

A PANEL ASSESSMENT OF REAL CONVERGENCE IN CEMAC¹.

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Abstract

Some authors support that regionalism among underdeveloped countries will tend to cause divergence of their income levels, and regional integration among rich countries will tend to cause convergence. This paper tests this convergence hypothesis in CEMAC between 1990-2002. Our findings lend support to the “convergence club” defined according to policy choices rather than initial levels of human capital. They show that unilateral and preferential suppression of tariff and non-tariff barriers favor the convergence of per capita incomes and reduce the dispersion of real per capita income levels of partners in the sub-region. These results make the idea of convergence club based on the initial levels of productive technology and GDP per capita relative.

JEL: F42, O47, C33.

Key Words: Trade Reforms, Regional Integration, Convergence, Central Africa.

1. Introduction.

Many of the crucial debates in regional integration are encapsulated in the question of disparity of income levels among the member countries. Economists are interested in knowing whether in a regional grouping the distribution of income changes over time. More specifically, they are interested in whether within a grouping intra-differences in income levels tend to disappear or to increase over time. If they diminish, then there may be less worry about creating compensation schemes such as the Regional and Cohesion Fund Policies in the European Union. If they increase, some of the member states will continuously benefit from their membership while others will be getting a fair share of gains. This may lead to the disintegration of the community as was the case in the UDEAC in 1968, the East African Community (EAC) in 1977, and more recently in the Central American Common Market (CACM). Economists are also interested in knowing whether member countries that are relatively poor today are likely to remain poor in the future. All these concerns are related to the empirical phenomenon called convergence.

The main assumption behind the analysis of convergence in regional integration groupings is that similarity in production and trade structures among countries will ease the integration process. Theoretical models predict that countries will trade more between them and obtain higher gains from trade if they are different (in terms of factor endowments in the Heckscher-Ohlin tradition or in terms of technology in Ricardian models), while according to other models (enhancing imperfect competition and intra-industry trade) trade will occur especially among similar countries. In spite of these different approaches, it is generally agreed that adjustment costs are smaller when integration occurs between countries that are relatively alike. The more similar countries are, the more likely they will be exposed to common shocks (Brühlhart, 2000) and greater similarity in production structures is likely to increase business cycle correlations (Krugman, 1993; Imbs, 2001). This means that common macroeconomic and industrial policies will be more effective the larger is the similarity among country members.

¹ CEMAC stands for “Economic and Monetary Community of Central Africa”, and covers six countries: Cameroon, Central Africa Republic, Chad, Congo, Equatorial Guinea, and Gabon.

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Another reason to believe that similar countries integrate more easily is that they are more likely to lie in the same diversification cone, and this allows at least the theoretical possibility to achieve factor price equalization through trade (Deardorff, 1994).

Standard neoclassical growth theory predicts that the elimination of trade barriers and free movement of production factors across countries will result not only in the overall welfare increase in the integrated area, but also cause real convergence of countries in the region. However, many authors (Baumol et al, 1994, Henner, 2001; Venables, 1999; Dowrick and Nguyen, 1989, Baumol, 1986) demonstrated that convergence seemed to hold among rich countries. The most frequently cited work in this area is Baumol (1986) who based his research on a sample data of 16 OECD members and obtained a significant negative coefficient of the initial income variable in a classical growth model regression. Hence the result supported the existence of absolute convergence. In another research (Baumol et al, 1994), the outcome of using the same methodology on the sample of over 70 countries was that convergence does not exist. The results of these two empirical studies suggested that there might be a “convergence club”, meaning a subset of countries for which convergence applies, while countries outside of the “club” would not necessarily experience convergence vis-à-vis those in the club. According to these authors, only countries with an adequate initial level of human capital endowments can take advantage of modern technology to enjoy the possibility of convergent growth (Baumol et al, 1994, p. 65). A direct implication of this line of reasoning emphasized by Venables (1999, p. 2) is that regionalism among underdeveloped countries will tend to cause divergence of their income levels, and regional integration among rich countries will tend to cause convergence.

However, Sachs and Warner (1995) suggested that poorly managed economies, such as those with the absence of secure property rights, autarkic trade policies, inconvertible currencies, and so forth are unlikely to experience convergence no matter what the underlying production technology or initial level of human capital. Put another way, these authors lend support to the “convergence club” defined according to policy choices rather than initial levels of human capital. They further suggested that poor policy choices are reversible, and not irrevocably linked to low levels of income (p. 5). In their view, burdensome taxes on foreign trade are particularly harmful, since these not only distort economic incentives, but also cut countries off from international flows of knowledge (p. 6). In conclusion, these authors argued that convergent growth can be achieved by all countries that follow a reasonable set of political and economic policies, including civil peace, basic adherence to political and civil rights, and most decisively openness through the absence of trade quotas, export monopolies or inconvertible currencies (p. 23). This conclusion was later confirmed by Varblane and Vahter (2005) who analysed the process of economic convergence in transition economies during 1995-2004 and found that unconditional β - convergence and σ -convergence existed across the countries under consideration within the analysed period.

Our concern in this paper is to test the “convergence club” hypothesis in CEMAC. We are interested in knowing whether regionalism in CEMAC is bound by the characteristics of African economies to always experience divergence of income levels of member countries.

