This item was submitted to [Loughborough's Research Repository](#) by the author.
Items in Figshare are protected by copyright, with all rights reserved, unless otherwise indicated.

Identifying aggregate supply and demand shocks in small open economies: empirical evidence from African countries

PLEASE CITE THE PUBLISHED VERSION

<http://dx.doi.org/10.1016/j.iref.2011.08.004>

PUBLISHER

© Elsevier

VERSION

AM (Accepted Manuscript)

LICENCE

CC BY-NC-ND 4.0

REPOSITORY RECORD

Ahmad, A.H., and Eric J. Pentecost. 2019. "Identifying Aggregate Supply and Demand Shocks in Small Open Economies: Empirical Evidence from African Countries". figshare. <https://hdl.handle.net/2134/14016>.

This item was submitted to Loughborough's Institutional Repository (<https://dspace.lboro.ac.uk/>) by the author and is made available under the following Creative Commons Licence conditions.

For the full text of this licence, please go to:
<http://creativecommons.org/licenses/by-nc-nd/2.5/>

**Identifying Aggregate Supply and Demand Shocks in Small Open Economies: Empirical
Evidence from African Countries**

A. H. Ahmad
Department of Economics
University of Bath
Bath, BA2 7AY
A.H.Ahmad@bath.ac.uk

Eric J. Pentecost
School of Business and Economics
Loughborough University
Loughborough
Leicestershire, LE11 3TU
United Kingdom
E.J.Pentecost@lboro.ac.uk

Revised, June 2011

Abstract

This paper contributes to the debates on the sources of the African growth constraint. It uses a tri-variate structural VAR with a long-run identification scheme akin to the Blanchard and Quah method, to identify demand and supply shocks in 22 African countries between 1980 and 2005. Domestic supply shocks are the most important contributor to real output fluctuations in these countries. Contrary to expectations, the external shock played only a marginal role as a source of real output variation in the countries covered. A partial correlation analysis between the identified shocks and a measure of the fiscal policies of the countries reveal that fiscal policies pursued by these countries during the period are largely pro-cyclical.

JEL Classification: E62, F41, F43

Key Words: African countries; Structural VAR

1. Introduction

The motivation of this paper is to address the on-going debate over the disappointing economic performance of African countries over recent decades, with specific attention to the identification of the sources of the economic constraints on economic growth.

In 1957 Ghana, then the wealthiest nation in sub-Saharan Africa, had a per capita income almost equal to that of South Korea (US\$ 490 against US\$ 491 in 1980 dollars). By the early 1980s, Ghana's annual income per head had fallen by nearly 20 per cent to US\$400, while South Korea's per capita GDP was, by then, over US\$ 2,000. The UNDP's 1990 Human Development Report suggests that South Korea had an annual purchasing power per head ten times greater than Ghana (US\$ 4,832 against US\$ 481) based on 1987 statistics (The Economist, 26 May, 1990, p.81). Furthermore this was not just a country-specific problem, but an African problem. Collier and Gunning (1999), for example, note that African economic performance had been markedly worse than that of other regions, during the 1980s as per capita GDP declined by 1.3 percent per annum, five percent below the average for all low income developing countries. During 1990-94 the decline accelerated to 1.8 percent per annum which, widened up the gap to 6.2 percentage points. For most of African countries, 1980s are considered as 'a lost decade' with slow, and even negative, growth commonplace (Fisher, 1991). Since the mid-1990s economic performance in Africa seems to be improving, which is, perhaps attributable to structural adjustment programmes sponsored by the IMF and the World Bank.

To identify the potential economic shocks to the African countries since 1980 we undertake a tri-variate VAR analysis, following Dungey and Pagan (2000). For small open economies, like those in Africa, where external shocks are likely to be at least as important as domestic shocks in influencing the evolution of output growth and inflation, the tri-variate VAR is preferred to Blanchard and Quah's (1980) more usual bi-variate VAR. In this framework in addition to domestic output growth and inflation world output growth is added to the model. This variable is assumed to be an important exogenous determinant of individual country exports, and therefore fluctuations in world output growth are likely to have significant effects on the domestic output growth and inflation. A second contribution to the existing literature is to identify the contribution of national fiscal policies by a partial correlation analysis between the estimated shocks and a measure of fiscal policies of the countries studied.

The rest of the paper is organised as follows. The next section discusses identification of aggregate supply and demand within a structural VAR. Section 3 analyses the data from our large sample of 22 African countries and the results from the trivariate-VAR analysis. Section 4 concludes.

2. Aggregate Supply and Demand Shocks within an SVAR

The SVAR methodology imposes structural restrictions, based on economic theory (Hoffmaister et al 1998), on a Vector Autoregression (VAR). In particular, in a bi-variate VAR context, Blanchard and Quah (1989) interpreted the permanent shocks as aggregate supply shocks and transitory shocks as aggregate demand shocks. In an open economy context, a third-order VAR is necessary to capture potential effects from the rest of world onto domestic output growth and inflation (Dungey and Pagan, 2000). If the economy is assumed to be small then it is reasonable to assume that this economy has no effect on the world output.

