MACROECONOMIC CONVERGENCE IN CENTRAL AFRICA: A SURVEY OF THE THEORY AND EMPIRICAL EVIDENCE[¶]

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Abstract – The term "convergence" refers to two different macroeconomic issues: the cross-country convergence in the level of output, occurring as the result of the catch-up process, and the convergence of a set of macroeconomic fundamentals among a given set of countries, which can be seen as either a prerequisite for, or as the outcome of, a successful monetary integration agreement. This paper deals with the latter kind of convergence, whose theoretical foundations should be sought in the theory of the Optimum Currency Areas (OCAs). After reviewing the "old" and "new" theory of OCA, the paper singles out their implications in terms of "macroeconomic convergence" and "macroeconomic policy convergence", and discusses these implications both at a general level, and with reference to the CEMAC countries. The paper addresses in particular two questions: is CEMAC an OCA, or is it becoming an OCA through an "endogenous" process (as assumed by "new" OCA theory)? How successful has been the multilateral surveillance programme set up by the CEMAC treaty, and how consistent is it with the indications coming from economic theory? This analysis allows us to put the economic performance of CEMAC in the right perspective, and to single out some policy actions which could be taken in order to foster growth in the area.

Keywords:
F33 International monetary arrangements and institutions;
F36 Financial aspects of economic integration;
H60 National budget, deficit and debt
E31 - Price level; inflation; deflation
E32 - Business fluctuations; cycles

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1. NCGT-convergence and OCA-convergence in macroeconomics: meaning and implications for pro-poor growth.

This paper is the output of a policy study commissioned by UNECA in the framework of the capacity building project "Enhancing the capacity of member States to achieve macroeconomic policy convergence". As a part of this project, UNECA has requested a policy study aimed at "survey existing literature and provide empirical evidence on macroeconomic policy convergence, highlight pertinent international experiences and summarize the debate on the cons and pros of macroeconomic convergence". The study should "use country-level as well sub-regional information and data, covering the main regional economic communities in Central Africa (ECCAS, CEMAC)[1] to assess macroeconomic convergence in the sub-regions <...> and its importance for accelerated and sustained pro-poor growth in Central Africa" and "provide specific policy suggestions on the design and implementation of strategies for macroeconomic convergence in these regions."

Defining "macroeconomic convergence" may prove less self-evident than it seems at first sight. You will usually not find "macroeconomic convergence" in the index of any macroeconomics textbook (e.g., Dornbusch et al. (2004), Mankiw and Taylor (2008)). If you instead look for "convergence" only (i.e., without the adjective "macroeconomic"), you will be brought invariably to a discussion of the neoclassical exogenous and endogenous growth models. The same happens if you have a quick look at the scientific literature, using some of the most widespread bibliographic tools. If you search for "convergence" the Econlit database you get 21160 items, but a number of these deals with methodological issues in econometrics; if you narrow down the search looking for "convergence and growth", say, you still find a respectable 15207 items; if you instead search for "macroeconomic convergence" the harvest is surprisingly meagre: only 41 items, of which only 9 mention "macroeconomic convergence" in the title, of which 4 refers to African countries (none to the CEMAC), and the other to the European Monetary Union (EMU) and the Eastern Europe transition countries.[2]

"Convergence" in the context of neoclassical growth theory (henceforth, NCGT) refers to the process by virtue of which less developed countries will catch up with advanced countries, owing to the law of diminishing returns on capital (Barro and Sala-i-Martin, 1992). In what follows, we will define this kind of convergence as NCGT-convergence. A crucial question in NCGT-convergence is: how long will it take for per capita GDP of less developed countries (LDCs) to converge to the levels experienced in developed countries (DC's)? Is this process spontaneous, or are there any policies able to speed up it? Put in the geographical framework of our study, the question would become: how long will it take for CEMAC annual per capita GDP (equal to USD 775 at 2000 prices in 2006) to catch up with, say, the Euro area per capita GDP (equal to USD 21746; see Table 1)?[3] This may prove a difficult question to answer (the "convergence debate" is not yet settled; see Islam, 2003), but it is a question that makes sense and has an immediate relevance for pro-poor policies.

A layman may (legitimately) wonder in discovering that this convergence, i.e., the convergence macroeconomic textbooks speak of, is not what multilateral and supranational agencies usually mean for "macroeconomic convergence". While "convergence" *tout court* coincides with NCGT-convergence, the term "macroeconomic convergence" appears instead to be related to Optimum Currency Area (OCA) theory

(Mundell, 1961; Tavlas, 1993; Broz, 2005). In this framework, "macroeconomic convergence" refers to the convergence of a set of macroeconomic fundamentals among a given set of countries, which can be seen as either a prerequisite for, or as the outcome of, a successful monetary integration agreement.[4] This use of the terms "macroeconomic convergence" has become relatively widespread in the Nineties, during the run-up of EU countries to the EMU, when "convergence to the Maastricht parameters" had become the main concern of European policymakers. We will refer to it as OCA-convergence. Summing up, the study of OCA-convergence deals with the feasibility/optimality (ex ante), or the sustainability/stability (ex post) of a given monetary integration agreement.

"Macroeconomic policy convergence" is closely related to OCA-convergence. The so-called "inconsistent triad" problem (Gandolfo, 2002, chap. 20) makes clear that in a monetary union (henceforth, MU) with perfect capital mobility there is no room for monetary independence at a national level. As a consequence, a common monetary policy, possibly carried out by a supranational central bank, is widely seen as a prerequisite of a viable MU. In other words, monetary integration implies that national monetary policies *need* to converge (even in the absence of a common currency). This makes clear that when we speak about "macroeconomic policy" convergence in a MU we are actually speaking of the convergence of national *fiscal* policies. The question is still open as to whether, and to what extent, *fiscal policies* should also converge among the members of a MU. Multilateral surveillance agreements, akin to the Stability and Growth Pact (SGP) in the EMU, usually set bounds to some fiscal policy indicators, thereby implicitly endorsing the view that fiscal policy *convergence* is also needed for a viable MU. An argument often invoked at an informal level is that this kind of convergence ensures the coordination of national fiscal policies, which is considered as beneficial *per se*. However, the economic literature gives a less clear-cut answer. Upon closer scrutiny, the need of fiscal policy coordination in a MU does not appear as a self evident matter (see e.g. Gandolfo, 2002), and some authors question both the need of fiscal policy coordination, and the way this is enforced in multilateral surveillance programmes (we will come to these issues later on).

Summing up the discussion so far, macroeconomic theory considers two different concepts of convergence: NCGT-convergence and OCA-convergence (the latter closely related to "macroeconomic policy" convergence).[5] In order to define the content of this study, it is useful to sketch out the "pros and cons" of these concepts at a very broad level, as well as their relations to each other and to "pro-poor growth".

In principle, NCGT-convergence is a beneficial process, to the extent that it implies that LDCs income levels will "catch up" with DCs ones, thus bringing about an increase in LDCs GDP per capita. During this process, LDCs are expected to grow at a higher pace than DCs. We do not enter here in the debate about whether economic growth is always "pro-poor" (see Ravallion, 2004), as this is considered by the companion study by Tirelli (2010). Rather, since this policy study is requested to focus on Central Africa countries, we would like to stress here the obvious fact that in assessing the benefits of NCGT-convergence the reference set of countries matters. In particular, studying NCGT-convergence among a set of LDCs, may have little sense as far as pro-poor policies are concerned, for the simple reason that if poor countries converge to each other, they are likely to remain relatively poor. In the NCGT literature this outcome is captured by the "convergence clubs" concept, a term coined by Baumol (1986) and related to the so called "conditional convergence" process, where different

countries may reach different equilibria according to the different features of their technology.

Coming to OCA-convergence, it should be clear by now that the macroeconomic literature does not discuss its "pros and cons" *per se*. Rather, the assessment of OCA-convergence is part of a more general evaluation of the pros and cons of monetary integration. In this framework, OCA-convergence is approached mostly from the point of view of the "reduction of damages", rather than from that of the "increase of benefits". Many examples of this peculiar attitude will be given below. For instance, inflation convergence is requested in order to avoid competitiveness shifts among MU members, that may lead to disruptions in trade and ever growing intraregional external imbalances. Since these may compromise the viability of a MU (as the recent European experience shows), it then follows that inflation rates need to converge among member countries in order to avoid major crises (reduction of damage); however, sharing the same inflation rate does not *per se* bring any particular benefit to a given set of countries, except in the extreme case in which one is willing to assume that inflation has only costs, and that bringing each country to a zero inflation rate has no unemployment costs, because the Phillips curve is vertical in the long- and in the short-run (a feature that is almost invariably assumed rather than tested in the OCA-convergence literature). This example suggests two important differences between NCGT- and OCA-convergence. First, the pros and cons of NCGT-convergence are relatively easy to evaluate (at least to the extent that NCGT-convergence in LDCs implies catching-up with DCs), while the pros and cons of OCA-convergence require a careful assessment of the structural features that determine the success of a given monetary integration agreement. Second, the assessment of NCGT-convergence at a regional level may be pointless from the point of view of poverty reduction (because convergence to a group of low-income countries provides no particular relief to the poor), while on the contrary the assessment of OCA-convergence has a strong relevance only at a regional level (because it determines the viability of regional monetary integration agreements).

The relations of OCA-convergence with NCGT-convergence are rather loose. Take for instance the convergence in the real growth rates: this is considered by both NCG and OCA theory. In OCA theory, this kind of convergence is required in order to avoid disruptions in trade among the member of a MU, much in the same way as inflation convergence (Acocella, 2005). At the same time, convergence in the rates of growth is a relatively weak form of NCGT-convergence (Islam, 2003). In particular, when countries grow at the same rate, their relative income positions remain unchanged. As a consequence, the OCA-convergence requirement (i.e., the equality in the rates of growth) prevents the catch-up process (hence, poorer countries do not experience an improvement in their living standards), while on the contrary the occurrence of catch-up within a MU (with poorer countries growing faster than richer ones) would undermine its viability.[6] At a more general level, the relation between OCA-convergence and (pro-poor) growth are controversial, for at least two reasons: first, the standard argument that MUs foster growth through an increase in trade is controversial;[7] second, there is nothing in OCA theory that suggests that the growth effect of a MU will be proportionately larger in poorer countries, thus determining catch up (we will return on these points later on).

Taking stock of this brief discussion, we are now in a position to define more precisely the content of this study and to set out its structure.

First, we will deal with macroeconomic convergence in the framework of monetary integration theory, i.e., with what we have defined OCA-convergence. In other words, unlike previous studies such as UNECA (2007), we shall not consider NCGT-convergence. This choice is motivated by a number of practical and theoretical reasons. First, space limitations prevent a treatment of both issues; second, the issue of pro-poor policies and institutions is dealt with in the companion paper by Tirelli (2010); third, as explained before, the regional focus of the study suggests the need to address the convergence meaning that makes more sense in a regional framework (i.e., the OCA-convergence); fourth, by focussing on OCA-convergence we will be able to examine issues that are crucial for the conduct of macroeconomic policy in a MU. In particular, this approach will allow us to put in perspective the economic rationale of multilateral surveillance programmes such as those adopted by the CEMAC. At the same time, it is important to stress that this choice does not reflect a value judgment about what kind of convergence issue is more important for "accelerated and sustained pro-poor growth" in Central Africa. As we stated before, and as we shall see later in more detail, at the theoretical level very little suggests that OCA-convergence will allow poor countries to grow faster, and this result, though not undisputed, is confirmed by a host of empirical studies. Although this may appear as a "negative", "unconstructive" result, a careful assessment of it will allow us to formulate some constructive criticisms and policy proposals on crucial issues like the structure and content of the surveillance programmes.

Second, in order to better define OCA-convergence (and the related concept of "macroeconomic policy convergence"), we will need to summarise briefly the main results of OCA theory. This will enable us to put in a correct perspective both the convergence criteria set out in regional monetary integration agreements, and the empirical studies on macroeconomic convergence carried out at the regional level.

Third, throughout the study we will stress the fact that the assessment of macroeconomic convergence *per se*, i.e., outside the reference framework of OCA-theory, makes little sense. This is especially true when convergence *does not* occur (as it appears to be the case of CEMAC countries), because in this case it becomes crucial to understand why it does not, to quantify the costs determined by the non convergence, and to take the right policy measures. OCA theory has known several stages of development since its first statement in the early Sixties. As a consequence, the meaning of macroeconomic convergence within the more general framework of the assessment of the pros and cons of an OCA has developed. In particular, as stated before, the convergence of some macroeconomic fundamentals (e.g., the inflation rates) has been considered in turn as either a *prerequisite for*, or as a (desirable) *outcome of* OCA membership. In principle, these two perspectives are rather different, if not completely opposite. If "macroeconomic convergence" is a prerequisite (as envisaged by "old" OCA theory), it is meaningful for a country interested in joining a monetary union (henceforth, MU) to assess it and look for policies that may eventually enforce it, while countries already belonging to a MU have no obvious interest in assessing it, unless in the unlikely case that they desire (or are forced) to leave the union. If instead "macroeconomic convergence" is to be seen as an outcome, the only policy measure needed to ensure it is simply to join the OCA: in this respect, the assessment of macroeconomic convergence is relatively useless for a country that does not belong to a MU, as it is uninformative on what could possibly occur should the country join the union;[8] at the same time, taken in this perspective (i.e., the perspective of the "new" or

"endogenous" OCA theory), the study of convergence may become interesting for countries already belonging to a MU, as it allows them to verify the "endogenous OCA" assumption and to evaluate the macroeconomic costs related to MU membership. Since CEMAC countries belong by definition to a MU, the more recent studies on their macroeconomic convergence have been carried out exactly in this perspective (see Carmignani, 2010).

The paper structure is as follows. Section 2 reviews OCA theory and establishes the role of macroeconomic convergence within the "old" and "new" version of the theory. Section 3 focuses on macroeconomic policy convergence: it first reviews the literature on convergence criteria and multilateral surveillance programmes, and then evaluates CEMAC multilateral surveillance programme in the light of the relevant literature. Section 4 deals with the empirical literature focussing on macroeconomic convergence (and macroeconomic policy convergence) in Sub-Saharan Africa (henceforth, SSA) countries: it highlights the main results, by critically reviewing the methodology, and proposes fresh results based on a more rigorous testing methodology.

2. OCA theory and macroeconomic convergence

As Gandolfo (2002, p.333) aptly puts it, OCA theory derives its rationale from the inconclusiveness of the debate on fixed versus flexible exchange rates, for the simple reason that if fixed exchange rate were proven always superior, there would be only one OCA, coinciding with the world,[9] whereas if flexible exchange rates were shown to be always superior, no currency area would be optimal. OCA theory therefore exists for the very reason that "no single currency regime is right for all countries or at all times" (Frankel, 1999). However, as Tavlas (1993) clearly states, "the basic case" for evaluating the benefits of monetary integration rests upon the desirability of "exchange rate certainty" (meant to include both fixed exchange rates, and the limit case of a single currency). The logical circularity of this argument is striking: the results of an inconclusive debate (that on the desirability of fixed exchange rates) are invoked in order to settle another debate (the definition of OCAs) that has been raised by the inconclusiveness of the first one! The circularity can be avoided if one recognizes that the advantages (or costs) of belonging to a MU may not depend exclusively on exchange rate "certainty", but also on other factors, as stressed by the so called "new" OCA theory (Gandolfo, 2002). At the same time, this logical inconsistency may well explain why a number of authors (e.g., Mintz, 1970; Gandolfo, 2002; Baldwin, 2006) recognize that joining a MU is first and foremost a political, rather than an economic, decision.

Both the "old" and "new" OCA theory consider some kind of macroeconomic convergence among the prerequisite or the outcomes of OCA membership. In this section we briefly recall why macroeconomic convergence is a desirable outcome (or requisite) for countries belonging to MUs, we specify what kind of convergence is considered by the literature, and we show some basic stylized facts related to the optimality of CEMAC.

2.1 Why should we study convergence and what convergence should we study?

The heading of this section asks a well defined question, yet one that is often overlooked in empirical studies, including those related to CEMAC. In order to avoid "measurement without theory" problems, we shall briefly review the main theoretical

arguments supporting the need of some kind of macroeconomic convergence, distinguishing between the "old" and "new" approach to OCA theory. Remark that the "old" approach is still topical: "new" theories do still refer to most of the "old" criteria, the only difference being that "new" theories adopt a "cost-benefit" instead of a "single criterion" approach, and gauge the criteria in the light of some relatively recent debates in macroeconomic theory, like Friedman (1968) natural rate hypothesis, Lucas and Rapping (1969) analysis of the short-run Phillips curve, and Barro and Gordon (1982) analysis of reputational issues in the rules vs. discretion debate. In other words, "old" does not mean "passé", and the distinction between "old" and "new" theory is adopted here only for easiness of exposition, as usual in the related literature.[10]

2.1.1 Convergence in the "old" OCA theory

The criteria singled out by the "old" OCA theory share a common rationale: since by joining a MU a country gives up the possibility of adjusting its nominal exchange rate in response to macroeconomic shocks, the theory looks for those structural features of an economy that reduce its need to adjust the nominal exchange rate. Taking for granted the benefit of a MU, the theory adopts therefore a "reduction of damages" approach: the lesser the need for an economy to adjust the nominal exchange rate, the lesser the cost of belonging to a MU. The main criteria (listed according to the chronological order in which they were proposed) are:

1) *flexibility of prices and wages* (Friedman, 1953): it reduces the need to adjust employment or the nominal exchange rate in reaction to country specific shocks;
2) *high interregional factor (especially labour) mobility* (Mundell, 1961): it allows a country or region to absorb shocks without the need of adjusting the nominal exchange rate in presence of nominal rigidities that prevent the adjustment of real wages (see criterion 1 above);
3) *high degree of openness* (McKinnon, 1963): the more open the economy, the larger the benefits (or lower the costs) of belonging to a MU, for three distinct reasons:
   a. *nominal rate ineffectiveness*: in an open economy with a large pass-through, nominal exchange rate adjustments are likely to be ineffective; for instance, if such an economy reacts to an adverse external shock with a nominal devaluation, the initial benefit on the exports side is compensated by an increase in the price of imported inputs, which brings price competitiveness to the initial level. Since in this case the nominal rate is an ineffective instrument, the cost of renouncing it is low.
   b. *Resource reallocation costs*: a different line of reasoning stress that the larger the tradable sector, the larger the costs of resource reallocation between tradable and non tradable sectors during the adjustment process following a change in the nominal exchange rate.
   c. *Trade integration*: as Frankel (1999) puts it, "where traded goods constitute a large proportion of the economy, exchange-rate uncertainty is a more serious issue". For that reason, highly trade-integrated regional areas may consider forming a MU.

Remark that the above arguments apply in particular to small countries, as they necessarily depend on a number of imported inputs and are almost invariably more open than larger ones.

4) *high product diversification* (Kenen, 1969): it reduces the impact of industry-specific shocks relative to the size of the economy, thus reducing the need to resort to nominal exchange rate adjustments;
5) *high fiscal integration* (Kenen, 1969): it allows to absorb the impact of asymmetric shocks through fiscal transfers from one to another country, thereby reducing the need of nominal exchange rate adjustments;
6) *convergence of inflation rates* (Fleming, 1971): under fixed exchange rates, differences in inflation rates translate into variations of the terms of trade and give rise to persistent or even rising current account disequilibria.
7) *political factors* (Mintz, 1970), i.e., the "political will to integrate on the part of the prospective members".

As the previous discussion shows, the only convergence explicitly mentioned as such by "old" OCA theory is that of *inflation rates*, and this is only *one* among *seven* criteria of optimality. In other words, "old" OCA theory provides no economic rationale for analyzing the convergence of variables like the money stock, prices, fiscal receipts, or GDP, just to quote a few variables that have been considered in previous empirical analyses (see Par. 4 below). In fact, "old" theory suggests at least two other easily measurable dimension of "convergence" (in a broad sense) that would ensure a viable MU: openness and product diversification. However, these structural features are often overlooked in the OCA-convergence debate, probably because there is no obvious benchmark against which to assess their "convergence". While in the case of inflation rates the benchmark is straightforward (in order to avoid competitiveness shifts they must be *equal* across member countries), as far as openness and diversification is concerned we can only say "the higher, the better", but there is no rigorous method for determining "how high is high enough" to warrant MU membership, and no requirement that these variables should be equal across member countries. This may explain why openness and diversification are usually not considered in formal OCA-convergence testing. Therefore, a first answer to the questions raised in this section is: we should study the convergence of the inflation rates, because lack thereof will cause current account disruption within a MU. The recent crisis of the Euro area is a rather telling example of this phenomenon.

2.1.2 Convergence in the new OCA theory: the cost-benefit approach

While the "old" OCA theory operates in a "reduction of damages" perspective, the "new" theory weighs the benefits of OCA membership against its costs. This change of attitude is probably related to the historical developments of the international monetary system. In the Bretton Woods era, fixed exchange rates were considered as an ultimate, unchangeable feature of the economic system. As a consequence, discussing their merits appeared as pointless. The fall of the Bretton Woods regime gave rise to a more equilibrate discussion.

The major benefits pointed out in the literature are:

1) *macroeconomic stability through the solution of time-consistency problems* (Giavazzi and Pagano, 1988): by joining a MU with a low-inflation country, the monetary authorities of an otherwise inflation-prone country take a credible commitment towards anti-inflation policies. This increases their reputation, thus solving time-consistency problems and favouring convergence of inflation rates to the bottom. Under the extreme hypothesis of vertical short-run Phillips curve, this outcome is only beneficial, in that it minimizes the costs of inflation without increases in unemployment.
2) *increase in trade*: according to Rose (2001), joining a MU causes a sizeable increase in trade (due to the elimination of exchange rate risk, to enhanced transparency in prices, to greater financial integration); this, in turn, would synchronize the economic cycles of member countries through increased demand spillovers.
3) *saving on exchange reserves* (Mundell, 1973; Frankel, 1999): by joining a MU member countries no longer need international reserves for intra-regional transactions; moreover, the pooling of foreign exchange reserves entails an international risk sharing, determining a better coverage of imports requirements than would otherwise be possible.
4) *political advantages* (Gandolfo, 2002): a MU "carries more weight than the single countries in negotiating as a whole with outside parties".

Among the major costs, we recall:

1) *loss of autonomy in monetary policy* (De Grauwe, 1992): by joining a MU a country renounces an autonomous monetary policy, thus loosing a degree of freedom in reacting to external shocks. This may lead to an increased volatility of output growth. It is important to remark that recent studies, such as Ramey and Ramey (1995) and Hnatkovska and Loayza (2004), point out that there is a negative relation between growth and its volatility. This relation becomes stronger in low-income countries, where long-run growth decreases by about half a point for each unit increase in the standard deviation of the real growth rate (Hnatkovska and Loayza, 2004, Fig. 2a). In principle, the costs of renouncing a stabilizing policy instrument may therefore be particularly severe in LDCs. Several issues are here at stake:
   a. *symmetry of shocks*: if member countries are hit by an asymmetric shock, this will either push for a discontinuation of the union (if there is no leader country), or exacerbate domestic business cycles in the peripheral countries (if there is a leader country). Therefore, the *degree of symmetry of the shocks becomes* an important criterion (Alesina *et al*., 2002).
   b. *Synchrony of business cycles*: if member countries are hit by the same shock, but are in different stages of the business cycle, they may require different policy answers, which increase the costs of sharing the same monetary policy. As a consequence, the *degree of business cycle synchronization among member countries becomes* an important criterion.[11]

c. *Nature of the shocks*: the cost of renouncing a policy instrument varies according to the nature of the shocks (Gandolfo, 2002). The "modern view" stresses the superiority of fixed exchange rate as a stabilizing tool in case of money demand shock and aggregate supply shocks, while flexible exchange rates are superior in case of aggregate demand shocks. A definite answer, however, is impossible because it crucially depends on the economy structural parameters (see Melitz, 1991, and Gandolfo, 2002, App. M, for a more formal treatment).[12]

2) *Increased specialization in production* (Artis, 1991): under flexible exchange rates the scattering of production facilities across countries can be used by multinational firms as a hedging strategy against exchange rate risk. Under fixed exchange rate, on the contrary, the countries are encouraged to exploit their comparative advantages, leading to a more spatially concentrated and specialized production. As stressed by the "old" theory (see criterion 4 in Sec. 2.1.1 above), this process increases the costs of adjustment in response to asymmetric shocks. However, Frankel and Rose (1997) argue that this effect is offset by the trade promotion effect: therefore, the net result of joining a MU would be business cycle synchronization. In this case the formation of an OCA becomes an endogenous process (the so-called *endogenous OCA hypothesis*).

3) *Perverse incentive effects on fiscal policy*

a. Tornell and Velasco (2001) dispute the view that fixed exchange rates provide more "discipline" than flexible rates. They point out that under fixed exchange rates an unsustainable path of public spending can be protracted over time. The resulting external imbalance will progressively deplete the stock of reserves, eventually requiring a costly adjustment of the peg. The parity adjustment, however, can be postponed provided the initial stock of foreign exchange reserves is large enough. On the contrary, in case of flexible exchange rates the unsound policies are immediately punished through nominal exchange rate devaluation. Therefore, flexible exchange rates may provide more discipline.[13]

b. Feldstein (2005) points out a similar "signalling" problem: unified monetary policy with decentralized fiscal policies creates a free riding problem, as spendthrift countries do not incur in market discipline through higher national interest rates.

4) *loss of autonomy in fiscal policy* (De Grauwe, 1996): as Gandolfo (2002) points out, different models give rise to different results as far as the need for fiscal coordination is concerned. However, the arguments listed above show that in the absence of fiscal discipline a MU may break down, as union membership may favour unsustainable paths of public spending in profligate countries. This stresses the need for the adoption of some binding rules. However, an autonomous fiscal policy may be called for by the need to react to asymmetric shocks. Hence, although needed for the viability of the union, fiscal policy restraints may amplify the output volatility.

Before examining the relation of this discussion with the CEMAC experience, it is useful to carefully analyze its theoretical foundations. As Gandolfo (2002) points out, some advantages emphasized by the "new" OCA theory are not completely "objective" or "neutral": they depend, instead, on the "the adhesion to a particular school of thought or to a particular (social) preference function". In particular, benefit number one (macroeconomic stability through reputation gains) rests on a relevant number of assumptions:

a) *inflation has only costs*, therefore the optimal inflation rate is the lowest attainable;
b) *the Phillips curve is vertical in the long- and possibly also in the short-run*, thereby implying that the *reduction* of inflation has no long- or short-run costs in terms of unemployment; this assumption rests in turn on two methodological assumptions:
    a. *representative agent models provide sound foundations to macroeconomic thinking*;
    b. *expectations are rational*.

While a thorough survey of the underlying debates clearly exceeds the scope of this study, we think nevertheless useful to recall that these assumptions are disputable, and to suggest that the macroeconomics that was fashionable in DCs in the '80s may not be relevant anymore in the 21st century in LDCs, especially after the financial crisis. Failure to recognize this will lead to biased answers to the question on "why do we study convergence". In order to put the discussion in perspective we recall that:

a) inflation has not only costs:
    a. every introductory macroeconomics textbook recalls that in presence of nominal rigidities and inefficiencies in the labour market, inflation plays a crucial role in the adjustment of the real wage;
    b. after the global financial crisis of 2007/2008 low inflation commitment are now questioned even by mainstream economists such as Blanchard *et al*. (2010), because they are conducive to liquidity traps, thus limiting the effectiveness of monetary policy in case of recessions; as a consequence, this kind of commitment may lead to increased output volatility (see Section 2.2.2 below);
    c. moreover, comparative studies (e.g., Khan and Senhadji, 2000) stress that although "single digit" inflation is generally a sensible goal, the threshold above which inflation lowers growth is nonlinear and considerably higher for LDCs than for DCs. Using a panel of 140 countries observed over 39 years they find that this threshold is equal to 3% for industrial countries but rises to 12% in LDCs (see their Table 3). As we shall see in Sec. 3.6, 3% is the inflation ceiling adopted by CEMAC multilateral surveillance.
b) as far as the "vertical Phillips curve" (hence, the absence of adjustment costs for reducing inflation) is concerned;
    a. the hypothesis of rational expectations upon which the vertical Phillips curve rests has not withstand empirical evidence in a number of occasions (Sumner, 1986; Lovell, 1986; Weizsacker, 2008);

b. the representative agent framework within which the vertical Phillips curve result is obtained has been questioned as a reliable tool for macroeconomic analysis (Kirman, 1992), in particular because of observational equivalence problems stemming from aggregation (Lippi, 1988); as a consequence, long-run aggregate Phillips curve may not be vertical (hence, there can be long-run costs from reducing inflation) even in the presence of individual vertical Phillips curve (Hughes Hallet, 2000);
c. at a more general level, Fuhrer (1995) tests the relevance of Lucas (1976) critique and finds the critique to be empirically irrelevant and the Phillips curve to be a structurally stable relation. *A priori* dismissal of the inflation/unemployment trade-off appears therefore not to be grounded on empirical evidence.

What these remarks indicate is not that inflation convergence makes no sense from a theoretical point of view. Rather, they warn that inflation convergence and/or a low inflation target may prove more costly, in the short and in the long run, than usually assumed in most statements by government or central bank officials (or economists such as Artis, 1991). Following Gandolfo's (2002, par. 20.2.2) remarks, we conclude that while the need for inflation rates to converge among MU members is *a fact* (otherwise trade disruptions would necessarily follow), the need for these rates to converge to zero (or to a very low value) is largely *an opinion* reflecting a particular set of social preferences. Moreover, as far as CEMAC is concerned, these remarks point out the need of a more thorough investigation of structural features like the formation of expectations and the working of labour markets, rather than convergence *per se*.

Coming now to the core of this study, under the "new" theory, the "credibility" argument implies that inflation rates *will* converge: in other words, inflation convergence now becomes an outcome, rather than a prerequisite, of OCA membership. Moreover, three further aspect of OCA-convergence come into play:

1) *business cycles convergence*, i.e., the synchronization of business cycles among member countries, which is crucial for reducing the macroeconomic costs of union membership. Remark that even this kind of convergence can be seen as either a prerequisite, or an outcome, of OCA membership: this second view is taken by the so-called "endogenous OCA theory" of Frankel and Rose (1997), and depends strongly on the promotion of trade effect measured by Rose (2000).
2) *Economic shock convergence*, i.e., the contemporaneous correlation of the shocks affecting member countries, which also reduces the need for country specific policies (hence, the cost of relinquishing nominal exchange rate adjustments).
3) *Fiscal policy convergence*, i.e., the need of convergence of some fiscal policy indicators to shared reference values, on sustainability grounds, in order to avoid free riding problems and the subsequent need to bail-out spendthrift countries (this kind of convergence is usually referred to as *macroeconomic policy convergence*). Remark that fiscal *convergence* is intrinsically different from fiscal *integration*, as required by the "old" approach.

The rationale for macroeconomic policy convergence will be discussed in depth in Section 3, while empirical tests of convergence will be surveyed in Section 4. Before doing that, we briefly survey the theoretical and empirical evidence on the optimality of CEMAC.

