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Macroeconomic Adjustment
and Growth

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Fiscal Policy with Fixed Nominal Exchange Rates

Côte d'Ivoire

Christophe Chamley
and
Hafez Ghanem

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Côte d'Ivoire's increase in debt in the 1980s (from 30 percent of GDP to 100 percent) did little for new investment, because the investment-GDP ratio barely compensated for inflation. The country's fiscal stance hurt the real exchange rate and international competitiveness.

WORKING PAPERS

**Macroeconomic Adjustment
and Growth**

WPS 658

This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of a PRE research project, "The Macroeconomics of the Public Sector Deficit" (RPO 675-31). Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Raquel Luz, room N11-057, extension 34303 (65 pages).

Côte d'Ivoire represents an ideal opportunity for a case study of the effects of fiscal policy in a developing country with a fixed exchange rate. For the last 15 years, the growth of the Ivorian economy has been dramatically affected by both exogenous factors and the responses of fiscal policy.

After a commodity boom in 1976-77, expansionary fiscal policies increased the price of nontradable goods relative to tradable goods.

Government deficits induced large external deficits.

Chamley and Ghanem analyze the structure of government spending and revenues to investigate whether there is a relationship between the large government deficits and the Ivorian economy's poor performance during the 1980s. They also examine what factors determine the real exchange rate and the external balance.

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I. INTRODUCTION

The fiscal deficit in Cote d'Ivoire has averaged 9 percent of GDP during the eighties. The ratio exceeded 12 percent in 1980 and 1981. Its theoretical value (total expenditures minus revenues, including parastatals), is now greater than 14 percent. Its actual value is unknown since the government has stopped the service of its foreign debt since April 1987 and has accumulated a large amount of domestic arrears. Numerous missions of the Fund and the Bank have repeatedly emphasized that the level of government spending is not sustainable, and have suggested many reforms to address the issue. The most recent attempt at so-called "redressement" concentrates again on the reduction of spending and of the public deficit. This paper describes how the large deficits developed in Cote d'Ivoire and led to the current crisis. We focus on the impacts of these deficits on the competitiveness of the economy, its credit worthiness and its growth.

The present economic situation of Cote d'Ivoire is dismal. The coffee/cocoa price boom of the mid-seventies threw the macroeconomic policy on the wrong track and severe imbalances became obvious in 1980 when the internal and the external deficit exceeded 10 percent of GDP. Since 1980, numerous attempts have been made at putting the economy back to a growth path. During this 10 year period:

- Real GDP has been stagnant, with the same level in 1980 and 1987. It has decreased since 1983 while the population kept growing at a rapid pace.

- Employment in the formal private sector (non agricultural), has decreased from 200,000 in 1982 to 146,000 in 1988, which represents about 1.4 percent of the population.

- Total investment has decreased from 35 percent of GDP in 1977 to less than 15 percent since 1984. The deficit of the government has increased from 12 percent to 15 percent, on an accrual basis.

- The financial system is now stalled, with many insolvent debtors.

- Foreign lending to the private sector has stopped for the last eight years. Since 1982, all net foreign borrowing has been made by the government, which seems to have exhausted its present borrowing capability.

- The level of the foreign debt exceeds now 100 percent of GDP. No one expects this debt to be paid back, and its value on the secondary market is between 5 and 10 percent.

The purpose of this paper is to investigate the possibility of a relation between the dismal performance of the economy and the large levels of government deficits. Such linkages are difficult to establish even with a large sample. Since this study is limited to one country, the analysis has to rely on a variety of data.

There is a possibility that the deficits in Cote' d'Ivoire are more the symptoms of a disease of general mismanagement rather than the cause of the absence of real growth. An important issue is whether the current crisis is due to the non competitiveness of the economy and whether the failure of the real exchange to adjust may be due to some rigidity. This analysis of this problem is beyond the scope of the present study.

The paper is organized as follows. In Section 2, we review the impact of the celebrated commodity boom of 1976-1977 and its aftermath. A quantitative evaluation of the external shocks that have affected the primary exports shows

that the position of the country is now back to its initial state before the boom. The vulnerability of the public revenues and of the whole economy to international fluctuations has increased.

In Section 3, a positive description of the fiscal policy is provided through the structural definition of the deficit. We will also review the main components of revenues and expenditures in their relation with the evolution of the deficit. An important cause of debt accumulation has been the steady increase of government current expenditures.

In Section 4, we address the issue of the impact of the fiscal policy on the level of domestic prices, the competitiveness of the economy, the external balance, and the level of saving and investment.

II. EXTERNAL SHOCKS

2.1 Commodity Prices

The economy of Cote d'Ivoire has been heavily dependent on its two main exports, cocoa and coffee. This dependency has increased over the last twenty years. The prices of these two commodities show two remarkable properties:

1. The prices are highly variable. Their evolution since 1960 is represented in Figure 1. One can observe readily the very significant boom of the mid-seventies which appears *ex post*, as an anomaly in the time series. Prices seem to have been more variable since 1975.

2. The comovements of the prices is remarkable since some external factors which affect these two commodities are independent. For instance, the sudden rise of coffee prices in 1976 was caused by a frost in Brazil.

3. There is no apparent trend of the prices of cocoa and coffee. Their ratio has also been remarkably constant since the early seventies.

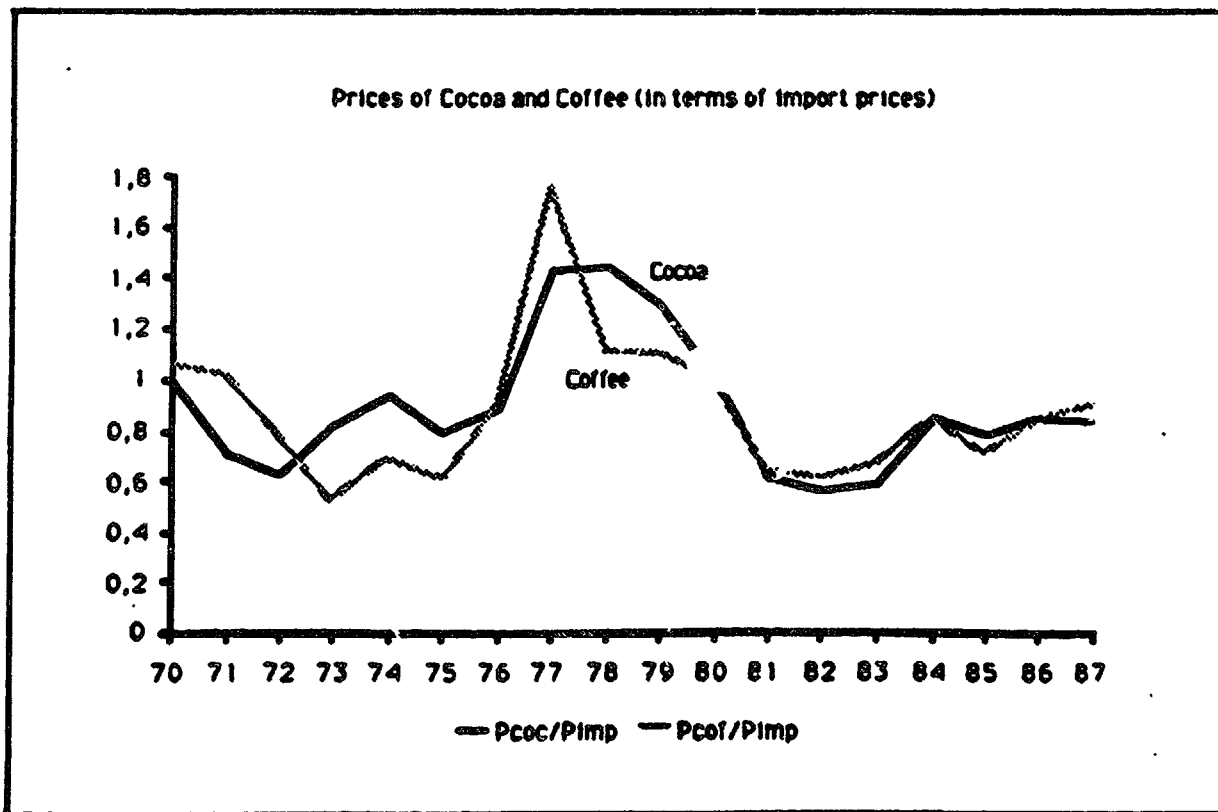
The figure 1 shows no evidence of a random walk. A simple regression of prices on their lagged values show that the behavior of logarithms of the prices (in terms of import prices), can be described by the equations

$$p_t - p^* = .5(p_{t-1} - p^*) + \epsilon_t \quad (R^2 = .22, \text{ t stat.} = 2.) \text{ for cocoa, and}$$

$$p_t - p_{t-1}^* = -.5(p_{t-2} - p^*) + \epsilon_t \quad (R^2 = .22, \text{ t stat.} = 2.) \text{ for coffee.}$$

Both of these equations show a regression towards the trend value p^* (which can be normalized at zero). There is thus no evidence that price

FIGURE 1



innovations induce a permanent shock, as would be the case if prices followed a random walk. A more detailed analysis of the properties of the time series of the two basic commodity prices was undertaken in the background of this paper. Since *ex post* forecasting is easy, the study has attempted to detect whether there was some evidence of a trend in 1979, before the adjustment program began. No such evidence could be detected¹.

In view of these properties, it may be interesting to recall some of the perceptions during the first commodity boom. First, it seems that a distinction was to be made between the two commodities: The coffee boom was understood to be the result of a freeze in Brazil, and was perceived as temporary. However, the increase of the price of cocoa (which was not as spectacular as that of coffee), was apparently perceived as permanent. The cause for this myopia is not clear. Note that the duration of the cocoa boom was a little longer for cocoa. In 1979, authorities had experienced three years of largely above trend prices, (see Figure 1), and they were very slow in recognizing that the boom had been indeed temporary.

The boom of the mid-eighties encouraged misperceptions of the policy makers about the long-run level of prices. The current slump to historical lows does not appear to be out of line with price fluctuations. However, it has precipitated the most severe crisis in the history of the country because of the accumulation of debt since 1978.

¹Others have studied this issue (Cuddington and Urzua, [1987], Ardeni and Wright, [1990]). An important issue here is to consider only the information available in 1979 when the government pursued a policy of high expenditures despite the end of the boom.

2.2 Measurement of External Shocks

The fiscal and economic crisis of the eighties, which has deepened recently, has been blamed on a combination of external shocks and fiscal policies poorly designed and implemented. In order to disentangle these causes, we have computed some measurements of the external shocks which have affected the markets for primary commodities and the service of the foreign debt. Our purpose is to measure how variations of the prices and quantities of the three primary commodities (coffee, cocoa and wood), and the flow of the debt service affected the national income of the country. We ignore induced effects and follow an accounting approach.

For the economy of Cote d'Ivoire, the definition of national income Y can be rewritten as

$$Y_t = \sum_{i=1}^{i=4} P_{i,t} X_{i,t} + H_t - P_{Q,t} Q_t - Z_t,$$

where $P_{i,t}$ and $X_{i,t}$ are the prices and the quantities of the exports of cocoa ($i=1$), coffee ($i=2$), wood ($i=3$), and other commodities ($i=4$), respectively. The production of these goods requires some domestic inputs and they are entirely exported; the value added in other sectors of the economy is equal to H_t . The terms $P_{Q,t} Q_t$ represents the value of imports, and Z is equal to the interest payment on foreign borrowings. All prices are deflated by a domestic price index (i.e., the GDP deflator).

In this method, we attribute all changes of $X_{i,t}$ to exogenous factors. There is no difficulty in doing so provided that we are aware of the assumption. The same remark applies to the service of the foreign debt.

Denote by an asterisk a value in the base year which will be chosen to be 1975, the last before the commodity boom. A change in income that is due to changes of P, X and Z can be decomposed into:

$$\Delta Y_t = Y_t - Y_t^* = P_t X_t - P_t^* X_t^* - (Z_t - Z_t^*),$$

which can be rewritten

$$Y = (P_t - P_t^*) X_t + (X_t - X_t^*) P_t^* - (Z_t - Z_t^*), \text{ or in words,}$$

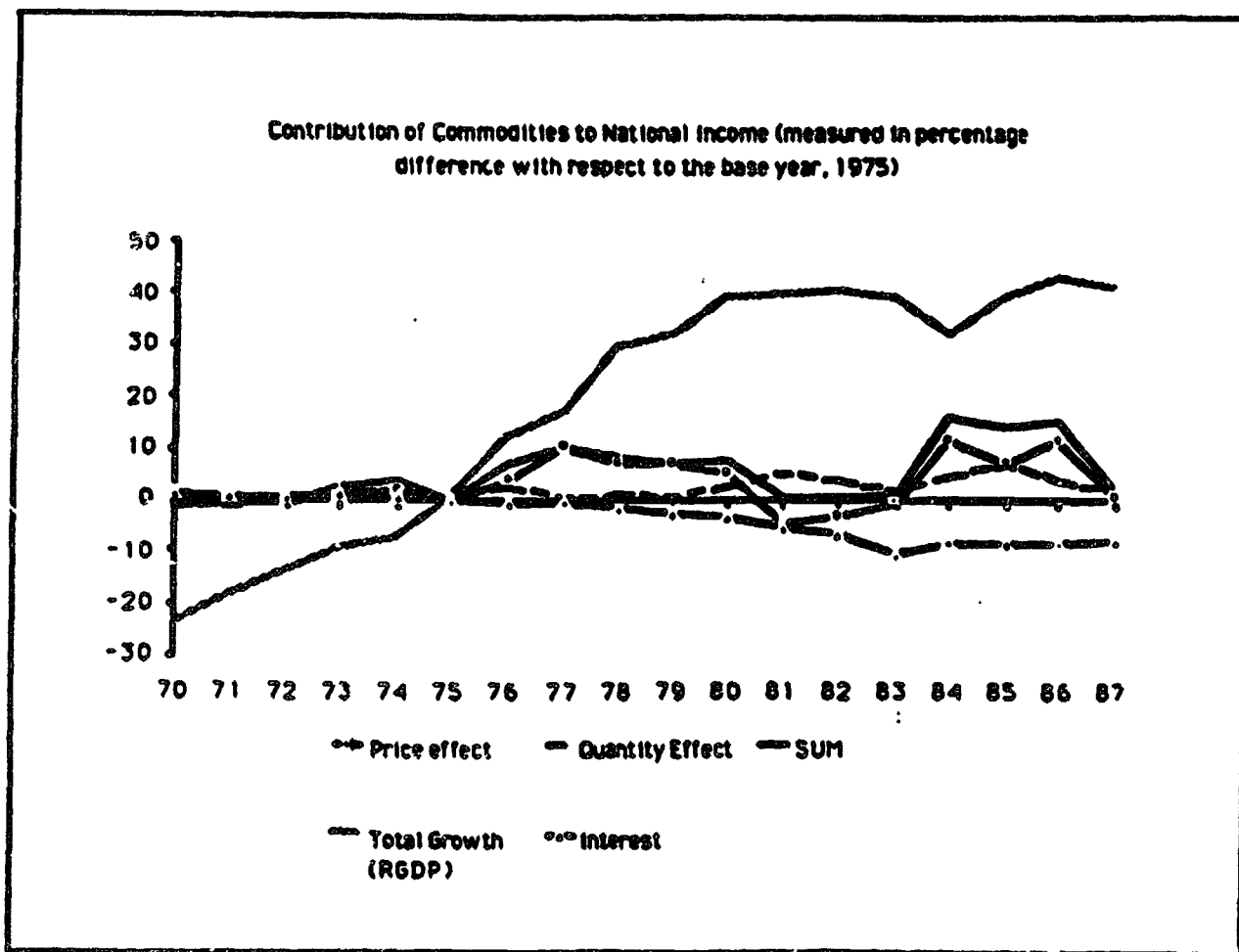
Total Variation = Price Change + Quantity Change - Debt Service.

