

Impact of Public Expenditure on Economic Growth in WAEMU Countries: A Re-Examination

By

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Abstract

Besides fulfilling their state sovereignty responsibilities, governments are increasingly participating in economic growth through the production of goods and services. This is why it is possible to measure a government's weight in the economy by estimating the share of its expenditure in the gross domestic product (GDP). However, the issue of the effectiveness of government expenditure requires accurate knowledge of economic repercussions, as these have, for a long time, been considered to be destructive to the wealth that usually derives from taxes and borrowing. The aim of this study is thus to re-examine the structure of government spending in the member states of the West African Economic and Monetary Union (WAEMU), and to determine their relative influence on economic growth. The issue of the impact of public expenditure on the level of economic performance is not new. Numerous studies have explored this area of economic analysis. However, the relationship between the specificities of public expenditure and the resultant economic growth is an aspect of this analysis that calls for further research. The distinction between productive and non-productive public expenditure is the cause of the differing levels of economic growth that can be observed in the WAEMU area. Statements of non-productive public expenditure vary significantly from one country to another, depending on each country's specificities and priorities of the moment. The study attempted to demonstrate that public expenditure in the WAEMU area tends to improve economic growth at a low but still significant level. A comparative analysis of the results shows that public expenditure in countries with characteristics similar to those of the WAEMU countries accounts for economic growth in a more significant way than in the case of other countries, mostly those in the Sahel region. The analysis also shows that too much intervention in the economy from the government increases private sector mistrust, leads to opportunistic behaviour and reduces the marginal efficiency of capital. Finally, the results of this study show that bad governance and the deterioration of the political risk index considerably weaken the economic growth in the WAEMU region.

1. Introduction

The nature and credibility of institutions are new variables that one must consider when appraising the efficiency of the implementation of an economic policy (Boettke, 2005). Economists and donors (financial institutions, donor countries, etc.) are becoming increasingly interested in these two variables. In such a context, government and the way it functions become determining factors not only in the intensity and maintaining of partnership agreements, but also, and especially, in the strategies of development and economic growth. Nowadays, North–South relations hinge on good governance. That is, the capacity of governments in the South to set up an effective regulatory framework, to respect their commitments and to spend public money on the real needs of their countries, have become the indicators of how credible they are in the eyes of the North. While expanding on the new theories of growth, still referred to as theories of endogenous growth, many economists have been interested in the interaction between public expenditure and economic growth.

When statistics on individual countries are taken into account, the results of this study offer a picture of mixed results, as does the existing economic literature. For example, Ott (2002) and Button et al (2003) maintain that public expenditure does not account for economic growth while economists such as Rosner (2003) and Glosch and Roy (2004) have shown that public expenditure contributes to an improvement in the rate of economic growth in developing countries.

So, it is evident that the debate on the relationship between public expenditure and economic growth is not new. It has indeed featured a great deal in the literature. However, few of studies analyse the case of WAEMU countries. The rare studies examine the countries of the region case by case. When the authors deal with the member states of the Union, they do not consider the impacts of public expenditure with an aggregate view. Thus, an analysis of the influence of different components of public expenditure, private sector and institutional variables such as economic governance and political risk index could be interesting. In a context of lack of resources and constraints imposed by good governance, this analytical contribution provides added value to the identification of sectors that improve economic growth and a better understanding of the role of government as an actor in economic development. This study is all the more relevant because the countries of the Union have been facing several crises and waves of socio-political instability which have weakened the fundamentals of the economy. It is thus important to engage in a reflection on the search for solutions that would lead to lasting peace and guarantee a better environment for economic growth.

The WAEMU region is a large market of more than 70 million consumers with an average annual per capita income of \$390 (ADB, 2011). With the expectations of this

huge population in mind, the issue of how to achieve a positive and sustainable economic growth derived from productive public expenditure is important. The study sought to address the specific question of whether it was empirically possible to demonstrate that certain specificities of public expenditure stimulate or hinder economic growth. We could argue further that from an institutional point of view the situation of WAEMU countries is not very bright. Indeed, according to Transparency International (2009), the corruption index statistics show that almost all the countries in the WAEMU area have an index that is below 4 on a scale ranging from 0 (the highest level of corruption) to 10 (the highest level of integrity). Moreover, according to the Economist (2008), a look at the democracy index, which accounts for governance, shows that except for Benin and Togo all the other countries in the Union could be classified among authoritarian regimes, since their indices were below 4 on a scale from 0 (for an authoritarian regime) to 10 (for a democratic regime). In addition, some WAEMU countries have experienced unconstitutional changes and armed conflicts and still have areas of tension within their territory. It would thus be appropriate to consider all these parameters in the analysis of factors that are likely to account for economic growth in this area of the West African region.

Numerous and varied studies have analysed the effects of public expenditure on the level of economic growth. Some of them are: Barro (1990), Devarajan (1996), Barro and Sala-I-Martin (1992), and Ventelou (2002). More recently, Rajaraman (2005) and Gupta et al (2005) have highlighted the impact which public expenditure could have on the trends in a country's gross domestic product (GDP). Case studies focusing on certain African countries were carried out by Ashipala and Haimbodi (2003) using data from Namibia. For the specific case of West Africa in general, and of the WAEMU area in particular, little research has been done on the relationship between public expenditure and economic growth. The main studies are those of Nubukpo (2007) and Dumont and Mesplé-Somps (2000). The study by Dumont and Mesplé-Somps (2000) analysed the impact of infrastructure expenditure on the competitiveness of the Senegalese economy. There are also some sector-based studies on the impact of public expenditure in the health and education sectors (see, for example, Chimobi, 2009).

This study is different from those mentioned above in three respects. First, it focuses on just the WAEMU area; second, it analyses public expenditure through their specificities; and third, in addition to public expenditure, it takes into account institutional variables while accounting for economic growth.

The study's focus on the WAEMU area can be justified by several reasons. The member states of the Union use a common currency, the CFA franc, which is pegged to an external convertible currency, the Euro. This monetary connection, made possible by financial cooperation agreements between the Central Bank of West African States (BCEAO) and the French Public Treasury impose an unusual budgetary discipline on the countries of the Union. This implies that the allocations of public expenditure should be more rational and efficient. It is therefore necessary to identify the best sectors for public investments in order to improve economic growth. WAEMU countries face international pressures related to the accumulation of budgetary deficits, to the risk of the non-sustainability of the public debt, and to the crowding-out effects that are detrimental to the private sector.

Unlike previous studies, this one examined the specificities of public expenditure and

measured their different effects on economic growth. Specifically, it sought answers to the following questions: Is the productive nature of public expenditure essentially related to the individual specificities of the member states? Why does the public expenditure described as non-productive differ from one country to another in the same geographical area? What explains the differences in economic performance that result from the effect of public expenditure?

A further point that makes this study relevant is that it considers account institutional variables as explanatory factors for economic growth. For more than a decade, some WAEMU member states have been marked by recurrent socio-political crises, armed conflicts and changes in government. This worrying situation engenders political instability and weakens the productive potential of the region. This is because the public expenditure that should have boosted economic growth is allocated to reconstruction, and rehabilitation of ex-combatants or of basic socio-economic facilities. A study of the interrelationship between public expenditure and economic growth would thus benefit from including explanatory variables such as the governance index, the political risk index, etc.

To sum up, this study aimed at analysing the impact of public expenditure on economic growth in the WAEMU countries by considering the effects of institutional variables in order to better understand the reality.

The aim of this study is to use macroeconomic and institutional variables to critically analyse the impact of the public expenditure on the economic growth of the WAEMU countries. Its specific objectives are to:

- a) estimate the impact of public expenditure on economic growth
- b) analyse the effects of institutional variables on public expenditure and economic growth
- c) check the stability of the model in relation to structural breaks.

The remainder of this paper is organized as follows. The next section outlines the objectives. Section 3 gives the review of the literature. The research methodology is found in Section 4; Section 5 describes analysis of the data, Section 6 presents the results and Section 8 concludes.

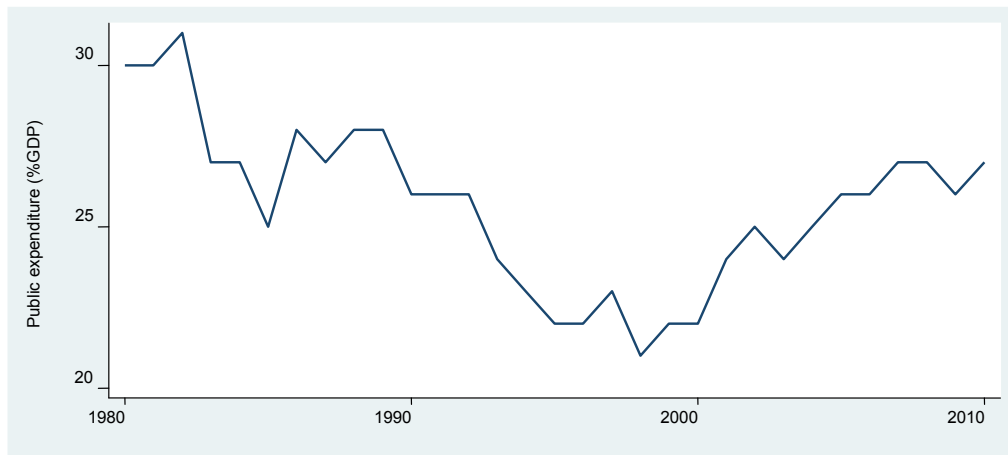
2. Public expenditure and economic growth: Trends

This section analyses the trends in public expenditure and economic growth in the WAEMU countries. It is subdivided into two sub-sections: the first section deals with the specificities of public expenditure and the second examines the main characteristics of economic growth.

Specificities of public expenditure

Figure 1, which is a curve of the trends in public expenditure as a percentage of GDP during the last three decades, shows a two-stage trend. Stage 1, which spans the period from 1980 to the end of the 1990s, is characterized by a downward trend in public expenditure. Stage 2, which spans the period from 2000 to the present, shows a clear upward trend.

Figure 1: Trend of public expenditure in WAEMU area



Source: Author's estimation based on ADB (2011)

The downward trend that characterizes the first stage can be attributed to the spells of instability related to the implementation of various structural adjustment programmes (SAPs) and the tough economic circumstances which the WAEMU countries went through. The prolonged drought in the 1980s also contributed to the reduction in government spending, following a decline in revenues from taxes and

in official development aid. Furthermore, the Franc-zone countries experienced financial difficulties in the late 1970s as a result of deterioration in terms of trade. This concerned coffee and cocoa for Cote d'Ivoire, oil and groundnuts for Senegal, cotton for Burkina Faso, and beef for Mali. Twenty years of opaque management of state-owned companies were not enough to ensure strong economic stability and sustainable economic development.

That led the WAEMU countries to record huge budget deficits. As a result, creditors and donors, interested in recovering their money, demanded a stabilization of public expenditure. In concrete terms, they demanded the countries concerned to reduce their expenditure and balance their way of life. All these measures, part of SAP, had to be accepted by governments that wished to continue benefiting from the favours and the indispensable financial assistance from foreign governments and investors. Unfortunately, the SAPs did not achieve the desired goals and the economic and financial difficulties continued and worsened beyond the 1990s. Consequently, public services were inadequate and non-functional most of the time, unemployment reached record figures, and inflation aggravated the social malaise as the countries' economies became less and less competitive. It is such economic circumstances that led to the devaluation of the CFA franc in January 1994 in Dakar, Senegal.

