.327)	(0.008)	(0.300)	(0.287)	(0.327)	(0.008)
Trade open (t-1)	0.265**	-0.004**	0.256***	-0.193**	0.265***	-0.004**
	(0.085)	(0.002)	(0.074)	(0.072)	(0.0850)	(0.002)
Population growth (t-1)	-0.214	-0.023	-0.221	-0.550	-0.214	-0.023
	(0.760)	(0.035)	(0.717)	(1.207)	(0.760)	(0.035)
Corruption (t-1)	0.544	-0.034*	0.818	-1.671**	0.544	-0.033*
	(1.199)	(0.018)	(1.069)	(0.795)	(1.199)	(0.018)
External conflic (t-1)	0.069	0.008*	0.022	0.323	0.0693	0.008
	(0.409)	(0.013)	(0.330)	(0.555)	(0.409)	(0.013)
Military in politics (t-1)	-0.086	-0.024	-0.101	-1.186*	-0.0860	-0.024*
	(0.316)	(0.016)	(0.309)	(0.604)	(0.316)	(0.016)
Crisis (dummy)	-4.393**	0.059*	-3.295**	3.517**	-4.393**	0.059*
	(1.678)	(0.042)	(1.567)	(1.534)	(1.678)	(0.042)
Constant	-21.03*	3.949***	-23.43**	51.11***	-21.03*	3.949***
	(10.24)	(0.228)	(9.000)	(8.915)	(10.24)	(0.228)
Observations	30	24	30	24	30	24

Notes: Our dependent variables are Gini index, and GDP per capita growth

Next, we check the robustness of our findings to the inclusion of other variables to control for government consumption, as well as the institutional environment namely investment profile. The results are present in the Table 6. Here again, the results regarding our interest variable that measures fiscal adjustment are consistent with our previous estimates. Although there is no statistically significant evidence for government spending effect on both equity and growth, we observe that the results concerning the other variables are almost the same.

Table 6: Robustness with adding news variables

VARIABLES	Baseline result		Adding news variables	
	GDP pc grth	Gini coef.	GDP pc grth	Gini coef.
	(1)	(2)	(3)	(4)
	All adjust.	All adjust.	all	All
ΔCAPB (t-1)	2.074*	-0.062*	2.150*	-0.053*
	(1.325)	(0.036)	(1.419)	(0.033)
Inflation (t-1)	0.189*	-0.002	0.218*	-0.001
	(0.125)	(0.002)	(0.137)	(0.002)
Public investment (t-1)	-0.112	0.022**	-0.063	0.0209**
	(0.327)	(0.008)	(0.389)	(0.007)
Trade open (t-1)	0.265**	-0.004**	0.297**	-0.004**
	(0.085)	(0.002)	(0.104)	(0.002)
Population growth (t-1)	-0.214	-0.023	-0.270	-0.004
	(0.760)	(0.035)	(0.941)	(0.024)
Corruption (t-1)	0.544	-0.033*	0.961	-0.035*
	(1.199)	(0.018)	(1.371)	(0.018)
External conflic (t-1)	0.069	0.008*	0.054	0.001
	(0.409)	(0.013)	(0.531)	(0.008)
Military in politics (t-1)	-0.086	-0.024	-0.230	-0.036**
	(0.316)	(0.016)	(0.515)	(0.016)
Crisis (dummy)	-4.393**	0.059*	-4.524**	0.053*
	(1.678)	(0.042)	(1.767)	(0.039)
Investment profil			0.150	0.013*
			(0.480)	(0.008)
Government consump			0.268	-0.003
			(0.419)	(0.006)
Constant	-21.03*	3.949***	-29.21*	4.009***
	(10.24)	(0.228)	(16.48)	(0.270)
Observations	30	24	30	24

Notes: Our dependent variables are Gini index, and GDP per capita growth

We also test the robustness of our results by focusing on alternative method of estimation namely weighted average least squares (WALS) approach, developed in Magnus et al. (2010). According to Authors, the WALS approach has both theoretically and practically advantage to standard Bayesian model averaging (BMA). Theoretical, it is superior because it examines the ignorance about the priors in a different manner, thereby obtaining a better risk profile and, in particular, avoiding unlimited risk. Practical, it is superior because its computing time increases linearly rather than exponentially with the dimension of the space of model selection. In

addition to these two problems, there are other embarrassing aspects with BMA model. One is that BMA takes different priors for the same parameter depending on which sub-model is considered. This is a bit difficult to interpret. Another uncomfortable aspect is that - since the exact BMA is computationally so demanding - it is very difficult to envisage extensions, for example "non-spherical perturbations". The WALS method addresses all these problems. The computational burden is trivial, and the proposed prior is attractive because it is "neutral" (imitating ignorance) and also close to the optimum in the sense of minimizing a risk or regret criterion (Magnus, 2002).

Table (7) shows standard error and t-ratio for each of the WALS estimates which shed some light on the relative importance of each regressor. As in the case of BMA, statistical significance of a regressor is evaluated by t-ratio of respective coefficient. Also, the criteria $t \geq 1$ is used. The results show that our model is consistent to the use of another estimation method. Even if there is a slight change in the amplitude of the coefficients, practically all variables keep the same sign and significance as the BMA estimate. The results confirm our finding that in fiscal consolidation period, there is no trade-off between growth and income inequality. This mean that fiscal adjustment does not alter the inclusiveness of growth in Côte d'Ivoire. Moreover, the result provide evidence that tax-based adjustment contributed more to the inclusiveness of growth with a positive effect on growth while reducing income gap.

Table 7: An alternative method, the WALS estimator

	GDP per capita growth			Gini coefficient		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All adjust.	Tax-based	Spend.-based	All adjust.	Tax-based	Spend.-based
ΔCAPB (t-1)	1.987*	2.060*	0.707	-0.069**	-1.556*	-0.087
	(1.348)	(1.645)	(2.055)	(0.031)	(1.326)	(1.297)
Inflation (t-1)	0.170*	0.226*	0.167*	-0.002*	-0.228**	-0.147*
	(0.132)	(0.143)	(0.139)	(0.002)	(0.089)	(0.087)
Public investment (t-1)	-0.105*	-0.046	-0.200*	0.019**	1.180**	1.265***
	(0.342)	(0.370)	(0.370)	(0.008)	(0.503)	(0.315)
Trade open (t-1)	0.260**	0.205**	0.244**	-0.004**	-0.062	-0.114*
	(0.087)	(0.091)	(0.092)	(0.001)	(0.066)	(0.070)
Population growth (t-1)	-0.360	-0.309	-0.351	-0.028*	-0.538	-0.247
	(1.691)	(1.719)	(1.791)	(0.027)	(1.546)	(1.361)
Corruption (t-1)	0.520	0.100	0.390	-0.037**	-0.304	-1.508*
	(1.230)	(1.265)	(1.281)	(0.017)	(1.670)	(0.841)
External conflic (t-1)	0.331	0.373	0.577	0.0153*	0.429	0.574
	(0.770)	(0.780)	(0.817)	(0.0135)	(0.960)	(0.643)
Military in politics (t-1)	-0.195	-0.229	-0.257	-0.019*	-1.207*	-1.308**
	(0.720)	(0.732)	(0.785)	(0.012)	(0.692)	(0.591)
Crisis (dummy)	-4.681**	-4.230**	-5.378***	0.0525*	2.658*	3.674**
	(1.766)	(1.971)	(1.778)	(0.038)	(2.593)	(1.732)
Constant	-22.27*	-18.09	-21.08	3.909***	36.60***	40.12***
	(11.94)	(12.00)	(13.21)	(0.201)	(9.275)	(9.271)
Observations	30	30	30	24	24	24

Notes: Our dependent variables are Gini index, and GDP per capita growth

3.8. Conclusion

This chapter examines the inclusiveness effects of fiscal consolidation in Côte d'Ivoire. Using a tighter fiscal stance, measured by changes in the cyclically-adjusted primary balance, over the period 1980-2014, it shows that fiscal consolidations are followed by an improved in growth performance, but also income gap decreases after periods of fiscal adjustments in Côte d'Ivoire. In other words, the results suggest there is no trade-off between growth and income inequality when implementing fiscal consolidations in Côte d'Ivoire. This conclusion contrasts to the results of several papers that analyze the impact of fiscal consolidations on inequality at the national level.

Our results also suggest that tax-based fiscal consolidations seem to increase economic growth. However, we have not found evidence to the expansionary effect of spending-based fiscal adjustment. These results could be explained by the fact that in developing countries, tax based-adjustment are generally a base-broadening measures. Therefore, this will contribute to strong tax revenue collections and play an important role in achieving higher, sustainable economic growth. Moreover, we find that tax revenue increases in Côte d'Ivoire were not associated with increases in inequality. Interestingly, when fiscal consolidation is achieved via revenue side, income inequality seems to be reduced further. In addition, reductions in primary expenditures do not seem to reduce the income gap.

To be sustainable, fiscal adjustment in developing economies will likely require revenue measures (Bevan, 2010, Gupta et al., 2005). Any negative impact of tax measures on inequality can be mitigated if they are accompanied by tax reforms that enhance the efficiency and fairness of the tax system, such as a greater reliance on progressive income taxation combined with the removal of opportunities for tax avoidance and evasion.

While this analysis provides an argument for tax-based rather than expenditure-based adjustments, it focuses on overall effects. Therefore, policy implications cannot be drawn without first studying the specific areas where spending cuts and tax increases are implemented. For example, broadening the bases of corporate and personal income taxes by reducing tax exemptions, closing loopholes, and improving tax compliance would increase revenues to fund incremental transfers. An increase in the consumption tax base (e.g., widespread adoption of value-added tax) would increase tax revenues, and these consumption taxes could also be designed to mitigate the adverse distributional effects (e.g., through appropriate treatment of small businesses and the application of excises to luxury goods). Further analysis should focus on providing more detailed estimates of the types of spending cuts and tax increases that lead to better and worse outcomes. Similarly, spending cuts in disability benefits would likely have a greater impact on inequality than any increase in taxes. Therefore, revenue constraints would require increased use of targeted social spending to protect households from poverty and improve the education and health of poor households.

Future research could also focus on the "narrative" approach to calculating fiscal adjustments in order to improve the evidence presented.

3.9. Annex

Annex A

All adjustment

GDP pc grwth	Coefficients	Standard error	t-ratio	pip	[1-Std. Err. Bands]	
ΔCAPB (t-1)	2.074419	1.325063	1.57	1.00	.7493564	3.399482
Inflation (t-1)	.1889882	.1245311	1.52	1.00	.0644571	.3135193
Public investment (t-1)	-.1116566	.3268585	-0.34	1.00	-.4385151	.2152019
Trade open (t-1)	.2651142	.0850265	3.12	1.00	.1800876	.3501407
Population growth (t-1)	-.2143852	.7601691	-0.28	0.21	-.9745543	.5457839
Corruption (t-1)	.5442505	1.198561	0.45	1.00	-.6543101	1.742811
External conflic (t-1)	.069275	.4088309	0.17	0.17	-.3395559	.4781059
Military in politics (t-1)	-.0860091	.316	-0.27	0.21	-.4020091	.2299909
Crisis (dummy)	-4.393484	1.677955	-2.62	1.00	-6.07144	-2.715529
Constant	-21.03308	10.23762	-2.05	1.00	-31.27069	-10.79546

Dependent variable: GDP per capita growth; pip is a posterior inclusion probability

Gini coeff.	Coefficients	Standard error	t-ratio	pip	[1-Std. Err. Bands]	
ΔCAPB (t-1)	-.0621367	.0358745	-1.73	1.00	-.0980112	-.0262622
Inflation (t-1)	-.0020148	.0020455	-0.98	1.00	-.0040603	.0000307
Public investment (t-1)	.0220519	.0088521	2.49	1.00	.0131998	.030904
Trade open (t-1)	-.0038058	.0016084	-2.37	1.00	-.0054142	-.0021973
Population growth (t-1)	-.0230976	.0355387	-0.65	0.41	-.0586362	.0124411
Corruption (t-1)	-.0335182	.0185868	-1.80	1.00	-.052105	-.0149315
External conflic (t-1)	.0080353	.0134113	0.60	0.39	-.005376	.0214466
Military in politics (t-1)	-.0236909	.0163539	-1.45	0.76	-.0400447	-.007337
Crisis (dummy)	.0599068	.0417215	1.44	1.00	.0181853	.1016283
Constant	3.948848	.2279542	17.32	1.00	3.720894	4.176802

Dependent variable: Gini coefficient; pip is a posterior inclusion probability

Tax-based Adjustment

GDP pc grwth	Coefficients	Standard error	t-ratio	pip	[1-Std. Err. Bands]	
ΔCAPB (t-1)	2.156848	1.620598	1.33	1.00	.53625	3.777446
Inflation (t-1)	.2494131	.1338656	1.86	1.00	.1155475	.3832787
Public investment (t-1)	-.0503015	.353488	-0.14	1.00	-.4037895	.3031865
Trade open (t-1)	.2066706	.0873501	2.37	1.00	.1193205	.2940207
Population growth (t-1)	-.2132797	.7696461	-0.28	0.21	-.9829258	.5563664
Corruption (t-1)	.1184191	1.240073	0.10	1.00	-1.121654	1.358493
External conflic (t-1)	.0811732	.4266722	0.19	0.17	-.345499	.5078454
Military in politics (t-1)	-.0935406	.3279097	-0.29	0.21	-.4214502	.2343691
Crisis (dummy)	-3.91746	1.872223	-2.09	1.00	-5.789682	-2.045237
Constant	-16.33579	10.07513	-1.62	1.00	-26.41092	-6.26066

Dependent variable: GDP per capita growth; pip is a posterior inclusion probability

Gini coeff.	Coefficients	Standard error	t-ratio	pip	[1-Std. Err. Bands]	
ΔCAPB (t-1)	-1.467866	1.377892	-1.07	1.00	-2.845758	-.0899743
Inflation (t-1)	-.2179389	.0886131	-2.46	1.00	-.3065521	-.1293258
Public investment (t-1)	1.299738	.44378	2.93	1.00	.8559579	1.743518
Trade open (t-1)	-.0771863	.0688508	-1.12	1.00	-.1460371	-.0083354
Population growth (t-1)	-.6036399	1.414436	-0.43	0.30	-2.018076	.8107964
Corruption (t-1)	-.0553283	1.401576	-0.04	1.00	-1.456904	1.346247
External conflic (t-1)	.2130904	.6493449	0.33	0.25	-.4362545	.8624353
Military in politics (t-1)	-1.322862	.6940933	-1.91	0.86	-2.016955	-.6287687
Crisis (dummy)	2.864304	2.293928	1.25	1.00	.5703755	5.158232
Constant	38.28258	9.297972	4.12	1.00	28.9846	47.58055

