# Revenue and Expenditure Nexus: A Case Study of ECOWAS

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**Abstract**

This paper aims to assess the relationship among fiscal variables (government revenue and expenditure) in Sub-Saharan African countries. Using yearly data for the period between 1980 and 2011 in fifteen ECOWAS countries, a weak long-run relationship between government expenditure and revenue emerge, but only in the case of WAMZ countries. Granger causality analysis show mixed results for WAEMU countries, while for four out of six WAMZ countries (Gambia, Liberia, Nigeria, and Sierra Leone) the "tax-and-spend" hypothesis holds, since government revenue would drive the expenditure.

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# 1. Introduction

The global financial crisis had a major impact on many African countries as a result, *inter alia*, of reduced commodity exports, the shrinking of domestic tax bases owing to a contraction of domestic output, and reduced remittances, leading to a deterioration of balance of payments positions. Public finance situation may get worse with the financial crisis which has turned into a global economic crisis. In fact, many countries that draw most of their budget revenue from one or two basic products are likely to be affected by the deterioration in terms of trade on raw materials. Governments must preserve the achievements in terms of macroeconomic stability without worsening the impact of external demand contraction on domestic activity. Therefore, African countries should continue implementing the macroeconomic and fiscal reforms that saw the continent achieving high growth rates prior to the financial and economic crisis.

Nevertheless, the current European economic crisis can also be seen as an opportunity for the African Union to learn from the structural weaknesses of the European Economic and Monetary Union (UN and AUC, 2012). A regional "Convergence, Stability, Growth, and Solidarity Pact", adopted by the Conference of Heads of State of West African Economic and Monetary Union (WAEMU) in December 1999 provided a framework for fiscal convergence similar to the European Union's Maastricht Treaty.

Furthermore, one way to establish fiscal policy is to examine the relationship between revenue and expenditure in the framework of Granger causality. These empirical results provide an objective statistical basis to form empirical judgments about the correlations underlying fiscal variables (Doré and Nachega, 2000). Several alternative hypotheses of government finance characterize the causal relation between expenditure and revenue. The "tax-and-spend" hypothesis, due to Buchanan and Wagner (1977) and Friedman (1978), theorizes a causal relation running from revenue to spending. It views spending as adjusting, up or down, to whatever level can be supported by revenue. The "spend-and-tax" hypothesis relies on the reverse relation, with revenue responding to prior spending changes, in line with the Ricardian equivalence theorem (Barro, 1974). The third hypothesis emphasizes the institutional separation of allocation and taxation functions of government and the independent determination of revenue and spending (Wildavsky, 1988). Finally, the fourth hypothesis indicates bidirectional causation between revenue and spending, if a feedback mechanism is established (Musgrave, 1966;

Meltzer and Richard, 1981).

The aim of this paper is to analyze the government revenue-expenditure nexus for Sub-Saharan countries in the years 1980-2011 using IMF data.

The remainder of this paper is organized as follows. Section 2 is devoted to present and discuss theoretical background and empirical evidence about this issue. In Section 3 we briefly illustrate econometric methodologies and data. Section 4 shows the empirical analyses, and Section 5 concludes, giving some policy implications.

## 2.    Recent trends in West-African macroeconomic indicators

The Economic Community of West African States (ECOWAS) is a regional group of fifteen West African countries. Founded on 28 May 1975, with the signing of the Treaty of Lagos, its mission is to promote economic integration across the region. Considered one of the pillars of the African Economic Community, the organization was founded in order to achieve collective self-sufficiency for its member states by creating a single large trading bloc through an economic and trading union (Grimm, 1999).

The WAEMU is an organization of eight West African states. It was established to promote economic integration among countries that share the CFA franc as a common currency. It was created by the Dakar Treaty on 10 January 1994, signed by the heads of state and governments of Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, and Togo. On 2 May 1997, Guinea-Bissau joined the organization.

Formed in 2000, the West African Monetary Zone (WAMZ) is a group of six countries within ECOWAS (Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone) that plan to introduce a common currency, the Eco, by the year 2015. All the members of the group are English-speaking countries.

As stated in Aryeetey (2001), the main problem for the West African region remains its inability to nurture a critical mass of countries, so that fall-outs turn from negative to positive. The lack of monetary coordination tends to adversely affect bilateral trade, which remains volatile, minimal, and one-sided.

A flexible exchange rate could have possibly alleviated the costs of external shocks in terms of trade within CFA zone. Devarajan and Rodrik (1991) calculations suggest that fixed exchange rates have been, on the whole, a bad bargain for the CFA member countries, and the output costs of maintaining a fixed exchange rate have outweighed the

benefits of lower inflation.

Results for WAMZ countries in Balogun (2009) suggest that the production and asymmetric shocks experienced by these countries are not caused by exchange rate devaluation. Moreover, given the *ex-ante* independent fiscal and monetary policy, only two countries could meet output convergence criterion.

Since the CFA arrangement produced lower inflation and higher GDP growth from the early 1950s to the mid-1980s, its benefits overcame the costs. On the other hand, during the 1986-1993 years, the zone experienced a cumulative deterioration of the terms of trade combined with growing external debt in line with fiscal indiscipline, and a bank crisis.

A study on exchange rate regime by Dordunoo (2000) suggests that inflation rate is generally lower in the CFA zone than in the flexible exchange rate zone. Moreover, investment/GDP ratio and trade growth are significant and positively correlated with growth, regardless of regime selection, while openness contributes more to growth in the CFA zone. Instead, results of Elbadawi and Majd (1996) indicate a weakening competitive position of the CFA members, during the second half of 1980s relative to the first half, compared with the non-CFA countries, in terms of output growth as well as the performance of exports, investment, and savings. Moreover, as noted by Hadjimichael and Galy (1997), the fixed exchange rate regime does not buffer CFA franc countries form external shocks. Further, wide differences still exist between real exchange rate shocks facing CFA zone and non-CFA zone West African countries (Ogunkola, 2005). Roudet *et al.* (2007) find that much of the long-run behaviour of real effective exchange rates in WAEMU countries can be explained by fluctuations in terms of trade, government consumption, investment, and productivity. Chudik and Mongardini (2007) present a methodology to estimate equilibrium real exchange rates for Sub-Saharan African countries, and their empirical findings replicate well the historical experience for a number of countries in the sample.

