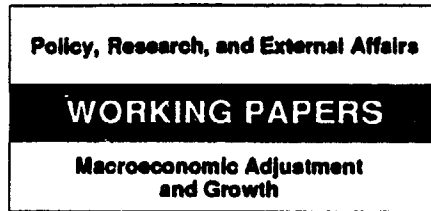


WPS 0775



Country Economics Department  
The World Bank  
October 1991  
WPS 775

# The Macroeconomics of Public Sector Deficits

## A Synthesis

William Easterly  
and  
Klaus Schmidt-Hebbel

Ten case studies suggest that two unorthodox methods of deficit financing — inflation tax and financial repression — are both ineffective in raising revenue and disruptive of macroeconomic stability. Fiscal stabilization leads to both higher private consumption and increased investment and to external adjustment — characterized by a lower trade deficit and a depreciated real exchange rate.

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This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is a synthesis of a research project on “The Macroeconomics of Public Sector Deficits” (RPO 675-31). An earlier draft was presented at the World Bank Conference on Macroeconomics of Public Sector Deficits, Washington, DC, June 1991. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Rebecca Martin, room N11-053, extension 39065 (91 pages). October 1991.

Easterly and Schmidt-Hebbel examine the macroeconomic consequences of public deficits by summarizing the results of ten case studies of developing countries — Argentina, Chile, Colombia, Côte d'Ivoire, Ghana, Morocco, Mexico, Pakistan, Thailand, and Zimbabwe — as well as by examining broader evidence.

Cross-section correlations of fiscal balances with macroeconomic variables are surprisingly strong. Stable and low fiscal deficits are associated with good growth performance. Fiscal balances are positively related to investment and to current account balances. High fiscal deficits show an association with highly negative real interest rates (financial repression), money creation, and high black market exchange rate premia. The aggregate of the ten case studies shows an association between fiscal adjustment in the 1980s, improvement of the current account, and real depreciation of the exchange rate.

The case studies show that both foreign and domestic macroeconomic shocks play a secondary role in the cyclical variation and structural changes of nonfinancial public sector deficits. Active fiscal policies, under the direct control of policymakers, are both the main culprit of fiscal crises and an effective instrument in bringing about fiscal adjustment. Fiscal adjustment is achieved by reducing overblown government bureaucracies, cutting inefficient transfers and subsidies, reforming tax systems to increase broad-based taxation, and reforming or privatizing public enterprises and commodity marketing boards.

Inflation does not show any simple correlation with fiscal deficits across countries. The cross-section relationship between inflation and money creation shows a “Laffer curve” pattern, with maximum seigniorage at inflation between 68 percent and 160 percent. In contrast, the studies using individual

countries' time series data find revenue-maximizing inflation rates that seem to rise with actual average inflation — the “optimum” rate is estimated to be only 4 percent in Thailand, but 966 percent in Argentina. The assumption of a money demand with constant semi-elasticity for inflation overestimates the “optimum” inflation rate in high-inflation countries and underestimates it in low-inflation countries. Seigniorage is unimportant as a steady-state phenomenon, but it can be important as a temporary source of revenue in times of crisis. Even large surges of money creation are not closely linked to accelerated inflation.

Financial repression is a common resort for countries in a fiscal crisis. But the collapse of private credit, investment, and growth in those countries following episodes of financial repression hardly makes it the recommended way to deal with crises.

Private consumption and investment are significantly affected by the public budget structure, the overall deficit, and its financing. Private consumption is reduced by income taxes — with the size of the effect in between what the Keynesian and permanent-income hypotheses would predict. Public saving (or the public surplus) tends to raise consumption somewhat — particularly in countries where the public sector has preferred access to resources of the financial system. Real interest and inflation rates — and hence how the public deficit is financed — do not affect private consumption in any systematic way.

Responses of private investment to the public capital stock (or to public investment) range widely. And the fiscal deficit explains a great deal of variation in the trade deficit and the real exchange rate. The “fundamentals” approach to the real exchange rate is vindicated, which should serve as an antidote to the notion that nominal devaluation alone can restore macroeconomic balances.

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This paper is based on work done for the World Bank research project 675-31. We thank Mario Blejer, Vittorio Corbo, Stanley Fischer, Johannes Linn, Carlos Rodriguez, Vito Tanzi, and participants of the World Bank Conference on Macroeconomics of Public Sector Deficits (Washington, D.C., June 1991) for comments to a previous draft. We are also grateful for comments and assistance of Paolo Mauro, for research assistance of Maria Cristina Almero-Siochi and Piyabha Kongsamut, and for interaction with the participants in the research project.

## **INTRODUCTION**

Fiscal deficits have been at the forefront of macroeconomic adjustment in the 1980s, both in developing and developed countries. Fiscal deficits were blamed in good part for the assortment of ills that beset developing countries in the 1980s: over-indebtedness leading to the debt crisis beginning in 1982, high inflation, and poor investment and growth performance. This paper will examine the evidence for the macroeconomic effects of fiscal deficits, using the results of a set of 10 case studies done for the World Bank research project, "The Macroeconomics of Public Sector Deficits." The ten cases were Argentina, Chile, Colombia, Côte d'Ivoire, Ghana, Morocco, Mexico, Pakistan, Thailand and Zimbabwe.

The methodology guiding the case studies can be summarized briefly.<sup>1</sup> The macroeconomic effect of the fiscal deficit depends on how it is financed. To a first approximation, each major type of financing corresponds to a macroeconomic imbalance, if used excessively. Money creation to finance the deficit leads to inflation; domestic borrowing leads to a credit squeeze and crowding out of private investment and consumption; external borrowing leads to a current account deficit and real exchange rate appreciation.

The effect of the deficit depends also on the composition of spending. Some types of public consumption are complements to private consumption, while others are substitutes. Deficits may directly lower private consumption if consumers anticipate future taxes and save accordingly. Some public investments displace private investment; others raise private profitability and thus investment. The effect of fiscal policy on the real exchange rate depends on the extent to which public spending is composed of nontradables.

The organization of the paper is as follows: we first present a summary of the stylized facts of fiscal adjustment, both within the 10 case studies and in a broader sample of countries. We then present the results of the decomposition of the deficit in the case studies, which seeks to assess the degree to which deficits were driven by policy as opposed to external or macroeconomic

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<sup>1</sup>Further detail is available in the project's research proposal, Easterly, Rodriguez and Schmidt-Hebbel (1989).

shocks. The next three sections use the results of the case studies to relate deficits to macroeconomic imbalances: we first analyze the relationship between the domestic financing of deficits, inflation, and real interest rates; we then analyze the relationship of deficits to private consumption and investment; finally we examine the relationship of deficits to external imbalances. While macroeconomic imbalances are clearly interrelated, we assume the effects of such interrelationship are small and use a sequence of partial equilibrium analyses of each type of imbalance. We then close with some thoughts on policy implications of the analysis.

## I. OVERVIEW

### A. Correlations of Public Sector Deficits with Other Economic Variables

To get an overview of the relationship between fiscal deficits and other economic variables, we collected data on a large sample of countries, including OECD countries. The statistical appendix lists the data and sources for this sample. To get a feeling for the usefulness of fiscal deficits as an indicator for overall economic performance, we calculated simple correlations between public sector balances (as percent of GDP), and other major macroeconomic variables, shown in Table 1.1.

There are good reasons not to expect very strong correlations. Fiscal deficits are measured different ways across countries, introducing some measurement error into the sample. In addition, the theoretical relationship between deficits and other macroeconomic variables depends crucially on the means of financing them.<sup>2</sup> Despite these caveats, we find a significant statistical relationship between the deficit and many, though not all, macroeconomic performance variables. Per capita growth is significantly and positively related to fiscal surpluses.<sup>3</sup> There is

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<sup>2</sup>More generally, simple correlations may fail to be significant because of the omission of other variables.

<sup>3</sup>An interesting short-run counterpart to this result is the suggestion of Giavazzi and Pagano (1990) and Blanchard (1990) that fiscal austerity can be expansionary.

**Table 1.1**  
**Cross-section Correlations of Consolidated Public Sector Balance**  
**As Percent of GDP with Other Variables**

	<u>Correlation</u>	<u>T-Statistic</u>
GDP growth	0.19	1.46
Per capita GDP growth	0.37	3.02 **
Per capita growth with variance of deficits	-0.36	-2.88 **
Real interest rate	0.31	2.34 *
Money creation (% of GDP)	-0.33	-2.40 **
Inflation	-0.16	-1.21
Investment (% of GDP)	0.24	1.70 *
Total consumption (% of GDP)	-0.48	-3.97 **
Private consumption (% of GDP)	-0.38	-3.00 **
Real exchange rate 1/	-0.15	-1.10
Current account (% of GDP)	0.54	4.76 **
Black market premium	-0.35	-2.65 **

1/ From David Dollar (1990) using PPP comparisons from Summers and Heston (1988); appreciation is up.

**Notes:** Public surplus is positive, deficit is negative. OECD countries' public balances are general government. Sample size varies between 50 and 59. Period of averages is longest period for which data are available for each pair of concepts for each country.

**Source:** OECD Economic Outlook; World Bank Data

\* significant at 5% level (one-tailed)

\*\* significant at 1% level (one-tailed)

also an interesting negative and significant correlation between per capita growth and the variance of fiscal balances. Low and stable fiscal deficits are associated with high growth.

Fiscal balances are positively related to real interest rates, contrary to the usual prediction that deficits lead to high interest rates and surpluses to low ones. Since there are a large number of negative real interest rates in the sample, this is likely explained by an association between financial repression and fiscal deficits. Fiscal balances are negatively related to money creation

(seignorage), which confirms that countries that run high deficits do so in part through greater reliance on seignorage.<sup>4</sup> However, inflation rates show little correlation with fiscal balances, perhaps reflecting in part the non-linear relationship between money creation and inflation to be discussed in Section III.

Fiscal balances are positively, though weakly, related to total gross domestic investment, offering at least superficial support to the notion that deficits crowd out investment. The fiscal balance is negatively related to both total and private consumption, which is superficially consistent with the notions that taxes crowd out private consumption and that public and private consumption are complements, and inconsistent with the "Ricardian" notion that deficits lower consumption. These associations will be explored in more detail using the case study results in Section IV.

Fiscal balances are correlated with external current account balances across countries. This lends superficial support to the "fiscal approach to the balance of payments," which says that fiscal imbalances are the main source of external imbalances.<sup>5</sup> The causation behind the correlation could go either way depending on the type of financing constraint -- countries with more access to net external financing may run larger deficits, or those that run large deficits may require more external financing. The estimated relationship in the case studies (as discussed in Section V of this paper) usually assume the latter, and find strong time series correlations as well. A suggestive association is found between fiscal balances and black market premia, indicating that countries with high deficits are more likely to tightly control the foreign exchange market and that deficits drive up the premium created by such controls.<sup>6</sup> However, real exchange rates show little association with fiscal deficits. This may reflect the extent to which trade intervention differs

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<sup>4</sup>de Haan and Zelhorst (1990) find that the correlation holds only for high inflation countries.

<sup>5</sup>See for example Bartoli (1989), Balassa (1988), Sachs (1989) and Reisen and van Trotsenburg (1988). However, note that the link breaks down if the Ricardian hypothesis of offsetting private saving holds (Leiderman and Blejer (1988), Frenkel and Razin (1987)).

<sup>6</sup>One of the case studies, Ghana, looked at this relationship in detail, and will be discussed in section V.

across countries. Section V will address summarize the time-series relationships between fiscal balances and the real exchange rate from the case studies, which relationships turn out to be surprisingly strong.

There are two messages to be carried away from this set of generally strong but occasionally weak set of associations between fiscal balances and macroeconomic performance. One is that the fiscal balance is a useful indicator of macroeconomic health despite problems of comparability across countries. The other is that we need to delve deeper to trace the effect of deficits on specific macroeconomic variables like inflation, private investment, and real exchange rates, as we will do in the following sections.

#### **B. Macroeconomic Trends in Case Study Countries**

Figure 1.1 confirms that the dominant macroeconomic policy trend of the 1980's was fiscal adjustment. The case study countries registered steady fiscal improvement, on average, from 1982 to 1988. Other developing countries showed a less pronounced deficit reduction; OECD countries cut their deficits in half during the same period.

The counterpart to the fiscal adjustment in developing countries was a huge reduction in current account deficits as shown in Figure 1.2. This again was more pronounced in the case study countries than in other LDCs. The simultaneous decline of fiscal and external deficits is another bit of evidence on the close association between the two.

The counterpart to the decline in external deficits in the project case studies is a major depreciation of the real exchange rate as shown in figure 1.3. This is an interesting contrast to the remainder of LDCs, which if anything show moderate real appreciation.

While the real exchange rate, fiscal and external deficits seem to move together in the project case studies, this is not the case with inflation and real interest rates. Figure 1.4 shows inflation to be a noisy, trendless series in both the project cases and in other developing



Figure 1.1  
**PUBLIC SECTOR BALANCES**  
 OECD AND DEVELOPING COUNTRIES

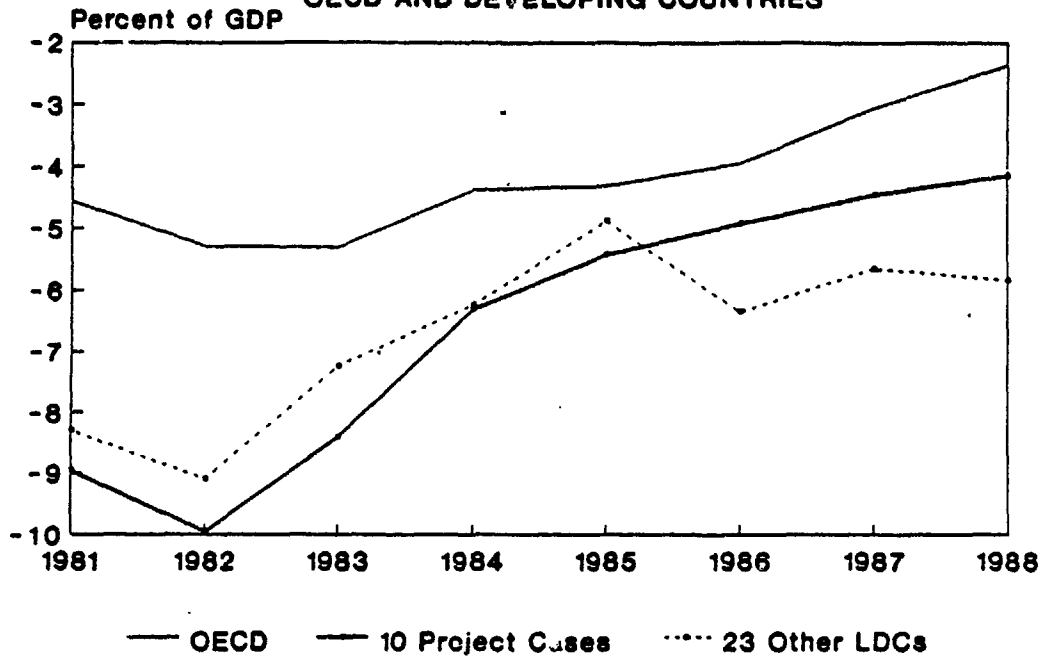
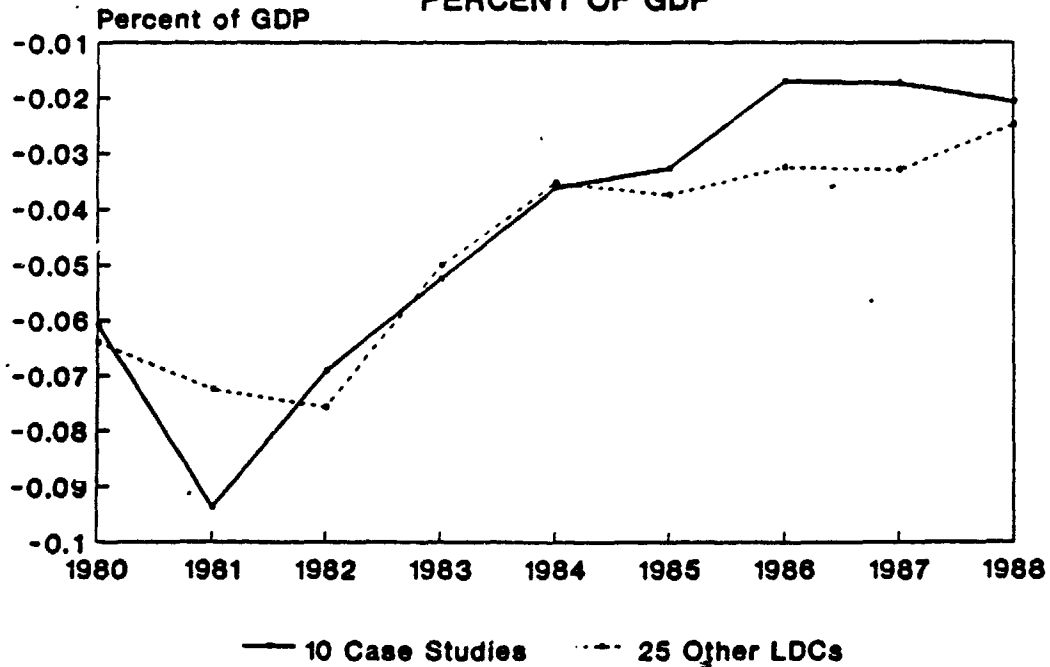


Figure 1.2  
**CURRENT ACCOUNT BALANCES**  
 PERCENT OF GDP



countries.<sup>7</sup> This is in contrast to the steady disinflation in the OECD countries. Similarly, real interest rates show no trend to speak of in the 10 project cases and in other LDCs, while real interest rates rose steadily in OECD countries (figure 1.5). The volatility of the LDC real interest rates and the large negative numbers for average real interest rates makes clear that financial repression was alive and well in the 1980s.

We next examine the individual macroeconomic evolution of the case study countries in the 1980s. Figure 1.6 shows the evolution of consolidated nonfinancial public deficits in the 1980s.<sup>8</sup> We see strong fiscal adjustment in Chile, Ghana, Mexico, and Thailand. Fiscal adjustment is absent or reversed in Argentina, Cote d'Ivoire, and Pakistan. Colombia, Morocco, and Zimbabwe are in between.

The composition of the financing of the deficit in the case study countries is shown in figure 1.7. Argentina, Ghana, Mexico, and Zimbabwe increased their reliance on domestic financing in the early 1980s at about the same time the debt crisis began (late 1982), the consequence of which was a decline of external financing of fiscal deficits.<sup>9</sup> We will see later how this led to implicit taxes through financial repression in these 4 countries. Morocco (not shown in the graph for lack of data) also turned increasingly to domestic finance in the aftermath of the cutoff of external lending. Chile experienced a milder version of the turn from external to domestic financing of the deficit, until the deficit was turned into a surplus in 1987-88.

Colombia was able to smooth the reduction in external financing and saw only a gradual rise in domestic public borrowing. Thailand maintained steady flows of domestic financing until deficits were cut sharply after 1986. Pakistan also slowly increased its reliance on domestic

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<sup>7</sup>Countries that experienced inflation above 1000 percent are excluded because they have a disproportionate effect on the average. Thus, Argentina is excluded from the project series, and Bolivia, Brazil and Peru from "other" developing countries. The excluded observations also do not show a clear trend.

<sup>8</sup>Appendix V describes deficit definitions.

<sup>9</sup>Ghana subsequently benefitted from large inflows of foreign financing (much of it highly concessionary) as it began a major reform program.

Figure 1.3  
**REAL EXCHANGE RATE INDEX**  
**AVERAGES**

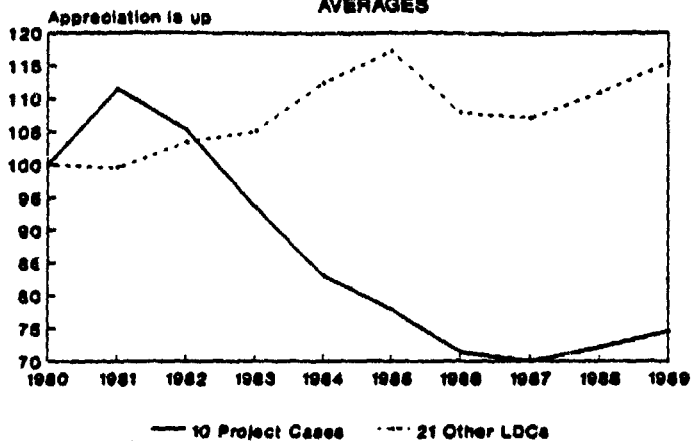
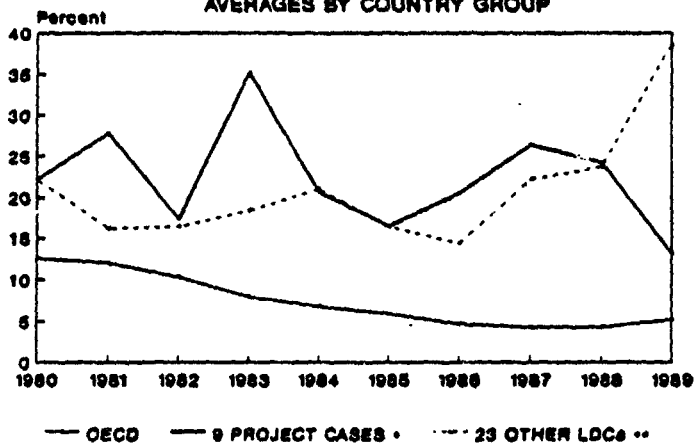