Let y_t^* , y_t and π_t represent the logs of real foreign output, the log of real domestic output and the domestic inflation rate, respectively. Then a tri-variate autoregressive (VAR) model can be set up to represent the small open economies of Africa as follows:

$$\Delta y_t^* = \sum_{j=1}^k a_{11j} \Delta y_{t-j}^* + e_{1t} \quad (1)$$

$$\Delta y_t = \sum_{j=0}^k a_{21j} \Delta y_{t-j}^* + \sum_{j=1}^k a_{22j} \Delta y_{t-j} + \sum_{j=1}^k a_{23j} \Delta \pi_{t-j} + e_{2t} \quad (2)$$

$$\Delta \pi_t = \sum_{j=0}^k a_{31j} \Delta y_{t-j}^* + \sum_{j=1}^k a_{32j} \Delta y_{t-j} + \sum_{j=1}^k a_{33j} \Delta \pi_{t-j} + e_{3t} \quad (3)$$

where the constant terms are suppressed for notational convenience and the variables are differenced sufficiently to achieve stationarity. The structure of the system is that the real value of foreign output evolves independently of the other variables. Therefore, the foreign output equation includes neither current or lagged values of the other variables. The small country assumptions also mean that domestic output and inflation are allowed to depend on the current and past values of foreign output. The residuals e_{1t} , e_{2t} and e_{3t} are assumed to be related to each other through different types of shocks, which are foreign productivity shocks, v_t , domestic demand shocks η_t and domestic supply shocks, ε_t . Since these shocks are not observable, they need to be identified from the VAR residuals. Let the relationship between the residuals and the innovations be given by

$$\begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \end{bmatrix} = \begin{bmatrix} g_{11} & g_{12} & g_{13} \\ g_{21} & g_{22} & g_{23} \\ g_{31} & g_{32} & g_{33} \end{bmatrix} \begin{bmatrix} v_t \\ \varepsilon_t \\ \eta_t \end{bmatrix} \quad (4)$$

In the above system, there are fifteen unknowns to identify. These are nine elements, g_{ij} , of matrix G linking the VAR residuals and the structural innovations, three variances σ_v^2 , σ_ε^2 , σ_η^2 and three covariances $\sigma_{v\varepsilon}$, $\sigma_{\varepsilon\eta}$, $\sigma_{\eta v}$ in the variance-covariance matrix, Σ , of the structural innovations. From equation (4) the variance-covariance matrix of the VAR residuals Σ_e is denoted by

$$\Sigma_e = G \Sigma G' \quad (5)$$

The elements of Σ_ε provides six of the fifteen restrictions required for exact identification of the system. The Blanchard-Quah methodology is used for the additional six assumptions that all variances are unity, i.e. $\sigma_\varepsilon^2 = \sigma_\eta^2 = \sigma_{\eta\varepsilon}^2 = 1$ and all co-variances are zero, which is $\sigma_{\varepsilon\varepsilon}^2 = \sigma_{\varepsilon\eta}^2 = \sigma_{\eta\varepsilon}^2 = 0$. The domestic supply shocks ε_t and domestic demand shocks η_t have no impacts on the large country, so $g_{12}=g_{13}=0$. Finally, demand shocks have no long-run effects on domestic output:

$$g_{23} \left[1 - \sum_{j=1}^k a_{33j} \right] + g_{33} \left[1 - \sum_{j=1}^k a_{23j} \right] = 0 \quad (6)$$

These restrictions are adequate to identify the structural system.

Impulse response functions, variance decomposition analysis and a historical decomposition of the output effects of the structural shocks are considered with the view to investigate the plausibility of the identification presented here.

Given that the domestic country is assumed to be small, world output growth is taken to be exogenous. Therefore, domestic shocks would not affect world output. A positive shock to foreign growth, probably from a global technological improvement or a favourable supply effect will affect the domestic supply. For example, a global supply shock would raise the domestic output growth and a favourable supply effects in terms of fall in oil prices (this might not be the case for oil exporting countries of Nigeria, Gabon and others included in the sample). The latter will improve the countries' terms of trade. This will impact on the domestic output positively. If global output shock represents a rise in world interest rates, there would be inter-temporal substitution effect and domestic output growth rises. Small open economies provide several channels by which disturbances in the world economy influence their performance. Shortfalls in world output or world interest rate fluctuations are good examples of exogenous macroeconomic dynamics that affect the business cycles of small open developing economies. Changes in world output can be seen as exogenous disturbances which affect the demand for the goods and services of small open economies. A fall in world output has a negative wealth effect and leads to a decline in domestic absorption and a real depreciation under both exchange rate regimes.

A positive domestic supply shock increases output directly and therefore, the effect would be positive and persistent. A long-run neutrality of aggregate demand is assumed and as a result the shocks have no effect on the long-run path of domestic supply. The assumption is consistent with many macroeconomic models, which include Mundell-Fleming open-economy models, rational expectations sticky-wage models proposed by Fisher-Gray types and Lucas-Barro imperfect information models. All the same, the short-run interactions among the variables are freely determined by the model.

This paper further links the identified shocks with the fiscal policy of the countries, to identify the cyclical behaviour of fiscal policy in these countries. The issue of pro-cyclicality and counter-cyclicity of fiscal policy in developing countries is yet to be settled in the literature. An appreciable literature has argued that fiscal policy in developing countries is pro-cyclical in contrast to industrial countries where it is argued that fiscal policy is either acyclical or countercyclical (Gavin and

Perotti,1997; Talvi and Végh,2005). At the other spectrum are those who claim that fiscal policy conducted in developing countries is counter-cyclical (Diallo, 2009). In line with Kaminsky, Reinhart, and Vegh (2004) and Ilzetzi and Vegh (2008), this paper views fiscal measures from the policy instruments perspective, rather than from the outcomes (which could lie outside the policy makers' control). Two fiscal policy instruments are government consumption and tax rates. There are studies used fiscal deficit, which has been criticised as not an appropriate measure of fiscal policy. This is because of the cyclicity of tax revenues. As we are unable to obtain data on tax rates, the paper uses data on government consumption as measure of fiscal policy.

