CEFAGE-UE *Working Paper*

2012/03

Monetary integration in Eastern and Southern Africa: choosing a currency peg for COMESA

Carlos Vieira, Isabel Vieira

CEFAGE-UÉ, Universidade de Évora, Portugal

Monetary integration in Eastern and Southern Africa: choosing a currency peg for COMESA

Carlos Vieira and Isabel Vieira[1]

CEFAGE-UÉ, Universidade de Évora, Portugal

Abstract:

African countries involved in monetary integration projects have been advised to peg their currencies against an external anchor before the definite fixing of exchange rates. In this study we estimate optimum currency area indices to determine, between four alternatives, which international currency would be the most suitable anchor for COMESA members and for a set of other selected African economies. We conclude that the euro and the British pound prevail over the US dollar or the yen; that the euro would be the best pegging for most, but not all, COMESA members; and that some of these economies display evidence of more intense integration with third countries, with which they share membership in other (overlapping) regional economic communities, than within COMESA.

Key words: optimum currency areas, monetary anchor, currency pegs, African regional economic communities, African monetary integration.

JEL Classification: F15; F33.

[1] This paper is forthcoming in the South African Journal of Economics. Acknowledgements are due to the Journal, The Economic Society of South Africa and Blackwell Publishing. The definitive version is available at www.blackwell-synergy.com. The authors also acknowledge partial financial support from FCT (program POCTI), and thank two anonymous referees for their valuable comments and constructive suggestions.

1 - Introduction

Africa has been a fertile ground for economic integration projects. Amongst its various, and sometimes overlapping, communities, the Common Market for Eastern and Southern Africa (COMESA)[2] aims at full monetary integration by the end of the 20s. However, as the recent Eurozone experience suggests, monetary unions involving heterogeneous economies may jeopardise growth and employment perspectives in the least prepared members. In order to avoid such negative effects in Africa, monetary integration should be mainly oriented by real, rather than nominal, convergence objectives and evolve gradually, supporting economic development and progress achieved in trade integration and macroeconomic coordination. Accordingly, it has been suggested that, for a considerable time before their irrevocable fixing, domestic currencies should be pegged against an international anchor.[3] Which international currency should be chosen in the case of the COMESA and whether it would be a good choice for all its members are open questions that motivated this study.

The paper considers four potential pegs - the euro, the dollar, the British pound and the yen – and utilises the optimum currency area (OCA) index proposed by Bayoumi and Eichengreen (1997) to evaluate their relative suitability as anchors for COMESA currencies. The first two moneys are the most likely candidates, being currently the major international currencies. However, as Mundell (2002) pointed out, the choice of the former could be problematic for countries with strong trade links to the United States (US) if this country's public and external debt problems promote a diversification away from the dollar and an appreciation of the euro. The United Kingdom (UK) has

[2] COMESA current members are: Burundi, Comoros, Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan (South Sudan became an independent nation on July 2011), Swaziland, Uganda, Zambia and Zimbabwe.

[3] See for instance, Mundell (2002) and UNECA (2008). The latter specifically suggests a period of seven to ten years of pegging for COMESA currencies.

strong historical ties with most of these African countries, currently as a partner in the Commonwealth of Nations. As it seems unlikely that the British pound is replaced by the euro in the next few years, it makes sense to evaluate its suitability as a reference currency, in the context of this analysis. Finally, the Japanese yen, though a more unlikely choice, is considered for the fact that Japan is a major trade partner for many COMESA members, in some cases the most important of the four.

Given the relatively low weight of intra African trade, even within regional economic communities, and thus the improbable choice of internal currency pegs, our study may also be useful for other planned African monetary unions. Accordingly, in addition to current COMESA members, the empirical analysis includes other relevant African economies involved in integration projects aiming at full monetary integration, such as Morocco and Tunisia (members of the Arab Maghreb Union), Ghana and Nigeria (members of the West African Monetary Zone and of the Economic Community of West African States) and South Africa and Tanzania (members of the Southern Africa Development Community). Other countries, belonging to the two CFA franc zones, whose currencies were pegged to the French franc and, since 1999, to the euro, are obviously not considered.

As noted by Bayoumi and Eichengreen (1997, p. 761), although 'many economists did not like it very much', the OCA theory remained 'the workhorse for analyses of European monetary unification'. The theory has also rooted many assessments of monetary integration in Africa and is adopted as the basis for our empirical study, which uses the OCA index developed by the two authors. As discussed in more detail ahead, this approach does not cover all relevant considerations that decision makers should take into account. The index comprises various OCA characteristics but fails to

explicitly take into account the dynamics underlying economic and monetary integration processes, also disregarding policy discipline and institutional credibility gains from monetary integration.

However, both theoretical and empirical developments, of which the first ten years of full monetary union in Europe are a good example, suggest that the most challenging features of monetary integration draw from individual countries' incapacity to smooth their economies in the aftermath of asymmetric shocks (or of common shocks with specific impacts across the integrated area). Such difficulties, resulting from strict fiscal constraints and from the absence of alternative adjustment mechanisms capable of providing at least some short term relief following a crisis, highlight the utility of real convergence before embarking on monetary integration. In fact, when participating countries exhibit relatively heterogeneous productive structures, the probability of specific disturbances does not decline with the progress of integration, increasing the costs of monetary unification. The OCA index encompasses some of the effects of productive specialization, namely the asymmetry of shocks and the dissimilarity of the commodity composition of exports, and is thus one practical tool to evaluate monetary integration projects.

2 - The optimum currency area theory, monetary integration in Africa and the choice of an international monetary anchor

The COMESA convergence criteria require that all member countries have market determined foreign exchange rates by 2015.[4] Currently, though some progress has been

[4] Revised convergence criteria for COMESA are fully detailed in UNECA (2008), p. 199.

achieved, different regimes, presented in Table 1, and some government intervention still prevail amongst COMESA members.

Table 1: COMESA countries' exchange rate regimes

Exchange rate arrangement	Monetary Policy Framework					
	Exchange Rate Anchor				Monetary aggregate target	Other
	US Dollar	Euro	Composite	Other		
Currency board arrangement	Djibouti					
Other conventional fixed peg arrangement	Eritrea Malawi Rwanda Seychelles Zimbabwe	Comoros Congo	Libya	Swaziland		
Crawling peg	Ethiopia					
Managed floating, no pre-determined path for exchange rate	Mauritius				Burundi Kenya Madagascar Sudan Uganda	Egypt
Independently floating					Zambia	

Source: IMF's De Facto Classification of Exchange Rate Regimes and Monetary Policy Framework, 2008

Given the specified objective of full economic and monetary union, exchange rate variability within COMESA will disappear and, consequently, domestic autonomy over foreign exchange and monetary policies will then be lost. According to the optimum currency area theory,[5] such loss is less costly for open economies sharing high levels of bilateral trade, for the lost policy instruments would be of little use in such contexts. Costs also diminish when labour and capital are mobile and common fiscal stabilisers are available to substitute for the abandoned policy tools.