Bénassy-Quéré and Coupet (2003) conclude that the existing CFA franc zone cannot be viewed as an optimum currency area: CEMAC and WAEMU countries do not belong to the same clusters. The results support the creation of a monetary union, connecting the Gambia, Ghana and Sierra Leone to the WAEMU. Including Nigeria in this zone is not supported by the analysis. Analogous results are achieved by Debrun *et al.*

(2002), which demonstrated that an ECOWAS monetary union might be desirable for most of the non-WAEMU countries, while could be less attracting for many actual members. The major reason is that Nigeria would have a preponderant weight in such a union, albeit its high fiscal distortion, and this could generate inflation. In addition, Nigeria's terms of trade differ from those of its neighbours, implying asymmetric shocks.

In the same way, Honohan and O'Connell (1997) warn that, although the trend is toward more flexible monetary regimes, the transition to greater flexibility might exacerbate credibility and macroeconomic management problems.

The empirical findings in Dramani (2010) show that the convergence process and, hence, that of integration has not been carried out uniformly in the Franc zone: the process has been given greater emphasis in WAEMU than in CEMAC zone, casting doubts on the common convergence path in the franc zone.

The empirical results in Cham (2010) show that real exchange rate variability has increased substantially across WAMZ zone in recent years (2000 to 2005). In addition, terms of trade, trade balance and money supply percent of GDP are negatively correlated among member countries.

In line with theory and most evidence for advanced and emerging market economies, Fernández Valdovinos and Gerling (2011) demonstrates that higher inflation increases inflation uncertainty and relative price variability in all WAEMU countries. However, the pattern, magnitude and timing of these two channels vary considerably by country.

The analyses of Fielding and Shields (2001) turn out that there is a large and positive degree of correlation between inflation shocks to the different members of the CFA. Thus, they conclude that there is no particular advantage to having two currencies rather than just one.

Despite evidence of significant trade complementarities within WAEMU, Goretti and Weisfeld (2008) stress that the implementation of the union's current trade regime still suffers from persistent non-tariff barriers and administrative weaknesses. In addition, ECOWAS members have a lot to gain by implementing the export diversification strategy (Odularu, 2008). A research on bilateral trade in WAEMU and CEMAC zone by Dramani (2011) show a sensitive reduction of the effects borders, an improvement of the institutional effects as well as the effects bound to the distance on the flux of the intra-zone trade. On the other hand, a relative symmetry of real demand shocks emerg-

es, while the price and supply shocks present an asymmetric character.

Hadjimichael and Galy (1997) calculate that the shift of the peg of the CFA franc to the euro could be positive over the long term for the countries involved, albeit might be a risk of a weakening of external competitiveness.

The findings shown in Chuku (2012) reveal a relatively high degree of symmetry in the responses of the economies to external disturbances, while about 85 percent of the correlations in supply, demand and monetary shocks among the countries are asymmetric. The size of the shocks and speed of adjustment among countries are also dissimilar. Instead, Hoffmaister *et al.* (1998) highlight that external shocks appear to have a greater influence on output and real exchange rate fluctuations in CFA franc area. Houssa (2004) underlines the presence of economic costs for a monetary union in West Africa, since aggregate supply shocks are poorly correlated or asymmetric across these countries, while aggregate demand shocks are more correlated between West African countries. In a seminal work, Devarajan and de Melo (1987) address the question whether particular aspects of the CFA zone – such as the lack of autonomy of the two Central Banks and the surrender of the exchange rate as a policy instrument – have impeded its members' growth, by testing whether CFA zone countries had different GNP growth rates from selected "comparator" countries during 1960-1982. Results show that CFA countries grew significantly faster than comparator SSA countries but usually slower, and often significantly so, than the whole sample of developing countries. Similarly, Guillaumont *et al.* (1988) estimated that the "relative growth performance" of 12 franc zone African countries appears to be close to the average performance of other developing countries and better than that of other African countries. The results are explained by the direct influence of the foreign exchange regime of the zone and by its impact on economic policy.

With the exception of Burkina Faso and Mali, the growth experience for WAEMU countries has been disappointing, even when compared to other Sub-Saharan African (SSA) countries. Kinda and Mlachila (2011) find that the variables most closely associated with growth accelerations and decelerations in SSA are changes in terms of trade, private investment, civil tension, real exchange rates, and inflation. Moreover, a certain asymmetry between accelerations and decelerations emerges, and the WAEMU region is quite different from the rest of SSA. On the other hand, Wane (2004) notes that growth

is largely explained by changes in literacy rates and factor accumulation, but not by growth of total factor productivity (TFP). Besides, the estimation identifies aid, government spending, credit to the private sector, and openness as positive determinants of TFP growth, and government deficits as a negative determinant.

Fouda and Stasavage (2000) identify three different alternatives that CFA franc zone could be take into account in order to reform itself: i. extend the existing CFA arrangements to other African countries; ii. EU can replace France as an external guarantor for African currencies; iii. focusing on inter-Africa relations rather than those with the EU.

CFA experience suggests that monetary union might weaken fiscal discipline through prospect of a bailout (Masson and Pattillo, 2001). Nonetheless, the implementation of structural adjustment programmes by various governments in the sub-region has brought about a reasonable level of convergence.

Oshikoya and Tarawalie (2010) study the sustainability of fiscal policy in the WAMZ countries using annual time series data for the period 1980 to 2008. The results showed that fiscal policies in Gambia, Ghana, Guinea, and Nigeria had been sustainable, although the sustainability was rather weak for these countries.

As for the government expenditure-revenue relationship, causality tests in Doré and Nachega (2000) illustrate that, in the long-run, the "tax-and-spend" hypothesis holds for Burkina Faso and Senegal; the reverse flow ("spend-and-tax" hypothesis) is valid for Benin and Togo; a feedback mechanism exists in Côte d'Ivoire and Mali; while neutrality hypothesis (with the absence of any causal link) has been found for Niger.

Finally, an exhaustive discussion of the government revenue-expenditure nexus is shown in Dalena and Magazzino (2012)[1].