This expression is not a linear approximation. Note that the price effect is measured with the actual level of output X. This is not surprising. The output of cocoa tripled from 1975 to 1985, and a percentage point increase of P in 1985 has a bigger effect than in 1975. In order to normalize the changes we divide all terms by the level of output in the base year, and we have

$$\begin{aligned} \Delta Y_t / Y_t &= [(P_t - P_t^*) / P_t] (P_t X_t / Y_t^*) + [(X_t - X_t^*) / X_t^*] (P_t^* X_t^* / Y_t^*) \\ &\quad - (Z_t - Z_t^*) / Y_t^* . \end{aligned}$$

The values of the components of the shocks for quantities, prices and the debt service are represented in Figure 2. The decomposition in price and

FIGURE 2



quantity effects is presented in Figure 15 and 16 in the Appendix. They illustrate some interesting facts about the contribution of the primary sector to economic growth in Cote d'Ivoire:

1. There is no evidence of an upwards trend of the prices of the three commodities. During the second boom (84-86) prices increased less than in the first. Their impact however was greater because output had increased since the seventies.

2. There is apparently no evidence of a contribution of the primary exporting sector to growth over the last fifteen years. This is very striking: The main policy makers have emphasized the role of the primary commodities in the development of national wealth.

The increase of real output in the cocoa sector was partially offset by declines in the production of coffee and wood. Between 1975 and 1987, the total growth of real output for the sum of the three commodities (weighted by their shares in GDP) was only 2 percent!

The sector of primary commodities became more sensitive to price fluctuations since the share of wood which has a less volatile price was reduced in favor of cocoa. Therefore, the evolution of the activities producing primary commodities was such that they provided a small contribution to the long-run growth of the economy while making it more vulnerable to external shock.

3. The current level of prices is at a historical low. This precipitated the current crisis. But this crisis should not hide the previous facts, i.e. that the contribution of the primary commodities on growth trend is dubious.

4. The figure also shows that the service of the debt has increased in 1989 to a level that is equal to 12 percent of 1975 GDP in 1989.

The public sector has captured most of the windfall gains since 1975. The large fluctuations which have been described here had a decisive impact on the balance of the government budget to which we now turn.

III. PUBLIC REVENUES AND EXPENDITURES

The fiscal policy in Cote d'Ivoire has been characterized by wide fluctuations of revenues, expenditures and deficits. In order to put these in some perspective we will use the notions of structural levels of revenues and deficit, which are familiar in industrialized countries. In this section we first present a brief description of the sources of public revenues and a discussion of their structural level. The level of structural revenues will provide the basis for the computation of the structural surplus (or deficit). After this computation, we will consider how the composition and the drift of expenditures led to the fiscal deficit and the present crisis.

3.1 The Structural Level of Public Revenues

The structure of public revenues in Cote d'Ivoire similar to that of other Sub-Saharan countries²: The domestic sector which is formal and non agricultural is very small. Hence the domestic base for taxation is narrow, and most taxes are levied at the border or on the rural sector that sells the primary commodities (cocoa and coffee), to a marketing board. A description of the basic composition of revenues is essential for the understanding of the fiscal policy since 1975.

The institutional rules of the CFA put severe restrictions on domestic borrowings by the government: the level of the domestic government debt cannot exceed 20 percent of the previous year's tax revenues. This creates an

²See the survey of Tanzi [1988].

opportunity for a one time deficit, and this opportunity was used immediately after the first commodity boom, in 1978-1979. Once the ceiling has been reached any further borrowing depends on the growth rate of the tax base which is closely linked to that of the formal sector. We will see there was little such growth, if any, since 1980. The primary purpose of this institutional rule is to prevent the the government from financing expenditures by issuing a currency that is backed by the monetary union (and the French Treasury). A permanent money growth for financing is thus infeasible in Cote d'Ivoire.

There is however, no institutional restriction on the level of foreign borrowing by the government. All public financial resources depend on taxes and foreign borrowings. Fiscal revenues are raised through implicit and explicit taxes.

3.1.1. Implicit Taxes

All the domestic production of the cocoa and coffee is sold to a marketing board ("*Caisse de Stabilization*"), which handles the exports. The gap between the border and the producer prices, net of procession costs, generates implicit taxes. The producer prices have varied very little until recently (in terms of the domestic price level), and the marketing board, which is the arm of the government in this sector, has absorbed all the wide fluctuations of the border prices.

Such a policy of price smoothing is very reasonable since the public sector in Cote d'Ivoire has better access to foreign credit markets which can provide insurance to the economy. However, since the revenues of the government fluctuate widely, it is essential to keep track of the long-run

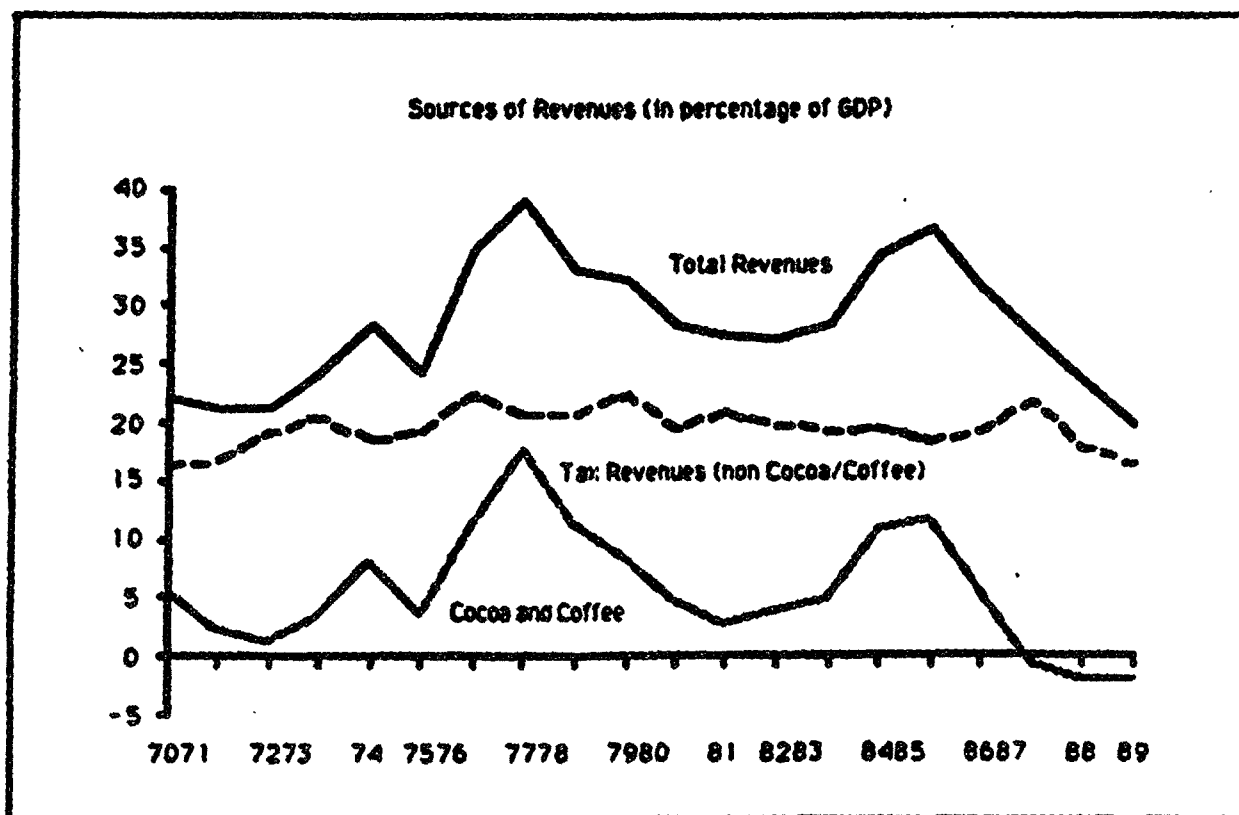
level of the border prices and not to expect that temporary price increases as permanent shifts in the terms of trade. Unfortunately such myopic behavior seems to have been the rule since the first commodity boom of the mid-seventies. Cocoa and coffee revenues are plotted as a percentage of GDP in Figure 3. They match closely the windfall gains and losses for the entire economy (compare with Figure 1).

3.1.2. Explicit Taxes

Since 1980, the burden of explicit taxes has reached about the maximum that is allowable in the economy. During the eighties, repeated changes of the statutory rates or tariffs, VAT and direct taxes on personal and business income have attempted to induce an augmentation of revenues. They led to failures. The values of the statutory rates and the structure of the economy are such that further increases of the rates lead only to higher evasion, shifts of activities towards the informal sector, and smuggling.

The most recent such attempt was in 1987 when tariffs were increased by 30% across the board, and the normal VAT rate of 25% extended to commerce. Initially, this led to increases in nominal revenue as well as in its share of GDP. Thus, revenue from import duties rose from CFAF 233 billion in 1986 to CFAF 245 billion in 1987, despite a decline in the CIF value of imports. The ratio of tariff revenue to imports rose from 33 to 36%. Similarly, revenue from domestic indirect taxes rose from CFAF 195 billion (6% of GDP) to CFAF 224 billion (7% of GDP). As a result, total tax revenue (increased from 18 to 20% of GDP). However, those revenue increases proved to be short-lived. The tax base shrunk due to a decline in economic activity as GDP in current prices

FIGURE 3



fell by 3.9% in 1987, 1.6% in 1988 and 3.3% in 1989. Thus, all categories of revenues fell in absolute terms. The tax base decreased even further due to increased fraud and increasing ad-hoc tax and tariff exemptions, as economic agents tried to avoid the higher tax rates. This has been especially true for import tariffs, as the ratio of tariff revenue to total revenue in 1989 was below its 1986 level, despite the higher rates. Overall tax revenue as a proportion of GDP fell from their 1987 peak, so that by 1989 the tax to GDP ratio stood at the same level as 1986 (see table below).

The Evolution of Tax Revenue 1986-90 (CFAF billion):

	1986	1987	1988	1989
Import duties	233	245	214	213
Direct taxes	150	152	150	1242
Indirect domestic taxes	195	224	206	188
Total tax revenue	578	621	570	543
GDP	3244	3118	3068	2967
Imports (CIF)	709	672	620	658
Import duties/imports (5)	33%	36%	35%	32%
Taxes/GDP (%)	18%	20%	19%	18%

Because of the small tax base, the average effective rate of taxation in the formal non agricultural sector nears 50 percent, (see Appendix A). the ratio between non cocoa-coffee public revenues and measured GDP has thus fluctuated remarkably little since 1975, as one can see in Figure 3. Its value has followed a path that is slowly but definitely declining.

3.1.3. The Structural Level of Public Revenues

A key issue in the evaluation of the fiscal stance is the definition of a long-run level of revenues. In an industrialized country the long-run level of taxes would be determined by an agreement between tax payers about the desirable fraction of permanent income that should be used to finance public expenditures. The value of this ratio is typically less than the maximum that is feasible, (the level at the top of the "Laffer curve"). In Cote d'Ivoire, the situation is simple in some respect since numerous policy studies reforms and experiments during the eighties have shown that the level of explicit taxes as a percentage of GDP cannot be raised. The ratio between explicit taxes and GDP can therefore be considered to be the maximum feasible, and defines for us the structural value of explicit tax revenues.

The main source of the fluctuations of the revenues comes from the implicit taxes. Consider cocoa for instance: Revenues of the implicit tax on cocoa fluctuate with the international price and the quantity of supply, which may be affected by droughts, as in the early eighties. In the definition of the structural level of the cocoa tax we have to take into account both effects. We define this level by the following formula:

$$R_t = (p_t - c_t)X_t - (p_t^* - c_t)X_t^* ,$$

where X_t is the actual real output of the crop, X_t^* is the trend value, p_t is the border price, p_t^* its long-run value, and c_t is the producer price including processing costs. The value of p_t^* is taken to be equal to that in the reference year (1975), adjusted for inflation,

$$R_t = \frac{P_{75} P_t}{P_{75}},$$

where P_t is the GDP deflator.

The deviation of revenues from the "standard" level can be expressed as fraction of GDP, and we replace the above formula by

$$R_t = \frac{(P_t X_t - \frac{P_{75} P_t}{P_{75}}) X_t^* - c_t (X_t - X_t^*)}{GDP}$$

The trend values of the quantities are found by a simple regression. The same computation is then made for coffee and wood.

3.2 The Structural Surplus

We use three definitions of the actual surplus:

1. The overall surplus is the difference between total revenues and total expenditures.
2. The current surplus is the difference between total revenues and current expenditures.
3. The primary surplus is the equal to the difference between the overall surplus and the interest payments.
4. The primary current surplus is the difference between the current surplus and the interest payments.

These definitions provide different instruments to evaluate the surplus, or the deficit, from a long-term perspective. For example, a deficit that finances capital expenditures is not much different from the financial behavior of a private firm that invests in a period of growth, and is thus less worrisome than a deficit that finances current expenditures. This argument obviously ignores that private firms earn a financial return from investment in order to pay the interest of the debt, while the government investment often do not generate, at least directly, this earning capacity.

The values of the surplus that are obtained from the previous definitions are represented in Figure 4. These values are subject to large fluctuations because the structure of revenues is highly sensitive to external shocks. There is no reason for the government budget to be balanced in a given year, as there is no reason that it should be balanced on any given day or week. However, the budget constraint of the government over the long-run needs to be met. In order to iron out the cyclical fluctuations and evaluate the fiscal stance for the medium- to long-run, we use the measurements of the structural surplus.

The structural surplus is quite naturally defined as the difference between structural revenues and structural expenditures. We have already defined the structural revenues. Expenditures in Cote d'Ivoire are not linked to cycles as some public programs would be in industrialized countries (e.g., unemployment insurance). Hence, we make no correction of the expenditure side for the fluctuations of the economy. All expenditures are thus assumed to be discretionary and structural.

