MODELING AFRICAN DEVELOPMENT PROSPECTS

DOMINICK SALVATORE (*)

Abstract

In this paper we describe an econometric model and use it for policy simulations to examine the effect of various policies for solving the present crisis and lay the groundwork for the resumption of long-term economic development in Africa. The major domestic and foreign variables examined are: 1) a devaluation of the nation's currency, 2) a decrease in government expenditure, 3) an increase in net transfer payments from abroad, 4) an increase in world demand, 5) an increase in real commercial loans, and 6) an increase in primary commodity prices. The overall conclusion that arises is that the African countries modeled have very few effective domestic policy tools at their disposal and have faced an international community which has been reluctant to undertake substantial trade and aid measures.

Résumé

Dans cet exposé l'on décrit un modèle économétrique utilisé pour des simulations politiques afin d'étudier l'effet des différentes politiques envisagées pour résoudre la crise actuelle et poser les bases de la reprise du développement économique à long-terme en Afrique. Les principales variables intérieures et extérieures étudiées sont: 1) une dévaluation de la monnaie nationale, 2) une diminution des dépenses publiques, 3) une augmentation des payments des transferts nets de l'étranger, 4) une croissance de la demande à l'échelle mondiale, 5) une augmentation des prêts commerciaux réels et 6) une montée des prix des produits de base. La conclusion globale est que les pays africains considérés dans le modèle n'ont pas du tout d'instruments réels de politique intérieure à leur disposition et ont fait face à une communauté internationale peu disposée à se charger d'échanges importants et des mesures d'aide.

Most of Africa is today in a desperate situation. It is the only continent where standards of living have declined continuously for nearly a decade and are still declining. The grave problem of generally declining development trends in Africa have in recent years been greatly compounded first by a devastating drought and famine and more recently by a serious external debt and financial crises. Drastic measures by the African countries themselves and unparalleled help from the industrial countries are urgently needed in order to overcome the unfolding of a human drama of poverty, hunger, desperation, and political strife of a dimension that the world has never seen before. It is clear, however, that we must look beyond the present crisis to determine the best course of action and the most appropriate policies that are necessary to encourage long-term development in Africa. This requires a careful analsis of present conditions in each African country, an evaluation of future potentials, a determination of the best policy mix to promote long-term development, and an estimate of the foreign aid and other resource flows from the developed countries that are required to achieve an acceptable growth rate in the future. In this paper we construct a quantitative framework or econometric model of a number of African economies and utilize such models for various policy simulations. The aim of such country studies is to suggest a methodology for approaching and resolving the present crisis and lay the groundwork for the resumption of long-term economic development on a sustained basis in Africa.

To be sure, the study of developing countries in general, and African countries in particular, is subject to some major limitations. The most serious are the divergencies between what can be captured in the models and the African reality itself. To some extent, of course, this problem arises in the study of both developed and developing economies alike. But the problem is very serious in Africa because the subsistence sector represents a substantial portion of many African economies and a great proportion of internal exchanges (trade) are conducted on basis of barter. There is also the problem of an inadequate data base. African national data sources often do not provide data of sufficient quality. Coverage is often limited, time series are short, revisions are frequent, and reporting lags are often relatively long. For this reason, the data used in the studies of the individual African countries have been compiled at the United Nations from various national and international sources. The use of this data base has the advantage of common, or at least comparable, data definitions across countries. Furthermore, the years from the early 1980s to the present were unusual because of the serious drought and famine engulfing most of Africa. Therefore, we had to utilize 1960s and 1970s data rather than 1980s data to get more realistic results. Because of these modeling and data limitations, the models presented in this paper should be regarded as first generation models and, as such, they are subject to continuous revisions and improvements. They will serve, however, to evaluate the internal consistency and effectiveness of the various policy mixes and development strategies advocated for African countries. It will also help put development planning on a more objective and scientific basis rather than being based, as it often happens, on speculation and lofty statements without much hope or possibility of implementation.

Quantitative framework of african economies

The study of each African nation begins with a quantitative framework or prototype model, which is then adapted to the specific circumstances of the nation being studied. The quantitative framework describes a typical developing economy that is essentially small and open in the sense that activities, prices, and interest rates in the country are affected by conditions in world markets where its own influence is minimal. This is quite realistic for the African countries being studied. The quantitative framework is adequately disaggregated to analyze the movements of real and nominal gross national product and its main components, and can be used to analyze movements in production, consumption, capital formation, and trade in real and nominal terms. In addition, it encompasses trends in prices, labor market conditions, monetary phenomena and interest rates, the balance of payments, and external liabilities. Because the model specification takes into account interactions between the domestic economy and the rest of the world, the models so constructed can be used to study the transmission of economic influences to the developing countries from the rest of the world (1).

The most important elements or blocks of the model can be grouped into consumption and capital formation; taxes and the government budget; production by sector; wages and prices; international trade and payments; and money and investment finance. These are the basic components which are usually required to study the development process and evaluate the effec-

(*) Director of the Graduate Program in Economics at Fordham University, New York.

(1) The complete set of equations of the prototype model is available from the author on request.

tiveness of the various macropolicies that each nation or group of nations can undertake within the framework of various growth scenarios for the rest of the world. The study of each country starts by examining gross domestic output, consumption, and savings. The availability of domestic savings imposes the upper limit on capital formation. Taxes and transfer payments, together with total government expenditures, determine the overall government budget deficit or surplus. This budget balance, in turn, affects government debt levels which need to be financed by domestic and foreign savings. Gross domestic product is the sum of value-added by three major sectors: 1) agriculture, forestry and fishing; 2) industry, encompassing mining, quarrying, manufacturing, utilities and construction; and 3) services. The value-added level for each sector is assumed to be a simple function of labor, capital, and imported raw materials. In contrast with industrialized countries, the level of employment may not significantly affect wages. Rather, wages are assumed to be determined by expected inflation and labor productivity trends. The determination of prices follows a mark-up-over-cost approach in a stage of process framework. Trade in merchandise is decomposed into four groups: food, beverage and tobacco; basic materials; fuels; and manufactures and others. Real imports of goods demanded are explained by relative prices, including tariff rates, real income, and external debt constraints. The demand for exports by foreigners in each category is specified as a function of world trade volume and relative export and consumer prices. In the case of commodities of which the nation is a large supplier, exports are postulated to be a function of domestic supply. Capital flows include private and government capital inflows and affect the level and growth of domestic investment and the foreign debt of the nation. The sum of balances on current and capital accounts yields the overall balance of payments.

The monetary sector in the study of each country incorporates not only aggregate monetary indicators, but also integrates relationships between the monetary sector and the balance of payments. Monetary authorities are assumed to supply all the currency the public wants to hold and the amount of reserves that it considers desirable to create. Currency and reserve levels determine the amounts of loans and discounts that banks are able to supply. In turn, commercial loans influence investments and, in this way, the level of economic activity.

Dynamic policy results

We now describe the responses of the ten African economies modeled to changes in six exogenous variables representing changes in the major domestic policy instruments and foreign variables ([2]). The major domestic and foreign variables examined are: 1) a devaluation of the nation's currency with respect to the U.S. dollar, 2) a decrease in government expenditure, 3) an increase in net transfer payments from abroad, 4) an increase in world demand, 5) an increase in real commercial loans, and 6) an increase in primary commodity prices ([3]). The responses of African nations to the above domestic policy instruments and international shocks is of crucial importance in identifying the most effective development and aid strategies to overcome the present crisis and stimulate the rate of economic development.