Figure 1.4  
**INFLATION RATES (CPI)**  
**AVERAGES BY COUNTRY GROUP**



· not including Argentina  
 ·· not including Bolivia, Brazil, and Peru

Figure 1.6  
**REAL INTEREST RATES**  
**AVERAGES, DIFFERENT COUNTRY GROUPS**

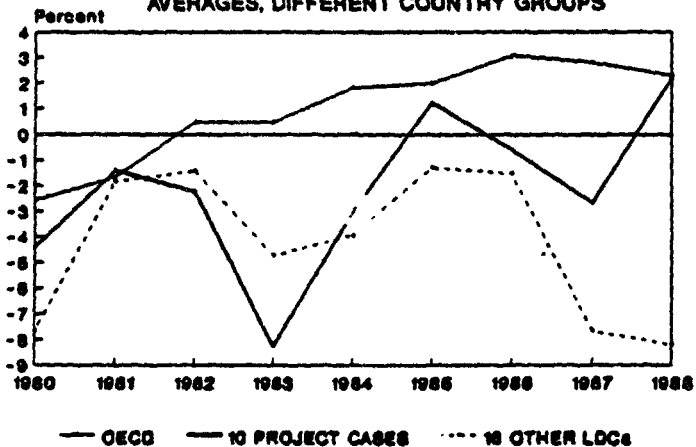


Figure 1.8a  
**STRONG FISCAL ADJUSTMENT**

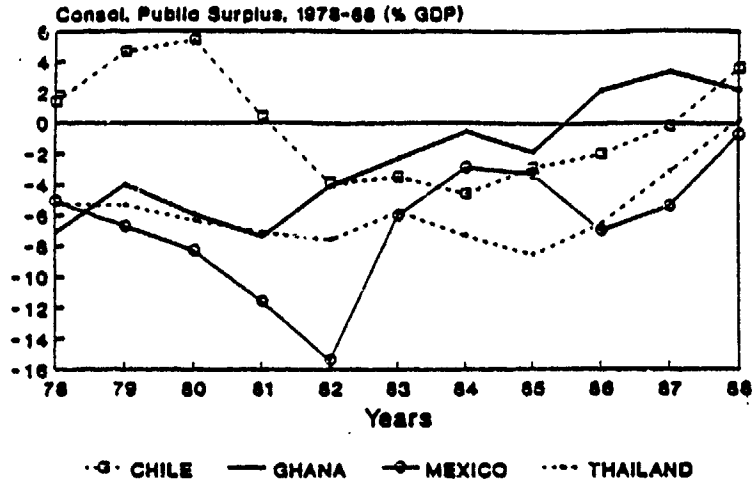


Figure 1.8b  
**MODERATE FISCAL ADJUSTMENT**

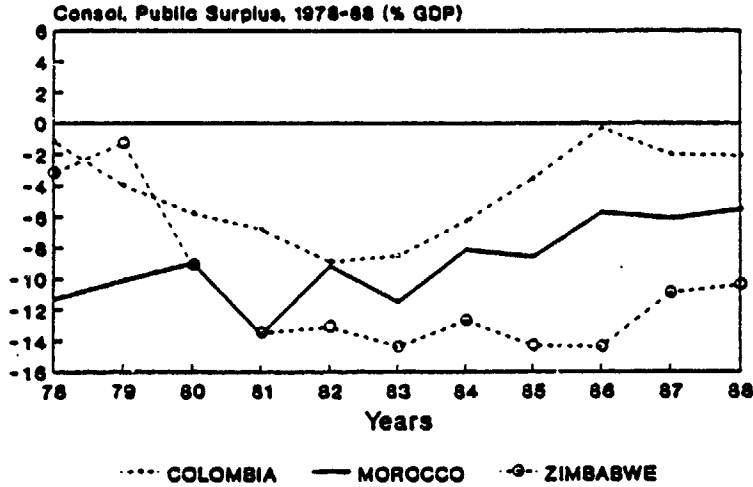
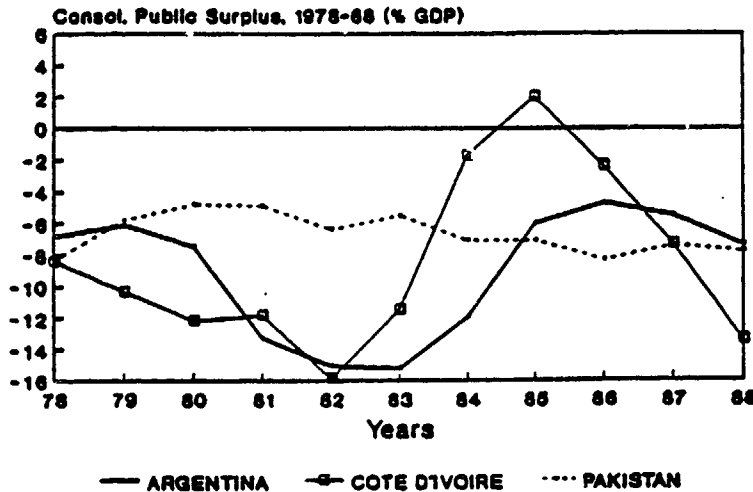
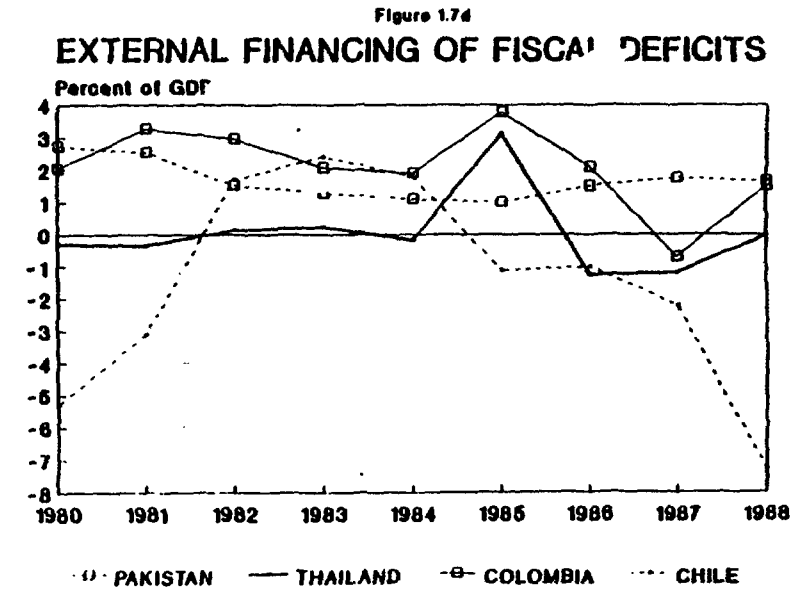
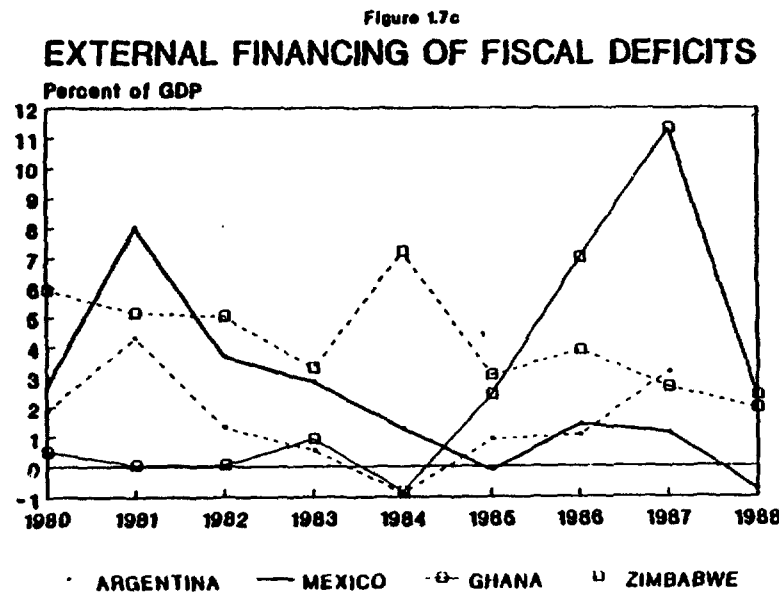
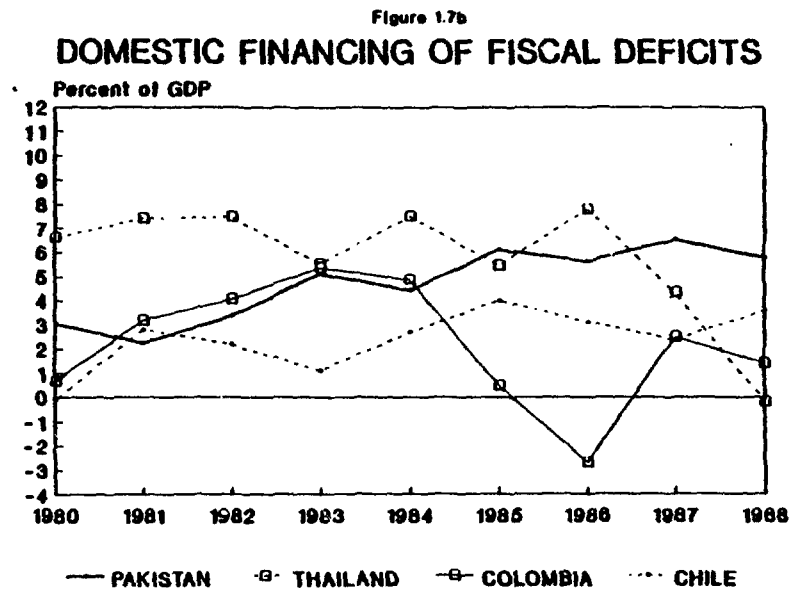
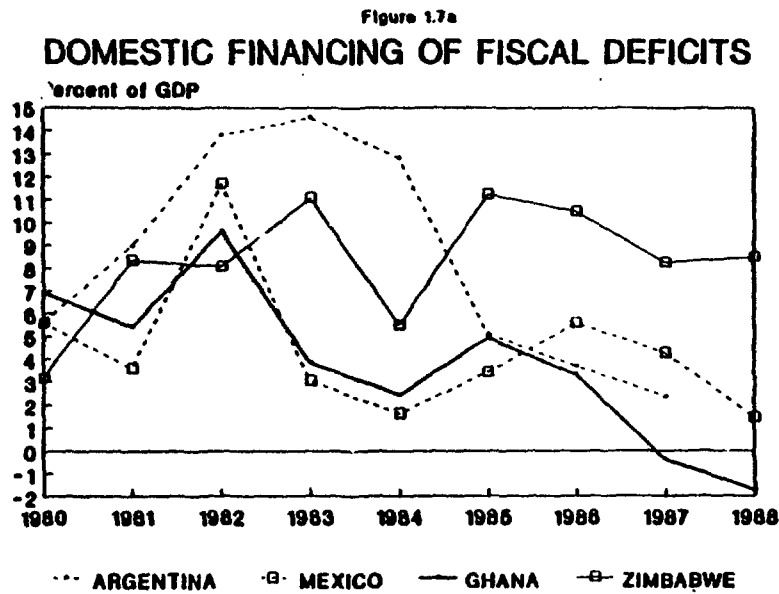


Figure 1.8c  
**REVERSED OR ABSENT FISCAL ADJUSTMENT**





financing as its public external borrowing gradually diminished. These three countries avoided the sharp macroeconomic crises that affected the others, in part because they had greater access to foreign financing, reflecting good fiscal behavior.<sup>10</sup>

Four of the countries that were identified as making sharp shifts from external to internal financing -- Argentina, Mexico, Ghana, Chile -- also had severe episodes of negative growth in the early 1980s. Ghana's and Chile's growth subsequently recovered strongly in the wake of fiscal adjustment, other reforms, and improved access to foreign financing. Côte d'Ivoire experienced a severe decline in external borrowing and also had negative growth. Other countries that relied increasingly on domestic financing of deficits without a sharp financing crisis -- Morocco, Zimbabwe, and Colombia -- have had erratic growth performance, but not as poor as the previous ones. The star performers are Thailand and Pakistan, countries that had continuing access to external financing and eschewed financial repression as a means of financing.<sup>11</sup>

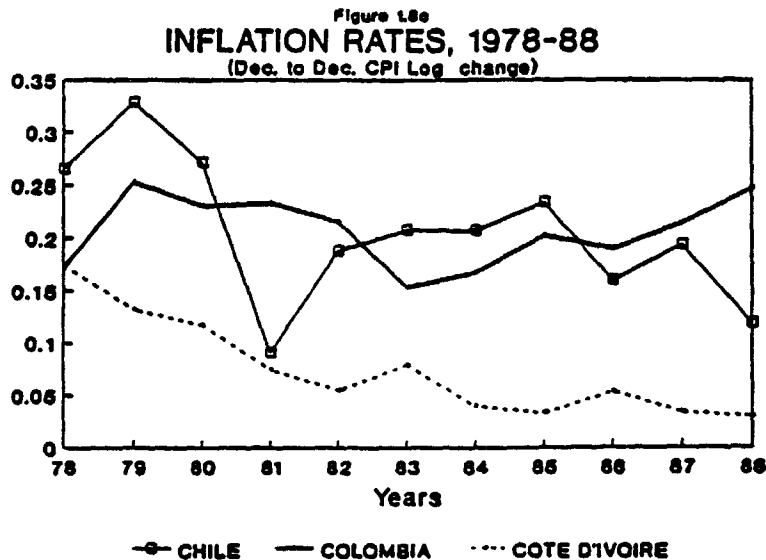
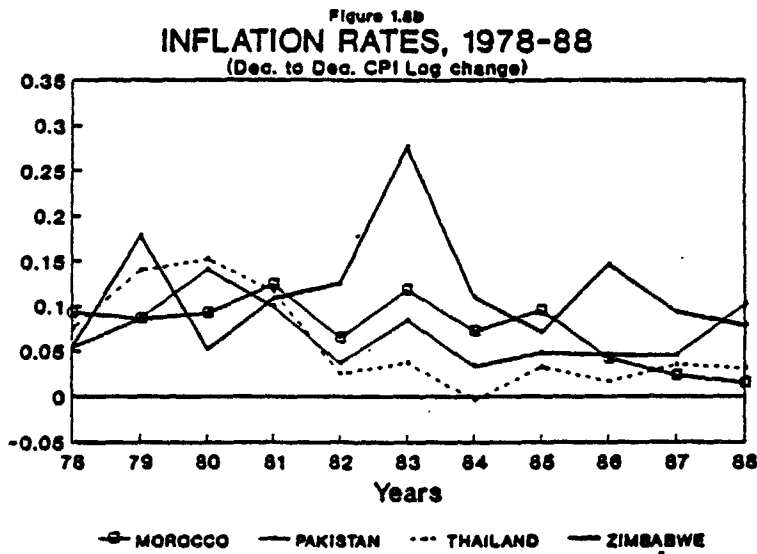
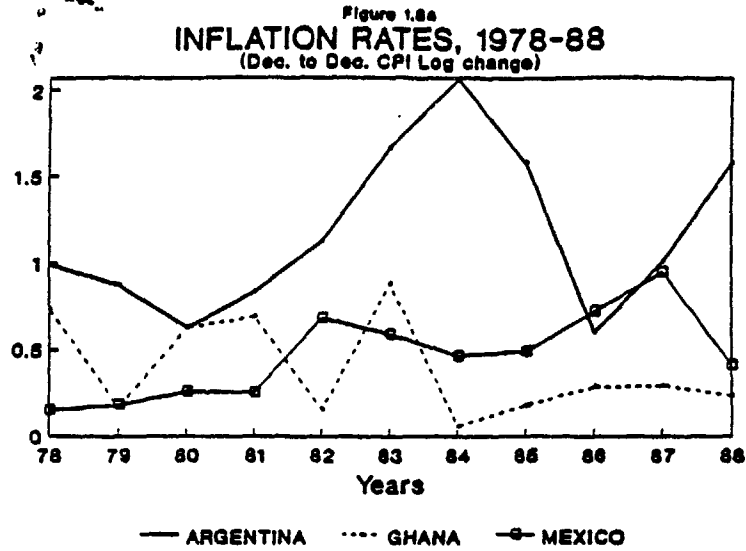
Figure 1.8 shows the inflation rates of the case study countries during the 1980s. There were accelerations of inflation in Argentina, Ghana, and Mexico at about the time of the shift from external to domestic financing of fiscal deficits, and a milder temporary acceleration in Zimbabwe. However, other countries that relied increasingly on domestic financing show no evidence of higher inflation, as inflation was stable in Zimbabwe (after 1983), Morocco, Chile, Pakistan, and Colombia.

We conclude from this section that strong fiscal and external adjustment was typical of both the 10 case studies reviewed here and LDCs in general. The case studies are less typical in the strong real depreciation they achieved. Inflation and real interest rates do not show clear

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<sup>10</sup>Pakistan's deficit was high, but we will see later how the deficit was consistent with stable debt ratios and low inflation until later in the 1980s.

<sup>11</sup>The high growth in Pakistan enabled the country to sustain a higher deficit, as will be discussed in section II, but the sources of the growth are not fully clear.



trends in response to fiscal adjustment. The countries forced to make an abrupt shift from external to domestic financing of the deficit fared poorly in terms of growth, and some of them show an acceleration of inflation.

In the remainder of the paper, we will examine some of the problems posed by the macroeconomic stylized facts presented here. Were deficits conscious policy choices or did they passively respond to external and domestic macroeconomic variables? How tight is the link between deficits, seignorage and inflation? How much did countries resort to financial repression to finance the deficit? What were the consequences of deficits for interest rates with and without financial repression? How did the deficit and its composition affect private consumption (and thus saving), private investment, and thus growth prospects? How important are deficits in explaining real exchange rate movements?

## **II. PUBLIC DEFICITS: MEASUREMENT, CAUSES AND REMEDIES**

This section focuses on alternative public deficit concepts, deficit determinants, and components of successful fiscal stabilization programs, derived from the project's 10-country sample.

### **A. Public Sector Deficits: Alternative Definitions and Public Sector Coverage**

Alternative deficit measures differ by how they are defined and which public sub-sectors they encompass. Appendix V<sup>12</sup> reviews the main deficit categories. Figure 2.1 illustrates different above-the-line deficit categories for the cases of Morocco (1983-88) and Argentina (1980-85). The significant fiscal adjustment achieved by Morocco is underestimated by the decline of its cash basis deficit, because the country was able to reduce its accruals basis deficit at an even

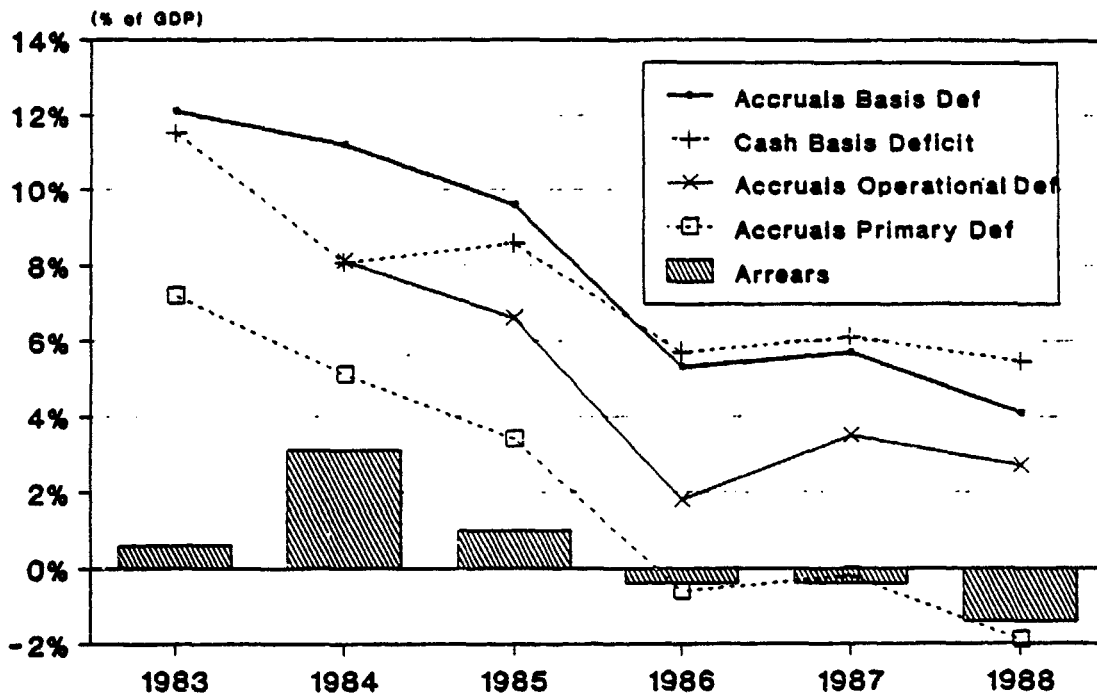
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<sup>12</sup> For detailed discussions and summaries of alternative deficit measures see Blejer and Chu (1988), Tanzi, Blejer, and Teijeiro (1988), Buiter (1987), Congressional Budget Office (1990), Eisner (1986), Kotlikoff (1988), Fischer and Easterly (1990), Mackenzie (1989), Tanzi (1985), Teijeiro (1989), Towe (1991), and World Bank (1988).

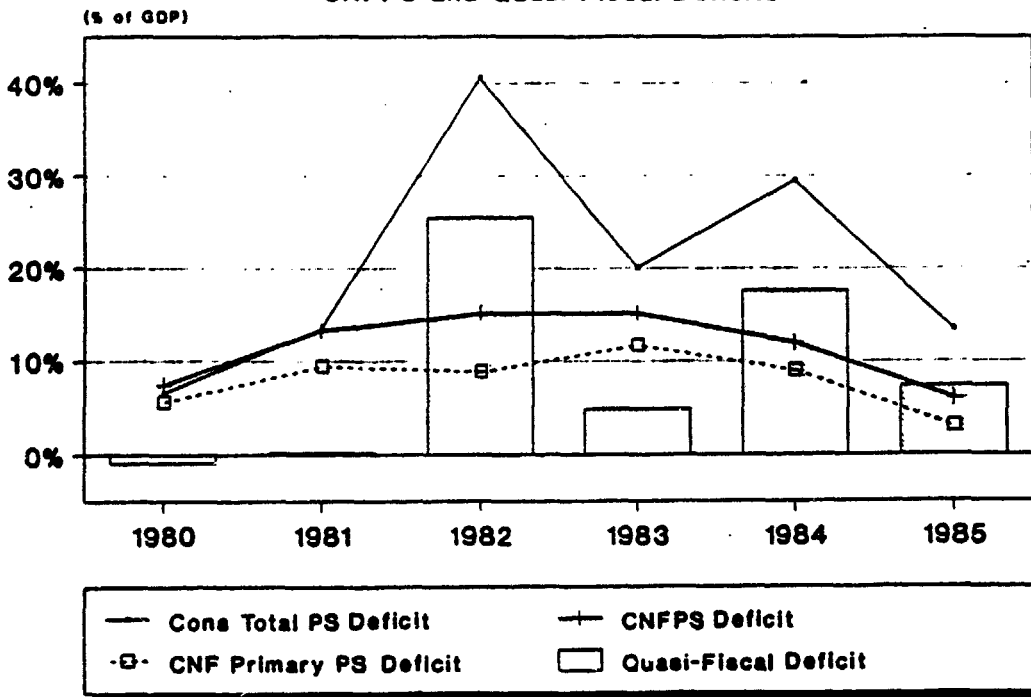


## Figure 2.1 PUBLIC SECTOR DEFICITS: ALTERNATIVE MEASURES AND SECTOR COVERAGE

**A. Morocco 1983-88 Fiscal Adjustment:  
Alternative Measures of Central Government Deficits**



**B. Argentina 1980-85 Fiscal Destabilization:  
CNFPS and Quasi-Fiscal Deficits**



more stringent pace by reducing accumulation of arrears and starting to repay them in 1986. However, the operational deficit -- economically more meaningful than the nominal deficit -- did not fall as fast as the latter, due to the decline of the inflation component of domestic interest payments resulting from lower inflation.

The Argentine experience of serious fiscal deterioration illustrates how misleading a partial measure of the deficit is when the central bank pursues quasi-fiscal programs leading to significant losses. Between 1980 and 1983 the nominal consolidated non-financial public sector (CNFPS) deficit doubled, but a significant share of this increase was due to higher nominal interest payments from an exploding inflation. Anyway, either measure of the CNFPS deficit -- nominal or operational -- seriously underestimates the deteriorating total fiscal stance in 1982 (and afterwards), when the Central Bank's quasi-fiscal deficit increased by an unprecedented 25 percentage points (pp.) of GDP!

The next subsections focus mostly on nominal above-the-line CNFPS deficits, to be followed by a last subsection on quasi-fiscal and total public deficits for the relevant country cases.

## B. Sensitivity of Deficits to Foreign Variables

Foreign shocks are a source of fiscal instability in developing countries. Commodity exporters and highly indebted countries face an inherent instability from fluctuating export prices and foreign interest rates which hinder significantly fiscal adjustment efforts. In the following we will test the sensitivity of public deficits to foreign shocks in a sub-sample of 6 of the case studies.<sup>13</sup>

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<sup>13</sup>In broad terms, countries face four types of foreign shocks: changes in price and interest conditions of their foreign trade and credit flows, and changes in quantity constraints affecting foreign trade and credit flows. While quantity constraints are rather uncommon in foreign trade (abstracting from countries affected by global embargoes or trade restrictions affecting certain items), massive changes in borrowing constraints are a stylized fact in credit markets. The aftermath of the 1982 debt crisis implied in fact a massive regime change in the form of foreign resource constraints faced suddenly by most developing debtor economies. While the latter constitutes a strong foreign shock affecting below-the-line financing sources, we focus in the following only on changes in foreign terms of trade and interest rates, which affect above-the-line deficits.

Changes in export prices affect the public sector directly (via profits of the exporting state-owned company or marketing board) or indirectly (through taxes on profits or on exports). The quantitative impact of the export price shock on government accounts depends on the tax and property structure, the amount exported, and the magnitude of the price shock. Countries facing high export price volatility, and where a large share of exports is through a SOE (such as Chile and Mexico) or a marketing board (Cote d'Ivoire, Ghana), have fiscal accounts sensitive to terms of trade shocks. Public sector accounts in countries with a diversified foreign trade structure where the private sector is the main exporter and export taxes are low or absent, such as Pakistan or Zimbabwe, do not suffer significantly from export price volatility. Import prices affect public expenditure in some countries. In Morocco, for instance, the decline in imported food prices was the main cause of the substantial decline in subsidies to the private sector in the mid-1980s. Changes in foreign interest rates affect highly-indebted countries with a high share of variable-interest debt, such as Argentina and Colombia.

In addition to measuring the impact of foreign shocks on public accounts, it is illuminating to assess their contribution to overall public sector deficits. Both dimensions are presented for 6 countries in table 2.1. Column 1 determines the average absolute change in public deficits due to different foreign shocks over the relevant sample periods. For instance, foreign shocks have contributed on average to a 2.3% of GDP variation of the public sector deficit in Chile and to a 0.3% of GDP variation in Zimbabwe. Countries highly sensitive to terms of trade changes are Chile (copper), Mexico (oil) and Thailand, while in Colombia (coffee and oil) and Morocco (phosphates) the average contribution of terms of trade shocks to deficits is only around 1% of GDP. In Zimbabwe the influence of terms of trade shocks on government revenue is negligible. By contrast to terms of trade shocks, interest rate fluctuations have much lower effects on public deficits -- they contribute at most 0.4% of GDP to the variation of public sector deficits in our sample.

TABLE 2.1

CONTRIBUTION OF FOREIGN SHOCKS TO PUBLIC DEFICITS

	(1) Average Absolute Variation of Public Deficits Due to Foreign Shocks (% of GDP)	(2) Average Relative Contribution of Foreign Shocks to Variation of Public Deficits (% of variation of deficits)
<u>1. Chile, 1973-1988</u>		
Foreign Shocks	2.3	12
Copper Price Changes	2.7	15
Foreign Interest Rate Changes	0.4	-3
<u>2. Colombia, 1984-1989</u>		
Foreign Shocks	1.0	50
Coffee Fund Changes	1.2	59
Oil Co. Surplus Changes	0.9	-9
<u>3. Ghana, 1972/73-1988</u>		
Foreign Interest Rate Changes	0.1	0
<u>4. Morocco, 1971-1988</u>		
Phosphate Co. Contributions	0.8	-17
<u>5. Thailand, 1970-1988</u>		
Terms of Trade Changes	2.2	41
<u>6. Zimbabwe, 1980/81-1988/89</u>		
Foreign Interest Rate Changes	0.3	-3

**Notes:** The first column computes the annual average absolute variation of the deficit caused by the corresponding changes in foreign variables. (The exception is Chile, which presents period averages for 1973-75, 1975-81, 1981-86, and 1986-88). If more than one foreign variable is considered, the sum of the average absolute variations for the individual variables differs from the average absolute variation of the combined shocks, due to opposite signs of individual variations. The second column reflects the average relative

contribution of foreign shocks to the variation of public deficits, defined as: 
$$\left( \sum_{i=t}^{t+n} dv_i(\text{sign } d_i) \right) / \sum_{i=t}^{t+n} |d_i|$$
, where  $d_i$  is the

change in the deficit in period  $i$ ,  $dv_i$  is the change in the deficit caused by variable  $v$ ,  $t$  is the initial period, and  $n+1$  is the total number of periods.

The average relative contribution of foreign shocks in column 2 measures the degree of correlation between foreign-shock induced deficits and the overall public deficit. In Chile, Colombia, and Thailand, adverse foreign shocks increase deficits, with shares varying between 12% and 50% of the total fluctuation of deficits. In Ghana, the tiny foreign interest shocks are uncorrelated with deficits. However, in Zimbabwe and Morocco foreign shocks have the opposite sign of the changes of overall deficits, indicating that domestic macroeconomic shocks and fiscal policy changes more than compensate for the influence of adverse foreign shocks.