FIGURE 4

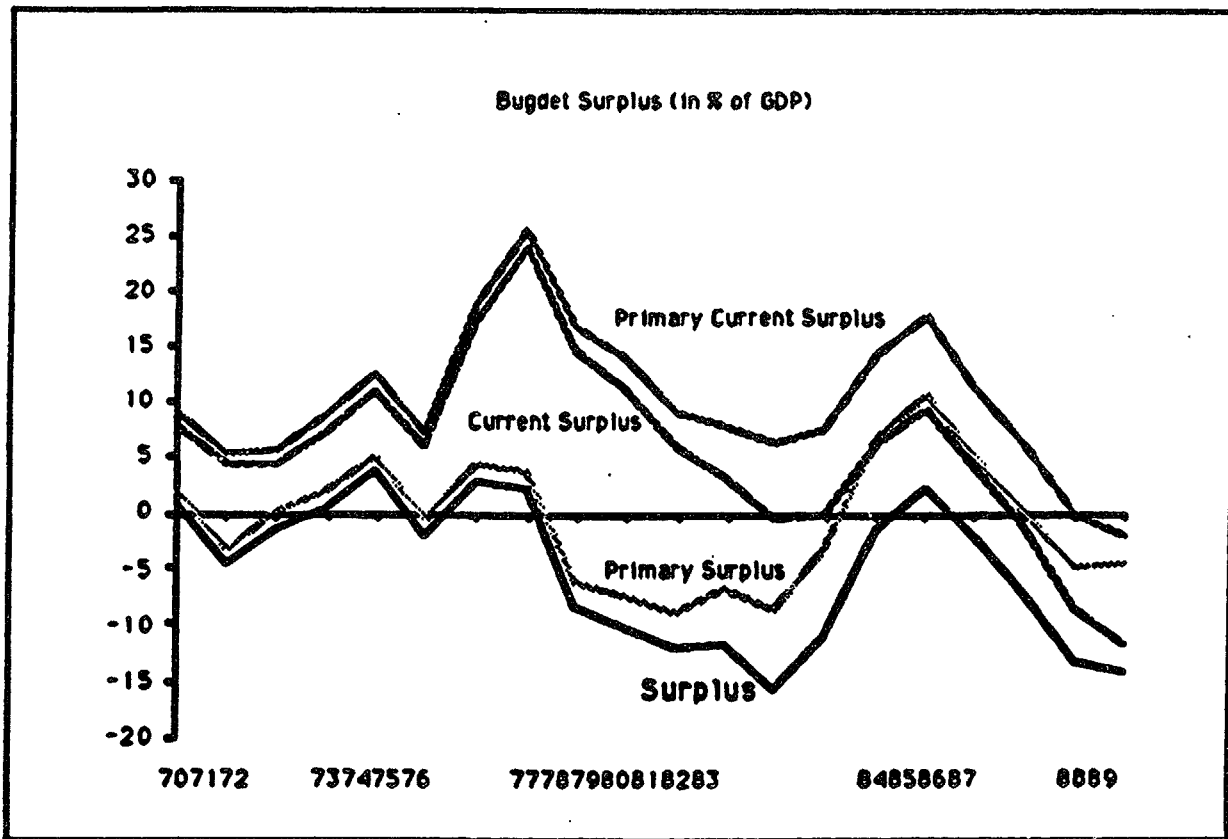
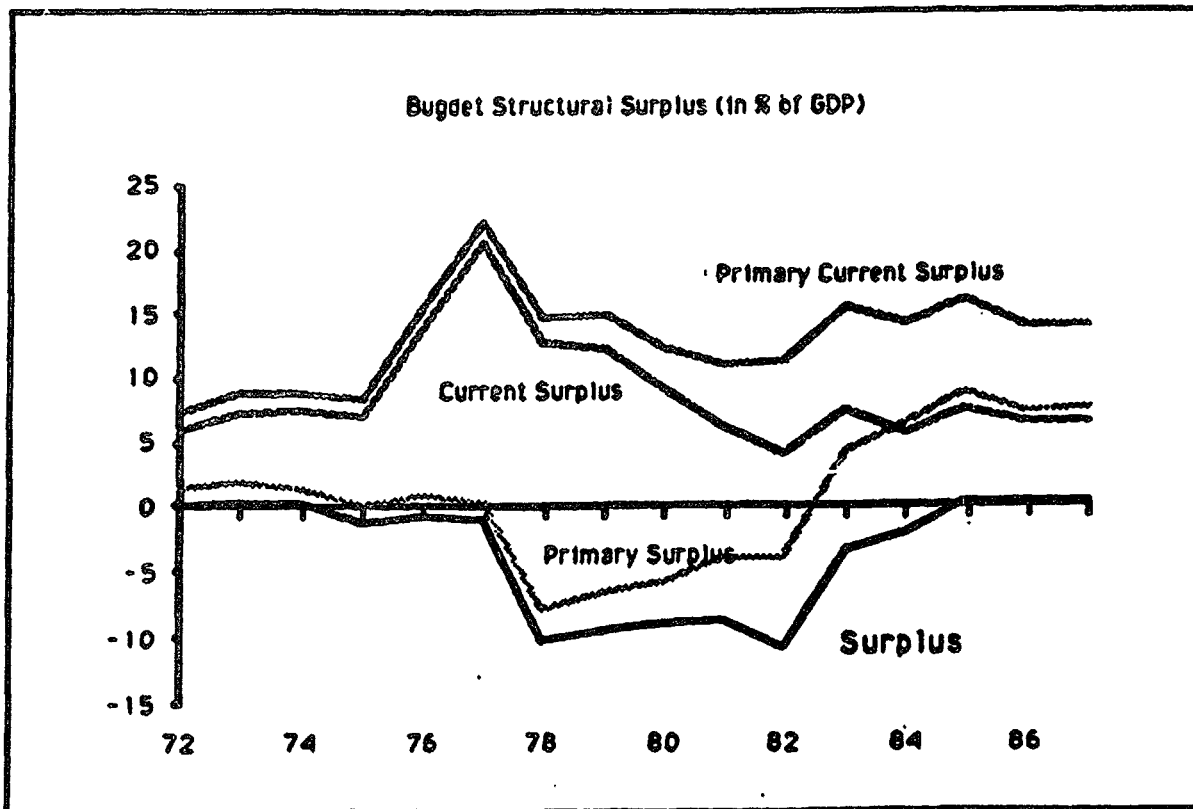


FIGURE 5



To each definition of the actual surplus corresponds a similar definition of the structural surplus. The values of the levels of the actual and of the structural surplus according to the various definitions are represented in Figures 4 and 5. They highlight very nicely the main features of the fiscal policy in Cote d'Ivoire over the last twenty years. The structural definitions of the surplus provide a much clearer view than that of the standard definitions. The most interesting fact concerns perhaps the overall deficit: three distinct regimes can be observed which are separated by relatively short transition periods (of about two years each).

1. Before 1975, the structural budget was in equilibrium.
2. In the first phase (1976 to 1982), the structural deficit jumped from about zero to 10 percent of GDP. It stayed very close to that value for six years until 1982.
3. Since 1985, the budget has been by and large in structural equilibrium.

The values of the surplus are computed here on an accrual basis. However, the Ivorian government has been accumulating arrears since 1987 at an annual rate of about 3 percent of GDP. More important, the service of the foreign debt (about 8 percent of GDP), has been suspended since the spring of 1987. The budget deficit on a cash basis is therefore lower than its accrual value. The primary surplus provides an indication of the surplus when the interest service of the debt is not paid. Since the non payment of foreign interest is at least partially structural (nobody expects the debt to be ever

serviced entirely), this definition of the structural surplus has some indicative value.

The present program of adjustment aims at a reduction of expenditures while maintaining or increasing the level of revenues. It is possible that these measures will lead to a structural surplus of the budget. This is a situation which has not yet been experienced by the economy of Cote d'Ivoire, and it reflects the gravity of the fiscal crisis.

3.3 Composition of Public Expenditures

The large structural deficits during the period 1977 to 1984 were driven by expenditures. The composition of these expenditures is one of the main issues in the discussion of the rise and fall of the deficit, and of the current fiscal policy. In this section we follow a fairly mechanical approach: First, the main flows of expenditures on goods and services for consumption, interest payments, and capital expenditures, are presented from an accounting point of view. Second, we evaluate how the application of some principles of public expenditures based on the idea of permanent consumption would have changed the path of the public debt. The other important issues about the impact of fiscal policy (e.g., the relation between the wage bill and labor costs), will be addressed in Section 4.

3.3.1 The Flows of Public Expenditures

During the first commodity boom, the public sector embarked on a spending program that extended well beyond the duration of the boom.

Half of the current expenditures were devoted to the wage bill. This ratio has not changed markedly since 1970. However, the level of total current expenditures increased dramatically because of the rising cost of the debt service.

The three main features of the pattern of expenditures were:

1. Current expenditures on non interest payments increased from an average of 16 percent of GDP before the boom to about 21 percent during the eighties, (Figure 6). For the ten years of macroeconomic adjustment, which began in 1980, one cannot detect any declining trend of the ratio between current non debt expenditures and GDP. Attempts at "structural adjustment" proved to be a complete failure in this respect.
2. The main cause of the significant deficits was the high level of capital expenditures which increased from 8 to 22 percent of GDP in the three years after 1975. Many of these expenditures were wasted on inefficient projects. The composition of public investment is discussed in the Appendix B. The pre 1982 levels were unsustainable, and the ratio between capital expenditures and GDP has declined steadily since 1979. Its current value (less than 5 percent), is probably not sufficient to cover the depreciation of the public capital stock.
3. The service of the debt (which is mainly foreign debt), has increased significantly, from 3 percent of GDP in 1980 to 9 percent in 1990 because two factors, i.e., the growth of the stock of the debt, and the increase of the world interest rates which took place in the eighties.

FIGURE 6

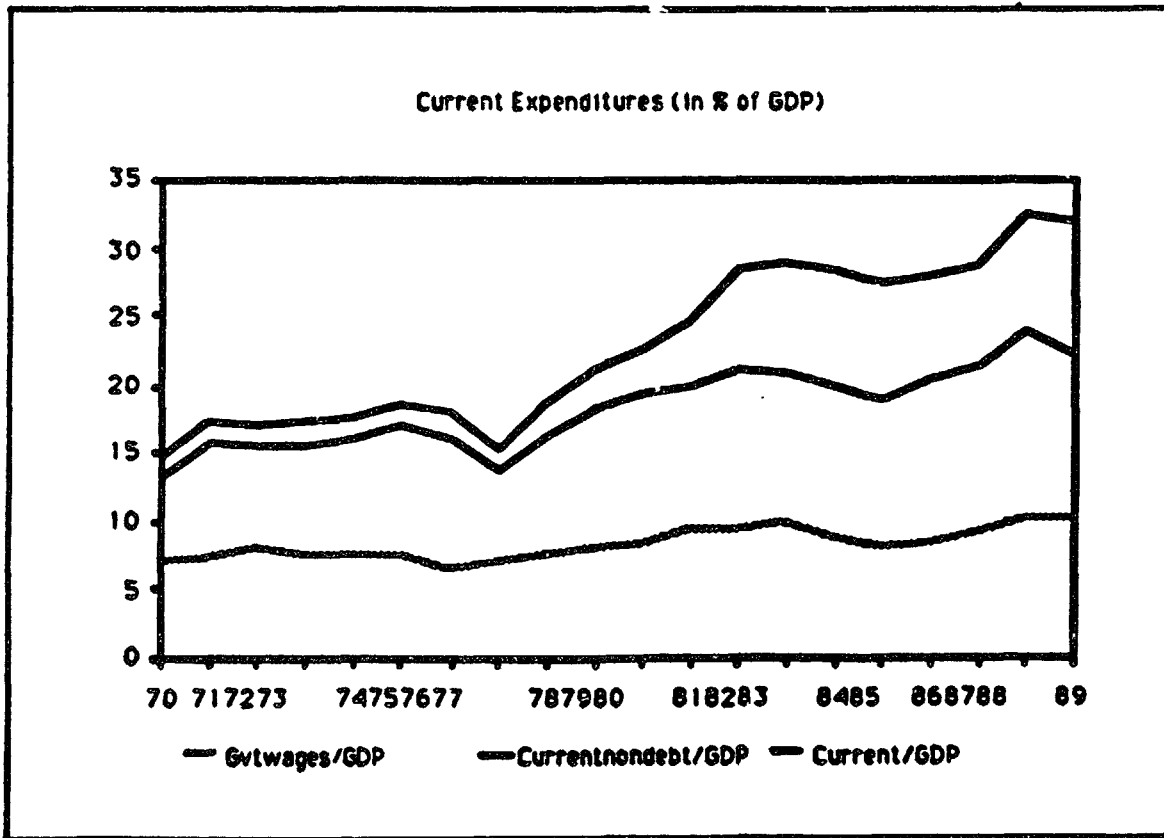
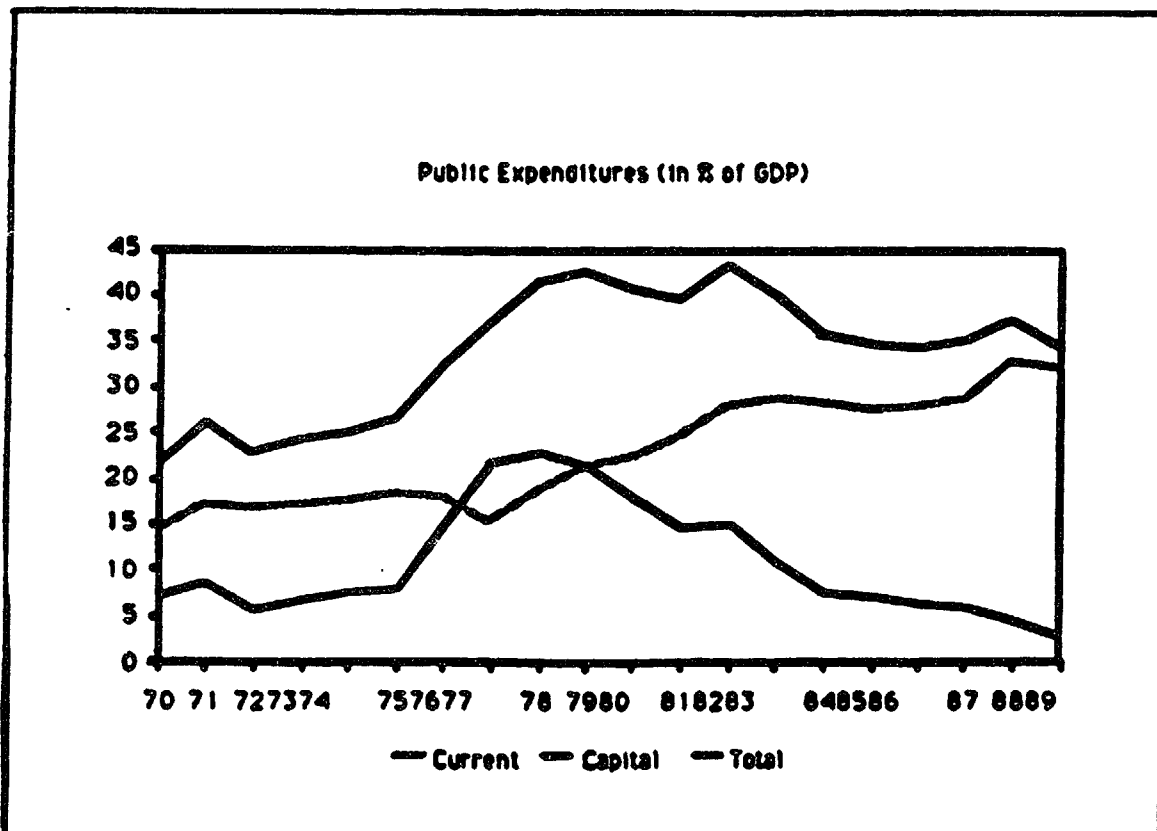


FIGURE 7



3.4 Simple Principles for Government Consumption

In this paragraph we compare the actual and the hypothetical patterns of public deficits and debt under some simple counterfactual assumptions.

1. The ratio of current expenditures (excluding debt) to GDP is maintained at a constant level that is equal to its 1975 value.
2. The structural deficit is maintained at a value that is compatible with a constant debt to GDP ratio which is equal to .5 with a growth rate of 3 percent per year (the average value during the period 1975). This value is somewhat optimistic. But the purpose of the results of the simulation will show that even under this optimistic assumption the pattern of expenditures was not "reasonable".
3. The level of total expenditures is equal to its efficient level in a theory of permanent consumption under uncertainty which is presented in more details in Appendix D.

One of the most striking features of the response of fiscal policy to the commodity boom in Cote d'Ivoire is the increase of consumption expenditures. It has already been pointed out that an important fraction of the current expenditures are on education and therefore on human investment. However, the high level of spending on education was not matched by a high level of real input or output. It resulted from a policy of high salaries, and these expenditures can therefore be viewed at least partially, as a form of transfer to individuals.

