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Revisiting the theory of optimum currency areas: Is the CFA franc zone sustainable?♦

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Abstract: This paper aims at explaining why the CFA countries have successfully maintained a currency union for several decades, despite failing to meet many of optimum currency area criteria. We suggest that the CFA zone, while not optimal, has been at least sustainable. We test this sustainability hypothesis by relying on the Behavioral Equilibrium Exchange Rate (BEER) approach. In particular, we assess and compare the convergence process of real exchange rates towards equilibrium for the CFA zone countries and a sample of other sub-Saharan African (SSA) countries. Our findings evidence that internal and external balances have been fostered and adjustments facilitated in the CFA zone as a whole—compared to other SSA countries—as well as in each of its member countries.

Keywords: Equilibrium exchange rates, CFA zone, Optimum Currency Areas, currency union sustainability.

JEL Classification: F31, F33, C23.

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1. Introduction

Created in 1945 during the Bretton-Woods agreements, the CFA franc (*Franc des Colonies Françaises d'Afrique*) initially aimed to help France to recover its "special links" with its colonies undermined by World War II. Political independencies in the 1960s have resulted in a reorganization of the monetary agreement, leading to the introduction of two monetary unions with their own currency referred to the CFA franc. The two currencies, initially pegged to the French franc, have been both pegged to the euro at the same parity of 655.96 CFA per euro since the launch of the European currency. However, they are not directly convertible between each other. The first CFA franc (*Franc de la Communauté Financière de l'Afrique*), issued by the Central Bank of West African States,[1] is the legal tender of the West African Monetary Union (WAEMU),[2] while the second one (*Franc de la Coopération Financière Africaine*), issued by the Bank of Central African States, is the legal tender of the Central African Monetary Area (CAEMC).[3] The convertibility of the CFA francs is however unlimited relative to euro and totally granted by the French Treasury. While capital flows are free inside the franc zone,[4] exchange-rate reserves must be centralized in the two central banks, and at least 65% must be deposited in a special operating account held by the French Treasury. Moreover, France has a decisional power in the CFA zone since it is represented by a delegate in the executive boards of the two central banks.[5]

The monetary agreement has endured over time; despite significant events that could call it into question such as political independencies in the 1960s, the strong devaluation of the CFA franc in 1994 or the launch of the single currency in Europe. It has thus often been a point of reference for other countries in the area, even though it is not the only experience regarding regional monetary integration.[6]

[1] *Banque Centrale des Etats d'Afrique de l'Ouest*.
[2] The West African Economic and Monetary Union is composed by Benin, Burkina Faso, Guinea Bissau, Ivory Coast, Mali, Niger, Senegal, and Togo.
[3] The Central African Economic and Monetary Community is composed by Cameroon, Central African Republic, Chad, Congo Brazzaville, Equatorial Guinea, and Gabon.
[4] In fact since the two CFAs are not directly convertible, free capital movements exist only between France and each issuance area.
[5] To go further on the agreements administering the operation of the franc zone, which rule the CFA franc, see Hajimichael and Galy (1997), or Banque de France (2002).
[6] The other monetary union is the Common Monetary Area (CMA) created in the 1920s. It is composed by the Republic of South Africa with two former British colonies, Lesotho and Swaziland, and Namibia.

However, the CFA zone has also been challenged and whether it has been beneficial or detrimental over the past has been much discussed and analyzed.[7] Usual concerns refer to the economic rationale for this monetary union, i.e. the relevance for these countries to share the same currency, regarding the challenges of growth and development in the area. This issue has been mainly studied by referring to the Optimum Currency Area (OCA) criteria. However, empirical studies have been unable to draw clear-cut conclusions on the optimality of the CFA zone. This can be obviously linked to the limitations of the OCA framework in explaining the actual formation of monetary unions. Thus, some economists such as Goodhart (1995) have challenged the relevance of economic criteria on the grounds that currency area formation is mainly dominated by political considerations. However, even though the OCA analysis can be challenged on political grounds, it has also been frequently criticized for providing several heterogeneous properties which are not necessarily linked and are unlikely to be met. Moreover, Tavlas (1994) mentions a lack of consensus on the weight given to each of those criteria which has resulted in a "problem of inconclusiveness". Indeed, conclusions appear very sensitive to the criteria that are being applied (see Willett, 2001, for a critical review of the OCA theory).

In order to overcome the drawbacks of the OCA framework, we propose an alternative approach that highlights the sustainability of the CFA zone rather than its optimality. Thus, our aim is not to provide an additional criterion, neither a replacement for OCA criteria, but rather to develop an approach that focuses on economic conditions that have ensured the durability of the exchange-rate commitment over time. Indeed, despite the CFA zone countries failed to meet several major criteria for being an OCA, the currency union has survived, suggesting that the CFA zone, while not being optimal, has been at least sustainable. More specifically, we define a sustainable currency area as a monetary union in which real exchange rates do not deviate persistently from their equilibrium paths. Indeed, such currency union can be considered as fostering internal and external balances and/or facilitating the adjustment to shocks and then be qualified as sustainable. As illustrated by the recent experience of the EMU, where real exchange rates differences have strongly increased (Coudert et al., 2012), the challenge faced by any monetary union is to prevent unacceptable economic disequilibrium from persisting in any part of the monetary area.

[7] See references in Section 2.

We test this sustainability hypothesis by analyzing real exchange rates dynamics on the grounds that, as real exchange rates affect and are affected by all other policies, their behavior can then give a good indication of the functioning of an exchange-rate regime. We rely on the Behavioral Equilibrium Exchange Rate (BEER) approach to estimate the convergence process of real exchange rates towards equilibrium. In particular, we check whether this convergence process has been more effective in the CFA franc zone, compared to a control group. The latter includes a sample of other sub-Saharan African (SSA) countries which share most of the salient features of the CFA zone countries (commodities producers, low or middle-income countries), except the exchange-rate regime.

Relying on annual data over the 1985-2009 period, three main findings emerge from our analysis. We first evidence that real exchange rates converge toward their equilibrium level faster in the CFA zone than in other SSA countries. Secondly, our results show the key role of fundamentals in this convergence process in the CFA zone, while in the other SSA countries, the adjustment mainly stems from the exchange-rate policy. Finally, this result still holds when individual members of the CFA zone are considered, suggesting that the CFA agreements have been sustainable not only for the whole CFA area but also for each of its member countries.

The rest of the paper is organized as follows. Section 2 points the limits of the OCA criteria for the CFA franc zone and presents our approach in terms of sustainability. Section 3 describes the econometric methodology and displays our empirical results for the whole CFA zone. Section 4 gives additional details on the sustainability issue by providing a country-by-country analysis. Section 5 concludes.