Even moderate shocks could explain a lot of deficit variation. In Colombia, for example, shocks of moderate magnitude have a huge influence (50%) on the variability of deficits. Colombia did not require such substantial fiscal adjustment during the relevant sample period (1984-89), so that foreign shocks had a more significant role in its deficit evolution. However, in Chile, which shows the highest magnitude of foreign shocks, their relative contribution to deficit variability has been low (12%). Chile embarked during 1973-88 on massive fiscal adjustment programs which overshadowed the influence of foreign shocks.

Optimal responses to shocks depend on their transitory/permanent nature: purely transitory shocks should be (dis) saved and hence reflected by public deficits, while permanent shocks should induce corresponding changes in expenditure or revenue without affecting deficits. In the case of public sectors which own large commodity-exporting companies (Morocco, Chile, Mexico) or collect large revenues from private exporters (Ghana, Cote d'Ivoire), price or revenue-stabilization funds (such as those implemented in Chile and Venezuela) or hedging through risk-sharing contracts are efficient mechanisms for isolating the budget from transitory export price shocks.

### C. Sensitivity of Deficits to Domestic Macroeconomic Variables

A second group of variables affecting deficits -- still outside the direct control of fiscal policymakers -- are domestic macroeconomic variables. In the following, we concentrate on those variables which have the strongest effects on public budgets: inflation, the real interest rate, the real exchange rate, and growth.

#### Inflation

Inflation affects the budget deficits through various channels.<sup>14</sup> Anticipated inflation affects nominal interest payments to domestic debt holders. Inflation also affects the primary deficit (the Keynes-Olivera-Tanzi effect).<sup>15</sup> Tax collection lags in non-fully indexed tax systems (for example, nominally fixed excise taxes) lead to declining real revenue when inflation increases. Inflation also tends to lead to public demoralization and hence lower tax compliance. However, if income brackets are non-indexed, higher inflation leads to bracket creep and hence higher direct taxation. Real public current expenditure declines with inflation when public wages or transfers are not indexed. While in many countries the net effect of inflation is to increase primary deficits, the budget structure could conceivably reverse this effect.

Table 2.2 summarizes the effects of inflation on public deficits in the sample countries, identifying the channels through which they operate.<sup>16</sup> Results from estimated tax

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<sup>14</sup> The channels mentioned below add bracket creep and transfer effects to the five-item list of Dornbusch, Sturzenegger, and Wolf (1990).

<sup>15</sup> See Olivera (1967), and Tanzi (1977, 1978). Sometimes the Keynes-Olivera-Tanzi effect is used more restrictively for the tax erosion effect mentioned below.

<sup>16</sup> The effect of inflation on deficits via nominal interest payments on the debt is excluded from table 2.3.1 as a separate channel of transmission.

**TABLE 2.2****INFLATION AND PUBLIC DEFICITS****1. Effects of Inflation on Tax Revenue:****1.1 Negative**Colombia: T  
(1972-1987)Ghana: DT, IT  
(1970/71-1988)**1.2 Zero**Chile: DT, IT  
(1973-1989)

Morocco: T

Pakistan: DT, TT, IT  
(1972/73-1987/88)Zimbabwe: IT, TT  
(1970/71-1988/89)**1.3 Positive, Due to Non-  
Indexation of Income  
Brackets**Zimbabwe: DT  
(1970/71-1988/89)**2. Effects of Inflation on Public Expenditure:****2.1 Negative**Chile: Transfers  
(1973-1989)**2.2 Zero**

Morocco: Public Expenditure

**3. Effects of Inflation on Public Deficit:  
Positive Effect of Inflation on CNFPS Deficit**

Thailand (1971-88)

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**Note:** DT is direct tax revenue, IT is indirect tax revenue, TT is trade tax revenue, and T is total tax revenue.

revenue functions allow us to classify countries according to the net influence of inflation on tax revenue. Inflation lowers taxes in Colombia (for aggregate tax revenue) and in Ghana (for both direct and indirect taxes). The only positive effect of inflation on taxes is found for direct tax revenue in Zimbabwe, where non-indexation of income brackets leads to bracket creep. Short collection lags, indexation of tax revenue and/or indexation of income brackets could be behind the non-significant effects of inflation on tax revenue in the other 4 cases: Chile (direct and indirect taxes), Morocco (total taxes), Pakistan (direct, indirect, and trade taxes), and Zimbabwe (indirect and direct taxes).

Some partial evidence on the effects of inflation on expenditure categories follows in Table 2.2. Transfers to the private sector in Chile decline with inflation, presumably due to incomplete indexation, while no evidence of a significant effect of inflation on aggregate public expenditure could be found in Morocco.

In most countries, the net influence of inflation is to raise nominal public sector deficits, due to the dominance of the interest payment and tax reduction effects of rising prices. An example is Thailand: according to econometric results a 10 pp. increase in inflation raises the CNFPS deficit by 0.9 pp. of GDP.<sup>17</sup>

### Real Interest Rate

Real interest payments (and hence both the nominal and the operational deficit) obviously increase one-to-one with the real interest rate. Inflation shocks which are unexpected (or, even if expected, are not reflected by higher nominal interest rates due to interest controls), reduce ex-

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<sup>17</sup> Calculation based on a reduced-form equation estimated for the CNFPS deficit in Thailand and on 1988 deficit, inflation and GDP levels.



post real interest rates and hence the operational deficit. For instance, in Ghana the one-period inflation rise from 30% in 1982 to 115% in 1983 increased the nominal CNFPS deficit only slightly but reduced the operational deficit significantly due to the drop in ex-post real interest rates to negative levels.

Financial liberalization since the mid-1970s, with partial or complete deregulation of interest rates, has increased the sensitivity of deficits to interest rate. After early and radical financial liberalizations in Chile (1974-75) and Argentina (1977), the 1980s saw partial or complete liberalizations in Mexico, Morocco, and Zimbabwe. While the massive rise in real interest rates during the 1970s in Chile did not impinge on the deficit due to the virtual absence of domestic interest-bearing debt, the increasing domestic debt stocks of the 1980s, in conjunction with moderately high interest rates, added to the burden of the central bank, which holds most of the public sector domestic debt. In Morocco, partial liberalization of interest rates since 1984 has increased significantly the cost of domestic debt to the Treasury. It is estimated that a future increase of rates on government debt to competitive market levels could add 2 pp. of GDP to the deficit.

Less access to foreign financing after 1982 caused many countries to combine deficit reduction with increased domestic financing. A case in point is Pakistan. After 1981/82 its government decided to raise its domestic non-bank borrowing, which contributed 1.5 pp. of the increase in the nominal deficit, from 4.8% of GDP in 1980/81 to 7.4% in 1987/88, through higher domestic interest payments.

### Real Exchange Rate

A real depreciation raises public expenditure (measured in local currency units) by increasing foreign interest payments and the cost of traded-goods capital and intermediate goods acquired by the public sector. Public sector revenue is boosted by a real depreciation from higher surpluses of traded-goods producing firms and from direct and indirect taxation on production or sales of traded goods. The net effect of the real exchange rate (RER) on the deficit (in real terms or as a share of GDP) hence depends on the relative weights of traded and non-traded items in public expenditure and revenue.

Table 2.3 summarizes the effects of the RER on tax revenue, SOE profits, transfers and consolidated deficits.<sup>18</sup> In Colombia, total tax revenue was reduced by real devaluation -- presumably because of the negative correlation between the RER and quantitative import restrictions or because of a highly elastic import demand. The opposite is true for Ghana and Zimbabwe, where various revenue categories (direct and indirect taxes in Ghana, direct and trade taxes in Zimbabwe) are increased by devaluation -- presumably because traded-goods activities (sales and production) are taxed more heavily than non-traded activities. Because the remaining tax categories are shown to be insensitive to the RER, aggregate tax revenue rises with a higher RER in the latter two countries.

Positive effects from real devaluations on public budgets are reaped in countries where a significant share of SOEs is comprised by tradable-goods producing companies -- typically the case where the big commodity exporters are public enterprises -- Chile, Colombia, Mexico, and

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<sup>18</sup> The real exchange rate is defined here consistent with the relative price of traded to non-traded goods -- a real depreciation means a higher RER.

Morocco. Devaluations also boost net revenues from profits of agricultural marketing boards -- this is clearly the case in Côte d'Ivoire.

A computation of the net effect of the RER on the CNFPS deficit combines the above mentioned effects on public revenue with the large and positive effect of the RER on foreign interest payments and with any effects on public expenditure. In many of our sample countries, the interest effect dominates whatever positive effect the RER has on the primary deficit. The exceptions are Colombia, where the RER effect is zero, and Mexico, where the share of oil-related federal revenue in GDP (7.9% in 1989) is more than twice as large as interest payments on dollar-denominated debt (3.4% in 1989).

### Output

Transitory output shocks affect non-financial public deficits because of changing tax bases and transfer payments to the private sector. This anticyclical behavior of public deficits motivated traditional Keynesian prescriptions of using the budget as an automatic stabilizer to counteract "autonomous" demand shocks. In countries with non-independent central banks or under extreme financial crises, the anti-cyclical behavior of the non-financial deficit is reinforced by anticyclical quasi-fiscal operations of the financial public sector, as we discuss below.

Trend growth is sometimes seen as a cure to public deficits -- if growth is high enough, it is argued, tax bases expand and hence countries can grow out of deficits. This view is flawed due to two reasons. First, it neglects the fact that not only tax bases but also successful pressures for higher public expenditure rise with output levels. Second, growth will not materialize if public deficits are high, inflation and real interest rates are high, and hence private investment is depressed.

Table 2.3Real Exchange Rate and Public Deficits1. Effects of a RER Devaluation on Tax Revenue:1.1 Negative

Colombia: T  
(1972-1987)

1.2 Positive

Ghana: DT, TT  
(1970/71-1988)

Zimbabwe: DT, IT  
(1970/71-1988/89)

2. Positive Effects of a RER Devaluation on Profits  
or Transfers from SOEs:

Chile:	Surplus of SOEs and Copper Taxes
Colombia:	Surplus of Coffee Fund and State Oil Company
Cote D'Ivoire:	Revenue from Cocoa/Coffee Marketing Board
Mexico:	Surplus of SOE
Morocco:	Contributions of State Phosphate Company

3. Net Effect of the RER Devaluation on the CNFPS Deficit:3.1 Increases Deficit

Chile  
Ghana

3.2 Close to Zero

Colombia  
Thailand (sns)  
Zimbabwe (nns)

3.3 Lowers Deficit

Mexico

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**Note:** T is total tax revenue, DT is direct tax revenue, IT is indirect tax revenue, and TT is trade tax revenue; sns is statistically not significant and nns is numerically not significant.

### An Illustration

How sensitive are deficits to domestic variables? Table 2.4 presents the case of Zimbabwe, showing by how much the CNFPS deficit is affected by normalized changes in macroeconomic determinants. The domestic real interest rate has a significant effect on the deficit, resulting from the high level of public debt: a 1 pp. increase in the rate raises the deficit by 0.4 pp. of GDP, reflecting the 0.40 domestic debt/GDP ratio. Interestingly, inflation has a lower positive effect on the deficit than the real interest rate; the reason being that the 0.40 effect on the deficit via higher nominal interest payments of a 1 pp. rise in inflation is neutralized in part by the positive bracket-creep effect on income taxation. A devaluation contributes to a slightly lower deficit in Zimbabwe; the higher foreign interest payments are more than compensated by increased tax collection. Finally, growth seems to have a strong effect on deficits; however, its magnitude is overestimated because it considers only the influence of GDP on tax revenue, not on public expenditure.

### D. Fiscal Policies

In this subsection, we compare the role of fiscal policy variables to the influence of foreign and domestic macro variables in the evolution of public deficits. Based on time-series results for the decomposition of public sector deficits according to the three groups of deficit determinants,<sup>19</sup> we compute the contribution of each of these groups to changes in public deficits. Figure 2.2 presents the average relative contribution of the three groups of variables to

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<sup>19</sup>Based on the deficit decomposition methodology by Marshall and Schmidt-Hebbel (1989).

Table 2.4

**SENSITIVITY OF NON-FINANCIAL PUBLIC SECTOR DEFICITS TO  
CHANGES IN MACROECONOMIC DETERMINANTS: ZIMBABWE 1988**

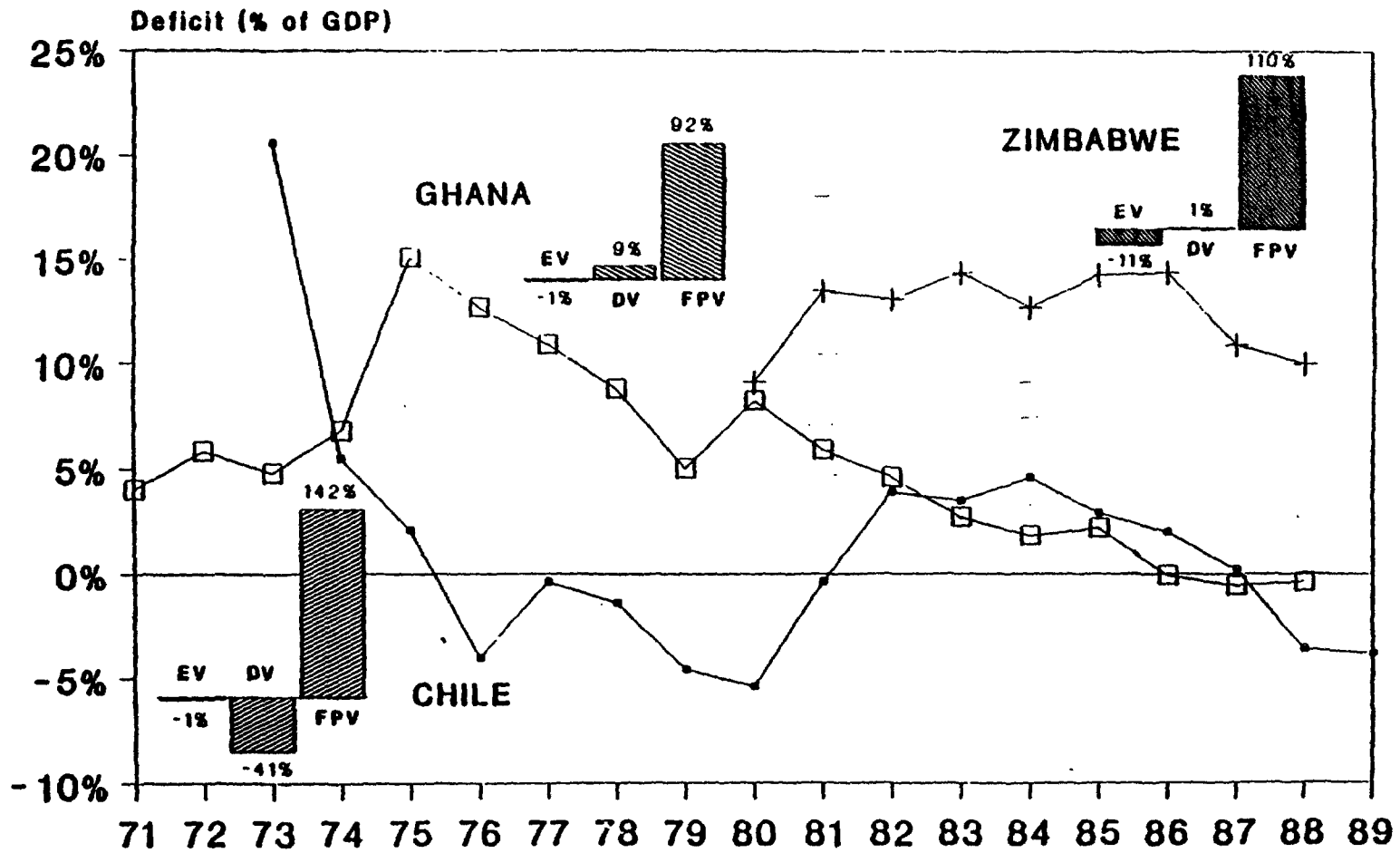
<u>Changes in Macro Determinants</u>	<u>Changes in NFPS Deficits</u> (Percent. Points of GDP)
1 pp. Increase of Domestic Inflation	0.31
1 pp. Increase of Domestic Real Interest Rate	0.40
1 % Devaluation of Real Exchange Rate	-0.06
1 % Growth of Real GDP	-0.37
1 pp. Increase of Foreign Interest Rate	0.25

Note: based on 1987/88 and 1988/89 CNFPS budgets.

changes in CNFPS deficits<sup>20</sup> and the evolution of deficits over time in Chile, Ghana and Zimbabwe. This evolution reflects the influence of both transitory (or cyclical) shocks and,

<sup>20</sup>The average relative contribution of each group of deficit determinants is calculated based on the equation presented in the note to table 2.1; hence the equation is now used separately for external, domestic macroeconomic and fiscal policy variables. However, in order to present the relative contribution of each group of variables,  $d_i$  is defined here as the explained change in the deficit, not the actual change as in table 2.1. Hence the average relative contribution of external variables to actual deficits in column 2, table 2.1, differs from the average relative contribution of external variables to explained deficits in figure 2.2. The average absolute deviations between actual and explained deficit changes in pp. of GDP are 0.9 for Chile (1974-88), 2.0 for Ghana (1972/73-1988), and 1.4 for Zimbabwe (1981/82-1988/89).

**Figure 2.2**  
**Nominal Consolidated Non-Financial Public Sector Deficits**  
**and Deficit Decomposition According to Main**  
**Determinants in Three Countries: 1971-1989**  
**(Central Government Deficits for Ghana)**



particularly in the cases of Chile and Ghana, structural policy shifts resulting in lower trend deficits.

Chile's 1973-89 fiscal experience reveals four distinct periods: a first massive fiscal stabilization (1973-76), consolidation of public sector retrenchment (1977-80), crisis and deficit explosion (1981-84), and a second significant fiscal stabilization (1985-89). Fiscal policy makers are the main actors behind this experience, dominated by achieving CNFPS surpluses in the neighborhood of 5% of GDP. On average, the relative contribution of fiscal policy variables (FPV) to changes (and therefore to trend reduction) in the deficit is 142%. Hence changes in fiscal policy variables compensated for the strongly negative contribution of domestic macroeconomic variables (DV) and the slightly negative contribution of external variables (EV).

Ghana is a case of gradual but also highly successful fiscal adjustment.<sup>21</sup> The contribution of fiscal policy variables to this turn-around is also massive, explaining 92% of the change in the deficit. Improvements in domestic macro variables helped to a small extent, contributing by 9% to the fluctuations and structural correction of the central government deficit in Ghana.

Zimbabwe shows a substantial deterioration in its CNFPS budget after 1980, which is partly reversed when a limited fiscal stabilization started in 1987/88. Zimbabwean policy makers compensated for the influence of variables beyond their control: fiscal policy variables explain 110% of the variation of public deficits, neutralizing the negative contribution of foreign interest shocks to the deficit.

A central conclusion emerges from these three cases: fiscal policy variables dominate absolutely these countries' experiences of fiscal adjustment or deterioration. External and

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<sup>21</sup>The figures for Ghana for the 1971-1981 sub-period are fiscal-year data for 1971/72 - 1981/82, and those for Zimbabwe are for fiscal years throughout 1980-1988.



domestic macroeconomic shocks play a minor, and often even negative, role in the cyclical variation and structural changes of public sector budgets. Hence active fiscal policies are both the main culprit in fiscal crises and an effective instrument in bringing about fiscal stabilization and adjustment.

Which were the main fiscal policy instruments for achieving fiscal adjustment or causing public sector deterioration in these three and the other seven countries? Table 2.5 identifies the contribution of specific policies in 10 relevant country experiences, one for each of our sample countries. Three cases (Chile, Mexico, Thailand) correspond to strong and fast fiscal adjustment, four follow a more gradualist approach of fiscal retrenchment (Colombia, Ghana, Morocco, Zimbabwe), one case is of moderate deterioration (Pakistan), and two of massive fiscal deterioration (Argentina, Cote D'Ivoire).

Loss of control of public consumption (particularly wages and employment levels) is a major cause of a loosened fiscal stance. Two dramatic examples for this are Argentina (1977-82), where the increase in current expenditure was so massive that capital investment had to fall by almost 5 pp. of GDP during this period of extreme fiscal deterioration, and Zimbabwe, which during a period of fiscal retrenchment (1986/87-1988/89) was not able to avoid further increases in its public wage bill amounting to 4.0 pp. of GDP. Also, part of Côte d'Ivoire's massive fiscal deterioration is due to rising current expenditure. Conversely, the examples of strong austerity policies in Chile (1973-75), Ghana (1975/76-1988), Mexico (1986-89), and Thailand (1985-88) illustrate the important role played by current expenditure reduction, and, in particular, by cuts in wages and public employment.

Table 2.5

**CONTRIBUTION OF POLICIES TO COUNTRY EXPERIENCES  
OF FISCAL ADJUSTMENT OR DETERIORATION**

(Percentage Points of GDP)

<u>Country Experience</u>	<u>Start and End-of- Period Deficit Levels</u>	<u>Change in Deficit and Contribution of Fiscal Policy Changes</u>	
1. Argentina: 1977-82 Deterioration	4.7; 15.1	<u>Change in Deficit</u>	<u>+10.4</u>
		Higher Current Exp.	15.1
		Lower Capital Exp.	-4.7
2. Chile: 1973-75 Adjustment	20.6; 2.1	<u>Change in Deficit</u>	<u>-18.5</u>
		Lower Public Employment	-4.3
		Higher Rev from Tax Ref.	-10.5
		Higher SOE Oper. Surplus	-8.4
3. Colombia: 1984-89 Adjustment	6.3; 2.2	<u>Change in Deficit</u>	<u>-4.1</u>
		Lower Pub. Wages/Salaries	-1.2
		Lower Fixed Investment	-2.1
		Higher Tax Revenue	-2.1
		Higher SOE Oper. Surplus	-1.9
4. Cote D'Ivoire: 1984-89 Deterioration	1.7; 14.4	<u>Change in Deficit</u>	<u>+12.7</u>
		Higher Current Exp.	3.6
		Lower Current Exp.	-5.1
		Lower Tax Revenue	2.9
		Lower Rev. Commodity Fund	12.7
5. Ghana: 1976/76-88 Adjust.	15.1; -0.4	<u>Change in Deficit</u>	<u>-15.5</u>
		Lower Wage Bill	-1.3
		Lower Exp. on Goods/Serv.	-1.6
		Lower Transfers/Subsidies	-5.4
		Lower Public Investment	-1.8
		Higher Grants/Non-Tax Rev.	?

6. Mexico:	14.9; 5.1	<u>Change in Deficit</u>	<u>-9.8</u>
1986-89 Adjustment		Lower Current Expenditure	-2.5
		Lower Other Expenditure	-4.6
		Lower Public Investment	-0.7
		Higher Direct Tax Revenue	-3.0
		Higher VAT Revenue	-0.9
7. Morocco:	12.1; 4.1	<u>Change in Deficit</u>	<u>-8.0</u>
1983-88 Adjustment		Lower Exp. on Goods/Serv.	-2.9
		Lower Transfers/Subsidies	-1.7
		Lower Capital Expenditure	-3.3
		New Petroleum Levy	-3.4
8. Pakistan	4.8; 8.3	<u>Change in Deficit</u>	<u>+3.5</u>
1980/81-1986/87		Higher Non-Int. Cur. Exp.	+2.9
Deterioration		Lower Direct Tax Revenue	+0.8
		Lower Indirect Tax Reven.	+1.9
9. Thailand:	8.6; -0.2	<u>Change in Deficit</u>	<u>-8.8</u>
1986-88 Adjustment		Lower Pub. Wages/Sals.	-1.4
		Lower Public Investment	-3.5
		Higher Revenue	-2.2
10. Zimbabwe:	14.4; 10.0	<u>Change in Deficit</u>	<u>-4.4</u>
1986/87-1988/89		Higher Pub. Wages/Sals.	+4.0
Adjustment		Lower Transfers/Subsidies	-5.0
		1988 Direct Tax Reform	-2.4
		1988 Custom Duty Reform	-1.8

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**Note:** The data refers to the central government for Ghana and Morocco, and to the general government for Pakistan. In all other cases the data refers to the CNFPS.

Cutting transfers and subsidies is often an effective way to contribute both to fiscal stabilization and market deregulation. In Ghana and Zimbabwe lower transfers/subsidies contributed massively to deficit reduction, by 5.4 and 5.0 pp. of GDP, respectively. On the revenue side, tax reforms are at the heart of addressing structural deficits. In Chile, direct and VAT tax reforms brought in a staggering 10.5 pp. of GDP, while the 1988 Zimbabwe tax reforms rendered a significant 4.2 pp. of GDP. Higher tax revenue helped also Colombia, Mexico, and Thailand in reducing their deficits.<sup>22</sup>

Rationalization of public enterprises and reforms of agricultural marketing boards constitute the fourth element of successful stabilization in our 10-country sample. Higher operating surpluses of SOEs contributed significantly to improving structural deficits in three countries: in Chile by a dramatic 8.4 pp. of GDP, in Colombia and in Ghana by smaller amounts. Conversely, the dramatic deterioration in Côte d'Ivoire was caused by the decline in revenue from the cocoa and coffee revenue stabilization fund due to continuing producer price supports during a period of declining world prices.

An encouraging finding from our sample is that successful fiscal retrenchment does not have to rely on lower public investment. In the most dramatic fiscal turnaround (Chile, 1973-75), public capital formation was not reduced. In the three countries where public investment fell during fiscal adjustment -- Colombia, Ghana, and Mexico -- it was reduced by moderate amounts. Only one case of fiscal retrenchment -- Thailand -- relied heavily on cutting public investment. Conversely, the two most dramatic declines in public investment occurred in Côte d'Ivoire and in Argentina, during periods of public deficit explosion. In the latter case, public capital expenditure

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<sup>22</sup>In these two cases it was not possible to separate the effects of tax reforms from those arising from changes in macroeconomic variables affecting tax revenue.

continued its systematic decline beyond 1982, reaching a 30-year trough in the latest year with available data (6.1% of GDP in 1987).