The second stage has been characterized by a slight increase in public expenditure. This could be attributed to the fact that a good number of countries in the Union have begun to enjoy the positive effects of the devaluation of the CFA franc in terms of exports of goods and services following the improvement of the competitiveness of their economies. In addition, the implementation of regional programmes by the executive organs of the Economic Community of West African States (ECOWAS) and of WAEMU has attracted public investment in big economic and social infrastructure projects (such as businesses, roads, health, and education).

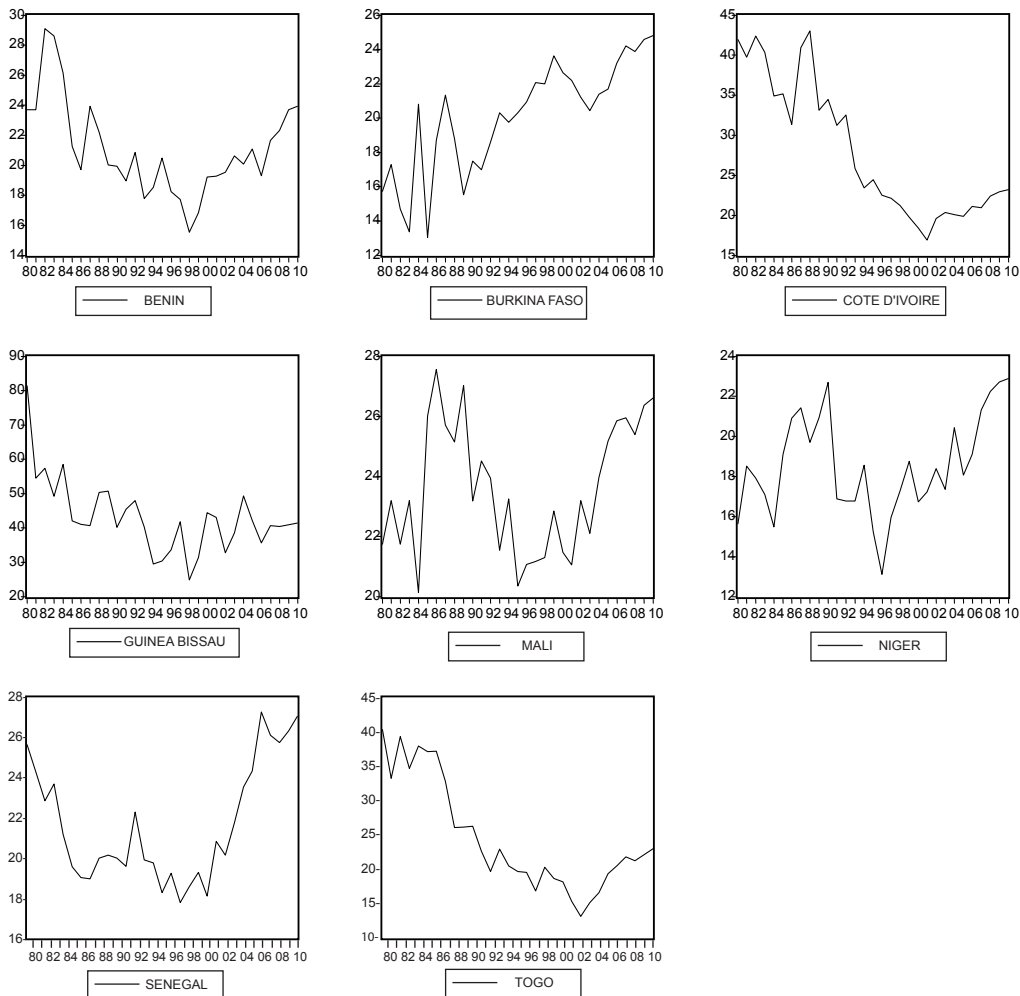
Taken individually, the WAEMU countries display great heterogeneity in their public spending, as Figure 2 indicates. Two categories of countries emerge as a function of the convergence of the rates of their public spending. The first category will be referred to as Group 1 and the second as Group 2.

Group 1 comprises Benin, Cote d'Ivoire, Guinea Bissau, Senegal and Togo, and Group 2 comprises Burkina Faso, Mali and Niger. The Group 1 countries display a similarity in trends with regard to public expenditure. Common to all of them is the fact that public expenditure slightly decreased since the 1980s. The curves representing this trend show a descending slope. This reflects a firm commitment by those countries to reduce their governments' way of life, governments which had been for long described as spendthrift. However, the question that arises is whether this reduction in public expenditure stimulated a return to a positive and sustained economic growth. Only an empirical study would provide us with pertinent answers.

The Group 2 countries are those whose public spending did not follow the downward trend that was observed in most of the WAEMU member states since 1980. Three Group 2 countries, namely Burkina Faso, Mali, and Niger, are Sahelian countries. For various reasons Sahelian countries historically have less access to substantial amounts of external credit (for lack of adequate debt repayment guarantees). We can also assume that they thus attract less foreign direct investment. A natural consequence of this is that their expenditure is modest and objective (Fantessi, 2015). These countries get hit

hard by natural disasters such as droughts, locust invasions, bush fires, poverty, and epidemics. Much still needs to be done in those countries to bring relief assistance to their populations. This explains why they cannot afford to reduce their public expenditure.

Figure 2: Trends in public expenditure by countries (% GDP)



Source: Author's estimation based on ADB (2011)

Beyond a better analysis of the specificities of public expenditure in WAEMU zone, it is important to have a detailed examination of the impact of public expenditure by sector. Figures B1, B2 and B3 (see Annex) provide the trends of public expenditure in percentage of GDP referring to major sectors such as education, defence and health. The tables point out significant lags between the countries because of current priorities defined by government and efforts to keep electoral promises announced during presidential campaigns. Concerning the education sector, public expenditure is increasing in Benin, Niger and Senegal and is constant in Burkina Faso, Cote d'Ivoire and Mali. Public investments are higher in Togo with an average of 5% of GDP after a remarkable

decrease in the mid-2000s. In the health sector, statistics show a falling trend in Benin, Cote d'Ivoire and Mali from 2007. This sector benefits from substantial and regular financial support in particular in Burkina Faso, Senegal and Togo. The irregular trends of public expenditure in this sector are observed in Guinea Bissau and Niger. The "V" curve observed in Cote d'Ivoire is justified by the negative effects of military and political crises, starting in 2002. The curves of public expenditure in the defence sector, generally presented as a strategic sector, point out the specificities of the WAEMU member states. The trend in each country is different from the others. In Benin, for example, military expenditure did not exceed 1.2% of GDP from 1999. This is in contradiction with the statistics in Cote d'Ivoire. From 1990 to 2000, military expenditure in Burkina Faso reduced. In Mali and Togo, military expenditure was above 2% of GDP on average. However, the expenditure in Senegal was estimated at 1.5% of GDP, on average.

In short, there are significant differences in the allocation of public expenditure depending on the sector considered as strategic or priority. It is important to make sure that expenditure is productive and involve positive and sustainable economic growth.

Public expenditure in WAEMU countries is generally presented in economic and functional classifications, as indicated in the Tables 1 and 2.

Table 1: Functional classification of public expenditure in the WAEMU countries

Year 2011 (% GDP)	Benin	Burkina Faso	Cote d'Ivoire	Guinea Bissau	Mali	Niger	Senegal	Togo
General Services	9.09	14.37	8.63	2.96	7.94	7.02	8.67	7.32
Defence	0.94	1.43	1.66	1.11	1.87	0.87	1.53	2.01
Order and Public Security	1.17	2.84	1.95	1.53	1.96	1.05	1.64	1.85
Economics Affairs	2.24	2.82	2.58	2.21	2.37	2.22	2.05	2.11
Protection, Environment	0.18	0.95	1.74	0.38	0.89	0.77	1.52	0.93
Accommodation, Equipment	1.64	2.37	3.09	2.14	2.78	0.23	1.94	2.02
Health	3.92	6.28	8.82	6.26	6.29	3.51	4.33	5.75
Leisure, Cultures	0.12	0.87	1.51	0.22	0.86	0.63	1.47	0.72
Training	5.55	4.81	5.18	2.93	4.19	4.81	6.48	5.25
Social Protection	0.17	0.43	1.28	0.10	0.32	0.47	1.25	0.80

Source: World Bank (2012)

Table 1 shows the allocation of public expenditure by sector in percentage of GDP in 2011. This classification conforms with Directive No. 08/2009 of WAEMU, defining the budgetary nomenclature of government expenditure (see Table A1 in Annex). As in Table A2 (in Annex), Table 1 points out the significant lags and divergence in the repartition of public expenditure by sector. The financial support for each sector depends on the economic conjuncture. The economic provisions and expectations in WAEMU area inspired the following comments.

In Benin, the reduction of public expenditure does not allow achieving the objectives of investment expenditure and social priority sectors. In 2011, the repayment of previous debts was the priority for the government. Thus, the implementation of the investment programmes slowed down. The expenditure objectives for social priority sectors mentioned in the financial and economic programme framework were difficult to reach. On the whole, in Burkina Faso, public investments in all the sectors were constant in 2010 and 2011 25.7% and 25.3%, respectively. To face expenditure derived from the

social crisis, the government restructured the budget in 2011 by cancelling non-essential expenditure such as holidays, receptions and workshops. This was achieved by reducing the number of missions or by reporting the construction of administrative buildings. In Cote d'Ivoire, public expenditure has been increasing across all sectors (from 18.6% on 2010 to 19.2% of GDP on 2011) because of the implementation of activities identified in the national programme for reinsertion and rehabilitation, reorganization of the administration in areas formerly occupied by rebels, and security and human expenditure. The investments expenditure fell from 3.1% of GDP in 2010 to 2.7% in 2011 with a weak rate of implementation of the component supported by external resources. However, investments expenditure is supported by the Presidential Programme for Urgency, specific investments and the rehabilitation of socio-economic infrastructure and administrative services.

In Mali, public expenditure for social sectors (education and health in particular, as priority sectors) represented 32.4% of the global budget in 2011 and 33.5% in 2012. Capital expenditure, with 53% supported by external resources, represented 7.0% of GDP in 2011 and estimated at 6.8% in 2012 and 7.2% in 2013. According to ADB (2011), the current structure of public expenditure is unfavourable to economic growth and its efficiency for social sectors seems to be weak with regard to obtained results. In Senegal, public expenditure and loans reached 30% of GDP in 2011. The Public Expenditure and Financial Accountability (PEFA) evaluation in 2011 pointed out that 84% of public expenditure is shared between five sectors: sovereignty expenditure (31%), education (30%), infrastructure, accommodation and energy (11%), health and social (9%), and agriculture and environment (5%). The percentage of investment to the social sectors (education and health) increased from 2008 to 2010. This evaluation revealed that the performances observed in the managing of public finances remain modest in reference of the statistics of 2007.

Like the functional classification, the analysis of the economic classification allows additional information on the sharing of public expenditure by sectors.