2.2 Is CEMAC an "old" or a "new" OCA (or neither)?

2.2.1 Some quick background information

Monetary union in French colonies dates back to the beginning of the XX century, when they adopted the French franc. This *de facto* monetary union was strengthened after WWII by a number of agreements. Since December 26, 1945, most French colonies in Africa joined the CFA franc. After achieving the political independence at the beginning of the '60s Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon decided to establish the UDEAC (*Union Douanière des Etats de l'Afrique Centrale*). Moreover, on 18 October 1983 the UDEAC members decided to join other Central African states in the ECCAS (*Economic Community of Central African States*). In 1994 the UDEAC members decided to strengthen their economic integration process by creating the CEMAC (*Communauté Économique et Monétaire de l'Afrique Centrale*), that superseded the UDEAC in 1999. This further step towards economic integration was made possible because in 1984 Equatorial Guinea had joined the CFA franc zone.

In 2008 the CEMAC accounted for 8% of SSA GDP, corresponding to 0.13% of world GDP (measured at current USD; see Table 2). At the beginning of the '90s Cameroon accounted for more than half of the Community GDP. Since then its relative size has shrink to about a third (see Table 3), owing in particular to the buoyant growth in new oil countries such as Equatorial Guinea and Chad (see Table 4).

Before proceeding, another brief remark: convergence is a long-run issue. As a consequence, in the following we will assess it using the longest possible sample of data. In so doing, we will refer to Cameroon, Chad, Central African Republic, Congo, Equatorial Guinea and Gabon as "CEMAC countries", even in cases in which this definition may be incorrect in historical terms, because CEMAC was formally established only in 1994. However, five out of the six CEMAC members (the former French colonies: Cameroon, Chad, Central African Republic, Congo and Gabon) share the same money since the beginning of the 20th century (be it the French franc or the CFA franc). Time series data on the main macroeconomic indicators are available since at least 1960, when the CFA zone countries gained their independence. Although at that time CEMAC did not yet exist, we will for short speak of "CEMAC" data even before 1994.

2.2.2 CEMAC and "old" OCA theory

There is a wide agreement that CEMAC is not an OCA in the sense of the "old" theory, because:

a) *interregional (i.e., intra-CEMAC) factor mobility is low*, as recognised for instance by UNECA (2008);

b) *product diversification is low*: a few primary products account for the largest share of exports in almost all CEMAC member country, and the

overall trend is toward an increase in product specialization even in non oil countries (see Fig. 1);

c) *the degree of openness varies widely but interregional trade is very low*: in 2005 Equatorial Guinea and the Central African Republic were respectively the second and the last-but-one SSA countries as far as trade openness is concerned, with a total trade-to-GDP ratio equal to 156% and 32% respectively (source: World Bank, 2008; see Fig. 2). Small oil exporting countries are extremely open by any standard (in 2004 Equatorial Guinea ranked 16th among 174 countries, with a trade-to-GDP ratio close to that of Estonia or Ireland), while large countries (Cameroon) or non-oil exporting ones (Central African Republic) are relatively closed (with trade-to-GDP ratio below 40%), and in any event the intra-regional trade is extremely low, at around 4% of total trade (UNECA, 2008). Moreover, the overall degree of openness shows no definite trend (Fig. 3), setting aside some upward shifts in coincidence with the start-up of oil extraction (in Equatorial Guinea at the beginning of the '90s and in Chad at the beginning of the century). This should be contrasted with the apparent upward trend in the degree of openness of the "core" European Union (EU) countries (Fig. 4), where an apparent "convergence to the top" of openness has occurred (mostly as a result of an increase in intra-regional trade).[14]

d) *fiscal integration is low*, as documented for instance by UNECA (2008, chap. 5).

e) *inflation convergence has proven extremely low* in previous empirical analyses (UNECA, 2007), although, as we will see in more depth in Section 4 of this study, more recent econometric techniques shed a new light on this issue. Moreover, since intra-regional trade is very low, in order to avoid major trade disruptions convergence towards the largest trading partner (the Euro area), is far more important than intra-regional inflation convergence. We will come to this point later, as it has generally went unnoticed in the applied literature.

This prompts two further remarks. First, the fact that CEMAC is not an OCA in the "old" sense does not mean that "old" criteria are useless: on the contrary, they implicitly define an agenda of economic policy interventions that should be put in place in order to reduce the costs of membership for CEMAC countries. There is a widespread awareness of these issues and many of these developments are already under way and are summarised in UNECA (2008): among them we quote the removal of administrative barriers to the free circulation of CEMAC citizens (abolitions of visa obligations, etc.) and the improvement of transport infrastructures in order to foster intraregional trade. Second, the lack of an economic rationale for CEMAC suggests that political factors have been prevailing in its making. While this may seem obvious for CEMAC, as most of its member countries have inherited union membership from their colonial history, we should stress that nowadays there is wide agreement that political factors have been prevailing also in the making of CEMAC closest model and partner, namely, the EMU (see Baldwin, 2006).[15]

2.2.3 CEMAC and "new" OCA theory

It is sometimes asserted that "new" OCA theories provide a stronger economic rationale for MUs. Let us evaluate this claim in relation with the CEMAC experience.

Macroeconomic stability vs. resilience to external shocks

According to the consensus view, expressed by IMF studies such as Hadjimichael and Gali (1997) and Iossifov *et al*. (2009), the CFA Franc zone has performed relatively better than other SSA countries in terms of higher growth and lower inflation, at least from the beginning of the '50s to the mid '80s; then, adverse evolution of the terms of trade determined a loss of competitiveness and the situation worsened, also because the decision of devaluate was delayed until 1994, when CEMAC was established. The devaluation was followed by a burst of inflation, then growth resumed at an acceptable pace. On the basis of this evidence, Iossifov *et al*. (2009) conclude that CEMAC has reaped the benefits of macroeconomic stability derived from the MU membership (i.e., benefit (1) in Section 2.1.2).

Fig. 5 compares CEMAC and SSA real growth (see also Table 4). A quick look suggests a more cautious evaluation of the historical developments. First of all, the average growth rate of CEMAC from 1961 to 2006 has been 3.8%, only 0.4 points above the other SSA countries average growth (3.4%). It is true that in some instances CEMAC countries have largely outperformed SSA ones, but, as Fig. 5 shows, this happened in the aftermath of the two positive oil price shocks: after all, it is not surprising for oil exporting countries to perform better when oil price is rising (a similar remark is made by Fouda and Stasavage, 2000). The simple correlation between oil price growth and CEMAC growth is 0.33 with a Student's t of 2.4, and oil price explain about 40% of the variance of CEMAC growth in a dynamic model estimated from 1970 through 2006, with a strongly significant coefficient (Table 5). What as not been observed to our knowledge is that the relation works also the other way around: when oil price fall, things go worse, and this may well explain why after the negative oil price shock following the collapse of OPEC in 1986 CEMAC largely *under*performed SSA countries.[16] In the light of this analysis, the relation between MU membership and economic growth appears less evident than assumed in some previous studies. It is fair to point out that this result is not completely novel. Similar conclusions are reached for instance by Devarajan and Rodrik (1991), Elbadawi and Majd (1996) and Evlo (1997) in their study of the CFA franc zone, as well as Ben Hammouda *et al*. (2007) in their study of five regional economic communities in Africa. A different view is expressed by Anyanwu (2003): in a panel study considering 14 ECOWAS countries from 1990 to 2000 he finds that membership to WAEMU[17] increases GDP per capita by ten times with respect to the other ECOWAS non-WAEMU countries.[18]

What is indeed apparent from Fig. 5 is that CEMAC output *volatility* greatly outperformed that of other SSA countries: the coefficient of variation (ratio of sample standard deviation to sample average) of CEMAC growth rate is almost double, at 1.11, than that of the other SSA countries (equal to 0.65).

Iossifov *et al*. (2009) suggest that this feature could depend on the pro-cyclical conduct of fiscal policy, determined by the strong dependence of budget balances on oil price. In fact, their Fig. 4 shows a strong negative correlation between non-oil primary fiscal balance and oil government revenues, thus suggesting that CEMAC fiscal policy

has become more expansionary the higher the government oil revenues. In other words, output volatility may depend on the fact that CEMAC fiscal authorities have been unable to save in good times. Our Fig. 6 replicates this result using BEAC rather than World Bank data and a slightly shorter sample (starting in 1986 instead of 1980). Apparently, the strong pro-cyclicality of fiscal policy is confirmed. However, a discerning observer may remark that the negative correlation is determined, here as well as in Iossifov *et al*. (2009), by a few outlying observations. If we observe the data in the time domain (Fig. 7) we see that they are concentrated at the end of the sample. In fact, if we drop the last three observation (2006 through 2008), the strong negative correlation equal to −0.73 reduces to an insignificant 0.07. As Table 6 shows, the correlation coefficient becomes negative when it is calculated up to the year 2006, and becomes statistically significant only if we include also the year 2007. It is apparent that the correlation between oil revenues and non-oil balances has been positive, rather than negative, for the largest share of the sample. In the light of this evidence, the pro-cyclical behaviour of CEMAC fiscal policy appears therefore to be a relatively limited episode related to the exceptional increase in oil price level in the last years of the sample (see Fig. 7), a period in which CEMAC growth has been relatively stable (at least, by historical standards). On the contrary, oil revenues and government balance moved quite close together at the beginning of the sample, when CEMAC growth featured a much higher volatility. This suggests that at least as far as we can understand from area-wide data, government profligacy in good times does not really explain the higher volatility of CEMAC growth. In fact, a more natural explanation is provided by cost (1) of Section 2.1.2, namely, by the amplification of (positive and negative) shocks due to the loss of monetary autonomy. A hint in this direction comes from the fact that the coefficient of variation of the other SSA oil-exporting countries (which were potentially subject to the same kind of oil price shocks) is much lower than that of CEMAC.[19] These tentative conclusions need to be qualified by considering a larger span of data and by analyzing country, rather than area-wide data. The importance of this issue however cannot be understated, in the light of the result presented by Hnatkovska and Loayza (2004).

As is to be expected, the benefits of monetary stability are more apparent when measured with reference to inflation. Average CPI inflation in CEMAC from 1961 through 2006 was equal to 6.18%, against an "other SSA" average of 8.43% (see Fig. 8).[20] Even in this case, however, the data disclose some interesting patterns. Before 1986 CEMAC and "other SSA" inflation goes hand in hand, with a correlation of 0.80. Much of the advantage of CEMAC in terms of low inflation occurs in the aftermath of the negative oil price shock, when the CEMAC entered a recession. The question is therefore why the other SSA (non oil) countries did not benefit of this shock in term of lower imported inflation. A possible answer is that in the period from the mid '80s through the mid '90s a number of countries in SSA experienced periods of protracted hyperinflation mostly as a consequence of political instability.[21] Where the advantages become apparent is after 1994 (i.e., after the foundation of CEMAC): in the period from 1996 to 2006 average CPI inflation in other SSA countries has been twice as much (at 6.14%) that of CEMAC (at 2.94%), and the two inflation patterns have been decoupled (their correlation has halved, at 0.39).

Yet, in the absence of a more thorough analysis, it is unclear whether the data confirm a theoretical result (namely, that MUs deliver macroeconomic stability), or a truism (namely, that for a developing country it is better not to run a civil war and to have sizeable reserves of crude oil). The two points could be tied together: after all, one expected benefit of economic and monetary integration is that of favouring political integration, thus reducing the likelihood of conflicts between member countries (an argument that has often been invoked with reference to economic and monetary integration in Europe after the experience of WWII).

The "currency union effect" on trade and the "endogenous OCA hypothesis"

As far as the trade promotion effect of MU is concerned (advantage (2) in Section 1.2.1), this has been investigated in SSA economies by Anyanwu (2003) and Tsangarides *et al*. (2006, 2009) among others. Both studies exploit an augmented gravity model in the tradition of Rose (2000). As usual in this kind of studies, they find a very high impact of MU membership on trade. Anyanwu (2006) considers WAEMU countries and finds that they trade twice as much with each other than other Western African (ECOWAS) countries not sharing the CFA franc; Tsangarides *et al*. (2006) finds a very similar result by considering all African countries and controlling for a number of other variables, including the colonial status of the country and the duration of MU membership. Tsangarides *et al*. (2006, 2009) are aware of Baldwin's (2006) criticisms to gravity models and take into account some of them; it is unclear however how they address the "treatment effect" issue pointed out by Persson (2001). Taken at their face value, these encouraging results[22] imply that in CEMAC countries an "endogenous OCA formation" process could be under way, where the promotion of trade determined by MU membership would bring about increased demand spillovers, that in turn determine a synchronization of economic cycles, thus reducing the macroeconomic costs of union membership. In terms of "convergence", these results thus imply that one should observe, besides high and growing interregional trade, business cycle synchronization in CEMAC countries. As a matter of fact, however, the reliability of these results, or at least their application to the CEMAC case, may be questioned by observing that interregional trade in CEMAC is low, and that, as we shall see in Section 4, business cycle synchronization, if any, proceeds very slowly (to say the least).

It is important however to stress that these evidences (high "currency union effect", low "endogenous OCA" effect) are not necessarily conflicting. In fact, the "endogenous OCA/currency union effect" literature has generally overlooked two important economic facts, a theoretical one, and an empirical one.

On the theoretical side, this literature ignores the fact that in a dynamic economy it is *exports growth*, not their level or the level of *trade*, that stimulates output growth.[23] At an even more general level, since the "currency union effect" applies to each member country, it may well be that the positive effects on growth of the increase in one country's exports are offset by the increase in other countries' exports (to the extent that the latter are *imports* for the first country). The net effect (i.e., the increase in *net* exports of the first country) is therefore uncertain, as demand injections through the stimulus on exports may be more than compensated by demand leakages through increased imports.[24] In fact, to the extent that it leads to a proportional increase of

exports and imports, the "promotion of trade" effect is likely to result in an improvement of the external accounts of surplus countries, at the expenses of the other MU members, with leading to potentially harmful consequences. This, at least, is what appears to have occurred in the EMU, where the inception of the euro in 2002 has witnessed an unprecedented rise in Germany external balance, accompanied by a worsening in the external accounts of almost all its European trading partners (Fig. 9). We add that this remark, while relevant in theory, is not directly applicable to the CEMAC experience. In fact, patterns where a dominant country expands its exports at the expenses of the other members do not emerge in CEMAC, nor are they expected to do, for the simple reason that intraregional trade is low. As a consequence, the external accounts of CEMAC countries appear to be relatively uncorrelated with each other (see Fig.10).[25] By the way, the low level of intraregional casts some doubts on the reliability of SSA-wide studies such as those quoted above, and as a matter of fact studies focussed on CEMAC, such as Mata (2008), find very little evidence of trade creation due to MU membership in CEMAC countries.

On the empirical side, the confidence on the fact that demand spillover may exert a significant impact on business cycles is at odd with what has often been found in macroeconometric simulations of multi-country models, namely, that "contributions to foreign GDP generated through trade are found to be small" (Douven and Peters, 1998). Remark that the fact that this results refer to OECD countries reinforces the case in point, because if trade spillovers are weak among countries whose trade relation are relatively strong, the same spillovers must be even weaker among countries whose trade connections are almost non existing (as CEMAC countries). These arguments, while reconciling two apparently conflicting evidences, cast some doubts on the validity of the "endogenous OCA" hypothesis.

The risk pooling/saving on exchange reserve argument

As Gandolfo (2002) points out, this is one of the more objective (i.e., less ideological) advantages of MU membership. Iossifov *et al*. (2009) provide evidence on this point, showing that the pooled reserve of the CEMAC zone provide a better coverage in months of imports than the reserve of each single country (with the possible exception of Equatorial Guinea).

External vs. internal monetary stability: the euro peg and fear of floating

Bénassy-Quéré and Coupet (2005) point out another important feature of MUs in SSA (including CEMAC), one that is overlooked by OCA theory, as this was "mainly designed for industrial countries". In fact, we have seen that while their intraregional trade is low, CEMAC countries are relatively open, with trade-to-GDP ratios in a range from 40% to 156%. Unsurprisingly enough, their major trade partner is the euro area, which accounts for about 40% of CEMAC exports and 60% of CEMAC imports. In this respect, the peg to the euro may well be more important for member countries than the simple fact of sharing the same currency: "high indebtedness and pass-through may twist the choice towards pegs on international currencies".[26] This reminds the "fear of floating" literature initiated by Calvo and Reinhardt (2000), where debt servicing difficulties, the likelihood of severe current account reversals, difficulties to credit market access, and higher pass-through from exchange rate swings to domestic

inflations advise developing countries to "confine exchange rate movement to a narrow band". In this respect, it is useful to remind that four out of the six CEMAC countries have either qualified (Cameroon, Central African Republic, Republic of Congo) or are eligible (Chad) to the Highly Indebted Poor Countries (HIPC) joint initiative of the IMF and the World Bank.[27] This approach entails a significant change of perspective: rather than by the desirability of regional integration, MU would result as a by-product of the member countries "fear of floating", the main empirical implication being perhaps that convergence of CEMAC inflation to euro area inflation becomes far more important than convergence of member countries inflations with each other, a point that has been overlooked in most empirical analyses.

Political considerations

Although some of the argument listed above may provide an economic rationale to CEMAC membership, it is now widely recognised that the main motivation for CEMAC were political (see e.g. Masson and Pattillo, 2004).

Pushing this argument further, Iossifov *et al*. (2009) argue that the "revealed preferences" of the political establishment show that the benefits of CEMAC have prevailed over the costs (thus implicitly validating it as an OCA). However, in the CEMAC as elsewhere, for this argument to be convincing, one should be able to assume that the political establishment has come to power by virtue of a democratic process and is able to withstand to pressure from lobbies, so that its preferences reflect that of the majority of the constituency, thus assuring that the benefits are shared by the majority of the population. The governance indicators of Kaufmann *et al.* (2008), however, show that CEMAC countries are placed low in the "voice and accountability" and in "control of corruption" ranking, as well as in the "violence" and "rule of law" ranking (see Table 7 and the Fig. from 11 to 14).[28] Gabon and Cameroon constitute the two more notable exceptions. Contrary to most CEMAC countries, Cameroon was able to improve its performance under all the governance dimensions considered. Gabon consistently ranks higher among CEMAC countries, and although its rank in the "voice& accountability" dimension has worsened, it was the only CEMAC country to overcome an EMU country in 2007 (in the "violence" dimension Gabon performed better than Spain). Setting aside these exceptions, the overall performance of CEMAC countries is relatively poor: they generally fall in the bottom 25% of the ranking and most of them have worsened their relative position over the last decade.

In the light of this evidence, therefore, the "establishment revealed preference" argument cannot be taken seriously, unless one is willing to take up the issue of whom preferences are revealed, and to put this in the right political economy perspective. For instance, in small LDCs that rely essentially on natural resources extracted mainly by foreign companies (as showed by Iossifov *et al*., 2009, box 4; see also our Fig. 1), some degree of "'capture' of the state by private interests" (using the words of Kaufmann *et al*., 2008) is extremely likely to occur.[29]

At a more general level, the literature on OCAs very often evocates "political factors" as something of completely exogenous and predetermined with respect to the economic functioning of a country. However, asserting that something has been done "for political reasons" does not mean that the political decision was independent from the economic interests of some subject. MUs, like every economic fact, are no free

lunches. Just to give an example drawn from the European experience, Acocella (2005) stresses that European Monetary System (EMS) membership in Italy may have been motivated by the wish to resort to an external factor (the so-called "strong currency policy") in order to discipline the behaviour of trade unions.[30] The OECD Economic Outlook time series suggest that this goal has actually been attained (be it or not the main motivation of the membership choice): since the beginning of the monetary integration experiments in Italy, the growth rate of real wages has fallen behind the growth rate of the economy, becoming negative on average since the inception of the euro (see Fig. 15 and Tab. 8).[31] While these data deserve certainly a more thorough analysis, a very general lesson should be kept in mind: whenever we speak of inflation, we are actually speaking of the distribution of income. In an accomplished democracy the technical dimension of the problem should never conceal the political one from the scrutiny of the constituency.[32]

2.2.4 Convergence and optimality

The debate on the optimality of CEMAC is still open and will probably never be settled, because, as for any other MU, the answer depends on the preference function used for weighing benefits against costs (a point stressed by Gandolfo (2002) and systematically neglected in the applied literature). However, the previous discussion help us to put in perspective the study of OCA-convergence: we are now able to answer to the "what" and "why" questions. Basically, convergence in inflation rates is an essential condition for avoiding current account crises within the union (or with the major trading partner, in case of peg to an external hard currency), and convergence (better saying, synchronization) of economic cycles is both a test of the endogenous OCA hypothesis, and a condition for minimizing the costs determined by the loss of autonomy of the monetary (and fiscal) policy in the presence of uncorrelated external shocks.

The "how" question will be answered in Section 4, but before doing that we need to investigate more in depth the issue of macroeconomic policy convergence and its implementation in multilateral surveillance agreements.

3. Macroeconomic policy convergence: the sense and nonsense of multilateral surveillance agreements

3.1 Fiscal policy coordination, convergence and integration in a MU

In a MU monetary policy has by definition "converged", as it is entrusted to a supranational central bank. The issue then arises of whether national fiscal policies should "converge", and how this convergence should be defined and enforced. As it happens, in most of the applied literature, including that related to CEMAC (e.g., Iossifov *et al*., 2009), the need for fiscal policy *convergence* in a MU is often presented as a self-evident fact of nature, sometimes referring to the benefits of fiscal policy coordination.

International macroeconomic policy *coordination* occurs when national policy makers take into account the impact of their decisions on other countries in the design of national economic policies.[33] Fiscal coordination is therefore very different from fiscal integration, as requested by the "old" OCA theory (point 5 in Section 2.1.1). The

latter occurs when fiscal policy is conducted at a supranational or "federal" level. In principle, this would facilitate transfers from one to another MU member, in order to allow them to better withstand the impact of asymmetric shocks. In other words, fiscal integration implies that also fiscal policy, like monetary policy, is devolved (at least in part) upon a supranational authority (as is well known, this has not yet happened neither in the EMU nor in the CEMAC).

The case for fiscal policy coordination has a wider relevance, not limited to OCA theory. Fischer (1987) states it very clearly: "any one country that expands will create a current account deficit; all countries expanding together avoid that problem". In the light of this assertion, one expects that in a MU the main benefit of macroeconomic policy coordination should be seen in the need of avoiding disruptions in intra-regional trade (possibly determined by "twin deficits behaviour"), much in the same way as the inflation convergence criterion of the "old" OCA theory. However, rather than on external balances, the "new" OCA literature focuses on fiscal balances, stressing the need to avoid the externalities (macroeconomic spillovers) created by possibly unsustainable fiscal policies in member countries.[34] When fiscal coordination is defined (or enforced) by setting specific targets on fiscal policy variables, we obtain as a special case fiscal policy *convergence*. This definition is based on the presumption that fiscal policy will be coordinated if fiscal policy variables converge to the specified targets.

A careful analysis of the theoretical and empirical literature shows that the need of addressing fiscal externalities through coordination is not undisputed, that the assumption that *convergence* will bring about coordination is questionable, and that the choice of the convergence parameters and of the enforcement rules is open to discussion.[35] These points are addressed in the next three sections.

3.2 Fiscal externalities and fiscal convergence

As for the first point, some authors question the view that fiscal externalities must be internalized through supranational rules. Buiter *et al.* (1993) and Buiter (2006) distinguish between two classes of externalities: those determined by unsustainable fiscal policies, and those determined by sustainable fiscal policies. As for the first ones, since national economic stability is in the self-interest of every national government, Buiter (2006) argues that a credible "no bail-out" clause will impose a sufficient restraint on national fiscal programmes, unless one assumes irrationality of national governments (with the associated need of paternalistic policies at supranational level). Moreover, it is argued that financial market will discipline sovereign borrowers by imposing risk premia on the public debt of the more spendthrift countries (Bayoumi *et al*., 1995). Therefore, once monetary financing of deficit is prohibited, this will dissuade national policy makers to engage on unsustainable deficit paths.[36] As for the macroeconomic spillovers that can occur without violating the sustainability of national policies, the literature has insisted on cross-border effect determined by the impact of national policies on union-wide nominal and real risk-free interest rates. Their empirical relevance has been assessed for instance by Douven and Peters (1998) and Faini (2006) and generally found to be non negligible.[37] However, many authors stress that this kind of externality is actually a "pecuniary" externality, determined by the normal functioning of the price mechanism through the law of supply and demand. In complete competitive markets these externalities have no adverse consequences on efficiency:

they only have distributional consequences (between debtors and creditors), but unless markets are distorted, there is no need for government interventions (Buiter, 2006). By the way, as Hau (2006) points out, the same kind of externalities occurs through the functioning of private credit markets, without raising the same concerns. The presumption that governments need "peer-pressure" because of their intrinsic irresponsibility should be confronted with the evidence of the huge private defaults recorded in the last decade.

Another strand of literature analyses the welfare enhancing effect of fiscal policy coordination in a MU, with mixed results, leading Gandolfo (2002) to conclude that in a MU "the case for fiscal-policy coordination is less cogent than that for a common monetary policy".[38]

Assuming however that some coordination is needed, we come to the issue as to whether "convergence" to exogenously set parameters ensures "coordination". Buiter (2006), referring to the convergence rules of the SGP, states that "the SGP is completely useless as a policy coordination device. It influences and constrains each individual without any reference to economic conditions in other countries". This determines a logical inconsistency: this design of the convergence parameters would make sense only if there were no cross-border spillovers, but in the absence of such spillovers, there would be no need for "supranational surveillance". As Ferré (2008) points out, "narrow" coordination, where each country looks only at national variables, brings about higher volatility of interest rates, government deficits and output, thus undermining the long-run growth of the union.

3.3Coordination and convergence in LDCs: market discipline vs. "agency of restraints"

The previous discussion refers almost exclusively to the EMU experience. Although the CFA franc zone (hence, the CEMAC) has important similarities with the EMU (as stressed for instance by Strauss-Kahn, 2002), there are also important differences, both in the structure of the respective economies, and in the institutions of the MUs, that suggests that some arguments set out above do not apply directly to CEMAC countries.

Iossifov *et al*. (2009) point out two specific reasons that call for supranational coordination of fiscal policy in the CEMAC: first, the capital markets in the region are still "in their infancy". As a consequence, the "market discipline" argument cannot be applied to these countries. Second, the statute of BEAC limits, but does not prohibit, monetary financing of public deficit. As a consequence, there is the risk of free riding behaviour by national government, with possible inflationary consequences.

The need for supranational convergence criteria is stressed also by Obinyeluaku and Viegi (2009). Using a panel of 20 African countries, they find evidence that the conduct of economic in Africa is compatible with a "fiscal dominant regime", as defined by Canzoneri and Diba (1996). In a "fiscal dominant regime" the price level cannot be determined independently of the government's present value borrowing constraint. As a consequence, the central bank lacks the necessary autonomy to warrant price stability. Canzoneri and Diba (1996) show that the enforcement of a deficit criterion would ensure a monetary dominant regime. Therefore, the results by Obinyeluaku and Viegi (2009) suggest that in African countries MU without a

surveillance programme cannot provide an "agency of restraint" that prevents unsustainable or inflationary fiscal policy patterns.[39]

The same point has been made by Masson and Pattillo (2001, 2004). They stress that in Africa institutional challenges, and in particular the pressure by fiscal authorities on national central banks, have historically been much greater than in Europe. As a consequence, it is doubtful that the creation of a regional central bank *per se* can solve the credibility problems of the existing national central banks: in order to exert a greater discipline on fiscal authorities than national central banks, a regional central bank must be supported by other institutional features. As an example, Masson and Pattillo (2004) refer to CEMAC. In their views, the experience of CEMAC countries shows that MU *per se* is not associated with a noticeable increase in policy coordination. A greater effort in this direction has been spurred by the crisis of the early '90s, after which a new supranational institution has been created.

As recalled in Section 2.1.2 above, a convincing argument in favour of the need of binding rules is set out by Tornell and Velasco (1991). Focussing on SSA countries experience during the '80s, they find evidence that flexible exchange rates provide more fiscal discipline than fixed ones. Fixed exchange rates do adversely affect the degree of fiscal adjustment even after controlling for a number of macroeconomic variables, such as the variation in the terms of trade, and the initial values of GDP per capita and debt-to-GDP ratio. The theoretical explanation is that fixed exchange rate allow the policy makers to delay the costs of adjustment. As a consequence, countries belonging to a MU need some additional constraint on fiscal variables.

3.4Fiscal sustainability and fiscal convergence

The previous discussion highlights that the rationale for setting deficit or debt ceilings is the need to avoid adverse macroeconomic spillovers determined by unsustainable fiscal policies in member countries. In order to assess the theoretical consistency of the convergence parameters chosen by a given multilateral surveillance programme, it is therefore crucial to set out their relations with public debt sustainability. We list here some remarks in decreasing order of generality.

First of all, it is useful to remind that the economic theory has not reached an agreement on a definition of "public debt sustainability" both rigorous and operational (see Chalk and Hemming, 2000, Bagnai, 2004). In other words, any reference to "sustainability" in defining convergence parameters is *necessarily* sloppy for lack of an agreed upon and rigorous theoretical benchmark.

In particular, if one relies on definition of sustainability grounded on the public sector *solvency* constraint, as it is customary in the vast majority of the empirical literature on fiscal sustainability, then every constant value of the debt-to-GDP ratio, as well as any exponentially *growing* pattern of this ratio (provided that its growth rate is smaller than the spread between the real interest and growth rates), shall be considered sustainable (see Appendix 7.2). This is the reason why Buiter (2006) states that the SGP fiscal convergence parameters are not necessary for "national financial-fiscal sustainability".

Furthermore, if one instead identifies sustainability with a constant value of the debt-to-GDP ratio, then the dynamic analysis of the government budget identity stipulates that in the presence of positive nominal growth rates *any* value of the deficit-

to-GDP ratio will be sustainable (as it will eventually lead to a constant steady-state value of the debt-to-GDP ratio). For the "dynamic stability" approach to provide non trivial answers, one must apply it to a dynamic model of the whole economy (not to a single government budget identity), as done for instance by Bagnai (1995). In this case, however, the answers depend on the structure of the underlying model. This point is related to the issue, systematically neglected in the applied literature, of the optimal level of public debt. By setting a zero upper bound on government deficits, most surveillance programmes (and the related assessment of convergence) assume implicitly that the optimal value of the debt is zero (a treatment very similar to that reserved to the optimal inflation rate, see Section 2.1.2). However, this is not what the theoretical literature says (see for instance Zee, 1988). Clearly, in the absence of a thorough theoretical and empirical analysis of the issue of "public debt optimality", any "Maastricht-like" threshold will be open to Buiter (2006) criticism of arbitrariness.