[5] The OCA theory was firstly developed by Mundell (1961) and subsequently enriched with the contributions of McKinnon (1963), Kenen (1969), and many others. Despite its many critics, it remains the most relevant theoretical reference to evaluate monetary integration. Dellas and Tavlas (2009) provide a recent review of the OCA literature.

In addition, to prevent monetary integration from compromising economic development and social welfare, significant levels of real convergence should be attained, to reduce the number of asymmetric disturbances requiring differentiated adjustment responses. In the case of African economies, however, the relatively high degree of trade specialization increases the likelihood of specific shocks and the potential utility of domestic shock absorbers. Not surprisingly, evaluations of prospective monetary unions in Africa tend to conclude that the involved economies do not comply with OCA requirements. Even if actual monetary unions, such as the US or the Eurozone, fail to conform to such conditions, studies involving African and non-African nations show that the distance to the OCA paradigm is much larger in Africa (see Zhao and Kim, 2009).

The conclusion that African countries appear not to be ready for full monetary integration is rather robust, holding across time and geography and for studies assessing a variety of variables. Covering a large spectrum of economies, involved in four integration projects,[6] Bayoumi and Ostry (1997) studied the size and correlation of economic disturbances and the intensity of intraregional trade, concluding that all projects were far from constituting OCAs. Debrun, Masson and Pattillo (2005) proposed a broad theoretical framework, encompassing institutional and political credibility aspects and OCA considerations related to the synchronicity of shocks. Their model, calibrated with data for West African countries, was used to evaluate the prospect of monetary integration in the Economic Community of West African States. More recently, in addition to providing a comprehensive survey of the OCA literature in the African context, Debrun, Masson and Patillo (2011) extended their previous approach to

[6] The CFA franc zone, the Economic Community of West African States, the Southern African Development Coordination Conference and the Cross-Border Initiative.

allow comparisons between scenarios of monetary integration and of domestic institutional reforms. Assessing integration projects for the East African Community, Southern African Development Community and the Economic Community of West African States, they concluded that, in spite of the potential benefits of monetary integration in terms of institutional credibility and fiscal discipline, in most cases such benefits would be inferior to the costs of being unable to stabilise specific shocks with domestic policy instruments and similar to what could be achieved with domestic reforms.

More specific studies were developed by, *inter alia*, Khamfula and Teseayohannes (2004), who analysed OCA conditions within the Southern African Development Community, Buigut and Valev (2006), who studied demand and supply shocks hitting Eastern and Southern African economies, Agbeyegbe (2008) who assessed nominal exchange rate and inflation convergence in the Southern Africa Development Community, or Tsangarides (2008), who applied clustering algorithms to classify West African countries according to their compliance to OCA variables and to Maastricht type convergence criteria. All studies produced non-favourable prognoses over monetary integration in the analysed communities. COMESA has attracted less attention from academics but, as Carmignani (2004) showed, this very heterogeneous set of countries also performed poorly, in view of its objective of becoming a monetary union, in terms of shocks' symmetry, macroeconomic policy coordination and income per capita convergence.

In sum, analyses of monetary integration in Africa indicate that, while some projects could in the future be successfully implemented, most countries still have to pursue a long route before being able to reap liquid economic benefits from monetary union.

Current processes of integration should thus be gradual and slow, to allow for the consolidation of progress attained with required convergence criteria and to provide sufficient time to learn how to deal with fixed foreign exchange rates, for instance in a system of adjustable pegs, as European countries did within the European Monetary System.

In this study, we focus on the relatively less studied COMESA countries and evaluate the quality of four possible international currency pegs they could adopt in the path to monetary union. To this end, we follow Bénassy-Quéré and Lahrèche-Révil (2000), who used the OCA indices proposed by Bayoumi and Eichengreen (1997) to select optimum monetary and foreign exchange anchors for Central and Eastern European countries. Bayoumi and Eichengreen (1997) operationalised the OCA theory by producing an index that decreases in value with a country's readiness for monetary union with a reference economy. The authors first estimate an equation relating foreign exchange variability to OCA related variables - the asymmetry of business cycles, the openness of countries to foreign trade, the dissimilarity of bilateral exports and the relative dimension of involved economies - and then use the obtained estimates to calculate the OCA indices. The underlying hypothesis is that countries meeting OCA conditions to a greater degree face more stable exchange rates. Therefore, all the above mentioned OCA variables are expected to be positively related to foreign exchange variability, except for the openness to trade, as exchange rates tend to be less volatile for important trade partners.

The index proposed by Bayoumi and Eichengreen (1997) is not without limitations as an instrument to assess the quality of a group of countries to embark in monetary integration. It encapsulates various OCA implications and is thus more robust than

alternative methodologies focusing on single criteria, but it is a static indicator that fails to take into account the dynamic aspects of integration. If, as suggested by Frankel and Rose (1997), OCA characteristics are endogenous and convergence is easier within a single currency environment (i.e., if 'monetary unions are more justifiable *ex post* than *ex ante'*), the OCA index would not be useful to evaluate integration projects.

However, following Krugman (1991, 1993), economic and monetary integration will only improve the OCA characteristics of the involved countries if a reduction in transaction costs, resulting from eliminating foreign exchange variability, leads to an increase in the amount of intra-industry trade in the integrated area. If no significant trade growth occurs, or if (due to productive specialization) trade between member countries is mainly inter-industrial, the OCA qualities of the area would not be enhanced and participating countries would find monetary union more costly than beneficial.

The utility of the OCA index for our analysis resides in its informative power on the nature of dynamic developments that are most likely to unravel in a specific integration context (specifically, whether more specialization or more convergence is expected). As the index includes variables related to the asymmetry of shocks and to the type of trade between countries, it allows for a differentiation between more and less prepared countries for monetary integration.[7]

Another limitation of the OCA index is the fact that it does not take into account institutional and political credibility gains from monetary integration. According to

[7] In retrospect, the values of the OCA indices obtained by Bayoumi and Eichengreen (1997) for European countries would have been more valid to signal less prepared countries than the Maastricht criteria. Countries that are currently facing the most difficulties coping with the single currency, such as Portugal, Greece, Spain and Italy (Ireland is the non identified exception), were considered by the authors as 'converging countries', i.e., not yet prepared for monetary integration with the group of 'converged countries'. In the ten years that followed the adoption of the euro, these peripheral countries not only did not converge, but have worsen their previous current account and fiscal disequilibria, both in absolute terms and in relation to their Eurozone partners.