Table 2: Economic classification of public expenditure in the WAEMU zone

Year 2011 (% GDP)	Benin	Burkina Faso	Cote d'Ivoire	Guinea Bissau	Mali	Niger	Senegal	Togo
Total expenditure	24.1	25.3	21.9	20.8	23.1	23.3	27.8	23.3
Current expenditure	15.1	13.4	19.2	11.8	16.3	13.9	16.2	16.2
Without interests	14.2	13.0	17.2	11.6	15.8	13.6	14.9	15.3
Salaries	7.40	6.00	7.60	4.60	5.30	3.70	6.2	5.70
Interests	0.90	0.40	2.00	0.10	0.50	0.40	1.30	0.90

Source: World Bank (2012)

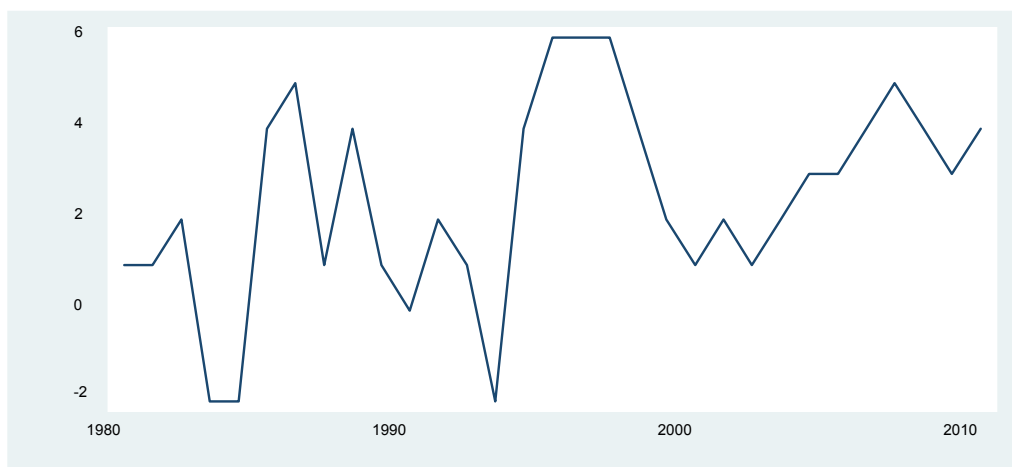
Table 2 shows that public expenditure for salaries is higher with an average of 6% of GDP in most of WAEMU countries, in particular in Benin, Burkina Faso, Cote d'Ivoire and Senegal. The rates of salaries in Togo and Mali are estimated at 5.7% and 5.3%, respectively, of GDP. Referring to the population living in Cote d'Ivoire and Senegal, the ratio of salaries is acceptable. However, the statistics of a small country like Benin are remarkable. This value of the ratio is justified by increasing salaries and employing temporary workers in the administration. In Burkina Faso, the government had to

compensate economic agents and traders victims of social troubles and had to support rehabilitation of administrative buildings. The social pressure forced the government to increase salaries (5.0%), in addition to generalizing indemnities to all civil servants. The annual rate of salary rose from 5.6% in 2010 to 6.0% in 2011. In Cote d'Ivoire, the increase in salary (from 7.1% in 2010 to 7.6% in 2011) is explained by the recruitments in the social sectors and the new army, named *Forces Républicaines de Côte d'Ivoire (FRCI)*. The ratio of salary to fiscal resources (44.7% in 2011 and 41.5% in 2010) was higher than the standard identified by WAEMU (=35%). This country was the only one to devote 2% of GDP to the payment of interests. Compelled by donors, Guinea Bissau had to implement policy based on the reduction of public expenditure by decreasing salaries from 4.9% in 2010 to 4.6% of GDP in 2011. In Togo, the salary to fiscal resources ratio decreased from 39.1% in 2010 to 35.2% in 2011. This level is not too far from the community level. Table A2 in Annex shows the trend of public expenditure according to the economic classification from 2003 to 2013

Trends in economic growth

The fundamental questions that arise are: Is it possible to find a similarity or a common trend of economic growth between the WAEMU countries? Is WAEMU regulated by a particular criterion?

Figure 3: Trends of economic growth in the WAEMU zone



Source: Author's estimation based on ADB (2011)

Several comments can be made about the information in Figure 3. Among these comments is that over the entire period from 1980 to 2010, the rate of economic growth in the WAEMU countries remained, on average, positive, at 2.66%. However, this rate fell drastically between 1983 and 1985, between 1992 and 1994, and from 1997. The early 1980s were marked by severe economic crises related to a reduction in sales of staple agricultural products. Healy (2005) pointed out a drop of 48% in prices for Ivoirian producers divided by two. Yet, most of the WAEMU countries get the bulk of

their revenue from exports of primary sector products (i.e., farming, fishing and livestock products). So, a slight drop in the prices of these products on the world market will negatively affect the performance indicators of these countries'. And we assume that when the farmers anticipate a drop in export receipts, they too reduce their production quantity (Pollard and Graham, 1992). Obviously, the purchasing power will also diminish, reducing business turnover as well.

Pessimistic expectations or future market outlook are a hindrance to economic dynamism. Another reason is the poor performance of state-owned companies. Soon after independence (in 1960 for most WAEMU member states), the private sector was still at an embryonic stage. The states, therefore, had to take charge of economic development by creating numerous state-owned companies. Unfortunately, these quickly became inefficient due to mismanagement, corruption and fund embezzlement. In addition, with the crisis, the WAEMU countries' economic growth in the first half of the 1980s was confronted with major obstacles.

Thanks to the first round of SAPs, the economies in the WAEMU country experienced growth once again (5.01% in 1986). But while in some countries those SAPs were a success, in others they were a failure. This explains why economic growth in the WAEMU area experienced strong fluctuations. In 1993, this growth reached its lowest point (about -1.52%). Against this backdrop, governments had to take drastic measures, devaluing the CFA franc in 1994. Quite obviously, the change in the exchange parity has been beneficial to the economies of the WAEMU area, because since then the countries have recorded sustained positive growth. Nonetheless, one cannot fail to note the downward trend since 1997, a trend that can be attributed either to the financial crisis in East Asia or to the sector-based budgetary policies adopted by individual countries.

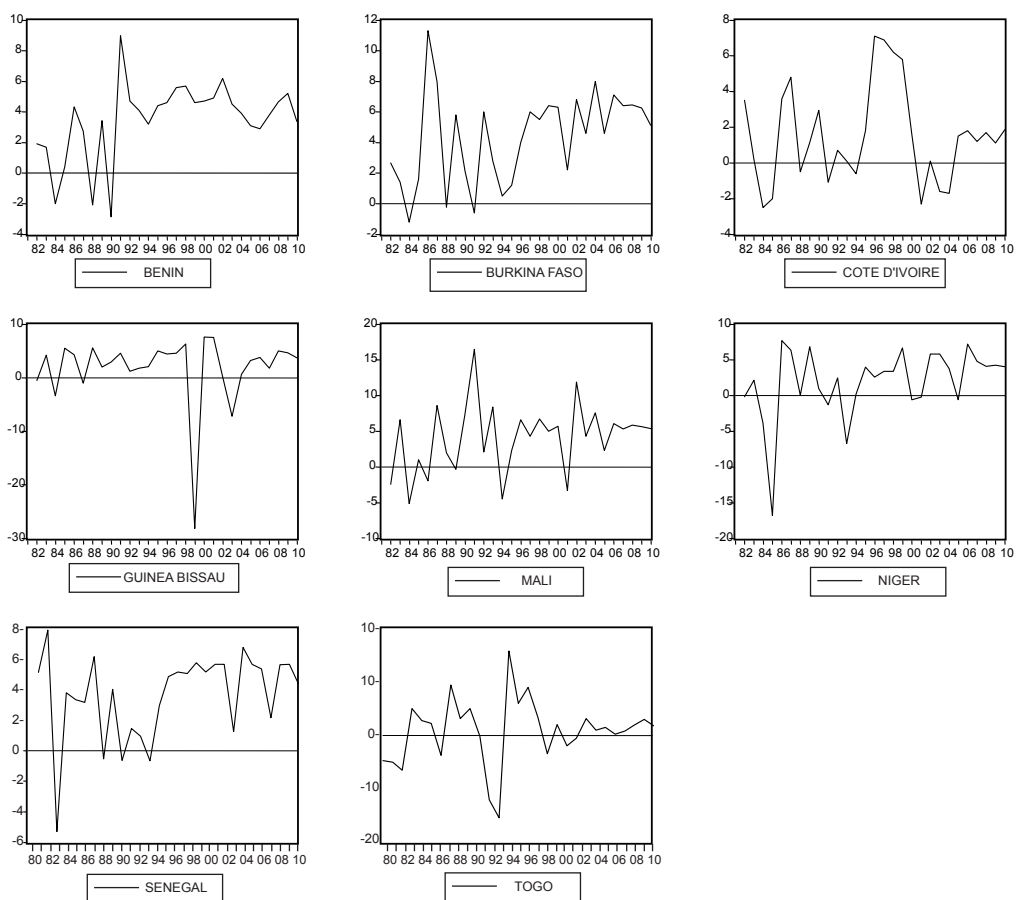
The question is: Against this background, what observations can be made about each WAEMU member state? Does a convergence of economies exist in the WAEMU area? Is the fact of grouping the different member states into two categories according to their public spending characteristics relevant to an analysis of economic growth?

Figure 4 reveals significant differences in the trends during the past three decades. The changes in growth rates could be put into three categories: the first category is that of countries that managed to stabilize their level of growth at a positive and sustained rate; this was the case in Benin, Burkina Faso and Senegal. The second category is countries that visibly have real difficulty in achieving sustained economic growth; this is the case in Guinea Bissau, Cote d'Ivoire and Mali. The third category is that of countries that maintained zero economic growth on average over the entire period; this is the case in Niger and Togo.

The countries in the first category succeeded in stabilizing after strong fluctuations in the rate of economic growth, especially after 1994, that is the year of the CFA franc devaluation. Indeed, Benin, Burkina Faso and Senegal took advantage of the changes in the exchange parity through a combination of factors: productive resources, interventionist government policies, and the domestic and external economic environment. For their part, the economies of the second-category countries, namely Guinea Bissau, Cote d'Ivoire and Mali, were extremely vulnerable. The strong fluctuations that occurred over the period under study could be seen as a consequence of the lack of credibility in government interventions, of the ineffectiveness of budgetary and fiscal policies,

and definitely of the unstable domestic economic environment. The economies of the countries in the third category experienced modest performance over the period under study; indeed, the annual average growth rate was practically zero in Niger and Togo. This is why in Figure 4 the curve of economic growth is the same as the horizontal axis that is typical of a level equal to zero.

Figure 4: Trends in economic growth by country in the WAEMU zone



Source: Author's estimation based on ADB (2011)

Three main lessons can be learnt from the above analysis of the trends in public expenditure and economic growth in the WAEMU area. First, there seems to be a heterogeneity in public spending that is due to several factors that are indigenous to countries, and due also to external or environmental factors. Second, those specificities could be attributed to the various levels of economic performance observed in the area. Third, fluctuations in GDP cannot be explained as the sole public expenditure by countries. This is why it would be interesting to measure the combined effects of institutional variables and the private sector's contribution to economic growth.

3. Review of theoretical and empirical literature

This section is devoted to a review of the theoretical and empirical literature on the interrelations that can exist between public expenditure and economic growth. The section will essentially point out the theoretical advances made on the issue and the quantitative instruments that have been used to measure the nature of the correlation between the two economic variables.

Review of theoretical literature

The World Bank (2006) reports that close to 26% of the developing countries' GDP in 1991 was allocated to government spending, against 34% in 2005. However, this huge budget apparently did not lead to economic growth in the WAEMU area over the same period. As an example, countries like Cote d'Ivoire and Senegal actually recorded negative rates of economic growth. Just after the crisis in Cote d'Ivoire, the economic growth rate was -0.4% from 2010 to 2011. In other words, one of the essential questions that can be asked is: To what extent does government spending stimulate or hinder growth? There is abundant economic literature on this issue, but from which there are no clear and definite conclusions. These vary according to country or continent; they even vary within a given geographical area.