Moreover, simple debt arithmetic implies that the two thresholds on debt and deficit are tied in the long run by a simple relation:

$$\bar{d} = \frac{(1+\gamma)\bar{f}}{\gamma} \qquad [1]$$

where $\bar{d}$ is the "convergence" value of the public debt-to-GDP ratio, $\bar{f}$ the "convergence" value of the public deficit-to-GDP ratio, and γ the long-run nominal growth rate (see the Appendix).[40] This raises several issues of consistency. By defining the two values of $\bar{d}$ and $\bar{f}$, one is actually defining (implicitly) a value for γ that may, or may not, be consistent with the structure of the economy. Moreover, since γ is generally outside the control of the policy maker, there is no general presumption that it will be such as to reconcile the two target values $\bar{d}$ and $\bar{f}$. This implies that in practice one of the two convergence criteria will become irrelevant.[41] This is precisely what happened in the convergence to EMU, where the debt criterion was actually discarded and only the deficit criterion was enforced.[42]

3.5 Convergence, discipline, and enforcement

It should be clear by now that in the framework of the "new" OCA theory the term "macroeconomic policy convergence" is used in practice as a politically more appealing substitute for "fiscal discipline". In fact, rather than on *coordinating* national fiscal policies with the aim of avoiding intra-regional current account imbalances, the emphasis is on *restraining* national policies in order to avoid "unsustainable" behaviours.

However, for discipline to be a credible policy options, rules have to be enforced. It is interesting then to analyse the enforcement mechanisms envisaged by the CEMAC treaty and by its closest forerunner (Maastricht treaty), as well as to analyse the related historical developments.

As is well known, the Stability and Growth Pact (SGP), adopted by the Amsterdam European Council of 17 June 1997 (European Council, 1997) in an effort to streamline the "excessive deficit procedure" (EDP) envisaged by Maastricht treaty, requested the EU member state to achieve a "medium-term objective of budgetary

position close to balance or in surplus", in such a way as to leave them some fiscal space to deal with normal cyclical downturns without breaching the 3% deficit ceiling set in Maastricht treaty. A government deficit exceeding this ceiling may be considered as exceptional whenever it results from an unusual event "outside the control of the member state", or from a severe economic downturn (an annual fall of real GDP of at least 2%): in this case the member state is not subject to sanctions. Otherwise, the European Council starts an EDP that goes through the following steps:

a) the Council makes recommendations to the member states and sets a deadline of four months for putting them in practice;
b) if the member state fails to comply, the Council may impose sanctions, in the form of a non-interest bearing deposit with the Commission, whose amount consists of a fixed component equal to 0.2% of the country's GDP, and to a variable component equal to 10% of the difference between the "excessive deficit" and its 3% reference value. The overall amount shall not exceed 0.5% of the country's GDP (which implies that every deficit in excess of 6% will be fined by an equal amount);
c) if the excessive deficit has not been corrected within two years, the Council may decide that this deposit be converted in a fine (i.e., will not be returned to the member state).

As Buiter (2006) points out, the imposition of sanctions was not automatic, but depended on a political decision taken by the Council.[43] This explains why the violation of the ceiling by the two leading countries (Germany and France) led to a suspension of the EDP (decided on July 13, 2004), rather than to its application. In fact, Germany and France had breached the ceiling starting in 2002 (see Fig. 16), but the attempt by the European Commission to get the violators sanctioned two years later failed, despite a petition filed with the European Court of Justice. Eventually, in 2005 the SGP was weakened by adopting the following modifications (Alves and Afonso, 2007):

a) a deficit above 3% will not be considered as excessive in the presence of a negative value of real GDP growth, or of a protracted period of positive but low growth (relative to its potential);
b) all the relevant deadlines are extended (European Council, 2005).

Coming now to the CEMAC, the procedure to adopt when a member country does not comply with the multilateral surveillance framework is set out in the articles 58 to 61 of the "Convention régissant l'Union Économique d'Afrique Centrale (UEAC)", an annex to the CEMAC Treaty signed in March 1994. The definition of excessive deficit is given by the article 55. A deficit is deemed to be excessive if it is incompatible with the monetary policy objectives, or if it is accompanied by the violation of one of the following surveillance criteria:

1) positive primary balance;
2) non accumulation of domestic and external arrears;
3) non increase of the ratio between the public wage bill and government receipts.

The Article 58 of the CEMAC Treaty establishes that the CEMAC Council may exempt a country from complying with the multilateral surveillance procedure in case of "difficulties or serious threats of difficulties", and this exemption can be renewed after

six months. The decisions must be taken unanimously. The "difficulties" however are not quantified.

Unlike the SGP, the CEMAC treaty does not envisage a binding enforcement strategy based on the imposition of fines. The procedure to follow in case of "excessive deficits" is defined by the articles 59 through 61 of the "Convention". The CEMAC Council addresses to the non-compliant member country a directive. The country is then expected to elaborate within 45 days an adjustment programme, that entitles it to receiving support from the other member countries. If the country fails to present this programme, or if the programme is found to be inconsistent with the directive or with the economic policy of the CEMAC, or, finally, if the country fails to put it in place, the Council may decide to impose, by simple majority, a number of sanctions, including the withdrawal of the support granted to the non-complying country.

It may appear that the CEMAC enforcement procedure is much weaker than the one established in the SGP. It must be stressed, however, that the EDP was never enforced. In the light of this historical experience, the lack of a (supposedly) incisive enforcement procedure of the surveillance framework in the CEMAC is less harmful in practice than it can appear in theory, and it may even be considered as beneficial. After all, the specification of strict rules can result in a loss of credibility, should it become apparent that nobody will follow them. This may have exacerbated moral hazard problems in the EMU that may have concurred to the euro crisis of 2010. This is all the more likely than, as Buiter (2006) puts it, it is "truly strange" to fine a country for excessive deficit, thereby worsening its fiscal position.

3.6 Fiscal convergence in CEMAC countries: the historical evidence

After the 2001 refinement, the multilateral surveillance procedure in the CEMAC currently considers three sets of indicators (CEMAC, 2009; Iossifov *et al*., 2009):

1) first rank criteria (critères de base):
   a. the basic fiscal balance must not be negative;[44]
   b. the public debt-to-GDP ratio must not exceed 70%;
   c. the inflation rate must not exceed 3%;
   d. domestic and external payment arrears must not increase.
2) second rank criteria (critères complémentaires) :
   a. the structural basic fiscal balance must not be negative;
   b. the non-oil basic fiscal balance must not be negative;
   c. the non-oil primary fiscal balance must not be negative;
   d. the core inflation rate must not exceed 3%;
3) other indicators (répères indicatifs):
   a. the ratio of net international reserves to monetary balances must be greater or equal to 20%;
   b. the primary fiscal balance must not be negative;
   c. the average tax rate (no reference value is given);
   d. the ratio between the change in the public wage bill and the change in revenues;
   e. the current account deficit;
   f. the external debt service-to-exports ratio.[45]

Only the first rank criteria are mandatory, and as such they supersede the three surveillance criteria specified in the CEMAC treaty and recalled in the previous Section 3.5. The recent evolution of the first three criteria is depicted in Fig. 17 through 19, and the data are reported in Tables 9 through 11.[46] Fig. 20 shows the percentage of compliance with the first three criteria among all the six CEMAC countries. A 100% value would indicate that all the CEMAC countries are contemporaneously satisfying the first three criteria. Such an event did never occur. The compliance percentage averages about 60%, and shows no significant trend in the last decade. However, a glance at Fig. 17 through 19 shows that this relative stability in the non compliance results from two opposite trends: an improvement in the fiscal indicators on the one hand, and increasing difficulty to comply with the 3% ceiling in inflation on the other hand. This evidence should perhaps read in the light of Khan and Senhadji (2000) analysis of how a sensible ceiling for inflation can be defined in LDCs (see also Ndiaye, 2007).

3.7Fiscal convergence in CEMAC countries: an assessment

The CEMAC fiscal balance rule reminds the SGP recommendation of "medium-term objectives of budgetary positions close to balance or in surplus". There are however important differences. In the SGP, the ≤0% rule is a recommended medium-term objective that should provide a country with enough fiscal flexibility, thus allowing it to react to adverse shocks without breaching the 3% ceiling (Artis and Buti, 2000). In the CEMAC surveillance programme, on the contrary, 0% is *the* parameter and there is no reference to the medium term: in principle, the ≤0% deficit rule must be satisfied each and every year. The CEMAC deficit parameter appears therefore much more stringent than that envisaged by the EMU.[47] At the same time, the debt criterion at 70% is much less stringent than the deficit criterion, especially if one considers that a 0% deficit-to-GDP ratio implies a 0% debt-to-GDP ratio in the long run (see Eq. [1] above). The performance of the Central African Republic illustrates this point very clearly: although it never complied with the fiscal balance criterion (its basic balance-to-GDP ratio averaged -2.0% from 1994 to 2009 and was never positive, Table 9), the Central African Republic has been able to bring its public debt in line with the reference value on 2008 (Table 10), notwithstanding the global financial crisis. This pattern is consistent with Eq. [1] in Sec. 3.4. In fact, since in the same period the nominal growth rate in the Central African Republic approached 6% (see Tables 4 and 11), a steady 2% deficit would eventually bring about a 1.06×0.02/0.06=35% debt-to-GDP ratio (see Table 10).

The coexistence of a strict deficit criterion with a lax debt criterion causes at least two problems. First, there is a problem of credibility and enforcement of the deficit rule, which is made worse by the way in which flexibility is provided (namely, with the "flexible" application of "rigid" parameters). Since Eq. [1] implies that the two criteria may be inconsistent, the historical experience suggests that the more stringent will be abandoned: in the euro area it was the debt criterion, while in the CEMAC it could be the fiscal balance criterion. Second, a lax debt criterion is tantamount to no debt criterion at all: however, the sustainability of fiscal policies depends in practice on the stock of public debt. In other words, this set of rules may undermine fiscal flexibility without properly addressing the issue of sustainability.[48]

In fact, the CEMAC deficit criterion may be less restrictive than it appears, as it refers to "basic fiscal balance", defined as total revenue net of grants ("hors dons") and total expenditure net of foreign-financed capital expenditures. Let S^B be the basic balance, S^G be the overall balance (hence, $S^G=-F$), R total revenue, E total expenditures, G grants and I^F foreign-financed capital expenditures. We then have:

$$S^B = R-G-(E-I^F)$$

and, considering that $S^G = R - E$, we obtain:

$$S^G = S^B + G - I^F$$

These relations imply that when the *basic* balance is equal to zero, the *overall* balance (which determines debt accumulation) will be equal to the difference between grants and foreign-financed capital expenditures. As shown in Table 12, this difference has averaged −0.7 GDP points on the whole CEMAC area in the first twelve years of CEMAC, i.e., foreign-financed public investment has on average exceeded grants. In other words, the "basic balance" rule allows for a positive overall deficit. However, the size of this deficit is not large enough to restore consistency with the debt criterion. Given that since 1994 the average nominal growth rate in CEMAC has been equal to 12% (see Table 12), it then follows that the steady state level of the public debt-to-GDP ratio consistent with the zero basic balance rule is equal to about 0.007/0.12=6%; if we take a more prudential stance and do not consider the grants in the overall balance, the steady-state debt ratio rises to 0.017/0.12=14%, which is still very low in comparison with the 70% parameter and with the historical experience.[49] Put it in another way, if we invert Eq. [1] to get the expression of the steady state deficit consistent with a given debt target:

$$\bar{f} = \frac{\gamma \bar{d}}{1+\gamma} \qquad [2]$$

we find that a debt criterion at 70% under a nominal growth rate at 12% is consistent with a steady state overall deficit at 7.5%, hence with a basic balance at around −6% of GDP. Hence, even after accounting for the difference between basic and overall balance, the inconsistence between the two criteria remains striking. This suggest that in order to restore consistency, either the debt criterion must become more stringent, or the deficit criterion less stringent, or both.

This discussion prompts several further remarks. First, rather than adopting vague escape clauses, another (and perhaps better) way to introduce flexibility (thereby avoiding "fiscal overkill" in case of major external shocks), would be that of defining the deficit criterion in terms of "structural" budget balance.[50] In fact, the "basic structural budget balance" is already considered among the "second rank" criteria, where the "cyclical" features of the ordinary balance are removed by taking a five years moving average of oil revenues. UNECA (2007) proposes that the main surveillance criterion be formulated in terms of "structural basic balance". As Table 13 shows, the structural balance gives a less optimistic (in "good times"), but much more stable (in "bad times) prospect on the state of fiscal policy, thus avoiding to signal "excessive deficits" in the presence of cyclical downturns (such as in 2009). At the same time, UNECA (2007) points out that the measure of structural balance currently adopted purges the cyclical component only from receipts. This is unwarranted, because total

expenditures have been on average at least as volatile as total receipts (the standard deviation of the total expenditures-to-GDP ratio over 1987-2006 id equal to 3.5, that of total receipts to 3.5; see Fig. 21); moreover, total expenditures have shown a strong anti-cyclical behaviour (their simple correlation coefficient with GDP nominal growth rate is equal to -0.7 over the same sample).

Another important feature to consider is the role of oil receipts in public debt dynamics. Fig. 22 shows the path of the overall (domestic and external) public debt-to-GDP ratio in selected CEMAC countries: we represent the whole area, Cameroon, and the two countries that did not comply with the debt criterion in 2006. The overall picture is that of an impressive achievement in the reduction of the debt-to-GDP ratio after the devaluation and the establishment of CEMAC in 1994: in 2008 every CEMAC country complied with the 70% criterion (see also Fig. 18). In principle, this suggests an optimistic view about public debt sustainability and the working of the surveillance programme. There are however some caveats, one concerning the level, and the other the volatility of the public debt-to-GDP ratio.

As far as the level is concerned, it must be noticed that this impressive performance is mostly attributable to oil revenues. A very rough measure of the contribution of oil revenues to debt reduction is given by the cumulated sum of oil revenues as a share of GDP: at the CEMAC level, this is equal to about 130 GDP points from 1995 to 2006, thus explaining the about 110 GDP points reduction in the debt-to-GDP ratio over the same period. In fact, as Fig. 18 shows, the reduction of the debt-to-GDP ratio has been more painful and less firm in the only non-oil country of CEMAC, namely, the Central African Republic. Table 13 reports the recent evolution of the non-oil basic fiscal balance. As is to be expected, the picture that emerges is rather bleak at the Community level, especially in times of fast rising oil prices.

Fig. 23 shows the results of a counterfactual experiment where the path of public debt is simulated starting from the initial condition in 1994 onwards, in the absence of oil sector. In other words, we have simulated Eq. (5) in App. 6.1 by removing oil receipts from f_t and taking as γ_t the non-oil nominal GDP growth.[51] Unsurprisingly enough, the results are much less comforting. Take for instance the case of Congo. If oil receipts and GDP are taken into account, the average deficit-to-GDP ratio and nominal GDP growth over 1994-2008 are -1% (implying an average surplus) and 15% respectively, which taken together imply a steady state debt ratio of -7%. However, the non oil deficit and nominal growth are 47% and 8%, which implies a steady state debt ratio of about 585%. The simulation suggests that in the absence of oil receipts the situation would have further worsened on average after 1994. In particular, the debt at the CEMAC level would converge to a steady state close to 190%, resulting from the ratio of an average non-oil deficit close to 11% with a non-oil long-run nominal growth close to 6%.

As far as the volatility of the debt-to-GDP ratio is concerned, it must be stressed that the behaviour of any ratio is strongly and nonlinearly affected by that of its denominator. Since CEMAC growth is extremely volatile (Fig. 5), some episodes of sharp drop in the debt-to-GDP ratio may be determined by a burst of high (inflationary) growth. However, a reversal of this growth may lead to a rapid worsening of the situation: episodes of this kind are apparent in the case of Congo (Fig. 23). This suggests a more prudential attitude in "good times".

Given the windfall character of oil revenues, their eventual exhaustion in the medium- to long-run, and their dependence on factors completely outside the control of CEMAC policy makers (the largely unexplained variations in the price of crude oil), these very crude simulations point out the need of considering the non-oil basic budget balance as a more reliable indicator of fiscal sustainability. This is suggested by UNECA (2007) and strongly advocated by Iossifov *et al.* (2009). In fact, after the 2008 revision of the surveillance framework, a non negative non-oil basic budget is taken into account among the secondary (i.e., non mandatory) convergence criteria. As stressed in the last convergence report by UNECA (2009), the evolution of this indicator shows the persistence of structural fragilities in CEMAC oil economies.

Taking stock of this discussion, a possible synthesis could be that of defining the reference parameter in terms of a value of the (possibly structural) non-oil basic balance *consistent with the 70% parameter*. This would automatically allow any windfall oil revenues to be devoted to "fiscal consolidation". The current "second rank" criterion, namely, that the non-oil basic budget as a percentage of non-oil GDP must be non negative, appears however unnecessarily restrictive.

The variables reported in Table 14 allow us to evaluate some alternative proposal. The average nominal growth ratio over 1995-2006 has been 10.6% for total GDP and 7.2% for non-oil GDP.[52] In the same period, average non-oil total deficit has been equal to 9.9 GDP points and to 13.5 non-oil GDP points. Taking first as a benchmark total GDP, which makes sense, because the debt target is defined with reference to total GDP,[53] the steady state debt ratio implied the non-oil deficit and the total growth rate is 9.9%/10.6%=93%; if instead we take non-oil growth, the steady state debt raises to 9.9%/7.2%=136%; finally, if we consider the ratio of overall non-oil deficit over non-oil GDP, the ratio rises further to 13.5%/7.2%=187%. Even in the most favourable case we obtain a value well in excess of the 70% ceiling.

By applying the steady state deficit formula [2] and rounding up the results to integers, if we take as reference the total growth rate, we get a convergence value of 7% for the non-oil deficit, corresponding to about 5% for the basic non-oil deficit (given the average spread between these two balances). If instead we adopt a more prudential stance and we use non-oil growth rate, the convergence value drops to 5% for non-oil deficit and to 3% for non-oil basic deficit respectively.

Fig. 24 simulates the effect of the 5% non-oil basic deficit rule on CEMAC debt convergence. It must be stressed that this simulation probably overstates the effects of fiscal consolidation, because it is performed by iterating forward the debt accumulation equation from 1994 onwards imposing the respect of the 5% rule but leaving the growth rates unchanged. Since the average non-oil basic deficit from 1994 onwards has been equal to 9% on average, the 5% rule imposes a −4 GDP points correction on total deficit. This restrictive fiscal measure would likely determine a downward revision of the growth rates, hence, an upward revision of the debt path. Keeping this in mind, the results are rather telling: even the (apparently) lax 5% basic non-oil deficit fiscal rule would have determined a much quicker fiscal consolidation. If we adopt the rather extreme hypothesis that the restrictive measure would halve the nominal growth rate, the results do not change a lot: the debt-to-GDP ratio converges to zero in 2008.

These results show that the zero non-oil basic balance rule is probably too restrictive.[54] Sensible value of the convergence parameters must be selected keeping in

mind the consistency between the long-run (or steady state) values of debt and deficit, under reasonable assumption on the long-run nominal growth path. In this respect, one should remember that LDCs are likely to show higher real and nominal growth rates than DCs. As a consequence, fiscal targets that closely mimic the SGP zero balance rules (or are even stronger, as it is the case for CEMAC) make little sense in the context of DCs.

4. Assessing macroeconomic convergence: methods and applications to CEMAC countries

Unsurprisingly enough, the study of OCA-convergence has received a great momentum from the building of EMU, both at the theoretical and methodological level. In fact, reference studies for the definition of macroeconomic convergence, such as Hall *et al*. (1997), deals with the issue of monetary policy convergence in the European Monetary System (EMS), the forerunner of EMU.

As we shall see, the empirical analysis of convergence leaves a lot of scope for further research: not all the available methods have yet been applied, the methods that have been applied are not always the most appropriate, and the interpretation of their results is not always convincing. Two remarks will illustrate this point.

The first one is that while the interest for the empirical assessment of OCA-convergence follows the adoption of Maastricht treaty, previous studies of convergence had dealt almost exclusively with NCGT-convergence i.e., cross-country convergence of GDP per capita level as result of a catching-up process. Due to technical progress, GDP per capita is a non stationary variable. The variables whose "convergence" is relevant under OCA theory, instead, are mostly stationary (e.g., inflation and the business cycle). As a consequence, some empirical studies on OCA-convergence assess it on the non-stationary counterpart of the relevant variables (e.g., on the level of prices, rather than on the inflation rates), although this makes little sense from a theoretical point of view and results in uninformative tests.

The second one is that most of the literature on economic convergence in Europe *precedes* the inception of the euro in 1999, and was therefore concerned with the sustainability of the EMS and the likelihood of its safe conversion into the EMU (e.g., MacDonald and Taylor, 1991; Hafer and Kutan, 1994). Remark that in the EMS monetary authorities, though committed to convergence by Maastricht treaty, preserved their autonomy. Therefore, at that time it made a lot of sense to test whether they were actually complying with their commitment to "converge". However, the one-to-one translation of tests of monetary convergence to a full-fledged and long-established MU as CEMAC makes little sense, as in this context monetary authorities have by definition surrendered their autonomy to a supranational bank.

In this Section we will first set out the operational definitions of convergence, and then move to a survey of the main empirical results related to CEMAC.

4.1 Operational definitions of convergence

In this subsection we sketch the operational definitions of convergence that have been proposed in the literature, in order to put in perspective the empirical results presented later. As the literature on "convergence" in a broad sense (i.e., including "growth theoretical" convergence) is huge, we will focus mainly on the definitions of

convergence that are (or could be) relevant to the studies performed in CEMAC countries. The analysis carried out in Section 2 above has shown that according to OCA theory two concepts of "convergence" are particularly relevant: the convergence of inflation rates of member countries to a unique value, and the synchrony of the business cycle among member countries. Let us consider these two concepts in turn.

4.1.1 Convergence among economic variables

σ-convergence

Probably the simplest tool to investigate the convergence among a set of variables consists in investigating the time pattern of a measure of dispersion of their distribution. In the growth literature, this goes under the name of σ–convergence (σ being the usual symbol for the standard deviation). σ–convergence, although appealing as a descriptive tool, presents two unsatisfactory features: first, the σ criterion does not inform us on the sign of the spreads among the variables; second, a formal test of convergence (i.e., a formal test on the size of σ) can be obtained only under very restrictive distributional assumptions (Hall *et al.*, 1997). The first issue has generally went unnoticed, but it is not a trivial one, because as far as the viability of a MU is concerned, relatively large inflation differentials whose sign changes often are less dangerous than comparatively smaller but persistent inflation differentials.

The recent European experiences illustrates the latter case: the average largest inflation differential in the EMU from 1999 to 2008 has been equal to 2.7 points, which is small in comparison of the average size of the largest inflation differential in the CEMAC in the same period, equal to 8.2 points (see Table 15 and 16).[55] However, the comparatively smaller inflation differentials in the EMU have been very persistent, leading to a loss of competitiveness and to a current account crisis in a number of peripheral economies. In fact, if we take the twelve inflation differentials with the dominant country (Germany), we see that their sign is reversed in only 18 cases (corresponding to 15% of the sample); on the contrary, if we take the inflation differentials between CEMAC countries and Cameroon (the largest CEMAC economy), the reversals of sign are much more frequent, reaching 46% of the available observations. However, despite the evident occurrence of a crisis, the standard deviation of the inflation rates in the EMU is smaller, less volatile, and downward sloped, i.e., it exhibits σ–convergence, whereas CEMAC inflation rates do not (see Fig. 25).

Definitions of convergence based on time series analysis

As convergence is intrinsically a dynamic process, and a long-run one, its empirical study has drawn extensively on the modern literature on long-run time series analysis, based on the concept of cointegration. According to the definition originally proposed by Engle and Granger (1987), two non stationary time series are said to be cointegrated if they do not drift far apart in the long run. This definition can be extended to any number *n* of time series. When two or more time series are cointegrated, their long-run behaviour is explained by one (or more) common stochastic trend.

As shown in Appendix 7.3, the application of modern time series analysis to the assessment of convergence has lead to two different approaches: the first one, proposed by Hall *et al.* (1997) following Bernard and Durlauf (1995), broadly speaking identifies convergence with cointegration. While appealing and easy (perhaps too easy) to

implement, this definition presents some shortcomings. The first one is that cointegration is a property of the whole time series, while convergence may occur toward the end of the sample, for instance because of a structural change. In other words, cointegration tests tell us whether the variables have always moved together, which is a different concept from convergence, that occurs when variables move increasingly close to each other. Cointegration is therefore too strong a condition for convergence. At the same time, cointegration may be too loose a condition for convergence: the requirement that a linear combination of the variables is stationary (as requested by the definition of cointegration) may not be strong enough to ensure convergence. In most cases, convergence imposes (unit) restrictions on the parameters of the linear combination (see App. 7.3 and Sec. 4.2 below for an example). Another shortcoming derives from the fact that cointegration, by its very nature, requires that the time series involved are non stationary: for two time series to have a common trend, they first must display a trending behaviour. This restricts the applicability of the convergence assessment to trending series. While this is not a big limitations for the empirical assessment of NCGT-convergence, as this deals with trending series such as per capita GDP, it may become a drawback in the assessment of OCA-convergence, insofar as this deals with stationary variables, such as the inflation rate, that is not expected to feature a trend in the long run.

These limitations are removed by Andrew Harvey and his co-authors (Busetti *et al*., 2006a), who propose an original approach for testing convergence among the levels and the growth rates of a set of time series. The logic of this approach, which rests on simple stationarity and non-stationarity tests, is expounded in Appendix 7.3 and an application to CEMAC inflation rates is given in Section 4.3 below.

4.1.2 "Convergence" of economic cycles

As explained above, the "convergence" (i.e., synchronization) of economic cycles warrants that a common monetary policy will not harm any member economy in the presence of a common external shock. A related, but distinct, issue is that of verifying whether the shocks hitting the member economies are on average symmetric or asymmetric, because in the presence of "symmetric" (i.e., correlated) shocks a "symmetric" (i.e., common) policy answer would not undermine growth in member countries (irrespective of their cyclical position). UNECA (2007) defines this as the "shock convergence" issue. Of course, the best situation is that where both the cycles and the shocks are synchronized.

Cycles synchronization

Frequency domain econometrics provides with a number of sophisticated methods for investigating the synchronization of the cyclical components of a given time series, for instance by examining the coherency spectrum of two series (see Harvey, 1990). There are however two important limitations: first, spectral analysis is extremely data intensive, it requires long time series of possibly quarterly or monthly data, a requirement that is impossible to satisfy in some cases (including CEMAC); second, the analysis in the frequency domain cancels the information in the time domain (Iacobucci, 2003). We have seen, however, that convergence is by definition an asymptotic process, i.e., one in which time matters.[56]

For this reason, the synchronization of economic cycles has been studied mainly in the time domain, by examining the correlations among the cyclical components of each country GDP, after removing the trend component by means of *ad hoc* methods like the Hodrick-Prescott filter.

"Symmetry" of shocks

As stated before, by symmetric shocks we mean shocks of the same sign and/or hitting all the regions of the currency area. The first studies in this area looked at the correlation of business cycles or at the volatility of bilateral real exchange rates between each pair of countries (de Grauwe and Vanhaverbeke, 1991). As stressed by Bénassy-Quéré and Coupet (2005), this approach "did not assess the degree of symmetry of the shocks, but rather the degree of asymmetry of the results of the shocks, including economic policy reaction". These studies failed to identify the shocks, by mixing them up with the cycles, and failed to identify the nature of the shocks (i.e., whether supply or demand shocks, real or monetary shocks), although the modern theory of OCAs suggests that the optimality of a given exchange rate regime is strongly dependent on the nature of the shocks (see Sec. 2.1.2 above).

In order to cope with these issues, Bayoumi and Eichengreen (1993) propose to apply Blanchard and Quah (1993) decomposition of shocks between supply and demand side based on a VAR model. This methodology (or suitable variants of it) has been applied to countries in SSA by Fielding and Shields (2001), Buigut and Valev (2007), UNECA (2007). It should be noted that the identification of the shocks proceeds from very restrictive *a priori* on the structure of an economic system. On the other hand, this literature does usually *not* provide any evidence about the statistical congruency of the underlying VAR model with the data (no tests on the residuals are provided, the choice of lags is often undocumented, the structural stability of the coefficients is not tested, and so on). Since shocks are after all an empirical matter, some more information about the reliability of the empirical models would be reassuring (to say the least).

4.2 Assessing convergence in the CEMAC: a survey of the empirical literature

The most recent and extended study of macroeconomic convergence in CEMAC is UNECA (2007), that also provide a survey of some previous empirical studies in SSA and the CFA franc zone. This important study exemplifies both the strengths and the weaknesses of some methodological developments surveyed above. As far as convergence among variables is concerned, UNECA (2007) refers to MacDonald and Taylor (1991) and apply Johansen (1988) maximum likelihood cointegration estimator, that allows the researcher to verify the number of stationary linear combinations among a set of N variables. UNECA (2007) considers the six CEMAC countries. Accordingly, the hypothesis that the variables share the same stochastic trend (i.e., "converge") is identified with the presence of five stable linear combinations (cointegrating relations).[57] More precisely, this procedure envisages two polar cases: if there are zero cointegrating relations, this implies that there are N stochastic trends in the data: in other words, each variables evolves along an independent stochastic trend, with no relations to the other variables; if there are N stable linear combinations, this means that the data are stationary (hence, there is no trend at all in the data). In the intermediate cases, the presence of $M<N$ linear combinations implies that the data are lead by $N-M$ stochastic

trends: "full convergence" obtains when $M=N-1$, otherwise we have cases of "partial convergence", where the data may follow more than one attractor. In principle, this suggests the possible presence of convergence clubs, but the study does not explain how the methodology can lead to the identification of such clubs.

