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Abstract

This paper uses VAR techniques to investigate the potential for forming monetary unions in Eastern and Southern Africa. All countries in the sample are members of various regional economic organizations. Some of the organizations have a monetary union as an immediate objective whereas others consider it as a possibility in the more distant future. Our objective is to sort out which countries are suitable candidates for a monetary union based on the synchronicity of demand and supply disturbances. Although economic shocks are not highly correlated across the entire region, we tentatively identify three subregional clusters of countries that may benefit from a currency union.

Keywords: East and Southern Africa, Economic Integration, Monetary union, Structural VAR model

JEL classification: F33; F15

1. Introduction

The map of Africa is layered with a complex network of regional organizations. Many countries belong to a multiplicity of customs unions, development associations or other multi-country institutions that have various objectives and envision various degrees of integration (see Appendix). Some countries also use a common currency. For example, the Common Monetary Area (CMA) uses the South African Rand as a common currency (Grandes, 2003) while the West African Economic and Monetary Union (UEMOA) and the Central African Economic and Monetary Community (CEMAC) use the CFA franc, previously pegged to the French franc and now to the euro (Fielding and Shields, 2001). In recent years, after the successful launching of the euro, many additional groups of countries have started to consider adopting a common currency. For example, the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA) are pursuing a monetary union. The question has been raised of the potential of extending the Common Monetary Area in the Southern cone to include the countries of the South Africa Development Community (SADC) (Guillaume and Stasavage, 2000). Other organizations do not have a monetary union agenda at present but all have economic integration as an objective, which may include a common currency in the future. However, the effect of overlapping membership is viewed by many (World Bank, 2000; ECA, 2004; Panagariya, 2000; Masson and Pattillo, 2004) as a stumbling block to integration due to confusion arising from differences in rules of origin, wasteful duplication of effort and counterproductive competition among countries and institutions.

The goal of this paper is inform these deliberations by sorting out what groupings of countries appear to be good candidates for monetary unions. We focus on Eastern and Southern Africa since a number of countries in West Africa are already in similar monetary arrangements and have been studied by the previous literature (e.g. Fielding and Shields, 2001; Debrun et al 2002; Wane, 2004). The possibility of monetary unions in Eastern and Southern Africa has not received much research attention despite the apparent policy drive in that direction.

The methodology used here follows Bayoumi and Eichengreen (1992) who were among the first to identify the underlying structural shocks using the Vector Autoregression (VAR) technique developed by Blanchard and Quah (1989). Their results indicate that the EU could be

divided into a core group of countries with smaller, more correlated shocks than the periphery countries.[1] Since then, a large literature including Bayoumi and Taylor (1995), Ramaswamy and Slok (1998), and Kouparitsas (1999), has applied this methodology or a related approach to different compositions of country groups in Europe. More recently a number of studies have used the same approach to investigate the situation in Central and Eastern Europe and in East Asia. Fidrmuc and Korhonen (2001) and Frenkel and Nickel (2002) use VAR to assess the similarity of shocks between the countries of the Euro area and the European Union accession countries. Studies that have applied the approach to East Asia (e.g. Yuen and Ling (2001) and Zhang et al (2004)), identify tentative groupings of East Asian economies with potential for monetary union. Application of this methodology to Africa has been limited to Fielding and Shields (2001) who identify and compare economic shocks to different members of the two CFA monetary unions in West Africa. They conclude that the pattern of output shocks suggests a need to redraw the internal boundaries of the Franc zone.

Alternative methodologies applied to Eastern and Southern Africa provide mixed results. A study by Khamfula and Huizinga (2004) using a GARCH model investigates which countries of SADC are suited to enter a South Africa Monetary Union. Their results indicate low degrees of symmetry of the real exchange rate shocks across most of these countries, suggesting that a monetary union would amass high costs relative to benefits. Bayoumi and Ostry (1997) regress real growth on its first two lags. Their results indicate that asymmetry of shocks prevails while the few significant correlations of shocks they find do not involve contiguous states. Masson and Pattillo (2004) raise serious doubts about a full African monetary union due to economic disparities and poor linkages. Their results, however, offer support for the selective expansion of the CMA. They view selective expansion of existing monetary unions as a means of inducing countries to improve their policies. Grandes (2003) concludes that the CMA and Botswana form an optimal currency area using a Generalized Purchasing Power Parity model. Mkenda (2001) employs the same model to analyze the suitability of the EAC for a monetary union. Their study found that the real exchange rates between the EAC countries are cointegrated during the period

[1] Theoretically, a group of countries are suitable candidates for a monetary union if economic shocks across the member countries are positively and highly correlated. In that case, a common monetary policy can accommodate the economic conditions in the entire union. In contrast, desynchronized business cycles call for independent monetary policy by each country.

from 1980 to 1998, suggesting that the EAC is an optimum currency area. The limitation of this approach is that it does not distinguish disturbances from responses since movements in macroeconomic variables reflect the combined effects of shocks and responses (Angeloni and Dedola, 1999). The identification scheme due to Blanchard and Quah (1989) used here makes this distinction. The rest of the paper is structured as follows. The next section introduces the methodology. Section 3 presents the empirical results and makes references to the results obtained in the literature using alternative methods. Section 4 concludes.

2. Methodology

The aim is to identify and compare macroeconomic shocks to different Eastern and Southern African countries. We focus on shocks to aggregate output growth and inflation. To recover the underlying shocks we use the VAR identification scheme due to Blanchard and Quah (1989) and Bayoumi and Eichengreen (1992). The identification scheme is based on the Aggregate Demand-Aggregate Supply (AD-AS) framework. In this framework, the short-run aggregate supply curve is upward slopping due to sticky wages. A higher price level lowers the real wage, inducing higher employment and raising output. However, in the long-run real wages adjust to price changes so that the long-run aggregate supply curve is vertical at the full employment level of output. The aggregate demand curve is downward sloping both in the short and the long-run to reflect the assumption that lower prices boost demand. Supply shocks such as those originating from changes in technology, have long-run permanent effects on the full employment level of output. A positive supply shock reduces price and increases output. Conversely, the effect of a positive shock to aggregate demand is a short-term increase in output that gradually returns to its initial level as the real wage adjusts. The long-term effect is only a permanent increase in prices. Thus, both supply and demand shocks have long-run effects on the level of prices though in opposite directions. A positive demand shock increases prices whereas a positive supply shock lowers them.

