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PROSPECTS FOR A MONETARY UNION IN THE EAST AFRICA COMMUNITY: SOME EMPIRICAL EVIDENCE

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Abstract
This paper examines generalised purchasing power parity (G-PPP) and business cycle synchronisation in the East Africa Community with the aim of assessing the prospects for a monetary union. The univariate fractional integration analysis shows that the individual series exhibit unit roots and are highly persistent. The fractional bivariate cointegration tests suggest that there exist bivariate fractional cointegrating relationships between the exchange rate of the Tanzanian shilling and those of the other EAC countries, and also between the exchange rates of the Rwandan franc, the Burundian franc and the Ugandan shilling. The Fractionally Cointegrated Vector AutoRegressive (FCVAR) results imply the existence of a single cointegrating relationship between the exchange rates of the EAC countries. On the whole, there is evidence in favour of G-PPP. In addition, there appears to be a high degree of business cycle synchronisation between these economies. On both grounds, one can argue that a monetary union should be feasible.
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1. INTRODUCTION

This paper aims to assess the prospects for a monetary union in the East African Community (EAC), a group of six countries intending to achieve a common monetary policy and currency by 2024, by considering some of the conditions for an optimal currency area (OCA). More specifically, it applies fractional cointegration methods to test whether generalised purchasing power parity (G-PPP) holds in the EAC. In addition, it examines business cycle synchronisation by using the Hodrick–Prescott (HP) filter to decompose GDP into trend and cyclical components and measure the degree of correlation between the latter in this set of countries. Because South Sudan joined the EAC only in April 2016, and therefore, very few observations are available for this country, the analysis focuses on the other five members of the union only.

Unlike earlier studies on the EAC based on the classical I(0)/I(1) dichotomy (see, *e.g.* Buigut and Valev, 2005; Buigut, 2011; Mafusire and Brixiova, 2013; Yabara, 2014), we adopt a fractional cointegration framework that allows for long memory in the residuals

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of the cointegrating relationship, and therefore, for a slow dynamic adjustment towards the long-run equilibrium. Long-memory models have already been estimated in various papers testing for purchasing power parity (PPP). For instance, Booth *et al.* (1982) found evidence of long memory during the flexible exchange rate period (1973–1979), and Cheung (1993) during the managed floating regime. Baum *et al.* (1999) estimated ARFIMA models for real exchange rates in the post-Bretton Woods era and found no evidence to support long-run PPP. Diebold *et al.* (1991) and Baillie and Bollerslev (1994) reported fractional cointegration with nonstationary, but mean-reverting cointegrating errors (see the survey by Gil-Alana and Hualde, 2009 for further examples).

More recent studies have employed fractional integration and cointegration to analyse OCAs (see, *e.g.* De Truchis and Keddad, 2013 for the case of the ASEAN economies). In the present paper, we carry out for the first time this type of analysis for the EAC and employ, among others, the recently introduced Fractionally Cointegrated Vector AutoRegressive (FCVAR) approach proposed by Johansen and Nielsen (2012).

The structure of the paper is as follows: Section 2 provides some background information about the EAC; Section 3 explains the relevance of G-PPP for OCAs; Section 4 outlines the fractional integration and cointegration methods used; Section 5 presents the empirical results, and Section 6 offers some concluding remarks.

2. THE EAC

The EAC is an intergovernmental organisation including the recently established nation of South Sudan and the five countries in the African Great Lakes region in Eastern Africa: Burundi, Kenya, Rwanda, Tanzania and Uganda. The organisation was originally established in 1967, but collapsed in 1977 and was officially revived on 7 July 2000. In 2008, after talks with the Southern Africa Development Community and the Common Market for Eastern and Southern Africa, the EAC agreed to become part of a free trade area including the member states of all three, and therefore, an integral part of the African Community. The EAC is also a potential precursor to the establishment of an East African Federation. In 2010, it launched its own common market for capital, goods and labour in the region, with the objective of creating a common currency union and eventually a political federation. In November 2013, a protocol was signed outlining the plans of the five member countries to launch a monetary union within 10 years.

