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Exchange Reform, Parallel Markets, and Inflation in Africa

The Case of Ghana

Ajay Chhibber
and
Nemat Shafik

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This model using Ghanaian data shows that in the presence of an active parallel market, official devaluation does not cause inflation because prices have already adjusted to the parallel exchange rate. Although structural factors were important in the past, inflation in Ghana has been primarily a monetary phenomenon and the product of weakness in the financial system in recent years.

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Policy, Research, and External Affairs

WORKING PAPERS

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This paper — a product of the Office of the Vice President, Development Economics — is part of a larger effort in PRE to understand the dynamics of inflation, exchange reform, and price decontrol in Africa. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Maureen Colinet, room S9-041, extension 33490 (67 pages with figures and tables).

Adjustment programs typically involve a complex policy package that includes price liberalization, devaluation, and trade policy reforms — together with public enterprise and fiscal reform, including reduced subsidies and rationalization of public spending.

A common concern in these reform packages is the potential inflationary effects of the combination of devaluation, trade liberalization, subsidy reduction, and price decontrol. This issue is critical in Africa, where inflation has accelerated in several countries, particularly those undergoing adjustment.

Some argue that devaluation — an important instrument in IMF and World Bank adjustment programs — is not necessarily the best instrument for real exchange rate devaluation, given its inflationary effects and taking into account the structure of African economies. Some have criticized IMF and World Bank programs as leading to the so-called "Latin Americanization" of Africa.

In Ghana, which has carried out one of the most thorough structural adjustment programs in Africa, an increasingly high inflation rate has been attributed to major devaluations of the official exchange rate. Chhibber and Shafik dispute this conclusion based on careful testing and simulations using a macroeconomic model estimated with Ghanaian data.

The model results show that there is no direct relationship between the official exchange rate and inflation; prices had already adjusted to the exchange rate prevailing in parallel markets.

The results also show that official devaluation had a positive effect on Ghana's budget. Revenue improvements came from three channels: the higher grant aid disbursed at a more depreciated exchange rate, a reduction in the subsidies that had accrued to importers through an overvalued exchange rate, and an increase in export taxes as cocoa farmers increasingly marketed their output through official channels.

The official devaluation therefore did not produce higher budget deficits, demand pressure did not spill onto the parallel market, and the exchange premium narrowed considerably. The key to the success of the program was the adequate level of foreign financing, combined with a coherent set of fiscal policies.

Chhibber and Shafik argue that although inflation had structural causes in the past, the acceleration in recent years is primarily a monetary phenomenon. It also reflects weakness in the financial system that must be tackled to sustain reform.

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Produced at the PRE Dissemination Center

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This paper is part of a larger research project on inflation and fiscal adjustment in Africa. We are grateful to Vikram Nehru for his help and encouragement, but absolve him of any responsibility for the interpretations. Thanks are also due to the participants in a seminar sponsored by the Ministry of Finance in Accra on November 16, 1989.

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1. Introduction

Adjustment programs typically involve a complex policy package which include some combination of price liberalisation, devaluation and trade policy reforms, as well as public enterprise and fiscal reform, including reduction in subsidies and rationalisation of the public expenditure program. A common concern in these reform programs is the potential inflationary effects of a combination of devaluation, trade liberalization, subsidy reduction and price decontrol. This issue has become critically important in the African context where inflation has been accelerating in a number of countries, and in particular in those undergoing adjustment programs. This is particularly evident in countries which are not members of the CFA Franc zone. In a recent paper Guillaumont and Guillaumont (1989) argue that devaluation - an important instrument in IMF and World Bank adjustment programs - is not necessarily the best instrument to bring about real exchange rate devaluation given its inflationary effects and taking into account the structure of African economies. IMF and World Bank programs have been criticised by others as leading to the so called "Latin Americanisation" of Africa.[1]

This paper presents a theoretical framework to address the question of exchange rate devaluation in the presence of parallel markets in Section 2. It then uses the Ghanaian data to empirically estimate a model in Section 3 which is applied to analyze policy trade-offs for Ghana in Section 4. The last section draws together the lessons from the Ghanaian experience. Ghana has carried out one of the most thorough adjustment programs in Africa. Its inflation rate is high and in recent years

[1]The most recent critique has come from the Economic Commission for Africa (ECA).

has been rising, although it is lower than during the worst crisis years. Ghana's average annual inflation rate[2] has declined considerably since 1984 as against the average for the period 1976-83. However, the inflation rate has risen from under 10 percent per annum in 1985 to almost 40 percent per annum in 1987. Although inflation declined to a little over 30 percent per annum in 1988, there remain concerns and questions about its underlying causes and consequences. Ghana has devalued the official exchange rate on average by well over 40 per cent per annum between 1983 and 1988 (See Table 1). Ghana's high inflation rate has been attributed to the large devaluations of the official exchange rate.

This paper disputes this conclusions about the inflationary consequences of devaluation based on careful testing and simulations with a model estimated with Ghanian data. The model simultaneously determines the rate of inflation and the exchange rate premium and links the monetary and real sides of the economy through several channels. The results show that there is no direct relationship between the official exchange rate and inflation; prices had already adjusted to the shadow exchange rate represented by the exchange rate prevailing in parallel markets. The results also show that the Ghanian official devaluation had a positive effect on the budget. The revenue improvements came primarily from two channels -- (a) from higher grant aid disbursed at a more depreciated exchange rate, and (b) from a reduction in subsidies to importers due to exchange over-valuation. The official devaluation therefore did not result in higher budget deficits and as a result excess

[2]As recorded by the official CPI.

demand pressure did not spill onto the parallel market and the exchange premium narrowed considerably. The key to the success of the program was the adequate level of foreign financing, combined with a coherent set of fiscal policies. The paper shows that acceleration in inflation in recent years is primarily a monetary phenomenon, reflecting as well underlying weakness in the financial system which need to be tackled to sustain the reforms.

2. The Model

The approach used for the analysis attempts to integrate within one framework three transmission mechanisms for inflation in Ghana : via excessive money creation, via direct cost push factors such as the cost of foreign exchange and food prices, and through real factors. What is often missing in the analysis of inflation is the interactions between these transmission mechanisms. For example, changes in individual prices and the exchange rate have budgetary implications. How the resulting change in the budget gets financed in turn affects debt management and inflation. Changes in monetary and credit policy have consequences for the availability of working capital and investment capital. This affects the level of real output which also has implications for the management of inflation. The framework set up in this paper is designed to quantify these interactions in the presence of parallel markets.

The approach adopted here, in some ways, synthesises the monetarist and cost-push schools of inflation.[3] The monetarists argue that cost-push factors such as food prices, wage or exchange rate changes can only cause a shift in the price level but cannot explain how it translates into sustained inflation. For this to happen, one needs monetary accomodation, without which the inflationary process stalls. While this is no doubt true, we argue that although money can be viewed as the proximate cause of inflation, cost-push factors can trigger, directly or indirectly, changes in the rate of monetisation and in the velocity of circulation of money. In order to understand the inflationary process, it is necessary to disentangle the underlying factors which ultimately result in higher growth of domestic liquidity.

The focus of previous analytical work in this area has been on the interaction between exchange rate changes and inflation. When the exchange rate is administered it acts as a stabiliser to the inflationary process but at the cost of trade imbalances or growth.[4] This happens because as inflation accelerates due to high fiscal deficits or cost-push factors such as an increase in food prices, the real exchange rate appreciates. Where the nominal exchange rate is allowed to adjust to inflation automatically the inflationary process can become self-feeding.[5] Similar problems can

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[3] For a comprehensive treatment of the monetarist and cost push analyses of inflation in developing economies, see Kirkpatrick and Nixson, (1976), Williamson (1985), Taylor, (1983).

[4] See for example Khan and Lizondo (1986).

[5] See Drazen and Helpman (1986) and van Wijnbergen (1988) for an analysis of this issue.

arise in the case of dual exchange rates[6] when the government attempts to control the exchange rate changes and there is a parallel market for foreign exchange. As the official rate remains fixed and the parallel market depreciates, export earnings channelled into the official exchange market decline and the duality in the exchange market becomes unsustainable. With a rising parallel market premium the implicit tax on exchange rate proceeds in the official market increases.

When the government attempts to unify the two markets, it loses the implicit tax. Unless accompanying fiscal changes are brought about, the higher fiscal deficit (due to the loss in the implicit tax on foreign exchange transactions) is usually monetised leading to higher inflation which could lead to further depreciation of the parallel market exchange rate. A destabilising process from unification to higher deficits, higher inflation and an increase in the parallel market premium can be established. Pinto (1988) shows the conditions under which this destabilising process can develop. This has obviously not happened in Ghana as the premium between the two rates has gradually declined. Moreover, the government's budgetary position has, if anything, improved due to the devaluation of the official exchange rate for reasons that are explained in later sections.

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[6] See Dornbusch (1986) and Pinto (1988)

2.1. The Theoretical Model

A segmented goods[7] market is hypothesized. There is an official market at which goods are available at a subsidised price (P_3). In the parallel market and the uncontrolled legal market there are traded goods and non-traded goods. Traded goods are priced equal to foreign goods (P_f) converted at the parallel exchange rate, plus a mark-up for the unit costs of smuggling(s).[8]

$$P_1 = (1 + s)\ [e_p \cdot P_f).$$

We assume for expository convenience that $\dot{s} = 0$

$$\dot{P}_1 = \dot{e}_p + \dot{P}_f\ ; \quad \dot{s} = 0.$$

A third category of final goods transacted in the parallel market are non-traded goods. The production of these requires labor and imported inputs. The foreign exchange for the purchase of imported inputs comes from official sources (e_o) as well as from the parallel market (e_p). The following variable mark-up model is used to explain non-traded goods prices (P_2):[9]

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[7]Refers to goods and services.

[8]The variable arguments of this unit costs function are the extent of policing and the volume of smuggling. A larger volume of smuggling decreases the unit costs of smuggling. The unit costs of smuggling are assumed to be invariant to the level of demand in the economy.

[9]See Kalecki (1971).

$$P_2 = (1 + u)\,[\theta e_p \,.\, P_f + (1-\theta)\, e_0 P_f]^{\alpha_1} (wp)^{\alpha_2}$$

where wp denote unit labor costs, and θ is the parallel market's share of foreign exchange used for imported inputs. The size of the mark-up is a function of excess demand (ED) in the economy.

$$\dot{P}_2 = \alpha_0\, ED + \alpha_1\, \theta[\dot{e}_p + \dot{P}_f] + \alpha_1\, (1-\theta)(\dot{e}_0 + \dot{P}_f) + \alpha_2\, \dot{w}p$$

The average rate of inflation is weighted average of the changes in prices of traded (P_1) and nontraded (P_2) goods and goods at controlled prices (P_3).

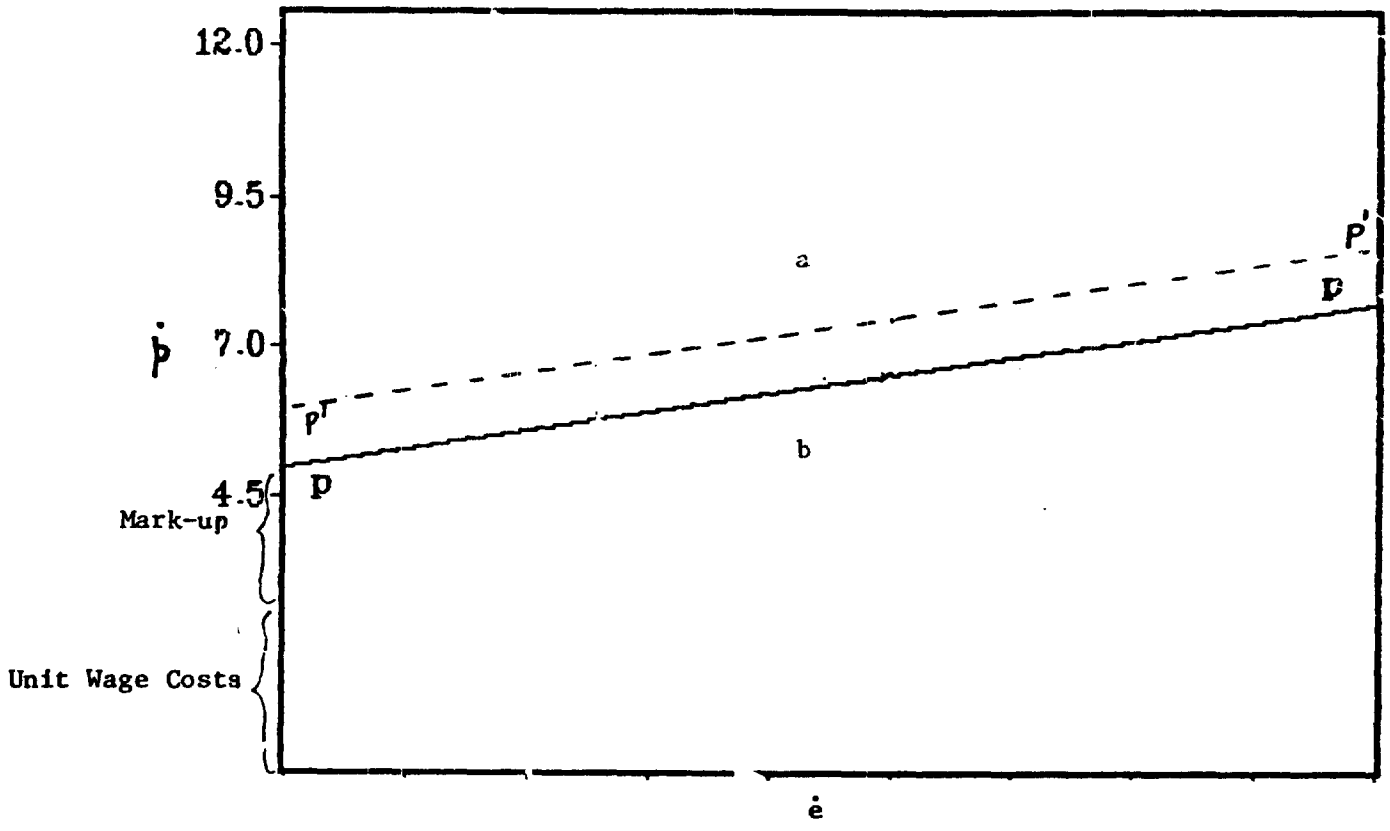
$$\dot{P} = \lambda_1 \dot{P}_1 + \lambda_2 \dot{P}_2 + (1-\lambda_1 - \lambda_2)\, \dot{P}_3$$

Equilibrium in the goods market is depicted in Figure 1 by the PP line. In area a, there is excess supply as the mark-up over unit costs is too high. Prices must fall to clear the goods market. At b the opposite holds. There is excess demand since the mark-up is too low and therefore prices must rise to clear the market. An increase in aggregate demand brought about by a larger fiscal deficit shifts PP to P^1P^1, thereby increasing the mark-up. We assume that there is a surplus in the labor market such that an increase in aggregate demand decreases the size of the labor surplus, but has no effect on unit labor costs.

In the asset markets, there is a domestic asset cedis, and a foreign asset, foreign exchange (F).

Figure 1

Mark-Up Model of Inflation Determination



Overall demand is a function of total financial assets which are defined as:

$$A = M + e_pF$$

Where M represents the money supply, e_p is the parallel exchange rate, F is the foreign asset. The demand for foreign exchange is composed of transactions demand and portfolio demand.

$$e_p \cdot F_d = h(e_p/eo,\ P/P_3,\ A) + j\ [(i - i^* - e_p^e),\ A]$$

where $h_1 < 0$, $h_2 > 0$, $h_3 > 0$; $j_1 < 0$, $j_2 > 0$.

The supply of foreign exchange is a function of the exchange premium the real exchange rate (r) and the ratio of parallel market prices to the controlled official price.

$$e_pF_s = n(e_p/e_0,\ r,\ P/P_3)$$

where $n_1 > 0$, $n_2 > 0$, $n_3 > 0$.