The rational principles of government consumption share common features with the theory of consumption for private individuals. In view of the

fluctuations of income, this theory has to take into account the uncertainty of the future flow of public revenues. Any theory of consumption which takes into account uncertainty and intertemporal choice will use some form of permanent income. We now turn to the application of these principles for the case of Cote d'Ivoire.

3.4.1. Application of the Principles of Efficient Public Consumption

A simple regression shows that the level of government income can be described by the equation:

$$z_t = 0.276 + 0.63(0.276 - z_{t-1}) + \epsilon_t \quad (R^2 = 0.38)$$

The representation of the actual and the fitted values is given in Figure 8.

We have computed efficient levels of public expenditures for a real growth rate of the economy of 6 percent (which is somewhat optimistic, as discussed previously). We assume also that the ratio between debt and government revenues that can be sustained in the long-run is equal to one (or about 30 percent of GDP). An equivalent assumption is a 3 percent growth rate and a debt ratio (to revenues) that is equal to 2. Note that the actual growth rate between 1975 and 1989 was 3 percent. The actual level of expenditures and the values obtained from the model of permanent consumption are represented in Figure 9. The variation of the optimal values are much smaller

FIGURE 8

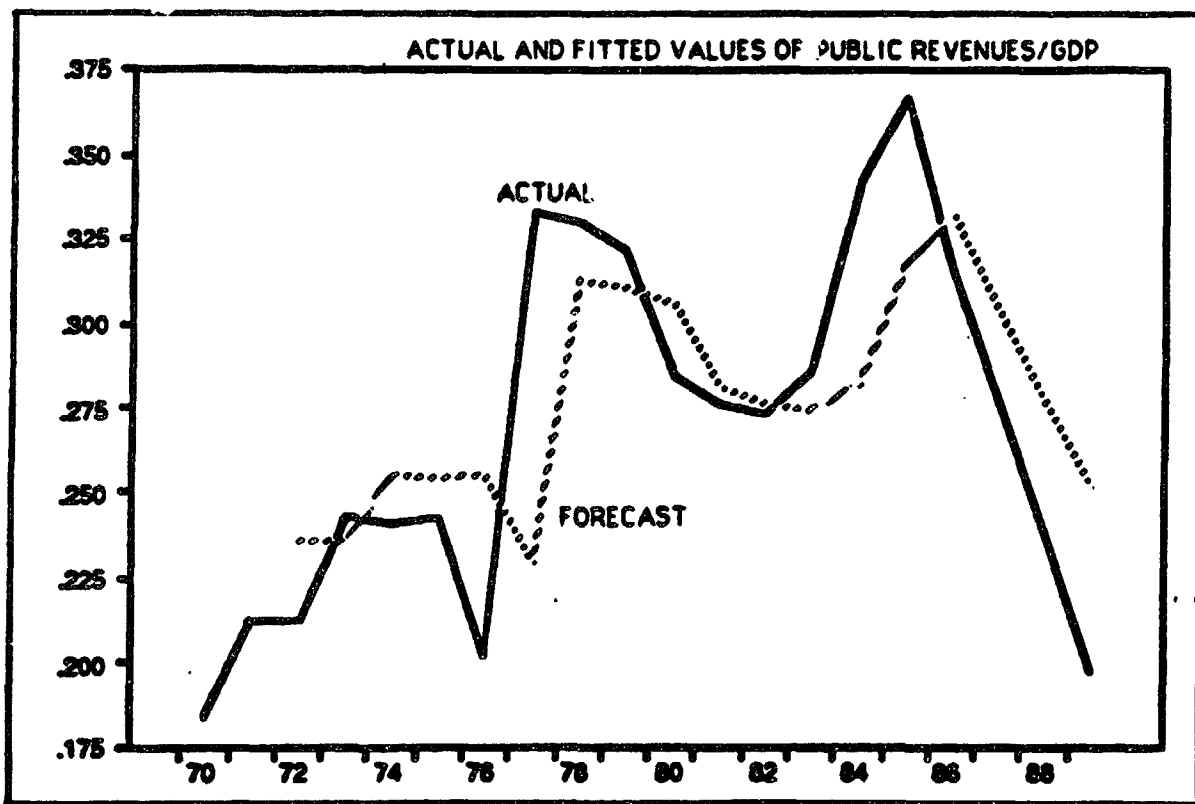
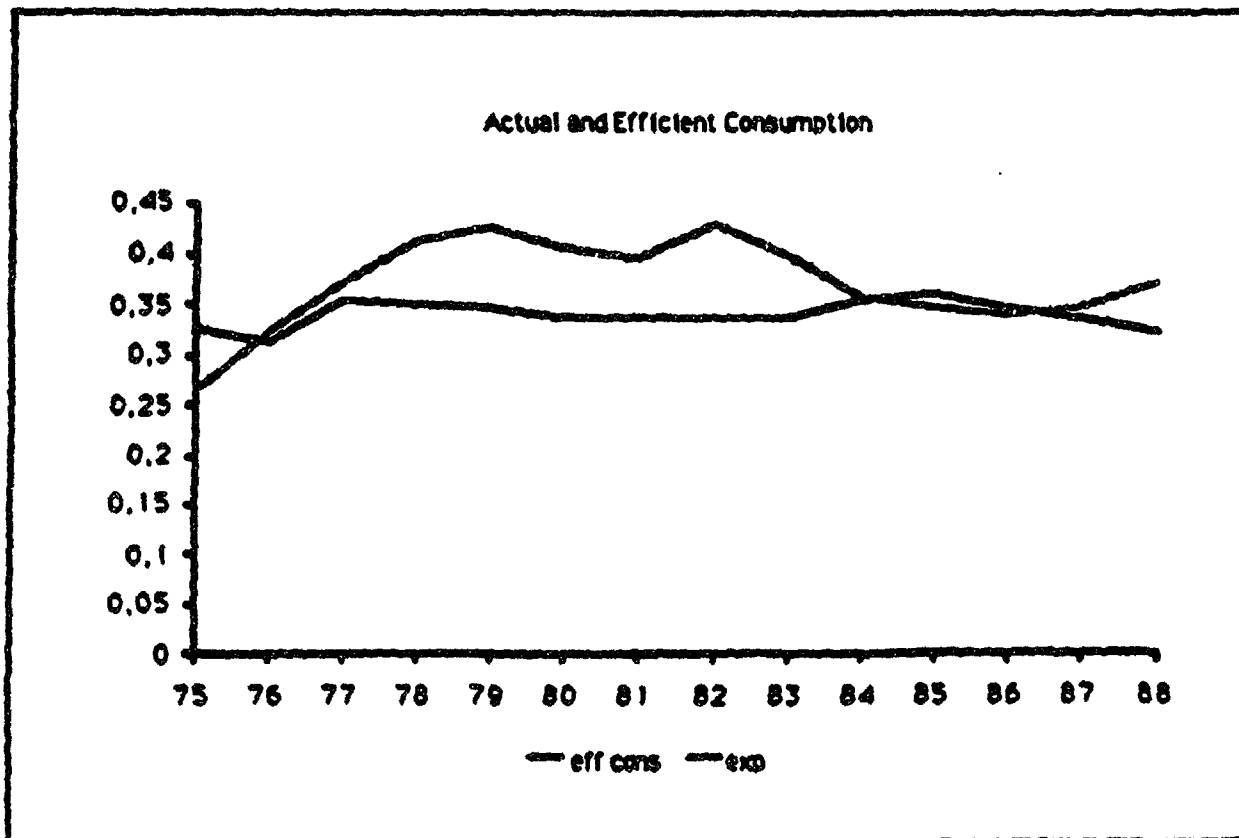


FIGURE 9



than the actual values. We can also not that the rise of consumption is much less pronounced for the theoretical values than for the actual values. The figure illustrates the myopic behavior of consumption in the decisions of the public sector.

IV. IMPACTS OF FISCAL POLICY

The expansionary fiscal policy that followed the commodity boom of 1976 raises the standard issues of the "dutch disease", of their impact on the external deficit and on the level of saving and investment. In this section we first provide a brief discussion of some theoretical issues. We then analyze the impact on the aggregate level of prices and on the relative prices between the main sectors of production.

4.1 The Price Level and the Real Exchange Rate

The price level in Cote d'Ivoire doubled from 1975 to 1980. This value has to be put in the perspective of the late seventies during which the worldwide inflation rate was also fairly high; the GDP deflator increased in France by 62 percent. Nevertheless, the higher inflation rate in Cote d'Ivoire had important effects in the regime of fixed nominal exchange rate. The positive inflation differential has been attributed by some to the high money growth rate and by others to the high level of government expenditures.

The Monetarist Interpretation

The high growth of the money supply, which doubled from the end of 1975 to the end of 1977, has led some credence to a monetarist explanation of the inflation rate after 1975. Such arguments have a firm base on arithmetics. Can we reasonably think that the money expansion was the cause for the sudden

rise of prices ? The main objection to the monetarist explanation is theoretical and follows from the institutional regime of economic policy.

The link between money expansion and prices is based on an "excess-supply" of money that leads to a price increase in order to clear the market for goods. But the policy regime is that of a fixed nominal exchange rate between Cote d'Ivoire and France with free capital mobility, at least in the direction from Cote d'Ivoire to France (and other capital markets)³. In this situation there can hardly be an excess supply of money. The relevant quantity of money for the country is the quantity in the whole currency zone. There may be a situation of "excess-demand" when the country is rationed for foreign liquidities. But this situation is not relevant both for the theoretical argument, and for the empirical facts of the period 75-80.

4.1.1. Relative Prices in the Boom

During the first commodity boom and the period that followed immediately the level and the structure of prices were significantly altered. Government expenditures expanded suddenly. Some of the expenditures were devoted to imports which have a price that is not too sensitive to the demand by Cote d'Ivoire. Public expenditures had also an impact on the demand for non traded

³One could argue about the restrictions about the outflow of capital. Anecdotal evidence about the remission of CFA notes from foreign deposits (notably in Switzerland) indicates that controls cannot be very effective for large deposit holders. Small depositors use money only for transaction and are probably not very sensitive to fluctuations of the opportunity cost of money in the range that has been observed under the CFA regime. Attempts to find an econometric relation between the level of money and the observed real interest rate have failed for Cote d'Ivoire.

goods for which the supply cannot be adjusted easily. Hence, prices increased more for services than for manufacturing. The ratio between some sectoral prices and the GDP deflator are represented in Figure 10. The curves of the prices of services and those of the other sectors of the economy (e.g. manufacturing, construction, in general industry), form a pincer: During the first two years of the boom (1976-1977), services led the price increases, while industrial prices lagged behind the average increase. This average is represented in the figure by the horizontal line at the level 100. In the second phase of the expansionary fiscal policy (from 1978 to 1981), the price increases were carried more to the other sectors of the economy. The behavior of the relative prices seem to fit an interpretation that is based on the rise of demand by the public sector. This expansion was financed at first by the revenues from the commodity boom in 1976-1978, and then by foreign borrowing in 1979-1980. We now consider the evolution of the overall level of prices and of the real exchange rate in relation to the fiscal policy.

4.1.2 The Impact of Fiscal Policy on the Real Exchange Rate

The rise of domestic prices during the first boom led to a loss of competitiveness of the economy. All the available indices follow similar paths. The ratios between price indices in Cote d'Ivoire and France are represented in Figure 11. During the expansionary period, prices increased much faster in Cote d'Ivoire, as it was mentioned at the beginning of this section. In the recession period after 1980, prices increased at a smaller rate⁴. Note that

⁴The fiscal policy was much more expansionary in France during the early eighties.

FIGURE 10

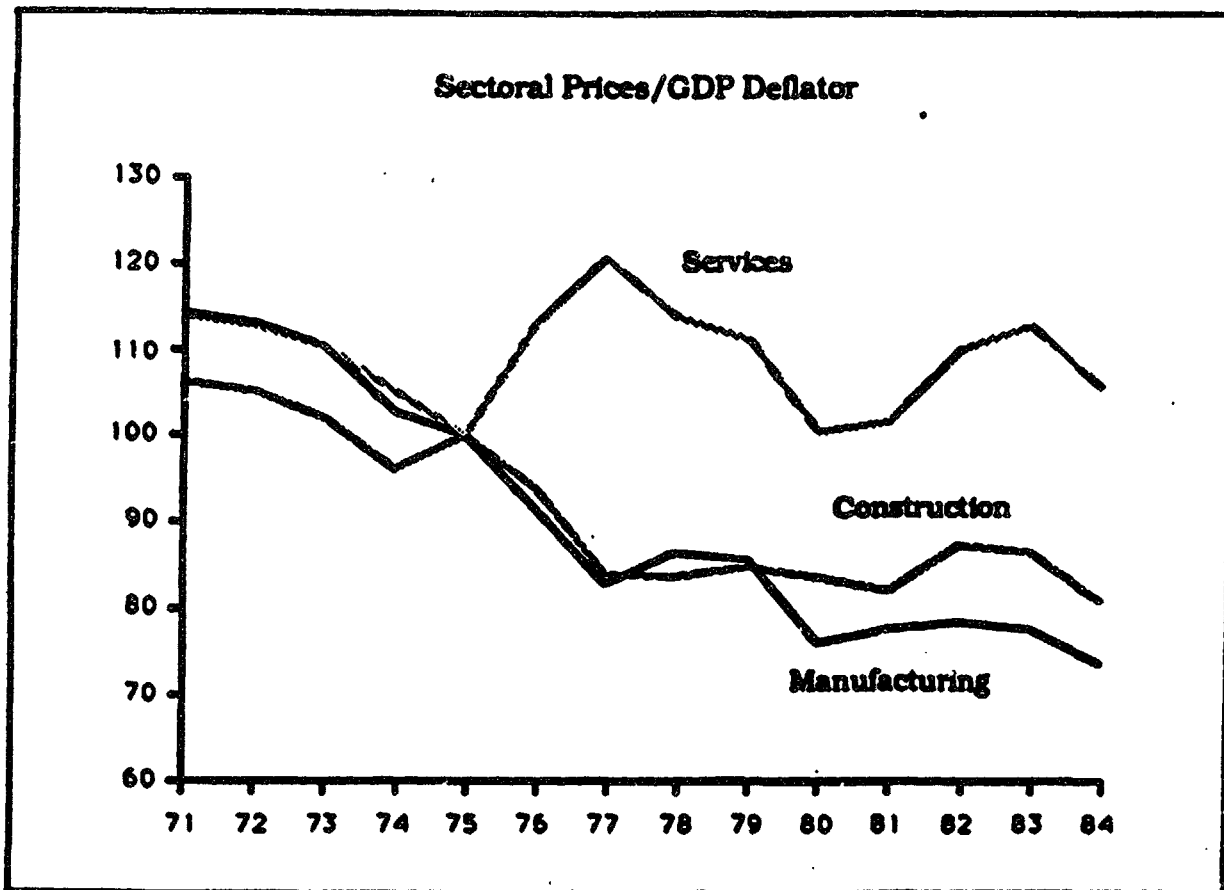
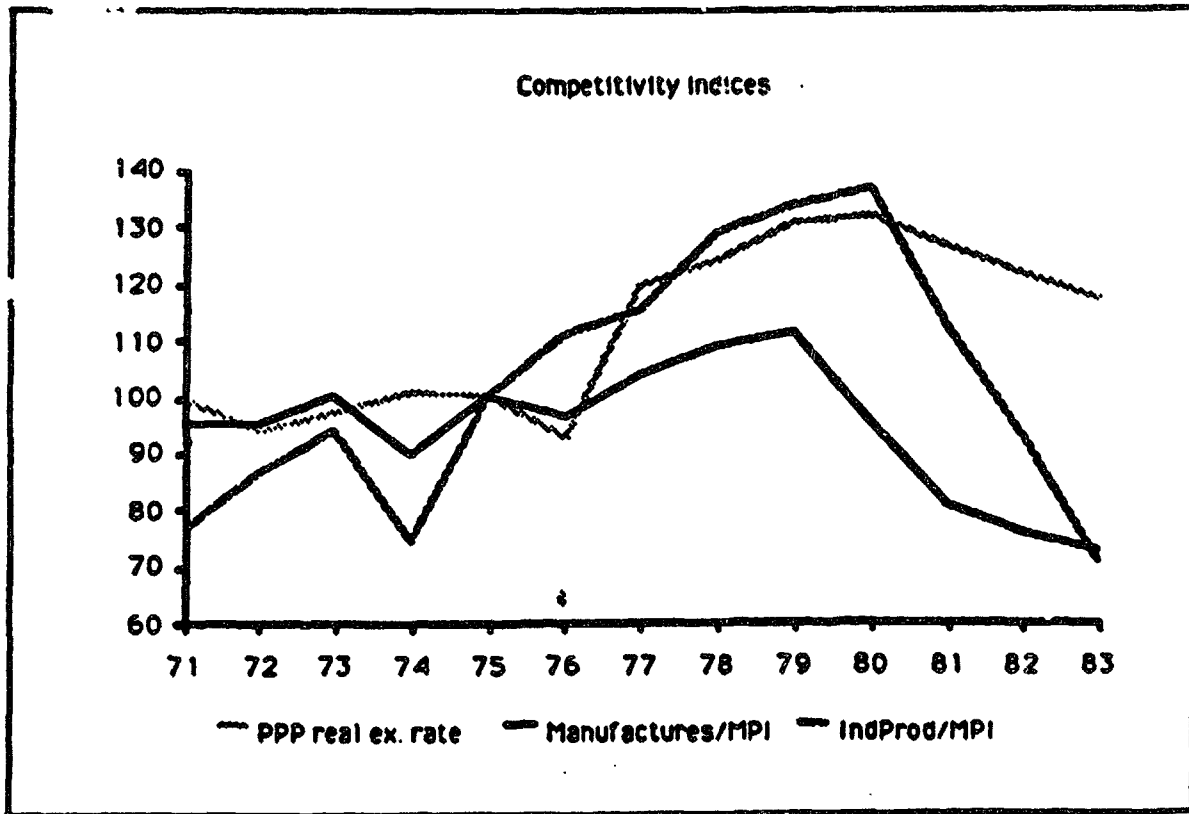


