Policy, Research, and External Affairs

WORKING PAPERS

Macroeconomic Adjustment and Growth

Country Economics Department
The World Bank
June 1991
WPS 696

Macroeconomics of Public Sector Deficits

The Case of Chile

Jorge Marshall
and
Klaus Schmidt-Hebbel

Chile's success suggests that fiscal stabilization is a prerequisite for structural reform — and that structural reform need not be postponed until stabilization is fully achieved.

Policy, Research, and External Affairs

WORKING PAPERS

Macroeconomic Adjustment and Growth

WPS 696

This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of PRE's series of case studies on the macroeconomics of public sector deficits. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Susheela Jonnakuty, roomN11-039, extension 39074 (99 pages).

Marshall and Schmidt-Hebbel analyze the structure of public deficits in Chile, distinguishing between consolidated nonfinancial public deficits and quasifiscal losses of the Central Bank — focusing on the determinants and sustainability of the deficits.

In the framework of an estimated portfolio model, they simulate the path of domestic inflation and interest rates for money-financed and debt-financed deficits.

Then they trace the effects of deficits, and their form of financing, on private consumption and investment — focusing on empirical estimates of the different channels through which public spending and taxation crowd in or crowd out private spending.

Finally, they measure the spillover effects from the deficit to the real exchange rate and the trade surplus.

Chile's successful experience suggests that fiscal stabilization is a prerequisite for structural reform — and that structural reform need not be postponed until stabilization is fully achieved.

Produced by the PRE Dissemination Center

TABLE OF CONTENTS

° Useful comments were provided by Bela Balassa, Juan Carlos Lerda, and Jim Hanson to a first draft. Efficient research assistance was provided by Eduardo Saavedra.

TABLES

FIGURES

1. INTRODUCTION

Chile has faced massive external shocks and policy changes during the last two decades. Public finance has been at the center of the policy shifts, and fiscal deficits varied accordingly. This paper analyzes the macroeconomic effects of fiscal deficits in Chile since 1974 and up to the present.

TABLE 1.1

SELECTED MACROECONOMIC INDICATORS (1970-89)

Year	GDP Growth (%)	Inflation (%)	Current Account (% of GDP)	Non-Financial Public Sector a/ Surplus (% of GDP)
1970-73	0.7	204.3	-2.4	-23.4
1974	1.0	369.2	-0.5	- 5.5
1975	-12.9	343.3	-5.2	- 2.1
1976	3.5	197.9	1.7	4.0
1977	9.9	84.2	-3.7	0.4
1978	8.2	37.2	-5.2	1.4
1979	8.3	38.9	-5.4	4.6
1980	7.8	31.2	-7.0	5.4
1981	5.5	9.5	-14.4	0.4
1982	-14.1	20.7	-9.2	-3.9
1983	-0.7	23.1	-5.4	-3.5
1984	6.3	23.0	-10.7	-4.6
1985	2.4	26.4	-8.3	-2.9
1986	5.6	17.4	-6.9	-2.0
1987	5.7	21.5	-4.3	-0.2
1988	7.4	12.7	-0.7	3.6
1989	10.0	21.4	-3.1	3.8

Sources: Central Bank and Budget Office.
a/ Includes general government and public enterprises.

The evolution of the economy during the period is summarized in Table 1.1. From the perspective of fiscal policy and macroeconomic adjustment this period may be broken into several subperiods.

The first two years of the 1974-1989 period were characterized by a major stabilization effort aimed at correcting the macroeconomic imbalances inherited from the Allende government. During this period most prices were liberalized, real assets that had been transferred to the state during 1970-73 were returned to the private sector, the exchange rate was sharply devalued, and contractionary monetary and fiscal policies were carried out to restore internal and external balances. As a result of both the stabilization policies and adverse foreign shocks, GDP declined by almost 13% in 1975, the unemployment rate jumped to 15%, and real wages declined to 65% of their 1970 level.

Beginning in 1976, Chile experienced four years of recovery with GDP growing at an average annual 7.5%. However, inflation was still high, largely due to the crawling peg rule of the nominal exchange rate. During this period the government carried out radical structural reforms, liberalizing domestic markets as well as external trade. Between 1975 and 1979 tariffs were reduced from high and widely varying levels to an almost flat structure of 10%. Interest rates were freed and most banks were privatized during this period.

A significant fiscal adjustment was achieved very early in this period. The key active fiscal policies were the reduction of current and capital expenditure and the increase in public enterprise tariffs.

The 1980-81 years correspond to a foreign-financed, private expenditure boom. The government, after three years of pre-announcing the path of the nominal exchange level, decided to fix this rate indefinitely in 1979 with the aim of achieving a convergence of domestic inflation to the external level. A combination of elements -- overestimated private wealth levels, high real wage increases due to backward indexation, and the capital account liberalization during a period of

unlimited foreign funds[1] -- contributed to the spending frenzy of the private sector. As a result, private external debt jumped from US$2.7 billion in 1978 to $8.1 billion in 1981. The current account deficit peaked at 14.4% of GDP in 1981.

As opposed to most other developing country experiences, the public sector in Chile refrained from running deficits during the period of easy access to foreign funds. In fact, the 1978-81 phase is characterized by a sequence of surpluses in the public budget as a result of the preceding reforms. However, during the same period a radical reform of the social security system was implemente The old scheme -- a state owned pay-as-you-go system -- was replaced by a capitalization system run by private corporations. This reform had -- and still has -- strong fiscal effects because the government has to finance the transition period. This implies paying pensions to the population which did retire or will retire under the old system, without receiving the revenues from the increasing share of the active population that was affiliated to the new private social security funds. The counterpart of this higher public deficit is an increase in private sector saving, part of which is financing the public sector by acquiring domestic public debt.

1982 and 1983 are the years of the debt crisis. After (and already before) August 1982 external credits dried out and the economy started a painful adjustment path resulting from reduced domestic spending in an economy unable to generate the price adjustment required to avoid a strong recession. The required real exchange rate depreciation did not materialize until 1983 due to the combination of a fixed exchange rate policy and full backward wage indexation. As a result of this "double nominal anchor" problem, the adjustment was highly recessionary: GDP fell sharply, by 14% during 1982, and unemployment sky-rocketed to 30% the following year. In the medium term, the real

---

[1]For a discussion of the causality between domestic spending, foreign lending and the real exchange rate during this period see Morandé and Schmidt-Hebbel (1988), in particular chapter 5.

exchange rate and real wage adjustment made possible an expansion of exports, activity levels recovered, and the current account deficit was significantly reduced.

During these years a significant change in the public sector balance took place. An initial surplus of 5.4% of GDP in 1980 reversed into a 4.0% deficit in 982. Both government revenue and expenditure were severely hit by the debt crisis, reflecting the decline in GDP and the deterioration of the terms of trade. Total tax revenue fell from 26% of GDP in 1980 to 22% in 1982. Also, employment emergency programs had to be financed after the burst of unemployment in 1983.

The 1984-1986 period is characterized by a major fiscal adjustment program aimed at both stabilization and structural reforms. While a reduction in current and capital expenditure was achieved, a new tax reform was implemented. Direct tax rates were significantly reduced with the purpose of encouraging private saving and investment. However, the most important fiscal policy innovations of this period were the so-called quasi-fiscal operations. In order to avoid the breakdown of the whole financial system, the government decided to assist the private sector by providing Central Bank credits at subsidized rates and exchange rate subsidies to debtors in foreign currency. These credits attained such levels that Central Bank real liabilities grew by a factor of 3.5 during the 1985-1988 period.

The last period, 1987-1989, is characterized by relative macroeconomic stability, high growth and fiscal consolidation. At the end of the 1980s, the Chilean economy shows a healthy condition. During these last years GDP has grown at an average 7.7% per year, inflation has averaged 18% per year, and the unemployment rate has declined to 5% in 1989.

With regard to fiscal policy, this final phase shows a recovery of public finances. Fiscal deficits turned into surpluses as a result of the economic recovery, an increase of public enterprise surpluses and a recovery in the price of copper.

Hence there are three crucial aspects of the management of fiscal policy in Chile during the 1980s which are noteworthy. First, the tax and expenditure reforms contributed to a leaner government sector, to which the privatization of public enterprises made a significant contribution. Second, the 1981 social security reform caused a large negative effect on the public sector budget, which will last for the period of demographic transition to the new system. This implies that it is hard to make meaningful comparisons of fiscal accounts before and after the reform. Third, in order to avoid the collapse of the financial system, the government established a series of subsidized operations to the banking system and its debtors. An implication of this is that the increase in the domestic public debt was related to transfer payments to the private sector. These three aspects of the management of fiscal deficits in Chile were crucial in the macroeconomic adjustment during the 1980s.

This study is organized as follows. Section 2 describes the evolution of fiscal policy in Chile during the 1974-1988 period emphasizing the structure and decomposition of non-financial public sector deficits, the scope of quasi-fiscal operations, and the sustainability of public sector deficits. Section 3 develops a three-asset portfolio model in order to estimate the impact of domestic deficit financing on interest and inflation rates and assess the implications of alternative strategies of domestic financing of public deficits. Section 4 analyzes direct and indirect fiscal policy effects on private consumption and investment. Section 5 estimates the impact of public sector deficits on real exchange rates and the current account. Section 6 concludes.

2. FISCAL POLICY, DECOMPOSITION OF 1974-1988 DEFICITS AND SUSTAINABILITY OF THE DEFICIT

This section analyzes the evolution of fiscal policy in Chile since 1974. A brief introduction describing the evolution of fiscal policy during the 1974-1988 starts the discussion. In subsection 2.2 a decomposition of the non-financial public sector deficit is performed, which allows to distinguish between exogenous and endogenous fiscal policy determinants of the deficits. A quantification of quasi-fiscal operations is presented in 2.3. Finally, subsection 2.4 looks at deficit sustainability by presenting simulation results for the financing of the public sector deficit and for the primary surplus of the public sector under alternative public debt/GDP paths.

2.1 Fiscal Policies during 1974-1988

Table 2.1 shows the main determinants of the consolidated non-financial public sector deficits during the 1974-1988 period. There are four well-defined subperiods regarding the evolution of the public sector deficit during these years.

The first subperiod covers the 1974-75 years during which a drastic process of fiscal stabilization was carried out by the new military government. The last year of the Allende administration, 1973, was characterized by a huge fiscal imbalance resulting from large public enterprises losses, a decrease in fiscal revenues due to the Keynes-Olivera-Tanzi effect, and an over-expansion of public sector wages, employment and social security payments. In 1973 the public sector deficit climbed over 20% of GDP, being financed by a huge inflation tax.

