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Economic Systems xxx (2006) xxx–xxx

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**ECONOMIC
SYSTEMS**

The exchange rate system and macroeconomic fluctuations in Sub-Saharan Africa

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Accepted 23 November 2005

Abstract

In this paper, we investigate the sources of macroeconomic fluctuations in Sub-Saharan African (SSA) countries with particular attention to the exchange rate system. We use a structural Vector Autoregression (VAR) model with limited capital mobility and long run restrictions to identify the shocks. Supply and terms of trade shocks tend to dominate output movements in the CFA and non-CFA countries alike. However, terms of trade shocks tend to influence the CFA zone to a greater extent and there seems to be a higher influence of demand shocks on output and the real exchange rates in the non-CFA countries.

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JEL classification: E32; O24; C22

Keywords: Business cycles; Terms of trade; Sub-Saharan Africa; Time series models

1. Introduction

As independence spread in the late 1950s and 1960s, the African continent was thought to be a land of promise. The potential growth of Africa was well ahead of Eastern and Southern Asia and experts anticipated the coming African boom (Easterly and Levine, 1996).

Sub-Saharan Africa (hereafter SSA) is blessed with an abundance of natural resources, yet economic performance has been mediocre at best. African countries have been characterized as having poor political and economic policies, sub-standard education and low school attendance. Inadequate infrastructure and a lack of functioning markets and property rights also plague Sub-

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33 Saharan African countries. Governmental institutions are weak with mostly corrupt and inefficient
34 bureaucracies. Collier and Gunning (1999) provide an extensive survey of the literature dealing
35 with poor growth performance in Africa.

36 Sub-Saharan Africa can be divided into two sub-groups of countries: the CFA Franc countries
37 and the non-CFA Franc countries.¹ The CFA countries kept their economic relationship with
38 France after independence. They maintained a freely convertible exchange rate vis-à-vis the
39 French Franc at a predetermined parity.² Since January 1, 1999, the CFA Franc has been pegged
40 to the Euro at a rate of 100 CFA Franc = €0.152449. The remaining countries in Sub-Saharan
41 Africa constitute the second sub-group. These countries adopted a flexible exchange rate regime.
42 They have also experienced considerable fluctuations in their exchange rates.

43 There is evidence that growth and inflation performance has been different in the CFA countries
44 versus the non-CFA countries. Using an extensive data set from 1964 to 1993, Hadjimichael et al.
45 (1995) demonstrate that the non-CFA Franc countries show better growth performance than the
46 CFA Franc countries. On the other hand, the inflation rate and its variability tend to be much higher
47 in the non-CFA countries than in the CFA zone. Table 1 shows the mean annual growth rate and
48 inflation across the CFA and non-CFA countries for our sample period, 1960–2000.

49 In fact the non-CFA countries have on average grown twice as fast as the CFA countries during
50 the 1960–2000 period. Leading in growth performance in the non-CFA countries are Botswana,
51 Uganda, Kenya and Malawi with a growth rate of 9.1%, 7.8% and 6.0%, respectively. In the CFA
52 countries, Congo, Benin and Chad recorded the highest output growth rate with 6.0%, 3.1% and
53 3.0%, respectively. Moreover, some countries recorded negative growth rates of output during the
54 period considered. These countries include Niger, Togo and Gabon in the CFA zone and Burundi
55 and Zimbabwe in the non-CFA zone. Furthermore, the standard deviations indicate that the
56 variability of output growth has generally been somewhat higher across the CFA countries than the
57 non-CFA countries.

58 On the other hand, the CFA countries outperform the non-CFA countries with an annual
59 average inflation rate of 6.7% against 13.1% for the latter. In the CFA zone, Togo realizes the
60 lowest inflation with 4.8% and Chad records the highest with 11.1%. The inflation rate in the non-
61 CFA countries ranges between 6.2% in Ethiopia and 24.0% in Ghana during the 1960–2000
62 period. The inflation variability is somewhat smaller across the CFA countries than across the
63 non-CFA countries. This is expected, since fixed exchange rates are known to constrain
64 discretionary monetary policy, which leads to lower inflation rates and inflation rate variability.

65 More importantly, SSA countries seem to lag behind other regions of the World in terms of
66 output growth performance. Bayoumi and Eichengreen (1994b) find that the average annual
67 growth rates of output and inflation are 3.3% and 7.2% for Western European countries during the
68 1960–1990 period against 6.0% and 8.4% for East Asia and 3.1% and 4.9% for the Americas,
69 including the United States and Canada. The output and inflation variability is somewhat higher
70 across SSA countries than in other regions of the world considered above.

71 Another characteristic of the SSA countries is that they depend on the export of few primary
72 commodities. Dhonte et al. (1993) show that Uganda, Nigeria, Zambia and Guinea obtain
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¹ The CFA stands for “Communauté Financière Africaine” in West Africa and “Coopération Financière en Afrique Centrale” in Central Africa. The CFA Franc zone consists of 14 countries with 7 in West Africa (Benin, Burkina Faso, Côte d’Ivoire, Mali, Niger, Sénégal and Togo) and 6 in Central Africa (Cameroon, Central African Republic, Chad, Congo and Gabon) and the Islamic Republic of Comoros. France was the colonial power for most of the CFA Franc countries.

² From January 1, 1960, to January 11, 1994, the parity was 100 CFA Franc = 2 French Franc, but on January 12, 1994, the CFA Franc was devalued by 50% to boost African exports.

Table 1
Output growth and inflation rates and their variability in SSA: 1960–2000

| | Output growth | | Inflation | |
|---------------------|---------------|-------|-----------|-------|
| | Mean | S.D. | Mean | S.D. |
| CFA countries | | | | |
| Benin | 0.031 | 0.047 | 0.108 | 0.098 |
| Burkina Faso | 0.018 | 0.077 | 0.048 | 0.073 |
| Cameroon | 0.019 | 0.055 | 0.071 | 0.068 |
| C.A.R. ^a | 0.016 | 0.106 | 0.058 | 0.068 |
| Chad | 0.046 | 0.141 | 0.053 | 0.067 |
| Congo | 0.030 | 0.589 | 0.111 | 0.102 |
| Côte D'Ivoire | 0.027 | 0.084 | 0.065 | 0.062 |
| Gabon | −0.014 | 0.214 | 0.063 | 0.080 |
| Mali | 0.022 | 0.096 | 0.101 | 0.091 |
| Niger | −0.005 | 0.260 | 0.059 | 0.091 |
| Senegal | 0.016 | 0.058 | 0.086 | 0.108 |
| Togo | −0.015 | 0.096 | 0.048 | 0.135 |
| Average | 0.015 | 0.140 | 0.067 | 0.080 |
| Non-CFA countries | | | | |
| Botswana | 0.091 | 0.069 | 0.121 | 0.072 |
| Burundi | −0.006 | 0.238 | 0.114 | 0.093 |
| Ethiopia | 0.028 | 0.044 | 0.062 | 0.077 |
| Gambia | 0.020 | 0.256 | 0.090 | 0.103 |
| Ghana | 0.037 | 0.083 | 0.240 | 0.216 |
| Kenya | 0.060 | 0.157 | 0.096 | 0.080 |
| Lesotho | 0.028 | 0.085 | 0.129 | 0.053 |
| Madagascar | 0.017 | 0.035 | 0.126 | 0.092 |
| Malawi | 0.060 | 0.084 | 0.207 | 0.256 |
| Mauritius | 0.044 | 0.070 | 0.100 | 0.098 |
| Nigeria | 0.038 | 0.302 | 0.157 | 0.147 |
| Rwanda | 0.026 | 0.134 | 0.106 | 0.102 |
| South Africa | 0.030 | 0.027 | 0.087 | 0.046 |
| Swaziland | 0.054 | 0.083 | 0.100 | 0.051 |
| Tanzania | 0.049 | 0.087 | 0.173 | 0.082 |
| Uganda | 0.078 | 0.178 | 0.232 | 0.330 |
| Zambia | 0.034 | 0.136 | 0.233 | 0.284 |
| Zimbabwe | −0.020 | 0.158 | 0.117 | 0.102 |
| Average | 0.035 | 0.117 | 0.131 | 0.120 |

Source: Calculations by the authors based on data sources cited in text.

