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The Macroeconomic Effects of Foreign Capital, Liberalization and Reform in Sudan: An Empirical Investigation

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This article analyzes the macroeconomic effects of the 1980s liberalization, foreign capital inflow and reform policies on the Sudanese economy, in particular on its economic growth, investment, industrialization, exports, and inflation. A simple macroeconomic model, linking growth, foreign capital, trade, and liberalization is developed. The model's estimates validate prevailing beliefs that the economy performed poorly during liberalization and show that the contribution of foreign capital to investment, growth, and industrialization was limited. However, the results of the analysis must be properly qualified, taking into account the inherent data shortcomings that limit disaggregated and sophisticated model specification.

I. Introduction

Neither theory nor recent empirical studies appear to offer conclusive support for the view that liberalization and foreign capital made a significant long-term contribution to growth and development in Less Developed Countries (LDCs), particularly in Sub-Saharan Africa. The evidence that they contribute to poverty alleviation and equity is even more meager. The link between growth and foreign capital has been the subject of an extensive debate. Twenty years after the debate was launched, Griffin (1991), referring to a host of specific empirical studies, concluded that the data continued to suggest that foreign aid has not significantly contributed to an acceleration of growth and, in some cases, appears to retard it. He also concluded that there is no evidence that foreign capital was more successful in reaching the poor (Griffin, p.666). Other economists argued that multilateral development assistance tend to distort national development strategies and priorities (see, for instance, Padayachee (1995)). Finally, Griffin (1991) identified the following three political effects of foreign aid. It tended to "(i) strengthen whatever group happened to be in power, (ii) prolong military rule and weaken democratic forces, and (iii) enlarge the state and increase its power vis-a-vis civil society." (p.670).

Given the above, it may logically be asked, what positive contribution, if any, can liberalization and foreign capital make to growth in LDCs. This paper addresses this question within a simple macroeconomic model, using Sudan as a case study.

The extent, nature, and results of the IMF/World Bank involvement in the Sudanese economy is well documented (see e.g., Ali (1985), Brown (1988), Hussien (1988), and Hassan

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(1997)). These authors cite long lists of economic indicators attesting to the worsening of the country's economy despite, and to some authors partly because of multilateral official development assistance. However, none of these studies constitutes an attempt to undertake a comprehensive assessment of the economic reform package in its entirety. Instead, they tend to focus on the nature and effects of one or perhaps a few of the reform measures, the devaluation issue in particular. This study seeks to overcome most of the shortcomings of previous works by developing a simultaneous equations model that captures the effects of the entire reform package on growth, investment, industrialization, exports, and inflation.

The paper starts with a presentation of economic policies of Sudan, in particular the 1977/78-1984/85 liberalization and foreign capital inflow period. Section II also discusses the effects of these policies on economic growth, investment, industrialization, exports, and inflation. The various channels of interaction between liberalization, foreign capital, and reform policies and economic variables identified in this section are then combined, in Section III, into a simple macroeconomic model, which is estimated to assess the effects of the reform measures. The paper ends with a summary of conclusions.

II. The Sudanese Economy

Sudan, is one of the largest and poorest of African countries. At the time of writing this paper, the country was experiencing severe economic problems and civil war. In this article, I do not focus on the current economic conditions. Rather, I examine attempts that have been made in the past to reform its economy, including the events leading to IMF and World Bank involvement in the Sudanese economy for the period between 1978 and 1984. Sudan's agreement with the IMF and the World Bank adjustment programs associated with the inflow of foreign capital and the effect of these policies on the economy at large are analyzed.

Agriculture is the backbone of the Sudanese economy, accounting for 33 percent of GDP, 85 percent of the labor force, and over 90 percent of exports. The industrial sector which accounts for 8 percent of GDP is primarily concerned with processing agricultural products (Ministry of Finance and Economic Planning (1991)).