The Pinochet government cut abruptly fiscal spending, reducing real wages, the public pay roll, and public investment. Tax rates were raised and many firms - which had been transferred to the state by the Allende government - were returned to the private sector. The remaining public enterprises were required to behave as private firms maximizing profits. In 1975, a tax reform

Table 2.1 : Chile: Non-Financial Public Sector Operations

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
General Government															
Current Revenues	30.3	34.9	37.4	38.6	33.2	32.5	32.9	32.1	29.9	27.7	28.7	28.6	28.2	28.4	28.7
Direct Taxes	5.7	8.3	7.0	5.4	5.3	5.2	5.4	5.5	4.8	3.1	3.4	3.1	3.2	3.1	2.9
Indirect Taxes	13.0	14.6	14.0	14.9	13.7	13.3	13.4	14.8	13.8	14.6	16.3	17.1	17.1	17.3	14.5
Copper Taxes	1.7	1.3	2.6	2.6	2.8	1.9	1.9	0.2	1.0	1.9	1.3	0.5	0.6	1.1	4.7
Social Security	3.1	3.4	3.4	3.7	3.7	5.3	5.6	4.7	3.3	2.8	2.8	2.4	2.5	2.2	1.9
Other Incomes	6.8	7.3	10.3	12.1	7.7	6.7	6.6	6.9	7.2	5.3	5.0	5.5	4.9	4.7	4.7
Current Expendit.	26.4	27.6	31.0	33.0	26.8	24.8	24.5	26.7	31.9	30.6	30.7	29.5	27.4	26.3	23.2
Purchases	4.3	4.4	3.7	4.9	4.7	3.0	3.1	2.9	3.3	3.2	3.4	3.2	3.0	3.3	2.7
Wages	10.0	9.3	8.9	11.0	10.0	9.2	9.1	8.8	10.3	8.9	8.5	7.8	7.4	6.8	6.2
Domestic Interests	0.4	0.5	0.2	0.8	0.9	0.7	0.5	0.2	0.0	1.3	1.8	2.4	1.2	1.7	1.8
External Interests	0.9	2.1	2.0	0.9	0.7	0.5	0.4	0.3	0.5	0.5	0.6	0.[illegible]	1.1	1.3	1.3
Total Transfers	6.4	10.3	12.3	12.2	9.8	10.8	10.9	14.1	17.3	16.3	16.2	15.0	14.3	13.0	11.2
Other expenditures	4.3	1.1	3.9	3.2	0.7	0.5	0.5	0.4	0.4	0.4	0.2	0.3	0.3	0.2	0.1
Savings	3.9	7.3	6.3	5.6	6.5	7.7	8.4	5.5	-1.9	-2.9	-2.0	-0.9	0.8	2.1	5.5
Public Investment	8.7	5.7	3.1	4.2	3.5	3.2	2.6	2.5	2.1	2.1	2.3	3.1	3.3	3.0	2.9
Other Expenditures	1.9	1.6	0.1	0.5	0.8	-0.7	0.3	0.1	-1.8	-1.9	-0.7	-0.4	-0.8	-0.6	-0.8
Surplus	-6.6	-0.0	3.1	0.9	2.1	5.1	5.5	2.9	-2.3	-3.1	-3.5	-3.6	-1.7	-0.3	3.4
Public Enterprises															
Current Revenues	32.8	35.9	31.0	26.6	24.7	27.0	25.8	20.8	24.2	29.5	29.8	35.3	35.4	34.7	37.8
Current Expenditur	25.3	30.2	20.5	18.4	18.3	17.6	16.3	15.6	16.5	18.5	19.2	21.2	22.6	21.8	22.2
Net Savings	7.5	5.7	10.5	8.2	6.4	9.4	9.5	5.2	7.7	11.0	10.6	14.1	12.8	12.9	15.6
Taxes and Transfer	4.8	5.4	6.9	5.2	4.4	8.3	7.5	5.6	7.1	8.6	8.2	9.6	9.1	9.7	12.6
Investment	3.9	3.5	3.0	2.7	3.2	1.9	2.6	2.6	2.6	2.6	3.7	4.0	4.7	4.0	3.3
Other Income	2.3	1.1	0.3	-0.8	0.4	0.2	0.5	0.4	0.3	-0.1	0.3	0.3	0.5	0.9	0.6
Surplus	1.2	-2.1	0.9	-0.5	-0.8	-0.5	-0.1	-2.5	-1.6	-0.4	-1.1	0.8	-0.4	0.1	0.3
Consolidated Surplus	-5.5	-2.1	4.0	0.4	1.3	4.6	5.4	0.3	-3.9	-3.5	-4.5	-2.9	-2.1	-0.2	3.7
Financing	5.5	2.1	-4.0	-0.4	-1.3	-4.6	-5.4	-0.3	3.9	3.5	4.5	2.9	2.1	0.2	-3.7
Internal	5.2	5.0	-0.9	-0.1	-4.0	-4.6	-5.3	-3.1	1.7	2.4	1.8	-1.1	-1.0	-2.2	-7.3
External	0.3	-2.9	-3.1	-0.3	2.7	0.0	-0.1	2.8	2.2	1.1	2.7	4.0	3.1	2.4	3.6

Source: Budget Office, Ministry of Finance.

introduced the value-added tax, simplifying notably the tax system and indexing the tax base. As a result of these policies, the public sector deficit was quickly reduced. In 1975, the deficit as a fraction of GDP was only 2%.

The second subperiod covers the 1976-1981 years. The public sector showed important surpluses, allowing for a reduction in domestic public debt. Having stabilized the fiscal deficits in the previous years, public finances were favored by the recovery of growth, the new tax system, and the profit maximizing behavior of public enterprises.

The third subperiod goes from 1982 until 1986. The debt crisis in 1982 triggered a sequence of public sector deficits. The recession that followed the debt crisis produced a fall in public sector revenues, particularly in external trade related taxes. The huge unemployment rate (30% in 1983) forced the government to undertake a series of programs that increased fiscal spending. During that period, the government undertook two structural reforms that contributed to the deterioration of public finances. First, a state-run pay-as-you-go social security system was replaced by a privately run fully funded system, deepening an already existing deficit in the public social security system. Second, a tax reform aimed at raising private investment reduced progressively direct tax rates after 1983.

However, the most important fiscal policy brought about by the debt crisis were the quasifiscal operations carried out by the Central Bank. Beginning in 1983, the Central Bank rescued a technically bankrupt financial system using a package of subsidized loans. A similar operation was aimed at helping private domestic and external debtors. These operations are called quasi-fiscal to the extent that they respond to a fiscal instrument (subsidies) used by the Central Bank. This institution experimented heavy losses as a consequence of the referred policies, which were financed by transfers from the general government.

Table 2.2 shows estimates of total public sector deficits after taking into account quasi-fiscal operations. It is not simple to measure the contribution of the Central Bank to the consolidated

deficit due to its accrual base accounting system. Two available estimates are shown in table 2.2. Both of them contain accrued terms, so they are not strictly comparable with the non-financial deficit (measured on a cash ase) Anyhow, it is evident from table 2.2 that quasi-fiscal operations were an essential component of fiscal policy during the 1980s.

Finally, the 1987-1989 period shows a strengthening of public sector finances, which not surprisingly parallels the behavior of most macroeconomic indicators. A significant contribution to this recovery was played by public enterprises, which benefited from high GDP growth, a recovery in copper prices and, running foreign exchange surpluses also were favored by the depreciated real exchange rate.

2.2 Decomposition of Public Sector Deficits

The decomposition of the non-financial public sector deficit attempts to measure the contribution of exogenous and endogenous fiscal policy variables to the fiscal deficit, following closely our methodology presented elsewhere (see Marshall and Schmidt-Hebbel, 1989a, b and a compact presentation in the appendix of Morande and Schmidt-Hebbel, 1991). Endogenous variables are those under the control of fiscal policymakers: tax rates, public investment, public sector wages, and so on. Exogenous variables are domestic and external variables that affect the fiscal deficit but are beyond the direct control of the fiscal policymaker, such as inflation, output growth, interest rates, or the real exchange rate.

TABLE 2.2

NON-FINANCIAL, QUASI-FISCAL AND TOTAL PUBLIC SECTOR DEFICIT
(% of GDP)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
(1) Non financial Public Sector Deficit	-5.4	-0.3	4.0	3.3	4.5	2.9	1.6	-0.3	3.6
(2) Central Bank Net Interest Payments	-1.1	-1.9	-1.4	0.5	2.9	4.7	4.9	3.8	2.9
(3) Central Bank Losses	-1.0	-1.5	-0.6	6.2	6.3	21.0	4.2	0.5	5.2
Total Deficit									
(1) + (2)	-6.5	-2.2	2.6	3.8	7.4	6.6	6.5	3.5	-0.7
(1) + (3)	-6.4	-1.8	3.4	9.5	10.8	23.9	5.8	0.2	1.6

Sources: Table 2.1 and Central Bank Balance Sheets.

There are two alternatives to decompose fiscal variables, depending if they are classified as behavioral variables. For non-behavioral fiscal variables, an accounting decomposition is performed as shown by the following example. Let WL/PY be the wage bill paid by the government, as a share of current-price GDP. Then the discrete-time change in this ratio can be written as follows:

$$(2.1) \qquad [WL/PY]_t - [WL/PY]_{t-1} = [WL/PY]_{t-1}[1 + \hat{W} + \hat{L} - \hat{P} - \hat{Y} + R]$$

where hats (^) denote the corresponding percentage rates of change and R represents the algebraic residual due to the sum of the products of discrete-time rates of change.

The above expression illustrates the change in a fiscal variable, decomposed by the variation of endogenous policy variables (wage rate, W, and public employment, L) and exogenous macroeconomic variables (GDP deflator, P, and real GDP, Y). Generalizing this procedure to other fiscal variables, it is straightforward to decompose the evolution of the public sector deficit into its endogenous and exogenous macroeconomic determinants.

For behavioral fiscal variables the decomposition is based on their behavioral structure. Take for example the following equation for constant-price tax revenue:

$$(2.2) \qquad (T/P)_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 \pi_t + \alpha_3 e_t$$

where real tax revenue (T/P) is a function of real output, the inflation rate (π) and the real exchange rate (e). The decomposition of the change in tax revenue as a fraction of GDP can be written as:

$$(2.3) \qquad \Delta(T/PY)_t = (T/PY)_{t-1}[a_1(PY/T)_{t-1}-1)\hat{Y} + a_2(P/T)_{t-1}d\pi + a_3 (eP/T)_{t-1}\hat{e}_t]$$

In this case the decomposition uses the least squares estimators a_i for the unknown coefficients a_i that relate tax revenue to its structural determinants.

Table 2.3 shows the list of decomposed fiscal variables, the methodology of decomposition, and the endogenous and exogenous variables that were used in the decomposition. Five public sector variables are decomposed using the estimation procedure: direct taxes, indirect taxes, copper taxes, public enterprises surplus, and total transfers to the private sector. The last variable includes all the transfers given by the government to the private sector, including social security payments.

In the case of direct and indirect taxes, real income, the inflation rate and the real exchange rate are the main determinants of tax revenue. The change in tax structures - and the corresponding change in tax rates - are reflected by changes in appropriate dummy variables. OLS estimation results are shown in table 2.4.