^a Central African Republic.

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92–96% of their export revenues from coffee, petroleum, copper, bauxite and aluminium, respectively. Other countries rely heavily on the export revenues from at least one of the following primary commodities: cocoa, cotton, sugar, tea, tobacco, timber and fish. As they rely on few export commodities, terms of trade fluctuations can be expected to figure prominently in the economic performance of the SSA countries. Moreover, intra-regional trade is very limited in the SSA countries. [Hadjimichael et al. \(1995\)](#) estimate that intra-regional trade in the SSA accounts for only 12% of total trade volume. The leading SSA countries in terms of intra-regional trading shares are Mali with 35%, Malawi with 33% and Zimbabwe with 32%. The main trading partner of SSA countries is the European Community with a 58% trade share followed by the G-3

(United States, Canada and Japan) with 21%. Overall, SSA countries prefer trading with industrial countries, in particular with the G-7 countries, rather than trading among themselves. A primary reason is the specialization of the SSA countries in exporting primary commodities.

Hoffmaister and Roldós (1996) find that supply shocks are more important than demand shocks in output fluctuations using a panel data for Asia and Latin America. Fiscal and not monetary shocks are the main source of real exchange rate fluctuations. Terms of trade shocks account for much of the trade balance fluctuations. Hoffmaister et al. (1998) examine the sources of macroeconomic fluctuations in Sub-Saharan Africa using panel data. They compare the CFA Franc countries to the non-CFA Franc countries and find terms of trade shocks to be the main source of fluctuations of output and real exchange rates in CFA Franc countries. Moreover, Kose and Riezman (2001) find that terms of trade shocks play a greater role in explaining the fluctuations in aggregate output in Africa than financial shocks.

In general, Sachs and Warner (1997) and Rodrik (1998) find macroeconomic stability to be an important factor for African growth in the long run. The volatility of the exchange rates is higher with unstable political regimes. External shocks might also impact macroeconomic stability in SSA. As some Sub-Saharan African countries follow fixed exchange rates and others float their currencies, there is a good reason to expect the exchange rate system to play some role.

While fixed exchange rates reduce uncertainty and transaction costs compared with flexible exchange rates, these benefits may be outweighed by increased output volatility due to sticky prices and increased international interdependence. If countries face idiosyncratic shocks, an independent monetary policy is needed to stabilize the domestic economy. Theoretical work on the effects of the exchange rate system has been inconclusive. Helpman (1981) and Dornbusch (1983), among others, provide evidence that exchange rate arrangements cannot be ranked unambiguously in terms of their impact on macroeconomic stability or domestic welfare. Instead, several studies have analyzed macroeconomic performance under different historical exchange rate arrangements. Using macroeconomic data from the Bretton Woods and the subsequent floating regime, Baxter and Stockman (1988) found no clear relationship between exchange rate flexibility and output stability or synchronization of the business cycle. Using bivariate VARs, Bayoumi and Eichengreen (1994a) analyzed the standard deviations of supply and demand shocks under alternative monetary regimes and found little difference in the incidence of supply or demand shocks under the Bretton Woods and the subsequent float.

It is known that the effects of the exchange rate system depend on some structural characteristics (e.g., openness, capital mobility, the existence of rigidities), as well as the types and the sources of shocks impinging on the domestic economy. Since fixed rate systems set limits to discretionary policy, one may expect a lower incidence of domestic demand shocks under fixed rate systems. Similarly, a fixed rate system can be viewed as a commitment mechanism that prevents the policymaker from pursuing expansionary policies. Thus, it should be interesting to disentangle the effects of policy shocks which may be attributable to the exchange rate system from those of the macroeconomic environment and to examine whether the incidence of certain type of shocks is higher in the CFA or the non-CFA African countries.

The objective of this paper is to examine the sources of macroeconomic fluctuations in SSA. Given that African countries export primary commodities, it is important to ascertain the role of domestic versus foreign shocks. Moreover, our methodology allows for the distinction between supply shocks (those related to the macroeconomic environment) and policy related nominal shocks. We pay particular attention to the exchange rate system to see if there is any pattern to economic performance with respect to the exchange rate system. Using an aggregate supply/aggregate demand model with limited and exogenous capital mobility, we identify a set of

shocks. We distinguish between terms of trade, supply, balance of payments, demand and monetary shocks. Examining the incidence of the shocks can shed some light on the effects of domestic versus external, supply versus demand factors in driving macroeconomic fluctuations in the SSA. By comparing economic performance under fixed versus flexible exchange rate regimes, we analyze the conduct of macroeconomic policy under alternative exchange rate systems. Section 2 presents the theoretical framework and methodology. The model is illustrative in that it has a simple formulation while it provides a reference for identifying a set of orthogonal shocks. Section 3 presents empirical results while Section 4 concludes.

2. Model and methodology

Consider a small open economy with limited capital mobility. Political instability and weak financial/institutional infrastructure in SSA suggest that it is inappropriate to assume uncovered interest parity. In what follows, we adapt a small open economy aggregate supply/aggregate demand (AS/AD) model to reflect exogenous capital mobility that may be more appropriate for SSA. The following equations provide the elements of such a model that will provide the restrictions to identify the shocks within a structural VAR framework:

$$h_t = h_{t-1} + \varepsilon_t^h, \quad \text{terms of trade} \quad (1)$$

$$y_t^s = \bar{y}_t + \theta h_t, \quad \text{aggregate supply} \quad (2)$$

$$\bar{y} = \bar{y}_{t-1} + \varepsilon_t^s, \quad \text{evolution of capacity output} \quad (3)$$

$$nx_t = \eta_1(s_t - p_t) - \eta_2 y_t + z_t = 0, \quad \text{trade balance} \quad (4)$$

$$z_t = z_{t-1} + \varepsilon_t, \quad \text{trade balance shock} \quad (5)$$

$$y_t^d = d_t - \gamma[i_t - E_t(p_{t+1} - p_t)] - z_t, \quad \text{aggregate demand/IS} \quad (6)$$

$$d_t = d_{t-1} + \varepsilon_t^d, \quad \text{evolution of autonomous AD} \quad (7)$$

$$m_t^d = p_t + y_t - \lambda i_t, \quad \text{money demand} \quad (8)$$

$$m_t^s = m_{t-1}^s + \varepsilon_t^m, \quad \text{money supply} \quad (9)$$

$$y_t^s = y_t^d = y_t, \quad \text{goods market equilibrium} \quad (10)$$

$$m_t^s = m_t^d = m_t, \quad \text{money market equilibrium} \quad (11)$$

where h : terms of trade as proxied by the relative price of the primary export commodity, y : real GDP, \bar{y} : capacity output, i : nominal interest rate, s : nominal exchange rate (e.g., CFA Franc per dollar), p : domestic price level, m : money stock, d : autonomous aggregate demand, all variables except the interest rate are in logarithms, E_t is the conditional expectations parameter, and all Greek parameters are positive.

The observed movements in the variables are due to five mutually uncorrelated “structural” shocks with finite variances. These are terms of trade shocks, ε_t^h , aggregate supply shocks, ε_t^s , trade balance shocks, ε_t^z , aggregate demand or real demand shocks, ε_t^d , and money supply shocks, ε_t^m .

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Eq. (1) is the evolution of the terms of trade, which is assumed to be exogenous. Eq. (2) is an aggregate supply equation, where aggregate supply depends on capacity output and terms of trade. Capacity output in Eq. (3) is a function of the productive capacity of the economy (e.g., capital stock and human capital or employment), and, for simplicity, is assumed to be a random walk process. The balance on goods and services (Eq. (4)) is assumed to be a function of the real exchange rate ($s_t - p_t$) and domestic real income. For simplicity, we normalize the foreign price level to unity so that ($s_t - p_t$) measures the relative price of foreign goods in terms of domestic goods. In the model, z_t is a trade balance shock that captures exogenous capital flows or shifts in imports or exports. Eq. (5) implies that the exogenous part of the trade balance follows a random walk.

