

# FOREIGN EXCHANGE SHORTAGE, GROWTH AND INFLATION: AN ECONOMETRIC APPLICATION TO ETHIOPIA\*

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## 1. Introduction

Among the major developing country regions, sub-Saharan Africa has the lowest provision of basic needs, the highest population growth, and the lowest efficiency in investment. Per capita GNP growth rates continue to stagnate or to decline in most countries. Within this group of countries, Ethiopia faces particularly severe conditions in many aspects of social and economic development. The present analysis endeavours to examine some of these aspects by considering the Ethiopian case relative to the context of sub-Saharan Africa and to general hypotheses on the development process of low-income economies with foreign exchange and absorption capacity constraints, with particular attention to the links between real and monetary variables.

The analysis proceeds as follows: section 2 presents a cross-country comparison based on six socio-economic indicators, which are deemed less subject to errors in data and other defects affecting the interpretation of results; section 3 then considers the recent evolution of the Ethiopian economy, as reflected by the interaction between structural features and economic policy changes; and section 4 tackles the main objective of the analysis, with an econometric application on a set of macroeconomic relations. Some of these relations are then connected to each other to form a unitary — though still tentative — general modeling. In section 4, policy simulations and forecasts based on estimated results are also presented and their implications for economic policy are briefly reconsidered in the final section.

## 2. A cross-country data analysis of six social and economic indicators: Ethiopia within sub-Saharan Africa

In order to compare social and economic indicators of African countries, with particular regard to the relative position of Ethiopia, two approaches have been used, aimed at different but complementary analytical purposes. First, a simple analysis on original data has been carried out, so as to evaluate differences in cross-country distributions of the selected indicators, linear relationships among these indicators and the position of the Ethiopian economy in this framework. Secondly, data have been transformed for those indicators with a distribution clearly straying from normality: in this way distribution asymmetries are smoothed down and the cross-country comparison can be shifted

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from an analysis of actual values to an analysis of standardised values, within a grid of series of equal intervals corresponding to the various indicators. If the values obtained show that a country is out of the 'general' pattern in one or two indicators, i.e. if there are significant deviations on its development profile as revealed by the level in the grid of most original and transformed values, then this outcome can be attributed to: (i) errors in the data; (ii) possible internal imbalances and policy failures; and (iii) different characteristics of the development path of that country relative to the reference country group examined (McGranahan et al. 1985). The analysis has been limited to six indicators due to the need to avoid, as far as possible, variables which would produce unreliable results, because of data deficiencies or non-univocal interpretations.<sup>1</sup>

The selected socio-economic indicators are the following: life expectancy at birth (LE), rate of infant mortality, per 1000 live births (IM), percentage share of agricultural GDP (GDPA), per capita net disbursements of official development aid from all sources (ODAPC), total external debt per capita (EDPC), and GNP per capita (GNPPC). ODAPC, EDPC and GNPPC are estimated in US\$. All indicators are based on World Bank estimates for 1987, except ODAPC which is an average of 1986-1987 figures to smooth year-to-year variations. For sub-Saharan Africa thirty two countries have been considered, while excluding countries with less than one million inhabitants. Over two thirds of this group of countries is made up by low-income economies, i.e. economies with less than 500 US\$ of GNP per capita in 1988 (the only upper middle-income economy, as defined by the World Bank, is Gabon).

A simple correlation analysis on these indicators shows a negative relationship between LE and IM and a positive one between GNPPC and EDPC, other relations being less significant. Ethiopia lies on the lowest level among the countries considered for both GNP per capita and foreign debt per capita. Moreover, it presents one of the worst rates of infant mortality.<sup>2</sup> With less than 30 US\$ of ODAPC, Ethiopia is among the poorest receivers of international grants in per capita terms. As for the share of agricultural production, this indicator may be liable to errors especially for higher figures, due to the limited reliability of rural estimates in a developing country and to the higher dependency of these estimates on changes in prices of agricultural commodities. In Ethiopia agriculture is estimated to be 42% of GNP, which is not significantly different from the

1 An analysis of defects in usage and other problems associated with cross-country comparisons of social and economic indicators is provided by McGranahan et al. (1985) and Harvey (1985).

2 According to another health indicator, i.e. population per physician, the country represents the worst situation in Africa, but different definitions of this indicator make it more unreliable for international comparisons.

African average.

With regard to cross-country distributions of the indicators, "stem-and-leaves" diagrams point to a reasonably symmetrical shape for LE, IM and GDPA, while highlighting definite asymmetries in the other cases. Even if the analysis here takes in just six indicators, there seems to be an analogy with results of other more detailed and thorough studies: percentage-type social indicators tend to show large changes among least developed countries, whereas per capita-type economic indicators straggle upward at the upper income levels (McGranahan et al. 1985: 241). In order to remove asymmetries, the most suitable transformation has been found to be the square root for ODAPC and the natural logarithm for EDPC and GNPPC (for GNPPC it has been also necessary to exclude Gabon from the sample, since its value for this indicator more than doubles the second highest value in the distribution). In this way, it is possible to construct a grid of values from 0 to 100 with ten regular intervals and analyse the profile of Ethiopia in this framework. Results are given in Table 1: indicators with transformed data are labelled by adding 'MOD'; values are presented in their — original or transformed — unstandardised form (if standardised, L, A and U would be 0, 50 and 100, respectively).