Dependent variable: Gini coefficient; pip is a posterior inclusion probability

Spending-based Adjustment

GDP pc grwth	Coefficients	Standard error	t-ratio	pip	[1-Std. Err. Bands]	
ΔCAPB (t-1)	.4919049	2.028863	0.24	1.00	-1.536958	2.520767
Inflation (t-1)	.1952003	.1340607	1.46	1.00	.0611397	.329261
Public investment (t-1)	-.2195677	.3572582	-0.61	1.00	-.5768259	.1376905
Trade open (t-1)	.2423319	.0911908	2.66	1.00	.1511411	.3335228
Population growth (t-1)	-.2386435	.8219606	-0.29	0.21	-1.060604	.5833171
Corruption (t-1)	.4537125	1.266139	0.36	1.00	-.8124269	1.719852
External conflic (t-1)	.1521645	.521436	0.29	0.20	-.3692715	.6736005
Military in politics (t-1)	-.0967167	.3500474	-0.28	0.21	-.4467641	.2533306
Crisis (dummy)	-5.082114	1.718902	-2.96	1.00	-6.801016	-3.363212
Constant	-17.82684	11.40358	-1.56	1.00	-29.23042	-6.423259

Dependent variable: GDP per capita growth; pip is a posterior inclusion probability

Gini coeff.	Coefficients	Standard error	t-ratio	pip	[1-Std. Err. Bands]	
ΔCAPB (t-1)	.1158537	1.353773	0.09	1.00	-1.237919	1.469626
Inflation (t-1)	-.1324965	.0885376	-1.50	1.00	-.2210342	-.0439589
Public investment (t-1)	1.373749	.3239215	4.24	1.00	1.049827	1.69767
Trade open (t-1)	-.1318375	.0732168	-1.80	1.00	-.2050542	-.0586207
Population growth (t-1)	-.168977	.9569946	-0.18	0.21	-1.125972	.7880176
Corruption (t-1)	-1.341501	.8609589	-1.56	1.00	-2.20246	-.4805424
External conflic (t-1)	.3018897	.5758022	0.52	0.34	-.2739125	.8776918
Military in politics (t-1)	-1.512925	.5570659	-2.72	0.94	-2.069991	-.9558587
Crisis (dummy)	3.713405	1.666625	2.23	1.00	2.04678	5.380029
Constant	42.76065	8.783252	4.87	1.00	33.9774	51.5439

Dependent variable: Gini coefficient; pip is a posterior inclusion probability

Annex B: Variables definitions and sources

Variables	Description/Notes	Source
GDP per capita growth	GDP per capita growth (annual %)	World Bank Development Indicators
Gini coefficient	Inequality estimates after the deduction of taxes and social contributions	Standardized World Income Inequality Database (SWIID)
Cyclically Adjusted Primary Balance (CAPB)	See main text for details of variable construction. State level primary balance (revenues minus expenditures net of interest payments) as a share of state GDP	Authors' calculations based on BCEAO database.
Inflation	Inflation, consumer prices (annual %)	World Bank Development Indicators
Public investment	Gross fixed capital formation (% of GDP)	World Bank Development Indicators
Trade open	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product. The indicator is divided by two in oder to have trade open.	Authors' calculations based on World Bank trade indicator (% of GDP)
Population growth	Annual population growth rate	World Bank Development Indicators
Corruption	Corruption within the political system	International Country Risk Guide (ICRG)
External conflic	The external conflict measure is an assessment both of the risk to the incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, withholding of aid, trade restrictions, territorial disputes, sanctions, etc) to violent external pressure (cross-border conflicts to all-out war).	International Country Risk Guide (ICRG)
Military in politics	The military involvement in politics, even at a peripheral level, is a diminution of democratic accountability.	International Country Risk Guide (ICRG)
Crisis (dummy)	Dummy variable that adopts one for war years and zero for other years	Authors regarding the years of war.

CHAPTER 4: CREDIBILITY OF FISCAL FORECASTS AND THEIR DISTRIBUTIONAL EFFECTS IN CEMAC AND WAEMU COUNTRIES

Abstract

The chapter investigates the fiscal forecasts and it social effects in CEMAC and WAEMU countries. The objective of this chapter is threefold. First, it aims to assess the quality of fiscal forecasts (accuracy, rationality and unbiasedness) in these two-economics areas. Second, it tries to analyze the determining factors of fiscal forecast deviation for CEMAC and WAEMU countries. Third, it analyzes the social effects of fiscal policy shocks through its impacts on the growth inclusiveness. The statistical analysis of the quality of fiscal forecast shows that only one country produces both relatively unbiased and accurate fiscal forecasts – Benin. The test of inefficiency shows that both in these two economic areas, the inefficiency of fiscal forecast occurs in most time because the forecast deviation is proportional to the forecast itself, but also because the past errors are repeated in the present. Furthermore, the degree of cross-country heterogeneity is high in the sample. The investigation on potential determinants errors denote that a part of revenue forecast errors can be explained by random shocks to the economy like unexpected changes in the GDP growth, change, consumer price measured by inflation and the price volatility. Against our expectation, public debt/GDP ratio is associated with lower budget balance forecast error. Our study does not find evidence of the effect of election year on revenue forecasts. Finally, the good practice of PFM namely the publication by the government of a report or a chapter on fiscal risks seem relevant in reducing errors in revenue forecasting. Regarding the distributional effect of fiscal policy shocks, the results suggest that an error in revenue forecast considered as fiscal policy shocks has a detrimental effect on inclusive growth.

Keywords: Fiscal Policy**,** revenue forecast errors, accuracy, efficiency, unbiasedness, income distribution

JEL Classification Numbers: C53, E62, H68, D31, I3

4.1. Introduction

A budget can be viewed as an instrument through which the government hopes to achieve not only its objective of sound financial management and control, but also other objectives such as the allocation and distribution of resources stabilization, growth, etc. Preparing government budget forecasting involves not only predictions about the macroeconomic development but also the predictions about the functioning of political and institutional framework. Furthermore, there are changes in tax laws and structural changes in the economy that make forecast even more difficult.

From a theoretical point of view, fiscal policy can generate significant externalities and risks of unsustainable public finances. In order to internalize these external effects and ensure stability, the monetary unions in West Africa (WAEMU) and Central Africa (CEMAC) adopted a multilateral surveillance mechanism of fiscal policies. The Pact of convergence, stability, growth and solidarity adopted in these two unions in 1999 aimed at consolidating public finances in these areas, ensuring compatibility of national fiscal policies with the common monetary policy and providing stable fiscal environment to the private sector. For the Pact to reach its goal, governments need to be able to produce reliable fiscal forecasts in the short and medium terms that can guide policy and programmatic decisions. Fiscal forecasting consists in making projections for the ongoing year and the years on the fiscal situation, based on the latest available information such as past, current, and projected economic conditions, or new measures announced by the government or voted by the Parliament. By allowing governments to assess their fiscal space in the years ahead, fiscal forecasting plays a major role ensuring fiscal discipline and planning stable and transparent fiscal policies for the medium-term.

Existing literature identifies three kinds of errors in fiscal forecasting (see Auerbach, 1999; Leal et al., 2008). First, "economic" errors can occur due to projections of macroeconomic variables,

such as GDP, inflation and interest rates that are commonly used as underlying assumptions for budget projections. Second, "policy" errors due to the inaccurate projection of the impact of the policies pursued. They can be explained by the establishment of new, not yet announced by the forecast target date, or the cancellation of previously announced measures; but also by errors in the estimation of the effect of a measure that has been implemented. Last, "technical" errors are the residual forecast errors that cannot attributed to policy changes and macroeconomic performance. They could partly come from behavioral responses, but also to a poor model specification on the fiscal side.

Some authors such as Zakaria and Ali (2010) group the sources of fiscal forecasting errors into two groups: (1) errors that are caused by endogenous factors, which can occur because of the use of incorrect settings, *inter alia* prices, income, and elasticities of demand and supply of products, etc.; (2) errors caused by exogenous factors i.e. that are outside the control of the government such as the availability of loans and grants, change in terms of trade, the volatility of oil price, the domestic political instability in the country, etc.

The purpose of this study is to analyze fiscal forecasting errors in WEAMU and CEMAC countries, and to suggest policy guidance to help governments improve their fiscal forecasts. To achieve these goals, we first apply existing methodologies to budget data from WAEMU and CEMAC countries to test fiscal forecasts according to the following three aspects: accuracy, efficiency and unbiasedness. Second, we try to identify determinants of fiscal forecasts errors in the region, among economic, political, and institutional factors. Third, we analyse the distributive consequences of fiscal forecasts errors.

The remainder of this chapter is structured as follows. The next section presents the data analysis. Section 3 briefs the economic performance, section 4 provides stylized facts about fiscal forecast errors in the region. Section 5 assesses the quality of fiscal forecast errors,

through formal tests of unbiasedness, accuracy, and rationality. Section 6 presents empirical evidence on the potential determinants of fiscal forecast errors. Section 7 analyses the social effects of fiscal forecasts errors, while the final section concludes.

4.2. Data analysis

Our sample covers a panel of African countries members of the Central African Economic and Monetary Community[12] (CEMAC) and the West African Economic and Monetary Union[13] (WAEMU, also known by its French acronym, UEMOA). Available data span over the period from 2004 to 2015. However, budget and outturns data are available for 12 countries only for the period from 2010-15. The rationale for these countries' coverage:

There are strong similarities among CEMAC and WAEMU member States. The 12 sub Saharan countries covered by this study make up the CFA franc zone (see Chart 1). This zone comprises two monetary unions maintaining Euro-pegged currencies under the supervision of regional Central Banks[14]. CEMAC and WAEMU regions account for 14 percent of Africa's population and 12 percent of its gross domestic product (GDP). These countries have in common official language (French with the exception of Lusophone Guinea Bissau and Spanish-speaking Equatorial Guinea), and similar administrative models. They share comparable macroeconomic patterns: mostly low-income countries depending on grants (WAEMU) or oil (CEMAC).

Both regions present institutional and fiscal data consistency. The CEMAC and WAEMU member states share a common framework for public finance management (PFM), designed

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[12] Namely: Gabon, Cameroon, the Central African Republic (CAR), Chad, the Republic of the Congo and Equatorial Guinea. Very few budget data have been made available for Equatorial Guinea, reason why the quantitative works do not comprehensively cover this country.
[13] Namely: Benin, Burkina Faso, Cote d'Ivoire, Mali, Niger, Senegal, and Togo. Very few budget data have been made available for Guinea-Bissau, reason why the quantitative works do not comprehensively cover this country.
[14] The Central African States' Bank (BEAC) and the Western African States' Bank (BCEAO)

after a francophone tradition for budget and accounting systems. They hence present strong similarities in institutional arrangements for their PFM systems. Budget classifications, charts of accounts and budget management systems have been aligned with regional standards. Thereby, fiscal and real sector statistics are mostly comparable across CEMAC and WAEMU Countries.

Governments across the regions heavily rely on fiscal policies to cope with volatile macroeconomic frameworks. Although most countries displayed resilience and sustained growth after the 2008 recession, they have had to cope with climate related agricultural slumps, political and military instability, volatile commodity prices, and a sharp decline in oil revenue. Since the CAF currencies are pegged to the Euro, hence desynchronized with sub-Saharan economic cycles, monetary policies give little leverage to weather economic booms and busts. Which leaves governments with crucial needs to implement sound and sustainable fiscal policies.

Chart 1: Country coverage used for the Case Study
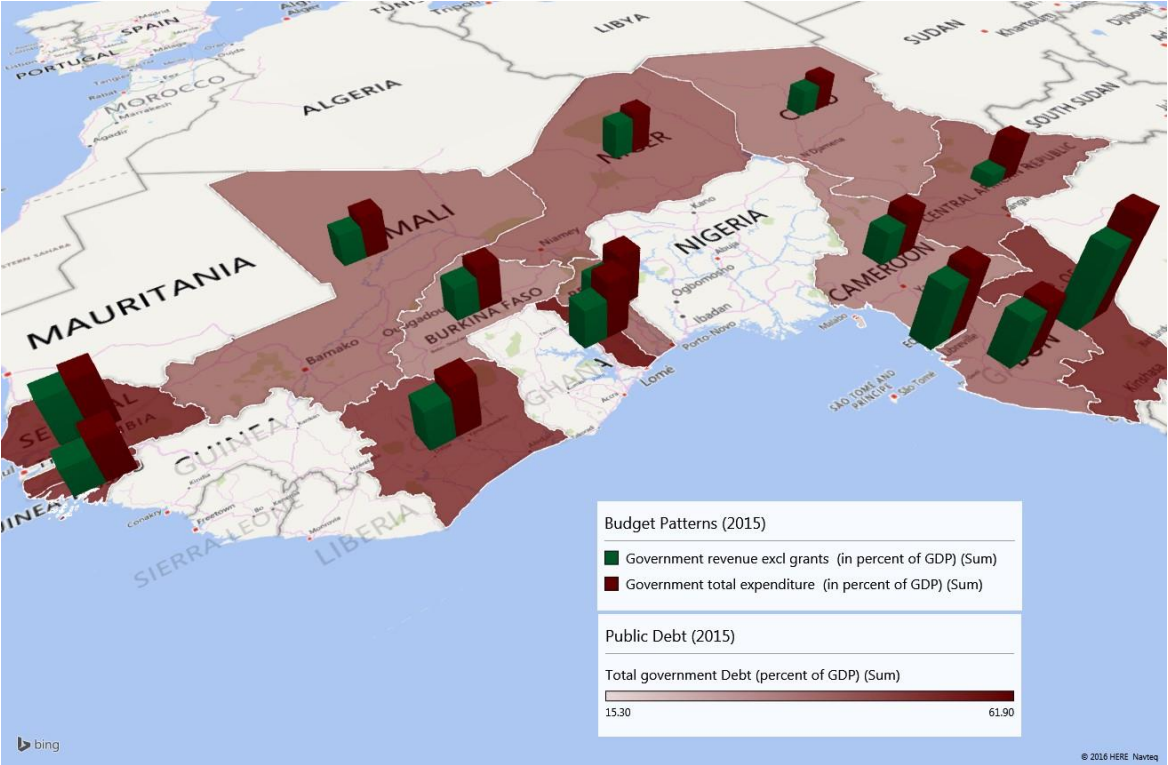
Source: Authors using data from WEO.

The data used for this study are collected from various sources. The dataset contains IMF's World Economic Outlook (WEO) data on GDP growth, inflation, debt ratio to GDP, oil price, the outturn of government revenue. The revenue forecasts are from National Authorities database of each country and are used to compute our dependent variable "revenue forecast error", as the outturn minus the forecast. With the WEO data, we construct the variable measuring output gap as the difference between actual GDP and the potential GDP. Table A2 in appendix presents a summary description of the variable. Several data come from the IMF's fiscal affairs department (FAD) resources, including technical assistance volumetry.