Taxes from the copper industry are a function of the real exchange rate and the price of copper. Total transfers to the private sector were correlated with real income and the inflation rate. Finally, the public enterprise surplus was related to the exchange rate and the copper price.

The results of the non-financial public sector deficit decomposition are shown in tables 2.5 - 2.7. To avoid unnecessary detail the annual results were aggregated into four subperiods covering 1974-1988, relevant for fiscal policy (see section 2.1).[2]

Table 2.5 shows the decomposition results for public sector revenue, which registers an impressive improvement during the first subperiod, a slight deterioration in the second period, and only minor changes during 1982-86 and 1987-88.

The massive 19.7 percentage point of GDP increase in public sector revenue during 1974-75 reflects a significant recovery in tax revenue and public firm surpluses. In turn, the improvement in tax revenues is explained by changes in effective tax rates due to the 1974 tax reform and the reduction in tax evasion.

Declining effective tax rates during 1976-81 reflect higher levels of tax evasion. A negative effect on revenue is also due to the declining number of affiliates to the old social security system, as a result of the already mentioned reform.

---

[2]The figures in these tables denote cumulative changes of the corresponding variables. For instance, the cumulative variation in direct taxes in 1974-75, i.e. between 1973 and 1975 levels, is 3.2 percentage points of GDP.

Table 2.3

DECOMPOSED PUBLIC SECTOR VARIABLE

Fiscal Variable	Methodology	Endogenous and Exogenous Variables
Direct Taxes	Estimation	Copper price Exchange Rate Real Income Effective tax rate
Direct Taxes	Estimation	Real Income Effective tax rate
Indirect Taxes	Estimation	Real income Inflation Effective tax rate
Social Security Revenues	Accounting	System Affiliates Effective tax rate Real income
Purchases of Goods and Services	Accounting	Real purchases Income
Wage Bill	Accounting	Public real wage Public employment Real Income
Total Transfers	Estimation	Real income Inflation
Interest Payments	Accounting	Debt Stock Interest rate Nominal income
Public Investment	Accounting	Real Investment Real Income
Public Enterprise Surplus	Estimation	Exchange Rate Copper price Real income

Table 2.4

Estimation Results of Behavioral Public Sector Variables (1973-1989)

Dependent Variable	Independent Variables							R^2	DW
	Const	Income	Exchange Rate	Inflation Rate	Copper Price	D1	D2		
1. Direct Taxes	506.3 (.93)	3.36 (1.92)				298 (2.2)	-494 (3.0)	.73	1.7
2. Indirect Taxes	364.9 (0.5)	10.65 (4.4)		-0.91 (1.5)		786 (2.1)	1833 (2.9)	.95	1.6
3. Copper Taxes	-84.9 (0.2)	-6.34 (1.9)	7.41 (1.6)		27.7 (3.4)			.54	1.4
4. Public Firms Surplus	-2869 (4.6)		43.0 (10.3)		23.5 (3.3)			.92	1.9
5. Total Transfers to Private Sector	1121 (0.5)	11.2 (1.8)		-3.8 (1.6)				.65	1.6

1/ Direct taxes and transfers are a function of lagged income.
2/ D1=1.0 for 1975-81, 0 for 1982-89 in the case of direct taxes.
D1=1.0 for 1975-83, 0 for 1984-89 in the case of indirect taxes.
3/ t-statistics are reported for each regression.
4/ Sample period: 1975-1989.

Table 2.5

Decomposition of Public Sector Revenues
(Changes in Revenue caused by their Determinants,
in Percentage Points of GDP)[1]

	1974-75	1976-81	1982-86	1987-88
Direct Taxes	3.2	-2.8	-2.3	-0.3
Real Income	-0.1	0.6	-0.1	0.3
Effective rate	3.3	-3.4	-2.1	-0.6
Indirect Taxes	4.4	0.1	2.3	-2.5
Real Income	-1.3	4.7	0.0	1.4
Inflation	0.4	0.8	0.0	0.0
Effective rate	5.4	-5.5	2.4	-3.9
Copper Taxes	0.7	-1.0	0.3	4.1
Copper price	-3.1	2.3	-1.2	3.9
Exchange rate	1.2	-0.6	1.5	0.1
Real income	0.7	-2.7	0.0	-0.8
Effective rate	1.8	0.0	0.0	0.8
Social Security	-1.2	1.3	-2.2	-0.6
Number of affiliates	0.1	-1.8	-1.1	-2.4
Real wage	0.0	1.5	0.4	0.1
Real income	0.4	-1.8	0.8	-0.3
Remainder	-1.7	3.4	-1.7	0.2
Other Incomes Sector Income	4.2	-0.6	-2.0	-0.1
Public Enterprise Surplus 3/	8.4	-0.4	2.1	0.7
Total Variation	19.7	-3.0	-1.8	1.2

Notes:
1/ The variation of a variable in 1974-75 is the change between the 1973 and 1975 levels. The same applies to other periods.
2/ The effective tax rate include tax evasion and other fluctuations in tax revenues.
3/ Net of taxes and transfers to the government (see text).

The copper price plays an important role through its impact on copper tax revenue. Its strongly negative contribution in the first subperiod and its positive influence on public revenue during the last subperiod are particularly noteworthy.

The impact of privatizations on public finances is hidden in the "Other Public Sector Income" account. The contribution of these asset sales to fiscal income has not been large in spite of the number of privatized enterprises.

Note also that the surplus of public enterprises is net of taxes and transfers to the government. It is not possible from the available information to decompose tax revenue between private and public enterprise contributions. The same applies to "Other Public Sector Income", which includes transfers from public firms.

In this respect, it is interesting to decompose the difference between public enterprise current income and expenditure, a proxy for profits obtained by this sector. The so-defined "profits" have three uses: taxes and transfers to the government, capital formation, and the surplus presented in table 2.5. Table 2.6 presents this additional information.

This table reflects the importance of the real exchange rate and the copper price for Chilean public finances. The sensitivity to the real exchange rate reflects the dominance of tradable-goods producing firms among public enterprises and particularly the size of the state copper company (CODELCO) among them. Hence the strong 1982-86 real devaluations contributed to a massive 9.1 percentage point (of GDP) improvement in public enterprise profits. The important role of the price of copper reflects again the share of CODELCO in public enterprises.

Table 2.6 also suggests the structural change in the behavior of public firms, which started maximizing profits in 1974. This is reflected by the residual term, which accounts for the effect of variables other than the exchange rate and the copper price in the evolution of public firms profits.

TABLE 2.6

DECOMPOSITION OF PUBLIC ENTERPRISE PROFITS
(Changes in Profits caused by their Determinants
in Percentage Points of GDP)

	1974-75	1976-81	1982-86	1987-88
Total Variation	11.6	-0.4	7.6	2.8
Exchange rate	7.4	-3.5	9.1	0.8
Copper price	-2.7	2.0	-1.0	3.3
Non-explained Variation	6.9	1.1	-0.5	-1.3

Table 2.7 shows the decomposition results for public sector expenditures. Looking at the variation in total expenditures, it turns out that sector public spending as a share of GDP contracted significantly during the 1976-81 and 1987-88 periods.

Decreasing levels of public employment and investment caused large declines in public sector expenditures between 1974 and 1981. Fiscal adjustment during this period was associated with a decline in the size of government as measured by public employment and investment. On the other side, inflation increased public expenditure through its effect on total transfers, as a result of backward indexation rules in a period of declining inflation.

Real income plays an important role in the fall of public expenditures during 1987-1988. This is simply the result of relatively constant levels of real fiscal spending during a period of strong growth.

It is noteworthy that fiscal adjustment during the 1980s was not accomplished by the reduction in public investment, a common practice in other Latin American countries. Adjustment in terms of fiscal expenditure fell largely on public sector wages and transfers to the private sector.

Finally, table 2.8 rearranges and summarizes the information provided by tables 2.5 and 2.7. It reports the net impact of fiscal policy, macroeconomic, and external variables on the non-financial public sector deficit.

The sharp decrease in the 1973-75 public sector deficit is largely explained by fiscal policy variables. The more important policies were the increase in indirect and direct effective tax rates, the decline in public employment, and the surge of the public enterprise surplus. As mentioned in section 2.1, fiscal policy during these years was aimed to restore macroeconomic balances following disequilibria during the Allende administration.

The 1976-81 period is characterized by a relatively constant level of the deficit. However, the results in table 2.8 suggest that this relative flatness results from two opposite forces. On one side, fiscal policy variables - effective tax rates, public sector real wages and the external public debt - increase the public sector deficit. Also, a decreasing inflation rate - together with a backward indexation scheme - pushes the deficit up. On the other side, a large increase in real income and the rise of copper prices reduced the size of the deficit.

During 1982-86, the source of an increasing deficit are fiscal policy variables: reduced direct tax rates, declining number of affiliates to the state-run social security system, and the rising public debt. The change in these variables reflects the tax reform of 1982, the social security reform of 1980, and the government intervention in the economy after the debt crisis, respectively.

Finally, the 1987-88 recovery of the non-financial public sector is associated with changes in macroeconomic and external sector variables. In particular, the surge in real income and copper prices explain a decreasing public sector deficit. On the other side, fiscal policy variables like indirect

Table 2.7
Decomposition of Public Sector Expenditure
(Changes in Expenditure caused by their Determinants in
Percentage Point of GDP)

	1974-75	1976-81	1982-86	1987-88
Purchases goods & servs.	0.2	-1.4	0.1	-0.3
Real Purchase	-0.3	0.2	0.0	0.1
Real income	0.5	1.7	-0.0	-0.4
Non-explained	0.0	0.1	0.1	0.0
Wage Bill	-0.2	-0.5	-1.4	-1.2
Public Employment	-4.3	-2.1	-0.1	0.0
Real wages	0.2	3.3	-1.5	0.4
Real income	1.2	-4.2	0.1	-0.9
Non-explained	2.7	2.4	-0.1	-0.6
Foreign Int. Payments	1.4	-1.8	0.9	-1.1
Debt Stock	1.7	2.8	2.9	2.5
Interest rate	-0.2	0.5	-0.5	0.2
Real income	0.1	-0.5	-0.1	-0.2
Exchange rate	0.6	-0.3	0.4	0.1
Non-explained	-0.8	-3.8	-1.9	-3.8
Domestic Payments	0.5	-0.3	1.1	-1.2
Debt stock		2.7	0.1	
Interest rate		0.2	0.2	
Real income		-0.1	0.8	
Non-explained		-1.7	-2.4	
Total Transfers	2.6	3.8	-0.5	-1.5
Inflation	2.5	5.4	-0.1	0.1
Real income	0.2	-2.1	-0.6	-0.3
Non-Explained	0.1	0.5	0.2	-1.3
Public Investment	-0.2	-3.2	0.8	-0.3
Real investment	-0.8	-1.8	0.8	0.0
Real income	1.1	-1.5	0.0	-0.4
Non-Explained	-0.4	0.1	-0.1	0.0
Other Expenditures	-3.5	-2.3	-0.9	-0.2
Total Expenditures	0.8	-5.7	-0.2	-4.3

