MILITARY EXPENDITURES AND ECONOMIC PERFORMANCE: LESSONS FROM THE ETHIOPIAN ECONOMY

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ABSTRACT

This paper examines the impacts of military expenditures on various sectors of the Ethiopian economy in general and on social programs (education and health expenditures) in particular. Unlike most similar studies, a medium-sized macroeconmetric model and a specific country data set are used to estimate the impacts of defence expenditures. The simulation results indicate that an increase in military expenditures adversely affect output growth and the current account balance. The results also show that there was a trade-off between military expenditures and social programs.

1. INTRODUCTION

1.1. Objective

Due to the significant increases in military expenditures in many LDCs, the impact of defence expenditures has attracted the attention of economists in recent years. In particular, this interest gained momentum following Benoit's 1978 conclusion regarding the relationship between defence spending and economic growth. In this study, Benoit (1978: 271) concluded that, '[c]ontrary to my expectations, countries with a heavy defence burden generally had the most rapid rate of growth, and those with the lowest defence burden tended to show the lowest growth rates'. This conclusion, according to Grobar and Porter (1989:318), '[s]hocked development economists by presenting positive cross-country correlations between military expenditure rates and economic growth rates in less developed countries (LDCs)'. Consequently, scrutiny of the methodology and the results of the study intensified. Specifically beginning the early 1980s, various studies have examined whether such an allocation of resources negatively affects the performance of the economies or not, and if so to what extent. Such studies include: Lim (1983), Frederiksen and Looney

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(1983), Nabe (1983), Faini, Annez and Taylor (1984), Deger (1986), Weede (1986), Gyimah-Brempong (1989a), Grobar and Porter (1989), Stewart (1991), Grobar and Gnanaselvam (1993), and Knight, Loayza, and Villanueva (1996), to name a few. These and most other similar studies are carried out using cross-section data (multi-country studies), and focus on the impact of military expenditures on economic growth.

But as Chan (1985: 35) in his survey of the literature noted, '[t]here are definite limits in the extent to which cross-sectional analyses of aggregate data can inform us about the complex causal interactions that characterise the relationship between military spending and economic performance'. That is, in addition to multi-country tests, country-specific interactions between defence spending and other economic aggregates are required. In contrast to most studies, therefore, this study has three main objectives: First, to examine the effect of military expenditures on output growth and other macroeconomic aggregates using a specific country data set; second, to asses possible trade-offs between military expenditures and social programs, especially expenditures on health and education; and the third, most important objective is to examine these issues in an integrated macroeconomic framework. Such an approach has two distinct advantages: First, using a specific country data set limits the prevalence of potentially offsetting interactions, as is usually the case in some cross-sectional analyses; second, examining the issue in an integrated macroeconomic framework helps identify the transmission mechanism and the impact of military expenditures on various sectors of the economy. Accordingly, this study uses a medium-sized macroeconometric model to address the above issues. The study is organised as follows: After giving descriptive background on the size of military expenditures in the next sub-section, a brief review of previous studies and an outline of the model used in this study are presented in the second section. And simulation and conclusions of the study are presented in the third and fourth sections, respectively.

1.2. The Relative Size of Military Expenditures in Ethiopia

Successive Ethiopian governments have played a significant role in the Ethiopian economy. This is particularly true beginning the mid-1970s, after the then new government adopted a 'socialist' economic development path. Following such policies, both the share of public expenditures in GDP and degree of intervention significantly increased. Public expenditures as a percentage of GDP increased from 13 percent in the 1960s to 34 percent in the 1980s. Such an expansion of government expenditures was taking place in the absence of any increases in government revenue. On average, government revenue only covered about 67 percent of total current government expenditures between 1975 and 1988. Consequently, the central government budget deficit as a percentage of GDP increased from a low of about 1 percent in the 1960s to

about 8 percent of GDP in the 1980s. By 1990 it reached 17 percent of GDP.

Ethiopia's military expenditures and arms imports as a percentage of GNP (see Fig. 1.1) were lower than the all-Africa average until 1974. Beginning 1975, however, both the level of military expenditures and the size of the armed forces significantly increased. By 1980, domestic military outlays (excluding foreign military aid) as a percentage of GNP reached 9.7 percent while the all-Africa average was only 2.9 percent. That is, over the decade (1971-1980), domestic military outlays in Ethiopia increased by 262.5 percent compared to only 3.6 percent for the all-Africa average. On the other hand, the respective growth rates in per capita GNP, during the same period, were 1.7 percent and 6.6 percent. This pattern of military expenditures continued during the 1980s. Ethiopian domestic military expenditures as a percentage of GNP averaged roughly twice that of the all-Africa average between 1981-1987[1] , while the average standard of living deteriorated (negative growth rate of per capita GNP) in both Ethiopia and in all of Africa on average.

Figures 1.1 and 1.2 also indicate a similar picture regarding the level and changes in military expenditures in Ethiopia relative to the all-Africa average. Military expenditures as a percentage of the central government budget (Fig.1.2) and arms imports as a percentage of total exports (Fig. 1.3) have been higher in Ethiopia than the all-Africa average. This is probably because Ethiopia had a well-established domestic army while most of the rest of African countries were under colonial rule. Consequently, Ethiopian domestic military expenditures as a percentage of the central government budgets were almost twice the all-Africa average between 1971 and 1974. After 1974, military expenditures as percentage of the central government budget dramatically increased in Ethiopia relative to the all-Africa average. By 1987, it increased to 24 percent while for all-Africa it was only 13.1 percent. Compared to 1974, this represents an increase of 72.6 percent and 18 percent, respectively. Similarly, between 1974 and 1987, arms imports as a percentage of total exports averaged 13.2 percent per annum for all-Africa, while that of Ethiopia reached 158 percent of its total exports. Given that the main source of foreign exchange is export earnings and the scarcity of foreign exchange, such an allocation of resources suggests a high opportunity cost in terms of, say, forgone imports of intermediate inputs.

In addition to the material resources allocated for military purposes, the size of the Ethiopian armed forces also grew between 1971 and 1987. As shown in Figure 1.4, between 1976 and 1987, the size of the armed forces per 1000 inhabitants in Ethiopia was twice the size of the all-Africa average.