During the 1970s, the country embarked upon a series of development plans: the 1970-1975 Five-Year Plan (FYP), and the 1977/78-1983/84 Six-Year Plan (SYP). Their main objectives were to increase and diversify Sudan's agricultural output, promote a number of import-substituting industries, and alleviate transportation bottlenecks. The FYP designed by the military government that took power in 1969 through a military coup, was supposed to lay the foundation for a strong 'socialist' economy. The plan sought to achieve a 7.6 annual growth rate of GDP, through a total investment of US$1.1 billion, with 58.1 percent allocated to agriculture, 32.2 percent to industry, and 8.7 percent to service sector (Ministry of National Planning (1970)). More importantly, the public sector was assigned a leading role with 56 percent of total investment. While government surpluses were to finance 49 percent of total investment, the remaining was to be financed by foreign sources (mainly socialist countries and Arab oil countries). The prospects for obtaining external resources appeared to be good at the time. Following the 1973 oil price shock, Arab oil countries were eager both to find outlets for their surplus

petro-dollars and to lessen their dependence on the West, the US in particular for food imports. As Brown (1988) relates, between 1973 and 1977, over US$3 billion in foreign loans were committed for investment in Sudan's strategy of becoming the 'breadbasket' of the Middle East (Brown (1988, p.54)). In fact, public investment rose by about 50 percent in real terms between financial years 1972/73 and 1973/74, and doubled again the following year. The country's GDP economy growth rate was about 10 percent for the period 1973/74-1975/76 (Table 2.1).

In 1977 a Six-Year Plan 1977/78-1982/83 (SYP) for socioeconomic development began. This plan provided for an investment of US$7.4 billion to be financed almost equally from domestic and external resources. An annual GDP growth rate was projected as 7.5 percent for this period; agriculture was to grow at 6.5 percent and industry at 9.5 percent (Ministry of Finance and Economic Planning (1976)). High investment led to an increase in aggregate demand. Although foreign aid declined after 1976, expansionary government policies continued through domestic borrowing from the Central Bank (excessive monetary expansion).[1] Consequently, inflation reached 26 percent in 1977/78 and GDP declined, falling from an average growth rate of 10 percent per annum to -2 in 1977/78. The Government's overall balance, which had been positive in 1970/71, turned into a deficit of 5 percent of GDP in 1977/78 (Table 2.1). The situation with regard to the external sector was equally bad. The trade deficit, which had been small (2 percent of GDP) in 1970/71 grew to 8 percent in 1977/78. Foreign debt increased from US$337 million in 1970/71 to nearly US$2 billion by-end 1978. Finally the debt service ratio - measured as debt service payments due as a percentage of merchandise exports - grew rapidly, reaching 29 percent in 1977/78 (Table 2.1).

Consequently, the government was obliged to reassess its development policy: first, the initiation of World Bank/IMF program, and secondly, the effective scrapping of the government's one-year-old, Six-Year Plan of socioeconomic development. In June 1978 amidst severe shortages of basic food imports and fuel, the Sudanese government negotiated the first of a series of stabilization and structural adjustment programs with the IMF and World Bank. The 1978 IMF 'Stand-by Agreement' provided 30.2 million in Special Drawing Rights (SDR); a three-year agreement concluded in May 1979 provided for 200 million in SDR through the 'Extended Fund Facility', and three separate one year 'Stand-by Agreement' providing 198, 170, and 90 million in SDR were concluded between 1982/83 and 1984/85, respectively (Hussien (1988)). Trade liberalization, devaluation, and other demand restraint measures were key aspects of every IMF stabilization package. Closely associated with IMF packages were World Bank structural adjustment programs, including a three-year (1979/80-1981/82) Economic Recovery Program (ERP), a three-year annual program entitled 'Prospects, Programs, and Economic Development' (PPED), covering the period 1982/83-1984/85 (Ministry of Finance and Economic Planning, 1979 and 1982, respectively). With the involvement of these institutions in the formulation and implementation of economic policy in Sudan, the country's development priorities shifted. The new priorities emphasized integrating the domestic economy into global markets - an outward looking strategy of export promotion rather than the existing inward looking

1. In contrast to the SYP projection that sufficient foreign capital would be available, the developments which took place during the first year of the plan brought the inflow of foreign capital to a complete halt. The situation became even tighter when Saudi Arabia, Kuwait and other Arab oil countries curtailed their inflow of capital to Sudan as a result of Sudan's support to the 1977 Camp David Agreement.