We conclude that successful, i.e. sustainable, non-financial public sector adjustment typically requires acting simultaneously on four fronts: reducing an overblown government bureaucracy, cutting transfers and subsidies to the private sector (other than efficient and targeted social programs), enacting tax legislation for increased, broadly-based direct and indirect taxation, and reforming and/or privatizing public enterprises. Efficient public investment, particularly in social or physical infrastructure, should not only be exempted from fiscal cuts but possibly expanded to encourage economic growth.

#### E. Quasi-Fiscal Deficits

Quasi-fiscal deficits (QFDs) -- expenses or losses incurred by public financial institutions -- are an exclusively Latin American phenomenon in our sample. They reflect a subordination of public financial institutions -- in particular of the central bank -- to the ministry of finance. They involve transfers to public non-financial or financial institutions outside the central government (such as development banks in Argentina or Mexico or provincial governments in Argentina), to private financial institutions (such as technically bankrupt commercial banks in Argentina and Chile), or to the non-financial private sector (like private exporters or debtors in Chile).<sup>23</sup>

QFDs grow at times of domestic financial and external payments crises due to support to distressed financial institutions and domestic debtors burdened by foreign-currency denominated external liabilities. In Argentina and Chile quasi-fiscal expenditures of the Central Bank resulted from emergency loans to financial institutions and losses from exchange rate guarantee programs.

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<sup>23</sup>See the treatments of Teijeiro (1989) and Robinson and Stella (1988).

The bailing out of domestic financial institutions between 1982 and 1987 in Chile was based on three subsidized programs: emergency loans to financial institutions liquidated in 1981, purchase of commercial banks' bad loans with repurchase commitment, and rescheduling of bank debtors. Losses from exchange rate insurance programs were incurred by the Central Bank of Chile due to three sources: exchange rate subsidies to domestic debtors of dollar-denominated external debt, exchange rate insurance to exporters, and capital losses on foreign liabilities of the financial system due to exchange rate devaluations. In Mexico, QFDs were due to financial subsidies granted by development banks as well as the transfer of bad debts of all levels of government to the federal government, with no additional data on central bank losses.<sup>24</sup>

QFDs can be of massive proportions during years of financial and external crises in countries with weak public financial institutions. QFDs of the central bank amounted to a cumulative 55.0% of GDP during 1982-85 in Argentina and to a 41.1% of GDP during the same period in Chile. Figure 2.3 compares the size of QFDs to CNFPS deficits in Argentina, Chile, and Mexico. In Argentina, QFDs are roughly the same as CNFPS deficits during 1982-1985, the sum of both exceeding on average 25% of GDP per year!<sup>25</sup> In Chile, QFDs exceeded an average 10% of GDP per year during 1982-85, more than doubling CNFPS deficits.

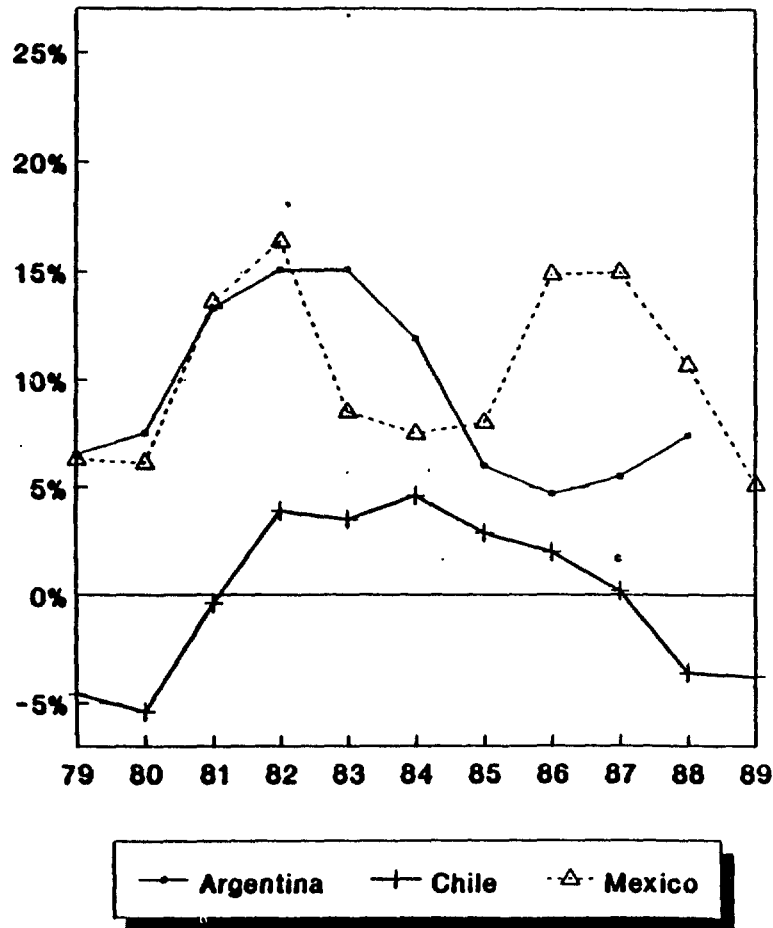
Both countries illustrate how misleading non-financial public sector deficits can be. For instance, while CNFPS deficits are falling during 1984 in Argentina, a strong deterioration in the fiscal stance of the overall public sector, including the central bank, is apparent from figure

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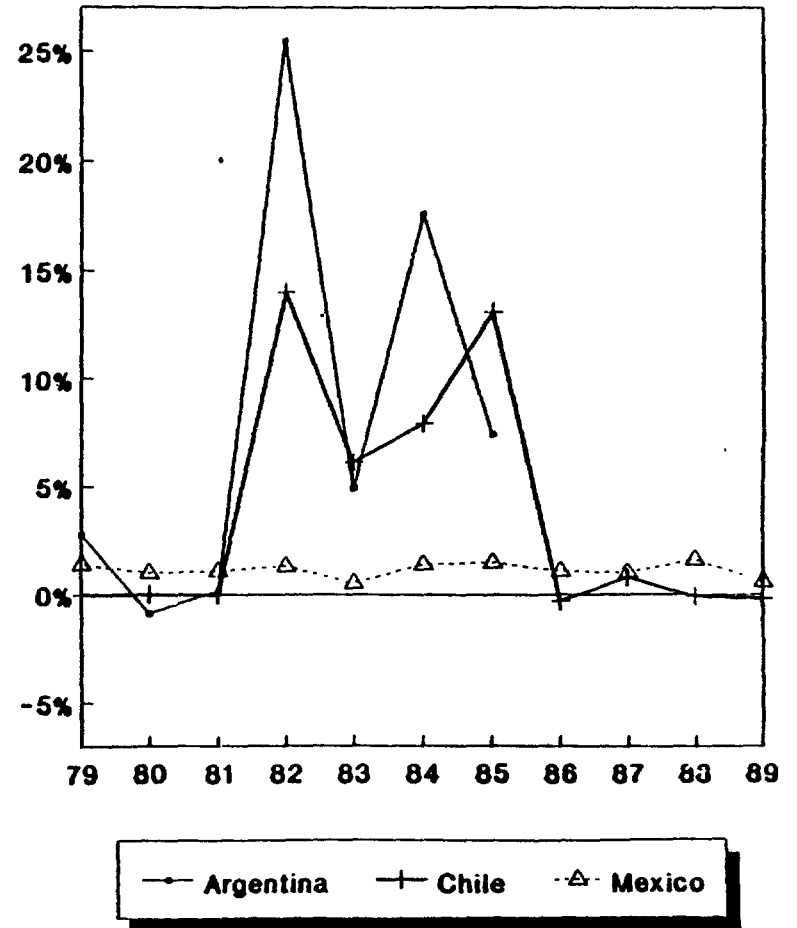
<sup>24</sup> The list of quasi-fiscal operations include both cash and accrued losses, as well as transfers of assets of ex-ante unknown value. Some estimations, like the one for Chile (based on Eyzaguirre and Larranaga, 1990) attempt to reconcile stock and flow measures by carrying out ex-post calculations based on loan recovery.

• <sup>25</sup> No data on QFDs is available after 1985 for Argentina.

Figure 2.3  
 Argentina, Chile, and Mexico: 1979-1989  
 CNFPS Deficits



Quasi-Fiscal Deficits



2.3. In Chile, CNFPS deficits underestimate both the 1981-85 fiscal crisis and subsequent fiscal adjustment.<sup>26</sup> In Mexico, QFDs are a relatively stable share of financial subsidies and bad loans hovering at around 1% of GDP.

#### F. Sustainability of Public Sector Deficits

After focusing on the determinants of above-the-line deficits in the preceding sub-sections, we now look at below-the-line financing constraints of the deficits. Our main question is: given reasonable assumptions about macroeconomic variables and the behavior of public debt holders, are current deficit levels in the sample countries sustainable? Following the initial work by Buiters (1983, 1985, 1987) and van Wijnbergen (1989), and country applications such as those by van Wijnbergen, Anand and Rocha (1988) to Turkey, Buiters and Patel (1990) to India, and De Melo (1990) to Morocco, we define sustainable deficit levels as those consistent with stable public sector debt to output ratios.<sup>27</sup> Appendix IV presents an expression for the primary public sector surplus, on which the sustainable surplus (or deficit) calculations are based.

Figure 2.4 compares sustainable and actual primary surplus levels for five relevant fiscal experiences during the 1980s. In two cases (Chile and Zimbabwe), upper and lower bounds, consistent with possible deviations of the relevant macroeconomic variables<sup>28</sup> from base-case levels, are added to the mid-point estimates.

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<sup>26</sup>In fact, QFDs in Chile start to reverse their sign in 1986, when small profits are made from the commercial banks repurchases of bad loans sold to the Central Bank during the financial crisis. Hence QFDs were limited in Chile to the 1982-85 crisis period.

<sup>27</sup>Which could be either current debt ratios or those deemed to be consistent with stable creditor portfolios. This is related to the concept of solvency (Buiters (1987)).

<sup>28</sup>They are the relevant variables determining the primary deficit (see appendix IV, equation (2)): the rates of income growth, inflation, domestic and foreign real interest, and real exchange rate devaluation.



Figure 2.4

## ACTUAL AND SUSTAINABLE PUBLIC SECTOR PRIMARY SURPLUSES

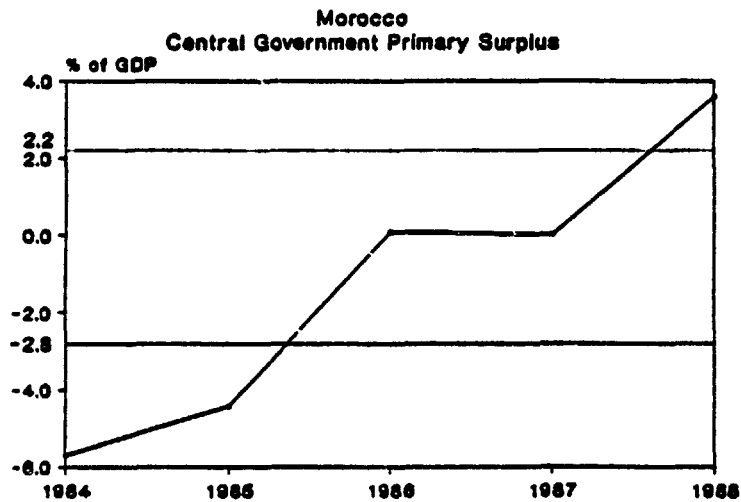
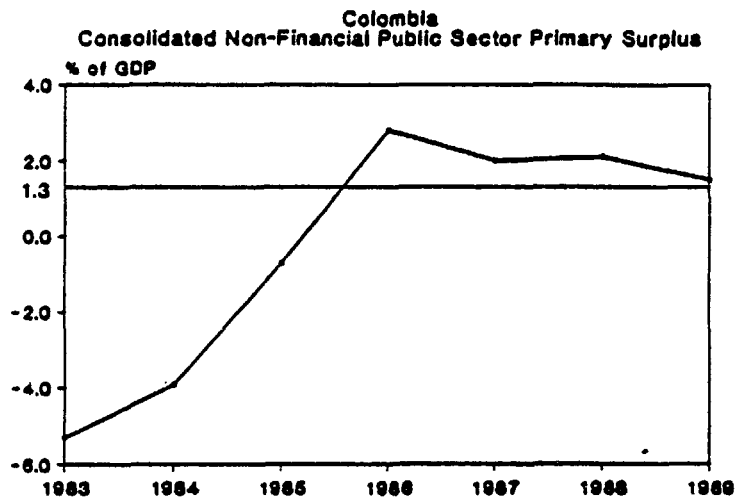
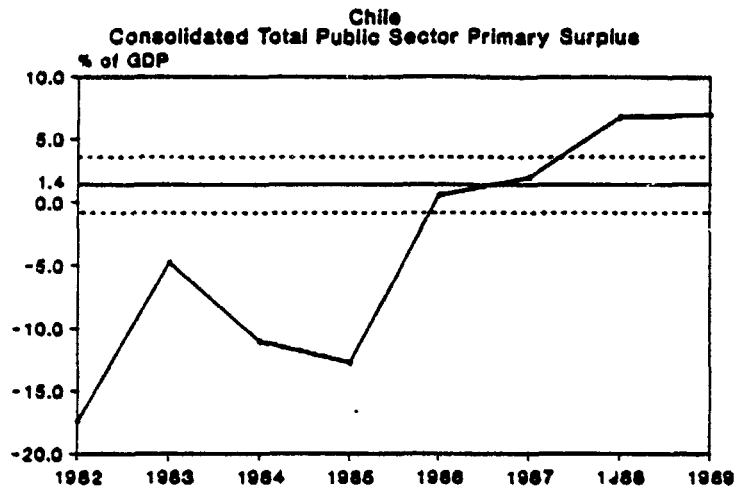
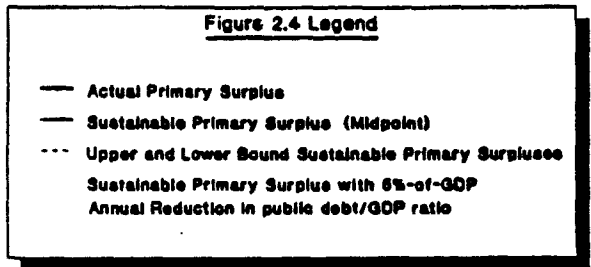
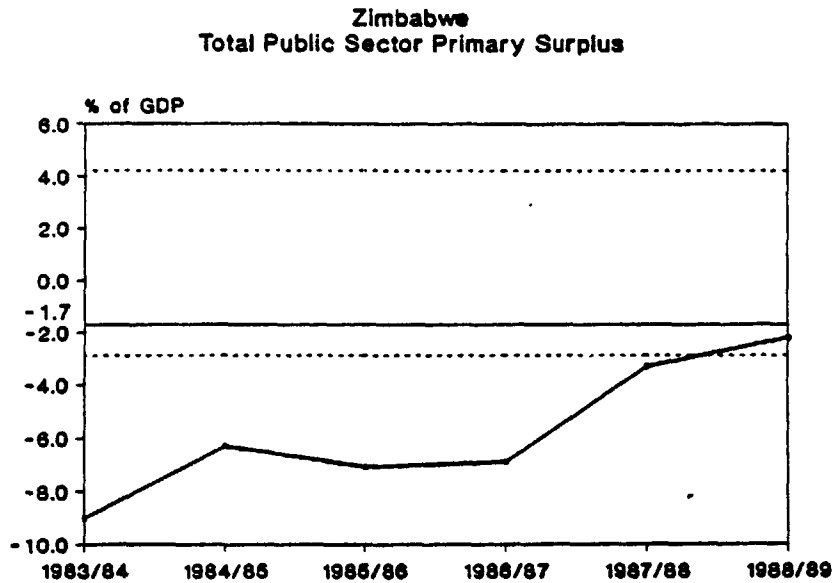
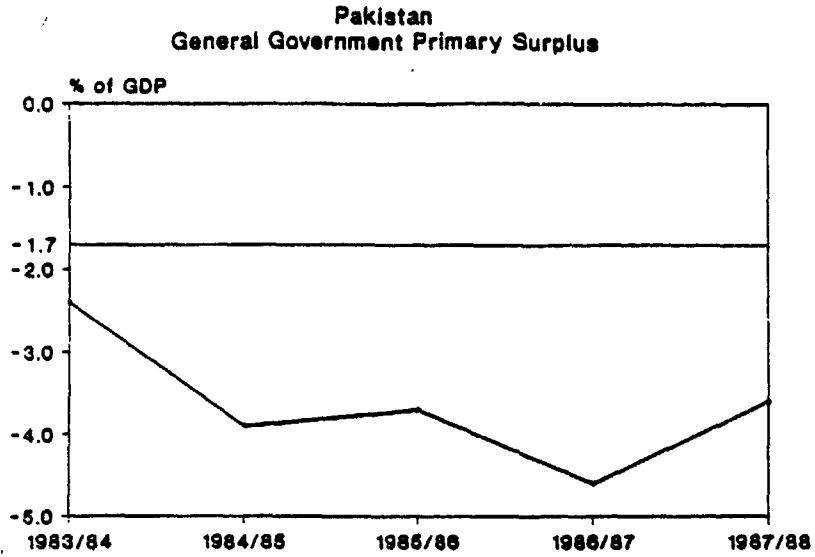


Figure 2.4  
(Continued)



Sustainable primary surplus levels diverge widely, not only due to different levels of public liability stocks and macroeconomic variables in each country, but also because the calculations were made for different public sector coverage. They range from 1.4% of GDP for the total public sector in Chile to -2.8% of GDP (a sustainable primary deficit) in Morocco. In the latter case<sup>29</sup>, if current public debt levels are reduced by 25 pp. of GDP during 5 initial years, Morocco would have to generate a primary surplus of 2.2% of GDP during the transitory phase of debt amortization.

Chile's massive public sector adjustment during the 1980s (comprising both the non-financial deficit and the central bank's quasi-fiscal losses) pushed its primary surpluses in 1988-89 well beyond the upper bound of sustainable levels. Colombia reached sustainable primary surplus levels in 1987-89 after strengthening significantly its fiscal stance. Morocco also pursued strong fiscal adjustment policies, resulting in a 1988 primary surplus level which is beyond what is needed for declining public debt to output shares, although subsequently its fiscal stance deteriorated somewhat. Pakistan's fiscal deterioration raised its primary deficits beyond the 1.7% of GDP level consistent with stable debt to output ratios. Finally, Zimbabwe's modest fiscal adjustment in 1987-89 reduced its primary deficit to within the broad range of values consistent with sustainable levels, but still is distant from an upper-bound level of sustainable primary surplus consistent with an adverse macroeconomic scenario.

Although these calculations are based on simple assumptions, they provide useful benchmarks for evaluating fiscal stance from a longer-run perspective. The next section focuses on the macroeconomic implications of short-term fiscal adjustment, relaxing the assumption of exogenous inflation and interest rates embedded in the previous exercises.

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<sup>29</sup> The Morocco results were taken from de Melo (1990), while the other four country calculations are those of the case studies.

### III. DEFICITS, INFLATION, AND REAL INTEREST RATES

#### A. Fiscal deficits and inflation: evidence from the case studies

Any notion that fiscal deficits and inflation display a simple relationship conspicuously fails -- as was noted in table 1.1, the simple correlation coefficient is only .16. There are two reasons why the relationship fails. One is that countries make different choices on printing money ("seignorage") to finance the deficit, partly because they differ in the extent to which other means of finance are available.<sup>30</sup> The case studies identified a number of nonmonetary sources of finance in the low-inflation, high-deficit countries. For example, Zimbabwe has access to a deep pool of domestic saving, some of it involuntary because of import rationing. Morocco also financed the deficit with cheap domestic debt finance. Pakistan had access to extensive concessional external finance. Côte d'Ivoire is a special case because the adherence to the Franc Zone effectively eliminates printing money as a means of financing. However, in all of these cases, the studies suggest that deficits cannot continue at past levels without sooner or later spilling over into inflation, as cheap sources of finance are being exhausted or exchange rate regimes prove unsustainable.

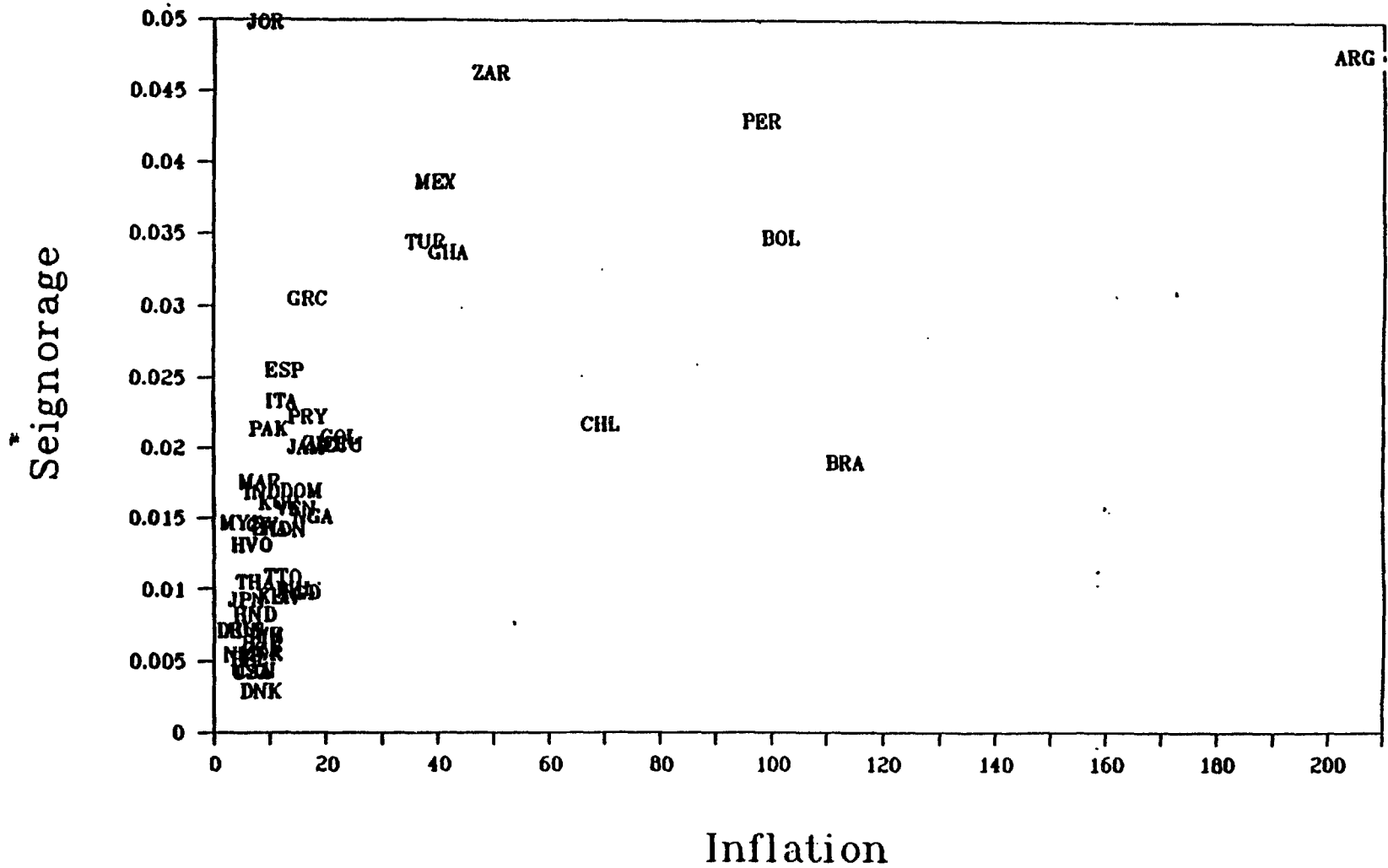
The second reason why the deficit inflation relationship fails is that money creation and inflation are nonlinearly related. Figure 3.1 shows a scatter of inflation and seignorage revenue. The scatter suggests a conventional "Laffer curve" relationship between the inflation rate and seignorage revenue, with revenue falling off at some point because of the elastic response of money demand. Econometric estimation of a quadratic equation statistically confirms the "Laffer

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<sup>30</sup>A similar point is made in Fischer and Easterly (1990), which also makes the point that the growth rate affects whether deficits are inflationary.

Figure 3.1

# INFLATION VS. SEIGNORAGE



curve.<sup>31</sup> The exact maximum of the curve is sensitive to the inclusion of the extreme points -- with Argentina, the maximum is at 160% inflation, while without Argentina, it is only at 68%.

These cross-section results differ drastically from calculations of revenue-maximizing inflation from individual time-series results for the case studies.<sup>32</sup> A regularity is that high-inflation countries allegedly have very high seignorage-maximizing inflation rates -- in Argentina it is 966%, in Chile 792%, and in Ghana 125% -- moderate inflation countries find more moderate maximizing rates -- Colombia's is 80% -- and low inflation countries have low maximizing inflation rates -- Thailand's is only 4%! One hypothesis to explain this is misspecification of money demand as having a constant semi-elasticity with respect to inflation (the Cagan function), when in fact the semi-elasticity falls in response to inflation.

Appendix I shows how a plausible theoretical model, in which interest-bearing liquid assets can be substituted for money in transactions, implies a falling semi-elasticity of money demand with respect to inflation.<sup>33</sup> If the elasticity of substitution between interest-bearing assets and money in transactions is greater than one, then a "Laffer curve" exists with a limit on maximum seignorage.<sup>34</sup> If this is the "true" money demand, then the seignorage-maximizing inflation rate will be overestimated in high inflation countries when a constant semi-elasticity of money demand is assumed -- because the low semi-elasticity of money demand in high inflation countries is taken

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<sup>31</sup>We estimated the following cross-section relationship (t-statistics in parentheses):

$$\frac{S}{Y} = .010 + .043\pi - .01303\pi^2$$

(4.9)      (4.1)      (2.31)

Where  $S/Y$  is average seignorage revenue to GDP 1970-89, and  $\pi$  is average inflation 1970-89. There were 49 observations and the  $R^2$  was .44. The quadratic term is still significant even if Argentina is excluded.