Confronted by the economic crisis of the 1970s and the 1980s, and the mediocrity of the performance of their economies, most CEMAC countries undertook major reforms in the context of S.A.P guided by the Bretton Woods institutions. These reforms in the trade sector aimed to disrupt the protectionist tendencies, which were prevailing in African economies as from 1960s. Thus, apart from the macroeconomic stabilization measures, other efforts were generally deployed on:

- the progressive elimination of quantitative restrictions and price control,³ simultaneously
- the reduction of tariff barriers and their variability.
- the suppression of exemptions
- the easing or abandonment of contingencies,
- the flexibility of the exchange rate,

³ In Cameroon, the first series of 105 products were liberalized from quantitative restrictions in 1989/90 and the second series of 22 products in 1990. In Gabon, quantitative restrictions were definitely and officially removed in 1994 with the publication of the Presidential Decree No. 772/PR/MCIRS/MFBP cancelling all licenses and authorization to import or to export.

- the progressive suppression of state monopolies in international trade,
- the privatization or reform of public enterprises.
- the reduction or elimination of non-tariff barriers

These unilateral reforms were reinforced from 1994 by the devaluation of the CFA franc and the preferential tax and customs liberalization. While the former was designed to improve the external competitiveness of exports of the sub-region, the later aimed at eliminating all internal obstacles to cross-border trade among member countries and simplifying the external tariff. Thus, new structures were introduced to deal with domestic sales, intra-CEMAC trade, and trade with the rest of the world.

Regarding the domestic market, various specific taxes were replaced by a turnover tax (TCA) with two rates, a normal and a reduced rate. These rates were fixed freely by each member state within the range of 7% to 18% for the normal rate and 3% to 6% for the reduced rate. In July 1994, the rates fixed were 5% and 15% in Cameroon and Chad, 5% and 10% in CAR, and 5% and 12% in Congo and Equatorial Guinea (Njinkeu et Monkam, 1999; Giorgio Barba Navaretti et al, 1998). Gabon opted for a value added tax at a rate of 18% from April 1995. Besides, all exemptions and privileges attached to the qualification for preferential regimes were canceled (TU⁴, TIP⁵, Investment codes). The TCA was later replaced by the Value-added Tax (VAT) in Cameroon and Congo applied at the rate of 17% (World Bank, 1998).

With respect to intra-CEMAC trade flows, multiple rates of indirect taxation were simplified, and a generalized Preferential Tariff (GPT) equivalent to 20% of the common External Tariff was introduced. This rate came down to 10% in 1996, and through January 1, 1998, the GPT came to 0% and intra-CEMAC trade was carried out free of import duties.

Vis-à-vis the rest of the world, custom duties were set into a four-tier structure with a 50% top rate (duties had previously been up to 300% in some countries), and quantitative restrictions were eliminated. The four categories of custom duties were replaced by a single system, the Common External Tariff (CET), imposed on all imports from non-member countries. The CET is comprised of two taxes, a customs duty and a temporary surcharge tax. The customs code classifies products into four groups, representing successive levels of product transformation. Simultaneously, the array of tax reduction and exemption offered by preferential regimes as well as by investment codes, were phased out. Imports were classified into four groups and custom duties ranged from 5% to 50% in January 1994 as follows:

- i Essential goods 5%
- ii Raw materials and capital goods 15%
- iii Intermediate and miscellaneous goods 35%
- iv Consumer goods 50%

In December 1994 these rates were lowered to 5%, 10% 20% and 30% respectively. The second component of the CET, the temporary surcharge tax with a rate ranging between 0% and 30% was introduced in 1995 on specific products in order to substitute for the protection formerly provided to firms via non-tariff barriers. This tax was canceled in January 1997 in many CEMAC economies.

With regard to institutional blockages, the 1994 CEMAC treaty introduced the principle of a restrictive list of questions for which unanimity in decision-making is necessary. This treaty created a court of justice with jurisdiction over conflicts among member countries.⁶ Also, the principle of an autonomous General Secretariat has been accepted. Contributions required from member states are expressed as a percentage of exports to the rest of the world. Staff positions are no longer allocated among member states. Staffs are to be recruited solely on the basis of their competence given the predefined job profiles.

The policy changes described above reflected the recognition that reliance on administrative controls had driven most economic activities outside formal channels, depressed exports, contributed to an inefficient structure of domestic production, and hampered long-run growth.

⁴ "Taxe Unique" or Unique Tax

⁵ "Taxe Intérieure sur la production" or Internal Tax on Production

⁶ This duty was incumbent to the Council of Heads of States in which each member has veto power.

It is worth mentioning that the main characteristic of the fiscal and customs structure of the CEMAC during the pre-reform period was its lack of uniformity across the member countries. Many special taxes and a case by case system of negotiation of tax rates between individual firms and fiscal authorities originally put in place to support the industrialization process rather created an economic environment of corrupt practices within the grouping in which considerable financial resources were spent for the obtainment of licenses, privileges and other administrative advantages instead of supporting productive activities. In some member States, corrupt activities perpetuated by fiscal authorities were intensified during the period of economic crisis since public salaries were cut down (Tybout et al, 1997). These corrupt practices enormously increased the cost of trading within the sub-region (Idem, p. 11). In addition, the inefficiency of sub-regional institutions together with the requirement of a consensus in decision-making led to the stagnation of regional integration initiatives. The situation was aggravated by the fact that the accords of UDEAC⁷ had no provision related to the transfer of sovereignty from Member States to the sub-regional body. This institutional limitation, which naturally opened doors to all sorts of distortions in decision-making together with rigid nominal exchange rates, increased the need for reforms in order to revitalize the economies of the sub-region.