import substitution policy. For instance, a World Bank-sponsored 'Export Action Program' was a major objective of ERP. This program seeks to rehabilitate Sudan's capital investment in the modern-irrigated agricultural sector through policy reforms and institutional improvements, and to help increase exportable output (cotton) substantially from the irrigation schemes over the 1980-1990 period. Several modern irrigation projects were supporting this export recovery program. In fact, about US$594 million, or 59 percent of World Bank Group lending to Sudan was allocated to modern irrigated and export oriented agricultural sub-sector. In contrast, rain-fed agriculture, which provides a living for nearly 75 percent of the population, was virtually neglected as only US$19.5 million (or 3 percent of World Bank loans) were allocated to this sub-sector (World Bank (1985a, Annex i, p.21)). The structural adjustment programs also focused on increasing capacity utilization in capital-intensive modern industry such as the 'Sugar Rehabilitation Project' with the intention of increasing sugar exports (World Bank (1983)). Infra-structural investments in transportation and power to service modern industry amounted to US$346 million and accounted for an additional 34 percent of the World Bank loans by 1985 (World Bank (1985a, p.9))

The Sudanese government has taken several steps in support of stabilization and adjustment targets. They included substantial and frequent devaluation, a liberalization of trade was introduced and subsidies on imports were removed, increases in nominal interest rates, and substantial price increases spread over the years for several commodities such as sugar, wheat, petrol, cement, etc. Moreover, organizational reforms in agricultural, industrial, and commercial enterprises were also included.

The socioeconomic situation, however, continued to deteriorate despite these policy measures. Tables 2.1 and 2.2 document the various facets of this economic and social decline. The liberalization and foreign capital inflow period (1977/78-1984/85) was one of very abysmal economic performance. GDP declined in real terms and development expenditure as percentage of GDP dropped by 50 percent. The government's deficit tripled, reaching 15 percent of GDP in 1984/85. The growth in money supply increased from 23 percent of GDP to 35 percent, giving rise to an average annual inflation in excess of 30 percent over the period. In the external sector, the deficit on the current account grew from 6 percent of GDP in 1977/78 to 17 percent in 1981/82 before it dropped down to 9 percent in 1984/85. Foreign debt peaked in 1985 to about US$10 billion, i.e., US$500 per capita compared with the country's per capita income of only US$360 at the time. The tempo of capital flight increased in presence of liberalization and high rates of inflation, with estimates that range between US$14 to 60 billion for the period in question (Ali (1985)). The debt service ratio rose dramatically and arrears to the IMF accumulated. Finally in January 1985, the IMF canceled the ongoing 1984/1985 Stand-by Agreement as multilateral debt-service payments falling due were not rescheduable. The decline in living standards and the persistence of economic hardship led to increased instability that in 1985, ultimately brought down the military regime in power since 1969. In the following section, I conduct an empirical investigation of the effects of the entire reform package on economic growth, investment, industrialization, exports, and price level.

Table 2.1 Sudan: Macroeconomic Indicators, 1970/71-1986/87

Indicator	70/71	73/74	76/77	77/78	78/79	79/80	80/81	81/82	83/84	84/85	85/86	86/87
GDP growth rate		10	15	-2	-10	1	2	8	-4	-14	9	2
Current revenue % GDP	22	16	16	16	16	15	15	13	13	10	9	9
Current expenditure % GDP	18	14	14	15	20	18	21	20	17	22	20	17
Development expenditure % GDP	2	3	7	6	5	6	6	5	4	3	2	4
Overall balance % GDP	2	-1	-5	-5	-9	-9	-12	-12	-8	-15	-13	-12
M2 % GDP	17	20	23	23	27	26	29	28	28	35	32	31
Exports % GDP	16	13	11	8	10	12	9	9	13	11	9	7
Imports % GDP	18	17	17	16	19	24	23	27	23	19	17	15
Trade deficit % GDP	-2	-4	-6	-8	-9	-12	-14	-18	-10	-8	-8	-8
Current account balance % of GDP	2	-4	-5	-6	-7	-10	-12	-17	-11	-9	-11	-12
T.O.T 81/82 = 100%	171	145	160	164	151	139	130	100	128	106	102	106
Foreign debt (mill. US$)	337	602	1809	1952	2330	5008	6169	6885	8466	8929	9568	11126
Debt-service ratio	8	14	22	29	33	53	70	95	137	162	244	296