2. The CFA zone: from non optimality to sustainability

The CFA zone looks back to a history of more than 60 years of monetary integration. Its birth resulted from a political decision between France and its former SSA colonies, and was therefore exogenous to economic considerations. In particular, it was created while the economic requirements needed for forming a monetary area were not satisfied (Dufrénot and Sugimoto, 2009). However, although these requirements were not meet *ex ante*, whether they could be verified *ex post* has been widely debated in the literature. This issue has been mainly studied by applying the OCA criteria to the CFA franc zone.

2.1. The CFA zone and the optimality criteria

Within this literature, some authors have focused on the regional or idiosyncratic nature of shocks facing the member countries. Estimating a VAR model, Fielding and Shields (2001) show that the CFA countries have been characterized by symmetric price shocks while output shocks seem to be asymmetric. Zhao and Kim (2009) use a similar methodology while examining a richer set of shocks. They find that domestic outputs of the CFA franc zone countries are strongly influenced by country-specific shocks while regional shocks are far less important than in EMU countries. The authors conclude that the CFA franc zone countries are structurally different from each other and are thus more likely to be subject to asymmetric shocks. Bénassy-Quéré and Coupet (2005) carry out a cluster analysis which allows them to assess the similarity (symmetry) between countries. Their findings show that CAEMC and WAEMU countries do not belong to the same clusters, indicating structural differences inside the CFA zone. Following the framework developed by Bayoumi and Eichengreen (1997) for European countries, Bangaké (2008) derives an OCA index for the CFA zone countries by regressing the bilateral nominal exchange-rate volatility on variables used in the standard literature of OCA (asymmetric disturbances to output, dissimilarity of the commodity composition of exports, trade linkages and size). His results reveal structural convergence between the WAEMU countries, indicating an optimal currency area, while the CAEMC economies tend to diverge.

Studies which investigate trade-generating effects of the currency union reach more optimistic results. Indeed, the common currency seems to have promoted closer trade links and more synchronized cycles (Masson and Pattillo, 2004; Tsangarides et al., 2009). However, differentiating the effects of hard pegs (currency unions) from conventional soft pegs, Qureshi and Tsangarides (2012) find more nuanced results: the trade-generating effect of pegs is at least as large for Africa as that of currency unions, suggesting that trade-generating effects are not a specific feature of currency unions in African countries. Still, even though progress has been made in this area, the lack of product diversification still results in a very low ratio of intra-zone trade. According to Yehoue (2006), it stood at about 9.6 percent over the 1960-2004 period for the CFA zone, compared to an average of 60 percent for the European Union. Finally, another factor often posited to help the workings of a currency area is risk-sharing, which in turn would be encouraged by the establishment of a currency union. However, this does not appear to have been a major factor within the CFA countries which are still characterized by a low integration of credit and capital markets (Yehoue, 2006).

These mitigated conclusions are in sharp contrast with the optimistic vision according to which the CFA zone has enhanced credibility and disciplined national monetary and fiscal policies of its member countries.[8] Indeed, as those countries lack a well-developed financial infrastructure including sophisticated financial institutions and broad and deep markets for foreign exchange, pegs can provide a simple and credible anchor for monetary policy. Likewise, countries lacking internal discipline for monetary policy (as revealed by a history of high and variable inflation) stand to gain more from giving up their currencies, provided that the anchor country is able to commit to sound monetary policy (Alesina and Barro, 2002). The analysis of monetary and fiscal performances in those countries tends to corroborate this view, by evidencing lower inflation rates and more fiscal discipline than for the non-CFA countries. Devarajan and de Melo (1990) find that the average inflation rate of the CFA countries continued to be lower than other African economies in the 1980s while their performance was noticeably worse in terms of GDP, export growth and investment levels. This result has been supported more recently by Yehoue (2006), who evidences that the CFA member countries have outperformed the non-CFA countries in terms of inflation over the 1960-2004 period and brought down their fiscal deficit after the 1994-devaluation. The CFA zone countries have also benefited from a more stable economic and financial environment (Masson and Patillo, 2004), that has conventionally been associated to their irrevocable commitment to a fixed exchange-rate regime and guaranteed convertibility of their currency.

These results demonstrate the difficulties in obtaining clear-cut conclusions when the OCA analysis is mobilized in order to determine the optimum area for a single currency. As emphasized by Devarajan and Rodrik (1991), this problem of inconclusiveness illustrates rather the tradeoffs between inflation benefits and output costs involved by the currency union membership. Indeed, while in the long run one cannot trade off higher inflation for more rapid growth and lower unemployment, tradeoffs still exist in the short run and thus there is still a plausible (if controversial) case for using the nominal exchange rate as an adjustment mechanism to help soften the effects of shocks. Developing a formal framework for clarifying those tradeoffs, Devarajan and Rodrik (1991) find that, for most CFA members, the inflation benefits do not appear to have been large enough to offset the costs on the output side.

[8] Strictly speaking, credibility does not explicitly belong to the OCA theory. However, the establishment of EMU led to some revisions of the analytical framework of the theory with a reconsideration of the effective costs and benefits from monetary integration. The credibility issue is clearly part of this reassessment, as illustrated by DeGrauwe (1996, 2000, 2011) among others arguing that credibility plays the key role in explaining the success or the collapse of such unions. In particular, according to this author, credibility has played the key role in explaining the European Monetary System crisis in 1992-1993.

However, they recognize that their results should be interpreted with cautious as they have ignored some important features of the currency union—savings obtained by pooling reserves, attractiveness to foreign investors of a convertible currency, and the special relationship with France—and made also strong hypotheses (CFA policy makers would have followed the appropriate exchange-rate policies in response to terms of trade shocks).

In summary, there is little support for the hypothesis that strong endogenous responses to the currency union have been a major factor in explaining the durability of the CFA currency bloc. Even more, the OCA literature seems to provide no clear evidence of the readiness of the CFA members to have established a lasting and well functioning currency union. What is surprising is that, despite failing to meet many of these criteria, those countries have successfully maintained a currency union for several decades.

2.2. Sustainability and real exchange-rate behavior

In order to solve this puzzle, we adopt an alternative approach focusing on the sustainability of the CFA zone rather than on its optimality. Indeed, while the CFA zone cannot be qualified as an optimal currency area, its durability over time tends to show that it has been at least sustainable. Our aim is thus to understand why this monetary agreement has been economically viable, which can be considered as a necessary condition to the maintenance of the agreement. In this respect, one striking feature of the CFA countries is that they have been able to adjust to the instability generated by heavy reliance on agricultural products and raw materials, without using the nominal exchange rate as an instrument of adjustment, except for the CFA franc devaluation in 1994.