Eq. (6) is a conventional aggregate demand (IS) equation where aggregate spending depends on the expected real interest rate and the exogenously given level of the trade balance. The autonomous portion of aggregate demand, d_t , is assumed to follow a random walk in Eq. (7). Eq. (8) is a conventional money demand equation with unitary income elasticity. Eq. (9) is the evolution of money supply, which for simplicity is assumed to follow a random walk. Finally, we close the model by postulation of goods and money market equilibrium relationships (Eqs. (10) and (11)).

In order to solve the model, we eliminate the interest rate from Eq. (6) using Eq. (8) to get:

$$p_t = \left(\frac{\lambda\gamma}{1 + \lambda\gamma} \right) E_t p_{t+1} + \left(\frac{\lambda}{1 + \lambda\gamma} \right) (d_t - z_t) + \left(\frac{1}{1 + \lambda\gamma} \right) m_t - \left(\frac{1 + \lambda}{1 + \lambda\gamma} \right) y_t \quad (12)$$

This is a first-order difference equation in the price level. Note that for finite values of the parameters, and assuming $\lambda\gamma \neq 1$, the forward-looking solution is convergent. With rational expectations, and given the stochastic processes for the exogenous variables in Eqs. (1), (3), (5), (7) and (9), the forward-looking solution for the price level is given by

$$p_t = m_t + \lambda(d_t - z_t) - (1 + \lambda)y_t. \quad (13)$$

From Eq. (13), equilibrium real money balances are

$$m_t - p_t = \lambda(z_t - d_t) + (1 + \lambda)y_t. \quad (14)$$

The equilibrium real exchange rate, which is compatible with trade balance, is obtained using (4)

$$s_t - p_t = \frac{\eta_2}{\eta_1} y_t - \frac{1}{\eta_1} z_t. \quad (15)$$

It can be shown that the long run impact of the structural shocks on the endogenous variables has a peculiar triangular structure. In order to show the long run impact of the five structural shocks $\varepsilon_t = [\varepsilon_t^h, \varepsilon_t^s, \varepsilon_t^z, \varepsilon_t^d, \varepsilon_t^m]$ on the system of endogenous variables $X_t = [h_t, y_t, (s_t - p_t), (m_t - p_t), p_t]$, we express the solution to the model in first differences:

$$\Delta h_t = \varepsilon_t^h \quad (16)$$

$$\Delta y_t = \theta \varepsilon_t^h + \varepsilon_t^s \quad (17)$$

$$\Delta (s_t - p_t) = \left(\frac{\eta_2}{\eta_1} \right) (\theta \varepsilon_t^h + \varepsilon_t^s) - \left(\frac{1}{\eta_1} \right) \varepsilon_t^z \quad (18)$$

$$\Delta (m_t - p_t) = \lambda(\varepsilon_t^z - \varepsilon_t^d) + (1 + \lambda)(\theta \varepsilon_t^h + \varepsilon_t^s) \quad (19)$$

$$\Delta p_t = \lambda(\varepsilon_t^d - \varepsilon_t^z) - (1 + \lambda)(\theta \varepsilon_t^h + \varepsilon_t^s) + \varepsilon_t^m. \quad (20)$$

Note that although endogenous variables have unit roots, all are difference stationary. The long run impact of the structural shocks on the endogenous variables is triangular. Specifically, all shocks except terms of trade shocks have no long effect on the terms of trade. Real demand, trade balance and monetary shocks have no long run impact on output. Real demand and monetary shocks have no long run impact on the real exchange rate, and monetary shocks have no long run effect on real money balances.

Given the model structure above, the long run effects of the shocks on the endogenous variables are given by:

$$\begin{pmatrix} \Delta h_t \\ \Delta y_t \\ \Delta(s_t - p_t) \\ \Delta(m_t - p_t) \\ \Delta p_t \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & 0 & 0 \\ a_{21} & a_{22}(1) & 0 & 0 & 0 \\ a_{31}(1) & a_{32}(1) & a_{33}(1) & 0 & 0 \\ a_{41}(1) & a_{42}(1) & a_{43}(1) & a_{44}(1) & 0 \\ a_{51}(1) & a_{52}(1) & a_{53}(1) & a_{54}(1) & a_{55}(1) \end{pmatrix} \begin{pmatrix} \varepsilon_t^h \\ \varepsilon_t^s \\ \varepsilon_t^z \\ \varepsilon_t^d \\ \varepsilon_t^m \end{pmatrix} \quad (21)$$

where $a_{ij}(1)$ represents the cumulative long run effect of shock j on variable i . The zero entries in Eq. (21) provide the 10 (long run) restrictions needed to identify the shocks.

3. Empirical results

This study covers 30 SSA countries from both the CFA Franc and the non-CFA Franc zones. The CFA countries covered in the study include Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Côte D'Ivoire, Gabon, Mali, Niger, Senegal and Togo. The non-CFA countries are Botswana, Burundi, Ethiopia, Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Nigeria, Rwanda, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.³

The data used in the sample consist of 40 annual observations from 1960 to 2000 taken from the International Financial Statistics (IFS) CD-ROM published by the International Monetary Fund (IMF). The data set includes the following series: terms of trade, output, real exchange rates, real money balances and the price level. We construct a terms of trade (TOT) index as the relative price of the primary export commodity of a country in the sample. The primary exporting commodities that account for a sizable portion of exports for each country are: coffee (Central African Republic, Côte d'Ivoire, Togo, Burundi, Ethiopia, Kenya, Madagascar, Rwanda, Tanzania and Uganda); crude oil (Cameroon, Congo, Gabon and Nigeria); cotton (Benin, Burkina Faso, Chad, Mali and Senegal); tobacco (Malawi and Zimbabwe); wool and livestock (Lesotho); Uranium (Niger); groundnuts (Gambia); cocoa (Ghana); fish (Mauritius); gold (South African Republic); sugar (Swaziland); diamonds (Botswana); copper (Zambia). The total shares of the primary export commodities are detailed in Table A.1. The terms of trade are constructed as the price of the primary export commodity in world markets multiplied by the exchange rate and divided by the price level of the G-7 countries.

Output is measured by the real Gross Domestic Product Index in 1995 prices. Real exchange rate is the nominal exchange rate times the foreign price divided by domestic prices. The exchange rate is the domestic country price of the SDR. Because of its wide availability, the

³ This sample covers the bulk of SSA except for the Comoros Islands in the CFA group and Angola, Equatorial Guinea, Guinée, Guinea Bissau, Liberia, Mozambique, Sierra Leone, Somalia, Sudan and Democratic Republic of Congo (former Zaire) in the non-CFA group. These were dropped from the study because of insufficient data.

Consumer Price Index (CPI) is used as a proxy for domestic prices. Foreign Prices are proxied by the Foreign Price Index and are constructed using the inflation rates of the G-7.⁴ To find real money balances, we deflate M1 by domestic CPI and convert all series into the logarithmic form.

The proper specification of the VAR requires testing for times series properties of the data. The variables are tested for unit roots using the Augmented Dickey-Fuller (ADF) test.⁵ The estimated ADF test statistics show that the null hypothesis of a unit root cannot be rejected at the log level for the data for most of the series in question at the 5% significance level. The ADF test statistics also indicate that the variables are stationary in the first differences at the 5% significance level. This makes the use of a VAR in first differences appropriate.

We let $\Delta X_t = [\Delta h_t, \Delta y_t, (\Delta s_t - \Delta p_t), (\Delta m_t - \Delta p_t), \Delta p_t]$ and estimate the VARs with one or two lags. The residual diagnostics imply that these lag lengths are appropriate. In what follows, we summarize innovation accounting results (impulse response analysis and variance decompositions) typical of VAR analysis.

The response of output to terms of trade (ε_t^h), supply (ε_t^s), trade balance (ε_t^r), real aggregate demand (ε_t^d) and monetary shocks (ε_t^m) can be summarized as follows⁶: in most of the CFA countries, terms of trade shocks initially increase output except for the Congo Republic, where output decreases. Output effects of terms of trade shocks are also positive for all the non-CFA countries except for Rwanda, Kenya and Zimbabwe. This may be due to the limitation of our terms of trade index where the index is constructed as the relative price of the primary export commodity. Terms of trade innovations seem to have a bigger impact in the CFA countries than in the non-CFA countries. The percentage of primary commodity export is also very high in these countries, which may exacerbate any effect due to the terms of trade. Supply shocks lead to an expansion of output in most countries, as expected. Moreover, the increase in output is more pronounced for the non-CFA countries than the CFA countries. Finally, the nominal shocks seem to increase the price level and this increase is more pronounced for the non-CFA countries, as expected. This is due to the free hand in conducting monetary policy, as flexible exchange rates do not constrain discretionary monetary policy.