<sup>32</sup>Barro (1990) also suggests that the maximum of the Laffer curve is at inflation rates around 100%.

<sup>33</sup>Dornbusch, Sturzenegger, and Wolf (1990) describe the progressive substitution of interest-bearing assets for money in high-inflation episodes.

<sup>34</sup>Edwards and Tabellini (1990) present suggestive evidence for seignorage Laffer curves in a number of developing countries.

as inevitable rather than seen as a consequence of the high inflation. Similarly, the seignorage-maximizing inflation rate will be underestimated in low inflation countries if the high semi-elasticity observed there is treated as fixed, instead of recognized as falling as inflation rises. The cross-section result of seignorage maximizing inflation being between 68 and 160% is closer to the truth than the case study results.

The case studies all find rather unfavorable tradeoffs between inflation and seignorage revenue. The amount of additional inflation required to achieve another percentage point of GDP in long-run seignorage revenue is 15 percentage points in Colombia, 20 in Ghana, between 7.5 and 26 in Morocco, 50 in Chile, and 97 percentage points in Argentina -- the tradeoff worsens as the average inflation rate rises. Given the unfavorable tradeoff and the widespread consensus on the undesirability of inflation, it is hard to believe that revenue motivations alone explain the persistence of inflation in the high inflation countries.<sup>35</sup>

#### **B. Steady-state seignorage versus one-shot seignorage episodes**

Given the attention devoted to seignorage in the literature, it is easy to forget how small it is as a source of revenue. Table 3.1 shows the average seignorage for a sample of developed and developing countries for which the data is available. Seignorage is calculated as the ratio to real GDP of the yearly sum of deflated monthly changes in the money base. The generally small amount of seignorage for the ten case studies is typical of the overall pattern of seignorage among all countries. The maximum amount of average seignorage revenue over an extended time is less than 5 percent of GDP. Seignorage is also mainly a phenomenon of developing countries -- only

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<sup>35</sup>Similar conclusions are reached by Blejer and Liviatan (1987) and Kiguel and Liviatan (1988). A large literature on optimal seignorage (e.g. Mankiw (1987)) has found little support in developing countries (Edwards and Tabellini (1990)).

Spain, Greece, and Italy had seignorage above 1 percent of GDP among industrial countries, and the average seignorage is more than twice as high in developing countries.<sup>36</sup>

Seignorage revenue is of the same order of magnitude as revenue from individual excise taxes. Table 3.1 shows revenue from individual product excise taxes and from seignorage for 35 countries in which data on both are available in 1985.<sup>37</sup> Why then are macroeconomists so preoccupied with taxes on money as compared to taxes on beer, jute, and cigarettes?

Perhaps one reason is that seignorage can be a large source of temporary revenue during times of crisis. The time-series averages conceal tremendous year-to-year fluctuations in seignorage. Figure 3.2 shows a frequency distribution of the individual yearly observations for the same sample of countries as in Table 3.1. While nearly half the sample is concentrated in observations of less than one percent of GDP, a significant number of observations of high seignorage revenue exist, reaching as high as 13 percent of GDP. The average time series coefficient of variation in the sample is 90 percent.<sup>38</sup>

This suggests that a fruitful approach to seignorage would be the study of episodes of high seignorage to see how they are achieved and what their consequences are. A number of the case studies in this project include such episodes -- bursts of seignorage appear in Ghana in 1978 and 1983, in Chile under Allende in 1971, in Mexico in 1982, and in Argentina in 1975 and 1983.

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<sup>36</sup>Similar magnitudes were found in the study of Fischer (1982).

<sup>37</sup>The product chosen in each country is the largest single source of excise tax revenue in the Government Finance Statistics.

<sup>38</sup>Coefficient of variation is calculated over 1970-89 for a reduced sample of 26 countries with data over that period (in order to standardize the number of observations, which affects the variance). Coefficient of variation = standard deviation/mean.



**Table 3.1**  
**Average Seignorage**

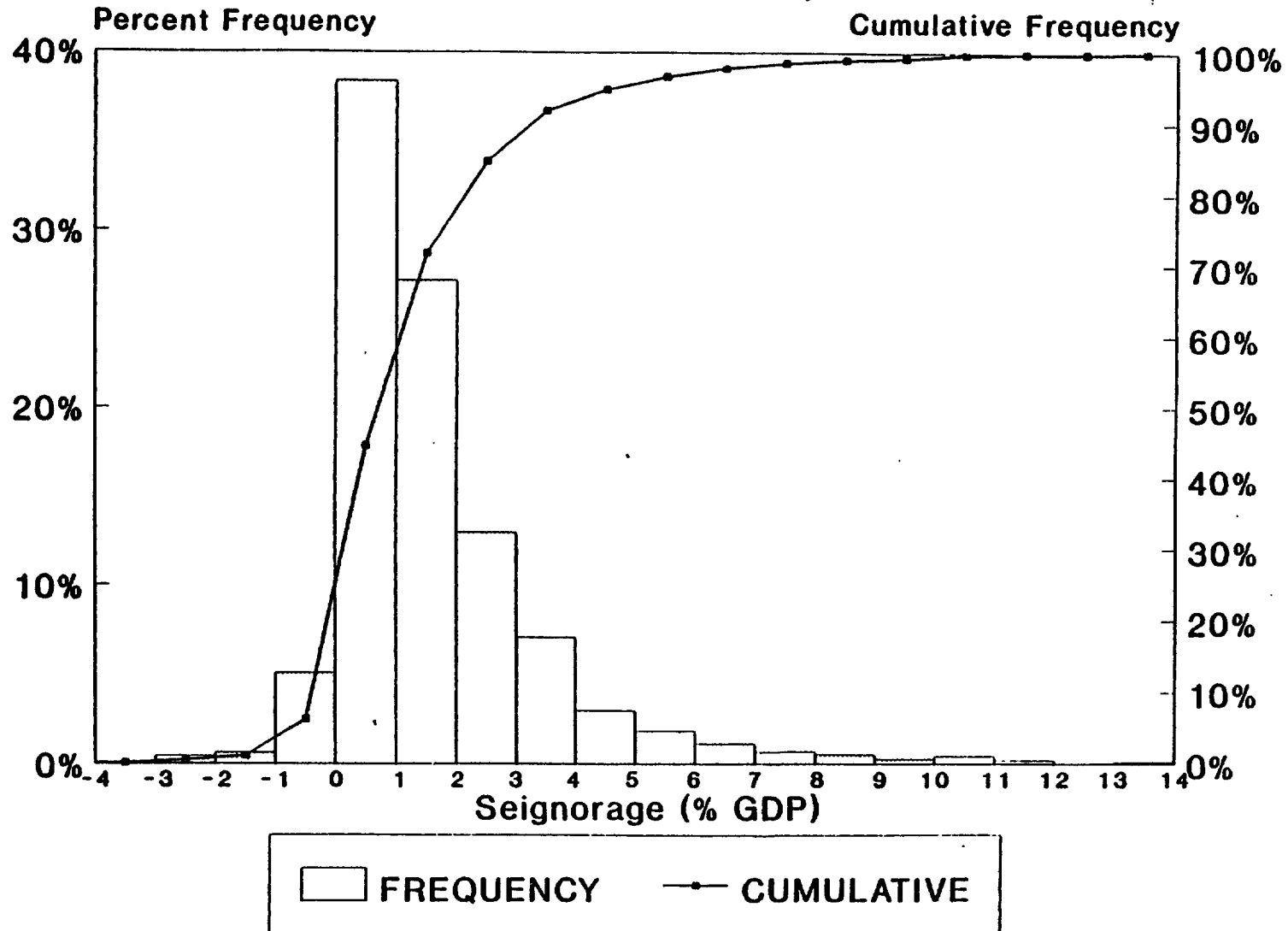
Country	Average Seignorage (% GDP)	Largest Excise Tax, 1985	Excise Tax Product
<b>OECD</b>			
Austria	0.9	1.0	Wine
Belgium	0.5	1.1	Mineral Oils
Canada	0.4	0.7	Gasoline
Denmark	0.4	1.1	Cigarettes
Finland	0.6	1.3	Fuel
France	0.6	0.4	Insurance
Germany, Federal Republic	0.7	1.3	Mineral Oil
Greece	2.8	2.2	Fuel
Italy	2.2	1.7	Mineral Oil
Japan	1.0	0.6	Liquor
Netherlands	0.6	0.8	Petroleum
Norway	0.6	1.5	Vehicle Transfer
Spain	2.3	1.3	Petroleum
Sweden	0.6	1.0	Petrol Fuel Oil
United States	0.4	0.3	Motor Vehicle Fuels
Average OECD	1.0	1.1	
<b>Developing Countries</b>			
Argentina	4.2	2.5	Fuel
Bangladesh	1.0		
Bolivia	2.9		
Brazil	2.3	0.2	Electricity
Burkina Faso	1.1	0.7	Beverages
Chile	3.7		
Colombia	2.1	0.6	Gasoline
Cote d'Ivoire	1.3	1.1	Petroleum
Dominican Republic	1.6	1.8	Petroleum
Ecuador	1.8	0.3	Beer
Ghana	3.1		
Honduras	0.8	0.5	Beer
India	1.5	0.7	Textiles and Jute
Indonesia	1.4	0.9	Tobacco
Jamaica	1.9		
Jordan	5.0		
Kenya	1.1		
Korea	1.6	0.8	Liquor
Malawi	2.0		
Malaysia	1.3	0.7	Petrol
Mexico	3.1	1.4	Gasoline
Morocco	1.7	1.2	Tobacco
Nigeria	1.1		
Pakistan	2.0		
Paraguay	1.9	0.9	Fuel
Peru	3.6	4.1	Gasoline
Philippines	1.0		
Sri Lanka	1.3		
Thailand	1.0	1.5	Petroleum Products
Trinidad & Tobago	0.9		
Turkey	3.4		
Venezuela	1.5	0.5	Liquor
Zaire	4.4	0.3	Tobacco
Zambia	2.0	1.9	Petroleum
Zimbabwe	1.1		
Average Developing	2.1	1.1	

**NOTES:** Seignorage is defined as the nominal change in the money base each month divided by the CPI for that month. The typical method of calculating the ratio of the nominal change in the money base over the entire year to the annual nominal GDP can seriously overstate seignorage in high inflation countries. Interest paid on reserves should also be subtracted to get a true estimate of seignorage, but the data is generally lacking. Few developing countries pay interest on reserves. Where interest is paid, it appears that it is quantitatively unimportant. An important exception is Argentina, where the combination of high inflation and interest paid on reserves makes this adjustment very important. We use the Argentine seignorage series constructed by Rodriguez for this project. Periods covered are generally 1965-89 but vary depending on data availability (periods available on request).

**SOURCES:** Excise taxes: Government Finance Statistics, IMF.

Seignorage: Money Base Statistics, IMF, with the exception of Argentina and Colombia from Case Studies of this Project.

Figure 3.2  
**FREQUENCY DISTRIBUTION OF ANNUAL  
 SEIGNORAGE OBSERVATIONS, 51 COUNTRIES**



A different type of one-shot seignorage took place in Ghana. The government captured 2.5 percent of GDP through a currency conversion and partial expropriation of deposits in 1979. In 1982, the government again expropriated private wealth through the demonetization of the largest denomination note (an example recently followed by another crisis-ridden economy, the Soviet Union). These episodes brought a short-term gain to public finances at considerable long-run cost -- the Ghana case study estimates that seignorage was permanently lowered by 1 to 2 percent of GDP because of the fall in money demand after the 1979 currency expropriation.

Table 3.2 looks at characteristics of episodes of high (conventional) seignorage in the broader sample. We identified 18 yearly observations (out of 1143) in which seignorage was more than 4 percentage points above the average seignorage to GDP ratio in that country.<sup>39</sup> We see that "spikes" of high seignorage are indeed short-lived. All of the episodes lasted only one year, except for the Bolivian hyperinflation of 1982-84. The episodes are associated with developing countries -- of OECD countries, only Denmark indulged in a seignorage spike. One might have thought that these bursts of seignorage revenue would be associated with accelerations of inflation. Surprisingly, this hypothesis is not confirmed by the data. Of the 16 episodes (treating Bolivia 1982-84 as a single episode), only 9 of them showed rising inflation -- roughly the same proportion of rising inflation that exists in the broader sample. One might think that inflation shows a lagged response, but there is no evidence for this, as the following year's inflation also shows no tendency to accelerate. Of course, some of the episodes of rising inflation are quite spectacular. Bolivia in 1982-84 and Peru in 1988 experienced classic hyperinflations, in which real

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<sup>39</sup>There are actually 21 such observations, but 3 of them were found to involve changes in measurement of money base, and were discarded.

Table 3.2  
**EPISODES OF HIGH SEIGNORAGE "SPIKES"**  
**(MORE THAN 4 PERCENTAGE POINTS OF GDP ABOVE AVERAGE)**

Year of Spike	SEIGNORAGE		COMPONENTS OF SPIKE (% of GDP) <sup>40</sup>		GROWTH		INFLATION (December over December)			
	Seignorage Spike (%g points of GDP above average)	Average Seignorage	Change in Real Money Base + Above Avg. Money Base	Above Average Inflation Tax	Growth Year of Spike	Average Growth Rate	Inflation Year of Spike	Change in Inflation Over Previous Yr	Average Inflation Rate	
Argentina	1975	9.0	4.2	-4.0	6.5	-0.5	2.2	336.1	296.2	105.4
Bolivia	1982	7.5	2.9	-0.8	7.9	-4.4	2.7	296.6	271.4	54.5
	1983	5.3		-3.3	8.6	-6.5		327.8	31.3	
	1984	7.0		-3.9	20.8	1.0		2176.2	1848.4	
Chile	1971	6.7	3.8	10.9	-3.0	9.1	1.5	19.4	-15.6	91.3
Denmark	1985	4.2	0.4	4.3	-0.2	4.3	2.4	3.6	-2.0	7.7
Dominic Rep.	1986	4.9	1.6	5.3	-0.6	3.0	5.7	6.5	-21.8	13.1
	1988	5.7		2.2	3.0	1.3		57.5	32.5	
Ghana	1978	4.7	3.1	-0.6	3.8	9.8	1.7	108.5	-2.4	38.6
Jamaica	1984	5.4	1.9	4.7	1.0	-1.4	-0.2	31.2	14.5	17.0
Mexico	1982	7.9	3.1	1.4	3.7	-0.6	5.0	98.9	70.2	29.8
Peru	1985	6.7	3.6	2.7	2.5	2.2	2.2	158.3	46.8	82.1
	1988	6.0		-7.3	14.8	-8.0		1722.1	1607.5	
Trinidad & Tobago	1982	4.2	0.9	4.3	-0.0	-4.7	1.6	10.8	-0.8	10.5
Zaire	1976	4.1	4.4	0.5	2.2	-5.5	3.1	78.8	42.1	47.1
	1982	4.9		4.4	-0.6	-0.4		41.0	-12.0	
	1987	5.7		-0.1	4.1	0.6		106.5	68.2	
Zambia	1986	6.0	2.0	5.4	1.1	0.2	1.8	34.6	-23.7	18.9
Averages for "spike" episodes or countries		8.8	2.7	1.5	4.2	0.0	2.5	311.9	236.2	43.0
Average for non-"spike" (39) countries in sample			1.4				4.5			11.2

<sup>40</sup>Components will not sum to the "spike" because of the covariance term.

money demand fell, but inflation soared into 4 digits. Large inflation accelerations also took place in Argentina in 1975, Mexico in 1982, and Zaire in 1987.

A decomposition of the seignorage spikes into components associated with the real change in the money base and the inflation tax helps understand the cases in which inflation did not accelerate.<sup>41</sup> Table 3.2 shows that the real change in the money base explains most or all of the above average seignorage in 7 out of the 16 cases. In 6 of these cases, inflation declined. The failure of a close association between acceleration of inflation and bursts of seignorage is because seignorage was driven mainly by real money balances in nearly half of the cases. An understanding of this phenomenon would require more careful examination of the individual cases, but apparently there was scope for temporary increases in seignorage revenues through actions like raising reserve requirements or through exploiting exogenous increases in demand for money. Price controls were used in Chile in 1971 to generate the "real" change in money demand, but inflation exploded the following year.<sup>42</sup>

Of course, the classic inflationary method worked as well as a method to generate bursts of seignorage. One-time inflation taxes over 8 percentage points of GDP above average were achieved in the hyperinflations in Bolivia and Peru, while less spectacular increases were registered in Ghana, Argentina, and Zaire. The money base fell in all of these cases, limiting the potential for further inflation taxes.

The growth rates during the seignorage spikes were not such as to recommend this method of raising revenue. In 12 out of the 16 episodes, growth during the episode was below the average growth rate for that country -- 8 cases actually registered negative output growth (gross not per capita)! We must be agnostic about whether growth was poor because of the

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<sup>41</sup>Appendix II explains how the decomposition is done.

<sup>42</sup>This is not a general pattern however -- of the 9 cases where seignorage is explained largely by the change in the real money base, 4 had rising inflation the following year, 2 had inflation essentially unchanged, and 3 had falling inflation the next year. Dornbusch et al. (1990) note the rise in real money balances in the early stages of hyperinflation. Our story is a different one: exogenous or policy-induced rises in real money balances allow large temporary seignorage without hyperinflation.

unusually high seignorage, or whether countries resorted to seignorage because economic recession dried up other revenue sources. But it is interesting that the countries with "spikes" have a lower average growth than other countries in the sample, which may reflect that they also tend to have higher average seignorage and inflation.

In conclusion, seignorage may be more important as a source of temporary increases in revenue than as a steady state phenomenon. But the link between these temporary seignorage surges and inflation is weak. A surprising number of episodes of high seignorage are due to increases in real money balances instead of accelerated inflation, illustrating the scope for temporary revenue increases through various fiat actions by the monetary authorities besides printing money. But the poor performance of countries that resort to such measures is not encouraging to the case for bursts of seignorage as a useful instrument of public finance.

### C. Interest rates, financial repression, and fiscal deficits: evidence from the case studies

There are two ways in which fiscal deficits can affect real interest rates. If interest rates are not controlled, then a high fiscal deficit financed through domestic borrowing would be expected to result in high real interest rates. Alternatively, interest rates could be controlled, and the implicit tax on financial assets be a hidden source of revenue for the government.

Figure 3.3 shows real interest rates in the case study countries in the 1980s. It is apparent that controls on interest rates were quite significant in Ghana, Mexico, and Zimbabwe, since real interest rates were strongly negative in many years. Table 2 in the Statistical Appendix presents this and other studies' estimates of "revenue" from financial repression that resulted from such controls. Although estimates differ widely because of different methodologies, there is a consistent finding that Ghana, Mexico, and Zimbabwe reaped significant amounts of revenue from controls on domestic interest rates, particularly in the aftermath of the international credit crunch

Figure 3.3a  
**REAL INTEREST RATES, 1978-88**

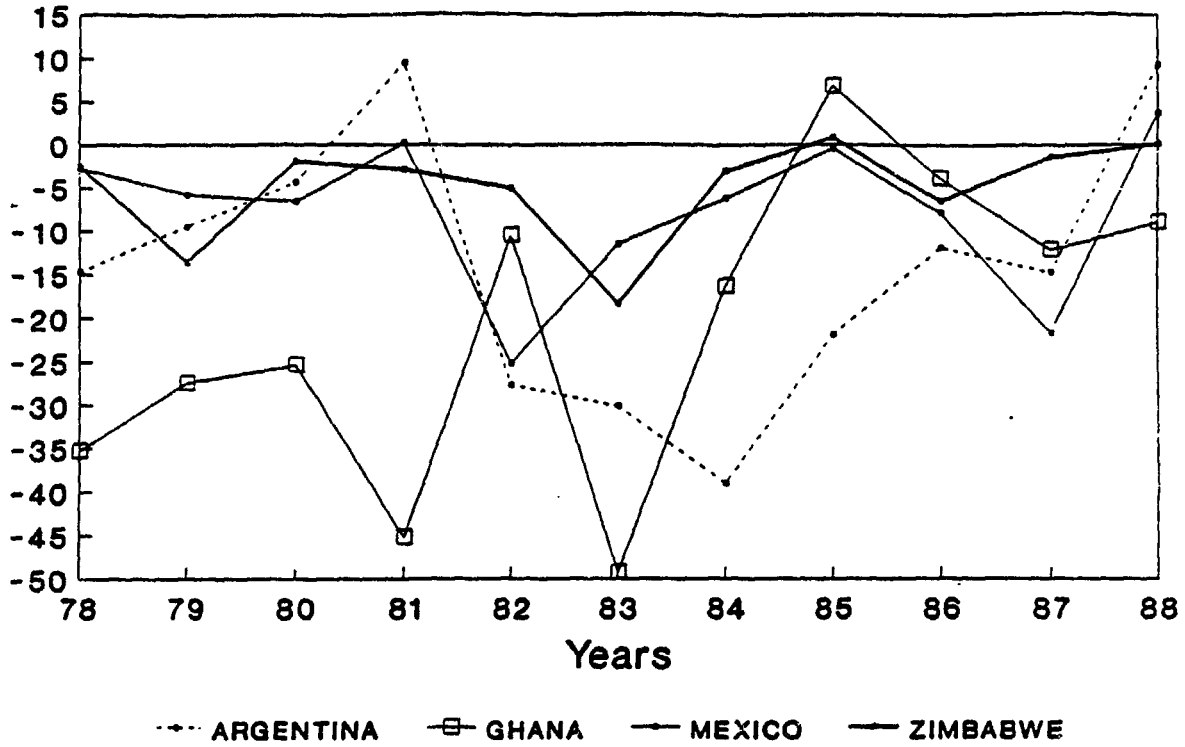
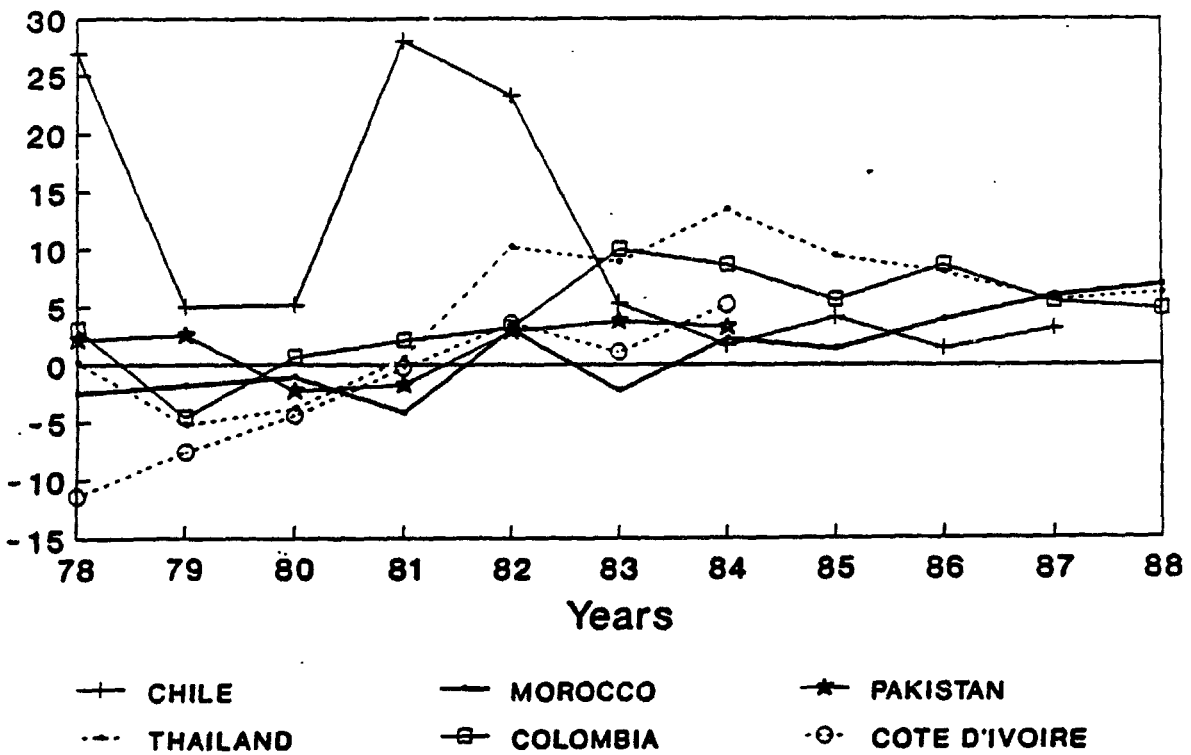


Figure 3.3b  
**REAL INTEREST RATES, 1978-88**



in 1982.<sup>43</sup> The control of the nominal interest rate under high inflation was a quick way to obtain "revenue" to replace the lost external financing after 1982.

However, the control of interest rates was a costly strategy for private credit and investment.<sup>44</sup> Figure 3.4 shows the evolution of domestic private credit in the case studies. Mexico experienced a serious decline in the ratio of private credit to GDP from already low levels in the aftermath of the financial repression. Ghana's private credit ratio was at an abysmal level, reflecting years of financial repression. Zimbabwe is different from the other cases of financial repression in that private credit kept rising through 1986. The case study argues that import and capital controls were unusually effective both at increasing saving through suppressing demand and at retaining assets in the country.

By contrast, countries that eschewed financial repression, like Chile and Thailand, show a buoyant increase in private credit. This may help to explain some of the superior investment and growth performance in those two countries in the late 1980s.<sup>45</sup>

Argentina's massive decline in the ratio of private credit to GDP reflects a more unusual kind of financial repression after 1985. The case study shows how the government, far from controlling interest rates, oscillated between paying increasing real interest rates and "melting down" domestic liabilities through surprise devaluations and other methods (including a forced conversion of time deposits into government bonds of questionable value in 1990). This tactic was necessary because the high real interest rates themselves fueled the accumulation of more debt, in a standard example of highly unstable debt dynamics. Although the government managed to keep fooling the public into buying domestic debt, increasingly high real interest rates

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<sup>43</sup>Estimates by Giovannini and de Melo (1990) find much higher revenue from financial repression for Morocco and Zimbabwe than do the other sources, because they calculate the tax rate as the ex-post difference between domestic and foreign interest rates, including devaluation. Morocco and Zimbabwe both were experiencing steady real devaluation in the early 80's, tending to raise the estimate of the tax rate using this method.