Figures 1 and 2 in the Appendix report the evolution of the real (REER) and nominal (NEER) effective exchange rates for the CFA zone countries and for a sample of sub-Saharan African countries. Three periods can be distinguished. From the mid 1980s to 1993, REERs in almost all CFA countries appreciated, stemming from an appreciating trend of their nominal effective exchange rates primarily caused by the appreciation of the French franc vis-à-vis the US dollar (Elbadawi and Majd, 1996; Coleman, 2008), and from a real depreciation of their main trade African partners. This trend was reversed with the devaluation of the CFA franc in 1994 that allowed REERs to depreciate and to stabilize. From 2000 to 2009, NEERs again appreciated along with the appreciation of the euro, leading to an appreciating trend also for the REER. Compared to the CFA zone, the non-CFA countries enjoyed less stable real effective exchange rates over the period considered. Indeed, mainly in response to a fall in their terms of trade, deep devaluations occurred in those countries (Broda, 2004) and led to a much higher variation in real exchange rates (Figure 2).

However, the higher stability of real and nominal exchange rates of the CFA zone does not allow concluding whether the currency union has fostered the adjustment of domestic and external sectors of those countries. Indeed, small price adjustments may have occurred over the period, leading to relatively stable real effective exchange rates at the expense of unstable outputs. In order to handle this issue, we rely on equilibrium exchange rates approaches, which involve establishing whether real exchange rates dynamics have been consistent with the equilibrium paths of economies. In this respect, an exchange-rate regime in which the convergence process of real exchange rates toward their equilibrium level is effective can be considered as fostering internal and external balances and/or facilitating the adjustment to shocks and then be qualified as sustainable.

We rely on the Behavioral Equilibrium Exchange Rate (BEER) approach which allows the real exchange rate to fluctuate around a time-varying equilibrium value. In this approach, the equilibrium real exchange rate corresponds to the real exchange rate that ensures the internal and the external equilibrium of an economy (Edwards, 1989). Its equilibrium path is then driven in the long run by its relationship with a set of long-run fundamentals. Moreover, as our focus is to evaluate the convergence process of real exchange rates towards equilibrium, this approach is more appropriate than the Fundamental Equilibrium Exchange Rate (FEER) approach as the short-run dynamics of real exchange rates can be captured by a vector error correction model derived from this long-term relationship. Thus the BEER approach allows addressing explicitly the issue of the dynamics of real exchange-rate adjustment and their speed of convergence towards equilibrium (Soto and Elbadawi, 2008).

3. Assessing the sustainability of the CFA zone

Following the framework developed by Coudert et al. (2011) for commodity producers, we consider a BEER model that includes relevant determinants of real exchange rates for CFA and other SSA countries: (i) a Balassa-Samuelson effect to account for productivity differences across countries, (ii) the net foreign asset position in percentage of GDP as a proxy for the external balance, and (iii) terms of trade.

The long-run value of the REER is thus represented by the following equation:

$$reer_{it} = \mu_i + \beta_1 prod_{it} + \beta_2 nfa_{it} + \beta_3 tot_{it} + \varepsilon_{it} \qquad (1)$$

where subscripts i ($i = 1, \ldots, N$) and t ($t = 1, \ldots, T$) respectively represent country and time indices. $reer_{it}$ is country i's real effective exchange rate, $prod_{it}$ its PPP GDP per capita relative to its trade partners, nfa_{it} its net foreign asset position in percentage of GDP, and tot_{it} its terms of trade. ε_{it} is an error term and μ_i accounts for country-fixed effects. All variables are expressed in logarithm, except the net foreign asset position.

3.1. Data

We consider yearly data over the 1985-2009 period for two samples of countries:

- The panel of CFA countries that includes the following 13 economies: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Equatorial Guinea, Gabon, Mali, Niger, Senegal, and Togo.[9]

- The panel of other SSA countries including—given data considerations—15 economies: Botswana, Burundi, Congo Democratic, Gambia, Ghana, Malawi, Mauritius, Mauritania, Mozambique, Nigeria, Rwanda, Sierra Leone, Sudan, Uganda, and Zambia.

The real effective exchange rate for each country i is calculated as a weighted average of real bilateral exchange rates against the ten main i's trading partners. Bilateral rates are derived with consumer price indices. The weights are extracted from the DOTS database of the International Monetary Fund (IMF), they are normalized to sum to one, and correspond to the average share of each partner in imports and exports of goods and services over the 1996-2009 subperiod. Nominal exchange rates and consumer price indices are taken from the World Development Indicators (WDI) database (World Bank).

The proxy for the Balassa-Samuelson effect corresponds to the real PPP GDP per capita of country i relative to its ten main trading partners, using the same weights as for the calculation of the REER series. PPP GDP per capita series are extracted from WDI. The net foreign asset position for each country i is extracted from the updated and extended version of dataset constructed by Lane and Milesi-Ferretti (2007), and expressed as a percentage of the country

[9] Guinea Bissau is not taken into account because it has been a member of WAEMU only since 1997.

i's corresponding GDP (source of GDP data: IMF, WEO database and WDI). Turning to the terms of trade, we follow Cashin et al. (2004) and Coudert et al. (2011). For each country, terms of trade are a weighted average price of the three main commodities exported by the country deflated by the unit value of OECD countries' manufactured exports. The weights of each commodity in the countries' exports are calculated from the International Trade Center database over the 2001-2009 period,[10] and commodity price data are taken from IMF, WEO database.

3.2. Panel unit root and cointegration tests

Before estimating Equation (1), we have to determine the order of integration of each variable and then to test the existence of a cointegrating relationship between the REER and its fundamentals. To this end, we rely on recent panel unit root and cointegration tests. More specifically, we consider third generation tests that allow accounting for both cross-sectional dependencies and structural breaks in the series. Accounting for these characteristics is particularly important in our context. Indeed, given that the considered countries are likely to share similar properties—especially those of the CFA zone—not accounting for potential cross-section correlations may lead to important size distortions (Pesaran, 2004). In addition, various countries of our sample have undergone breaks in the dynamics of their real exchange rates, such as the devaluation of the CFA franc in 1994. It is thus necessary to account for this property to derive reliable results when implementing the tests.

We consider the third generation panel unit root test proposed by Carrion et al. (2005). Overcoming the deficiencies of the previous generations' tests,[11] it is based on the null hypothesis of stationarity, and accounts for multiple unknown structural breaks in mean and/or in trend in the individual time series. Let $y_{i,t}$ be a stochastic process described as follows:

$$y_{i,t} = r_{i,t} + \beta_i t + \varepsilon_{i,t}$$

$$r_{i,t} = \sum_{k=1}^{mi} \theta_{i,k} D\left(T_{b,k}^{i}\right)_t + \sum_{k=1}^{mi} \gamma_{i,k} DU_{i,k,t} + r_{i,t-1} + u_{i,t} \qquad (2)$$

[10] See Table A1 in Appendix.