4.3. Economic performance

CEMAC: Facing Volatile Revenue and Geopolitical Instability[15]

Over 2010-15, the volatility, and more lately the slump in international crude oil prices had a severe impact on a community where five of the six members are net oil exporters. With oil representing more than 81 percent of regional exports and 54 percent of fiscal revenues, most countries are now being forced to scale back their investment plans drastically. The fall in oil prices did not have a significant impact in 2014 when regional growth was driven by an increase in oil production and the continuation of public investment programs. Nonetheless, growth in 2015 has slowed down mostly because of lower public investment. The instability around the Lake Chad region and the 2012-15 continuing civil strife in the Central African Republic (CAR) have triggered humanitarian crisis and severely disrupted economic activity, requiring extensive, and costly military operations in response. CEMAC's main challenge is now to embark on an ambitious reform agenda to underpin macroeconomic stability and better support sustainable and inclusive growth. The regional institutions should be the cornerstones of this effort, but they face substantial challenges.

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[15] From IMF Country Report No. 15/222 "common policies of CEMAC Member Countries"

Table 1.1: Selected Economic and Financial Indicators for CEMAC

CEMAC: Selected Economic and Financial Indicators, 2011–15	2011	2012	2013	2014 Est.	2015 Proj.
National income and prices	*(Annual percent change)*				
GDP at constant prices	3.6	5.4	2.4	4.7	2.8
Oil GDP	-3.7	-1.3	-8.0	2.7	0.5
Non Oil GDP	5.8	6.4	4.6	4.7	3.6
Consumer prices (period average)	2.6	2.8	2.1	2.7	2.6
	(percent of GDP)				
Government financial operations					
Total Revenue excluding grants	27.6	27.6	26.8	24.8	21.7
Government expenditure	25.3	29.2	30.3	29.7	27.4
Overall fiscal balance excluding grants	2.3	-1.6	-3.5	-4.9	-5.7
External public debt	12.0	13.1	15.4	17.5	22.0

Source: IMF World Economic Outlook (WEO) database.

WAEMU: The Need for Structural Reforms towards more Inclusive Growth[16]

The region's recent period of high growth and subdued inflation benefitted from a post-conflict catch-up effect in Cote d'Ivoire and from scaled-up infrastructure investment in the region. However, the business environment remains unattractive, competitiveness is weak, and structural transformation and economic diversification have been modest. Poverty, unemployment, and income and gender inequalities remain high. The fiscal deficit has widened throughout the region, largely driven by large public investment programs, albeit with a lack of efficiency. WAEMU is now faced with the following fiscal challenges ahead: increasing domestic revenue and better improving current spending to create fiscal space for development needs; improving public investment efficiency to boost growth and speed up development agenda; fiscal consolidation; and improving PFM practices.

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[16] From IMF Country Report No. 16/96 "common policies of WAEMU Member Countries"

Table 1.2: Selected Economic and Financial Indicators for WAEMU

WAEMU: Selected Economic and Financial Indicators, 2011–16	2011	2012	2013	2014	2015 Est.	2016 Proj.
National income and prices						
GDP at constant prices	0.8	6.7	6.0	6.3	6.3	6.3
Consumer prices (period average)	3.9	2.4	1.3	-0.1	1.0	1.7
Government financial operations						
Total Revenue excluding grants	16.3	17.5	17.8	17.8	18.2	18.5
Government expenditure	22.7	22.6	23.8	23.8	24.3	24.3
Overall fiscal balance excluding grants	-6.4	-5.1	-6.0	-6.0	-6.1	-5.8
Overall fiscal balance including grants	-3.9	-2.5	-3	-3.4	-4.6	-4
External public debt	30.9	24.6	24.7	25.2	30.4	30.3

Source: IMF World Economic Outlook (WEO) database.

Figure 1: Macroeconomic overview

Source: Authors calucation, using data from WEO.

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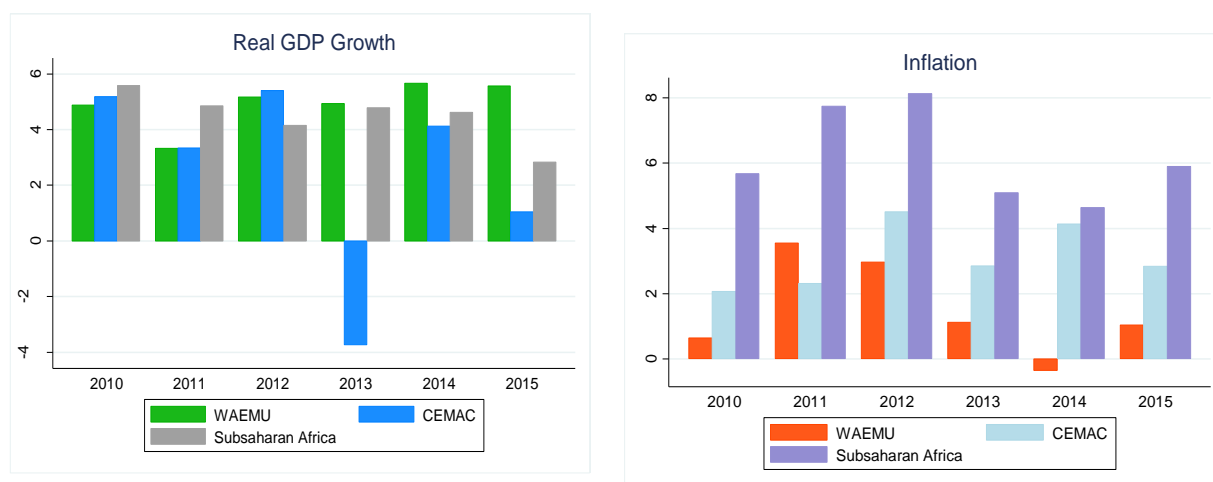
4.4. Credibility of fiscal and macroeconomic francophone Africa: stylized fact

The preparation, discussion and execution of budgets require forecasts for the main public finance aggregates, which generally draw on a broader set of macroeconomic forecasts. The quality of these forecasts is key for the sound management of public finances, since budgetary choices need to be consistent with macroeconomic constraints. Therefore, this section investigates over the medium term the stylized fact about the main macroeconomic indicators (real GDP growth and inflation) and the fiscal variables (government revenue, tax revenue and expenditure).

Macroeconomic Forecasting

The macroeconomic forecasting is essential in the budget process and it provides a basis from which to asses proposed policy options. Also, macroeconomic forecasts allow the consideration of the influence of the economic cycle on budget constraints.

The Figure 2 bellows shows that over the period 2010-2015, some francophone Africa forecasters overestimated real GDP growth while others underestimate such macroeconomic variable. The amplitude of errors varies from one country to another. Benin and Togo are those that realized a small bias for underestimating GDP while Cameroon make a small error by overestimate GDP. Cote d'Ivoire and Mali are the countries that are too optimistic in their budget process.

The graph shows that for the inflation, all the countries of the two areas overestimate their forecast. These errors found in the forecasts of inflation can be explained by the fact that inflation has remained under control below the community norm 3% in both community spaces. This evolution is due to lower cereal prices and good crop, but also to the fuel price decline in some Member States. However, falling prices could hide a decline in activity that would

generate less income, which would tend to compress domestic demand in particularly, therefore the activity.

Figure 2: Macroeconomic Forecasting
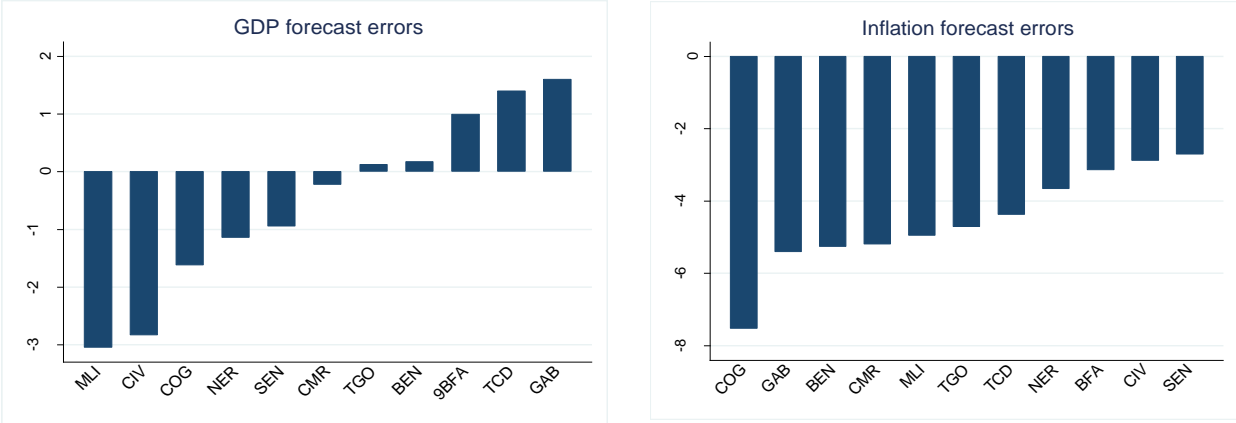
Source: Authors, using data from WEO and from documentation of national budget Autorities. In charts below "errors" are deviations between forecasts and outturns as a percent of forecasts.

Balance forecasting

Forecasts for budget balances appear to be more credible than those for revenue and expenditure. Figure 2.5 which combines all forecasting errors (Revenue, Expenditure and Balance) shows that deviations in Revenue most often offset deviations in Expenditure – that is deviations are often similar and of same sign. Therefore, Balance forecasts (black dots in the figure 3) are quite maintained within the ± 5 percent best practice with the exceptions of Niger, Senegal and Congo. All told average deviations for balances reach only two thirds of deviations for Revenue and Forecasting. We believe this may result from the possible underlying causes:

- Some governments may purposely overestimate their year-ahead Revenue to: (i) raise fiscal targets and possibly step-up the efficiency of tax collection, (ii) present the Parliament with ambitious plans for government expenditure, and (iii) set a momentum for donors to meet their pledges for grants.

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- Expenditure forecasts generally follow trends in Revenue forecasts that is under or overestimated to the same extent, to abide by target balances set in compliance with donors' conditionalities and Parliaments' orientations for deficits.

- Countries rein in government spending down the road with regards to actual revenue collection, grants disbursement, trends in oil prices, and availability of government cash.

Figure 3: Balance forecast errors over the period 2010-2015
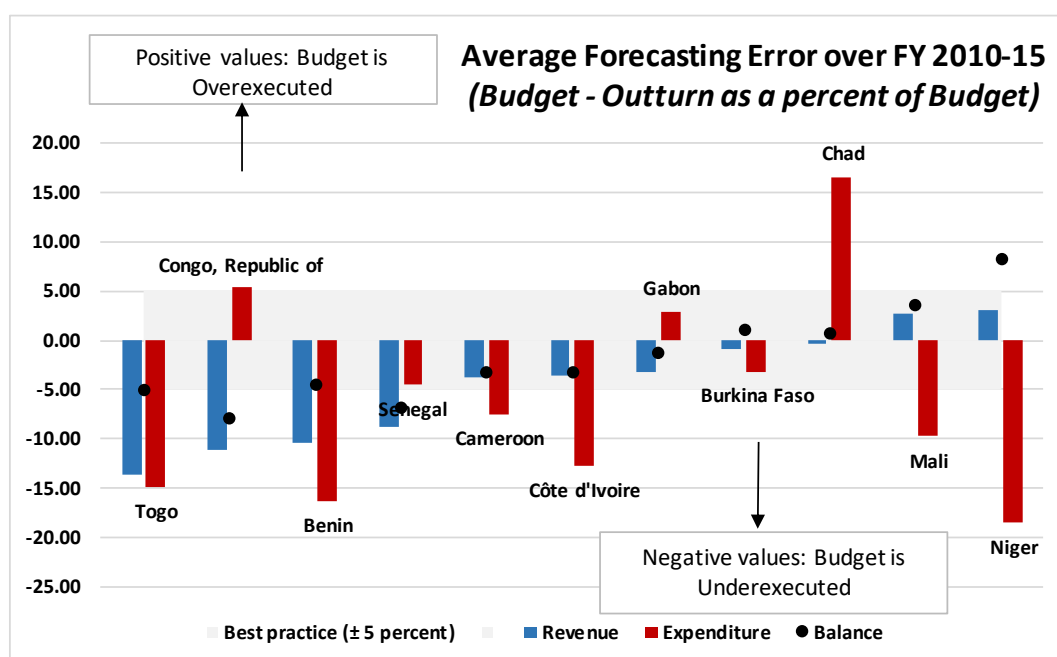
Source: Authors, using data from WEO and from documentation of national budget Autorities.

Compliance with regional convergence standards

For the sake of integration and financial stability, WAEMU and CEMAC have implemented similar multilateral surveillance and convergence mechanisms. In this context, the member countries have committed to meet fiscal targets presented in Table 1.3. When designing budgets and monitoring budget execution, the member countries must therefore abide by these fiscal targets. Over the period all countries have met public debt criteria, half have largely met their balance target, none succeeded in levying taxes to the required amount.

Table 1.3: Compliance with convergence standards.

Number of WAEMU Countries Violating Convergence Criteria 2011-15

WAEMU = 8 Member-states	2011	2012	2013	2014	2015
First-order Criteria					
Overall Balance / GDP (≤- 3 percent)	4	2	3	4	5
Total Debt / GDP (≤ 70 percent)	0	0	0	0	0
Second-order Criteria					
Tax Revenue / GDP (≥ 20 percent)	8	8	8	8	8

Number of CEMAC Countries Violating Convergence Criteria 2011-15

CEMAC = 6 Member-states	2011	2012	2013	2014	2015
First-order Criteria					
Basic Balance / GDP (≥ 0)	2	3	4	5	5
Total Debt / GDP (≤ 70 percent)	0	0	0	0	0
Second-order Criteria					
Tax Revenue / GDP (≥ 18 percent)	6	6	6	6	6

Source: Authors, using data from WEO.

Budget credibility

The credibility of a budget is measured through four PEFA performance indicators (PI):

- PI-1 Aggregate expenditure out-turn compared to original approved budget: this indicator measures the actual total expenditure compared to the originally budgeted total expenditure but excludes expenditure categories over which the government will have little control such as debt service payments, and donor funded project expenditure. Scores rank from "A" (best rating when deviations do not exceed 5 percent) to "D" (deviations exceed 15 percent).

- PI-2 Composition of expenditure out-turn compared to original approved budget: this indicator measures deviation between budget and outturns broken down by main budget item and categories. Score ranking is similar to PI 1.

- PI-3 Aggregate revenue out-turn compared to original approved budget: This indicator is similar to PI-1 for Revenue and uses the same ranking.

- PI-4 Stock and monitoring of expenditure payment arrears. This indicator assesses stock and management of expenditure obligations incurred by government, for which payment is overdue at the end of the fiscal year and constitutes a form of non-transparent financing.