An increase in P increases the transactions demand for foreign exchange as the difference between the parallel and controlled price rises. An increase in P also increases expectations that the parallel exchange rate will depreciate. This leads to an increase in the portfolio demand for foreign exchange, given domestic and foreign interest rates. The effect on the supply of foreign exchange is also positive, but on

balance the net effect is an increase in demand. A rise in e_p is required to offset this net demand increase and restore equilibrium. A rise in e_p increases the supply of foreign exchange in the parallel market. The direct price effect of e_p on F_d is negative. But there is a positive wealth effect. If the substitution effect is greater than the wealth effect, the overall demand effect is negative and the ee curve unambiguously slopes upwards (Figure 2c). An increase in e_p also lowers the expectation of future devaluation e_p^e and thereby lowers the portfolio demand for foreign exchange.

We have drawn Figure 2a to show equilibium in e_p and P. In quadrant I we have an excess supply of goods but an excess demand for foreign exchange so that equilibrium is restored with a decline in P and an increase in e_p. In quadrant II we have an excess supply of goods and foreign exchange and both P and e_p decline. The tâtonnement in Quadrants III and IV is self-explanatory.

What happens if the official exchange rate is devalued? There are two effects which could potentially go in opposing directions. First, with an official devaluation there is a direct cost-push effect which shifts PP upwards to P^1P^1. In addition, there are budgetary effects which determine private asset holdings. If the budget deficit improves with an official devaluation and the rate of monetary creation declines,[10] then ee curve shifts inwards due to a declining wealth effect. The P^1P^1 curve also shifts inwards as the lower excess demand reduces the average level of mark-up in the

[10]Assuming Ricardian equivalance does not hold.

Figure 2a: EQUILIBRIUM INFLATION AND PARALLEL EXCHANGE RATES

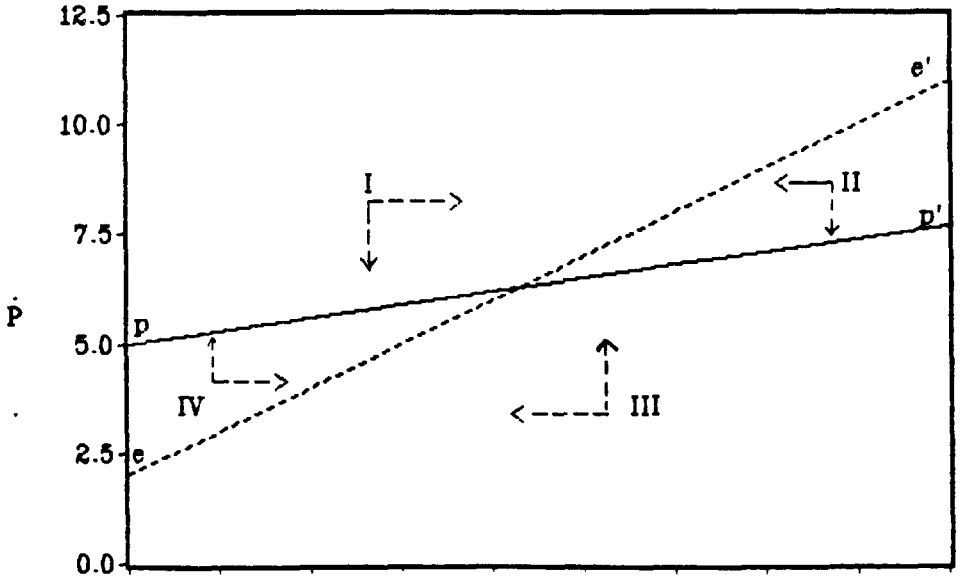
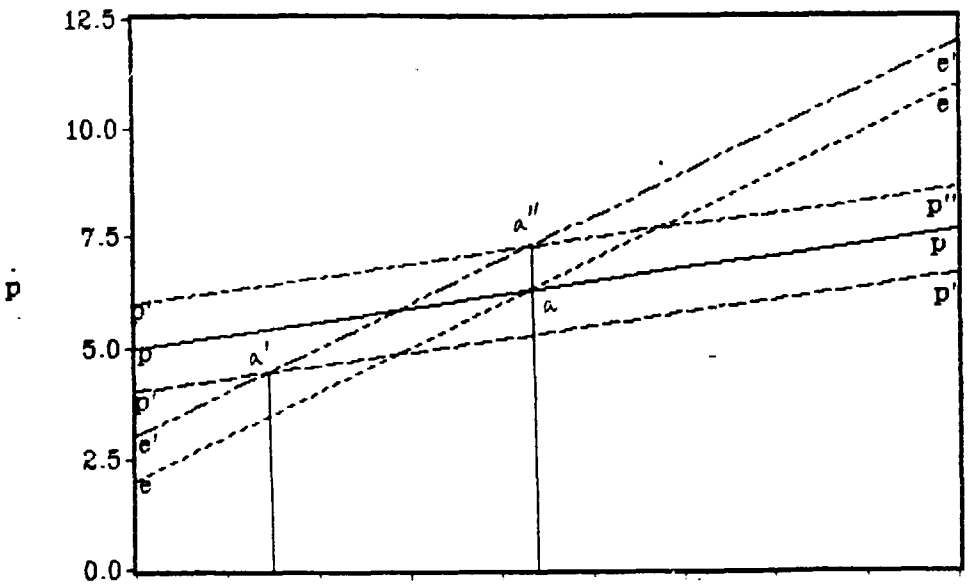


Figure 2b: COMPARATIVE STATICS WITH DEVALUATION OF THE OFFICIAL EXCHANGE RATE



economy. How far inside P^1P^1 shifts depends on the size of the wealth effect on demand and on the mark-up in comparison with the higher cost-push effect of a devaluation (Figure 2b).[11] As long as the cost push effect of the official devaluation is not larger than P^1P^1, then e_p unambiguously declines, but the net effect on P is an empirical question that depends on the relative magnitudes of different variables. This empirical question will be explored in the simulation model that follows. On the other hand if the official devaluation leads to a larger budget deficit both ee and PP shift outwards and e_p and P rise unambiguously.

A recent model (Azam and Besley, 1989) also simultaneously determines the parallel exchange rate and the CPI. However, their model addresses somewhat different issues from those discussed in this paper. Their focus is on the relative price of goods smuggled between Ghana and Cote d'Ivoire, changes in the official producer prices and the impact of that change on the parallel market exchange rate and inflation. The analytical focus of our model is on the joint determination of the exchange premium and inflation with changes in the official exchange rate. We also build in the fiscal-monetary side and the real sector. The policy issues we address concentrate on exchange rate, interest rate and monetary policy and their impact on inflation and the parallel market premium. The section that follows presents an empirical application of this model to Ghana and is followed by simulations that explore the implications of a number of policy changes.

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[11]We verify econometrically in Section 3 that there is no cost-push effect for Ghana.

3. The Empirical Estimation of the Model

The detailed empirical model with all the equations and identities is presented in Table 2. The model is divided into four blocks: Inflation, Parallel Exchange Rate, Money and Fiscal and the Real Side.

3.1. Block A: Inflation

Inflation is hypothesised to have both monetarist and cost-push determinants. The overall rate of inflation is a weighted average of traded (P_1), non-traded (P_2) and controlled (P_3) prices (Equation 2:1). For traded goods, the change in the domestic price is equal to the change in foreign price plus the change in the nominal exchange rate (Equation 2.2). For goods that are nontraded,[12] prices are determined by a mark up over unit labor costs (wp) and the cost of imported inputs (mc)[13] (Equation 2.3). The size of the mark up depends on the degree of excess demand (ED) that exists in the economy. Changes in unit labor costs result from deviations of wage growth from productivity growth in the economy. Following Corbo and McNelis (1987), the assumption is made that changes in import costs are the sum of changes in foreign prices and the nominal exchange rate (Equation 2.4).

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[12] Nontraded here refers to both goods that it is not feasible to trade, such as land, and goods that are de facto nontradables, such as items protected by prohibitive tariffs and/or quotas.

[13] Bruno, 1979; Gordon, 1975; and Corbo, 1985.

Table 1: GNANA - ECONOMIC INDICATORS

Mid-1987 Population (mils.)	13.6
1987 Per Capita GNP in US$:	390

	A. Shares of Gross Domestic Product (from current price data)						B. Growth Rates(% per annum) (from constant price data)				
	1965	*1973*	*1980*	*1986*	*1987*	*1988*	*1965-73*	*1973-80*	*1980-87*	*1987*	*1988*
Gross Domestic Product m.p.	100.0	100.0	100.0	100.0	100.0	100.0	3.4	-0.3	1.4	4.8	6.0
Net Indirect Taxes	12.8	8.0	3.6	..	..	..	..	..	..	..	..
Agriculture	43.5	49.0	57.9	47.8	50.6	..	4.5	0.0	0.0	0.0	3.6
Industry	18.6	18.6	11.9	17.2	15.9	..	4.3	-3.4	0.1	11.3	10.3
(of which Manufacturing)	9.8	11.7	7.8	11.2	9.9	..	6.5	-2.8	1.3	10.0	9.3
Services	37.9	32.4	30.2	35.0	33.5	..	1.1	0.6	4.2	9.4	7.8
Resource Balance	-9.6	5.1	-0.7	-3.3	-2.9	-3.8	..	..	..	..	..
Exports of GNFS	17.1	21.4	8.5	19.2	20.6	17.8	0.4	-8.7	0.3	9.8	3.3
Imports of GNFS	26.7	16.4	9.2	22.5	23.6	21.6	-7.8	-3.6	-0.3	18.4	4.5
Total Expenditures	109.6	94.9	100.7	103.3	102.9	103.8	2.2	0.5	1.4	5.9	6.1
Total Consumption	91.7	85.9	95.1	93.7	92.2	94.6	2.8	0.8	1.3	4.7	5.4
Private Consumption	77.3	75.0	83.9	82.6	81.6	86.5	2.9	0.0	1.7	5.4	5.1
General Government	14.5	10.9	11.2	11.2	10.6	8.2	1.1	8.4	-1.6	0.0	6.7
Gross Domestic Investment	17.9	9.0	5.6	9.6	10.9	12.5	-3.5	-3.6	3.2	21.3	16.2
Fixed Investment	..	7.7	6.1	9.5	10.7	..	3.6	-0.8	2.5	21.4	..
Changes in Stocks	..	1.4	-0.5	0.1	0.1	..	..	..	..	..	..
Gross Domestic Saving	8.3	14.1	4.9	6.3	7.9	8.6	12.3	-7.7	1.8	3.0	13.0
Net Factor Income	-1.3	-0.8	-0.4	-2.4	-2.7	-2.7	..	..	..	..	..
Net Current Transfers	..	-0.2	0.0	1.3	4.2	..	..	..	..	..	..
Gross National Saving	..	13.1	4.5	5.1	9.3	..	14.2	-8.0	8.7	22.7	5.9

In millions of LCUs (at constant 1980 prices)	*1965*	*1973*	*1980*	*1986*	*1987*	*1988*					
Gross Domestic Product	35,594	43,174	42,852	44,335	46,463	49,260	3.4	-0.3	1.4	4.8	6.0
Capacity to Import	5,190	5,898	3,628	2,223	3,730	3,620	-0.8	-6.1	-1.6	67.8	-3.0
Terms of Trade Adjustment	-2,558	-1,456	0	-1,189	-684	-800	..	..	..	..	..
Gross Domestic Income	33,036	41,718	42,852	43,146	45,779	48,460	3.4	0.2	1.3	6.1	5.9
Gross National Product	35,443	43,033	42,670	43,994	45,910	48,560	3.4	-0.3	1.4	4.4	5.8
Gross National Income	32,885	41,577	42,670	42,806	45,226	47,760	3.4	0.2	1.2	5.7	5.6

C. Price Indices	(1980 = 100) *1980*	*1984*	*1985*	*1986*	*1987*	*1988*	Inflation Rates (% p.a.) *1965-73*	*1973-80*	*1980-87*	*1987*	*1988*
Consumer Prices (IFS 64)	100.0	824.2	909.1	1132.5	1583.3	..	6.4	60.3	45.7	39.8	31.4
Wholesale Prices (IFS 63)	100.0	844.3	1319.9	2158.6	3051.4	..	8.6	41.4	67.8	41.4	..
Implicit GDP Deflator	100.0	670.8	812.6	1152.6	1612.4	2127.5	8.1	45.4	48.3	39.9	31.9
Implicit Expenditures Defl.	100.0	678.2	828.7	1212.9	1665.4	2210.0	7.7	44.8	48.9	37.3	32.7

D. Other Indicators: Growth Rates(% p.a.):	*1965-73*	*1973-80*	*1980-87*
Population	2.3	1.8	2.6
Labor Force	..	..	..
Gross Natl. Income p.c.	1.1	-1.6	-2.1
Private Consumption p.c.	0.6	-1.8	-1.7
Import Elasticity:			
Imports (G+NFS) / GDP(mp)	-2.3	13.6	-0.2
Marginal Savings Rates:			
Gross National Saving	..	-348.9	310.8
Gross Domestic Saving	39.9	-424.7	80.3
ICOR (period averages):	..	-73.4	5.3

Share of Total Labor Force in:	*1965*	*1973*	*1980*	*1987*
Agriculture	61.0	57.6	55.8	..
Industry	15.3	17.0	17.8	..
Services	23.7	25.4	26.4	..
Total	100.0	100.0	100.0	..

Table 1 ... (contd.)

Ghana

I. Budget	Share of GDP (%) 1980	1984	1985	1986	1987	1988	Growth Rates 1980-84	1986	1987	1988
Current Receipts	..	8.0	11.3	12.4	13.4	12.2	..	63.2	58.3	30.8
Current Expenditures	..	8.6	11.2	11.9	10.8	10.2	..	58.2	32.5	37.8
Current Budget Balance	..	-0.6	0.1	0.5	2.6	1.9	..	..	..	..
Capital Receipts	..	..	..	..	..	..	..	..	..	..
Capital Expenditures	..	2.5	4.2	7.3	7.8	8.3	..	..	..	..
Adjustments	..	..	..	..	..	..	..	..	..	..
Overall Deficit	..	-3.1	-4.1	-5.5	-4.9	-5.5	..	..	..	..
Official Capital Grants	..	0.4	0.6	1.5	1.7	1.4	..	..	..	..
External Borrowing (net)	..	..	..	..	..	..	..	..	..	..
Domestic Non-Bank Financing	..	0.5	0.3	0.6	0.6	..	..	..	..	..
Domestic Bank Financing	..	0.7	0.9	0.5	-1.0	-0.7	..	..	..	..