## 3.   Econometric methodology, data and empirical model

With the growing use of cross-country data over time to study purchasing power parity, growth convergence and international R&D spillovers, the focus of panel data econometrics has shifted towards studying the asymptotic of macro panels with large $N$ (number of countries) and large $T$ (length of the time series) rather than the usual asymptotic of micro panels with large $N$ and small $T$. A strand of literature applied time series procedures to panels, worrying about non-stationarity, spurious regression

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[1] See also Table A in *Appendix*.

and cointegration. Im, Pesaran and Shin (IPS, 2003) proposed a test based on the average of the ADF statistics computed for each individual in the panel. Formally we assume that under the alternative hypothesis the fraction of the individual processes that are stationary is non-zero Maddala and Wu (1999) proposed a new simple test based on Fisher's suggestion, which consists in combining P-Values from individual unit root test. Fisher-type tests approach testing for panel-data unit roots from a meta-analysis perspective. The joint test statistic, under the null and the additional hypothesis of cross-sectional independence of the errors terms $\varepsilon_{it}$ in the ADF equation, has a chi-square distribution with $2N$ degrees of freedom. In essence, we choose these tests because they do not require strongly balanced data, and the individual series can have gaps.

Then we control for the (eventual) cross-section dependence in the data. The parametric testing procedure proposed by Pesaran (2004) tests the hypothesis of cross-sectional independence in panel data models with small $T$ and large $N$.

Furthermore, we adopted the $t$-test for unit roots in heterogeneous panels with cross-section dependence, proposed by Pesaran (2003). Parallel to the IPS test, it is based on the mean of individual DF (or ADF) $t$-statistics of each unit in the panel. Null hypothesis assumes that all series are non-stationary.

Westerlund (2007) proposed new panel cointegration tests that are designed to test the null hypothesis of no cointegration by testing whether the error correction term in a conditional error correction model is equal to zero. If the null hypothesis of no error correction is rejected, then the null hypothesis of no cointegration is also rejected.

However, as Pesaran *et al.* (1999) argued, the GMM estimation procedure for dynamic panel model (for instance, Arellano and Bond, 1991) might produce inconsistent and misleading coefficients of the long-run coefficients unless they are truly identical. This problem is exacerbated when the time dimension of the panel is large.

The concept of mean-group estimates suggests that while individual country regression estimates may be unreliable, by averaging across the estimates we obtain a more reliable measure of the average relationship across groups/countries (Pesaran and Smith, 1995).The PMG estimator allows the intercepts, short-run coefficients, and error variances to be different across groups, but the long-run coefficients are constrained to be homogeneous. There are good reasons to believe that the long-run equilibrium relation-

ship amongst variables should be identical across groups, while the short-run dynamics are heterogeneous. This dynamic estimator is more likely to capture the true nature of the data. Finally, the null hypothesis of long-run slope homogeneity in the coefficients is tested using the Hausman test.

Finally, in random-coefficients models, we wish to treat the parameter vector as a realization (in each panel) of a stochastic process (Swamy, 1970).

The Pesaran (2006) Common Correlated Effects Mean Group estimator (CCEMG) allows for the empirical setup, which induces cross-section dependence, time-variant unobservables with heterogeneous impact across panel members and problems of identification. The Augmented Mean Group (AMG) estimator accounts for cross-section dependence by inclusion of a 'common dynamic process' in the country regression. This process is extracted from the year dummy coefficients of a pooled regression in first differences (FDOLS) and represents the levels-equivalent mean evolution of unobserved common factors across all countries.

Granger causality tests (Granger, 1980) are statistical tests of causality in the sense of determining whether lagged observations of another variable have incremental forecasting power when added to a univariate autoregressive representation of a variable. $X_t$ is Granger causal for $y_t$ if $x_t$ helps predict $y_t$ at some stage in the future. It should be noticed, however, that Granger causality is not causality in a deep sense of the word. It just talks about linear prediction, and it only has "teeth" if one thing happens before another.

The empirical investigation in this study is carried out using a panel dataset for a sample of ECOWAS member countries with annual frequency from 1980 to 2011, and the data were provided by IMF[2] database.


### 4.    The estimates

The variables used in the empirical analyses are summed up in Table 1. Moreover, Figures 1 and 2 in *Appendix* give supplementary graphical descriptions of these data.

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Table 1. List of the variables.

| Variable | Explanation | Source |
|---|---|---|
| y | Gross domestic product, constant prices, % change | IMF |
| GGTE | General government total expenditure, % of GDP | IMF |
| GGR | General government revenue, % of GDP | IMF |

In Table 2 some preliminary descriptive statistics are shown. In order to give a more detailed analysis, we derived three different groups. Interestingly, WAEMU countries show an economic growth slower than WAMZ ones, but lower public deficit/GDP ratios, having a more efficient system of tax collection. Conversely, government expenditure and revenue shares present similar means around 21 and 18 per cent, respectively.

Table 2. Exploratory data analysis (WAEMU, WAMZ and ECOWAS countries, 1980-2011).

| Variable | | Mean | Median | Standard Deviation | Skewness | Kurtosis | Range |
|---|---|---|---|---|---|---|---|
| WAEMU | y | 2.9085 | 3.2830 | 4.4354 | -1.8087 | 12.7569 | 41.0890 |
| | GGTE | 21.0784 | 21.2330 | 3.3353 | -0.5878 | 3.8982 | 19.0790 |
| | GGR | 18.9534 | 18.4385 | 5.9322 | 4.4691 | 30.2767 | 50.2720 |
| WAMZ | y | 3.4355 | 4.1880 | 6.4679 | -1.1941 | 10.8877 | 58.7090 |
| | GGTE | 21.4634 | 20.2330 | 7.6063 | 1.4042 | 5.7391 | 41.9810 |
| | GGR | 18.1048 | 16.0830 | 8.2659 | 1.3563 | 4.7952 | 41.6490 |
| ECOWAS | y | 3.3212 | 3.8920 | 5.2470 | -1.4605 | 13.1061 | 58.7090 |
| | GGTE | 21.8191 | 21.2475 | 6.1506 | 1.3581 | 6.6226 | 41.9810 |
| | GGR | 19.0484 | 17.9600 | 7.2378 | 2.1094 | 10.6366 | 55.9500 |

Table 3 shows the results of IPS and Fisher-type panel unit root tests. The level models have been specified without subtracting the cross-sectional averages from the series, while the Hannan-Quinn information criterion is used to determine the number of lags used to remove higher-order autoregressive components of the series. More or less, *GGR* appears to be stationary everywhere, although for the WAMZ group it does not reject the null that all panels have a unit root at a 5% significance level. Government expenditure (*GGTE*) seems to be stationary everywhere, except for WAMZ countries. However, the first differences of the two series appear clearly stationary in each panel.