Sources: World Bank (1985b, 1987)

Table 2.2 Sudan Social Indicators

	Latest single year			Same region/income group	
	1970-75	1980-85	1990-96	Sub-Saharan Africa	Low-income
POPULATION					
Total population, mid-year (millions)	16.0	21.5	27.3	596.4	3,236.2
Growth rate (% annual average)	2.9	2.8	2.1	2.7	1.8
Urban population (% of population)	18.9	22.4	32.3	31.7	29.1
Total fertility rate (births per woman)	6.7	5.8	4.7	5.6	3.2
POVERTY (% of population)					
National headcount index	..	..	..	..	..
Urban headcount index	..	..	..	..	..
Rural headcount index	..	..	..	..	..
INCOME					
GNP per capita (US$)	280	360	320	490	490
Consumer price index (1987=100)	7	67	4,444	266	275
Food price index (1987=100)	..	62	804	..	..
INCOME/CONSUMPTION DISTRIBUTION (% of income or consumption)					
Lowest quintile	..	..	..	..	..
Highest quintile	..	..	..	..	..

Table 2.2 (Continued)

	Latest single year			Same region/income group	
	1970-75	1980-85	1990-96	Sub-Saharan Africa	Low-income
SOCIAL INDICATORS					
Public expenditure					
Health (% of GDP)	..	..	..	..	1.5
Education (% of GNP)	..	4.8	..	5.3	3.6
Social security and welfare (% of GDP)	..	..	..	..	..
Gross primary school enrollment rate					
Total	47	52	51	..	..
Male	59	61	55	..	..
Female	34	42	47	..	..
Access to safe water (% of population)					
Total	50	40	50	45	76
Urban	..	..	66	63	80
Rural	43	..	45	34	72
Immunization rate (% under 12 months)					
Measles	..	6	74	56	80
DPT	..	8	77	55	81
Child malnutrition (% under 5 years)	..	55	34	..	..
Life expectancy at birth (years)					
Total	44	45	54	52	63
Male	42	44	53	51	62
Female	45	47	56	54	64
Mortality					
Infant (per thousand live births)	110	88	74	91	68
Under 5 (per thousand live births)	176	132	116	147	94
Adult (15-59)					
Male (per 1,000 population)	615	537	445	448	231
Female (per 1,000 population)	525	462	378	376	206
Maternal (per 100,000 live births)	..	655	370	..	..

World Development Indicators 1998 CD-ROM, World Bank.

III. The model

This section sets out the macroeconomic model that has been designed to explore the effects of liberalization, foreign capital, and reform policies on the Sudanese economy, in particular on its rate of economic growth, investment, industrialization, exports, and on its inflation level. The basic equations of the model as well as the definitions of the variable are given in Table 3.1. A description of how each equations of the model is derived is given below.

1. Economic Growth

Our macroeconomic model starts from the general form of the production function $Y = f(K, L, A)$. That is, the level of output (Y) depends on available capital (K) and labor (L) and on a factor (A) that represents the level of technical progress. Expressing the production function in growth rates, we have: $G = DY/Y = f(I/Y, G_L, a)$, where G_L is the growth rate of labor, and a is some appropriate indicator of technical knowledge. In empirical analysis of growth in LDC's there has been the tendency to use the share of industrial output in GDP as a proxy for a, on the ground that industrialization requires or imposes the existence of basic infrastructures and technical know-how, all of which are important pre-conditions for further growth.

The link between growth and trade has been the subject of an extensive debate (e.g., Feder (1983), Salvatore (1983), Salvatore and Hatcher (1991), Balassa (1978, 1982) and Ram (1985)). That debate brought up the following argument. The exposure of the domestic economy to the global market can have a positive effect on growth. This could be achieved through injecting a greater degree of competition and keeping the economy abreast with the latest technological advances and by leading to higher savings and investment (Haberler (1959) and Caves (1970)). Michaely (1977) has empirically confirmed this positive relationship. However, the role played by exports will depend, among other things, on the type of exports a country produces and the same impact may not be experienced by primary exporters. Thus, the growth in the percentage of exports to GDP is added as an explanatory variable to the growth function.