The theory of endogenous growth has generated several models linking public expenditure to the long-term growth rate (Barro, 1990, 1991). Public expenditure can have an effect on economic growth through two principal channels: through the first channel it increases the stock of capital in the economy through public investment in economic and social infrastructure or through state-owned company investment. Through the second channel, public expenditure has an indirect effect on economic growth by increasing the marginal productivity of the production factors provided by the private sector through spending on education, health and other services which contribute to human capital accumulation (Tanzi and Zee, 1997). Following Devarajan et al (1996), Ventelou (2002) carried out a deeper analysis of the relationship between public expenditure and economic growth by incorporating into the analysis the concept of productive versus non-productive expenditure. This distinguishes his study from previous ones. Ventelou's analyses have shown that while the size of the government is an important indicator of public expenditure and growth, it is the optimal choice of the composition of public expenditure that remains the major issue. They have led to the conclusion that the final decision will be a function of the contribution of the expenditure components in the process of economic growth.

The positive impact of public spending on economic growth was highlighted by Ram (1986), who studied the impact of government size on economic growth (measured by the GDP growth rate) for 115 countries over the period 1960 to 1980. According to Ram's study, the total impact of the size of the public sector on growth was generally observed to have been positive over that period. The study by Rosner (2003) concluded that certain components of public spending, notably those allocated to social welfare and services, contributed to an increase in the growth rate in developing countries. Such a finding was corroborated by the study by Del Monte and Papagni (2001). Similarly, studies by Aghion et al (2007) and that by Ouattara (2008), in addition to reopening the debate on the impact of government spending on growth, all agree that this spending plays a positive and indispensable role in the increase in the GDP.

The increase in public spending is an ascending function of the national wealth, as the government is keen on modernizing and increasing basic public facilities for the good of the population. However, in the economic literature public spending has not always been perceived as an engine for economic growth.

The effectiveness of public spending has been disputed through the political market theory. Authors like James Buchanan (Nobel Prize Winner in 1986) and Gordon Tullock (1961) have contested the idea that the state is the representative of public interest. They have argued that governments are economic agents who seek to maximize their satisfaction through an election or re-election, and that public decisions result from an aggregate of private decisions such as electoral promises. Governments are thus more concerned about honouring their electoral promises than they are about making public spending effective and productive. Likewise, the theory of bureaucracy stipulates that public officials or bureaucrats seek to maximize their income or power, which leads to an unjustified increase in public spending. This type of analysis has been further deepened by authors like Bleart (1991) and Muller (2005). Therefore, the concept of productive public spending needs to be questioned.

Ojo and Oshikoya (1995) and Ono and Shibata (2001) showed that a rise in public expenditure significantly reduced the growth of the per capita GDP in an economy where they looked at only two sectors. Tenou (1999) found the same results. For their part, by considering the budgetary deficit ratio rather than public consumption spending, Ghura and Hadjimichael (1996) found a negative and significant correlation with the per capita growth rate in their study of a sample of countries in sub-Saharan Africa. The results of a study by Dar and Amirkhalkhali (2002) on the Organisation for Economic Co-operation Development (OECD) countries did not enable the authors to decisively support the idea that public expenditure has a positive effect on economic growth, since the coefficients in their study were not statistically significant.

Review of empirical literature

Diamond (1989) was the precursor of the economic assessment of the link between public expenditure, the private sector and economic growth. Following him, there was renewed interest in the public expenditure-economic growth couple based on theoretical models focused on the productivity of government expenditure.

Research by Herrera (1998a) examined the effect of public spending on education on economic growth over a long period. The researcher used a model of endogenous

growth through capital accumulation in education sector only. He found that the growth dynamics were given impetus by the government, since its choices in budgetary allocations influenced the speed of human capital accumulation. Similarly, Dessus and Herrera (2000) arrived at the same conclusion according to which the physical capital expenditure had a positive impact on economic growth. This conclusion was inspired by a panel data model involving 29 countries from Latin America, Africa, and Asia which were observed for a period of 11 years, from 1981 to 1991. The model used is based on a simultaneous equations system that uses log-linear specifications to explain the determinants of GDP and the stocks of public and private capital. The estimation was based on triple least squares with fixed effects and variables transformed by the within-operator.

Aghion et al (2007) examined the different factors of economic growth on panel data from 17 OECD countries for the period from 1985 to 2003. They used total factor productivity as the measure for growth. Their study sought to determine the factors of growth by including in the analysis the variables of human capital and the rigidity on the goods and labour markets. They incorporated government size into their estimations as a component of the rigidities on the goods and labour markets. The findings did not enable the authors to conclude that the public sector had a significant and positive effect on economic growth.

Empirical studies on the relationship between public expenditure and economic growth in a sample of countries taken solely from the African continent have produced mixed results. In this connection, Ashipala and Haimbodi (2003) showed that there were two long-term relationships between the level of economic activity measured by the GDP and the public and private investment in Namibia. Contrary to these results, those from a study by Mansouri (2003) showed that in Morocco public expenditure in capital had a spillover effect on private investment and on the real economic growth. Using a chronological series model based on the ordinary least squares, Mansouri showed that public consumption expenditure supplanted private investment and slowed down economic growth because of wastage.

Few studies have examined the relationship between public expenditure and economic growth in West African countries. Using a computable general equilibrium model, Dumont and Mesplé-Somps (2000) analysed the impact of public infrastructure on the competitiveness and growth of Senegal's economy. They found that an increase in public spending on infrastructure led to a better commercial performance and economic growth. The long-term impact of public expenditure varies according to country: in a study using causality tests and based on annual data for the period from 1970 to 2005, Chimobi (2009) found that there was no long-term relationship between government expenditure on health and education and the national income in Nigeria.

Two relevant papers are focused specifically on WAEMU countries as a case study (see Nubukpo, 2007; Ouattara, 2008). Nubukpo assessed the impact of public spending on growth from 1965 to 2000 by using an error correction model. He showed that gross public expenditure did not have a significant impact on economic growth in most WAEMU countries. The conclusion of Ouattara's study is quite different. Based on productivity and externality of public expenditure, he pointed out that public expenditure can have a positive impact on economic growth in WAEMU countries. Therefore, the

Nubukpo (2007) results could be explained by the missing of social and environmental factors in the model. How to identify clearly public expenditure that is conducive to economic growth? This study is a deep analysis of the public expenditure through health, education, defence and security sectors. In addition, it is important to note that five of the eight member states of WAEMU benefitted from the Heavily Indebted Poor Countries Initiative (HIPC) since 2000. This initiative has jointly been launched in 1996 by the most industrialized countries, the International Monetary Fund (IMF) and the World Bank. The three other countries were still working to comply with the requirements. It is interesting to observe the structure of their public expenditure and the effects derived on economic growth.

Ouattara (2008) considers a theoretical model with three sectors: public, private and public good lambda supposed to have an externality effect on the private sector. In comparison with the present study, the analysis is restricted to a theoretical exercise focused on microeconomic and macroeconomic approaches with regard to the link between factorial productivities and public expenditure.

As can be observed, there has been keen interest in research related to government size and economic growth. At the same time, though, there has been no unanimity in the way the composition and specificity of government expenditure affect the growth rate of a given country. Indeed, research findings show a mixed picture depending on the computation methods used, the structure of government expenditure, and the countries or continents studied. Very little of this research has been devoted to the implications of this heterogeneity of government expenditure on the level of economic growth rate in the WAEMU area.

4. Methodology and analytical framework

This study used a two-step methodology: the first step consisted of estimating a dynamic model of economic growth derived from a production function; the second step consisted of verifying the stability of the model, which was the concern of the study's second objective. To this end, the study used Chow's (1960) stability test to account for the possible structural breaks over the period studied for each country.

Let us posit the following production function with two factors:

$$Y = F(K_t, L_t, A) \quad (1)$$

where Y is the level of production, K the stock of capital, L the labour and t the level of the technology. The time appears as an explicit argument of the production function because the two factors "capital" and "labour" are supposed to be insufficient to explain the production. The variable "time" represents all the other factors. In addition, the effects of public expenditure on another variable cannot be observed at the same date (t). For this reason, the choice of a dynamic model is well addressed.

Equation 1 can be written as follows:

$$Y_t = K_t^\alpha L_t^{1-\alpha} A_t \quad (2)$$

We consider the level of technology as follows:

$$A_t = e^{xt + \sum_{j=1}^J \beta_j X_{jt}} \quad (3)$$

where the x coefficient represents exogenous technical change and the X_{jt} represents the other exogenous variables. Then the production technology is given by:

$$Y_t = K_t^\alpha L_t^{1-\alpha} e^{xt + \sum_{j=1}^J \beta_j X_{jt}} \quad (4)$$

Deriving Equation 2 from the time, we get:

$$dY / dt = F'_K dK / dt + F'_L dL / dt + F'_A dA / dt \quad (5)$$

Let us note \dot{x} / x the growth rate of variable x , we obtain:

$$\dot{Y} / Y = F'_K (K / Y) \dot{K} / K + F'_L (L / Y) \dot{L} / L + F'_A (A / Y) \dot{A} / A \quad (6)$$

If we suppose that $\alpha = F'_K (K / Y)$, $\beta = F'_L (L / Y)$ and $\gamma = F'_A (A / Y)$ we can obtain the following equation:

$$\dot{Y} / Y = \alpha \dot{K} / K + \beta \dot{L} / L + \gamma \dot{A} / A \quad (7)$$

With regard to the previous equations, we consider the following production function with more than two factors:

$$Y_t = F (K_t, DP_t, H_t) \quad (8)$$

where Y_t designates the level of production per capita, K_t public expenditure variables matrix, DP_t private investment expenses in GDP with positive expected sign, H_t institutional variables supposed to take into account political and social instability and (t) the time variable. We suppose that this variable is referring to variables such as debt service (SD) and terms of trade (TE) in GDP. With regard to the high propensity to borrow and the impact of the debt service on economic growth, we expect and assume a negative sign for each country of the Union because of unsustainable external debt. The impact of the terms of trade should have a positive sign because the WAEMU countries are involved in a region integration process and they should benefit from the common agreements on tariffs and trade.

Public expenditure variables matrix regroups variables corresponding to the main headings as specified in the Directive No. 08/2009 of WAEMU related to the budgetary nomenclature. Thus, we have the following equation:

$$K_t = K_t (DG_t, DD_t, DS_t, DE_t) \quad (9)$$

where, DG represents the expenses of public administration services in GDP. For this variable, the expected sign is negative because there is any financial returns flux. DD indicates defence and security expenditure in GDP; the expected sign should be negative for the countries which have faced military conflict at least one time. We assume that a country needs to mobilize enough money to face military conflict to the detriment of investing in productive activities. DS and DE represent health and education respectively in GDP. We are expecting a negative sign because of the bad rank of most of WAEMU countries in terms of economic governance and corruption (Transparency International, 2009) and public company management. Several studies highlight a negative impact of these variables on economic growth in the short term. We believe that one of the reasons is that insufficient resources allocated to health and education sectors.

Institutional variables comprise political risk (RP) index, economic risk (RE) index, financial risk (RF) index and country risk (RC) index as indicated in the following equation:

$$H_t = H_t(RP_p, RE_p, RF_p, RC_t) \quad (10)$$

The remainder of this analysis will focus only on the political risk (RP) index because other data on the period under study are not available. This index refers to the probability that social events or political decisions may sometimes cause economic, commercial and financial loss (see Table A3 in the Annex). Different signs are expected in terms of impact on economic growth. Most countries of the WAEMU area face many difficulties in keeping peace and promoting good governance.