The economic reforms, in modifying the incentive structure aimed to reinforce the openness of CEMAC economies. They have doubtlessly consolidated the importance of the private sector compared to the public one in member countries. They are ingredients of a liberalization policy, since practically this refers to the liberalization of imports or the trade policy movement towards the neutrality of relative prices or the substitution of the forms of state intervention, which may create more distortions by those that may create fewer distortions (Collier et al, 1997). Trade liberalization can also be considered as an evolution towards multilateralism when it simultaneously associates the elimination of quantitative restrictions with the reduction of tariff barriers to imports and exports. Generally, trade reforms rely on three approaches based on changes in trade policies, prices and quantities.

Theoretically speaking, the above-described reforms positively affect growth policies and favor the openness of the economy. The process of liberalization creates a regular and judicious environment, which gives to firms the possibility of developing their activities with equal opportunities (Henner 1996). Thus, we distinguish internal liberalization, which facilitates the development of the private entrepreneurship, and external liberalization; both of which assure the better allocation of resources through the market channels. Globally, the liberalization policy gives high priority to market rules. It allows reducing the distortions in the relative price structure and allocates resources where they are rationally used. This favorably impacts on both the regional as well as the international specialization and convergence of income per capita levels of member economies.

With respect to the developments above, it can be established that preferential and unilateral liberalization improves the perspective of regional economic integration in SSA (Jebuni 1997, p.364; Collier and Gunning, 1993, p. 16) and favors the convergence of income levels of member economies (World Bank, 2000, p. 41; Sachs and Warner, 1995). In connection with this evidence, this paper seeks answers for the following questions: after the wave of economic reforms of the 1980s and the 1990s in central African economies, is there a tendency in the CEMAC for less advanced countries to grow more rapidly than the richer countries, and thereby to converge in living standards or income levels? Or instead, are there tendencies for the “rich to get richer and the poor to get poorer”, so that the gap between rich and poor nations tends to widen over time? Is there a tendency for the dispersion of real per capita income across member economies to fall over time? More specifically, the paper examines whether less advanced economies tend to grow faster than wealthy ones within the sub-regional grouping under consideration (β - convergence). It also checks whether the dispersion of real per capita income across member economies tends to fall over time (σ -convergence). These specific objectives rely on the theoretical hypothesis that unilateral and preferential suppression of tariff and non-tariff barriers favor the convergence of per capita revenues and reduce the dispersion of real per capita income levels of partners in the sub-region.

⁷ UDEAC (Union Douanière des Etats de l'Afrique Centrale or Central African States customs Union) was transformed in 1994 to give birth to CEMAC

The rest of the paper is articulated around the literature review (section 2), the methodology (section 3), the empirical results (section 4) and finally the conclusion (section 5).

2. Literature Review

2.1. Theoretical review.

Broadly speaking, economic convergence in a regional integration grouping is understood to mean the increasing alignment of the economic variables considered, due to more rapid advances in less favored countries than in the average of the grouping. Two types of economic convergence are usually considered: nominal and real. Nominal convergence refers to the tendency towards a greater uniformity of nominal variables indicative of macroeconomic stability. Real convergence expresses the approximation of the levels of economic welfare, generally proxied by per capita income. Our study focuses on real convergence.

The literature in economic growth has used many definitions of real convergence (Quah, 1993). Meanwhile all definitions turn around two concepts, β - convergence and σ - convergence. There is β - convergence in a cross-section of economies if a negative relationship is found between the growth rate of income per capita and the initial level of income. In other words, β - convergence occurs if poor economies tend to grow faster than wealthy ones. On the contrary, σ -convergence occurs when the trend in the dispersion of the levels of real per capita income is falling over time (Sala-i-Martin, 1995). Though different, these two concepts are related. Suppose there's β -convergence in a group of countries i where $i = 1, 2, \dots, N$. In discrete terms, the real annual per capita income for an economy can be defined as follows:

$$\text{Log}(Y_{it}) = a + (1 - \beta) \cdot \text{Log}(Y_{it-1}) + \mu_{it} \quad (1)$$

Where "a" and β are constants. $0 < \beta < 1$, and μ_{it} is the error term. The requirement $\beta > 0$ implies β -convergence. The annual rate of growth $\text{Log}(Y_{it} / Y_{it-1})$ is inversely proportional to $\text{Log}(Y_{it-1})$. A higher coefficient β corresponds to a great tendency of convergence. The disturbance term captures temporary shocks on the production function, the saving rate, etc. We assume that μ_{it} has mean zero, the same variance δ^2_{μ} for all economies and is independent over time and across economies.

In order to measure the cross-sectional dispersion of income, we take the sample variance of the Log of income,

$$\sigma_t^2 = \left(\frac{1}{n}\right) \sum_{i=1}^N [\text{log}(y_{it}) - \mu_t]^2 \quad (2)$$

Where μ is the sample mean of $\text{Log}(Y_{it})$. If N is large, then the sample variance is close to the population variance, and we can use (1) to derive the evolution of σ_t over time :

$$\sigma_t^2 \cong (1 - \beta)^2 \cdot \sigma_{t-1}^2 + \delta_{\mu}^2 \quad (3)$$

This is a first-order difference equation, which is stable if $0 < \beta < 1$. If there is no β - convergence so that $\beta < 0$, then the cross-sectional variance increases over time. This would simply mean that if there is no β - convergence, there cannot be σ -convergence. In other words, β - convergence is a necessary condition for σ -convergence.