The technical efficiency of production also depends on economic decisions made by both managers and workers in response to institutional arrangements and profitable opportunities. As such reform can have an impact on the production function, see, for example, Lin (1992). To capture the effect of the 1977/78-1984/85 liberalization and reform period, a dummy variable (D_t) is added to the growth equation (Table 3.1).

Finally, the dependent variable is defined as growth in real per capita GDP in year t, in which case labor does not need to be an explanatory variable. Capital is taken as gross fixed investment as a percentage of GDP.

2. Savings and Investment

The level of investment is determined by both the level of domestic savings and foreign capital. According to the two-gap models of Chenery and Stout (1966) and Taylor (1993), foreign capital inflow is expected to exert a positive effect on investment and growth. However, the view of these models, that all foreign capital inflows would be used to finance investment, was challenged by Griffin (1970) who pointed out that part of the capital inflow would be consumed rather than invested. In such a case domestic savings would be less than the increase in capital flows. Griffin's argument led to an extended debate and to many empirical studies.[2] Some of these empirical studies have confirmed that foreign capital inflow, though partly

2. For a critical survey of the issue see Padayachee (1995) and for the outcomes of the empirical studies see White (1992).

neutralized by the resulting reduction in domestic savings, makes a positive net contribution to the rate of capital formation (Chenery and Eckstein (1970) and Voivadas (1973)) and leads to an increase in the level of investment and growth (see, e.g., Papanek (1972)). On the other hand, Gupta and Islam (1983) study of determinants of growth for a large number of LDCs with a set of pooled cross-country and time series data covering 1950-73, found that the coefficient of foreign capital was insignificant in almost all type of regression equations tested. Thus, the above findings were mixed and further empirical evidence is needed.

Following Chenery and Carter (1976) and Salvatore (1983), savings are assumed to depend positively on growth in per capita income and the rate of exports.[3] Finally, the expected effect of liberalization and reform on investment is controversial. By improving the investment climate and reducing controls on imports, liberalization and reform can have a positive effect. Alternatively, due to investors' skepticism and the adverse impact of the currency devaluation, liberalization could exert an adverse effect on investment. This adverse effect would be stronger if there is macroeconomic instability in the economy. Some studies have confirmed the fall in private investment due to the lack of credibility of over-ambitious reforms in an unsettled macroeconomic environment (see, for instance, Faini and De Melo (1990)). A dummy variable is used in our analysis to account for the liberalization and reform period.

3. Industrialization

Industrialization has been one of the most important goals of LDCs. The desire to increase the pace of industrialization had led some LDCs to adopt outward-oriented growth strategies. A third equation is introduced in which industrial output is determined by the growth in the domestic economy, by the rate of exports and by the rate of foreign capital inflow. As Salvatore (1983) correctly pointed out there is no clear theoretical indication of the direction of effect exports could have on industrial output as this is more of an empirical question. The growth of real per capita income is expected to exert a positive effect on industrial output as a percentage of GDP. Finally, liberalization is expected to have a positive impact on industrial output as a result of greater access to raw materials and imported inputs as well as a shift to industries which have a greater comparative advantage. Nevertheless, in the absence of structural changes in the economy, liberalization could have a negative effect on industrial output.

4. Exports

The relative competitive position of an economy (as reflected in its real exchange rate) and the conditions in the world market are main determinants of exports. Industrialization can also be expected to affect the range and quality of exports. Thus, exports are expected to grow with an increase in real exchange rate, growth in world income (a proxy that reflects the world market conditions), and with increases in industrial production. Furthermore, liberalization is supposed to have a positive effect on exports by removing the bias against

3. The inclusion of these two variables in the savings function of LDCs is well established both theoretically and empirically (Mikesell and Zinser (1973)).

them and by making them more competitive in the international markets.

5. Inflation

The price level is an important determinant of the macroeconomic stability of the economy. Moreover, the sustainability of liberalization and reform programs depends on price stability. Therefore, a fifth equation is introduced which postulates that growth in consumer price index in a given year (CPI_t) depends positively on growth in GDP per capita (DY_t), growth in money supply (M_t), and on the terms of trade (TOT_t). Like in all previous equations, a dummy variable is included to capture the effect of liberalization and reform. As a result of devaluation, which is an important component of the reform package, the binary variable is expected to have a positive effect on the price level.