The extent to which military expenditures in Ethiopia were much higher than for the

[1] Editor's Note: Just before the 1998 Ethio-Eritrean conflict, this figure has considerably declined to around 2% of GDP.

all-Africa average is more apparent from Table 1.1. The level of Ethiopian GNP per capita averaged about 17 percent of the all-Africa average per annum between 1971 and 1987. But during the same period, domestic military outlays as a percentage of GNP and as a percentage of central government budget, arms imports as a percentage of total exports, and armed forces per 1000 inhabitants averaged 164, 202, 1643, and 154 percent of the all-Africa average, respectively. When military outlays as a percentage of GNP and as a percentage of central government budget are weighted by relative GNP per capita (Ethiopian values relative to the all-Africa average), the respective Ethiopian outlays were 947 and 1172 percent of the all-Africa average. That is, for equivalent GNP per capita Ethiopia was allocating 9.5 dollars, on average, for military purposes for every dollar allocated by the all-Africa average.

Due to the severity of the internal conflict, therefore, Ethiopia allocated more resources, both human and material, for military purposes than the average for all of Africa. Clearly, this significantly contributed to both the overall public expenditures and hence the total government debt directly. Given that most of the military equipment was imported, and therefore competing for scarce foreign exchange resources that could be used to import intermediate inputs, what was the impact of such an allocation on the growth of output? Further, how did such a big increase in military expenditures affect various sectors of the economy? And was there a trade-off between defence expenditures and social programmes?