Taking into account Equations 9 and 10, Equation 8 becomes:

$$Y_t = F(DG_p, DD_p, DS_p, DE_p, DP_p, RP_p, SD_p, TE_t) \quad (11)$$

Deriving Equation 8, we obtain:

$$\begin{aligned} \frac{dY}{dt} = & F'_{DG} \cdot \frac{dDG}{dt} + F'_{DD} \cdot \frac{dDD}{dt} + F'_{DS} \cdot \frac{dDS}{dt} + F'_{DE} \cdot \frac{dDE}{dt} + F'_{DP} \cdot \frac{dDP}{dt} \\ & + F'_{RP} \cdot \frac{dRP}{dt} + F'_{SD} \cdot \frac{dSD}{dt} + F'_{TE} \cdot \frac{dTE}{dt} \end{aligned} \quad (12)$$

If \dot{x}/x is the growth rate of variable x , as defined in Equations 5 and 6, we obtain:

$$\begin{aligned} \frac{\dot{Y}}{Y} = & F'_{DG} \cdot \frac{DG}{Y} \cdot \frac{D\dot{G}}{DG} + F'_{DD} \cdot \frac{DD}{Y} \cdot \frac{D\dot{D}}{DD} + F'_{DS} \cdot \frac{DS}{Y} \cdot \frac{D\dot{S}}{DS} + F'_{DE} \cdot \frac{DE}{Y} \cdot \frac{D\dot{E}}{DE} \\ & + F'_{DP} \cdot \frac{DP}{Y} \cdot \frac{D\dot{P}}{DP} + F'_{RP} \cdot \frac{RP}{Y} \cdot \frac{D\dot{R}}{RP} + F'_{SD} \cdot \frac{SD}{Y} \cdot \frac{D\dot{S}}{SD} + F'_{TE} \cdot \frac{TE}{Y} \cdot \frac{D\dot{E}}{TE} \end{aligned} \quad (13)$$

Suppose that for each γ_i , $\gamma_i = F'_{M_i} \cdot \frac{M_i}{Y}$, we obtain:

$$\frac{\dot{Y}}{Y} = \gamma_1 \frac{D\dot{G}}{DG} + \gamma_2 \frac{D\dot{D}}{DD} + \gamma_3 \frac{D\dot{S}}{DS} + \gamma_4 \frac{D\dot{E}}{DE} + \gamma_5 \frac{D\dot{P}}{DP} + \gamma_6 \frac{D\dot{R}}{RP} + \gamma_7 \frac{D\dot{S}}{SD} + \gamma_8 \frac{D\dot{E}}{TE} \quad (14)$$

Equation 14 can be written under a logarithmic model form, as follows:

$$\begin{aligned} Y_t^* = & \gamma_0 + \gamma_1 DG_{t-i}^* + \gamma_2 DD_{t-i}^* + \gamma_3 DS_{t-i}^* + \gamma_4 DE_{t-i}^* + \gamma_5 DP_{t-i}^* + \gamma_6 RP_{t-i}^* \\ & + \gamma_7 SD_{t-i}^* + \gamma_8 TE_{t-i}^* + \gamma_9 Y_{t-i}^* + \gamma_4 + \mu_t \end{aligned} \quad (15)$$

Variable noted with (*) are in a logarithmic form. This model can present objective limits because some explicative variables do not influence the explained variable at the date (t). Therefore we inserted timely lag noted by (i) index and varying from 0 to 10. We use the Akaike information criterion (AIC) and the Schwartz information criterion (SIC) to determine the optimal number of lags.

Results and methodology are presented in Annex (see Table A4).

Given this, Equation 15 becomes:

$$\begin{aligned} lY_t = & \gamma_0 + \gamma_1 lDG_{t-1} + \gamma_2 lDD_{t-1} + \gamma_3 lDS_{t-1} + \gamma_4 lDE_{t-3} + \gamma_5 lDP_{t-1} + \gamma_6 lRP_t \\ & + \gamma_7 lSD_t + \gamma_8 lTE_t + \gamma_9 lY_{t-i} + \mu_t \end{aligned} \quad (16)$$

The remainder of this analysis focused on this dynamic model. Logarithmic variables are noted with the letter “ l ”. Variables were observed from 1985 to 2011. This period is justified because institutional data from Transparency International (2009) are not available before 1984.

Equation 16 includes a lagged dependent variable among independent variables. This autoregressive process (1) looking like a Koyck model with lag suggests to use the “ h ” test of Durbin to test for serial correlation. The Autoregressive Conditional Heteroskedasticity Lagrange Multiplier (*ARCHLM*) test is used to test for heteroscedasticity. The Augmented Dickey-Fuller (*ADF*) test is used to test for unit roots. The Feasible Generalized Least Squares (*FGLS*) estimator is used to estimate parameters of Equation 16 for each of the eight countries of the WAEMU zone. The results will be resumed in a table for a better visibility and a comparative analysis.

To achieve the third objective set for this study, namely that of verifying the stability of the model in view of the structural breaks, Chow’s (1960) stability test was used. This is constructed like Fisher’s test. It has the following form:

$$H_0 : SCR - (SCR1 + SCR2) = 0 \quad (17)$$

$$H_1 : SCR - (SCR1 + SCR2) = 0$$

$$\text{With } SCR = e'e = \sum_i e_i^2 \quad (18)$$

SCR corresponds to the sum of the squares of residues. The numbers 1 and 2 represent each one of the two sub-periods studied, depending on the date of the structural break. The null hypothesis (H_0) assumes that there is no structural change, meaning that the coefficients are equal for the two sets of data. The decision rule was that the null hypothesis of the stability of coefficients would be rejected if the empirical value obtained from the test was higher than the critical value at the 5% significance level or if the probability associated with Fisher’s F statistic was less than 0.05. The Chow stability test is a test of predictive precision. It is preferred to the Cusum Recursive Test because the breakpoint dates are known beforehand. In this, Figure 2, which is related to the trends in public expenditure in the WAEMU countries, enabled us to identify the break points that would require a deep analysis. The sample from each country was subdivided into two sub-samples of different sizes with specific rupture periods corresponding to their respective socio-economic histories.

5. Data for the study

The data used in this study are essentially a compilation of data from the 2011 ADB CD-ROM (see ADB, 2011) and the World Bank's (2010). The data on institutional variables were obtained from the Transparency International (2009).

General services of public administration (DG) expenditure regroup executive and legislative administration expenses, fiscal and financial affairs expenses, administrative affairs, external economic aid, general services, research and development for general services of public administration and transfers.

The defence and security expenditure (DS) is related to the sovereign responsibilities of member states. It is devoted, to varying degrees, to putting in place a secure and serene environment that is conducive to industrial development and the promotion of activities that are likely to generate economic growth. Research by Herrera (1998b) has contributed to a better understanding of the effect of military spending on economic growth in developed countries. In the West African context, the results regarding this effect are rather mixed because, despite the budget allocated to military spending, criminality and insecurity are on the rise. Worse, unconstitutional changes in the region are very often the work of the military.

The health expenditure (DS) and education expenditure (DE) are, according to the theorists on endogenous growth, factors of economic growth because they have a significant effect on the productivity of production factors. However, recent studies have cast doubt on their relevance in the short term because of the pernicious effects of corruption and opportunistic behaviour that tend to divert such financial flows to other uses (Ventelou, 2002; Hodges, 2005).

Private sector expenditure (IP) is often portrayed as the engine of economic growth. Indeed, the private sector supports and stimulates economic activity. Within the WAEMU area, the private sector does not have the same weight due to differences, between countries, in the levels of development. Nevertheless, there seems to be unanimity among all the studies done on the issue that the private sector has a positive impact on growth.

The political risk index (RP) is an institutional indicator whose value varies from 0 to 100. It comprises 12 factors. It is a reflection of a country's socio-economic conditions, the levels of government stability, investment profile, internal and external conflicts, corruption, the military's involvement in politics, religious tensions, respect for the laws of the country, ethnic tensions, the practice of democracy, and the quality of bureaucracy. The political risk index is constructed from weighted marks varying between 0 and 4 and 6 and 12 maximum points depending on which risk factors are considered. The arithmetic total mark of the different factors produces the perceived level of political

risk for the country concerned. The higher the total mark, the lower the political risk. This variable was found to be relevant to the analysis of the relationship between public expenditure and economic growth. Both negative and positive coefficients were expected depending on the country.

The debt service (SD) is the totality of the expenses which a country allocates each year to the repayment of its debt. This SD variable corresponds to the amount of interest payments and the annuity of the repayment of the debt principal as a ratio of exports. The variable is a criterion of the sustainability of the debt because it is captured as a proportion of the wealth that a country can create annually.

The terms of trade (TE) refers to the return on the price of the exchanged products. It is generally calculated as the ratio of the global export price index to the global index of import prices. The global index is a considerable source of information for an analysis of international trade.

6. Results and discussion

This section presents the research results and the various comments that arise from them. To check the statistic properties of variables, we test for the existence serial correlation, presence of heteroscedasticity (Tables A5 and A6 in Annex) and unit roots test.

Testing for stationarity process

When $t = 1, \dots, T$, series $\{\eta_t\}$ follow a stationarity process if $E(\eta_t) = \omega$ t is constant and independent of t , if $Var(\eta_t) = \sigma_\eta^2$ is constant and independent of t and if $Cov(\eta_t, \eta_{t+k}) = E[(\eta_t - \omega)(\eta_{t+k} - \omega)] = \rho_k$ is not dependent of t .

The Dickey-Fuller test supposes as hypothesis that the process is a white noise. That is to say, a null mathematical expectation of the series and the covariance and the variance is constant. The Augmented Dickey-Fuller (ADF) test is more robust than this restricted hypothesis. The decision rule is to accept null hypothesis of none stationarity process if the estimated value of *ADF* is lower than the absolute critical value in Mac Kinnon table.

Table 3: Results compiled from unit roots tests

Estimated values ADF	Benin	Burkina Faso	Cote d'Ivoire	Guinea-Bissau	Mali	Niger	Senegal	Togo
/DG	-5.10	-4.57	-5.93	-5.53	-4.76	-4.14	-6.26	-8.73
/DD	-6.11	-4.39	-7.88	-4.27	-4.62	-5.62	-5.44	-4.49
/DS	-5.95	-5.63	-4.19	-5.32	-7.84	-5.19	-5.31	-7.74
/DE	-5.74	-4.84	-5.41	-5.67	-6.38	-4.42	-4.51	-4.58
/DP	-7.38	-6.42	-5.24	-6.60	-6.94	-5.22	-4.32	-5.61
/RP	-6.21	-7.84	-6.30	-6.93	-7.81	-5.38	-4.28	-5.94
/SD	-8.06	-4.70	-5.12	-5.57	-6.18	-4.28	-5.39	-4.21
/TE	-5.13	-5.01	-6.72	-4.32	-5.53	-4.98	-6.45	-4.07

Critical values at 1%, 5% and 10% thresholds are respectively 3.85, 3.04 and 2.66.

Source: Author's estimation from data from ADB(2011)

The results in Table 3 indicate that the series follow a stationary process for all the variables. The estimated values are upper the absolute critical value of the ADF test. The series do not contain trends and seasonality.

Estimation of the model

Tables 4 and 5 present the compiled results of the estimation of Equation 16 for each country in the WAEMU region observed from 1985 to 2011.