G. Terms of Trade	1980	1984	1985	1986	1987	1988
Merch. Exports Price Index	100.0	48.5	44.1	46.1	47.0	47.0
Merch. Imports Price Index	100.0	120.5	120.5	109.7	114.0	117.5
Merch. Terms of Trade	100.0	40.2	36.6	42.0	41.2	40.0

H. Balance of Payments	US$ millions (at current prices) 1980	1984	1985	1986	1987	1988
Exports of Goods & NFS	1,210	610	670	813	906	943
Merchandise (FOB)	1,104	566	632	773	827	841
Non-Factor Services	107	44	38	40	79	103
Imports of Goods & NFS	1,175	696	836	940	1,189	1,289
Merchandise (FOB)	908	533	669	713	952	1,110
Non-Factor Services	266	163	168	228	238	179
Resource Balance	36	-86	-166	-127	-283	-346
Net Factor Income	-86	-115	-111	-111	-132	-135
(Interest per DRS)	30	30	31	43	58	73
Net Current Transfers	-3	21	33	72	202	172
(workers remittances)	1	5	0	1	1	..
Curr A/C Bal before Off. Transf	-54	-180	-244	-166	-224	-325
Net Official Transfers	83	141	110	123	123	174
Curr A/C Bal after Off. Transf	29	-39	-134	-43	-101	-151
Long-Term Capital Inflow	93	203	38	135	220	221
Direct Investment	16	2	6	4	5	20
Net LT Loans (DRS data)	127	46	107	269	241	230
Other LT Inflow (Net)	-50	155	-74	-138	-26	-34
Total Other Items (net)	-218	-232	157	-122	-30	68
Net Short Term Capital	-118	-99	93	-41	-42	69
Capital Flows N.E.I.	0	0	0	0	0	0
Errors and Omissions	-100	-133	63	-81	12	2
Changes in Net Reserves	95	94	-128	-46	-180	-125
Net Credit from the IMF	-31	214	122	16	-25	-45
Other Reserves Changes	126	-120	-249	-62	-155	-80
As Share of GDP:						
Resource Balance	0.8	-2.0	-3.7	-2.2	-5.6	-6.7
Interest Payments	0.7	0.7	0.7	0.8	1.1	1.4
Current Account Balance	-1.2	-4.1	-5.4	-2.9	-4.4	-6.3
Memorandum Items:						
Reserves excl. Gold (mil. US$)	180	302	479	513	195	221
Reserves incl. Gold (mil. US$)	330	437	552	624	332	310
Official X-Rate (LCUs/US$)	2.75	35.34	54.05	89.29	147.00	202.00
Index Real Eff. X-R Base 1980	100.00	72.15	52.45	30.24	23.34	22.19
GDP (millions of current US$)	4,445	4,419	4,504	5,723	5,075	5,145

Table 2: THE MODEL

A. Inflation

2.1.	$\dot{P}$	=	$\lambda_1\dot{P}_1 + \lambda_2\dot{P}_2 + (1-\lambda_1 - \lambda_2)\,\dot{P}_3$
2.2.	$\dot{P}_1$	=	$\dot{P}_f + \dot{e}$
2.3.	P_2	=	$U + [a_1\dot{wp} + a_2\,\dot{mc}]$
2.4.	$\dot{mc}$	=	$\dot{pf} + \dot{e}$
2.5.	U	=	$f(ED);\ f_1 > 0$
2.6.	ED	=	log M/p - log Md/p
2.7.	log Md/p	=	$\delta(\log y,\ i,\ P^{e});\ \delta_1 > 0,\ \delta_2 < 0,\ \delta_3 < 0$
2.8.	$\dot{e}$	=	$\phi\ \dot{e}_0 + (1-\phi)\ \dot{e}_p$

B. Parallel Exchange Rate

2.9.	F	=	$F^t + F^p$
2.10.	e_pF^t	=	$h(e_p/e_0, P/P_3, A);\ h_1 < 0,\ h_2\ 0$
2.11.	e_pF^p	=	$j[i_{-1}^{*} - \dot{e}^{e}_{p}]\ .\ A;\ j_1 > 0$
2.12.	$e_p.Fs$	=	$n\ (e_p/e_0, r, P/P_3);\ n_1 > 0,\ n_2 > 0,\ n_3 > 0.$

C. Money and Fiscal

2.13.	M_2	=	m + R
2.14.	R	=	COG + NFA + OA
2.15.	COG	=	COG^{-1} + GBB
2.16.	GBB	=	GDEF - GFB - GDB.
2.17.	GDEF	=	GEXP - GREV.

2.18. GREV = CUDT + EXPT + GOREV + AID.

2.19. CUDT = IMPQ.Pf.e_0.tm

2.20 EXPT = EXPQ.Px.e_0.tx.

2.21. AID = \$AID.e_0.

2.22. GEXP = WBILL+SUBS+INTD+INTF+GOVI+GOEXP

2.23. WBILL = Wg.Lg.

2.24. INTF = FDEBT.if.e_o.

2.25. FDEBT = $FDEBT_{-1}$ + GFB/e_o.

2.26. INTD = DDEBT.i.

2.27. DDEBT = $DDEBT_{-1}$ + GDB

2.28. PCRED = $PCRED_{-1}$ + ΔPCRED

2.29. ΔPRCED = ΔTCRED - ΔGCRED

D. Real Side

2.30. gy = $a_0 + a_1gk + a_2gPoP$.

2.31. K = $K_p + K_g$.

2.32. K_p = K_{p-1} (1-δ) + Ip.

2.33. Kg = Kg_{-1} (1-δ) + Ig.

2.34. Ip = f(PCRED)

where

AID	=	Foreign Aid in Cedis
\$AID	=	Foreign Aid in US dollar
COG	=	Government borrowing from the Central Bank
CUDT	=	Customs Duty Earnings
DDEBT	=	Domestic Debt
e_0	=	Official Exchange Rate Cedis/US\$
e_p	=	Parallel Exchange Rate Cedis/US\$

e	=	Weighted average Exchange Rate
ED	=	Excess Demand
EXPT	=	Export Tax Revenue
EXPQ	=	Export Volume
F	=	Foreign Exchange in Parallel Market
F^T	=	Transactions Demand for Foreign Exchange in Parallel Market
F^P	=	Portfolio Demand for Foreign Exchange in Parallel Market
PDEBT	=	Foreign Debt
GBB	=	Government borrowing from the Central Bank
GDEF	=	Fiscal Deficit
GFB	=	Government Foreign Borrowing
GDB	=	Government Domestic Borrowing
GEXP	=	Government Expenditure
GREV	=	Government Revenue
GOVI	=	Government Investment (Nominal)
GDEXP	=	Other Government Expenditure
gy	=	Growth Rate of real output
gk	=	Growth rate of capital stock
gPoP	=	Growth rate of population
IMPQ	=	Import Volume
INTF	=	Interest on Foreign Debt
INTD	=	Interest on Domestic Debt
i	=	Domestic Interest Rate on Six Month Deposits
if	=	Foreign Interest rate
Ip	=	Real Private Investment
Ig	=	Real Public Investment
K	=	Capital Stock
Kp	=	Private Capital Stock
Kg	=	Government Capital Stock
Lg	=	Government Labor Growth
M	=	Money Supply (M2); includes 30-day Deposits
Md	=	Money Demand
mc	=	Costs of Intermediate imports
P	=	CPI
P_1	=	CPI for Traded Goods
P_2	=	CPI for Non-traded Goods
P_3	=	CPI for Controlled Goods
PCRED	=	Credit to Private Sector (Real)
Pf	=	Import Price Index
Px	=	Export Price Index
r	=	Real Official Exchange Rate
TCRED	=	Total Credit (Real)
tm	=	Customs Duty rate
tx	=	Export Tax Rate
wp	=	Unit Labor Costs
wg	=	Government Wage Level
WBILL	=	Government Wage Bill

Specifying Excess Demand

Two different approaches to modelling excess demand in the goods market were tried. The first uses Walras' law to assume that excess demand in the goods market is equivalent to excess supply in the money market.[14] This implies that the substitution between money and goods is far more important than that between money and other financial assets. This is a plausible assumption in a developing economy with a relatively shallow financial system characterized by administered interest rates and a limited number of financial assets.[15] It is an appropriate assumption in the case of Ghana.

The excess supply of money is specified as the log difference of real money supply to real money demand (Equation 2.6). A standard money demand function is hypothesized and Y is real income, i is the rate of interest on deposits, and Pe is the expected rate of inflation.[16]

A second approach that was tried was to use the ratio of capacity output to actual output. Capacity output was defined as the multiple of an average output-capital ratio to the capital stock. This approach gave poor econometric results and was rejected.

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[14] See Chhibber et al, 1989 for further discussion of the relevance of this assumption.

[15] This argument was put forth by Khan, 1980.

[16] Mid-year (June) M2 figures were used for money supply and the six month deposit rate was used for the interest rate. The price indices used were also June figures.

Wage-Push Inflation

Changes in wages can have inflationary consequences when they exceed the growth in labour productivity, i.e. a "wage gap" exists.[17] In order to assess this channel for the acceleration of inflation, it was necessary to construct an index of nominal wages in the economy. This was done by constructing a weighted average of the average mid-year wages paid in the public and private sectors over the 1965-87 period. The weights varied over time depending on the relative shares of formal sector workers employed in the public and private sectors. The resulting wage index may be slightly biased upwards since it does not include informal sector wages, for which there is no available data.

Real wages have not moved monotonically in Ghana (Appendix Figure 5). After a peak in 1975, the trend was steadily downward: consequently it was not plausible to assume that productivity followed a time trend, in the Ghanaian case. Regressions of real wage growth[18] on a constant, a time trend, and a lagged dependent variable always resulted in insignificant coefficients. Instead, it was necessary to analyze labour productivity more directly in order to evaluate the

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[17] Bruno and Sachs define the wage gap which causes inflation as the difference between wages and productivity. They use two different measures of productivity for their empirical work on the OECD countries: (1) average labour productivity at cyclical peaks interpolated at constant exponential rates, and (2) labour productivity as a function of a time trend and unemployment. Bruno and Sachs, 1985, p. 179,

[18] Real wage growth was defined as: WGPG = log W-log W(-1) - log P - log P(-1).

inflationary consequences of the wage gap. The proxy used for labour productivity was the growth rate of real output per capita.[19] The following equation was estimated:

$$WGPG = \underset{(0.84)}{-0.05}\ CONSTANT + \underset{(1.83)}{1.81}\ (GDP/POPG).$$

The residual that resulted from this regression was defined as the "wage gap." The coefficient on labor productivity is not significantly different from unity.

Econometric Estimation: Inflation

Table 3 contains the results of econometric estimates of the reduced form inflation equation for Ghana.[20] All of the regressions are two stage least squares estimates.[21] The model performs well with all of the variables significant and

[19] Data are not available for the actual labour force in Ghana. Figures from censuses for various years (1960, 1970, 1984, and 1987) are available and there is a series for formal sector employment defined as units employing ten or more workers. Because of these data constraints, it seemed more plausible to assume a constant participation rate of the population than to assume a constant rate of formal sector participation, which one would expect to increase over time. This is confirmed by the fairly steady participation rates observed across censuses reported in Killick, 1978, p. 77. Consequently, the proxy used for labour productivity was real output as a share of the total population in Ghana. Note also that since real output includes the productivity of the capital stock, it is necessary to assume Cobb-Douglas technology to justify the use of output per capita as a proxy for labour productivity.

[20] Mid-year (June) observations were used for the series for M2, the consumer price index, + the official + parallel market exchange rates. All real values are in 1980 prices.

[21] Because the R2 is not reliable in two stage least squares estimates, they are not reported here. Instead, the Chi2(B=0) statistic is reported as a measure of the goodness of fit of the equation.

Table 3: INFLATION EQUATIONS WITH WAGE VARIABLES, 1965-87

Equation	Constant	$\dot{e}_o + \dot{P}_f$	Log (M/P-1)	Log y	i	$\dot{W}$	$\dot{Wg}$	$\dot{p}$-1	CHi^2	DW
3.1	18.8822 (1.64)	0.0887 (0.28)	0.3939 (2.34)	-1.9721 (1.76)	0.0372 (1.92)	0.3447 (0.64)		0.4551 (1.85)	10.09	1.83
3.2	13.6146 (1.47)	0.4812 (2.04)	0.4420 (3.90)	-1.5027 (1.68)	0.0315 (1.00)		-0.1185 (0.26)	0.4404 (1.65)	12.45	1.90

All equations were estimated by two stage least squares using PCGIVE. The instruments used were lagged values of inflation, output, money supply, interest rates, import prices at the official and parallel market exchange rates, the parallel market premium, the wage gap, and real public sector wages.

e_o : Official Exchange Rate (Cedis/US$)

$\dot{P}_f$: Foreign Price Index in US$

M : Money Supply (M2)

y : Real GDP

i : Six-month Deposit Rate

$\dot{W}$: Real Wage Minus Productivity

$\dot{Wg}$: Real Public Sector Wages

$\dot{P}_{-1}$: Lagged Inflation

appropriately signed with the exception of the unit wage costs. This is not surprising in Ghana given that a very small share of the labor force is in the formal sector and unionized and that there has been tremendous downward pressure on wages in recent years.[22]

An alternative argument might be that it is public sector wages that rise at a faster rate than productivity and therefore fuel inflation.[23] Given the difficulties in measuring public sector productivity, it has been assumed to be constant so only the growth rate in public sector wages has been included in the inflation equation. The results reported in equation 3.2 of table 3 also confirm that public sector wages did not contribute to the inflationary process in Ghana. This is consistent with a declining trend in real public sector wages over much of the high inflation period.

Equation 4.1 in Table 4 drops the wage variables as there is no evidence that wages were an important factor in overall price determination in Ghana. The resulting equations are very robust with significant coefficients and diagnostic statistics. Expected inflation was specified using both perfect foresight and adaptive lagged inflation. The empirical results indicate that lagged inflation worked better.[24]

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[22] However, union activity is not totally absent in Ghana. Aboagye describes the increase in the rise in the number of industrial disputes in Ghana from 10 in 1972 to 43 in 1974 when rising inflation eroded real wages. Aboagye, 1979, p. 14.

[23] Note that this distinction between private and public sector wages may be slightly artificial in the Ghanaian case for a number of reasons. The statistics for private sector wages include some parapublic sector wages and private sector wages respond in part to movements in public sector wages.

[24] The relationship between price controls and inflation was also explored econometrically, but the results were inconclusive. The findings are available from the authors.

Table 4: INFLATION EQUATIONS, 1965-88

Equation	Constant	$\dot{e}_o + \dot{P}_f$	$\dot{e}_p + \dot{P}_f$	Log (M/P-1)	Log y	i	$\dot{P}_{-1}$	CHi^2	D.W.
4.1	14.3193 (2.07)	0.2909 (2.03)		0.4036 (3.80)	-1.5513 (2.30)	0.0390 (2.97)	0.3209 (2.17)	22.62	1.80
4.2	8.8233 (1.97)		0.1649 (4.52)	0.3566 (6.90)	-1.0049 (2.32)	0.0258 (3.25)	0.5872 (5.22)	69.60	1.39
4.3	9.1805 (1.80)	0.0691 (0.39)	0.1474 (1.60)	0.3832 (5.31)	-1.0533 (2.12)	0.0281 (2.86)	0.5596 (3.32)	42.74	1.35

All equations were estimated by two stage least squares using PCGIVE. The instruments used were lagged values of inflation, output, money supply, interest rates, import prices at the official parallel market exchange rates, and the parallel market premium.

e_o : Official Exchange Rate (Cedis/US$)

e_p : Parallel Market Exchange Rate (Cedis/US$)

P_f : Foreign Price Index in US$

M : Money Supply (M2)

y : Real GDP

i : Six-month Deposit Rate

P_{-1} : Lagged Inflation

Inflation and Exchange Rates

The cost-push literature posits the relationship between the exchange rate and inflation operates through the inelastic demand for imports and inelastic supply for exports that characterize many developing economies.[25] Because of such rigidities, a devaluation implies cost increases for importers without a concommitant rise in the income of exporters, at least in the short run.

Econometric evidence on the relationship between inflation and exchange rates is presented in table 4. Equation 4.3 includes both inflation in the domestic price of foreign goods calculated at the official exchange rate ($\dot{e}_o+\dot{P}f$) and the price of foreign goods calculated at the parallel market exchange rate ($\dot{e}_p + \dot{P}f$). Both coefficients are insignificant, which may reflect multicollinearity since the correlation coefficient between the variables is high. However, when either representation of the domestic price of foreign goods is included on its own, it is highly significant. Equation 4.1 in table 4 shows the significance of the import price index at the official exchange rate ($\dot{e}_o+\dot{P}f$). Equation 4.2 includes only the parallel market version of import prices ($\dot{e}_p + \dot{P}f$) along with the basic inflation equation. Again, the coefficient is highly significant.