Identification of supply and demand shocks

We assume that fluctuations in real output $\{y_t\}$ and the price level $\{p_t\}$ are the result of two underlying types of shocks: supply and demand shocks. Assume also that the variables are

unit root, so that the vector $X_t \equiv \begin{bmatrix} \Delta y_t \\ \Delta p_t \end{bmatrix}$ is stationary. The joint process of two variables (changes in GDP and the price level) can be represented by an infinite moving average representation of a vector of the two variables and an equal number of structural shocks. Let ε_t be the vector of demand and supply shocks, ($\varepsilon_{dt,}$ ε_{st}). Formally, the bivariate moving average of X_t can be represented as:

$$X_t \equiv \begin{bmatrix} \Delta y_t \\ \Delta p_t \end{bmatrix} = \sum_{i=0}^{\infty} L^i \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix} = \sum_{i=0}^{\infty} L^i A_i \varepsilon_{t-i} \quad (1)$$

where Δy_t and Δp_t represent changes in the log of output and prices and L is the lag operator. A_i represents the impulse response function of the shocks to the elements of the vector X_t, and $\varepsilon_{dt,}$ ε_{st} are independent white noise supply and demand shocks normalized so that $Var(\varepsilon_t)=I$. To decompose the shocks, the AD-AS framework assumes that demand shocks do not have any effect on output in the long-run. Thus, the cumulative effect of demand shocks on the change of the log of output (Δy_t) must be zero:

$$\sum_{i=0}^{\infty} a_{11i} = 0 \quad (2)$$

The supply side and demand side shocks can be recovered from estimating a finite order VAR. The optimal lag length (p) is chosen such that its residuals approximate white noise. Each element of vector X_t is regressed on lagged values of all the elements of X_t:

$$X_t = K + \Phi_1 X_{t-1} + \Phi_2 X_{t-2} + ... + \Phi_p X_{t-p} + e_t, \quad (3)$$

where K denotes a vector of constants, Φ_is are the coefficients from the estimating equation and e_t is a vector of the residuals $\begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix}$. The vector e_t is a composite of demand and supply shocks. If

the process is covariance stationary we can take expectations of (3) to calculate the mean μ of the process:

$$\mu = K + \Phi_1\mu + \Phi_2\mu + ... + \Phi_p\mu \tag{4}$$

Subtracting (4) from (3) gives (3) in terms of deviations from the mean:

$$X_t - \mu = \Phi_1(X_{t-1} - \mu) + \Phi_2(X_{t-2} - \mu) + ... + \Phi_p(X_{t-p} - \mu) + e_t \tag{5}$$

The VAR(p) in (5) can be represented as a VAR(1) process. To do this, define:

$$\xi_t \equiv \begin{bmatrix} X_t - \mu \\ X_{t-1} - \mu \\ . \\ . \\ X_{t-p+1} - \mu \end{bmatrix}, F \equiv \begin{bmatrix} \Phi_1\ \Phi_2 .....\Phi_p \\ I_2\ \ 0\ .... \\ . \\ . \\ 0.....\quad I_2\ 0 \end{bmatrix}, V_t \equiv \begin{bmatrix} e_t \\ 0 \\ . \\ . \\ 0 \end{bmatrix}$$

Then (5) can be written as VAR(1):

$$\xi_t = F\xi_{t-1} + V_t \tag{6}$$

and recursive substitution of (6) implies that:

$$\xi_{t+s} = V_{t+s} + FV_{t+s-1} + F^2V_{t+s-2} + ... + F^{s-1}V_{t+1} + F^s\xi_t \tag{7}$$

If the eigenvalues of F all lie inside the unit root circle, then $F^s \to 0$ as $s \to \infty$ and the VAR is covariance stationary (Hamilton, 1994). The first two rows of (7) then give the vector moving average (∞) representation of X_t :

$$X_t = \mu + e_t + C_1e_{t-1} + C_2e_{t-2} + C_3e_{t-3} + C_3e_{t-3} + C_4e_{t-4}. \tag{8}$$

where $C_j = F_{11}^{(j)}$ and $F_{11}^{(j)}$ denotes the upper left block of F^j which is the matrix F raised to the j^{th} power. Equations (1) and (8) yield the relationship between the estimated residuals (e_t) and the structural shocks (ε_t):

$$e_t = A_0 \varepsilon_t \tag{9}$$

Therefore we need to know the elements of A_0 to calculate the underlying structural supply and demand shocks. The variance-covariance matrix of residuals $E(e_t e_t') = A_0 E(\varepsilon_t \varepsilon_t') A_0'$ and the C_is are known from estimation. To recover the four elements of A_0 in the two-by-two case we need four restrictions[2]. Two are simple normalizations which define the variances of $\varepsilon_{dt,}$ and ε_{st} (usually to one). Since $\varepsilon_{dt,}$ and ε_{st} are deemed to be pure shocks, a third restriction applied is to assume that demand and supply shocks are orthogonal so that $E(\varepsilon_{dt}\, \varepsilon_{st}) = 0$ (Bayoumi and Eichengreen, 1992). $E(\varepsilon_t \varepsilon_t')$ then drops out as I_2, and we have $E(e_t e_t') = \Omega = A_0 A_0'$. The variance-covariance matrix of residuals Ω is a known symmetric matrix. From this we obtain the following three restrictions:

$$\begin{aligned}
&\mathrm{Var}(e_{yt}) = a_{11}(0)^2 + a_{12}(0)^2 \\
&\mathrm{Var}(e_{pt}) = a_{21}(0)^2 + a_{22}(0)^2 \\
&\mathrm{cov}(e_{yt} e_{pt}) = E(e_{yt} e_{pt}) = a_{11}(0)a_{21}(0) + a_{12}(0)a_{22}(0)
\end{aligned} \tag{10}$$

The final restriction is to impose the condition that demand shocks have no long term effects on output as in (2). In terms of the VAR this implies:

$$\sum_{i=0}^{\infty} \begin{bmatrix} c_{11i} & c_{12i} \\ c_{21i} & c_{22i} \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} = \begin{bmatrix} 0 & * \\ * & * \end{bmatrix} \tag{11}$$

These restrictions allow the matrix A_0 to be uniquely defined and hence the demand and supply shocks to be identified. Two series of exogenous shocks are obtained and the correlations of these shocks computed for the East African countries.

[2] Four equations to solve for four unknowns

Data

The main data source used in this study is the World Bank's *World Development Indicators.* This is supplemented by comparable figures from the IMF's *International Financial Statistics* and the African Development Bank *Country Statistics*. Annual data for 21 Eastern and Southern Africa countries is used. For most of these countries the data cover the sample period from 1971 to 2002. For Ethiopia, Tanzania, and Uganda, the data are from 1970 to 2001, whereas for the Comoros, Mauritius, Mozambique, and Namibia the data are for the period 1980-2002. Real GDP growth is used to measure changes in output, while changes in the implicit GDP deflator represent price changes. For each country we use the first difference of the natural logs of real GDP and the implicit GDP deflator for estimation. Although they are available, it is worth noting that the quality of reported data by some countries, particularly Uganda, Sudan, Rwanda, and Burundi may have been affected by civil unrest - Uganda throughout most of the early 1980s, Rwanda and Burundi in the early 1990s and Sudan through most of the data period. The data for Zimbabwe proved unstable and this country is not included in the analysis. Data for several countries of interest within the region: Djibouti, Somalia, Angola, Congo DR, and Eritrea are either not available or the series are too short to be used for any meaningful analysis.

3. Empirical results

The time series properties of the variables were investigated using the Augmented Dickey-Fuller test and it was found that both variables are I(1). Therefore the first differences of the variables are used to ensure stationarity. Tests for stability show that the eigenvalues of (F) in (6) all lie inside the unit root circle except for Zimbabwe (see Appendix 2). The VAR is thus covariance stationary. For estimation of the empirical two-variable VAR the number of lags is set to two in all cases since both the SBIC and AIC statistics indicate that all models have an optimal lag length of one or two. From the estimated VAR the underlying supply and demand shocks were recovered as described in section 2.

The range of the underlying demand and supply shocks constrained to be of unit variance are provided in Table 1. While the shocks vary from country to country in magnitude, overall the

demand shocks show more dispersion than the supply shocks. Countries that have had some civil strive like Rwanda, Sudan, Ethiopia, Rwanda, and South Africa show wide swings in supply and demand shocks. However, even relatively politically stable countries (e.g. Madagascar, Kenya and Tanzania) have experienced wide swings especially in terms of demand shocks.