Table 1

EXTREME AND AVERAGE CORRESPONDENCE VALUES OF SOCIAL AND ECONOMIC INDICATORS IN SUB-SAHARAN AFRICA AND THE RELATIVE POSITION OF ETHIOPIA (1987)

grid	LE	IM	GDPA	ODAPCMOD	EDPCMOD	GNPPCMOD
L	41	169	76	0.78	4.06	4.87
A	50	118	39.5	5.78	5.9	5.91
U	59	67	3	10.79	7.75	6.96
Ethiopia	47(4)	154(2)	42(5)	3.77(3)	4.06(1)	4.87(1)

L = lower bound; A = average value; U = upper bound

(in brackets, correspondence levels of Ethiopia: correspondence levels range from 1 to 10; for symbols of indicators see text)

From these results and from the observation of cross-country trends, with sub-Saharan countries ordered according to their GNP per capita, it is possible to conclude:

- (i) rather than suggesting possible out-of-alignments of one or two indicators for Ethiopia relative to the general development pattern in sub-Saharan Africa, the figures confirm the serious situation of the country, aside from the still relatively low foreign indebtedness;
- (ii) the slightly curvilinear and downward-concave trend of GDPA can possibly be explained by higher productivity in agriculture for countries with a GNP per capita of 250-300

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US\$ compared with the poorest low-income economies, while at the upper levels other sectors acquire more relevance in the national output;

(iii) through the logarithmic transformations, the modified values of GNPPC and EDPC appear overshadowed by the strong variability in ODAPCMOD, but for EDPC a high variability can be observed in the original values (more precisely, Zambia, Ivory Coast and the People's Republic of Congo show particularly high values of indebtedness in terms of the general context and their development profiles).

The following section focuses on some major structural characteristics and problems of the Ethiopian economy from a historical perspective, through a brief review of its recent experience.

### 3. Recent evolution and main features of the Ethiopian economy

With reference to some of the issues considered in the foregoing section, the revolution of 1974 is acknowledged to have brought about major positive changes in Ethiopia in terms of social progress, by improving public education and health and reducing urban-rural income inequality. The literacy rate is estimated to have increased from 7% in 1973 to more than 40% in 1981<sup>3</sup> and similarly the primary school enrollment ratio increased from 19% to 47% during the same period; access to health services applied to nearly 40% of the population in 1981, while covering just 15% in 1973 (World Bank 1984). However, in terms of economic indicators, there has been a comparatively slower performance: whereas real GDP growth outweighed population growth in the period 1965-1973, with yearly growth rates being 4.1% and 2.5% respectively (2.1% for the latter according to IMF data), the opposite occurs between 1973 and 1986, when the corresponding figures are 1.5% and 2.5%, respectively. If the last three years are excluded, real GDP growth is just sufficient to counterbalance population growth. During the 1980s, per capita GDP is estimated to have fluctuated slightly around 100 US\$ in constant 1980 values (UNIDO 1988). The changes mentioned above can be interpreted as consequences of different internal and international conditions and the reshaping of economic policy after 1974. In this regard various phases in the development of the country can be distinguished.

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3 Other sources report a much lower percentage rate (17% in 1983), suggesting a possible overestimation of this indicator (Schwab 1985).



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In the 1960s and early 1970s the Ethiopian economy was characterized by a relatively balanced growth of domestic investment and savings, with both variables representing ca. 10-14% of GDP in those years. The need for external finance to cover the savings gap was kept at a low level, with a few exceptions in the late 1960s. Inflation was moderate on the average, being nearly 4% p.a. between 1963 and 1973, and money supply (money and quasi-money) also grew moderately, so that its ratio to GDP did not exceed 15% until 1972.

In order to keep this favourable pace and, particularly, to defend the purchasing power of the local currency (birr) in years of higher current account deficits and to stimulate savings, restrictive monetary policies were adopted in 1966 and 1970, while a system of differentiated interest rates was established aimed at supporting priority sectors and exports (Mauri & Caselli 1986). The decision of the Ethiopian authorities to maintain a fixed gold parity for the birr in spite of two devaluations of the US dollar in the period 1972-1974 was justified by the fear of (i) a loss of export receipts, should a devaluation be undertaken (given the rigidity of foreign demand for Ethiopian commodities), and (ii) other negative effects on the external debt (linked to financial obligations in currencies other than the US dollar), imports and inflation. In this way, short-run windfalls were obtained: the savings gap even turned negative in 1973 and 1974, exports increased substantially in both quantity and value and the debt service ratio almost halved between 1971 and 1974.