TABLE 2.8

SUMMARY OF PUBLIC SECTOR DEFICIT DECOMPOSITION
(Changes in Public Sector Deficits Compared by Groups of Determinants, in Percentage Points of GDP)

	1974-75	1976-81	1982-86	1987-88
Fiscal Policy Variables	-14.1	13.2	5.7	5.2
Indirect tax rate	-5.4	5.5	-2.4	1.8
Direct tax rate	-3.3	3.5	2.2	0.7
Copper tax rate	-1.8	0.0	0.0	-0.8
Public employment	-4.3	-2.1	-0.1	0.0
Affiliates soc. sec.	-0.1	1.8	1.1	2.4
Public investment	-0.8	-1.8	0.8	0.0
Public s. real wage	0.2	3.3	-1.5	0.4
Public external debt	1.7	2.8	2.9	0.5
Public domestic debt			2.7	0.1
Real purchases	-0.3	0.2	0.0	0.1
Macroeconomic Variables	4.7	-7.5	-2.8	-2.7
Real income	3.4	-10.8	-1.3	-2.9
Real exchange rate	-0.7	0.3	-1.2	0.0
Inflation rate	2.1	4.6	-0.1	0.1
Real wage	-0.1	-1.6	-0.4	-0.1
Domestic interest			0.2	0.2
External Sector Variables	2.9	-1.8	0.8	-3.6
Copper price	3.1	-2.3	1.3	-3.9
External interest	-0.2	0.5	-0.5	0.3
Non-Decomposed Accounts				
Public Enterprise Surplus (after transfers)	-8.4	0.4	-2.1	-0.7
Other Public S. Income	-4.2	0.6	2.0	0.1
Other Public S. Expenditure	-3.5	-2.3	-0.9	-0.2
Explained Deficit	-22.6	2.3	2.7	-1.9
Non-explained Deficit	4.1	-4.7	-0.9	-3.9
Total Deficit	-18.5	-2.4	1.8	-5.8

tax rates (a decrease in the VAT rate) and the continuing decline of affiliates to the social security system had a negative impact on public finances during this period.

2.3 Quasi-Fiscal Operations and Domestic Debt

An essential feature of the Chilean adjustment process after 1982 was the quasifiscal operations to support a bankrupt financial system, in effect subsidizing private debtors and financial institutions.

Quasi-fiscal operations are carried out by central banks. Nonetheless, they correspond to a fiscal policy action rather than a purely monetary or financial one. Examples of quasi-fiscal operations are subsidized credits, exchange rate subsidies, free-of-charge guarantees given by the Central Bank, or any other policy containing an element of subsidy to private sector agents. The nature of these operations often makes its estimation difficult. Moreover, the accounting systems utilized by central banks and general governments differ. The Central Bank uses an accrual base system whereas government transactions are registered on a cash basis. This feature complicates the joint treatment of both institutions.

The main quasi-fiscal programs developed by the Chilean Central Bank after the debt crisis were:

1. Credit to Bankrupt Banks: In 1981 the Central Bank offered emergency credits to eight financial institutions facing insolvency. Later all these institutions went bankrupt and the total amount of these credits turned into Central Bank losses.
2. Purchase of Bad Loans: The Central Bank acquired bad loans from the private banks, with the latter's commitment to purchase back the bad portfolio in the future. In this sense, the Central Bank provided liquidity to the financial sector. However, the operation also involved a subsidy from the Central Bank as the credits were given at subsidized rates.

3. Preferential Exchange Rate: Private external debtors were allowed to purchase dollars at a subsidized exchange rate for servicing their debt, after the massive 1982-83 devaluations which raised the domestic-currency cost of foreign debt service.

4. Debt Rescheduling: The Central Bank rescheduled domestic debts and financed this operation through loans at negative spreads.

5. Exchange Rate Guarantees: The Central Bank purchased foreign exchange with the commitment to sell it back after a year at the purchasing exchange rate adjusted by the inflation rate. In a period of an appreciating real exchange rate, the above operations produced losses to the Central Bank.

6. Foreign Exchange Capital Losses: The acquisition of private external debt pushed the Central Bank into a net external debtor position. Large real devaluations during the 1982-88 period caused significant capital losses to this institution.

Table 2.9 reports estimated losses incurred by the Central Bank due to quasi-fiscal operations. Losses were estimated as the present value - at December 1989 - of total Central Bank disbursements minus the economic value of the corresponding assets.

The total estimated loss is about US$ 9.0 billion. This figure represents almost 40% of 1989 GDP. Its equivalent cash-flow is about US$ 540 million, considering an average 6% interest rate on Central Bank liabilities.

The Central Bank financed most quasi-fiscal operations by issuing domestic debt. As a result, its outstanding domestic debt increased by US$ 5.7 billion during the 1982-89 period, while its external debt increased by US$ 4.0 billion.

TABLE 2.9

CENTRAL BANK LOSSES ORIGINATED BY QUASI-FISCAL OPERATIONS
(US$ million, December 1989)

Quasi-Fiscal Operation	Present Value of Disbursement	Estimated Asset Value	Net Loss
Credit to Bankrupt Banks	1,930	0	1,930
Purchase of Bad Loans	3,114	2,513	601
Preferential Exchange Rate	3,320	0	3,320
Debt Rescheduling	1,570	1,180	390
Exchange Rate Guarantee	1,585	0	1,585
Foreign Exchange Capital Losses	1,227	0	1,227
TOTAL	12,746	3,693	9,053

Source: Eyzaguirre and Larranaga (1990)

In order to finance Central Bank losses, the general government transferred to this institution approximately US$ 7.2 billion in Treasury bonds during 1983-86. In this form, the government recognized that the Central Bank was his financial agent during the debt crisis.

Nonetheless, the Central Bank exhibits a large cash-flow deficit as shown in table 2.10. This deficit is rooted in quasi-fiscal operations and is not financed by the above mentioned fiscal transfers to the extent that Treasury bonds in hands of Central Bank yield a (minimum) real return of 2% while the average real interest on Central Bank liabilities is 6%.

2.4 How Sustainable is the Deficit?

This sub-section analyzes two issues related to the sustainability of public deficits. First, the focus is on deficit financing under the fiscal policies carried out now in Chile. Second, the issue of public debt is addressed.

2.4.1 Fiscal Policy and Deficit Sustainability under the New Government

The drastic structural reforms - as well as the deep stabilization programs - that allowed the Chilean economy to start a dynamic growth path were undertaken under military rule. On March 1990, a new president took over the government after having been elected by a broad political coalition. The new administration has stressed that the basic framework - a stabilized, free-market, open economy - will be preserved. However, the new government has also stressed that social demands, largely postponed under the previous government, will strongly emerge. Political stability would require at least a partial satisfaction of these demands.

The relationship between political and economic stability is critical for the new government. Fiscal policy is at the center stage. On the one side, the satisfaction of social demands requires an increase in government spending, particularly in education, health, housing, and social security. On

TABLE 2.10

ESTIMATED CENTRAL BANK DEFICIT

(As % of GDP)

Expenditure	2.95
Domestic Liabilities	1.66
External Liabilities	0.83
Dollar-Denominated Domestic Liabilities	0.48
Revenue	1.05
International Reserves	0.58
Loans to the Financial Sector	0.47
Treasury Bonds	0.43
Deficit	1.47

Source: Eyzaguirre and Larranaga (1990)

the other side, the financing of higher expenditure can be a delicate matter: tax hikes are politically resisted and can jeopardize investment and growth; debt financing is seriously limited given the already large stock of public debt; and money financing is out of the question given the stabilization commitment of the new government. Anyhow, since the end of 1989 the Central Bank is autonomous so that the government would not have access to inflationary financing.

During its first four months in power, the new government obtained parliamentary approval for a tax increase. The new law established an increase in the VAT rate from 16% to 18%, an increase in the profit tax rate from 10% to 15% together with an expansion of the tax base, and a rise in personal income taxes. An estimated additional US$600 million (2.3% of GDP) is expected to be collected as a result of the tax reform.

Table 2.11 shows the estimated public sector budget for 1991. Calculations include the effect of the tax reform and increased social expenditure. Overall the non-financial public sector shows a balanced budget. However, the Central Bank estimated deficit would reach 1.5% of GDP.

Assuming that macroeconomic conditions do not change too much, the 1991 budget turns out to be a good proxy for future public sector budgets as fiscal policy is expected to remain unchanged at least until the next election year (1994). Hence the estimates from Table 2.11 focus our attention on the financing of the Central Bank deficit.

The Central Bank deficit reflects the quasi-fiscal debt issue analyzed in the previous sub-section. As mentioned, the autonomous Central Bank can finance its deficit by printing money or by issuing debt.

Along the lines of Buiter (1988) we define a sustainable deficit level as one that avoids increasing debt/GDP ratios over time. Table 2.12 shows simulation results for Central Bank debt/GDP ratios for different levels of monetary financing.

TABLE 2.11

ESTIMATED 1991 PUBLIC SECTOR BUDGET
(% of GDP)

1.	General Government	
	Current Revenue	24.7
	Operational	1.6
	Social Security	1.9
	Income Tax	3.8
	Value-Added Tax	8.9
	Trade Taxes	3.0
	Other Taxes	2.1
	Copper Surplus	1.7
	Other Income	1.7
	Current Expenditure	20.8
	Wages	3.8
	Purchases	2.6
	Social Security	7.0
	Transfers	5.3
	Interest Payments	2.1
	Saving	3.8
	Investment	3.1
	Other Capital Expenditure	0.7
	Surplus	0.0
2.	Public Enterprises	
	Saving (after transfers)2.4	
	Investment	2.4
	Surplus	0.0
3.	Central Bank	
	Current Income	1.5
	Domestic Assets	0.5
	External Assets	0.6
	Current Expenditure	3.0
	Domestic Liabilities	2.2
	External Liabilities	0.8
	Surplus	-1.5
Consolidated Total Public Sector Surplus		-1.5

Source: Budget Office and Table 2.10.

As expected, monetary financing - compromising seignorage and the inflation tax - is a direct function of GDP growth and the inflation rate. Total revenue for the Central Bank fluctuates between 0.6% to 1.1% of GDP depending on the macroeconomic scenario.

The Central Bank has to finance the remaining deficit by issuing domestic debt. The initial domestic public debt/GDP ratio is 30% and the initial total public debt/GDP ratio is 60%. Table 2.12 shows what happens to these ratios after five years of debt-financed (after-money-financed) deficits.[3]

The evolution of debt/GDP ratios depends on two factors. On one side, large revenue from monetary finance requires a low amount of debt financing, so that the debt/GDP ratio decreases over time. On the other side, high GDP growth reduces the debt/GDP ratio. Total public debt/GDP ratios show a more favorable evolution than domestic public debt/GDP ratios as the former include external Central Bank debt, whose path is given exogenously. The simulations results in Table 2.12 suggest that the Central Bank deficit - and hence the total public sector deficits[4] - is sustainable under reasonable macroeconomic conditions as reflected by declining debt/output ratios. However, some difficulties might arise from the fact that the deficit is concentrated in the Central Bank. In particular, the autonomous character of this institution could be jeopardized if the Central Bank depends on the government to finance its deficit.