Debrun, Masson and Pattillo (2005, 2011), these are relevant aspects to consider in Africa. In fact, many African countries face problems resulting from lack of independent central banks, which are often forced to finance public deficits, and fiscal distortions, due to socially inefficient government spending. The authors considered that such problems could be ameliorated by giving up autonomy over domestic monetary policy, in favour of an independent supranational institution, and by accepting a set of fiscal discipline rules required for a well functioning monetary union. Nevertheless, as referred above, their analyses also concluded that, for most of the countries in their sample, the potential gains from a more restrict and credible institutional environment would not surpass the costs from giving up domestic mechanisms of adjustment to cushion economies affected by asymmetric shocks.

Without disregarding the relevance of credibility arguments, in what follows we focus our attention on pertinent OCA considerations, aiming at identifying the less costly pegging arrangements for COMESA countries, assuming such anchoring objective as an intermediate step in the way to full monetary union.

3 – The optimum currency area determinants of exchange rate variability

Following Bayoumi and Eichengreen (1997), the estimating equation assumes the variability of bilateral exchange rates to be dependent upon a series of explanatory variables that encapsulate traditional OCA conditions: the asymmetry of business cycles between the two countries, the dissimilarity of the composition of exports, the bilateral openness ratio and the average economic dimension:

$$sder_{ij} = \beta_0 + \beta_1\, sdy_{ij} + \beta_2\, dissim_{ij} + \beta_3\, btrade_{ij} + \beta_4\, size_{ij} + e_{ij}, \qquad (1)$$

Since the main purpose of the paper is to assess the relative degree of compliance with the OCA conditions of the African countries *vis-a-vis* the main potential monetary anchors, the estimation only considers the exchange rate behaviour between each of the 56 countries in the sample, including 21 African nations, and the currently four main international currencies.[8]

The dependent variable $sder_{ij}$ is the standard deviation, over an eleven-year period, of the yearly log-variations of the bilateral nominal exchange rate between countries *i* and *j*:

$$sder_{ij} = standard\ deviation\ [\Delta\ (log\ er_{ij})] \qquad (2)$$

where er_{ij} is the nominal exchange rate between country *i* and country *j* in a given year. Here, *j* is either the US dollar, the euro, the yen or the British pound, the currencies of the four reference countries. Exchange rate variability in this period is higher when the yen is the partner currency, and very similar on average when considering the other three monetary anchors (see Table 2). Although not shown in the table, it is also slightly higher for the African countries than for the other nations in the sample.[9]

The asymmetry of business cycles, sdy_{ij}, is measured as the standard deviation of the difference in the real output growth rates between countries *i* and *j*:

$$sdy_{ij} = standard\ deviation\ [\Delta\ (log\ y_i) - \Delta\ (log\ y_j)], \qquad (3)$$

[8] The 56 countries are: Argentina, Australia, Brazil, Bulgaria, Burundi, Canada, Chile, China, Colombia, Comoros, Czech Republic, Denmark, Egypt, Eritrea, Estonia, Ethiopia, Ghana, Hong Kong, Hungary, India, Indonesia, Israel, Kenya, Latvia, Lithuania, Madagascar, Malawi, Malaysia, Mauritius, Mexico, Morocco, New Zealand, Nigeria, Norway, Pakistan, Peru, Philippines, Poland, Romania, Rwanda, Seychelles, Singapore, Slovakia, South Africa, South Korea, Sudan, Swaziland, Sweden, Switzerland, Tanzania, Thailand, Tunisia, Turkey, Uganda, Venezuela and Zambia.

[9] Results not shown, but available upon request. The set of 21 Africa countries includes 15 COMESA members plus Ghana, Morocco, Nigeria, South Africa, Tanzania and Tunisia. Four COMESA countries are not included (Congo, Djibouti, Libya and Zimbabwe) for lack of consistent data during most of the analysed time frame.

where *y* stands for real output. In this sample, business cycles are on average somewhat more asymmetrical when the US or the UK are the partner countries or when African nations are involved.

Table 2: Variability of African exchange rates against four reference currencies, 1999-2009 (%)

	Eurozone	US	Japan	UK
Burundi	11.08	8.87	12.65	11.50
Comoros	0.00	9.11	10.93	6.92
Egypt	15.98	9.94	12.33	15.24
Eritrea	8.88	8.79	8.23	11.53
Ethiopia	8.99	6.15	11.96	5.66
Ghana	15.94	21.76	24.27	18.45
Kenya	7.48	5.95	11.69	6.62
Madagascar	16.67	15.68	18.55	18.78
Malawi	10.32	9.34	11.89	12.28
Mauritius	6.50	7.15	7.08	8.54
Morocco	3.00	6.87	8.49	6.28
Nigeria	9.63	8.63	12.37	8.91
Rwanda	10.21	6.68	10.35	11.08
Seychelles	16.64	15.33	20.91	11.92
South Africa	13.50	16.99	15.56	14.56
Sudan	9.57	6.02	12.17	7.02
Swaziland	13.50	16.99	15.56	14.56
Tanzania	8.77	4.83	7.39	9.64
Tunisia	2.28	7.17	9.81	6.51
Uganda	8.60	8.25	12.38	6.62
Zambia	15.16	16.17	18.88	15.57

Note: The variability of the bilateral exchange rates is measured as the standard deviation of the log variations of the bilateral exchange rate with the Eurozone, the US, Japan and the UK in the period 1999-2009.

To quantify the degree of dissimilarity in export patterns, $dissim_{ij}$ is computed as the sum of the absolute differences in the relative share of each of eleven categories of merchandise trade in each pair of countries,[10]

[10] A more detailed classification of exports could potentially reflect more accurately the differences in export patterns, but it is difficult to find correct, complete and long datasets when studying African countries. Bayoumi and Eichengreen (1997) considered only three categories of exports: manufactured goods, food and minerals. We chose the more detailed and informative taxonomy provided by the Standard International Trade Classification (SITC rev. 1), consisting of the following 10 broad categories

$$dissim_{ij} = \sum_{k=0}^{9} \left| X_i^k - X_j^k \right|, \qquad (4)$$

where *k* is k-*th* product category and X^k is the product share in total merchandise trade. The computation of this variable has shown that, for this sample of countries and time period, the export structure is more dissimilar when Japan is the reference country, and also when considering the African countries. This probably reflects the high degree of specialization in the exports of agricultural and mineral primary products in some of these economies, as noted by Bayoumi and Ostry (1997).