3. African growth: response to external and internal shocks

3.1 Data Set

The data is sourced from the IMF's International Financial Statistics database. It is of monthly frequency, covers the period 1980:01-2005:12 and comprises of domestic real GDP, y , Foreign real GDP, y^* and domestic CPI for each of the 22 African countries. Foreign real GDP is represented by US output, which is highly and significantly correlated (correlation coefficient of 0.73) with world output. The series were first logged and then subjected to battery of unit root tests that includes ADF, PP and KPSS to identify their level of integration. Table 1 shows that the series rejected stationarity in levels, but fail to reject stationarity in first differences. In addition, Johansen cointegration tests were used to determine if the variables are cointegrated or not. This is important, because if the series are cointegrated, an SVECM should be used in the place of an SVAR. The results indicate that variables are not cointegrated and therefore the SVAR was estimated for each of the countries covered.

3.2 Sample Period 1980:1-2005:12

The impulse response functions show the direction and the magnitude of an impact on a variable due to changes in another variable. A foreign supply shock should raise domestic output growth, put a downward pressure on inflation and improve trade balance. The responses of output and inflation to the US GDP, domestic supply and demand shocks are computed and reported in figure 1. The output of these countries does not seem to be sensitive to the external shock that emanates from the US GDP. For example only four countries' output responded to the US GDP shock. These are Botswana, Central Africa, Ethiopia and Nigeria. A positive US GDP shock has produced a positive, but insignificant responses from real output of Botswana, Central Africa and Egypt, albeit after a lag of about two quarters. However, Ethiopia's output responded to the shock by a mild contraction that persisted up to the tenth quarter. Nigeria's real GDP responded by an insignificant mild contraction up to the sixth quarter after the shock. Similar results were reported by Ahmed and Park (1994) for developed countries.

A positive supply shock is expected to have a persistent positive effect on the domestic supply growth. A positive supply shocks have resulted in a positive and sustained response by the real output from the period contemporaneous to the shock up to the tenth quarter in all the countries. However, the magnitude varies from country to country. Zambia recorded a 3% positive response during the period immediately after the shock whereas six countries' output responded by a 2% rise during the period contemporaneous to the shock. These are Gabon, Ghana, Libya, Malawi, Mauritania and Tanzania. The rest of the countries recorded about 1% output rise due to domestic supply shock, except Egypt, Mauritius and Tunisia, where immediate response to the shock was less than 0.5%. The degree of persistence also varies among the countries. In many countries, the response of the output has risen to between 3% and 4% by the second and sixth quarter, where it mostly stayed up to the tenth quarter. These are Algeria, Botswana, Gabon, Ghana, Libya, Malawi and Tanzania. A positive domestic supply shock produced different responses from the countries. In four of the countries the response was a decline in inflation. Algeria, Egypt, Ghana and Tunisia responded by a different degree of fall in their CPI, although in some instances insignificant.

A positive domestic demand shock has yielded a non significant response by the real GDP of the countries covered, except in Benin and Senegal. Inflation has also responded insignificantly to the foreign supply shocks in all the countries. However, responses of inflation to the domestic supply shock are significant in Benin, Central Africa and Senegal. A positive demand shock has induced a positive and significant rise in inflation in all the countries, except in Gabon.

It is evident from the results that output of countries of Botswana and Mauritania has responded by positively to a positive shock of the US GDP. Botswana's main exports are diamond which appears to be sensitive to external shocks. Mauritania's main exports are iron ore and gold, which constitute about 60% of the country's exports. In Central Africa where diamonds account for about half of the country's exports, the domestic output responded to an external positive shock by an insignificant rise. Egypt is increasingly becoming an important gold exporting country. The results indicate that its output responded positively to external shocks like other countries in this category. The results also highlights role of price distortion in these economies. For example countries that operate one form of price control or the other recorded a rise in inflation when there is a positive shock to the domestic aggregate supply. These countries include Benin, Cameroon, Central Africa, Gabon and Senegal. However, other countries that do not belong to this category recorded decline inflation as a result of a positive domestic supply shock, albeit in some cases insignificant. For example, in Egypt where the price controls were dismantled in the 1991 reforms, a positive shock to the domestic supply resulted in a decline in the country's inflation.