Beside these two concepts, Barro (1991) and Barro and Sala-I-Martin (1991, 1992) introduced the notion of "Conditional Convergence" in which difference between countries is related to their long term

per capita income levels. These authors also distinguish conditional from absolute convergence. Thus, a set of economies displays conditional β - convergence if the partial correlation between growth and initial income is negative. In other words, in a cross-sectional regression of growth on initial income where a number of additional variables are held constant, if the coefficient on initial income is negative, then the economies in the data set display conditional β - convergence. If the coefficient on initial income is negative in a univariate regression, then the data set displays absolute β - convergence.

In an economy, the wider the initial gap between the level of per capita GDP and the level of long term per capita income, the faster the growth of the economy. Formally, if country i has Y_i^* as a long term per capita income and Y_i as the level of per capita GDP, the growth rate y_i^* is assumed to be a linear function of the gap between Y_i^* and Y_i :

$$y_i^* = \beta (Y_i^* - Y_i) \quad (4)$$

A positive value of β implies a conditional convergence. The level of long term per capita income Y_i^* is here represented by certain structural variables such as the initial level of human capital. Barro (1991) estimated equation (4) and found a positive and significant coefficient for β and significant coefficients for the other structural variables. He concludes that a poor country tends to grow more rapidly than a rich country with the condition of having a certain quantity of human capital.

Concerning the theoretical link between regional economic integration and real convergence, the implications of traditional theories of trade are very clear. Let's consider the impact of market integration. The Heckscher-Ohlin model demonstrates that countries export goods rich in factors, which are abundant in their economies and import goods rich in factors whose endowment is weak. In abstraction to transport costs, liberalization tends to equalize prices of goods traded. Thus countries will export the more products that exploit their best factor endowment. The demand for abundant and less expensive factors increases while that of limited and expensive factors falls. The convergence of prices of goods tends to bring about convergence of factor prices. In peripheries where labor is abundant, real salaries will fall while at the centre where labor is limited, they will increase, everything being equal. Capital or labor mobility is made possible between the two poles in conformity with the predictions of Mundell (1957). Labor will migrate from periphery to centre in search of high salaries. The consequence is an increase in wages in the periphery and a fall in wages in the centre. As for capital, it will move from the centre to the periphery in search of better returns. This movement reduces the wages of the centre and increases those of the periphery. The whole movement favors the alleviation of the difference in factor prices between regions and ends up in the convergence of income levels of member countries.

2.2 Empirical Review

During the past two decades, there has been a significant increase in concerns about convergence. Overviews of the convergence literature are found in Durlauf and Quah (1999), and Temple (1999). The reason for the sudden increase was twofold. First the existence of convergence across economies was proposed as the main test of the validity of modern theories of economic growth and as a distinguishing feature between the earlier model (Solow, 1956) and endogenous growth models. The second reason for the evolution of the convergence debate was the ready availability of international comparable GDP data, which permitted the comparison of GDP across a large number of countries and its evolution over time.

The familiar studies of the convergence hypothesis at international level build on early contributions by Baumol (1986), Lucas (1988) and Romer (1986). Today there is a large literature drawing on neo-classical and endogenous growth models, whilst employing a range of empirical techniques. The more recent tests for convergence include Barro and Sala-i-Martin (1991), Carlino and Mills (1993, 1996), and Bernard and Jones (1996) for the US. Coulombe and Lee (1995) examine regional convergence processes for Canadian provinces. Mallick and Carayannis (1994) look at

Mexican states and Chatterji and Dewhurst (1996) at British countries. The consensus from all these studies is that income convergence has been strong on a regional level.

Based on the European Union experience, it is evident that preferential reforms within regional integration groupings lead to the convergence of levels of income of member countries. This is observable through the improving economies of Ireland, Spain and Portugal who have made enormous progress in reducing the gap in growth, which formerly separated them from the more advanced nations of the EU. The analysis of the dispersion of revenue levels in this group was done by Ben-David (1993) for the period covering the 1980s. The results obtained clearly show a progressive convergence in income levels as from 1947 (creation of Benelux), through 1951 (formation of CECA), 1957 (creation of the EEC), 1962 (elimination of all quotas), 1968 (elimination of all internal tariffs of the EEC) to 1981. As a whole, the difference in the levels of income dropped by two-third during the above period, due especially to the more rapid growth of less advanced economies of the community. As illustration, during the 1980s, the per capita GDPs of Ireland, Spain and Portugal were 61%, 49% and 27% of the per capita GDPs of the larger countries of the EU respectively. During the 1990s, these figures rose to 91%, 67% and 38% respectively (World Bank, 2000). Meanwhile this convergence did not include Greece though she joined the EU long before Spain and Portugal. The main reason put forth is the absence of the necessary reforms in Greece. Thus even though regional integration is potentially beneficial, deep reforms are necessary in the less advanced economies in order to materialize the potentially beneficial effects. This is why we are proposing to test this convergence hypothesis in the CEMAC sub-region at the dawn of waves of reforms of the 1980s and 1990s.