[11] For details about previous generations' panel unit root tests, see Banerjee (1999) and Hurlin and Mignon (2007) among others.

where $r_{i,t}$ is a random walk with deterministic components, $u_{i,t}$ is i.i.d (0, $\sigma^2_{u,i}$), $\varepsilon_{i,t}$ is i.i.d (0, $\sigma^2_{\varepsilon,i}$), $u_{i,t}$ and $\varepsilon_{i,t}$ are supposed to be independent, *i* denoting the individual dimension and *t* the time dimension of the panel. The deterministic components $D\left(T^i_{b,k}\right)_t$ and $DU_{i,k,t}$ are dummy variables defined respectively as 1 for $t = T^i_{b,k} + 1$ and 0 otherwise, and 1 for $t > T^i_{b,k}$ and 0 otherwise, with $T^i_{b,k}$ the *k*-th date of the break for the *i*-th individual, $k = 1, \dots, m_i$, $m_i \geq k$; m_i being the maximum number of structural breaks.

Under the null hypothesis of stationarity, $\sigma^2_{u,i} = 0$, and the model can be written as follows:

$$y_{i,t} = r_{i,0} + \sum_{k=1}^{mi} \theta_{i,k} DU_{i,k,t} + \beta_i t + \sum_{k=1}^{mi} \gamma_{i,k} DT^*_{i,k,t} + e_{i,t} \qquad (3)$$

where $e_{i,t} = \sum_{j=1}^{t} u_{i,t} + \varepsilon_{i,t}$; with $DT^*_{i,k,t} = t - T^i_{b,k}$ for $t > T^i_{b,k}$ and 0 otherwise. Consequently, if $\sigma^2_{u,i} = 0$ then $e_{i,t} = \varepsilon_{i,t}$, and $y_{i,t}$ is stationary; otherwise $y_{i,t}$ is integrated. Two models are encompassed in this general specification. The first one—"model with constant"—is a model with individual effects and shifts in the mean. In this case, the coefficients of trend variables must be equal to zero ($\beta_i = \gamma_{i,k} = 0$). The second model—"model with constant and trend"—also includes temporal effects and shifts in the individual time trend. In this model, the coefficients of trend variables are different from zero ($\beta_i \neq 0$ and $\gamma_{i,k} \neq 0$).

The test statistic $Z(\lambda)$ is given by:

$$Z(\lambda) = \frac{\sqrt{N}(LM(\lambda) - \bar{\xi})}{\bar{\varsigma}} \qquad (4)$$

where $LM(\lambda)$ is the LM statistic proposed by Carrion et al. (2005), depending on the structure of the long-run variance of the residuals which can be homogeneous or heterogeneous.[12] λ represents the dates of breaks that differ from one country to another. The parameter $\bar{\xi}$ is the simple mean of *N* individual mean values (ξ_i) of a standard Brownian motion, and $\bar{\varsigma}^2$ is the

[12] For details, see Carrion et al. (2005). Using Monte Carlo experiments, the authors show that the LM statistic with homogeneous long-run variance is more relevant for small sample sizes. Accordingly, we only provide results for the homogeneous variance case. Complete results are available upon request to the authors.

simple mean of N corresponding individual variances (ς_i^2). Under the null hypothesis, $Z(\lambda)$ follows weakly a standard normal distribution.

Table 1 displays the results of Carrion et al. (2005)'s unit root test for CFA and other SSA countries. Our findings clearly show that the null hypothesis of stationarity is rejected for all variables.

Table 1. Unit root tests for CFA zone and other SSA countries

Variables	CFA		Other SSA	
	With constant	*With constant and trend*	*With constant*	*With constant and trend*
Reer	7.333***	18.571***	-0.130	5.921***
Prod	4.314***	17.847***	9.193***	8.256***
Nfa	3.506***	15.915***	8.141***	15.381***
Tot	7.882***	8.683***	6.445***	32.007***

*Notes:***, **, * indicate the rejection of the null hypothesis of stationarity at the 1%, 5% and 10% significance level respectively.* m_i *= 2, and the optimum break point is chosen by considering the modified Schwarz information criterion (LWZ) of Liu, Wu and Zidek (1997). The homogeneous long-run variance case is retained for assessing the LM statistics.*

We now proceed to test the existence of a long-run relationship between the REER and its fundamentals. To this end, we follow the methodology proposed by Basher and Westerlund (2009) consisting in applying a third generation unit root test on the residuals of the estimated cointegrating relationship.[13] Consequently, we first estimate Equation (1)—with and without trend—for the CFA zone and other SSA countries using the panel fixed-effect estimator (within), and then apply Carrion et al. (2005)'s unit root test to the corresponding residuals.

As shown in Table 2, there exists a stable long-run relationship between real effective exchange rates and their fundamentals for the two samples of countries.

[13] According to Basher and Westerlund (2009), this method is very similar to the one proposed by Westerlund (2005). It has the advantage of not requiring an efficient estimator of the cointegration vector under the null (see Basher and Westerlund, 2009). In addition, it allows us to apprehend the stability of the cointegrating relationship.

Table 2. Cointegration tests for CFA zone and other SSA countries

	CFA		Other SSA	
	With constant	*With constant and trend*	*With constant*	*With constant and trend*
Statistic	0.031	1.559*	0.080	-0.546
p-value	0.487	0.059	0.468	0.707

Note: See Table 1.

3.3. Adjustment of real exchange rates to their equilibrium level

We now proceed to the estimation of Equation (1) and analyze the adjustment speed of real exchange rates to their equilibrium value. We consider the following error-correction model, which is a re-parameterization of an ARDL(p,q)[14] model:

$$\Delta reer_{i,t} = \theta_i \left(reer_{i,t-1} - \beta_{0i} - \beta_i^{'} x_{it} \right) + \sum_{j=1}^{p} \lambda_{ij} \Delta reer_{it-j} + \sum_{j=0}^{q} \delta_{ij}^{'} \Delta x_{it-j} + \varepsilon_{it} \qquad (5)$$

where θ_i is the error-correction term measuring the speed of adjustment, x_{it} is the *k x 1* (here *k*=3) vector of explanatory variables, and β_i and δ_i respectively denote the long-run and short-run coefficients.

We may expect that the substantial 1994 devaluation of the CFA franc and deep depreciations occurring in other SSA countries altered the adjustment process of real exchange rates. To test those hypotheses, Equation (5) is also estimated by considering three additional variables: (i) the dummy DUM94 which accounts for the sharp devaluation of the CFA franc in 1994 for the CFA zone, (ii) a dummy variable DUM for the other SSA countries to account for specific deep devaluations—of the same magnitude as the devaluation of the CFA franc (i.e. a depreciation of nominal effective exchange rate higher than 50%)—that have characterized those countries, and (iii) the variation of the NEER to account for the influence of the exchange-rate regime.