Correlations of supply and demand shocks

Tables 2, 3, 4, and 5 report the correlation coefficients of the identified supply and demand shocks among the Eastern and Southern African countries with positive and statistically significant correlations highlighted. If the correlations are positive they are considered symmetric and if negative they are considered asymmetric. The more symmetric the shocks, the more feasible it becomes for a group of countries to establish a monetary union. The tables contain a large number of correlations for all pairs of countries. We will first highlight some of the more important pair-wise findings and then summarize our overall impression of the results.

We look first at the supply shocks; these are more critical since they are more likely to be invariant to demand management policies (Bayoumi and Eichengreen, 1994). The correlations of contemporaneous and lagged supply shocks in Tables 2 and 3 are generally small and asymmetry seems to prevail. There are a few positive and significant correlations. Even then, unlike in Bayoumi and Ostry (1997), only a weak pattern is discernible. In the southern tip, South Africa, the major economy in the southern tip and anchor for the CMA, shows some significant correlation in the supply shocks it faces with those faced by its neighboring states of Lesotho, Swaziland, and Mozambique. We also find some positive and significant pair-wise correlations among contiguous states in the Eastern and North Eastern region, although no one specific country seems to be a natural anchor for this region. Although there are a few significant cross correlations between the Northern and Southern economies, we cannot identify any form of consistency.

The Island economy of Seychelles shows significant correlations with the other insular countries of Madagascar and Comoros. It also seems to show more correlation with the Eastern African Community countries than with the Southern African ones. This is probably due to proximity and to the fact that the United Republic of Tanzania includes the Island economies of

Zanzibar and Pemba. Tanzania seems to be the water-shed economy, showing significant supply shock correlation with countries in the Northern, the Southern regions and the Island economies. Coincidentally, Tanzania is also the only country that is a member of the EAC and SADC.

The correlations of demand shocks reported in Tables 4 and 5 also reinforce the results seen from Tables 2 and 3. There is an indication of a CMA effect in the Southern tip of Africa suggested by the supply shock correlations, while the Eastern and North Eastern economies show some significant correlations though with less visible patterns. The demand shocks for the island economies again seem to correlate more with the Eastern African countries than Southern Africa. It seems that Egypt, though a big economy has had less effect on the North Eastern and Eastern African economies near it than South Africa has had on its neighbors. Again Tanzania seems to merge well with countries to the south and to the north.

Overall, the correlations found for the Eastern and Southern Africa seem more asymmetric compared to the correlations for CFA zone obtained by Fielding and Shields (2001) and more comparable to the exchange rate disturbances found for the SADC by Khamfula and Huizinga (2004). They are, however, much smaller and less symmetric that some of the results found for the European Community and the European accession countries found by Fidrmuc and Korhonen (2001) and Frenkel and Nickel (2002).

Based on these correlations and geographical proximity, we tentatively suggest a tripolar route to monetary integration. The first is a Rand based monetary union in southern Africa consisting of the existing CMA, expanding northwards to include Botswana, Mozambique, and Zambia. South Africa's reluctance to expand the CMA (Sparks, 2002) would be the political hurdle to overcome. The second is an East African monetary union with the nucleus as the proposed EAC monetary union. This could gradually expand to include Rwanda, Burundi, Ethiopia, Sudan and Egypt. Though it might not seem to be the natural anchor for the region it might still be the right nucleus since the East African Community is showing the necessary political will and has taken concrete steps towards a monetary union. A third monetary union could be based on the IOC for the Island economies.

Impulse response

In addition to isolating the underlying disturbances, it is beneficial to compare the response of the economies to the shocks in terms of magnitude and speed of adjustment. This can be done by looking at the impulse response functions. The larger the size of the shock, the more disruptive its effects will be on the economy. Similarly, the slower is the adjustment after disturbances, the larger will be the cost of maintaining a single currency.

For briefness, instead of drawing an impulse response function for the impact of each shock on each variable for all countries, we focus on the asymptotic effect of each shock on each variable. Table 6 summarizes the total long-run impulse response to a unit positive supply and demand shock for each economy. The impulse responses of the output level to a supply shock are generally small, all being less than 13 percent. The speed of adjustment is also relatively high, most dissipating by the second year and all by the third year. Except for Burundi, Comoros and Zambia, the cumulated effect of a supply shock on output is positive as expected. However there is a wider cross-country variation in the impulse response of the price level to a demand shock. For most countries, the speed of adjustment is short. Like in the output response, the effect of most shocks dissipates by the second year. For four countries: Uganda, Zambia, Sudan, and Mozambique the speed of adjustment is slow and hence the accumulated effect relatively large (40% and over). For all countries except Burundi and Swaziland, demand shocks produce an increase in prices over time. Most of the impulse responses of the price level to a supply shock also dissipate by the second or third year. Only Uganda has a slow speed of adjustment and a large long-run effect (52%). However for quite a number of countries the cumulative effect of a positive supply shock on the price level are negative though small.

From these results it would seem that the impulse responses are generally small for most countries and dissipate quickly, by the second or third year. This is the same time of adjustment as for the European Community countries found by Bayoumi and Eichengreen (1992), while the overall cumulative effects seem smaller than those found by Fielding and Shields (2001) for the CFA zone. Countries that show a marked difference in size and speed of adjustment seem to be confined to those (Rwanda, Uganda, Sudan, Mozambique) that have experienced some sort of civil strive. It would be expected that as these countries stabilize the shocks to the economies

will reduce. These results tentatively point to a possibility of monetary unions for some of the Eastern and Southern African economies.

Variance Decomposition

The forecast error variance shows the contribution of each shock to the movements in the two variables of the vector $X_t \equiv \begin{bmatrix} \Delta y_t \\ \Delta p_t \end{bmatrix}$. This gives an indication of which shocks are the more predominant accounting for the variability in vector X_t. This is important because differences in the cause of variability in the countries could be indicative of underlying differences in the transmission mechanism and the policy strategies of the Eastern and Southern African countries, which could be an obstacle to regional monetary integration.

Table 7 shows the proportion of variability of the log of real output due to demand shocks at one to six year time horizon. The proportion due to supply shock is found by subtracting from unity. For most countries supply shocks account for most (over 80%) of the variability of real output. However there are several countries where the demand shocks account for over 50% of the variability at the six year horizon. These results show more variation than the results obtained for East Asia (Yuen and Ling, 2001; Zhang et al, 2004) or those presented for the European Union by Ballabriga et. al. (1999). The variance decomposition of the price level indicates that demand shocks account for a high proportion (over 80%) of the price level variability across most economies. However, there are a few countries that show wide variations, with some countries less than 10%. Thus, although there are indications that structural supply and demand shocks contribute to output changes and price variations in the same way for most of the Eastern and Southern African countries, the contribution is quite different for some countries.

4. Conclusion.

We use a two-variable VAR model to investigate the potential for forming monetary unions in Eastern and Southern Africa. The countries in the sample are members of regional economic organizations that either have a monetary union as an immediate objective or might consider it in the future. We decompose the economic shocks experienced by these economies

into supply and demand disturbances and study their correlation for all pairs of countries. The results do not provide strong evidence in favor of a broad monetary union encompassing a large number of countries in the region. Nonetheless, we find tentative supportive evidence for three groupings of countries: 1) in the southern tip of Africa expanding the Common Monetary Area; 2) the member countries of the East Africa Community potentially including several other neighboring economies; and 3) several island economies. We should reiterate that even this supportive evidence is relatively weak.