2.4.2 Public Debt and the Sustainability of Deficits

Apart from financing social expenditures, public finances will be stressed by the large level of public debt. Total public debt increased from US$7.9 billion in 1981 to more than US$22 billion

---

[3]Table 2.12 simulations are computed assuming constant real interest rates.

[4]Recall from Table 2.11 that the estimated 1991 deficit is entirely concentrated in the Central Bank.

in 1989. This figure includes both domestic and external debt, held by the financial and non-financial public sector. The steep increase in public debt reflects the government intervention in the economy after the debt crisis.

Leaving aside public firms and the large state bank (Banco del Estado), an estimation of the net public debt of the consolidated general government and Central Bank is about 60% of GDP.

To illustrate the implications of public debt for public finances, let's start with the public sector budget constraint. If the public deficit is financed through monetary creation and issuance of domestic and foreign public debt, financing of the primary deficit, as a fraction of GDP (d), can be expressed as:

$$(2.4) \qquad d = \dot{m} + m(\pi + n) + \dot{b} + \dot{b}^* - b(r - n) - b^*(r^* - n + \mu)$$

where π is the inflation rate, n is the GDP growth rate, r is the real interest rate paid on domestic debt, r* is the real interest paid on foreign debt, and μ is the rate of real devaluation.[5] The outstanding stocks of base money, domestic public debt, and external public debt - as shares of GDP - are denoted by m, b, and b*; respectively. A dot over a variable denotes the time derivative.

Table 2.13 shows simulations results for primary public surplus levels required for (i) maintaining a constant debt/GDP ratio, and (ii) decreasing this ratio by 5 percentage points of GDP per year.

A clear implication from Table 2.13 is that the large public debt outstanding makes public finances highly sensitive to macroeconomic fluctuations. Under an optimistic scenario, with output

---

[5]The real domestic (foreign) interest rate r (r*) is defined as the difference between the nominal domestic (foreign) interest rate and domestic (foreign) inflation, and the rate of real devaluation is defined as the rate of increase of the nominal exchange rate plus foreign inflation minus domestic inflation.

growing at 5% and interest rates at 6%, the public sector can maintain its debt ratio by running a 0.8% of GDP deficit. Alternatively, it may reduce significantly the debt/GDP ratio by 5 percentage points of GDP, running a primary surplus of 3.6% of GDP. However, in a bad year with 2% growth and 10% interest rates, the public sector would have to generate a primary surplus of 4.2% to maintain constant the debt/GDP ratio, required to jump to 8.6% of GDP if this ratio were to be lowered by 5%.

TABLE 2.12

CENTRAL BANK DEFICIT FINANCING AND DEBT/GDP RATIOS[6]

	Inflation Rate:	15%	
	GDP Growth:	2%	5%	7%
Monetary Financing (% of GDP)		0.6	0.7	0.8
Domestic Debt/GDP		32.1	27.2	24.4
Total Debt/GDP		59.2	50.1	45.8
	Inflation Rate:	30%	
	GDP Growth:	2%	5%	7%
Monetary Financing (% of GDP)		0.9	1.0	1.1
Domestic Debt/GDP		30.4	25.8	23.1
Total Debt/GDP		57.6	49.4	44.4

[6]Debt/GDP ratios are shown for year 5 of deficit financing, starting at levels of 30% for domestic debt and 60% for total public debt at year 0.

TABLE 2.13

PRIMARY PUBLIC SURPLUSES UNDER ALTERNATIVE PUBLIC DEBT PATHS

Real	Primary	Real Interest Rate (%)	GDP Growth (%)	Surplus (% of GDP)
(i) Constant Public Debt/GDP				
Scenario:				
	Optimistic	6.0	5.0	-0.8
	Pessimistic	10.0	2.0	3.6
(ii) Decreasing Public Debt/GDP by 5% Per Year				
Scenario:				
	Optimistic	6.0	5.0	4.2
	Pessimistic	10.0	2.0	8.6

Note: Simulations assume an inflation rate of 15%, a constant real exchange rate, and equal domestic and external real interest rates. Base values correspond to 1987.

3. DEFICIT FINANCING, INTEREST RATES AND INFLATION

This section develops a model for assessing the inflation and interest rate effects of alternative strategies of financing public sector deficits.

The past years have witnessed a revival of interest in the relation between fiscal deficits and macroeconomic variables. The growing literature on fiscal deficits has dealt with a variety of issues such as the relation between fiscal deficits and economic growth, the sensitivity of macroeconomic variables to changes in the public sector budget and the channels through which fiscal deficits are transmitted to the rest of the economy. This literature emphasizes the implications of the increased reliance on domestic financing of public deficits as a result of the sharp reduction in external financing to most high-debt countries[7].

In this section a framework is proposed for analyzing empirically the macroeconomic consequences of alternative strategies of domestic financing. The model introduces modifications to the framework proposed in Easterly (1989) along a model developed by Mujica (1990) in order to capture specific features of the Chilean economic experience during the 1980s[8].

The rest of this section is organized as follows. Subsection 3.1 provides the empirical background for the issues discussed in this section. Subsection 3.2 presents the basic structure of a model that relates explicitly the means of domestic financing to the behavior of interest rates and inflation. In subsection 3.3 we estimate asset demand equations and reduced-form equations for the nominal interest rate and the price level. Finally, subsection 3.4 discusses some simulation exercises for alternative deficit financing policies.

---

[7]Evidence of this interest is reflected in Buiter (1988), van Wijnbergen (1988) and Dornbusch (1984,1987).

[8]For a reference on the Chilean experience in the 1980s see Corbo (1985,1989), Edwards and Edwards (1987), Ffrench-Davis and de Gregorio (1987) and Morandé and Schmidt-Hebbel (1988).

3.1 The Stylized Facts

A brief review of the policies and evidence carried out in Chile during the 1980s from the perspective of their effects on interest and inflation rates will help to introduce this section. The stylized facts are depicted in Figures 3.1 - 3.4. Figure 3.1 shows the evolution of the short-run nominal interest rate (30 days) using quarterly data for the 1975.I-1988.IV period. Figure 3.2 depicts the evolution of the 30 - day inflation rate for the 1975.II-1988.IV period. Figures 3.3 and 3.4 summarize the evolution of money and domestic public debt (as percentages of GDP) for the 1976.I-1988.IV and 1983.I-1988.IV periods, respectively.

Comparing figures 3.1 and 3.2, a similar time pattern emerges for both the interest and the inflation rate during two distinct periods. In the first period, from 1975.I through 1978.IV, both rates decline systematically. In the second period, from 1979.I through 1988.IV, the two rates remained stable with the exception of a sharp upward jump in the fourth quarter of 1982.

The relative stability of interest rates and prices in Chile during the 1980s -- by Latin American standards -- contrasts with the erratic behavior of money and particularly with the upward trend of the stock of domestic public debt. Figure 3.3 illustrates the significant changes of M1 velocity of circulation: M1 as a share of GDP ranged between 13% and 31%. Demand for real M1 as measured by its velocity of circulation peaks in the first quarter of 1983 and thereafter starts a downward trend. Between 1983.I and 1987.IV Chile's real balances -- as a percentage of GDP -- decreased by 12%. Figure 3.4 shows the evolution of the domestic public debt as a share of GDP. From a stable low level of around 10% before the debt crisis in 1982, public debt rises sharply to 80% of GDP in 1983.I, starting an upward trend until 1986.IV.

As many other countries in Latin America, Chile faced in the early 1980s an adverse external environment which triggered a crisis of vast proportions forcing major adjustments in macro policy, particularly in the management of fiscal deficits. However, what seems to be of particular interest

in the Chilean case is that the sharp decline in external financing was preceded by the implementation of a set of economic reforms aimed at increasing the role of market mechanisms and reducing existing barriers to international trade and capital movements. As discussed in Section 2, the reduction in the government's role in economic activity was the main factor behind the sequence of surpluses in the public sector budget before the debt crisis in 1982. As a result of these policies, the government was able to finance the deterioration in the public sector budget after the debt crisis in 1982 without destabilizing the economy. On the other hand, a social security reform implemented during the same period and the management of the debt crisis modified drastically the nature of the effects associated with a change in the public sector budget. In the first place, the reform implemented in the social security system had strong fiscal consequences and was related with an increase in private saving, part of which was transferred to the public sector as domestic public debt issues. Second, as a result of the debt crisis and the overexpansion of domestic credit the financial system was in a very fragile position. In order to avoid the breakdown of the financial system, the Central Bank provided credit to the private sector at subsidized rates. This subsidy accounted for the quasi-fiscal content of the credit policy and implied a financial transfer from the public sector to private corporations. Both the social security reform and the quasi-fiscal operations of the Central Bank must be considered in any attempt to explain the inflation and interest effects related to changes in fiscal deficits. The empirical model presented in this section will emphasize these specific features of the fiscal adjustment undertaken in Chile.

FIGURE 3.1 : NOMINAL INTEREST RATE

(1975.1 - 1988.4)