Kenya, Tanzania and Uganda have had a history of cooperation dating back to the early twentieth century. The customs union between Kenya and Uganda in 1917, which then Tanganika joined in 1927, was followed by the East African High Commission from 1948 to 1961, later by the East African Common Services Organisation from 1961 to 1967, and then, by the EAC until 1977. Inter-territorial cooperation between the Kenya Colony, the Uganda Protectorate and the Tanganika Territory was first formalised in 1948 by the East African High Commission. This provided a customs union and a common external tariff. It also dealt with common services in communications, transport, research and education. After independence from Britain was obtained, these integrated activities were extended and the High Commission was replaced by the East African Common Services Organisation, which many observers thought would lead to a political federation between the three territories. However, the new organisation faced difficulties owing to the lack of fiscal coordination and the dominant economic position of Kenya.

In 1967, the East African Common Services Organisation was superseded by the EAC. This body aimed to strengthen ties between members through a common market, a common customs tariff and a range of public services to achieve balanced economic growth within the region. In 1999, Kenya, Tanzania and Uganda signed the Treaty for the establishment of the EAC, which entered into force in July 2000. In 2007, the Treaty was also signed by Burundi and Rwanda, thus, expanding the EAC to five countries. According to the Treaty, the EAC should first form a customs union, then a common market and a monetary union, and finally a political union. The Customs Union became operational in 2005, and was formally completed in 2010. The Common Market Protocol was signed in 2009, and there is a plan for creating a common market, including free movement of goods, labour, persons, services and capital. Recently, in April 2016, South Sudan also joined the EAC.

The process of creating a monetary union started early, but proceeded slowly. Thus, in 2007, the EAC member countries decided to fast-track it, with the intention of signing a protocol to establish the East African Monetary Union (EAMU) in 2012; this was finally signed in 2013, while its actual implementation, initially planned to be completed by 2015, is now expected to take several years, *i.e.* at least until 2024. The experience of other monetary unions clearly shows that it is a complex project, with a non-negligible risk of failure, and therefore, it is essential to ensure that the requirements for a successful EAMU are met.

A few recent papers have provided some evidence on the prospects for the EAC. For instance, Wang (2010) found that the EAC members are financially less open than developed economies; within the EAC, Kenya is the most financially open economy, followed by Uganda and Tanzania. Rusuhuzwa and Mason (2012) examined the period 1995–2010 using different methods. Specifically, they used the HP filter to investigate whether macrovariables such as GDP exhibit correlated trend and cyclical components in the EAC countries, estimated a VAR model to identify supply shocks, and also tested if real effective exchange rates were cointegrated. They concluded that these countries face asymmetric shocks and have different production structures, and therefore, convergence is difficult to achieve; as a result appropriate institutions for macroeconomic surveillance should be built before a monetary union can be established; a common basket currency could be introduced as a first step. Finally, Drummond *et al.* (2015) also found a prevalence of asymmetric shocks and considerable dispersion in growth rates, both making convergence problematic; exchange rates are effective shock absorbers, but this mechanism will not be available once a monetary union is formed, therefore, other mechanisms should be put in place to adjust to shocks before a monetary union can be finalised. All these papers, however, are based on the classical dichotomy between I(0) stationary and I(1) nonstationary variables, while our analysis below introduces a much greater degree of generality and flexibility by allowing for fractional integration/cointegration and also shedding light on the long-memory properties of the series of interest and their linkages.

3. G-PPP AND OCAS

G-PPP for m countries in a world of n countries requires that there exists a long-run equilibrium cointegration relationship between their m-1 bilateral real rates. When G-PPP holds, the real exchange rate between two countries can be expressed as a weighted average of the other real rates in the currency area. These weights reflect not only trade linkages, but also technology transfers, immigration and financial flows.