The credibility of the countries' budgets is low, particularly in the CEMAC region. Table 1.4 below presents the ranking of CEMAC and WAEMU countries' PFM performance for assessment undertaken during the period 2010-16. This table features largely poor performance across the countries with differences between the WAEMU and the CEMAC:

- PEFA assessments have been regularly carried out in the WAEMU probably in response to donors' requests. Five WAEMU countries present low performance (inferior to two on a scale of four), only one (Mali) shows strong performance albeit with weaknesses in arrear monitoring.
- Only two CEMAC member countries have undertaken a PEFA assessment and their performance is low. This suggest CEMAC Member countries do not perform well in fiscal forecasting.

Table 1.4: Credibility of budgets in CEMAC and WAEMU

PEFA Assessments		Fiscal years covered	PI-1 *Aggregate expenditure*	PI-2 *Composition of expenditure*	PI-3 *Aggregate revenue*	PI-4 *Stock and monitoring of arrears*	PI-1-4 *Country average for PI-1, 2, 3, 4*
WAEMU	**Benin**	2012-14	**0**	**0**	**4**	**0**	**1.0**
	Burkina Faso	2012-14	**3**	**2.5**	**1**	**3.5**	**2.5**
	Cote d'Ivoire	2011-13	**4**	**2.5**	**3**	**1.5**	**2.8**
	Guinea Bissau	2009-11	**2**	**1.5**	**4**	**0**	**1.9**
	Mali	2008-10	**4**	**4**	**4**	**2.5**	**3.6**
	Niger	2009-11	**1**	**2.5**	**1**	**1.5**	**1.5**
	Senegal	2008-10	**3**	**1.5**	**4**	**3**	**2.9**
	Togo	2013-15	**2**	**1.5**	**1**	**1**	**1.4**
Average ranking for WAEMU			**2.7**	**2.3**	**2.8**	**1.6**	**2.3**
CEMAC	**C.A.R**	2007-09	**1**	**1**	**2**	**1.5**	**1.4**
	Cameroon		N/A	N/A	N/A	N/A	N/A
	Chad	No data available	N/A	N/A	N/A	N/A	N/A
	Congo Rep.		N/A	N/A	N/A	N/A	N/A
	Eq. Guina		N/A	N/A	N/A	N/A	N/A
	Gabon	2010-12	**2**	**0**	**1**	**0**	**0.8**
Average ranking for CEMAC			**1.5**	**0.5**	**1.5**	**0.8**	**1.1**

Source: Authors using data from PEFA. 4 stands for best possible score ("A"), 1 for lowest score ("D"), and 0 for non-documented indicators ("NA", "NR" or "NU").

4.5. Statistical tests on the quality of fiscal forecasts in WAEMU and CEMAC Countries

In this section, we assess the quality of fiscal forecasts in WAEMU and CEMAC countries, by applying statistical tests to our dataset. Three aspects are tested: accuracy, rationality and unbiasedness. In what follows, for each tested fiscal variable, forecast error on fiscal indicator i for year t e_{it} is defined as the outturn (A_{it}) minus the forecast (F_{it}), calculated as a share of GDP.

$$e_{it} = A_{it} - F_{it} \qquad\qquad (1)$$

e_{it} is an indicator that can be positive or negative depending on whether the forecast respectively underestimates or overestimates the outturn.

The errors in this part are computed over the period 2010-2015, then six years. However, for some countries there is lack of data. The tax revenue errors in Burkina Faso is calculated over three years (2012-2014). For other countries, tax forecast errors are computed over 5 years. Also, for the expenditure, the errors are calculated over the period 2010-2014.

4.5.1. Unbiasedness test

Biases correspond to cases of systematic overestimation or underestimation. Bias is a problem of direction: Forecasts are typically too low (downward bias) or typically too high (upward bias). The unbiasedness of forecasts can be analyzed through simple descriptive, the mean error (ME). The ME provides an indication of the average direction of the projections. In other words, it allows to see in a simple manner if forecast deviations of a country are prone to overestimation or to underestimation of the actual value. Thereby, it is a pointer to a possible bias in the forecast. The country-level analysis for total revenue, tax revenue, and total expenditure forecast deviations are reported in the following charts.

Revenue forecasting: total revenue

The graph shows that five countries performed well according to best practices. In fact, the best practice hypothesis is that the forecast deviation is low than 5% of outturn (both in positive term as well as negative term). These countries are Gabon, Togo, Benin, Mali, and Burkina Faso. In our sample, only three countries collected more than projected. These countries have a positive forecast error (Burkina Faso, Côte d'Ivoire, and Chad). Finally, we can note that bad forecasts often occurred in oil producers or low capacity countries.

Fi gure 4: mean total revenue forecasting deviation over fiscal year 2010-2015
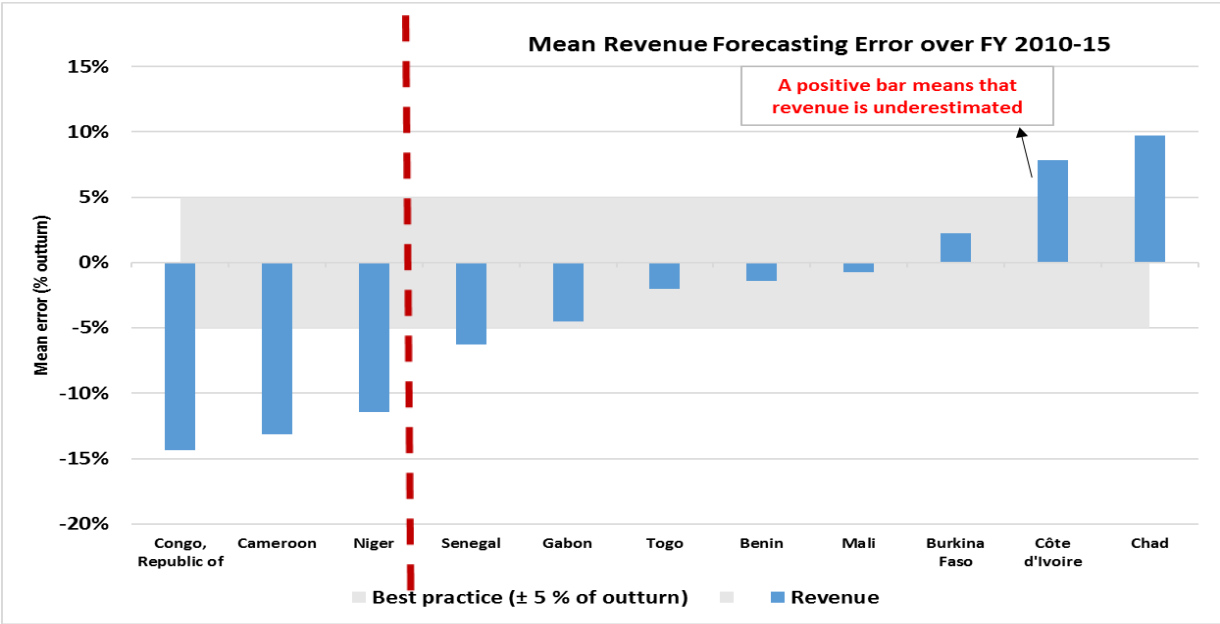
Source: Authors calculation using data from WEO and from documentation of national budget Autorities.

Revenue forecasting: tax revenue

The graph representing the ME of tax revenue allow us to see that forecasts were slightly less biased in six countries according to best practices. When we compared the result to those of total revenue, we concluded that significant mean errors on tax revenue forecasts do not necessarily imply large mean errors on total revenue forecasts. Here also, bad forecasts often linked with oil-producer or low-capacity countries.

Figure 5: mean tax revenue forecasting deviation over fiscal year 2010-2015
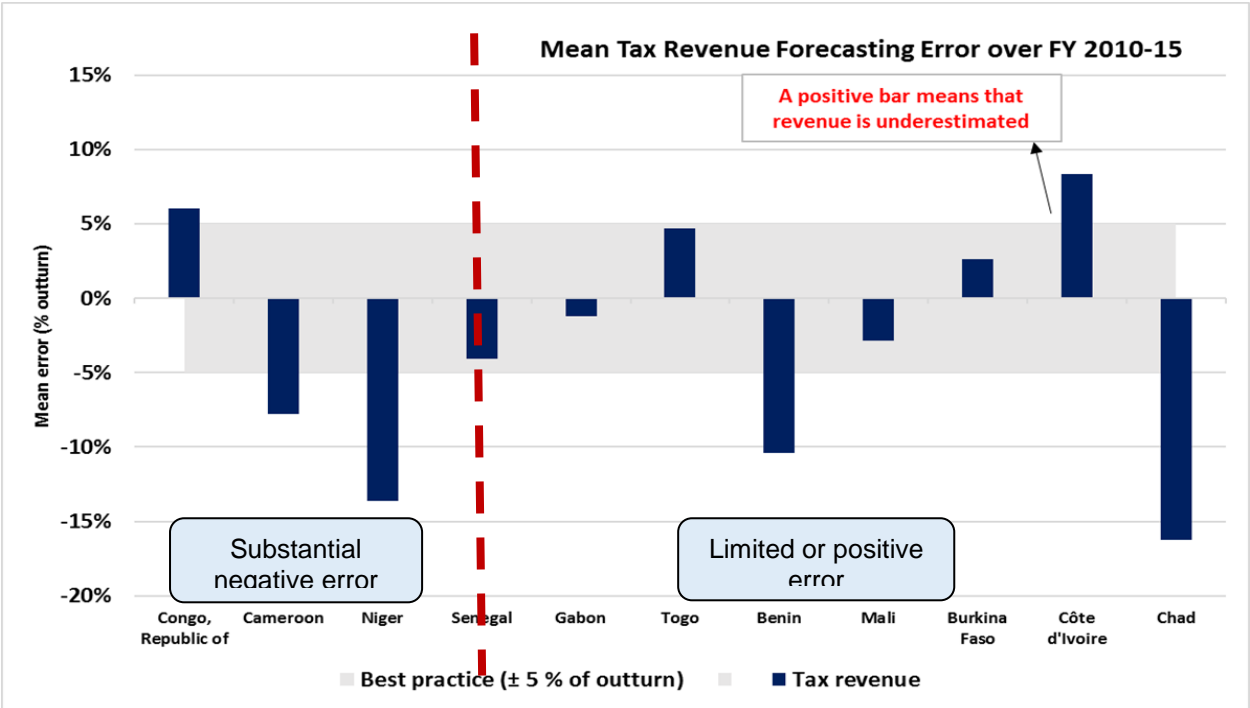
Source: Authors calculation using data from WEO and from documentation of national budget Autorities.

Expenditure projections

In the case of expenditure forecasts, four countries performed well against best practices. These countries are Cameroon, Republic of Congo, Benin, and Côte d'Ivoire. The mean deviation of expenditure forecasts in these countries is below the threshold of 5% in absolute term. Only Côte d'Ivoire overspend on average during the period of study. The under-spending or the over estimation of expenditure often linked with lack of government cash and low investment execution rates.

Figure 6: mean expenditure forecasting deviation over fiscal year 2010-2015
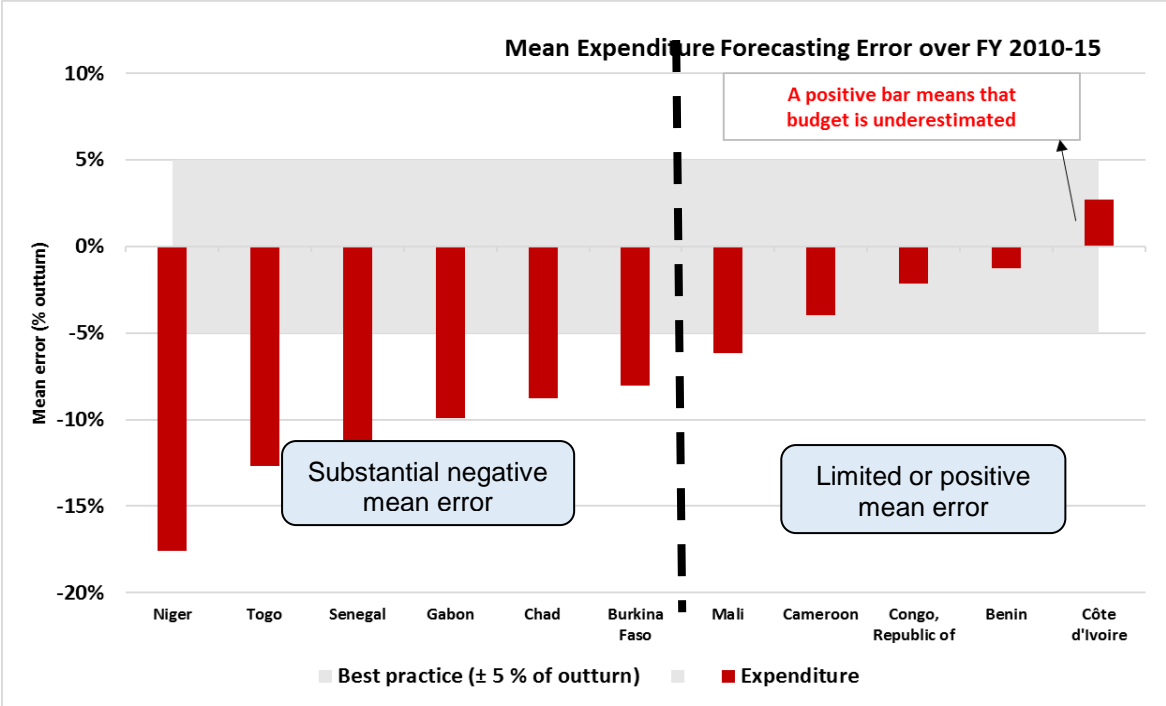
Source: Authors, using data from WEO and from documentation of national budget Autorities.

After analyzing the mean error of our fiscal variables, we confront the revenue forecast deviations and the expenditure forecast deviations. It allows us to group the countries into three categories. The red case contains countries that substantial overestimate revenue and underestimated expenditure. This situation describes to the substantial deterioration of budget

balance. The green case is the countries that have less errors in revenue and less errors on expenditure. Therefore, it implies less effect in budget balance. The orange case is the countries that have error on their budget balance, but it is rather positive.

Table 2.2: degree of bias

revenue expenditure	Limited or positive mean error	Substantial negative mean error
Limited or positive mean error	Benin, Mali, Côte d'Ivoire	Congo, Cameroon
Substantial negative mean error	Gabon, Chad, Burkina Faso, Togo, Senegal	Niger

Source : Authors classification

We analyze the effect on budget balance of a potential errors on revenue and/or expenditure. The following graph is order according to increasing error on budget balance. First, the graph shows that two countries (republic of Congo and Cameroon) have potential problem. They have substantial mean negative errors on revenue that are not compensated by expenditure - the mean error on budget balance is highly negative for them. In other word, the budget balance is deteriorated more than what was predicted. Second, when mean errors are limited both on the revenue and the expenditure side, the mean error on the budget balance remains limited. Third, all countries with a negative bias on expenditure forecasts also tend to underestimate their budget balance.