The simulation exercises performed involve *sustained five-year changes* in each of the six policy variables during the last five years of the estimation period for each model. The responses of an economy are obtained by comparing the solutions of the model with and without a change in the policy instrument, all other things being equal. The responses take into account the direct as well as the indirect effects on an economy of the changes in the policy instrument examined. To be noted is that in such nonlinear models as those estimated for the African economies, the magnitude of the responses reflect not only the estimated value of the parameters and the time-lag structure utilized, but also the levels of economic activity and prices prevailing at the time of the simulations. Thus, the simulations are reported in terms of percentage changes in the key endogenous variables from their simulated baseline paths, resulting from each of the policy instruments examined. The simulations results are summarized in **tables 1** through **6** that follow.

Devaluation of the nation's currency

According to traditional trade theory, a devaluation of a nation's currency reduces the foreign-currency price of its exports and increases the domestic-currency price of its imports. This stimulates the nation's exports and discourages its imports. The increase in the production of exports and import-substitutes in the devaluing nation increases its GDP and is generally inflationary. The resulting domestic inflation dampens both the expansion of exports and the production of import-substitutes, thus moderating the expansion of the nation's GDP. The remaining net increase in the devaluing nation's GDP stimulates domestic consumption and investments and usually leads to an increase in the nation's money supply. These lead to further expansion of the nation's GDP. While this sequence of events and results is usual in the long run for developed nations, it frequently does not occur in the short run and in developing nations. In the short run, the foreign-currency value of the devaluing nation's exports falls before increasing (the J-curve effect) if the foreign demand for the nation's exports is price inelastic. On the other hand, the foreign-currency value of the nation's imports may fail to fall with a devaluation if the nation's real GDP rises sufficiently. As a result, the trade balance may worsen rather than improve following a devaluation, even in a developed nation. In the long run, because of demand and supply inelasticities, the domestic inflation resulting from a devaluation and from other internal conditions in developing nations often neutralizes, or more than neutralizes, the relative price effects of a devaluation on the devaluing nation's exports and imports and, therefore, on its trade balance. Indeed, it is well known that a devaluation is less likely to be successful and its results more likely to be perverse in a developing nation than in a developed nation. Such perserve responses are frequently observed in the results examined in this chapter.

Nevertheless, devaluation remains an important policy instrument in the limited toolbox of developing nations.

With the above in mind, we can go on to summarize with **table 1** the effects of a devaluation of the nation's currency vis-à-vis the U.S. dollar for the ten African countries studied. We concentrate on the percentage changes in selected endogeneous variables from their baseline simulated paths resulting from a 10 percent increase in the domestic-currency price of the dollar (devaluation). From **table 1**, we see that during the first year of the simulation experiment the dollar value of exports (XVG) increases in six countries (Gabon, Ghana, Kenya, Madagascar, Senegal and Sierra Leone) but declines in the other countries (Ethiopia, Morocco, Sudan and Tunisia) because of the J-curve effect, reflecting the price-inelastic demand for exports in the short run. On the other hand, the dollar value of imports (MVG) increases in Ethiopia, Gabon, Ghana, Madagascar, Senegal and Sierra Leone. Thus, qualitatively, the first-year effect of the currency devaluation on the current account balance of the countries studied differs across nations ([4]). The net

([2]) The ten African economies modeled are: Gabon, Ghana, Ethiopia, Kenya, Madagascar, Morocco, Senegal, Sierra Leone, Sudan, Tunisia.

([3]) Some of these simulations could not be performed for a few of the countries studied because some of the models do not contain the relevant policy variable.

([4]) To be noted is that the «change» and the «% change» results in the current account (CA) in this and in the other simulations have *opposite signs* for all countries, except Gabon, because the current account balance was negative to begin with. Specifically, since all African countries modeled, except Gabon, faced a negative current account balance, an improvement in the current account balance resulting from a devaluation makes the current account balance less negative (i.e., positive). For example, if the current account improves from -30 to -20, the change is $-20-(-30)=+10$. The percentage change in the current account balance, however, is negative (i.e. $-20-(-30)/-20=-1/2$ or -50%). Only for Gabon (which had a positive current account balance to begin with) will the «change» and «% change» in the current account resulting from the various simulations have the same sign. Thus, the best way to interpret the effect on the current account of each of the simulations is to take the direction of the change from the «change» results and use only the absolute value of the «% change» results. Indeed, in the case of the current account (as opposed to the other endogenous variables), the results in terms of «% change» are less important than the results only in terms of «change».