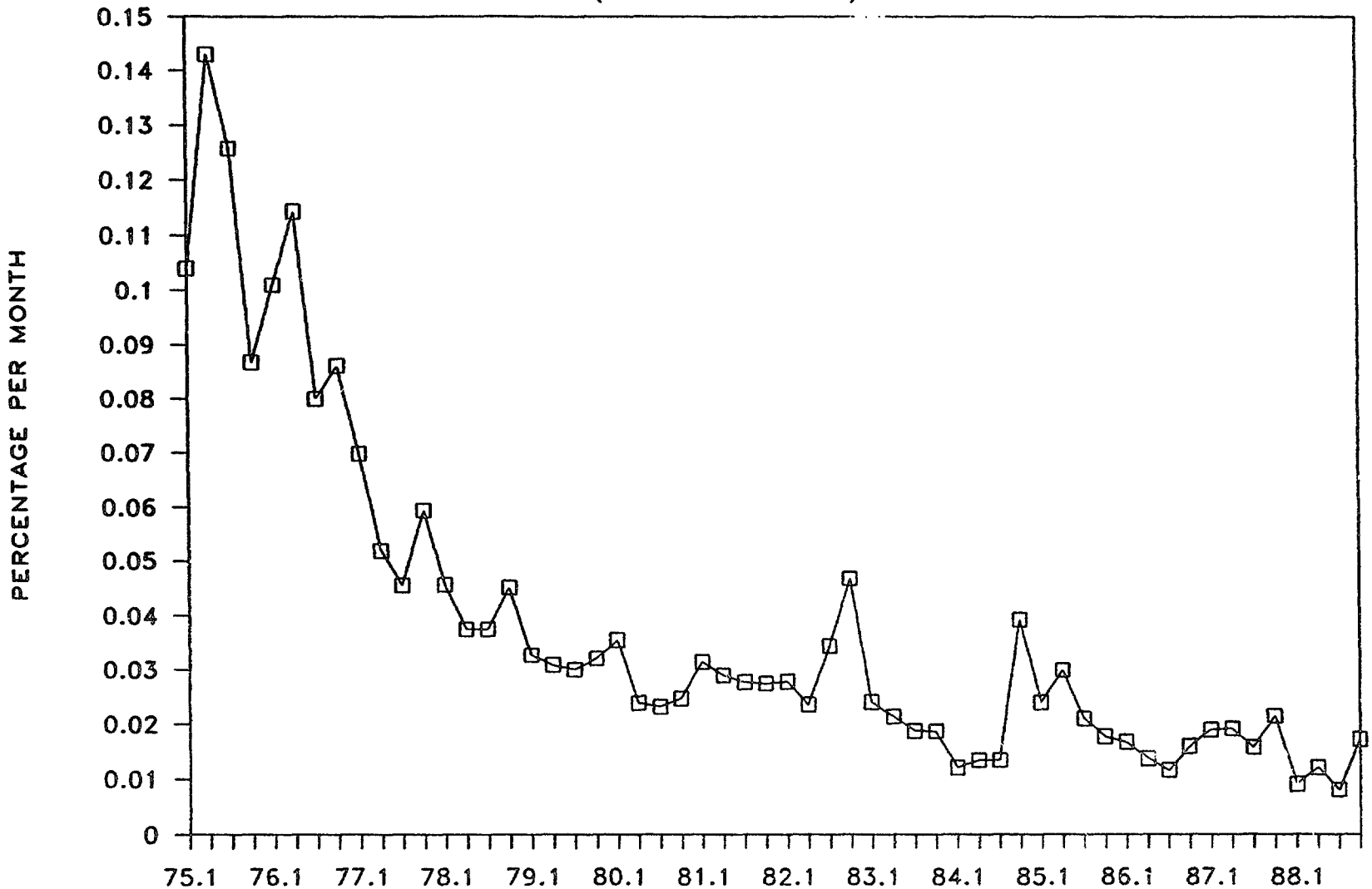


FIGURE 3.2 : INFLATION RATE

(1975.2 - 1988.4)

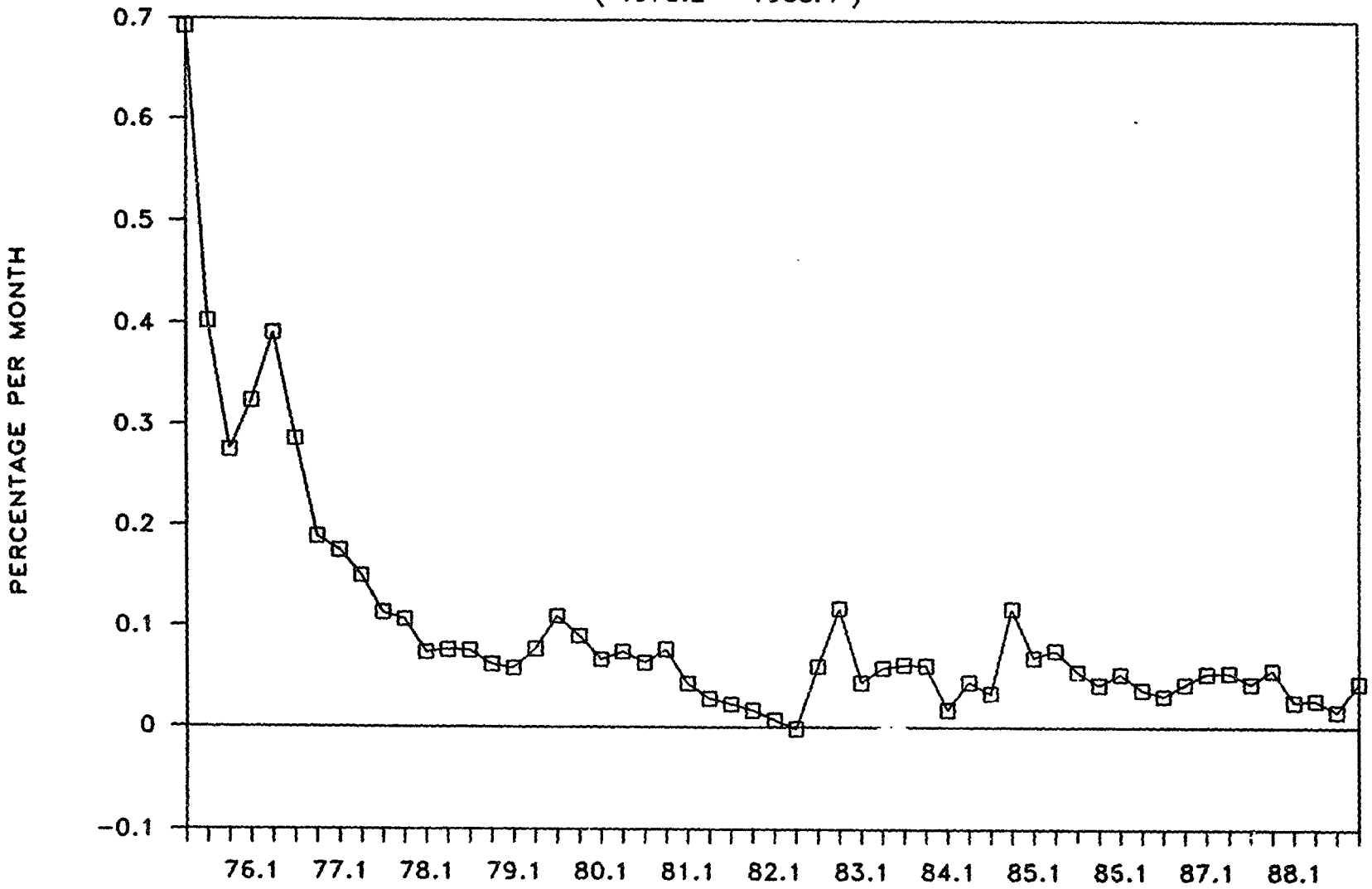


FIGURE 3.3 : MONEY (M1)

(1975.1 - 1988.4)

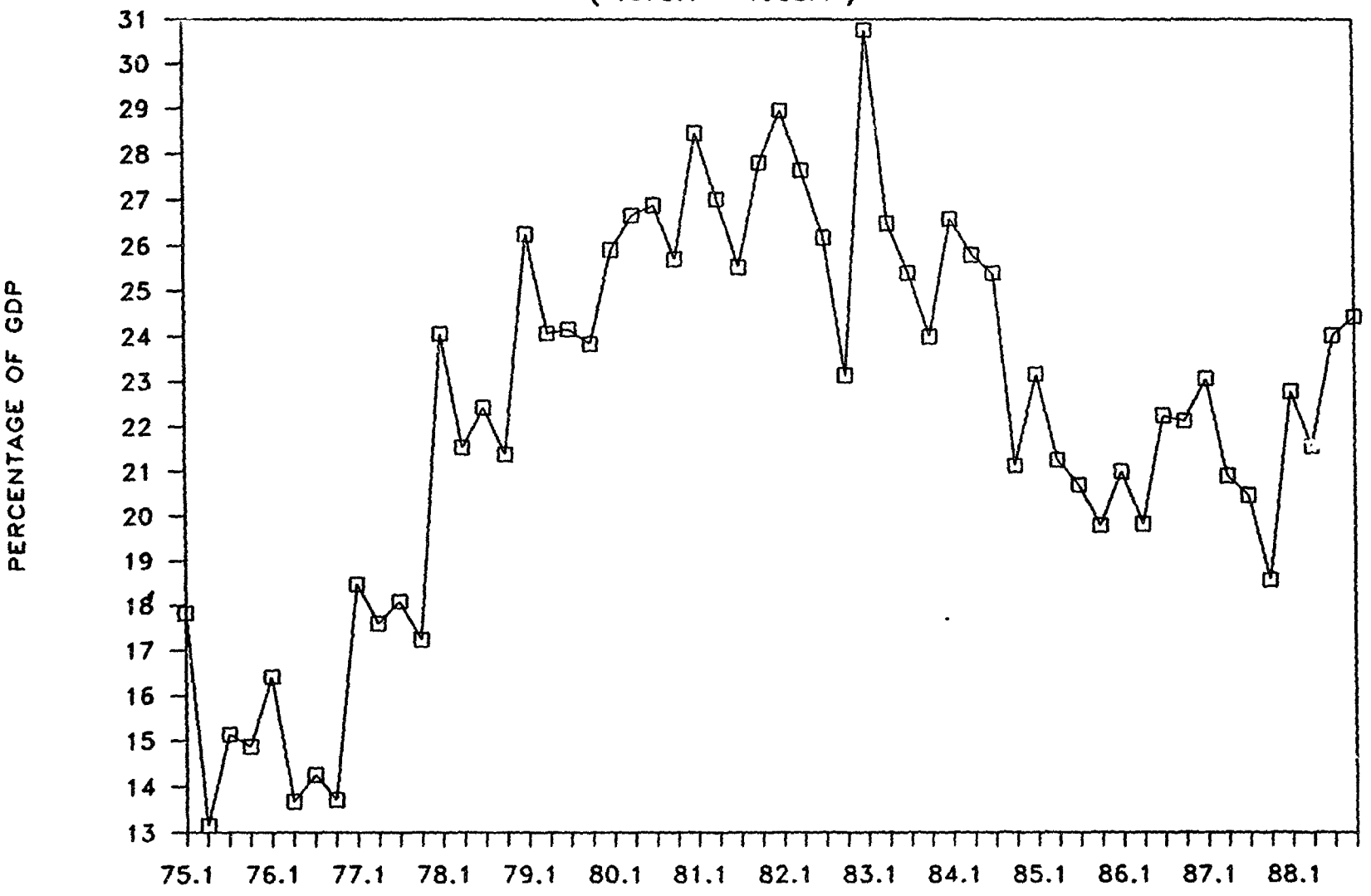
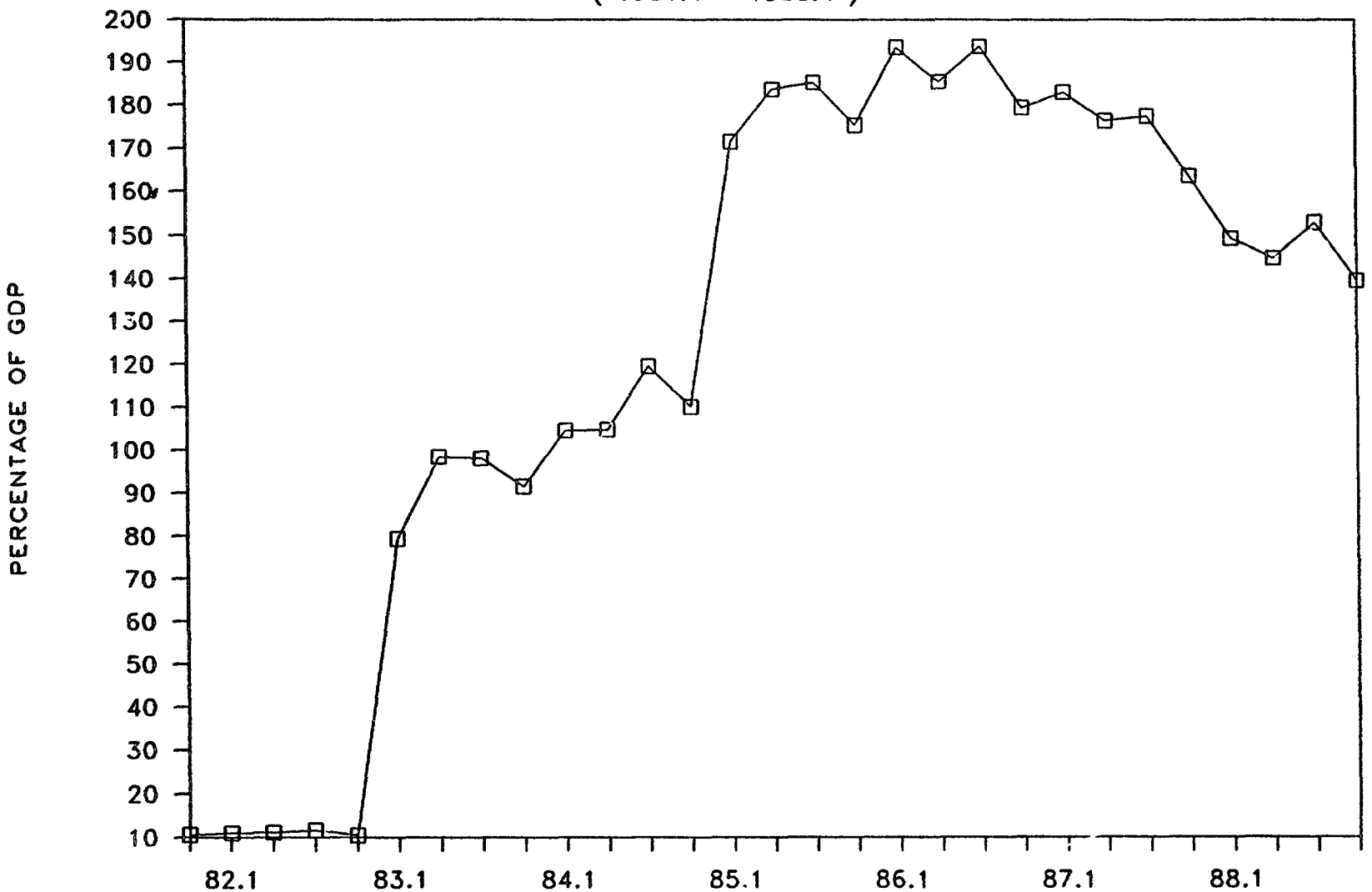