Figure 7: mean forecasting error over fiscal year 2010-2015
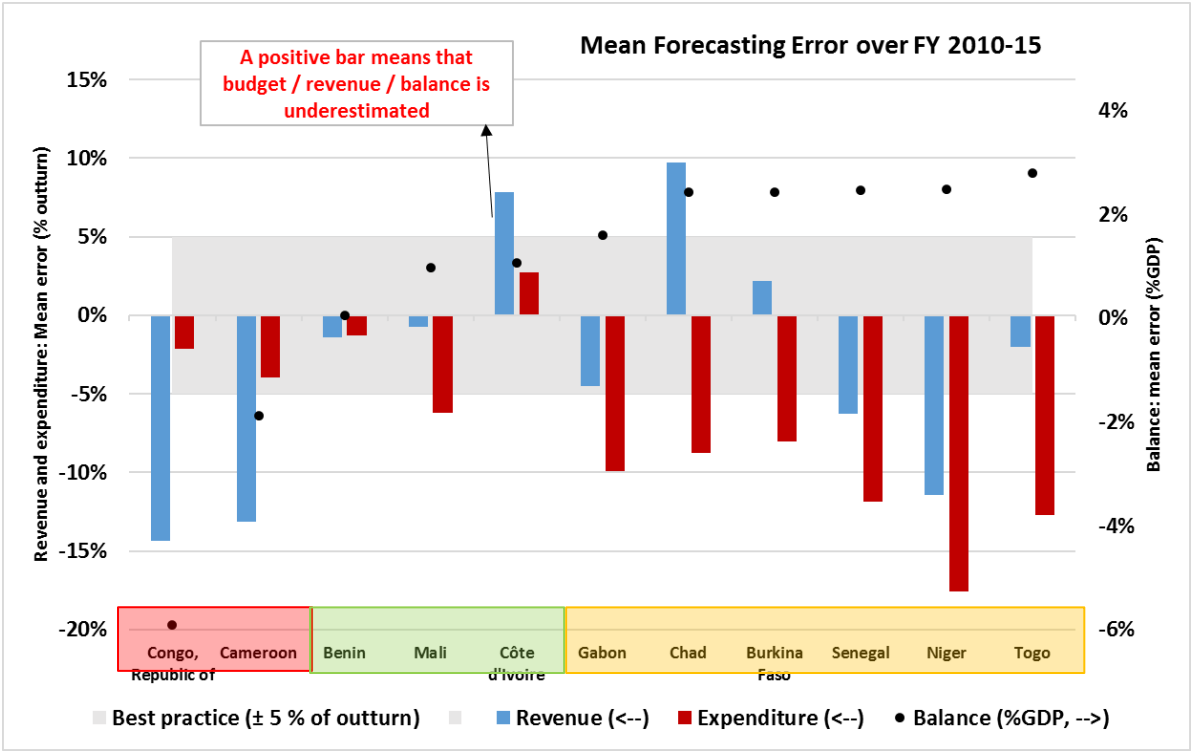
Source: Authors, using data from WEO and from documentation of national budget Autorities.

4.5.2. Test of accuracy

The accuracy in budgetary forecasting refer to "how closely the forecasted value of a quantity corresponds to its observed or actual value". Musso and Phillips (2002) suggest two ways: the first one determines how close forecasts and actuals are in quantitative terms, while the second one refers to the capacity to forecast the direction of change in the final outcome. Accuracy is an issue of magnitudes: Forecast errors can be too large (in either direction) using a particular forecasting technique. In practice, the accuracy of forecasts can be analyzed by either by econometric test either through simple descriptive: mean absolute error (MAE). Thereby, this is an interesting option when evaluating the forecasting record of a given institution (Melander et al., 2007). The MAE refers to the average absolute difference between the forecast and the outturn. It measures the average magnitude of the errors in a set of forecasts, without

considering their direction (it measures the average absolute deviation of forecasted values from original ones). The study is a country-level analysis and covers the period 2010-2015. The chart below the MAE of revenue and expenditure of each country in our study.

We order the graph by the sum of the MAE on revenue and expenditure. The analysis of the graph shows that while eight countries performed well in terms of unbiasedness against best practices either for revenue or expenditure forecasts, all but one seems to produce relative inaccurate forecasts. As the main finding, among countries which fared best in terms of unbiasedness (green), only Benin also fares relatively well in terms of accuracy.

Figure 8: mean forecast absolute error over fiscal year 2010-2015
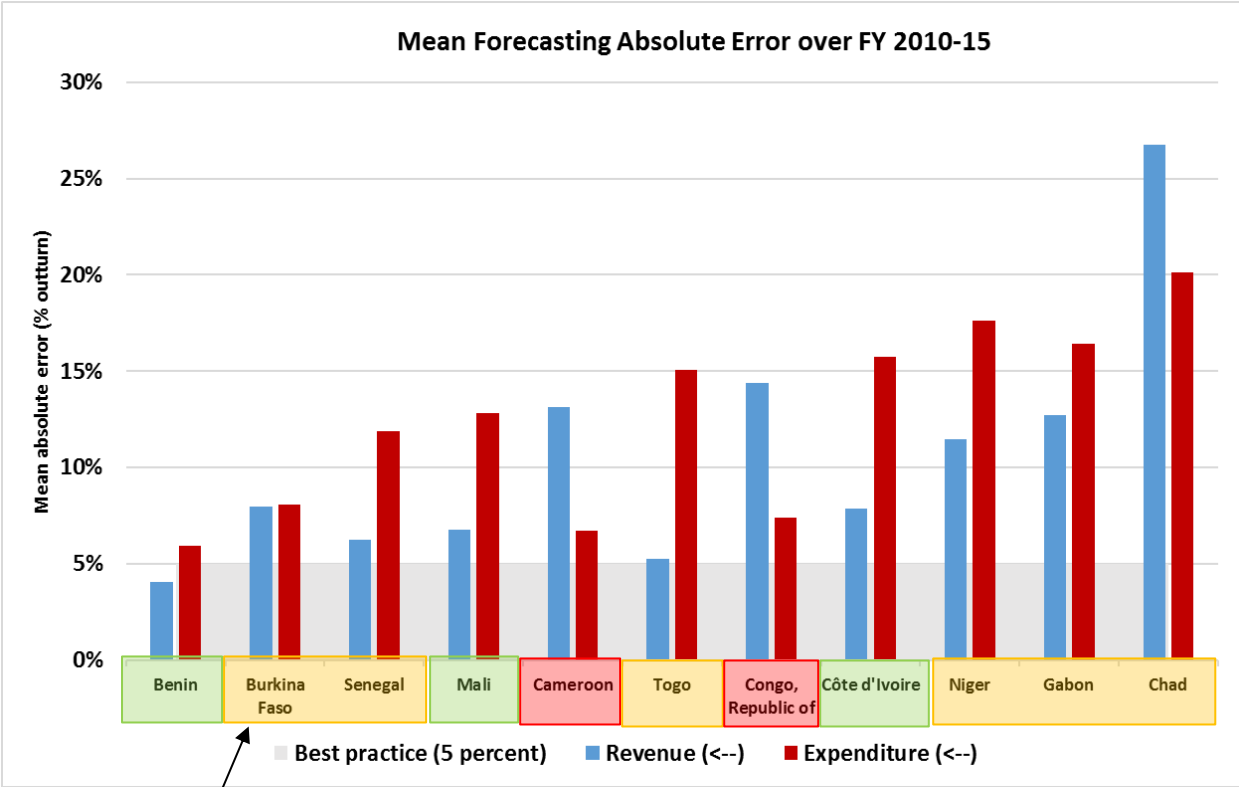
The colors reflect the unbiasedness rating
Source: Authors, using data from WEO and from documentation of national budget Autorities.

4.5.3. Test of rationality

The rationality (or efficiency) refers to how much a forecast fully exploits the information available at the time the forecast is made. The rationality can be examined by looking at the extent of information available at the time the forecast was elaborated (data, policy measures) in order to determine whether or not the predictions are optimal with regards to this particular information set (Wallis, 1989). To test a rationality, a necessary condition is that the forecast should be an unbiased predictor of the actual (Muth, 1960). The sufficient condition is that the forecast error is uncorrelated with the predicted value, which implies that the correlation coefficient between the forecast error and predicted value should be zero. In other words, the sufficient condition is that the predicted error must be uncorrelated with historical information. We push forward our analysis to investigate the source of rationality, by applying a methodology developed by Jalles et al. (2015). First, we distinguish the co-movements between the deviation of the outcome of the forecast and the forecast itself (the β-test). In other word, β-test allows to show if the forecast deviation is proportional to the forecast itself. The main idea is to know whether the forecast error is uncorrelated with the entire information set at time t. The forecast value F are considered as a proxy of information available at the time of forecast. The estimate equation is:

$$e_t = \alpha + \beta F_t + \mu_{1t}, \qquad\qquad (3)$$

Where e and F denote forecast errors and forecast, respectively.

Table (2.4) shows that in the case of tax revenue and total revenue (column 1 and 2), the coefficients of β are different from zero in the sample. These results mean that both for the two fiscal variables, the forecast deviation is proportional to the forecast itself. By against the expenditure forecast deviation seem to not be proportionally correlated with the forecast itself

(column 3). The significant value of β mean that the lack of rationality stems from the used of the model that have not a minimum variance. In other words, the lack of rationality could be due to the poorly implementation of the forecast methods (e.g. econometric forecasting methods).

Table 2.4: proportionality of forecast deviation

VARIABLES	Tax revenue	Revenue	Expenditure
	(1)	(2)	(3)
β	-0.0258***	-0.0164***	-0.00513
	(0.00796)	(0.00341)	(0.00387)
Observations	84	68	81
R-squared	0.127	0.293	0.025
Number of country	11	11	11

Source: Authors, using data from WEO and from documentation of national budget Autorities.

The second step for rationality is to see the co-movement between the deviation of the outcome of the forecast in the current period and that in the previous period (the ρ-test). This test allows to see if the errors of the past are repeated in the present. Formally, we estimate ρ by regressing the current-period forecast error on the previous period error as shown the follow expressions:

$$e_t = \gamma + \rho e_{t-1} + \mu_{2t},$$

Where e and e_{t-1} denote forecast errors and its previous value, respectively.

The Table (2.5) below shows that there is a correlation between the past error and the present errors for the three fiscal variables use in the study. Therefore, the significant value of ρ implies that the past errors seem repeated in the present.

Table 2.5: persistence in time of forecast errors

VARIABLES	Tax revenue	Revenue	Expenditure
	(1)	(2)	(3)
ρ	0.915***	0.560***	0.282**
	(0.207)	(0.147)	(0.127)
Observations	67	54	67
R-squared	0.262	0.257	0.083
Number of idcountry	11	11	11

Source: Authors, using data from WEO and from documentation of national budget Autorities.

These two results allow us to tell that the fiscal forecast seem to be inefficient in CEMAC and WAEMU countries. The inefficiency arises because the forecast deviation is proportional to the forecast itself (this is the case of tax revenue and total revenue), but also because the past errors are repeated in the present.

4.6. Determinants of fiscal forecast errors

The analysis on efficiency of government fiscal forecasts is in most of the literature presented together with potential determinants of forecast errors. In our study, we focus on a particular aspect of budget forecasting that is revenue forecasting. Revenue forecasting is essential in assessing budget planning and management processes. Revenue forecasts define the budget envelope and form the basis for effective medium-term planning. They are necessary to achieve sustainable financing of government projects and programs and to avoid major unplanned and possibly unsustainable fiscal deficits over time.

4.6.1. Methodology and explanatory variables

Based on existing literature, a following baseline model is used to look for determinants of forecast errors:

$$e_{it} = \beta_0 + \beta_1 GDPerror_{it} + \beta_2 INFerror_{it} + \beta_3 GAP_{t-1} + \beta_4 DEBT_{t-1} + \beta_5 POP_t + \delta_t + \omega_i + u_{it} \quad (5)$$

Where e_{it} is total revenue forecast errors, $GDPerror_{it}$ and $INFerror_{it}$ are the real GDP growth forecast errors and inflation forecast errors respectively; GAP_{t-1} is the output gap for year t-1; $DEBT_{t-1}$ is the public debt stock in percent of GDP for year t-1; β_j are the regression parameters, t and i index years and countries, respectively; δ_t is the time-specific trend, ω_i represents country-specific effects and u_{it} the stochastic error term for each country i and year t. Time-specific intercepts are included to account for time-varying omitted variables and stochastic shocks that are common to all countries.

In this first baseline model, the choice of regressors is mainly guided by political economy literature applied to fiscal policy (Boylan, 2008; Aidt et al., 2011; de Deus and Mendonça, 2015).

We use macroeconomic variables such, inflation forecast errors and GDP growth forecast errors that should account for part of the errors in fiscal forecasts. Errors on real GDP forecasts should affect budget balances through automatic stabilizers and possibly anti-cyclical fiscal policies. Hence, a positive relationship between budgets forecast errors and GDP forecast errors is expected due to the fact that a greater bias on economic growth implies greater budget balance forecast errors. The reason for this is that revenue projections take into account forecasts on economic growth. An error on inflation can also affect revenue forecast errors through various channels. Firstly, real tax revenues may be reduced resulting in higher budget deficits. Moreover, inflation leads to higher long-term interest rates implying higher debt servicing costs and as a consequence a worsening of the fiscal balance. Secondly, inflation may positively affect the government revenue by the creep of support on the income tax revenue and also through eroding the value of nominal government debt (Lis and Nickel, 2009).

The output gap is the gap between actual and potential GDP and represents the control for the business cycle during budgetary planning stage.

$DEBT_{t-1}$ expressed as percentage of GDP, allows one to see the effects of public debt stabilization on budget forecasts. Debt creates obligations that must be met and weakens the ability to offset unplanned expenditures. These effects are subject to two interpretations. On the one hand, positive relationship, higher public debt can be associated with higher budget balance forecast errors as a consequence of lack of fiscal discipline by governments; on the other hand, a greater public debt can be associated with lower budget balance forecast error due to the

possibility of creating aversion to fiscal policymakers increasing public debt (de Deus and Mendonça, 2015).

Some additional economic variables can also be used as regressors, namely oil price volatility and raw agricultural price volatility. Oil price volatility is important in our model as most countries in the sample are oil producers (especially all CEMAC members, except Central African Rep). In these countries, the budget is heavily dependent on the oil sector (74% in 2008)[17]. Hence government revenues tend to be highly volatile due to the instability of international prices of oil. In addition, oil price shocks tend to be persistent and the oil price cycles are highly unpredictable. These characteristics make fiscal management more challenging in such countries with very important implications for the forecast performance. As regards the population, larger states tend to have larger tax administration, then may have more resources for their revenue forecast effort.

In addition to these economic variables, there are other political and institutional variables that could explain the budget forecast error in our analysis.