The variable $btrade_{ij}$ is the mean of the ratio of bilateral exports to domestic GDP in both countries:

$$btrade_{ij} = \left(\frac{X_{ij}}{GDP_i} + \frac{X_{ji}}{GDP_j} \right) \Big/ 2 \qquad (5)$$

where X_{ij} is the bilateral export flows from country *i* to country *j*. This bilateral openness variable registers, as expected for this sample, a lower value for the African states and when Japan and the UK are the reference countries. The African countries are on average considerably more open to the Eurozone than to any other reference partner. To account for the relative economic dimension of both economies, $size_{ij}$ is the mean of the two countries' log of GDP, measured in US dollars:

$$size_{ij} = \left(\log GDP_i^{usd} + \log GDP_j^{usd} \right) / 2 \qquad (6)$$

---

of products: 0 - Food and live animals, 1 - Beverages and tobacco, 2- Crude materials, inedible, except fuels, 3 - Mineral fuels, lubricants and related materials, 4 - Animal and vegetable oils and fats, 5 – Chemicals, 6 - Manufactured goods classified chiefly by material, 7 - Machinery and transport equipment, 8 - Miscellaneous manufactured articles, 9 – Commodities and transactions not classified, according to kind.

Finally, e_{ij} is the stochastic error term. All variables are measured as averages over an eleven-year period, between 1999 and 2009.

As previously referred, countries displaying a higher degree of compliance to OCA conditions are expected to face more stable exchange rates, and thus all coefficients in equation (1) should be positive, except for β_3, as bilateral exchange rates are presumably less volatile if the two countries are important trade partners.

Data on bilateral nominal exchange rates, current GDP in US dollars and trade related variables (except for exports by product, used to calculate $dissim_{ijt,}$, collected from the United Nations COMTRADE database) were computed from the CEPII-Chelem database. GDP at constant prices in domestic currency is from the IMF's *International Financial Statistics*.

Given the set of 56 countries in the sample and 4 reference partners, equation (1) was estimated for the 1999-2009 period averages with a total of 224 observations. The beginning of the sample was chosen to coincide with the emergence of the euro, but also because of difficulties in finding previous homogeneous data on trade composition for some of the African countries.

3.1 - OLS estimation

As often expected in this type of model, problems of heteroskedasticity emerged in the residuals of the simple OLS estimation, identified with the Breusch-Pagan test, potentially causing biased standard errors and consequently biased statistical inference. Therefore, heteroskedasticity-consistent standard errors have been computed using the Huber-White sandwich estimator of variance to allow the fitting of the model. These robust standard errors allow more accurate hypothesis tests and confidence intervals.

The regression specification error test (RESET) also uncovered problems of model specification, solved when using logs in the *btrade* and *size* variables and introducing a dummy variable do distinguish when Japan was the partner country (*dJapan*). During this period, as noted above, these countries' bilateral exchange rates with Japan exhibited on average a significantly higher variability than with the other three partners. The cross-country estimation produced the following results:

$$\begin{aligned} \hat{sder}_{ij} = &-0.2988 + 0.0121\, sdy_{ij} + 0.0043\, dissim_{ij} - 0.0057 \ln btrade_{ij} + \\ &\quad (.1750) \quad (.0036) \qquad (.0104) \qquad (.0027) \\ &+ 0.1277 \ln size_{ij} + 0.0223\, dJapan \\ &\quad (.0628) \qquad (.0084) \end{aligned} \tag{7}$$

Robust standard errors are reported in parentheses, the overall R-squared for the goodness of fit is 0.19 for 224 observations. The *F*-statistic (7.11) for the joint significance of the independent variables, here a Wald test using the robustly estimated variance matrix, rejects the null hypothesis that all coefficients in the model are zero. The Ramsey regression specification error test, after the few changes in the model specification reported above, did not reject the null hypothesis of no omitted variables, at the 5% significance level, with a test statistic of 2.32.

All coefficients display the expected signs and, with the exception of *dissim*, all are statistically significant at least at the usual 95% confidence level. The probable explanation for the lack of significance of the variable measuring the dissimilarity in the composition of exports is that, being a secondary proxy for the asymmetry of shocks, its significance may be overpowered by the variable measuring output disturbances, a possibility also observed by Bénassy-Quéré and Lahrèche-Révil (2000). In fact, *dissim*

becomes statistically significant when removing *sdy* from the equation, suggesting a collinearity problem, although the overall explanatory power of the model considerably decreases.

The results thus seem to confirm the previous findings in Bayoumi and Eichengreen (1997) and Horváth (2007), suggesting that the standard OCA factors help explain the dynamics of bilateral exchange rate variability also in a more recent time period and with a completely different set of countries, including a large sample of African nations.

3.2 - IV-GMM estimation

The OLS estimation results above may be misleading if any of the regressors are endogenously determined by the dependent variable. In particular, Bayoumi and Eichengreen (1998), for industrial countries, and Devereux and Lane (2003), for industrial and developing countries, note that the volume of bilateral trade (*lnbtrade*) and the asymmetry of business cycles (*sdy*) may be potentially influenced by the variability of the bilateral exchange rate. Therefore, for a more consistent estimate of the model, we instrumented those two variables using the log-distance between both countries (*lndistance*), and three dummy variables indicating whether both countries share a common border (*border*) or a common language (*language*) and if they had a colonial relationship in the past (*colonizer*). These instruments are drawn from the traditional gravity model literature on bilateral trade flows, and have also been chosen by Devereux and Lane (2003) and, except for the variable *colonizer* since their studies only cover industrial nations, by Bayoumi and Eichengreen (1998) and Horváth (2005).

Before presenting and discussing the results of the estimation using instrumental variables, it is convenient to check if this choice of instruments satisfies both necessary

conditions of validity and relevance for the consistency of the instrumental-variables GMM estimator. The Hansen's J test statistic (0.0476, with a p-value of 0.9765) does not provide evidence against the validity of the instruments or the correct specification of the structural equation, giving confidence that the instrument set is appropriate. To assess the relevance of the instruments, Shea's partial R-squared of 0.031 for the variable *sdy* and 0.139 for the variable *lntrade* suggests, as expected, that these instruments are more relevant to explain trade flows than the asymmetry of economic shocks.[11] It is however difficult to draw definite conclusions from these values of the partial R-squared, for a lack of absolute standard references, as these statistics depend on the specifics of the data employed and of the model being estimated.

Table 3 reports the estimation results by GMM with a heteroskedasticity-consistent weighting matrix, considering both endogenous variables (column 1) and also, in view of the previous test results on the relevance of the instruments, retaining *sdy* in the group of exogenous regressors (column 2). In this latter case, the partial R-square is 0.1662 and the F-statistic for models with one endogenous regressor (*lnbtrade*), against the null hypothesis that the excluded instruments are not relevant, reports a statistic of 15.7072. This value largely rejects the null and exceeds the minimum threshold of 10 set by Stock, Wright and Yogo (2002) for inference to be reliable. The OLS estimates obtained before are replicated in the last column for an easier comparison.