G-PPP can be interpreted in terms of an Optimum Currency Area (OCA), *i.e.* a group of regions or countries with economies closely linked by trade in goods and services and by factor mobility for which it is ideal to adopt a single currency or a group of currencies pegged to each other and fluctuating together vis-à-vis other currencies. According to Mundell (1961), under the assumption of short-run rigidity of prices and wages and no factor mobility, a group of economies can be considered an OCA if they experience the same types of real disturbances. The volume of intra-regional trade among members is also important: in the Heckscher–Ohlin model, if two countries are major trading partners then there will be some degree of factor price equalisation. Thus, within a currency area with sufficiently linked economies, the real exchange rates will share a common stochastic trend; this implies that there should be at least one cointegrating relationship between them (see Enders and Hurn, 1994).

Various papers have already analysed the feasibility of a monetary union in the EAC. Mafusire and Brixiova (2013) tested empirically the extent of shock synchronisation among the EAC members, and concluded that, given the structural differences still existing between them, a common monetary policy would have asymmetric effects and might not be beneficial to some members. Buigut and Valev (2005) applied a two-variable SVAR model to test for correlation between shocks in the EAC countries, and on the basis of their evidence argued against the desirability of a monetary union in the EAC. Yabara (2014) investigated FOREX dynamics in the EAC, and found that country-specific shocks are the main drivers of the exchange rates of Kenya, Tanzania and Uganda, while worldwide spillovers from the dollar and the euro have played an increasing role since the global financial crisis in the case of those of Burundi and Rwanda. Below, we contribute to the literature on the EAC by using fractional cointegration methods to examine exchange rates linkages and carrying out correlation analysis for business cycle synchronisation.

4. METHODOLOGY

Until the 1980s, nonstationary economic and financial time series were usually modelled assuming a deterministic function of time and stationary I(0) residuals from the regression model. After the seminal work of Nelson and Plosser (1982), the consensus became that the nonstationary element of most series is stochastic, and I(1) models with unit roots were normally specified. However, the I(0)/I(1) dichotomy is a rather restrictive assumption, since the differencing parameter required to obtain stationarity is not necessarily an integer, but could be any real value as in the case of fractionally integrated or I(d) processes belonging to the long-memory category.

Long memory implies that observations which are far apart in time are highly correlated, and this property can be captured in a fractional integration framework. A fractionally integrated, or I(d) model, x_t, can be expressed in the following form:

$$(1-L)^d x_t = u_t, \quad t = 0, \pm 1, \ldots, \tag{1}$$

where d can be any real value, L is the lag-operator ($Lx_t = x_{t-1}$) and u_t is I(0), defined as a covariance stationary process with a spectral density function that is positive and finite at the zero frequency. The polynomial $(1-L)^d$ in equation (1) can be expressed in terms of its binomial expansion, such that, for all real d,

$$(1-L)^d = \sum_{j=0}^{\infty} \binom{d}{j} (-1)^j L^j = 1 - dL + \frac{d(d-1)}{2} L^2 - \frac{d(d-1)(d-2)}{6} L^3 \ldots$$

and thus

$$(1-L)^d x_t = x_t - dx_{t-1} + \frac{d(d-1)}{2} x_{t-2} - \frac{d(d-1)(d-2)}{6} L^3 \ldots$$

In this context, d plays a crucial role since it indicates the degree of dependence of the time series. The higher the value of d is, the higher the level of association between the observations will be. Specifically, if $d = 0$, $x_t = u_t$, x_t is said to be characterised by "short memory" or I(0), and autocorrelation (AR) is of a "weak" form, with the autocorrelation coefficients decaying exponentially. If $d > 0$, x_t is said to exhibit "long memory," so called because of the strong association between observations that are distant in time. If d belongs to the interval (0, 0.5), then x_t is still covariance stationary, while $d \geq 0.5$ implies nonstationarity. Finally, if $d < 1$, the series is mean-reverting, *i.e.* the effects of external shocks disappear in the long run, in contrast to the case of $d \geq 1$, when they persist indefinitely.