According to Lewis-Beck (1990), it is common that political candidates are re-elected when the economy is experiencing good times and thus they are motivated to present a prosperous economic environment. Furthermore, for Aidt et al., 2011, when a close election race is expected, the politician incentive to manipulate fiscal policy for electoral goals intensifies, thereby increasing political budget cycle size. In the context of budget forecasting, this behavior biased budgets. As point Bischoff and Gohout (2010), biased tax projections can help the political candidate in its fight for reelection. In order to test the electoral bias, we use a dummy variable that takes the value 1 for the year before the presidential election, and zero otherwise.

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[17] BANQUE DE FRANCE – Rapport Zone franc – 2008 : L'évolution de la situation économique et financière dans la zone CEMAC

We also look at the correlation of the errors with the corruption perception index taken from the WGI. Corruption may affect budget performance through its impact on tax revenue and public spending. In the case of revenue, corruption can alter the manner by which revenues are generated, for example, when part of the tax proceeds does not accrue to the government and is usurped. Also Ghura (1998) concluded that corruption reduces tax revenues by reducing the revenues from almost all taxable sources (including incomes, profits, property, capital gains,)

We compute two dummy variables related to the government budgetary activities. First, we ask to know if the government published a report or a chapter on fiscal risks (see explanatory memorandum of the Finance Act, preamble or conditions MTBF ratings). So, the dummy takes one if there is publication on fiscal risk and zero if not. Second, we look at if the macroeconomic and budgetary forecasts are confronted with those carried out by independent agencies or the IMF forecasts, the WB, or the central bank. The comparison of government forecasts for other organizations may enable him to know discrepancies in his forecasts. In fact, the forecast methods used by international agencies to forecast tend to be more sophisticated.

We also take account the intensity of technical assistance of Fiscal Affairs Department (FAD) in each country of our sample. The aim of these assistance is to improve the government public finances. These assistances take various forms that can be project of law, methods etc...

The data is a cross-sectional time series data set, and thus pooled OLS is the simple way for estimating due to the fact that it does not consider non-observed effects. It is important to note that in our sample, forecast errors magnitude differs from one country to another. Hence it is possible that country effects can be relevant for explaining budget balance forecast errors. Therefore, the model in equation (5) is estimated employing fixed effect estimator (FE). The literature on panel data emphasizes that panel data sets are likely to exhibit substantial cross-sectional dependence, which may arise due to the presence of common shocks and unobserved

components that become part of the error term ultimately, spatial dependent and due to idiosyncratic pair-wise dependence in the disturbances with no particular pattern of common components or spatial dependence (Baltagi, 2008). Assuming that cross-sectional dependence is caused by the presence of common factors, which are unobserved (and as a result, the effect of these components is felt through the disturbance term) but they are uncorrelated with the included regressors, the standard FE is consistent, although not efficient and the estimated standard errors are biased. Using the tests developed by Frees (1995) and Pesaran (2004), we found evidence for the presence of cross-sectional dependence. Also, the Breush-Pagan test and the Durbin Watson test showed the presence of panel heteroscedasticity and serial autocorrelation, as common for panel data with country-year observations. To correct these problems, the model (5) was estimated using the Driscoll and Kraay (1998) standard errors as implemented by Hoechle (2007). This estimation accounts for heteroscedasticity and cross-sectional dependence problems. Moreover, this option allowed us to correct the auto-correlation of any order. Some studies using GMM methods of reasons of a possible endogeneity of certain variables. Here, we decline to address the issue of endogeneity due limited number of observations. This should not have any effect on our results.

4.6.2. Estimation results

In this sub-section, we turn to the econometric results. The base line results are displayed into Table 3. In order to assume the robustness of our results, baseline Equation (5) is estimated in the first time by adding others economic variables as determinants of revenue forecast errors (Table 4), and secondly by using the political and institutional factors (Table 5). The dependent variable is the revenue forecast errors as defined previously by expression (1). In the base line results (Table 6), all coefficients of the variables in the estimations of expression (5) are positive

and are highly significant at determining the revenue forecast errors. Results show that forecasters tend to substantially over-predict the revenue on average.

GDP growth forecast errors is significant in determining the revenue forecast in the all sample estimations. Therefore, a strongly significant impact indicating that a GDP growth forecast errors by 1% results in an increase of revenues forecast errors by 0.2%. As regard the effect of inflation forecast error, the study did not found evidence from the impact of the inflation on determining the revenue forecast errors in the whole sample in one hand when we took only inflation and GDP growth forecast error as determinant of revenue forecast error (column 1 of Table 3), and in other hand when we control revenue forecast error by adding another important variables (output gap, debt, and population size). We now return to examination of the cyclical pattern of bias in government forecasts. The output gap allows us to see if the bias is greater in a recession.[18] The cyclical term is indeed positive but not significant. So, our data does not allow us to say that the over-optimism tends to be greater in recessions. Regarding the coefficients of public debt/GDP, the negative and statistically significant in models show that greater public debt seem to be associated with less bias in revenue forecasts.

The column (2) shows also that population size has increase the errors in revenue forecasting in the countries. This can be explained by the importance of informal sector in the economy. So, a much of the resources of this sector escapes the State, thereby distorting its forecast for revenue.

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[18] The output gap has a negative value in our database, this correspond to recessions.

Table 3: baseline results

VARIABLES	Dependent variable: Revenue forecast errors	
	Driscoll-Kraay Fixed-effects estimation	
	(1)	(2)
GDP errors(t)	1.476***	1.569***
	(0.206)	(0.311)
Inflation errors(t)	0.435	0.223
	(0.312)	(0.122)
Output Gap(t-1)		0.161
		(0.227)
DEBT (t-1)		-0.078**
		(0.031)
Population size		21.60***
		(1.428)
Constant	168.9***	447.8***
	(33.64)	(72.58)
Number of observations	61	60
Number of groups	11	11
R-squared	0.521	0.499
Time dummies	YES	YES

Source: Authors estimates
Note: Driscoll-Kraay robust t-statistics in parentheses. They are robust to very general forms of cross-sectional and temporal dependence. All regressions control for the determinants of revenue forecast errors identified in the baseline specifications. Country fixed effects, Time fixed effects, and a constant term are included in each regression but are not reported.
*** p<0.01, ** p<0.05, * p<0.1

We rerun equation (5) with taking into account another economic factor such oil price volatility and agricultural raw material price volatility that could make forecasting more or less accuracy (see Table 4). The coefficient of oil price volatility is positive and statistically positive for all specification in our model. As reminder, all CEMAC countries are producer of petroleum except Central Africa. This finding shows that oil price volatility is also an important determinant of revenue forecasts errors. Given the fact that most of countries of our sample are

dependent to agricultural product, controlling for the volatility of the price of agricultural raw material aims to test whether our findings are robust to economic fluctuations. We can observe that the coefficients associated to raw material price volatility are strongly significant. This means the CEMAC and WAEMU countries are most affected by the fluctuations of world price of raw agricultural material. In a word, in the period of high volatility of world price, CEMAC and WAEMU countries forecasters overestimate their revenue.

Table 4: Estimation with economic variables

VARIABLES	Dependent variable: Revenue forecast errors		
	Driscoll-Kraay Fixed-effects estimation		
	(1)	(2)	(3)
GDP errors(t)	1.569***	2.459***	1.773**
	(0.311)	(0.607)	(0.480)
Inflation errors(t)	0.223	0.340**	0.402*
	(0.122)	(0.117)	(0.177)
Output Gap(t-1)	0.161	0.612***	0.496***
	(0.227)	(0.054)	(0.114)
DEBT (t-1)	-0.078**	0.006	-0.109*
	(0.031)	(0.046)	(0.049)
Population size	21.60***	16.98***	17.68***
	(1.428)	(0.952)	(1.754)
Agri. Raw Mat. Price Vol (t)		2.977***	
		(0.297)	
OIL price volatility (t)			0.607**
			(0.241)
Constant	447.8***	665.5***	544.5***
	(72.58)	(26.14)	(61.20)
Number of observations	60	55	55
Number of groups	11	11	11
R-squared	0.499	0.615	0.526
Time dummies	YES	YES	YES

Source: Authors estimates

Note: Driscoll-Kraay robust t-statistics in parentheses. They are robust to very general forms of cross-sectional and temporal dependence. All regressions control for the determinants of revenue forecast errors identified in the baseline specifications. Country fixed effects, Time fixed effects, and a constant term are included in each regression but are not reported.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Now, we analyze the errors in government revenue forecast by considering political, institutional, and governance factors (Table 5). The estimate of the variable "Election" is not significant for whole sample. We cannot conclude that CEMAC and WAEMU politicians tend to produce overoptimistic revenue forecasts to achieve electoral goals. Regarding to the institutional variables, the coefficient of "Corruption" has negative and significant sign in the estimation (Column 3). The results show that the least corrupt countries tend to reduce errors in revenue forecasts.

Concerning the good practice of PFM, the publication by the government of a report or a chapter on fiscal risks seem relevant in reducing errors in revenue forecasting. We found that the FAD technical assistance in previous year had no effect on the quality of forecasts. On the other hand, a thorough analysis shows that it is from the third year onwards, thus in the medium term, that the effects of technical assistance on the quality of income forecasts are felt. Also, our study did not found evidence for the comparison of the forecast to those made by independent agency

(IMF, World Bank, and Central Bank) in the quality of revenue forecast in WAEMU and CEMAC countries.

Table 5: estimation with politic and institutional variables

VARIABLES	Dependent variable: Revenue forecast errors					
	Driscoll-Kraay Fixed-effects estimation					
	(1)	(2)	(3)	(4)	(5)	(6)
GDP errors(t)	1.569***	1.482***	1.533***	1.750***	1.717***	1.030**
	(0.311)	(0.287)	(0.296)	(0.420)	(0.400)	(0.281)
Inflation errors(t)	0.223	0.366***	0.278***	0.615**	0.625**	0.311
	(0.122)	(0.095)	(0.083)	(0.192)	(0.230)	(0.402)
Output Gap(t-1)	0.161	0.123	0.225	0.575***	0.563***	0.787***
	(0.227)	(0.209)	(0.182)	(0.115)	(0.130)	(0.106)
DEBT (t-1)	-0.078**	-10.65***	-8.207***	-7.666**	-7.260**	0.668
	(0.031)	(1.303)	(1.137)	(2.405)	(2.714)	(3.335)
Population size	21.60***	22.63***	23.67***	18.80***	17.73***	16.78***
	(1.428)	(2.262)	(2.602)	(2.300)	(2.616)	(1.147)
Election		-1.206				
		(2.249)				
Corruption			-0.553**			
			(0.181)			
Publication of Budget Risk				-5.976**		
				(1.988)		
Independent agence					-0.407	
					(2.325)	
FAD – TA (t-1)						-1.049
						(0.947)
Constant	447.8***	516.2***	501.1***	634.4***	627.5***	780.2***
	(72.58)	(39.22)	(36.61)	(43.56)	(47.21)	(22.56)
Number of observations	60	60	60	55	55	42
Number of groups	11	11	11	11	11	11
R-squared	0.499	0.521	0.529	0.522	0.517	0.601
Time dummies	YES	YES	YES	YES	YES	YES

Source: Authors estimates
Note: Driscoll-Kraay robust t-statistics in parentheses. They are robust to very general forms of cross-sectional and temporal dependence. All regressions control for the determinants of revenue forecast errors identified in the baseline specifications. Country fixed effects, Time fixed effects, and a constant term are included in each regression but are not reported.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.6.3. Robustness test

In this section, we investigate the robustness of the results presented above. First, we include additional economic and institutional variables in the baseline model and estimated it with the same method as Driscoll-Kraay estimation. Moreover, we include the lagged value of our dependent variable as explanatory factor of current revenue forecast errors. Then we re-estimate the benchmark model by an appropriate econometric method.

4.6.3.1. Testing for additional controls on baseline specification

Our first attempt in this sensitivity checking consist in adding further controls in the baseline specification to take into account other variables likely to affect CEMAC and WAEMU countries government revenue forecast. These additional controls are political stability and absence of violence or terrorism measure perceptions and the size of government measure by the ratio of total revenue on GDP. First time, we add each variable individually and secondly, we add these two control variables together. Table 6 below details estimation results.

In column (1 to 3), we control for the size of government. The size of government has a positive effect on revenue forecast errors meaning that the larger the government, the more difficult it seems to forecast revenue. Moreover, all the variable of our baseline model keeps these sign and significance showing the consistence of our finding.

In column (4 to 6), we include political stability and absence of violence or terrorism measure perceptions. Here, the coefficients associated are highly significant in all specifications. Moreover, these coefficients remain statistically significant with the same negative effect when we include both size of government and political stability in the same equation (see column 7 to 9 in Table (6). Also, all the variable of baseline model (Table 6) as the same sign and significance even there are change in the coefficients.

In a word, our hypothesis about the effect of variables in our baseline model on government revenue forecast errors remains in force when we use another economic and institutional variable.

Table 6: Testing for additional control variables

VARIABLES	Dependent variable: Revenue forecast errors / Driscoll-Kraay Fixed-effects estimation								
	Government size			Politic stability			Gov. size and Politic stability		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP errors(t)	1.115**	1.857*	1.226*	1.699***	2.605***	1.984***	1.243***	2.028**	1.440**
	(0.438)	(0.761)	(0.558)	(0.281)	(0.485)	(0.360)	(0.367)	(0.664)	(0.445)
Inflation errors(t)	0.004	0.241*	0.325	0.413**	0.583**	0.720**	0.177	0.472**	0.619*
	(0.135)	(0.107)	(0.191)	(0.161)	(0.172)	(0.287)	(0.173)	(0.174)	(0.266)
Output Gap(t-1)	0.139	0.561***	0.529***	0.173	0.672***	0.602***	0.151	0.620***	0.625***
	(0.146)	(0.112)	(0.127)	(0.255)	(0.0655)	(0.115)	(0.172)	(0.138)	(0.146)
DEBT (t-1)	-0.059***	-0.0112	-0.0838*	-0.152***	-0.0703*	-0.186***	-0.125***	-0.0809*	-0.155**
	(0.015)	(0.034)	(0.036)	(0.038)	(0.035)	(0.042)	(0.023)	(0.036)	(0.046)
Population size	22.70***	18.22***	19.14***	20.04***	15.30***	15.77***	21.30***	16.59***	17.33***
	(1.882)	(1.988)	(3.097)	(1.807)	(0.906)	(1.625)	(2.348)	(1.988)	(3.117)
Gov. size	178.5***	126.1**	176.3***				173.0***	118.8**	169.9***
	(35.77)	(42.13)	(36.38)				(37.74)	(45.80)	(42.16)
Politic stability				-9.749***	-10.67***	-11.90***	-8.544***	-9.902***	-10.92***
				(1.931)	(1.838)	(2.542)	(2.003)	(1.402)	(1.682)
Agri. Raw Mat. Price Vol (t)		2.028***			2.766***			1.887***	
		(0.409)			(0.250)			(0.415)	
OIL price volatility (t)			0.033			0.384			-0.151
			(0.209)			(0.256)			(0.213)
Constant	453.8***	654.9***	620.3***	489.0***	719.3***	635.2***	489.8***	705.5***	700.8***
	(48.01)	(48.98)	(50.88)	(80.64)	(34.41)	(52.62)	(58.69)	(63.82)	(62.54)
Number of observations	60	55	55	60	55	55	60	55	55
Number of groups	11	11	11	11	11	11	11	11	11
R-squared	0.594	0.659	0.621	0.526	0.651	0.569	0.614	0.689	0.657
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: Authors estimates
Note: Driscoll-Kraay robust t-statistics in parentheses. They are robust to very general forms of cross-sectional and temporal dependence. All regressions control for the determinants of revenue forecast errors identified in the baseline specifications. Country fixed effects, Time dummies, and a constant term are included in each regression but are not reported.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.6.3.2. Revenue forecasting errors determinant estimation: Using the bias-corrected least-squares dummy variable (LSDV-C) estimator

We pursue the robustness analysis by introducing on the right-hand side of the equation (5) a lagged value of errors with the objective of reproducing the dynamics of the errors in the revenue forecast. The idea is to capture the persistence of errors as we can see in the studies of de Deus and Mendonça (2015), and Debrun and Kinda (2017). Therefore, this implies estimation of the following model:

$$e_{it} = \beta_0 + \beta_1 e_{it-1} + \beta_2 GDPerror_{it} + \beta_3 INFerror_{it} + \beta_4\, GAP_{t-1} + \beta_5 DEBT_{t-1} +$$

$$\beta_6 POP_t + \delta_t + \omega_i + u_{it} \quad (6)$$

Where e_{it} and e_{it-1} are the revenue forecast errors and its lag value, $GDPerror_{it}$ and $INFerror_{it}$ are the GDP growth forecast errors and error in consumer price index respectively; GAP_{t-1} is the output gap at the period (t-1); $DEBT_{t-1}$ (GDP ratio) is the public debt stock at the time (t-1); POP_t is the population size α and β_j are the parameters, t, i and j index years, countries and regressors, respectively; δ_t is the time-specific trend, ω_i represents country-specific effects and u_{it} the stochastic error term for each country i and year t. The time-specific intercepts are included to account for time-varying omitted variables and stochastic shocks that are common to all countries.