These results would seem to imply that since both the official and parallel market rates matter, the overall rate of inflation is a weighted average of changes in

[25] If the imports are composed largely of capital goods and intermediates for which no domestic substitutes exist, the economy is particularly vulnerable to cost-push inflation from import prices.

both exchange rates since the market is segmented and clearing at two different prices. In order to test this hypothesis, a grid search was conducted using varying values of ϕ to determine whether the overall fit of the inflation equation improved with varying weights on a composite foreign price variable. The result was that the fit deteriorated as the relative weight of the official exchange rate increased. This was true even when the sample period for the grid search was restricted to the pre-1983 period. This is an indication that consumer prices reflected the shadow price of foreign exchange even during the period prior to the introduction of the auction.[26] This is also confirmed by equation 4.3 in which both the official and parallel market exchange rates are included in the inflation equation and the parallel rate is far more significant. The inflation equation was also estimated recursively and the results of the one-step Chow tests indicated that the parameters were stable at the 1% confidence level over the entire sample period.

To summarize, the results on the determinants of inflation indicate that the relevant cost-push variable is the shadow cost of foreign exchange measured by the parallel market exchange rate. This is important in the context of the comparative static exercises in Section 2. To recapitulate an official devaluation leads to a slower rate of parallel exchange rate depreciation. But the effect on inflation was unambiguous if there was a direct cost-push effect of official devaluation. Since this cannot be empirically verified in Ghana, the effect on inflation of official exchange rate devaluation must be unambiguously negative.

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[26] This is consistent with the method by which the CPI is compiled in Ghana. Officials at the Government Statistical Service stated that they monitor prevailing market prices, rather than official controlled prices, in constructing the consumer price index.

Other results in this sub-section are that wage-push inflation was not important in Ghana. The coefficient of the excess demand variable measured by the excess supply of real money is also significant. Monetary growth therefore is a key variable in determining the pace of inflation but should be viewed in conjunction with factors which affect the desire to hold money. Factors which affect money demand are real income growth and interest rates. A rise in income raises money demand lowering inflation. An increase in the six-month deposit rate lowers money demand which includes only up to 30-day deposits. This in turn leads to higher inflation. The question then arises as to what determines the parallel market exchange rate, the rate of monetary growth and the level of real activity in the economy. We turn now to an analysis of these factors.

3.2. BLOCK B: Exchange Rate Premium

We estimate a dynamic variant of the theoretical model in Section 2 to identify the factors which determine the differential between the official exchange rate and the parallel market exchange rate. The growth in the parallel market premium is defined as:

$$ed = \dot{e}_o - \dot{e}_p.$$

The demand for foreign exchange in the parallel market is divided into a transaction demand and a portfolio demand (Equation 2.9). The transactions demand

depends on exchange premium and the degree of price controls (Equation 2.10). In determining their asset portfolio demand, agents choose between holding Ghanian cedis and foreign exchange ($e_p.F$). The relative shares of cedis and foreign exchange in the public's asset holdings will depend on the relative returns between cedis and foreign exchange. This will depend on domestic and foreign interest rates and the rate of expected depreciation in the parallel market (Equation 2.11).

The supply of foreign exchange to the parallel market will depend on the exchange premium, the real official exchange rate, as well as the difference between prices in the parallel market and controlled prices. The resulting empirical model which determines the parallel market exchange rate is based on the supply and demand factors for foreign exchange in the parallel market. This model posits that the parallel market premium depends on the real effective official exchange rate, the depreciation-adjusted interest differential and the stock of real money balances in the economy.[27]

This model was estimated for Ghana using the cedi/$ exchange rate in the parallel market on the left hand side and the real official exchange rate,[28] the depreciation-adjusted interest rate differential between Ghana and the United

[27]A version of this model was first used by Dornbusch et al (1986) for Brazil and subsequently for Algeria by Rocha (1989). See these studies for a derivation of the estimated equation. We ignore the variable P/P_3 in the estimation as we have no composite index of P_3.

[28] The real exchange rate used is based on the official exchange rate, trade-weighted by the country's twenty major trading partners, deflated by the world WPI and the domestic CPI.

Kingdom,[29] and the real stock of cedi assets on the right hand side.[30] The resulting estimate is reported as equation 5.1 in table 5. The model shows that the coefficient of the relative yield variable is significant but that of real money balance is insignificant. The significance of the relative yield variable implies that as long as real interest rates in Ghana diverge widely from world rates, there will always be a parallel market premium. Exchange rate unification therefore implies eventual opening up of the capital account so that there is legal arbitrage between Ghanaian cedis and foreign assets. This result highlights the important linkages between exchange rate management and domestic interest rates. Although a number of other factors, such as confidence and credibility, offset movements in the premium, the interest rate constitutes an accessible policy instrument for influencing the exchange rate premium.

The real exchange rate and the real stock of domestic assets are insignificant in equation 5.1. The equation performs much better when a dummy variable is included for 1978, the year in which the cedi's link to the US$ was severed and the

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[29] The interest rate differential was defined as:

$$(1+i^*)(1+\hat{e})/(1+i) - 1$$

where i^* is the deposit rate on assets held in the United Kingdom, $\hat{e}$ is the depreciation of the official exchange rate in Ghana, and i is the six month deposit rate in Ghana. The "official" e was used until 1978 when an "effective" rate was introduced. After 1978, this effective rate was the relevant one for the vast majority of official transactions. The UK deposit rate was chosen because it is widely believed that most Ghanian assets held abroad are in the UK.

[30] The use of the relative yield between cedi and UK sterling-demoninated assets to explain movements in the cedi-US $ premium is valid if the Bank of Ghana did not maintain broken cross exchange rates by allowing different growth rates between the cedi/$ and cedi/£ premia. This seems a very plausible assumption since the existence of broken cross exchange rates would create considerable opportunities for arbitratage.

official exchange rate was devalued. The resulting estimates are reported as equation 5.2 in table 5.

An additional factor that may explain the parallel market premium is foreign exchange reserves in terms of months of imports. When foreign exchange reserves are running low, there is greater pressure on the authorities to devalue. When the growth rate in foreign exchange reserves in terms of months of imports (FXIMPT) is included in the model (equation 5.3) it is insignificant. This does not mean that the variable is totally irrelevant to the evolution of the parallel market premium.

If there is imperfect substitutability between Ghanaian cedis and foreign exchange, the exchange rate premium is also affected by uncertainty about future exchange rates, inflation and government policies. While it is not possible to quantify much of this uncertainty adequately, the effects of price instability have been explored empirically. A variable representing price volatility over time was constructed (PVAR) using monthly consumer price indices.[31] In periods of rapid price changes, there is greater pressure on the authorities to devalue which results in a reduction of the exchange rate differential. The inclusion of PVAR also results in the real exchange rate becoming significant. Because of the major changes in the foreign exchange regime, equation 5.4 was also estimated recursively to analyze the stability of the coefficients. As with the inflation equation, the one-step Chow tests indicated

[31] The index used here captures the variability of the aggregate CPI over time. An alternative is to consider the consequences of variability of relative prices as in Fischer, 1981. That approach addresses the question of whether shifts in relative prices as a result of inflation have negative effects on resource allocation.

Table 5: EXCHANGE RATE PREMIUM EQUATIONS, 1965-88

Equation	Constant	RER	Ry	M2/p	DUM 78	FX/IMPT	PVAR	CHi^2	DW
5.1	-0.5157 (0.74)	-0.0004 (0.17)	0.9992 (2.56)	0.0040 (0.63)				2.87	2.38
5.2	-0.0303 (0.20)	-0.0012 (0.85)	1.1486 (4.00)		-1.8476 (4.01)			8.54	2.33
5.3	-0.2224 (1.11)		1.0525 (5.51)		-1.8490 (4.34)	0.7329 (0.66)		11.07	2.20
5.4	-0.4874 (2.81)	-0.0038 (2.87)	1.3173 (5.67)		-2.4904 (6.21)		1.8525 (3.56)	13.96	1.73

All equations were estimated by two stage least squares using PCGIVE. The instruments used were lagged values of the exchange rate differential, the real exchange rate, relative yields, price variability, inflation, and foreign exchange as a proportion of imports.

RER : Real Exchange Rate Index ($/Cedis)

Ry : Relative Yield between Cedis and UKStg.

DUM78 : Dummy Variable for 1978

FX : Foreign Exchange Reserves in US$

IMPT : Import Bill in US$

PVAR : Index of Monthly Variation in Prices

M2P : M2/CPI

parameter stability at the 1% confidence level over the sample period. These test results imply that, despite the policy reforms that have occurred, some of the underlying economic relationships have been captured in the model.

In the case of Ghana, the differential between the official and parallel market exchange rates was so large that the share of transactions that occurred through official channels decreased steadily over time. The spread between the official and parallel market exchange rates is depicted in nominal terms in figure 3. Because of this leakage to smuggling and parallel market activities, the efficacy of the overvalued official exchange rate as an export tax diminished. The Ghanaian government's strategy was one of a gradual reduction of the fiscal deficit combined with a relaxation of exchange rationing and large, discrete devaluations.[32] The reduction in the fiscal deficit was necessary to reduce demand in the economy and thereby reduce the rate of inflation and the rate of depreciation of the parallel exchange rate. The process began in April 1983, the foreign exchange auction was introduced in September 1986 and a unified auction rate was instituted in March 1987.

Figure 4 shows how the growth in the premium would have behaved in the absence of changes in the official exchange rate and domestic interest rates. The figure shows that predominant effect of the narrowing of differentials has come from the official devaluation, with some additional effect due to interest rate policy. However, in 1988, interest rates have had an adverse effect on the exchange premium.

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[32] Pinto, May 1988, p. 21.

Figure 3

PARALLEL AND OFFICIAL EXCHANGE RATES

(NOMINAL)

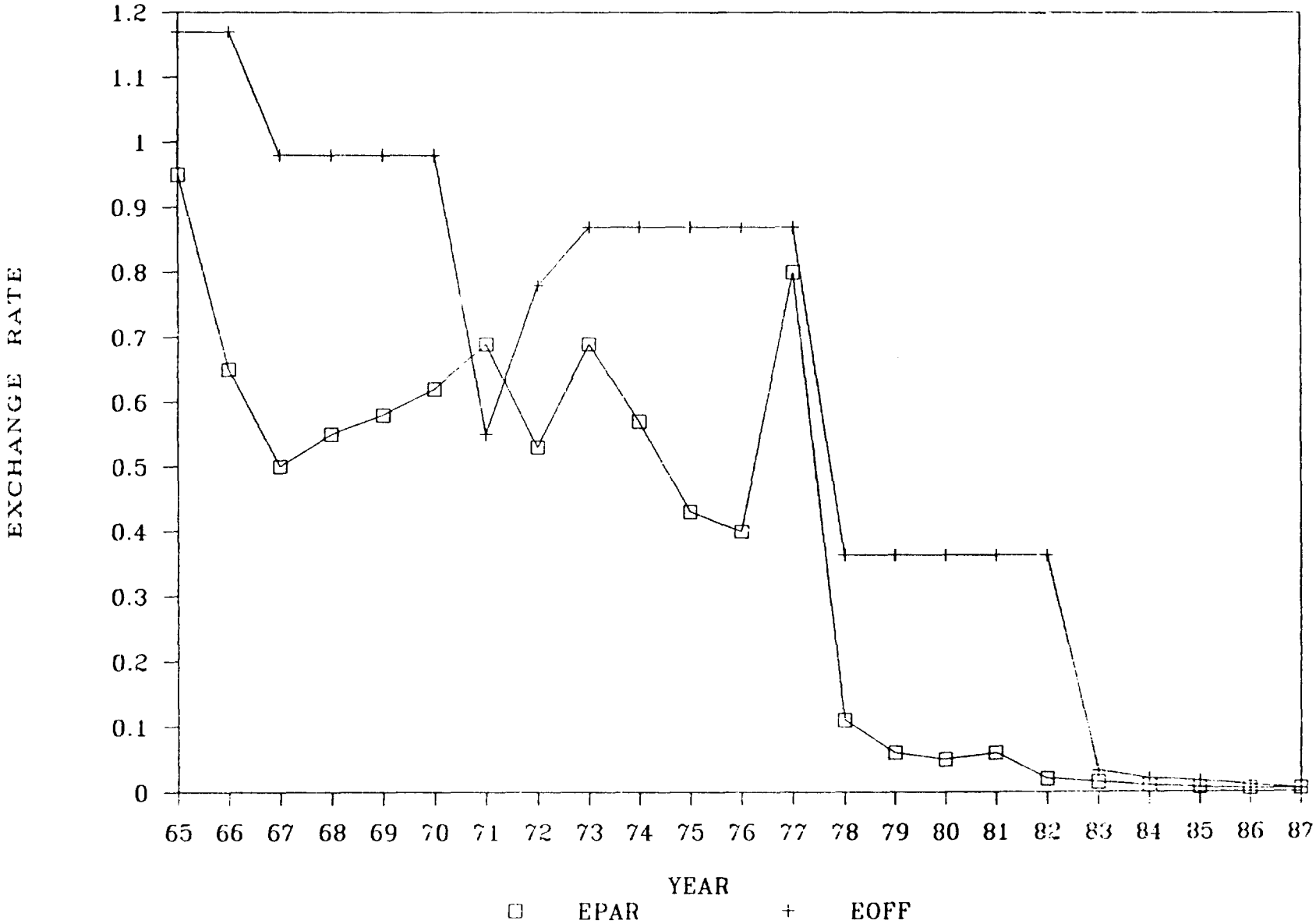
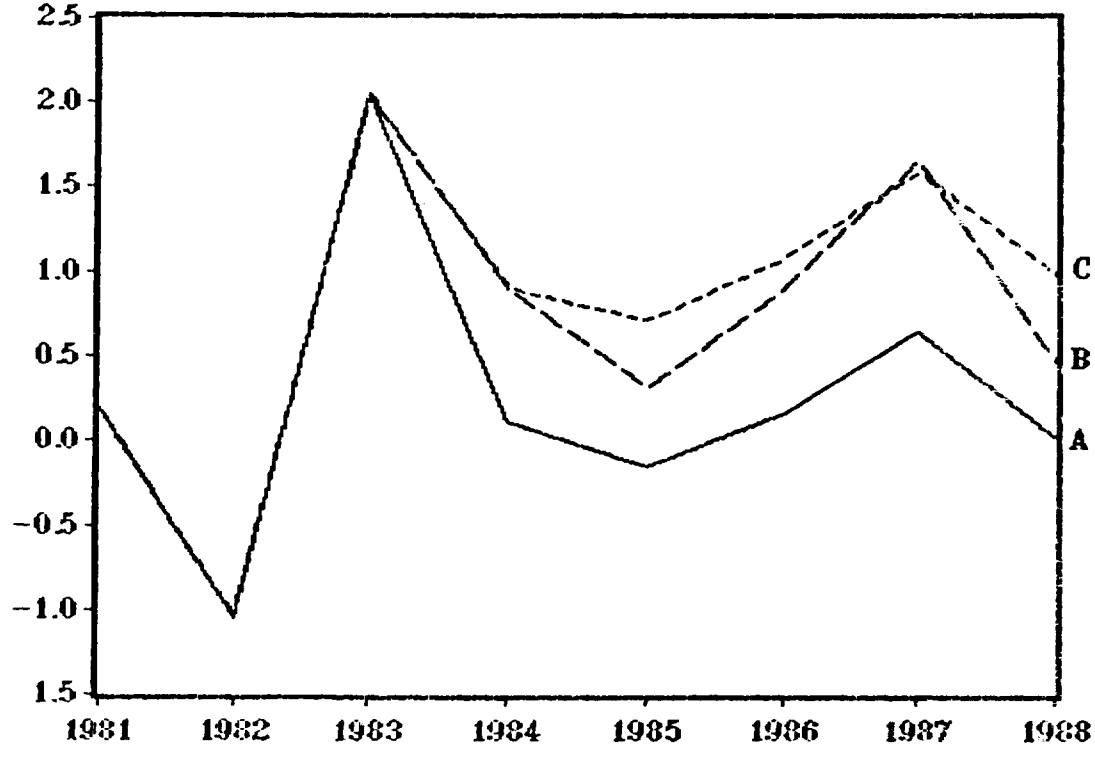


Figure 4

Growth in Exchange Rate Premium

Underlying Factors



A - Actual
B - With PER and interest rates at 1982 level for 1984 onwards
C - With PER at 1982 level from 1984 onwards.