There are several methods for estimating and testing the fractional differencing parameter d. Some of them are parametric while others are semi-parametric and can be specified in the time or in the frequency domain. In this paper, we use a Whittle estimator of d in the frequency domain (Dahlhaus, 1989) along with a testing procedure based on the Lagrange Multiplier (LM) principle that also uses the Whittle function but in the frequency domain. We test the null hypothesis:

$$H_o: d = d_o, \tag{2}$$

for any real value d_o, in a model given by the equation (1), where x_t is the errors in a regression model of the form:

$$y_t = \beta^T z_t + x_t, \; t = 1, 2, \ldots, \tag{3}$$

where y_t is the observed time series, β is a ($k\times$ 1) vector of unknown coefficients and z_t is a set of deterministic terms that might include an intercept (*i.e.* $z_t = 1$), an intercept with a linear time trend ($z_t = (1, t)^T$) or any other type of deterministic processes. The LM test of Robinson (1994) is robust to a certain degree of conditional heteroscedasticity and is the most efficient method in the Pitman sense against local departures from the null (see Robinson, 1994).

The multivariate extension of the I(d) model involves the concept of fractional cointegration, which concerns the possible existence of long-run equilibrium relationships between the series of interest. Given two real numbers d and b, the components of the vector z_t are said to be cointegrated of order d and b, denoted $z_t \sim CI(d, b)$, if all the components of z_t are I(d) and there exists a vector $\alpha \neq 0$ such that $s_t = \alpha' z_t \sim I(\gamma) = I(d - b)$, $b > 0$. Here, α and s_t are called the cointegrating vector and error, respectively. Below, we carry out bivariate fractional cointegration tests as in Marinucci and Robinson (2001) as well as multivariate tests as in the FCVAR model introduced by Johansen (2008) and further expanded by Johansen and Nielsen (2010, 2012). This is a generalisation of Johansen's Cointegrated Vector AutoRegressive (CVAR) model, which allows for fractional processes of order d with cointegrating order d–b. Both fractional cointegration methods are more general than the standard cointegration framework since they allow the cointegration residuals to be a fractionally integrated process, possibly with long-memory properties. The method in Marinucci and Robinson (2001) is a Hausman test that consider the null of no cointegration against the alternative of fractional cointegration. It is based on:

$$8s\,(\hat{d}^* - \hat{d}_i)^2, \qquad \frac{1}{s} + \frac{s}{T} \to \infty, \tag{4}$$

where $i = x, y$ refers to each of the series under investigation, s is a bandwidth parameter (in our case, $T\,0.5$), $\hat{d}_i$ are the estimates of the individual series and $\hat{d}^*$ is a restricted estimate in the bivariate representation of the series. The limit distribution is χ_1^2.

The FCVAR model in particular has additional advantages, specifically more flexibility to determine the cointegrating rank (or number of cointegrating vectors) by means of statistical tests and to estimate jointly the adjustment coefficients and the cointegrating relations in addition to the short-run dynamics.

To understand this approach, consider first the well-known, non-fractional, CVAR model. Let y_t, $t = 1, 2, \ldots, T$ be a p-dimensional I(1) time series. The CVAR model is specified as

$$\Delta Y_t = \alpha\beta' Y_{t-1} + \sum_{i=1}^{k} \Gamma_i \Delta Y_{t-i} + \varepsilon_t = \alpha\beta' L Y_t + \sum_{i=1}^{k} \Gamma_i \Delta L^i Y_t + \varepsilon_t \tag{5}$$