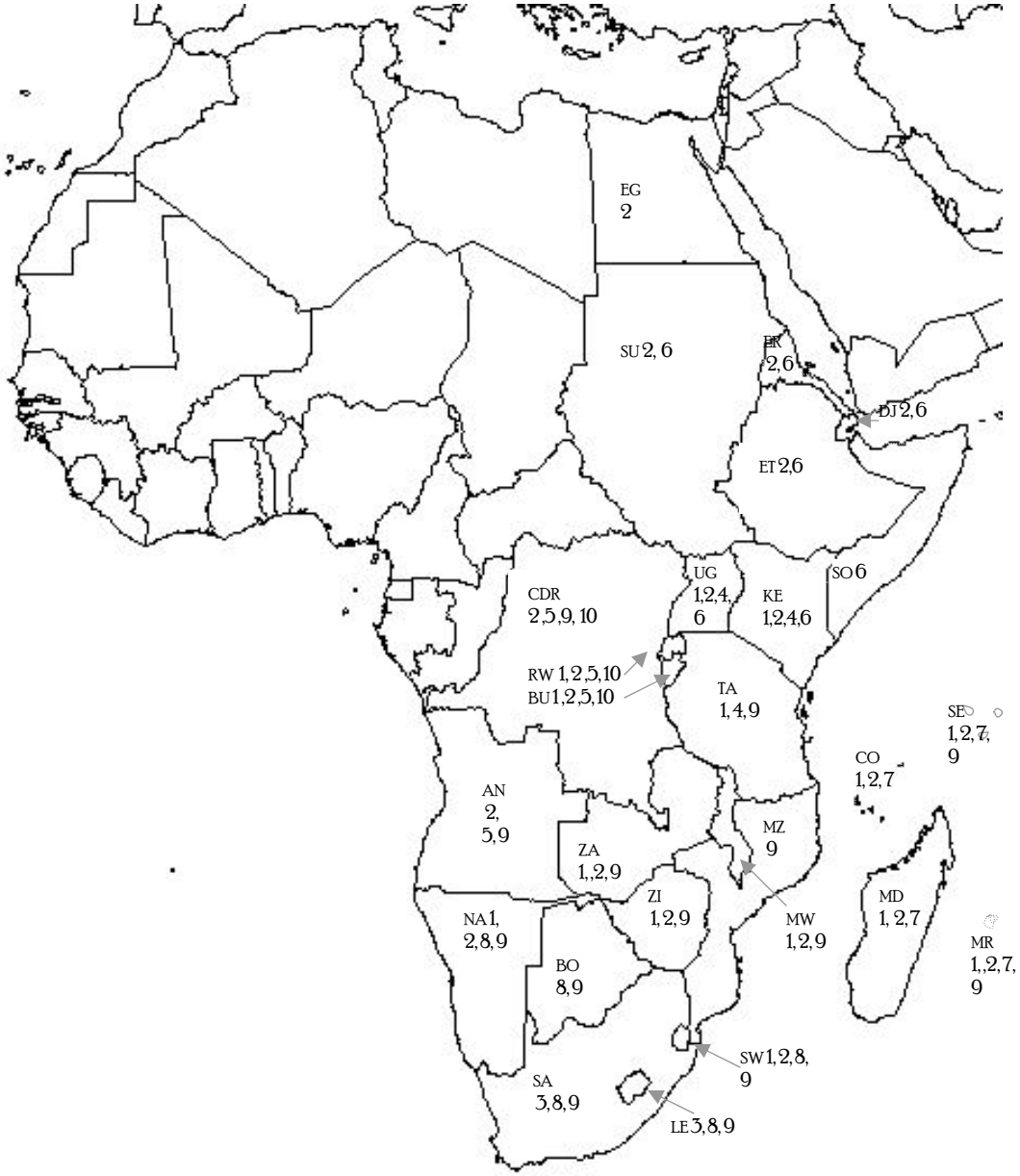
Evidence suggests that the optimum currency area criteria might be endogenous in the sense that it might be easier to satisfy then after a monetary union is formed than before. Two rationales have been offered for this endogeneity: a policy rationale (Artis and Zhang, 1997) and a trade rationale (Frankel and Rose, 1998; and Rose, 2000). The economies that we study are partners in economic cooperation organizations which aim to promote cross-border trade and investment. In time these efforts may increase the synchronicity of business cycles among the various countries providing better conditions for monetary unions. Indeed, some studies (Cernat, 2003; Carrère, 2004) have found improvements in intra-African trade from these regional agreements. However, other researchers (Bayoumi and Ostry, 1997; Yeats, 2004) point to apparent limitations to increased intra-African trade due to non-complimentary production structures of these economies. Since this kind of limitations cannot be resolved quickly, it is more appropriate in the African context for countries aspiring for monetary union to start with groups that are potentially OCA. Thus as Artis (2003) points out the optimal currency area framework is still useful to consult, even more so in the African context. It is also worth noting that definite steps are already being taken toward monetary union among some countries, most notably the East African Community members where a strong political will for monetary union exists, a factor that has been stressed by Feldstein (1997) as the major motivation for the European monetary union.

We should also point out that the symmetry of shocks, though important, is only one factor that favors the implementation of a monetary union. A complementary approach is to capture the welfare effects of the proposed monetary union using a multi-country theoretical

framework that reflects some of the key economic and political features found in the subregions. This is a fruitful area for further research.

Appendices

Appendix 1. Regional Economic Groups in Eastern and Southern Africa



Notes:

1) Cross Border Initiative (CBI). The CBI is a framework of harmonized policies to facilitate a market-driven concept of integration in Eastern and Southern Africa region and the Indian Ocean. It is not an institution or a new trading bloc. It was launched in 1992 with the support of ADB, EC, IMF and WB.
2) Common Market for Eastern and Southern Africa (COMMESA). The 20 member COMESA originally begun as the Preferential Trade Area (PTA) in 1983. In 1994

COMESA replaced the PTA. Besides a common market COMESA has the objective of establishing a monetary union and common central bank by 2025.