Table 1 ***Effect of a 10 Percent Devaluation Against the Dollar.***

	Ethiopia 1975-1979	Gabon 1977-1981	Ghana 1977-1981	Kenya 1976-1980	Madagascar 1975-1979	Marocco 1976-1980	Senegal 1976-1980	Sierra Leone 1976-1980	Sudan 1976-1980	Tunisia 1977-1981
GDP										
1st year										
Change	61.64	19.60	8.16	323.05	7,035.13	1,638.02	3,162.38	25.72	−2.98	−2.10
% Change	0.98	3.64	0.16	1.30	1.77	4.03	0.73	4.48	−0.16	−0.11
5th year										
Change	83.55	7.18	−2.74	318.71	8,263.75	1,050.00	6,597.06	25.48	19.11	39.76
% Change	1.22	1.59	−0.06	1.00	1.81	2.01	1.62	4.09	0.89	1.62
IK										
1st year										
Change	0.32	13.38	0.24	0.00	22.09	288.14	162.55	4.72	0.00	−0.07
% Change	0.05	4.78	0.04	0.00	0.04	2.44	0.28	7.52	0.00	−0.01
5th year										
Change	−1.22	5.19	−1.05	−1.90	66.31	211.89	337.29	2.51	0.00	4.20
% Change	−0.21	3.59	−0.39	−0.03	0.09	2.18	0.55	2.84	0.00	0.51
XGV										
1st year										
Change	−1.41	0.00	0.44	11.46	0.54	−2.90	0.47	0.72	−0.89	−16.79
% Change	−0.59	0.26	0.05	1.54	0.17	−0.23	0.09	0.63	−0.15	−2.23
5th year										
Change	7.31	0.02	−3.63	20.26	1.12	−35.16	9.72	0.82	1.89	−11.41
% Change	1.70	0.75	−0.51	1.61	0.27	−1.45	2.02	0.38	0.27	−0.55
MGV										
1st year										
Change	0.90	0.00	0.77	−20.47	2.21	−84.62	4.89	1.43	−3.78	−18.12
% Change	0.32	0.03	0.09	−2.53	0.67	−3.67	0.74	0.95	−0.60	−1.13
5th year										
Change	3.62	0.00	−1.89	−22.63	6.08	−102.59	25.44	6.54	21.39	−34.84
% Change	0.69	0.45	−0.20	−0.96	0.90	−2.72	2.62	1.70	1.90	−1.13
CA										
1st year										
Change	−3.04	0.00	−0.48	42.54	−2.65	117.34	−5.64	−1.06	3.13	−7.43
% Change	6.55	3.07	0.60	−33.76	4.81	−8.40	6.09	1.76	−2.27	1.20
5th year										
Change	3.75	0.02	−1.47	64.85	−8.85	126.67	−15.68	−7.17	−39.65	46.63
% Change	−4.14	4.58	0.35	−7.31	2.04	−9.02	3.55	3.92	12.45	−11.39
MG09										
1st year										
Change	0.00	0.01	0.17	19.94	1.03	7.34	10.54	1.76	−0.69	9.13
% Change	0.00	0.62	0.03	3.22	0.34	0.42	1.86	0.98	−0.14	0.93
5th year										
Change	3.00	0.02	−3.13	16.72	1.59	11.41	13.22	1.04	1.52	9.03
% Change	1.72	2.17	−0.63	2.29	0.75	0.52	3.55	0.50	0.36	0.65
XG09										
1st year										
Change	1.10	−0.00	0.85	−22.01	2.23	−100.07	4.70	1.59	−5.58	−20.19
% Change	0.34	−0.03	0.08	−2.31	0.61	−3.58	0.81	1.05	−0.59	−1.20
5th year										
Change	3.04	0.00	−1.42	−14.38	4.03	−75.66	15.47	4.35	15.74	−29.62
% Change	0.69	0.38	−0.30	−1.06	0.81	−3.11	2.33	1.84	1.66	−1.23
PUX09										
1st year										
Change	−0.01	−0.00	0.00	−0.02	−0.00	−0.00	−0.01	0.00	−0.00	−0.03
% Change	−0.62	−0.35	0.01	−1.45	−0.17	−0.65	−1.73	0.03	−0.01	−3.16
5th year										
Change	0.01	−0.02	0.00	−0.01	−0.01	−0.02	−0.02	0.00	−0.00	−0.02
% Change	0.66	−1.19	0.14	−0.52	−0.48	−1.98	−1.46	0.06	−0.05	−1.20
PGDP										
1st year										
Change	0.03	0.08	0.22	0.05	0.08	0.05	0.02	0.06	0.08	0.04
% Change	3.04	6.33	10.10	4.10	7.50	5.17	2.17	5.58	7.78	4.12
5th year										
Change	0.04	0.23	1.20	0.11	0.10	0.05	0.08	0.12	0.17	0.12
% Change	3.14	10.36	10.77	6.56	7.57	3.72	5.36	6.69	9.00	7.20
M2										
1st year										
Change	51.73	10.24	308.88	522.50	8,751.44	1,800.24	1,871.69	10.12	31.29	28.35
% Change	0.04	0.08	0.10	0.06	0.10	0.11	0.02	0.09	0.08	0.04
5th year										
Change	155.77	25.94	1,343.86	1,333.34	14,456.50	2,121.11	20,694.06	34.77	144.13	161.90
% Change	0.07	0.15	0.11	0.08	0.10	0.07	0.12	0.13	0.11	0.09

Note 1: For each variable statistics for the first year of the multiplier experiment and for the fifth year are calculated. These statistics reflect the effect of a change in the indicated exogenous variable on selected endogenous variables in the system. The actual time period used is not the same for all countries and is given under each country label.
Note 2: The statistics are calculated as follows: Difference = (Yhat − Y); % Difference = ((Yhat − Y)/Y)*100; Where: Y = Actual value of endogenous variables; Yhat = Predicted valye of endogenous variables.

effect of all forces at work is that real GDP declines during the first year in Sudan and Tunisia, but it increases in all other countries.
Since the foreign demand for exports in most of the models is more price-elastic in the long run than in the short run, the devaluation generally leads to a rise in the dollar value of exports over time. The exceptions are Ghana, Morocco and Tunisia. Through multiplier effects, the devaluation-induced increase in real exports causes real GDP to increase above its baseline value in most models during the fifth year of the simulation experiment, with the exception of Ghana. **Table 1** shows that, in the long run, the growth of real GDP resulting from the 10 percent devaluation of the national currency ranges from 0.9 percent for Sudan to 4.1 percent for Sierra Leone.
As expected, the exchange-rate-change experiment results in higher inflation rates (PGDP) throughout the simulation exercise in all countries modeled. Inflation — as measured by the increase in the GDP price deflator — seems to be particularly sensitive to currency devaluation in the models of Gabon, Ghana and Sudan (see **table 1**). In these cases, the inflation rate rises by about 10 percentage points relative to the baseline in the fifth year of the simulation exercise, as a result of the 10 percent devaluation. On the other hand, the models of Ethiopia and Morocco show relatively small inflationary impacts (3.1 percent and 3.7 percent, respectively) stemming from the 10 percent currency devaluation. The percentage change in other selected endogenous variables of the model ([5]) in each country resulting from the 10 percent devaluation of the nation's currency, during the first and the fifth year of the simulation experiment, are also reported in **table 1**. Many of the responses are small and some are perverse, thus conforming with the results of the effects of a devaluation in other developing countries.

Decrease in government expenditure

A reduction in government expenditures reduces the demand for goods and services and leads to a general contraction of the economy. This, in turn, reduces the rate of inflation in the nation, which stimulates its exports and discourages its imports (which also fall because of the decline in the nation's GDP), thus inproving the nation's trade and current account balances.
In this exercise, real government expenditure is assumed to decrease by 10 percent in the first year of the simulation period, and to remain 10 percent below its baseline value through the fifth year of the period. Monetary policy is restrictive due to the endogeneity of the money supply ([6]). The results of this experiment are in general agreement with the above theoretical expectations and are provided in **table 2**.
The fiscal contraction reduces the demand for goods and services. The decline in real GDP from its baseline value ranges from a low of 0.9 percent in the case of Senegal to 3.1 percent for Sudan. By the fifth year of the fiscal contraction, the government-expenditure multiplier ranges from between 0.5 (for Sierra Leone) to 3.0 (for Ethiopia). The medium value of all the multipliers for all the models is about 2, which is much in line with the value of the government-expenditure multipliers obtained in other large-scale models which assume endogenous behavior by the monetary authorities.
The effect of the decline in demand on inflation is initially small but, in most instances, increases over the course of the simulation period. The disinflationary impact in the fifth year ranges from virtually no effect in the Gabon model to a 5.3 percent decline in the inflation rate in the Senegal model. The fiscal contraction also produces a rise in the dollar value of exports for most countries by the fifth year of the simulation exercise due to the lower relative cost of domestically-produced tradable goods. On the other hand, with domestic demand reduced, the dollar value of imports declines in all models. Consequently, the current account balances of all the countries show a cumulative improvement during both the first and the fifth year of the fiscal-contraction experiment.