The simplest way to derive the FCVAR model is to replace the difference and lag operators Δ and L in (5) with their fractional counterparts, Δ^d and $L_b = 1 - \Delta^b$, respectively. We then obtain

$$\Delta^b Y_t = \alpha\beta' L_b Y_t + \sum_{i=1}^{k} \Gamma_i \Delta^b L_t^i Y_t + \varepsilon_t, \tag{6}$$

which is applied to $Y_t = \Delta^{d-b} X_t$ such that

$$\Delta^d X_t = \alpha\beta' L_b \Delta^{d-b} X_t + \sum_{i=1}^{k} \Gamma_i \Delta^b L_b^i Y_t + \varepsilon_t, \tag{7}$$

where ε_t is p-dimensional independent and identically distributed with mean zero and covariance matrix Ω. The parameters have the usual interpretations from the CVAR model. Thus, α and β are $p \times r$ matrices, where $0 \leq r \leq p$. The columns of β are the cointegrating relationships in the system, *i.e.* to say the long-run equilibria. The parameters Γ_i govern the short-run behaviour of the variables, and the coefficients in α represent the speed of adjustment towards equilibrium for each of the variables. The FCVAR model permits simultaneous modelling of the long-run equilibria, the adjustment responses to deviations from them and the short-run dynamics of the system. Nielsen and Morin (2016) provide Matlab computer programmes for the estimators and test statistics.

5. EMPIRICAL RESULTS

We employ monthly data on real exchange rates defined in terms of domestic currency vis-à-vis the U.S. dollar from 1990 to 2015; these were obtained from the IMF's International Financial Statistics (https://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B&sId=1409151240976). The year 2015 was chosen by which monetary union was initially expected to have been achieved, which makes it interesting to assess its feasibility at that stage, and also makes our results directly comparable to those of other related studies using a similar sample. The series are shown in Fig. 1, and appear to have a similar behaviour, all of them exhibiting an upward trend. Standard unit root tests suggest that none of them is characterised by I(0) stationarity (see Table 1). For the business cycle synchronisation analysis carried out subsequently, we use instead annual data on real GDP (at current purchasing paper parities in order to make meaningful

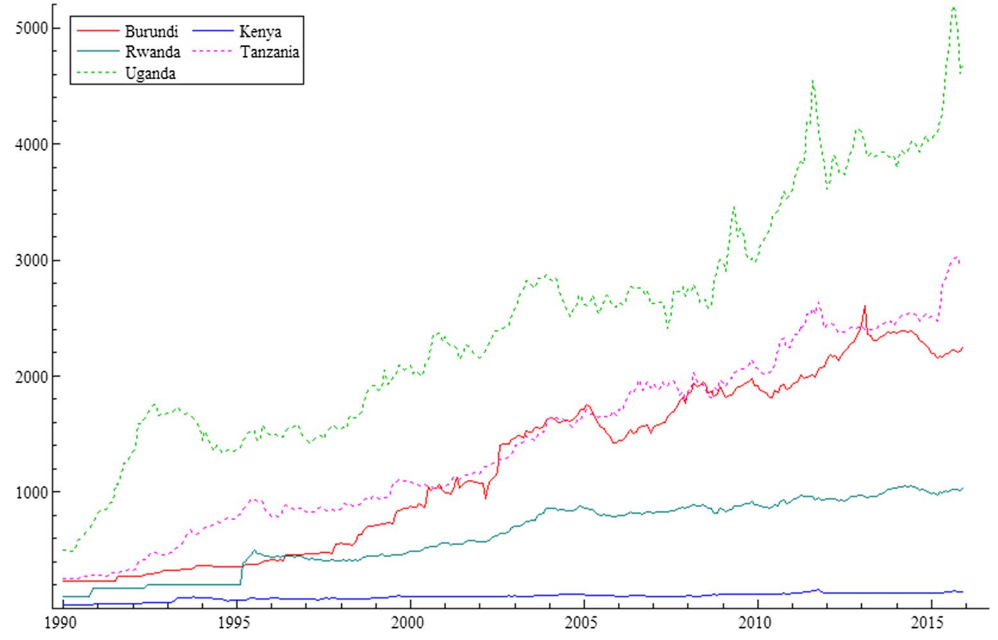

Figure 1. Real exchange rates of the member countries of the EAC [Colour figure can be viewed at wileyonlinelibrary.com]

comparisons across countries); the sample period is 1960–2014, and the data source is from the Penn World Table 9.1.