The estimation of model (6) may yield biased coefficient estimates because the lagged dependent variables are included. Also, with the unbalanced nature of our panel, we use for the regression the bias-corrected least-squares dummy variable (LSDV-C) estimator by Bruno (2005).

Results displayed in Table 7 show that the efficiency of our revenue forecast error is also driven by the pass error confirming the results obtained in the descriptive statistic section. We find

evidence that the signs and the significance levels of our variables are almost unchanged for the two-different specification. The result did not give evidence of effect of error of GDP forecast on revenue forecast errors. The errors in inflation forecast become significant with the same positive sign. The only major change occurs in the magnitude of the coefficients. Focusing on the output gap, we notice that coefficients estimated by the LSDV-C are about 0.08% higher than those estimated by the Driscoll-Kraay estimation. However, for the population size, the magnitude of coefficient is somewhat small from about 5% compare to the Driscoll-Kraay estimation.

Table 7: Bias Corrected LSDV Dynamic Panel Model estimator

VARIABLES	Dependent variable: Revenue forecast errors		
	LSDV-C, one-periods	LSDV-C, two periods	Driscoll-Kraay FE
	(1)	(2)	(3)
errors (t-1)	0.604***	0.595***	
	(0.126)	(0.126)	
GDP errors(t)	0.348	0.352	1.569***
	(0.632)	(0.630)	(0.311)
Inflation errors(t)	0.753**	0.747**	0.223
	(0.362)	(0.358)	(0.122)
Output Gap(t-1)	0.008	0.006	0.161
	(0.509)	(0.506)	(0.227)
DEBT (t-1)	-0.156*	-0.156*	-0.078**
	(0.083)	(0.085)	(0.031)
Population size	16.56	16.65*	21.60***
	(10.08)	(10.01)	(1.428)
Number of observations	47	47	60
Number of groups	11	11	11
Time dummies	YES	YES	YES

Source: Authors estimates

Note: the table reports the result of estimation of the dynamic model specification (6) using the least square dummy variable approach (LSDV) with the proposed bias correction for dynamic panel models of Bruno (2005) explaining the sd of the revenue forecast errors. Country fixed effects, time dummy, and a constant term are included in each regression but are not reported. Biased-corrected standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.7. Social effects of fiscal forecasts errors

This section assesses the distributional effect of fiscal forecast errors in studied countries sample. An important aspect of distributional outcomes arising from fiscal policy changes is related to their implications for income distribution. As is widely recognized, income distribution plays a key role in political and economic stability and thus has a wider significance (see for example Alesina and Perotti, 1996). Accordingly, governments are tasked with the role of determining the desirable distribution of resources within the economy and employing an array of policy tools to adjust economic outcomes for their populations. We consider a fiscal forecast errors as a shock in fiscal policy, that is, the measurement error associated with the fiscal projection. Fiscal policy shocks can affect income inequality through its impact on the distribution of market income as well as disposable income. In fact, a shock in fiscal policy generally leads to a short-term reduction in output and employment, often associated with a fall in the share of wages. This tends to increase market income inequality, given the relatively high share of wages in the incomes of low-income groups (Jenkins et al., 2013). Increasing unemployment also tends to widen wage inequality, as unskilled wages decline relative to skilled wages, as employers accumulate skilled labor (Mukoyama and Sahin, 2006). The duration and magnitude of these effects depend on the size of the automatic stabilizers, as well as the response of growth and its impact on employment. While multipliers are particularly high during downturns (Jordà and Taylor, 2016), fiscal policy shocks can have a significant effect on employment. These effects can be long-lasting if a prolonged period of slow growth has negative effects on supply side of economy (Aghion et al., 2009). Beyond its effects on market incomes, fiscal policy shock also affects the level and composition of taxes and expenditures and therefore disposable incomes. When fiscal policy shocks are based on increasing regressive taxes and reductions in incremental spending, income inequality tends to increase the more.

Hereafter follows an econometric test of social effect of fiscal policy shocks over the years 2004-2015 for 11 WAEMU and CEMAC countries. The test takes the following form:

$$inclusive_{it} = \alpha + \beta * FE\_shock_{it} + \gamma X_{it} + \eta_i + e_{it} \; ; \quad i = 1, \dots, N \; ; t = 1, \dots, T \qquad (7)$$

Where i and t denote respectively the country and time period; X is a vector of determinants and control variables, η_i is the time-invariant country's fixed effect; and e_{it} is the idiosyncratic error term. FE_shock is our fiscal forecast errors computed as the difference between as outturn and forecast of government revenue.

inclusive is the dependent variable, that captures the social effect of forecast errors and hence fiscal policy shocks. Our measure of inclusive growth stems from that of Ramos et al. (2013), which stated that inclusive growth is both an outcome and a process: on the one hand, it ensures that everyone can participate in the growth process, both in terms of decision-making for organizing the growth progression as well as in participating in the growth itself; on the other hand, inclusive growth makes sure that everyone shares equitably the benefits of growth. Thus, inclusive growth has elements pertaining to "broad based growth, shared growth, and productive employment opportunities". The indicators: For participation, we use the employment-to-population ratio which represent the absorption rate; and for benefit sharing, unlike Ramos et al. (2013) that focused both on poverty and income inequality, we focus our analysis only on income inequality measured by the Gini coefficient. This is due to data constraint. Finally, as inclusive growth encompasses the pace of growth, we include the per capita income growth to account the growth progression. The Gini coefficients are from the Standardized World Income Database (SWIID) and measured the net Gini i.e. the Gini after tax and transfer. The employment-to-population ratio, which is the proportion of a country's population that is employed, is provided by World Bank Indicator. The GDP per capita growth is from World Bank Indicator.

The inclusiveness index is constructed through a min-max normalization[19] of data on income inequality index, the employment-to-population ratio, and the per capita income growth. Next, we multiply the index by 100 to have an indicator ranging from 0 to 100 scales. The lower values of the index imply better performances; that is, the closer to 0 the index, the more inclusive the country. More especially, the index will be closer to 0, the lower the Gini index, and the higher the employment-to-population ratio and an increase in per capita income. In other words, the low value indicates a high level of inclusiveness. The higher index value represents a worse performance in terms of inclusiveness. The index is the sample average of the three min-max normalizations. Intuitively, it represents the average distance of a country's position regarding growth, inequality and employment to the best situations within the group of countries analyzed.

The set of independent variables includes. A variable of main interest in our study is the fiscal policy shocks variable. We also include control variables that have been found in literature as determinant of inclusive growth. These variables account for the economic fluctuations (output gap, oil price volatility, and inflation), public total investment, agriculture value added in percentage of GDP, politic stability, public spending on health expressed as percentage of GDP, and foreign direct investment inflow as percentage of GDP. The frequency of these explanatory variables is in general annual. In order to control for the quality of overall governance and efficiency of the public sector we control for the level of corruption, government effectiveness, and rule of law. Bad governance with corruption increases income inequality, mostly by reducing economic growth Abed and Gupta (2002). We measure government effectiveness, and rule of law with the Worldwide Governance Indicators (WGI), and corruption with

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[19] The **min–max normalization** consists of calculating the ratio between the country's figure minus the lowest figure possible in the two periods, and the difference by the highest and the lowest figures possible, also considering the two periods. This is done for each one of the three series.

Transparency International institutional database. Therefore, the poor quality of these variables is expected to lead to increased inequality through distorts the economic and financial environment and affects people's ability to earn income and achieve reasonable standards of living.

The results presented in Table 8 show that the coefficient of fiscal policy shocks is positive and statistically significant. This suggests that an error in revenue forecast referred to as fiscal policy shocks has a detrimental effect on inclusive growth. A one percent increase in revenue forecast errors is associated with about 0.12 decrease in the growth inclusiveness in the countries used in our study. The positive and somewhat significant (at the 10 percent level in the estimation with fixed effects and robust standard errors) coefficient on oil price volatility and inflation imply that economic fluctuations harm the inclusiveness of growth. The estimates show a negative and significant effect of government spending on health on our index of inclusive growth. Specially, an increase of total public expenditure in general and spending on health in particular induces an increase in growth inclusiveness. Similar result is obtained when one controls for the agricultural value added. These results highlight that the well-targeted investment to support the disadvantaged (for example, specific investments that improve the productivity of the agricultural sector in developing countries, or those that improve the prospects for higher labor force participation of women) also helps ensure that the benefits are more broadly shared. In this context, the estimation suggests that an increase in agriculture value added of 1 percent of GDP leads to a medium-term increase in inclusive growth of about 0.7 percentage point. Furthermore, our results on the effects of institutional variables quality such as government effectiveness, and rule of law are consistent with findings from literature with suggests that higher quality of institution variables increase inclusive growth by increasing growth and reducing income inequality.

Table 8: Distributional effects of fiscal policy shocks

VARIABLES	Dependent variable: Inclusive growth index			
	Driscoll-Kraay Fixed-effects estimation			
	(1)	(2)	(3)	(4)
Fiscal policy shocks	0.123**	0.120***	0.129***	0.119***
	(0.034)	(0.032)	(0.032)	(0.031)
Output Gap	0.051	0.092	0.071	0.097
	(0.139)	(0.121)	(0.134)	(0.135)
Oil price volatility	0.853**	0.826**	0.755*	0.589*
	(0.349)	(0.321)	(0.320)	(0.272)
Inflation	0.693**	0.759***	0.733**	0.783**
	(0.191)	(0.160)	(0.214)	(0.243)
FDI inflows	0.260	0.189	0.308	0.327
	(0.245)	(0.286)	(0.254)	(0.253)
Gov. spending on health	1.088	1.106	1.426	2.505**
	(0.799)	(0.804)	(0.895)	(0.992)
Public investment	-1.960**	-1.884**	-2.087**	-2.429**
	(0.637)	(0.656)	(0.650)	(0.791)
Agric. value added	-0.700***	-0.681***	-0.685***	-0.753***
	(0.134)	(0.135)	(0.131)	(0.164)
Corruption		-0.289		
		(0.246)		
Gov. effectiv.			-11.70**	
			(4.767)	
Rule law				-13.06***
				(1.906)
Constant	-6.154	-7.350	-19.87	-17.53
	(19.41)	(17.19)	(24.64)	(21.81)
Number of observations	55	55	55	55
Number of groups	11	11	11	11
R-squared	0.402	0.410	0.411	0.428

Source: Authors estimates
Note: Driscoll-Kraay robust t-statistics in parentheses. They are robust to very general forms of cross-sectional and temporal dependence. The fiscal policy shocks are the errors in forecast. The dependent variable is inclusive growth index, the lower values of the index implies better performances. Country fixed effects, Time dummies, and a constant term are included in each regression but are not reported. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.8. Conclusion

In this chapter, we assessed revenue forecasting in two francophone Africa areas (CEMAC and WAEMU) by looking at budgetary projections. Having in mind that forecasting is a complex task surrounded by huge uncertainty, we documented the statistical properties of forecast errors using data collected from national draft budgets that were made for the period 2004-2015. We performed a panel data analysis of the potential determinants of revenue forecasting errors as well as the distributional effect of fiscal policy shocks considering a wide set of economic, political and institutional variables.

Our results from statistical point of view show that the quality of forecasts is worse for revenue in all sample. Further, the degree of cross-country heterogeneity is higher in the sample. The statistical analysis shows that only one country produces both relatively unbiased and accurate fiscal forecasts – Benin. The test of inefficiency shows that both in these two economic areas, the inefficiency of fiscal forecast occurs in most time because the forecast deviation is proportional to the forecast itself (this is the case of tax revenue and total revenue), but also because the past errors are repeated in the present.

The results regarding the analysis on determinants of revenue forecasting errors confirm those found in the literature. In this sense, the results denote that a part of revenue forecast errors can be explained by random shocks to the economy. For instance, unexpected changes in the GDP growth, change in consumer price measured by inflation and the price volatility. Moreover, unlike the findings of de Deus and Mendonça (2015), our work found that output gap (economic cycle) in the previous year is relevant economic factor that cause a bias in the government revenue forecast errors. However, public debt/GDP ratio is associated with lower budget balance forecast error, against our expectation. According to de Deus and Mendonça (2015), this can be the possibility of creating aversion to fiscal policymakers. The study cannot

conclude that CEMAC and WAEMU politicians tend to produce overoptimistic revenue forecasts to achieve electoral goals. The good practice of PFM namely the publication by the government of a report or a chapter on fiscal risks seem relevant in reducing errors in revenue forecasting. Lastly, concerning institutional variables (corruption and politic stability), such as noted by Pina and Venes (2011), the findings indicate that they cannot be neglected in the analysis of fiscal forecasting error.

Regarding the distributional effect of fiscal policy shocks, the results suggest that an error in revenue forecast considered as fiscal policy shocks has a detrimental effect on inclusive growth. These effects on employment and inequality are mitigated in a healthy economic environment accompanied by better institutional quality.