MILITARY EXPENDITURES AS A PERCENTAGE OF GNP: ETHIOPIA AND ALL AFRICA

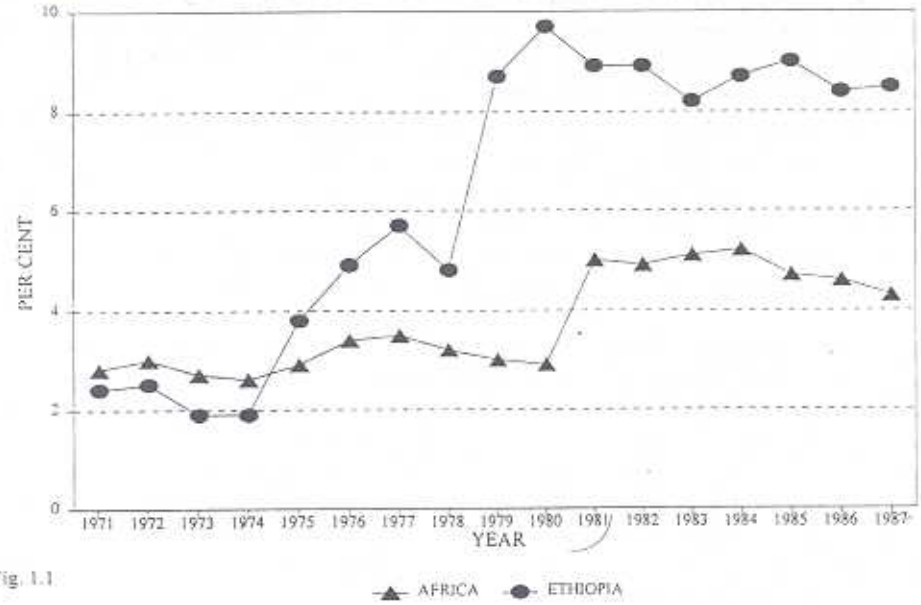

Fig. 1.1

MILITARY EXPENDITURE AS PERCENTAGE OF CENTRAL GOVERNMENT OUTLAYS

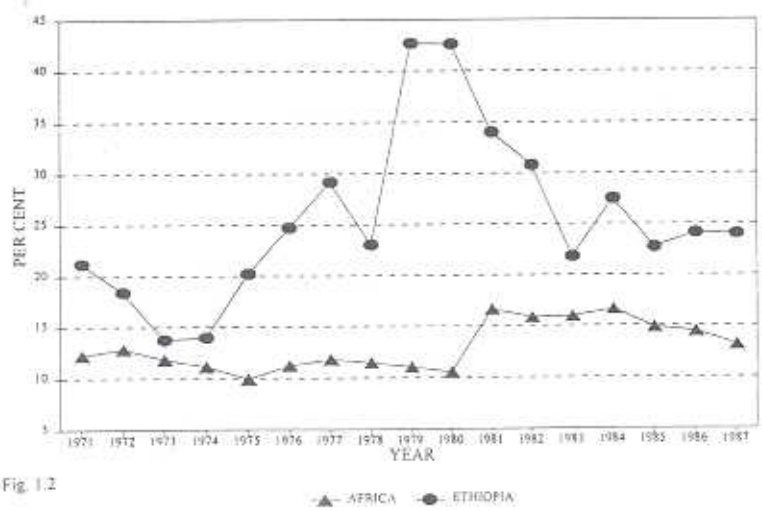

Fig. 1.2

ARMS IMPORTS AS PERCENTAGE OF TOTAL EXPORTS

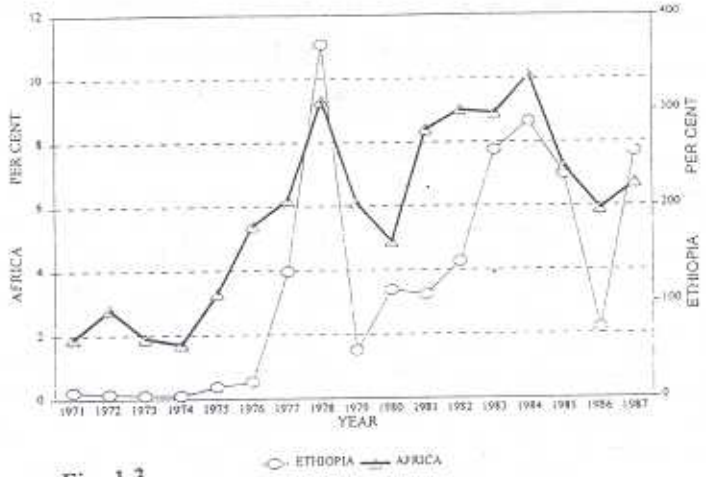

Fig. 1.3

ARMED FORCES PER 1000 INHABITANTS:
AFRICA AND ETHIOPIA

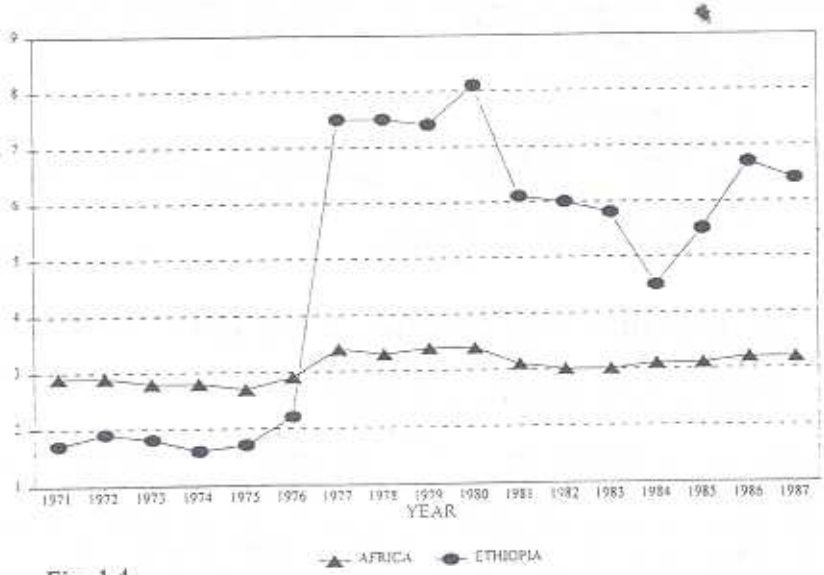

Fig. 1.4

Table 1.1. Military Outlays Relative to the All-Africa Average

ETHIOPIAN GNP PER CAPITA, MILITARY EXPENDITURES CENTRAL GOVERNMENT EXPENDITURE, ARMS IMPORTS AS A % OF TOTAL EXPORTS AND ARMED FORCES PER 1000 INHABITANTS RELATIVE TO TOTAL AFRICAN AVERAGE (%)							
YEAR	1	2	3	4	5	6	7
1971	18	86	471	955	174	59	416
1972	18	83	451	778	144	66	207
1973	18	70	383	631	116	64	211
1974	17	73	433	742	125	57	218
1975	17	131	774	1205	204	63	385
1976	16	144	887	1357	221	76	328
1977	16	163	999	1518	247	221	2135
1978	16	150	949	1277	202	227	3978
1979	16	290	1793	2400	388	218	823
1980	17	334	1912	2319	406	238	2306
1981	18	178	1014	1167	205	197	1286
1982	18	182	1001	1075	195	200	1583
1983	19	161	843	719	137	193	2907
1984	18	167	908	899	166	145	2852
1985	17	191	1149	920	153	177	3235
1986	17	183	1053	965	167	209	1231
1987	18	198	1078	999	183	200	3827
Average	17	164	947	1172	202	154	1643

Formula: (i) relative measure - (value / value)*100; (ii) GNP per capita weighted measures - (value/value)*(GNP^A/GNP^E)*100, where superscripts A and E represent total Africa and Ethiopia, respectively and GNP is GNP per capita.

1. Relative GNP per capita.
2. Relative domestic military outlays to output ratio.
3. Relative domestic military outlays to output ratio weighted by GNP per capita.
4. Relative domestic military outlays to total central government budget weighted by GNP per capita.
5. Relative domestic military outlays to total central government budget.
6. Relative armed forces per 1000 inhabitants.
7. Relative arms imports as a ratio of total exports.

2. THE IMPACT OF CHANGES IN MILITARY EXPENDITURES

2.1. A Brief Review of Previous Studies

As stated earlier, despite various efforts, the answer to the above stated questions and the overall evidence regarding the net impact of military spending on economic growth to date is mixed, at best. For instance, among the above cited studies, Benoit (1978), Frederiksen and Looney (1983), Weed (1986), and Stewart (1991) concluded, using a single equation model and a multi-country data, that there is a positive and, in many cases significant, relationship between defence spending and economic growth. The main arguments given to defend these results are based on the familiar

Keynesian explanations and technological spin-offs. That is, an increase in military expenditures leads to an increase in demand and hence to an employment of otherwise idle resources. Further, since the military sector is more modernised relative to other sectors in LDCs, this will lead to an increase in skill level and other positive externalities to the economy at large. Studies by Lim (1983), Faini, Annez and Taylor (1984), Deger (1986), Gyimah-Brempong (1989a), Grobar and Porter (1989), and Knight, Mohammed and Suleiman (1994), Loayza and Villanueva (1996) on the other hand, indicate negative relationship between military expenditures and economic growth. According to the last set of studies, the main reason why economic growth and defence spending are negatively related is due to the opportunity cost of allocating scarce government resources for military purposes, instead of say for investment and other foreign exchange-starved sectors.

Among the above cited studies, that of Nabe (1983), Gyimah-Brempong (1989a) and Mohammed and Suleiman (1994) deserve special attention due to their focus on the African economies. The first two studies used cross-sectional data of African countries. The methodologies used, sample period and country coverage, however, differ. Nabe (1983) used co-variation and path analysis to test the relationship between military expenditures and economic development over the sample period 1967 to 1976. On the basis of pooled data of 26 African countries, Nabe (1983: 584) concluded that, '[t]here is a repeated absence of co-variation between military expenditures and economic development...[therefore] the weight of our statistical evidence is contrary to the proposition that military expenditures have a positive effect on development'. Gyimah-Brempong's study is extensive both in terms of country coverage (39 African countries) and the length of sample period (1973 to 1983) as compared to that of Nabe (1983). Gyimah-Brempong (1989a) estimated a four-equation simultaneous model using the three stage least square method with defence burden (military expenditures to GDP ratio) as one of the explanatory variables. His results indicate that a unit increase in military expenditures would have a negative multiplier impact of 0.12 on GDP. Gyimah-Brempong (1989a: 79), therefore concluded that, '[t]he implication of this result is that African countries cannot use increased defence spending to simulate economic growth because there is a trade-off between high defence burden and economic growth'.

Studies that have examined the trade-offs between military expenditures and social programs are relatively limited, particularly in the less developed countries. In the African context, Gyimah-Brempong (1989b) examined a possible trade-off between defence spending and social expenditures (expenditures on education, health, housing and other social services) using a utility maximisation model and three stage least square estimation technique. His study covered 20 Tropical African countries over a 10-year period (1973-1983). The estimated results indicate that there is a significant budgetary trade-off between military and social expenditures. That is, an

increase in military expenditures negatively affects spending on social programmes. Similarly, Mohammed and Suleiman (1994) examined the same issue as applied to the case of Ethiopia using simple correlation and a regression equation. Their findings indicate that there was indeed a negative relationship between defence expenditures on the one hand and education and health expenditures on the other.