In the period 1973-1978, a remarkable slowdown of economic activity was registered, with an annual GDP growth of 1.4% in real terms, an investment-output ratio below 10% for most years and an inflation rate of ca. 15% p.a. The ratio of money supply to GDP grew steadily, reaching more than 23% in 1978: this happened initially as a consequence of Ethiopian favourable foreign accounts, as mentioned above. After 1974, however, it was caused on the contrary by the abrupt worsening of the foreign accounts position and by the increased use of foreign loan financing. This change was clearly reflected by other monetary variables: both public deficit and government domestic debt shrank in 1973 compared to the previous year, whereas in the immediate post-revolutionary period they underwent a rapid increase. Furthermore, in the presence of decreasing capital inflows from abroad and a significant drop in coffee exports (1974-1975), the Ethiopian economy began to rely more heavily on foreign borrowing. This process was initially facilitated by the relatively good creditworthiness of the country, shown by the low debt service ratio.

Besides the changes occurring in international trade markets (oil price increase and

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world commodity price decrease), after 1975 Ethiopia had to face a difficult internal situation. This resulted from the implementation of a new set of economic policies, warfare (Eritrea, Somalia) and the fall-out of the severe drought of 1974. The new revolutionary government set up at the end of 1974 stressed the need for development based on strong intervention by the public sector in all productive activities, even if a few sectors have been allowed the possibility of joint initiatives with foreign capital and few others have been left to the private sector (on the whole, small-sized manufacturing and services); secondly, the target of a more equitable income distribution was pursued. However, both objectives encountered initial difficulties: government control of the economy has been necessarily limited by the existence of a large subsistence market, while some improvement in the living conditions of sections of the rural population was achieved, but it contributed to reduced crop exports and an increased need for food imports in urban centres (Nelson & Kaplan 1981).

During 1979 and 1980, greater internal stability and better harvests brought about a temporary recovery, with real GDP rising 5% per year. Increased export volume more than offset the persistent negative trend of export prices in 1979 and increased government revenues in 1980 contributed to reduce the fiscal deficit and to curb inflation (from 15-16% of the previous three years to ca. 5%).

In the years following 1980, with the exception of 1983 and 1986, a worsening performance of the economy reappeared (0.3% of real GDP growth between 1980 and 1986), accompanied by a negative evolution in the terms of trade, shortage of domestic and imported raw materials, and insufficient levels of external resources (IMF 1984). The relatively low rate of inflation in the early 1980s is attributed to various factors: a renewed government control over credit expansion, price and wage stabilization and the maintenance of an overvalued exchange rate (World Bank 1984). The appreciation of the birr — pegged to the US dollar — relative to the currencies of most major trading countries has hindered Ethiopian exports of coffee to non-member countries of ICO:<sup>4</sup> in spite of the stated objective to diversify exports, coffee still represents more than 60% of export revenues. The savings gap has soared, its ratio to GDP has risen from ca. 5% in 1980 to more than 10% in 1986, and the money supply-GDP ratio has increased, reaching almost 40% in 1986.

In view of the latest evolution, the targets fixed by the 10- year perspective plan for

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4 As a member of this organization (International Coffee Organization), Ethiopia has a yearly quota for exports of this commodity to ICO member countries.

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1990 can not be achieved: besides other objectives such as improvement of health and education, they pursued (i) the near doubling of per capita GDP in real terms — till reaching 200 US\$ by the end of the decade — (ii) an investment rate of 21% — which would imply a much faster rate of capital formation than the one actually attained —, and (iii) a savings rate of 16%;<sup>5</sup> (iv) they relied moreover on a significant inflow of aid and export earnings (World Bank 1981; Schwab 1985).

In summary, the economic development of Ethiopia in the last fifteen years has been severely undermined by internal and external constraints, represented by structural and policy-related factors. On the one hand, domestic investment has increased at an insufficient pace vis-à-vis the needs of economic growth, and domestic savings have undergone an even more negative trend: the resulting imbalance has been filled partly by increased demand for foreign credits, and partly by high government spending and money creation. The consequences have been a deterioration of the external debt position, high public deficits and eventually inflationary pressures. On the other hand, wide annual fluctuations of exports, to a great extent due to changing production and price levels of the principal export commodity, have been accompanied by growing import needs and hence worsening trade deficits. However, also in this case a gap arises in terms of internal capital and consumption requirements, with subsequent possible inflationary pressures. In the following section the relationships of these economic variables within this historical framework are further investigated by carrying out an econometric application.

#### 4. Preliminary hypotheses and empirical results

##### 4.1 *Theoretical background*

The main purpose of the econometric analysis presented below is to evaluate the impact of the internal and external constraints considered in section 3 on the performance of the real and money economy in Ethiopia. Before examining results, attention is addressed to possible determinants of growth and inflation in a low-income developing country, by partly drawing on the conceptual framework of two gap models (Taylor 1979; Taylor 1983; Harvey 1985).

Unlike an econometric model applied to Ethiopia with specific reference to the energy

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5 The latest figures (1986) are ca. 12% and 1.2% for the investment rate and the savings rate, respectively.