4.9. Appendices

Appendix A1: countries

WAEMU	CEMAC
BENIN	CAMEROON
BURKINA FASO	CENTRAL AFRICAN REPUBLIC
CÔTE D'IVOIRE	CHAD
MALI	CONGO, REP.
NIGER	GABON
SENEGAL	
TOGO	

Appendix A2: variables definition and data sources

Variables	Description	Sources
Revenue outturn	Revenue outturn	National Autorities documents
Revenue forecast	Revenue forecast	National Autorities documents
Real GDP growth	Real GDP, current prices in national currency	World Economic Outlook (WEO)
Inflation	Average consumer prices, Percent change	World Economic Outlook (WEO)
Output Gap	Difference between actual GDP and potential GDP, Authors calculations based on WEO data	World Economic Outlook (WEO)
Debt	General government gross debt 9percent of GDP)	World Economic Outlook (WEO)
OIL price	Crude oil, average ($/bbl)	World Economic Outlook (WEO)
Agricultural Raw Price	Agricultural raw material, nominal($/kg)	World Economic Outlook (WEO)
Politic Stability	Captures perception about the likelihood that the government will get destabilised /overthrown through unconstitutional or violent means	Worldwide Governance Indicators (WGI)
Government Effectiveness	Measuring the competence of the bureaucracy and the quality of public service delivery	Worldwide Governance Indicators (WGI)
Corruption	Measures the perceived levels of public sector corruption	Transparency International
Election	Election Year	

GENERAL CONCLUSION

GENERAL CONCLUSION

Achieving a pattern of income distribution that policy makers deem desirable and acceptable to society as a whole is one of the objectives of fiscal policy in its own right. Indeed, it promotes social cohesion and political stability and enables the whole of society to participate in the overall process of economic growth, even if the contribution of different groups of the population varies. But achieving an income distribution model that stimulates growth and job creation should also be considered an intermediate goal. For both of these reasons, it is essential for developing countries to carefully consider how fiscal policies influence the distribution of income as part of their development strategies. The role of fiscal measures as instruments for simultaneously stimulating economic activity and improving income distribution may be viewed in a different light. Indeed, the potential for using taxation and public spending to reduce inequality without compromising economic growth is likely to be much greater than is generally assumed. In the context of fiscal consolidation in many economies, tax and spending measures should enhance or maintain the distributive effects of fiscal policy while supporting economic efficiency. These measures include reducing opportunities for tax evasion and tax avoidance, increasing the progressivity of income taxes relative to higher income brackets, reducing unproductive expenditures, and means-tested programs. Improving the distributive impact of fiscal policy in developing economies will require improving their ability to raise tax revenues and spend these resources more efficiently and equitably.

Developed economies have a much longer history of using fiscal policy to address inequality and promote inclusive growth than those in developing countries. Therefore, as developing countries explore the more active use of fiscal policy for inclusive purposes, they can learn from the experiences of advanced countries. Those experiences clearly suggest that fiscal policy can have a significant effect on inequality, which is a source of optimism about its potential to promote equity. Nevertheless, this optimism should be tempered by the different circumstances

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of advanced economies compared to developing economies, as well as by the need for least developed countries to maintain fiscal sustainability and economic growth.

In general way, inclusive economic growth can be thought of as encompassing income growth in which no socio-economic group is deprived of growth benefits. Fiscal policy is inclusive if it deploys instruments that promote inclusion and promotes its traditional objectives of growth and macroeconomic stability. Here, the non-income dimensions of inclusion are ignored, so that inclusive economic growth is growth with declining inequality. In addition, we are interested only in fiscal instruments such as taxation and public spending.

Therefore, the objective of this thesis was to analyze the effects of fiscal policy on inclusive growth and to do so, we have presented four essays in which different econometric techniques are used to assess the growth inclusiveness effects of government fiscal policy in developing countries. Our analysis is divided into two parts: through Chapters 1 and 2, the first part has dealt with the evaluation of government tax and spending policy effects on inclusive growth in developing countries. The second part of this thesis has presented the analyzing of fiscal adjustment, fiscal forecast and inclusive development through Chapters 3 and 4.

Main results

Chapter 1 examines how public tax revenue components (value added tax, personal income tax, and corporate income tax) affect the inclusiveness of growth in developing countries. The link between tax policy and inclusive growth deserves attention, as income and consumption levels are the main indicators of household well-being. So, any change in tax policy necessarily implies a change in price structure which affects consumer preferences. This change can affect households indirectly through the change in production factors cost, and thereby their income. The inclusive growth index used refers to that developed by Anand and al. (2013), which

integrates both the pace and distribution of economic growth. In fact, it integrates growth and income distribution into a single measure. Thereby, it provides a framework to study equity and efficiency together.

Using a database of 91 developing countries over the period 1990-2015, we show that, personal income tax (PIT) has been the best tool to affect the income distribution, leading to a more inclusive growth. The study discusses also the role played by institutional variables qualities in the implementation of tax policy. In the case of corporate income tax, the chapter provides evidence that this tax contributes to greater inclusive growth if and only if the countries have a strong institution quality like low corruption and a good bureaucratic policy. Moreover, we analyze the nonlinear effect of the taxation on inclusive growth. The specific objectives is a determination of the threshold of taxation for developing countries beyond which the inclusiveness of growth declines. Our result shows that there is an optimal tax beyond which, any increase in the personal income tax rate should have negative impact on inclusive growth. Regarding the VAT, the analysis of threshold effect shows that it is from a certain threshold that the VAT revenue positively affects inclusive growth. This highlight several problems in VAT such as numerous exonerations, and non-refunding of VAT credits making VAT little accountable. Furthermore, the chapter tried to see whether or not there is a politico-budgetary cycle in the effect of taxation. The analysis shows that governments tend to reduce the income tax rates in electoral periods, but not necessarily the consumption tax rates. This implies that the income tax rates have a bigger impact on voters' choices compared to consumption taxes. Finally, we examine whether the impact of tax policy on inclusive growth has been affected by great financial crisis that took place during the year 2008. We found the improvement in the effect of tax policy on inclusive growth after the financial crisis. One explanation could be developing countries have reformed their tax system in the sense of taxation in favor of pro-poor growth.

Chapter 2 evaluates the effects of government expenditure components on both equity and growth, in sub-Saharan countries. Specifically, the chapter tries to analyze whether it is possible to design public spending in order to promote a more equitable society without sacrificing economic growth. The chapter is important for countries in sub-Saharan Africa at the time when governments face many political and economic challenges such as commodity price volatility, inflation, terrorism, and poor institutional quality (corruption, poor governance). Thus, the inclusion of the growth target could only be achieved through a quality institution and productive pro-poor government expenditures in the form of broad-based spending on education, health and infrastructure. To carry out the study, a panel-data vector autoregressive (panel VAR) approach is employed on annual data of 10 sub Saharan African countries over the period 1990-2015.

Our findings from impulsive response function give evidence that investment in infrastructure (quality and stock) contributed to more inclusive growth in Sub-sub Saharan African economies than others government spending in long term. This effect could be observed by an increased in GDP per capita growth and reducing in income inequality measured by Gini index. However, our results do not find evidence that public spending on education and health affect both equity and growth in Sub-Saharan Africa countries. In fact, among other reasons, these programs are in many countries located in urban areas thus not directly benefiting the rural poor or even those in the informal settlements in urban areas. Moreover, social spending in developing countries often benefits the rich and middle classes more than the poor. Therefore, a higher share of social spending on items such as health and education will not be reflected in higher incomes for the poor. These results are confirmed by the variance decomposition analysis (FEVD).

Chapter 3 explores the effects of fiscal adjustment on inclusive growth in Côte d'Ivoire over the period 1980-2014. Addressing such issue seems necessary as poor income distribution could

reduce the government's political support for implementing consolidation measures, but also because high levels of inequality could hurt long-term growth. In order to measure the impact of fiscal adjustments we use the cyclically adjusted primary balance (CAPB) as the measure of the government's fiscal stance. The interest of this fiscal measure is that it isolates discretionary policy action from effects resulting from economic activity such as inflation or real interest rate changes. Contrary to Yang et al. (2015) that use a share price index as an additional variable determining the CAPB, we use the international price of cocoa. In fact, cocoa accounts for 15% of Côte d'Ivoire's GDP and more than 50% of its export earnings. When considering cocoa price as a business cycle factor, it would be ideal to include other types of commodity prices such as oil price and coffee price. But we use only the price of cocoa as a business cycle factor due to its particular relevance to tax revenues, and we believe this index is representative of the other commodity price movement. Therefore, a period of fiscal adjustment corresponds to a year in which the cyclically adjusted primary balance (CAPB) improves by at least 1 per cent of GDP. The estimation of the inclusiveness effects of fiscal consolidation in Côte d'Ivoire is made using the Bayesian Model Averaging (BMA) method developed by Magnus, Powell, and Prüfer (2010).

Our results show that fiscal consolidations are followed by an improved in growth performance, but also income gap decreases after periods of fiscal adjustments in Côte d'Ivoire. In other words, there is no trade-off between growth and income inequality when implementing fiscal consolidations in Côte d'Ivoire. This conclusion contrasts to the results of several papers that analyze the impact of fiscal consolidations on inequality at the national level. Our findings also suggest that tax-based fiscal consolidations seem to increase economic growth. However, the results did not find evidence to the expansionary effect of spending-based fiscal adjustment. These results could be explained by the fact that in developing countries, tax based-adjustment are generally a base-broadening measures. Therefore, this will contribute to strong tax revenue

collections and play an important role in achieving higher, sustainable economic growth. Moreover, we find that tax revenue increases in Côte d'Ivoire were not associated with increases in inequality. Interestingly, when fiscal consolidation is achieved via revenue side, income inequality seems to be reduced further. In addition, reductions in primary expenditures do not seem to reduce the income gap.

The **last chapter** investigate the fiscal forecasts and it social effects in CEMAC and WAEMU countries. The objective of this chapter is threefold. First, it aims to assess the quality of fiscal forecasts (accuracy, rationality and unbiasedness) in these two-economics areas. Second, it tries to analyze the determining factors of fiscal forecast deviation for CEMAC and WAEMU countries. Third, it analyzes the social effects of fiscal policy shocks through its impacts on the growth inclusiveness. Having in mind that forecasting is a complex task surrounded by huge uncertainty, we documented the statistical properties of forecast errors using data collected from national draft budgets that were made for the period 2004-2015. Three aspects are tested: accuracy, rationality and unbiasedness. Assuming the presence of cross-sectional dependence in our model, that could be caused by the common factors which are unobserved, we resort to a Driscoll and Kraay (1998) standard errors estimation method in order to have the unbiasedness estimators.

The statistical analysis of the quality of fiscal forecast shows that only one country produces both relatively unbiased and accurate fiscal forecasts – Benin. The test of inefficiency shows that both in these two economic areas, the inefficiency of fiscal forecast occurs in most time because the forecast deviation is proportional to the forecast itself, but also because the past errors are repeated in the present. Furthermore, the degree of cross-country heterogeneity is high in the sample. The investigation on potential determinants errors denote that a part of revenue forecast errors can be explained by random shocks to the economy like unexpected

changes in the GDP growth, change, consumer price measured by inflation and the price volatility. Against our expectation, public debt/GDP ratio is associated with lower budget balance forecast error. Our study does not find evidence of the effect of election year on revenue forecasts. Finally, the good practice of PFM namely the publication by the government of a report or a chapter on fiscal risks seem relevant in reducing errors in revenue forecasting. Regarding the distributional effect of fiscal policy shocks, the results suggest that an error in revenue forecast considered as fiscal policy shocks has a detrimental effect on inclusive growth. These effects on employment and inequality are mitigated in a healthy economic environment accompanied by better institutional quality.

Recommendations

Overall, our analysis in Part 1 has shown that fiscal policy especially tax and expenditure policy play a critical role in the inclusive growth and its effect depends on the quality of countries institutions. The main recommendation from the Chapter 1 goes to the least developed countries, which must rely on indirect taxation for achieve their goal of redistribution and poverty reduction. These countries should adopt inclusive growth strategies in a healthy institutional environment that focus on the effective management of revenues from indirect taxes including VAT given the dominance thereof in their tax system. In addition, Chapter 2 also showed that the composition of government spending affects the inclusiveness of growth especially in sub-Saharan African countries, but the effect is greater in the case of investment in infrastructure than other kinds of public spending. The main recommendation for sub-Saharan countries is to consider temporary and well-targeted programs to help those being left out by the growth process. Furthermore, Governments of sub-Saharan African countries should direct their policies strategies on increasing productive public expenditure on health, education, and infrastructure.

The results obtained in Part 2 of this thesis suggest that restoring public finances is a prerequisite for sustainable and inclusive economic growth, and this require credible medium-term fiscal adjustment strategies as well as a credible budgetary projection. Chapter 3 shows that in the case study of Côte d'Ivoire there is no trade-off between growth and income inequality in a period of fiscal adjustment. Furthermore, tax-based fiscal consolidations seem to play a major role in inclusive economic growth than spending-based fiscal adjustment. Here, the main recommendation is to implement tax reforms that enhance the efficiency and fairness of the tax system, mainly by broadening the tax-base through a reduction of tax exemptions with combating opportunities for tax avoidance and evasion.

Moreover, as we have shown in Chapter 4, the quality of fiscal forecasts is not good. The inefficiency of fiscal forecast occurs in most time because the forecast deviation is proportional to the forecast itself, but also because the past errors are repeated in the present. Furthermore, a part of revenue forecast errors can be explained by random shocks to the economy. Therefore, these errors in revenue forecast considered as fiscal policy shocks has a detrimental effect on inclusive growth. For these countries, we recommend the good practice of PFM namely the publication by the government of a report or a chapter on fiscal risks, and a comparison of government forecasts with those of independent agencies. In addition, the forecasting body should include outside experts in order to widen the economic knowledge available to the forecasting body and can improve how well a forecast is trusted.

Limitations and possible extensions

With respect to redistribution, this work focuses only on income equity. Therefore one of the areas of research, and that we did not explore in this thesis, is to incorporate gender equity into inclusive growth: Achieving greater gender equity is an important aspect of fostering greater inclusiveness of growth, including enhancing human capabilities. In other word, it is to show evidence on the direct links between fiscal policy and gender equality. The idea is to provide evidence on how women and men are affected by fiscal policy in different ways and how fiscal policy can contribute to advance gender equality.

Next, the notion of inclusive growth is very broad and can be perceived differently across countries. Each country can focus on a pillar of its choice according to its economic and social agenda. In such a situation, there may be heterogeneity. Then a possible extension of this work would be to estimate our model with a heterogeneous panel or estimate country by country.

Finally, further study could consider the "non- tax revenue" obtained by the government from sources other than tax. Revenue from this source can offert geater space for developing

countries public finance and are also less sensitive to commodity price fluctuations for resource-rich countries.

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