Table 2 reports the parametric estimates of d for the exchange rate series; in all cases the unit root cannot be rejected, which implies that shocks have permanent effects.

Table 3 shows the bivariate fractional cointegration test results. In 6 out of 10 cases, the null of fractional cointegration cannot be rejected. The exchange rate of the Tanzanian shilling is cointegrated with all the other exchange rates, while that of the Rwandan franc is cointegrated with those of the Burundian franc and the Ugandan shilling. By contrast,

Table 1. Unit root test results (level)

		ADF		KPSS		ERS	
Regions	**Countries**	**Intercept**	**Trend**	**Intercept**	**Trend**	**Intercept**	**Trend**
EAC	Burundi	−12.02117***	−12.26035***	0.633800**	0.066219	0.460858***	1.319934***
	Kenya	−12.87034***	−12.97026***	0.285753	0.099174	0.213165***	0.796350***
	Rwanda	−16.41462***	−16.66984***	0.465540**	0.129004*	0.269527***	0.995164***
	Tanzania	−13.82535***	−14.02910***	0.488859**	0.065768	0.141447***	0.515228***
	Uganda	−19.73215***	−19.70431***	0.066046	0.037295	0.217988***	0.810317***

Note: *, **, *** stand for statistical significance at the 10, 5 and 1% level respectively.

Table 2. Estimates of d using a parametric approach

	Countries	**Differencing parameter value**
East African Community	Burundi	0.98 (0.88, 1.11)
	Kenya	0.94 (0.82, 1.07)
	Rwanda	1.01 (0.91, 1.15)
	Tanzania	0.74 (0.65, 1.06)
	Uganda	0.85 (0.75, 1.01)

Note: The values in parenthesis are the 95% confidence intervals for the estimated values of *d*.

Table 3. Bivariate cointegration relationships within the EAC

	Burundi	**Kenya**	**Rwanda**	**Tanzania**	**Uganda**
Kenya	0.127 0.938 0.987	–	–	–	–
Rwanda	**9.101** **9.647** **0.795**	2.714 0.169 0.918	–	–	–
Tanzania	**4.241** **2.463** **0.933**	**10.066** **1.844** **0.883**	**6.613** **3.971** **0.887**	–	–
Uganda	0.198 2.463 0.886	0.004 1.214 0.852	**0.348** **7.745** **0.793**	**12.930** **23.129** **0.523**	–

Notes: The first two values refer to the test statistics for H_x and H_y, respectively, using the Hausman test of Marinucci and Robinson (2001). The third value is the estimated value of d^*. $\chi_1^2(5\%) = 3.84$. In bold and with an asterisk, those cases where we reject the null hypothesis of no cointegration at the 5% level.

Table 4. Rank tests

Rank	**D**	**LR statistic**
0	0.463	80.74
1	**0.512**	**29.22**
2	0.639	7.57
3	0.653	2.36

Note: In bold the cases when the null hypothesis cannot be rejected.