<sup>44</sup>Similar conclusions are reached by Chamley and Honohan (1990), Easterly (1989), and Giovannini and de Melo (1990). Dornbusch and Reynolds (1989) argue that financial repression is costly only under very high inflation.

<sup>45</sup>Easterly (1991) presents evidence from cross-section regressions that financial repression has a negative effect on long-run growth.



Figure 3.4a  
PRIVATE CREDIT, RATIO TO GDP  
Financial Repression Cases

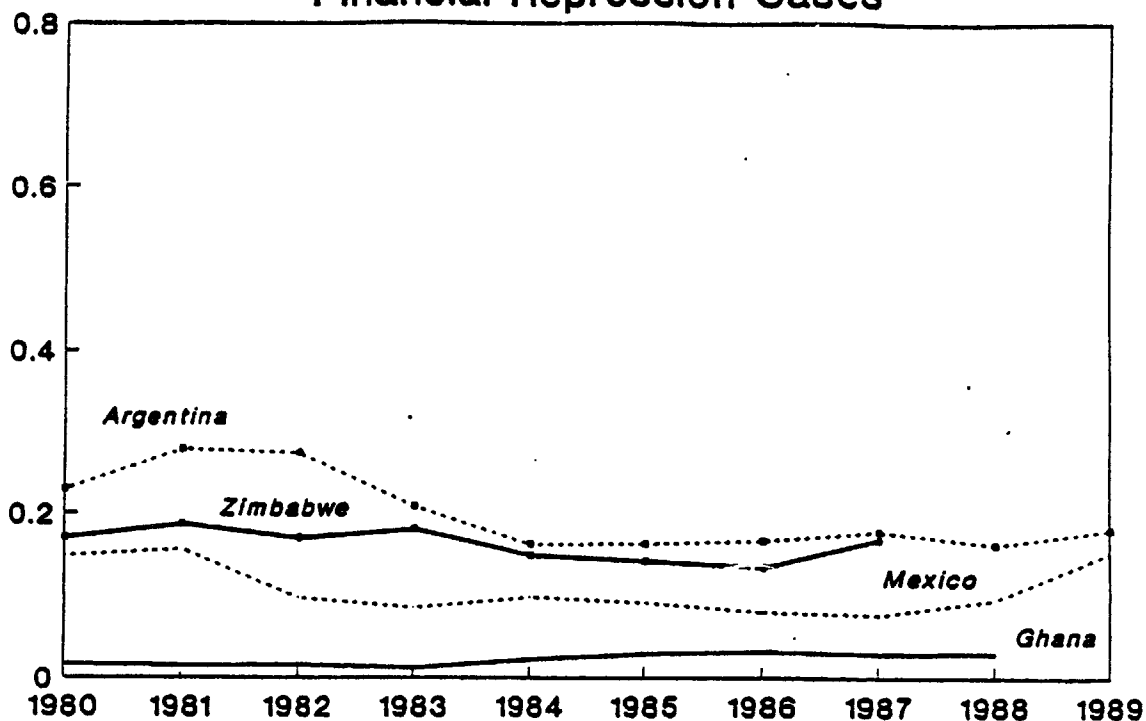
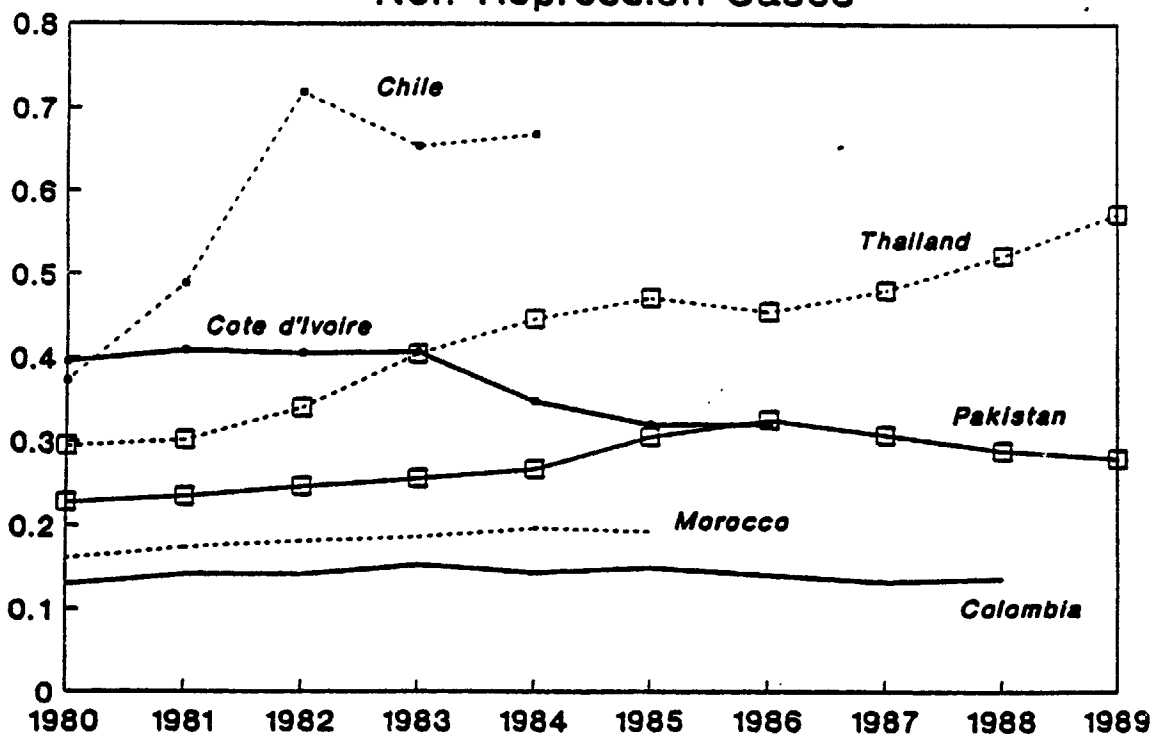


Figure 3.4b  
PRIVATE CREDIT, RATIO TO GDP  
Non-Repression Cases



were required to do so. The Argentina case study gives an entertaining chronicle of the rise in nominal interest rates at the outset of successive economic plans, each of which opened with a discrete devaluation:

Plan	Date	Devaluation	Nominal Interest rate (monthly)
Austral	June 1985	40%	7%
Primavera	August 1988	24%	10%
Bunge Born I	July 1989	200%	17%
Bunge Born II	December 1989	54%	60%
Erman Plan	January 1990	220%	100%

The case studies also considered the effect of deficits on uncontrolled interest rates in econometric simulations. The Chile case study shows that a doubling of the deficit financed by domestic debt (implying a rise of 2% in the domestic debt stock) increases real interest rates by only .1 percentage points. In Colombia, an increase in debt financing of 1 percent of GDP raises real interest rates by 3 to 5 percentage points. An increase of government domestic debt in Pakistan of about 3 percent leads to a real interest rate increase of about half a percentage point. The doubling of the domestic real interest rate from 4 to 8 percent in the 1980's in Pakistan was associated with a rise from 9 to 21 percent in the ratio of public domestic debt to GDP. In Morocco, a simulation shows a domestically financed increase in the budget deficit of 2 percentage points of GDP to increase the real interest rate by only .4 percentage points. In Zimbabwe (after decontrol of interest rates), a 10% debt-financed increase in government spending is associated with an increase of only 1.5 pp in the real interest rate. We conclude that the short-run effect of government fiscal expansion on the uncontrolled real interest rate is generally modest.<sup>46</sup>

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<sup>46</sup>For industrial countries, Barro and Sala-i-Martin (1990) find that fiscal variables have no significant effects on the real interest rate.

#### IV. PRIVATE SECTOR RESPONSE TO PUBLIC DEFICITS

How do private consumers in developing countries react to public deficits (or to public saving), to taxes and public transfers, or to interest rates boosted by domestically-financed deficits? In which direction and magnitude is private investment (and hence growth) affected by public investment programs, corporate taxes, and interest rates?

##### A. Private Consumption and Fiscal Policies

Fiscal policies affect private consumption through various channels:

1. Private Disposable Income: a current tax hike affects private consumption through disposable income, according to the standard Keynesian hypothesis (KH). If it is transitory, the effect will be minimal, according to the permanent income hypothesis (PIH), which states that only permanent tax changes affect forward-looking consumer behavior. Both are wrong according to the Ricardian equivalence hypothesis (REH), which states that under certain restrictive conditions only government spending matters, independently whether it is financed by taxes, debt or money.<sup>47</sup>

2. Public Saving (or Deficit): according to the REH, permanent public saving affects consumption with the same coefficient as permanent private disposable income (net of taxes). Permanent public saving (i.e. the permanent public deficit excluding public investment) should be the relevant variable, if public investment adds to productive wealth. However, current public saving (which sometimes is used as a proxy for permanent saving) could have strong positive effects on consumption for a reason unrelated to the REH: under domestic financial repression with compulsory credit flows financing government deficits, credit to the private sector and hence private consumption (and investment), are the residual variables. This effect, which will be hard to distinguish from the REH, will be termed the "direct crowding-out hypothesis" (DCH).

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<sup>47</sup>The original statement is due to Barro (1974). Surveys of empirical evidence (mostly negative) can be found in Bernheim (1987) and Haque and Montiel (1987).

3. **Public Consumption:** abstracting from the REH, aggregate public consumption, and in particular public spending on certain categories such as education, health and in-kind transfers, could crowd out or in private consumption expenditure, depending on the substitutability or complementarity of the corresponding public spending category with private consumption.

4. **Rates of Return:** the real interest rate determines intertemporal consumption allocation when consumers are not liquidity constrained, although its effect on current consumption levels is theoretically ambiguous due to the offsetting substitution, income, and wealth effects. Even when it is unambiguous, the effect of the real interest rate on consumption is low or zero when borrowing constraints are pervasive. The effect of inflation, the (negative) return on monetary asset holdings, on the level of saving and consumption is also theoretically ambiguous.

Table 4.1 summarizes the effects of the above mentioned fiscal policy-related variables. Most of the case studies identify both current (or transitory) and long-run (or permanent) disposable income levels as important determinants of private consumption, by magnitudes which are often half-way between the extreme KH and PIH.

Does public saving or the deficit affect private consumption directly and separately? In most countries it does not: permanent public saving is not significant in Chile, Mexico, and Pakistan; current public saving or deficits do not contribute to consumption in Colombia, Cote d'Ivoire, Ghana, and Pakistan. In three cases, however, public saving or the deficit have the expected signs and significance levels, consistent with either the REH or DCH. In Argentina and Morocco permanent public surpluses, and in Zimbabwe permanent public saving, raise consumption. However, the magnitudes of the coefficients are much lower than those of long-run or permanent income, implying that taxes, not only government spending, affect consumption. Are these three coefficients a result of at least partially forward-looking consumers treating the public sector's budget constraint as part of their own, as postulated by the REH? Or do they

**TABLE 4.1**  
**SENSITIVITY OF PRIVATE CONSUMPTION TO FISCAL POLICIES**  
 (Qualitative and Quantitative Response Coefficients)

Country	Income		Public Saving		Public Deficit		Public Consumption		Real Interest	Inflation
	Current	Permanent	Current	Permanent	Current	Permanent	Consumption	EU/TR	Rate	Rate
1. Argentina, 1915-84, 1961-84	(+)				(-)					
2. Chile, 1960-88	(+) 0.55	(+) 0.37		(0)				(0)	(0)	(0)
3. Colombia, 1971-86	(+)	(+)	(0)						(+)	
4. Cote d'Ivoire, 1972-1987	(+)				(0)					
5. Ghana, 1969/70-1988	(+) 0.67 <sup>1</sup>	(+) 0.32 <sup>1</sup>			(0)				(0)	
6. Mexico, 1981.I-1989.IV	(+)	(0)		(0)				(+)	(-)	(0)
7. Morocco, ?		(+) 0.88 <sup>2</sup>				(-) 0.25 <sup>2</sup>			(0)	(-) -0.23 <sup>2</sup>
8. Pakistan, 1963-87		(+) 1.35 <sup>1</sup>		(0)	(0)		(-) -0.56 <sup>1</sup>			(-) -1.11 <sup>2</sup>
9. Thailand, 1971-87	(+) 0.79 <sup>2</sup>								(+) 0.10 <sup>2</sup>	(-) -0.23 <sup>2</sup>
10. Zimbabwe, 1965-88	(+) 0.63	(+) 0.10		(+) 0.33					(0)	(0)

Table 4.1  
(Cont'd)

Notes:

- (i) Symbols (+), (-) and (0) denote signs of the coefficients of private consumption determinants from the corresponding econometric estimations. The positive and negative signs correspond to statistically significant coefficients, (0) denotes a coefficient not significantly different from zero, and a blank space denotes the exclusion of the corresponding variable from the country study.
- (ii) EH/TR denotes public expenditure on privately appropriated services (education and health) and/or transfers to the private sector.
- (iii) Specifications and estimation techniques vary by countries. The dependent variable (private consumption) enters in levels for Argentina, Ghana, and Pakistan, log levels for Morocco and Thailand, both levels and log levels for Colombia, ratio to national income for Cote d'Ivoire, and ratio to private disposable income for Chile, Mexico, and Zimbabwe.
- (iv) The numerical coefficients without a note are partial derivatives of private consumption rates (to either private disposable or national income) with respect to the rate of the corresponding variable (to either private disposable or national income), unless noted otherwise. When noted otherwise, coefficients are: <sup>1)</sup> marginal propensities; <sup>2)</sup> elasticities; <sup>3)</sup> semi-elasticities.
- (v) The specifications for Morocco, Colombia, and Pakistan (the two latter based on error-correction models) allow to distinguish between short and long-run coefficients; the latter are presented for Morocco and Pakistan in the table.

result from direct-crowding out due to financial repression? Argentina<sup>46</sup> liberalized its domestic financial markets in 1977 (late in the relevant sample period), while Morocco and Zimbabwe had non-liberalized financial markets with institutional arrangements allowing the public sector preferential access to resources of the domestic financial system. Hence we conclude tentatively that DCH dominates REH in those cases.<sup>49</sup>

The real interest rate is not a significant consumption determinant in 5 of the 8 countries which included it as a right-hand variable. Three countries show significant effects of the real interest rate: in Mexico it depresses private consumption (which signals the dominance of

<sup>46</sup> In the case of Argentina, public expenditure and revenue, not the deficit, were entered separately as consumption determinants. However, their coefficients were so similar in magnitude -- with opposite signs -- and significance levels, that the public deficit is a valid summary variable for them. However, the relevant income variable was chosen to be GNP, not private disposable income net of taxes. Hence the introduction of the deficit (or of revenue and expenditure separately) does not cancel taxes included in disposable income, and therefore this specification is not directly consistent with the REH.

<sup>49</sup> The results for Chile, Zimbabwe, Ghana, and Morocco are consistent with those of a recent 13-developing country study (which includes them with exception of Morocco), which estimates the following ranges for the coefficients of current income, estimated permanent income, and estimated permanent public saving, respectively: 0.49-0.79, 0.20-0.28, and 0.42-0.56 (Corbo and Schmidt-Hebbel, 1991, table 3.1).

the substitution effect) while in two countries (Colombia and Thailand) a higher real interest rate raises consumption, i.e., reduces private saving. The non-significant results suggest that either the liquidity, income, and wealth effects tend to cancel each other and/or borrowing constraints preclude consumers from responding to interest rate swings by shifting consumption across time according to their preferences.

Inflation has an unexpected effect in our sample. While inflation has no discernible influence on private consumption in three countries, it has a significantly negative effect in three other countries (Morocco, Pakistan, and Thailand), which are among the low-inflation countries of our sample. Seigniorage (and hence inflation tax) and inflation are correlated in two of these three low-inflation countries,<sup>50</sup> and hence higher inflation causes a drop in real income not reflected in conventional disposable income. Alternatively, higher inflation is correlated with greater macroeconomic instability, inducing higher precautionary saving.

#### **B. Private Investment and Fiscal Policies**

Fiscal policies affect private investment through various channels:

1. **Public Capital:** in Appendix III we present a model in which the relationship between private investment and public capital is theoretically ambiguous. Public capital could be a near-perfect substitute for private capital and drive down the private rate of return. Public capital invested in steel plants is an obvious example. However, governments also invest in activities where the private sector would not invest, like infrastructure, for which it is difficult to charge user fees. The net effect on private investment will be stronger the lower the substitutability of private capital for public infrastructure.

2. **Public Deficit:** as in the case of consumption, domestic financial repression with preferential access of the public sector to domestic resources in order to finance its deficit implies

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<sup>50</sup> In Morocco and Thailand, the inflation rate is positive and significant at a 10% level in an equation for seigniorage. In Pakistan it is not significantly different from zero.

that the latter could crowd out directly private investment. If this is in particular the case of public sector investment projects, it leads to the direct crowding out of private investment by public investment flows.

3. Corporate Taxes and Investment Incentives: the profit tax and investment incentive structure affects after-tax profits and the user cost of capital. In the country studies, corporate tax revenue is entered either as a separate investment determinant or as a tax rate affecting the user cost of capital. Other tax incentives to investment also modify the user cost of capital.

4. Real Interest Rate: without financial repression, domestic deficit financing tends to raise the real interest rate and hence lower investment profitability.

Table 4.2 summarizes the effects of the above mentioned fiscal policy-related variables, leaving the discussion of the role of non policy-related variables to the original case studies. Consistent with the theoretical ambiguity of the relationship between public capital and private investment, the case studies found sharply different results. The Pakistan study found that the ratio of private capital stock to output rises by 2.1 pp with a 1 pp increase in the public capital stock/output ratio. In Zimbabwe, a higher public capital stock raises private investment flows; however, the effect is smaller than in Pakistan. The Chile and Colombia studies found the opposite in some regressions, indicating substitution between public and private capital in production.

Some studies used public investment rather than the public capital stock as a determinant of private investment -- again the results show opposite signs in different countries. The Ghana and Mexico studies found a negative effect of public on private investment (although the Mexico effect was only weakly significant), while the Thailand study found a positive effect of public on private investment. For Argentina, no significant effect was found. Finally, the



**TABLE 4.2**  
**SENSITIVITY OF PRIVATE INVESTMENT TO FISCAL POLICIES**  
 (Qualitative and Quantitative Response Coefficients)

<u>Country</u>	<u>Public Capital</u>		<u>Public</u>			<u>Corporate Tax</u>	<u>Cost of Capital</u>	
	<u>Stock</u>	<u>Flow</u>	<u>Deficit</u>	<u>Consumption</u>	<u>Revenue</u>	<u>Revenue</u>	<u>User Cost</u>	<u>Real Int. Rate</u>
1. Argentina, 1915-84		(0)		(-)	(+)	-		
2. Chile, 1961-1988	(-)/(0)						(0)/(-)	
3. Colombia, 1925-88	(-)						(0)/(-)	
4. Cote d'Ivoire, 1972-87			(-) -0.10					
5. Ghana, 1967-88		(-) -1.10				(+) 3.97		(0)
6. Mexico, 1970-89		(0)/(-) 0/-0.12				(-) -0.40/-0.86	(-) -0.05	
7. Morocco, ?		(+)					(-) -1.10 <sup>u)</sup>	
8. Pakistan, 1972/73-1987/88	(+) 2.09 <sup>u)</sup>						(-) -1.26 <sup>u)</sup>	
9. Thailand, 1971-87		(+) 0.57 <sup>u)</sup>	(-) -1.15 <sup>u)</sup>					
10. Zimbabwe, 1965-88	(+) 0.20						(-) -0.45	

Table 4.2  
(Cont'd)

**Notes:**

- (i) Symbols (+), (-) and (0) denote signs of the coefficients of private consumption determinants from the corresponding econometric estimations. The positive and negative signs correspond to statistically significant coefficients, (0) denotes a coefficient not significantly different from zero, and a blank space denotes the exclusion of the corresponding variable from the country study.
- (ii) Specifications and estimation techniques vary by countries. The dependent variable is private investment for all countries (less Cote d'Ivoire and Pakistan); it enters in levels for Argentina, log levels for Thailand, ratio to GDP for Chile, Ghana, Mexico and Zimbabwe, log ratio to GDP for Morocco, and either level, log level or ratio to GDP for Colombia. In the case of Pakistan, the dependent variable is the private capital stock to GDP ratio. Due to data limitations, the dependent variable is the domestic investment to national income ratio in the case of Cote d'Ivoire.
- (iii) The numerical coefficients without a note are partial derivatives of private investment rates (to GDP) with respect to the rate of the corresponding variable unless noted otherwise. When noted otherwise, coefficients are: <sup>1)</sup> elasticities. In the case of Pakistan, the coefficients are: <sup>2)</sup> partial derivatives of the private capital stock/output ratio with respect to the private capital stock/output ratio and the user cost of capital, respectively.
- (iv) The specifications for Morocco, Colombia, and Pakistan (the two latter based on error-correction models) allow to distinguish between short and long-run coefficients; the latter are presented for Morocco and Pakistan in the table.
- (v) The specification for Morocco includes an output and a private investment equation, the latter depending on output growth. Output was found to be positively (marginally significant) affected by public investment. Hence we infer that reduced-form private investment depends positively on public investment, as shown in the table.
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Morocco study found that public investment contributes to growth, and because the latter raises private investment, we may infer that public investment increases private capital formation.<sup>51</sup>

If these results are taken literally, we find direct evidence for the beneficial effect of public sector capital on private investment only in three of the studies, which is surprising in view of the widespread assumption that public investment raises the private rate of return to capital and thus private investment. A plausible explanation in those countries that find a negative (Chile, Colombia, Ghana, and Mexico) or zero (Argentina) relationship is that public investment is concentrated in activities that substitute directly for private initiative and/or that financing of public investment takes directly resources which would have been available for private investment.

Only a few studies entered public deficits (or their main components) as separate private investment determinants. In the two cases where deficits are entered directly, they play a

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<sup>51</sup>By way of comparison, Aschauer (1989) finds public capital to positively influence private investment in the U.S., and Bartoli (1989) finds a similar result for a sample of Latin American countries.

negative role, which is weak in Cote d'Ivoire and strong in Thailand. In the Argentina study, the three main components of deficits instead of the deficit per se are entered. As already mentioned, public investment did not affect private capital formation in Argentina; however, public consumption and public revenue play significant roles, with signs consistent with the crowding-out hypothesis. From our partial evidence we may conclude that deficits tend to crowd out private investment, particularly when the public sector has no easy access to foreign financing, but has preferential access to domestic resources through repressed domestic financial markets.

Corporate taxes have a strong negative effect on private investment in Mexico (where they enter separately) and in Morocco (where the corporate tax rate is part of the user cost of capital). In Morocco investment incentives also play a strong positive role, as reflected by the user cost of capital.<sup>52</sup> In Ghana, however, corporate taxes play an unexpected significant and positive role in private investment -- presumably due to the exclusion of corporate profits as a result of data unavailability.

Finally, the real interest rate enters private investment equations in seven case studies. The results, as compared to other studies which show frequently that private investment is interest-insensitive, are surprisingly strong: the effect of the cost of capital is significant and negative in 5 cases.<sup>53</sup> The corresponding coefficients range from low (Chile and Mexico) to moderate (Zimbabwe) and to high (Morocco and Pakistan). Only two cases (Colombia and Ghana) found private investment to be interest-insensitive, and in the former an interest effect was found in some regressions.

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<sup>52</sup> The Morocco study is the only one which considers the corporate tax rate and investment incentives, differentiated by regions and capital categories, in the calculation of the user cost of capital series.

<sup>53</sup> See Rama (1990) and Serven and Solimano (1991).