2.2. Model Specification: Basic Attributes

In addition to the relevant identities and definitions, the basic model[1] used to examine these issues contains twenty-two behavioural equations pertaining to four sectors of the economy. These sectors include: output supply, labour demand, domestic aggregate demand and external sectors. Within the aggregate demand category, government expenditure is disaggregated into total expenditures, expenditures on education and expenditures on health services. Military expenditure as ratio of GDP is one of the explanatory variables in the equations for health and education expenditures. Another equation is also specified for arms imports as one of the components of import demand to account for possible trade-offs between military and non-military imports.

In broad terms, the model is specified along the lines of the structuralist hypothesis in which supply constraints dominate economic activity. For instance, due to the importance of resource constraints on the supply side of the economy, an effort is made to incorporate the role of capital and intermediate inputs on output supply. In brief, consistent with the dominance of supply constraints and the subsistence level of the economy, the workings of the model are structured as follows: Export earnings are the main sources of foreign exchange (capacity to import), which determines the level of imported inputs (both military and non-military goods). The level of imported production inputs determines the level of capacity utilisation, which in turn determines actual output directly and via its impact on the utilisation of domestic inputs indirectly. The level of output, in conjunction with government policy in the financial sector, determines both the level and the composition of aggregate demand. As the military government increased its defence expenditures, therefore, it is likely to affect the level of aggregate demand and alter its composition as well. The role of aggregate demand is to determine the allocation of available output between its various components. This allocation will influence and be influenced by the behaviour of the financial sector, and will determine the external balance via patterns of expenditure (domestic goods vs. imports), growth (consumption vs. investment) and hence will indirectly influence output.

The main data sources used to estimate the model are various official publications of international agencies, and published and unpublished government reports. Where choice is available, however, data from international agencies are used to maintain consistency in updating and facilitating comparisons over time. The primary data

sources include: International Financial Statistics, Government Financial Statistics, and Balance of Payments Yearbook published by the International Monetary Fund; Yearbook of National Income Statistics and World Tables published by the United Nations. Additional data from the National Bank of Ethiopia and the Ethiopian Statistical Office were also used to supplement the international data sources.

3. ESTIMATION AND SIMULATION RESULTS

To estimate[1] the impact of military expenditures on various sectors of the economy in general and social programs in particular, the basic model is re-simulated by incorporating the following changes: (1) real military expenditures are kept at 1973 level and any deviation from this level is treated as additional injection to the supply of non-military goods and services; and (2) the size of the armed forces is also kept at its 1973 level, and the additional members of the armed forces are included as part of the total labour force[2]. The main objective of the policy design is then to answer the question of how the economy would have performed had the government kept its military expenditures and the size of its armed forces at their 1973 level. It should be noted that the per capita GNP weighted military expenditures, as ratios of GNP and total central government budget, were much higher in Ethiopia relative to the all-Africa average even in 1973. An increase in military expenditures above the 1973 level, therefore, should suggest that military expenditures in Ethiopia was excessive, on a GNP per capita basis, even by African standards, which are considered relatively high.[3]

A positive increase in any endogenous variable as a result of the incorporated changes would indicate that the increase in military expenditures after 1974 had a negative impact on the endogenous variables concerned. A comparison of the basic simulation (control run) and the results obtained after incorporating the above changes are summarised in Tables 1.2 to 1.4.

As can be seen from Table 1.2, a reduction in military expenditures and the size of the armed forces would have increased, on average, total output (RY) and sectoral outputs (agricultural output - RAO, and manufacturing output - RMO). Consequently, private consumption (RC) and investment expenditures (RI), in Table 1.3, would have also increased. For instance, manufacturing output, agricultural output and total output would have increased, over the sample period, by about 0.3, 0.1 and 0.75 percent per annum, respectively, if the size of the armed forces and the ratio of military expenditures to total output had been maintained at their 1973 levels. Private consumption and investment would also have increased by 0.75 and 0.6 percent,

[1] Editor's Note: Estimation of model parameters using the new time series approach is not carried out owing to shortage of longer series. Since the model is used for simulation purpose, the model's weakness in this respect is openly acknowledged and considered not to be detrimental.

respectively. This is because reductions in military expenditures and the size of the armed forces affect the output sector by increasing the capital available for investment purposes and adding to the labour force engaged in production. It is worth noting that the increases in output due to an increase in the labour force, both expressed as per unit of capital, are modest. This indicates that labour shortage is not a serious problem for such economies.

With regard to the possible trade-off between military expenditures and social programs, both expenditures on education and health (as ratios of GDP) would have been higher if military expenditures had been kept at the 1973 level. Due to the negative relationship between military expenditures and expenditures on education and health, military expenditures were increased at the expense of social programs (education and health, in this case). As indicated in Table 1.3, expenditures on education (RGEE) and on health (RGEH) would have increased, on average, by about 94.1 percent and 86.5 percent, respectively, over the simulation period. The significant portion of the increase in military expenditures could not be financed without sacrificing other government programs, especially programs with relatively large budget shares like education and health.

Table 1.2. The Impact Of Defence Expenditures

The Impact of Reductionsin Military Expenditures							
Deviations From Control Run - %							
YEAR	CUR	RAO	RMO	RY	IT	RMCD	RMCND
1973	-0.02	0.00	0.25	-0.03	-0.22	0.00	0.00
1974	-0.01	0.02	0.29	0.06	-0.05	-0.01	0.00
1975	0.21	0.02	0.39	0.34	1.93	0.01	0.00
1976	0.07	0.05	0.20	0.32	0.73	0.10	0.01
1977	0.25	0.11	0.49	0.90	2.25	0.13	0.01
1978	0.99	0.11	0.98	1.76	8.21	0.29	0.02
1979	0.75	0.12	0.32	1.50	6.82	0.61	0.04
1980	0.53	0.11	0.26	1.20	5.44	0.67	0.04
1981	0.23	0.11	0.11	0.81	3.31	0.55	0.04
1982	0.17	0.11	0.26	0.71	2.59	0.40	0.03
1983	0.19	0.08	0.26	0.56	2.37	0.31	0.02
1984	0.08	0.12	0.20	0.54	1.42	0.25	0.02
1985	0.21	0.15	0.25	0.73	2.24	0.22	0.02
1986	0.49	0.14	0.30	0.97	3.81	0.27	0.02
1987	0.50	0.17	-0.05	0.95	3.85	0.37	0.02
Average	0.31	0.09	0.30	0.75	2.98	0.28	0.02