Impulse response analysis is useful in considering the signs and magnitude of responses to specific shocks. However, the relative importance of shocks for a given variable fluctuations is assessed is better assessed through the variance decompositions. Table 1(a) to 1(u) present variance decomposition of real output and inflation to US GDP, supply and demand shocks. Foreign shocks have not significantly impacted on the domestic output of these countries, except in Egypt, Gabon and Ghana where foreign shock accounted for more than 10% of domestic output variations. Gabon recorded the highest of 14%. But in the remaining countries, the US GDP shocks accounted for less than 10% of the domestic output changes for up to ten years period. Domestic supply shock is the most important source of domestic real output variations in all the countries covered. However, its

relative significance seem to declined in some countries. For example, in Nigeria and Senegal, the supply shocks accounted for about 99% of output fluctuations, but its contribution in both countries declined to about 68% by the 30th quarter. The influence of demand shocks on domestic output varies across the countries. However, its relative importance is generally low as it accounts less than 20% of output variations in all the countries, except in Senegal where the influence of demand shock on her output is about 30%. The external shock has impacted less on the inflation of the countries, accounting between 3-21% of their inflation. South Africa recorded the highest influence of foreign output on her inflation. Domestic supply shocks contribution to inflation varies from one country to another. In Algeria, Central Africa, Benin, Ethiopia, Malawi and Senegal, between 20 over 40% of variations in inflation are attributable to the domestic supply shocks. However, domestic supply shocks is responsible for less than 10% of inflation in Botswana, Egypt, Kenya, Libya, Mauritania, Mauritius, Nigeria, Tanzania, Tunisia, Uganda and Zambia. The most important source of inflation in the countries is the demand shock, which is responsible for about 50-90% of inflation in the countries, except in Senegal where the dominant contributor is the foreign output shock. The country where its highest influence is recorded is Zambia. On the whole, Domestic supply shocks are the most of the shocks in explaining movements in domestic output. This means that policies that aim at improving country-specific supply constrained would be more fruitful in raising the economies' economic growth rate.

External shocks are very important to inflation of Gabon, where it accounted for over 90% of inflation variation in that country. Over 20% of South Africa's inflation was due to the external shocks. This could be explained by the fact that U.S., which is used as a proxy for foreign countries, is the largest trade partner of the country as about third of her exports/imports are to and from the U.S. Countries where demand shocks have shown relative importance to their output are Nigeria and Senegal, where the demand shocks have contributed to more than 20% of their output variation.

3.3 Fiscal policy

Fiscal policy is measured as real government consumption. A partial correlation analysis between the shocks and a fiscal measure are reported in Table 3 reveals that the fiscal policy pursued by the countries is procyclical. Only results for Central Africa and Morocco appear to suggest that fiscal policy in these two countries is countercyclical. The results are consistent with reported findings from other developing countries that includes Gavin and Perotti (1997), Talvi and Végh (2005) and Ilzetzki and Vegh (2008). The countries that have high and significant coefficients are Botswana, Ghana, Malawi, Mauritius, and Uganda, where the coefficients range between 0.9 and 0.5. The countries with the lowest coefficients are Cameroon, Kenya, Mauritania and Senegal and apart from Kenya, the coefficients are also insignificant.

4. Conclusion

This paper investigated demand and supply shocks in 22 African countries, with an aim of identifying sources and importance of these shocks. An SVAR that uses a long-run restriction schemes proposed by Blanchard and Quah was used in identifying the shocks. Domestic supply shocks resulted in a

sustained rise in real GDP of all the countries covered. Foreign supply shocks have produced a positive real output responses in Botswana, Egypt, Gabon, Mauritania and Tunisia, reflecting importance of solid minerals in their exports. These countries' exports have large contents of mineral resources in their exports and as it is evident from the results, the higher the content, the larger the response. Domestic demand shocks did not produce any significant response in real output of the countries, except in Senegal and Benin. Inflation has responded positively to the demand shocks in all the countries, except in Gabon, where it is the foreign output shock that induced a positive rise in inflation. The most important source of real output variations in these countries is the supply shock, which accounted between 70-95% of output variations in these countries. Foreign shocks were less influential than the demand shocks in real output of the countries, except in Gabon.

A partial correlation analysis between the shocks and a fiscal measure of the countries indicated that fiscal policy undertaken by these countries during the sample period was pro-cyclical, which agrees with most of the findings reported from other developing countries.

References

- Blanchard Olivier Jean and Danny Quah (1989), 'The Dynamic Effects of Aggregate Demand and Supply Disturbances', *The American Economic Review*, 79: 4, 655-673.
- Barro, Robert J. "The Neoclassical Approach to Fiscal Policy." In *Modern Business Cycle Theory*, edited by Robert J. Barro. Cambridge, Mass.: Harvard University Press, 1989.
- Clarida, R. H. and Gali, J. (1994), 'Sources of Real Exchange-Rate Fluctuations: How Important Are Nominal Shocks?', *Carnegie Rochester Conference Series on Public Policy*, 41, 1--56.
- Collier, P. and Gunning, W. (1999) 'Explaining African Economic Performance', *Journal of Economic Literature*, 37:1, 64-111.
- Diallo, Oumar, 2009, 'Tortuous Road Toward Countercyclical Fiscal Policy: Lessons from Democratized Sub-Saharan Africa', *Journal of Policy Modeling*, 31, 36--50.
- Dungey, M. and Pagan, A. (2000) 'A Structural VAR Model of the Australian Economy', *The Economic Record*, 76:235, 321-342.
- Easterly, W. and R. Levine (1997), 'Africa's Growth Tragedy: Policies and Ethnic Divisions', *The Quarterly Journal of Economics*, 112: 4, 1203-1250.
- Enke, Stephen (1963), *Economics for Development*, Dennis Dobson, London.
- Fischer, S. (1991) 'Growth, Macroeconomics, and Development', *NBER Macroeconomics Annual*, 6, 329-364.
- Gavin, Michael and Roberto Perotti (1997). 'Fiscal Policy in Latin America,' in *NBER Macroeconomics Annual 1997*, 12, 11-72 National Bureau of Economic Research.
- Hoffmaister, A. W., J. Roldos and P. Wickham (1998), 'Macroeconomic Fluctuations in sub-Saharan Africa', *IMF Staff Paper*, 45: 1, 132-160.
- Ilzetzki, Ethan and Carlos A. Vegh (2008). 'Procyclical Fiscal Policy in Developing Countries: Truth or Fiction?', *NBER Working Papers 14191*, National Bureau of Economic Research,
- Kamarck, A. M., 1976. *The Tropics and Economic Development* (John Hopkins University Press, Baltimore, MD).
- Kaminsky, Graciela L, Carmen M. Reinhart and Carlos A. Vegh (2004) 'When It Rains, It Pours: Procyclical Capital Flows and Macroeconomic Policies,' *NBER Working Papers 10780*, National Bureau of Economic Research.
- King , Robert G., Charles I. Plosser, James H. Stock and Mark W. Watson 'Stochastic trends and economic fluctuations', *American Economic Review*, American Economic Association, 81(4), 819-840.
- Plessi, S., Smit, B. and Sturnegger, F. (2008) 'Identifying Aggregate Supply and Demand Shocks in South Africa', *Journal of African Economies*, 17:5, 765-793.