3.3. Block C: Monetary-Fiscal Block

Monetary growth is modelled conventionally as a function of the money multiplier and the growth of reserve money, which in turn is affected by the size of the fiscal deficit and the manner in which it is financed. The fiscal block is included in the model to incorporate the effect of price changes on various elements of public expenditure and revenue. Fiscal revenues are a function of the exchange rate, tax on foreign trade, and output. Government expenditures are disaggregated between, wages, subsidies, interest payments, and public investment, and other government expenditure. These components of government expenditure depend, in turn on variables such as the exchange rate and output. The size of the fiscal deficit is thus the endogenous outcome of government policy.

Money Supply

The growth of broad money supply (M) is the sum of the growth of reserve money (R) and changes in the money multiplier[33] (m) (Equation 2.13). Reserve money is defined as the sum of net foreign assets (NFA), government borrowing from

[33]The money multiplier is defined as the ratio of broad money to reserve money: m = M/R which can be written as: m = (C+D)/(C+RR+ER); m = (1+c)/(c+r+e); where c is the ratio of currency (C) to deposits (D), r the ratio of reserves (RR) to deposits and e the ratio of excess reserves (ER) to deposits. Changes in any of these ratios, such as a shift in government policy on reserve requirements, can affect the size of the money multiplier. The behavior of the money multiplier, depicted in Appendix Figure 7, indicates the rise in the currency/deposit ratio after 1983.

the reserve bank (COG), and other assets which include central bank credit to banks and other net assets (Equation 2.14). Government borrowing from the reserve bank is last year's outstanding debt with the reserve bank (COG-1) plus new borrowing from this source (GBB). Borrowing from the reserve bank is treated as a residual financing item, after net foreign borrowing (GFB) and non-bank domestic borrowing by the government (GDB).

The Fiscal Deficit and its Components

The fiscal deficit (GDEF) is defined as government expenditure (GEXP) less government revenue (GREV). Government revenues (GREV) are divided into customs duties (CUDT), export taxes (EXPT), autonomous aid disbursements (AID)[34] and other government revenue (GOREV). Customs duties (CUDT) are a function of import levels (IMPQ), foreign prices, tariffs (tm) and the official exchange rate (eo) (Equation 2.19) Simliarly, export taxes are a function of export levels (EXPQ), the foreign price for exports (Px), the official exchange rate (eo) and the export tax rate (tx) (Equation 2.20).

Other government revenues, which are essentially non-trade tax receipts, were modelled as a function of nominal GDP. The estimated equation was:[35]

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[34] We treat autonomous aid disbursements as a revenue item rather than a financing item because the value of aid disbursements have increased with the devaluation of the official exchange rate.

[35] This equation, like all of the others unless otherwise indicated, is based on two stage least squares estimates.

$$\log(GOREV) = \underset{(6.41)}{-6.1962} + \underset{(16.15)}{1.2793} \log(GDP)$$

DW = 1.74
Chi2 = 5273.62
TSLS

Instruments: lags of government revenue and of GDP.

Government expenditure (GEXP) was disaggregated into the wage bill (WBILL), subsidies and transfers to enterprises (SUBS), interest payments on foreign debt (INTF) and domestic (INTD) debt, public investment (GOVI) and other government expenditure (GOEXP) (Equation 2.22). The wage bill is defined as the product of average nominal wages paid by the government and total public employment (Equation 2.23). The interest on foreign debt is a function of the stock of debt (FDEBT), interest rates (if) and the exchange rate (Equation 2.24). The government's stock of foreign debt increases with new foreign borrowing (GFB). Analogously, interest payments on domestic debt are defined as the product of the stock of domestic debt (DDEBT) and the domestic interest rate (i) and the stock of domestic debt depends on new domestic borrowing (GDB) (Equation 2.26-2.27). Such a formulation implies that greater government borrowing serves to increase the domestic interest rate or, when interest rates are controlled, to crowd out private borrowing.

Government investment is treated as an exogenous policy variable. Other government expenditure is modelled as a function of nominal output:[36]

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[36] Real import prices were also tried in the other government expenditure equation for Ghana but were not empirically relevant.

$$\log(GOEXP) = \underset{(8.20)}{-2.5374} + \underset{(34.03)}{0.9516} \log(GDP)$$

DW = 2.15
Chi2 = 11955.01
TSLS

Instruments: lags of government expenditure and of GDP.

Government expenditure on subsidies and transfers reflects the difference between controlled and market prices as well as operating losses of the enterprises. It also includes social security payments. The size of government transfers as a share of GDP is depicted in Figure 5. The graph depicts the sharp rises in subsidy expenditure in the 1970s and the relative decline during the more austere 1980s. Econometrically, transfers and subsidies as a share of GDP (SUB/GDP) have been modelled as a function of agricultural output (GDPAG) and the import price index relative to the GDP deflator (PMI/YDEF):[37]

$$\log(SUB/GDP) = \underset{(3.72)}{-3.0443} \underset{(3.13)}{-0.2452} \log(GDPAG) + \underset{(3.96)}{0.9258} \log(PMI/YDEF)(-1)$$

DW = 1.76
Chi2 = 792.14
TSLS

Instruments: lags of GDP in agriculture, subsidies as a share of GDP, and import prices as a ratio of the GDP deflator.

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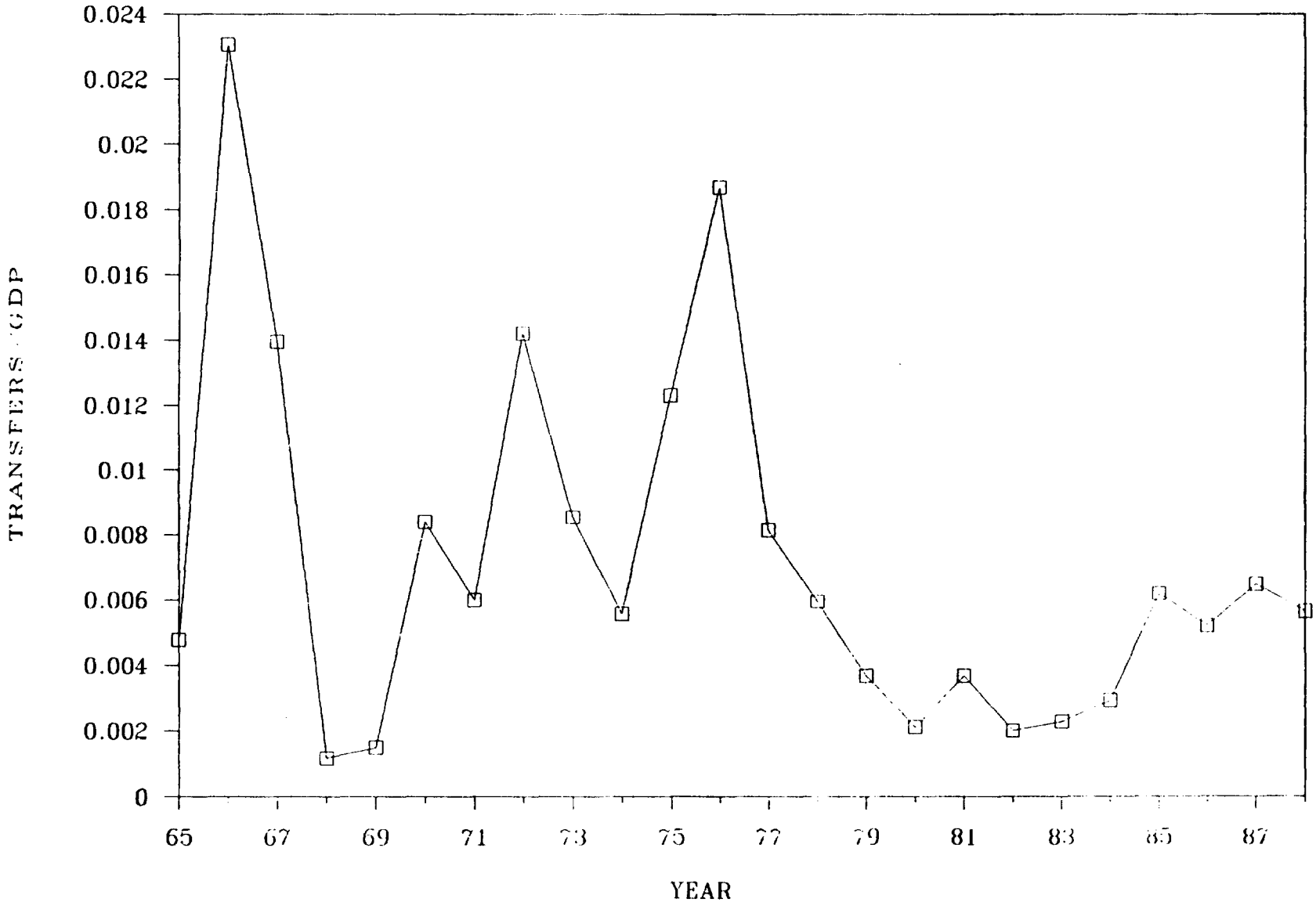
[37] Other variables that were tried but were found to be insignificant were: the difference between urban and rural consumer price indices for a variety of commodities, GDP, and price variability.

Figure 5

GOVERNMENT TRANSFERS AS A SHARE OF GDP



The negative relationship between agricultural output and subsidies shows that the government attempted to cushion the effects of food price inflation due to droughts. This cushion constitutes a greater burden for the government subsidy bill when the relative price of imports is greater than domestic prices.

3.4. Block D: The Real Side: Investment and Output

In order to explore the consequences of price dynamics for the real side of the economy, a simple model of output and investment determination was estimated for Ghana. In addition, an export function is defined to analyze the interaction between exchange rates, the balance of payments and inflation.

Exports are hypothesized to be a function of the real exchange rate, agricultural output, and lagged exports:

$$\log(EXPT) = \underset{(0.94)}{-3.4206} - \underset{(1.67)}{0.2560} \log(RER)(-1)$$

$$+ \underset{(1.35)}{1.0286} \log(GDPAG)(-1) + \underset{(3.38)}{0.7978} \log(EXPT)(-1)$$

$$DW = 2.02$$
$$\bar{R}2 = 0.58, \text{ OLSQ.}$$

The equation indicates a relatively low short run elasticity of exports of about 0.26 with respect to the real exchange rate.[38] This is not surprising given the long gestation periods associated with some of Ghana's major exports - cocoa and forestry products. Note also that the long-run elasticity of real exports to the real exchange rate in Ghana is about 1. This is a very plausible number and close to that obtained in numerous studies on export elasticities.[39]

Output is hypothesized to be determined by a Cobb-Douglas production function:

$$y = A.\ K^{\alpha 1}\ .\ L^{\alpha 2}$$

Assuming constant returns to scale and rearranging,

$$\log (Y/L) = a_0 + a_1 \log (K/L)$$

which relates the productivity of labor to the capital-labor ratio.

For empirical estimation, it was assumed that the participation rate was constant over the period so that the population could serve as a proxy for the labour force. The empirical estimate of this production function using TSLS was:

$$\log (Y/L) = \underset{(6.44)}{1.7052} + \underset{(7.47)}{0.4481} \log (K/L)$$

DW = 0.68
Chi2(B=0) = 27313.41
TSLS

[38] Note that a rise in the real exchange rate index measures an appreciation. This explains the negative coefficient in the regression. The inclusion of agricultural output, although not strictly significant, improves the performance of the real exchange rate variable as well as the overall equation. Thus, it was kept in the model.

[39] See Balassa (1985) and Chhibber et al (1989) for Zimbabwe.

Instruments: lags of the capital-labor ratio, output-labor ratio, and deviation of output from trend.

The capital-labor ratio is significant and appropriately signed. The coefficient implies that the share of capital in output is approximately 45 percent.

A number of different models of investment determination were tested on the data for Ghana. Because of the numerous shocks to the economy, the absence of any real growth during much of the period, and the existence of considerable uncertainty, the private investment rate was fairly volatile (see Appendix Figure 8). In addition, the data for private investment, which is derived as the difference between aggregate investment, which is estimated largely on the basis of imports and government investment, may not be very reliable. In particular, the private investment series displays a sharp drop in 1976 that is difficult to explain. Nevertheless, the following equation provides a plausible explanation of the determinants of private investment over the period:

$$\underset{(3.50)}{PRIVID = 9.7888} + \underset{(3.08)}{0.5785(PCRED)} - \underset{(4.93)}{21.2118(DUM76)}$$

DW = 1.46

CHI2 = 97.38.

TSLS.

Instruments: lags of private investment and of private credit.

This implies that investment is a function of the real quantity of credit available to the private sector and a dummy variable to capture the unusual collapse of investment in 1976. The quantity of credit reflects the rationing that occurs under administered interest rates. The irrelevance of the interest rate to investment determination was verified econometrically. The elasticity of private investment to the real private credit is about 0.58. This implies that a ten percent reduction in real credit to the private sector will result in a 5.8 percent decline in real private investment. This is a very sizable impact and has obvious implications for the design of a program oriented towards the recovery of private investment.

In some countries there is a positive relationship between government investment, and private capital formation.[41] When this was tested econometrically in Ghana, the results indicated insignificant effects resulting from government investment both in the aggregate and in infrastructure.[42] This apparent absence of complementarity, or "crowding in," between public and private capital formation should be an area for concern in planning future public investment programs, especially at a time when capital formation is constrained.

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[41] For empirical evidence on Korea, India, Turkey, Egypt, Indonesia, and a number of other countries, see Sundarajan and Thakur, 1980; Tun Wai and Wong, 1982; Blejer and Khan, 1984; Chhibber and van Wijnbergen, 1988; Shafik, 1989.

[42] Government investment in infrastructure was defined as the sum of development expenditure on community services, fuel and power, and transportation.

4. Policy Issues

The model is used to examine three sets of policy issues. First, we address the major criticism of adjustment programs that they rely excessively on nominal devaluations and that they ignore constraints to effective implementation of this policy in the African context. Second, we examine growth and inflationary implications of alternate credit and monetary programs. Finally, we look at some of the trade-offs of the government's subsidy policies designed to protect vulnerable consumers and firms during adjustment.

4.1. Exchange Rate Policy.

The econometric results presented in Section 3 showed that a 1 percent devaluation leads to about .14-.16 percent immediate increase in inflation . The long-run effects are even larger because of the important role of lagged expectations. To recapitulate the lagged inflation variable was highly significant with a coefficient of about 0.5. This implies that if the short run effect of exchange rate devaluation is about 0.15 the long-run effect would be twice that or about 0.30.

These are the effects on inflation of movements in the free market exchange rate. The Ghanaian story is somewhat more complicated because the official rate has been catching up to the parallel market rate and this has had budgetary implications. In Ghana, the devaluation of the official rate led to budgetary improvements in recent years since the government is a net supplier of foreign exchange to the economy. In

addition the devaluations reduced the large subsidy to those importers with access to foreign exchange at the official exchange rate. Although the subsidy to importers was reduced, the government did not transfer all of the gains to exporters. Part went to the Government as windfall revenue gains, especially from cocoa. In addition, the devaluation of the official rate meant that a larger proportion of foreign exchange transactions occurred through official channels. Moreover, the devaluation of the official rate did not result in an immediate increase in prices through a cost-push type mechanism because the pricing of products already reflects the shadow cost of foreign exchange except for the few items where the government has some direct control on pricing. This is a crucial reason why the exchange rate unification in Ghana between 1984 and 1988 a rise in inflation as was discussed in the theoretical discussion in Section 2.