## V. FISCAL DEFICITS, TRADE DEFICITS, AND REAL EXCHANGE RATES

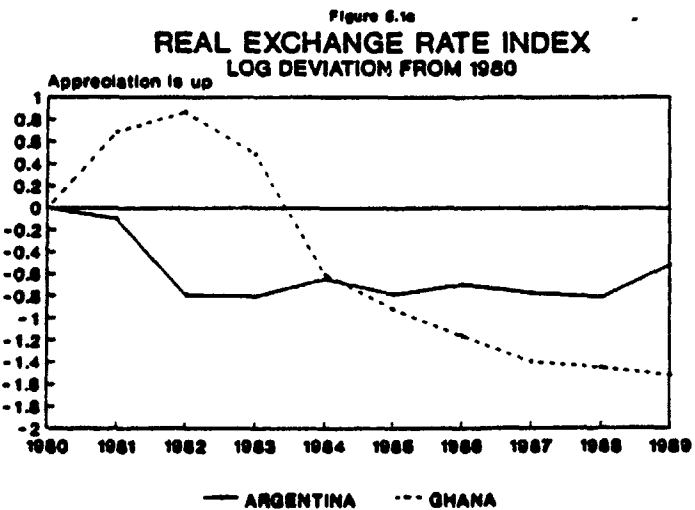
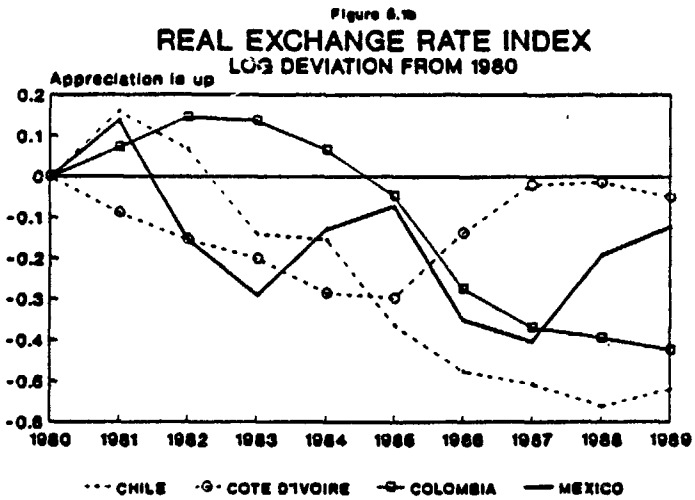
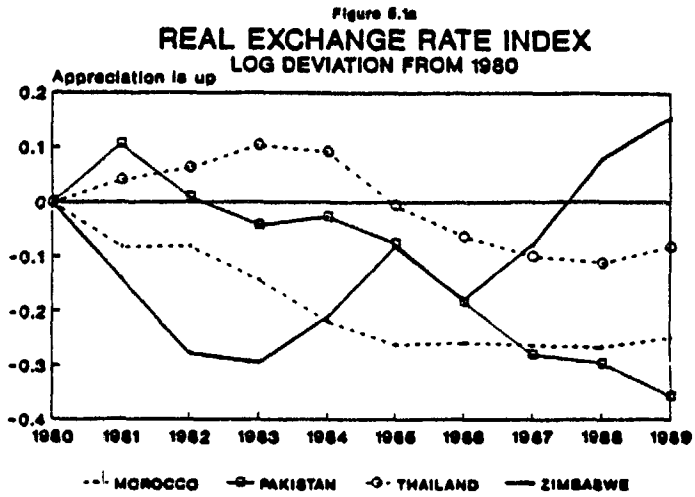
The project case studies found surprisingly robust relationships between the fiscal deficit, the trade deficit, and the real exchange rate, of the type proposed by Rodriguez (1989). He suggested a two-step relationship between the fiscal deficit and the real exchange rate: the fiscal deficit and other determinants of investment and saving behavior determine the external deficit, which then determines the real exchange rate consistent with clearing of the domestic goods market.

Figure 5.1 presents the evolution of real exchange rates in the 10 project countries in the 1980s. Real exchange rates are closely correlated with the behavior of fiscal deficits in many episodes. The major fiscal adjustment in Cote d'Ivoire in 1982-85 was accompanied by real depreciation; subsequent fiscal backsliding in 1985-88 occurred together with real appreciation. The large fiscal deficit reduction in Colombia over 1983-88 was accompanied by real depreciation. Similarly, Chile's real depreciation of 1984-88 was contemporaneous with a fall in the deficit. Ghana's reform program after 1982 included both a deficit reduction and a real depreciation of the official exchange rate (as well as a depreciation of the real black market exchange rate). Morocco experienced both a deficit reduction and a real depreciation over 1982-85; Thailand had both occurring together over 1985-88. These episodes demonstrate that fiscal adjustment and real depreciation are closely associated, because real exchange rates reflect fundamentals such as excess demand arising from deficits, and in some of these cases because nominal devaluations and fiscal adjustment occurred together in adjustment packages.<sup>54</sup>

Six of the case studies tested directly the relationship between fiscal and external deficits (the others used comprehensive macroeconomic frameworks that related the variables indirectly). All of the six found evidence that fiscal deficits were associated with external deficits,

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<sup>54</sup>Edwards (1989) found that nominal devaluation affected the real exchange rate significantly in the first year, and that the real exchange rate adjusted slowly to its equilibrium value, although nominal devaluation was neutral in the long run (p. 141). However, nominal devaluations last as real devaluations if accompanied by fiscal adjustment.



although in two of the cases the evidence was qualified.<sup>55</sup> These same six studies found that the trade surplus was a significant determinant of the real exchange rate, with the expected sign that higher surpluses lead to greater real depreciation. Thus, in the complete system, a lower fiscal deficit leads to real depreciation.

The other four case studies also found evidence that the fiscal deficit significantly affects the real exchange rate.<sup>56</sup> In Thailand and Morocco, the estimated model equations indicate an appreciation of the real exchange rate when fiscal deficits increase. In Ghana, a modified approach to take into account a black market in foreign exchange found that higher fiscal deficits both appreciate the official exchange rate and raise the black market premium. The only contrary result was in the Pakistan study, where a deficit reduction due to a cut in public investment would appreciate the real exchange rate in general equilibrium because of the negative supply effect of reducing public investment.

The studies also examined the Rodriguez (1989) hypothesis that increases in public spending, for a given deficit, would affect the real exchange rate because of differences between the public and private sector propensity to spend on nontradables vis-a-vis tradables. The results from the six case studies that tested this directly are split. In Côte d'Ivoire, Argentina, and Zimbabwe, higher government spending leads to real appreciation, indicating the government is more prone to consume nontradables than the private sector. In Colombia, Chile, and Mexico, it is the reverse, suggesting that those governments consume tradables more heavily than the private sector.

The studies also generally found that terms of trade improvements lead to real appreciation of the currency. Six of the seven studies that tested this relationship found this effect to be significant, although the seventh study, Thailand, found the counter-intuitive result

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<sup>55</sup>In Chile, only the simple correlation was significant; the significance disappeared when other determinants of the trade deficit were added. In Côte d'Ivoire, the relationship was significant only in the 1979-89 period.

<sup>56</sup>In general, causality may not be unidirectional: Section II of this paper and Fierro and Reisen (1990) show how the real exchange rate may affect tax revenue.

that terms-of-trade improvements depreciate the real exchange rate. The Ghana study found that terms of trade improvements tend to lower the black market premium.

Thus, all of the studies give support to the notion that the real exchange rate is sensitive to both policy and external variables, with the fiscal deficit prominent among them. This contrasts with the result mentioned earlier that there is little cross-section association between deficits and real overvaluation. A plausible explanation is that differences in trade intervention are largely responsible for cross-national differences in overvaluation, while in any given country macro policies such as fiscal deficits explain real exchange rate movements over time. For example, the Colombia study found that most of the real depreciation associated with the adjustment program of 1985-89 was due to the reduction of the deficit.

## VI. POLICY CONCLUSIONS

To conclude, we summarize the main policy implications of the 10 case studies and the analysis of this paper.

Fiscal Adjustment. Three case studies of the project (Chile, Mexico, Thailand) show strong and fast fiscal adjustment, four follow a more gradualist approach to fiscal stabilization (Colombia, Ghana, Morocco, Zimbabwe), and three correspond to moderate (Pakistan) or massive (Argentina, Cote d'Ivoire) fiscal deterioration. The first two groups encompass countries which have achieved in the late 1980s sustainable deficit levels, defined as those compatible with stable public debt to income ratios. By contrast, the latter three countries have raised their deficits levels increasingly beyond sustainable levels during the 1980s. Both foreign and domestic macroeconomic shocks play a minor role in the cyclical variation and structural changes of non-financial public sector deficits. Active fiscal policies, under the direct control of policymakers, are both the main culprit of fiscal crises and an effective instrument in bringing about fiscal stabilization and adjustment.

The experiences show that successful non-financial public sector adjustment requires acting on four fronts: reducing an overblown government bureaucracy, cutting transfers and subsidies (other than efficient social programs), adopting tax systems conducive to broadly-based direct and indirect taxation, and reforming or privatizing public enterprises and commodity marketing boards. Efficient public investment, particularly in social or physical infrastructure, should not only be exempted from fiscal cuts but possibly expanded to encourage economic growth.

Quasi-fiscal losses -- the deficits of the public financial sector, particularly the central bank -- are a result of emergency loans to the financial system or exchange rate subsidies, granted in periods of financial distress and external crises and in countries where the central bank is subordinated to the ministry of finance. A sound regulatory framework for the commercial banking sector and a more independent central bank are necessary features -- although no guarantees -- for preventing recurrent quasi-fiscal deficits.

Fiscal deficits and inflation. A conventional inflation tax "Laffer curve" is well supported by cross-sectional empirical evidence. Conventional time-series estimates of revenue-maximizing inflation rates appear to be biased (upward in high inflation countries, downward in low inflation ones) by misspecification of money demand as being of constant semi-elasticity with respect to inflation, when in fact the semi-elasticity falls as inflation rises.

Thus, to the extent that deficits are financed by money creation, the relationship between fiscal deficits and inflation is indisputable. However, the "fiscal approach to inflation" exaggerates the link. Seignorage is so trivial as a source of fiscal revenue, and the tradeoffs between additional inflation and amounts of fiscal financing so unfavorable, that it is hard to believe that revenue motivations alone explain cases of chronic high inflation like Argentina.<sup>57</sup>

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<sup>57</sup>Similar conclusions are reached in the work of Kiguel and Liviatan (1989).



Seignorage is more important as a source of temporary surges in revenue, but even there the link to inflation is weak.

Fiscal deficits and financial repression. There is an association between financial repression and fiscal crises -- high fiscal deficits are correlated with highly negative real interest rates, and the disappearance of external financing of fiscal deficits seems to lead to high taxes on financial intermediation. But the poor performance of countries -- in terms of depressed private credit, investment, and growth -- that engage in strong financial repression hardly recommends this solution to fiscal crises. It is true that financial liberalization will worsen the public debt burden. However, adjustment of conventional taxes to lower deficits would be far preferable to implicit taxes on financial assets -- since both are taxes, there is no reason to expect conventional fiscal adjustment to be any more contractionary than adjustment through financial repression.<sup>58</sup>

Budget Structure, Deficits, and Private Consumption. Taxes have an unambiguously negative effect on private consumption through disposable income. While a temporary tax hike does not have the massive effect predicted by the simple Keynesian hypothesis, nor does it have the minimal size attributed to it by the permanent-income hypothesis.<sup>59</sup> If the tax increase is maintained over time, the response of consumption will grow stronger. According to the Ricardian equivalence hypothesis, higher (permanent) public saving should lead to an offsetting reduction in private saving. Alternatively, if domestic financial markets are controlled and if the public sector has preferential access to their resources, a higher (current) deficit will directly crowd out private expenditure in general and consumption in particular. However, most studies showed that public saving (or public deficits) had no significant effects on private consumption. The policy implication is that increasing public saving -- reducing public deficits -- is the most

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<sup>58</sup>Dornbusch et al. (1990) make a similar argument with respect to inflation taxes.

<sup>59</sup>A similar conclusion is reached for the U.S. by Poterba (1988).

effective contribution fiscal policy can make to raise national saving.<sup>60</sup> The way the deficit is financed -- and hence the changes in domestic real interest and inflation rates -- can have some effect on private consumption. While the role of real interest rates is either ambiguous or negligible, inflation tends to reduce consumption in low-inflation countries.

Budget Structure, Deficits, and Private Investment. A wide range of responses of private investment to the public capital stock (or to public investment) is observed in developing countries. A negative influence of public capital on private investment is frequently present in countries with a large public enterprise sector which competes with private firms and where the public sector has preferential access to domestic financial resources. Aggregate public deficits -- not only public investment -- tend to crowd out private investment (and consumption) in the latter countries. The implication is that privatization or reform of public firms and marketing boards, a concentration of public investment on public and social infrastructure, and deregulation of domestic financial markets (encompassing the elimination of credit ceilings, compulsory credit allocation, preferential access of the government to credit, and interest controls) are the three elements which would reinforce private/public sector complementarity and hence increase the prospects for higher private investment and growth.

Fiscal deficits, trade deficits, and real exchange rates. A simple model relating real exchange rates to trade deficits to fiscal deficits explains a great deal of real exchange rate variation. Real exchange rates really do seem to be driven by "fundamentals", which should serve as an antidote to the mistaken notion of many policymakers that nominal devaluation by itself can restore macroeconomic balance although it is useful in combination with fiscal adjustment.<sup>61</sup> Real exchange rates also seem to be affected considerably by whether government spending is oriented more towards tradables or nontradables -- our studies show no strong presumption either

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<sup>60</sup> This conclusion is shared by recent cross-country saving studies for developing countries: Corbo and Schmidt-Hebbel (1991) and Schmidt-Hebbel, Webb, and Corsetti (1991).

<sup>61</sup> Edwards (1989) concludes that real exchange rates can reach their "fundamentals"-determined level more quickly by combining fiscal adjustment with nominal devaluation.

way.<sup>62</sup> This suggests that policymakers pay attention to the composition of government spending when deciding on an accommodating exchange rate policy.

Fiscal deficits and growth. This research project did not directly address the effect of fiscal deficits on growth. But there are some suggestive findings pointing toward further research. Low per capita growth is associated with both a high level and a high variance of the fiscal deficit.<sup>63</sup> The conventional notion that public investment is good for private investment and growth receives little support in the econometric work for the case studies, so there is little basis on which to justify high deficits "because they are due to investment". Countries that were forced to shift from external to internal financing of deficits -- often because of debt crises induced by previous fiscal mismanagement -- had particularly poor growth performance in the 80's. Low and stable fiscal deficits seem to be a good idea for the long-run prospects of a country as well as for the short-run imbalances reflected in inflation, interest rates, and real exchange rates. And growth itself makes deficits less harmful: countries like Pakistan and Thailand could sustain larger deficits because of high growth, while economic collapse worsened the macro effects of deficits in Argentina, Cote d'Ivoire, and Mexico.

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<sup>62</sup>See the model of Khan and Lizondo (1987) for a similar theoretical result.

<sup>63</sup>While this study just looked at simple illustrative correlations, Fischer (1991) found an effect of the level of the deficit on growth in cross-section multivariate regressions.

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## APPENDIX I:

SEIGNORAGE-MAXIMIZING INFLATION RATES  
AND MISSPECIFICATION OF MONEY DEMAND

An empirical regularity noted in the text is that the estimated seignorage-maximizing inflation rate rises with the inflation rate that is actually observed. In high inflation countries, the seignorage maximizing rate is high, while it is low in low inflation countries. For example, the estimated seignorage maximizing rate in Thailand is only 4% per annum, while in Argentina it is 21.8% per month.

This suggests a systematic misspecification of money demand. In a constant semi-elasticity money demand function a la Cagan (1956), the seignorage-maximizing rate is just the reciprocal of the semi-elasticity of money demand with respect to inflation. Thus, it appears that high inflation countries systematically have lower semi-elasticities, which contradicts the assumption of constancy of this parameter. This is intuitively plausible -- as inflation gets high, households substitute into other assets that play some of the roles of money. At very high rates of inflation, all the good substitutes for money have already been found. Further increases in inflation would not have much effect, since money demand is already at rock bottom. This intuition is confirmed by a simple model of money demand, inflation and seignorage.

A model of seignorage, money demand, and growth

It is assumed that infinitely lived dynasties maximize a standard intertemporal utility function:

$$(1) \quad \max \int_0^{\infty} e^{-\rho t} \frac{c^{1-\sigma} - 1}{1-\sigma} dt$$

where  $\rho$  is the discount rate,  $c$  is consumption, and  $1/\sigma$  is the intertemporal elasticity of substitution.

Production ( $y$ ) in the one-good economy is assumed to depend only on a broad concept of capital ( $k$ ), as in Rebelo (1991) and Barro (1990). Population is assumed fixed and normalized at one, so all variables can be interpreted in per capita terms.

$$(2) \quad y = A k$$

There are three assets available to the consumer -- capital  $k$ , nonindexed money (real value  $m$ ), and indexed money (real value  $b$ , referred to as "bonds" for short). Bonds pay no interest but are fully indexed to the price level. This type of asset is observed in many Latin American countries that have highly liquid deposits indexed by consumer prices (for example, the UPAC deposits in the Cajas de Ahorro y Vivienda in Colombia). Since capital has real return  $A$  and there is no uncertainty, capital always dominates bonds, and capital dominates money at expected inflation rates above  $-A$ . However, there is assumed to be a cash-in-advance constraint,



which is that some combination of money and bonds must be held in order to purchase consumption goods:

$$(3) \quad f(m,b) - c \geq 0$$

Here  $f$  is linearly homogeneous in  $m$  and  $b$ , and satisfies  $f_m > 0$ ,  $f_b > 0$ ,  $f_{mm} < 0$ ,  $f_{bb} < 0$ . In other words, either money or bonds can be used for transactions.<sup>64</sup> In general, they will be imperfect substitutes so that both will be used. This approach is in the same spirit as the Lucas and Stokey (1987) generalization of cash-in-advance models to include "cash" and "credit" goods. The intuitive justification is also similar to the "shopping costs" approach of Arrau and de Gregorio (1991).

The consumer will face the following budget constraint each period:

$$(4) \quad c = y - M - B - I$$

where  $M$ ,  $B$ , and  $I$  are the real flows of resources devoted to accumulation of money, bonds, and capital, respectively. The accumulation of the 3 assets will be given by:

$$(5) \quad \dot{m} = M - \pi m$$

$$(6) \quad \dot{b} = B$$

$$(7) \quad \dot{k} = I$$

The  $A$  parameter is defined net of depreciation so  $I$  is net investment.  $\pi$  is the inflation rate.

The consumer-producer solves the intertemporal problem (1)-(7) with perfect foresight. The first order conditions imply the following standard expression for the growth  $g$  of consumption (and output):

$$(8) \quad g = (A - \rho) / \sigma$$

Note that growth is not affected by the rate of inflation, which is a standard result when the cash-in-advance constraint applies only to consumption goods.

The first order condition for the allocation of wealth between  $m$  and  $b$  will be the following:

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<sup>64</sup>A similar cash-in-advance constraint appears in Walsh (1984).

$$(9) \quad f_m/f_b = (A + \pi)/A$$

Consumers will substitute bonds for money in transactions as inflation rises. The determination of the ratio of money to consumption will be given by (3), which can be rewritten as:

$$(10) \quad f(m/c, b/c) = 1$$

One convenient function to discuss the sensitivity of money demand to inflation in this formulation is the CES function:

$$(11) \quad f(m,b) = \lambda[\gamma m^n + (1-\gamma)b^n]^{1/n}$$

where bonds and money have elasticity of substitution  $1/(n-1)$  in transactions.

From (9), the ratio of bonds to money with this function will be:

$$(12) \quad \Phi = \frac{b}{m} = \left[ \left( \frac{1-\gamma}{\gamma} \right) \left( \frac{A+\pi}{A} \right) \right]^{1/(1-n)}$$

From (10), the ratio of money to consumption will be given by:

$$(13) \quad \frac{m}{c} = \frac{1}{\lambda} (\gamma + (1-\gamma) \Phi^n)^{-\frac{1}{n}}$$

From (12) and (13), it can be seen that money demand is unambiguously a negative function of inflation. From (13), the semi-elasticity of money demand with respect to inflation will be:

$$(14) \quad \frac{\partial \ln(\frac{m}{c})}{\partial \pi} = - \left( \frac{(1-\gamma) \Phi^n}{\gamma + (1-\gamma) \Phi^n} \right) \left( \frac{1}{1-n} \right) \left( \frac{1}{A+\pi} \right)$$

It can be shown that the absolute value of the semi-elasticity falls with inflation as inflation gets arbitrarily large.<sup>65</sup> This reflects the substitution out of money into bonds as inflation rises. As

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<sup>65</sup>If  $n < 0$  (elasticity of substitution less than one), then we can see from (14) that the absolute value of semielasticity falls unambiguously. If  $n > 0$  (but  $< 1$ , as required) then the absolute value of semielasticity may rise initially as inflation rises, but will eventually fall as inflation goes to infinity. A sufficient condition for the absolute value of the semielasticity to fall monotonically is  $n < 1/2$  (elasticity of substitution less than 2).

this substitution proceeds, the marginal value of bonds in transactions falls so that the response to further changes in inflation is low when inflation is already high.

It is of interest to see how this affects the calculation of the seignorage maximizing rate. Seignorage will be given by money growth, which is equal in steady state to the inflation rate plus the growth rate, times existing holdings of money (defined as a ratio to consumption):

$$(15) \quad s = (\pi + g) \cdot m/c$$

The government is assumed to determine money growth exogenously and to waste the proceeds  $s$  (or equivalently transfer them back to consumers in lump sum form).

An interior maximum for seignorage will exist if money demand falls off more quickly than inflation rises at some level of inflation. It can be shown this requires that the elasticity of substitution between bonds and money be greater than one in absolute value. If this elasticity is less than or equal to one, then seignorage will always increase with inflation until consumption is driven to zero. Intuitively, money is essential to transactions if the elasticity is less than one, so seignorage behaves as it would in the cash-in-advance model with only money.

The seignorage maximizing rate does not have a closed form solution. However, the model can be simulated with notional parameters to see how the optimal inflation rate responds to the substitutability of money. Table 1 shows the simulated values of optimal inflation for various elasticities. The optimal inflation rate becomes astronomical as the elasticity approaches unity, while it is modest when substitutability is high.

Simulation of model with different elasticities

$n$	$e = \frac{1}{n-1}$	$\pi \text{ max}$
.2	-1.25	12,600%
.225	-1.29	5,200%
.25	-1.33	1,750%
.275	-1.38	760%
.3	-1.43	400%
.35	-1.54	160%
.4	-1.67	80%
.5	-2.0	40%

The cross-section results presented in Section 2 of the text suggest an inflation-maximizing rate between 68 and 160% across countries, consistent with moderately high substitutability between bonds and money. This would suggest that the optimal inflation rate was overestimated in the high inflation countries (e.g. Argentina) and underestimated in the low inflation countries (e.g. Thailand).

If the true money demand function is such that the semi-elasticity of money demand falls with inflation, then the use of a Cagan constant semi-elasticity function will lead one to overestimate optimal inflation in high inflation countries, and underestimate it in low-inflation countries. To see this, consider a generic money demand function:

$$(16) \quad \ln m = g(\pi) \text{ where } g' < 0 \text{ and } g'' > 0$$

The only restrictions on money demand are that it is a negative function of inflation and that the absolute value of the semi-elasticity of money demand with respect to inflation falls with inflation, as implied by the model.

The seignorage-maximizing "optimal" inflation rate will be given by the solution to the implicit function given by the first order condition:

$$(17) \quad \pi_{\max} = -1/g'(\pi_{\max})$$

However, suppose that the money demand function is erroneously supposed to be of constant semi-elasticity and a log-linear Cagan function is estimated. We can think of this as an estimation of the linear approximation of (16) in the neighborhood of the historical average inflation  $\pi_H$ :

$$(18) \quad \ln m = g(\pi_H) + g_H(\pi_H) \cdot (\pi - \pi_H)$$

The estimated "optimal" inflation  $\pi_{\max}$  will then be given by:

$$(19) \quad \pi_{\max} = -1/g'(\pi_H)$$

The assumption that  $g'' > 0$  (the absolute value of the semi-elasticity falls with inflation) ensures that the estimated optimal inflation  $\pi_{\max}$  will rise with historical average inflation  $\pi_H$ . Since (17) is not affected by the historical average inflation, this means that the estimated optimal inflation will be greater than the true optimal inflation in countries where historical inflation is higher than the true optimum, and lower in countries where historical inflation is below the true optimum. From (17) and (19), we can see that the erroneous calculation of optimal inflation is due to failure to take into account the variation in the semi-elasticity as inflation varies.

**APPENDIX II**  
**DECOMPOSITION OF SEIGNORAGE**

The decomposition is based on the following equation for seignorage T:

$$(1) \quad T_t = \frac{P_t M_t - P_{t-1} M_{t-1}}{P_t} = \left( \frac{\pi_t}{1 + \pi_t} \right) M_{t-1} + M_t - M_{t-1}$$

where  $P_t$  is the price level at time t,  $M_t$  is the real money supply at time t, and  $\pi_t$  is the inflation rate at time t. The steady-state value of seignorage is given by the following:

$$(2) \quad \bar{T} = \frac{\bar{\pi}}{1 + \bar{\pi}} \frac{\bar{M}}{1 + \bar{g}} + \frac{\bar{g}}{1 + \bar{g}} \bar{M}$$

where a bar denotes an average level of a variable, and we assume that real money grows proportionally to output, with output growth given as  $\bar{g}$  and the trend value of real money as  $\bar{M}$ . The first term gives the inflation tax component of seignorage, while the second gives the seignorage that accrues from an increase in real money balances.

The deviation of seignorage from the average can then be given as follows:

$$(3) \quad T_t - \bar{T} = \left( \frac{\pi_t}{1 + \pi_t} - \frac{\bar{\pi}}{1 + \bar{\pi}} \right) \frac{\bar{M}}{1 + \bar{g}} \\ + \left( \frac{\bar{\pi}}{1 + \bar{\pi}} \right) \left( M_{t-1} - \frac{\bar{M}}{1 + \bar{g}} \right) \\ + \left( M_t - M_{t-1} - \frac{\bar{g}}{1 + \bar{g}} \bar{M} \right) \\ + \left( \frac{\pi_t}{1 + \pi_t} - \frac{\bar{\pi}}{1 + \bar{\pi}} \right) \left( M_{t-1} - \frac{\bar{M}}{1 + \bar{g}} \right)$$

The first term here is the above-average seignorage due to the inflation tax rate being above average. The second term gives the above-average revenue due to the real money base being above average. The third term gives the real change in the money base minus the amount that would take place as money grows with output. The last term is the covariance of inflation and money.

### APPENDIX III

#### A MODEL OF PRIVATE INVESTMENT AND GOVERNMENT CAPITAL

In the style of the new growth literature,<sup>66</sup> we assume that there are constant returns to scale in all types of capital, where capital is broadly defined to include both physical and human capital. However, we aggregate physical and human capital and distinguish only between public and private capital. Public capital includes only goods that will not be produced in the absence of government intervention, such as infrastructure. Private capital consists of investments where the returns are not appropriable by other agents. The government can invest in either type of capital, whereas the private sector will invest only in private capital. We assume that government investments in private capital are a perfect substitute for those made by the private sector. This implies a production function like the following:

$$(1) \quad Y = A \left( \gamma(K_p + G_p)^\eta + (1-\gamma)G_g^\eta \right)^{\frac{1}{\eta}}$$

where  $K_p$  is private-owned private capital,  $G_p$  is government-owned private capital, and  $G_g$  is government infrastructure capital. Infrastructure capital and private capital are imperfect substitutes, with elasticity of substitution  $1/(\eta-1)$ .