Shapiro, M. D. and M. W. Watson (1988), 'Sources of Business Cycles Fluctuations', NBER Macroeconomics Annual, 111-148.

Sims, C. A. (1980), 'Macroeconomics and Reality', Econometrica, 48, 1-48.

Talvi, Ernesto & Vegh, Carlos A., 2005. 'Tax Base Variability and Procyclical Fiscal Policy in Developing Countries,' Journal of Development Economics, Elsevier, 78(1), 156-190.

Xavier, Sala-i-Martin (1991), 'Growth, Macroeconomics, and Development: Comments', NBER Macroeconomics Annual, 6, 368-378

Figure 1. Impulse Responses

(a) Algeria

Real GDP Responses

Inflation Responses

(b) Benin

Real GDP Responses

Inflation Responses

**(c) Botswana
Real GDP Responses**

Inflation Responses

**(d) Cameroon
Real GDP Responses**

Inflation Responses

**(e) Central Africa
Real GDP Responses**

Inflation Responses

**(f) Egypt
Real GDP Responses**

Inflation Responses

(g) Ethiopia
Real GDP Responses

Inflation Responses

(h) Gabon
Real GDP Responses

Inflation Responses

(i) Ghana
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(j) Kenya
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(k) Libya
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(l) Malawi
Real GDP Responses

Response to US GDP Shocks

Response Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(m)Mauritania
Real GDP Responses

Inflation Responses

(n) Mauritius
Real GDP Responses

Inflation Responses

(0) Morocco
Real GDP Responses

Inflation Responses

(p) Nigeria
Real GDP Responses

Inflation Responses

**(q) Senegal
Real GDP Responses**

Inflation Responses

**(r) South Africa
Real GDP Responses**

Inflation Responses

(s) Tanzania
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(t) Tunisia
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(u) Uganda
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

(v) Zambia
Real GDP Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Inflation Responses