FIGURE 11



the inflation rate was still positive during the recession, with an average value of 7 percent. The prices in the sectors of construction and manufacturing showed more variation than the average price level in the economy.

At the end of the cycle of boom and bust (around 1983-1984), the relative prices in the industrial sectors with respect to France were at about the same level as at the beginning of the cycle. However, the general price level in Cote d'Ivoire (as measured by the CPI), was still 20 percent higher than in France. This difference was due mainly to the rise in the price of services, which we have already observed in Figure 10.

The concomitance of a large increase of public expenditures and of a rise of the domestic price level in the late seventies raise the important issue of the relation between public expenditures and the domestic price level or the real exchange rate. We have estimated for Cote d'Ivoire the same econometric relation as was presented in other related studies⁵. The basic idea is that the domestic price level (with respect to some foreign price), adjusts to clear the market for domestic goods. An exogenous increase of demand raises the demand for non-tradeable goods, and thus their price with respect to that of the tradeable goods. A good example of exogenous demand is the level of public expenditures. Since the domestic price level is some average of the price of non-tradeable and tradeable goods, and the price of tradeable goods is "anchored" by foreign prices, one should observe a positive relation between the exogenous shocks of demand (e.g. public expenditures), and the

⁵See in particular, Rodriguez, [1989], [1990].

ratio between domestic and foreign prices (of competing goods). This relation is embodied in the equation:

$$(1) \quad \text{Log(RER)} = a_0 + \alpha D + \beta \text{Log}(P_X/P_M) \quad , \quad \text{with the notation}$$

P_X , price index for exports,

P_M , price index for imports,

P , domestic price level (CPI or GDP deflator),

$$\text{RER} = P/P_M$$

D , a variable that represents exogenous shocks of demand.

The presumption is that the signs of α and β are positive.

The exogenous shocks to demand D , can originate in the private or the public sector. It is interesting in view of this to examine whether the shocks of the public sector have a greater effect on the domestic price level than those of the private sector. A simple method is to check this is to introduce an additional variable in the previous equation which measures the differential effect of the public sector on prices:

$$(2) \quad \text{Log(RER)} = a_0 + \alpha D + \beta \text{Log}(P_X/P_M) + \gamma G \quad ,$$

where G is a variable that measures public expenditures.

A standard measure for the exogenous to total demand is the ratio between domestic expenditures and income (the absorption), which by the National Income Accounts is equal to one minus the ratio between the trade surplus and

GDP. One can then directly substitute the ratio between the trade balance and GDP in in the previous equation. The variable G is then taken to be the ratio between total expenditures of the public sector and GDP. In this case the equation to be estimated is

$$(3) \text{ Log}(P/PM) = a_0 + \alpha[(X-M)/Y] + \beta \text{Log}(P_X/P_M) + \gamma[G/Y] ,$$

variable in the equation: (TBY) (LPXM) (GY)

with the notation

X exports,

M imports,

G public expenditures,

Y GDP.

This equation has been estimated in levels and first differences. The results are presented in the following tables. The equation in levels has a coefficient of autocorrelation that is almost equal to one, and one can focus on the equations in first differences.

The main econometric issue here concerns the measurement of the exogenous shock to overall aggregate demand. It is represented here by the Trade Account Balance, i.e. the difference between exports and imports of goods. The level of exports is obviously exogenous, while the level of imports is not. The level of imports depend on the ratio between domestic prices and import prices, which is the dependent variable itself. For this reason, it is recommended to omit this variable from the regressors and to use instrumental variables. The results are reported in Tables 3, 4 and 5. The estimated

values of the coefficients are not very different from those of ordinary least squares, and the variations of the estimated values are in the direction that can be expected from the simultaneity bias.

TABLE 3

SMPL 1972 - 1989
 18 Observations
 LS // Dependent Variable is DRER

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
DRER(-1)	0.2408597	0.1180427	2.0404453	0.061
DTBY	-1.0123158	0.2336479	-4.3326559	0.001
DLPXM	0.2537120	0.0612287	4.1436799	0.001
DGY	0.2954056	0.2216652	1.3326658	0.204
R-squared	0.797402	Mean of dependent var	-0.002754	
Adjusted R-squared	0.753989	S.D. of dependent var	0.070566	
S.E. of regression	0.035000	Sum of squared resid	0.017150	
Durbin-Watson stat	1.498803	F-statistic	18.36750	
Log likelihood	37.06402			

Residual Plot				obs	RESIDUAL	ACTUAL	FITTED
	:	*	:	1972	0.00326	-0.07960	-0.08286
	:	*	:	1973	0.00145	0.04774	0.04629
*	:		:	1974	-0.06313	-0.11441	-0.05128
	:	*	:	1975	0.01386	-0.00626	-0.02011
	:	*	:	1976	0.01174	-0.01981	-0.03155
	:	*	:	1977	0.01432	0.15135	0.13703
	:	*	:	1978	0.02395	0.06577	0.04182
	:	*	:	1979	0.00582	0.02817	0.02234
	:	*	:	1980	-0.00047	0.00796	0.00843
*	:	*	:	1981	-0.03689	-0.12903	-0.09214
	:	*	:	1982	-0.00056	-0.08718	-0.08663
	:	*	:	1983	-0.00976	-0.02452	-0.01476
	:		:	1984	0.04952	-0.03610	-0.08562
	:		*	1985	0.07241	0.01279	-0.05962
	:	*	:	1986	-0.00630	0.05501	0.06131
	:		:	1987	0.03863	0.04779	0.00916
	:		*	1988	0.02655	0.05046	0.02391
	:	*	:	1989	0.02492	-0.01970	-0.04462

TABLE 4

SMPL 1972 - 1987
 16 Observations
 LS // Dependent Variable is DRER

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
DRER(-1)	0.2098443	0.1251979	1.6761008	0.120
DTBY	-1.0602705	0.2451468	-4.3250439	0.001
DLPXM	0.2717070	0.0656498	4.1387332	0.001
DGY	0.2432914	0.2456048	0.9905806	0.341

R-squared	0.807909	Mean of dependent var	-0.005020
Adjusted R-squared	0.759886	S.D. of dependent var	0.073689
S.E. of regression	0.036109	Sum of squared resid	0.015646
Durbin-Watson stat	1.588033	F-statistic	16.82348
Log likelihood	32.73793		

Residual Plot				obs	RESIDUAL	ACTUAL	FITTED
:	*	:		1972	0.00197	-0.07960	-0.08157
:	*	:		1973	-0.00430	0.04774	0.05204
*	:	:		1974	-0.05763	-0.11441	-0.05677
:	:	*	:	1975	0.01218	-0.00626	-0.01843
:	:	*	:	1976	0.01129	-0.01981	-0.03110
:	:	*	:	1977	0.01547	0.15135	0.13588
:	:	*	:	1978	0.02879	0.06577	0.03698
:	:	*	:	1979	0.00822	0.02817	0.01995
:	:	*	:	1980	-0.00111	0.00796	0.00908
*	:	*	:	1981	-0.03212	-0.12903	-0.09691
:	:	*	:	1982	-0.00017	-0.08718	-0.08702
:	*	:	:	1983	-0.01575	-0.02452	-0.00878
:	:	:	*	1984	0.04843	-0.03610	-0.08453
:	:	:	*	1985	0.07362	0.01279	-0.06082
:	*	:	:	1986	-0.00891	0.05501	0.06392
:	:	:	*	1987	0.04201	0.04779	0.00578

TABLE 5

SMPL 1972 - 1989
 18 Observations
 TSLS // Dependent Variable is DRER
 Instrument list: C DLPXM DGY DMPI DXPI DM2Y
 Convergence achieved after 4 iterations

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
DTBY	-1.2980029	0.3170463	-4.0940491	0.001
DLPXM	0.2618667	0.0666945	3.9263591	0.002
DGY	0.0815958	0.2342520	0.3483248	0.733
AR(1)	0.3327123	0.2148239	1.5487674	0.144
R-squared	0.763662	Mean of dependent var	-0.002754	
Adjusted R-squared	0.713018	S.D. of dependent var	0.070566	
S.E. of regression	0.037803	Sum of squared resid	0.020007	
Durbin-Watson stat	1.681937	F-statistic	15.07908	
Log likelihood	35.67766			

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1972	0.01990	-0.07960	-0.09950
: * :	1973	-0.01145	0.04774	0.05920
: * :	1974	-0.02732	-0.11441	-0.08709
: * :	1975	-0.01458	-0.00626	0.00833
: * :	1976	0.03359	-0.01981	-0.05341
: * :	1977	0.03506	0.15135	0.11630
: * :	1978	0.02865	0.06577	0.03712
: * :	1979	0.00341	0.02817	0.02476
: * :	1980	-0.00906	0.00796	0.01703
* * :	1981	-0.03573	-0.12903	-0.09330
: * :	1982	-0.00664	-0.08718	-0.08054
* * :	1983	-0.03681	-0.02452	0.01228
: * :	1984	0.07872	-0.03610	-0.11481
: * :	1985	0.04639	0.01279	-0.03360
: * :	1986	-0.03345	0.05501	0.08846
: * :	1987	0.04117	0.04779	0.00663
: * :	1988	0.03302	0.05046	0.01744
: * :	1989	0.01790	-0.01970	-0.03760

The general impression from these tables is that there is a relation between demand shocks and the real exchange rate. The main reason to be prudent about the interpretation of the results of the previous tables is that the surplus of the trade balance is used as one of the determinants of the real exchange rate. Although we have attempted to correct for the endogeneity through the use of instruments, it may be worthwhile to test other specifications.

The main purpose of introducing the trade surplus as a explanatory variable is to find a proxy for exogenous changes of demand. As an alternate method, we use the sum of private consumption and investment, normalized by GDP, (variable PABO). In equation 2 we replace the variable D by

$$D = (\text{PRIVATE CONSUMPTION})/Y \quad (= CY \text{ in the regression equation}) .$$

The results of the estimation are presented in the following Table 6.

The equation performs less well in terms of curve fitting, and the coefficient of government expenditures is not significant anymore. Note that government expenditures on services do not appear directly in the variable PABO, but they have an endogenous effect on this variable.

In conclusion, there is some empirical evidence for the positive impact of government expenditures on the real exchange rate. But this evidence does not seem to be strong enough to use the fitted equation for prediction about the impact of future reduction of government expenditures on the real exchange rate. This last equation seems to be the most appealing, especially when one consider the structure of the residuals in the diagram following the table.

TABLE 6

SMPL 1972 - 1987
 16 Observations
 TSLS // Dependent Variable is RER
 Instrument list: C LPXM LPXM(-1) GY GY(-1) DMPI DXPI DM2Y
 Convergence achieved after 3 iterations

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
LPXM	0.8388000	0.2302365	3.6432106	0.004
CY	5.1383729	1.9226965	2.6724826	0.022
GY	0.6318227	0.1903373	3.3194895	0.007
C	-2.3044383	1.1204568	-2.0566771	0.064
AR(1)	-0.6475179	0.3233685	-2.0024149	0.071
R-squared	0.536256	Mean of dependent var	0.835603	
Adjusted R-squared	0.367622	S.D. of dependent var	0.091462	
S.E. of regression	0.072733	Sum of squared resid	0.058191	
Durbin-Watson stat	1.756467	F-statistic	3.179996	
Log likelihood	22.22991			

Residual Plot				obs	RESIDUAL	ACTUAL	FITTED
:	:	*	:	1972	0.03489	0.83947	0.80459
:	*	:	:	1973	-0.00825	0.88722	0.89547
:	:	*	:	1974	0.03916	0.77281	0.73365
:	*	:	:	1975	-0.00610	0.76656	0.77266
:	:	*	:	1976	0.04760	0.74674	0.69914
:	*	:	:	1977	-0.03768	0.89810	0.93578
:	:	*	:	1978	0.00244	0.96387	0.96143
:	:	*	:	1979	0.03929	0.99204	0.95274
:	*	:	:	1980	0.00339	1.00000	0.99661
:	:	*	:	1981	-0.01985	0.87097	0.89081
:	:	*	:	1982	0.04909	0.78378	0.73470
:	:	*	:	1983	0.03092	0.75926	0.72834
*	:	:	:	1984	-0.18133	0.72316	0.90449
:	*	:	:	1985	-0.06090	0.73596	0.79686
:	:	*	:	1986	-0.03120	0.79096	0.82216
:	:	:	*	1987	0.09362	0.83875	0.74513

4.2 The Balance of Payments

The deficit of the balance of payment is the sum of the external deficits of the private and the public sector. We have seen that the capacity for domestic borrowing by the public sector albeit not insignificant, is severely limited by the regime of the CFA zone. When this capacity is exhausted, the public sector has to turn abroad for its financing.

The capability of the private sector to run an external deficit depends on the willingness of lenders to lend in Cote d'Ivoire. Before and during the first commodity boom it appears that foreign loans to the private sector were indeed significant. After the completion of the first cycle (1975 to 1982), the capability of the private sector to borrow abroad seems to have been exhausted⁶.