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sector and also based on a two gap approach (Cesen-Ansaldo 1986), in the model presented in sub-section 4.3 investment and exports are not disaggregated into an exogenous and an endogenous component, since they are treated as exogenous variables. Furthermore, consumption is not introduced as a residual: in the analysis the potential stimulation or, alternatively, displacement effect of investment and/or exports on consumption has been evaluated. Consequently, the savings gap and the trade gap can be solved simultaneously in terms of variations in the levels of domestic investment and exports, without an a priori hypothesis on which of the two gaps should be the "binding constraint".<sup>6</sup>

The economy of a low-income developing country is often characterized by the predominance of a single agricultural commodity in domestic production and exports. Low productivity in agriculture, slow growth of foreign demand, fluctuating prices of commodity exports eventually coupled with an overvalued exchange rate and high export duties,<sup>7</sup> all are factors contributing to an unsatisfactory rate of growth of exports and high dependency on imports. The trade gap between payments for imports and net non-factor services (including the debt service) and receipts for exports must be equal to the difference between domestic investment and savings, i.e. the savings gap, in order to comply with the basic macroeconomic identity linking aggregate output and income to aggregate expenditures.

Inflows of foreign capital in the form of aid, commercial lending and direct investment are necessary partly to offset the negative balance of real transactions, but they are mostly insufficient to cover the deficits in the current account and the balance of payments. In view of the risks associated with a chronic balance of payments deficit, and in the presence of weak investment demand, typical of a country which lacks technical expertise and managerial skills, the government runs a fiscal deficit aimed at sustaining growth. Thus, even in a situation approaching full employment, a fiscal deficit does not necessarily imply inflationary pressures in the short run, since it supports demand for domestic production. If no policy of export promotion is implemented or no increased concessionary financing of trade deficits is obtained from abroad, public deficits may well create problems in the medium term, by requiring a high rate of money

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6 In practice, in order to carry out 'ex ante' simulations on the estimated regression equations, the savings gap has been considered as the 'binding constraint', since net non-factor services are treated as a residual for simplicity (see later on in the text and note 10).

7 In the case of Ethiopia, export duties on coffee exports amounted to more than 40% of f.o.b. price on average in the period 1977-1985.



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supply and swelling the internal and external indebtedness of the government. The increased rate of money supply tends to generate, in turn, "monetary" inflation, which may add to or replace an already existing "excess demand" inflation (if the lack of foreign exchange leads to restraints on imports of essential commodities) or "imported" inflation (particularly in a small and open developing country).

#### *4.2. Determinants of growth and inflation: single equation estimations*

As for the performance of the Ethiopian economy from the late 1960s to the mid-1980s, the linkages and causalities outlined above have been first examined by applying OLS to various single equation specifications. The statistical information has been drawn from national sources (National Bank of Ethiopia, National Accounts Division, Ministry of Finance), complemented where necessary by World Bank and UN figures (with regard to population estimates and indicators of indebtedness).<sup>8</sup> Regression results are presented in the Appendix. Whenever lagged variables have been used, the Durbin h test has been applied besides the Durbin-Watson test, since the latter does not guarantee in this case no serial correlation in the residuals when significant results are obtained.

Alternative production functions have been estimated for the period 1968-1986, in order to evaluate possible determinants of GDP growth. In contrast with other econometric analyses on African economies (Oyejide 1989), population estimates, sometimes used as a proxy for labour force, have been left out because of their insufficient reliability. The results of estimated equations (I) and (II) in the Appendix show a higher elasticity of production to exports than to gross fixed investment and, within the former, a higher elasticity of GDP to coffee exports than to exports of commodities other than coffee.

Regressions of total domestic consumption on values lagged one year, domestic investment and exports reveal an apparent irrelevance of exports as a potential factor affecting internal consumption, while the estimated parameter for investment is statistical-

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<sup>8</sup> All data have been used in current values: since deflators for variables other than GDP are either limited to shorter time series (foreign trade) or even not available (domestic investment), only GDP estimates have been deflated by applying the GDP deflator at factor cost (DEFL) and its projections. Except for the retail price index, which is estimated according to common annual periods, national statistics refer to the Ethiopian fiscal year, which runs from July 8 to July 7 relative to the Gregorian calendar. Therefore, data referred to a specific year in this analysis belong in reality to an annual interval covering the last months of the preceding year and the first months of that year.

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ly significant and negative, thus implying some trade-off between domestic investment and consumption. In other words, past consumption and investment appear to underlie a budget constraint, with different possible allocations of available resources. The alternative specification of a consumption function, based on lagged consumption and gross domestic product, offers unreliable results in this case, due to the strong collinearity between these two variables. The size and evolution of imports can be similarly explained by the two components of internal demand, i.e. consumption and investment.