Response to US GDP Shocks

Response to Domestic Supply Shocks

Response to Demand Shocks

Table 1: Unit Root Tests								
No.	Country	Variables	ADF		PP		KPSS	
			Level	1 st Diff	Level	1 st Diff	Level	1 st Diff
1.	Algeria	LGDP	-1.39	-2.92**	-2.16	-8.24**	1.14 [#]	0.12
		LCPI	-1.66	-2.98**	-0.16	-7.39**	1.08 [#]	0.25
2.	Benin	LGDP	-0.77	-2.91**	-0.8	-7.40**	1.12 [#]	0.10
		LCPI	-2.69	-8.44**	-2.53	-21.85**	2.02 [#]	0.00
3.	Botswana	LGDP	-1.62	-5.01**	-1.20	-8.35**	1.13 [#]	0.20
		LCPI	-1.59	-6.07**	-2.89	-10.68**	0.47 [#]	0.12
4.	Cameroun	LGDP	-1.89	-2.93**	-1.97	-7.75**	1.12 [#]	0.20
		LCPI	-0.83	-6.95**	0.82	-6.94**	1.12 [#]	0.08
5.	Central Africa	LGDP	-1.78	-4.68**	-2.34	-6.55**	1.22 [#]	0.26
		LCPI	-1.06	-6.83**	0.83	-6.82**	1.12 [#]	0.06
6.	Egypt	LGDP	-1.03	-3.05**	-1.29	-10.26**	1.14 [#]	0.16
		LCPI	-1.31	-6.68**	-1.35	-6.79**	1.14	0.32
7.	Ethiopia	LGDP	-0.75	-3.50**	-0.74	-7.60**	1.15 [#]	0.16
		LCPI	-0.74	-4.53**	-0.58	-7.37**	1.23 [#]	0.14
8.	Gabon	LGDP	-0.48	-4.34**	-0.61	-6.70**	1.19 [#]	0.05
		LCPI	-1.59	-6.69**	-1.65	-6.73**	1.12 [#]	0.09
9.	Ghana	LGDP	-0.65	-4.32**	-0.64	-5.52**	0.90 [#]	0.14
		LCPI	3.41	-3.95**	7.96	-5.42**	1.02 [#]	0.31
10.	Kenya	LGDP	-1.51	-4.76**	-1.22	-8.51**	1.14 [#]	0.22
		LCPI	-1.49	-7.65**	-1.39	-7.63**	1.17 [#]	0.06
11.	Libya	LGDP	1.42	-4.00**	-0.32	-7.35**	1.15 [#]	0.04
		LCPI	-1.82	-2.94**	-1.75	-7.70**	1.07 [#]	0.03
12.	Malawi	LGDP	0.28	-3.85**	0.58	-8.43**	1.13 [#]	0.22
		LCPI	-0.72	-4.71**	5.73	-8.78**	1.01 [#]	0.23
13.	Mauritania	LGDP	-0.35	-4.10**	-0.01	-8.24**	1.15 [#]	0.05
		LCPI	2.08	-8.69**	1.98	-8.79**	1.20 [#]	0.32
14.	Mauritius	LGDP	-0.30	-4.32**	-0.86	-12.26**	1.14 [#]	0.11
		LCPI	3.78	-7.70**	3.18	-8.02**	1.13 [#]	0.21
15.	Morocco	LGDP	-1.26	-4.77**	-0.89	-9.67**	1.11 [#]	0.04
		LCPI	-2.46	-9.60**	-2.63	-9.64**	1.13 [#]	0.09
16.	Nigeria	LGDP	0.23	-3.18**	1.03	-6.33**	1.07 [#]	0.42
		LCPI	0.50	-8.57**	0.56	-8.49**	1.12 [#]	0.07
17.	Senegal	LGDP	0.35	-3.79**	-0.01	-7.40**	1.24 [#]	0.09
		LCPI	-1.25	-8.54**	-1.22	-8.63**	1.18 [#]	0.09
18.	South Africa	LGDP	-2.76	-3.79**	-2.41	-7.39**	1.24 [#]	0.07
		LCPI	-2.87	-5.47**	-2.04	-5.13**	1.13 [#]	0.01
19.	Tanzania	LGDP	-1.90	-4.28**	-1.46	-8.60**	1.12 [#]	0.30
		LCPI	-2.69	-5.18**	0.93	-10.14**	1.08 [#]	0.32
20.	Tunisia	LGDP	1.10	-4.08**	1.06	-8.58**	1.14 [#]	0.22
		LCPI	-0.65	-4.83**	-0.56	-5.12**	1.19 [#]	0.12
21.	Uganda	LGDP	-0.86	-3.08**	-0.39	-7.86**	1.10 [#]	0.09
		LCPI	0.79	-8.28**	0.57	-8.35**	1.11 [#]	0.27
22.	Zambia	LGDP	-1.66	-6.08**	-0.56	-8.75**	1.12 [#]	0.20
		LCPI	0.49	-9.08**	-0.39	-9.09**	1.15 [#]	0.23
** and [#] signify rejection of the null at 5% level of significance.								

Table 2
Variance Decompositions

(a) Algeria				(b) Benin			
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	0.697599	99.30240	0.000000	0.135179	99.86482	0.000000	
4	1.319167	95.81604	2.864796	1.123328	86.74560	12.13107	
8	1.121261	94.82389	4.054847	3.661426	83.33741	13.00117	
12	0.974957	93.65991	5.365129	3.730439	82.21944	14.05013	
20	0.848007	91.06307	8.088923	3.738947	82.15733	14.10372	
30	0.796416	89.11219	10.09139	3.755063	82.03315	14.21178	
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	1.314343	0.404809	98.28085	3.352159	0.383648	96.26419	
4	1.912087	3.802834	94.28508	3.391468	26.16956	70.43898	
8	2.096226	11.47596	86.42781	3.096229	35.58237	61.32140	
12	2.159426	16.84905	80.99153	3.308824	35.62448	61.06669	
20	2.077913	21.46978	76.45231	3.315946	35.96312	60.72094	
30	1.999664	23.84811	74.15223	3.318753	35.98966	60.69158	
(c) Botswana				(d) Cameroon			
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	3.139049	96.86095	0.000000	0.152395	99.84760	0.000000	
4	8.959465	86.92816	4.112373	2.450423	96.08224	1.467342	
8	8.157334	83.34474	8.497930	2.936212	93.66187	3.401922	
12	8.022418	84.54211	7.435471	3.099937	92.44003	4.460034	
20	8.071869	84.96298	6.965149	3.262621	91.57599	5.161386	
30	8.018019	85.30063	6.681352	3.310156	91.36872	5.321122	
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	1.728150	0.223229	98.04862	0.760715	0.062224	99.17706	
4	4.632431	4.455278	90.91229	2.392645	3.072200	94.53516	
8	6.337457	5.090593	88.57195	3.831946	7.019245	89.14881	
12	6.770689	5.064453	88.16486	4.277224	8.284746	87.43803	
20	6.994070	5.145714	87.86022	4.312025	8.726697	86.96128	
30	7.015931	5.157453	87.82662	4.309978	8.854381	86.83564	
(e) Central Africa Republic				(f) Egypt			
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
4	2.464903	93.89102	3.644080	1.189876	98.81012	0.000000	
1	2.154552	97.84545	0.000000	5.778992	91.18669	3.034320	
8	5.944772	88.48952	5.565709	11.61283	80.78628	7.600884	
12	6.074277	88.12934	5.796381	11.68917	80.89487	7.415963	
20	6.305047	87.84564	5.849310	11.89244	80.65995	7.447611	
30	6.323049	87.82361	5.853340	11.97479	80.59596	7.429252	
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	0.738759	0.442552	98.81869	0.048876	0.013569	99.93756	
4	1.750316	26.32616	71.92352	0.119168	7.888055	91.99278	
8	3.067606	27.83053	69.10186	1.731025	9.046626	89.22235	
12	4.721425	28.33871	66.93987	2.129253	9.465143	88.40560	
20	4.866925	28.56622	66.56686	2.221445	9.820932	87.95762	
30	4.883234	28.58933	66.52743	2.251901	9.920681	87.82742	