To estimate Equation (5) and its variants, we use the pooled mean group (PMG) estimator developed by Pesaran et al. (1999) which provides consistent estimation of the coefficients. Compared to other techniques—Fully-Modified OLS or Dynamic OLS, for instance—this estimator has the advantage to allow the short-run coefficients to differ freely across countries

[14] ARDL: autoregressive distributed lag. Given the time dimension of our panel, we retain $p = 1$, and $q \leq 1$.

while the long-run coefficients are restricted to be the same for all individuals. Results are summarized in Table 3.[15]

Table 3. PMG estimations

	CFA countries			Other SSA countries		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Prod	0.425***	0.375***	0.069*	-0.263*	-1.060***	-1.234***
	(0.094)	(0.083)	(0.041)	(0.153)	(0.198)	(0.218)
Nfa	0.217***	0.100**	-0.013	0.409***	0.114**	0.346***
	(0.050)	(0.043)	(0.041)	(0.054)	(0.052)	(0.072)
Tot	0.097**	0.096**	0.192***	-0.003	0.530***	0.856***
	(0.044)	(0.041)	(0.042)	(0.058)	(0.083)	(0.086)
Error-correction term	-0.328***	-0.229***	-0.190***	-0.286***	-0.187***	-0.075
	(0.047)	(0.042)	(0.024)	(0.038)	(0.059)	(0.053)
DUM					-0.212**	
					(0.087)	
Δ*neer*			0.658***			0.585***
			(0.020)			(0.092)
DUM94		-0.330***				
		(0.025)				
Constant	1.801***	1.210***	0.744***	1.252***	-0.149**	-0.174
	(0.264)	(0.219)	(0.092)	(0.172)	(0.070)	(0.184)
Half-life deviation	1.744	2.665	3.289	2.058	3.348	-
Observations	312	312	312	360	360	360

*Notes: Standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Let us first consider the standard specifications defined by Equation (5) and displayed in columns (1) and (4). For the CFA countries, the coefficients of the long-run relationship are statistically significant and their signs are consistent with what is expected: an increase in terms-of-trade leads to an appreciation of the equilibrium exchange rate. The results also confirm the existence of the Balassa-Samuelson effect in the CFA zone, since an increase of the relative GDP per capita implies an appreciation of the equilibrium exchange rate. Finally, an improvement of the net foreign position also causes the equilibrium exchange rate to appreciate. The results for the other SSA countries in the long run show the absence of a terms-of-trade effect since the associated coefficient is non significant, and a weak Balassa-Samuelson effect—the corresponding coefficient being significant only at the 10% level.

[15] We only report the estimates of the long-run part of the model.

Finally, only the net foreign position exerts in the long run a positive impact on the real effective exchange rate. Regarding the convergence speed of real exchange rates towards equilibrium, the correction of half of real exchange-rate deviations requires on average 3.5 months more for the other SSA countries than for the CFA zone countries. Thus, despite pegged exchange rates, real exchange rates adjust more quickly in the CFA zone, going in favor of the sustainability of this zone.

Let us now investigate whether this adjustment process stems mainly from the behavior of fundamentals or from changes in nominal exchange rates. Accounting for the dummies DUM94 and DUM (columns (2) and (5)), our results still hold: the adjustment speed of real exchange rates is obviously slower in the two areas, but it is still faster in the CFA zone (0.229) compared to other SSA countries (0.187). Moreover, despite taking into account the effects of strong devaluations or depreciations, the adjustment—while slower—remains significant, suggesting that the convergence process of real exchange rates towards equilibrium mainly stems from the behavior of economic fundamentals.

To investigate more deeply this issue, we finally account for the effects of the exchange-rate policy by replacing the dummy variables by changes in nominal effective exchange rates. Results, displayed in columns (3) and (6), show that the error-correction term remains significant, confirming the key role played by economic fundamentals in the exchange-rate adjustment process in the CFA zone. This may explain why the real appreciation of the CFA franc, in the last decade, did not translate into real exchange rate overvaluation for the whole zone (see Abdih and Tsangarides, 2010; and Couharde et al., 2011). In contrast, for the other SSA countries, the adjustment of real exchange rates is mainly driven by movements of the nominal exchange rate, as shown by the error-correction term which is no more significant.

Overall, our findings put forward important differences between CFA and other SSA countries. In the CFA zone, real exchange rates converge toward their equilibrium level faster than in other SSA countries. These results are not surprising as they have been already evidenced for industrialized and developing countries. Rogoff (1996) observes that the speed of real exchange rate adjustment has been particularly slow among industrialized countries while their exchange rates were floating. Cheung and Lai (2008) show that there is no significant evidence that greater nominal rate flexibility tends to yield faster real rate adjustment in developing countries. We evidence also that fundamentals play a key role in the convergence process for the CFA economies, while the adjustment toward equilibrium is mainly driven by the exchange-rate policy in the other SSA countries. These contrasted responses corroborate the findings of Broda (2004). Using a panel VAR, he evidences that, in the 1980s, African countries with flexible regimes buffered against negative terms of trade shocks by large nominal depreciations, while the response in those with fixed regimes stemmed from the fall in domestic prices. Another explanation, and usually omitted by the OCA literature, could come from the role played by France's aid. As highlighted by Yehoue (2006), negative terms of trade shocks in the CFA zone have been generally accompanied by an increase in France's aid, suggesting the role of the anchor country in absorbing a part of those shocks. The CFA zone thus appears as a monetary area in which internal and external balances are fostered and adjustments facilitated, compared to other SSA countries. In this respect, the CFA zone can be considered as a sustainable area which has ensured the durability of the exchange-rate commitment over time despite failing to meet many of OCA criteria.

It is worth noting that our analysis has concerned the convergence process of real exchange rates for the whole CFA zone. To provide a complete analysis, we have now to investigate whether the sustainability found at this aggregated level still holds at an individual level or instead reflects a simple statistical *artefact*.

4. Further investigation on the sustainability of the CFA zone

4.1. Assessing the sustainability: a country-by-country analysis

In addition to analyzing differences in adjustment speed of real exchange rates between CFA zone countries and non-CFA ones, we replicate the same analysis on a country-by-country basis for the CFA zone. Accordingly, we rely on the PMG estimator which allows short-run coefficients, speed of adjustment and error variances to differ across countries. As before, the significance and the size of error-correction coefficients are used as proxies of the sustainability of the currency area. For each member country, a non-significant error-correction term is interpreted as indicating that the CFA franc agreements are not sustainable, while the existence of mean-reverting real exchange rates reflects instead their suitability.

Table 4 presents the estimated coefficients of the error-correction term and half-life (in years) for each CFA member country. As previously, we consider the three following specifications: (i) a model where effects of exchange-rate policies are omitted (column 1), (ii) a specification that takes into account the CFA franc devaluation (column 2), and (iii) a specification accounting for changes in nominal effective exchange rates (column 3).