Table 1.3. The Impact of Defence Expenditures

The Impact Of Reductions In Military Expenditures							
Deviations From Control Run - %							
Deviations From Control Run - %							
YEAR	RC	RI	RGEE	RGEH	RG	P	RXCOF
1973	-0.02	-0.10	-0.56	4.52	-0.02	0.18	-0.08
1974	0.06	0.00	7.20	11.61	0.02	0.11	-0.05
1975	0.31	0.92	14.30	18.04	0.13	-1.54	0.71
1976	0.30	0.21	21.43	24.45	0.09	-0.46	0.21
1977	.87	.17	44.45	44.81	0.18	-1.74	0.80
1978	1.74	1.11	90.13	84.08	0.23	-7.51	3.33
1979	1.52	1.01	128.36	116.02	0.07	-6.58	2.94
1980	1.23	0.50	143.57	128.52	0.03	-5.32	2.40
1981	0.81	0.35	137.58	123.60	0.07	-3.07	1.40
1982	0.70	1.07	138.82	124.63	0.10	-2.28	1.05
1983	0.56	0.65	136.62	122.82	0.06	-2.17	1.00
1984	0.52	0.52	140.03	125.62	0.10	-1.09	0.51
1985	0.70	0.37	134.44	121.03	0.14	-1.81	0.83
1986	0.97	0.52	133.70	120.42	0.10	-3.52	1.61
1987	0.93	0.41	141.94	127.18	0.13	-3.43	1.57
Average	0.75	0.58	94.13	86.49	0.10	-2.68	1.22

where:

RC	= real private consumption
RI	= real investment expenditures
RGEE	= real government expenditures on education to output ratio
RGEH	= real government expenditures on health to output ratio
RG	= real government expenditures
P	= domestic consumer price index - 1985=100
RXCOF	= real exports of coffee

Table 1.4. The Impact of Defence Expenditures

The Impact Of Reductions In Military Expenditures							
Deviations from Control Run - %							
YEAR	RX	RXHK	RXOSN	RMNT	RGUN	RMFL	CA
1973	-0.03	-0.18	-0.22	0.25	0.00	-9.76	6.88
1974	-0.02	-0.11	-0.14	0.32	-66.47	-18.55	136.63
1974	-0.02	-0.11	-0.14	0.32	-66.47	-18.55	136.63
1975	0.26	1.53	1.87	0.38	-74.50	-25.38	-58.30
1976	0.08	0.46	0.56	-0.08	-89.16	-31.30	824.03
1977	0.30	1.72	2.11	0.40	-97.12	-45.79	157.64
1978	1.25	7.03	8.55	0.53	-97.12	-62.74	158.17
1979	1.10	6.22	7.57	1.30	-97.63	-70.99	154.43
1980	0.89	5.09	6.20	1.02	-97.39	-73.44	186.47
1981	0.52	3.00	3.66	-0.86	-97.39	-72.53	197.42
1982	0.39	2.25	2.75	-0.23	-97.39	-72.73	202.45
1983	0.37	2.14	2.61	-0.15	-95.51	-72.39	-2416
1984	0.19	1.09	1.33	-0.14	-97.39	-72.92	212.41
1985	0.31	1.79	2.19	0.08	-98.45	-72.03	126.70
1986	0.60	3.43	4.18	0.08	-98.45	-71.91	150.82
1987	0.58	3.34	4.08	0.48	-98.84	-73.20	134.35
Average	0.45	2.59	3.15	0.22	-86.86	-56.38	11.58

where:

RX = total real exports
RXHK = real exports of hides and skins
RXOS = real exports of oil seeds & nuts
RMNT = real imports of intermediate inputs
RGUN = real arms imports
RMFL = real imports of fuel and lubricants
CA = current account balance

As can be seen from Table 1.2, a reduction in military expenditures and the size of the armed forces would have increased, on average, total output (RY) and sectoral outputs (agricultural output - RAO, and manufacturing output - RMO). Consequently, private consumption (RC) and investment expenditures (RI), in Table 1.3, would have also increased. For instance, manufacturing output, agricultural output and total output would have increased, over the sample period, by about 0.3, 0.1 and 0.75 percent per annum, respectively, if the size of the armed forces and the ratio of military expenditures to total output had been maintained at their 1973 levels. Private consumption and investment would also have increased by 0.75 and 0.6 percent, respectively. This is because reductions in military expenditures and the size of the armed forces affect the output sector by increasing the capital available for investment purposes and adding to the labour force engaged in production. It is worth noting that the increases in output due to an increase in the labour force, both expressed as per unit of capital, are modest. This indicates that labour shortage is not a serious problem for such economies.

With regard to the possible trade-off between military expenditures and social programs, both expenditures on education and health (as ratios of GDP) would have

been higher if military expenditures had been kept at the 1973 level. Due to the negative relationship between military expenditures and expenditures on education and health, military expenditures were increased at the expense of social programs (education and health, in this case). As indicated in Table 1.3, expenditures on education (RGEE) and on health (RGEH) would have increased, on average, by about 94.1 percent and 86.5 percent, respectively, over the simulation period. The significant portion of the increase in military expenditures could not be financed without sacrificing other government programs, especially programs with relatively large budget shares like education and health.

Further, a reduction in arms imports (RGUN in Table 1.4) in the mid-1970s would have had a significant positive impact on the current account balance. The current account balance (CA in Table 1.4) would have improved by about 11.6 percent, on average, if the government had kept its military expenditures at its 1973 level. This result probably is not surprising since most of the arms, vehicles and other related army requirements are imported. More specifically, a reduction in military expenditures would have decreased arms imports and imports of fuel (RMFL in Table 1.4) by 86.9 and 56.4 percent per annum, respectively, while all exports would have slightly increased on average, over the simulation period. The increase in exports is due to an increase in excess supply, which reduces the supply and demand gap, which in turn decreases domestic prices leading to an increase in the real exchange rate (depreciation).