Table 2
Variance Decompositions

(g) Ethiopia				(h) Gabon		
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.479377	99.52062	0.000000	0.129712	99.87029	0.000000
4	8.352452	89.49849	2.149060	2.598500	97.09914	0.302362
8	7.513766	86.24275	6.243487	12.61881	84.34973	3.031462
12	6.514348	85.62970	7.855956	13.86917	82.35359	3.777237
20	5.911580	84.26661	9.821813	14.44197	81.66495	3.893079
30	5.600261	83.74670	10.65304	14.47827	81.61639	3.905349
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.287772	0.188646	99.52358	98.20162	0.007283	1.791096
4	2.414337	7.913673	89.67199	85.02673	11.25738	3.715884
8	3.797290	13.64155	82.56116	81.99757	13.97521	4.027224
12	5.575889	15.05473	79.36938	80.14147	15.76745	4.091085
20	5.519622	17.95117	76.52921	79.40028	16.39592	4.203797
30	5.405677	19.64493	74.94939	79.37767	16.41640	4.205926
(i) Ghana				(j) Kenya		
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.948023	99.05198	0.000000	0.409052	99.59095	0.000000
4	8.157540	91.04738	0.795084	0.371236	99.22212	0.406640
8	11.59851	85.84332	2.558164	1.611625	95.89511	2.493262
12	11.16919	82.76995	6.060863	1.781171	95.23749	2.981342
20	11.02019	80.46502	8.514792	1.729888	95.07788	3.192232
30	11.04960	79.38328	9.567118	1.677671	95.01054	3.311785
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.012081	0.988645	98.99927	6.619090	0.009465	93.37145
4	3.514152	7.484227	89.00162	8.119859	1.788591	90.09155
8	6.340093	11.69651	81.96340	9.843909	3.389220	86.76687
12	7.191480	12.97630	79.83222	10.33944	5.291002	84.36956
20	7.239602	13.29020	79.47020	10.17049	7.170474	82.65904
30	7.279925	13.48217	79.23791	10.07751	8.436345	81.48615
(k) Libya				(l) Malawi		
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.379312	99.62069	0.000000	0.089157	99.91084	0.000000
4	1.834764	97.92614	0.239100	0.327360	95.70023	3.972406
8	3.290019	92.54507	4.164909	1.141665	94.93488	3.923451
12	3.399166	88.75001	7.850828	1.228336	94.37930	4.392364
20	3.664106	86.29047	10.04543	1.363493	92.63320	6.003304
30	3.764561	85.52276	10.71268	1.415634	89.99254	8.591830
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.456643	0.104375	99.43898	0.000832	4.182117	95.81705
4	5.088087	0.448835	94.46308	1.098662	5.236041	93.66530
8	6.527052	0.507621	92.96533	1.272701	7.951434	90.77586
12	7.524410	0.661936	91.81365	1.397055	10.39482	88.20813
20	8.250193	1.055560	90.69425	1.619632	15.51283	82.86754
30	8.292084	1.379007	90.32891	1.922339	21.01767	77.05999

Table 2
Variance Decompositions

(m) Mauritania				(n) Mauritius		
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.341140	99.65886	0.000000	1.650680	98.34932	0.000000
4	0.285520	97.32375	2.390734	1.439080	98.09559	0.465330
8	0.329365	96.93890	2.731730	0.917985	98.31001	0.772006
12	0.342350	96.84188	2.815767	0.913677	98.06674	1.019579
20	0.342441	96.82494	2.832623	0.893354	97.94582	1.160822
30	0.342566	96.82009	2.837345	0.871667	97.91429	1.214042
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.242112	0.041890	99.71600	5.892880	4.058424	90.04870
4	1.186943	3.776650	95.03641	7.667576	5.215885	87.11654
8	1.298330	5.096483	93.60519	7.821074	7.016395	85.16253
12	1.297166	5.512266	93.19057	8.396674	7.193949	84.40938
20	1.294359	5.766615	92.93903	8.374595	7.292513	84.33289
30	1.294100	5.793982	92.91192	8.372648	7.363108	84.26424
(o) Morocco				(p) Nigeria		
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.060205	99.93979	0.000000	0.183057	99.81694	0.000000
4	0.599076	96.87550	2.525420	3.775915	95.05124	1.172844
8	6.277502	90.80418	2.918315	9.732592	79.88312	10.38428
12	5.946612	91.06283	2.990558	9.303063	70.73596	19.96098
20	5.651234	91.26708	3.081684	9.260990	69.70403	21.03498
30	5.415327	91.49998	3.084696	9.039772	67.81870	23.14153
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.114766	2.535742	97.34949	0.001189	0.022156	99.97665
4	1.203512	3.337419	95.45907	0.938649	5.660758	93.40059
8	2.793708	3.999742	93.20655	2.342962	7.760214	89.89682
12	2.977792	5.100876	91.92133	2.695416	9.849148	87.45544
20	3.047471	6.072823	90.87971	2.527979	9.338862	88.13316
30	3.048741	6.582463	90.36880	2.409436	9.622358	87.96821
(q) Senegal				(r) South Africa		
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.259468	99.74053	0.000000	1.120657	98.87934	0.000000
4	0.223169	82.85547	16.92137	1.139210	94.32366	4.537125
8	2.193185	74.13200	23.67482	2.474951	90.07819	7.446864
12	2.564259	71.14698	26.28876	2.622265	88.72255	8.655189
20	2.486433	68.90421	28.60936	2.536647	88.23583	9.227519
30	2.428857	68.03732	29.53382	2.528947	88.11764	9.353412
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:		
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks
1	0.502992	2.842035	96.65497	1.218182	0.009633	98.77218
4	2.873270	39.65645	57.47028	18.73362	1.758078	79.50830
8	4.965927	40.35368	54.68039	21.95426	4.570347	73.47540
12	4.823426	41.75256	53.42401	20.90553	6.176654	72.91781
20	4.626647	42.02510	53.34826	21.07563	6.653437	72.27094
30	4.520969	42.07036	53.40868	21.05664	6.749669	72.19370