In order to quantify these effects the model in Section 3 was simulated with a slower official exchange rate depreciation in the period 1984-1988 so that the official rate was 25% less depreciated than the actual outcome. The results of this simulation show that the parallel exchange rate would have depreciated faster than the actual case (see Figure 6). This implies that the exchange premium increases. The cost of such a policy would be lower growth as the higher fiscal deficit arising from slower exchange rate adjustment would result in higher government borrowing which would squeeze out private investment.

One would expect lower inflation in the simulation as the parallel exchange rate depreciates more slowly. In fact, because of lower growth, inflation turns out to

Figure 6a: CPI WITH SLOWER OFFICIAL DEVALUATION

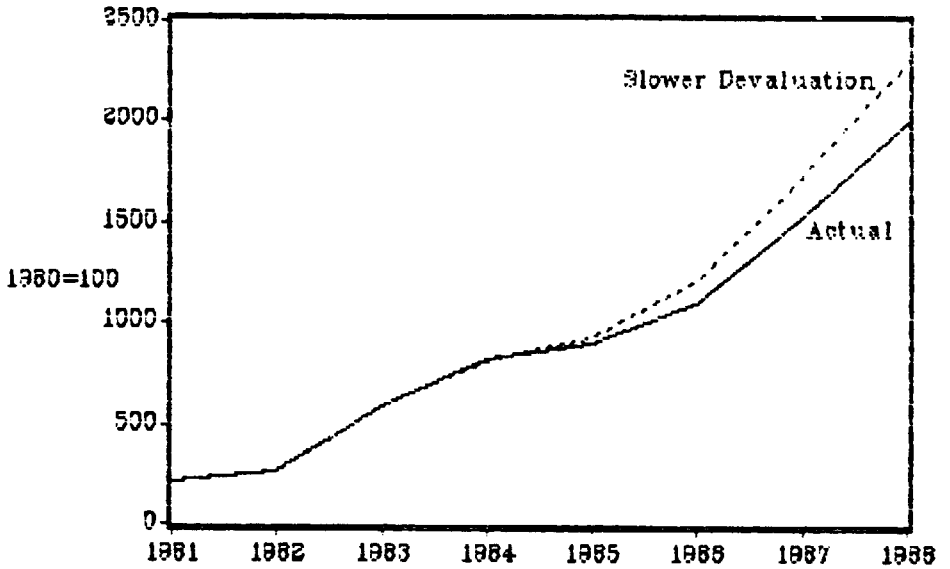
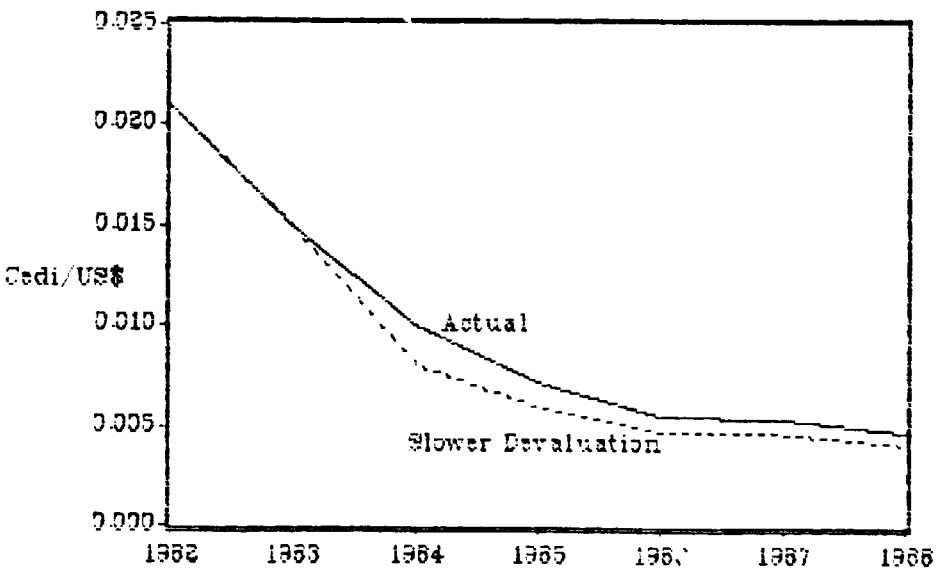


Figure 6b: PAR. MKT. EXCHANGE RATE WITH SLOWER DEVALUATION



be higher under this formulation averaging 29.3 percent per annum as against 27.8 percent per annum in the base case during 1983-88. The net outcome is lower growth, a larger public debt, higher inflation and a more overvalued official exchange rate. This result is counter-intuitive and is due to three factors: (a) the official devaluations did not have a cost-push effect as prices had already adjusted to the parallel exchange rate; (b) the devaluation had a positive budgetary effect and therefore did not fuel inflation, as a result, a substantial real devaluation took place which narrowed the premium; and (c) relative yields of cedis versus foreign exchange improved because the large official devaluation reduced expectations of future devaluation. A key to the budgetary improvement was the large amount of official foreign exchange inflows which came in to support the policy reforms and was not disbursed at a more depreciated exchange rate. In summary, this section has shown that the devaluations could not explain the high and persistent inflation in Ghana since the reforms and particularly since 1986.

4.2. Monetary and Credit Policy

The inflation equation (Table 4, Equation 4.1) identifies the key role of monetary growth in determining the rate of inflation in the system. The short run elasticity of inflation with respect to real money balances is about 0.4 and the long-run steady state elasticity is 1.0. This implies that a 1% increase in monetary growth will, with lagged effects, result in 1% higher inflation, ceteris paribus. Monetary growth averaged over 42 percent per annum between 1983-1988. Therefore monetary policy must be an important component of any anti-inflationary package. A

breakdown of base money growth shows that the predominant factor behind monetary growth has been the rise in net foreign assets (NFA). This raises the issue of why the increase in NFA has not been sterilized by the monetary authorities and whether the huge increase in foreign aid strained the absorptive capacity of the Ghanian economy.

Fiscal policy has a limited role to play in addressing current inflationary issues. Simulations show that a 10 percent cut from actual levels in current government expenditures during 1984-1988 would have led to some reduction in monetary growth and inflation, but not by a large magnitude. The average inflation rate for the period drops from 27.8 percent per annum to 26.1 percent per annum. Current expenditures went up from 8.6 per cent of GDP in 1984 to 11.9 percent of GDP in 1986 but have since declined to 10.2 per cent of GDP. A large part of the increase is due to rising interest payments which increased sharply in 1986 (see Table 1). This is a non-discretionary part of government expenditure. Other components of government expenditure did not increase much, implying that the option to cut current expenditures to reduce inflation is limited. Public sector wages have been cut to levels that now seriously undermine public sector productivity. Without a major restructuring of the civil service possibly further retrenchment and a revision of the pay scales the wage bill cannot be squeezed further.

The other option would be to cut public investment but this is a double-edged sword. Cutting public investment reduces the fiscal deficit and monetary growth, but it also lowers overall economic growth. Public investment grew from a very low level of 2.5 percent of GDP in 1984 to 8.3 percent of GDP in 1988. The growth in public

capital formation is almost entirely responsible for the recovery in Ghana's investment rate to 12.5 per cent of GDP in 1988. Private investment has played a relatively small part in Ghana's recovery in this period and remains a weak point in Ghana's adjustment program. Our model results show that the availability of credit to the private sector is a key constraint in determining the level of private investment.

In order to quantify the trade-offs between public investment, growth and inflation we carried out two simulations. In the first, public investment is cut by 10 percent from base year levels with the reduced fiscal deficit leading to lower monetary growth. In the second, public investment is cut by 10 percent, as in the first simulation, but the reduced fiscal deficit leads to lower public sector borrowing. The level of total credit is left unchanged so that the extra credit is made available to the private sector which in our model results in higher private investment.

In the first simulation the benefits of lower monetary growth are marginal. There is a clear trade-off between lower monetisation and growth. The net effect on inflation is marginal and it comes at the cost of lower growth as the reduction in public investment is not offset by increasing private investment. The second simulation leads to higher growth than in the base case with some reduction in inflation. There are two reasons for this. First, the lower public investment reduces the public sector's borrowing requirements and releases credit for the private sector. Second, as the level of public sector borrowing declines, future interest payments on public sector debt are reduced. The cumulative effect of reduced interest payments further lowers public sector borrowing requirements thereby releasing more credit to the private sector.

This second simulation shows a "virtuous circle" that results from reducing the public sector's borrowing requirement. The added effect of reduced interest payments to the cut in the "primary deficit" results in increases in credit to the private sector which have a net effect of increasing private investment by more than the cut in public investment, leading to higher and more balanced growth. The crucial element is the recovery in private investment which has been held back by the public sector's borrowing requirements, despite the introduction of a very significant adjustment program.

4.3. Food Prices, Subsidies and Inflation

How much of the inflation in 1983 was due to the drought in Ghana during that year? This is important because if the lagged effects of that drought led to the high and persistant inflation, then that inflation needed to be accommodated. Trying to control that inflation would only imply an unwarranted credit squeeze and a recession. The mechanism for a drought to affect inflation in our model is not through the standard cost-push effect of higher food prices, on wages and overall prices. We have shown in Section 3 (Block A) that wage-push inflation was not important in Ghana.

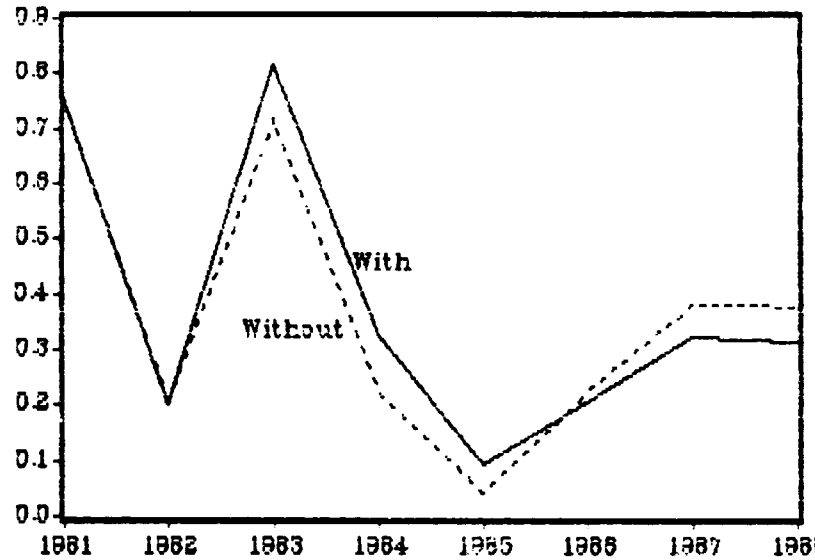
In our model the impact of drought is felt through its impact on the budget and through its impact on overall output. In Section 2 we established the negative relationship between the level of agricultural output and the ratio of transfers and subsidies to GDP. A drought also lowers real output in the economy and thereby

lowers money demand. As a result, we get higher inflation for the same level of money supply.

A simulation of the model was run to show the effects of the counterfactual of no drought in 1983.[43] The results showed that the 1983 drought compounded Ghana's problems by adding to the adjustments required in the face of external shocks and structural weaknesses in the economy. The economy would have required a smaller adjustment had the drought not occurred. The real exchange rate would have still appreciated had agricultural production levels been maintained at pre-drought levels, but not by as much as it did. Growth would have been higher and most importantly the level of domestic and foreign debt would have been lower. As a result, one can presume that Ghana would have been in a better position to accomodate future adjustments. Average inflation would also have been lower because the significant food price inflation Ghana witnessed in 1983 would not have occurred. Nevertheless, the simulations show that the pattern of rising inflation that Ghana has witnessed since 1986 would have persisted since it was based on monetary growth in the later period (Figure 7).

[43]Agricultural output was brought up to trend in 1983 and overall output was adjusted accordingly.

Figure 7: CPI INFLATION WITH AND WITHOUT DROUGHT



4.4. Prospects for the Future

In the medium-term, there are three objectives for future monetary-exchange rate policy which are interrelated: (a) complete unification of the exchange markets, (b) reduction of monetary growth to control inflation without hurting growth, (c) revival of private investment. A fuller discussion of these could be the subject of a separate paper, on the financial system in Ghana and its problems. But the model used in this paper shows the interactions between these objectives and it is useful to mention these interactions.

The three policy objectives are critically dependent on changes in the financial system in Ghana. Full unification of exchange rates will require further liberalisation of interest rates to achieve parity in yields. Without the parity, there will be capital

flight, including from the foreign assistance that Ghana receives. There is evidence that the financial system is unwilling to accept deposits even at the present negative real deposit rates, while at the same time parts of the private sector are unable to get sufficient credit for both long term investment as well as credit for working capital.

Financial sector reform aimed at reducing the cost of financial intermediation will therefore raise deposit rates and increase financial savings in cedis. This will achieve three objectives: (a) reduce interest rate differentials between cedis and foreign exchange and facilitate the full unification of the parallel and official exchange markets; (b) reduce inflation by increasing the desire to hold cedis; and (c) channel more savings into the financial system to meet the working capital and investment needs of the private sector. At the same time monetary growth can also be reduced by greater efforts at resource mobilization. Current revenues could be raised from present levels of about 12% of GDP to about 15% of GDP with expenditures remaining at present levels.

5. Conclusions

This paper has presented a theoretical framework to analyze the issue of exchange rate reform in the presence of parallel markets. The model is then applied to examine the Ghanian reforms. The results address, among other things, a central criticism of adjustment programs in Africa, i.e., their excessive reliance on the exchange rate as a tool to bring about relative price adjustments in the economy.

This is alleged to be excessively inflationary. In the case of Ghana, which has carried out one of the most thorough adjustment programs in Africa which has included very large adjustments in the official exchange rate, high inflation was and continues to be a problem.

However, the recent inflationary surge in Ghana is not due to the exchange reforms. The empirical results for Ghana shows that the official devaluations had no direct effect on consumer price inflation. If anything, the official devaluations had a positive budgetary effect which was anti-inflationary. Statistical tests show that both before and after 1983 the relevant exchange rate for pricing decisions was the shadow price of foreign exchange represented by the parallel exchange rate. The devaluation of the official rate, therefore, was not inflationary in Ghana since prices already reflected the more depreciated shadow exchange rate. In fact, a slower devaluation according to our model simulations would have led to higher depreciation of the parallel exchange rate and higher inflation.

The theoretical and empirical models also address the determinants of the exchange premium. The model explains differential growth of the parallel and the official rate as a function of the official real exchange rate , interest rate differentials and uncertainty. Devaluation of the official rate leads to narrowing of the differentials. Similarly, reduction in the relative yield through either upward movement of domestic interest rates or through reduction in the expectation of a devaluation has also leads to narrowing of the exchange rate premium.

The improvement in the budgetary position of the government in response to official devaluation requires some explanation. Traditionally, Ghana relied heavily on export taxes, particularly on cocoa[44]. This taxation was carried out through direct tax levies and, more importantly, through an overvalued exchange rate which lowered the real price received by exporters. A large part of this tax went to importers, which included public enterprises, as an exchange rate subsidy. With the devaluation, this tax returned to the government, a part of which was given back to exporters through higher producer prices. Another crucial factor was the heavy inflow of concessional assistance in support of the program.[45] Between 1984-1988 Ghana received an average of almost 5 percent of GDP in foreign concessional assistance. This has significant lessons for exchange rate reforms in Africa which can be destabilising where there is not adequate funding of the adjustment program. It is useful to contrast the Ghanaian experience with the Zambian reforms where an important factor responsible for the unravelling of the introduction of the exchange rate auction was the under-funding of the program.[46]

The size of the initial devaluation also made a difference. The official devaluation had no visibly significant impact on prices but it led to a depreciation of the real exchange rate, thereby reducing the exchange rate premium and slowing the depreciation in the parallel exchange rate. The government's interest rate policy also

[44]For evidence see the World Development Report 1986, and Mansfield, 1980.