Table 4. Error-correction term and half-life (in years),
CFA zone country-by-country estimations

Country	*Error-correction term and half-life (in years)*		
	(1)	(2)	(3)
Benin	-0.497*** 1	-0.356*** 1.58	-0.131** 4.93
Burkina Faso	-0.15* 4.26	-0.044 -	-0.086*** 7.7
Cameroon	-0.577*** 0.8	-0.411*** 1.31	-0.242** 2.5
Central African Rep.	-0.503*** 1	-0.226*** 2.7	-0.211*** 2.92
Chad	-0.363*** 1.53	-0.218** 2.82	-0.136** 4.74
Congo (Rep. of)	-0.51*** 0.97	-0.519*** 0.95	-0.292*** 2
Côte d'Ivoire	-0.371*** 1.5	-0.239*** 2.54	-0.167*** 3.79
Equatorial Guinea	-0.093** 7.1	-0.092*** 7.2	-0.377*** 1.46
Gabon	-0.148** 4.32	-0.117* 5.57	-0.091** 7.3
Mali	-0.244*** 2.49	-0.185*** 3.39	-0.232*** 2.62
Niger	-0.241** 2.51	-0.14* 4.6	-0.165*** 3.84
Senegal	-0.119 -	-0.03 -	-0.105** 6.25
Togo	-0.446*** 1.17	-0.404*** 1.34	-0.236*** 2.57
CFA	-0.328*** 1.74	-0.229*** 2.66	-0.190*** 3.29

*Notes: *,**,*** denotes the significance at respectively 10%, 5% and 1% level. Results are extracted from models (1), (2), and (3) presented in Table 3. For each country, the first line reports the estimated error-correction term, and the second line the corresponding half-life in years.*

The results show a systematic pattern for each CFA country which is, in addition, similar to the CFA zone as a whole. Indeed, the adjustment of real exchange rates, while being lower in column (3) than in columns (1) and (2) (except for Equatorial Guinea), remains significant when changes in nominal exchange rates are taken into account. Overall, these results strengthen our previous findings of a strong sustainability of the CFA zone as significant mean reversion in real exchange rates still hold for each of the member countries.

4.2. Investigating inter-country differences

Obviously, our findings also evidence a speed of adjustment of real exchange rates that varies across CFA countries. In order to investigate how much the observed inter-country variation stems from inter-country differences in structural economic characteristics, we isolate the main factors of heterogeneity within the CFA zone, as highlighted by the OCA literature, that may influence the behavior of real exchange rates: degree of openness, pattern of specialization (oil-exporting or importing country, single-commodity exporter or diversified economy) and inflation dynamics. Thus, instead of using variables suggested by the OCA theory to categorize each country as good or bad candidate in forming an OCA and delimitate the optimal perimeter of the CFA zone, we rather mobilize them in order to explain observed adjustment speeds.

The inter-country differences could first arise from the degree of openness. Indeed, the higher the degree of openness, the more changes in international prices are transmitted to domestic prices (McKinnon, 1963), and the more real exchange rates of pegged currencies are expected to adjust. To ascertain whether openness to trade facilitates real exchange-rate adjustment, the degree of trade openness reported in Table 5 is measured by the average ratio of total trade (imports plus exports) to the country's GDP over the 1985-2009 period. A second factor accounting for the inter-country differences is the specialization pattern that is not neutral regarding the impacts exerted by shocks. As pointed by Kenen (1969), diversification is expected to reduce the need for real adjustments via the nominal exchange rate and tends to insulate economies against a variety of disturbances. We assess these specialization patterns by isolating the main export sectors, and by classifying countries between net oil exporters and importers (see Table 5). It should be recalled that path-dependent patterns of specialization characterize the CFA zone, dating back to the colonialist period: CFA member countries had to furnish raw materials to the metropolitan France, as well as outlets to its manufactured products (Marseille, 1984). This special form of trade has exacerbated the role played by natural resource endowments in specialization patterns, making most of CFA member countries weakly diversified economies. Finally, as currencies are pegged, external imbalances must be corrected by internal adjustment, and the speed with which domestic prices can adjust may be a critical factor (Friedman, 1953). For price stickiness variable, we use the findings of Coleman (2011) which evidence long memory in non-food price inflation for Burkina Faso, Chad, Côte d'Ivoire, Gabon, Niger and Senegal, and in food price inflation for Chad, Cote d'Ivoire and Niger over the 1989:11–2002:09 period.

Table 5. Inter-country differences in structural economic characteristics

Countries	*Error-correction term*	*Openness degree*	*Specialization patterns*			*Inflation persistence*
Burkina Faso	-0.086***	72.1	Net oil importer	agricultural (82%)		Non-food price persistence
Gabon	-0.091**	139.7	Net oil exporter	fuels (76%)		Non-food price persistence
Senegal	-0.105**	82.4	Net oil importer	agricultural (42%)	manufactured (32%)	Non-food price persistence
Benin	-0.131**	35.7	Net oil importer	agricultural (75%)		Non-food price persistence
Chad	-0.136**	112.2	Neither	agricultural (54%)	fuels (41%)	food and non-food price persistence
Niger	-0.165***	61.7	Neither	manufactured (38%)	agricultural, mining (22%)	food price persistence
Côte d'Ivoire	-0.167***	60.6	Neither	agricultural (61%)	manufactured (19%), fuels (19%)	food and non-food price persistence
CFA	**-0.190*** **					
Central African Rep.	-0.211***	41.7	Net oil importer	pearls, gold (45%)	agricultural (40%)	No inflation persistence
Mali	-0.232***	41.7	Net oil importer	agricultural (59%)	pearls, gold (31%)	No inflation persistence
Togo	-0.236***	95.9	Net oil importer	agricultural (39%)	manufactured (30%)	No inflation persistence
Cameroon	-0.242**	116.0	Net oil exporter	fuels (45%)	agricultural (43%)	No inflation persistence
Congo (Rep. Of)	-0.292***	93.3	Net oil exporter	fuels (82%)		No inflation persistence
Equatorial Guinea	-0.377***	66.6	Net oil exporter	fuels (81%)	agricultural (15%)	No inflation persistence

Notes: The error-correction term corresponds to the specification (3) in Table 4 which accounts for changes in NEER. The classification between oil exporters and importers is based on the sign of the differential between oil exports and imports during the 1995-2009 period (UNCTAD database). When the sign is positive, the country is a net oil exporter, when it is negative the country is net oil importer. "Neither" signals that country is oil exporter or oil importer depending on the years. The degree of trade openness corresponds to the mean ratio of total trade (imports plus exports) to the country's GDP over the 1985-2009 period. Specialization patterns are based on data representing the share of each sector in the total good exports, extracted from the CNUCED database for the 1995-2009 period (see Table A2 in Appendix). Member states that exhibit long memory in food and non-food price inflation are characterized by inflation persistence (Coleman, 2011).

As shown in Table 5, a direct link between real exchange-rate adjustment speed and price stickiness is evidenced: as expected, real exchange rates in the CFA zone adjust more slowly in countries where price dynamics has been more persistent. But, even for CFA countries that experienced persistence in their inflation dynamics, the convergence process of their real exchange rates toward equilibrium still remains effective.