We then present variance decompositions (VDC) to characterize the sources of macroeconomic fluctuations in SSA. Tables 2 and 3 present the variance decompositions of terms of trade (relative price of primary commodity), domestic output, the real exchange rate, and the price level for the CFA Franc and non-CFA countries, respectively.

The variation in the terms of trade seems to be exogenous even in the short run for both the CFA and the non-CFA countries except for Chad, Mauritius and Nigeria. This is not surprising, since these countries export primary commodities and the prices for these primary commodities are largely determined in world markets. The sources of output fluctuations reveal interesting patterns. External shocks such as those in terms of trade appear to have a greater influence on fluctuations of output in CFA Franc countries than in the non-CFA countries. Terms of trade shocks do not play a major role in the movements of output in the non-CFA group except in Uganda and Zimbabwe. Terms of trade shocks appear to play a greater role in countries with non-diversified exports. Congo and Gabon, which derive 85% and 75% of revenue from oil exports, have 53% and 34% of their output fluctuations explained by the terms of trade disturbances in the short run. The relative importance of terms of trade shocks for output in the CFA group may also

⁴ As we emphasized earlier, the G-7 countries are the major trading partners of SSA countries.

⁵ These test results are available from the authors upon request.

⁶ Due to the number of graphs, we only highlight the results; a detailed Appendix is available from the authors upon request.

Table 2
Variance decompositions for the CFA countries

| Country | Year | Terms of trade | | | | | Domestic output | | | | |
|--------------------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Benin | 1 | 87.6 | 1.9 | 0.0 | 9.4 | 1.1 | 2.7 | 91.7 | 0.1 | 5.3 | 0.3 |
| | 4 | 93.6 | 0.7 | 0.2 | 4.5 | 1.0 | 2.9 | 94.6 | 0.0 | 1.9 | 0.6 |
| | 8 | 96.8 | 0.3 | 0.1 | 2.3 | 0.5 | 4.3 | 94.4 | 0.0 | 1.0 | 0.3 |
| Burkina Faso | 1 | 86.8 | 0.1 | 1.6 | 8.5 | 3.0 | 24.4 | 71.9 | 1.1 | 0.4 | 2.2 |
| | 4 | 86.6 | 0.5 | 2.8 | 5.3 | 4.9 | 11.5 | 84.9 | 0.3 | 1.0 | 2.3 |
| | 8 | 92.4 | 0.3 | 1.6 | 3.0 | 2.7 | 10.2 | 88.1 | 0.2 | 0.5 | 1.1 |
| Cameroon | 1 | 94.1 | 4.7 | 0.0 | 1.1 | 0.1 | 0.6 | 62.4 | 0.5 | 5.9 | 30.7 |
| | 4 | 97.2 | 1.6 | 0.2 | 0.9 | 0.1 | 8.2 | 81.6 | 0.1 | 3.5 | 5.6 |
| | 8 | 98.6 | 0.8 | 0.1 | 0.4 | 0.0 | 12.8 | 84.7 | 0.0 | 1.0 | 1.5 |
| Central African Republic | 1 | 88.7 | 0.0 | 0.0 | 0.1 | 11.1 | 0.2 | 59.5 | 1.5 | 7.4 | 31.4 |
| | 4 | 95.1 | 0.0 | 0.2 | 0.6 | 4.1 | 8.5 | 70.2 | 1.8 | 4.2 | 15.3 |
| | 8 | 97.2 | 0.0 | 0.1 | 0.3 | 2.3 | 6.6 | 81.7 | 1.0 | 2.3 | 8.4 |
| Chad | 1 | 8.4 | 2.3 | 10.2 | 15.4 | 63.8 | 26.7 | 50.3 | 1.5 | 0.5 | 21.0 |
| | 4 | 48.4 | 6.3 | 5.1 | 6.2 | 33.9 | 20.0 | 53.7 | 1.4 | 5.5 | 19.4 |
| | 8 | 75.7 | 3.0 | 2.4 | 2.9 | 16.0 | 22.8 | 59.3 | 1.0 | 3.7 | 13.1 |
| Congo | 1 | 92.0 | 1.8 | 0.5 | 5.6 | 0.0 | 52.6 | 4.8 | 11.2 | 27.6 | 3.8 |
| | 4 | 96.3 | 0.7 | 0.3 | 2.2 | 0.6 | 66.4 | 18.7 | 3.7 | 9.2 | 2.2 |
| | 8 | 97.9 | 0.4 | 0.1 | 1.2 | 0.3 | 62.6 | 31.4 | 1.5 | 3.7 | 0.9 |
| Côte D'Ivoire | 1 | 81.6 | 1.6 | 11.7 | 3.3 | 1.7 | 36.2 | 63.7 | 0.0 | 0.0 | 0.1 |
| | 4 | 91.1 | 1.8 | 4.9 | 1.0 | 1.2 | 55.9 | 43.8 | 0.2 | 0.0 | 0.0 |
| | 8 | 95.4 | 0.9 | 2.5 | 0.5 | 0.7 | 58.2 | 41.7 | 0.1 | 0.0 | 0.0 |
| Gabon | 1 | 90.9 | 2.7 | 0.0 | 6.3 | 0.0 | 34.1 | 52.8 | 0.0 | 0.2 | 13.0 |
| | 4 | 94.9 | 2.3 | 0.1 | 2.5 | 0.1 | 33.5 | 60.6 | 0.4 | 0.7 | 4.8 |
| | 8 | 96.8 | 1.4 | 0.1 | 1.6 | 0.1 | 27.6 | 69.6 | 0.2 | 0.5 | 2.1 |
| Mali | 1 | 79.3 | 1.7 | 0.4 | 1.0 | 17.5 | 5.7 | 86.0 | 1.3 | 7.0 | 0.1 |
| | 4 | 85.6 | 1.7 | 0.3 | 0.6 | 11.8 | 7.4 | 87.3 | 0.5 | 3.3 | 1.6 |
| | 8 | 91.5 | 1.1 | 0.2 | 0.4 | 6.9 | 7.6 | 89.5 | 0.3 | 1.7 | 0.9 |
| Niger | 1 | 81.9 | 1.6 | 0.9 | 0.8 | 14.9 | 1.5 | 75.6 | 6.6 | 12.5 | 3.8 |
| | 4 | 85.9 | 3.7 | 0.7 | 1.7 | 7.9 | 8.5 | 76.5 | 3.9 | 6.9 | 4.2 |
| | 8 | 92.1 | 2.2 | 0.4 | 1.0 | 4.4 | 6.3 | 83.4 | 2.7 | 4.7 | 3.0 |
| Senegal | 1 | 44.0 | 38.5 | 0.8 | 0.2 | 16.5 | 18.9 | 50.6 | 0.7 | 29.6 | 0.1 |
| | 4 | 57.2 | 26.2 | 1.2 | 3.4 | 12.1 | 29.0 | 59.9 | 0.8 | 11.2 | 2.1 |
| | 8 | 75.7 | 14.8 | 0.7 | 2.2 | 6.6 | 31.2 | 63.0 | 0.3 | 4.5 | 1.0 |
| Togo | 1 | 76.6 | 23.0 | 0.1 | 0.0 | 0.3 | 0.0 | 77.6 | 9.0 | 1.8 | 0.6 |
| | 4 | 87.9 | 10.0 | 0.6 | 1.3 | 0.2 | 4.8 | 89.7 | 1.3 | 3.4 | 0.9 |
| | 8 | 92.8 | 5.8 | 0.4 | 0.8 | 0.2 | 4.5 | 93.2 | 0.5 | 1.4 | 0.4 |