3) Common Monetary Area (CMA): The CMA is a monetary arrangement that uses the South African Rand as a common currency though each member country issues its own currency at par with the Rand. The Rand zone came into existence formally in 1974 when South Africa, Botswana, Lesotho, and Swaziland signed the Rand Monetary Agreement (RMA). Botswana opted out in 1976, but has since been linked to the Rand through a currency basket where the Rand weighs 60-70 percent. The CMA replaced the RMA in 1986, and Namibia joined in 1992.
4) East African community (EAC): Currently only 3 countries are involved. But Rwanda and Burundi have applied to join. The East African countries revived the EAC with the treaty of 1999, and have signed a Customs Union Protocol in 2004. A Common Market, A Monetary Union, and ultimately a Federation are planned. The renewed interest in monetary cooperation in East Africa comes nearly four decades after the demise of the East African Currency Board (EACB) in 1966. This was a continuation of a monetary arrangement backed by sterling pound set up by the British colonial power.
5) Economic Community of Central African States (ECCAS). An 11 member community, the ECCAS was established in 1983 by members of Central African Customs and Economic Union (UDEAC) and Economic Community of the Great Lakes (CEPGL). Angola became a fully fledged member in 1999. The objective is economic stability in the region and ultimately a Central African Common Market. ECCAS has overlapping membership with the Central African monetary Union (CEMAC), under the franc zone arrangement. The four countries within this community; Angola, Democratic Republic of Congo, Rwanda, and Burundi not members of CEMAC are included in the study.
6) Intergovernmental Authority on Development (IGAD). IGAD was created in 1996 by 7 member states in the horn of Africa to supersede the Intergovernmental Authority on Drought and Development (IGADD). The revitalised IGAD expanded the areas of corporation. The objective of IGAD is to achieve economic integration and sustainable development in the region.
7) Indian Ocean Commission (IOC). IOC was created in 1984 with three members; Seychelles, Madagascar, Mauritius. The Comoros and Réunion (colony of France) joined in 1986. The objective of IOC is economic and commercial cooperation especially on maritime resources. Réunion (as a French colony) is not included in the study.
8) Southern African Customs Union (SACU). The five member SACU was established in 1910, and is thus one of Africa's oldest organisations. It provides for duty free movement of goods and a common external tariff. Tariffs, collected by South Africa, are paid into the South African Revenue Fund. The share for the BLNS states is calculated based on a formula, with the residual going to South Africa.
9) Southern Africa Development Community (SADC). SADC is a 14 member organisation established in 1992. Its forerunner, Southern Africa Coordination Conference (SADCC) was mainly concerned with lessening dependence on the then apartheid-ruled South Africa. SADCs main objective is to become a common market.
10) Economic Community of the Great Lakes Countries (CEPGL). The three member community CEPGL was established in 1976. The objective is to promote security and regional economic cooperation.

Appendix 2. Eigenvalue stability condition. All the eigenvalues (except for Zimbabwe) lie inside the unit root circle.

Botswana	.2590692 + .6246209i	.2590692 - .6246209i	.4089056 + .3141038i	.4089056 - .3141038i
Burundi	.3248622 + .313089i	.3248622 - .313089i	-0.41798	0.292918
Comoros	0.66989	-0.42474	-.2827078 + .315506i	-.2827078 - .315506i
Egypt	0.530908	.3099168 + .1664645i	.3099168 - .1664645i	-0.17048
Ethiopia	-0.66534	0.523973	-.02166416 + .3032552i	-.02166416 - .3032552i
Kenya	.3781657 + .2849878i	.3781657 - .2849878i	0.361337	-0.20006
Lesotho	.06656797 + .6797069i	.06656797 - .6797069i	-0.4928	0.326938
Madagascar	.2994799 + .5352505i	.2994799 - .5352505i	.00004683 + .4507063i	.00004683 - .4507063i
Mauritius	0.791532	.33261 + .485475i	.33261 - .485475i	-0.25113
Malawi	-0.57	.325979 + .2996425i	.325979 - .2996425i	0.256229
Mozambique	.6019361 + .1585619i	.6019361 - .1585619i	-0.4501	-0.02752
Namibia	.07092345 + .5326837i	.07092345 - .5326837i	-0.49132	0.397418
Rwanda	-0.41745	.2386292 + .3200258i	.2386292 - .3200258i	-0.20306
South Africa	0.720133	.1830761 + .4748003i	.1830761 - .4748003i	-0.24097
Seychelles	0.80347	.1113275 + .56843i	.1113275 - .56843i	-0.47477
Sudan	0.855946	.2296599 + .5079118i	.2296599 - .5079118i	-0.22133
Swaziland	-0.59124	-.1681201 + .4976256i	-.1681201 - .4976256i	0.52525
Tanzania	.3475588 + .3641935i	.3475588 - .3641935i	0.328399	-0.10391
Uganda	.6550534 + .05269854i	.6550534 - .05269854i	-0.40497	-0.01825
Zambia	0.762015	-.1605999 + .3214873i	-.1605999 - .3214873i	0.176776
Zimbabwe	1.182185	-0.48305	.2441246 + .389508i	.2441246 - .389508i

The eigenvalues λ of the matrix F in (6) satisfy:

$\left|I_n\lambda^p - \Phi_1\lambda^{p-1} - ..... - \Phi_p\right| = 0$. For p=2 we have $\left|I_n\lambda^2 - \Phi_1\lambda - \Phi_2\right| = 0$

The VAR is covariance stationary as long as $|\lambda| < 1$, that is lie within the unit root circle, such that the consequences of (ε_t) eventually dies out. Except for Zimbabwe (which is dropped from analysis) the VAR satisfies stability condition.

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Table 1. Descriptive statistics of demand and supply shocks.

	Demand shocks			Supply shocks		
Country	Range	Minimum	Maximum	Range	Minimum	Maximum
Botswana	4.575	-1.414	3.160	0.633	-0.293	0.339
Burundi	4.239	-1.963	2.276	3.590	-1.664	1.926
Comoros	3.602	-1.925	1.677	4.162	-1.628	2.533
Egypt	4.907	-1.778	3.129	4.262	-1.678	2.584
Ethiopia	4.401	-2.076	2.325	5.705	-1.446	4.258
Kenya	5.217	-1.358	3.858	1.844	-1.056	0.788
Lesotho	4.484	-2.238	2.245	4.147	-1.806	2.340
Madagascar	6.007	-2.285	3.721	4.828	-2.877	1.950
Mauritius	3.681	-2.417	1.264	1.267	-0.722	0.545
Malawi	4.709	-1.796	2.913	3.949	-2.292	1.657
Mozambique	5.047	-1.416	3.631	3.984	-2.279	1.705
Namibia	4.109	-1.717	2.391	3.602	-1.695	1.907
Rwanda	6.799	-4.262	2.537	5.165	-3.875	1.289
South Africa	5.156	-2.217	2.938	4.478	-1.929	2.548
Seychelles	4.259	-1.884	2.375	4.808	-2.681	2.127
Sudan	5.763	-2.779	2.983	4.099	-2.350	1.748
Swaziland	5.050	-1.531	3.518	4.225	-1.767	2.457
Tanzania	5.742	-1.261	4.481	4.011	-2.231	1.780
Uganda	4.216	-1.712	2.504	5.320	-2.877	2.443
Zambia	4.279	-1.545	2.733	3.644	-1.571	2.072