The responsiveness of domestic investment to internal money supply, supposedly positive through the changes in interest rates, does not appear very significant according to regression results. However, if a narrower definition of money supply is followed (MS1), by considering only currency outside banks and net demand deposits and excluding "near money", this relationship is confirmed at the 95% confidence interval by the estimated parameter, for the period 1965-1986 (equation III).

As for variables of indebtedness, in accordance with the macroeconomic relationships mentioned in sub-section 4.1 the internal debt of the government follows the evolution of the public deficit and, indirectly, of the resource gap, since the latter variable can be used as an explanatory factor for the public deficit (equations IV and V, both concerning the period 1965-1985). The same relation does not come out so clearly for long-term external debt: in this case the estimation has been limited to the period 1975-1986 and has similarly involved a lagged predetermined variable of indebtedness. Also the potential role of external debt, and particularly of debt-servicing constraints, as a disincentive for internal investment demand ('debt overhang' hypothesis) appears not to be the case of Ethiopia: when regressing the investment rate ( $I/GDP$ ) on the debt service ratio (debt service/ $X$ ) results are rather shaky in terms of statistical significance, thus reflecting the relatively better position of Ethiopia compared to other African countries in this respect. In fact, the debt service ratio grows from ca. 3.5% in 1974 to almost 17% in 1986, a rate which remains quite below the African average.

With regard to the remaining relationships, concerning monetary variables (i.e. public deficit versus money supply, and the latter vs. inflation) and their interaction with the real economy, the public deficit can be considered as a relevant determinant of the evolution of money supply. The corresponding equation (VI), relative to the period 1965-1985, holds significant results, but the observation of the scattergram of residuals around the fit points to some degree of discontinuity between the period until the early 1970s and afterwards. Hence, a piecemeal linear model has been estimated by assuming 1973-74 to be the turning point, i.e. by introducing a dummy variable with zero values

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till 1973 and unit values from 1974 onwards. Results of equation (VII) validate the model at 95% confidence interval (the Durbin-Watson test is inconclusive, however) and suggest that, since the establishment of the revolutionary government, money supply, even though following a more rapid increase compared to the previous period, has been kept on a slower pace relative to the remarkable growth of government deficit. Corresponding results when using MS1 instead of MS are analogous, although slightly less significant with regard to this aspect.

In order to analyse possible elements affecting inflation in Ethiopia, the retail price index for Addis Ababa (excluding house rent) is the only indicator available: this index is believed to be indicative of price developments in the country as a whole and is used by the IMF as a proxy for the consumer price index (International Financial Statistics). According to the conceptual framework previously adopted, increased money supply could be an engine of inflation; therefore a major instrument to reduce inflation would be a tighter control over the rate of monetary expansion. This hypothesis has been tested by applying Granger's causality test to functions of inflation, regressed on lead and lag money supply variables, and vice versa. The significance of results has been hampered by the limited number of observations for the price index, with estimates covering the period 1969-1986. Due to the presence of positive autocorrelation in the residuals, the Cochrane-Orcutt procedure has been applied and for MS1 results are given in equation (VIII) (for RPI and MS results are less significant, but analogous). In spite of the negative results of Granger's test on both directions of causality, an F test on the null hypothesis on the lag inflation coefficient is rejected if the original OLS estimates without correction for autocorrelation are used, while no significant results are obtained in the opposite case. Moreover, the only statistically significant estimated parameter in the (VIII) is the one related to  $RPI_{-1}$  (93% confidence interval). This unexpected result is similar to that reported by another analysis on inflation in an African country, which suggests that "money supply may have been largely endogenous and propelled by the process of inflation" (Maningi & Wuyts 1984).

If money supply has played a predominantly passive or adaptive role vis-à-vis inflation in Ethiopia, then other factors should be investigated: while no sufficient quantitative information is available to check the relevance of imported inflation, an evaluation of the possible contribution of excess demand inflation has been attempted by regressing the retail price index on real GDP growth and on its own lagged values, over the period 1969-1986. As an alternative formulation, a dummy variable which takes into account years of drought, famine and heavy warfare has been introduced. Results similar-

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ly show how, in the case of Ethiopia, inflationary pressures tend to be created not so much by the overheating of domestic production in years of domestic recovery or expansion, but rather by factors causing supply shortages in the local market, partly out of government control and typical of years of stagnation and economic disarray (equations IX and X).<sup>9</sup>

#### 4.3 Simulation results and forecasts

Functional relations among variables so far presented have been partly connected to form a simultaneous equation model applied to the period 1968-1986. Using the same symbols (Appendix), the model is structured as follows:

$$GDP_t = a_1 + a_2X_t + a_3I_t \quad (a)$$

$$CT_t = b_1 + b_2CT_{t-1} + b_3I_t \quad (b)$$

$$M_t = c_1 + c_2CT_t + c_3I_t \quad (c)$$

$$RGDP_t = GDP_t/DEFL_t \quad (d)$$

$$S_t = GDP_t - CT_t \quad (e)$$

$$RG_t = I_t - S_t = M_t - X_t + LIAB_t \quad (f)$$

$$PDEF_t = d_1 + d_2RG_t \quad (g)$$

$$MS1_t = e_1 + e_2PDEF_t \quad (h)$$

$$GID_t = f_1 + f_2GID_{t-1} + f_3PDEF_t \quad (i)$$

The system involves three exogenous variables (gross fixed investment, commodity exports and GDP deflator) and two predetermined endogenous variables (lagged domestic consumption and lagged government internal debt).<sup>10</sup> The model has not been extend-