Table 3. Panel unit root tests.

| Area | GGR | GGTE |
|---|---|---|
| *Im, Pesaran and Shin (IPS) test* | | |
| WAEMU | -2.3745 | -3.3049 |
|  | (0.0088) | (0.0005) |
| WAMZ | -1.5037 | 0.3426 |
|  | (0.0663) | (0.6341) |
| ECOWAS | -2.6032 | -2.7441 |
|  | (0.0046) | (0.0030) |
| *Fisher-type test* | | |
| WAEMU | 32.4023 | 40.6455 |
|  | (0.0089) | (0.0006) |
| WAMZ | 28.3033 | 11.1679 |
|  | (0.0050) | (0.5146) |
| ECOWAS | 61.9058 | 75.0691 |
|  | (0.0005) | (0.0000) |

Notes: for the IPS test the *W-t*-bar statistic and the P-Values are reported; for the Fisher-type test the Inverse chi-squared statistic and, in parentheses, the P-Values are reported. Panel unit root tests include the intercept.

A standard assumption in panel data models is that the error terms are independent across cross-sections. Empirical findings in Table 4 show that, at a 5% significance level, the hypothesis of cross-sectional independence in our panel data might be maintained only for government revenue series in WAMZ countries.

Table 4. Panel cross-section dependence tests.

| Area | *1* | | *2* | |
|---|---|---|---|---|
|  | GGR | GGTE | GGR | GGTE |
| WAEMU | 4.684 | 2.820 | 7.84 | 3.21 |
|  | (0.0000) | (0.0048) | (0.000) | (0.001) |
| WAMZ | 1.811 | 2.370 | 0.89 | 2.12 |
|  | (0.0701) | (0.0178) | (0.372) | (0.034) |
| ECOWAS | 4.648 | 1.990 | 8.34 | 4.08 |
|  | (0.0000) | (0.0466) | (0.000) | (0.000) |

Notes: 1: Pesaran (2004) cross-sectional dependence in panel data models test; 2: Pesaran (2004) CD test for cross-section dependence in panel time-series data. Pesaran's statistic and, in parentheses, the P-Values are reported. Tests include the intercept.

To eliminate the cross dependence, the standard DF (or ADF) regressions are augmented with the cross section averages of lagged levels and first-differences of the individual series (CADF statistics). Now, when cross dependence problem is taken into account, previous results are confirmed, since government expenditure in WAMZ countries is the only non-stationary series, in line with conclusions based on IPS and Fisher-type tests (Table 5).

Table 5. Panel unit root test in presence of cross section dependence tests.

| | *Pesaran's CADF test* | |
| --- | --- | --- |
| Area | GGR | GGTE |
| WAEMU | -3.320 | -2.022 |
| | (0.000) | (0.022) |
| WAMZ | | -1.714 |
| | | (0.515) |
| ECOWAS | -2.763 | -2.744 |
| | (0.003) | (0.003) |

Notes: The *Z-t*-bar or *t*-bar statistics and, in parentheses, the P-Values are reported. Panel unit root tests include the intercept.

The panel cointegration tests point to the existence of a long-run relationship between government expenditure and revenue. As for the panel cointegration tests, the $G_a$ and $G_t$ statistics test $H_0$: $a_i=0$ for all $i$ versus $H_1$: $a_i<0$ for at least one $i$. While the $P_a$ and $P_t$ test statistics pool information over all the cross-sectional units to test $H_0$: $a_i=0$ for all $i$ against the alternative $a_i<0$ for all $i$. Here, the null of no cointegration is rejected by all Westerlund (2007) tests at the 5 per cent level (see Table 6). The group statistics show that for WAMZ countries we cannot reject the null of absence of panel cointegration. Thus, panel data findings reveal the existence of a long-run relationship between government expenditure and revenue, albeit only in the case of WAMZ countries.

Table 6. Westerlund panel cointegration tests for WAMZ countries.

| Area | Group statistics and Panel statistics | Value | P-Value |
| --- | --- | --- | --- |
| WAMZ | Gt | -1.702 | 0.044** |
| | Ga | -7.949 | 0.013** |
| | Pt | -5.074 | 0.001*** |
| | Pa | -6.340 | 0.000*** |

Notes: P-Values at the 5% significance level in parentheses. Panel cointegration tests include intercept.

Table 7 presents results obtained from alternative estimators: MG, PMG, and DFE. Results may vary quite substantially across methodologies given that the MG procedure is the least restrictive, and thus potentially inefficient. The DFE allows for individual intercepts to vary across countries, and is similar to the GMM procedure. The PMG computations were obtained using the Newton-Raphson algorithm without a common time trend. The constraint of common long-run coefficients (i.e. from MG to PMG) has yielded lower standard errors and slower speed of adjustment. This outcome is expected given that the MG estimators are known to be inefficient. In this application we take the maximum lag as being 1; thus, the ARDL (1,1) has been estimated.

Table 7. Pooled Mean-Group, Mean-Group, and Dynamic Fixed Effects Models.

| Dependent variable: GGR | Estimator | | | |
|---|---|---|---|---|
| | Pooled mean-group | Mean-group | Dynamic Fixed-Effects | Swamy Random-Coefficients |
| *Long run* | | | | |
| EC | 0.2618 *** (0.0160) | 0.2234 (2.1048) | 1.4551 *** (0.4069) | |
| *Short run* | | | | |
| EC | 0.2731 *** (0.0889) | 0.2853 *** (0.0995) | 0.3316 *** (0.0808) | |
| GGTE | 0.4300 *** (0.1599) | 0.4771 ** (0.2132) | 0.4826 *** (0.0567) | 0.6376 *** (0.1684) |
| Constant | 0.6281 (0.6413) | 4.1328 (5.4392) | 0.4653 * (0.2770) | 0.9917 * (0.5341) |
| N | 252 | 252 | 252 | 252 |
| Hausman test | 0.00 (0.9751) | | 10.79 (0.0010) | |
| Parameter constancy test | | | | 197.26 (0.0000) |

Notes: Standard Errors in parentheses. For DFE estimates, the standard errors are heteroskedasticity consistent. For the diagnostic tests P-Values are reported. Significance levels: * 10%, ** 5%, *** 1%.