Table 3.1 The Model and Definition of Variables

$$DY_t = a_0 + a_1 I_t + a_2 R_t + a_3 DX_t + a_4 D_t + u_{1t} \quad (3.1)$$

$$I_t = b_0 + b_1 DY_t + b_2 FK_t + b_3 X_t + b_4 D_t + u_{2t} \quad (3.2)$$

$$R_t = c_0 + c_1 DY_t + c_2 X_t + c_3 FK_t + c_4 D_t + u_{3t} \quad (3.3)$$

$$X_t = d_0 + d_1 RER_t + d_2 W_t + a_3 R_t + d_4 D_t + u_{4t} \quad (3.4)$$

$$CPI_t = e_0 + e_1 DY_t + e_2 M_t + e_3 TOT_t + e_4 D_t + u_{5t} \quad (3.5)$$

where

CPI_t : percentage change in consumer price index in year t;

DX_t : growth in the percentage of exports to GDP in year t;

D_t : dummy variable which assumes a value of one for the years of liberalization, and zero elsewhere;

DY_t : growth of real GDP per capita income in year t;

FK_t : foreign capital inflow as a percentage of GDP in year t;

I_t : gross fixed capital information as a percentage of GDP in year t;

M_t : percentage change in money supply in year t;

RER_t : real exchange rate in year t;

R_t : industrial production as a percentage of GDP in year t;

t : 1970/71, ..., 1984/85;

TOT_t : percentage change in terms of trade in year t;

U_{it} : disturbance term for the ith equation in year t; and

W_t : index of real GDP of all market economies in year t, and;

X_t : exports as a percentage of GDP in year t;

Table 3.2 Regression Results (3SLS Estimates)

	Equation (3.1) DY_t	Equation (3.2) I_t	Equation (3.3) R_t	Equation (3.4) X_t	Equation (3.5) CPI_t
Constant	-8.66 (-3.83)[a]	13.29 (17.64)[a]	1.68 (0.84)	-40.93 (-2.17)[b]	-5.68 (-0.53)
DX_t	0.58 (3.87)[a]				
D_t	-6.33 (-3.17)[a]	-5.47 (3.90)[a]	8.56 (1.53)	49.53 (1.84)	5.25 (0.48)
DY_t		0.47 (6.01)[a]	0.74 (4.34)[a]		1.06 (2.71)[a]
FK_t		0.80 (1.78)	0.51 (0.67)		
I_t	0.03 (0.08)				
M_t					1.02 (3.74)[a]
RER_t				0.41 (1.12)	
R_t	0.76 (8.28)[a]			-0.91 (-0.40)[b]	
TOT_t					-0.12 (-0.63)
W_t				11.36 (2.52)[b]	
X_t		-0.34 (-0.56)	-0.10 (-3.07)[a]		
Adjusted R^2	0.76	0.74	0.63	0.56	0.54

Note: For definition of variables see Table 3.1.
Number in parenthesis indicate t-values of the regression coefficients.
a statistically significant at 1 %
b statistically significant at 5 %

6. The Empirical Results

Only regression results using Three-stage Least Squares (3SLS) method are reported in Table 3.2.[4] The adjusted coefficient of determination are provided. The '*t*' values for the individual estimated coefficients are given in parenthesis below them. The most important determinants of growth are industrial output and exports, both significant at well below one percent, and with the expected sign. The significance of the industrialization coefficient in the growth function differs from findings of Salvatore (1983), where strongly inward-oriented

4. Ordinary Least Squares (OLS) was also attempted and gave similar results in terms of the statistical significance of the variables and the explanatory power of the regression equations, indicating the robustness of the estimates. Moreover, the Hausman (1978) test was conducted to test for endogeneity, and the null hypothesis of consistency of variables could not be rejected.