It should be noted that due to the differences in modelling approaches and the data set used, one cannot directly compare the quantitative magnitudes reported in this studies with most of the studies reviewed earlier. One of the few exceptions to this approach is the study by Grobar and Gnanaselvam (1993) which examined the effects of defence spending on the Sri Lankan economy. Using Sri Lankan data from 1960 to 1988, they estimated the effect of military spending on investment. On the basis of their estimates, Grobar and Gnanaselvam (1993: 403) concluded that, given a fixed incremental capital-output ratio (ICOR) of 2.5, a 3.8 percentage point increase in military spending would lead to a 5.5 and 2.2 percentage points decline in investment to GDP ratio and in GDP, respectively. Clearly, the results obtained in this study are qualitatively similar to that of Sri Lanka, and the impact of military spending on the growth of output, in particular, is of the same order of magnitude. Further, In terms of broad qualitative indicators, the results of this study are consistent with the studies that found a negative relationship between military expenditures and economic growth and with those that found a trade-off between defence spending and social programs. This is particularly true in the case of studies that used African data exclusively. Of particular interest in this regard is the study by Mohammed and Suleiman (1994) who used Ethiopia as a case study. Even though their approach is slightly different than the one used in this study, their results are consistent with the

above reported results. More specifically, they indicate that a unit increase in defence expenditures leads to about 13 and 3 percent decrease in education and health expenditures, respectively. Military expenditures in Ethiopia exceeded that of African average by a wide margin, particularly since the mid-1970s, while its GDP per capita and its growth were among the lowest in the continent. It is not surprising, therefore, that military expenditures in an economy with limited resources would have an adverse effect on economic growth and a significant trade-off in terms of other social programs.

4. CONCLUSION

The comparative actual data and the simulation results indicate that military expenditures in Ethiopia negatively affected the performance of the economy. In summary, the results of this study indicate that an increase in military expenditures decreased total and sectoral outputs, components of aggregate domestic demand, expenditures on education and health (indicating the existence of a budgetary trade-off), increased arms imports, and worsened the current account balance.

The policy implications of the above results are obvious. To the extent that military expenditure adversely affect economic performance, at least in the least developed countries, governments may have to rearrange resource allocation priorities away from defence expenditures. This is particularly essential in countries like Ethiopia where military expenditures increased at the expense of investment in human capital (education) and health facilities. Whatever the noneconomic arguments might be, the results of this study and many others indicate the high opportunity cost of military expenditures. Such expenditures, therefore, cannot be justified on the grounds of stimulating aggregate demand since such expenditures lead to direct budgetary trade-offs and create supply bottlenecks by competing for the scarce foreign exchange resources.

Unavailability of data preclude projecting the likely economic impacts of the pending an all out Ethio-Eritrean war, but it is likely to have a significant negative effect on both economies which just started some signs of recovery from years of devastation. Preliminary evidence supports this conjecture as there is already a significant shift in allocation of resources to the war effort at the expense of productive use of such resources.

NOTES

[1] For brevity, model structure, estimates and their statistical attributes are not given in the annex. Interested readers could obtain the complete model by contacting the author.

[2] Including the excess military personnel into the labour force may seem to contradict the common assumption of excess supply of labour in such economies. But since most of the people called for military service were the most productive members of the work force and whatever underemployment that might have existed was adjusted by capacity utilisation, any additional recruitment for military service should represent a decrease in the effective labour force - especially in the non-agricultural sector.

[3] For instance, according to Sivard (1985:14), military expenditures as a percentage of GNP for Latin American countries was only 1.32 percent of GNP, which is lower than the all-Africa average.

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ANNEX: THE MODEL

The model specified and estimated results are reported below. This will serve as a supplement to the paper. This is one version of the model used in forecasting (simulating) the results included in the paper. Additional equations and other versions are also available (can be obtained for the author) but do not change the basic results.

A1. MODEL ESTIMATION

A1.1. SYSTEMS ESTIMATION (2SLS)

EXOGENOUS VARIABLES: COFPI, D1, MP, MPI, POP, RF, RFR, RGR, RMILEX1, RMS, RTGB, RWR, T, WWPI, WY, XPI, XPK.

A1.1.1. OUTPUT SUPPLY

$$\ln\left(\frac{RY}{RFCA}\right) = \underset{(24.01)}{6.01} + \underset{15.5}{0.79}\ln\left(\frac{STR}{RFCA}\right) - \underset{(3.3)}{0.19}D_1 \qquad [1]$$

$$\bar{R}^2 = 0.94 \quad DW = 0.57 \quad \rho = 0.88 \quad SSE = 0.08 \quad \bar{Y} = 1.78$$

$$Ln(CUR) = \underset{(0.14)}{0.31} + \underset{(2.51)}{0.26}Ln\left(RMNT/RMO_{-1}\right) + \underset{(2.66)}{0.12}Ln\left(RMS/RY\right)_{-1} + \qquad [2]$$

$$+\underset{(3.08)}{0.48}Ln(CUR_{-1}) - \underset{(4.72)}{0.75}$$

$$R^{-2} = 0.82 \quad D.H. = 0.49 \quad SSE = 0.09 \quad \bar{Y} = 0.10$$

$$Ln(RAO) = \underset{(8.16)}{6.10} + \underset{(8.38)}{1.26}Ln(LAFI) + \underset{(4.68)}{0.07}Ln(RF_{-1}) - \underset{(5.73)}{0.04}T \qquad [3]$$

$$R^{-2} = 0.75 \quad D.W. = 1.6 \quad \rho = 0.13 \quad SSE = 0.21 \quad \bar{Y} = 8.80$$

$$Ln(RMO) = \underset{(2.19)}{1.84} + \underset{(2.69)}{0.46}\, Ln(LM) + \underset{(2.17)}{0.26}\, Ln(RMNT) + \underset{(4.45)}{0.44}\, Ln(RFCA) \quad [4]$$

$R^{-2} = 0.51$ D.W. = 0.85 $\rho = 0.71$ SSE = 0.21 $\bar{Y} = 7.2$

$$Ln(RC) = \underset{(1.55)}{0.52} + \underset{(25.93)}{0.92}\, Ln(RDY) + \underset{(1.2)}{0.01}\, Ln(RC_{-1}) \quad [5]$$

$R^{-2} = 0.97$ D.h. = 2.1 SSE = 0.02 $\bar{Y} = 9.29$

$$Ln(RMCD) = \underset{(6.35)}{3.02} + \underset{(4.71)}{0.26}\, Ln\left(\left(RDY_{-1} + RDY_{-2}\right)/2\right) - \underset{(1.72)}{0.70}\, Log\left(MPI/P\right) - \underset{(1.22)}{0.02}\, T$$