In Africa, studies on convergence are rather few in spite of the importance of the issue for the region. The work of Jones (2002) on absolute and conditional convergence in ECOWAS finds the existence of both β and σ convergence in the grouping. This study concludes that the member countries of ECOWAS form a convergence club. Dufrenot and Sanon (2005) also test the process of β -conditional convergence of per-capita GDP in the same grouping between 1985 and 2003 under the assumption of parameter heterogeneity and contrary to Jones (2002) they find no evidence of real conditional convergence (p. 16). These authors conclude that in ECOWAS, member states individually follow their long-run growth paths. In this respect they recommend active coordination of policies to reduce the structural heterogeneity. Akanni-Honvo (2003) examines the implications of regional integration agreements on the process of convergence or divergence of member economies in developing regions between 1975 and 2000. The results show that the creation of regional integration groupings in less advanced regions does not automatically lead to absolute convergence across member countries, and that conditional convergence that appears in some regions is weak. Meanwhile, the dynamic of convergence of per-capita GDP that is perceived in SACU in Africa, ASEAN in Asia and MERCOSUR in Latin America is supported by concerted investment policies in infrastructures, complementary production capacities, the diversification of economic structures, and finally the capability of more advanced economies in the groupings to generate the necessary and sufficient spillover effects on other member countries. In addition the frontier effects have a contrasting impact on the economic growth of member states and on the convergence process within the groupings. However, this author cautions against reading too much into his findings, as they need to be confirmed by a model-based analysis in different sub periods that would convincingly shed more lights on the process of real convergence in regional integration groupings in less advanced regions. This caution gives more relevance to this paper in Central Africa.

Nearly two decades have passed since African countries undertook the economic reform program and efforts made so far to study the likely effects of the policy measures on target variables such as, whether less advanced economies tend to grow faster than wealthy ones within the sub-regional groupings under consideration (β -convergence), and whether the dispersion of real per capita income across member economies tends to fall over time (σ -convergence) are rare. However, for the purpose of economic policies, the sub-regional grouping authorities need to know to what extent poor member countries are catching up to wealthy ones as a consequence of economic reforms within the groupings. They also need to know by how much the real income dispersion within the groupings will fall over time. It is on account of this vacuum that the current paper has specific relevance.

3. Methodological Approach

The specialized literature on real convergence has come up with a wealth of different measures and openly debated on their relative merits⁸. The simplest indicator for assessing real convergence between countries (regions) within an area is to test whether the per capita GDP of a country (region) or a set of countries is approaching the average of the area. The two most popular measures are the beta-convergence and sigma-convergence. The former is generally tested by regressing the growth in per capita GDP on its initial level for a given cross-section of countries. In turn, this beta-convergence covers two types of convergence: absolute and conditional (on a factor or a set of factors in addition to the initial level of per capita GDP). In contrast, sigma-convergence designates the reduction in the dispersion of per capita GDPs within a sample of countries.

The basic neo-classical beta-convergence model, as proposed by Barro and Sala-I-Martin (1991, 1992), for the evaluation of convergence or divergence trends across countries or regions adopts the following form:

$$\frac{1}{T} \ln\left(\frac{Y_{i,t}}{Y_{i,t-T}}\right) = \alpha + \ln Y_{i,t-T} \left(\frac{1 - e^{\beta T}}{T}\right) + \varepsilon_{i,t-T} \quad (5)$$

Where $Y_{i,t}$ represents the GDP per capita of the country or region i ; T is the period of analysis; β is the coefficient and ε is the error term. A negative value for the slope coefficient β indicates convergence of GDP per capita across territorial units of analysis, in a given time period, while a positive value indicates divergence.

This methodology to test beta-convergence has been criticized for producing biased results. Quah (1993, 1995, 1996) argues that this methodology largely neglects the dynamics of changing national (regional) income distributions and proposes the use of a complex method based on the use of Markov chains to capture the dynamics of the entire cross-country distribution. Boyle and McCarthy (1997, 1999) have suggested the use of the Kendall index of rank concordance, referred to as *gamma*-convergence in addition to *sigma*-convergence in testing *beta*-convergence. More recently Petrakos et al (2001) re-examined from a critical theoretical and empirical viewpoint the convergence literature and provided a new dynamic framework of analysis, which allows for a better understanding of the forces in operation described by the two sides involved in the debate. Unfortunately, its application to the measurement of disparities in the European Union yielded results that were difficult to interpret (Idem).

In general, none of the existing measurement procedures mentioned above is accepted as inherently superior to the others in any circumstances. Probably because of its intuitive appeal, the first approach (beta-convergence) remains the most commonly used. It is also the one to which we refer in this paper.

3.1. Model specification.

We develop an empirical model that will be applied to CEMAC to test for absolute and conditional convergence. This model tries to capture the main immediate determinants of the growth of income per capita. Following the usual procedure in the literature (De la Fuente, 1998), we derive an empirical convergence equation from a log-linear approximation to a simple growth model. We assume that the production side of the economy can be described by a reduced-form aggregate production function of the form:

$$Y_{it} = \theta^\gamma K_{it}^{\alpha_k} H_{it}^{\alpha_h} R_{it}^{\alpha_r} (A_{it}^g L_{it})^{1-\alpha_k-\alpha_h-\alpha_r} \quad (6)$$

Where Y_{it} is aggregate output in country i at time t , L the level of employment and A_{it} an indicator of the level of technical efficiency, which grows at an exponential rate g . The variables K , H and R

⁸ Barro and Sala-i-Martin (1995), Quah (1993, 1996), and Grossman (1996)

denote, respectively, the stocks of physical, human and technological capital, and ϵ is an indicator of the relative weight of the government sector in the economy.