Table 2. Correlations of contemporaneous supply shocks

	BO	BU	CO	EG	ET	KE	LE	MD	MR	MW	MZ	NA	RW	SA	SE	SU	SW	TA	UG
Botswana	1.00																		
Burundi	-0.08	1.00																	
Comoros	-0.41	-0.03	1.00																
Egypt	0.28	-0.30	0.31	1.00															
Ethiopia	0.01	0.11	0.00	0.21	1.00														
Kenya	-0.23	-0.07	-0.28	-0.04	-0.04	1.00													
Lesotho	0.03	0.11	**0.39**	0.19	0.19	-0.13	1.00												
Madagascar	-0.19	-0.34	0.02	0.16	-0.22	**0.40**	-0.24	1.00											
Mauritius	-0.37	**0.42**	0.08	-0.07	0.18	**0.39**	0.31	**0.52**	1.00										
Malawi	-0.14	-0.38	-0.29	0.11	0.08	0.29	0.06	0.00	-0.07	1.00									
Mozambique	-0.23	0.05	0.04	-0.32	0.22	0.23	-0.04	0.17	**0.57**	0.05	1.00								
Namibia	-0.07	0.21	0.16	0.01	0.05	-0.39	0.34	0.00	0.21	-0.46	-0.11	1.00							
Rwanda	-0.10	0.19	-0.19	-0.11	0.20	**0.48**	0.22	0.04	0.23	-0.05	-0.13	-0.14	1.00						
South Africa	0.02	-0.32	0.10	0.22	0.25	-0.11	**0.37**	-0.06	-0.15	0.12	**0.38**	-0.19	0.05	1.00					
Seychelles	-0.48	-0.16	0.33	-0.05	0.19	-0.12	0.08	0.20	0.30	0.27	0.07	0.32	0.13	0.05	1.00				
Sudan	0.24	0.05	-0.23	-0.01	**0.34**	-0.16	-0.13	-0.09	0.07	-0.05	0.21	0.11	-0.04	-0.01	-0.08	1.00			
Swaziland	-0.06	-0.08	0.15	0.04	-0.05	-0.05	0.13	0.17	0.29	-0.04	0.32	0.16	-0.38	**0.47**	-0.05	0.01	1.00		
Tanzania	-0.27	-0.20	0.07	0.28	0.04	0.06	0.03	**0.40**	**0.51**	0.17	**0.51**	-0.11	-0.12	0.30	**0.36**	-0.03	**0.32**	1.00	
Uganda	0.11	**0.56**	-0.27	-0.04	0.20	-0.20	0.03	-0.21	-0.03	-0.26	-0.09	0.10	0.13	-0.21	-0.23	0.25	-0.04	-0.30	1.00
Zambia	0.25	-0.27	-0.18	0.22	-0.36	-0.07	-0.28	0.11	-0.45	0.10	-0.51	0.15	-0.33	-0.21	-0.13	-0.20	-0.14	-0.23	-0.20

Notes: Bold indicates statistical significance at the 10 percent level.

Table 3. Correlations of contemporaneous supply shocks with supply shocks lagged one period.

	BO	BU	CO	EG	ET	KE	LE	MD	MR	MW	MZ	NA	RW	SA	SE	SU	SW	TA	UG	ZA
LBotswana	0.03	0.08	0.02	-0.01	-0.03	0.14	0.11	-0.23	-0.27	-0.01	-0.25	-0.49	**0.34**	0.01	-0.05	-0.1	-0.5	-0.11	-0.24	0.05
LBurundi	0.01	0.03	0.21	-0.09	-0.19	-0.02	-0.04	-0.07	-0.1	-0.03	-0.13	0.25	0.01	0	-0.16	0.12	0.17	-0.2	0.16	0.1
LComoros	-0.02	0.23	-0.1	0.02	0.18	0.09	-0.17	0.22	0.12	-0.04	0.37	0.01	-0.18	-0.11	0.25	0.06	0.25	-0.24	**0.53**	-0.1
LEgypt	**0.43**	0.1	-0.5	-0.03	**0.35**	0.25	0.25	-0.21	-0.27	0.27	-0.2	-0.45	0.13	-0.06	-0.28	0.07	-0.28	-0.37	0.03	-0.1
LEthiopia	**0.39**	-0.22	0.17	0.16	-0.01	0	0.02	0.09	0	-0.08	**0.37**	0.15	-0.25	-0.1	-0.4	0.06	-0.15	-0.21	-0.1	**0.4**
LKenya	0.16	-0.12	-0.1	-0.07	-0.16	-0.12	**0.41**	-0.06	0.14	-0.04	0.07	0.23	0	**0.31**	0.08	-0.14	0.16	0.15	-0.16	-0.1
LLesotho	-0.05	-0.02	0.2	-0.15	0.05	0.17	-0.02	0.06	0.27	-0.01	0.04	0.16	-0.11	-0.22	0.14	-0.12	0.12	-0.36	-0.21	-0.1
LMadacascar	0.03	0.05	-0.4	-0.26	0.12	-0.07	0.18	-0.03	0.19	-0.06	**0.48**	-0.19	0.09	0.27	0.14	0.17	0.12	**0.41**	0.12	-0.5
LMauritius	**0.43**	0.31	0.03	-0.23	0.33	-0.18	0.27	-0.36	0	-0.24	0.03	0.23	0.19	0.01	0.05	0.3	0.27	-0.31	**0.49**	-0.3
LMalawi	-0.01	-0.17	**0.4**	0.22	0.09	-0.14	0.18	0.27	0.08	0.04	-0.28	**0.42**	-0.14	-0.09	**0.32**	-0.09	-0.15	-0.01	-0.38	0.17
LMozamb.	**0.39**	0.08	-0.1	0.14	-0.05	-0.26	-0.03	-0.15	-0.3	-0.44	-0.23	**0.47**	0.11	-0.08	0.03	0.11	0.05	-0.13	**0.47**	0.09
LNamibia	-0.13	0.12	0	-0.06	**0.55**	0.26	0.18	0.2	0.37	-0.02	0.04	-0.15	**0.4**	-0.04	-0.08	0.28	**0.46**	-0.06	0.33	-0.3
LRwanda	0.05	-0.14	0.25	-0.36	-0.55	0.22	-0.04	0.2	0.13	-0.17	0.2	-0.32	-0.02	-0.04	-0.3	-0.26	0.11	-0.16	-0.18	-0.1
LSouth Africa	0.19	0.06	-0.3	0.16	-0.2	0.04	-0.09	0.06	-0.03	-0.19	-0.08	0.19	-0.17	-0.24	-0.27	0	-0.06	-0.13	0.01	0.05
LSeychelles	-0.03	-0.08	0.06	0.1	0.06	**0.31**	-0.18	**0.6**	**0.53**	-0.16	0.18	0.17	0.06	-0.12	-0.05	0.06	0.1	-0.04	0.1	0.04
LSudan	0.11	-0.03	**0.4**	**0.43**	0.18	-0.08	0.13	0.04	-0.06	-0.13	-0.08	-0.2	-0.1	-0.08	-0.17	-0.12	-0.11	**0.32**	0.1	-0.1
LSwaziland	0.07	**0.35**	-0.3	0.27	**0.36**	-0.24	0.06	-0.12	0.18	-0.14	0.14	0.21	-0.1	0.12	0.08	**0.46**	0.13	0.15	0.3	-0.2
LTanzania	0.12	0.11	-0.4	0.01	**0.36**	0.29	0	0.04	0.22	-0.02	0.28	0.23	0.2	-0.11	-0.04	**0.39**	-0.07	0	0.22	-0.4
LUganda	0.15	-0.10	0.04	-0.28	0.0	-0.27	-0.31	-0.01	-0.4	-0.05	-0.22	-0.15	-0.17	-0.05	-0.09	0.18	-0.04	-0.08	0	0.13
LZambia	-0.31	0.02	-0.1	-0.01	0.17	0.19	**0.35**	-0.02	-0.02	**0.43**	-0.19	-0.16	**0.37**	0.29	0.23	-0.22	-0.08	0.12	-0.11	0

Notes: Bold indicates statistical significance at the 10 percent level. (L) Indicates supply shocks lagged one period.

Table 4. Correlations of contemporaneous demand shocks.