Real exchange rate

Price level

| | Year | Real exchange rate | | | | | Price level | | | | |
|--------------|------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Benin | 1 | 0.0 | 0.0 | 99.7 | 0.2 | 0.1 | 19.6 | 0.3 | 0.1 | 41.4 | 36.6 |
| | 4 | 0.6 | 1.6 | 97.7 | 0.2 | 0.1 | 29.0 | 0.9 | 0.0 | 42.2 | 27.8 |
| | 8 | 0.7 | 1.1 | 98.0 | 0.1 | 0.1 | 31.8 | 0.7 | 0.0 | 41.7 | 25.8 |
| Burkina Faso | 1 | 1.5 | 0.2 | 79.6 | 12.3 | 6.4 | 1.0 | 0.8 | 1.6 | 16.6 | 80.1 |

Table 2 (Continued)

| | | Real exchange rate | | | | | Price level | | | | |
|--------------------------|---|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Cameroon | 4 | 1.7 | 2.9 | 84.3 | 7.2 | 3.9 | 2.6 | 3.7 | 0.2 | 2.6 | 90.8 |
| | 8 | 1.3 | 4.6 | 87.4 | 4.3 | 2.4 | 1.4 | 1.9 | 0.2 | 1.2 | 95.3 |
| | 1 | 1.8 | 2.2 | 90.6 | 3.5 | 1.9 | 0.0 | 39.2 | 2.8 | 13.2 | 44.7 |
| Central African Republic | 4 | 1.9 | 1.8 | 91.7 | 2.9 | 1.7 | 0.7 | 55.1 | 1.5 | 13.4 | 29.3 |
| | 8 | 1.7 | 1.8 | 93.6 | 1.8 | 1.1 | 2.3 | 60.1 | 0.9 | 13.6 | 23.2 |
| | 1 | 14.3 | 0.0 | 71.6 | 7.4 | 6.6 | 4.7 | 25.9 | 4.0 | 0.1 | 65.2 |
| Chad | 4 | 13.0 | 2.4 | 69.8 | 8.7 | 6.2 | 10.4 | 13.5 | 12.1 | 3.8 | 60.2 |
| | 8 | 12.8 | 2.3 | 76.3 | 5.1 | 3.6 | 9.9 | 12.2 | 14.2 | 5.0 | 58.7 |
| | 1 | 0.9 | 0.0 | 96.0 | 0.2 | 2.8 | 64.4 | 8.1 | 0.2 | 1.0 | 26.6 |
| Congo | 4 | 1.9 | 3.3 | 90.3 | 3.1 | 1.6 | 54.8 | 6.8 | 0.7 | 0.3 | 37.4 |
| | 8 | 1.7 | 2.8 | 93.4 | 1.9 | 1.2 | 58.1 | 6.4 | 0.6 | 0.1 | 34.8 |
| | 1 | 0.2 | 3.7 | 80.2 | 16.0 | 0.1 | 13.2 | 50.0 | 4.1 | 16.4 | 16.2 |
| Côte D'Ivoire | 4 | 1.7 | 5.0 | 81.2 | 11.1 | 1.9 | 11.4 | 44.1 | 6.2 | 18.8 | 8.5 |
| | 8 | 1.4 | 8.6 | 82.2 | 6.5 | 1.2 | 10.5 | 59.8 | 5.9 | 17.1 | 6.7 |
| | 1 | 18.3 | 0.7 | 60.6 | 17.9 | 0.0 | 13.2 | 25.1 | 14.3 | 31.7 | 15.6 |
| Gabon | 4 | 16.7 | 2.2 | 66.5 | 9.6 | 5.0 | 16.7 | 14.8 | 24.6 | 23.5 | 20.3 |
| | 8 | 18.3 | 1.9 | 71.6 | 5.3 | 2.9 | 16.3 | 11.6 | 23.4 | 19.3 | 25.4 |
| | 1 | 1.0 | 1.5 | 93.9 | 3.4 | 0.2 | 7.0 | 9.0 | 7.2 | 6.3 | 70.5 |
| Mali | 4 | 2.2 | 3.2 | 88.4 | 4.2 | 2.0 | 30.8 | 1.3 | 1.7 | 1.5 | 64.8 |
| | 8 | 1.9 | 3.8 | 90.5 | 2.6 | 1.2 | 33.0 | 0.7 | 1.5 | 6.1 | 58.8 |
| | 1 | 6.9 | 0.0 | 84.0 | 8.6 | 0.4 | 0.1 | 20.1 | 3.9 | 31.4 | 44.5 |
| Niger | 4 | 7.2 | 0.8 | 84.7 | 6.2 | 1.2 | 1.8 | 30.5 | 3.0 | 29.1 | 35.7 |
| | 8 | 7.3 | 3.3 | 84.3 | 4.0 | 1.0 | 2.8 | 35.9 | 3.1 | 26.8 | 31.4 |
| | 1 | 6.5 | 9.7 | 66.1 | 14.2 | 3.5 | 1.7 | 0.2 | 0.4 | 12.9 | 84.9 |
| Senegal | 4 | 16.4 | 11.2 | 61.0 | 6.5 | 5.0 | 3.3 | 5.9 | 1.1 | 4.2 | 85.6 |
| | 8 | 13.3 | 12.1 | 67.3 | 4.2 | 3.1 | 6.6 | 5.9 | 1.8 | 1.8 | 84.0 |
| | 1 | 0.4 | 1.8 | 92.3 | 3.0 | 2.5 | 27.5 | 2.8 | 1.3 | 3.7 | 64.7 |
| Togo | 4 | 0.4 | 4.2 | 90.9 | 2.4 | 1.9 | 22.2 | 13.4 | 0.6 | 0.5 | 63.4 |
| | 8 | 1.0 | 5.9 | 90.4 | 1.5 | 1.2 | 24.4 | 17.9 | 0.4 | 0.2 | 57.1 |
| | 1 | 14.9 | 9.5 | 60.7 | 14.2 | 0.8 | 10.1 | 20.2 | 0.1 | 22.5 | 47.0 |
| | 4 | 17.8 | 27.4 | 44.0 | 8.6 | 2.3 | 3.4 | 16.8 | 0.3 | 23.9 | 55.5 |
| | 8 | 17.4 | 40.5 | 36.1 | 4.7 | 1.3 | 2.8 | 19.5 | 0.3 | 22.5 | 54.9 |

293

294 reflect the fixed exchange rate regime, which does not shield these countries from external
 295 shocks. This is in line with Hoffmaister et al. (1998), who found similar evidence for SSA using
 296 panel data.

297 For the majority of countries, supply shocks explain the bulk of output movements in both
 298 country groups. Supply shocks play a prominent role in output movements except for Congo in the
 299 CFA countries and Rwanda, South Africa and Uganda in the non-CFA countries. This finding is
 300 consistent with the evidence presented by Blanchard and Quah (1989), Gali (1992) and others on
 301 the importance of supply shocks as the main source of macroeconomic fluctuations in developed
 302 countries. Hoffmaister and Roldós (1996, 1997) present similar results for developing countries.

303 Monetary shocks explain little short run output variation, with the exception of Cameroon,
 304 Central African Republic and Chad in the CFA zone, and Burundi, Ghana and South African