economies resorting to import substitution policies had a negative and highly significant coefficient. The dummy for liberalization is negative and significant at the one percent level, indicating that liberalization did not seem to have a favorable impact on growth. The foreign capital inflow coefficient has the right sign but does not exert a statistically significant effect on investment as shown in Equation (2) of Table 3.2. This result supports the findings of Griffins (1970), Gupta and Islam (1983), and Padayachee (1995). Domestic investment is financed, by definition, by local savings and capital inflow from abroad. While the size of foreign capital inflow had consistently shown an upward trend over the reform period (Section II), gross national savings became negative, falling from about 2 percent of GNP in 1977/78 to -0.3 percent in 1982/983 (World Bank (1987)). More importantly, the budgetary deficit, which had increased drastically during the liberalization and reform period, was financed mainly from external sources. External financing of the budget deficit grew from a negligible one percent of GDP up to 1977/78 to an average of 8 percent of GDP during 1978/79 to 1984/1985 with an average annual growth rate of 109 percent (World Bank (1987)). Thus the size of the foreign capital devoted to investment purposes is substantially reduced and development expenditure as a percentage of GDP remained low about 3 percent (Table 2.1). It seems that foreign capital inflow to Sudan does not increase investment, but it does increase the size of the government. As Griffin (1991) observed foreign capital has sometimes been directed "not so much into investment and human development as into unproductive consumption, military expenditure and capital flight", (Griffin (1991, p.670)). The mobilization of domestic savings should be an important element in the country's development strategy. This is not to deny, however, that foreign capital appropriately directed can play a complementary role in the country's development. However, our model is highly aggregative and does not allow us to disaggregate the contribution of foreign capital, distinguish between its various forms, and identify both the potentially positive and negative contribution of each type.

Growth in per capita income has a positive and highly significant effect on investment. The negative and insignificant exports coefficient is not consistent with the evidence of Levine and Renelt (1992), who found a positive and robust link between exports and investment (also see, Maizels (1968) and Mikesell and Zinser (1973)). The Sudanese result suggests that low levels of profitability from exports do not act as an incentive to savings and investment. Finally, the dummy variable in the investment equation is negative and significant, indicating that liberalization and reform has a negative impact on investment. That is, investment could fall due to lack of credibility of overambitious reforms in an unsettled environment. This result is consistent with the findings of Faini and De Melo (1990).

The empirical results confirm the positive relationship between industrial output and the growth of domestic economy as measured by per capita GDP. Foreign capital inflow does not have a significant effects on industrial output which confirms the fact that such capital flows were mainly directed towards financing the budget deficit as well as capital flight. Other economists have argued that foreign capital has been a consequence, rather than a cause of rapid industrialization (Bell (1990)). Exports are found to have a significant negative effect on industrial output. This is not surprising in an agricultural country where nearly 90 percent of exports are agricultural primary products and the manufacturing sector is mainly an agro-industry type. The dummy variable is positive though insignificant, indicating that the liberali

zation measures have no significant effect on industrial output. It could be argued that the liberalization measures will take time to exert any effect on industrialization. For instance, Michaely and others (1991) found that the growth in manufacturing dropped immediately following liberalization but this was temporary and short lived.

The real exchange rate does not have a significant effect on exports since most of Sudanese exports are agricultural goods. While a devaluation could help exports of manufactured goods capturing more markets, the composition of exports from Sudan have not, as mentioned earlier, changed from primary to manufactured goods. On the other hand, growth in world income exerts a positive and significant effect on exports. Thus, Sudanese exports seem to be more income elastic than price elastic. The industrial output coefficient is negative and statistically significant, reconfirming the existence of a negative relationship between industrial output and exports (Equation (3)). Finally, the dummy is insignificant indicating that the liberalization and reform period does not witness a significant increase in exports as hoped for in the "Export Action Program" of 1980s.

The most important determinants of the price level are growth in money supply and per capita GDP, both significant at well below one percent, and with the expected sign. The terms of trade has a negative and insignificant coefficient. The dummy variable for liberalization has the right sign but, surprisingly is not significant. Thus, it seems that inflation resulted primarily from domestic factors including excessive monetary expansion. A similar result was obtained by Salvatore (1984) who examined the impact of the increase in oil price on oil importing developing countries and concluded that inflation in these countries can be mainly attributed to excessive monetary expansion since these countries would still have experienced inflationary pressures even in the absence of oil price rise.