We need to specify a policy rule whereby government capital is determined. To be consistent with a steady state solution, the policy rule needs to have government capital grow with the overall growth of the economy. One analytically tractable policy rule is that the government invests so as to maintain a desired ratio of infrastructure to private capital, and government-owned private capital to private-owned private capital:

$$(2) \quad G_p = \theta_p K_p$$

$$(3) \quad G_g = \theta_g K_p$$

Growth in this economy will be given by the usual Euler condition that consumption growth responds to the marginal product of private capital as follows:

$$(4) \quad g = \frac{\dot{c}}{c} = \frac{\frac{\partial Y}{\partial K_p} - \rho - \delta}{\sigma}$$

where  $\rho$  is the rate of time preference,  $\delta$  is the rate of depreciation, and  $\sigma$  is the inverse of the intertemporal elasticity of substitution.

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<sup>66</sup>For a survey see Easterly, King, Rebelo and Levine (1991)

Taking the derivative of (1) with respect to  $K_p$ , and substituting in from (2) and (3), the marginal product of private capital will be given by:

$$(5) \quad \frac{\partial Y}{\partial K_p} = A\gamma \left( \gamma + (1-\gamma) \theta_g^\eta (1+\theta_p)^{-\eta} \right)^{\frac{1}{\eta}-1}$$

From (5), it can be shown that an increase in infrastructure capital unambiguously raises the marginal product of private capital (and thus growth), while an increase in government-owned private capital lowers the rate of return to private capital and growth. Thus, whether public capital lowers or raises the rate of return to private capital depends on whether public investment is in infrastructure or in capital goods that are substitutes for capital in which the private sector wants to invest.

However, while the rate of return is straightforwardly related to the composition of public investment, the response of private investment is more complicated. In steady state, the ratio of private investment to GDP will be given by:

$$(6) \quad \frac{I_p}{Y} = (g+\delta) \frac{K_p}{Y}$$

The effect of public capital on private investment depends not only on how public capital affects the rate of return, but also on how it affects the steady state ratio of private capital to output. From (1)-(3), this ratio will be given by:

$$(7) \quad \frac{K_p}{Y} = A^{-1} \left( \gamma(1+\theta_p)^\eta + (1-\gamma)\theta_g^\eta \right)^{-\frac{1}{\eta}}$$

The ratio of private capital to output goes down if either type of government capital increases, which is simply definitional since government capital is defined as a ratio to private capital.

From (6), we see that private investment is unambiguously negatively related to government investment in private capital. This investment lowers both the rate of return to private capital and the ratio of private capital to output.<sup>67</sup>

The relationship between private investment and government infrastructure capital is ambiguous. Using (4), we can rewrite (6) as follows:

$$(8) \quad \frac{I_p}{Y} = \frac{\frac{\partial Y}{\partial K_p} K_p}{Y} - \rho \frac{K_p}{Y}$$

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<sup>67</sup>The assumption that one type of government capital is a perfect substitute for private capital is stronger than required. The private rate of return will still fall with public investments that are highly, but not perfectly, substitutable for private capital.

The first term in (8) gives the share of private capital in total production. A sufficient condition for infrastructure capital to increase private investment is that the share of private capital increase with an increase in infrastructure capital, which will occur if the marginal product of private capital rises proportionately more than the ratio of private capital to output falls. Not surprisingly, whether this share rises or falls depends on the elasticity of substitution between infrastructure and private capital. An elasticity less than one ( $\eta < 0$ ) will imply that the share rises with higher infrastructure capital. Thus, inelastic production is sufficient for infrastructure capital to raise private investment. However, a combination of high substitutability between private capital and infrastructure and a low discount rate could imply that infrastructure capital lowers private investment even though it increases the rate of return.

In conclusion, this appendix illustrates conceptually why the relationship between private investment and public capital is theoretically ambiguous. Since in the case studies we only observe the aggregate of all public investment, either sign is possible in the estimated relationships. A negative sign could be explained by a high proportion of public investment going into production activities that substitute for private initiative, or by a high elasticity of substitution between infrastructure and private capital. A positive relationship between private investment and public capital must reflect a high proportion of public investment going to infrastructure.



## APPENDIX IV: SUSTAINABLE DEFICITS

This appendix presents the equation for the sustainable primary deficit calculations shown in Section II.

We start with the current-price budget constraint of the consolidated total public sector, comprised by the non-financial and financial subsector, the latter including the central bank. It equates the above-the-line total nominal deficit (the sum of the primary deficit and net total interest payments) to below-the-line financing sources, given by the change in monetary and non-monetary public debt holdings:

$$(1) \quad \frac{PD}{Py} + i \frac{D}{Py} + E i^* \frac{D^*}{Py} = \frac{\dot{M}}{Py} + \frac{\dot{D}}{Py} + E \frac{\dot{D}^*}{Py}$$

where PD is the consolidated total public sector primary deficit, P is the GDP deflator, y is real GDP, i is the domestic nominal interest rate, D is the domestic public debt stock, E is the nominal exchange rate,  $i^*$  is the foreign nominal interest rate,  $D^*$  is the foreign public debt stock and M is the base money stock. All variables are in current-price domestic currency units, unless noted otherwise.

Simple manipulations of (1) allow obtaining the primary deficit/GDP ratio as:

$$(2) \quad pd = \dot{m} + (\pi + n)m + \dot{d} + (n - r)d + \dot{d}^* + (n - r^* - \epsilon)d^*$$

where lower case variables pd, d,  $d^*$ , and m are correspondingly defined as the ratios of PD, D,  $ED^*$  and M to GDP, respectively;  $\pi$  is the domestic rate of inflation, n is real GDP growth, r is the domestic real interest rate,  $r^*$  is the foreign real interest rate, and  $\epsilon$  is the rate of real exchange rate depreciation.

Equation (2) shows that the primary deficit of the consolidated public sector, as a share of income, is constrained to the sum of the following financing sources: inflation tax and seigniorage on the monetary base, the excess of domestic growth over the real costs of domestic and foreign debt, and increasing demands for monetary and non-monetary debt. Primary deficits are sustainable if they do not entail ever-increasing debt and money to income shares, but are consistent with debt and money demands. In the absence of explicit demands for public liabilities -- introduced in section III -- sustainability is defined in the more restrictive sense of constant debt and money to income ratios, consistent with steady-state (constant) inflation and interest rates.

The country applications summarized in section II calculate sustainable primary deficits as determined by equation (2), after imposing the steady-state condition of constant liability to income ratios. In most cases, the calculations assume that today's (or 1988 or 1989) liability to income ratios (i.e., those for 1988-1990) are the relevant steady-state values. Country applications differ by the relevant public sector coverage (central, general, non-financial, and total public sector), modifying equation (2) accordingly.

## APPENDIX V ALTERNATIVE DEFINITIONS AND COVERAGE OF PUBLIC DEFICITS

A frequently used measure is the "above-the-line" cash basis deficit, based on the difference between total cash-flow expenditure and revenue. Deficits measured on accruals (or payment order) basis, however, reflect accrued income and spending flows, independently if they involve cash flows or not. Accumulation of arrears on interest, wage or goods expenditure or on tax revenue are reflected by increasing accruals basis deficits, without affecting cash basis accounts.<sup>68</sup>

"Below-the-line" nominal deficits are measured as nominal changes in net public sector liabilities. Notwithstanding measurement errors, above-the-line (or current account) accruals-based nominal deficits should be equal to below-the-line (capital account) nominal or face-value flows of net public liabilities. Measured either way, these nominal deficits are often called public sector borrowing requirements (PSBR).

However, below-the-line deficits are nominal flows which typically differ strongly from the change in the real market value of net public sector liabilities. The real value of net public liabilities differs from the PSBR due to capital gains or losses from changes in asset prices or from changes in principal due to debt reduction programs. Among the empirically most significant causes of changes in real net liabilities are capital gains due to the amortization of domestic public debt derived from domestic inflation, capital losses on foreign public debt due to real depreciations, and capital losses from declines in the market value or principal of credits extended to the private sector.

The inflationary component of public interest payments on domestic public debt is a frequently made correction to above-the-line deficits to better reflect the change in net public liabilities. The economic rationale for it is that it constitutes a compensation of private holders of domestic debt which, being the counterpart of their capital loss from inflation, will be reinvested in public debt holdings in order to maintain unchanged real debt stocks. The difference between PSBR and the inflationary component of domestic debt holdings is termed the operational public deficit -- subtracting from it the remaining real interest payments on domestic debt, the primary (or non-interest) deficit is obtained.

Economically more meaningful deficit measures, consistent with forward-looking behavior, imply adjusting deficits by considering government contingent liabilities when they accrue -- not when actual payments are due. Governments acquire contingent liabilities as a result of social security (Kotlikoff, 1988, Mackenzie, 1989), medical insurance, and special government-sponsored programs, such as bank deposit insurance and company bailouts (Towe, 1991). The most general economic concept of the deficit would then be the change in government net worth (Buiters, 1983), which will equal the expected present value of all taxes, including the seigniorage on its nominal debt, plus the net value of current assets, including

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<sup>68</sup> The two most prevalent government deficit measures are those prescribed by the United Nations (1968) and the International Monetary Fund (1986), which are on accruals and cash basis, respectively.

natural resources and fixed capital, less the current value of all non-contingent and contingent liabilities. (See Towe, 1991, p. 118).

Alternative public sector coverage ranges from the central government (or "budget") to the central bank. The general government adds the provincial (or state) and municipal (or local) governments to the latter. A frequently employed coverage extends to the consolidated non-financial public sector, adding to (or consolidating with) general government the non-financial public firms or state-owned enterprises (SOEs). International practice defines the consolidated non-financial public sector (CNFPS) deficit by combining the nominal above-the-line deficit or PSBR with the consolidated operating deficit of non-financial SOEs, the latter defined as the difference between current revenue and current expenditure.

An even broader concept consolidates the latter with the deficit of the financial public sector (state banks and in particular the central bank), the latter often called quasi-fiscal deficit. This measure reflects the broadest possible measure of the public sector and its stance, and is relevant in countries where public financial institutions engage in heavy para-fiscal activities.

STATISTICAL APPENDIX: TABLE 1  
 CONSOLIDATED PUBLIC FISCAL SURPLUS(+) OR DEFICIT(-)  
 (% OF GDP)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average 1970-88	Average various years
<b>OECD</b>																							
.....																							
Australia	2.8	2.3	2.1	-0.2	2.3	-0.6	-2.9	-0.8	-2.8	-2.6	-1.9	-1.2	-1.0	-4.5	-4.0	-3.3	-3.0	-1.1	0.7	1.2	2.3	-1.0	-0.8 1970-90
Austria	1.2	1.5	2.0	1.3	1.3	-2.5	-3.7	-2.4	-2.8	-2.4	-1.7	-1.8	-3.4	-4.0	-2.6	-2.5	-3.7	-4.3	-3.1	-2.7	-1.1	-1.8	-1.8 1970-90
Belgium	-2.1	-3.0	-4.2	-3.8	-2.9	-5.3	-6.0	-6.3	-6.7	-7.5	-9.2	-13.1	-11.2	-11.4	-9.3	-8.7	-8.8	-7.2	-6.8	-6.5	-6.1	-7.0	-7.0 1970-90
Canada	0.8	0.0	0.0	0.9	1.9	-2.5	-1.8	-2.5	-3.1	-2.0	-2.8	-1.5	-5.9	-6.9	-6.5	-6.8	-5.5	-4.4	-2.6	-3.4	-3.0	-2.7	-2.7 1970-90
Denmark	3.2	3.9	3.9	5.2	3.1	-1.4	-0.3	-0.6	-0.4	-1.7	-3.3	-6.9	-9.1	-7.2	-6.1	-2.0	3.4	2.5	0.3	-0.4	-0.5	-0.6	-0.6 1970-90
Finland	4.3	4.5	3.9	5.7	4.6	2.7	4.9	3.2	1.4	0.4	0.3	1.2	-0.6	-1.7	0.4	0.1	0.8	-1.2	1.4	2.7	2.5	1.9	2.0 1970-90
France	1.1	0.8	0.8	0.8	0.1	-2.2	-0.6	-0.8	-2.1	-0.8	0.0	-1.9	-2.8	-3.1	-2.8	-2.9	-2.7	-1.9	-1.8	-1.4	-1.2	-1.2	-1.2 1970-90
Germany	0.2	-0.2	-0.5	1.2	-1.3	-5.6	-3.4	-2.4	-2.4	-2.6	-2.9	-3.7	-3.3	-2.5	-1.9	-1.1	-1.3	-1.8	-2.1	0.2	-0.8	-2.0	-1.8 1970-90
Greece	-0.1	-0.9	-0.3	-1.4	-2.2	-3.4	-2.6	-2.1	-1.7	-2.5	-2.9	-10.9	-7.6	-8.6	-10.2	-14.0	-12.7	-12.0	-14.5	-17.8	-17.2	-5.8	-6.9 1970-90
Ireland	-3.6	-3.5	-3.2	-3.8	-6.9	-11.1	-7.4	-6.6	-8.6	-11.0	-12.2	-13.3	-14.1	-12.0	-10.1	-11.8	-11.6	-9.2	-2.6	-2.8	-1.1	-8.6	-7.9 1970-90
Italy	-4.0	-5.9	-8.6	-7.9	-7.8	-12.9	-9.8	-8.6	-10.4	-10.2	-8.6	-11.6	-11.3	-10.7	-11.6	-12.5	-11.7	-11.1	-10.9	-10.2	-10.2	-9.8	-9.8 1970-90
Japan (% GNP)	1.7	1.2	-0.1	0.5	0.4	-2.8	-3.7	-3.8	-5.5	-4.7	-4.4	-3.8	-3.6	-3.7	-2.1	-0.8	-0.9	0.7	2.1	2.7	3.1	-1.8	-1.3 1970-90
Netherlands	-1.1	-1.0	-0.4	0.6	-0.5	-3.0	-2.7	-1.8	-2.8	-3.7	-4.1	-5.5	-7.1	-6.4	-6.3	-4.8	-6.0	-6.5	-5.0	-5.1	-5.1	-3.6	-3.7 1970-90
Norway	3.2	4.3	4.5	5.7	4.7	3.3	2.5	1.2	-0.1	1.3	5.7	4.7	4.4	4.2	7.5	10.4	5.9	4.8	3.1	1.0	1.2	4.3	4.0 1970-90
Spain	0.0	-1.0	-0.1	0.8	-0.4	-0.5	-1.1	-1.4	-2.4	-2.2	-2.6	-3.9	-5.6	-4.8	-5.5	-7.0	-6.1	-3.2	-3.1	-2.1	-2.6	-2.6	-2.6 1970-90
Sweden	4.6	5.3	4.4	4.1	2.0	2.8	4.7	1.7	-0.5	-3.0	-4.0	-5.3	-7.0	-5.0	-2.9	-3.9	-1.3	4.2	3.4	5.3	4.6	0.2	0.7 1970-90
United Kingdom	2.9	1.3	-1.3	-2.7	-3.9	-4.6	-5.0	-3.4	-4.4	-3.3	-3.4	-2.6	-2.4	-3.3	-3.9	-2.7	-2.4	-1.2	1.1	1.3	0.7	-2.4	-2.1 1970-90
United States	-1.1	-1.8	-0.3	0.5	-0.3	-4.1	-2.2	-1.0	0.0	0.5	-1.3	-1.0	-3.5	-3.8	-2.8	-3.3	-3.4	-2.4	-2.0	-2.0	-1.3	-1.8	-1.7 1970-90
<b>AVG OECD</b>	<b>0.8</b>	<b>0.4</b>	<b>0.1</b>	<b>0.4</b>	<b>-0.3</b>	<b>-3.0</b>	<b>-2.3</b>	<b>-2.1</b>	<b>-3.1</b>	<b>-3.2</b>	<b>-3.3</b>	<b>-4.6</b>	<b>-5.3</b>	<b>-5.3</b>	<b>-4.4</b>	<b>-4.3</b>	<b>-3.9</b>	<b>-3.1</b>	<b>-2.4</b>	<b>-2.2</b>	<b>-2.0</b>	<b>-2.6</b>	<b>-2.5 1970-90</b>

STATISTICAL APPENDIX: TABLE 1  
 CONSOLIDATED PUBLIC FISCAL SURPLUS(+) OR DEFICIT(-)  
 (% OF GDP)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average 1970-88	Average various years			
<b>Developing Countries</b>																										
Argentina	-1.9	-4.4	-5.8	-7.5	-8.1	-15.1	-11.7	-5.1	-6.8	-6.1	-7.5	-13.3	-15.1	-15.2	-11.9	-6.0	-4.7	-5.5	7.4				-8.4	-8.4	1970-88	
Bangladesh											-14.5	-11.8	-13.6	-13.0	-10.4	-10.5	-9.9	-8.4	-7.1	-7.2	-8.1	-11.0	-10.4	1980-90		
Bolivia										-8.4	-9.0	-7.8	-14.7	-19.1	-27.4	-9.1	-3.4	-7.8	-6.7	-4.3	-3.3	-11.3	-10.1	1979-90		
Brazil										--	--	-5.2	-7.0	-3.5	-2.7	-4.3	-3.7	-5.5	-4.3				-3.6	-4.5	1981-88	
Bulgaria																-0.8	-2.6	1.2	-0.9	-0.6			-0.8	-0.7	1985-89	
Burkina Faso															-6.2	-3.1	-6.9	-5.5	-6.1	4.1			-5.6	-4.0	1984-89	
Chile	-2.1	-7.5	-8.1	-19.0	-5.5	-2.1	4.0	0.4	1.4	4.6	5.4	0.4	-3.9	-3.5	-4.6	-2.9	-2.0	-0.2	3.6	3.8			-2.2	-1.9	1970-89	
Colombia	-6.9	-7.4	-6.5	-7.1	-0.9	0.9	-1.9	-2.7	-1.2	-4.0	-5.8	-6.6	-8.9	-8.5	-6.3	-3.5	-0.3	-2.0	-2.1	-1.8	-2.2	-4.3	-4.1	1970-90		
Cote d'Ivoire	-3.4	-4.5	-1.3	0.0	-0.9	-2.3	-12.4	-3.6	-8.4	-10.3	-12.2	-11.8	-15.9	-11.4	-1.7	2.0	-2.4	-7.3	-13.5	-14.4			-6.4	-6.0	1970-89	
Dominica															-3.9	1.4	3.2	3.5	2.3	-8.8			1.3	-0.4	1984-89	
Dominican Republic	-0.3	0.8	1.4	-0.4	-2.6	1.9	-0.7	-1.3	-5.4	-5.1	-6.5	-5.8	-7.0	-5.3	-6.7	0.9	-5.6	-3.8	-5.6				-3.1	-3.1	1970-88	
Ecuador				3.1	0.8	-2.2	-3.3	-8.3	-6.2	-2.0	-4.6	-5.6	-6.7	0.0	-0.6	-1.9	-5.1	-9.6	-5.1				-3.3	-3.3	1973-88	
Ghana	1.3	-2.7	-3.5	-3.2	-5.1	-13.2	-9.2	-7.5	-7.1	-4.0	-6.0	-7.4	-4.1	-2.3	-0.5	-1.9	2.2	3.4	2.2				-3.6	-3.6	1970-88	
Honduras												-8.5	-12.5	-12.7	-11.4	-8.2	-6.3	-6.1	-6.7	-7.2			-9.1	-8.8	1981-89	
India								-5.4	-3.7	-5.0	-6.4	-7.3	-7.0	-7.5	-7.7	-9.1	-8.6	-8.6	-8.9	-9.3			-7.1	-7.3	1977-89	
Indonesia								0.4	1.3	2.6	0.1	-4.1	-2.6	0.9	-2.9	-6.8	-2.0	-0.7	-2.7				-1.1	-1.2	1978-89	
Jamaica								-14.5	-16.7	-15.3	-20.8	-16.6	-15.3	-13.6	-15.1	-13.2	-5.6	-5.4	-13.4	-4.3			-13.8	-13.1	1977-89	
Jordan															-4.7	-8.5	-8.7	-4.7	-14.3	-15.3	-6.6	-14.2	-9.4	-9.6	1983-90	
Kenya								-4.1	-3.8	-7.0	-6.3	-9.9	-6.9	-3.9	-4.4	-6.9	-5.3	-6.6	-4.3	-4.7			-5.6	-5.5	1977-89	
Korea							-1.4	-1.7	-1.3	-1.4	-3.2	-4.6	-4.3	-1.6	-1.4	-1.2	--	0.9	-1.6				-1.8	-1.8	1976-88	
Malawi								-3.6	-6.9	-11.6	-13.6	-16.4	-12.1	-8.7	-7.0	-4.9	-9.6	-6.6	1.2	-0.4			-8.3	-7.7	1977-89	
Malaysia															-11.9	-17.0	-17.9	-14.8	-11.1	-5.9	-10.3	-5.6	-2.7	-4.2	-6.1	1980-90
Mexico*	-3.5	-2.2	-4.4	-5.4	-5.7	-8.4	-7.2	-4.9	-5.1	-6.7	-8.3	-11.6	-15.4	-6.0	-2.9	-3.3	-7.0	-5.4	-0.7	2.0			-6.0	-5.6	1970-89	
Morocco		-3.0	-4.0	-2.0	-3.9	-9.5	-18.1	-15.8	-11.3	-10.1	-9.0	-13.6	-9.2	-11.5	-8.1	-8.6	-5.7	-6.1	-5.5				-8.6	-8.6	1971-88	
Nigeria																										
Oman																										
Pakistan			-3.7	-5.2	-9.3	-8.8	-8.3	-7.4	-8.3	-5.8	-4.8	-4.9	-6.4	-5.5	-7.1	-7.1	-8.3	-7.4	-7.8	-6.4				-6.8	-6.8	1972-89
Paraguay	-1.1	-2.2	-2.9	-0.6	0.2	-5.0	-3.3	-0.8	0.0	1.2	0.1	-2.9	-2.7	-5.3	-6.4	-2.6	-1.8	-2.9	-3.1	0.6			-2.2	-2.1	1970-89	
Peru																										
Philippines																										
Poland																										
Sierra Leone																										
Sri Lanka																										
Thailand																										
Trinidad & Tobago	-5.2	-5.4	-5.3	-3.1	0.7	-2.2	-5.0	-4.5	-5.3	-5.3	-6.3	-7.1	-7.6	-5.7	-7.3	-8.6	-6.6	-3.2	0.2	-1.4						
Turkey																										
Venezuela																										
Zaire																										
Zambia																										
Zimbabwe	-7.1	-6.5	-6.9	-8.1	-4.3	-7.8	-4.1	-4.8	-3.2	-1.3	-9.1	-13.5	-13.1	-14.4	-12.7	-14.3	-14.4	-10.9	-10.4							

STATISTICAL APPENDIX: Table 2  
(Ratio to GDP)

Summary of taxes on financial intermediation (excluding inflation tax)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	
<b>Easterly (1989)</b>											
											<b>averages</b>
Argentina	0.1	0.1	0.7	1.7	0.3	-2.9	0.1				0.0
Chile	0.2	1.8	1.4	0.0	0.0	0.1					0.4
Colombia	-0.2	-0.2	-0.2	-0.8	-0.9	-0.6					-0.3
Mexico	0.7	-0.2	5.5	3.9	1.7	0.1	5.1				2.0
Morocco	0.6	1.0	0.0	0.8	0.2	0.3	-0.6				0.4
Thailand	0.3	-0.0	-0.8	-0.7	-1.2	-1.0	-0.8				-0.4

Note: tax calculated as real interest rate times government domestic debt outside central bank as percent of (implicit long-run real interest rate assumed to be zero)

Giovannini and de Melo (1990)

Colombia	0.2	0.2	0.2	0.3	0.4						0.3
Mexico					0.5	0.8	10.8	11.0			5.8
Morocco	1.1	5.5	2.9	3.7	4.7	3.3					2.3
Pakistan					3.6	2.9					3.3
Thailand	1.2	0.9	0.2	0.5	1.7	-0.9					0.4
Zimbabwe	5.8	4.6	9.1	6.7	7.4	-0.5					5.5

Note: calculated as difference between foreign and domestic interest rate times government domestic debt out

Chamley and Honohan (1990)

Cote d'Ivoire		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ghana		0.0	2.4	0.0	0.1	0.4	0.5	0.2	0.2	0.2	0.5

Note: calculated as domestic real interest rate less 1 percent times government debt outside central bank

Tax on time deposits (from IFS data and real interest rates in this paper)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Argentina	0.8%	-1.4%	3.4%	3.5%	4.0%	2.2%	1.6%	2.1%	-1.2%	
Chile	-0.4%	-4.7%	-3.8%	-0.5%	-0.1%	-0.4%	-0.1%	-0.4%		
Cote d'Iv	0.4%	0.1%	-0.2%	-0.0%	-0.4%					
Colombia	0.0%	-0.1%	-0.1%	-0.5%	-0.4%	-0.3%	-0.4%	-0.2%	-0.2%	
Ghana	0.9%	1.3%	0.4%	0.9%	0.3%	-0.1%	0.1%	0.4%	0.3%	
Morocco	0.1%	0.4%	-0.2%	0.3%	-0.2%	-0.0%	-0.4%	-0.7%	-0.8%	
Mexico	1.3%	0.2%	3.9%	1.9%	1.2%	0.2%	1.2%	2.9%		
Pakistan	0.4%	0.3%	-0.3%	-0.4%	-0.3%					
Thailand	1.2%	0.1%	-3.2%	-3.1%	-5.7%	-4.2%	-3.6%	-2.5%	-2.7%	-1.2%
Zimbabwe	0.5%	0.6%	1.0%	2.6%	0.6%	0.0%	1.0%	0.4%		

Note: calculated as domestic real interest minus OECD average real interest rate (0.9%) times time deposits

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