$R^{-2} = 0.31$ D.W. = 2.7 SSE = 2.65 $\bar{Y} = 5.00$

$$Ln(RMCND) = \underset{(20.65)}{5.08} + \underset{(0.61)}{0.02}\, Ln(RDY_{-1}) - \underset{(7.09)}{1.49}\, Ln\left(MPI/P\right) + \underset{(5.44)}{0.04}\, T \quad [7]$$

$R^{-2} = 0.70$ $D.W. = 1.6$ $\rho = 0.15$ $SSE = 0.71$ $\bar{Y} = 5.73$

$$IT = \underset{(4.96)}{-173.76} + \underset{(6.40)}{0.09}\, Y + \underset{(3.13)}{3.11}\, ETI$$

$R^{-2} = 0.98$ $D.W. = 1.5$ $R^{-2} = 0.98$ $D.W. = 1.5$ [8]

$\rho = 0.25$ $SSE = 35690$ $\bar{Y} = 589.05$

$$Ln(RG) = \underset{(4.35)}{4.97} + \underset{(0.14)}{0.00}\Delta Ln(RY) + \underset{(2.00)}{0.33}Ln(RIT) + \underset{(4.75)}{0.02}T \qquad [9]$$

$$R^{-2} = 0.70 \quad D.W. = 1.8 \quad SSE = 0.11 \quad \bar{Y} = 7.55$$

$$Ln(RGEE) = \underset{(21.15)}{3.47} - \underset{(10.23)}{0.44}Ln(RMILEX) + \underset{(4.33)}{0.04}\Delta Ln(RY) + \underset{(1.05)}{0.58}D1 \qquad [10]$$

$$R^{-2} = 0.82 \quad D.W. = 2.20 \quad SSE = 0.35 \quad \bar{Y} = 1.75$$

$$Ln(RGEH) = \underset{(19.38)}{2.13} - \underset{(13.98)}{0.38}Ln(RMILEX) + \underset{(2.53)}{0.03}\Delta Ln(RY) + \underset{(7.05)}{0.48}D1 \qquad [11]$$

$$R^{-2} = 0.91 \quad D.W. = 2.30 \quad SSE = 0.16 \quad \bar{Y} = 0.62$$

$$Ln(RI) = \underset{(10.55)}{4.39} - \underset{(3.20)}{0.29}Ln(RER) + \underset{(7.38)}{0.51}Ln(RFCAI_{-1})$$

$$+\underset{(8.22)}{0.64}\Delta Ln(RY) + \underset{(2.29)}{0.08}\Delta Ln(P) \qquad [12]$$

$$R^{-2} = 0.77 \quad D.W. = 1.6 \quad \rho = 0.20 \quad SEE = 0.22 \quad \bar{Y} = 7.39$$

$$Ln(P) = \underset{(3.56)}{0.71} - \underset{(3.84)}{0.05}RGAP_{-1} + \underset{(7.58)}{0.70}Ln(MPI) + \underset{(1.91)}{0.09}Ln(P_{-1}) \qquad [13]$$

$$R^{-2} = 0.95 \quad D.h. = 2.20 \quad SSE = 0.09 \quad \bar{Y} = 3.80$$

EXTERNAL SECTOR

$$Ln(RX) = 3.20 + 1.37\,Ln(WY) - 0.63\,Ln(XPI) + 0.17\,Ln(RER) \quad [14]$$
(3.88) (5.55) (7.63) (2.56)

$R^{-2} = 0.76$ $D.W. = 1.5$ $\rho = 0.23$ $SSE = 0.12$ $\bar{Y} = 6.80$

$$Ln(RXCOF) = 3.52 + 0.65\,Ln(WY) + 0.10\,Ln(XPK) \quad [15]$$
(1.92) (1.47) (2.41

$$+ 0.28\,Ln(RER) - 0.12\,Ln(COFPI)$$
(1.98) (1.58)

$R^{-2} = 0.37$ $D.W. = 2.1$ $SSE = 0.56$ $\bar{Y} = 6.28$

$$Ln(RXHK) = -8.67 + 4.04\,Ln(WY) - 1.38\,Ln(XPI) + 1.01\,Ln(RER) \quad [16]$$
(2.66) (4.15) (4.23) (3.77)

$R^{-2} = 0.46$ $D.W. = 1.18$ $\rho = 0.32$ $SSE = 1.9$ $\bar{Y} = 4.68$

$$Ln(RXOSN) = -5.68 + 2.30\,Ln(WY) - 0.04\,Ln(XPI) + 1.28\,Ln(RER) \quad [17]$$
(1.79) (3.05) (8.27) (4.97)

$R^{-2} = 0.90$ $D.W. = 1.6$ $\rho = 0.21$ $SSE = 2.00$ $\bar{Y} = 3.71$

$$Ln(RMNT) = 6.13 + 0.20\,Ln(RMO) - 0.55\,Ln\left(MPI/P\right)$$

(4.40) (0.94) (4.76

$$-0.27\,Ln(RFCA_{-1}) + 0.32\,Ln(RX_{-1}) \qquad [18]$$

(2.94) (3.72)

$$R^{-2} = 0.50 \;\; D.W. = 1.70 \;\; SSE = 0.14 \;\; \bar{Y} = 7.76$$

$$Ln(RMFL) = 1.26 + 0.06\,Ln(RDY_{-1}) - 0.88\,Ln\left(MPI/P\right) + 0.60\,Ln(RMILEX1)$$

(2.91) (1.28) (3.12) (6.64) [19]

$$R^{-2} = 0.87 \;\; D.W. = 2.20 \;\; SSE = 2.50 \;\; \bar{Y} = 6.11$$

$$Ln(RGUN) = 12.02 + 2.32\,Ln(MP) - 1.23\,D1$$

(11.64) (7.14) (2.27) [20]

$$R^{-2} = 0.74 \;\; D.W. = 1.50 \;\; \rho = 0.20 \;\; SSE = 12.09 \;\; \bar{Y} = 5.14$$