This formulation is not completely standard since it allows the national output to be a function of the relative size of government. The indicator of the weight of the government sector in the economy is meant to capture in the simplest possible way the fact that public activities may affect productivity in a variety of ways other than through infrastructure investment, which contributes directly to factor accumulation.

From equation (6) we can derive a convergence equation⁹ of the form:

$$GYPC_{it} = g + \beta a_{it} - \beta^* \ln YPC_{it} + \gamma (\ln \theta_{it} + (\delta + g + n) \ln \theta_{it}) +$$

$$(\delta + g + n) \left[\alpha_k \ln \frac{sk_{it}}{\delta + g + n_{it}} + \alpha_h \ln \frac{sh_{it}}{\delta + g + n_{it}} + \alpha_r \ln \frac{sr_{it}}{\delta + g + n_{it}} \right] \quad (7)$$

Where $GYPC_{it}$ is the growth rate of income per capita in country i during the sub-period which starts at t . $\ln YPC_{it}$ is the log of income per capita at the beginning of the sub-period, s_{jit} the fraction of GDP invested in capital of type j ($j = k, h, r$), n_{it} the rate of population growth, a_{it} the log of the indicator of technical efficiency (A_{it}), ϵ the log of government's share in GDP, and δ the rate of depreciation of capital. β measures the rate of convergence towards a pseudo-steady state, which would be attained asymptotically if the rate of population growth, the share of government expenditures in GDP and the different investment rates remained constant over time. The value of the convergence coefficient will depend on the degree of returns to scale in the reproducible factors (in the different types of capital), with convergence being faster the faster diminishing returns set in.

Equation (3) can be extended to incorporate some important determinants of growth not considered by the theoretical model from which we started. Since we work with data on income per capita rather than output per worker, we control in a simple way for a technological catch-up effect. De la Fuente (1995) argued that, if technology diffuses across countries at a sufficiently rapid pace, those economies which are technically less advanced at the beginning of the period should, other things equal, grow faster than the rest. This effect, however, will gradually exhaust itself as each country approaches an equilibrium level of relative technical efficiency which is determined by its own research and Development effort and the speed of diffusion. To try to capture this effect we include a dummy for initially backwards countries in CEMAC.

After extension, we get a new equation that will be estimated to test for conditional convergence in the regional integration scheme under consideration.

$$\ln \Delta Y_{it} = \beta_0 + \beta_1 \ln Y_{it-k} + \beta_2 \ln G + \beta_3 PMA + \beta_4 INV + \mu_{it} \quad (8)$$

ΔY_{it} is the GDP per capita growth rate in time t in country i . Y_{it-1} stands for GDP per capita at the beginning of the period that determines either convergence or divergence ($\beta_1 < 0$). G is total government expenditure as a fraction of GDP ($\beta_2 > 0$). PMA is a dummy that takes 1 for initially backwards countries in the groupings. A positive relationship is expected between PMA and the GDP per capita growth rate ($\beta_3 > 0$). INV is capital investment, and μ_{it} is the error term.

3.2. Estimation techniques

Equations (1) and (8) above are estimated for a panel of member states in the grouping under consideration to test for absolute and conditional beta-convergence respectively. Secondly, we compute the standard deviation of the GDP per capita of member countries in the sub-region at the

⁹ From equation (6), we first subtract from both sides the income per capita of the beginning of the sub-period. We secondly introduce the logarithm and make necessary transformations.

beginning and at the end of the period. The comparison of the two values of this inequality measure shed light on whether the dispersion of real per capita income across member economies tends to fall over time (σ -convergence).

We have chosen the estimation procedure that doesn't tend to overlook the relative size or importance of each country, treating all observations as equal (cross section weights). This is justified by the disparity that exists among member states in central Africa. Finally, in order to take into consideration the pace of reforms in the sub-region, and the fact that business cycles are not synchronized across member countries, we first cover the whole period 1990-2002, and after we divide it into sub-periods.

3.3. Data collection.

The period of analysis starts in 1990 and ends in 2002. We first of all estimate our models for the entire period, and after we also estimate them for 1990-1994, 1995-2002, and 1998-2002. These three sub-periods correspond to different articulations of the economic reform process in the grouping. First, the unilateral reforms adopted in all the CEMAC member states under the World Bank and IMF Structural Adjustment Programmes (SAPs) in the first half of the 1980s were supposed to affect the factor mobility among the member economies by the year 1990. Second, in January 1994, preferential reform measures were introduced in the grouping, namely the devaluation of the CFA franc and the Tax and Customs reforms. These new measures are supposed to affect the results obtained in 1990-1994 and impact on the convergence process as from 1995. Third, in January 1998, the generalized Preferential Tariff (GPT) introduced in 1994 for intra-CEMAC trade flows, which was equivalent to 20% of the common External Tariff (TEC) was phased out and internal trade in the grouping was carried out free of import duties.

Our data are obtained essentially from the following sources: the World Bank, the IMF, the African Development Bank publications, and the headquarters of CEMAC. These are related to per capita GDP, total government expenditure as a fraction of GDP, and total investment as a share of GDP.

4. Empirical results.

4.1. Absolute convergence.

Table 1 : Results of the regression of the absolute β -convergence.