<sup>9</sup> The analogy between the two regression equations is reflected by the low statistical significance of individual parameters when regressing RPI on all three explanatory variables: this outcome implies that PCHRGDP and DD are roughly substitutes. It should be also noted that according to equation (X) only the intercept of the inflation function changes during drought and/or warfare years, while a corresponding change in the slope parameter, i.e. a change in the price expectation mechanism in the same years, has been excluded by results of another regression using the explanatory variable DD (RPI). Moreover, the role of public deficit expansion for inflation seems to be relatively less important, since the corresponding estimated parameter when adding PDEF to the (IX) as a further independent variable is not significantly different from 0.

<sup>10</sup> The variable LIAB represents current account liabilities due to net non-factor services and is calculated as a residual, knowing the resource gap and foreign trade flows.



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ed by allowing investment to be dependent on its lagged values and money supply, as stated in equation (III), or by using a function of inflation as in equation (IX) and applying results to an estimate of the GDP deflator, because this would have entailed problems of identification. Furthermore, attention has been addressed to the effects of different performances of investment and exports and alternative rates of inflation on overall economic activity.

While all regression equations hold significant results when estimated separately with OLS, by applying TSLS to the equation system only the first three equations lead to results which are both significant and satisfactory for a simulation procedure. Among the identities, only RGDP appears to track the actual trend sufficiently well. The reason lies to a great extent in the cumulative effect of errors of estimation, encountered when solving the other identities (domestic savings is the difference between two endogenous variables) and consequently the other regression equations.

Results for the first three equations are reported by (XI), (XII) and (XIII) in the Appendix. If these results are compared with those obtained with shorter time series (not presented here), there is a tendency of the estimated parameter of domestic investment to decrease slightly in absolute value when longer time series are used, in the functions of GDP and CT, and also to increase its significance level in the latter case; moreover, while in equation (a) the parameter of exports gets slightly larger in estimates on longer time series, in equation (b) there is a small reduction of the parameter value of lagged consumption, which appears thus to counterbalance the opposite tendency of the investment parameter. However, on the whole the stability of the model is not affected.

In order to evaluate the impact of different hypothetical developments of exports and domestic investment on economic growth in the recent past, 'ex post' simulations have been run based on three alternative assumptions for the period 1981-1985: results are given at Table 2. Had Ethiopia avoided a decrease in export prices in the early 1980s, largely due to a drop in coffee prices, there would have been a relevant improvement in GDP growth only in 1981, with a real GDP ca. 5% higher than the predicted value (fit), whereas in the following years the effect would have been more limited (SIMLN1). With the exception of 1985, the last year of the simulation, the positive effect for real GDP of a 10% increase of investment over the period considered appears slightly less than the similar effect engendered by a corresponding percentage increase of exports (SIMLN2 compared to SIMLN3). Furthermore, while the first two simulations do not alter the performance of consumption and imports directly, a 10% increase in domestic investment would require a sharp drop in total consumption and higher levels of (capital

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Table 2

SIMULATION RESULTS (1981-1985): SENSITIVITY OF ENDOGENOUS VARIABLES TO CHANGES IN THE EXOGENOUS VARIABLES

RGDP						
	actual	fit	simln1	simln2	simln3	
1981	8902.8	8972.2	9422.7	9449.4	9322.9	
1982	9049.6	9051.5	9250.2	9482	9457.7	
1983	9535	9020.1	9347.6	9451.4	9424.9	
1984	9239.9	10024.8	10245.7	10509	10478.7	
1985	8679.8	7958.2	8135.1	8320.4	8331.6	
CT				M		
	actual	fit	simln3	actual	fit	simln3
1981	8476.1	9063.3	8420.6	1384.2	1474.2	1578.8
1982	8833.5	9468.3	8552.5	1641.7	1705.8	1828.5
1983	9759.9	9889	8646.6	1752.9	1800.7	1927.7
1984	9702.5	10141.5	8490.4	2067	2018.4	2164.1
1985	9971.3	10664.4	8555.1	1770.4	1909.6	2037.9

RGDP = GDP at constant 1981 market prices (millions of birr)

CT = total consumption, current values (millions of birr)

M = commodity imports, current values (millions of birr)

SIMLN1: export unit values remain constant over the period, at the 1980 level

SIMLN2: exports are 10% higher

SIMLN3: domestic investment is 10% higher

goods) imports. On the other hand, even with the reminder that the estimates of these variables should be treated with more caution, results indicate a better performance of domestic savings and resource gap with SIMLN3 relative to the other simulations.