[45]See Leechor (1989) " Ghana's Adjustment Program " in Thomas, Chhibber, Dailami and de Melo ed. ' Structural Adjustment and the World Bank ', World Bank manuscript.

[46]See Fardi (1989) "Zambia's Adjustment Program", in Thomas, Chhibber, Dailami and de Melo ed. ' Structural Adjustment and the World Bank,' World Bank manuscript.

played an important supporting role in narrowing returns between cedi holdings and foreign assets. The reforms worked because of a coherent package of policies supported by adequate foreign financing. This is the central lesson from the Ghana experience that exchange rate policy is a key instrument of reforms but requires a coherent set of supporting policies to make it successful.

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Appendix Figure 1

INFLATION IN CONSUMER AND IMPORT PRICES

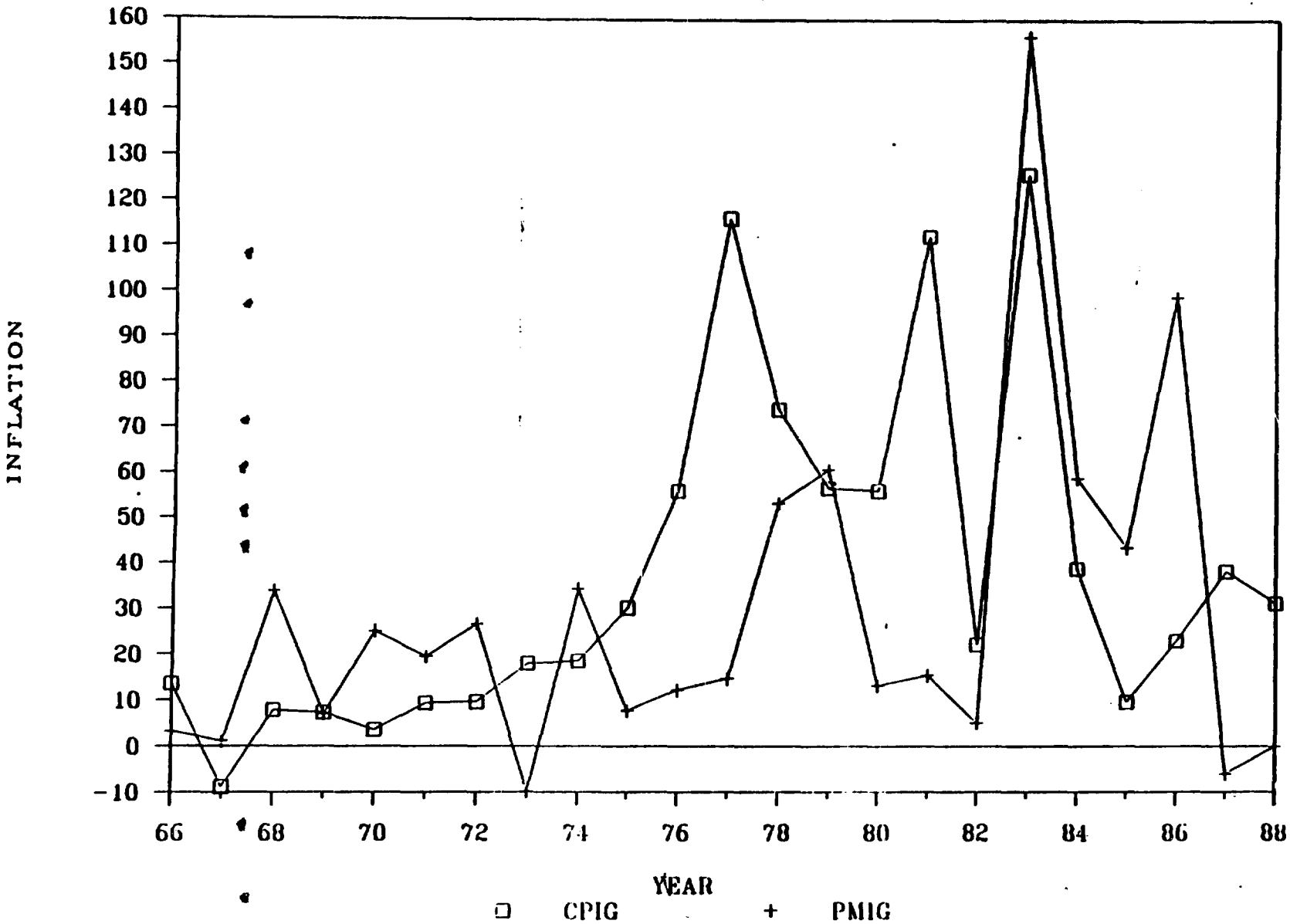
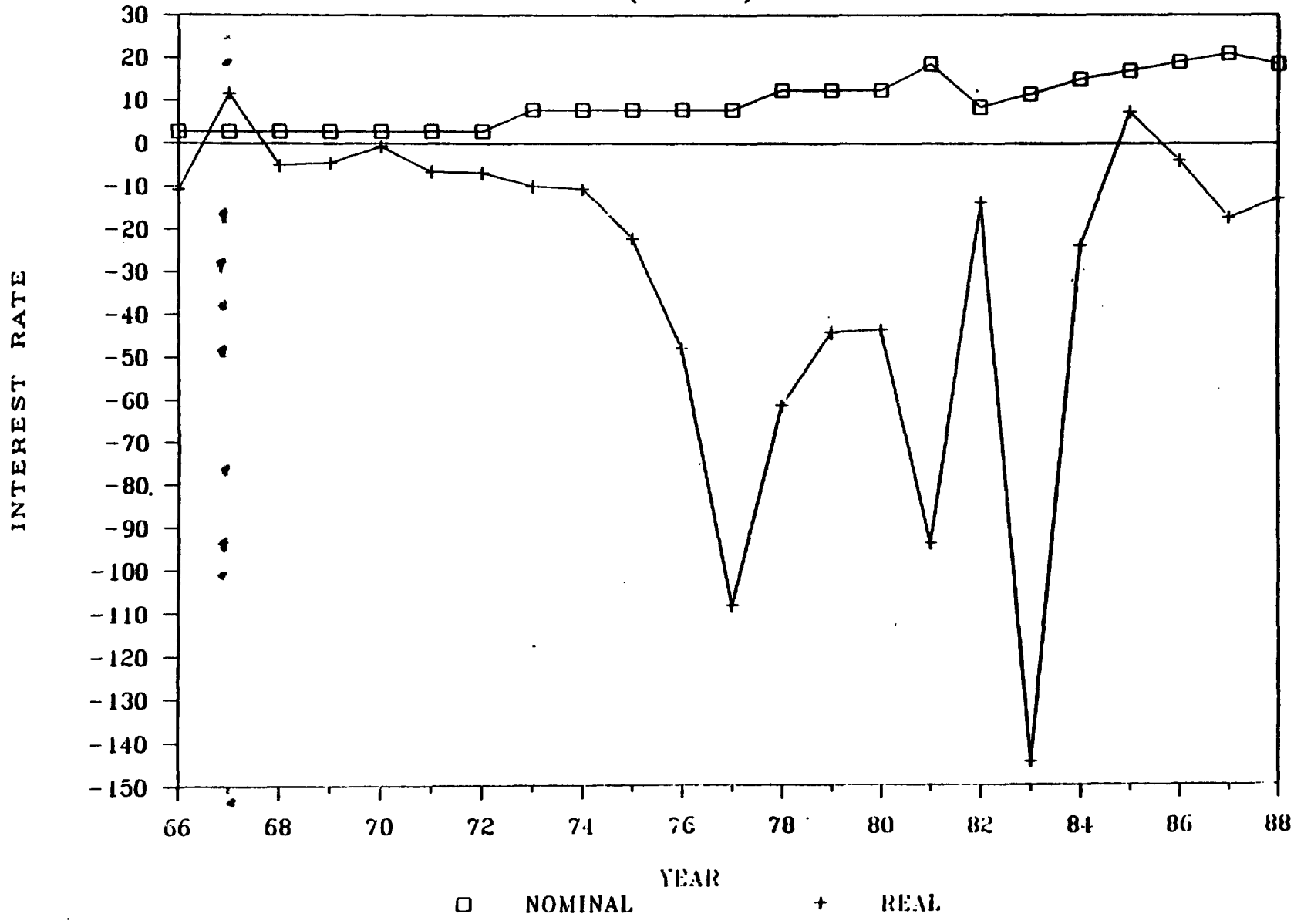


Figure 2

NOMINAL AND REAL SIX MONTH DEPOSIT RATE

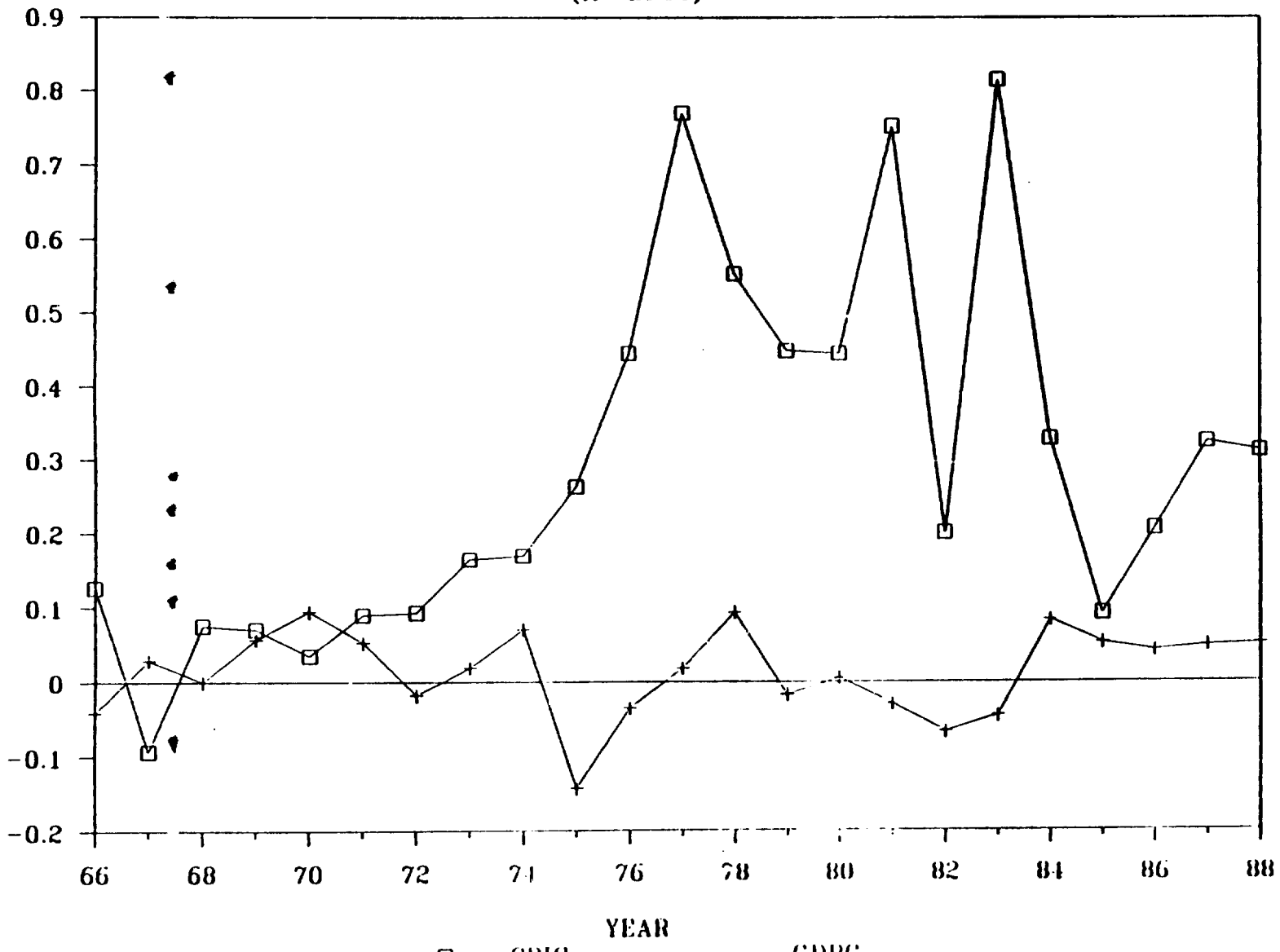
(IN LOGS)