IDENTITIES AND DEFINITIONS

RY	= RRY*RFCA	(24)
Y	= (RY*P)/100	(25)
OY	= Y - AO - MO	(26)
AO	= (RAO*P)/100	(27)
MO	= (RMO*P)/100	(28)
STR	= STR1*CUR	(29)
RFCA	= (RFCA1/CUR)	(30)
FCA	= (RFCA*P)/100	(31)
RDY	= RY - RIT	(32)
RIT	= (IT*100)/P	(33)
DY	= Y - IT	(34)
DC	= PC - MCD - MCND	(35)
PC	= (RC*P)/100	(36)
MCD	= (RMCD*P)/100	(37)
MCND	= (RMCND*P)/P	(38)
I	= (RI*P)/100	(39)
ROG	= RG - RGEE1 - RGEH1 - RMILEX1	(40)
RGEE1	= RGEE*RY	(41)
RGEH1	= RGEH*RY	(42)
GEE	= (RGEE1*P)/100	(43)
GEH	= (RGEH1*P)/100	(44)
OG	= (ROG*P)/100	(45)
G	= GEE + GEH + MILEX + OG	(46)
X	= (RX*XPI)/100	(47)
OX	= X - XCOF - XHK - XOSN	(48)
XCOF	= (RXCOF*COFPI)/100	(49)
XHK	= (RXHK*XPI)/100	(50)
XOSN	= (RXOSN*XPI)/100	(51)
TX	= XCOF + XHK + XOSN + OX + GR	(52)
TM	= MCD + MCND + MNT + MFL + GUN + OM	(53)
MNT	= (RMNT*MPI)/100	(54)
MFL	= (RMFL*MPI)/100	(55)
GUN	= (RGUN*MPI)/100	(56)
MT	= TM - GUN	(57)

AP	= MPI/P	(58)
RER	= (EXR*WWPI)/P	(59)
Y1	= PC + G + I + TX - TM	(60)
GAP	= Y - Y1	(61)
RGAP	= (GAP/P)*100	(62)
CA	= TX - TM	(63)

LIST AND DEFINITIONS OF VARIABLES

N.B: all real variables are in 1985 prices.

A. ENDOGENOUS VARIABLES

AO	= agricultural output (nominal) - million birr
AP	= ratio of import to domestic prices (MPI/P)
CA	= current account balance - million birr
CUR	= capacity utilization rate (RMO/CMO)
DC	= private consumption expenditures on domestic goods - million birr
GAP	= gap between aggregate expenditures and total output (nominal) as a ratio of nominal output
GEE	= government expenditures on education (nominal)- million birr
GEH	= government expenditures on health (nominal)- million birr
GUN	= nominal arms imports - million birr
I	= nominal investment expenditures - Million birr
IT	= indirect taxes - million birr
LAFI	= agricultural labor force index (1980=100)
LM	= labor force in manufacturing-thousands of individuals
MCD	= imports of consumer durables (nominal) - million birr
MCND	= imports of consumer non-durables (nominal)- million birr
MFL	= imports of fuel and lubricants (nominal) - million birr
MNT	= imports of intermediate inputs (nominal) - million birr
MO	= manufacturing output (nominal) - million birr
MT	= total non-military imports (nominal)- million birr
OG	= other government expenditures - million birr
OY	= output of other sectors - million birr (nominal)
OX	= other exports - million birr
P	= domestic consumer price index - 1985=100
PC	= total private consumption (nominal) - million birr
RAO	= real agricultural output - million birr
RC	= real private consumption - million birr
RDY	= real disposable income - million birr
RER	= real exchange rate (based on world whole sale price index - WWPI)
RFCA	= real capital stock, adjusted for capacity utilization - million birr
RFCA1	= real capital stock, unadjusted for capacity utilization - million birr
RG	= real government expenditures - million birr
RGAP	= gap between aggregate expenditures and total output (real)
RGEE	= real government expenditures on education to output ratio
RGEE1	= real government expenditures on education - million birr
RGEH	= real government expenditures on health to output ratio
RGEH1	= real government expenditures on health - million birr

RI	= real investment expenditures - million birr
RIT	= real indirect taxes - million birr
RMCD	= real imports of consumer durables - million birr
RMCND	= real imports of consumer non-durables - million birr
RMILEX	= the ratio of military expenditures to output
RMNT	= real imports of intermediate inputs - million birr
RMO	= real manufacturing output - million birr
RMFL	= real imports of fuel and lubricants - million birr
ROG	= real other government expenditures - million birr
RRY	= ratio of real output to capital stock- RY/RF
RX	= total real exports - million birr
RXCOF	= real exports of coffee - million birr
RXHK	= real exports of hides and skins - million birr
RXOSN	= real exports of oil seeds & nuts - million birr
RY	= real total output at factor cost - million birr
STR	= total employed labor force - millions of individuals
TM	= total imports (nominal) - million birr
TX	= export earnings and net transfers - million birr
XCOF	= nominal value of coffee exports - million birr
XHK	= exports of hides and skins (nominal) - million birr
XOSN	= exports of oil seeds & nuts (nominal)- million birr
Y	= nominal total output - million birr
Y1	= aggregate demand - million birr (nominal)

B. EXOGENOUS VARIABLES

CAPI	= capital inflow (net changes in reserves plus current account balance as a ratio of output)
COFPI	= export price index of coffee - 1985=100
CMO	= capacity manufacturing output - million birr
BD	= central government budget deficit - million birr
D1	= dummy variable (1975 - 1987 = 1)
ERR	= statistical error in national account
ETI	= weighted import and export price index, 1985=100
EXDC	= excess domestic credit (difference between growth in domestic credit and real GDP growth
EXR	= nominal exchange rate (birr/$US)
GR	= net transfers (grants+aid) - million birr
MP	= size of armed forces - thousands of individuals
MPI	= import price index - 1985=100
MS	= total money supply (currency + demand deposit) - million birr
MILEX	= military expenditures - million birr (nominal)
OM	= other imports - million birr
POP	= population - millions of individuals
RF	= rainfall - millimetres
RFR	= real international reserves - millions of SDRs
RGR	= real net transfers (grants+aid) - million birr
RMD	= real money demand - million birr
RMILEX1	= real military expenditures - million birr
RMS	= real money supply (currency + demand deposits) - million birr
ROP	= relative openness (the ratio of imports & exports to GDP)
RTGB	= total government borrowing - million birr
RWR	= real wage rate in manufacturing

STR1 = total labor force - millions of individuals
T = time trend
TLF = ratio of total labor force to capital stock
TOT = terms of trade (export/import)
V = income velocity (ratio of total output to money supply)
W = wage bill in manufacturing - thousands of birr
WWPI = world wholesale price index (1985=100)
WY = world GDP index - 1985=100
XPI = export price index - 1985=100
XPK = unit price index of Kenyan exports (1985=100)