In comparing the PMG and MG estimators, we note that the estimated long-run government budget elasticity is negative and statistically significant in both models. However, the MG estimate is larger in magnitude. The speed of adjustment estimates of each model imply significantly different short-run dynamics (compare 0.26 from PMG and 0.22 from MG). The addition of a linear time trend does not change this striking feature. The calculated Hausman statistic is 0.00: here we conclude that PMG estimator, which is the efficient estimator under the null, ought to be preferred. The DFE model further restricts the speed of adjustment coefficient and the short-run coefficients to be equal. In our case, the Hausman test suggests that the MG model is preferred to the DFE. The test of parameter constancy included with the random-coefficients model also indicates that the assumption is not valid for these data. With large panel datasets, we would not want to take the time to look at a simultaneous-equations model.

Given the outcome produced in Table 6 we evaluated if the presence of cross section correlation changes at all the results when estimating the cointegration vector. The long run coefficients estimated by means of the Common Correlated Effects Mean Group estimators (Pesaran, 2006) are reported in Table 8.

Results of the CCEMG estimator provide additional evidence. They are quite aligned with those for the case of no cross section dependence; in particular they are very similar to the estimates produced with the MG models. The regressors are still significant and correctly signed, but, interestingly, their size is slightly greater.

Table 8. Common Correlated Effects Mean Group and Augmented Mean Group estimators.

| Dependent variable: GGR | Estimator | |
|---|---|---|
| | **CCEFMG** | **AMG** |
| GGTE | 0.4755 *** (0.0852) | 0.5013 *** (0.0725) |
| Constant | 0.8767 (0.7544) | 0.4682 (0.4469) |
| | Cross-section averaged regressors for: | |
| GGR | 0.5449 *** (0.1619) | |
| GGTE | 0.4420 * (0.2222) | |
| Constant | | 0.6582 *** (0.1980) |
| N | 252 | 252 |
| Wald | 31.15 (0.0000) | 47.86 (0.0000) |
| RMSE | 0.1176 | 0.1323 |

Notes: all coefficients present represent averages across groups (country). Coefficient averages computed as outlier-robust means, using robust regression. For the diagnostic tests P-Values are reported. Significance levels: * 10%, ** 5%, *** 1%.

Finally, in Table 9 we show the results for causality tests. We perform Granger causality tests to investigate whether lagged values of government expenditure help in forecasting government revenue, and vice versa.

Table 9. Results for Granger causality tests.

| Country | Granger causality | $\chi^2$ | P-Value | Country | Granger causality | $\chi^2$ | P-Value |
|---|---|---|---|---|---|---|---|
| Benin | GGTE→GGR | 2.72 | 0.2562 | Gambia | GGTE→GGR | 0.09 | 0.9554 |
| | GGR→GGTE | 1.40 | 0.4954 | | GGR→GGTE | 7.58 | 0.0226** |
| Burkina Faso | GGTE→GGR | 7.46 | 0.0240** | Ghana | GGTE→GGR | 0.40 | 0.8191 |
| | GGR→GGTE | 2.76 | 0.2513 | | GGR→GGTE | 0.27 | 0.8716 |
| Côte d'Ivoire | GGTE→GGR | 0.52 | 0.7723 | Guinea | GGTE→GGR | 11.57 | 0.0031*** |
| | GGR→GGTE | 2.62 | 0.2702 | | GGR→GGTE | 2.56 | 0.2778 |
| Guinea-Bissau | GGTE→GGR | 2.85 | 0.2411 | Liberia | GGTE→GGR | 0.64 | 0.7260 |
| | GGR→GGTE | 1.88 | 0.3911 | | GGR→GGTE | 17.25 | 0.0002*** |
| Mali | GGTE→GGR | 6.11 | 0.0472** | Nigeria | GGTE→GGR | 1.12 | 0.5720 |
| | GGR→GGTE | 49.40 | 0.0000*** | | GGR→GGTE | 18.25 | 0.0001*** |
| Niger | GGTE→GGR | 1.22 | 0.5426 | Sierra Leone | GGTE→GGR | 4.36 | 0.1129 |
| | GGR→GGTE | 6.16 | 0.0459** | | GGR→GGTE | 7.15 | 0.0281** |
| Senegal | GGTE→GGR | 17.16 | 0.0002*** | | | | |
| | GGR→GGTE | 0.95 | 0.6222 | | | | |
| Togo | GGTE→GGR | 5.53 | 0.0630* | Cape Verde | GGTE→GGR | 16.52 | 0.0003*** |
| | GGR→GGTE | 2.48 | 0.2890 | | GGR→GGTE | 3.53 | 0.1712 |

Notes: 5% P-Values.

Empirical findings listed in Table 10 suggest a bi-directional flow (with a feedback mechanism) only for Mali. "Spend-and-tax" hypothesis (if causality runs form expenditure to revenue) holds for five countries. On the other hand, we find a unidirectional causality, running from government revenue to expenditure, in line with the "tax-and-spend" hypothesis, for five countries. Finally, four countries exhibit the absence of any causal relationship (neutrality hypothesis). These results confirm only partially that of in

Oshikoya and Tarawalie (2010).