Finally, forecasts for the next few years until 1995 have been estimated: alternative future values for the exogenous variables have been assigned by applying double exponential smoothing to two time series, i.e. the periods 1968-1986 and 1975-1986. In the latter case exports appear remarkably reduced compared to the former scenario, because of the less favourable trend registered in the 1980s vis-à-vis the preceding decade; opposite to this, under the same hypothesis levels of investment would be higher and inflation would be at similar levels.

In Table 3 results for 1990 and 1995 are presented: on the whole, if the trends of the post-revolutionary period should prevail over the more long run trends, national income in real terms would be nearly 5% lower in 1995 compared to the first hypothesis and would undergo a slow, steady decline after a peak in 1987. Under the same hypothesis, as opposed to the first one, in 1995 consumption would be more than 20% lower, im-

Table 3

FORECASTS OF ENDOGENOUS VARIABLES BASED ON TWO HYPOTHESES ON THE FUTURE TRENDS OF EXOGENOUS VARIABLES

Hp 1	X	I	DEFL	RGDP	CT	M
1990	1170.2	1358.1	1.3408	9261.4	13525.7	2522.1
1995	1384.8	1536.7	1.5432	9267	18092.8	3290.6
Hp 2	X	I	DEFL	RGDP	CT	M
1990	984	1477.9	1.3416	8818.3	12903.9	2581
1995	1101.9	1770	1.5447	8805.5	14798.5	3147.2

DEFL<sub>1981</sub> = 1 (except RGDP, all variables are in current values)

Hp 1: exogenous variables follow the trend of 1968-1986

Hp 2: exogenous variables follow the trend of 1975-1986

ports would increase at a slower pace till reaching a level nearly 4% lower in 1995, and the situation of domestic savings and the resource gap would not be so gloomy as the one suggested by the first hypothesis. In view of the actual situation in the mid-1980s, both scenarios lead to discouraging conclusions as to the prospects of economic development in Ethiopia: if population projections of the World Bank are taken into account, income per capita in real terms would decrease by ca. 22% between 1985 and 1995 according to the first hypothesis and even more (ca. 28%) following the second hypothesis.

## 5. Conclusions

Despite some achievements registered within social sectors, the development of the Ethiopian economy in the 1980s has registered a very weak performance and its prospects for the early 1990s look sombre. The country hardly appears able to match the minimum requirements for growth recommended by the World Bank, or even to sustain this development path without incurring major internal and external imbalances.

In the last part of the present analysis a rather schematic distinction has been drawn between an export-led and a domestic investment-led growth: from an "ex ante" and an "ex post" perspective, results reveal, on the one hand, a better growth outlook with the export promotion strategy and, on the other, a less negative incidence of a domestic investment support programme on the savings and trade gaps. Anyhow, in both cases

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a substantial amount of foreign assistance is needed, in order to avoid an excessive compression of domestic consumption and high and long-lasting balance of payments deficits. In the medium-long term, efforts should be undertaken to improve the productivity of labour, to stimulate a diversification of the production structure and exports, and to strengthen the national infrastructure network. Results of the analysis have highlighted how the monetary system is highly dependent on the evolution of the real economy. For instance, a better performance of the agricultural sector in some years has been a major factor positively affecting the growth of food prices and hence the inflation rate. Also in this sense, it is apparent that short-run policy measures should be functional in a thorough and realistic programme of structural rehabilitation.



## Appendix

## RESULTS OF REGRESSION ANALYSES

$\ln(\text{GDP}) = 3.02 + 0.5\ln(X) + 0.39\ln(I)$ (9.5) (8.92) (5.17)	$R^2_a = 0.96$ DW = 1.74	(I) F = 223.2
$\ln(\text{GDP}) = 3.75 + 0.34\ln(XC) + 0.19\ln(XR) + 0.32\ln(I)$ (10.3)(7.75) (4.05) (3.56)	$R^2_a = 0.96$ DW = 2.14	(II) F = 131.9
$I = 169.39 + 0.57 I_{-1} + 0.14 MS1$ (2.23) (2.9) (2.36)	$R^2_a = 0.93$ Dh = -0.05	(III) F = 129.6
$PDEF = 39.6 + 0.92 RG$ (0.98)(10.68)	$R^2_a = 0.86$ DW = 2.05	(IV)
$GID = 12.29 + 0.86 GID_{-1} + 0.77 PDEF$ (0.4) (13.07) (5.36)	$R^2_a = 0.99$ Dh = -0.7	(V) F = 902.9
$MS = 638.65 + 2.7 PDEF$ (5.95) (11.97)	$R^2_a = 0.88$ DW = 1.64	(VI)
$MS = 602.33 + 3 PDEF - 0.76 (PDEF - PDEF_{1973})D$ (6.06) (12.16) (-2.19)	$R^2_a = 0.9$ DW = 1.33	(VII) F = 88.4
$MS1 = 1628.9 + 3.29 RPI_{-1} + 0.92 RPI_{+1}$ (0.26) (1.99) (0.85)	$R^2_a = 0.98$ DW = 1.64	(VIII) F = 224.1
$RPI = 46.81 + 0.94 RPI_{-1} - 511.03 PCHRGDP$ (2.55) (17.1) (-2.46)	$R^2_a = 0.96$ Dh = 0.17	(IX) F = 195.1
$RPI = 30.52 - 28.07 DD + 1.002 RPI_{-1}$ (1.9) (-2.19) (19.8)	$R^2_a = 0.96$ Dh = 0.61	(X) F = 182.5
$GDP = 693.42 + 5.6 X + 3.8 I$ (1.91) (6.55) (5.08)	$R^2_a = 0.95$ DW = 2.21	(XI) F = 173.8
$CT = 402.61 + 1.18 CT_{-1} - 1.47 I$ (2.41) (17.2) (-2.47)	$R^2_a = 0.99$ Dh = -0.55	(XII) F = 932.3
$M = -694.64 + 0.12 CT + 1.13 I$ (-10.65) (6.12) (5.74)	$R^2_a = 0.98$ DW = 1.8	(XIII) F = 402.6