Table 3
Variance decompositions for non-CFA countries

| Country | Year | Terms of trade | | | | | Domestic output | | | | |
|--------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Botswana | 1 | 92.8 | 0.8 | 0.3 | 2.1 | 4.0 | 9.2 | 90.2 | 0.3 | 0.1 | 0.1 |
| | 4 | 96.1 | 1.4 | 0.1 | 0.8 | 1.7 | 6.0 | 92.6 | 0.2 | 0.0 | 0.2 |
| | 8 | 97.9 | 0.8 | 0.1 | 0.4 | 0.9 | 4.8 | 94.6 | 0.9 | 0.4 | 0.2 |
| Burundi | 1 | 91.8 | 1.0 | 0.0 | 5.3 | 1.9 | 11.8 | 49.6 | 0.3 | 10.9 | 27.4 |
| | 4 | 90.7 | 0.7 | 0.3 | 4.3 | 4.2 | 5.3 | 77.4 | 0.5 | 7.3 | 9.5 |
| | 8 | 94.1 | 0.5 | 0.2 | 2.7 | 2.6 | 6.1 | 85.2 | 0.3 | 3.7 | 4.7 |
| Ethiopia | 1 | 92.4 | 0.2 | 4.5 | 0.3 | 2.7 | 3.2 | 85.6 | 8.2 | 0.1 | 2.9 |
| | 4 | 97.3 | 0.4 | 1.2 | 0.4 | 0.8 | 1.4 | 94.7 | 2.5 | 0.5 | 0.9 |
| | 8 | 98.7 | 0.2 | 0.6 | 0.2 | 0.4 | 0.9 | 96.9 | 1.4 | 0.3 | 0.5 |
| Gambia | 1 | 78.4 | 2.9 | 0.4 | 17.5 | 0.8 | 25.5 | 59.4 | 0.3 | 3.0 | 11.8 |
| | 4 | 81.8 | 3.5 | 3.6 | 9.3 | 1.8 | 12.6 | 81.1 | 0.4 | 0.3 | 4.7 |
| | 8 | 88.2 | 2.3 | 2.4 | 5.9 | 1.2 | 9.5 | 86.9 | 0.2 | 0.7 | 2.7 |
| Ghana | 1 | 89.5 | 6.2 | 3.5 | 0.6 | 0.2 | 9.6 | 52.1 | 7.2 | 5.2 | 25.8 |
| | 4 | 95.7 | 1.0 | 1.1 | 0.7 | 1.5 | 1.7 | 79.8 | 5.3 | 3.5 | 9.8 |
| | 8 | 97.4 | 1.0 | 1.1 | 0.7 | 1.5 | 5.4 | 86.4 | 2.4 | 1.7 | 4.2 |
| Kenya | 1 | 69.6 | 15.4 | 1.1 | 7.9 | 6.1 | 9.4 | 58.7 | 6.2 | 10.9 | 14.8 |
| | 4 | 87.9 | 4.1 | 1.4 | 2.3 | 4.4 | 12.3 | 74.1 | 2.7 | 4.3 | 6.6 |
| | 8 | 93.3 | 2.3 | 0.7 | 1.3 | 2.4 | 14.0 | 78.7 | 1.5 | 2.3 | 3.5 |
| Lesotho | 1 | 86.8 | 6.1 | 1.4 | 5.6 | 0.1 | 11.4 | 80.6 | 0.0 | 7.6 | 0.4 |
| | 4 | 94.4 | 2.2 | 0.4 | 1.1 | 1.9 | 19.9 | 76.3 | 0.4 | 2.5 | 0.9 |
| | 8 | 97.1 | 1.1 | 0.2 | 0.6 | 1.0 | 20.7 | 77.2 | 0.2 | 1.4 | 0.5 |
| Madagascar | 1 | 49.4 | 0.2 | 11.8 | 1.1 | 37.6 | 15.1 | 66.0 | 15.4 | 0.5 | 3.1 |
| | 4 | 83.2 | 2.0 | 4.3 | 0.8 | 9.7 | 9.1 | 83.9 | 4.0 | 0.3 | 2.8 |
| | 8 | 90.2 | 1.3 | 2.5 | 0.5 | 5.5 | 7.6 | 88.9 | 2.0 | 0.1 | 1.3 |
| Malawi | 1 | 48.8 | 7.0 | 1.0 | 42.0 | 1.3 | 8.0 | 55.9 | 1.0 | 15.9 | 19.2 |
| | 4 | 69.4 | 13.2 | 2.6 | 13.6 | 1.1 | 25.0 | 61.9 | 0.8 | 4.0 | 8.3 |
| | 8 | 82.4 | 8.7 | 1.4 | 6.8 | 0.7 | 38.9 | 56.7 | 0.2 | 1.2 | 3.0 |
| Mauritius | 1 | 49.4 | 0.5 | 1.7 | 18.5 | 30.0 | 21.6 | 40.2 | 0.0 | 19.1 | 19.1 |
| | 4 | 55.4 | 5.5 | 0.7 | 9.2 | 29.2 | 13.5 | 71.6 | 1.2 | 4.1 | 9.6 |
| | 8 | 70.6 | 3.7 | 0.5 | 5.8 | 19.4 | 11.0 | 83.0 | 0.4 | 1.9 | 3.7 |
| Nigeria | 1 | 67.1 | 0.3 | 0.4 | 1.0 | 31.3 | 3.1 | 93.7 | 0.6 | 2.2 | 0.5 |
| | 4 | 89.2 | 1.7 | 0.1 | 0.5 | 8.5 | 10.8 | 88.1 | 0.1 | 0.5 | 0.4 |
| | 8 | 95.1 | 0.8 | 0.0 | 0.2 | 3.8 | 8.2 | 91.3 | 0.1 | 0.3 | 0.2 |
| Rwanda | 1 | 83.8 | 7.5 | 6.6 | 0.7 | 1.3 | 24.0 | 38.7 | 21.4 | 11.8 | 4.1 |
| | 4 | 80.9 | 3.1 | 9.8 | 2.4 | 3.9 | 7.1 | 39.4 | 8.1 | 23.4 | 11.1 |
| | 8 | 82.4 | 2.4 | 6.5 | 2.2 | 6.5 | 3.6 | 36.7 | 6.1 | 29.6 | 24.1 |
| South Africa | 1 | 82.0 | 0.4 | 5.8 | 0.5 | 11.3 | 8.7 | 10.7 | 30.5 | 7.3 | 42.9 |
| | 4 | 73.6 | 9.6 | 3.0 | 3.7 | 10.1 | 2.2 | 26.7 | 22.0 | 5.5 | 4.5 |
| | 8 | 78.9 | 8.9 | 2.1 | 3.1 | 7.0 | 4.9 | 59.5 | 10.1 | 3.8 | 21.7 |
| Swaziland | 1 | 81.8 | 0.3 | 3.1 | 0.7 | 13.9 | 3.2 | 89.6 | 0.5 | 6.3 | 0.1 |
| | 4 | 87.8 | 1.4 | 1.2 | 2.2 | 7.5 | 2.8 | 97.7 | 0.3 | 3.1 | 1.0 |
| | 8 | 93.7 | 1.1 | 0.6 | 1.0 | 3.6 | 1.5 | 96.5 | 0.1 | 1.4 | 0.5 |
| Tanzania | 1 | 75.4 | 2.1 | 0.2 | 15.7 | 6.6 | 4.4 | 70.7 | 0.6 | 17.0 | 7.4 |
| | 4 | 72.6 | 3.1 | 2.0 | 13.4 | 8.9 | 6.3 | 66.9 | 1.8 | 15.9 | 9.1 |
| | 8 | 83.2 | 1.8 | 1.6 | 7.5 | 5.9 | 7.3 | 77.7 | 1.3 | 8.0 | 5.7 |

Table 3 (Continued)