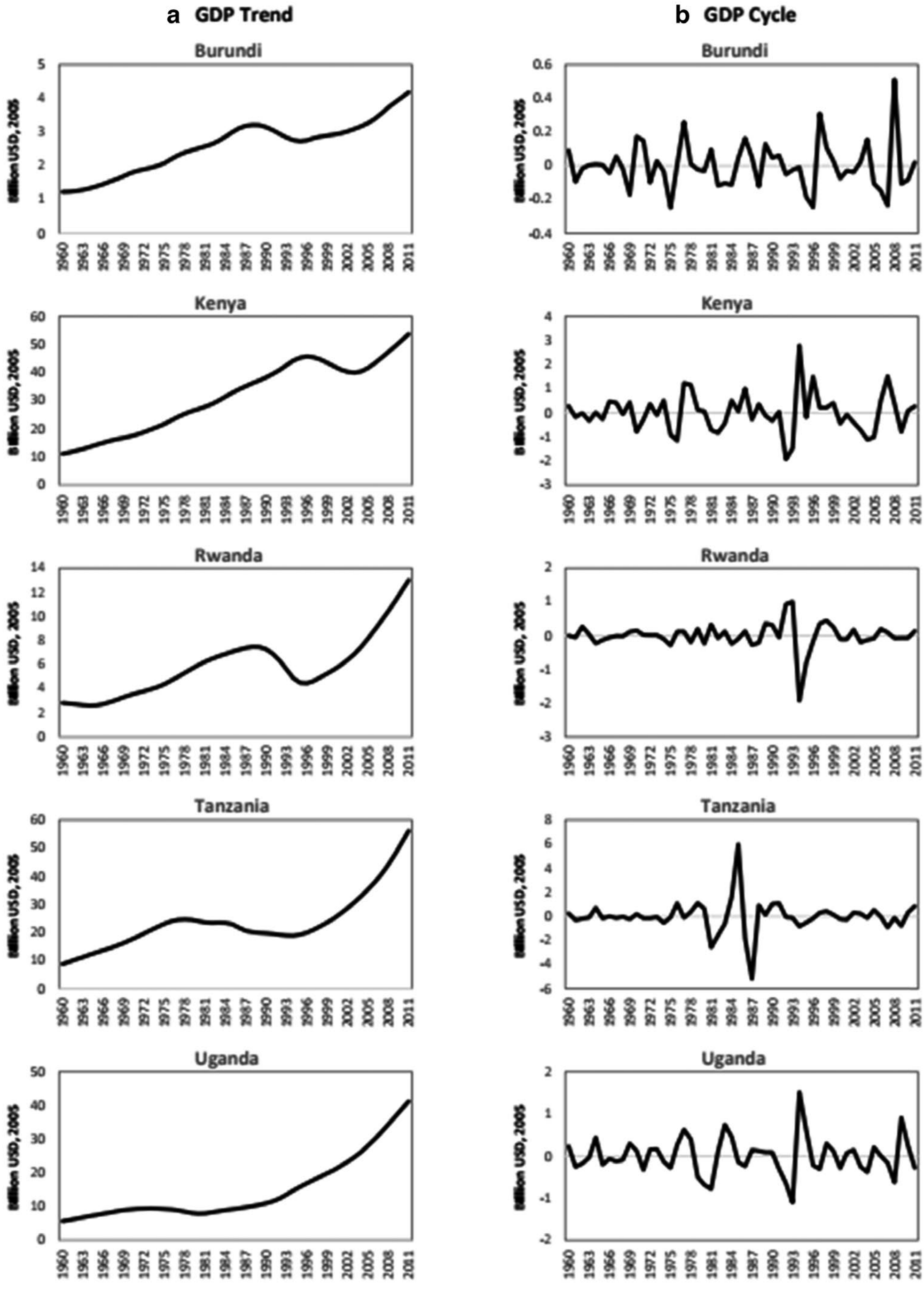

Figure 2. EAC trend and business cycles from 1960 up to 2011 obtained with the Hodrick–Prescott filter

Table 5. GDP business cycle correlation 1960–2014

	Burundi	**Kenya**	**Rwanda**	**Tanzania**	**Uganda**
Burundi	1				
Kenya	0.8884	1			
Rwanda	0.9445	0.7543	1		
Tanzania	0.8760	0.7067	0.9033	1	
Uganda	0.8317	0.7548	0.7977	0.9040	1

the Kenyan Shilling does not appear to be linked to the other currencies in the region. On the whole, the evidence concerning G-PPP is not conclusive.