These conditions explain the behavior of the balance of payment and its relation with the internal deficit since 1970. Their levels are represented in Figure 12. Because the yearly reporting of the data introduce some noise, we have also given a representation of the data after smoothing through a 3 year moving average (with weights of .25, .5 and .25). There were four phases:

1. Before the first commodity boom, the internal deficit was small (less than 3 percent of GDP). The deficit of the balance of payments was fairly significant (about 8 percent of GDP), and reflected the inflow

⁶We did not have data on the foreign indebtedness of the private sector. The constraint on foreign borrowing is mentioned in various recent reports; the data presented belows can be interpreted as supporting the existence of such a constraint.

of capital for investment in Cote d'Ivoire. There seems to have been little relation between the internal and the external deficit. The external deficit was mainly due to activities in the private sector.

2. The external deficit stayed at the same level during the expansionary phase of the boom as the increased exports were matched by spending on foreign goods.
3. During the phase that followed immediately the boom, the structural deficit did not adjust. The external deficit increased tremendously, fueled both by borrowing from the private and the public sector as the level of economic activity continued to increase. For the same period, the public sector used up all its capability for domestic borrowing.
4. Since 1982, the foreign sources of foreign borrowing have dried up completely for the private sector. The public sector could not increase its domestic borrowing. Therefore, the external and the internal deficit had to be identical.

An important feature of the balance of payments is the high level of unrequited transfers by the private sector (around 5 percent of GDP). These transactions are probably made by expatriates and individuals with high income. They are at the least, an indication that a large fraction of private savings is not used for investment in the Ivorian economy.

We now turn to the econometric analysis of the determinants of the trade surplus. The equation to be estimated is of the form:

$$(4) \quad \text{Trade surplus} = \alpha + \beta \text{Log}P + \gamma(P/P_M) + (\text{primary gov. surplus})/Y$$

Variable: *TBY* *LPXM* *RER* *PSURY*
in the
regression

We have seen in Figure 12, that a structural break probably happened in the early eighties. The equation (4) has therefore been estimated for two periods, 71-81 and 79-89. The overlap was necessary because of the scarcity of the data. The results are presented in the following Tables 7 and 8. They support the previous description. This is hardly surprising in view of the sharp features in Figure 12:

- (i) In the first period, the econometric estimation does not show a significant impact of the primary government surplus on the trade balance. The terms of trade and the real exchange rate have an impact in the expected direction.
- (ii) In the second period, prices do not have a significant effect, and the trade surplus is driven mainly by the government surplus. Some of the statistics of the estimation (residuals and the Durbin-Watson), are not very satisfactory. This may be due partly to the small sample, but most likely to the fact that the structural break occurred during the period of estimation. There is not enough data for a post-83 estimation.

FIGURE 12

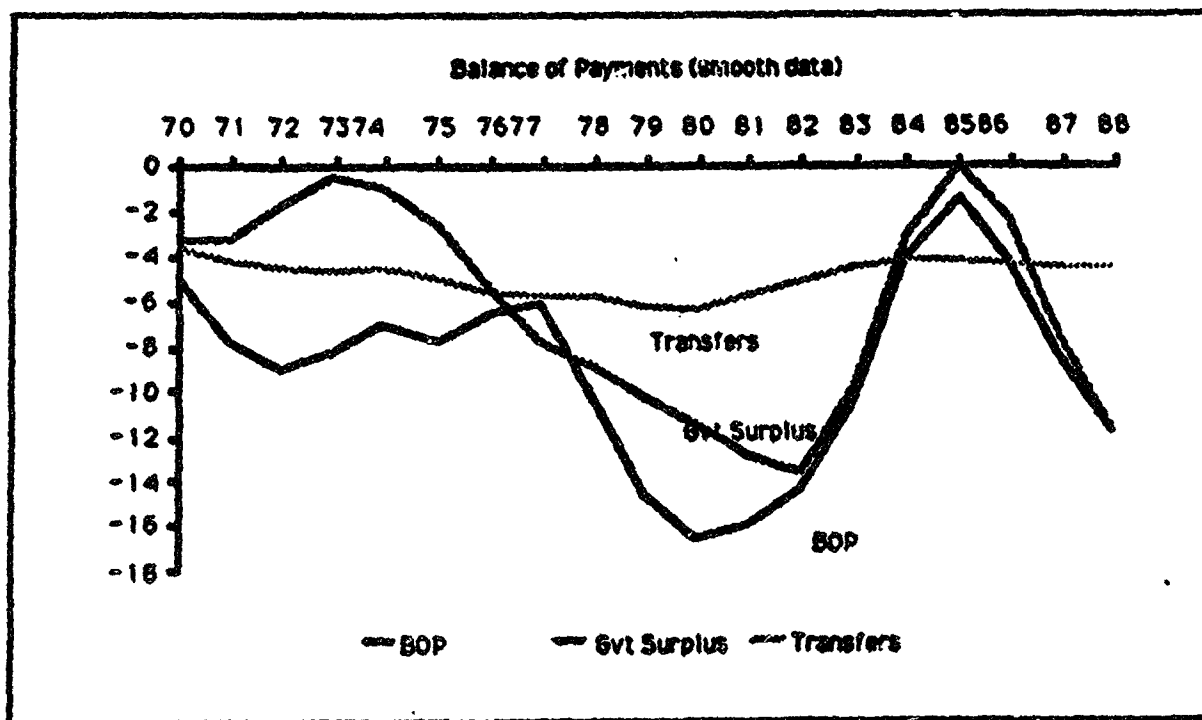


TABLE 7

SMPL 1971 - 1981

11 Observations

TSLS // Dependent Variable is TBY

Instrument list: C LPXM(-1) RER(-1) PSURY(-1) M2Y(-1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.4089229	0.0871602	4.6916263	0.002
LPXM	0.1377845	0.0509985	2.7017351	0.031
RER	-0.3799108	0.1095915	-3.4666092	0.010
PSURY	-0.2055119	0.2595929	-0.7916701	0.455
R-squared	0.896921	Mean of dependent var	0.075578	
Adjusted R-squared	0.852744	S.D. of dependent var	0.032577	
S.E. of regression	0.012501	Sum of squared resid	0.001094	
Durbin-Watson stat	2.515393	F-statistic	20.30298	
Log likelihood	35.07891			

Residual Plot				obs	RESIDUAL	ACTUAL	FITTED
:	:	*	:	1971	0.00123	0.06049	0.05926
:	:	:	*	1972	0.01114	0.07224	0.06111
:	*	:	:	1973	-0.00487	0.06338	0.06825
:	:	*	:	1974	0.00911	0.11693	0.10782
*	:	:	:	1975	-0.02405	0.05830	0.08234
:	:	*	:	1976	0.00618	0.12312	0.11694
:	:	*	:	1977	0.00927	0.13008	0.12081
:	:	*	:	1978	0.00536	0.07252	0.06716
:	:	*	:	1979	0.00203	0.05349	0.05146
:	*	:	:	1980	-0.00968	0.03773	0.04741
:	*	:	:	1981	-0.00573	0.04308	0.04881

TABLE 8

SMPL 1979 - 1989

11 Observations

TSLS // Dependent Variable is TBY

Instrument list: C LPXM(-1) RER(-1) PSURY(-1) M2Y(-1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0559946	0.1327515	-0.4218005	0.686
LPXM	-0.0906266	0.0482675	-1.8775905	0.103
RER	0.1755418	0.1506373	1.1653271	0.282
PSURY	0.9373257	0.2017353	4.6463152	0.002
R-squared	0.890146	Mean of dependent var	0.100989	
Adjusted R-squared	0.843066	S.D. of dependent var	0.054816	
S.E. of regression	0.021715	Sum of squared resid	0.003301	
Durbin-Watson stat	3.236739	F-statistic	18.90706	
Log likelihood	29.00473			

Residual Plot				obs	RESIDUAL	ACTUAL	FITTED
:	:	*	:	1979	0.00883	0.05349	0.04466
:	:	*	:	1980	0.00208	0.03773	0.03565
:	*	:	:	1981	-0.01656	0.04308	0.05964
:	:	:	*	1982	0.03410	0.07250	0.03841
:	*	:	:	1983	-0.01997	0.06191	0.08188
:	:	*	:	1984	0.01896	0.17382	0.15487
:	*	:	:	1985	-0.00733	0.19343	0.20076
:	:	*	:	1986	0.01695	0.16513	0.14818
*	:	:	:	1987	-0.02448	0.10776	0.13224
:	*	:	:	1988	-0.00772	0.09438	0.10210
:	*	:	:	1989	-0.00486	0.10764	0.11250

The equation (4) was also estimated for the balance of payment. The Trade surplus is replaced by the ratio between the balance of payment and GDP, (*BOPY*), and the primary surplus of the government is replaced by the total surplus, divided by GDP (*SURY*). The results are presented in Tables 9 and 10.

TABLE 9

SMPL 1971 - 1983

13 Observations

TOLS // Dependent Variable is BOPY

Instrument list: C LPXM(-1) RER(-1) SURY(-1) M2Y(-1) GY(-1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2662136	0.1024156	2.5993466	0.029
LPXM	0.2001880	0.0604843	3.3097541	0.009
RER	-0.3884315	0.1223529	-3.1746829	0.011
SURY	0.2317518	0.1781069	1.3011950	0.226
R-squared	0.854229	Mean of dependent var	-0.107648	
Adjusted R-squared	0.805639	S.D. of dependent var	0.045853	
S.E. of regression	0.020215	Sum of squared resid	0.003678	
Durbin-Watson stat	2.077865	F-statistic	17.58029	
Log likelihood	34.66130			

Residual Plot		obs	RESIDUAL	ACTUAL	FITTED
:	:	1971	0.02130	-0.09074	-0.11204
:	:	1972	0.01967	-0.08455	-0.10422
*	:	1973	-0.02856	-0.10747	-0.07891
:	*	1974	0.01125	-0.03485	-0.04610
:	*	1975	-0.01721	-0.10812	-0.09091
:	*	1976	-0.00041	-0.06006	-0.05965
:	*	1977	0.01150	-0.03543	-0.04693
:	*	1978	-0.00040	-0.11125	-0.11084
:	*	1979	-0.01435	-0.15183	-0.13747
*	:	1980	-0.02328	-0.17372	-0.15043
:	*	1981	-0.00448	-0.16750	-0.16302
:	:	1982	0.02639	-0.13616	-0.16254
:	*	1983	-0.00141	-0.13776	-0.13635

TABLE 10

SMPL 1979 - 1988

10 Observations

TOLS // Dependent Variable is bOPY

Instrument list: C LPXM(-1) RER(-1) SURY(-1) GY(-1) M2Y(-1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0321909	0.1183711	0.2719492	0.795
LPXM	-0.0748124	0.0617359	-1.2118149	0.271
RER	-0.0979733	0.1387308	-0.7062122	0.507
SURY	0.8981768	0.1963997	4.5732083	0.004
R-squared	0.922749	Mean of dependent var	-0.103986	
Adjusted R-squared	0.884124	S.D. of dependent var	0.064098	
S.E. of regression	0.021819	Sum of squared resid	0.002856	
Durbin-Watson stat	3.357176	F-statistic	23.88972	
Log likelihood	26.61434			

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1979	0.00814	-0.15183	-0.15997
: * :	1980	0.00142	-0.17372	-0.17514
* : * :	1981	-0.03178	-0.16750	-0.13572
: * :	1982	0.01844	-0.13616	-0.15460
* : * :	1983	-0.02328	-0.13776	-0.11448
: * :	1984	0.02442	-0.01284	-0.03726
: * :	1985	-0.00580	-0.00301	0.00279
: * :	1986	0.01075	-0.03939	-0.05014
: * :	1987	-0.00977	-0.08771	-0.07795
: * :	1988	0.00744	-0.12996	-0.13740

4.3 Saving and Investment

The saving rate has a procyclical pattern as one would expect from any consumption theory that is not based on hand-to-mouth behavior. The two measures of the saving rate that are presented in Figure 13 are the saving ratios out of GDP and out of gross national income (GDP minus foreign interest payments). The most important measure is the saving rate out of national income. After reaching a peak with the first commodity boom, it decreased to a historical low in the trough of the cycle (1983), recovered a little in the second boom to a level of below that of the early seventies, and has now reached new lows in the current crisis.

Although the data is somewhat sketchy, we have attempted to estimate a consumption function. The results are presented in Table 12. The dependent variable is the ratio between consumption and GDP, which varies inversely with the saving rate. Income shocks are represented by the rate of growth of real income (GDP minus factor payments, which is the variable *DRNY* in the estimated equation). The government surplus (as a fraction of national income), is represented by the variable *SURNY*. The only variable which is significant (with the right sign), is the terms of trade.

FIGURE 13

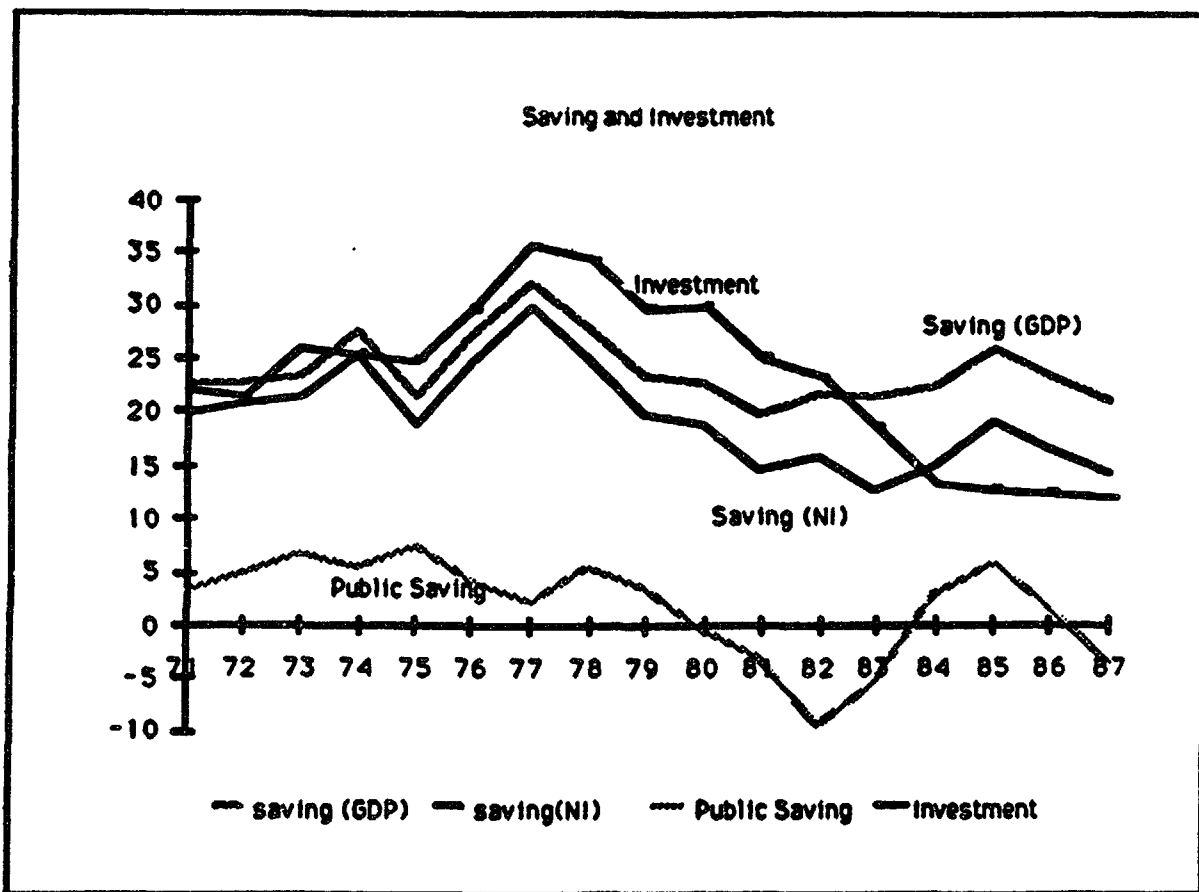


TABLE 12

SMPL 1972 - 1987

16 Observations

TOLS // Dependent Variable is CNY

Instrument list: C LPXM LFXM(-1) RER(-1) DRNY(-1) SURNY(-1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.6036069	0.1321946	4.5660493	0.001
LPXM	-0.1289399	0.0444823	-2.8986752	0.014
RER	0.0405002	0.1791345	0.2260879	0.825
DRNY	-0.4719180	0.3684730	-1.2807398	0.227
SURNY	0.1962204	0.2827652	0.6939340	0.502
R-squared	0.810157	Mean of dependent var	0.630840	
Adjusted R-squared	0.741123	S.D. of dependent var	0.041462	
S.E. of regression	0.021096	Sum of squared resid	0.004895	
Durbin-Watson stat	2.242739	F-statistic	11.73562	
Log likelihood	42.03349			