[11] Devereux and Lane (2003) and Horváth (2005) obtained relatively similar partial R-squared values for these two variables.

Table 3: IV-GMM regressions

	GMM (1)	GMM (2)	OLS (3)
Constant	-0.2270	-0.3864*	-0.2988*
	(0.2626)	(0.2004)	(0.1750)
sdy	-0.0081	0.0109***	0.0121***
	(0.0130)	(0.0034)	(0.0036)
dissim	0.0184	-0.0026	0.0043
	(0.0185)	(0.0105)	(0.0104)
lnbtrade	-0.0167**	-0.0127**	-0.0057**
	(0.0075)	(0.0055)	(0.0027)
lnsize	0.1006	0.1525**	0.1277**
	(0.0901)	(0.0698)	(0.0628)
dJapan	0.0004	0.0124	0.0223***
	(0.0145)	(0.0102)	(0.0084)
J-statistic	0.0476	3.0148	
	(p = 0.9765)	(p = 0.3893)	
N	224	224	224
C-statistic	5.0556	2.1224	
	(p = 0.0798)	(p = 0.1452)	

GMM estimates, with standard errors robust to heteroskedasticity in parentheses. Equation (1) uses the instruments *dissim*, *lnsize*, *dJapan*, *colonizer*, *lndistance*, *border* and *language* for the endogenous variables *sdy* and *lnbtrade*. Equation (2) uses the instruments *sdy*, *dissim*, *lnsize*, *dJapan*, *colonizer*, *lndistance*, *border* and *language* for the endogenous variable *lnbtrade*. First-stage results not reported. The *J*-statistic is Hansen's *J* test of overidentifying restrictions (P-values in parentheses). The *C*-statistic stands for the Sargan test of endogenous regressors (P-values in parentheses). Column (3) replicates the OLS estimates obtained before. The asterisks ***, ** and * denote 1%, 5% and 10% levels of significance, respectively.

When both *sdy* and *lnbtrade* are treated as endogenous variables, only the latter retains statistical significance in the regression. When only *lnbtrade* is considered endogenous, the results are very similar to the ones obtained before using simple OLS: apart from *dissim*, all other OCA variables display the expected signs and statistical significance.

However, both Sargan's *C* tests of endogeneity (orthogonality conditions), reported in the bottom line of the table, fail to reject the null hypothesis that these regressors are in fact exogenous. This implies that although the instrumental variables estimator is consistent, since the test statistics discussed above suggest that the instruments employed are both valid and relevant, it is also inefficient. The OLS estimator is more efficient and it will hence be employed in the OCA indices analysis below.

4 - The optimum currency area indices

The equation estimated above can be employed, as in Bayoumi and Eichengreen (1997), to compute an index comparing each individual country's OCA characteristics, relatively to a reference country. In the particular case of the African countries, this may help discern which groups of countries share identical OCA features, rendering them more suitable to take part in a monetary union, and may also help clarify which international currency should, if they choose to, be preferred as an anchor currency.

The index values in Table 4 are computed for the relationship between the individual African countries and each of the four reference currencies. The index corresponds to the fitted value for the exchange rate variability using the point estimates of the parameters obtained above in the OLS regression. The index is thus a weighted sum of each country's various OCA conditions considered here, taking the equation above as deterministic. The smaller the value of the index, the more would a country benefit from pegging its currency to the reference country.

The least integrated countries, with higher indices whatever the reference partner, are almost invariably Eritrea, Nigeria, Ethiopia and Malawi (only Nigeria is not in COMESA). On the other side of the spectrum, the more integrated countries rank differently for different reference partners. The top four in the rankings are precisely the same and in the same order when considering the US or the UK (Swaziland, Mauritius, Comoros and Ghana – the first three are COMESA economies), but differ slightly when the reference partner is the Eurozone, and substantially against Japan. The margins of error around the predicted values of the model are displayed in parentheses.

Table 4: Rankings of OCA indices for the African countries

	Eurozone	US	Japan	UK
Burundi	0.0900 *(.0739-.1061)*	0.1107 *(.0938-.1275)*	0.1212 *(.1005-.1419)*	0.0903 *(.0699-.1108)*
Comoros	0.0736 *(.0496-.0976)*	0.0827 *(.0609-.1046)*	0.1167 *(.0902-.1432)*	0.0769 *(.0481-.1057)*
Egypt	0.0929 *(.0831-.1027)*	0.1059 *(.0925-.1192)*	0.1362 *(.1210-.1514)*	0.1061 *(.0942-.1180)*
Eritrea	0.1349 *(.1081-.1616)*	0.1630 *(.1220-.2040)*	0.1738 *(.1391-.2085)*	0.1337 *(.1047-.1627)*
Ethiopia	0.1213 *(.1047-.1379)*	0.1360 *(.1153-.1568)*	0.1507 *(.1318-.1697)*	0.1336 *(.1147-.1526)*
Ghana	0.0755 *(.0592-.0919)*	0.0907 *(.0793-.1021)*	0.1130 *(.0960-.1300)*	0.0780 *(.0612-.0949)*
Kenya	0.0906 *(.0816-.0996)*	0.1023 *(.0928-.1118)*	0.1286 *(.1132-.1439)*	0.0884 *(.0770-.0998)*
Madagascar	0.1142 *(.0939-.1345)*	0.1233 *(.1032-.1435)*	0.1524 *(.1322-.1726)*	0.1242 *(.1052-.1432)*
Malawi	0.1252 *(.1026-.1478)*	0.1301 *(.1089-.1513)*	0.1567 *(.1333-.1800)*	0.1253 *(.1034-.1471)*
Mauritius	0.0712 *(.0521-.0903)*	0.0808 *(.0666-.0951)*	0.1151 *(.0976-.1326)*	0.0683 *(.0455-.0911)*
Morocco	0.0967 *(.0833-.1101)*	0.1173 *(.1018-.1328)*	0.1385 *(.1237-.1534)*	0.1045 *(.0936-.1153)*
Nigeria	0.1317 *(.1045-.1589)*	0.1302 *(.1018-.1585)*	0.1630 *(.1386-.1873)*	0.1403 *(.1175-.1631)*
Rwanda	0.0990 *(.0867-.1114)*	0.1164 *(.1008-.1321)*	0.1463 *(.1242-.1684)*	0.0973 *(.0814-.1132)*
Seychelles	0.0901 *(.0678-.1123)*	0.1265 *(.1087-.1443)*	0.1359 *(.1164-.1555)*	0.0877 *(.0615-.1139)*
South Africa	0.0788 *(.0681-.0895)*	0.0911 *(.0812-.1010)*	0.1027 *(.0858-.1197)*	0.0807 *(.0709-.0904)*
Sudan	0.1009 *(.0838-.1179)*	0.1289 *(.1008-.1570)*	0.1179 *(.0983-.1375)*	0.1044 *(.0886-.1202)*
Swaziland	0.0691 *(.0497-.0886)*	0.0673 *(.0476-.0870)*	0.1196 *(.0942-.1449)*	0.0669 *(.0424-.0915)*
Tanzania	0.0898 *(.0784-.1011)*	0.1048 *(.0906-.1191)*	0.1151 *(.0979-.1322)*	0.0918 *(.0784-.1052)*
Tunisia	0.0668 *(.0488-.0847)*	0.0921 *(.0807-.1035)*	0.1240 *(.1072-.1408)*	0.0801 *(.0659-.0943)*
Uganda	0.0885 *(.0762-.1008)*	0.1056 *(.0906-.1205)*	0.1293 *(.1133-.1453)*	0.0921 *(.0787-.1056)*
Zambia	0.0902 *(.0782-.1021)*	0.1072 *(.0929-.1216)*	0.1233 *(.1068-.1398)*	0.0805 *(.0610-.1000)*