Several features of UNECA (2007) are worth noting. First, the choice of variables. Convergence is tested on a very wide range of variables, ranging from money stock to government budget balance. Yet, the theory of OCA lends little support for the study of convergence of most of these variables. In fact, the only convergence explicitly considered by OCA theory is that of inflation rates. As stressed before, the tests on the money stock performed by Hafer and Kutan (1994) made sense, because they referred to EMS, not to EMU. For the EMS to be viable the formally autonomous national monetary policies had to be tied by cointegration. In a MU like CEMAC, where monetary policy is already managed by a supranational central bank, the test results are obviously uninformative about the opportunity of entering the MU! As far as the fiscal variables are concerned, there is little theoretical support for identifying "cointegration" with "fiscal policy convergence". To our knowledge, no theoretical model of fiscal policy coordination imposes long-run cointegrating restrictions on the behaviour of fiscal variables across countries. One could also wonder whether it is a good idea to impose "uniformity" of fiscal policies in a region that is characterized by a sizeable degree of structural differences and of shock asymmetry, as shown in UNECA (2007). Moreover, Iossifov *et al*. (2009) points out that total government receipts are strongly and jointly affected by oil price dynamics, hence a study of their cointegration makes little sense, because it likely indicates joint dependence on a variable outside the control of the policy makers, rather than "convergence" in the design of policies. At a more general level, no theoretical model suggest that MU membership will bring about GDP convergence, i.e., will boost the growth of poor economies *proportionately more* than that of rich economies, thus inducing a *catch-up* process. The argument that European economic integration has brought about convergence among member countries should be qualified, because there is no obvious mean for empirically discriminate between "spontaneous" convergence (the catch-up envisaged by standard growth theory) and "integration-induced" convergence. In this light, the fact that the results show non convergence among GDP levels in CEMAC is neither surprising nor particularly informative.[58]

Second, exclusive reliance on the cointegration approach leads to paradoxical results. The more apparent is the omission of trend stationary variables. These are omitted on the basis of the fact that they do not fit within the framework of the Johansen estimator. Strictly speaking this is incorrect, as Bernard and Durlauf (1995, p. 99) specify that their approach to measuring convergence applies also in case of trend-stationary variables, thus requiring that "the time trends for each country must be the same". It is fair to say that this definition, while offering an easily testable implication, has paradoxical results, because it misses the obvious fact that whenever two variables start from different initial conditions, they cannot converge if they share the same trend (two parallel straight lines meet only at infinity). Consider for instance the two trend stationary series represented in Fig. 26. Strict adherence to the "cointegration=convergence" paradigm would exclude these series from the analysis, as they are $I(0)$ (with trend). Application of the Bernard and Durlauf's "equal trend"

criterion would lead to rejection of convergence, as the trends of the series are different. At the same time, these trends are obviously converging. How useful is a theoretical framework that cannot deals with such cases? As recalled above, Hall *et al.* (1996) warns strongly against the identification of convergence with cointegration, stating that the latter is neither necessary nor sufficient for the former. Consider for instance the two series represented in Fig. 27. They are independent random walk, hence non cointegrated by construction. Would you also say that they are not converging?

These remarks need some qualification. For instance, in Fig. 26 and 27 convergence may be only apparent. The series in Fig. 26 are expected to continue along their paths, hence to diverge from the end of the sample onwards, while the behaviour of the series in Fig. 27 is by construction unpredictable. They are however warnings against an uncritical application of statistical techniques.

Another problematic feature of UNECA (2007) is the way in which price convergence is analysed. As far as inflation rates are concerned, UNECA (2007) considers only their σ-convergence and finds them to be converging (however, the discussion above warns against the usefulness of σ-convergence). When it comes to prices, UNECA (2007) asserts that if there are N-1 cointegrating relations among N price variables, price differentials will vanish. Let us check this assertion for 2 price series, $P_{i,t}$ and $P_{j,t}$. Cointegration requires that there is a stable linear relationship of this kind

$$ln\ P_{i,t} = \beta_0 + \beta_1 lnP_{j,t} + u_t$$

Now, if $\beta_0 \neq 0$ and $\beta_1 \neq 1$, this relation does actually imply a persistent price differential between i and j (remember Hall's *et al.* (1997) remark that "sensible convergence would require $\theta=1$", or Bernard and Durlauf (1995) definition of convergence; see App. 7.3). By differencing the long-run relation above, omitting the stochastic terms, we obtain

$$\Delta ln\ P_{i,t} = \beta_1 \Delta lnP_{j,t}$$

Hence, cointegration of prices, *per se*, does not imply that either the price or the inflation differential will vanish. By the way, as pointed out by Busetti *et al.* (2006), *absolute* convergence makes no sense when considering price indices. UNECA (2007) provides no information whatever about the size of the coefficients in the cointegrating relations.

At a more general level, we must recognize that maximum likelihood (ML) cointegration techniques rests on a number of statistical assumptions that are unverified and in most cases extremely unlikely. Just to make an example, ML assumes that the underlying data generating process has constant parameters. This is likely to be an untenable assumption in a set of countries like CEMAC, that underwent a major devaluation (not to say other shocks).

4.3Inflation convergence in CEMAC countries

We now provide an alternative analysis of inflation convergence in the CEMAC based on the framework of Busetti *et al.* (2007). We first address the issue of the convergence of area-wide inflation rates between CEMAC and the EMU, and then the issue of intraregional inflation convergence in CEMAC.

4.3.1 The CEMAC and the euro area

We start from the analysis of price convergence between the area-wide CEMAC price index and the EMU harmonized inflation price index. As stressed in Sec. 2.2.3 above, since European countries account for a large share of CEMAC trade, while interregional trade is almost inexistent, convergence to European prices matters much more than interregional price convergence, as far as the external equilibrium of CEMAC countries is concerned. The time series of consumer prices in CEMAC and in the EU-12 region are reported in Fig. 28. It is apparent that they have deviate starting in the mid '80s, and that the 1994 devaluation has brought CEMAC prices back on track with the European ones. At the same time, since the price levels appear to follow a similar trend, this suggests that some degree of convergence in inflation rates may have occurred.

Following Busetti *et al*. (2006) strategy (see App. 7.4 and Fig. 31), we begin by testing the non stationarity of the inflation differential, corresponding to the null hypothesis of no absolute convergence among inflation rates. The hypothesis is rejected by the Dickey-Fuller (DF) test, τ_0. Rejection of non convergence does not inform us about whether the inflation differentials have already reached a stable configuration, or instead convergence is still under way. To this end we need to analyse whether inflation convergence implies also convergence in price levels, and whether inflation differentials are stable. The non stationarity test on price levels, τ^*, fails to reject the null, hence no convergence in levels is under way. We move then to the analysis of the stationarity of the inflation differentials, in order to assess their stability using the ξ_0 test: the stationarity/stability hypothesis is accepted, which means that convergence in inflation rates between CEMAC and the EMU has already occurred. In other words, according to this evidence, the *de facto* membership to the euro area implied by the "truly fixed" EUR/XAF exchange rate is not accompanied by persistent shifts in competitiveness among the two MUs.

4.3.2 Convergence among the CEMAC regions

The number of inflation differentials among N regions equals $N(N\text{-}1)/2$. Since in CEMAC we have six countries (whose relative prices levels, computed with reference to the average CEMAC price index, are represented in Fig. 29), the relevant inflation differentials are 15. They are represented in Fig. 30, where the "spikes" in the mid '80s are determined by a burst of hyperinflation in Equatorial Guinea from 1983 to 1985 (also apparent in Fig. 29). The summary statistics of Busetti *et al*. (2006) procedure are reported in Table 18.

The hypothesis of non stationarity of the inflation differentials is accepted in three cases, all of them involving the Chad (the partner countries are the Cameroon, the Central African Republic, and the Gabon). The Chad appears therefore not to respect the basic requirement of OCA theory, i.e., that its inflation rate should converge to those of the other member countries. Setting aside this case, the prospects for inflation convergence in CEMAC appear to be rather encouraging: six out of 15 price differentials appears to be of "Type D" (see App. 7.3), i.e., cases in which inflation convergence has already occurred; the inflation differential between Cameroon and Gabon appears to be of "Type C", i.e., inflation convergence is under way. The remaining five cases involve Equatorial Guinea, where it appears that price level

convergence is in progress. In other words, the higher long-run inflation rate observed in Equatorial Guinea (Tab. 11) is determined by the "catch up" of this country's relative prices with the area-wide average (Fig. 29).

Summing up, inflation convergence in CEMAC, with the only exception of Chad, appears to be rather pervasive. Inflation rates have converged or are converging in 7 out of 15 cases, and in another 5 cases (all involving Equatorial Guinea) the persistence of inflation differentials is justified by ongoing convergence of relative prices.

4.4 Convergence of cycles among CEMAC countries

The most recent study on this issue is that of Carmignani (2010). Using annual GDP data from 1960 to 2007, he concludes that the degree of cycles synchronization is still very low, although slightly increasing over time. In his view, this shows that in case of CEMAC the "endogenous OCA" theory has little empirical support, and that policy harmonization and enhancement of physical connectivity among member countries could foster the convergence process. As remarked above, in the case of CEMAC this result is not surprising, since CEMAC lacks an essential feature of the mechanism that should determine "endogenous" OCA formation, namely, a high and growing level of intraregional trade.

5. Conclusions

As stated in the introduction, "convergence" in macroeconomics has two distinct meanings: NCGT-convergence, i.e., cross-country convergence in the per-capita GDP levels determined by the catch-up process (JEL O47), and OCA-convergence, i.e., the convergence of a set of macroeconomic fundamentals among member countries, which is needed in order to ensure the viability of a MU (JEL F33). In case of regional economic communities (RECs) among LDCs, regional assessments of NCGT-convergence make little sense as far as pro-poor growth is concerned: the presence of convergence may only indicate that the REC is becoming a "club" of poor countries. For this reason, given the regional scope of this study, we decided to focus instead on OCA-convergence, both because this concept is extremely relevant for MUs like CEMAC, and because, although the relations between the two concept of convergence are rather loose at the theoretical level, OCA-convergence may have implications for economic growth, hence for poverty reduction strategies.

After summarizing the main results of the different strands of literature on OCAs (the so called "old" and "new" OCA theory), we have analyzed whether CEMAC satisfies the criteria that ensure the viability of a MU, and whether its multilateral surveillance agreement is consistent from a theoretical point of view, using both the results of previous studies and fresh empirical evidence.

As for the first point ("is CEMAC an OCA?"), the evidence is mixed. Unlike previous studies, the results provided in this paper show that what is probably the most undisputed criterion for the optimality of a MU, i.e., inflation convergence (considered by both the "old" and the "new" theory), appears to be largely satisfied by CEMAC member countries (with the exception of Chad). However, while beneficial in theory, this outcome is less relevant in practice, because the low-level of intraregional trade implies that the persistence of inflation differentials among member countries would not determine major current account disruptions. At the same time, it is difficult to interpret

this result as evidence that "endogenous OCA formation" (as envisaged by the "new" theory) is under way, because studies focussed on business cycles synchronization find that this is still very poor across CEMAC countries, thereby contradicting the hypothesis that trade-induced demand spillovers are transforming CEMAC into an OCA.. We should add to this the fact that CEMAC does not fare very well under all the other criteria envisaged by the "old" theory (factor mobility, openness, diversification, fiscal integration). Taken together, these results imply that for CEMAC countries the costs of MU membership could be relatively high in terms of increased output volatility and possibly reduced long-run growth.

As a matter of fact, the received wisdom according to which CEMAC has benefited of higher growth because of its macroeconomic stability induced by sharing a common currency (a view expressed in particular by studies carried out by the IMF) does not fully withstand a closer scrutiny. As shown in this as well as in many other empirical studies, CEMAC growth did not outperform in a noticeable way SSA growth. At the same time, CEMAC growth was much more volatile than SSA growth. These two evidences are consistent, as empirical studies show a strong negative relationship between growth volatility and average long-run growth in LDCs. The claim that this volatility depends essentially on a fiscal pro-cyclical bias induced by national governments profligacy in good times does not receive a very strong support, at least at the area-wide level. Occam's razor leaves us with a more direct explanation, namely, that CEMAC higher output volatility may simply be the consequence of the reduced resilience to shocks, determined by the adoption of a common currency in a REC which was not, and is not becoming, an OCA. Should this be the case, rather than fostering pro-poor growth, MU membership would have undermined it, a conclusion reached in a number of other studies.[59]

Yet, the benefit of MU membership can (and perhaps should) be assessed not only on a purely economic dimension, but also in a political economy (or simply political) dimension, a fact that is often mentioned also in relation with the European experience. On the political side, regional economic integration can be seen as a crucial step towards a closer political integration, which in turn is certainly beneficial, to the extent that it may lead to a more peaceful political environment and to the fulfilment of essential OCA criteria (such as an increased factor mobility, and fiscal integration). On the political economy side, the costs of renouncing the monetary sovereignty should be gauged against the benefit of restraining the behaviour of fiscal authorities, in a context in which they may be biased towards excessive spending. Clear-cut conclusions in this respect are difficult: on the one hand, a number of analyses show that the very membership to a MU creates incentives to fiscal profligacy. On the other hand, CEMAC countries were able to realize a considerable fiscal consolidation effort, at least in term of debt reduction, since the adoption of the multilateral surveillance.

This brings us to the second point of our analysis, namely, the theoretical consistency of CEMAC multilateral surveillance agreement, which is analyzed in the framework of the recent debate on fiscal coordination and convergence, putting this discussion in perspective with respect to the recent European experience. It must be stressed that although CEMAC countries are very different to the euro area ones, the European experience is extremely relevant for at least two reasons: first, because the "truly fixed" exchange rate among the CFA franc and the euro makes CEMAC a *de*

facto extension of the euro area; second, because the cultural ties between CEMAC and France, dating back to the colonial period, have certainly contributed to shape the surveillance programme.

In fact, CEMAC multilateral surveillance programme shares with the European SGP some nonsensical features, among which the coexistence of two potentially inconsistent and unduly restrictive fiscal criteria, and a poor enforcement mechanism, that may give rise to fiscal rules credibility problem. In CEMAC countries, a further problem is caused by the heavy dependence of fiscal balances on the highly volatile prices of raw materials such as crude oil. In both MUs the inconsistency between fiscal criteria has been solved by referring only to the weaker one (the deficit criterion in the euro area, the debt criterion in the CEMAC), an opportunity offered by an equally weak and politically dominated enforcement mechanism. The recent European experience however suggests that the policy of changing the rules whenever they do not suit the need of the dominant political power may create moral hazard problems, such as those emerged in the 2010 crisis. To this end, the paper makes some constructive proposals on how to redesign the fiscal balance criterion in order to make it less sensitive to oil price volatility, and more consistent with the debt criterion, in an effort to strengthen its credibility.

Yet, owing to its attention to a wider and more theoretically motivated set of convergence indicators, the CEMAC surveillance agreement is in many respects better motivated and more consistent with its declared purposes than the SGP, the best proof of this claim being the fact that in the debate following the 2010 euro crisis many European authors evocate the need of including in the euro area surveillance some criteria that feature already among the CEMAC ones. In fact, the recent crisis of the euro shows that "fiscal convergence" as considered by Maastricht treaty is an almost useless and severely misleading criterion (as anticipated by Buiter, 2006). In particular, we have shown elsewhere (Bagnai, 2010) that the emphasis put by multilateral surveillance programmes (or by international investors at large) on the behaviour of the public sector has proven misleading in a number of recent economic crises, including the Asian crisis, the US subprimes crisis, the Iceland crisis, and the 2010 Eurozone crisis. In all these cases the financial fragility of the countries involved (1) originated in the private, rather than in the public sector (although it eventually resulted in increased public indebtedness, when the public sector was called to back up insolvent private companies in order to stop contagion), and (2) was (or had been) clearly revealed by the behaviour of the current account balance, rather than by the government balance. In most cases, monitoring the government balance only gave misleading indications to the investors and the policy makers. This feature of modern financial crises was noticed first by Hussain *et al.* (1999) but has become apparent to economist in developed countries only recently. On the basis of this striking evidence, some authors like Dullien and Schwarzer (2010) propose the adoption of a "stability pact" for (intra-regional) current account imbalances. Interestingly enough, CEMAC surveillance does already feature the current account balance (although among the non mandatory "other indicators").

Moreover, the euro crisis has stressed the importance of monitoring the inflation rate, which, as recalled in the paper, is the only economic variable for which convergence is expressly requested by OCA theory (since Fleming, 1971). In its dull

fight against the size of the public sector (Pasinetti, 1998), Maastricht treaty very inappropriately forgets the need to monitor inflation convergence: while inflation is monitored for accession countries, no "excessive inflation" procedure is envisaged for "ins" by the Treaty. This has led to competitiveness shifts and disrupting external imbalances. The argument according to which inflation would not be the cause of the external imbalances, but rather a consequence (being determined by foreign financed excess spending), does not change anything as far as macroeconomic surveillance is concerned: be it a symptom, or the cause, or both, inflation is very easy to monitor, and failure to do so is extremely unwise at any rate. The disastrous oversight of the inflation convergence criterion in Europe may have been motivated by theoretical arguments, such as those put forth by Giavazzi and Pagano (1988), according to which inflation convergence becomes an outcome, rather than a prerequisite, of the accession to a MU (which obviously implies that the "ins" do not need to monitor it). This is a central argument in the so-called "endogenous OCA" literature, that puts forth the argument that MU will endogenously generate the conditions for their viability (in terms of inflation convergence, of macroeconomic cycle synchronization, and so on). As far as inflation is concerned, Busetti *et al*. (2006b) results show that such an endogenous validation of the political decision to join the Eurozone did not occur in Europe. Interestingly enough, Busetti *et al*. (2006a) show that inflation convergence is still imperfect even in Italy, which became a MU in 1861 (150 years ago). This raises some doubt about the possibility that this kind of nominal convergence may occur spontaneously, and in fact there are also some doubts that the "endogenous OCA" mechanism is at work in CEMAC (Carmignani, 2010). At a more general level, Acocella (2005) points out that the argument of Giavazzi and Pagano (1988), according to which a "weak" country can acquire credibility by "tying" its monetary policy to a strong one, has never been credible, owing to the frequent realignments of the exchange rates in the EMS. Would this commitment have been credible, Europe had never experienced the 1992/93 crisis. This discussion stresses the need to closely monitor inflation rates, and in this respect CEMAC surveillance, by putting inflation among the first rank criteria, is certainly wiser than the European SGP.

It should be kept in mind that OCA theory does not request that inflation in member countries be low: it rather requests that member countries inflation rate be converging. As stated above, the situation of CEMAC appears relatively reassuring in this respect (with the possible exception of Chad). However, the *de facto* membership to the euro area, determined by the fixed EUR/XAF exchange rate, implies that in order to avoid competitiveness losses towards its main trading partner CEMAC must abide by the strong "price stability" commitment taken by the European institutions. This is a worrying feature, because cross country empirical studies suggest that in relatively fast growing LDCs a moderate rate of inflation may be beneficial for growth. This raises the issue of how long will CEMAC wish to keep its status of *de facto* euro area member, a question that is not yet topical, but will become crucial if Africa progresses towards monetary integration.

Although OCA-convergence has not taken place in CEMAC, some structural features of member countries, such as the relatively underdeveloped financial markets and the low share of intraregional trade, while being a hindrance to growth in some respect, could also prove a blessing as far as the viability of the MU is concerned. In

fact, the current setting of CEMAC makes it extremely unlikely that its sustainability can be endangered by private financing of huge intraregional imbalances, as in most recent financial crises. This result may appear paradoxical, because in a sense it is the very absence of some OCA criteria that ensures the viability of CEMAC as a MU. Of course, by this we do not mean that CEMAC countries should remain relatively insulated from each other in terms of intraregional trade, or that their financial markets should not develop. We rather would like to point out to the attention of the policy makers that these developments, while fostering growth, should be actively managed, as they may also open to the possibility of regional imbalances, that have proven extremely disruptive in the case of the Eurozone.

At a more general level, while the attention to OCA-convergence may be commendable, it inevitably biases the debate towards the closer historical experience, namely the European one. One may wonder whether this experience is relevant for countries interested in fostering (pro-poor) growth, as the European growth performance has been increasingly disappointing, both in absolute terms and relative to world average, especially after the inception of euro (Table 19), when the spread between world and euro area growth has reached 2 per cent points. To end on a positive note, we would therefore like to point out that rather than at Europe, countries interested in poverty reduction should perhaps look at the Chinese experience. At the beginning of its transition process China shared many structural features with most SSA countries, including low per capita income, low urbanization, high differential between urban and rural incomes, and a high share of the primary sector over total GDP. Since then China has managed to halve twice its poverty rate. It is now increasingly clear that China has many lesson to teach to other LDCs interested in poverty reduction. A recent paper of Dollar (2008) singles out some key policies:

1) the ability to create a good investment climate (with a low burden of bureaucracy and high quality of infrastructures) by encouraging competition among successful locations through decentralization of the decision making process, thus encouraging best practices;
2) an activist management of the "open door policy", aimed at avoiding that foreign enterprises become "enclaves" with no spillovers on the rest of the economy;
3) a pragmatic policy that has fostered infrastructure development through a full cost recovery policy, progressively reducing the role of public funding;
4) a high level of labour mobility, that has attracted labour force in the location where it was more productive, while at the same time fostering *per capita* income growth in the regions of origins (through remittances and through the relative decrease of population growth).

Table 20 compares some business climate indicators in China and SSA countries. Some interesting patterns emerge: for instance, CEMAC performance as far as the infrastructure development is concerned appears to be better than that of other SSA countries and of world average (with the exception of value lost due to power outages). Gabon performs consistently better than other CEMAC countries. The major hindrance appears to be the weight of bureaucracy, with long delays to obtain licenses, or to clear imports from customs (an essential feature for firms that imports parts or materials). As

for point 2 above, in most CEMAC countries foreign investment are addressed to the oil sector, which is relatively insulated from the rest of the economy, the only spillover being highly volatile government oil revenues. All these remarks point out specific lines of actions that can be addressed. Interestingly enough, some of them are consistent with OCA-convergence requirement (we refer in particular to fostering intra-regional labour mobility and developing trade through better infrastructure). None of them, however, depends essentially on the adoption of an area-wide single currency. In the light of this evidence, structural reforms, then, rather than the centralization of monetary policy, appear to be a safer road to pro-poor economic growth.

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7. Appendix

7.1 Public debt dynamics

Let D_t be the stock of nominal public debt at the end of year t, and F_t be the nominal public deficit:

$$F_t = \Delta D_t$$

We indicates with small letters the ratios of the variables to nominal GDP. Therefore:

$$\frac{\Delta D_t}{Y_t} = f_t \qquad [3]$$

and $d_t = D_t/Y_t$. Let γ_t be the rate of growth of nominal GDP. The deficit-to-GDP ratio can be decomposed as follows:

$$\frac{\Delta D_t}{Y_t} = \frac{D_t - D_{t-1}}{Y_t} = \frac{D_t}{Y_t} - \frac{D_{t-1}}{(1+\gamma_t)Y_{t-1}} = d_t - \frac{1}{1+\gamma_t} d_{t-1} \qquad [4]$$

By substituting Eq. [4] in Eq. [3] we obtain the dynamic equation of the debt-to-GDP ratio:

$$d_t = \frac{1}{1+\gamma_t} d_{t-1} + f_t$$

Assuming a constant path for both the nominal growth rate and the deficit-to-GDP ratio we get a first order linear difference equation with constant coefficients:

$$d_t = \frac{1}{1+\gamma} d_{t-1} + f$$

whose steady state path is given by Eq. [1] in the text, namely:

$$\bar{d} = \frac{(1+\gamma)f}{\gamma}$$

For small values of the nominal growth rates the steady state value can be approximated by $\bar{d} \approx f/\gamma$ (ratio of the deficit-to-GDP ratio to the nominal growth rate).

7.2The intertemporal budget constraint

Since Hamilton and Flavin (1986) the analysis of public debt sustainability is grounded on the *government intertemporal budget constraint* (or *solvency constraint*, or *present value borrowing constraint*). In order to define the constraint, let us express the government budget identity in discrete time as a ratio to GDP as follows

$$\frac{B_t}{y_t} = \frac{1+r}{1+n} \frac{B_{t-1}}{y_{t-1}} - a_t \qquad [5]$$

where B_t is the real stock of bond issued by the government evaluated at the end of time t, y_t is real GDP, r is the real interest rate on public debt prevailing between t-1 and t, n is the real rate of growth, and a_t is the primary surplus/GDP ratio (including seigniorage). We assume constant interest and growth rates in order to keep the notation as simple as possible. By leading identity [5], solving it with respect to the current value of B_t/y_t, and iterating it forward we obtain

$$\frac{B_t}{y_t} = \sum_{j=1}^{\infty}\left(\frac{1+n}{1+r}\right)^j E_t\left[a_{t+j}\right] + \lim_{j\to+\infty}\left\{\left(\frac{1+n}{1+r}\right)^j E_t\left[\frac{B_{t+j}}{y_{t+j}}\right]\right\} \qquad [6]$$

In Eq. [6] the debt/GDP ratio can in principle take any value in the limit. Therefore, Eq. [6] does not constrain the current value of B_t/y_t for any given path of a_t.

The *solvency constraint* is set by imposing that

$$\lim_{j\to+\infty}\left\{\left(\frac{1+n}{1+r}\right)^j E_t\left[\frac{B_{t+j}}{y_{t+j}}\right]\right\} = 0 \qquad [7]$$

namely, that the present value of the debt-to-GDP ratio eventually converges to zero. The constraint [7] implies that:

$$\frac{B_t}{y_t} = \sum_{j=1}^{\infty}\left(\frac{1+n}{1+r}\right)^j E_t\left[a_{t+j}\right] \qquad [8]$$

i.e., that the current value of the debt is equal to the expected present value of the infinite stream of future surpluses. This means that when the constraint is in force the debt must eventually be repaid, i.e., that the government must realize in the future at least one primary surplus large enough (if the current value of the debt stock is positive, there must be at least one positive value of a_t in the summation for the constraint to hold). Remark that in a growing economy, for the constraint [7] (or [8]) to be verified it suffices that B_t/y_t does not grow at a rate exceeding $(1+r)/(1+n) - 1 \approx r - n$; this happens when the service of the debt is not covered entirely by issuing new debt.

7.3 Definitions of convergence based on time series analysis

Convergence in expectation and cointegration

Hall *et al*. (1997) consider two stochastic series X_t and Y_t, possibly contaminated by measurement errors. Their preferred definitions of convergence are convergence *in expectation*:

$$\lim_{t\to\infty} E\left(X_t - \theta Y_t\right) = \alpha$$

and convergence *in conditional expectation*:

$$\lim_{k\to\infty} E\left(X_{t+k} - \theta Y_{t+k} \middle| I_t\right) = \alpha$$

where θ and α are known constants and I_t is the information set at time t. Hall *et al*. (1997) go on to remark that if the two series are both stationary convergence in expectation is trivially satisfied,[60] which means that the study of convergence is relevant only for non stationary variables (this assertion is questionable, as we shall see later).

If X_t and Y_t are non-stationary variables of the $I(1)$ type, convergence in expectations obtains when they are cointegrated with cointegrating vector $(1, -\theta)$. Most of the subsequent literature rests on this definition, thereby identifying convergence with cointegration. However, Hall *et al*. (1997) are very careful in stressing that cointegration is both too strong and too weak for a sensible convergence definition. It is too strong, because convergence is determined by the limiting behaviour of the series,

while cointegration is a property of the whole time history of the series; broadly speaking, in order to be cointegrated two series need to move together along the whole sample, while in order to be converging they just need to move closer together towards the end of the sample, which is compatible with *non* cointegration: hence, *non cointegration does not imply non convergence*. Cointegration may also be too weak a criterion, as convergence could require further parameter restrictions, depending on the economic meaning and on the units of measurement of the variables: hence, *cointegration does not imply convergence*. For instance, Hall *et al*. (1997) states that when the variables are in logs, "sensible convergence would imply that $\theta=1$" (more on this later). In this respect, Bernard and Durlauf (1995) distinguish between "convergence", that occurs when

$$\lim_{t\to\infty} E(X_t - Y_t) = 0$$

and "common trends", that occur when

$$\lim_{t\to\infty} E(X_t - \theta Y_t) = 0$$

Therefore, in Bernard and Durlauf language, convergence corresponds to cointegration with the additional constraint $\theta = 1$.

Convergence in variable parameters models

A natural choice in order to define an operational criterion for convergence that does not restrain the whole history of the observed variables is the adoption of variable parameters model.

For instance, Loufir and Reichlin (1993) estimate the following model:

$$X_{At} - X_{It} = \alpha_t + \beta_t (X_{At} - X_{Bt}) + u_t$$

where X_{It} is the value of indicator X at time t in country I, and X_{At} and X_{Bt} are the values of the same indicators in two reference countries A and B. In this variable parameters setting, we can say that I is converging towards A whenever $\lim_{t\to\infty} E(\beta_t) = 0$ and $\lim_{t\to\infty} E(\alpha_t) = 0$, while I is converging towards B whenever $\lim_{t\to\infty} E(\beta_t) = 1$ and $\lim_{t\to\infty} E(\alpha_t) = 0$. The equation can be estimated through the Kalman filter or recursive least squares (if the variables are stationary), and the time pattern of the parameters provide hints on the convergence of variables.

In the variable parameters model proposed by Hall *et al*. (1997):

$$X_t - \theta Y_t = \alpha_t + \varepsilon_t$$
$$\alpha_t = \alpha_{t-1} + u_t$$
$$\varepsilon_t \sim N(0, \sigma^2)$$
$$u_t \sim N(0, \omega_t)$$
$$\omega_t = \varphi \omega_{t-1}$$

convergence in means occurs whenever $\varphi<1$, which implies that ω_t converges to zero, α_t converges to a deterministic constant, and $\lim_{t\to\infty} E(X_t - \theta Y_t) = \alpha$. Convergence in this case has a testable implication ($\varphi<1$). Appropriate maximum likelihood tests may be constructed using the Kalman filter.

Stability and convergence among stationary variables

Hall's *at al*. (1997) remark that convergence in expectations is "trivially satisfied" in case of stationary variables is unsatisfactory. There are a number of economic problems in which convergence among two stationary variables matters: the best example comes probably from OCA theory, where it is crucial to assess whether the inflation rates of member countries have converged. While it is true that the expectation of the (scaled) difference between two second-order stationary variables will always be a constant α, it is also true that for this to provide a sensible definition of convergence some parameter restraints are needed. Let for instance X_t be the inflation rate of Cameroon and Y_t that of Gabon, supposed to be stationary variables.[61] In this case a sensible definition of convergence would imply that $\theta=1$ *and* $\alpha=0$, i.e., that the expectations of the two rate do not differ systematically in the limit. This condition is not "trivially satisfied": should this be the case, convergence in expectations would be useless for our purposes. A closer look at the logical structure of the problem however shows that the uselessness of Hall's *at al*. definition comes from the need to utilize the framework of the then recent and fashionable cointegration analysis, which deals essentially with non stationary series. However, rather than look for problems and data that make sense for a given instrument, an economist should be able to find instruments that make sense for a given problem. This is what does Andrew Harvey with his co-authors in a paper that considers explicitly the issue of convergence for both prices and the rates of inflation (Busetti *et al*., 2006).

A crucial feature of their approach is the careful distinction between *stability*, which occurs when two series have converged, and *convergence*, which is the process by virtue of which two series will eventually reach a stable configuration. This difference corresponds to two different tests (*stationarity* tests vs. *unit root* tests) that can be combined in an unified testing strategy.