Residual Plot				obs	RESIDUAL	ACTUAL	FITTED
:	*	:	:	1972	-0.00368	0.63158	0.63526
:		*	:	1973	0.00435	0.61372	0.60937
*	:		:	1974	-0.05387	0.57497	0.62884
:		*	:	1975	0.00532	0.63514	0.62981
:	*	:	:	1976	0.00076	0.58234	0.58158
:		*	:	1977	-0.00553	0.56008	0.56561
:	*		*	1978	0.01372	0.57877	0.56505
:		*	:	1979	-0.00382	0.60960	0.61342
:	:		*	1980	0.02346	0.62029	0.59682
:		*	:	1981	0.01007	0.66184	0.65177
:	*		:	1982	-0.01058	0.65239	0.66297
:		*	:	1983	-0.00338	0.66990	0.67328
:	*		:	1984	-0.00496	0.68875	0.69371
:		*	:	1985	0.00544	0.65490	0.64945
:	:		*	1986	0.02883	0.67327	0.64444
:	*		:	1987	-0.00613	0.68592	0.69206

The level of investment was significantly higher than domestic saving only between 1979 and 1983. The excess was financed mainly by the foreign borrowing of the public sector. Since 1984, investment has been below domestic saving. This situation is not surprising given the external flow of transfers, and the impossibility of public investment financed by foreign borrowings.

The decomposition of investment between the private and the public sector may be a little arbitrary because of the parastatals. We have nevertheless attempted to provide such a decomposition⁷ in the following table.

TABLE 11
Public and Private Investment and Consumption
(in shares of GDP)

	1980	1981	1982	1983	1984	1985	1986	1987
Total I	0.260	0.241	0.213	0.176	0.123	0.117	0.118	0.124
Public I	0.115	0.087	0.066	0.061	0.043	0.031	0.038	0.036
Total C	0.596	0.631	0.615	0.625	0.625	0.602	0.618	0.628
Public C	0.177	0.171	0.169	0.163	0.153	0.139	0.151	0.163

⁷There is no reliable data before 1980.

The equation of investment is presented in Table 13. Shock of income appears to have a large impact on total investment. The coefficient that measures the impact of government deficits on investment is relatively small and marginally significant. However the dependent variable here is the level of total investment. If a large fraction of the deficit is used to finance public investment, the crowding effect is much higher. There was no available data for the direct estimation of the impact of public investment or deficits on the level of private investment.

A complete analysis of the behavior of private investment would require the considerations of many other factors, the most important of them is probably the profitability of capital. Such an analysis is beyond the scope of the present study. We have a hunch that the high level of domestic prices (relative to competing countries), had a strong negative impact on the marginal product of capital. The data shows that the only borrower on foreign markets since 1983 has been the government. At this point it is not clear whether this is due to the rationing by foreign creditors, or to the low profitability of new capital in Cote d'Ivoire

TABLE 13

SMPL 1972 - 1987
 16 Observations
 TSLS // Dependent Variable is IY
 Instrument list: C IY(-1) DRNY(-1) SURY(-1)

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0047919	0.0112063	0.4276065	0.677
IY(-1)	0.8601507	0.0595097	14.453959	0.000
DRNY	0.3727822	0.0318842	11.691751	0.000
SURNY	-0.1027654	0.0499649	-2.0567513	0.062
R-squared	0.918014	Mean of dependent var		0.203432
Adjusted R-squared	0.897518	S.D. of dependent var		0.057541
S.E. of regression	0.018421	Sum of squared resid		0.004072
Durbin-Watson stat	2.078993	F-statistic		44.78886
Log likelihood	43.50700			

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: *	1972	-0.00767	0.19958	0.20724
: *	1973	0.01500	0.21555	0.20054
: *	1974	-0.00467	0.19486	0.19952
: *	1975	0.01816	0.22062	0.20246
* :	1976	-0.02298	0.22172	0.24470
: *	1977	0.03706	0.25796	0.22090
: *	1978	0.02206	0.29669	0.27463
: *	1979	-0.00404	0.27109	0.27513
: *	1980	-0.00770	0.26052	0.26821
: *	1981	-0.00290	0.24104	0.24394
: *	1982	-0.01150	0.21355	0.22505
: *	1983	-0.01495	0.17685	0.19180
: *	1984	-0.00666	0.12351	0.13017
: *	1985	-0.01563	0.11763	0.13326
: *	1986	-0.00090	0.11899	0.11989
: *	1987	0.01788	0.12476	0.10688

V. CONCLUSION

Cote d'Ivoire presents a case study where the effects of fiscal policy in a developing country with fixed exchange rate are highlighted. Monetary policy is constrained by the regime of the CFA zone. For the last fifteen years, the growth of the ivorian economy has been dramatically affected by both exogenous factors, and the responses of fiscal policy.

The argument that a rapid expansion of expenditures either by the government or the private sector following a commodity boom has a negative impact on the relative price of tradeables and non tradeables is well known. This relation has been observed here, and it has been illustrated in particular by Figure 10 and the results in Table 6.

The adverse evolution of the real exchange rate led to large external deficits. For the period that is covered by this study, the results indicate that before 1982, the real exchange rate had a strong impact on the external balance. After this date, this relation is replaced by a straight identity between the government deficit and the external deficit.

The importance of the impact of government expenditures on the economy has been recognized since the beginning of the adjustment period, 10 years ago. Despite this acknowledgment, progress has been extraordinarily slow. Before the crisis of last year, there was no indication that the government had altered its level of permanent expenditures to its long-run capacity to generate revenues. Expenditures were indeed significantly reduced in 1983-1984, but these reductions affected mainly capital expenditures, and were not accompanied by a reduction of current expenditures. The current crisis

illustrates the failure of the adjustment policy: during the eighties, the countries debt has increased from 30 percent to over 100 percent of GDP. This increase of the debt has not served new investments as the investment to GDP ratio was reduced to levels that barely compensate for depreciation. At the expansionary fiscal stance had an adverse effect on the real exchange rate and the country's position with respect to competitors in world trade. The government has faced the necessity of adjustment only when it had to declare unsolvency. The financial constraints in the current crisis limit severely the options for adjustment towards future growth.

APPENDICES

A THE SIZE AND THE BURDEN OF THE PUBLIC SECTOR

As in other countries that are at a similar stage of development, the share of the tax base in the economy is much smaller than in industrialized countries. The administrative resources that are available for the collection of revenues are also limited. Various indices illustrate that the tax base is very small with respect to the revenues that are required for the government policy. We consider here the size of the government labor force and the average effective tax rate.

The Labor Force in the Public Sector

According to the available data (Public Expenditures Survey, [1989]), the number of permanent civil servants who are not providing marketed services is about 110,000 in 1989. This number is probably not very different from its value in 1985. For that year, the total number of tax payers is about 209,000. (The number of individuals who fill a tax form is about 10,000). The ratio between the two numbers is thus about 50 percent. To put the problem into perspective, could we imagine an industrialized country where one third of the labor force is employed in government activities that do not earn income?

The Average Effective Tax Rate

The formal sector pays taxes at the border, at the level of firms' profits, and at the level of personal income. A significant part of the imports is undertaken by government agencies which do not pay border taxes. The effective average rate of the border taxes is therefore very high and has been estimated at about 65 percent⁸. A fraction of the border taxes falls on the informal sector. Making allowance for these two corrections, and using data on the taxes and the value added of the informal sector, the estimate for the average effective tax rate on activities in the formal sector is about 48 percent. The high rate of effective taxation may explain the slow but persistent reduction of the real level of activity in the formal non government sector since 1980. One branch of the formal sector has grown steadily however, the bottling of beverages. One may consider this production as an index of domestic production (and demand) that is more accurate than GDP.

The level of employment in the formal private sector which is already so small is not growing. In fact it has declined significantly since 1980 (Table below). The reduction of employment has reached 50,000 in six years, which corresponds to an average rate of 8 percent p.a. since 1982. It is remarkable that the number of African employees in managerial positions has increased, in balance with the decrease of non-Africans. All the reduction of the labor force in the formal sector has taken place in the employment of workers. This is not surprising: the minimum age restrictions must be especially effective for non qualified workers.

⁸This estimate is computed from data in Horton [1990b].

Employment in the formal private sector

Year	1982	1984	1986	1988
Employment (in 1000)	197.1	168.8	162.2	146.0

B. PUBLIC INVESTMENT

Government reacted to the coffee and cocoa boom of the mid-seventies by increasing its capital expenditures from 8% of GDP in 1975 to 22% in 1977. Private investment remained relatively stable during that period at around 13-15% of GDP. The increase of public investment was correlated with an apparent decline in the return on capital; comparing ICORs between 1970-75 and 1976-81, a very rough measure of the productivity of investment, indicates a 60% decline in investment efficiency. The agriculture sector received the highest share of public investment, 31% in 1981. A large part of this investment took place in extension services which includes the recurrent cost of extension agencies (mainly wages). The rate of return on those investments are difficult to measure: the data does not indicate an increase in agricultural output and value added as a result of these expenditures. On the other hand, one can remark that the financing of extension services for coffee and cocoa (SATMACI) and cotton (CIDT), did not encourage diversification out of traditional agricultural exports, as recommended by numerous Bank missions.

The second most important sector of public investment was that of transport and roads, (23% of total public investment in 1981). As a result of the public investment boom, Cote d'Ivoire today has the most developed highway and road system in Africa. However, their rate of return turn out to be of dubious value. In 1981, 16% of the investment budget was allocated to education. This included the construction of the higher institutes ("grandes ecoles") of Yamoussoukro where the cost per student is higher than in Ivy League colleges in the United States. When the public sector entered into

productive activities, e.g. investing in sugar and oil palm factories, the results were discouraging--the public companies producing those two goods today do so at a cost which is nearly double world prices.

The public investment program was drastically reduced after 1981, falling from 17 to 4% of GDP in 1990 (see Table below). Its composition also changed. The share of agriculture in total investment increased from 31 to 47%, reflecting the difficulty of reducing employment in the extension services. Investment in transport and road construction fell from 23 to 12% of the reduced total and road maintenance is becoming an important problem. Investment in education fell dramatically from 16% of total investment in 1981 to 3% in 1990, for a population growing at 3.5% . year this is hardly sufficient to cover the needs for new enrollments. That is, today the size of public investment program is, in relative terms, around half of its level in 1975, moreover, roughly 30% of what is now defined as capital expenditure consists of salary payments to extension workers, which was not the case in 1975.

The Sectoral Composition of Public Investment (percent)

	1981	1984	1987	1990
Agriculture	31	26	28	47
Transport and roads	23	27	29	12
Housing and urban devel.	13	18	17	20
Education	16	12	6	3
Others	17	17	20	18
Public Investment/GDP	17	8	5	4

Source World Bank resident mission, Abidjan.

C. COSTS AND RETURNS OF EDUCATION

One of the most important determinants of growth for a developing country is the level of education. Government expenditures on education in Cote d'Ivoire have been estimated at 40 to 45 percent of expenditures, (Mingat and Psacharopoulos, [1985]). Numerous studies have concluded that the wages of educational staff are very high in Cote d'Ivoire.

These high salaries can be observed in all francophone countries. Unit costs of public education at the primary level are at least 50 percent higher than in anglophone countries, which is already much larger than in other developing countries. The ratio between unit costs in Cote d'Ivoire and anglophone countries is even higher for secondary and higher education with values of 3.4 and 1.5, respectively. Furthermore, the education system puts more emphasis on secondary and higher education in Cote d'Ivoire than in other African countries.

The share of education expenditures in the government budget of Cote d'Ivoire is thus twice as high as in other African countries (10 percent against 5 percent). Note that the value of this share in advanced countries is also about 5 percent. Since measured GDP per capita is higher in Cote d'Ivoire than the average in Africa, and probably overestimated, the level of expenditures per capita is thus quite remarkable. The high cost of the staff is a consequence of institutional rigidities. Under severe budget problem the government tries to reduce other expenditures that are not under these

constraints, such as books and material supplies. There is some indication that the quality of education may suffer as a result.

One would expect that at least Ivorians get something more for the money, but output is not better than in other countries: the enrollment ratios are lower at the primary and the secondary levels as shown in Table below.

Country	Level of Education		
	Primary	Secondary	Higher
Cote d'Ivoire	60	15	1.9
Francophones	59	4	2.4
Anglophones	77	17	1.2

Source: Mingat and Psacharopoulos [1985].

The high level of wages in the formal sector inflates the measurements of the private rate of return to education. Those have been found to be high in Cote d'Ivoire (van der Gaag and Vijverberg [1987]). This is not surprising in a system where institutional constraints affect wages at all levels. In this situation of rationing one expects that signalling is an important allocation mechanism. Indeed van de Gaag and Vijverberg find that holding a diploma is a very important determinant of the wage rate. The measurement of the rate of return is obviously overstated since many graduates have some difficulties in finding adequate jobs.

D. SIMPLE PRINCIPLES FOR GOVERNMENT CONSUMPTION

One of the most striking features of the response of fiscal policy to the commodity boom in Cote d'Ivoire has been the increase of consumption expenditures. It has already been pointed out that an important fraction of the current expenditures are on education and therefore on human investment. However, the high level of spending on education was not caused by high inputs, but followed from the policy of high salaries. They thus represent a transfer to individuals, which is for the public sector a form of consumption.

The principles of rational government consumption share some common features with the theory of consumption for private individuals. In view of the fluctuations of income, this theory has to take into account the uncertainty of the future flow of public revenues. Any theory of consumption which takes into account uncertainty and intertemporal choice will use some form of permanent income. The purpose of this section is (i) first, to review how simple models of intertemporal choice under uncertainty can generate rules for the efficient level of consumption, and (ii) second, to apply these rules to Cote d'Ivoire and compare their results of their application with the actual experience of the last fifteen years.

A theoretical discussion of the efficient policy of expenditures on public consumption for a country with the stylized features of Cote d'Ivoire does not exist at the present time, and will probably be the subject of other studies. In an informal discussion one can identify immediately three types of issues:

1. the random processes that determine the variations of private and public income and the structure of the rates of returns between consecutive periods,
2. the evaluation of public expenditures,
3. the credit constraints that may prevent an adequate smoothing of expenditures

Here we will address (too briefly) the first two issues. This is not to deny that credit constraint are not important. We show at different places in this paper that they are. However, it is of interest to simplify the problem at first. The rules for efficient consumption that ignore the credit constraint already show 'prudent' properties and can be compared to the actual policy for the last fifteen years. Furthermore the introduction of a strict credit constraint may also stretch the realism of a model since the service of the debt is reduced *de facto* as it is now observed in Cote d'Ivoire.