Table 10. Summary of Granger causality tests results.

| Hypothesis | Causality flow | Countries |
|---|---|---|
| Feedback | GGTE↔GGR | 1: Mali |
| Spend-and-tax | GGTE→GGR | 5: Burkina Faso, Senegal, Togo, Cape Verde, Guinea |
| Tax-and-spend | GGR→GGTE | 5: Niger, Gambia, Liberia, Nigeria, Sierra Leone |
| Neutrality | GGTE↔GGR | 4: Benin, Côte d'Ivoire, Guinea-Bissau, Ghana |

In general, we can state that these are mixed results, since any causal link clearly outpaces the other. Nevertheless, it may be underlined that in four out of six WAMZ member States a causality flow running form government revenue to expenditure emerges. Control of taxation, according to Friedman (1978), is essential to limiting growth in government; and these countries raised both variables in the last decades (Nigeria represents the unique exception), so that higher taxes could finance more public services. It is quite interesting to point out a substantial difference of our causality analyses in respect to Doré and Nachega (2000) long-run results, for WAEMU zone.

## 5.    Concluding remarks and policy implications

This study has used several panel econometric techniques in order to explore the relationship between two public finance variables (government revenue and expenditure) in ECOWAS countries, in the period 1980-2011.

Further, panel stationarity and cointegration analyses revealed a weak empirical support to long-run relationship between government expenditure and revenue, since this emerged only for WAMZ countries. Granger causality analysis showed mixed results for WAEMU countries, while for four out of six WAMZ countries (Gambia, Liberia, Nigeria, and Sierra Leone) the "tax-and-spend" hypothesis holds.

During the year 2008, the respect of the convergence criteria by the Economic Community of ECOWAS' member States was strongly disturbed by the impact of the double exogenous shocks on food and energy prices, which resulted, in a net inflation increase and, within oil-importing States, and in a deterioration of public finances.

The European Union member States are suffering from a debt crisis that was brought about by various discrepancies in the structure of the monetary union established. One of them is the lack of a fiscal policy framework consistent with a monetary union. The Pact signed by the Heads of State of WAEMU countries in 1999, even

though it has provoked weaken economic growth, has also reduced the cyclical fluctuations, giving greater financial stability to those countries. Yet, in the last three decades, cyclical component of economic growth has reduced its oscillations, both for WAEMU and WAMZ member States.

Greater intra-African trade and regional integration are therefore required, in order to improve the benefits of a monetary union. This might enhance the creation of an African Monetary Fund (AMF) to play an oversight role and to curb financial instability where it is detected.

Given that some CFA countries have significant trade outside the CFA/Euro Area and have substantial dollar-denominated debts, significant changes in the euro-dollar or euro-yen exchange rates may be of considerable importance. While a weak euro would improve their international competitiveness, it would increase their debt payments. By contrast, a strong euro might offer price stability, even the high interest rates associated with such a monetary policy might deter investment.

Moreover, several efforts are still needed. African central banks' supervisory and regulatory functions should be strengthened and there should be minimal government intervention in the decisions taken by the regulatory agencies. It should be accompanied by the strengthening of financial institutions and enforcement of strict transparency standards in financial transactions (UN and AUC, 2012).

**References**

Aryeetey, E. (2001). Regional Integration in West Africa, *OECD Working Paper*, 170, March.

Balogun, E.D. (2009). Alternative reconsideration of output growth differential for West African Monetary Zone, *IFC Bulletin*, 32, 106-120.

Barro, R.J. (1974). Are Government Bonds Net Wealth?, *Journal of Political Economy*, 82, 1095-1117.

Bénassy-Quéré, A., and Coupet, M. (2003). On the Adequacy of Monetary Arrangements in Sub-Saharan Africa, *CEPII Working Papers*, 2003-11.

Buchanan, J.M., and Wagner, R. (1977). *Democracy in Deficit*, New York: Academic Press.

Cham, T. (2010). Real exchange rate misalignment in West African monetary zone (WAMZ) countries, *African Journal of Marketing Management*, 2(4), 80-90.

Chudik, A., and Mongardini, J. (2007). In Search of Equilibrium: Estimating Equilibrium Real Exchange Rates in Sub-Saharan African Countries, *IMF Working Paper*, WP/07/90.

Chuku, A.C. (2012). The Proposed Eco: Should West Africa Proceed with a common Currency?, paper presented at the Centre for the Study of African Economies (CSAE) 2012 Conference on "Economic Development in Africa", Oxford University, Oxford, 18-20 March.

Dalena, M., and Magazzino, C. (2012). Public Expenditure and Revenue in Italy, 1862-1993, *Economic Notes*, 41, 3, 145-172.

Debrun, X., Masson, P., and Pattillo, C. (2002). Monetary Union in West Africa: Who Might Gain, Who Might Lose, and Why?, *IMF Working Paper*, WP/02/226.

Devarajan, S., and de Melo, J. (1987). Evaluating participation in African monetary unions: A statistical analysis of the CFA Zones, *World Development*, 15, 4, 483-496.

Devarajan, S., and Rodrik, D. (1991). Do the Benefits of Fixed Exchange Rate Outweigh Their Costs? The Franc Zone in Africa, *NBER Working Paper*, 3727, June.

Dordunoo, C.K. (2000). Growth, Inflation and Foreign Exchange Rate Regimes in Sub-Saharan Africa (CFA & Non-CFA Zones), paper presented at the "Project LINK Fall Meeting", Oslo, 2-6 October.

Doré, O., and Masson, P.R. (2002). Experience with Budgetary Convergence in the WAEMU, *IMF Working Paper*, WP/02/108.

Doré, O., and Nachega, J.-C. (2000). Budgetary Convergence in the WAEMU: Adjustment Through Revenue or Expenditure?, *IMF Working Paper*, WP/00/109.

Dramani, L.A.G. (2010). Convergence and Economic Integration in Africa: the Case of the Franc Zone Countries, *AERC Research Paper*, 200, August.

Dramani, L.A.G. (2011). Bilateral trade in Waemu and Cemac zone, *Journal of Development and Agricultural Economics*, 3(1), 13-25.

Eberhardt, M., and Teal, F. (2011). Econometrics for Grumblers: A New Look at the Literature on Cross-Country Growth Empirics, *Journal of Economic Surveys*, 25, 1, 109-155.

Elbadawi, I., and Majd, N. (1996). Adjustment and Economic Performance Under a Fixed Exchange Rate: A Comparative Analysis of the CFA Zone, *World Development*, 24, 5, 939-951.

Fernández Valdovinos, C.G., and Gerling, K. (2011). Inflation Uncertainty and Relative Price Variability in WAEMU Countries, *IMF Working Paper*, WP/11/59.