Let z_t be the difference between two non-stationary time series ($z_t = y_t - x_t$). If this difference is stationary, the series will be said to have a *stable* relationship. This can be assessed using a *stationarity* test of the KPSS type (from Kwiatowski *et al*., 1992) on the demeaned observations:

$$\xi_1 = \frac{\sum_{t=1}^{T}\left(\sum_{j=1}^{t} e_j\right)^2}{T^2\hat{\omega}^2} \qquad [9]$$

where $e_t = z_t - \bar{z}$, $\bar{z}$ is the sample average, T the number of observations and $\hat{\omega}$ a non-parametric estimate of the long-run variance, given by:

$$\hat{\omega}^2 = \hat{\gamma}(0) + 2\sum_{\tau=1}^{m} w(\tau, m)\gamma(\tau) \qquad [10]$$

where $\hat{\gamma}(\tau)$ is the sample autocovariance of lag τ (hence, $\hat{\gamma}(0)$ is the sample variance), and $w(\tau, m)$ is a weight function, such as the Bartlett window, where m is the bandwith parameter. If the time series are known to have zero mean, it is pointless to demean their difference and the test can be carried out on the original series z_t, giving rise to the statistic:

$$\xi_0 = \frac{\sum_{t=1}^{T}\left(\sum_{j=1}^{t} y_j\right)^2}{T^2\hat{\omega}^2} \qquad [11]$$

Remark that the long-run variance in this case is computed putting in Eq. [10] the sample autocovariances of y_t, not e_t. The 5% critical values are 0.461 for ξ_1 and 1.656 for ξ_0 respectively. Rejection of the ξ_0 test (i.e., non stationarity of the non-demeaned difference) may imply that either the two series have no stable relation, or they have non-zero mean.

Coming now to *convergence*, this is a *limit* property of the difference between the series. In particular, the two series are said to *converge* if

$$\lim_{k\to\infty} E\left(z_{t+k}\middle|I_t\right) = \alpha$$

where I_t contains all the past history of z_t. The convergence is said to be *absolute* if $\alpha=0$ and *relative* (or conditional) if $\alpha\neq 0$. *Absolute convergence* then coincides with Bernard and Durlauf (1995) *convergence*. The simplest parameterization of convergence is provided by an AR(1) process of this kind

$$z_t - \alpha = \varphi(z_{t-1} - \alpha) + \eta_t \qquad [12]$$

that can be reparameterized as follows:

$$\Delta z_t = \gamma + (\varphi - 1)\, z_{t-1} + \eta_t \qquad [13]$$

where $\gamma=\alpha(1-\varphi)$. If $\varphi<1$, then the expected growth rate of z_t is a negative fraction $(\varphi-1)$ of the spread between the two variables in the previous period, z_{t-1}. In this case the spread z_t progressively reduces eventually converging to α.[62] If instead $\varphi=1$, the spread is not corrected in each period, and the two variables do not converge. Convergence can therefore be tested using a unit root test in Eq. [12].

If we are testing for *absolute convergence*, or if we otherwise know that $\alpha=0$, we can use the usual DF statistic with no intercept. The test statistic is indicated by τ_0 and corresponds to the *t* statistic of the φ-1 parameter in equation [13] where we put $\gamma=0$. The test discriminates to the left and its 5% critical value is equal to -1.95 for a sample of 50 observations. If instead we test for *relative convergence*, the problem then arise on how to choose the parameter α. Busetti *et al.* (2006) suggest to use a modified DF test carried out on the observations $z_t - z_T$: in other words, we set the unknown α equal to the last value of the observed series. The test statistic is indicated by τ^* and its 5% critical value is equal to -2.69.

How does this framework adapt to the issue of testing price behaviour? Two issues are here at stake: what is the relevant concept of convergence to test (absolute vs. relative)? And in what order shall we test for stability and convergence?

Notice that in case of price convergence/stability, tests on the level of z_t correspond to the study of relative prices, whereas tests on its first differences consider inflation differentials. An important point is that in studying price indices it is impossible to discriminate between absolute and relative convergence. The reason is

that two price indices can always be rebased in such a way as to coincide at the end of the sample (i.e., z_T=0 can always be obtained by construction). In other words, all we can assess is the so called "proportional law of one price", namely, the convergence in *relative* prices across regions. Interestingly enough, since the base years cancel out through first differencing, the same does not apply to inflation rates. Therefore, it makes sense to test for absolute convergence of inflation rates.

Busetti *et al*. (2006) propose a three-step testing strategy, where the convergence (i.e., unit root) tests are performed before the stability (i.e., stationarity) tests, leading to five possible outcomes (see also Fig. 31):

1) test for *absolute convergence of the inflation rates* using a standard DF test, τ_0, on inflation differentials:
   a. if we accept the null of no inflation convergence, the procedure ends, because if inflation rates do not converge, neither will price levels (this is case E in Fig. 31);
   b. if we reject the null, we move to step 2 in order to verify whether the convergence of inflation differentials implies also the convergence of the price levels.
2) test for *relative convergence of price levels* using a modified DF test, τ^*:
   a. if we reject the null of no convergence in level, a stationarity test, ξ_1, is needed in order to verify whether the level of the series have already reached a stable configuration (i.e., whether they have converged or are still converging);
   b. consider instead what happens if the null of non convergence in level is not rejected (hence, no relative price convergence is occurring): in this case, since we rejected in step 1 the non convergence of inflation differentials, a stationarity test on the inflation rates, ξ_0, is needed in order to assess whether they have converged or are still converging.
3) we then move to the stationarity tests, that will be performed:
   a. on price levels, using the ξ_1 statistic, if 2.a applies, with the following results:
      i. if we accept, price levels have converged, i.e., there will be no further adjustment of relative prices (this is case B in Fig. 31);
      ii. if we reject, price levels are converging, i.e., there will be some further adjustment of relative prices (this is case A in Fig. 31);
   b. on inflation differentials, using the ξ_0 statistic, if 2.b applies, with the following result:
      i. accept: inflation rates have converged (this is the restriction relevant for OCA theory and corresponds to case D in Fig. 31);
      ii. reject: inflation rates are converging (this would be a hint of an "endogenous OCA" process, and corresponds to case C in Fig. 31).

8. Tables

Table 1 – GDP per capita in CEMAC countries

			shares		
	GDP	Population	GDP	population	GDP per capita
Central African Republic	952.2	4.26	3.2%	11.1%	223
Gabon	5588.2	1.31	18.8%	3.4%	4263
Equatorial Guinea	3702.2	0.50	12.4%	1.3%	7470
Cameroon	12509.8	18.17	42.0%	47.3%	688
Chad	2789.6	10.47	9.4%	27.3%	266
Congo, Rep.	4229.9	3.69	14.2%	9.6%	1147
CEMAC (simple average)					2343
CEMAC (area-wide data)	29772	38			775
Euro area	6886243	317			21746

Note: the data refers to 2006. GDP and population data are in millions. GDP is measured in USD at constant 2000 prices. Area-wide GDP per capita is evaluated as the ratio of area-wide GDP to total population.

Table 2 – The size of CEMAC in 2008

		%CEMAC	%SSA	%World
Cameroon	23,396	29.8%	2.4%	0.04%
Central African Republic	1,970	2.5%	0.2%	0.00%
Chad	8,361	10.6%	0.8%	0.01%
Congo, Rep.	11,845	15.1%	1.2%	0.02%
Gabon	14,435	18.4%	1.5%	0.02%
Equatorial Guinea	18,525	23.6%	1.9%	0.03%
CEMAC	78,532		8.0%	0.13%
Sub-Saharan Africa	987,120			1.63%
World	60,587,016			

Note: GDP in current USD millions. Source: World Bank (2008).

Table 3 – GDP shares in CEMAC

	CMR	CAF	TCD	COG	GAB	GNQ
1987	59.2%	5.6%	5.7%	10.8%	18.1%	0.6%
1988	57.6%	6.1%	6.8%	10.6%	18.3%	0.7%
1989	53.7%	6.2%	6.7%	11.9%	20.9%	0.6%
1990	51.7%	6.1%	6.8%	11.8%	23.0%	0.6%
1991	50.6%	6.1%	7.0%	12.0%	23.7%	0.6%
1992	50.2%	6.0%	7.2%	12.4%	23.6%	0.7%
1993	51.2%	5.7%	6.4%	11.9%	24.0%	0.8%
1994	45.7%	5.7%	7.9%	11.9%	28.1%	0.8%
1995	47.1%	6.0%	7.8%	11.4%	26.7%	0.9%
1996	46.0%	4.9%	7.8%	12.4%	27.7%	1.3%
1997	45.8%	4.8%	7.9%	11.8%	27.1%	2.7%
1998	49.5%	5.3%	9.1%	10.2%	23.5%	2.3%
1999	48.6%	5.1%	7.6%	11.7%	23.2%	3.7%
2000	44.1%	4.5%	6.6%	15.3%	24.0%	5.6%
2001	44.8%	4.5%	8.0%	13.0%	21.9%	7.9%
2002	45.5%	4.3%	8.3%	12.6%	20.6%	8.7%
2003	45.4%	3.9%	9.1%	11.8%	20.6%	9.2%
2004	42.9%	3.5%	8.9%	11.8%	19.9%	13.0%
2005	36.2%	3.1%	12.8%	13.0%	19.2%	15.7%
2006	34.7%	3.0%	12.6%	14.4%	18.9%	16.5%
2007	34.6%	3.0%	11.9%	12.9%	19.6%	18.0%
2008	32.7%	2.8%	11.1%	13.5%	19.6%	20.2%
2009	36.9%	3.2%	10.3%	12.9%	22.1%	14.5%
2010	*35.3%*	*3.1%*	*10.6%*	*15.8%*	*20.5%*	*14.7%*
spread 2009-1987	-22.3%	-2.4%	4.6%	2.1%	4.0%	14.0%

Source: BEAC (2010); since 2005: CEMAC (2009).

Table 4 – Real growth in CEMAC and SSA

	CMR	CAF	TCD	COG	GAB	GNQ	CEMAC	SSA
1987	-2.1	-4.9	-2.4	0.2	-17.1	4.4	**-5.0**	**0.9**
1988	-7.8	1.7	15.5	1.8	12.8	2.7	**-0.9**	**4.6**
1989	-1.8	2.0	4.9	2.6	8.5	-1.2	**1.6**	**3.2**
1990	-6.1	-2.1	-4.2	1.0	5.2	3.3	**-2.1**	**2.7**
1991	-3.8	-0.6	8.5	2.4	6.1	-1.1	**0.5**	**-0.1**
1992	-3.1	-6.4	8.0	2.6	-3.1	10.7	**-1.5**	**-1.3**
1993	-3.2	0.3	-15.7	-1.0	3.9	6.3	**-1.7**	**1.2**
1994	-2.5	4.9	10.1	-4.5	3.7	2.6	**-0.2**	**1.8**
1995	3.3	6.4	1.5	2.6	5.0	11.7	**4.1**	**3.5**
1996	5.0	-2.8	1.7	6.4	3.8	34.6	**4.3**	**5.6**
1997	5.1	6.1	6.6	-1.4	5.6	95.3	**5.7**	**3.8**
1998	5.0	4.1	6.0	3.7	3.5	17.7	**4.6**	**2.4**
1999	4.4	3.8	-0.6	-2.7	-11.3	23.2	**-0.3**	**2.6**
2000	4.2	1.3	-0.1	7.6	-1.9	13.1	**3.2**	**3.6**
2001	4.5	2.7	11.7	3.8	2.5	67.8	**6.4**	**5.0**
2002	4.0	0.3	8.5	4.6	-0.3	20.4	**4.1**	**7.4**
2003	4.0	-4.6	14.7	0.7	2.5	14.4	**4.2**	**5.0**
2004	3.7	3.5	33.6	3.7	1.3	32.6	**6.6**	**7.1**
2005	2.3	3.0	8.6	7.1	3.0	8.9	**3.7**	**6.3**
2006	3.2	4.3	0.3	6.2	1.2	5.3	**3.1**	**6.5**
2007	3.4	3.6	1.8	-1.6	5.6	23.2	**4.4**	**6.9**
2008	3.1	2.2	-0.7	6.4	2.3	15.0	**3.8**	**5.5**
2009	2.0	2.0	1.9	6.8	-0.8	2.4	**2.0**	**2.1**
2010	*3.3*	*3.5*	*3.9*	*12.7*	*4.5*	*1.3*	***4.1***	**4.7**
average	**1.2**	**1.3**	**5.2**	**2.6**	**1.8**	**18.0**	**2.2**	**3.8**
average 1994-2009	**3.4**	**2.6**	**6.6**	**3.1**	**1.6**	**24.3**	**3.7**	**4.7**

Source: BEAC (2010); since 2005: CEMAC (2009). The data for SSA come from IMF (2010).

Table 5 – CEMAC growth and oil prices

Dependent Variable: CEMAC growth
Method: Least Squares
Sample: 1970 2006

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CEMAC growth(-1)	0.535657	0.132575	4.040418	0.0003
OIL	0.031465	0.012020	2.617709	0.0131
Constant	0.012772	0.008286	1.541429	0.1325
R-squared	0.401633	Mean dependent var		0.040087
Adjusted R-squared	0.366435	S.D. dependent var		0.044824
Durbin-Watson stat	2.146071	Prob(F-statistic)		0.000162

Note: the model was estimated following a general-to-specific procedure starting from a parsimonious and data congruent AD(1,1) specification. Data sources: the real growth rate is reconstructed using the national data in World Bank (2008), the oil price series comes from the International Financial Statistics (IMF, 2009), series 00176AAZZF "Average crude price".

Table 6 – CEMAC fiscal balances and oil revenues

oil revenues	non oil fiscal balance	correlation	p-values
1987	6.03	-10.46	
1988	5.58	-6.48	
1989	5.79	-5.92	
1990	7.98	-8.39	
1991	8.47	-9.21	
1992	7.13	-7.75	
1993	5.45	-7.72	
1994	8.28	-5.95	
1995	9.27	-1.76	
1996	10.27	-1.97	
1997	13.24	-5.64	0.471	0.141
1998	9.03	-7.38	0.450	0.139
1999	9.59	-2.98	0.482	0.093
2000	17.18	-4.18	0.472	0.087
2001	15.82	-5.71	0.428	0.109
2002	14.16	-6.76	0.381	0.144
2003	13.71	-4.03	0.415	0.096
2004	17.09	-6.44	0.357	0.145
2005	27.20	-8.57	0.071	0.774
2006	35.90	-13.58	-0.379	0.074
2007	33.59	-16.03	-0.573	**0.003**
2008	44.09	-19.51	-0.733	**0.000**

Note: the correlation coefficient for year *t* is computed using all the observations from the beginning of the sample through year *t*. Source: BEAC (2010).

Table 7 – Governance indicators in CEMAC and EMU countries

Voice&Accountability	1996	2007	Corruption	1996	2007	Violence	1996	2007	Rule of law	1996	2007
SOMALIA	2	3	SOMALIA	2	0	IRAQ	0	0	SOMALIA	0	0
EQUATORIAL GUINEA	7	4	EQUATORIAL GUINEA	11	2	Congo, Dem. Rep.	6	2	Congo, Dem. Rep.	1	1
CHINA	5	6	Congo, Dem. Rep.	0	4	CHAD	22	6	CENTRAL AFRICAN REPUBLIC	46	3
Congo, Dem. Rep.	6	9	CHAD	..	5	CENTRAL AFRICAN REPUBLIC	38	7	CHAD	22	6
CHAD	23	9	CONGO	21	11	CONGO	20	20	**CONGO**	6	8
CONGO	33	15	**CAMEROON**	7	16	**CAMEROON**	12	31	EQUATORIAL GUINEA	11	10
CAMEROON	13	21	CENTRAL AFRICAN REPUBLIC	..	18	CHINA	35	32	**CAMEROON**	4	13
CENTRAL AFRICAN REPUBLIC	33	22	**GABON**	4	21	**EQUATORIAL GUINEA**	32	38	**GABON**	19	33
GABON	37	25	CHINA	52	31	SPAIN	55	45	MAURITANIA	22	33
MAURITANIA	21	26	MAURITANIA	..	38	BURKINA FASO	45	46	CHINA	47	42
INDIA	52	59	INDIA	39	47	**GABON**	33	52	INDIA	62	56
SOUTH AFRICA	71	69	GREECE	69	66	UNITED STATES	78	56	SOUTH AFRICA	61	57
JAPAN	74	75	SOUTH AFRICA	76	67	ITALY	61	62	ITALY	82	61
GREECE	68	76	ITALY	73	71	GREECE	56	63	GREECE	82	69
SPAIN	85	83	PORTUGAL	91	84	FRANCE	76	65	PORTUGAL	85	82
UNITED STATES	91	85	SPAIN	84	84	UNITED KINGDOM	77	66	SPAIN	89	85
ITALY	75	87	JAPAN	85	85	BELGIUM	78	71	FRANCE	89	90
PORTUGAL	90	90	FRANCE	90	89	PORTUGAL	88	73	JAPAN	91	90
FRANCE	79	91	UNITED STATES	92	91	NETHERLANDS	95	76	BELGIUM	91	91
AUSTRALIA	93	93	BELGIUM	87	92	AUSTRALIA	91	79	UNITED STATES	94	92
UNITED KINGDOM	79	94	IRELAND	93	93	GERMANY	93	81	UNITED KINGDOM	97	93
AUSTRIA	92	94	GERMANY	95	93	JAPAN	76	85	NETHERLANDS	96	93
GERMANY	91	95	UNITED KINGDOM	96	94	CANADA	77	85	IRELAND	93	94
IRELAND	88	95	AUSTRIA	95	94	IRELAND	79	89	GERMANY	95	94
BELGIUM	90	96	AUSTRALIA	94	95	AUSTRIA	95	94	AUSTRALIA	96	95
FINLAND	95	98	NETHERLANDS	97	97	NEW ZEALAND	90	94	LUXEMBOURG	92	96
LUXEMBOURG	94	98	LUXEMBOURG	94	97	FINLAND	94	99	FINLAND	98	97
NETHERLANDS	96	99	FINLAND	100	100	LUXEMBOURG	90	100	AUSTRIA	99	97

Note: the table reports the percentage ranking in 1996 and 2007 of four governance indicators in CEMAC, EMU and a number of other selected countries. The meaning of the indicators is explained in the text and in Kaufmann *et al.* (2008). A lower rank indicates a worse performance. The CEMAC countries highlighted have worsened their position, those reported in bold have improved their position. Source: http://info.worldbank.org/governance/wgi/index.asp.

Table 8 – Real wages and real growth in Italy and the US

	Italy		USA	
	real wages growth	real GDP growth	real wages growth	real GDP growth
1971	6.20	1.82	1.65	3.46
1972	3.36	3.69	3.10	5.59
1973	6.07	7.13	2.23	5.88
1974	2.00	5.50	-2.05	-0.47
1975	6.53	-2.09	0.13	-0.18
1976	2.94	7.13	2.61	5.38
1977	4.40	2.56	0.89	4.66
1978	3.53	3.24	1.13	5.62
1979	1.65	5.96	0.12	3.18
1980	0.65	3.43	-1.12	-0.24
1981	2.15	0.84	0.25	2.52
1982	-0.32	0.41	1.13	-1.97
1983	0.42	1.17	0.87	4.52
1984	0.42	3.23	1.11	7.20
1985	1.15	2.80	0.73	4.10
1986	0.83	2.86	1.33	3.43
1987	2.16	3.19	0.84	3.34
1988	1.41	4.19	0.71	4.12
1989	2.08	3.39	-1.18	3.53
1990	1.26	2.05	0.12	1.86
1991	0.38	1.53	0.36	-0.19
1992	0.57	0.77	3.20	3.34
1993	-1.05	-0.89	-0.34	2.69
1994	-0.67	2.15	-0.35	4.06
1995	-0.87	2.83	0.12	2.54
1996	0.39	0.72	0.92	3.75
1997	1.36	1.89	2.17	4.55
1998	-2.88	1.44	4.47	4.22
1999	0.10	1.93	2.78	4.49
2000	-1.38	3.69	4.17	4.14
2001	-0.20	1.82	0.50	1.08
2002	-1.00	0.45	1.89	1.81
2003	-1.01	-0.02	1.27	2.49
2004	0.61	1.53	1.83	3.57
2005	0.20	0.66	0.38	3.05
2006	-0.51	2.04	1.23	2.67
2007	0.00	1.48	1.86	2.14
2008	0.20	-1.32	0.37	0.44
2009	0.61	-5.04	1.28	-2.44
71-79	4.08	3.88	1.09	3.68
80-09	0.24	1.51	1.10	2.69
99-09	-0.22	0.66	1.60	2.13

Note: the real wage series come from the OECD Economic Outlook database, variable WSRE (OECD, 2008); the real growth series come from World Bank (2008). The last three rows report averages over the pre-EMS, post-EMS and EMU subsample, respectively.

Table 9 – The basic fiscal balance-to-GDP ratio in CEMAC countries

	CMR	CAF	TCD	COG	GAB	GNQ
1994	-2.6	-5.7	-5.4	-12.5	-0.3	-10.3
1995	-1.5	-2.4	-2.8	-8.4	**5.0**	-24.9
1996	-0.6	-3.2	-2.2	-4.5	**5.9**	-6.7
1997	**0.0**	-1.9	-1.0	-6.7	**3.3**	-1.1
1998	-1.3	-0.8	**0.3**	-12.9	-12.9	-2.1
1999	**4.0**	-1.9	-1.7	-2.9	**0.9**	**2.0**
2000	**4.2**	-0.8	-2.9	**1.5**	**12.3**	**8.3**
2001	**2.4**	-1.0	-2.2	-0.7	**4.2**	**15.5**
2002	**3.7**	-0.5	-3.2	-7.2	**2.6**	**12.9**
2003	**3.9**	-3.4	-1.7	**1.0**	**7.4**	**13.4**
2004	**2.8**	-4.0	**2.1**	**5.0**	**7.9**	**11.4**
2005	**4.9**	-4.6	**1.1**	**17.4**	**9.6**	**20.9**
2006	**5.7**	-1.1	**3.8**	**17.8**	**10.2**	**25.7**
2007	**5.3**	-0.7	**3.8**	**10.1**	**9.5**	**21.2**
2008	**2.3**	-1.8	**5.0**	**27.7**	**13.0**	**21.5**
2009	**0.7**	-2.0	-6.0	**8.7**	**1.4**	-11.1
2010	***1.0***	*-0.8*	***1.5***	***26.6***	***3.0***	*-9.1*
average 1999-2009	**3.6**	-2.0	-0.2	**7.1**	**7.2**	**12.9**

Note: we put in bold the values compliant with the surveillance reference values. Source: data over 1994-2004 come from BEAC (2010), data over 2005-2010 from CEMAC (2009). The figures for 2010 are BEAC forecast.

Table 10 – The public debt-to-GDP ratio in CEMAC countries

	CMR	CAF	TCD	COG	GAB	GNQ
2001	80.0	78.4	**46.1**	225.4	**59.6**	**17.8**
2002	76.9	99.7	**47.1**	227.1	**67.8**	**14.9**
2003	71.7	107.0	**45.7**	234.4	**61.4**	**11.3**
2004	**56.8**	106.6	**34.8**	161.3	**51.2**	**6.9**
2005	**49.1**	113.1	**29.1**	118.2	**39.5**	**2.7**
2006	**32.4**	90.9	**27.1**	89.3	**31.9**	**1.9**
2007	**27.8**	85.6	**27.7**	73.0	**32.8**	**1.5**
2008	**20.6**	**69.2**	**24.1**	**65.4**	**12.0**	**1.1**
2009	**22.5**	**35.6**	**27.6**	73.3	**14.0**	**1.4**
2010	***19.8***	***33.4***	***24.0***	***52.6***	***10.9***	***1.2***
average 1999-2009	**48.6**	**87.3**	**34.4**	**140.8**	**41.1**	**6.6**

Note: we put in bold the values compliant with the surveillance reference values. Source: data over 2001-2004 come from UNECA (2007), data over 2005-2010 from CEMAC (2009). The figures for 2010 are BEAC forecast.

Table 11 – Inflation in CEMAC countries

	CMR	CAF	TCD	COG	GAB	GNQ	CEMAC	EMU
1994	12.7	24.5	41.3	42.4	36.1	38.8	34.9	2.7
1995	25.8	19.2	5.4	9.4	9.6	11.7	9.9	2.4
1996	3.6	3.7	11.3	7.5	**1.8**	6.7	4.4	2.2
1997	4.1	**1.6**	5.6	16.6	4.1	3.1	5.9	1.6
1998	3.9	**-1.9**	4.3	**-1.6**	**2.3**	7.8	**2.4**	1.1
1999	3.1	**-1.5**	**-8.0**	3.6	**-0.7**	**0.6**	**0.5**	1.1
2000	**0.8**	3.1	3.8	**0.5**	**0.5**	4.6	**1.4**	2.2
2001	4.5	3.8	12.4	**0.8**	**2.1**	8.8	4.4	2.4
2002	**2.8**	**2.3**	5.2	3.1	**0.2**	7.6	**2.9**	2.3
2003	**0.6**	4.2	**-1.8**	**-1.3**	**2.3**	7.3	**1.6**	2.1
2004	**0.3**	**-2.1**	**-5.3**	3.6	**0.4**	4.2	**0.6**	2.2
2005	**1.9**	**2.9**	7.9	**2.5**	**-0.2**	5.0	**2.9**	2.2
2006	5.1	6.6	8.1	4.7	4.0	5.0	5.2	2.2
2007	**1.1**	**1.0**	**-9.0**	**2.5**	4.8	5.5	**1.6**	2.1
2008	5.3	9.3	8.3	6.0	5.3	4.7	5.7	3.3
2009	**3.0**	4.7	8.4	4.0	**3.0**	5.5	4.2	0.3
2010	***2.5***	***3.0***	***3.0***	*3.5*	***3.0***	*3.5*	***3.0***	*1.1*
average 1999-2009	**2.6**	**3.1**	**2.7**	**2.7**	**2.0**	**5.3**	**2.8**	**2.0**

Note: we put in bold the values compliant with the surveillance reference values. Source: data over 1994-2004 come from BEAC (2010), data over 2005-2010 from CEMAC (2009). The figures for 2010 are BEAC forecast.

Table 12 – Basic balance and overall balance in CEMAC

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	average
S^B	-4.8	-1.1	0.2	-0.2	-4.7	0.4	5.3	2.9	2.1	4.4	4.9	9.2	1.5
S^G	-5.6	-2.1	-0.8	-1.3	-5.5	-0.3	4.6	2.4	1.6	4.0	4.1	8.7	0.8
G-I^F	-0.8	-1.0	-1.0	-1.1	-0.9	-0.8	-0.6	-0.6	-0.5	-0.3	-0.8	-0.3	-0.7
I^F	2.3	2.1	1.8	1.9	1.8	1.5	1.6	1.5	1.4	1.4	1.7	1.0	1.7
γ	29.9	11.7	13.6	9.2	-2.1	9.8	21.4	5.1	5.8	4.5	11.6	24.4	12.1

Note: S^B is the basic fiscal balance, S^G the overall fiscal balance, G the grants, I^F foreign financed capital expenditure and γ the nominal growth rate. Source: BEAC (2010).

Table 13 – Fiscal indicators in CEMAC

	basic balance	structural basic balance	non-oil basic balance
2005	9.2	2.7	-11.7
2006	11.1	1.8	-16.7
2007	9.2	3.1	-17.7
2008	11.9	2.8	-22.6
2009	-0.8	3.5	-22.4
2010	*4.1*	*5.2*	*-19.1*

Source: CEMAC (2009).

Table 14 – Selected CEMAC fiscal indicators

	Nominal growth rate	Nominal non-oil growth rate	Overall non-oil deficit over GDP	Overall non-oil deficit over non-oil GDP	Overall-basic balance spread
1995	11.7%	13.5%	10.8%	13.2%	2.1%
1996	13.6%	9.2%	9.6%	12.2%	1.8%
1997	9.2%	8.5%	12.4%	16.0%	1.9%
1998	-2.1%	7.5%	14.2%	16.7%	1.8%
1999	9.8%	1.4%	8.7%	11.0%	1.5%
2000	21.4%	7.2%	8.3%	11.9%	1.6%
2001	5.1%	10.2%	10.2%	13.9%	1.5%
2002	5.8%	6.4%	9.7%	13.2%	1.4%
2003	4.5%	3.9%	7.1%	9.7%	1.4%
2004	11.6%	4.8%	8.6%	12.4%	1.7%
2005	24.4%	6.1%	7.9%	13.5%	1.0%
2006	11.7%	8.1%	10.7%	18.8%	1.0%
average	**10.6%**	**7.2%**	**9.9%**	**13.5%**	**1.6%**

Source: BEAC (2010).

Table 15 - σ-convergence in the EMU

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	average
AUT	*0.5*	2.0	2.3	1.7	1.3	2.0	2.1	1.7	2.2	3.2	1.9
BEL	1.1	2.7	2.4	1.6	1.5	1.9	2.5	2.3	1.8	**4.5**	2.2
CYP	1.1	4.9	2.0	2.8	4.0	1.9	2.0	2.2	2.2	4.4	2.7
FIN	1.3	3.0	2.7	2.0	1.3	*0.1*	*0.8*	*1.3*	1.6	3.9	1.8
FRA	0.6	1.8	*1.8*	1.9	2.2	2.3	1.9	1.9	1.6	3.2	1.9
DEU	0.6	*1.4*	1.9	*1.4*	*1.0*	1.8	1.9	1.8	2.3	2.8	1.7
ITA	1.7	2.6	2.3	2.6	2.8	2.3	2.2	2.2	2.0	3.5	2.4
LUX	1.0	3.2	2.7	2.1	2.0	2.2	2.5	2.7	2.3	3.4	2.4
NLD	2.0	2.3	**5.1**	3.8	2.2	1.4	1.5	1.7	*1.6*	2.2	2.4
PRT	2.2	2.8	4.4	3.7	3.3	2.5	2.1	3.0	2.4	2.7	2.9
IRL	**2.5**	**5.3**	4.0	**4.7**	**4.0**	2.3	2.2	2.7	2.9	3.1	3.4
GRC	2.1	2.9	3.7	3.9	3.4	3.0	**3.5**	3.3	**3.0**	4.2	3.3
ESP	2.2	3.5	2.8	3.6	3.1	**3.1**	3.4	**3.6**	2.8	4.1	3.2
σ	0.7	1.1	1.0	1.1	1.0	0.7	0.7	0.7	0.5	0.7	0.8
spread	2.0	3.9	3.3	3.4	3.0	2.9	2.7	2.3	1.4	2.3	2.7

Note: in each year the largest inflation value is highlighted in **bold**, the smallest in *italic*. σ is the cross-country sample standard deviation, spread is the spread between the largest and the smallest inflation value in each year. Source: IMF (2010).

Table 16 - σ-convergence in the CEMAC

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	average
CMR	3.1	0.8	4.5	2.8	0.6	0.3	1.9	5.1	1.1	*5.3*	2.6
CAF	-1.5	3.1	3.8	2.3	4.2	-2.1	2.9	6.6	1.0	**9.3**	3.0
TCD	*-8.0*	3.8	**12.4**	5.2	*-1.8*	*-5.3*	**7.9**	**8.1**	*-7.4*	8.3	2.3
COG	**3.6**	*0.5*	*0.8*	3.1	-1.3	3.6	2.5	4.7	2.5	*5.3*	2.5
GBN	-0.7	*0.5*	2.1	*0.2*	2.3	0.4	*-0.2*	*4.0*	4.8	*5.3*	1.9
GNQ	0.6	**4.6**	8.8	**7.6**	**7.3**	**4.2**	5.0	5.0	**5.5**	6.0	5.5
σ	4.2	1.8	4.4	2.6	3.5	3.6	2.8	1.5	4.6	1.8	3.1
spread	11.6	4.1	11.6	7.4	9.1	9.5	8.1	4.1	12.9	4	8.2

Note: in each year the largest inflation value is highlighted in **bold**, the smallest in *italic*. σ is the cross-country sample standard deviation, spread is the spread between the largest and the smallest inflation value in each year. Source: BEAC (2010).