The Model

The Random Process of Income

The level of government revenues in each period y_t is exogenous and random. This assumption is fairly relevant here: Despite some attempts, the government has not been able to control effectively either the world prices of the two basic commodities, or the ratio between non agricultural taxes and domestic input. An important part of the variation of domestic input can be considered to be exogenous in the current context. A simple formulation of the random process that generates income is that

$$y_t = \bar{y} + a_1(y_{t-1} - \bar{y}) + a_2(y_{t-2} - \bar{y}) + \epsilon_t .$$

The parameters a_1 and a_2 are parameters that measure the convergence back to the trend value \bar{y} after a shock ϵ has occurred. When a_2 is equal to zero, the convergence to the long-run level of income is exponential with an average period of $1/a_1$. The random shocks ϵ_t could be serially correlated, but again we assume here that they are i.i.d..

The value of \bar{y} defines the long-run level of income. It is assumed to grow at the constant rate n . This is an important shortcut: expectations about the long-run growth rate affect in a major way the borrowing strategy of developing countries. In many cases, an unfounded optimism about the value of this growth rate has led to excessive borrowing. The analysis of the efficient consumption (and borrowing) strategy with a random growth rate will require a special study. Note however, that in the present framework, a "random walk" property of income is approximated when the rate of convergence of the transitory income to permanent income a_1 tends to zero.

The evolution of the government debt between two consecutive periods is given by the equation:

$$(5) \quad b_{t+1} = \frac{(1+r_t)b_t + c_t - y_t}{1+n} ,$$

where b measures the ratio between the government debt and the value of income \bar{y} , on the long-run growth path. Random shocks could affect the values of the rate of return between two consecutive periods, the level of

government revenues, the utility of expenditures. In the case of Cote d'Ivoire, shocks affected mainly the level of income. We therefore ignore the other components of fluctuations and concentrate on the variations of government income.

The budget constraint of the government requires that the present discounted value of the debt that is accumulated at time t tends to zero when t tends to infinity. This in turn requires that the value of b_t grows in the long-run at a rate that is less than the difference between the interest and the growth rates, $r-n$. During a transition period, the debt could grow at a very rapid rate. It is at this point that credit constraints may impose some additional restrictions, which will be ignored here.

The Evaluation of Public Expenditures

A standard evaluation of a stream of public expenditures, c_t , is to use the present discounted value of instant utilities:

$$J_t = J((c_r)) = \sum_{r \geq 0} \frac{1}{(1+\rho)^t} E[u(c_{t+r})],$$

where ρ is the discount rate, and expectations are formed on the basis of the available information at time t .

The choice of the utility function $u(c)$ is different from the standard forms that have been used for the individual's problems. It is essential to bear in mind that $u(c)$ measures the social utility when the level of public consumption is equal to c for a fixed level of total output. This consumption has to be retrieved from that of the private sector. In addition, the

financing of the expenditures induces a social cost of the tax distortions. Public consumption must therefore have a negative marginal utility beyond some level of expenditures, contrary to the general assumption about consumption for an individual's utility. The property of negative marginal utility beyond some level of consumption is well captured by the quadratic utility function of the form

$$u(c_t) = \alpha - \frac{\beta^2}{2} c_t^2 ,$$

where α and β are parameters.

The other property of the quadratic function is that the marginal utility, which is obviously decreasing, does not change much when the level of consumption is small and is finite when the expenditures level tends to zero: public expenditures do not become indispensable even at very low levels. This may be unrealistic for some policy makers. For this reason, the isoelastic utility function $u(c) = c^{1-\gamma}$ has often been used. This function however, is always increasing, which is not admissible here. For a large range of consumption levels, the quadratic function may provide a good approximation. As an example assume that the utility function of the economy is of the form:

$$U(c) = ac^{1-\sigma} + (\bar{y} - c)^{1-\gamma} ,$$

where the first term represents the utility of public expenditures (net of any social cost due to the transfer of resources), and the second term represents the utility of consumption in the private sector. This function is

maximized for a value of public expenditures \bar{c} . It increases for when expenditures are less than \bar{c} , and decreases beyond this critical level. For $\gamma = .5$, the efficient value of \bar{c} is equal to

$$\bar{c} = \frac{a^2}{1+a} \bar{y} .$$

The function U can be approximated by a quadratic function around the efficient value \bar{c} . The function and its quadratic approximation around the efficient value \bar{c} can be compared in Figure 14. The value of a is chosen such that the efficient consumption \bar{c} is equal to its average in the last fifteen years in Cote d'Ivoire.

The ratio between public expenditures and their efficient value is represented on the horizontal axis. The quadratic function is flatter than the actual utility function. It provides a very good approximation, for a large range of values, i.e., when expenditures are within 50 percent of their efficient level.

The Efficient Consumption Rule

The levels of consumption in any consecutive two periods t and $t+1$, must be such that the marginal utility of one unit of foregone consumption at time t is equal to the marginal utility of the additional consumption that is feasible at time $t+1$, discounted to the present. This efficiency rule is expressed by the Euler equation:

FIGURE 14

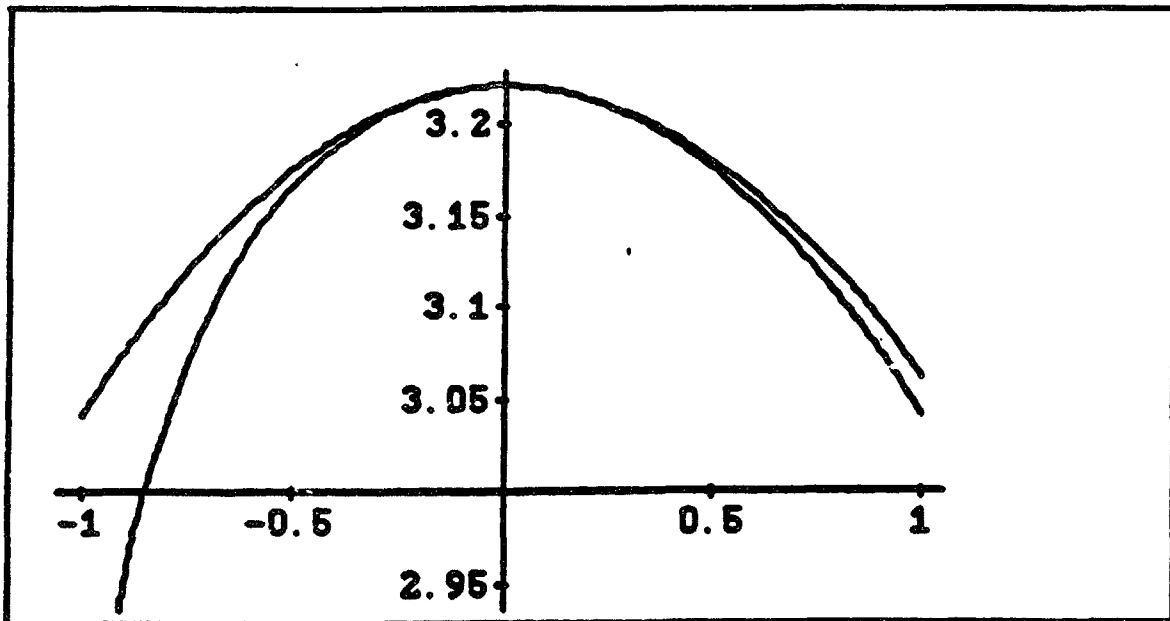


Figure C: Actual and Approximation Values of Public Expenditures

$$(6) \quad u'(c_t) = \frac{1+r}{1+\rho} E[u'(c_{t+1})] .$$

The efficient level of consumption is determined by the combination of the Euler equation, the equation of the debt accumulation (5) and the expectation that the discounted value of the debt tends to zero with probability one (the budget constraint). Since the interest rate is constant the efficient level of consumption at any instant depends only on the expected value of wealth at time t , call it W_t , and of the random properties of future shocks:

$$c_t = c(W_t) .$$

Under the definition of the income generating process that we have here, the level of expected wealth depends only on the currently observed values of the debt, and of the incomes y_t and y_{t-1} which provide all the available information for the future levels of income. The "permanent income" consumption function thus depends on the values of the debt and the past observations of income.

The method that is discussed in the previous paragraph applies to any type of utility function. The solution of the quadratic utility function is simple and has been analyzed in great details in other studies (See Berketsas [1978]). We assume for simplicity that the discount rate ρ is equal to the rate of return r , which is true on balanced growth path. The method of computation of the efficient consumption is the same when the two rates are

different. A non zero difference affects mainly the value of the constant term in the equation below, for an obvious reason: it changes the discounted value of the stream of "standard" income \bar{y} . The effect of an inequality of the two rates on the marginal propensity to consume from transitory income is much smaller. One can show that the consumption function is given by the expression

$$(7) \quad c_t = -rb_t + \bar{y} + A(y_t - \bar{y}) + B(y_{t-1} - \bar{y}) \quad ,$$

with the values A and B,

$$A = \frac{r}{1+r - a_1 - \frac{a_2}{1+r}} \quad , \quad B = \frac{ra_2}{(1+r)^2 - a_1(1+r) - a_2}$$

This consumption rule has remarkable properties:

- The rule is independent of the parameters of the utility function α and β , and therefore on the curvature of the utility function. This property depends on the equality of the discount rate ρ and the rate of return r .
- The rule applies to the total level of expenditures on consumption goods and on the service of the debt.
- The level of total expenditures is the sum of the *permanent income* \bar{y} and of a term that represents the transitory income $y_t - \bar{y}$. The fraction of transitory income that is consumed tends to one when income fluctuations have a long period, and to $r/(1+r)$ when this period tends to zero.

- The marginal propensity to consume out of current income does not have to be between zero and one. This has a simple interpretation: a shock on current income may be an indication of a higher shock in the future (as for a commodity boom that takes a few years), and therefore of a significantly higher permanent income.

FIGURE 15

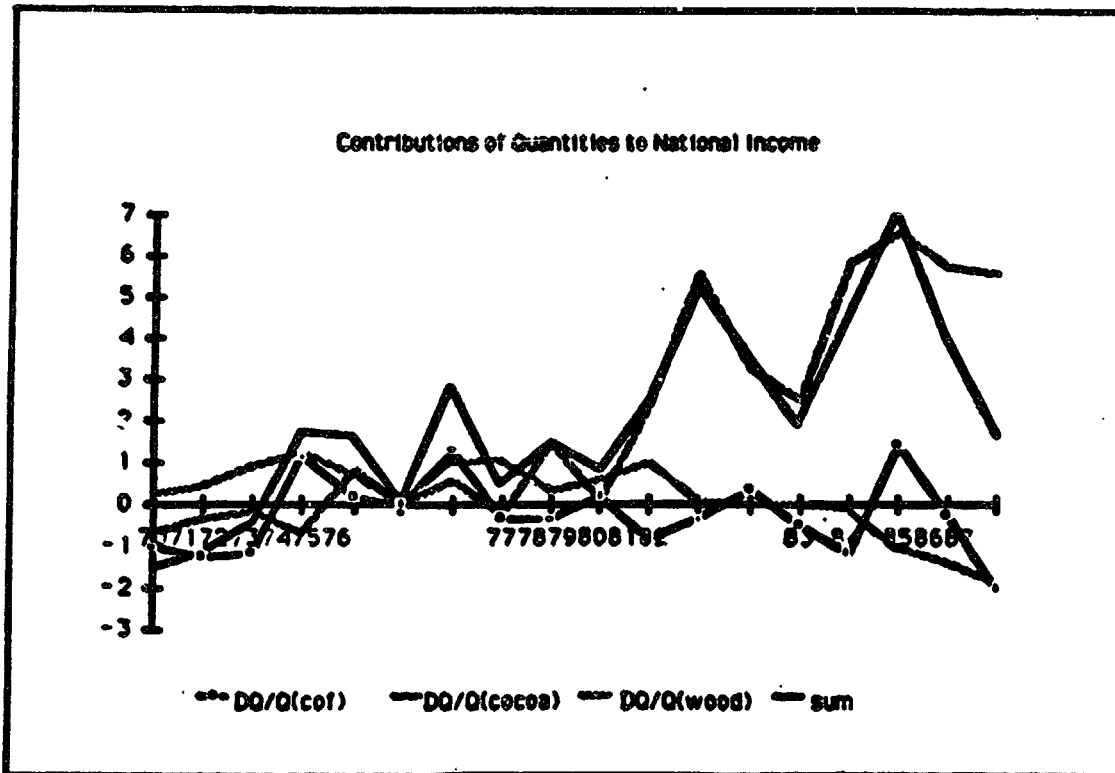
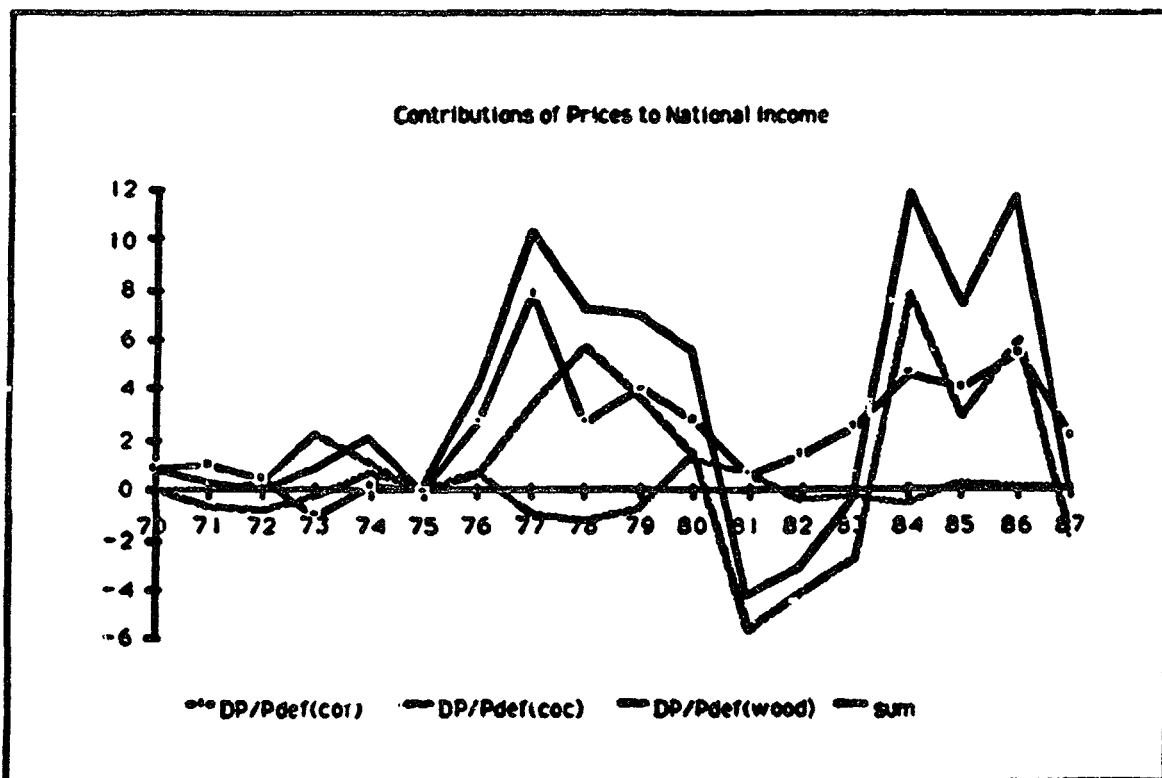


FIGURE 16



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