Notes: The index is computed with the OLS regression estimates obtained above, for the bilateral relationships with the Eurozone, the US, Japan and the UK. The margin of errors around predicted values is in parentheses.

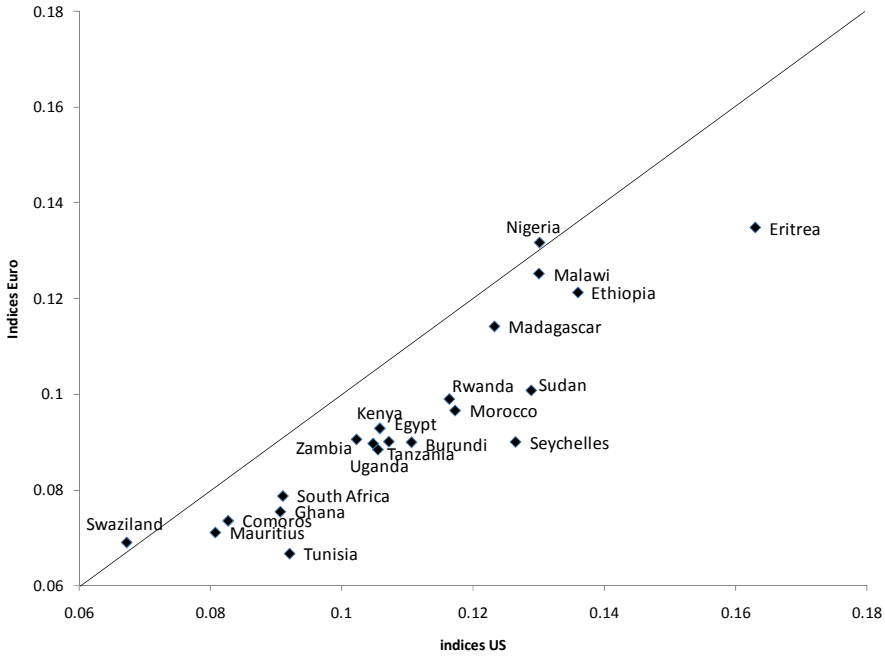
Overall, these African countries appear to be generally more integrated with the Eurozone and the UK and less integrated with the US and Japan, as the OCA indices' averages for the four references are 0.0948, 0.0977, 0.1101 and 0.1324, respectively. When only COMESA members are considered, the average values are a little higher: 0.0968 for the Eurozone, 0.0984 for the UK, 0.1125 for the US and 0.1349 for Japan.

Taking the indices as indicators of readiness to give up foreign exchange variability, the results suggest that not all COMESA members should fix their currencies simultaneously. Countries with values above average are relatively less prepared for a fixed exchange rate regime and would benefit from postponing pegging their currencies,

fixing only after more prepared partners have done so. In case of choosing the euro or the British pound as anchors, the countries that should postpone the pegging of their currencies are Eritrea, Ethiopia, Madagascar, Malawi and Sudan. Rwanda and Egypt should wait only if fixing against the euro and the pound, respectively.

The differences in the indices may be more perceptible in figures 1 to 3, where the values for the Eurozone are graphically compared with the same indices for each of the other three partners. The closer to the origin, the more prepared countries are to deal with the constraints of a pegged currency, according to the OCA theory. All points below the 45-degree line from the origin indicate an index for that particular country lower when considering the Eurozone (vertical axis) than the respective index with the other partner (horizontal axis).

Figure 1: OCA indices for African countries, Eurozone and US

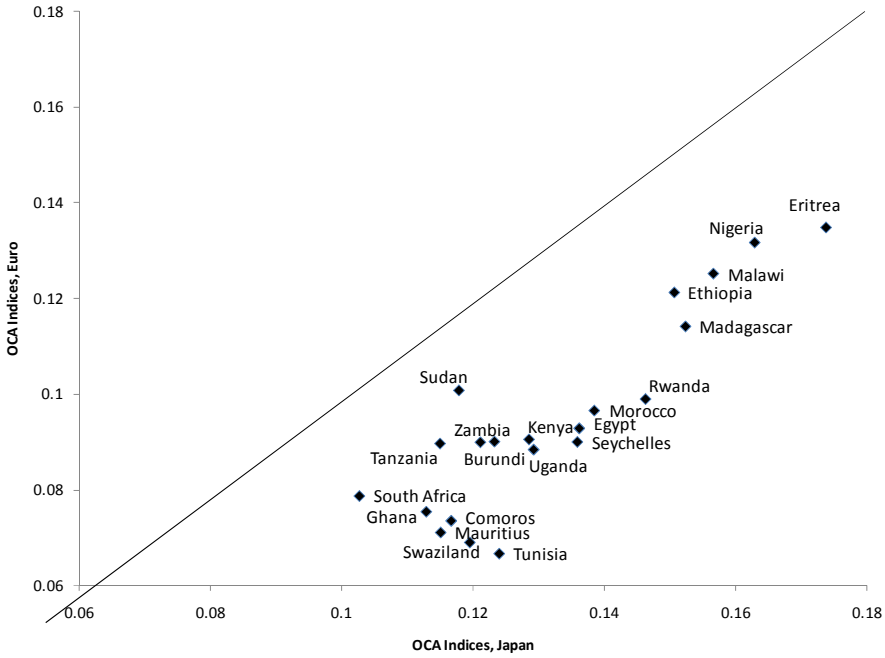


As may be seen in Figure 1, the OCA indices against the US dollar are systematically higher than those against the euro. Only Nigeria and Swaziland display slightly lower

OCA indices when considering the US as the partner country rather than the Eurozone. Coincidentally, these are the only two African countries in the sample where the US is a more relevant trade partner than the Eurozone during the analysed period. Eritrea and Ethiopia, a single country until 1993, display the higher OCA index values with reference to the US. Swaziland, the small landlocked country in Southern Africa, and Comoros and Mauritius, two archipelago island nations in the Indian Ocean, located off the Eastern coast of Africa, appear to be the most integrated with the US. Of these, only Mauritius currently pegs its currency to the dollar.