	BO	BU	CO	EG	ET	KE	LE	MD	MR	MW	MZ	NA	RW	SA	SE	SU	SW	TA	UG	ZA
Botswana	1.00																			
Burundi	0.08	1.00																		
Comoros	-0.23	-0.39	1.00																	
Egypt	0.04	0.04	-0.09	1.00																
Ethiopia	-0.11	-0.14	-0.25	-0.13	1.00															
Kenya	-0.10	0.07	-0.39	-0.09	0.03	1.00														
Lesotho	0.00	0.04	-0.30	-0.10	0.23	-0.06	1.00													
Madagascar	-0.04	-0.15	-0.06	0.06	0.02	**0.54**	-0.17	1.00												
Mauritius	**0.42**	0.21	-0.10	-0.08	0.04	0.30	-0.25	0.19	1.00											
Malawi	-0.09	-0.21	0.07	-0.02	-0.11	-0.04	-0.08	0.27	-0.59	1.00										
Mozamb.	0.24	-0.08	-0.17	**0.61**	-0.10	0.12	**0.37**	0.31	-0.06	0.05	1.00									
Namibia	**0.59**	0.23	-0.04	-0.09	0.14	-0.26	0.29	-0.03	**0.37**	0.03	0.04	1.00								
Rwanda	0.05	0.15	0.19	0.02	-0.06	-0.60	0.14	-0.70	-0.37	-0.03	-0.20	0.07	1.00							
South Afr.	0.12	0.12	-0.25	**0.32**	0.17	0.00	0.12	0.04	-0.06	-0.07	0.01	0.26	0.02	1.00						
Seychelles	-0.13	0.42	0.02	0.28	-0.15	-0.02	-0.10	-0.37	-0.01	-0.10	0.21	0.20	**0.31**	-0.04	1.00					
Sudan	0.27	-0.14	-0.24	-0.03	0.20	0.03	-0.01	-0.11	0.00	0.23	0.27	0.31	-0.17	0.03	-0.11	1.00				
Swaziland	**0.32**	**0.34**	-0.16	-0.26	-0.08	-0.13	0.10	-0.06	0.19	0.06	-0.28	**0.39**	0.00	**0.36**	-0.13	0.19	1.00			
Tanzania	0.10	0.09	-0.26	**0.52**	-0.01	0.20	0.05	**0.36**	0.29	-0.10	**0.76**	-0.04	-0.31	-0.03	0.11	0.10	-0.33	1.00		
Uganda	0.19	**0.41**	-0.35	0.01	0.09	0.01	**0.37**	0.00	-0.01	0.11	**0.38**	0.29	-0.07	-0.11	0.27	0.05	0.03	**0.40**	1.00	
Zambia	-0.20	0.09	-0.17	**0.38**	0.09	-0.10	-0.05	-0.12	-0.14	-0.19	-0.13	-0.09	-0.14	**0.32**	0.20	-0.04	0.03	0.02	-0.04	1.00

Notes: Bold indicates statistical significance at the 10 percent level.

Table 5. Correlations of contemporaneous demand shocks with demand shocks lagged one period.

	BO	BU	CO	EG	ET	KE	LE	MD	MR	MW	MZ	NA	RW	SA	SE	SU	SW	TA	UG	ZA
LBotswana	0.10	**0.38**	-0.40	**0.36**	-0.22	0.22	-0.13	0.18	0.09	0.10	-0.10	0.20	-0.10	**0.41**	0.18	-0.07	0.28	-0.03	-0.02	0.40
LBurundi	-0.02	-0.03	0.12	-0.05	-0.23	-0.22	0.11	-0.44	-0.16	-0.12	-0.32	0.13	0.15	0.25	0.07	0.06	0.25	-0.25	-0.09	0.30
LComoros	0.27	0.22	-0.32	-0.17	-0.03	0.07	-0.20	0.03	0.35	-0.16	0.02	0.06	-0.22	-0.22	-0.26	0.16	0.13	0.12	0.22	-0.41
LEgypt	**0.38**	0.14	-0.02	-0.07	-0.12	0.10	-0.05	-0.04	0.36	0.16	0.23	0.30	0.00	0.01	0.12	**0.42**	**0.45**	0.15	0.15	-0.26
LEthiopia	-0.12	-0.53	-0.03	0.05	-0.02	**0.34**	0.12	0.31	0.00	-0.04	0.07	-0.40	-0.26	-0.17	-0.37	-0.13	-0.45	0.12	-0.17	-0.02
LKenya	-0.09	-0.10	0.14	0.10	0.17	-0.09	0.05	0.02	-0.49	**0.33**	0.15	0.04	0.32	-0.24	0.10	0.02	-0.37	-0.01	0.04	-0.16
LLesotho	0.03	-0.25	**0.44**	0.06	-0.26	-0.05	-0.17	0.21	0.14	-0.10	0.10	0.07	-0.29	-0.39	-0.20	0.12	-0.11	0.14	-0.24	0.24
LMadagascar	-0.02	-0.14	0.09	-0.04	0.12	-0.07	0.28	0.09	-0.42	**0.55**	0.14	0.08	0.22	-0.11	-0.17	0.23	-0.06	-0.03	0.22	-0.44
LMauritius	0.09	**0.48**	-0.37	0.10	-0.10	0.35	0.25	**0.46**	-0.09	0.08	-0.04	-0.09	-0.20	**0.44**	-0.34	-0.26	0.22	0.11	0.22	0.11
LMalawi	-0.08	-0.32	-0.13	-0.16	0.24	-0.01	0.03	-0.18	0.08	0.09	0.02	0.02	0.11	-0.32	0.23	0.12	-0.15	-0.06	0.04	-0.16
LMozamb.	**0.57**	0.07	-0.07	-0.23	0.12	0.08	0.03	-0.05	0.06	0.17	-0.03	0.37	0.10	-0.03	-0.06	**0.45**	**0.42**	-0.27	-0.08	-0.24
LNamibia	0.15	0.02	-0.18	0.05	-0.03	**0.43**	-0.14	0.34	**0.48**	-0.28	-0.25	0.06	-0.43	0.31	-0.36	-0.04	0.10	0.05	-0.10	0.17
LRwanda	0.04	0.17	-0.08	-0.26	-0.27	0.03	-0.16	-0.29	0.41	-0.34	-0.35	-0.01	0.00	-0.05	0.09	0.04	0.20	-0.12	-0.25	0.16
LSouth Africa	-0.20	-0.12	0.27	0.16	0.02	0.02	0.20	-0.05	0.21	-0.09	0.16	-0.14	0.03	-0.09	-0.02	0.07	-0.02	0.18	0.00	0.05
LSeychelles	**0.33**	0.00	0.02	-0.35	0.09	-0.05	-0.16	-0.21	**0.52**	-0.17	-0.43	0.39	0.00	-0.06	-0.09	0.03	0.24	-0.26	-0.22	-0.19
LSudan	-0.02	0.00	-0.31	0.18	**0.44**	**0.43**	0.00	0.04	0.23	-0.40	-0.02	-0.10	-0.09	0.16	0.25	-0.05	-0.15	0.06	-0.03	**0.39**
LSwaziland	-0.44	0.10	-0.19	0.23	0.03	-0.15	0.16	-0.27	-0.04	-0.18	-0.26	-0.17	0.08	0.10	0.06	-0.15	0.01	-0.06	-0.09	**0.58**
LTanzania	**0.52**	0.16	-0.18	-0.12	0.08	0.13	**0.34**	0.10	-0.03	0.22	0.23	0.37	-0.05	0.05	-0.03	**0.30**	**0.44**	0.04	**0.38**	-0.21
LUganda	**0.47**	-0.22	-0.02	0.13	-0.09	-0.29	0.07	-0.12	0.09	0.00	-0.06	**0.57**	0.09	0.08	0.03	0.02	0.12	-0.01	0.08	0.13
LZambia	-0.09	-0.15	0.31	0.31	0.25	-0.08	0.05	0.07	0.32	-0.07	0.26	0.03	-0.24	0.23	-0.05	0.05	-0.06	0.40	-0.01	0.07

Notes: Bold indicates statistical significance at the 10 percent level. (L) Indicates demand shocks lagged one period.