| Country | Year | Terms of trade | | | | | Domestic output | | | | |
|------------|------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Uganda | 1 | 62.1 | 27.7 | 2.2 | 0.1 | 7.9 | 44.0 | 54.3 | 0.1 | 0.1 | 1.5 |
| | 4 | 90.8 | 6.4 | 0.8 | 0.1 | 1.9 | 66.4 | 31.5 | 0.2 | 0.0 | 1.9 |
| | 8 | 96.6 | 2.3 | 0.3 | 0.1 | 0.7 | 74.7 | 24.5 | 0.1 | 0.0 | 0.7 |
| Zambia | 1 | 49.8 | 0.0 | 4.0 | 36.9 | 10.0 | 18.5 | 46.0 | 14.4 | 16.0 | 5.0 |
| | 4 | 74.0 | 3.6 | 3.2 | 14.6 | 4.7 | 7.1 | 55.6 | 12.5 | 18.1 | 6.7 |
| | 8 | 82.6 | 2.5 | 2.4 | 9.1 | 3.0 | 4.1 | 68.0 | 9.8 | 13.5 | 4.7 |
| Zimbabwe | 1 | 47.1 | 3.7 | 20.4 | 0.2 | 28.6 | 23.7 | 52.8 | 3.7 | 6.0 | 13.8 |
| | 4 | 76.9 | 17.2 | 2.8 | 0.1 | 3.1 | 38.5 | 58.3 | 0.7 | 1.0 | 1.5 |
| | 8 | 87.8 | 10.3 | 0.6 | 0.0 | 0.6 | 50.8 | 48.3 | 0.2 | 0.3 | 0.4 |
| | | Real exchange rate | | | | | The price level | | | | |
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Botswana | 1 | 13.5 | 0.3 | 66.8 | 6.2 | 13.2 | 22.4 | 6.3 | 1.2 | 16.2 | 53.9 |
| | 4 | 26.0 | 6.5 | 58.2 | 2.7 | 6.7 | 10.0 | 5.1 | 1.4 | 12.9 | 70.5 |
| | 8 | 26.9 | 6.4 | 60.9 | 1.7 | 4.1 | 7.1 | 3.8 | 2.0 | 8.4 | 78.9 |
| Burundi | 1 | 6.0 | 16.4 | 74.4 | 2.8 | 0.4 | 23.9 | 0.2 | 1.7 | 55.2 | 19.0 |
| | 4 | 6.4 | 15.3 | 74.7 | 2.7 | 0.9 | 13.9 | 0.3 | 3.3 | 61.1 | 21.4 |
| | 8 | 5.8 | 13.9 | 77.6 | 2.1 | 0.6 | 8.1 | 1.5 | 4.0 | 66.4 | 20.0 |
| Ethiopia | 1 | 16.0 | 19.0 | 65.0 | 0.0 | 0.0 | 2.6 | 16.1 | 13.9 | 58.8 | 8.7 |
| | 4 | 20.9 | 14.8 | 63.9 | 0.1 | 0.3 | 1.6 | 32.2 | 2.0 | 26.0 | 38.2 |
| | 8 | 22.7 | 12.8 | 64.3 | 0.1 | 0.2 | 2.2 | 28.8 | 1.0 | 22.3 | 45.7 |
| Gambia | 1 | 8.5 | 6.1 | 81.3 | 3.6 | 0.5 | 4.7 | 2.6 | 11.9 | 54.4 | 26.3 |
| | 4 | 8.9 | 5.5 | 83.7 | 2.2 | 0.4 | 4.5 | 13.1 | 12.6 | 19.2 | 30.6 |
| | 8 | 7.5 | 4.4 | 86.5 | 1.4 | 0.3 | 3.1 | 16.7 | 12.4 | 35.1 | 32.7 |
| Ghana | 1 | 28.8 | 0.0 | 35.3 | 1.2 | 34.7 | 5.3 | 42.0 | 16.5 | 29.3 | 6.9 |
| | 4 | 44.6 | 0.8 | 37.9 | 1.6 | 14.7 | 15.1 | 22.9 | 21.0 | 20.2 | 20.9 |
| | 8 | 45.7 | 1.0 | 44.5 | 0.9 | 7.9 | 19.0 | 8.7 | 24.2 | 21.3 | 26.9 |
| Kenya | 1 | 30.4 | 2.4 | 60.0 | 7.1 | 0.2 | 2.9 | 35.1 | 10.6 | 42.9 | 8.5 |
| | 4 | 30.3 | 2.9 | 61.7 | 4.2 | 0.9 | 4.7 | 27.1 | 7.6 | 20.2 | 40.4 |
| | 8 | 30.4 | 2.4 | 64.0 | 2.6 | 0.6 | 3.2 | 23.1 | 11.0 | 16.0 | 46.8 |
| Lesotho | 1 | 6.6 | 3.5 | 70.0 | 12.3 | 0.6 | 12.4 | 0.1 | 13.4 | 2.3 | 71.9 |
| | 4 | 5.6 | 10.5 | 73.0 | 10.3 | 0.6 | 4.8 | 1.8 | 8.2 | 3.9 | 82.0 |
| | 8 | 3.7 | 16.8 | 72.3 | 6.8 | 0.4 | 1.5 | 2.4 | 7.9 | 9.3 | 79.0 |
| Madagascar | 1 | 0.6 | 1.0 | 69.9 | 0.0 | 28.5 | 0.3 | 30.7 | 11.1 | 39.5 | 18.4 |
| | 4 | 5.6 | 0.0 | 75.3 | 4.3 | 13.9 | 0.8 | 40.0 | 12.7 | 19.2 | 27.9 |
| | 8 | 5.0 | 0.9 | 82.8 | 2.8 | 8.6 | 0.5 | 37.9 | 13.9 | 17.3 | 30.4 |
| Malawi | 1 | 0.5 | 7.1 | 84.9 | 1.9 | 5.6 | 6.2 | 43.7 | 0.8 | 24.4 | 24.9 |
| | 4 | 0.6 | 6.4 | 80.7 | 2.2 | 10.2 | 6.0 | 12.9 | 0.2 | 44.6 | 36.3 |
| | 8 | 0.5 | 8.8 | 82.5 | 1.5 | 6.7 | 7.8 | 5.4 | 0.2 | 43.3 | 43.3 |
| Mauritius | 1 | 0.0 | 7.7 | 92.2 | 0.0 | 0.0 | 57.6 | 0.2 | 3.6 | 28.2 | 10.4 |
| | 4 | 0.8 | 8.5 | 87.9 | 0.4 | 2.4 | 38.0 | 0.7 | 2.1 | 23.5 | 37.8 |
| | 8 | 0.6 | 9.7 | 87.6 | 0.3 | 1.9 | 32.7 | 4.1 | 2.0 | 20.1 | 41.1 |
| Nigeria | 1 | 0.2 | 0.1 | 51.6 | 19.2 | 28.9 | 13.4 | 6.3 | 5.2 | 69.3 | 5.9 |
| | 4 | 20.0 | 0.9 | 53.2 | 11.0 | 14.9 | 34.9 | 15.6 | 1.6 | 26.3 | 21.7 |
| | 8 | 29.5 | 0.8 | 54.4 | 6.5 | 8.9 | 38.2 | 18.1 | 1.2 | 20.9 | 21.7 |

Table 3 (Continued)

| | | Real exchange rate | | | | | The price level | | | | |
|--------------|---|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m | ε_t^h | ε_t^s | ε_t^z | ε_t^d | ε_t^m |
| Rwanda | 1 | 0.2 | 0.0 | 99.7 | 0.0 | 0.1 | 12.0 | 0.0 | 78.6 | 7.0 | 2.5 |
| | 4 | 0.1 | 0.0 | 99.7 | 0.0 | 0.2 | 5.6 | 0.0 | 68.1 | 2.4 | 23.8 |
| | 8 | 0.1 | 0.0 | 99.7 | 0.0 | 0.2 | 3.9 | 0.1 | 47.6 | 1.7 | 46.7 |
| South Africa | 1 | 7.4 | 27.1 | 15.8 | 7.9 | 41.9 | 0.5 | 66.9 | 4.8 | 10.4 | 17.5 |
| | 4 | 7.4 | 29.0 | 33.2 | 6.5 | 23.8 | 12.1 | 65.7 | 2.3 | 3.5 | 16.5 |
| | 8 | 6.6 | 40.4 | 35.3 | 3.9 | 13.7 | 14.4 | 68.6 | 1.8 | 3.1 | 12.1 |
| Swaziland | 1 | 0.2 | 2.3 | 81.3 | 0.0 | 16.1 | 29.5 | 3.6 | 9.7 | 34.0 | 23.2 |
| | 4 | 16.4 | 12.1 | 58.0 | 3.0 | 10.5 | 27.8 | 2.6 | 8.2 | 25.2 | 36.1 |
| | 8 | 30.0 | 18.5 | 45.0 | 1.4 | 5.1 | 28.1 | 7.7 | 7.0 | 21.8 | 35.4 |
| Tanzania | 1 | 12.4 | 0.5 | 85.8 | 1.2 | 0.1 | 11.5 | 15.7 | 17.5 | 32.5 | 22.8 |
| | 4 | 11.9 | 5.7 | 80.3 | 1.8 | 0.4 | 15.9 | 13.8 | 14.3 | 20.8 | 35.2 |
| | 8 | 11.0 | 8.2 | 79.5 | 1.1 | 0.2 | 15.1 | 11.1 | 15.1 | 19.2 | 39.5 |
| Uganda | 1 | 16.5 | 7.9 | 21.0 | 22.0 | 32.7 | 19.8 | 6.8 | 12.9 | 2.0 | 58.5 |
| | 4 | 29.8 | 6.7 | 25.2 | 15.7 | 22.6 | 12.0 | 1.3 | 12.5 | 1.9 | 72.4 |
| | 8 | 42.9 | 7.8 | 27.6 | 7.9 | 13.9 | 7.2 | 1.1 | 12.6 | 1.4 | 77.7 |
| Zambia | 1 | 0.4 | 0.1 | 73.5 | 17.1 | 8.1 | 56.1 | 29.4 | 5.3 | 9.2 | 0.0 |
| | 4 | 9.7 | 2.0 | 74.4 | 8.4 | 5.5 | 24.4 | 33.2 | 10.8 | 26.2 | 5.4 |
| | 8 | 8.9 | 1.4 | 81.9 | 5.1 | 3.3 | 19.3 | 33.3 | 14.0 | 27.1 | 6.3 |
| Zimbabwe | 1 | 41.5 | 2.0 | 51.0 | 3.9 | 1.6 | 33.7 | 7.3 | 6.5 | 13.3 | 39.3 |
| | 4 | 54.1 | 1.1 | 41.6 | 1.4 | 1.7 | 82.7 | 8.6 | 1.4 | 1.0 | 6.4 |
| | 8 | 75.8 | 0.6 | 22.5 | 0.5 | 0.6 | 93.0 | 4.5 | 0.3 | 0.2 | 2.0 |