Fielding, D., and Shields, K. (2001). Modelling Macroeconomic Shocks in the CFA Franc Zone, *Journal of Development Economics*, 66, 199-223.

Fouda, S.M., and Stasavage, D. (2000). The CFA Franc Zone After EMU: Status Quo, Reform, or Dissolution?, *World Economy*, 23-2, 221-233.

Friedman, M. (1978). The Limitations of Tax Limitation, *Policy Review*, 7-14.

Goretti, M., and Weisfeld, H. (2008). Trade in the WAEMU: Development and Reform Opportunities, *IMF Working Paper*, WP/08/68.

Granger, C.W.J. (1980). Testing for Causality, *Journal of Economic Dynamic and Control*, 4, 161-194.

Grimm, S. (1999). Institutional Change in the West African Economic and Monetary Union (WAEMU) since 1994: A Fresh Start after the Devaluation Shock?, *Africa Spectrum*, 34, 1, 5-32.

Guillaumont, P., Guillaumont, S., and Plane, P. (1988). Participating in African monetary unions: An alternative evaluation, *World Development*, 16, 5, 569-576.

Hadjimichael, M.T., and Galy, M. (1997). The CFA Franc Zone and the EMU, *IMF Working Paper*, WP/97/156.

Hoffmaister, A.W., Roldós, J.E., and Wickham, P. (1998). Macroeconomic Fluctuations in Sub-Saharan Africa, *IMF Staff Papers*, 45, 1, 132-160.

Honohan, P., and O'Connell, S.A. (1997). Contrasting Monetary Regimes in Africa, *IMF Working Paper*, WP/97/64.

Houssa, R. (2004). Monetary Union in West Africa and Asymmetric Shocks: a Dynamic Structural Factor Model, *Center for Economic Studies Discussions Paper Series*, 04.11.

Im, K.S., Pesaran, M.H., and Shin, Y. (2003). Testing for unit roots in heterogeneous panels, *Journal of Econometrics*, 115, 53-74.

Keho, Y. (2010). Budget Deficits and Economic Growth: Causality Evidence and Policy Implications for WAEMU Countries, *European Journal of Economics, Finance and Administrative Sciences*, 18, 99-104.

Kinda, T., and Mlachila, M. (2011). The Quest for Growth in the WAEMU Region – the Role of Accelerations and Decelerations, *IMF Working Paper*, WP/11/174.

Maddala, G., and Wu, S. (1999). A Comparative Study of Unit Root Tests and a New Simple Test, *Oxford Bulletin of Economics and Statistics*, 61, 631-652.

Masson, P., and Pattillo, C. (2001). Monetary Union in West Africa (ECOWAS): Is it Desirable and How Could it be Achieved?, *IMF Working Paper*, 204.

Meltzer, A.H., and Richard, S.F. (1981). A Rational Theory of the Size of Government, *Journal of Political Economy*, 89, 914-927.

Musgrave, and R. (1966). Principles of Budget Determination, in Cameron, H., Henderson, W., (eds.), *Public Finance: Selected Readings*, New York: Random House.

Odularu, G.O. (2009). Export diversification as a promotion strategy for intra-ECOWAS trade expansion, *African Journal of Business Management*, 3 (2), 032-038.

Ogunkola, O. (2005). An evaluation of the viability of a single monetary zone in ECOWAS, *AERC Research Paper*, 147.

Oshikoya, T.W., and Tarawalie, A.B. (2010). Sustainability of Fiscal Policy: The West African Monetary Zone (WAMZ) Experience, West African Monetary Institute, 9, 2.

Pesaran, M.H. (2003). A Simple Panel Unit Root Test in the Presence of Cross Section Dependence, *Cambridge Working Papers in Economics*, 0346.

Pesaran, M.H., and Smith, R. (1995). Estimating long-run relationships from dynamic heterogeneous panels, *Journal of Econometrics*, 68, 1, 79-113.

Pesaran, M.H. (2006). Estimation and inference in large heterogeneous panels with a multifactor error structure, *Econometrica*, 74, 4, 967-1012.

Pesaran, M.H., Shin, Y., and Smith, R.P. (1999). Pooled mean group estimation of dynamic heterogeneous panels, *Journal of the American Statistical Association*, 94, 621-634.

Roudet, S., Saxegaard, M., and Tsangarides, C.G. (2007). Estimation of Equilibrium Exchange Rates in the WAEMU: A Robustness Analysis, *IMF Working Paper*, WP/07/194.

Swamy, P.A.V.B. (1970). Efficient inference in a random coefficient regression model, *Econometrica*, 38, 311-323.

Talvi, E., and Végh, C.A. (2005). Tax Base Variability and Procyclical Fiscal Policy, *Journal of Development Economics*, 78, 156-190.

United Nations, and African Union Commission (2012). The Impact of the European Debt Crisis on Africa's Economy – A Background Paper, 5th Joint Annual Meetings of the AU Conference of Ministers of Economy and Finance, Addis Ababa, Ethiopia, 26-27 March.

Wane, A.A. (2004). Growth and Convergence in WAEMU Countries, *IMF Working Paper*, WP/04/198.

Westerlund, J. (2007). Testing for error correction in panel data, *Oxford Bulletin of Economics and Statistics*, 69, 709-748.

Wildavsky, A. (1988). *The New Politics of the Budgetary Process*, Glenview, IL: Scott Foresman.
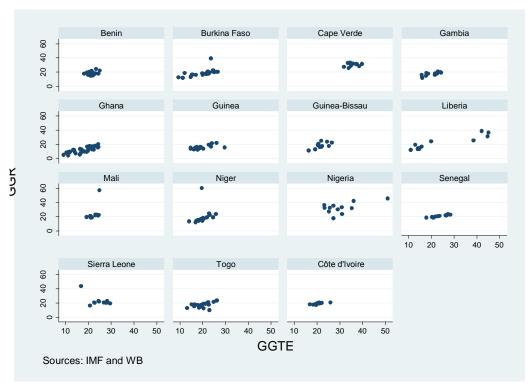
## Appendix



Figure 1. Government expenditure (GGTE) and revenue (GGR) in ECOWAS countries (1980-2011).
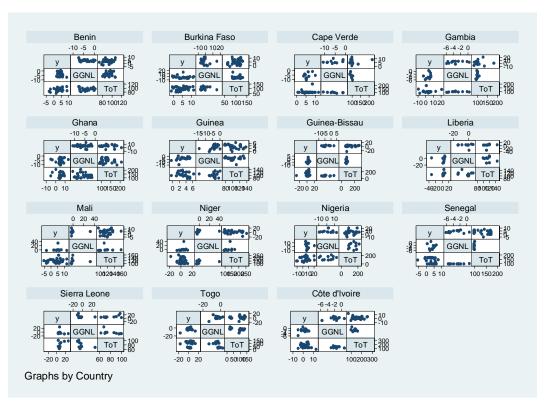
Figure 2. Economic growth (y), government budget (GGNL) and terms of trade (ToT) in ECOWAS countries (1980-2011).