While no general conclusion emerges from the analysis of the openness degree, differences in adjustment speeds can also be attributed to inter-country differences in specialization patterns. More specifically, regarding the figures displayed in Tables 5 and A2 in Appendix, countries which are characterized by slow adjustment speeds are primarily specialized in agricultural products and/or weakly diversified. This is typically the case of Burkina Faso and Benin for which the share of the agricultural sector in the total good exports is very high (82% for Burkina Faso, 75% for Benin). Regarding Gabon, its low adjustment speed may be linked to its weak diversification, being mainly fuel-exporting country. On the contrary, countries for which the adjustment speed tends to be higher are more diversified in the sense that they are not single-commodity exporters: Central African Republic, Mali, Togo, Cameroon, and to a lesser extent Equatorial Guinea.

5. Conclusion

In this paper, we argue that the CFA countries constitute a puzzle from the standpoint of OCA analysis. They have successfully maintained a currency union despite their failure to meet a number of important OCA criteria. This can be explained by several drawbacks of the OCA analysis, the stronger coming from its “problem of inconclusiveness” and its omission of political considerations. In this respect, optimality may lead to too restrictive criteria for monetary unions that have been formed rather on political than economical considerations, as the CFA zone.

We then suggest an alternative approach which focuses on the sustainability of the CFA zone rather than on its optimality. A sustainable currency area is defined as a monetary union that impedes its member countries to deviate permanently from their equilibrium paths. We test this hypothesis by assessing the convergence process of real exchange rates towards equilibrium for the CFA zone countries and a sample of other sub-Saharan African (SSA) countries in a framework consistent with the behavioral equilibrium exchange rate approach. Our findings support the view that the CFA zone is sustainable as real exchange rates tend to revert to their equilibrium paths, while in other SSA countries this adjustment process is mainly driven by movements in nominal exchange rates. This result evidenced for the whole zone still holds for each member country, suggesting that adjustments of real exchange rates have been facilitated, at both regional and country levels.

Finally, our findings at a country-by-country level show that inter-country differences can be attributed to heterogeneity in both specialization patterns and inflation persistence. While this heterogeneity is often put forward to reject the optimality of the CFA zone, we evidence that it does not act as a brake regarding the adjustment of real exchange rates. Indeed, the convergence process of real exchange rates towards equilibrium has been at work even in countries which exhibit most factors of rigidity (specializations in agricultural products and/or weakly diversified, persistence in inflation dynamics). This explains why the CFA zone can be more accurately described as a sustainable currency area rather than an optimal one.

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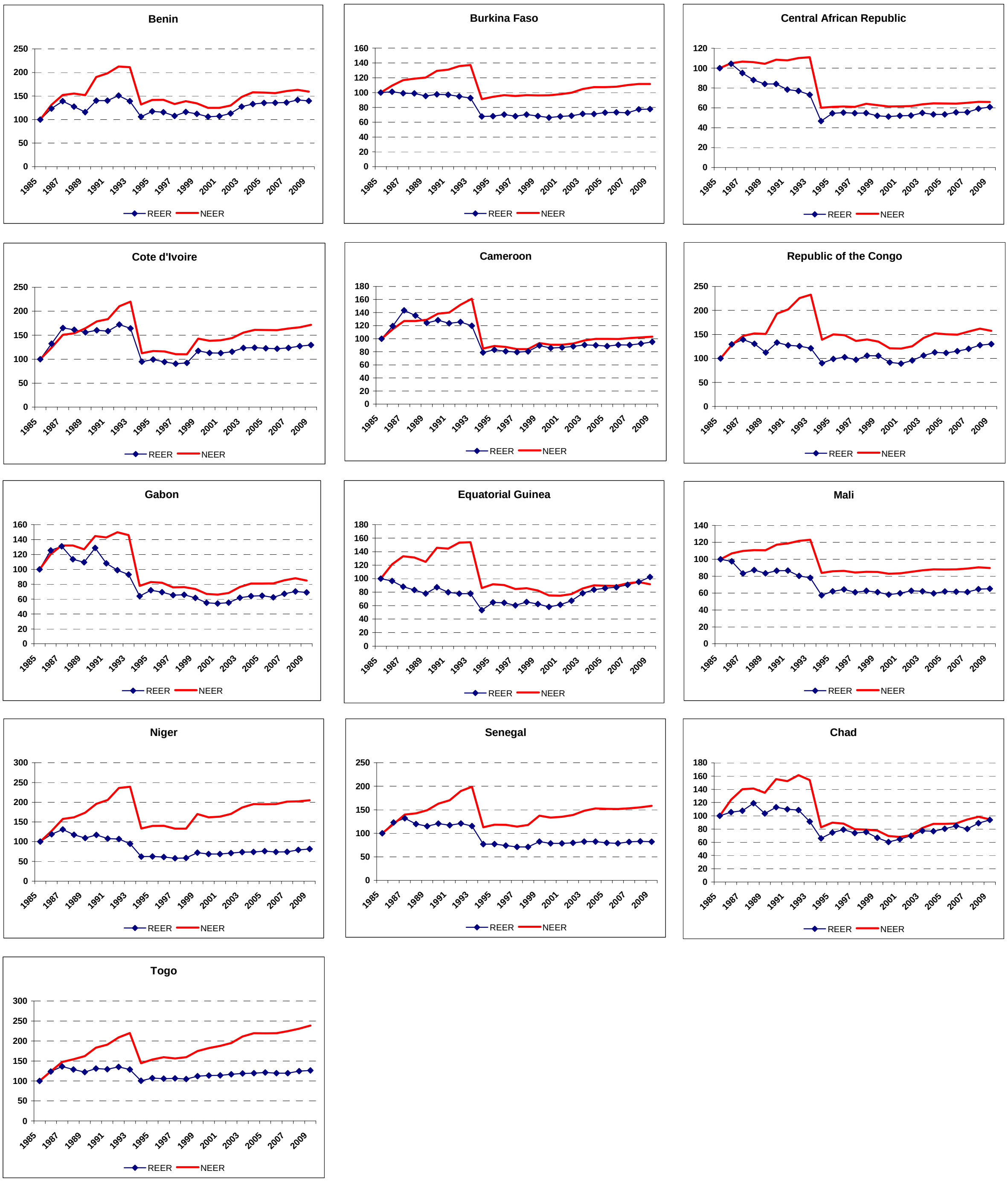
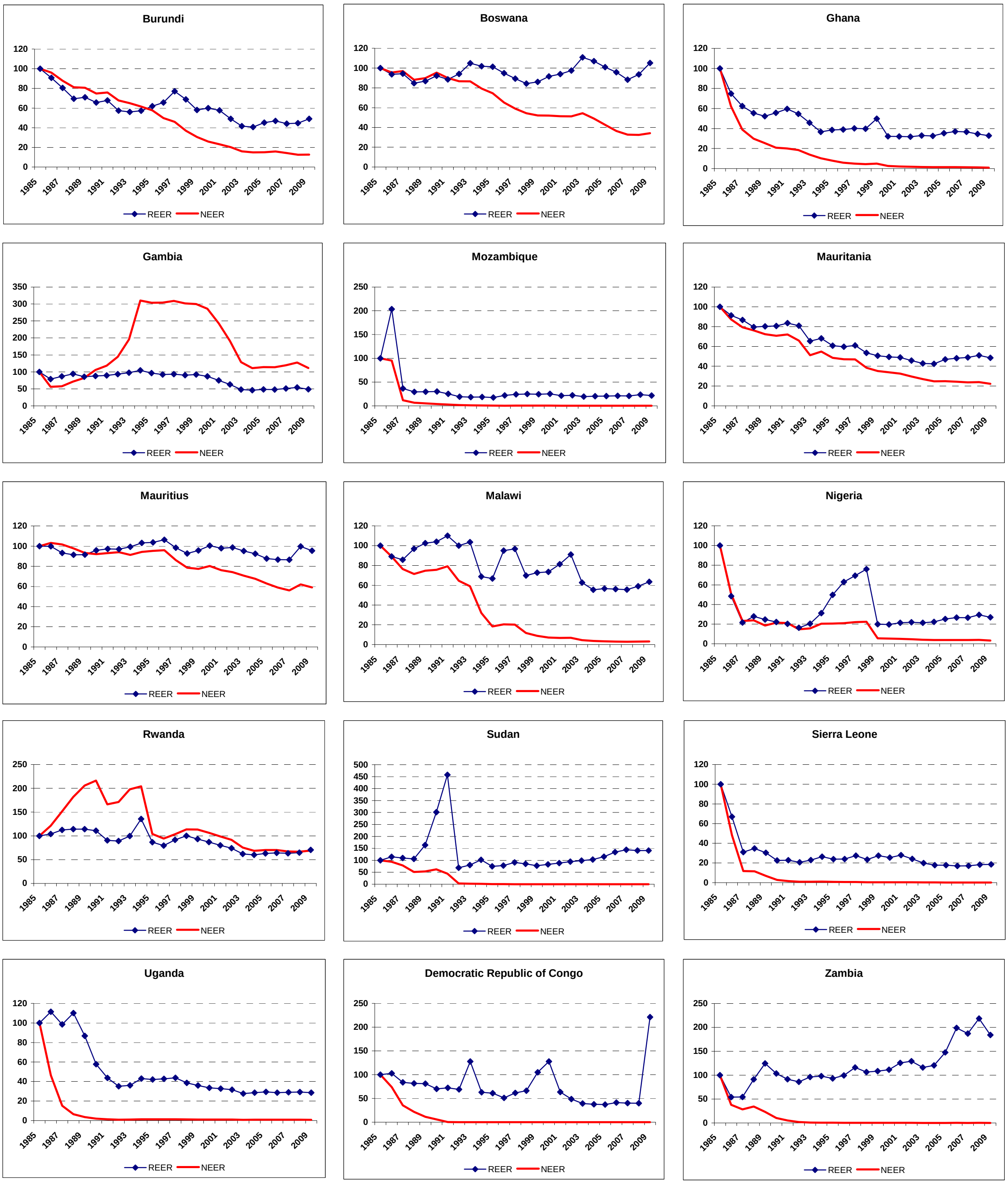
Appendix