		C	Log(Y_{it-k})	R^2	\bar{R}^2
1990-2002	Coeff	2.483	- 0.187	0.343	0.325
	t-stat	3.84*	-1.96***		
	Prob	0.0005	0.058		
1990-1994	Coeff	3.18*	-0.286	0.682	0.642
	t-stat	4.91*	-3.06*		
	Prob	0.000	0.005		
1995-2002	Coeff	1.897	-0.111	0.52	0.49
	t-stat	1.776***	-0.688		
	Prob	0.087	0.49		
1998-2002	Coeff	16.299	-2.48	0.647	0.445
	t-stat	3.08*	-2.91**		
	Prob	0.008	0.01		

Note: *, ** and *** imply significance at 1, 5 and 10% levels respectively.

We have considered 1970 as the starting period. In this year, the integration accords within the framework of UDEAC, which was later transformed to give birth to CEMAC, were just enacted.

Equation (1) was first estimated for the time intervals of 1990-2002, then for 1990-1994, 1995-2002 and finally 1998-2002. During these periods, our variable of interest, the level of GDP per capita at the beginning of the period has the expected sign. It is significant at 10% between 1990-2002. This means that by examining the global tendency in this time interval, there has been a weak economic catch-up between the less advanced and the more advanced economies of the grouping. Between 1990-1994, convergence is most pronounced since GDP per capita is significant at 1%. Meanwhile during 1995-2002, it has the expected sign but isn't significant. Finally, between 1998-2002, our main variable denotes absolute beta-convergence.

As a whole, the results of the estimation denote the importance of the unilateral as well as multilateral reforms in the integration zone. As such, the reforms undertaken by the CEMAC member States in the context of S.A.P and within the framework of the preferential liberalization have contributed to the narrowing up of the standard of living gaps in the sub-region. These results make the idea of convergence club based on the initial levels of productive technology and GDP per capita relative.

4.2 Conditional beta-convergence.

Equation (8) is estimated for the same periods as mentioned above to observe conditional convergence of development levels within the economic grouping.

Table 2 : Results of the conditional β -convergence.

		C	Ln(Y_{it-k})	Log(G)	Log(INV)	PMA	R^2	\bar{R}^2
1990-2002	Coeff	0.009	0.112	- 0.72	0.75	0.88	0.382	0.309
	t-stat	0.007	0.78	- 1.74****	3.42*	2.97*		
	Prob	0.99	0.44	0.09	0.002	0.006		
1990-1994	Coeff	18.26	- 2.17	- 0.051	0.139	4.49	0.684	0.672
	t-stat	11.01*	- 9.71*	- 0.129	0.68	10.04*		
	Prob	0.000	0.002	0.9	0.52	0.000		
1995-2002	Coeff	0.21	0.26	- 1.603	1.24	0.53	0.524	0.445
	t-stat	0.141	1.47	- 2.48**	4.66*	1.67		
	Prob	0.888	0.152	0.02	0.001	0.106		
1998-2002	Coeff	20.57	- 2.33	- 2.54	0.773	0.799	0.660	0.546
	t-stat	2.72**	-2.24**	- 3.76*	1.977***	2.05***		
	Prob	0.02	0.04	0.00	0.07	0.06		

Note: *, ** and *** imply significance at 1, 5 and 10% levels respectively.

The results in table 2 show no tendency of conditional beta-convergence during the period 1990-2002 and 1995-2002. The GDP per capita of the beginning of the period doesn't have the expected sign and isn't significant. Meanwhile, in the time interval of 1990-1994 and 1998-2002, there is conditional convergence towards a steady state. Our variable of interest is significant at 1% and 5% respectively.

As far as other variables are concerned, government expenses are significant at 10% between 1990-2002, at 5% between 1995-2002 and finally at 1% between 1998-2002. Meanwhile the coefficient of this variable is negative, which contrasts with the expected sign. This is not very surprising in connection with the literature since many works have had a negative sign for government size (Landau, 1983, 1986, Barro, 1991a, 1991b, Easterly and Rebelo, 1993 Koester and Kormendi, 1989). Meanwhile the coefficients are larger than we would have expected. Dela Fuente (1997b) had a coefficient of similar size and thought of a problem of endogeneity. Other more precautionary investigations of de la Fuente (1997b) led to the conclusion that the results aren't seemingly influenced by a reciprocal causality. This

means that an increase in the size of public sector seems to have an important negative effect on the level of GDP per capita, even when the factors of capital accumulation are considered (de la Fuente, 1998). This analysis remains dumb on the mechanism that causes the above raised effects.

Investments which represent a source of capital accumulation has the expected sign for all the periods and is significant at 1% in 1990-2002 and 1995-2002, and 10% in 1998-2002. This variable isn't significant between 1990-1994.

The dummy introduced to capture technological catch-up in certain economies of the grouping has the expected sign in all the periods. It is significant at 1% in 1990-2002 and 1990-1994 and at 10% in 1998-2002. The magnitude of the coefficient shows that the contribution of technology diffusion to the growth of the poor countries of the group was very important at the beginning of the period (around 88%) and regressed with time.

In general, our two models have helped to highlight the importance of economic cycles and unilateral and preferential reforms on absolute and conditional convergence expressed in terms of economic catch-up within the integration zone. We have also highlighted the contribution of technological diffusion within the grouping, of capital accumulation and of the weight of public sector to economic growth of the less advanced economies.

Meanwhile, judged on the basis of the adjusted \bar{R}^2 , the performance of our models isn't very good. However, in the case of absolute beta-convergence, the value of \bar{R}^2 we obtained aren't far from those in the literature.