Increase in net transfer payments from abroad

An increase in the flow of net transfer payments from abroad, by relieving the dominant of the trade-savings gaps of a developing nation, can stimulate its rate of growth and development. An increase in net *private* transfer payments from abroad also increases disposable income and, therefore, consumption, GDP, prices and imports. In this experiment, net private transfer payments (e.g., workers remittances) are assumed to increase 10 percent above their baseline value throughout the five years of the simulation period. The effect of this experiment on the selected endogenous variables of the models for nine of the ten countries modeled are reported in **table 3** ([7]).
From **table 3**, we see that the impact of this experiment on both real and nominal domestic variables is generally slight. The reason for this is that total net private transfer payments are small relative to the level of real GDP in each of the African countries modeled, so that a 10 percent sustained increase in this exogeous variable has only a minimal effect on all the selected endogenous variables of the models, except for the current account balance, of which net transfer payments are part.
For example, the maximum impact on real GDP in the fifth year of the exercise occurs in the model of Sudan. However, the percentage change of real GDP with respect to the transfer shock in this case is only 0.5. Since aggregate demand is virtually unaffected by the change in transfer payments, inflation in each country remains near its baseline value. Exports and imports of goods and services are also virtually unaffected. In fact, the experiment produces pronounced changes in only the current accounts of the models, where its impact is direct. We can, thus, conclude that for the growth of developing countries to be significantly stimulated by an increase in net private transfer payments from abroad, the increase must be unrealistically large.

Increase in world demand

An increase in world demand leads to an increase in the demand for the exports of most nations of the world, including those from the African countries modeled. This stimulates the level of economic activity in the nations modeled and increases domestic consumption and GDP and, therefore, investments, prices and imports.
The effects of a sustained 1 percent increase in the *level* of world demand were simulated for seven countries (Gabon, Ghana, Kenya, Madagascar, Morocco, Sudan and Tunisia). The simulation could not be performed for Ethiopia, Senegal and Sierra Leone because their model did not include this variable. World demand was calculated as the weighted average of the real GDP of the major trading partners of the respective countries. The simulation results are reported in **table 4**.
In general, the results reported in **table 4** conform to theoretical expectations. The shock to world demand increases real GDP in all countries, with increases ranging from 0.06 percent in Ghana to 1.75 percent in Madagascar during the first year of the experiment. In the fifth year, the percentage change in real GDP resulting from the 1 percent increase in the level of foreign economic activity ranges from 0.07 for Kenya to 2.75 for Madagascar, with an average of 1.13 percent for the seven countries for which the results are reported in **table 4** ([8]).
The growth in real GDP is induced via a rise in real exports of goods and services. The increase in the value of exports of goods and services (XGV) ranges from 0.21 percent for Kenya to 8.78 for Madagascar during the fifth year of the experiment. Thus, the multiplier and the income elasticity of exports with respect to foreign demand is highest

([5]) Fixed investments (IK), current account balance (CA), merchandise imports and exports (MG0), respectively), the unit value of merchandise exports (PUX0)), and the broadly defined money stock (M2).
([6]) As Eckstein (1983) documents, the magnitude of the fiscal multipliers obtained with macroeconometric models is heavily dependent on the assumed stance of monetary policy. See Stevens et al: (1984) for the multiplier estimates for the United States, Japan, the United Kingdom and West Germany.
([7]) The above simulation could not be performed for Senegal because this variable was not present in that model.
([8]) These estimates are much smaller than the estimates obtained for developed countries (Stevens, 1984) and for newly industrializing countries like Korea (Kwack, 1986). These may reflect the fact that exports of manufactured commodities by the African countries have been small.

Table 2 ***Effect of a 10 Percent Decrease in Government Spending.***

	Ethiopia 1975-1979	Gabon 1977-1981	Ghana 1977-1981	Kenya 1976-1980	Madagascar 1975-1979	Marocco 1976-1980	Senegal 1976-1980	Sierra Leone 1976-1980	Sudan 1976-1980	Tunisia 1977-1981
GDP										
1st year										
Change	-110.07	-5.54	-124.55	-384.78	-6,812.50	-1,010.53	-3,719.50	-8.13	-57.24	-31.98
% Change	-1.75	-1.03	-2.39	-1.55	-1.71	-2.49	-0.86	-1.41	-3.05	-1.69
5th year										
Change	-208.18	-6.34	-120.41	-590.81	-9,087.75	-1,248.25	-8,980.69	-3.15	-27.16	-27.95
% Change	-3.04	-1.40	-2.49	-1.85	-2.00	-2.39	-2.21	-0.51	-1.27	-1.14
IK										
1st year										
Change	0.25	0.19	0.57	0.00	0.00	121.60	22.57	-2.27	0.00	-18.10
% Change	0.04	0.07	0.09	0.00	0.00	1.03	0.04	-3.62	0.00	-3.12
5th year										
Change	0.41	0.07	2.00	-12.41	18.06	60.49	347.80	-0.23	0.00	0.63
% Change	0.07	0.05	0.74	-0.19	0.02	0.62	0.56	-0.26	0.00	0.08
XGV										
1st year										
Change	-0.09	0.00	0.59	1.15	0.10	-4.50	-0.41	0.38	-8.87	-0.19
% Change	-0.04	0.00	0.07	0.15	0.03	-0.36	-0.08	0.33	-1.51	-0.02
5th year										
Change	0.74	0.00	6.06	8.14	0.54	-11.44	-15.45	0.48	9.26	-0.46
% Change	0.17	0.00	0.85	0.64	0.13	-0.47	-3.21	0.23	1.34	-0.02
MGV										
1st year										
Change	-2.17	-0.00	-6.54	-15.93	-3.40	-53.01	-8.95	-4.54	-46.66	-40.63
% Change	-0.77	-0.16	-0.76	-1.97	-1.03	-2.30	-1.36	-3.03	-7.46	-2.63
5th year										
Change	-17.33	-0.00	-2.70	-61.68	-9.12	-77.33	-39.60	-6.59	-42.72	-49.04
% Change	-3.32	-0.19	-0.28	-2.63	-1.35	-2.05	-4.07	-1.71	-3.79	-1.59
CA										
1st year										
Change	2.82	0.00	8.94	22.00	5.01	69.93	10.95	6.28	42.15	46.08
% Change	-6.08	1.58	-11.22	-17.56	-9.12	-5.01	-11.82	-10.51	-30.48	-7.47
5th year										
Change	27.02	0.01	10.88	90.92	16.05	111.92	23.84	8.72	308.14	89.54
% Change	-29.79	1.37	-2.59	-10.24	-3.70	-7.97	-5.39	-4.77	-96.77	-21.88
MG09										
1st year										
Change	0.00	0.00	0.29	2.06	0.17	-0.49	0.46	0.92	-7.43	0.38
% Change	0.00	0.00	0.05	0.33	0.06	-0.03	0.08	0.51	-1.49	0.04
5th year										
Change	0.31	0.00	5.82	7.22	0.65	0.76	-6.96	0.59	7.25	-0.05
% Change	0.18	0.01	1.18	0.99	0.31	0.03	-1.87	0.28	1.73	-0.00
XG09										
1st year										
Change	-2.42	-0.00	-7.05	-16.80	-3.43	-63.16	-8.64	-4.86	-67.85	-44.95
% Change	-0.75	-0.17	-0.68	-1.76	-0.93	-2.26	-1.49	-3.20	-7.18	-2.67
5th year										
Change	-14.54	-0.00	-1.58	-37.20	-6.09	-51.83	-24.27	-3.85	-33.12	-35.74
% Change	-3.32	-0.22	-0.34	-2.74	-1.23	-2.13	-3.66	-1.62	-3.50	-1.49
PUX09										
1st year										
Change	-0.00	-0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
% Change	-0.04	-0.00	0.01	-0.16	-0.02	-0.33	-0.17	0.02	-0.02	-0.06
5th year										
Change	0.00	-0.00	-0.01	-0.01	-0.00	-0.01	-0.02	0.00	-0.00	-0.00
% Change	0.06	-0.00	-0.36	-0.28	-0.18	-0.51	-1.40	0.05	-0.18	-0.02
PGDP										
1st year										
Change	-0.00	-0.00	0.00	-0.01	-0.00	-0.01	-0.01	-0.02	-0.02	-0.00
% Change	-0.34	-0.09	0.03	-0.60	-0.34	-1.36	-1.12	-1.54	-2.21	-0.36
5th year										
Change	-0.01	-0.00	-0.20	-0.03	-0.01	-0.02	-0.08	-0.02	-0.07	-0.00
% Change	-0.95	-0.05	-1.82	-1.66	-0.65	-1.31	-5.26	-1.00	-3.77	-0.12
M2										
1st year										
Change	-28.27	-0.68	-101.82	-249.21	-2,473.94	-775.58	-2,881.94	-3.29	-21.32	-20.64
% Change	-0.02	-0.01	-0.03	-0.03	-0.03	-0.05	-0.03	-0.03	-0.05	-0.03
5th year										
Change	-224.58	-3.89	-549.44	-727.96	-4,779.75	-1,488.89	-27,677.00	-7.08	-98.18	-17.59
% Change	-0.11	-0.02	-0.05	-0.04	-0.03	-0.05	-0.16	-0.03	-0.08	-0.01