The results of this analysis must be properly qualified, taking into consideration the following limitations. Inherent data shortcomings represent a major limitation for disaggregated and sophisticated model specification.[5] The model, for instance, lacks explicit sectoral production functions as capital formation was given in aggregate form and no sectoral composition of capital formation was available. Furthermore, since there is no developed capital or financial market we can not employ endogenously determined interest rate equations in the model. Finally, the neoclassical production function employed in our model does not take into account the fact that a large proportion of total output is subject to natural disturbances (e.g., drought and civil war), capacity constraints, shortage of raw materials, and other supply bottlenecks prevailing in the Sudan.

IV. Conclusions

The article described the macroeconomic effects of the 1980s liberalization, foreign capital, and reform policies on the Sudanese economy, in particular on its economic growth, investment, industrialization, exports, and inflation. The macroeconomic data revealed that the reform period (1977/78-1984/85) was one of very abysmal economic performance. The country's GDP declined

5. Other analysts faced the same limitation, for instance, see the UN prototype model for African countries (Salvatore (1989)).

in real terms; development expenditure as percentage of GDP dropped by 50 percent; the budget deficit tripled, reaching 15 percent of GDP; and money supply increased from 23 percent of GDP to 35 percent, giving rise to an average annual inflation in excess of 30 percent over the period in question.

The inter relationship between liberalization, reform, and foreign capital inflow and the above mentioned macroeconomic variables are combined into a single macroeconomic model, which empirically assesses the effects of the reform program. The hypothesis that liberalization and foreign capital inflow lead to a more efficient utilization of resources and higher levels of growth is not supported by the growth equation in our model. Our finding of a significant relationship between growth and trade (particularly exports) is similar to the conclusions of Haberler (1959) and Caves (1970) who regard trade as an engine of growth. Industrial output which was used as a proxy for technical efficiency has a significant impact on growth. However, the investment coefficient has the right sign but is not a significant factor in the growth equation. Furthermore, our empirical results show that foreign capital inflow has no significant effect on investment. Not surprisingly, the external financing of the budget deficit, during the period in question, grew significantly and plunged domestic savings. The findings of earlier research on the macroeconomic impact of foreign capital on investment and economic growth were mixed but it was clear that the effects were not always positive and, in fact, quite often negative (see e.g., Griffin (1991) and White (1992)). However, the empirical finding of a lack of foreign capital-investment relationship must be heavily qualified as no attempt was made to disaggregate the contribution of foreign capital and distinguishing between its various forms and identifying both the potentially positive and negative contribution of each type. The liberalization variable in both growth and investment equations is significantly negative at the one percent level, emphasizing the downward spiral of the economy during the liberalization period. However, the liberalization variable does not exert any significant effect on both industrial output and exports equations, and surprisingly, it has no significant effect on inflation.

A positive link between industrial output and the growth of the domestic economy is established. Again, foreign capital inflow does not seem to exert a significant effect on industrialization. This reflects the fact that such capital flows were mainly directed towards unproductive sectors such as financing the growing budget deficit. Furthermore, capital flight increased in presence of liberalization and high rates of inflation.

The export equation shows that devaluation exerts no effect, reflecting the fact that most of the Sudanese exports are primary agricultural products. On the other hand, conditions on the world market as proxied by the index of real GDP of all market economies, is a significant determinant of exports. Thus, Sudanese exports seem to be more income elastic than price elastic.

Domestic factors, mainly growth in money supply and per capita income, are important determinants of the inflation level. Terms of trade variable has no significant effect on prices. This result supports the findings of Salvatore (1984) that the sources of inflation in LDCs are domestic, mainly excessive monetary expansion rather than external factors such as the increase in oil prices.

Finally, the empirical findings must be heavily qualified when taking into account the limitations of both the data base and the simple macroeconomic model. Inherent data shortcomings

represent a major limitation for disaggregated and sophisticated model specification. For instance, the model lacks explicit sectoral production functions as capital formation was given in aggregate form and no sectoral composition of capital formation was available. Moreover, the neoclassical production function employed in our model does not take into account the fact that a large proportion of total output is subject to natural disturbances (e.g., drought and civil war), capacity constraints, shortage of raw materials, and other supply bottlenecks prevailing in the Sudan. Also, since there is no developed capital or financial market we can not employ endogenously determined interest rate equations in the model.

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