Table 6. Long-run size of impulse responses.

	Impulse response of output level to a positive supply shock							Impulse response of price level to a positive demand shock							Impulse response of price level to a positive supply shock						
Time	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Botswana	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.04	0.04	0.04	0.04	-0.02	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02
Burundi	0.02	0.01	0	-0.01	-0.01	-0.01	-0.01	0.01	0.01	0.02	0.03	0.03	0.03	0.03	-0.07	-0.09	-0.08	-0.07	-0.06	-0.06	-0.06
Comoros	0.01	0.01	0.01	0	-0.01	-0.01	-0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05
Egypt	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.08	0.09	0.09	0.1	0.1	-0.02	0	-0.01	-0.02	-0.03	-0.03	-0.04
Ethiopia	0.13	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	-0.11	-0.1	-0.08	-0.08	-0.08	-0.08	-0.08
Kenya	0.05	0.1	0.12	0.13	0.13	0.13	0.12	0.04	0.03	0.02	0.01	0.01	0.01	0.01	-0.01	-0.07	-0.11	-0.12	-0.12	-0.12	-0.12
Lesotho	0.04	0.05	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.02	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03
Madagascar	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.06	0.09	0.1	0.09	0.08	0.08	0.08	-0.02	-0.05	-0.04	-0.02	-0.02	-0.02	-0.03
Mauritius	0.04	0.07	0.07	0.07	0.06	0.06	0.06	0.01	0.02	0.03	0.03	0.04	0.04	0.04	0	-0.03	-0.05	-0.06	-0.07	-0.07	-0.07
Malawi	0.05	0.03	0.04	0.04	0.04	0.04	0.04	0.09	0.14	0.15	0.15	0.14	0.14	0.14	0	-0.05	-0.08	-0.1	-0.1	-0.1	-0.1
Mozambique	0.06	0.09	0.11	0.11	0.11	0.11	0.1	0.19	0.23	0.31	0.34	0.37	0.38	0.39	-0.05	-0.02	-0.02	-0.05	-0.08	-0.11	-0.12
Namibia	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.05	0.04	0.03	0.04	0.04	0.04	-0.01	0	-0.01	-0.01	-0.01	-0.01	-0.01
Rwanda	0.09	0.07	0.05	0.04	0.04	0.04	0.04	0.05	0	0	-0.01	0	0	0	-0.11	-0.14	-0.16	-0.15	-0.15	-0.15	-0.15
South Africa	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.07	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Seychelles	0.06	0.06	0.04	0.04	0.04	0.04	0.04	0.03	0.05	0.08	0.1	0.11	0.12	0.13	-0.04	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02
Sudan	0.05	0.07	0.07	0.06	0.06	0.06	0.06	0.12	0.21	0.28	0.35	0.4	0.45	0.49	-0.06	-0.09	-0.11	-0.14	-0.17	-0.19	-0.21
Swaziland	0.04	0.03	0.05	0.05	0.05	0.05	0.05	0.04	0.02	0.02	0.02	0.02	0.02	0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Tanzania	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.1	0.16	0.18	0.19	0.19	0.19	0.19	-0.02	-0.01	0	0	0	0	-0.01
Uganda	0.05	0.07	0.07	0.07	0.07	0.07	0.06	0.19	0.26	0.35	0.41	0.45	0.48	0.51	-0.07	-0.15	-0.25	-0.34	-0.42	-0.48	-0.52
Zambia	-0.04	-0.03	-0.02	-0.03	-0.03	-0.02	-0.02	0.15	0.28	0.39	0.47	0.53	0.58	0.61	-0.03	-0.04	-0.05	-0.07	-0.08	-0.09	-0.09

Notes: Multiply by 100 to get percent change in variable

Table 7. Variance decomposition: Proportion of real output and price variability due to demand shocks.

	Variation in output due to demand shock						Variation in price due to demand shock					
Horizon: yrs	1	2	3	4	5	6	1	2	3	4	5	6
Botswana	70.69	68.72	70.35	70.92	72.97	70.8	67.45	70.66	69.59	63.18	73.95	68.66
Burundi	78.25	77.01	74.56	72.7	74.99	72.48	0.63	4.98	8.7	0.57	10.07	9.67
Comoros	74.41	79.31	63.73	61.28	65.5	59.72	8.94	15.58	15.56	8.9	17.25	16.42
Egypt	1.36	2.43	2.93	3.1	3.16	3.16	89.18	87.44	86.84	84.34	89.56	82.33
Ethiopia	15.43	16.92	18.3	18.58	18.74	18.71	49.22	48.93	48.49	48.84	48.55	48.52
Kenya	36.36	38.93	40.62	41.13	42.04	41.19	98.73	75.43	71.64	73.72	73.02	71.33
Lesotho	48.92	48.56	53.79	53.57	56.36	54.18	62	61.56	57.52	60.24	58.9	57.99
Madagascar	1.01	1.35	1.32	1.67	1.68	1.72	87.24	79.3	78.54	72.72	82.2	74.84
Mauritius	0.31	0.74	0.94	0.97	0.99	0.97	99.97	79.71	73.35	74.78	85.5	73.21
Malawi	3.81	3.87	4.01	3.95	4.01	3.94	99.9	81.61	76.39	77.92	76.62	74.8
Mozambique	1.8	2.19	3.78	4.12	4.78	4.92	94.37	92.86	91.33	92.53	94.85	86.74
Namibia	49.63	50.13	49.92	49.99	50.35	50.06	89.48	85.27	85.89	84.86	86.76	85.96
Rwanda	62.94	61.16	60.25	60.29	60.45	60.29	21.04	31.09	30.68	19.3	30.86	30.72
South Africa	7.15	8.93	11.26	14.33	16.75	15.79	97.2	97.65	97.88	97.19	105.1	98.01
Seychelles	3.53	7.97	7.61	7.54	7.68	7.73	38.89	36.45	45.35	29.02	52.84	49.53
Sudan	0	1.22	1.22	1.28	1.39	1.36	80.18	83.51	84.37	77.83	105.61	84.03
Swaziland	48.66	49.57	45.41	45.43	45.77	45.21	96.15	94.79	93.91	94.03	95.47	93.71
Tanzania	5.08	6.32	7.81	10.48	11.97	11.61	97.85	98.01	97.98	97.43	98.21	97.98
Uganda	2.18	2.34	3.81	4.68	5.46	5.73	88.99	78.97	69.52	76.5	76.68	58.61
Zambia	2.09	1.97	2.92	3.4	3.62	3.72	96.28	97.82	97.64	96.09	117.34	97.59

Notes: The values indicate the proportion of the forecast error variance in real output and price level due to demand shocks. The proportion due to supply shock is found by simply subtracting from one.