Note 1: For each variable statistics for the first year of the multiplier experiment and for the fifth year are calculated. These statistics reflect the effect of a change in the indicated exogenous variable on selected endogenous variables in the system. The actual time period used is not the same for all countries and is given under each country label.
Note 2: The statistics are calculated as follows: Difference = (Yhat – Y); % Difference = ((Yhat – Y)/Y) * 100; Where: Y = Actual value of endogenous variables; Yhat = Predicted valye of endogenous variables.

Table 3 ***Effect of a 10 Percent Increase in Net Transfer Payments.***

	Ethiopia 1975-1979	Gabon 1977-1981	Ghana 1977-1981	Kenya 1976-1980	Madagascar 1975-1979	Marocco 1976-1980	Sierra Leone 1976-1980	Sudan 1976-1980	Tunisia 1977-1981
GDP									
1st year									
Change	2.23	0.69	0.28	2.18	145.06	135.15	0.96	−0.09	1.02
% Change	0.04	0.13	0.01	0.01	0.04	0.33	0.17	−0.00	0.05
5th year									
Change	9.33	0.58	0.29	10.91	391.81	117.20	0.18	11.65	1.78
% Change	0.14	0.13	0.01	0.03	0.09	0.22	0.03	0.54	0.07
IK									
1st year									
Change	−0.01	1.10	0.00	0.00	0.00	−16.11	0.29	0.00	0.62
% Change	−0.00	0.39	0.00	0.00	0.00	−0.14	0.46	0.00	0.11
5th year									
Change	−0.02	0.73	0.02	0.55	−1.06	−5.72	0.02	0.00	0.32
% Change	−0.00	0.50	0.01	0.01	−0.00	−0.06	0.03	0.00	0.04
XGV									
1st year									
Change	0.00	−0.00	0.01	−0.01	−0.00	0.94	−0.04	−0.02	0.01
% Change	0.00	−0.00	0.00	−0.00	−0.00	0.08	−0.03	−0.00	0.00
5th year									
Change	−0.02	−0.00	0.09	−0.13	−0.02	1.32	−0.02	−0.80	0.07
% Change	−0.00	−0.00	0.01	−0.01	−0.01	0.05	−0.01	−0.12	0.00
MGV									
1st year									
Change	0.13	0.00	0.02	0.09	0.07	8.81	0.61	0.05	1.51
% Change	0.05	0.43	0.00	0.01	0.02	0.38	0.41	0.01	0.09
5th year									
Change	1.15	0.00	0.06	1.17	0.53	8.61	0.44	17.73	7.93
% Change	0.22	0.31	0.01	0.05	0.08	0.23	0.11	1.57	0.26
CA									
1st year									
Change	2.70	0.00	0.59	1.83	2.29	38.54	0.17	20.82	13.49
% Change	−5.82	1.63	−0.74	−1.46	−4.17	−2.76	−0.29	−15.05	−2.19
5th year									
Change	2.50	0.00	0.63	0.64	2.39	47.59	0.43	75.39	13.87
% Change	−2.76	0.78	−0.15	−0.07	−0.55	−3.39	−0.23	−23.68	−3.39
MG09									
1st year									
Change	0.00	−0.00	0.01	−0.01	−0.00	0.64	−0.09	−0.01	0.02
% Change	0.00	−0.00	0.00	−0.00	−0.00	0.04	−0.05	−0.00	0.00
5th year									
Change	−0.01	−0.00	0.07	−0.12	−0.03	0.22	−0.03	−0.77	0.11
% Change	−0.01	−0.01	0.01	−0.02	−0.01	0.01	−0.01	−0.18	0.01
XG09									
1st year									
Change	0.15	0.00	0.02	0.10	0.07	10.81	0.65	0.06	1.71
% Change	0.05	0.42	0.00	0.01	0.02	0.39	0.43	0.01	0.10
5th year									
Change	0.97	0.00	0.04	0.72	0.35	6.24	0.28	13.90	6.53
% Change	0.22	0.32	0.01	0.05	0.07	0.26	0.12	1.47	0.27
PUX09									
1st year									
Change	0.00	0.00	−0.00	0.00	0.00	0.00	−0.00	0.00	−0.00
% Change	0.00	0.00	−0.00	0.00	0.00	0.04	−0.00	0.00	−0.00
5th year									
Change	−0.00	0.00	−0.00	0.00	0.00	0.00	−0.00	0.00	−0.00
% Change	−0.00	0.00	−0.00	0.00	0.01	0.05	−0.00	0.05	−0.00
PGDP									
1st year									
Change	0.00	0.00	−0.00	0.00	0.00	0.00	0.00	−0.00	0.00
% Change	0.01	0.01	−0.00	0.00	0.01	0.18	0.17	−0.00	0.00
5th year									
Change	0.00	0.00	−0.00	0.00	0.00	0.00	0.00	0.02	−0.00
% Change	0.04	0.01	−0.01	0.03	0.03	0.13	0.05	0.82	−0.01
M2									
1st year									
Change	0.57	0.09	0.08	1.46	53.00	105.31	0.40	−0.03	0.59
% Change	0.00	0.00	0.00	0.00	0.00	0.01	0.00	−0.00	0.00
5th year									
Change	10.75	0.42	−0.61	13.31	275.88	151.36	0.41	36.29	3.60
% Change	0.01	0.00	−0.00	0.00	0.00	0.01	0.00	0.03	0.00

Note 1: For each variable statistics for the first year of the multiplier experiment and for the fifth year are calculated. These statistics reflect the effect of a change in the indicated exogenous variable on selected endogenous variables in the system. The actual time period used is not the same for all countries and is given under each country label.
Note 2: The statistics are calculated as follows: Difference = (Yhat − Y); % Difference = ((Yhat − Y)/Y)*100; Where: Y = Actual value of endogenous variables; Yhat = Predicted valye of endogenous variables.