Table 4: Results compiled from the estimations of FGLS method

FGLS method	Benin		Burkina Faso		Cote d'Ivoire		Guinea Bissau	
	coef	z	P>	z	coef	z	P>	z
/DG	0.59	2.17	0.02	0.25	0.33	1.50	0.01	0.13
/DD	-2.54	-3.58	0.04	-3.01	-2.81	-4.63	0.03	-4.41
/DS	0.12	4.11	0.02	-1.15	1.28	3.41	0.01	-3.02
/DE	0.27	2.36	0.01	0.61	0.63	3.72	0.02	0.75
/DP	3.05	3.52	0.01	3.43	4.67	3.25	0.03	2.71
/RP	1.88	2.71	0.03	-3.47	-3.15	-4.33	0.01	-3.24
/SD	-2.62	-2.48	0.04	-3.15	-4.43	-1.51	-0.2	-3.21
/TE	4.11	3.07	0.02	3.13	3.37	2.24	0.02	2.93
$\gamma(-1)$	1.24	2.89	0.01	2.49	3.01	2.43	0.03	1.84
C	7.33	3.25	0.02	9.37	6.62	3.21	0.03	8.16
R^2		0.75		0.84		0.74		0.75

Source: Author's estimation from data from ADB(2011)

Table 5: Results compiled from the estimations of FGLS method

FGLS method	Mali		Niger		Senegal		Togo	
	coef	z	P>	z	coef	z	P>	z
/DG	0.31	3.23	0.02	0.24	0.49	2.25	0.04	0.73
/DD	-2.32	-2.10	0.02	-1.50	-0.57	-1.33	0.01	-1.10
/DS	0.74	1.35	0.01	0.36	2.82	5.77	0.02	0.66
/DE	0.12	3.86	0.02	0.09	1.23	2.06	0.02	0.31
/DP	3.51	1.04	0.01	2.13	4.25	1.36	0.01	2.41
/RP	-3.27	-2.29	0.01	-3.92	1.20	5.52	0.01	1.29
/SD	-4.34	-3.25	0.02	-4.27	-2.48	-3.71	0.04	-3.82
/TE	3.72	4.66	0.03	3.75	4.19	1.83	0.01	4.24
$\gamma(-1)$	2.35	3.12	0.04	3.41	3.94	2.53	0.02	2.55
C	5.38	2.19	0.03	4.71	6.38	2.84	0.01	8.37
R^2		0.85		0.64		0.75		0.75

Source: Author's estimation from data from ADB(2011)

The selected method of estimation was the Feasible Generalized Least Squares (FGLS). We assumed that independent variables are exogenous. This hypothesis can be verified with the Hausman test, based on the null hypothesis $H_0 = E(X'_i \mu_i) = 0$. This test focuses on the difference between the estimator of feasible generalized least squares which is convergent and asymptotically efficient under the null hypothesis and the estimator of generalized moment which is always convergent.

Several observations can be made from the results in Table 4. The results for the first group of four countries show that, in general, expenditure of administration services had a positive and weak effect on economic growth. Elasticity values were high in Benin and Cote d'Ivoire with respectively 0.59 and 0.33. Structural policies should be implemented in the WAEMU area to improve the efficiency of administration services. The results for Benin were better than those for the other three countries. The elasticity of political risk index had a positive sign. The elasticity was higher in terms of absolute value for Burkina Faso and Cote d'Ivoire. It was almost zero for Guinea Bissau (just 0.43). One of the reasons for this is the socio-political instability that has prevailed in this country for decades now. Public expenditure for the administration services had little positive impact on GDP growth.

Thus, it is wrong to assume that public expenditure focused on relevant administration services is unproductive. Good administrative and institutional governance can consolidate economic growth. The elasticity of the political risk index and debt service was found to be negative. This suggests there might be an inverse relationship between the ineffectiveness of public expenditure and the accumulation of the budgetary deficit and the lack of credibility on the part of the country's institutions. However, debt service has not always had a negative impact.

It transpires from this study that public spending on health, education, defence and security, and consumption, all of which is often labelled as non-productive expenditure, did not turn out to have the same signs expected in all the countries. For example, the sign for health expenditure was found to be positive for Benin and Cote d'Ivoire, but negative for Burkina Faso and Guinea Bissau: -0.15 and -3.02 respectively. Health facilities are exceptionally well developed in Cote d'Ivoire compared with the other three countries. This can explain the results obtained. Besides, the reforms undertaken to increase access to health care and essential medicines have been implemented in line with the country's National Plan for Health Development (PNDS), to which a substantial budget has been allocated. As for Benin, it has a smaller population than that of Burkina Faso and also benefits from positive externalities arising from its geographical proximity with Nigeria. However, the elasticity sign of public spending on education was found to be negative for all the four countries. In the short term, this public spending did not have a positive and significant impact on economic growth, as mentioned in lots of empirical studies. It seems to be difficult to determine the real impact of education expenditure on economic growth. The education sector remains a big issue for policy makers in developing countries. Budgets and supports are low with regard to the urgent needs of the population and the targeted objectives in terms of ratio of performance cannot be reached.

The consumption expenditure, a variable derived from central government functioning, increases as the need increases to spread general administration services throughout the country. Countries allocate a bigger share of army budget to consolidate

their grip on power and fight insecurity from both within and across borders. Benin, Burkina Faso, Cote d'Ivoire and Guinea Bissau have all, at least once, experienced a forcible military takeover of government.

The empirical results obtained from the WAEMU countries have confirmed that the private sector remains the engine of economic growth. The expected signs have been confirmed and the coefficients were found to be high: 4.67 for Cote d'Ivoire and 3.43 for Burkina Faso, for example. Likewise, the official development assistance was found to have led to higher economic growth in almost all the countries, even though its coefficient was not statistically significant in Guinea Bissau.

All in all, it can be argued that the effect of public expenditure on economic growth is not uniform in the WAEMU area. Some forms of public expenditure are wrongly described as non-productive in the short term, yet they significantly contribute to an increase in GDP. This is the case of health expenditure which had a positive effect on the labour productivity in Benin and Cote d'Ivoire. The public expenditure that seems to have a positive and weak effect on economic growth in the short term is that spent on education, defence and security. For all the four countries, the physical capital expenditure and the private sector expenditure were found to have a positive and significant contribution to economic growth. However, the positive elasticity of the physical capital expenditure can be affected by the debt overburden on a given country and the deterioration of its political risk index.

Table 5 presents the results compiled for the second group of countries, namely Mali, Niger, Senegal and Togo.

As in the case of the countries in Table 4, for the four countries in Table 5 the different elasticity values of public expenditure for administration services had the expected positive and weak sign on economic growth for Mali, Niger, Togo and Senegal. These coefficients were all statistically significant at the 5% level, although they are relatively low in Mali and Niger with respectively 0.31 and 0.24.

The coefficients for the debt service and the political risk index for Mali and Niger were high and negative. This confirms what was mentioned earlier that WAEMU member states are facing difficulties to bring budgetary deficits and political instability under control.

The elasticity of public expenditure on health and education has a positive and weak sign for all the countries studied. Public spending on defence and security did not have a positive significant effect on economic growth in the short term. As in the cases of Benin and Cote d'Ivoire, public spending on health was found to have had a positive effect on economic growth in Senegal. This finding can be attributed to the fact that Senegal is ranked as the second largest economy in the WAEMU region. The country has indeed embarked on huge infrastructural projects in the areas of road and air transport, the construction of health centres, etc. Historically, Senegal hosted the biggest and best schools of medicine. And despite the economic difficulties it went through during the 1980s and 1990s, the country has managed to maintain an investment in the health sector that is conducive to economic growth.

From the results in Table 5, the elasticity of private investment also has a positive and significant sign with high coefficients for Senegal (4.25) and Mali (3.51). Likewise, the official development assistance has truly benefited all the countries in the WAEMU region. Even if it has diminished over the past few years, it remains salutary for those countries, as it enables them to face economic crises.

The WAEMU countries are highly indebted, which slows down their economic growth. They have contracted debts to finance the economy and boost the sectors deemed to be productive. Unfortunately, the expected results were not achieved because of structural obstacles specific to the respective economies, strategic choices made by political and economic players, opportunistic behaviours, etc. All this raises the issue of debt sustainability and of the guarantee of the common currency, the CFA franc. This currency is pegged to the euro, which imposes a certain amount of budgetary discipline, usually lacking in the WAEMU countries.

To complete the results of this study and to establish whether the third objective of the study had been achieved, the Chow test for parameter stability was carried out. In time series, the test indicates the temporary stability of a regression and in cross-section series, it indicates the stability of homogeneity of behaviours.

The stability test is based on a statistic of Fisher as follows:

$$f = \frac{\frac{SCR_t - (SCR_1 + SCR_2)}{k}}{\frac{SCR_1 + SCR_2}{T - 2k}} \quad (19)$$

where, the index 1 and 2 are characteristic of the two sub-periods. The null hypothesis H_0 for stability of coefficients $H_0 : f \approx F_{(k, T-2k)}$ is tested versus alternative hypothesis. To do this test, we need to take care of the constant generated automatically by the software and the cause of bias. After solving the constant issue, the results are compiled in Table 6.

Table 6: Results compiled from the stability test

Chow test	Break period	Estimated value	Probability F-statistic	Results or decision
Benin	1998	1.40	0.00	Rejection of H_1
Burkina Faso	1994	2.21	0.00	Rejection of H_1
Cote d'Ivoire	2000	1.28	0.01	Rejection of H_1
Guinea Bissau	1998	1.22	0.01	Rejection of H_1
Mali	1994	2.09	0.00	Rejection of H_1
Niger	1994	2.11	0.00	Rejection of H_1
Senegal	1994	2.39	0.00	Rejection of H_1
Togo	2002	1.23	0.01	Rejection of H_1

The critical value at 5% level is 2.49

Source: Author's estimation from data from ADB(2011)

To apply the Chow test, knowledge of the breakpoint year is essential. This test remains robust irrespective of the number of observations made on either side of the date chosen. In the case of the WAEMU countries, the different breakpoint dates were identified from Figure 2 on the trends in public expenditure in each country.

For Burkina Faso, Mali, Niger and Senegal, the structural breakpoint date is 1994, that is the year of the CFA franc devaluation. Several studies indicate that all the WAEMU

countries made the most of the change in the exchange parity between the CFA franc and the French franc. The breakpoint date is 1998 for Benin and Guinea Bissau. Since its change to democratic government in 1990, Benin achieved continued positive economic performance and saw considerable amounts of money flow into the public and private sectors until the end of the 1990s. Guinea Bissau suffered a coup and civil war between 1998 and 1999. The breakpoint date for Cote d'Ivoire is 2000. It is at the end of the 1990s that this country suffered its first coup d'état and saw the military come to power. Finally, the breakpoint for Togo is 2002, as it is then that this country began to invest heavily in the industrialization of its agriculture. This breakpoint can be observed from Figure 2.

On the basis of the results of the Chow test, the alternative hypothesis (i.e., of absence of the stability of coefficients) was rejected for all the countries in the WAEMU region. The estimated values are lower than the critical value in the Fisher table. The coefficients were thus stable for Niger and Senegal during the period studied. In other words, the CFA franc devaluation had a significant impact on public expenditure on economic growth in Burkina Faso, Mali, Niger and Senegal. The devaluation boosted the export of primary products, which are the main sources of export receipts for these countries. The additional revenues generated served to increase public investment.

The socio-political instability of the 2000s also affected economic performance indicators and the impact of public expenditure on economic growth: it deepened the budgetary deficit, made the debt burden heavier, and increased the political risk. The instability lasted for a decade and affected the economies of the WAEMU countries. The stability test also revealed that the massive investment recorded in Benin from 1998 had a positive effect on the country's economic growth.