t-statistics are given in brackets under the estimated parameters

 $R^2_a = R^2$  adjusted for degrees of freedom

Dh = Durbin h—statistic (not applicable for equation VIII)

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List of variables

GDP = GDP at current market prices  
 I = gross fixed investment  
 S = gross domestic savings  
 CT = total consumption  
 M = commodity imports  
 X = commodity exports  
 XC = coffee exports  
 XR = exports of commodities other than coffee  
 RG = resource gap  
 PDEF = public deficit  
 GID = government internal debt  
 MS = money supply (money and near money)  
 MS1 = currency outside banks and net demand deposits  
 RPI = retail price index (for Addis Ababa)  
 DEFL = GDP deflator (at factor cost)  
 RGDP = GDP at constant 1981 values  
 PCHRGDP = growth rate (percentage change) of RGDP  
 LIAB = net non-factor services (imports - exports)  
 D = dummy variable 'revolution' (0 till 1973; 1 since 1974)  
 DD = dummy variable 'drought/warfare' (0 in years of drought and heavy warfare;  
 1 otherwise)

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**Abstract**

*Many sub-Saharan countries have been affected by a slowdown, if not even a downtrend, in their already very low levels of economic and social development, as a consequence of both internal and external factors. These factors are, among others, the foreign debt burden, the insufficient achievements in financial resource mobilization, price and exchange rates distortions, the high dependency on exports of few commodities, and unfavourable weather and internal security conditions.*

*In order to interpret the causal links underlying this negative performance in the Ethiopian case, a time-series analysis has been carried out on various indicators of the real and monetary economy. The analysis is preceded by a brief cross-country comparison of a few indicators, aimed at highlighting specific features of Ethiopia as opposed to other African countries. In the construction and application of the model, emphasis is laid on possible determinants of growth and inflation in a low-income developing country and, in this concern, some theoretical underpinnings of the two-gap model and other related hypotheses are explored and tested. While the estimates cover the period 1968-1986, an 'ex post' policy simulation is applied to the last few years, so as to check the reaction of a few economic variables to changes in the levels of domestic investment and commodity export earnings. Finally, alternative developments are envisaged for the period until 1995, based on projections of the exogenous variables.*



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## **PENURIE DE DEVISES, CROISSANCE ET INFLATION: UNE APPLICATION ECONOMETRIQUE A L'ETHIOPIE**

### **RESUME**

*De nombreux pays sub-sahariens ont été affectés par un ralentissement, si ce n'est par une baisse de leurs déjà très bas niveaux de développement économique et social, comme conséquence de facteurs tant internes qu'externes. Ces facteurs sont, entre autres, le poids de la dette extérieure, les résultats insuffisants de la mobilisation de ressources financières, les distorsions des prix et des taux de change, la dépendance élevée au niveau des exportations de quelques marchandises, de même que les conditions climatiques et de sécurité interne défavorables.*

*Une analyse de séries temporelles de plusieurs indicateurs du système réel et monétaire a été réalisée de façon à interpréter les causes qui sous-tendent les résultats négatifs de l'économie éthiopienne. Cette analyse est précédée d'une comparaison inter-pays de quelques indicateurs, visant à dégager certains aspects propres à l'Ethiopie par rapport à d'autres pays africains. L'accent a été mis, dans la construction et l'application de ce modèle, sur de possibles facteurs de croissance et d'inflation dans un pays en développement de faible revenu et les fondements théoriques du modèle à "double gap" ainsi que d'autres hypothèses, ont été explorés et testés. Alors que les estimations couvrent la période 1968-1986, une simulation de politique économique "ex-post" a été appliquée aux dernières années dans le but de tester la réaction de certaines variables économiques aux changements dans les niveaux d'investissements intérieurs et de recettes d'exportation de marchandises. Enfin, des développements alternatifs, basés sur des projections de variables exogènes, sont envisagés pour la période allant jusqu'à 1995.*