Table 4 ***Effect of a 1 Percent Increase in World Demand.***

	Gabon 1977-1981	Ghana 1977-1981	Kenya 1976-1980	Madagascar 1975-1979	Marocco 1976-1980	Sudan 1976-1980	Tunisia 1976-1980
GDP							
1st year							
Change	2.88	3.27	22.86	6,884.44	87.99	27.18	2.35
% Change	0.54	0.06	0.09	1.73	0.22	1.45	0.12
5th year							
Change	6.23	5.51	23.90	12,518.38	187.31	56.11	15.63
% Change	1.38	0.11	0.07	2.75	0.36	2.62	0.64
IK							
1st year							
Change	1.60	1.00	0.00	0.00	−8.92	0.00	1.34
% Change	0.57	0.15	0.00	0.00	−0.08	0.00	0.23
5th year							
Change	3.63	1.11	−0.47	−138.00	−8.36	0.00	−0.73
% Change	2.51	0.41	−0.01	−0.18	−0.09	0.00	−0.09
XGV							
1st year							
Change	0.01	1.72	2.37	18.72	11.63	61.15	3.68
% Change	0.65	0.19	0.32	5.85	0.93	10.39	0.49
5th year							
Change	0.03	3.85	2.65	36.20	27.14	39.39	36.86
% Change	1.33	0.54	0.21	8.78	1.12	5.71	1.77
MGV							
1st year							
Change	0.00	1.34	0.95	−2.07	1.54	23.34	3.01
% Change	0.67	0.16	0.12	−0.62	0.07	3.73	0.19
5th year							
Change	0.01	2.35	2.53	3.97	7.72	87.08	39.50
% Change	1.68	0.25	0.11	0.59	0.20	7.73	1.28
CA							
1st year							
Change	0.00	0.25	2.18	21.72	13.28	72.57	2.72
% Change	1.82	−0.31	−1.73	−39.48	−0.95	−52.47	−0.44
5th year							
Change	0.01	1.06	1.31	40.29	28.62	200.35	16.50
% Change	2.70	−0.25	−0.15	−9.29	−2.04	−62.92	−4.03
XG09							
1st year							
Change	0.01	1.56	3.17	18.13	9.86	51.64	3.69
% Change	0.70	0.29	0.51	6.02	0.56	10.34	0.38
5th year							
Change	0.02	2.65	1.97	15.40	19.79	24.29	35.29
% Change	1.89	0.54	0.27	7.24	0.90	5.78	2.53
MG09							
1st year							
Change	0.00	1.53	1.00	−2.09	1.47	33.88	3.33
% Change	0.66	0.15	0.11	−0.57	0.05	3.59	0.20
5th year							
Change	0.01	1.74	1.52	−0.48	4.42	68.23	30.33
% Change	1.74	0.37	0.11	−0.10	0.18	7.20	1.26
PUX09							
1st year							
Change	−0.00	−0.00	−0.00	−0.00	0.00	0.00	0.00
% Change	−0.01	−0.11	−0.15	−0.01	0.37	0.04	0.11
5th year							
Change	−0.00	−0.00	−0.00	0.02	0.00	0.01	−0.01
% Change	−0.20	−0.02	−0.04	1.26	0.23	0.73	−0.71
PGDP							
1st year							
Change	0.00	−0.00	0.00	−0.00	0.00	0.01	0.00
% Change	0.01	−0.0	0.04	−0.17	0.10	1.06	0.03
5th year							
Change	0.00	0.00	0.00	0.01	0.00	0.09	0.00
% Change	0.15	0.04	0.07	0.84	0.18	4.53	0.05
M2							
1st year							
Change	0.31	2.57	14.92	2,099.50	65.13	10.32	1.53
% Change	0.00	0.00	0.00	0.03	0.00	0.03	0.00
5th year							
Change	4.21	20.74	30.29	7,702.25	225.21	192.32	16.92
% Change	0.02	0.00	0.00	0.05	0.01	0.15	0.01

Note 1: For each variable statistics for the first year of the multiplier experiment and for the fifth year are calculated. These statistics reflect the effect of a change in the indicated exogenous variable on selected endogenous variables in the system. The actual time period used is not the same for all countries and is given under each country label.
Note 2: The statistics are calculated as follows: Difference = (Yhat − Y); % Difference = ((Yhat − Y)/Y)*100; Where: Y = Actual value of endogenous variables; Yhat = Predicted valye of endogenous variables.

Table 5 ***An Increase in Real Commercial Loan Equivalent to a 10 Percent Fall in Government Expenditure.***

	Gabon 1977-1981	Ghana 1977-1981	Kenya 1976-1980	Marocco 1976-1980	Madagascar 1975-1979	Sierra Leone 1976-1980	Senegal 1976-1980	Sudan 1976-1980	Tunisia 1977-1981
GDP									
1st year									
Change	21.37	102.52	412.03	707.55	662.94	8.36	1,007.56	24.06	31.85
% Change	3.97	1.97	1.66	1.74	0.17	1.45	0.23	1.28	1.68
5th year									
Change	24.01	93.69	153.72	533.02	1,118.75	2.84	2,383.94	22.63	26.45
% Change	5.32	1.93	0.48	1.02	0.25	0.46	0.59	1.06	1.08
IK									
1st year									
Change	21.36	59.80	525.20	532.85	387.40	8.24	1,782.65	9.94	51.05
% Change	7.63	9.12	10.95	4.52	0.78	13.13	3.04	2.25	8.81
5th year									
Change	21.82	58.72	84.41	595.04	375.69	6.04	1,699.32	9.94	32.00
% Change	15.09	21.71	1.29	6.12	0.49	6.85	2.76	4.25	3.90
XGV									
1st year									
Change	−0.00	−0.48	−3.33	3.12	0.45	−0.38	0.11	3.68	0.18
% Change	−0.00	−0.05	−0.45	0.25	0.14	−0.34	0.02	0.63	0.02
5th year									
Change	−0.00	−4.68	−1.40	9.75	1.32	−0.45	4.30	4.55	1.33
% Change	−0.00	−0.66	−0.11	0.40	0.32	−0.21	0.89	0.66	0.06
MGV									
1st year									
Change	0.00	5.49	23.70	37.20	−0.01	4.70	2.29	20.19	41.05
% Change	0.60	0.64	2.93	1.61	−0.00	3.14	0.35	3.23	2.56
5th year									
Change	0.01	2.32	18.94	77.22	0.44	5.94	10.65	30.83	45.97
% Change	0.73	0.24	0.81	2.04	0.06	1.54	1.10	2.74	1.49
CA									
1st year									
Change	−0.01	−7.50	−35.00	−49.12	0.47	−6.49	−2.80	−18.46	−46.51
% Change	−6.11	9.41	27.78	3.52	−0.85	10.85	3.02	13.34	7.54
5th year									
Change	−0.02	−8.74	−27.75	−113.01	0.96	−7.87	−6.16	−131.09	−84.05
% Change	−5.21	2.08	3.13	8.05	−0.22	4.31	1.39	41.17	20.54
XG09									
1st year									
Change	−0.00	−0.25	−5.95	0.33	0.43	−0.92	−0.11	3.08	−0.37
% Change	−0.01	−0.05	−0.96	0.02	0.14	−0.51	−0.02	0.62	−0.04
5th year									
Change	−0.00	−4.48	−1.33	7.41	0.54	−0.55	1.98	2.91	0.35
% Change	−0.01	−0.91	−0.18	0.34	0.25	−0.26	0.53	0.69	0.03
MG09									
1st year									
Change	0.00	5.92	25.07	44.33	−0.01	5.03	2.21	29.36	45.40
% Change	0.66	0.57	2.63	1.59	−0.00	3.31	0.38	3.11	2.70
5th year									
Change	0.01	1.39	11.51	52.50	0.03	3.43	6.52	24.03	33.29
% Change	0.83	0.29	0.85	2.16	0.01	1.45	0.98	2.54	1.38
PUX09									
1st year									
Change	0.00	−0.00	0.01	0.00	0.00	−0.00	0.00	0.00	0.00
% Change	0.00	−0.01	0.47	0.23	0.00	−0.02	0.04	0.01	0.06
5th year									
Change	0.00	0.00	0.00	0.00	0.00	−0.00	0.00	0.00	0.00
% Change	0.01	0.28	0.06	0.07	0.06	−0.04	0.37	0.06	0.04
PGDP									
1st year									
Change	0.00	0.00	0.02	0.01	0.00	0.02	0.00	0.01	0.00
% Change	0.33	0.00	1.77	0.94	0.18	1.58	0.31	0.94	0.35
5th year									
Change	0.00	0.16	0.01	0.01	0.00	0.02	0.02	0.03	0.00
% Change	0.16	1.43	0.62	0.45	0.22	0.94	1.43	1.64	0.12
M2									
1st year									
Change	2.59	85.25	369.32	554.78	366.13	3.59	777.25	9.14	20.70
% Change	0.02	0.03	0.04	0.03	0.00	0.03	0.01	0.02	0.03
5th year									
Change	15.18	438.42	223.02	611.31	837.75	7.02	7,649.44	60.20	16.57
% Change	0.09	0.04	0.01	0.02	0.01	0.03	0.04	0.05	0.01