Table 17 – Tests of inflation convergence between CEMAC and EMU

Hypothesis	*statistics*	*result*
non convergence in inflation rates (τ_0)	-4.76	reject
non convergence in level (τ^*)	-1.49	accept
stability of inflation differentials (ξ_0)	0.04	accept

Source: author's calculations (see Sec. 4.3).

Table 18 – Summary results of the convergence tests on CEMAC region

	τ_0	τ^*	ξ_0	ξ_1	A	B	C	D	E
CMR_CAF	**-7.22**	-1.34	0.22					*	
CMR_TCD	-0.87								*
CMR_COG	**-3.30**	-1.47	0.12					*	
CMR_GBN	**-7.44**	-1.53	**0.48**				*		
CMR_GNQ	**-3.39**	**-3.37**		**0.56**	*				
CAF_TCD	-1.65								*
CAF_COG	**-3.54**	-2.42	0.09					*	
CAF_GBN	**-2.22**	-1.32	0.16					*	
CAF_GNQ	**-2.91**	**-3.12**		**0.59**	*				
TCD_COG	**-3.89**	-2.10	0.07					*	
TCD_GBN	-1.91								*
TCD_GNQ	**-2.34**	**-3.45**		**0.55**	*				
COG_GBN	**-3.38**	-1.68	0.12					*	
COG_GNQ	**-2.90**	**-3.35**		**0.51**	*				
GBN_GNQ	**-3.07**	**-3.55**		**0.58**	*				

Note: τ_0 is the DF statistics of the unit root test on inflation differentials (null hypothesis: no absolute inflation convergence); τ^* is the modified DF statistics of the unit root test on relative prices (null hypothesis: no relative price convergence); ξ_0 is the stationarity test on inflation differentials (null hypothesis: inflation rates have converged); ξ_1 is the stationarity test on demeaned price differentials (null hypothesis: relative prices have converged). Significant statistics are highlighted in bold. The last five columns indicate the outcome of the procedure: A means that convergence is level is under way, B that convergence in level has occurred, C that inflation rates are converging, D that inflation rates have converged, E that inflation rates are not converging.

Table 19 – Average real growth in core EMU countries in the last five decades

	Belgium	France	Germany	Italy	Luxembourg	Netherlands	Euro area	World	spread
60s	4.8	5.6	na	5.8	3.5	5.4	5.8	5.4	-0.3
70s	3.6	4.1	3.1	4.0	2.7	3.3	3.8	4.1	0.2
80s	2.2	2.3	2.0	2.6	4.6	2.0	2.3	3.0	0.7
90s	2.1	1.9	2.3	1.4	4.8	3.2	2.2	2.7	0.5
00s	1.5	2.1	0.8	0.5	3.4	1.6	1.4	3.6	2.2

Note: "spread" is the difference between world and euro area growth. Source: World Bank (2008) and IMF (2010).

Table 20 – Business climate indicators

	CHN	CMR	TCD	COG	GAB	KEN	TZA	ZAF	CEMAC	World
Value Lost Due to Power Outages (% of Sales)	1.3	4.9	3.3	16.4	1.7	6.4	9.6	1.6	6.6	4.9
Delay in Obtaining a Mainline Telephone Connection (days)	6.3	19.2	13.3	25.5	8.6	27.1	23.3	18.9	16.7	26.3
Days to Obtain Operating License	11.6	30.0	24.3	na	12.1	23.4	15.9	36.2	22.2	28.8
Average Time to Clear Imports from Customs (days)*	8.1	24.0	27.5	na	10.3	11.8	14.3	5.3	20.6	10.8
% of Firms Expected to Pay Informal Payment to Public Officials (to Get Things Done)	72.6	50.8	41.8	49.2	26.1	79.2	49.5	15.1	42.0	27.4

Source: https://www.enterprisesurveys.org/.

9. Figures

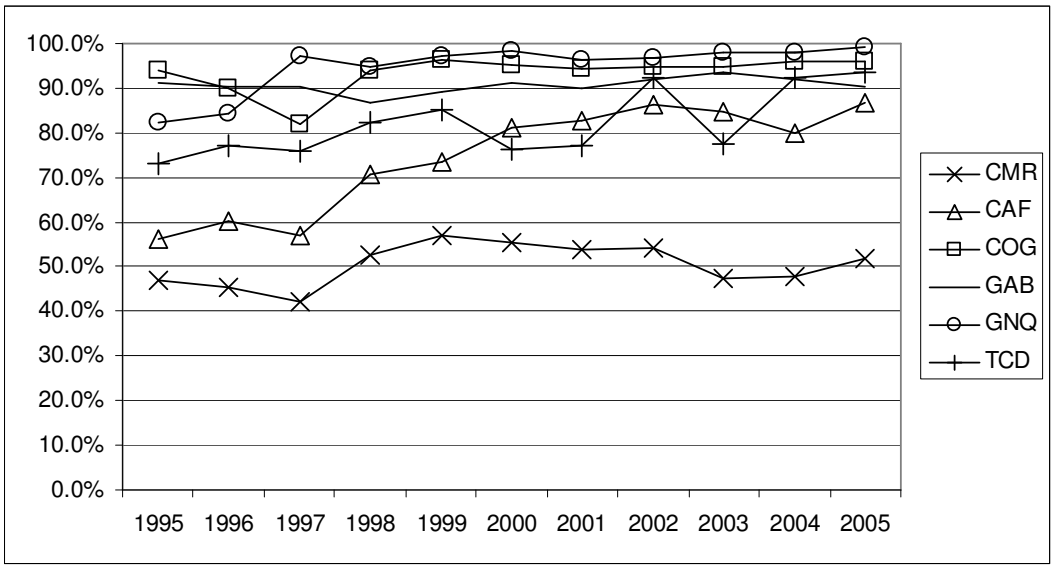

Fig. 1 – Product diversification: the share of the value of the first two largest product categories over total exports. The two largest categories are crude oil and cocoa for Cameroon, crude oil and timber for the Central African Republic, the Republic of Congo and Gabon, crude oil and natural gas for Equatorial Guinea, crude oil and cotton (before 2003, crude oil and livestock) for Chad. Source: BEAC.

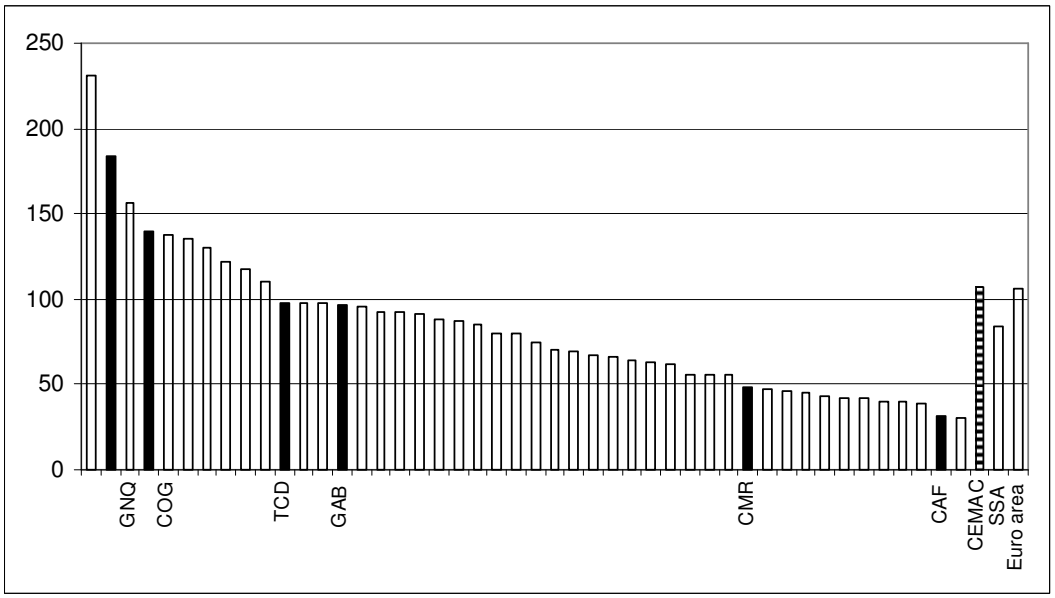

Fig. 2 – The degree of openness of CEMAC countries in comparison with other SSA countries. The figure reports total trade over GDP ratio in 2005 (source: World Bank, 2008). The data for Equatorial Guinea and the Central African Republic refer to 2004. CEMAC, SSA and Euro area data are simple averages of the countries belonging to each group (SSA includes CEMAC countries).

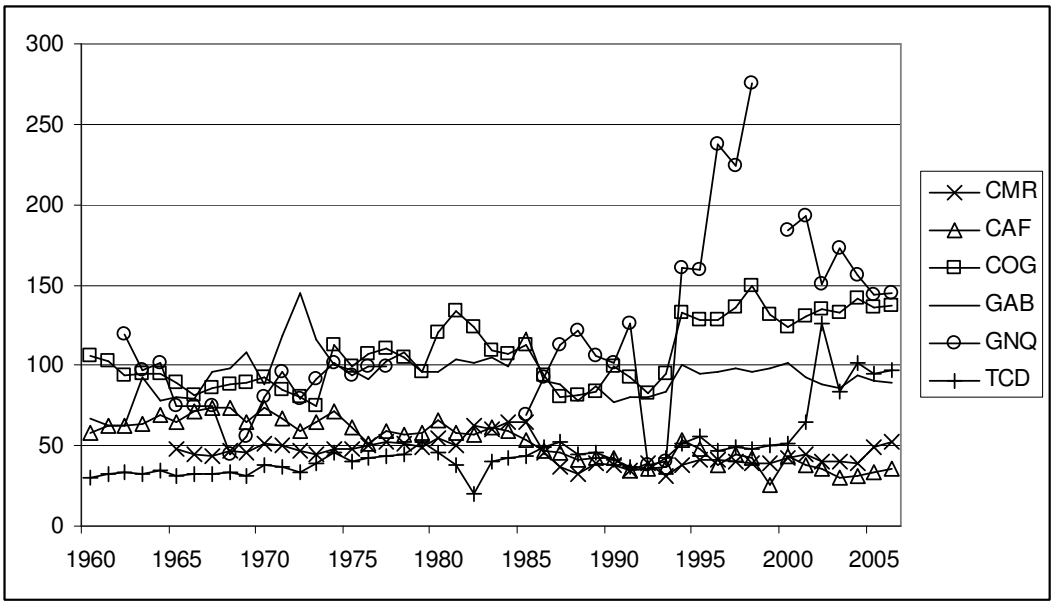

Fig. 3 – The evolution of the degree of openness in CEMAC countries. The figure reports the time series of total trade over GDP ratio in 2005 (source: World Bank, 2008).

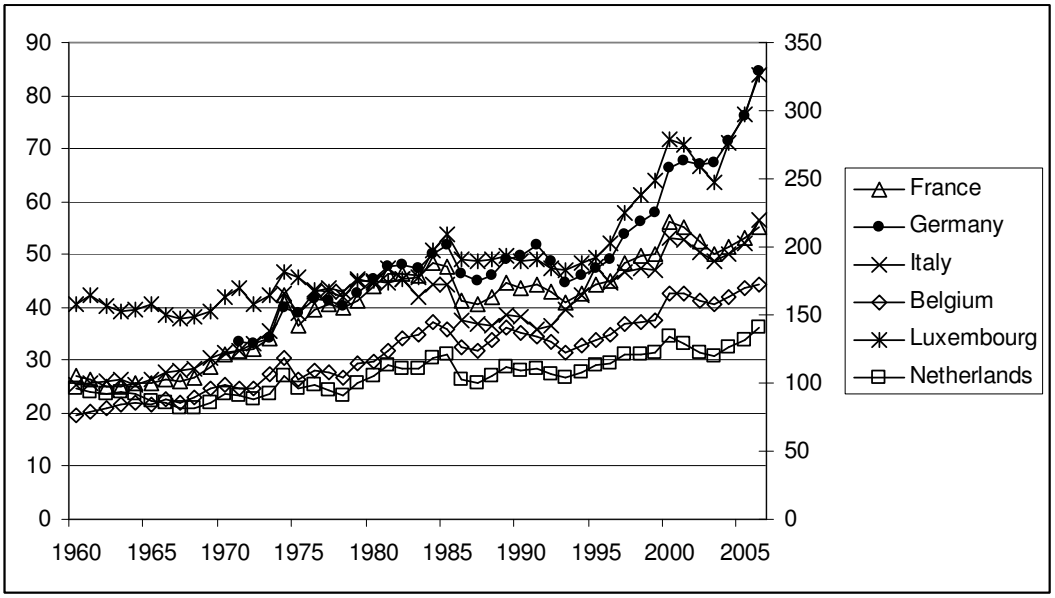

Fig. 4 – The evolution of the degree of openness in the "core" EU countries: France, Germany, Italy (left-hand scale), Belgium, Luxembourg and the Netherlands (right-hand scale). Source: World Bank (2008).

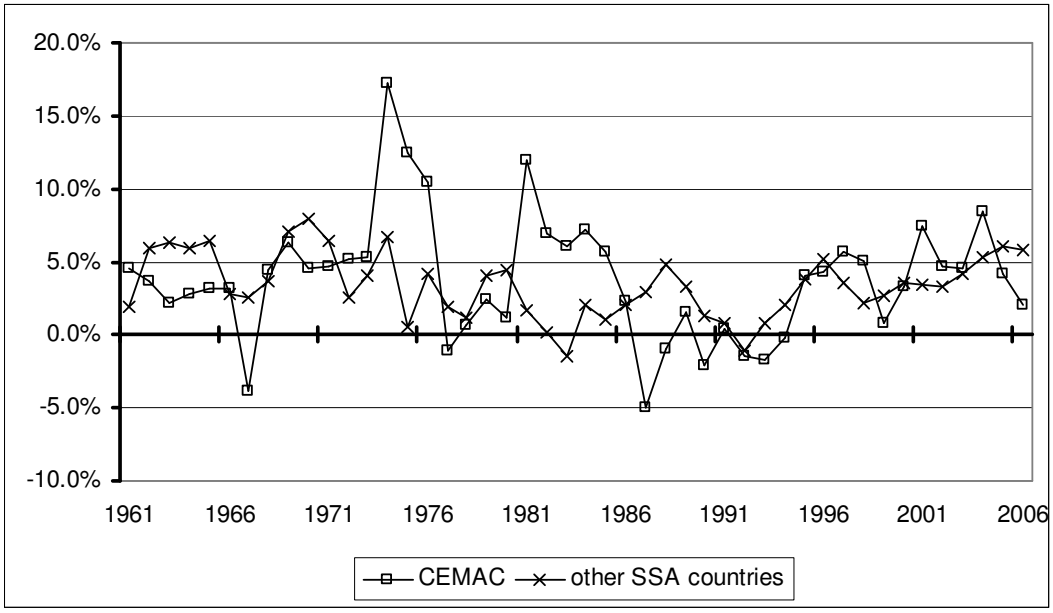

Fig. 5 – Real growth in CEMAC and in the other SSA countries (source: WDI, 2008).

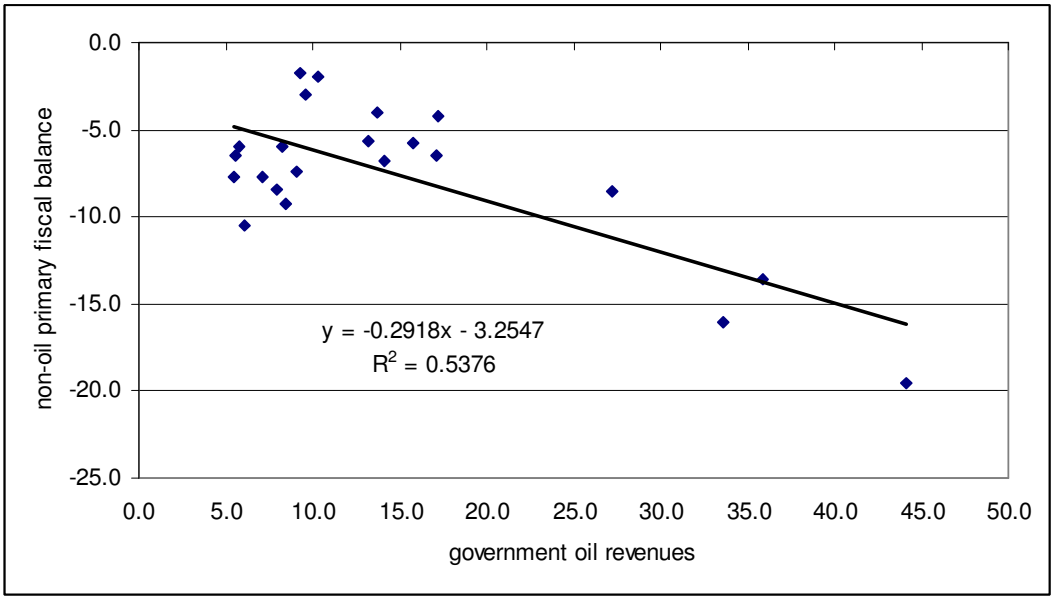

Fig. 6 – The relation between non-oil primary fiscal balance and government oil revenues (both expressed as a share of non-oil GDP) in the CEMAC, 1986-2008 (source: BEAC).

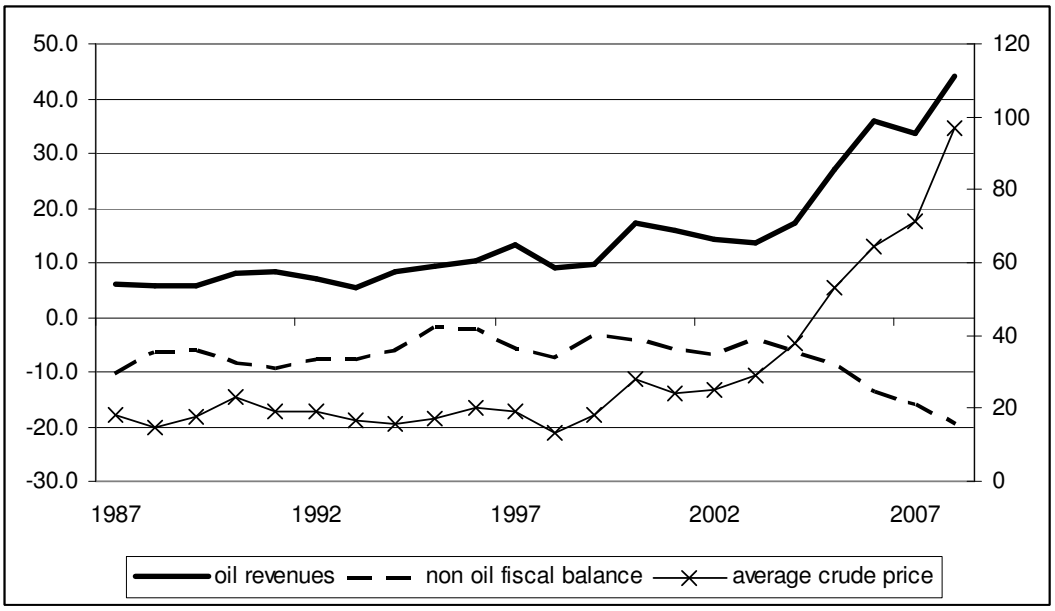

Fig. 7 – CEMAC non-oil primary fiscal balance and government oil revenues (left-hand scale, non-oil GDP points) and world average crude price (right-hand scale, USD). Sources: BEAC and IMF (2009).

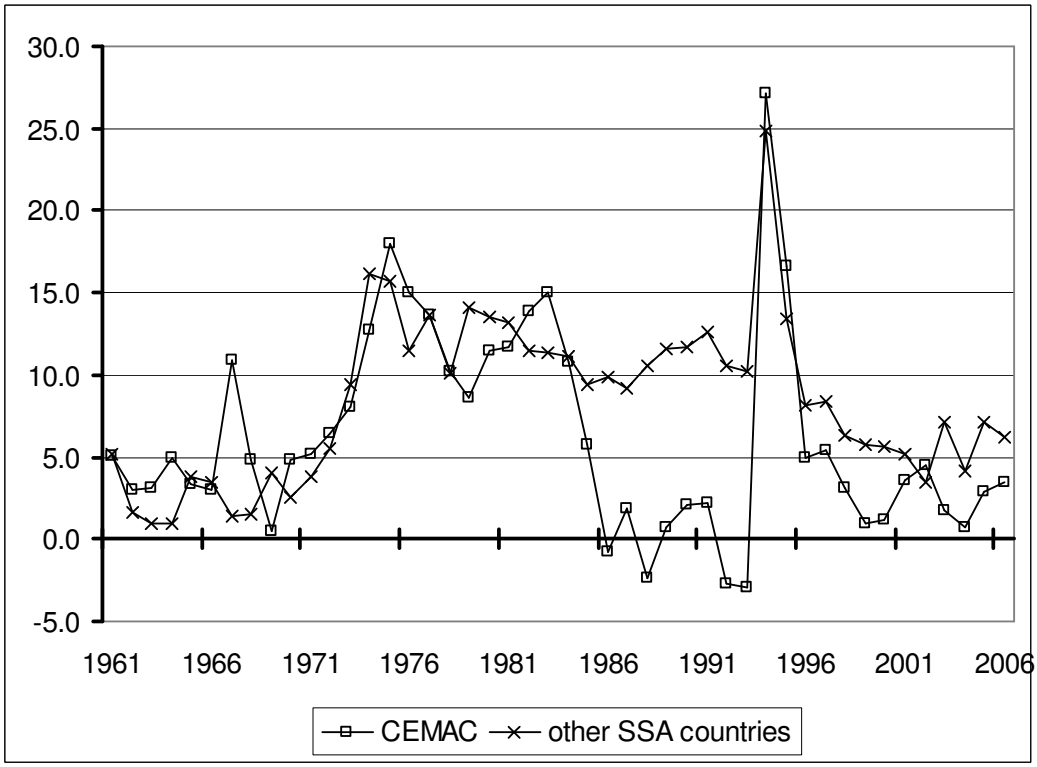

Fig. 8 – CPI inflation in CEMAC and in the other SSA countries (source: WDI, 2008).

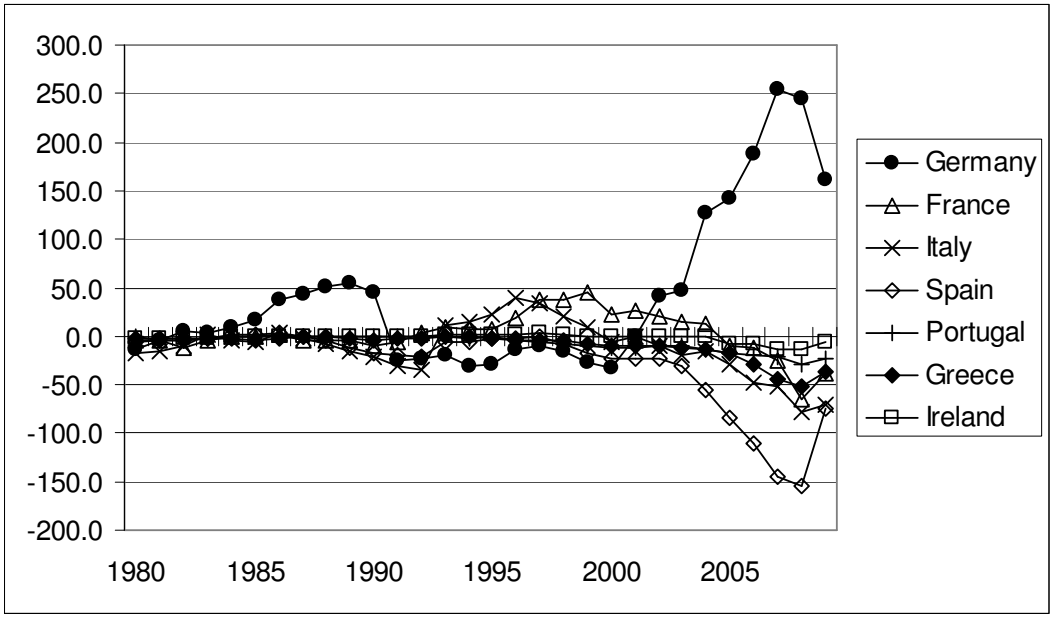

Fig. 9 – The current account balance in selected EMU countries (USD billions). Source: IMF (2010).

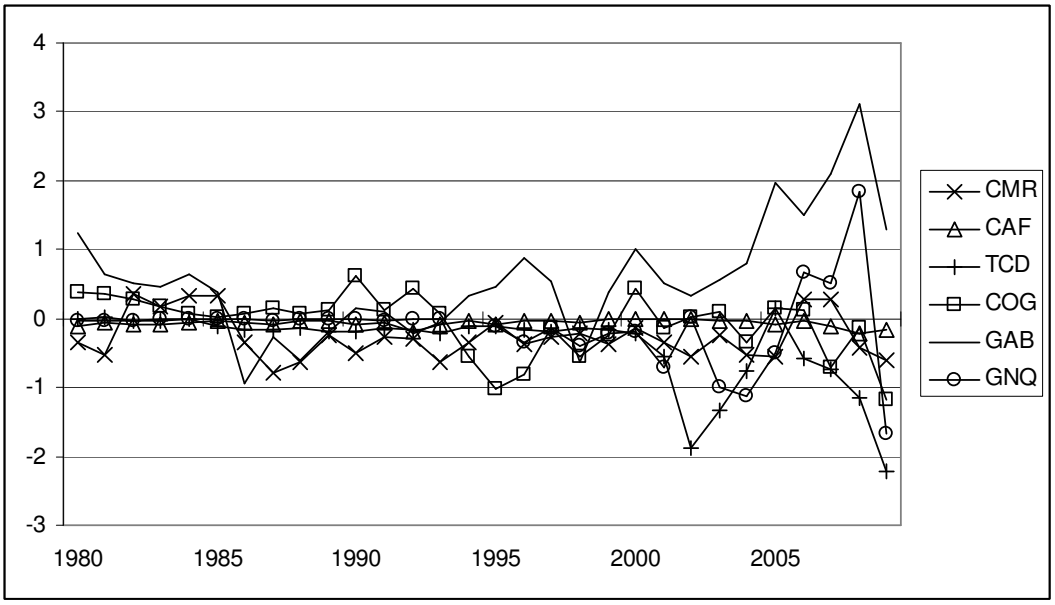

Fig. 10 – The current account balance in CEMAC countries (USD billions). Source: IMF (2010).

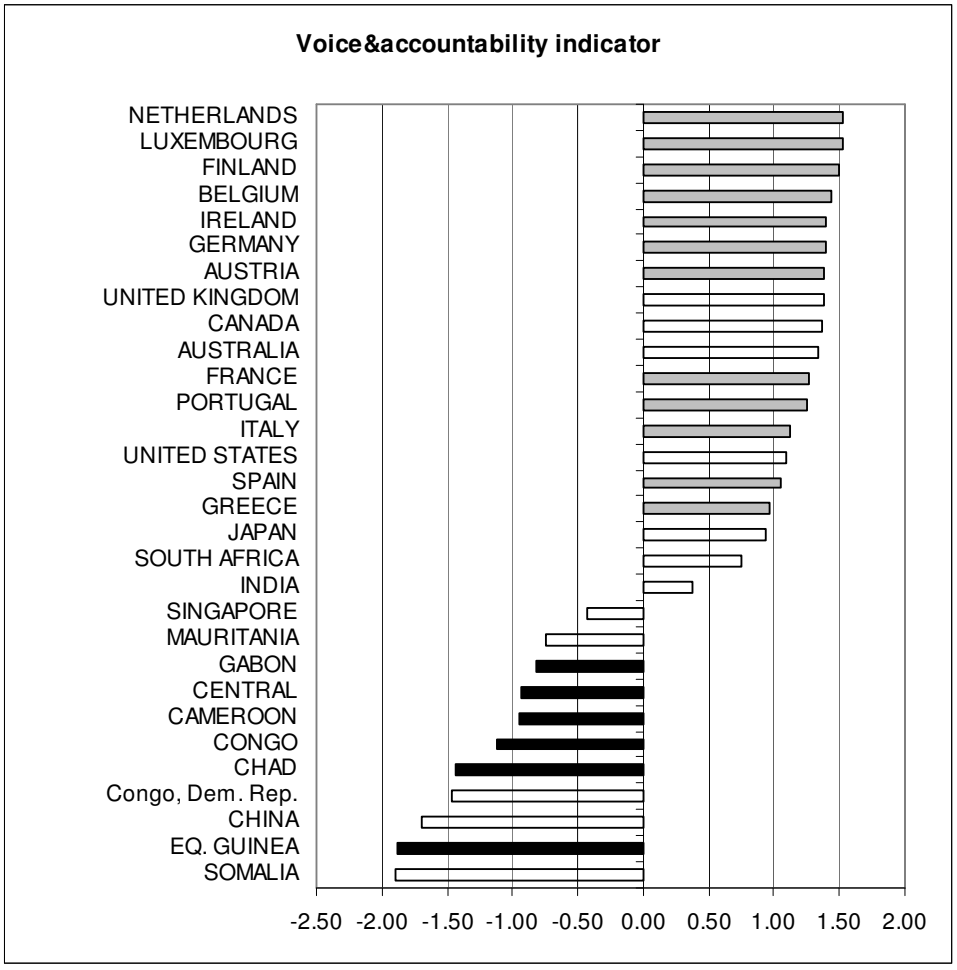

Fig. 11 – The "voice& accountability" governance indicator in CEMAC, EMU, and other selected countries. CEMAC countries are highlighted in black, EMU countries in grey. Data refer to 2007. Source: http://info.worldbank.org/governance/wgi/index.asp.