7. Conclusion and economic implications

This study addressed the issue of the re-examination of public expenditure in economic growth in the WAEMU region. It analysed macroeconomic and institutional variables to gain a better understanding of the possible interrelationships between public expenditure and economic growth. From the results of the study, it is important to highlight the main lessons learnt and the resultant economic policy implications. The study has confirmed the relevant contribution of the private sector to the consolidation of economic growth. This should encourage economic policy makers to maintain their effort in promoting the private sector. This sector, therefore, needs to be better supported and regulated to enable it to successfully complement the public sector and improve economic growth.

The study also found that the public expenditure that is usually considered productive was not uniform in the WAEMU area: in countries that have strong economic potential, such as Benin, Cote d'Ivoire and Senegal, public spending on health, for example, was found to have a positive and weak effect on economic growth. The impact of social expenditure on economic growth remains weak for Sahelian countries like Burkina Faso, Mali and Niger. However, the study found that for all the WAEMU countries, the physical capital expenditure led to growth. In view of this, the study recommends that this type of expenditure should be increased through massive investment in new economic and social infrastructure and in rehabilitating existing ones. In this respect, greater emphasis should be put on health expenditure so as to provide the populations with easy access to health care and medicines, and enable countries in the region to intensify their fight against diseases that are likely to negatively affect the total labour productivity. The study found that in the short term, the non-productive expenditure was that spent on education, defence and security.

Decision makers should, therefore, focus on high-spending sectors versus those that are likely to lead to economic growth. For example, significant efforts must be made to reduce public expenditure, in particular that related to the way of life of a country's leadership and its administrative machinery. The states must continue catering for their sovereignty-related responsibilities in matters of defence and security, health and education. Government must also reconsider investment in research and development and ensure that the training offered is geared towards meeting the needs of the labour market so as to render the public expenditure on education more productive in the short term.

Furthermore, the results of this study speak in favour of good governance and conflict prevention. After all, good governance is increasingly becoming a condition for a given country to receive official development assistance and have access to certain sources of funding. This is why its institutions must be strong and credible.

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Annexes

Table A1: The structure of public expenditure in the TOFE

Total government expenditure	
Primary expenditure	
•	<i>Current expenditure</i>
	- Staff cost in GOB
	- Social benefit
	- Subsidies and other transfers
	- Non-salary recurrent expenditure
	* GOB (General Operating Budget)
	* Special accounts
	* Other operations from the treasure
	* State autonomous structures
	- Stabilization Deficit
	- Social expenditure target
	- Other current expenditure
•	<i>Investment budget expenditure</i>
	- Financing from budget and budget support
	- Financing from loans and grants - projects.
Interest due on government debt	
•	<i>Domestic debt</i>
•	<i>Foreign debt</i>

Source: Extrait du Tableau des Opérations Financières de l'Etat (TOFE).

Table A2: The economic classification of public expenditure in GDP

BENIN										
	2003	2006	2007	2008	2009	2010	2011	2012	2013	
Total expenditure	20.6	19.7	23.6	23	25.9	21.6	24.1	23.2	21.7	
Current expenditure	13.9	15	16.1	15.7	15.8	15.5	15.1	14.2	16.1	
Interest free	13.3	14.6	14.5	15.3	15.3	15	14.2	13.4	15.5	
Salaries	5.2	5.5	5.4	6.1	7.3	7.3	7.4	7.1	7.6	
Interests	0.6	0.4	1.6	0.3	0.5	0.5	0.9	0.8	0.6	
Primary balance	-1.4	0	1.8	-1.4	-3.7	-1	-1.6	-0.8	-0.5	
Overall balance	-2	-0.5	0.2	-1.7	-4.2	-1.6	-2.5	-1.6	-1.1	

continued next page

Table A2 Continued**BURKINA FASO**

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	20.9	24.3	25.7	21.5	23.1	25.7	25.3	24.6	24.9
Current expenditure	10.5	12.8	13.8	12.3	12.4	12.1	13.4	12.6	12.7
Interest free	9.8	12.2	13.4	12	11.9	11.6	13	12.2	12.3
Salaries	4.6	5.3	5.8	5.4	5.8	5.6	6	6.2	6.3
Interests	0.7	0.6	0.4	0.3	0.4	0.5	0.4	0.4	0.4
Primary balance	-2.4	17.3	-5.3	-4	-3.1	-10.2	-7.7	-7.2	-8.1
Overall balance	-3	16.7	-5.7	-4.4	-3.5	-10.7	-8.1	-7.6	-8.5

COTE D'IVOIRE

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	18.9	18.2	20.4	21.3	21.1	22	21.9	22.4	23.2
Current expenditure	16.1	15.3	17.4	18	17.9	18.6	19.2	19.3	19.7
Interest free	13.4	13.8	15.7	16.2	16.3	16.9	17.2	17.5	18
Salaries	6.8	6.5	6.7	6.8	6.8	7.1	7.6	7.5	7.5
Interests	2.7	1.5	1.8	1.8	1.5	1.7	2	1.8	1.7
Primary balance	1.2	1.1	0.8	1.2	0	-0.6	-0.5	-1	-1.8
Overall balance	-1.5	-0.4	-1	-0.6	-1.6	-2.3	-2.5	-2.8	-3.5

GUINEA BISSAU

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	19.2	39.9	22	24.5	21.1	20.4	20.8	21.5	22.5
Current expenditure	12.6	28.1	16.1	13.9	11.9	11.8	11.8	11.9	12.4
Interest free	10.1	25.1	14.4	12	11.5	11.6	11.6	11.8	11.9
Salaries	5	12.4	6.6	5.4	5.2	4.9	4.6	4.6	4.7
Interests	2.5	3.0	1.7	1.9	0.5	0.2	0.1	0.1	0.5
Primary balance	-3.6	-6.5	-3.7	1.1	4.1	0	-1.5	-0.1	-0.7
Overall balance	-6.2	-9.5	-5.4	-0.8	3.6	-0.2	-1.6	-0.2	-1.2

MALI

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	22.5	24.0	24.7	21.2	25.9	22.9	23.1	22.9	23
Current expenditure	14.4	13.9	14.5	13.4	14.7	14.6	16.3	16.6	16.1
Interest free	13.7	13.4	14.1	13.1	14.3	14.2	15.8	16	15.6
Salaries	4.3	4.6	4.8	4.8	5	5	5.3	5.7	5.7
Interests	0.8	0.5	0.4	0.4	0.4	0.4	0.5	0.6	0.5
Primary balance	-1.5	30.8	-4.8	-1.9	-3.9	-2.3	-0.5	-2.9	-2.9
Overall balance	-2.2	30.4	-5.2	-2.2	-4.2	-2.7	-1	-3.5	-3.4

continued next page

Table A2 Continued**NIGER**

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	17.9	18.9	21.7	23.7	24.6	21.5	23.3	21.3	21.7
Current expenditure	10.4	9.3	11.6	12	12.1	13.5	13.9	12.9	12.6
Interest free	9.2	8.7	11.3	11.7	11.9	13.3	13.6	12.6	12.2
Salaries	3.7	3.6	3.5	3.5	3.8	3.8	3.7	3.4	3.3
Interests	1.1	0.6	0.3	0.2	0.2	0.2	0.4	0.3	0.4
Primary balance	-1.6	4.3	-0.6	1.6	-5.2	-2.3	-4.5	-0.3	0
Overall balance	-2.7	3.7	-0.9	1.4	-5.5	-2.5	-4.9	-0.6	-0.4

SENEGAL

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	21.6	27.5	26.5	26.3	26.8	27.2	27.8	28.9	29.7
Current expenditure	13.3	17.1	16	16.3	16.7	15.6	16.2	16.5	16.3
Interest free	12.2	16.2	15.5	15.7	15.9	14.7	14.9	15.1	14.9
Salaries	5.1	5.9	6.1	5.8	6	6.2	6.2	6.3	6.3
Interests	1.1	0.9	0.5	0.6	0.8	0.9	1.3	1.4	1.4
Primary balance	-0.5	-5.2	-3.2	-4.1	-4.4	-4.2	-4	-4.9	-5.3
Overall balance	-1.6	-6.1	-3.8	-4.8	-5.2	-5.2	-5.3	-6.3	-6.7

TOGO

	2003	2006	2007	2008	2009	2010	2011	2012	2013
Total expenditure	15.1	21.0	17.8	17.9	21.2	22.1	23.3	24.7	25.1
Current expenditure	14.1	17.0	16.2	14.7	15.9	15.4	16.2	17	17.1
Interest free	12.2	16.1	14.9	13.9	15	14.5	15.3	16.2	16.4
Salaries	5.3	5.1	5.3	4.9	6.3	5.8	5.7	5.5	5.3
Interests	1.8	0.9	1.3	0.8	0.9	0.9	0.9	0.7	0.8
Primary balance	4.3	-1.9	1.6	-0.1	-1.9	-1.8	-2.9	-3.4	-3.7
Overall balance	2.4	-2.8	0.4	-0.9	-2.8	-2.8	-3.8	-4.1	-4.5

Table A3: The political risk components

Political risk components		
Sequence	Component	Points (max.)
A	Government stability	12
B	Socio-economic conditions	12
C	Investment profile	12
D	Internal conflict	12
E	External conflict	12
F	Corruption	6
G	Military in politics	6
H	Religious tensions	6
I	Law and order	6
J	Ethnic tensions	6
K	Democratic accountability	6
L	Bureaucracy quality	4
Total		100

Source: International Country Risk Guide (2010)

Akaike (1976) and Schwartz (1978) information criteria determine the number of optimal lags. There are three statistical criteria for the minimizing the information: the Fisher test, the Akaike test and that of Schwartz. However, the formulation of each test is different. The Akaike and Schwartz criteria are based on the same mathematical principle that consists to keep an optimal value p^* to minimize the following functions:

$$\text{Akaike Information Criterion: } AIC(p) = Ln f \frac{SCR}{n^p} + \frac{2p}{n} \quad (A1)$$

$$\text{Schwartz Information Criterion: } SIC = Ln f \frac{SCR}{n^p} + \frac{pLn(n)}{n} \quad (A2)$$

SCR presents the Residual Sum of Square for the model with p lags, n the number of available observations (each lag implies a loss of observation) and Ln the napierian logarithm. In practice, we proceed to the estimation of the model from 0 to n th lags and the different values of Akaike and Schwartz criteria are noted step by step. Finally, the optimal lag is derived from the comparison of values as the minimum of the two criteria. Table A4 reviews the results obtained.

Table A4: Results compiled from Akaike and Schwarz tests

Variables	Optimal number of lags	Akaike Info Criterion	Schwarz Info Criterion
DG	1	61.5365	62.3380
DD	1	53.2210	54.0161
DS	2	63.7838	65.5683
DE	3	44.1108	44.9182
DP	1	54.0215	58.3268
RP	0	65.4157	69.5587
SD	0	48.5231	49.9965
TE	0	52.9804	57.3417

Source: Author's estimation from data from ADB(2011)

To test for serial correlation, the “d” test of Durbin-Watson (DW) is currently used. But it leads to bias results when an equation includes a lagged dependent variable among independent variables. An alternative is the “h” test of Durbin. It is presented as follows:

$$h = \rho * \sqrt{\frac{T}{1 - T * \sigma_{\lambda}^2}} \quad (\text{A3})$$

where ρ is the estimated statistic of DW , T the sample size and σ_{λ}^2 the variance of λ the estimated coefficient of the lagged dependent variable. If there is an independence of residues, the statistic “h” is distributed asymptotically as a variable following a standard normal distribution process. The hypothesis to be tested is: $H_0 : \rho = 0$ versus $H_1 : \rho \neq 0$. The decision rule is: We accept the null hypothesis of none serial correlation if the statistic $|h| \leq t_{\alpha/2}$.