Note 1: For each variable statistics for the first year of the multiplier experiment and for the fifth year are calculated. These statistics reflect the effect of a change in the indicated exogenous variable on selected endogenous variables in the system. The actual time period used is not the same for all countries and is given under each country label.
Note 2: The statistics are calculated as follows: Difference = (Yhat − Y); % Difference = ((Yhat − Y)/Y)*100; Where: Y = Actual value of endogenous variables; Yhat = Predicted valye of endogenous variables.

Table 6 ***Effect of a 10 Percent Increase in the Price of Primary Goods.***

	Ethiopia 1975-1979	Gabon 1977-1981	Ghana 1977-1981	Kenya 1976-1980	Madagascar 1975-1979	Marocco 1976-1980	Sierra Leone 1976-1980	Senegal 1976-1980	Sudan 1976-1980	Tunisia 1977-1981
GDP										
1st year										
Change	4.51	5.68	17.44	−1.38	1,898.44	62.16	4.32	601.25	49.51	4.77
% Change	0.07	1.05	0.33	−0.01	0.48	0.15	0.75	0.14	2.64	0.25
5th year										
Change	8.46	3.55	101.98	27.00	4,311.94	152.13	0.42	2,332.00	138.93	−4.34
% Change	0.12	0.79	2.10	0.08	0.95	0.29	0.07	0.57	6.49	−0.18
IK										
1st year										
Change	−0.37	2.24	46.40	0.00	0.00	−45.66	1.09	−9.46	0.00	4.20
% Change	−0.06	0.80	7.07	0.00	0.00	−0.39	1.74	−0.02	0.00	0.72
5th year										
Change	−0.18	0.68	31.03	2.25	−32.81	−23.79	0.18	−79.60	0.00	1.35
% Change	−0.03	0.47	11.47	0.03	−0.04	−0.24	0.20	−0.13	0.00	0.16
XGV										
1st year										
Change	13.76	0.01	79.81	9.11	29.20	71.32	5.40	34.11	139.50	39.01
% Change	5.79	0.87	8.97	1.22	9.12	5.71	4.74	6.64	23.69	5.18
5th year										
Change	41.41	0.01	107.69	25.20	43.28	117.07	4.14	21.13	96.21	51.43
% Change	9.62	0.32	15.15	2.00	10.50	4.81	1.94	4.39	13.95	2.47
MGV										
1st year										
Change	−0.02	0.01	54.66	0.21	1.18	13.62	1.75	0.54	41.69	14.69
% Change	−0.01	0.94	6.35	0.03	0.36	0.59	1.17	0.08	6.66	0.92
5th year										
Change	0.33	0.00	62.86	4.12	5.94	16.99	0.71	9.01	207.28	32.00
% Change	0.06	0.47	6.59	0.18	0.88	0.45	0.19	0.93	18.40	1.04
CA										
1st year										
Change	17.70	0.00	21.26	12.74	27.49	75.39	3.66	45.72	179.61	48.47
% Change	−38.15	1.93	−26.68	−10.11	−49.99	−5.40	−6.11	−49.32	−129.87	−7.86
5th year										
Change	63.02	0.00	33.91	38.08	46.12	148.79	3.87	26.07	502.11	78.24
% Change	−69.49	0.45	−8.06	−4.29	−10.63	−10.60	−2.12	−5.90	−157.69	−19.12
XG09										
1st year										
Change	0.00	0.01	5.07	1.15	0.72	12.61	3.41	1.74	65.73	7.91
% Change	0.00	0.97	0.96	0.19	0.24	0.72	1.89	0.31	13.16	0.81
5th year										
Change	3.49	0.00	45.66	6.29	0.74	12.63	1.40	2.63	31.61	3.82
% Change	2.00	0.47	9.23	0.86	0.35	0.58	0.67	0.71	7.53	0.27
MG09										
1st year										
Change	−0.02	0.01	62.50	0.22	1.19	15.96	1.91	0.50	60.54	15.77
% Change	−0.01	0.94	6.04	0.02	0.32	0.57	1.26	0.09	6.41	0.94
5th year										
Change	0.24	0.00	46.79	2.46	3.45	11.27	0.77	5.78	163.15	23.86
% Change	0.05	0.49	9.90	0.18	0.70	0.46	0.33	0.87	17.22	0.99
PUX09										
1st year										
Change	0.06	−0.00	0.14	0.01	0.09	0.04	0.05	0.06	0.11	0.04
% Change	6.06	−0.04	7.65	1.18	9.11	4.94	5.52	6.62	9.30	4.38
5th year										
Change	0.20	−0.00	0.07	0.02	0.19	0.05	0.03	0.05	0.11	0.04
% Change	11.31	−0.07	4.85	1.32	9.89	4.28	2.14	3.70	7.89	2.23
PGDP										
1st year										
Change	0.00	−0.00	0.00	0.00	0.02	0.01	0.02	0.00	0.01	0.00
% Change	0.49	−0.03	0.05	0.05	2.31	0.52	1.78	0.47	0.96	0.46
5th year										
Change	0.01	0.00	−0.01	0.00	0.03	0.01	0.03	0.02	0.17	0.01
% Change	0.44	0.17	−0.08	0.18	2.29	0.53	1.60	1.29	9.06	0.33
M2										
1st year										
Change	7.04	0.54	15.35	3.12	2,590.19	118.61	3.83	3,429.38	14.85	6.41
% Change	0.57	0.42	0.50	0.04	3.09	0.70	3.42	3.02	3.60	0.80
5th year										
Change	25.46	2.55	306.84	51.29	6,060.63	306.21	7.29	8,890.19	480.77	12.37
% Change	1.22	1.45	2.55	0.32	4.31	1.02	2.79	5.01	38.06	0.71