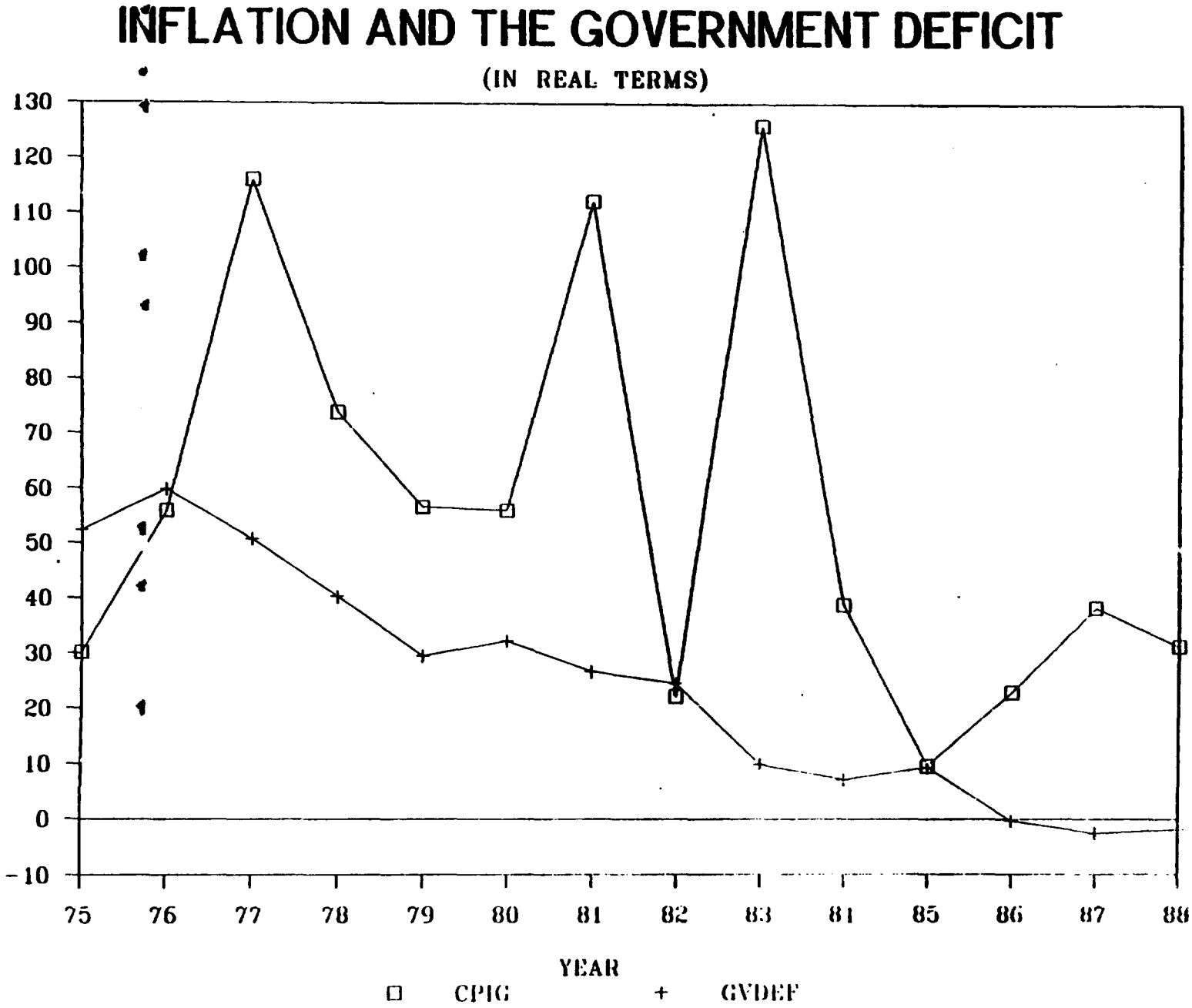
Appendix Figure 3

INFLATION AND REAL OUTPUT GROWTH

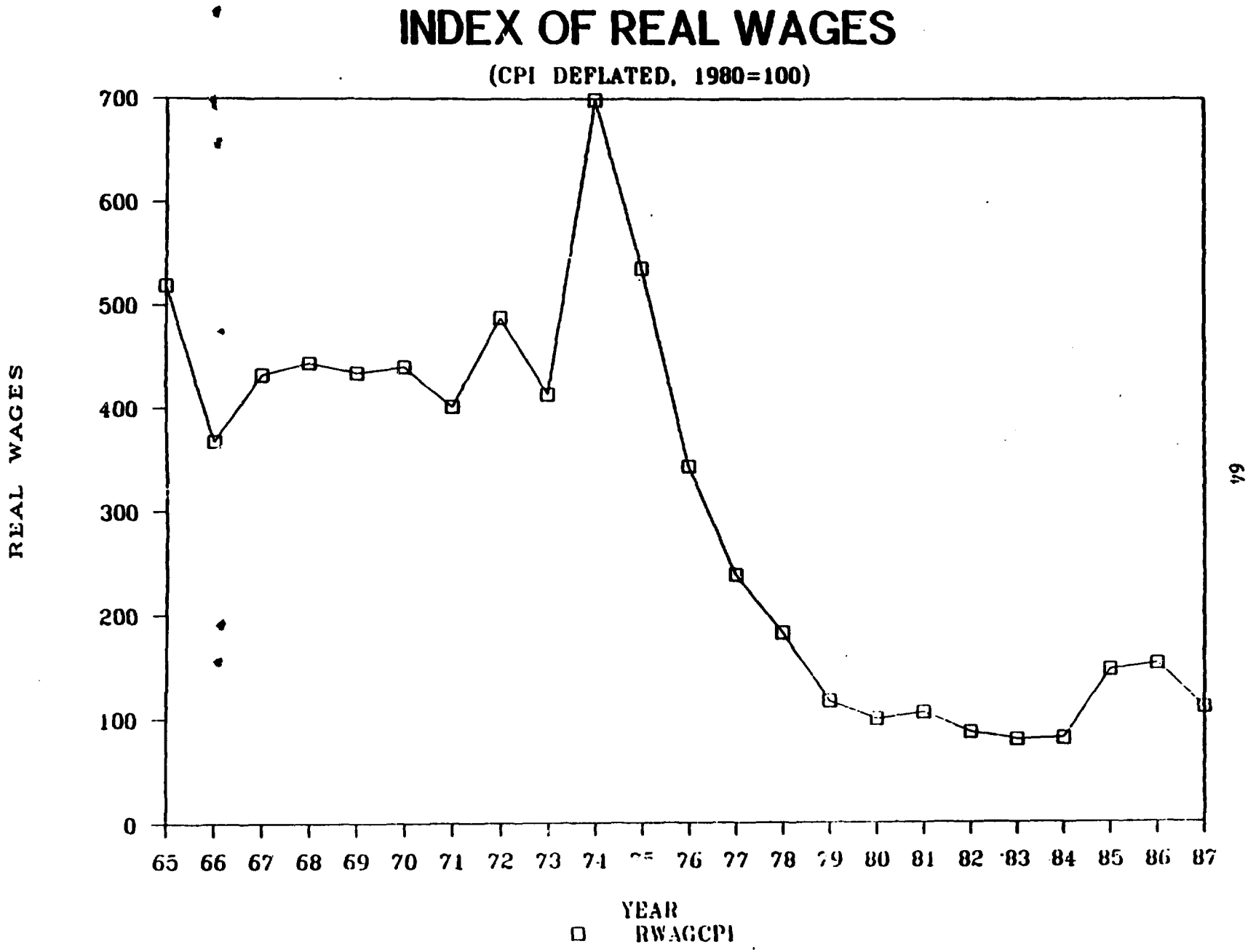
(IN LOGS)



Appendix Figure 4

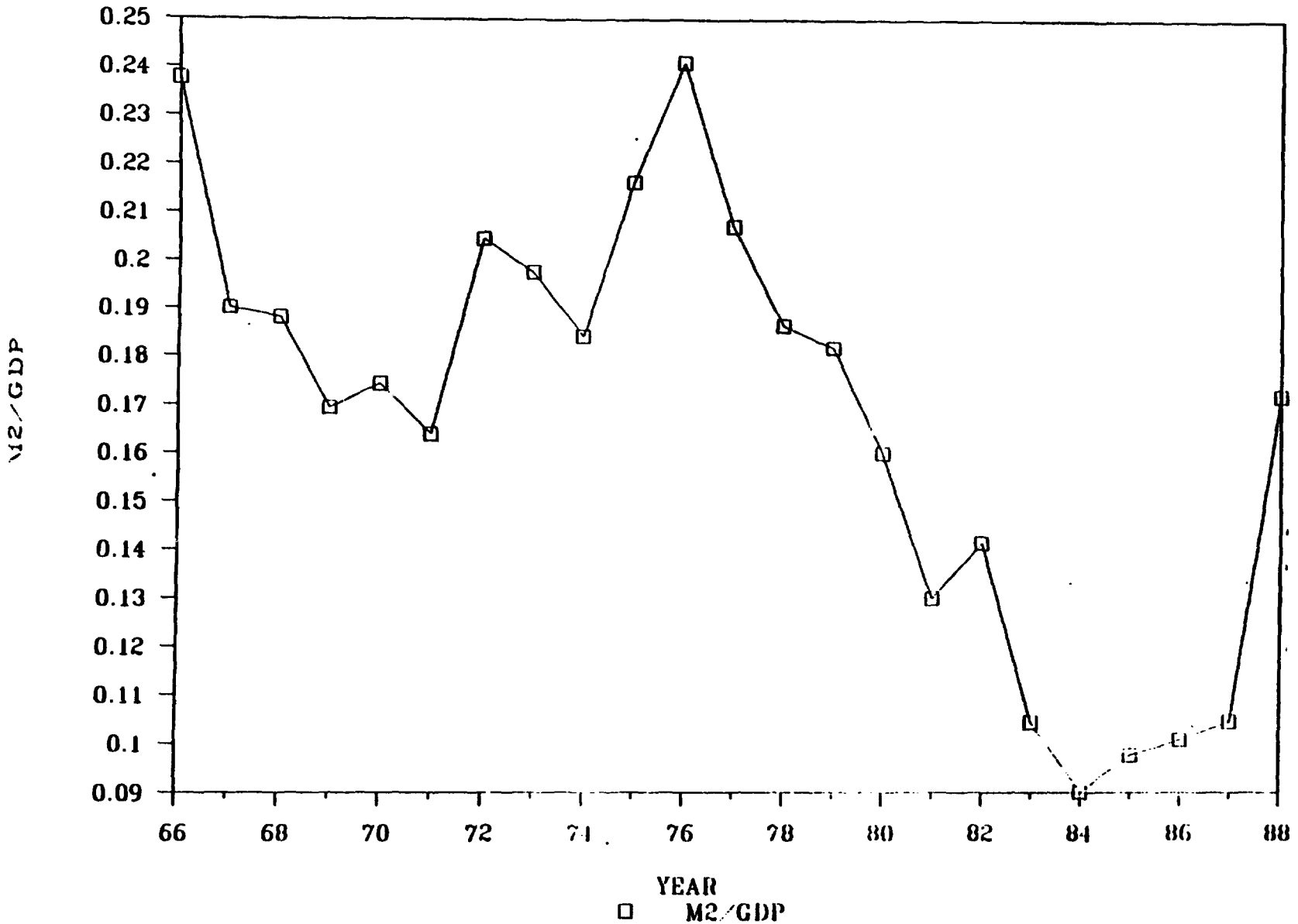


Appendix Figure 5



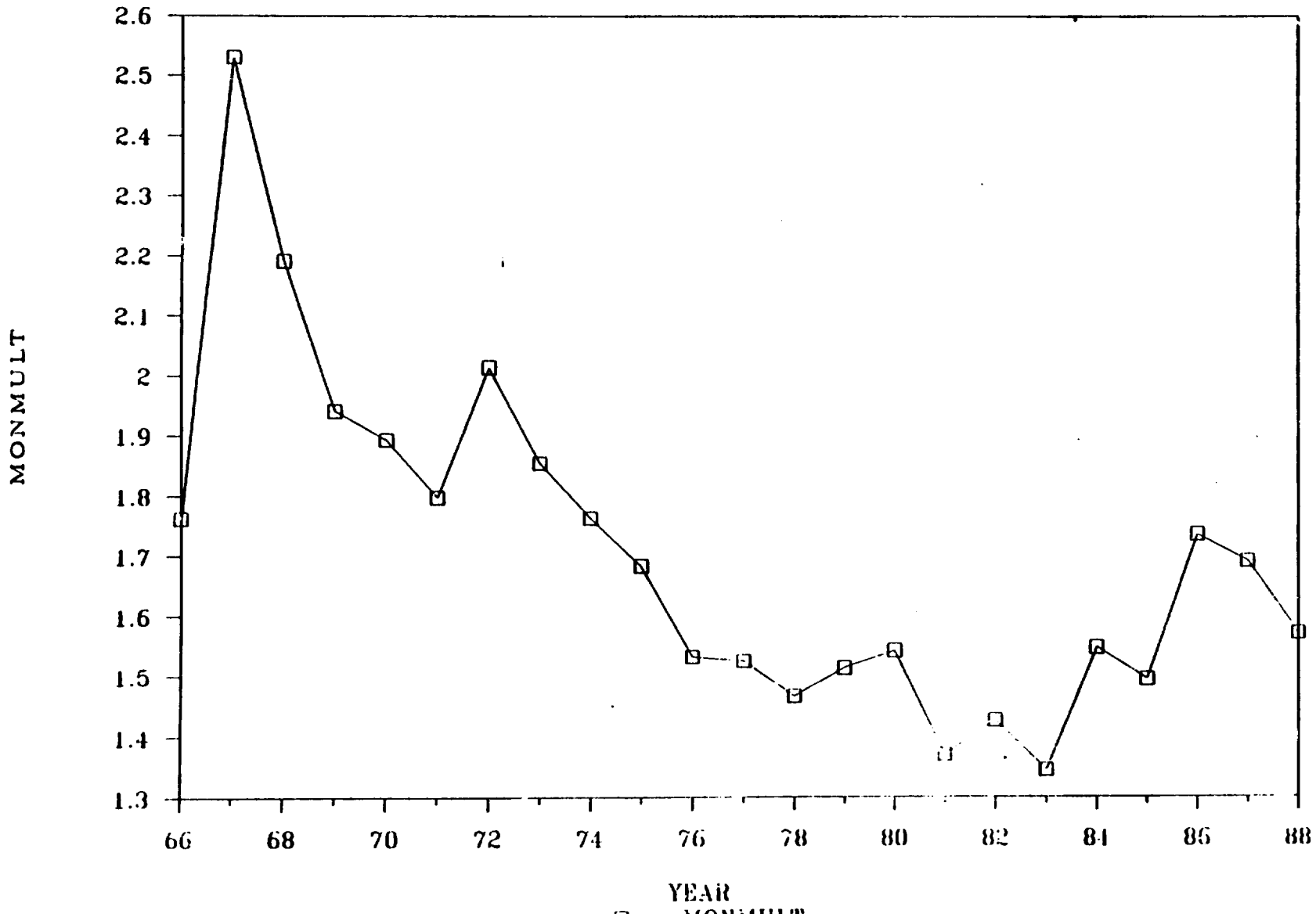
Appendix Figure 5

M2 AS A SHARE OF GDP



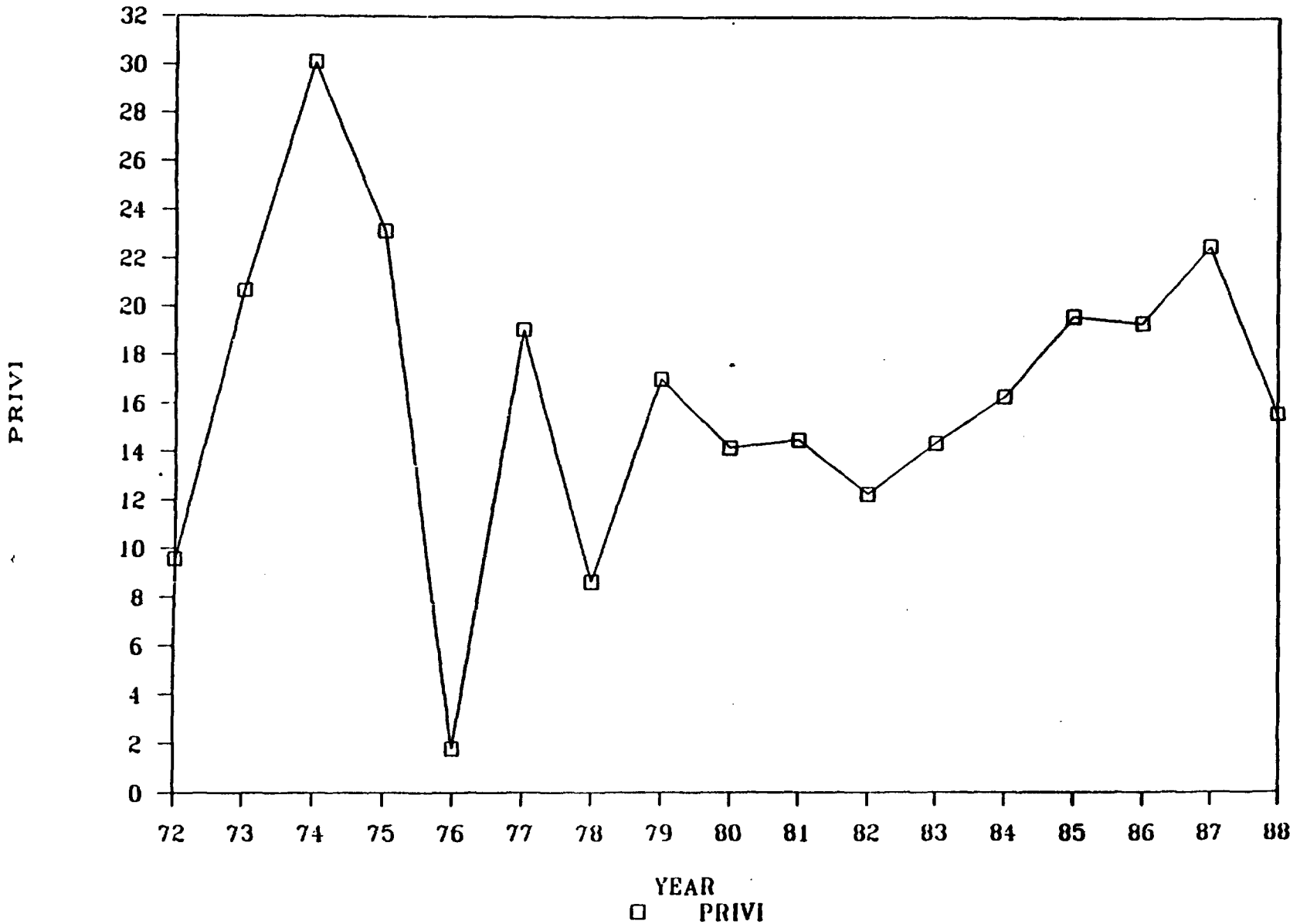
Appendix Figure 7

MONEY MULTIPLIER



Appendix Figure 8

REAL PRIVATE INVESTMENT



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