Next, we estimate the FCVAR model. The null of one fractional cointegration relationship cannot be rejected (see Table 4), which suggests that G-PPP holds. The resulting VECM specification is the following:

$$\Delta^{d}\left(\begin{bmatrix}\text{Burundian\_France}\\ \text{Kenyan\_Shilling}\\ \text{Tanzanian\_Shilling}\\ \text{Rwandan\_Franc}\\ \text{Ugandan\_Shilling}\end{bmatrix}-\begin{bmatrix}0.001\\0.022\\0.001\\0.002\\0.001\end{bmatrix}\right)=L_{d}\begin{bmatrix}1.000\\-0.311\\-1.075\\2.650\\-4.704\end{bmatrix}\upsilon_{t}+\sum_{i=1}^{2}\Gamma_{i}\Delta^{d}L_{d}^{i}\left(X_{t}-\mu\right)+\varepsilon_{t}.$$

The lag length was chosen on the basis of standard criteria (AIC, BIC). In any case, the results were found to be robust to selecting alternative lag lengths such as k = 1 and 3.[11] The estimated coefficients imply that external shocks have opposite effects in the case of the former British territories compared to Burundi and Rwanda.

Finally, we analyse business cycle synchronisation in the EAC. Specifically, we apply the HP method to decompose real GDP into trend and cyclical components using annual data from the Penn World Table 9.1 for the period 1960–2014.

The results are shown in Fig. 2. In all cases there is an upward trend. However, only Uganda appears to have experienced continuous growth, while the other countries have also gone through periods characterised by declines in GDP growth: in Rwanda this occurred following the genocide of the early 1990s; in Tanzania, after a period of buoyant growth driven by public investment in all sectors of the economy, poverty re-emerged at the beginning of the 90s; in both Kenya and Burundi the 1990s were a period of slow growth. Table 5 reports the correlations between the cyclical components for the five EAC countries analysed. Most of them are high and positive, which represents evidence in favour of the feasibility of a monetary union.

6. CONCLUSIONS

This paper examines real exchange rate linkages and business cycle synchronisation in the EAC with the aim of assessing whether or not this set of countries is likely to be able to create a successful monetary union. The univariate fractional integration analysis shows

[1] Note, however, that AIC and BIC are not necessarily the best criteria in applications involving fractional differentiation (Hosking, 1981; Beran *et al.,* 1998).

that the individual series exhibit unit roots and are highly persistent. The fractional bivariate cointegration tests (see Marinucci and Robinson, 2001) suggest that there exist bivariate fractional cointegrating relationships between the exchange rate of the Tanzanian shilling and those of the other EAC countries, and also between the exchange rates of the Rwandan franc, the Burundian franc and the Ugandan shilling. The FCVAR results (see Johansen and Nielsen, 2012) imply the existence of a single cointegrating relationship between the exchange rates of the EAC countries. On the whole, there is evidence in favour of G-PPP. In addition, there appears to be a high degree of business cycle synchronisation between these economies. On both grounds, one can conclude that a monetary union is feasible. Differences in exchange rate behaviour still exist between the former British colonies relative to Burundi and Ruanda, but on the whole the EAC might qualify as an OCA. A similar approach could be used to analyse the feasibility of other currency unions in Africa such as the South African Development Community or the West African Monetary Zone.

It should be stressed, however, that a successful union also requires fiscal convergence. At present there is no evidence that this has been achieved. The EAC countries are heavily dependent on external aid flows to combat fiscal imbalances; a measure of the fiscal deficit inclusive of foreign aid would be more informative about the state of their public finances with a view to forming a monetary union. It would also be useful for the EAC countries to agree on surveillance and the enforcement mechanisms for convergence criteria. A possibility would be to give an appropriate mandate to the EAC Secretariat.

The experience of other, already existing, African monetary unions could also be informative. The West African Economic and Monetary Union and the Central African Economic and Monetary Community have been a monetary union with 14 countries sharing the CFA as a common currency since they gained independence. Although theoretically different, the CFA currencies from each of the two regions are effectively interchangeable and have a fixed exchange rate to the euro. Despite being heterogeneous economies, these countries have been kept together by their common historical ties to the Francophone world. The existence of equivalent ties could also facilitate the creation of a union between the members of the EAC. Pegging the new EAC common currency to an international currency with a strong historical link such as the British pound could be an appropriate starting point.

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