Note 1: For each variable statistics for the first year of the multiplier experiment and for the fifth year are calculated. These statistics reflect the effect of a change in the indicated exogenous variable on selected endogenous variables in the system. The actual time period used is not the same for all countries and is given under each country label.
Note 2: The statistics are calculated as follows: Difference = (Yhat − Y); % Difference = ((Yhat − Y)/Y)*100; Where: Y = Actual value of endogenous variables; Yhat = Predicted valye of endogenous variables.

in Madagascar and lowest for Kenya.
The increase in real GDP resulting from the increase in the value of exports, in turn, results in an increase in prices (PGDP) in all countries, during the fifth year of the simulation experiment. In all cases, the increase in domestic incomes, combined with the higher domestic price levels, causes the value of imports (MGV) to remain above its baseline value in all countries in the fifth year of the simulation period (9).

Increase in real commercial loans

The fifth simulation involves an increase in real commercial loans equivalent to a 10 percent fall in real government expenditure in the nine countries (Gabon, Ghana, Kenya, Morocco, Madagascar, Sierra Leone, Senegal, Sudan and Tunisia) that include this variable in their model. Hence, this simulation increases the real purchasing power of the private (investment) sector (10). The increase in the level of private investment is expected, in turn, to increase the level of GDP and to lead to higher inflation and a deterioration in the nation's current account balance. As shown in **table 5**, these results are generally confirmed for the nine countries included.
From **table 5**, we see that the quantitative impact of this experiment is relatively large. This simulation also produces results in the first year of the experiment that are generally maintained through the fifth year. Thus, real GDP remains above its baseline value in all nine countries through the fifth year, with the gains in real GDP ranging from 0.3 percent for Madagascar to 5.3 percent for Gabon. The increase in real output was spurred by higher private investment spending, with the largest gain in investment occurring in the model for Ghana and Gabon. The increase in real spending results in a somewhat higher inflation rate in all the models simulated in this exercise. Accordingly, with the exception of Madagascar, this simulation experiment elicits a deterioration in the current account balance of each country.

Increase in primary commodity prices

In this simulation experiment, a 10 percent increase in the price of primary commodities is assumed. Most African countries are exporters of primary commodities and a great deal of their growth depends on these exports. For example, in Kenya, three commodities — coffee, tea and refined oil — account for about 60 percent of exports of good and services, and much of the growth of the entire economy depends on the price and value of these exports. Accordingly, a simulation which shocks the prices of primary goods is particularly relevant to the African countries modeled.
The route by which an increase in the price of primary commodities is expected to affect the economy of these countries is also fairly evident. Specifically, the increase in commodity prices increases the exports of the nation. This stimulates the real GDP which, in turn, leads to higher domestic investments, prices and imports. Since the effect on imports is secondary, the increase in primary exports and in the value of exports is likely to lead to an improvement in the current account balance of the nation. These expectations are generally confirmed in the simulation results reported in **table 6**.
The results reported in **table 6** show that, with the exception of Tunisia, the commodity price shock produces an increase in real GDP in the fifth year of the simulation exercise. This ranges from 0.1 percent for Ethiopia to 6.5 percent for Sudan. As expected, the increase in real output is due to higher nominal exports of goods and services. In the fifth year of the simulation exercise, the growth in the nominal value of exports ranges from 0.3 percent for Gabon to 15 percent for Ghana, with an average increase of 6.5 percent for all 10 countries modeled.
With higher real spending, the commodity-price shock results in higher inflation rates (except in Ghana), which ranges from 0.4 percentage points for Ethiopia to 9.1 percentage points for Sudan, with an average of 1.6 percentage points for all 10 countries modeled during the fifth year of the simulation experiment. The increase in real spending and domestic prices, in turn, increases the nominal value of imports, with the increase ranging from 0.1 percent in Ethiopia to 18.4 percent for Sudan, with an average increase of 2.9 percent for all 10 countries modeled. Although both imports and exports rise as a result of the assumed increase in primary commodity prices, exports rise faster than imports, so that the current account balance improves in all countries studied, with the largest improvement occurring in Sudan, Ethiopia and Tunisia, in that order.
In conclusion, we can say that an increase in primary commodity prices generally operates as expected and represents an important and effective instrument that could be used to overcome the serious crisis affecting most African countries today and to stimulate the rate of their economic and social development.

Conclusions and policy implications

The results of the simulation experiments reported above confirm that, for these small open economies under a fixed exchange rate regime, policy changes can have highly-significant and distinct effects on their macroeconomic situation. The model also indicated the existence of trade-offs and established quantitative guides for real-world policy decisions.
Of the six domestic and foreign variables examined, the first two and the fifth (devaluation, reduction in government expenditures, and increase in commercial loans) represent domestic policy instruments. While the effect of a devaluation is often small, in an absolute sense, and is sometimes perverse in developing countries, even in the long run, a devaluation remains a very important policy tool of developing countries to reduce chronic balance of payments deficits and stimulate growth, especially because very few other effective policy instruments are generally available for this purpose to these nations. Developing nations would want to reduce government expenditure as an austerity measure, as an anti-inflationary move, and in order to reduce imports. While this policy is generally effective, developing nations are usually very reluctant to adopt it (as the International Monetary Fund has found) because a reduction in government expenditure slows their rate of growth and development. Finally, we found that increasing commercial loans is a relatively effective policy to stimulate growth and to achieve the other goals of these nations.
The other variables examined in the simulation experiments are generally international in nature in that they represent shocks arising in the rest of the world and over which developing countries have little control. Developed countries could, however, deliberately try to influence them for the benefit of developing nations. Developed nations could, for example, increase the flow of resources to developing countries on concessional terms (foreign aid) (11), increase imports from developing countries by stimulating the level of economic activity in the developed world, and increasing primary commodity prices.
The overall conclusion that arises from this study is that developing nations, in general, and the African countries modeled, in particular, have very few effective domestic policy tools at their disposal and have faced an international community which has been reluctant to undertake substantial trade and aid measures for the benefit of the developing countries. ●

(9) The expectation that the increase in world demand, by increasing GDP in the nations modeled, would increase the level of domestic investments (IK) did not materialize, except for Gabon and Ghana during the fifth year of the simulation experiment, because of specific and unique reasons pertaining to each nation.
(10) This policy does not represent, however, an actual transfer of purchasing power from the government to the private sector. The increase in real commercial loans is only measured by or is made equivalent to a 10 percent reduction in real government expenditures in order to assign a readily meaningful value to this policy.
(11) This would have an effect similar to the international shock actually examined of increasing the net flow of private transfer payments from abroad in the African countries modeled.

The bibliography, which was not published for lack of space, is available on request. People who are interested in it should apply to MEDIT's editorial secretariat.

This paper represents an updating and synthesis of a volume on African development that I edited for the United Nations.