4.3 Sigma-convergence.

The main objective here is to know whether the economic catch-up phenomenon observed in some sub-periods in the CEMAC sub-region has enhanced the closing-up of development levels of member states in the grouping. In this respect, we have chosen a measure of inequality, which is the standard deviation of GDP per capita in the grouping. It helps to highlight the importance of the dispersion of development levels during the period 1990-2002 with respect to the year considered as the beginning of the period of the analysis.

The results of the calculation show that the trend of the closing-up of the standards of living of the different member countries of the sub-region was not constant. The years following the signing of the integration accords were characterized by a divergence of the standards of living of member economies, captured here by an increase in the standard deviation of GDP per capita from 1200 in 1970 to 2427 in 1975. The level of inequality in the sub-region thus remained high till 1985 when it started decreasing. Between 1985 and 1990, the standards of living closed-up at a speed of about 0.18% per year. This speed increased to 2.44% between 1990-1994 and finally to 3.4% in 1998-2002. It appears that the closing-up speed was rapid in the sub-periods where there has been economic catch-up between the poor and the rich countries of the group. This confirms the fact that beta-convergence is a condition for sigma-convergence.

5. Conclusion.

This paper aimed at testing the "convergence club" hypothesis in CEMAC at the down of waves of reforms of the 1980s and 1990s. It has investigated whether regionalism in CEMAC is bound by the characteristics of African economies to always experience divergence of income levels of member countries. An empirical model to test for absolute and conditional convergence was developed, and two convergence equations from a log-linear approximation to a simple growth model were derived. This model tries to capture the main immediate determinants of the growth of income per capita. The two equations were estimated for a panel of member states in the grouping under consideration.

With respect to absolute convergence, the results show that over the periods of analysis, our variable of interest, the level of GDP per capita at the beginning of the period has the expected sign. It is significant at 10% between 1990-2002, which is indicative of a weak economic catch-up between the less advanced, and the more advanced economies of the grouping. Between 1990-1994, absolute convergence is more pronounced since GDP per capita is significant at 1%. Meanwhile during 1995-2002, it has the

expected sign but isn't significant. Finally, between 1998-2002, our main variable denotes absolute beta-convergence.

In general, the results of the estimation denote the importance of the unilateral as well as multilateral reforms in the integration zone. As such, the reforms undertaken by the CEMAC member states in the context of S.A.P and within the framework of the preferential liberalization have contributed to the narrowing up of the standard of living gaps in the sub-region. These results make the idea of convergence club based on the initial levels of productive technology and GDP per capita relative.

With regard to conditional convergence, the results in table 2 show no tendency of conditional beta-convergence during the period 1990-2002 and 1995-2002. Meanwhile, in the time intervals of 1990-1994 and 1998-2002, there is conditional convergence towards a steady state. Our variable of interest is significant at 1% and 5% respectively.

Concerning other determinants of growth, government expenses are significant at 10% between 1990-2002, at 5% between 1995-2002 and finally at 1% between 1998-2002. Meanwhile the coefficient of this variable is negative, which contrasts with the expected sign. This is not very surprising in regards of the literature since many works have had a negative sign for government size (Landau, 1983, 1986, Barro, 1991a, 1991b, Easterly and Rebelo, 1993 Koester and Kormendi, 1989). Also the coefficients are larger than we would have expected. Investments which represent a source of capital accumulation has the expected sign for all the periods and is significant at 1% in 1990-2002 and 1995-2002, and 10% in 1998-2002. This variable isn't significant between 1990-1994. The dummy introduced to capture technological catch-up in certain economies of the grouping has the expected sign in all the periods. It is significant at 1% in 1990-2002 and 1990-1994 and at 10% in 1998-2002. The magnitude of the coefficient shows that the contribution of technology diffusion to the growth of the poor countries of the group was very important at the beginning of the period (around 88%) and regressed with time.

With respect to sigma-convergence, the standard deviation of the GDP per capita of member countries in the sub-region at the beginning and at the end of the period was computed. The comparison of the two values of this inequality measure shed light on whether the dispersion of real per capita income across member economies tends to fall over time (σ - convergence).

The results of the calculation show that the trend of the closing-up of the standards of living of the different member countries of the sub-region was not constant. The years following the signing of the integration accords were characterized by a divergence of the standards of living of member economies, captured here by an increase in the standard deviation of GDP per capita from 1200 in 1970 to 2427 in 1975. The level of inequality in the sub-region thus remained high till 1985 when it started decreasing. Between 1985 and 1990, the standards of living closed-up at a speed of about 0.18% per year. This speed increased to 2.44% between 1990-1994 and finally to 3.4% in 1998-2002. It appears that the closing-up speed was high in the sub-periods where there has been economic catch-up between the poor and the rich countries of the group. This confirms the fact that beta-convergence is a condition for alpha-convergence.

In general our findings in this paper lend support to the "convergence club" defined according to policy choices rather than initial levels of human capital. They confirm our theoretical hypothesis that unilateral and preferential suppression of tariff and non-tariff barriers favors the convergence of per capita incomes and reduces the dispersion of real per capita income levels of partners in the sub-region.

The main economic policy implications of these findings are that more attention should be paid to open policies in all regional integration groupings that cover less advanced economies. The era of isolated tiny national economies has to give way to strategic alliances that harness knowledge and resource-based comparative advantages through integration. This however does not come effortless and at no cost. In the short run, a lot of dedicated and hard work must be put in first. Some decent economic reforms have already been going on. The next step should be to sustain the reform measures unilaterally as well as multilaterally. This would hopefully give a good chance to developing countries in particular to achieve convergent growth and halve poverty as envisaged.

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