FIGURE 3.4 : PUBLIC DEBT

(1981.4 - 1988.4)



3.2 Public Deficit Financing and Private Sector Portfolio

The point of departure of the model is the basic government financing identity, which may be stated by rewriting (2.4) as an equation for the nominal total consolidated public sector deficit:

$$(3.1) \qquad G_t + i_{t-1}D_t + i^*_{t-1}e_tD^*_t = \dot{H}_t + \dot{D}_t + e_t\dot{D}^*_t$$

where G, D^*, D, H, i, i^* and e are respectively the primary deficit, the stock of foreign public debt, the stock of domestic public debt, the stock of high-powered money, the domestic nominal interest rate, the foreign nominal interest rate, and the nominal exchange rate.

The government budget identity states that the total public deficit consisting of the primary deficit plus foreign and domestic interest payments must be financed by changes in foreign and domestic public liability holdings. However, since for most developing countries after 1982 external borrowing was quasi-exogenous, an increase in the primary deficit must be basically financed by issuing bonds or by creating high-powered money. Therefore, the model will emphasize the trade-off associated with the choice between money and domestic debt financing for given levels of the primary deficit and foreign financing. This choice has serious implications for both real and nominal variables. Hence the focus in this section will be on inflation and interest rates.

Consider a small open economy that faces an exogenous flow of external credit. In each period individuals allocate their wealth, which is fixed at any point in time, among three broad assets: domestic money, public sector bonds and interest bearing foreign assets. The long-run portfolio demands for these three assets are given by the following expressions:

$$(3.2) \qquad m^d_t - p_t = \alpha_0 + \underset{\alpha_1 <> 0}{\alpha_1 y_t} + \underset{\alpha_2 < 0}{\alpha_2 i_t} + \underset{\alpha_3 < 0}{\alpha_3 (i^*_t + \delta_t)} + w_t$$

$$(3.3) \quad d_t^d - p_t = \underset{}{\beta_0} + \underset{\beta_1<>0}{\beta_1 y_t} + \underset{\beta_2>0}{\beta_2 i_t} + \underset{\beta_3<0}{\beta_3(i_t^* + \delta_t)} + w_t$$

$$(3.4) \quad e_t + m_t^* = \underset{}{\tau_0} + \underset{\tau_1<>}{\tau_1 y_t} + \underset{\tau_2<0}{\tau_2 i_t} + \underset{\tau_3>0}{\tau_3(i_t^* + \delta_t)} + w_t$$

where w is real financial wealth, y is domestic real output, p is the domestic price level, i is the domestic nominal interest rate, i^* is the foreign nominal interest rate, m is the domestic nominal money supply, m^* is foreign nominal asset holdings, d is public sector bonds, e is the nominal exchange rate, and δ is the expected rate of change of the exchange rate. All variables, except i, i^* and δ, are expressed in natural logarithms. The subscript t refers to time and the superscript d denotes demand. Expected coefficient signs are denoted below each equation.

Equations (3.2) - (3.4) specify long-run portfolio demands - as a fraction of real wealth - as depending on domestic real output, the domestic interest rate and the foreign interest rate adjusted by the expected rate of change of nominal exchange rate depreciation. Total wealth is given by the sum of the three asset holdings. Equations (3.2) - (3.4) assume implicitly unit elasticities with respect to wealth. A more general form would allow for non-unit wealth elasticities.

The wealth adding-up constraint implies that only two of the three demand equations are independent and therefore from now on we will focus on the equilibrium conditions in the domestic money and public sector bonds markets.

Let's focus now on the nature of short-run stock adjustment for the holdings of real balances and domestic public debt. Assuming a partial adjustment mechanism due to the existence of implicit

adjustment costs, the change in the stock of real balances and real public bonds holdings can be written as:

$$(3.5) \quad (\dot{m}_t - \dot{p}_t) = \underset{0<\sigma\leq 1}{\sigma}[(m_t^d - p_t) - (m_{t-1} - p_{t-1})] + \underset{\theta>0}{\theta S_t}$$

$$(3.6) \quad (\dot{d}_t - \dot{p}_t) = \underset{0<\mu\leq 1}{\mu}[(d_t^d - p_t) - (d_{t-1} - p_{t-1})] + \underset{\Omega<\Omega 1}{\Omega \dot{d}_t}$$

where the dot over a variable denotes a first-difference operator. These two equations represent the short-run equilibrium conditions in both the money and the public bonds markets. Naturally, the adding-up constraint requires that the foreign asset flow demand is a negative function of the right-hand variables included in equations (3.5)-(3.6).

Equation (3.5) suggests that a change in the determinants of the long-run demand for real balances would lead in the current period to a change in the stock of real balances which is a fraction of the difference between actual and lagged real money balances. In addition equation (3.5) includes a nominal money supply shock term (S) defined as the difference between the actual and expected rate of change in nominal money balances. This term captures the shock-absorber hypothesis proposed by Carr and Darby (1981), which states that when the government changes the rate at which it creates money, it causes a net unplanned increase in money holdings by individuals. Alternative uses of money are not found instantly, so money holdings will temporarily exceed desired levels.[9]

---

[9]Empirical studies for the Chilean economy that include a partial adjustment mechanism in the short-run demand for real balances are Acevedo and Vial (1979) and Matte and Rojas (1986). For studies that include a money supply shock term see Larraín and Larraín (1988) and Corbo (1982).

As in the case of the money market, a partial adjustment mechanism is assumed in the market for public bonds. Equation (3.6) also includes the actual rate of change in the stock of nominal public debt in the determination of the evolution over time of the level of real public bonds. This term makes explicit the effects of the increase in private saving and the transfer of resources to the private sector implied by the social security reform and the quasi-fiscal operations of the Central Bank in Chile after the debt crisis. Equation (3.6) suggests that a higher rate of the supply of nominal public bonds would increase the rate of change in real bonds holdings as a result of the positive correlation between the stock of public debt and private saving. This partial demand accommodation to supply shocks implies that the interest rate will not rise by as much it would increase in the absence of demand accommodation.

Substituting equations (3.2) and (3.3) into (3.5) and (3.6) and solving for the current values of real balances and real public bonds holdings we obtain the following equations:

$$(3.7) \quad m_t - p_t = \phi_0 + \phi_1 y_t + \phi_2 i_t + \phi_3(i_t^* + \delta_t) + \phi_4(m_{t-1} - p_{t-1}) + \phi_5 S_t + \phi_6 w_t$$

$$(3.8) \quad d_t - p_t = \Phi_0 + \Phi_1 y_t + \Phi_2 i_t + \Phi_3(i_t^* + \delta_t) + \Phi_4(d_{t-1} - p_{t-1}) + \Phi_5 S_t + \Phi_6 w_t$$

where the new ϕ_i and Θ_j coefficients are non-linear combinations of the structural coefficients of equations (3.2) - (3.6), as defined in Appendix 1.

Since the nominal stock of money and the nominal stock of domestic public debt are determined by the government budget equation (3.4) and real wealth is exogenous, equations (3.7) and (3.8) describe an adjustment mechanism for domestic prices and interest rates. Inverting these equations we can derive the reduced-form equations for the nominal interest rate and the price level.

$$(3.9) \quad i_t = \Omega_0 + \Omega_1 y_t + \Omega_2(i_t^* + \delta_t) + \Omega_3(m_{t-1} - p_{t-1}) + \Omega_4(d_{t-1} - p_{t-1}) + \Omega_5 m_t + \Omega_6 d_t + \Omega_7 d_{t-1} + \Omega_8 S_t + \Omega_9 w_t$$

$$(3.10) \quad p_t = \pi_0 + \pi_1 y_t + \pi_2(i_t^* + \delta_t) + \pi_3(m_{t-1} - p_{t-1}) + \pi_4(d_{t-1} - p_{t-1} + \pi_5 m_t + \pi_6 d_t + \pi_7 d_{t-1} + \pi_8 S_t + \pi_9 w_t$$

where the new Ω and π coefficients are also defined in Appendix 1.