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Republic in the non-CFA zone. These results are consistent with the findings of [Ahmed and Park \(1994\)](#) and [Hoffmaister and Roldós \(1997\)](#). The latter study found similar results for the CFA and non-CFA countries and developing countries of Asia and Latin America. Notice that trade balance shocks are negligible in output movements in both country groups except for Rwanda and South Africa in the non-CFA zone. Similarly, real demand shocks play a limited role in output movements in all countries except for Congo and Senegal in the CFA zone and Rwanda in the non-CFA zone.

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Trade balance disturbances are exogenous shifts in the balance of payments. Trade balance shocks explain most of the real exchange rate variability at short and long-term forecasting horizons in the CFA countries. Over 90% of the fluctuations of real exchange rates in the short and long run for Benin, Cameroon, Chad and Gabon are due to trade balance shocks. For some other countries, namely Central African Republic, Côte D'Ivoire, Niger and Togo, there is some role for terms of trade and supply disturbances in explaining the variability of real exchange rates in the CFA countries.

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The main sources of the real exchange rate fluctuations in the non-CFA countries are trade balance disturbances, yet there is a greater role for monetary and real demand shocks. The monetary shocks are important for Botswana, Ghana, Madagascar, Nigeria, South Africa, Swaziland and Uganda. This is consistent with greater monetary discretion afforded by flexible exchange rates. Moreover, terms of trade shocks play a significant role in real exchange rate movements in Botswana, Ethiopia, Ghana, Kenya, Nigeria, Swaziland, Tanzania, Uganda and Zimbabwe. In the non-CFA countries, supply disturbances play a limited role in real exchange rate fluctuations in the short and long run. Supply shocks matter only in South African Republic,

where they explain 27% and 40% of the variation of real exchange rates at short and long-term forecasting horizons, respectively.

The sources of price level variation at short-term forecasting horizons are monetary shocks in the CFA countries and monetary and terms of trade shocks in the non-CFA countries. At long-term horizons, supply and monetary shocks explain the movements in prices in the CFA countries, while the sources of price level variability are terms of trade and monetary disturbances in the non-CFA countries. Recall that the CFA countries adopted a fixed exchange rate system at the expense of giving up their monetary policy autonomy while the non-CFA countries follow a flexible exchange rate regime. However, there is no clear evidence that non-CFA countries have an “inflation bias” because of following a flexible exchange rate regime.

4. Conclusions

This paper investigates the sources of macroeconomic fluctuations in Sub-Saharan Africa. This issue is examined within the context of a small open economy model with limited capital mobility using a structural Vector Autoregression (VAR) approach. The empirical model allows for the recovery of five fundamental economic disturbances: terms of trade shocks, supply shocks, trade balance shocks, real aggregate demand shocks and monetary shocks.

In both the CFA and the non-CFA countries alike, the terms of trade seem to be exogenous in that domestic shocks play a limited role in the variation of the terms of trade. Supply shocks seem to dominate output fluctuations at short and long-term forecasting horizons while demand disturbances play a limited role in the CFA countries. Similarly, external shocks such as terms of trade disturbances seem to matter in output fluctuations while trade balances shocks play a negligible role in output movements in the CFA countries. There is some evidence that the effects of terms of trade shocks on output are due to the exchange rate system in the CFA countries. It is known that an exchange rate system may insulate an economy from external shocks. In fact, Hoffmaister et al. (1998) show that the CFA and the non-CFA countries have similar structural characteristics, so that the differences can be attributed to the exchange rate system.

In addition to supply and terms of trade shocks, demand shocks (real and nominal) tend to influence output fluctuations at medium and short-term forecasting horizons in the non-CFA countries. This may also reflect the exchange rate system where one may expect a higher incidence of demand side shocks. If these economies have some wage/price rigidities and information asymmetries, then demand shocks may have some influence on output. The main sources of real exchange rate fluctuations in the CFA countries are trade balance disturbances at all forecasting horizons. Real exchange rate variability in the non-CFA countries is mostly driven by trade balance and terms of trade disturbances. However, monetary disturbances affect real exchange rate movements in the non-CFA countries, indicating greater monetary discretion afforded by flexible exchange rates and the presence of some price rigidities.

Monetary shocks are the main source of price level movements in Sub-Saharan Africa. However, demand, terms of trade, and supply shocks also play a significant role in these countries. As for the role of the exchange rate system, there does not appear to be a major difference in the source of the price level movements in the CFA versus the non-CFA countries.

Since the bulk of output fluctuations in SSA countries are due to supply and terms of trade shocks, economic diversification, improving infrastructure and investment in human capital are fruitful venues for SSA. In addition, achieving economic development within a framework of political stability, commitment to democratic institutions, and viable governance is equally

important. While these policies seem far-fetched, some countries in SSA, notably Botswana, made considerable progress in this regard.

While a fixed exchange rate system helps maintain price stability by limiting monetary discretion, the CFA countries seem to pay a price. Fixed exchange rates may fail to insulate these economies against external disturbances, and without additional fiscal fine-tuning, the result is a loss of competitiveness. This may be one reason for the slower output growth in the CFA zone.

Uncited reference

Stockman (1983).

Acknowledgements

Sel Dibooglu gratefully acknowledges financial support from the Center for International Studies at the University of Missouri at St. Louis. The views expressed herein are those of the authors.

Appendix A

See Table A.1.

Table A.1
Primary commodity shares of exports in Sub-Saharan African countries

| | Commodity | Share in total exports (%) |
|--------------------------|-----------------------|----------------------------|
| CFA countries | | |
| Benin | Cotton | 42 |
| Burkina Faso | Cotton | 57 |
| Cameroon | Crude oil | 50 |
| Chad | Cotton | 85 |
| Central African Republic | Coffee and diamonds | 81 |
| Congo | Crude oil | 85 |
| Côte D'Ivoire | Coffee | 31 |
| Gabon | Crude oil | 75 |
| Mali | Cotton | 62 |
| Niger | Uranium | 83 |
| Senegal | Cotton and fish | 45 |
| Togo | Coffee and phosphates | 78 |
| Non-CFA countries | | |
| Botswana | Diamonds | 80 |
| Burundi | Coffee | 75 |
| Ethiopia | Coffee | 45 |
| Gambia | Groundnuts | 48 |
| Ghana | Cocoa | 49 |
| Kenya | Coffee and tea | 51 |
| Lesotho | Wool and livestock | 45 |
| Madagascar | Coffee and fish | 38 |
| Malawi | Tobacco | 68 |
| Mauritius | Fish | 35 |
| Nigeria | Crude oil | 96 |
| Rwanda | Coffee | 61 |

Table A.1 (Continued)

| | Commodity | Share in total exports (%) |
|--------------|-----------|----------------------------|
| South Africa | Gold | 20 |
| Swaziland | Sugar | 41 |
| Tanzania | Coffee | 44 |
| Uganda | Coffee | 74 |
| Zambia | Copper | 88 |
| Zimbabwe | Tobacco | 24 |

Sources: Deaton (1999) and Dhonte et al. (1993).

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