Bénassy-Quéré and Lahrèche-Révil (2000), using a slightly different methodology for the pre-euro period, also concluded that the only four African countries present in their sample should prefer to peg their currencies to the euro over the US dollar.

Figure 2: OCA indices for African countries, Eurozone and Japan



All countries exhibit considerably lower OCA indices when considering the Eurozone, compared with Japan, as in Figure 2. South Africa is the relatively most integrated

country with Japan, displaying the lowest value of the OCA index. Sudan, the closest country to the 45 degree line, is the only African nation in the sample for which Japan is a more important trade partner than the Eurozone, or even the UK or the US.

Figure 3: OCA indices for African countries, Eurozone and the UK

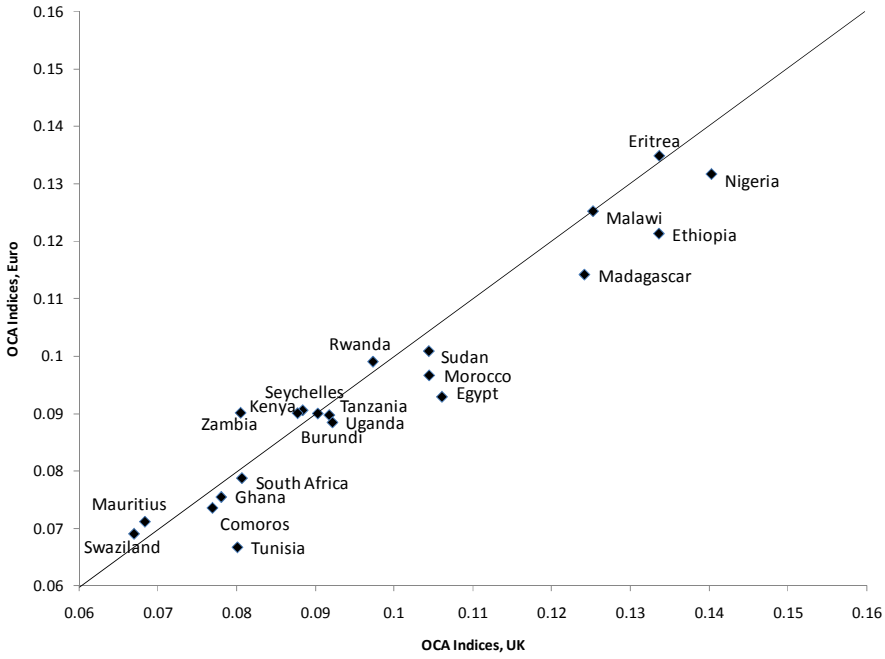


Figure 3 suggests that the British pound is, of the three alternatives, the strongest contender to the euro as the least economically costly anchor currency for the African nations considered here, according to the OCA conditions. Even so, only a third of the countries (all but Kenya are COMESA members) display higher OCA indices against the euro than against the British pound, and with a very slight advantage, as all stand very close to the 45 degree line. All are English-speaking countries and, with the exception of Eritrea, all belong to the Commonwealth.

5 – The optimum currency area indices and Africa's Regional Economic Communities

In view of their commitment to attain full monetary integration by the end of the 20s, COMESA countries have been advised to first experience a period of foreign exchange pegging against a foreign anchor. The OCA indices obtained above are useful to inform the discussion on which peg would be more appropriate, but also to evaluate the degree of integration within COMESA and in several African regional economic communities.

COMESA countries display heterogeneous levels of integration, with Swaziland, Mauritius and Comoros emerging as the most integrated members, irrespective of the reference currency, but other sets of countries with close OCA index values are also discernible. For example, the degree of economic integration between Kenya, Tanzania and Uganda is clear in the three figures above, all displaying very close index values for these countries. These three neighbours from Central East Africa, all bordering Lake Victoria, established since 2000 the East African Community, but have since the beginning of the XX century a long record of economic collaboration, formalized in almost consecutive regional arrangements – currently, Kenya and Uganda are also members of COMESA. Although significantly more integrated with the euro area than with the US or Japan, the index values for these former members of the British empire are however very similar when measured against the euro area or the UK.

A similar situation occurs in Rwanda and Burundi, two COMESA economies that form the Economic Community of Great Lakes Countries with Congo. These small neighbour countries also appear very close in the figures above, suggesting a high degree of economic integration. In their case, again, both the euro and the British pound appear to be the best choices of anchor currency.

Much less integrated appear to be the members of other African regional communities, such as the Arab Maghreb Union (of which Morocco and Tunisia are included in this study), the Indian Ocean Commission (integrating *inter alia* Comoros, Madagascar, Mauritius and Seychelles), the Intergovernmental Authority on Development (that includes for example Eritrea, Ethiopia, Kenya, Sudan and Uganda, the countries in the Horn of Africa) or the Southern Africa Development Community (including, from our sample, Malawi, Mauritius, Seychelles, South Africa, Swaziland, Tanzania and Zambia). The differences in the values of the OCA indices between these countries, whatever the reference partner considered, suggest that they are still not ready for full monetary integration.

Our analysis is based on a methodology that strictly considers bilateral pegs between a client and an anchor currency, neglecting the 'trade network externalities' identified by Meissner and Oomes (2009) as a key determinant of currency peg choice. In this sense, the choice of an anchor may be influenced by the fact that neighbouring and relevant trade partners have pegged to a particular currency. Therefore, expected trade creation effects resulting from lower transaction costs could justify the choice of a sub-optimal currency. This could for instance be considered by COMESA countries still pegging against the dollar or displaying lower OCA indices against the British pound than the euro. However, trade network externalities are relatively less relevant for African countries as the weight of commercial exchanges with neighbours is rather low, even within regional economic communities.

6 – Conclusions

The OCA index proposed by Bayoumi and Eichengreen (1997) was utilised to evaluate the quality of four potential anchors – the euro, the US dollar, the British pound and the yean – for COMESA countries, and a set of other selected African economies, if they decide to peg domestic currencies to an international money in their way to monetary union. The pegging strategy has been defended as a way of locking up success attained in the process of integration while, simultaneously, providing both the experience needed to manage domestic economies in a more restricted policy environment and the time to adapt before abandoning autonomy over instruments that may be useful in the adjustment to asymmetric shocks.