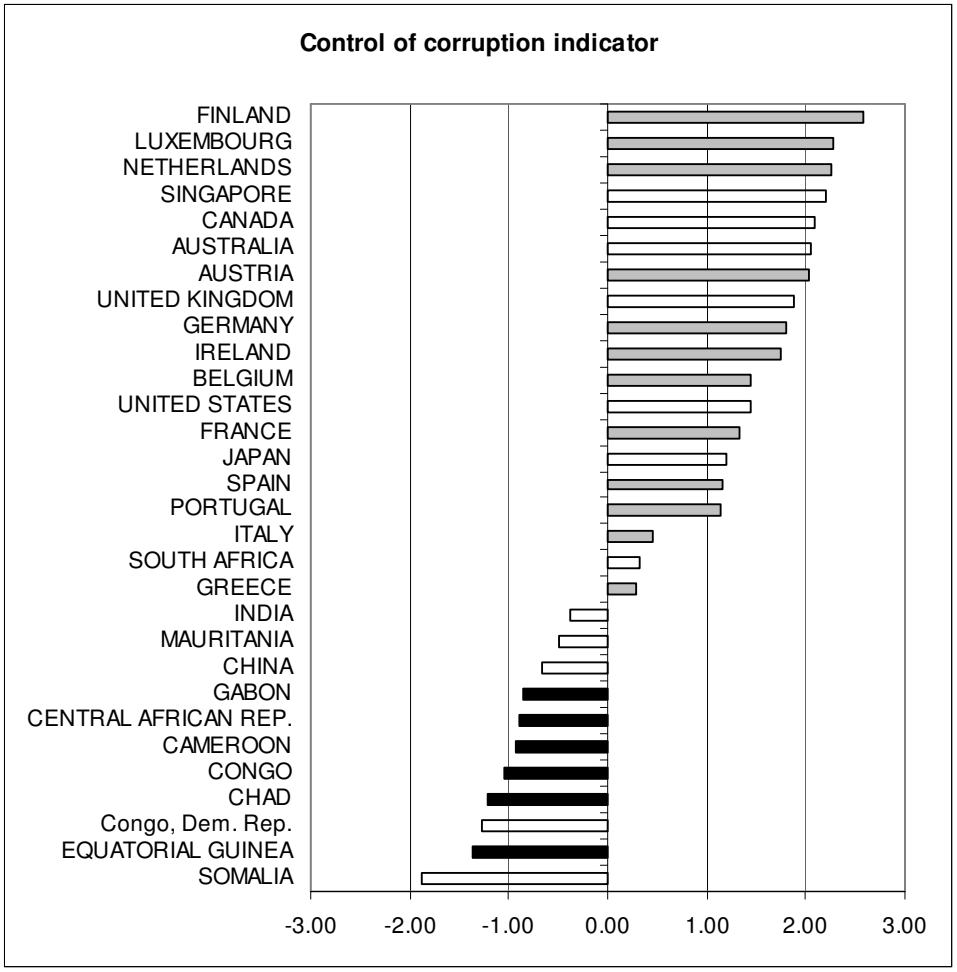

Fig. 12 – The "control of corruption" governance indicator in CEMAC, EMU, and other selected countries. CEMAC countries are highlighted in black, EMU countries in grey. Data refer to 2007. Source: http://info.worldbank.org/governance/wgi/index.asp.

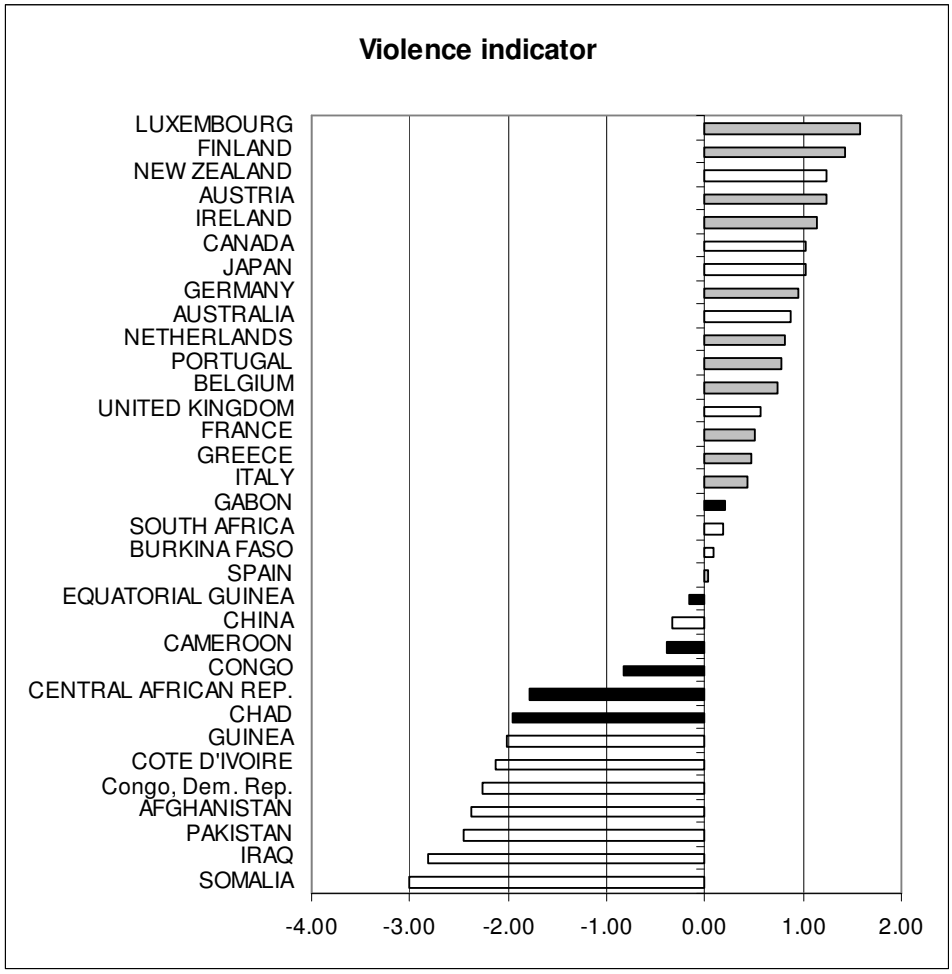

Fig. 13 – The "violence and political stability" governance indicator in CEMAC, EMU, and other selected countries. CEMAC countries are highlighted in black, EMU countries in grey. Data refer to 2007. Source: http://info.worldbank.org/governance/wgi/index.asp.

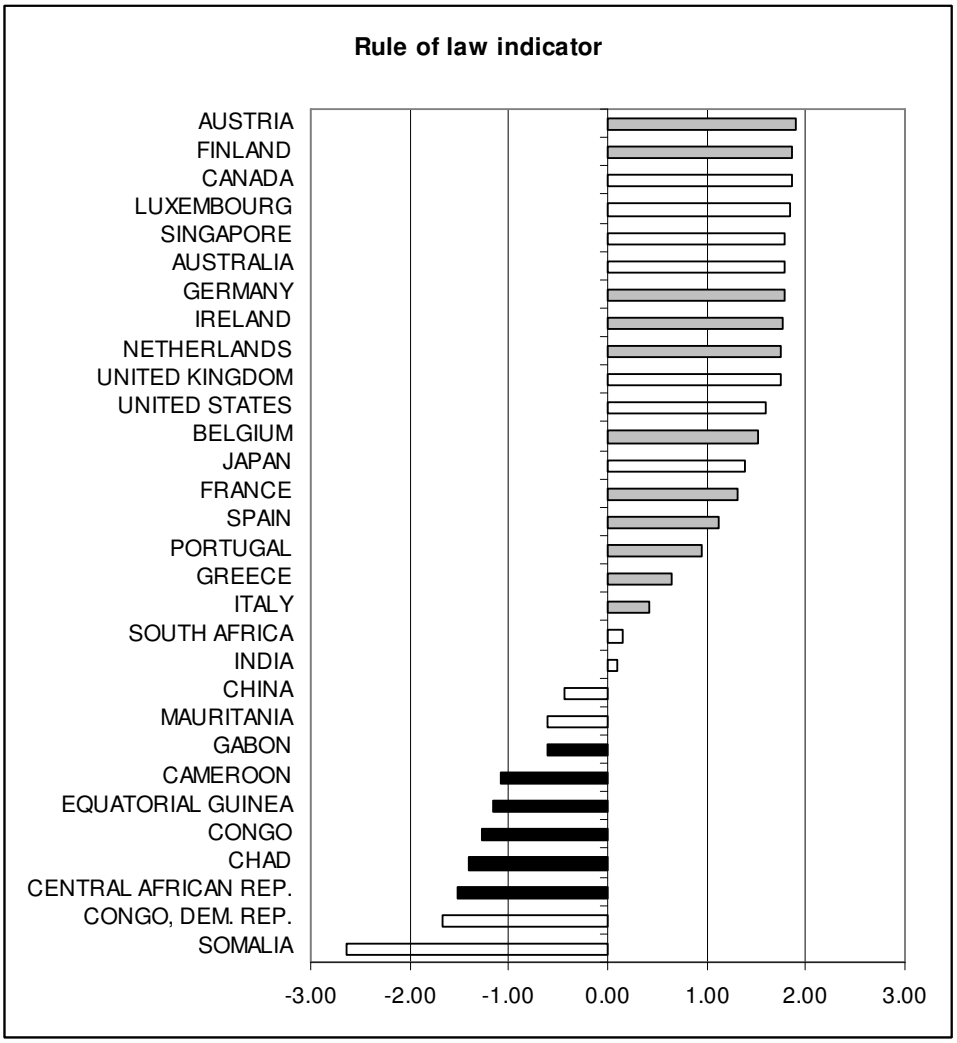

Fig. 14 – The "rule of law" governance indicator in CEMAC, EMU, and other selected countries. CEMAC countries are highlighted in black, EMU countries in grey. Data refer to 2007. Source: http://info.worldbank.org/governance/wgi/index.asp.

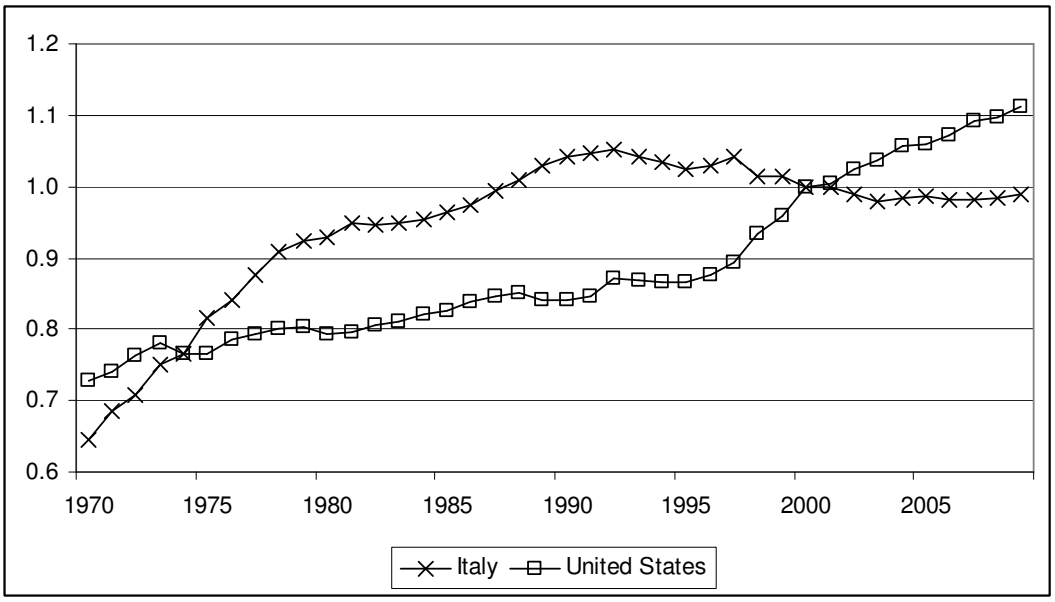

Fig. 15 – Real compensation rate of the private sector (deflated by the deflator of private consumption expenditure). Source: OECD (2008).

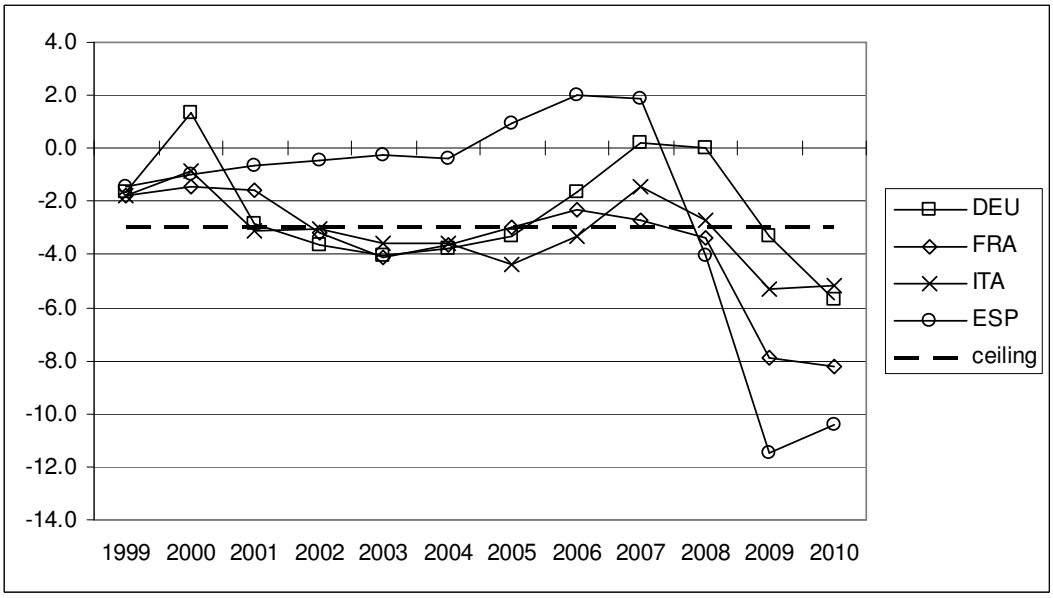

Fig. 16 – The government balance-to-GDP ratio in selected euro area countries. Source: IMF (2010).

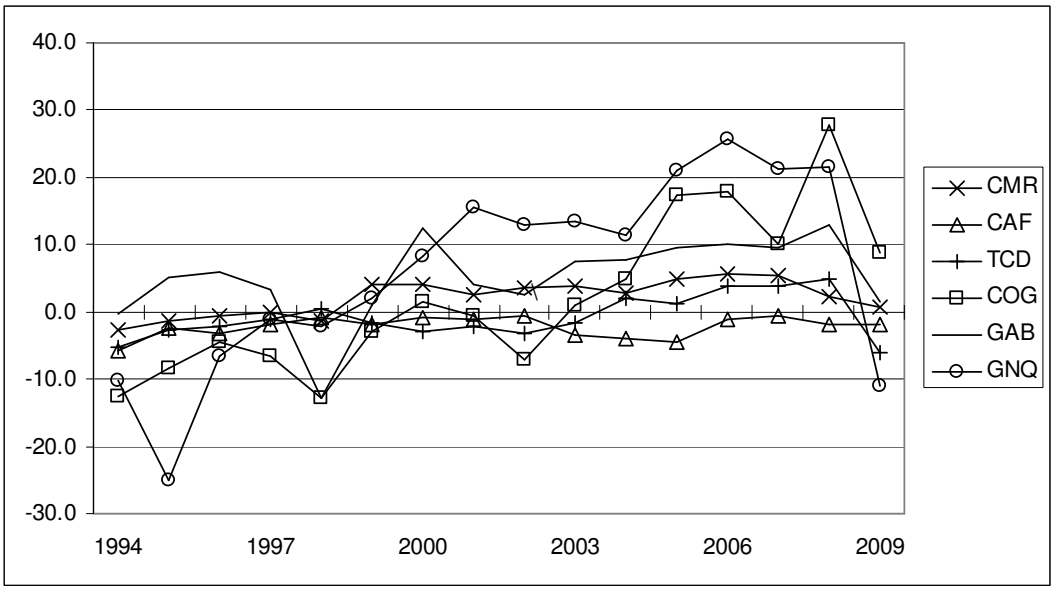

Fig. 17 – The basic fiscal balance-to-GDP ratio in CEMAC countries. Source: data over 1994-2004 come from BEAC (2010), data over 2005-2010 from CEMAC (2009).

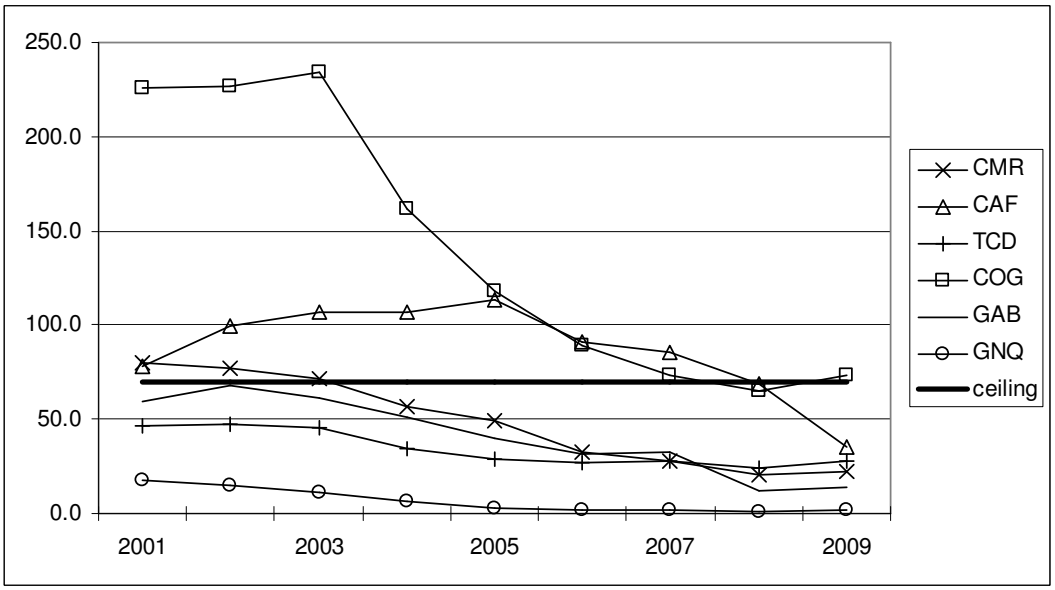

Fig. 18 – The public debt-to-GDP ratio in CEMAC countries. Source: data over 2001-2004 come from UNECA (2007), data over 2005-2010 from CEMAC (2009).

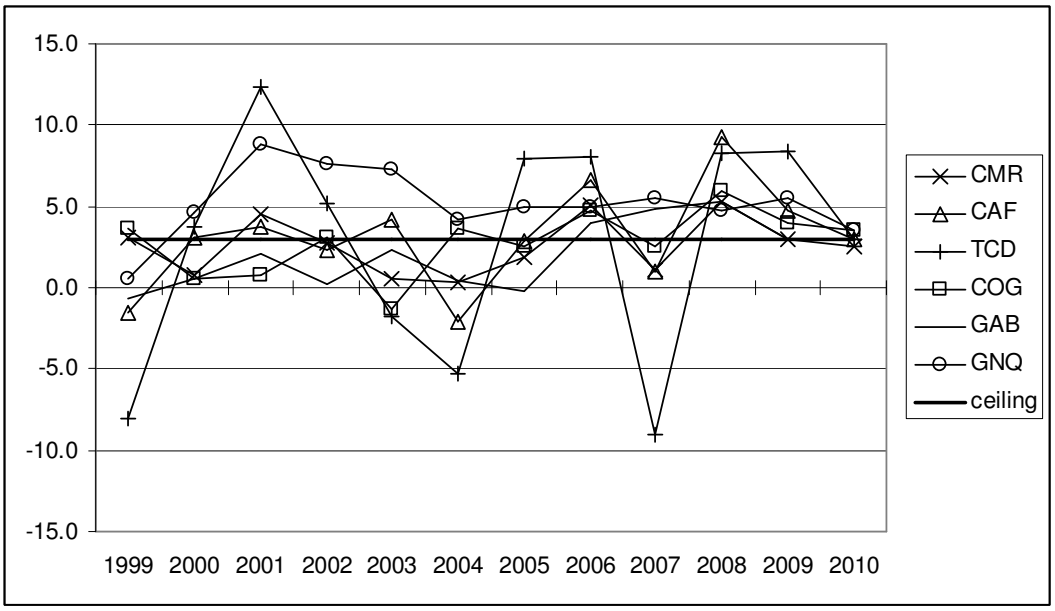

Fig. 19 – The inflation rate in CEMAC countries. Source: data over 1999-2004 come from BEAC (2010), data over 2005-2010 from CEMAC (2009).

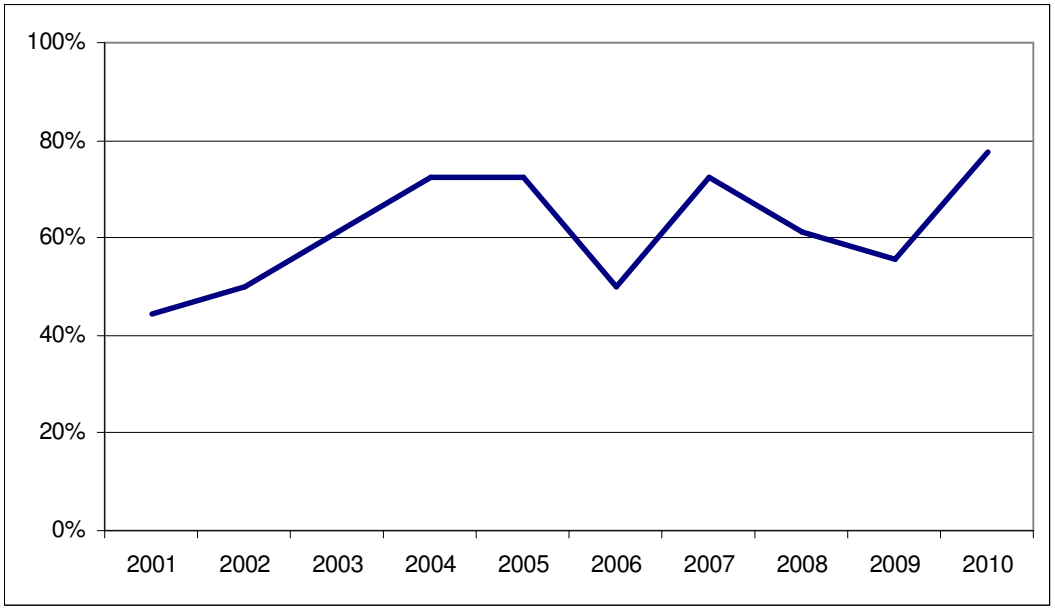

Fig. 20 – Compliance with the first three surveillance criteria (basic balance, debt, and inflation). The figure reports the percentage of criteria being satisfied among the six CEMAC countries.

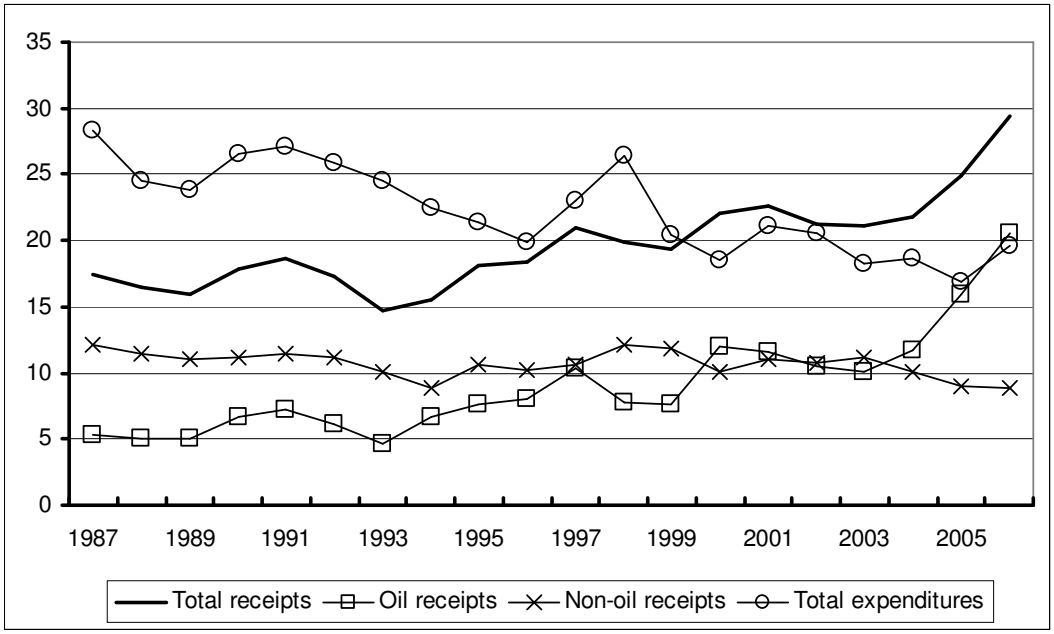

Fig. 21 – Government total receipts, oil receipts, non oil receipts and total expenditures in CEMAC as a share of GDP. Source: BEAC (2010).

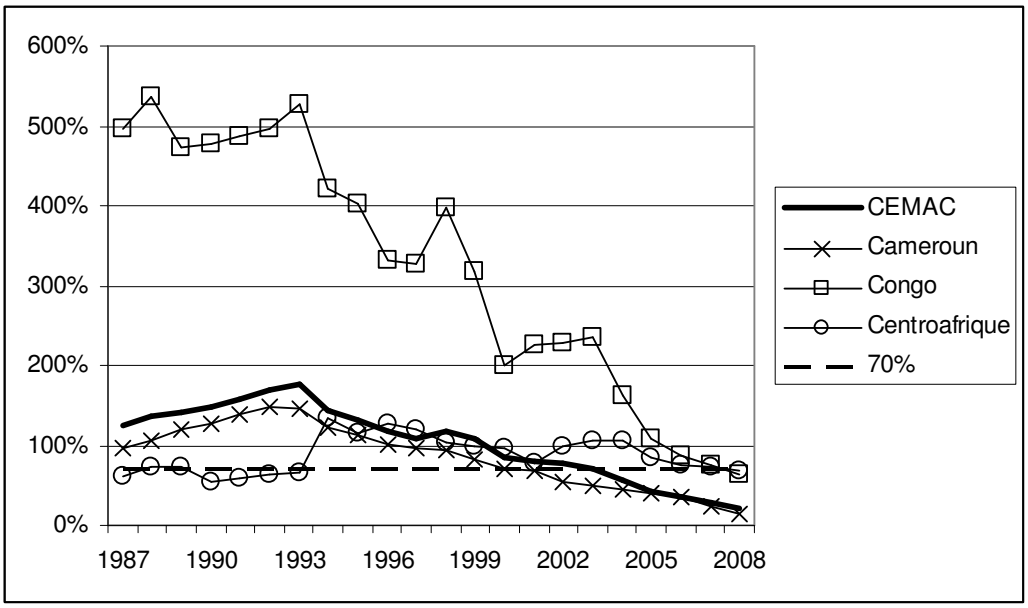

Fig. 22 – Public debt-to-GDP ratio in selected CEMAC countries. The data for 2001-2006 come from UNECA (2007), the data for 2008 come from UNECA (2009), the data from 1987 to 2000 have been retropolated using the debt accumulation equation, which implies that $d_{t-1} = (1+\gamma_t)(d_t - f_t)$. f_t is the overall budget balance and γ_t the nominal growth rate (source: BEAC, 2010).

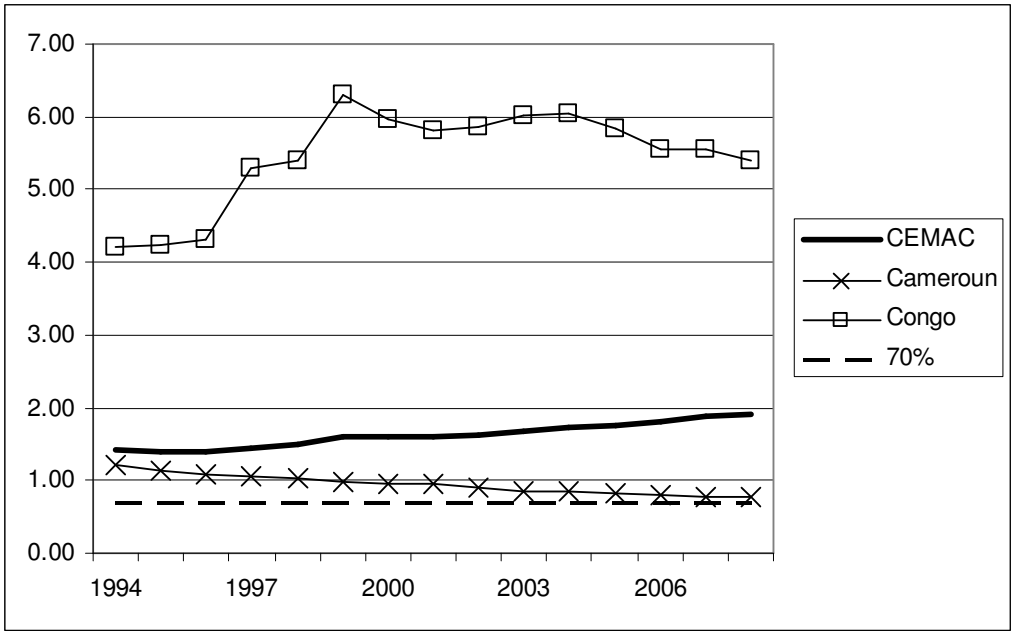

Fig. 23 – The path of overall (domestic and external) public debt over GDP in selected CEMAC countries in the absence of oil revenues (source: author calculations).

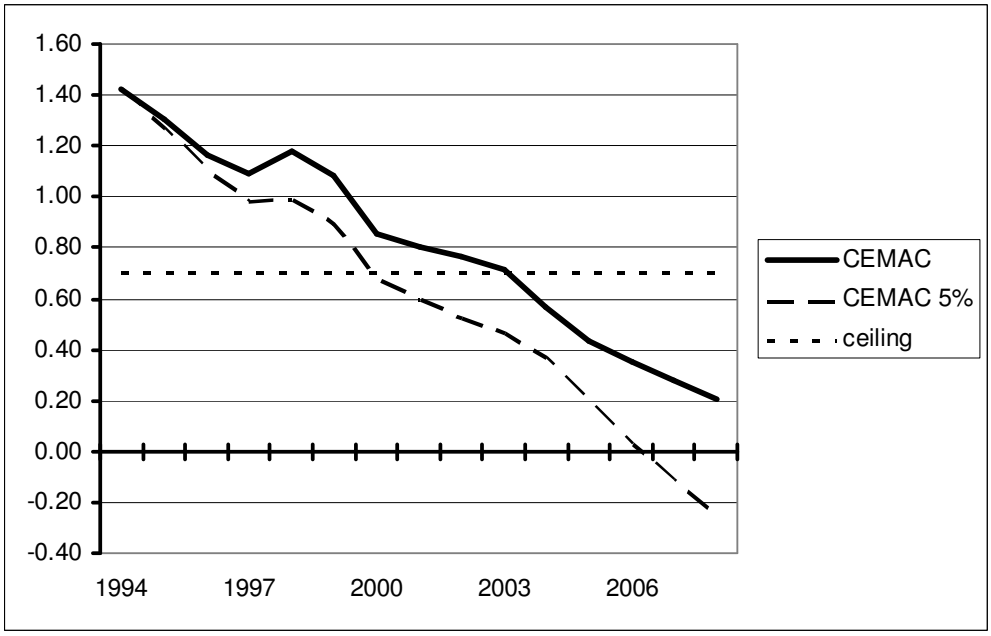

Fig. 24 – The path of the public debt-to-GDP at the CEMAC level: actual values, and simulation of a 5% basic non-oil deficit rule starting from the initial conditions in 1994, under the same real growth rate.