Table 2
Variance Decompositions

(s) Tanzania				(t) Tunisia			
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	0.267935	99.73206	0.000000	0.177848	99.82215	0.000000	
4	0.235151	99.67094	0.093909	1.716712	97.81600	0.467286	
8	0.464650	99.42163	0.113725	7.262075	86.36504	6.372888	
12	0.469849	99.41750	0.112648	7.446272	86.47764	6.076086	
20	0.404623	99.43677	0.158602	7.150791	87.03960	5.809606	
30	0.363671	99.34512	0.291212	7.101498	87.44934	5.449165	
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	0.243317	0.304568	99.45211	1.782702	0.000271	98.21703	
4	3.461808	0.153008	96.38518	1.972222	2.922940	95.10484	
8	2.831523	0.413912	96.75456	2.893487	7.738044	89.36847	
12	2.507026	1.062736	96.43024	3.032093	10.30799	86.65991	
20	2.212598	3.434465	94.35294	3.275172	10.76633	85.95849	
30	1.985756	7.228150	90.78609	3.330233	11.54321	85.12655	
(u) Uganda				(v) Zambia			
Variance Decomposition of GDP Due to:				Variance Decomposition of GDP Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	0.051005	99.94899	0.000000	1.099030	98.90097	0.000000	
4	1.418046	96.82325	1.758707	3.789984	96.18779	0.022223	
8	2.676919	93.01603	4.307050	6.791105	93.04929	0.159609	
12	3.223317	91.49613	5.280556	7.981458	91.77073	0.247812	
20	3.501586	90.95756	5.540850	8.793665	90.79196	0.414371	
30	3.566082	90.85069	5.583232	9.150702	90.35322	0.496081	
Variance Decomposition of Inflation Due to:				Variance Decomposition of Inflation Due to:			
Period	US GDP Shocks	Supply Shocks	Demand Shocks	US GDP Shocks	Supply Shocks	Demand Shocks	
1	0.124065	0.246888	99.62905	0.030485	0.008646	99.96087	
4	0.460843	2.260634	97.27852	1.068879	0.375578	98.55554	
8	2.866493	6.197755	90.93575	3.043479	0.575072	96.38145	
12	3.572738	6.788654	89.63861	3.209379	0.592822	96.19780	
20	3.567315	6.762468	89.67022	3.246050	0.614153	96.13980	
30	3.554947	6.746145	89.69891	3.247690	0.632784	96.11953	

Table 3 Partial Correlation Analysis			
No.	Country	Supply	Demand
1.	Algeria	0.28 (2.97)	-0.28 (-2.90)
2.	Benin	0.18 (1.87)	-0.11 (-1.12)
3	Botswana	0.53 (6.22)	-0.40 (-4.36)
4.	Cameroon	0.08 (0.81)	-0.08 (-0.81)
5.	Central Africa	-0.26 (-2.65)	0.22 (2.27)
6.	Egypt	0.39 (4.25)	-0.36 (-3.83)
7.	Ethiopia	0.28 (2.92)	-0.35 (-3.78)
8.	Gabon	0.08 (0.82)	0.22 (2.25)
9.	Ghana	0.59 (7.30)	-0.69 (-9.61)
10.	Kenya	0.04 (0.40)	-0.03 (-0.26)
11.	Libya	0.48 (5.50)	-0.50 (-5.67)
12.	Malawi	0.94 (27.96)	-0.95 (-30.05)
13.	Mauritania	0.17 (1.69)	-0.16 (-1.67)
14.	Mauritius	0.75 (11.23)	-0.76 (-11.63)
15.	Morocco	-0.44 (-4.94)	0.46 (5.26)
16.	Nigeria	0.47 (5.35)	-0.51 (-5.94)
17.	Senegal	0.01 (0.09)	-0.01 (-0.12)
18.	South Africa	0.46 (5.43)	-0.50 (-5.73)
19.	Tanzania	0.23 (2.42)	-0.23 (-2.32)
20.	Tunisia	0.21 (2.17)	-0.18 (-1.83)
21.	Uganda	0.53 (6.23)	-0.45 (-5.09)
22.	Zambia	0.39 (4.30)	-0.52 (-6.11)
Figures in the parenthesis are t-ratios			