Table A5: Results compiled from serial correlation test

Estimated Values « h » Durbin	Benin	Burkina Faso	Cote d'Ivoire	Guinea Bissau	Mali	Niger	Senegal	Togo
DG	1.04	1.25	1.26	0.28	1.10	0.13	0.99	1.32
DD	0.71	0.27	1.49	1.23	1.18	1.65	1.94	1.01
DS	1.56	0.75	0.28	1.73	1.29	1.38	1.70	1.39
DE	1.11	1.08	0.21	1.08	0.24	1.97	1.27	1.61
DP	0.53	0.84	0.78	0.14	0.52	0.31	0.25	0.66
RP	1.09	1.40	1.52	0.05	1.45	0.55	1.48	1.07
SD	1.72	1.21	1.35	1.39	0.13	1.67	0.14	0.82
TE	0.46	0.82	1.33	0.98	1.78	0.40	1.03	0.35

The critical value of $t_{\alpha/2}$ at 5% level is 1.96.

Source: Author's estimation from data from ADB (2011)

The results presented in Table A5 point out a non-serial correlation because the estimated values of “h” test of Durbin are statistically lower than 1.96 at 5% level, with regard to the decision rule.

To test for heteroscedasticity, we use the ARCH LM test which consists on regressing autoregressive residual squared on “q” lags:

$$e_t^2 = \alpha_0 + \sum_{i=1}^q \alpha_i e_{t-i}^2 \quad (\text{A4})$$

where e_t represents the residual term, i the number of lags derived from correlogram analysis of residual squares. The hypothesis of ARCH are: H_0 : Homoscedasticity with $\alpha_1 = \alpha_2 = \dots = \alpha_q = 0$ versus H_1 : Heteroscedasticity with at least one coefficient $\alpha_i \neq 0$. To implement the test, we use the statistic of the test $n * R^2$ where n is the number of observations of e_t and R^2 the coefficient of determination of the regression. Under the null hypothesis H_0 , the statistic of the test $n * R^2$ follows a Chi-square distribution with “q” degrees of freedom. The decision rule is as follow: if $n * R^2 \leq \chi^2(q)$ where $\chi^2(q)$ is the critical value in the table of Chi-square, the null hypothesis is accepted.

Otherwise, we assume the presence of heteroscedasticity. Variables are observed from 1985 to 2011 (27 observations for each of the WAEMU members states). The recursive specification of the model imply 26 observation (n=26). The tabulated value of the Chi-square with 25 degrees of freedom to the threshold limit at 5% is 14.61

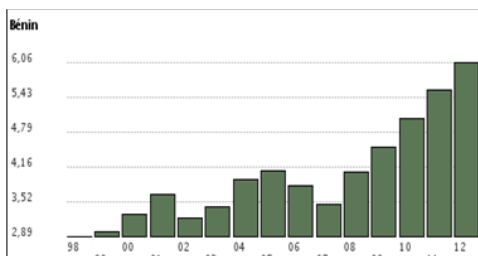
Table A6: Results compiled from heteroscedasticity test

ARCH LM	Benin	Burkina Faso	Cote d'Ivoire	Guinea Bissau	Mali	Niger	Senegal	Togo
$n * R^2$	19.76	22.10	19.24	19.76	22.36	16.38	19.50	19.76
$\chi^2(25)$	14.61	14.61	14.61	14.61	14.61	14.61	14.61	14.61

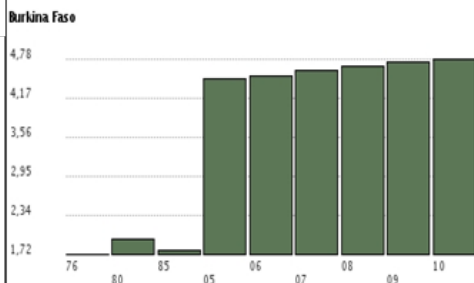
Source: Author's estimation from data from ADB(2011)

The results from Table A6 show presence of heteroscedasticity because all the estimated values of $n * R^2$ are statistically upper than the critical value of Chi-square at 5% level, as the decision rule says. Heteroscedasticity concerns only the variance-covariance matrix of stochastic perturbation and does not affects the estimators of Ordinary Least Squares (OLS) which remains unbiased. On the other hand, the variances of the same estimators are biased. To correct the heteroscedasticity, we can use the method of Feasible Generalized Least Squares (FGLS). This method leads to unbiased estimators independently of the variance-covariance matrix.

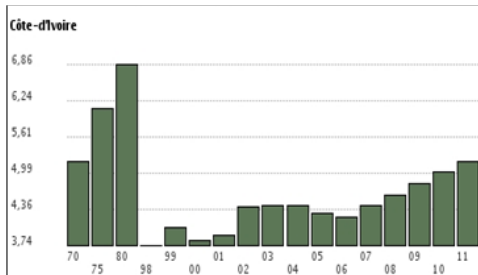
Figure B1: Public expenditure in Education sector in WAEMU Countries (% of GDP)



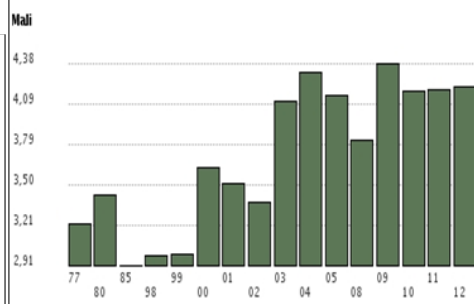
Perspective Monde | Université de Sherbrooke | Source: La Banque Mondiale



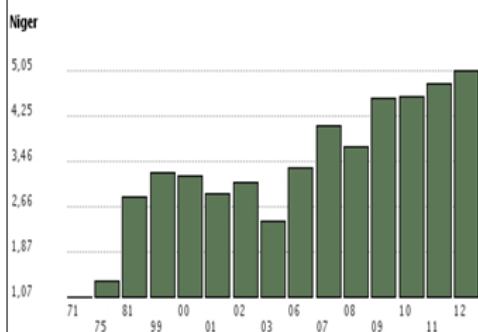
Perspective Monde | Université de Sherbrooke | Source: La Banque Mondiale



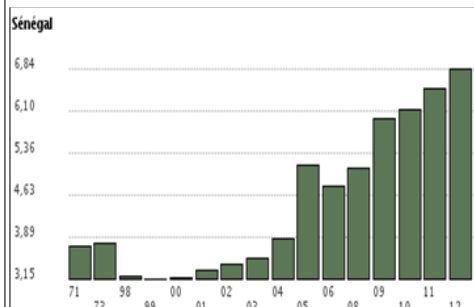
Perspective Monde | Université de Sherbrooke | Source: La Banque Mondiale



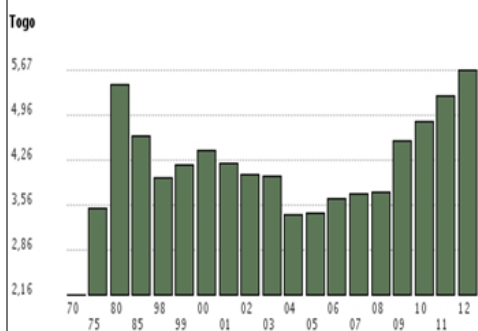
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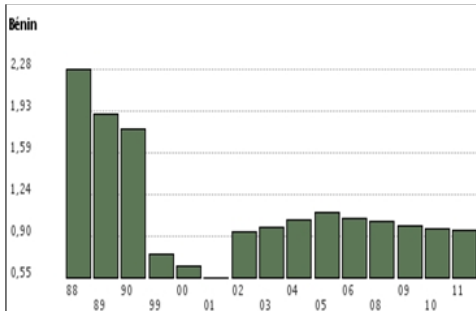


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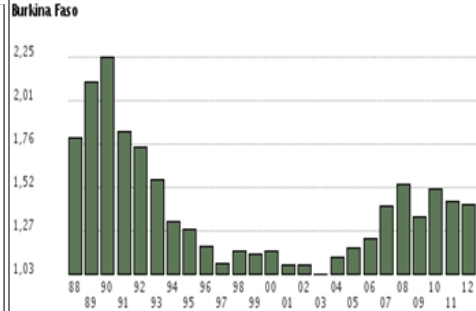


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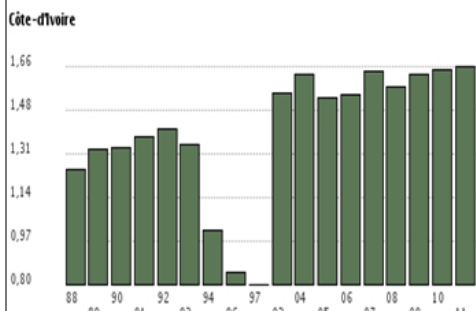
Figure B2: Public expenditure in Defence sector in WAEMU Countries (% of GDP)



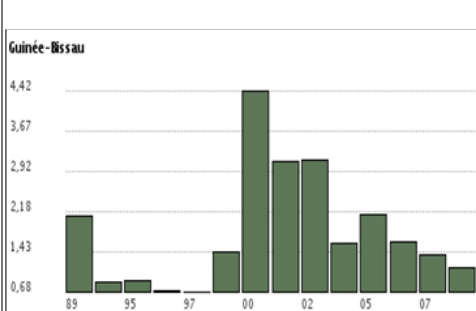
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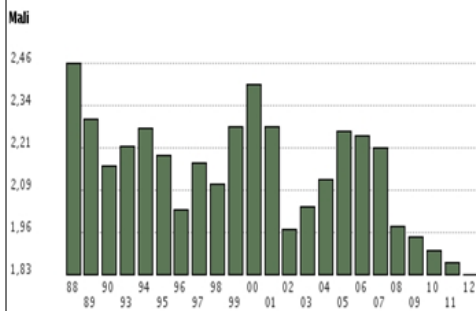
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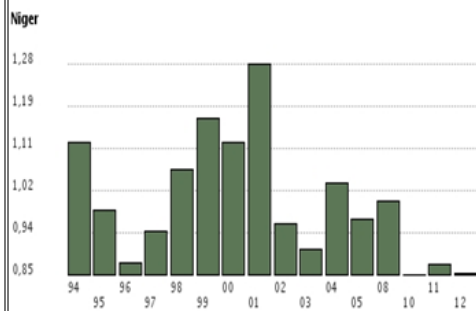
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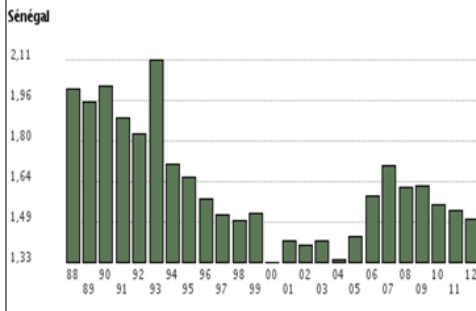
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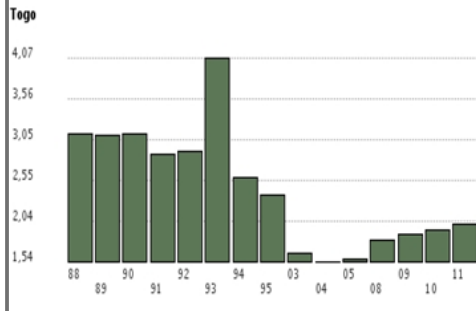
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Figure B3: Public expenditure in Health sector in WAEMU Countries (% of GDP)