Although disregarding explicit dynamic and institutional credibility effects, the index encapsulates various OCA requirements and may be interpreted as an indicator for individual countries' readiness for monetary integration. The estimates obtained in this study suggest that not all COMESA members are equally prepared, and thus should not advance at the same speed, to monetary union. Countries displaying lower OCA indices should peg first, while the others should follow only after having attained higher levels of economic integration. This is even more relevant in the African context, where the relatively high level of productive specialization suggests that lower transaction costs will mainly promote inter-industrial trade (associated to more asymmetric shocks) within integrated areas. Furthermore, some of the assessed member countries seem to be more prepared to embark on alternative monetary arrangements than to commit to full integration in the context of this community.

Despite the fact that currently eight COMESA countries have their currencies pegged to the dollar, and only two to the euro, these economies are generally more integrated with

the Eurozone and the UK than with the US or Japan. Focusing only on the possibility of pegging against the euro or the pound, three groups of countries emerge within COMESA, in terms of their readiness to fix domestic currencies: Swaziland, Mauritius and Comoros, displaying the lowest OCA index values, form the most integrated group; Madagascar, Ethiopia, Malawi and Eritrea are the less integrated; Burundi, Uganda, Zambia, Seychelles, Tanzania, Rwanda, Egypt and Sudan comprise the intermediate set. Some of these countries, for example Swaziland, Mauritius, Zambia or Rwanda, would probably marginally benefit from pegging their currencies against the British pound, while the remaining eleven COMESA members in our sample should peg to the euro.

All these countries have agreed to achieve full monetary integration in the context of COMESA. Therefore, the groupings identified in this analysis should not be taken as evidence that a number of countries should embark on closer economic associations amongst themselves, but rather that some appear to be more prepared for an intermediate phase of fixing domestic moneys against a foreign peg, before full monetary union. The groupings also indicate that a single peg appears not to be equally adequate for the whole set of COMESA countries. However, the hypothesis of pegging to a currency basket instead of a single currency has not been formally considered in this paper. It is nevertheless an option which may be particularly attractive for those countries where no clear superiority of an international monetary anchor over another has emerged in the analysis. Potential benefits arising from joint pegs to the same external anchor, namely trade network externalities, should also be considered in such cases.

Overall, the information provided by the OCA indices suggests that the COMESA group is not yet well suited for monetary integration. Some of its members are already

quite integrated, but the whole set is heterogeneous, with various countries closer to third countries (with which, in some cases, they share membership in other communities) than to their COMESA counterparts. In spite of the expected institutional and political credibility gains from monetary integration, the experience of the Eurozone suggests that monetary integration involving economies in distinct stages of convergence is not beneficial for the least prepared, and can seriously compromise their growth and employment perspectives. Fiscal discipline and other integration requirements increase the social and economic costs of adjusting to specific disturbances and add to the difficulties in conquering and maintaining competitiveness. Though Mundell (2002) defended that 'monetary stability is not everything, but, without it, the rest is nothing', African countries should not rush into monetary integration. If they do, they run the risk of sacrificing 'everything' for monetary stability.

References:

Agbeyegbe, T (2008) On the feasibility of a monetary union in the Southern Africa Development Community, International Journal of Finance and Economics, 13, pp. 150–157.

Bayoumi, T and Eichengreen, B (1997) Ever closer to heaven? An optimum-currency-area index for European countries, European Economic Review, 41 (3-5), pp. 761-770.

Bayoumi, T and Eichengreen, B (1998) Exchange rate volatility and intervention: implications of the theory of optimum currency areas, Journal of International Economics, 45, pp. 191-209.

Bayoumi, T and Ostry, J (1997) Macroeconomic shocks and trade flows within Sub-Saharan Africa: implications for optimum currency arrangements, Journal of African Economies, 6 (3), pp. 412-44.

Bénassy-Quéré, A and Lahrèche-Révil, A (2000) The Euro as a monetary anchor in the CEECs, Open Economies Review, 11(4), pp. 303-321.

Buigut, S and Valev, N (2006) Eastern and Southern Africa monetary integration: a structural vector autoregression analysis, Review of Development Economics, 10 (4), pp. 586–603.

Carmignani, F (2004). The road to regional integration in Africa: Macroeconomic convergence and performance in COMESA, Journal of African Economies, 15 (2), pp. 212–250.

Debrun, X, Masson, P and Patillo, C (2005) Monetary union in West Africa: who might gain, who might lose, and why?, Canadian Journal of Economics, 38 (2), pp. 454-481.

Debrun, X, Masson, P and Patillo, C (2011) Should African monetary unions be expanded? An empirical investigation of the scope for monetary integration in Sub-Saharan Africa, Journal of African Economics, 20 (2), pp. 104-150.

Devereux, M and Lane, L (2003) Understanding bilateral exchange rate volatility, Journal of International Economics, 60, pp. 109-132.

Frankel, J and Rose, A (1997) Is EMU more justifiable ex post than ex ante?, European Economic Review, 41 (3-5), pp. 753-760.

Khamfula, Y and Teseayohannes, M (2004) South Africa and Southern African monetary union: a critical review of sources of costs and benefits, South African Journal of Economics, 72 (1), pp. 37-49.

Krugman, P (1991) Increasing returns and economic geography, Journal of Political Economy, 99 (3), pp. 483-499.

Krugman, P (1993) Lessons of Massachusetts for EMU, in F Torres and F Giavazzi (Eds) Adjustment and Growth in the European Monetary Union, Cambridge University Press.

Horváth, R (2005) Exchange rate variability, pressures and optimum currency area criteria: some empirical evidence from the 1990s, Applied Economics Letters, 12 (15), pp. 919-922.

Horváth, R (2007) Ready for Euro? Evidence on EU new member states, Applied Economics Letters, 14 (14), pp. 1083-1086.

Meissner, C and Oomes, N (2009) Why do countries peg the way they peg? The determinants of anchor currency choice, Journal of International Money and Finance, 28 (3), pp. 522-524.

Mundell, R (2002) Does Africa need a common currency? Keynote Presentation, African Development Forum III, March 3–8, United Nations Economic Commission for Africa, Addis Abeba.

Stock, J, Wright, J and Yogo, M (2002) A survey of weak instruments and weak identification in generalized method of moments, Journal of Business and Economic Statistics, 20, pp. 518-529.

Tsangarides, C (2008) Monetary union membership in West Africa: a cluster analysis, World Development 36 (7), pp. 1261–1279.

UNECA (2008) Assessing Regional Integration in Africa III, United Nations Economic Commission for Africa.

Zhao, X and Kim, Y (2009) Is the CFA Franc zone an optimum currency area? World Development, 37 (12), pp. 1877–1886.