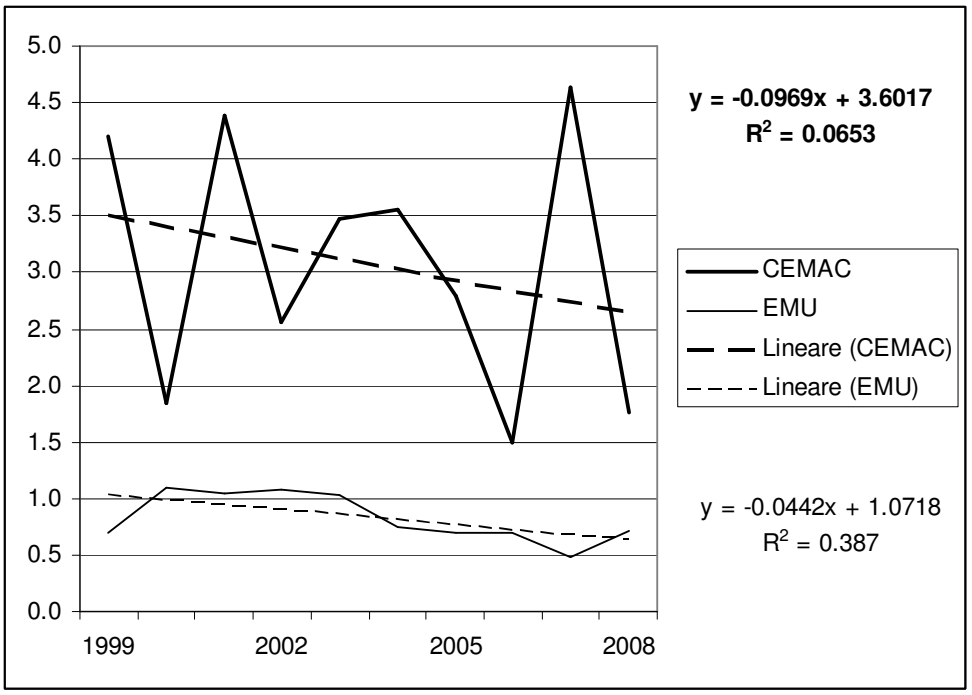

Fig. 25 – σ-convergence in CEMAC and in the EMU. The graph represents the patterns of the cross-country standard deviation of inflation in CEMAC (bold line) and in the EMU. The EMU standard deviations show a significant downward trend (the linear trend explains about 39% of their variance). On the contrary, the interpolation of the linear trend to the CEMAC standard deviations results in an insignificant regression, with an R^2 of only 0.06.

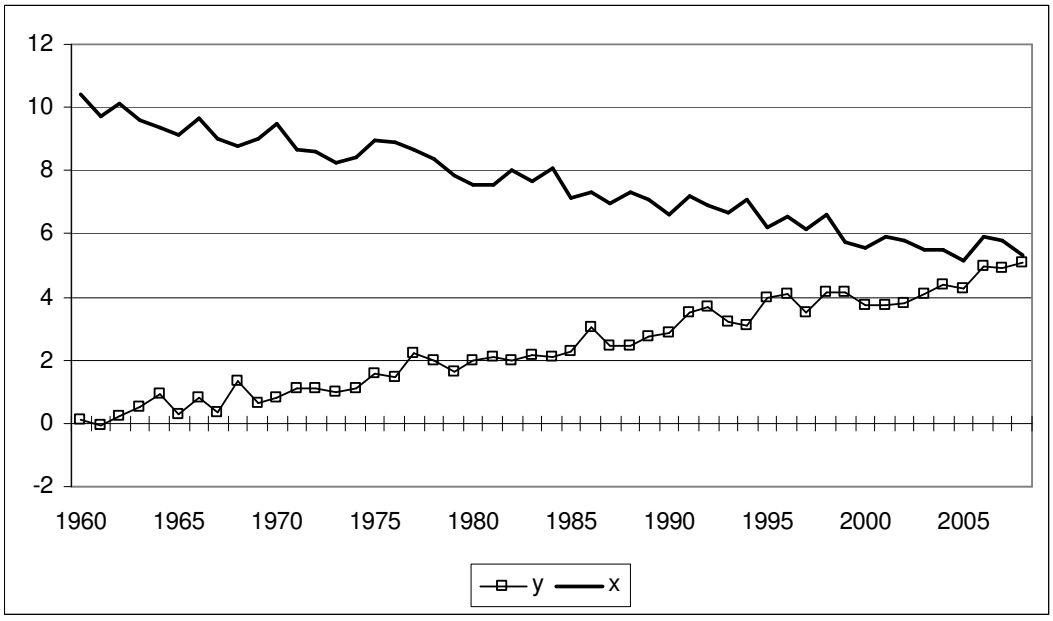

Fig. 26 – The realization of two trend stationary processes.

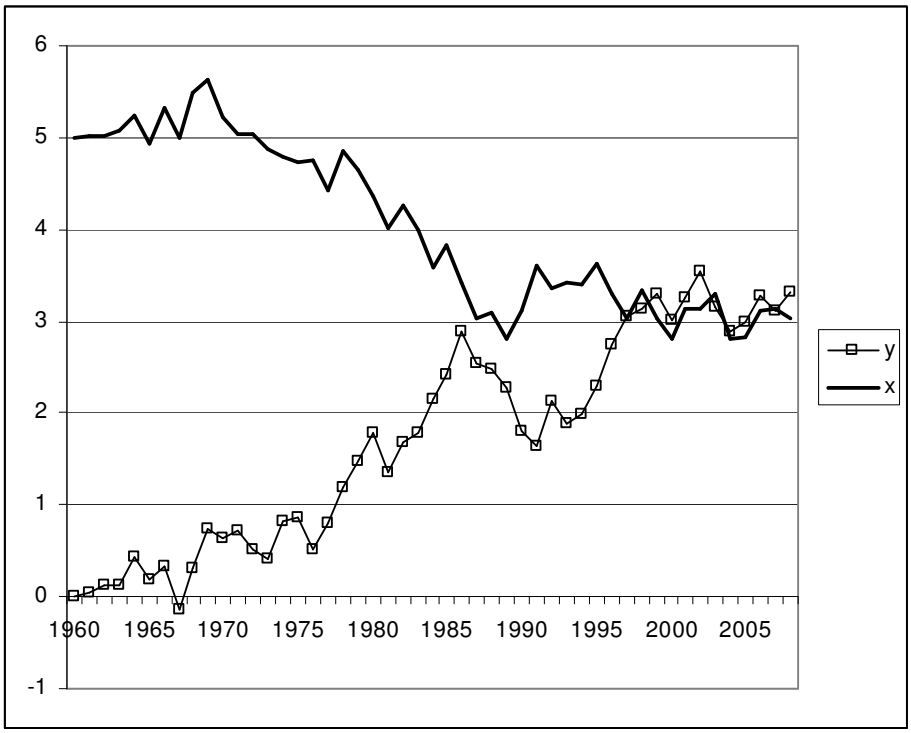

Fig. 27 – The realization of two independent random walks.

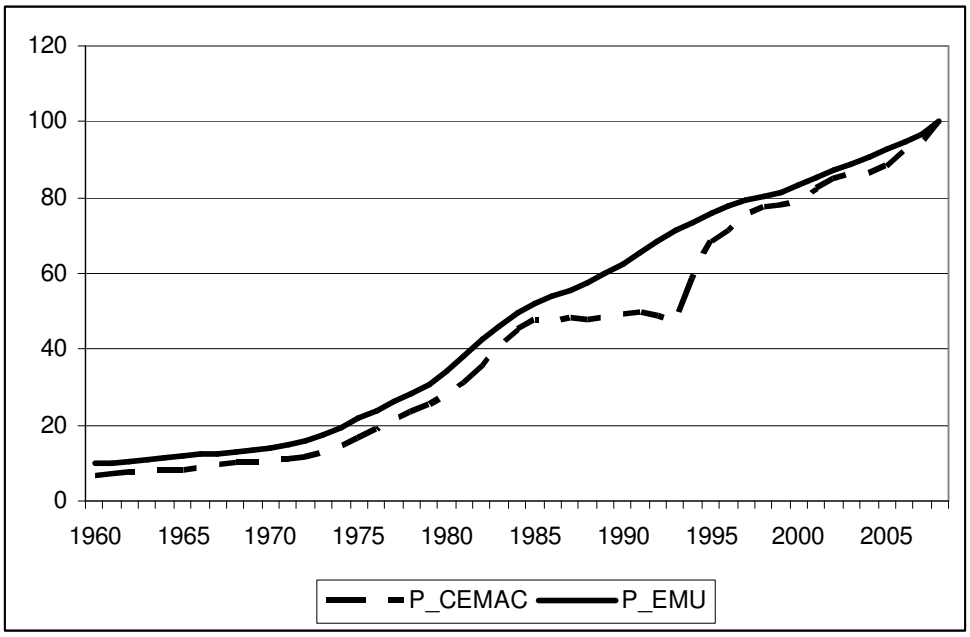

Fig. 28 – Consumption price indices in CEMAC and in the EMU. Sources: BEAC (2010) and IMF (2010).

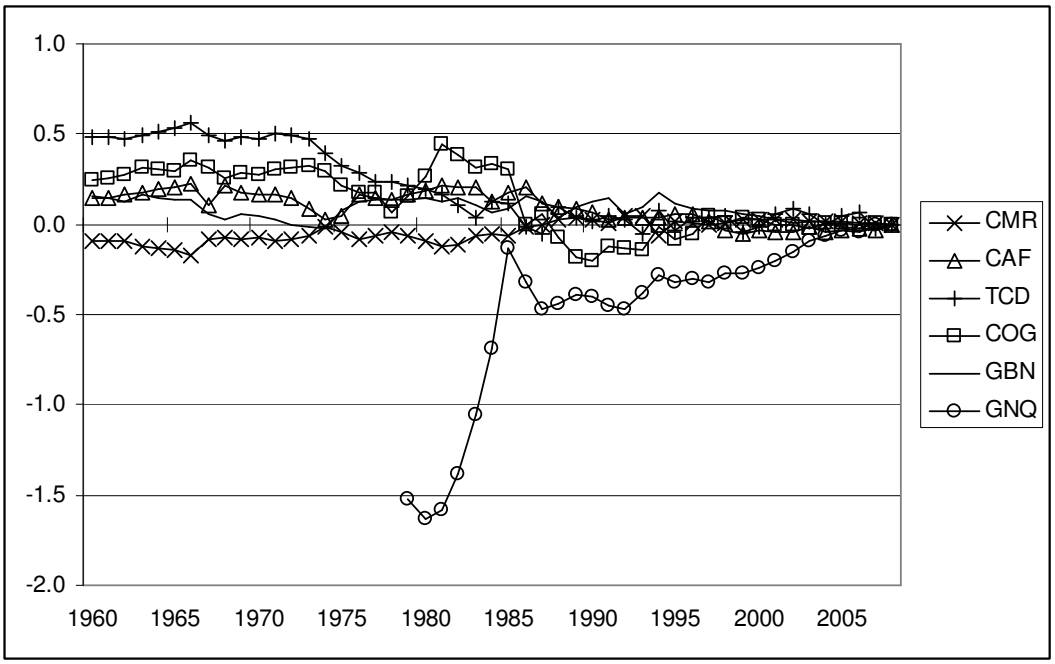

Fig. 29 – Regional relative prices in CEMAC (computed as differences with respect to CEMAC average inflation rate). Base year: 2008.

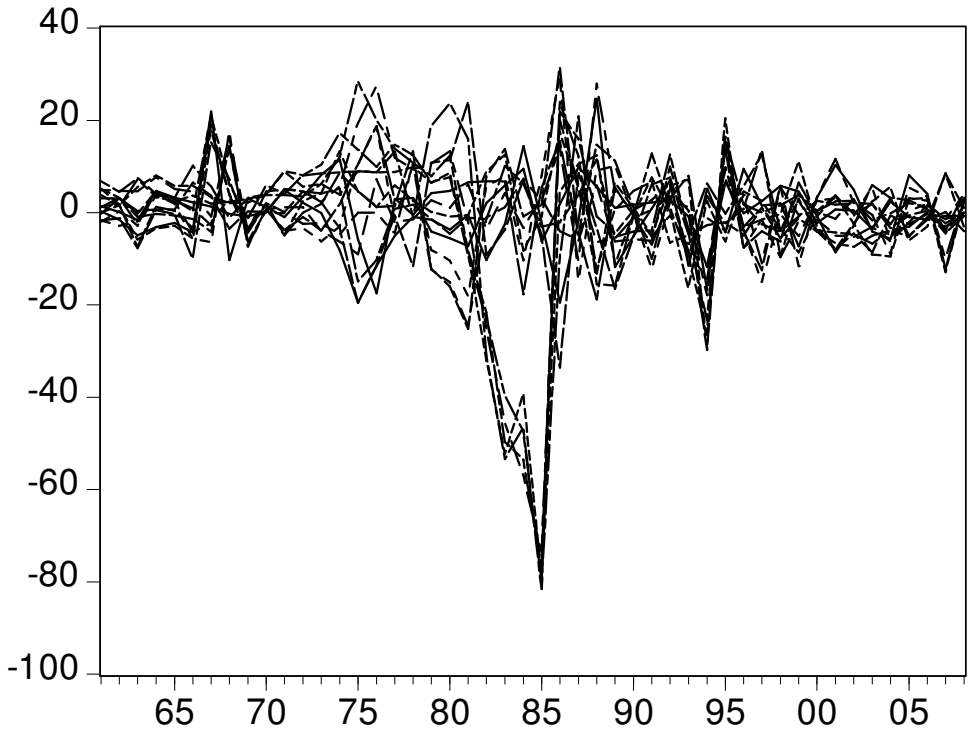

Fig. 30 – The inflation differentials among CEMAC countries.

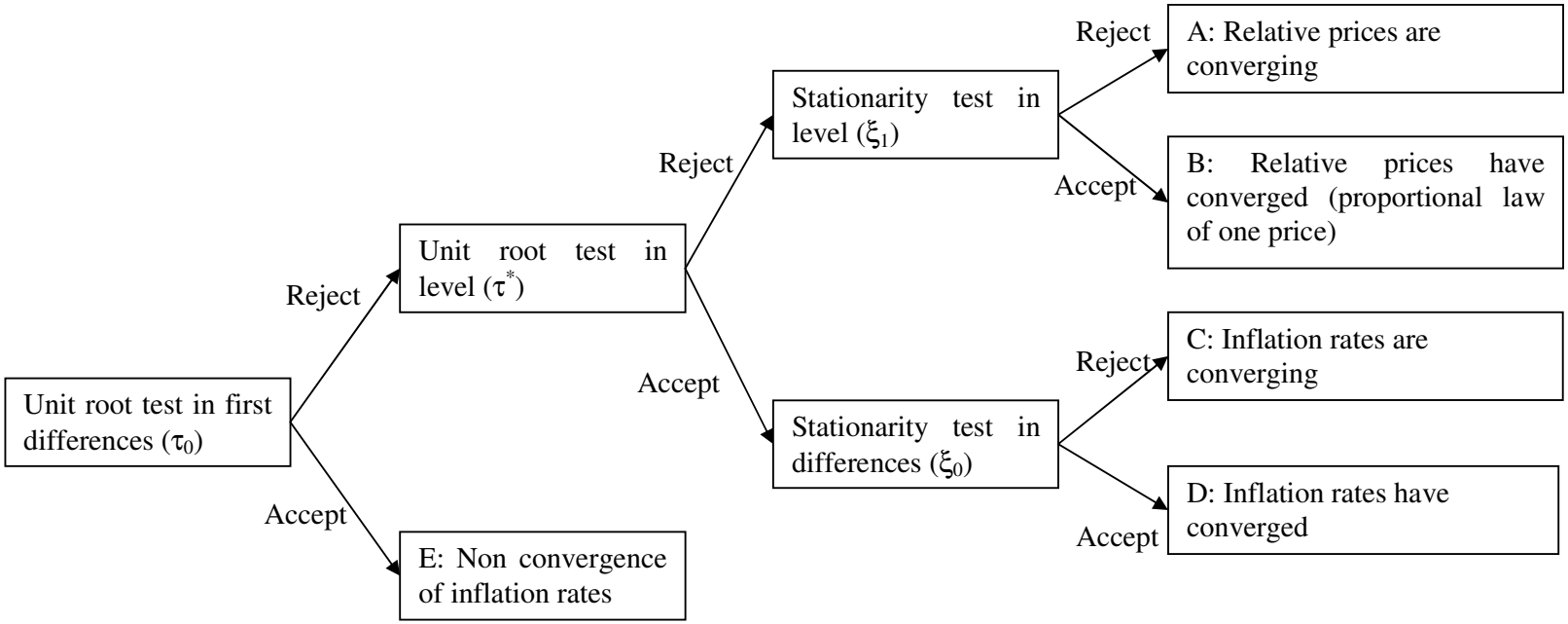

Fig. 31 – The convergence testing strategy (figure adapted from Busetti et al., 2006).

[1] The Economic Community of Central African States (ECCAS, also known as CEEAC, *Communauté Économique des États d'Afrique Centrale*) is a regional economic community (REC) established in 1983 and operational since 1985, involving ten Central African countries (Burundi, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Rwanda, São Tomé and Principe; Angola joined later in 1999). The CEMAC (*Communauté Économique et Monétaire de l'Afrique Centrale*) was established in 1994 among a subset of six ECCAS countries (Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon) and became operational in 1999. Since the CEMAC consists mainly of French speaking countries, we will refer to it using its French acronym, instead of the English one (CAEMC, Central African Economic and Monetary Community).

[2] These queries have been executed on May 6, 2009.

[3] When not otherwise stated, the data come from the 2008 CD-ROM edition of the World Development Indicators (World Bank, 2008). In order to make it comparable with the euro area average, the CEMAC average has been evaluated as the ratio of the area totals (i.e., total CEMAC GDP over total CEMAC population). This procedure amounts at taking the population weighed average of national figures. The simple average of national figure yields a higher value (2343 USD), because it is affected by the outlying behaviour of Equatorial Guinea, that features a relatively high GDP per capita (7470 USD), but accounts for only 1.3% of CEMAC population. As a consequence, the simple average would provide a biased account of the overall standards of living in CEMAC countries.

[4] More precisely, this literature refers more often to "nominal" and "real convergence", rather than to "macroeconomic convergence", one of the most debated issue being that of whether "nominal" convergence (i.e., convergence of nominal variables like inflation rate, interest rates, etc) as envisaged in Maastricht treaty is likely to bring to "real" convergence (i.e., convergence of real macroeconomic fundamentals). NCGT-convergence instead refers specifically to real GDP per capita.

[5] The intrinsic difference between these concepts of convergence is stressed by the fact that the Econlit/JEL descriptors system (http://www.aeaweb.org/econlit/subject.php) classifies them under different codes. In particular, studies related to NCGT-convergence fall usually in the O47 category ("Measurement of economic growth, aggregate productivity, cross-country output convergence"), while studies related to OCA-convergence are generally classified in the F33 ("International monetary arrangements and institutions") or F36 ("Financial aspects of economic integration") category. Remark that although both concepts legitimately belong to the field of macroeconomics, only OCA-convergence is sometimes referred to as "macroeconomic convergence", while NCGT-convergence is almost invariably referred to as "convergence" *tout court* (although it deals essentially with macroeconomic concepts such as aggregate output and total factor productivity).

[6] This conclusion need some further qualification: for instance, the relation between the rates of growth and external imbalances depends also on the elasticities of national imports with respect to national income in each country.

[7] Just to give a hint of what we mean by controversial, we recall that the estimates of the impact of monetary union membership on trade (which is a natural transmission mechanism from union membership to economic growth) are in a range between 300% (Rose, 2000) to 5% (Baldwin, 2006).

[8] As Frankel and Rose (1997) put it, this kind of assessment is subject to a standard "Lucas critique" argument.

[9] An hypothesis that as been strongly advocated by Mundell in a number of recent papers; Mundell (2005, 2009).

[10] On the relevance of "old" approaches for "new" theories see Tavlas (1993), and Gandolfo (2002).

[11] This criterion is often defined business cycle "symmetry". Since symmetry is the "correspondence of form on opposite sides of a dividing line", it turns out that if one observes the plot of the cyclical component of output, an expansion (above the horizontal axis) is symmetric to a recession (below the horizontal axis). In other words, cycles are symmetric whenever countries are on *opposite* phases of the business cycle. For the same reason, it would be more correct to speak of "correlated", instead of "symmetric", shocks.

[12] Gandolfo (2002) stresses that the answers depend also on the parameters of the social preference function.

[13] Tornell and Velasco (2001) examine this issue with reference to SSA countries and find that those belonging to monetary unions have delayed the fiscal adjustment needed in response to the adverse evolution of the terms of trade in the '80s.

[14] By "core" EU countries we mean the six initial members of the European Economic Community (EEC): Belgium, France, Germany, Italy, Luxembourg, the Netherlands. Similar trends may be observed in other EU countries.

[15] Interestingly enough, perusal of the European newspaper of the '90s will show that the decision to enter the EMU has been advocated by politicians as a purely "technical" decision grounded on economic rationality. The fact that economic literature is adamant in attributing this decision to political considerations leaves one with the uneasy sensation that nobody in Europe (neither the politicians, nor the economists) is willing to endorse what has been the most important decision in the last four decades of European history. This is not a marginal question, as it raises the issue of how transparent (hence, democratic) has been the decision process related to EMU membership.

[16] If one controls for oil prices, the statistical relation between CEMAC aggregate growth and terms of trade variation vanishes.

[17] The WAEMU (Western Africa Economic and Monetary Union, also known as UEMOA, Union Economique et monétaire Ouest-Africaine) includes the CFA franc countries of Western Africa, namely Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The ECOWAS (Economic Community of West African States) includes the WAEMU members and six more countries: Cape Verde, Gambia, Ghana, Liberia, Nigeria, Sierra Leone.

[18] We remark that Anyanwu's estimated equation is grounded on NCGT, which deals essentially with long-run growth. One may therefore wonder whether the results would be affected by choosing a different, possibly larger, sample. After all, the 1990-2000 decade was characterized by a relatively stable global macroeconomic environment. Therefore, the sample adopted may be relatively uninformative as to the resilience of MU members to external shocks.

[19] The countries considered are Cote d'Ivoire, Kenya, Nigeria, South Africa, Sudan; the coefficient of variation of their output over 1961-2006 is equal to 0.68. With the exception of Cote d'Ivoire and Nigeria, that belong to WAEMU, the other countries do not belong to formal MUs.

[20] The CEMAC inflation is a GDP-weighed average of national inflation rates; in the "other SSA" inflation is evaluated as the median of national CPI inflation rates. The reason why the median is used is that the GDP-weighed average of the "other SSA" countries would be severely affected by the burst of hyperinflation in Angola (inflation reached 4145% in 1996, and Angola accounts for a sizeable 3% to 4% of other SSA GDP): average "other SSA" inflation reaches 126% in 1996, with a contribution from Angola equal to 114% (i.e., Angola explained in that year 90% of "other SSA" inflation). The spike of other-SSA median inflation in 1994 is determined by CFA franc devaluation in WAEMU countries.

[21] Average inflation from 1986 through 1993 was above 30% in Angola, Guinea-Bissau, Mozambique, Niger, Sierra Leone, Uganda and Zambia.

[22] Baldwin (2006) would probably call them "incredible".

[23] On the relevance of this argument for African economies see for instance Thirlwall (2000).

[24] By the way, this may explain why Anyanwu (2003) finds a *negative* effect of trade openness on per-capita GDP in ECOWAS countries: in fact, what matters for economic growth is not openness *per se*, but rather export growth (Hussain, 1999). In the light of the preceding remarks, one may wonder whether the large effect of monetary union on per capita GDP in Anyanwu (2003) regression would resist after controlling for export *growth*.

[25] The average correlation rate between Germany current account and those of the other countries in Fig. 8 is -0.83. The average correlation rate between Gabon (the country showing the largest surpluses) and the other CEMAC countries over the same period is -0.09 and falls to -0.01 after 1999.

[26] See the discussion of criterion 3 in Section 2.1.1 above.

[27] See http://www.imf.org/external/np/exr/facts/hipc.htm.

[28] The "voice and accountability" indicator measures "perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media", the "control of corruption" indicator measures "perceptions of

the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests", the "violence" indicator measures "measuring perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism", and the "rule of law" indicator measures "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence". These indicators are constructed using an unobserved components model that synthesizes information on 340 variables reflecting different dimensions of governance, released by 32 independent organizations (Kaufmann *et al*., 2008).

[29] This may explain why Equatorial Guinea ranks consistently lower in the first two indicators.

[30] The EMS, established in 1979, was a currency area involving the continental European Economic Community (EEC) countries whose prominent feature was an "adjustable band" system that limited exchange rate flexibility among member countries. After many developments, it was superseded by the EMU in 1999.

[31] In the pre-EMS period real wage growth averaged 4.08% and was therefore 5% higher than real output growth (at 3.88%); in the EMS-EMU period real wage growth has fallen at 0.24%, some 80% less than real growth, that averaged 1.5%. In comparison, real wage growth in the United States has been relatively steady across these subsamples, at about 1.1%.

[32] The discussions as to whether this has occurred in Europe is still open. For instance, Gandolfo (2002, Par. 20.2.2) suggests that the strategy of using MU membership as a tool to reach national goals (in particular, deflationary policies) reflects an "economic policy illusion", by mean of which the national constituencies would be more willing to accept otherwise undesired policies if these are presented as the unavoidable consequence of external conditioning.

[33] Technically speaking, coordination is mostly represented as a policy game where each national government takes into account other countries' output in its objective function.

[34] See the discussion in Section 2.1.2.

[35] As usual, the literature refers mostly to the EMU. In what follows, it should be kept in mind that although the structure of the CEMAC agreement mimics many feature of the EMU, there are still relevant differences, that we will point out in due course.

[36] However, as recalled in Sec. 2.1.2 above, Feldstein (2005) argues that centralized monetary policy prevents the working of market discipline.

[37] For instance, Douven and Peters (1998), while founding that trade-induced GDP spillovers are negligible (thus invalidating the "endogenous OCA" hypothesis of GDP "synchronization" through increased trade), at the same time

[38] The early results of this literature are reviewed in Gandolfo (2002, par. 20.4), the recent results in Ferré (2008)

[39] However, it is fair to stress that upon closer scrutiny Canzoneri and Diba (1999) reversed their opinion about the usefulness of the SGP.

[40] Remark that in what follows we will refer to government deficit, instead of government balance, as do the CEMAC surveillance rules.

[41] This statement must be qualified: in fact, there is a particular case in which the two values of $\bar{d}$ and $\bar{f}$ are mutually consistent *for every value of* γ. This happens when $\bar{f}$ =0, which implies $\bar{d}$ =0 irrespective of γ.

[42] An explicit reference to "debt sustainability" was added in the 2005 revision of the SGP, of which more later.

[43] The political dimension of the decision is further stressed by the existence of another "escape clause": the Council could abrogate the sanctions "depending on the significance of the progress made" by the member country.

[44] The basic fiscal balance is equal to the difference between total revenue net of grants ("hors dons") and total expenditure net of foreign financed investment; the balance criterion is defined as a ratio to GDP. However, since what matters is the sign of the balance (positive), rather than its dimension, the division for a positive quantity like GDP in principle is pointless.

[45] CEMAC (2009) does not specify any reference value for the other indicators from c. to f. Iossifov *et al*. (2009) specify that the current account balance must be non-negative. The indicator d. corresponds to the criterion 3 in Section 3.5 above.

[46] We were unable to find a consistent time series related to the payment arrears. This variable in any case is subject to strong measurement errors.

[47] A similar concern is stressed by UNECA (2007) and Iossifov *et al*. (2009). Yet, it is true that some flexibility is allowed by the escape clauses, that are less strict than the European ones.

[48] The idea that macroeconomic convergence parameters should be defined in terms of debt, rather than deficit, ceilings has been put forward by Pisani-Ferry (2004). A reference to debt "sustainability" has been added to the revised SGP of 2005, but it is unclear what relevance will this reference have in practice.

[49] UNECA (2007) considers slightly different numerical values.

[50] An emphasis on "structural" balances is also built in the SGP revision (European Council, 2005)

[51] There are some evident limitations in this "what-if" approach: for instance, we assume that the non-oil GDP would be the same in the presence and in the absence of the oil sector, and we take as initial condition the ratio of debt to overall (instead of non-oil) GDP. The first of these limitations, however, may be less serious than it appears, because it is widely recognized that in CEMAC countries the oil sector is relatively insulated from the non-oil one (see for instance Iossifov *et al*., 2009).

[52] The beginning of the sample coincides with the first year since the inception of CEMAC. We dropped 1994 because it features an exceptional burst of inflation due to the devaluation. The end of the sample coincides with the last year for which we have reliable data. However, omitting the crisis years makes sense, as we are here interested in steady state reference values.

[53] As remarked above, since what matters is the sign of the non-oil balance, as it appears from the surveillance rule, the denominator of the ratio does not matter, as neither the non-oil nor the total GDP are ever expected to be negative. In what follows, however, the difference between total and non-oil GDP matters, the obvious implication being that if we refer to non-oil GDP we get more stringent convergence parameters.

[54] By the way, the fact that this rule is not mandatory exacerbates the problem of its credibility.

[55] The average largest inflation differential is calculated by averaging over the differentials among the highest and lowest inflation country in each year. We exclude from this calculation Malta, Slovenia and the Slovak Republic, that joined the EMU only recently

[56] The time-frequency domain analysis based on evolutionary spectral analysis and wavelets methods is much more data demanding and has known only a limited number of applications in economics, mostly in the domain of finance, where large datasets are available (Jouini, 2009).

[57] When Sao Tomé and Principe is included along with the CEMAC countries the number of countries raises to 7, and the hypothesis of "full" convergence coincides with the presence of 6 cointegrating relationships.

[58] UNECA (2007) attributes this result to the huge differences in size among CEMAC member countries. However, this argument applies to fiscal variables as well. A possible solution would be that of scaling the fiscal variables with each country's GDP, and to consider GDP per capita instead of GDP, as is usual in the growth theoretic convergence literature. Considering the GDP per capita, however, does not substantially alter the picture.

[59] The answer to the question asked by Ben Hammouda *et al*. (2007): "does macroeconomic convergence lead to growth?" is therefore likely to be negative (as their empirical study confirms).

[60] If X_t and Y_t are weak-sense stationary, they have constant means (say μ_X and μ_Y respectively), therefore convergence in expectations is trivially satisfied with $\mu_X - \mu_Y = \alpha$.

[61] This is not a trivial assumption, as most nominal variables are found to be $I(2)$, which means that inflation rates could actually be $I(1)$.

[62] We speak of "growth rate" on the basis of the assumption that in practical applications the series will be expressed in logarithms, hence $\Delta z_t \approx (z_t - z_{t-1})/z_{t-1}$.