Table A. Results of existing literature on government revenue and expenditure relationship.

| Simultaneous determination | Expenditure dominance | Revenue dominance | Neutrality hypothesis |
|---|---|---|---|
| Miller and Russek (1990), Baghestani and McNown (1994), Owoye (1995), Hasan and Lincoln (1997), Li (2001), De Castro et al. (2004), Al-Qudair (2005), Câmpeanu and Cataramă (2007), Hye and Jalil (2010) | Anderson et al. (1986), Ram (1988), Ahiakpor and Amirkhalkhali (1989), Manzini and Zarin-Nejadan (1995), Hondroyiannis and Papapetrou (1996), Payne (1997), Koren and Stiassny (1998), Wahid (2008), Zapf and Payne (2009), Saunoris and Payne (2010) | Park (1998), Fasano and Wang (2002), Eita and Mbazima (2008), Konuk-cu-Önal and Tosun (2008), Stoian (2008), Young (2008), Lemmer and Stegarescu (2009) | Narayan (2005), Narayan and Narayan (2006), Gil-Alana (2009) |

Source: Dalena and Magazzino (2012).

Table B. Paired samples statistics about government revenue for ECOWAS countries, 1980-2011 (results for t-tests, ANOVA and other comparison methods).

| | Groups | Mean | N | t | Mann-Whitney test | Bartlett test | Kruskal-Wallis test | One-Way ANOVA F test | Pearson $\chi^2$ test |
|---|---|---|---|---|---|---|---|---|---|
| GGR | *No* | 19.17 | 112 | | | | | | |
| | *WAEMU* | | | 0.22 | -1.717 | 17.288 | 2.950 | 0.05 | 6.429 |
| | *WAEMU* | 18.95 | 140 | | (0.0859) | (0.000) | (0.0859) | (0.8163) | (0.011) |

Table C. Paired samples statistics about government revenue for ECOWAS countries, 1980-1999 (results for t-tests, ANOVA and other comparison methods).

| | Groups | Mean | N | t | Mann-Whitney test | Bartlett test | Kruskal-Wallis test | One-Way ANOVA F test | Pearson $\chi^2$ test |
|---|---|---|---|---|---|---|---|---|---|
| GGR | *No* | 11.68 | 30 | | | | | | |
| | *WAEMU* | | | - | -4.899 | 2.908 | 24.003 | 32.58 | 22.424 |
| | *WAEMU* | 16.26 | 44 | 5.41 | (0.0000) | (0.088) | (0.0001) | (0.0000) | (0.000) |

Table D. Paired samples statistics about government revenue for ECOWAS countries, 2000-2011 (results for t-tests, ANOVA and other comparison methods).

| | Groups | Mean | N | t | Mann-Whitney test | Bartlett test | Kruskal-Wallis test | One-Way ANOVA F test | Pearson $\chi^2$ test |
|---|---|---|---|---|---|---|---|---|---|
| GGR | *No* | 21.64 | 84 | | | | | | |
| | *WAEMU* | | | 1.44 | -0.185 | 6.203 | 0.034 | 2.16 | 0.052 |
| | *WAEMU* | 20.04 | 101 | | (0.8534) | (0.013) | (0.8534) | (0.1430) | (0.819) |

Table E. Paired samples statistics about government expenditure for ECOWAS countries, 1980-2011 (results for t-tests, ANOVA and other comparison methods).

| | Groups | Mean | N | t | Mann-Whitney test | Bartlett test | Kruskal-Wallis test | One-Way ANOVA F test | Pearson $\chi^2$ test |
|---|---|---|---|---|---|---|---|---|---|
| GGTE | *No* | 22.74 | 112 | | | | | | |
| | *WAEMU* | | | 1.99 | 0.241 | 97.743 | 0.058 | 4.63 | 0.064 |
| | *WAEMU* | 21.08 | 140 | | (0.8096) | (0.000) | (0.8097) | (0.0323) | (0.800) |

Table F. Paired samples statistics about government expenditure for ECOWAS countries, 1980-1999 (results for t-tests, ANOVA and other comparison methods).

| | Groups | Mean | N | t | Mann-Whitney test | Bartlett test | Kruskal-Wallis test | One-Way ANOVA F test | Pearson $\chi^2$ test |
|---|---|---|---|---|---|---|---|---|---|
| GGTE | *No* | 16.57 | 30 | | | | | | |
| | *WAEMU* | | | - | -3.149 | 0.533 | 9.915 | 9.98 | 10.988 |
| | *WAEMU* | 19.51 | 44 | 3.09 | (0.0016) | (0.465) | (0.0016) | (0.0023) | (0.001) |

Table G. Paired samples statistics about government expenditure for ECOWAS countries, 2000-2011 (results for t-tests, ANOVA and other comparison methods).

| | Groups | Mean | N | t | Mann-Whitney test | Bartlett test | Kruskal-Wallis test | One-Way ANOVA F test | Pearson $\chi^2$ test |
|---|---|---|---|---|---|---|---|---|---|
| GGR | *No* | 24.80 | 84 | | | | | | |
| | *WAEMU* | | | 3.21 | 1.850 | 93.586 | 3.424 | 11.90 | 4.5558 |
| | *WAEMU* | 21.73 | 101 | | (0.0643) | (0.000) | (0.064) | (0.0007) | (0.033) |