Figure 1. Evolution of the real (REER) and nominal (NEER) effective exchange rates, CFA zone countries, 1985-2009



Note: A rise points to an appreciation.

Figure 2. Evolution of the real (REER) and nominal (NEER) effective exchange rates, other SSA countries, 1985-2009



Note: A rise points to an appreciation.

Table A1. Main commodity exports and their share in total exports, 2001–2009

Country	*Main exports*			*Share of exports in %*		
	1	*2*	*3*	*Export 1*	*Export 2*	*Export 3*
			CFA countries			
Benin	Cotton	Brazil nuts, cashew nuts and coconuts	Petroleum	42	9	8
Burkina Faso	Cotton	Gold	Oil seed	56	17	8
Cameroon	Petroleum	Hardwood logs	Cocoa	44	14	10
Central African Rep.	Diamonds	Hardwood logs	Hard Sawn wood	57	22	12
Chad	Petroleum	-	-	94	-	-
Congo Rep.	Petroleum	-	-	88		
Côte d'Ivoire	Cocoa	Petroleum	Rubber	33	30	4
Equatorial Guinea	Petroleum	-	-	95		
Gabon	Petroleum	-	-	84		
Mali	Gold	Cotton	Beef	68	20	3
Niger	Uranium	Gold	Beef	47	7	6
Senegal	Petroleum	Phosphate rock	Fish	24	17	16
Togo	Phosphate rock	Cotton	Iron ores	40	12	8
			Other SSA countries			
Botswana	Diamonds	Copper	Nickel	72	6	5
Burundi	Gold	Coffee	Tea	40	28	3
Congo Democratic	Diamonds	Copper ores	Petroleum	33	17	11
Gambia	Ground-nut oil	Sea food	Ground nut	12	10	10
Ghana	Gold	Cocoa	Plywood	42	29	3
Malawi	Tobacco	Sugar	Tea	58	10	7
Mauritius	Sugar	Sea food	Diamonds	29	18	4
Mauritania	Iron ores	Fish	Petroleum	54	28	10
Mozambique	Aluminum	Electrical energy	Shrimp	50	9	5
Nigeria	Petroleum	-	-	94		
Rwanda	Tea	Coffee	Tin ores	21	18	16
Sierra Leone	Diamonds	Cocoa	Aluminum	36	7	6
Sudan	Petroleum	-	-	83	-	-
Uganda	Coffee	Fish	Gold	20	11	6
Zambia	Copper	Other metal	-	72	7	-

Sources: International Trade Center (http://www.intracen.org) and authors' calculations.

Table A2. Specialization patterns (in %): share of each sector in total good exports

	Agricultural products	*Fuels*	*Ores and metals*	*Pearls and gold*	*Manufactured goods*
Benin	75	10	4	1	9
Burkina Faso	82	2	0	4	12
Cameroon	43	45	5	0	7
Central African Rep.	40	1	9	45	6
Chad	54	41	0	0	5
Congo	8	82	4	4	2
Côte d’Ivoire	61	19	0	1	19
Equatorial Guinea	15	81	0	0	4
Gabon	14	76	5	0	4
Mali	59	1	0	31	9
Niger	22	18	21	1	38
Senegal	42	20	6	1	32
Togo	39	10	18	2	30

Notes: authors’ calculations based on data extracted from the UNCTAD database.