Equations (3.9) and (3.10) are quite general as they do not only incorporate open and closed economy features but also allow for the possibility of distinguishing between short and long-run effect of shocks in the money and public bond markets.

In addition, the reduced-form equations make explicit the nature of the trade-offs associated to alternative strategies of domestic financing.

Table 3.1 summarizes the short and long-run effects of money and bond financed fiscal deficits on the interest rate and the price level. While the short-run effects of debt-financed deficits are ambiguous, long-run effects are positive. On the other side, short and long-run effects of money-financed deficits reduce the interest rate and raise inflation.

3.3 Empirical Results

This subsection presents the results obtained from the estimation of the short-run demands for real balances and real public debt (equations (3.7) and (3.8)), based on quarterly data for the Chilean economy.[10] We also estimated the reduced-form equations for the interest rate and the price level (equations (3.9) and (3.10)) in order to assess the ability of the model to describe directly the inflation and interest rate paths.

---

[10]The sample period for the money equation is 1976.I - 1988.IV, while for the domestic debt equation it covers 1982.I - 1988.IV.

3.3.1 Asset Demands

The estimated portfolio asset demands correspond to equations (3.7) and (3.8), amended by including exponential time trends, as reflected by the first lines of tables 3.3 and 3.4.

The estimates of the money demand equation are reported in Table 3.2. All coefficients have expected signs and almost all are significant at conventional levels. In particular, the significance of the coefficients of the unexpected nominal monetary shock (S_t) and the lagged dependent variable (m_{t-1}-p_{t-1}) indicates that real balances have been highly sensitive to money supply shocks and that the effect of a particular variable on real balance holdings is spread out over a significant period. Finally, the negative coefficient of the time variable may be related to changes in asset demands of individuals and businesses, arising from the strong financial innovations introduced between the mid-1970s and end-1980s. As a whole, these results are quite consistent with the process of stock adjustment implied by the model and suggest that conventional money demand models cannot give a consistent explanation of the behavior of real balances during this period in Chile.

Table 3.3 presents the estimates for the short-run public debt demand of equation (3.8). The results obtained are very satisfactory in terms of the overall fit and quite consistent with some of the hypotheses advanced earlier. For example, lagged real public bonds holdings turned out to be significantly positive, suggesting that if this factor is ignored a crucial element is left out of the story. On the other hand, since the coefficient of the actual rate of change in the stock of nominal public debt was not significant in preliminary regressions, the results in Table 3.3 report the estimates of equation (3.8) without this variable.

Another interesting result emerges comparing the relative size of the interest rate semi-elasticities of money and public bond holdings and the speed of adjustment in the money and public bond markets. The estimates imply a larger impact on inflation when fiscal deficits are money-financed rather than debt-financed.

TABLE 3.1

SHORT-RUN AND LONG-RUN CONSEQUENCES
OF FISCAL DEFICITS ON INTEREST RATES AND PRICES

	Financed by Money Creation	Financed by Public Debt Rise
INTEREST RATE		
Short Run Effect	$\frac{-(1-\theta)}{\mu\beta_2 - \sigma\alpha_2} < 0$	$\frac{1-\Omega}{\mu\beta_2 - \sigma\alpha_2}$?
Long Run Effect	$\frac{-1}{\beta_2 - \alpha_2} < 0$	$\frac{1}{\beta_2 - \alpha_2} > 0$
PRICE LEVEL		
Short Run Effect	$\frac{\mu\beta_2(1-\theta)}{\mu\beta_2 - \sigma\alpha_2} > 0$	$\frac{\sigma\alpha_2(\Omega-1)}{\mu\beta_2 - \sigma\alpha_2}$?
Long Run Effect	$\frac{\beta_2}{\beta_2 - \alpha_2} > 0$	$\frac{-\alpha_2}{\beta_2 - \alpha_2} > 0$

3.3.2 Reduced-Form Equations for Interest Rates and Prices

In order to assess the ability of the model to explain directly the behavior of interest rates and prices, we estimated their reduced-form equations for a 1983.I-1988.IV sample.

Table 3.4 reports the estimated coefficients for both the interest rate and the price level equations (3.9) and (3.10). The results are quite consistent with the hypothesis implied by the model and with the results obtained from the estimation of the structural equations (3.7) and (3.8). All variables with an unambiguous effect on the interest rate and the price level present the expected signs. The only exception is lagged real public bond holdings, which has the wrong sign in both the interest rate and the price level equations, but is not significant. This result can be explained in terms of the values of the estimated coefficients of the structural equations. For a high value of the coefficient related to the adjustment speed in the public bonds market (μ) -- which is the case according to our estimations -- the model implies small values for the coefficients of lagged real public bonds in the reduced-form equations (see Appendix 1). In addition, for those variables with an ambiguous effect in the reduced-form equations, the signs of the estimated coefficients coincide in all cases with the signs implied by the values obtained from the structural equations.

On the other hand, the overall fit for both the price level and the interest rate equations is quite satisfactory, in particular for a period dominated by frequent changes in government interventions and private expectations. The results also tend to confirm the hypothesis, implicit in the model, that the nominal interest rate and the price level have been sensitive to both foreign and domestic influences.

An interesting result concerns the effect of lagged real balances in the interest rate equation. As opposed to Edwards (1988) findings, here is clear evidence of a positive relationship between the interest rate and lagged real balances.

TABLE 3.2
ESTIMATION RESULTS FOR THE MONEY DEMAND
(1976.I - 1988.IV)

$$m_t - p_t = \phi_0 + \phi_1 y_t + \phi_2 i_t + \phi_3(i^*_t + \delta_t) + \phi_4(m_{t-1} - p_{t-1}) + \phi_5 S_t + \Gamma_1 TIME$$

	OLS	AR1	NLS
ϕ_0	-1.582	-1.959	
	(1.3)	(1.5)	
ϕ_1	0.415	0.486	
	(3.5)	(3.9)	
ϕ_2	-3.101	-3.595	
	(4.1)	(4.6)	
ϕ_3	-0.165	-0.102	
	(0.9)	(0.6)	
ϕ_4	0.702	0.660	
	(15.2)	(12.6)	
ϕ_5	0.148	0.151	
	(3.5)	(4.1)	
Γ_1	-0.004	-0.004	
	(4.1)	(4.0)	
σ	0.298	0.340	
α_1	1.390	1.430	1.394
α_2	-10.410	-10.590	-10.414
α_3	-0.550	-0.300	-0.555
$\overline{R^2}$	0.972	0.979	0.972
h	1.947	0.570	1.947
rho		0.285	

Note: t-values are in parenthesis. h is Durbin's h and rho is the residual first-order correlation coefficient. The estimation methods were: Ordinary Least Squares (OLS). Maximum Likelihood for AR1 residuals (AR1), and Nonlinear Least Squares (NLS).

TABLE 3.3

ESTIMATION RESULTS FOR THE PUBLIC DEBT DEMAND
(1983.I - 1988.IV)

$$d_t - p_t = \Phi_0 + \Phi_1 y_t + \Phi_2 i_t + \Phi_3(i^*_t+\delta_t) + \Phi_4(d_{t-1}-p_{t-1}) + \Phi_5 d_t + \Gamma_2 TIME$$

	OLS	AR1	NLS	
Φ_0	55.005 (3.8)		51.932 (3.7)	
Φ_1	-4.249 (3.3)		-3.956 (3.2)	
Φ_2	19.024 (2.6)		19.175 (2.7)	
Φ_3	-2.816 (2.1)		-2.820 (2.1)	
Φ_4	0.305 (4.6)		0.281 (4.2)	
Φ_5	-		-	
Γ_2	0.081 (4.5)		-0.082 (4.4)	
μ	0.695		0.719	
$ß_1$	-6.115		-5.502	-6.117
$ß_2$	27.380		26.668	27.381
$ß_3$	-4.052		-3.922	-4.054
$\overline{R^2}$	0.872		0.816	0.872
h	0.375		0.570	
rho			0.285	

Note: see table 3.2.

TABLE 3.4

REDUCED-FORM ESTIMATION RESULTS FOR THE INTEREST RATE AND THE PRICE LEVEL
(1983.II - 1988.IV)

(OLS)

	INTEREST RATE	PRICE LEVEL
CONSTANT	-1.170 (2.5)	-8.810 (1.3)
y_t	0.084 (1.9)	0.170 (0.3)
$(i^*_t+\delta_t)$	0.106 (4.8)	0.632 (1.9)
$(m_{t-1}-p_{t-1})$	0.055 (2.8)	-0.110 (0.4)
$(d_{t-1}-p_{t-1})$	0.00026 (0.03)	0.064 (0.6)
m_t	0.014 (1.9)	0.514 (2.0)
d_t	0.004 (0.5)	0.182 (1.6)
S_t	0.0039 (0.5)	-0.068 (0.6)
$\overline{R^2}$	0.757	0.977
DW	1.720	1.500

Note: t-values in parenthesis. DW is the Durbin-Watson statistic.

3.4 Simulation Results

The results reported in Tables 3.2 and 3.3 were used to simulate the impact of inflation on seignorage revenue and the effects on the interest rate and the price level of a change in the fiscal deficit under alternative strategies of domestic financing. In the simulation exercises that follow we used the multipliers summarized in Table 3.1 and the estimated coefficients of the first columns of Tables 3.2 and 3.3.

3.4.1 Inflation and the Inflation Tax

Figure 3.5 shows the steady state relationship between inflation rates and the inflation tax revenue derived from our estimated coefficients of the money demand equation and assuming no growth in the exogenous variables. The revenue-maximizing monthly inflation rate is 20%, which yields an inflation tax revenue of about 2% of GDP. Little tax gain is obtained from raising inflation. At an inflation rate of 2% per month the revenue is about 0.5% of GDP. Raising the inflation rate from 2% to 20% per month, increases seignorage revenue by only 1.5% percentage points of GDP.

3.4.2 Effects of a 100% Increase in the Fiscal Deficit

To simulate the effects of a one-period increase in the public sector deficit we have assumed that before the fiscal shock occurs the economy is at a steady-state equilibrium, with a 1% of GDP deficit and a 0.2 money/GDP ratio.[11]

Table 3.5 summarizes the magnitude of the short and long-run effects of a money-financed, transitory 100% rise in the fiscal deficit. The fiscal shock results in a fall in the interest rate by 0.39 percentage points in the first period and a long run decline of about 0.27 percentage points. The effect of the fiscal shock on the price level is of about 7% both in the short run and long run. This

[11] Recall that flow variables, such as GDP, are quarterly figures.

exercise suggests that the main effect of a change in the deficit financed by money creation is in the first period. In addition, since the increase in the price level never matches the increase in the stock of money required to finance the fiscal shock, this simulation suggests that money has real effects. The dynamic behavior of the interest rate and the price level after a money-financed 100% increase in the fiscal deficit are shown in Figures 3.6 and 3.7.

Let's consider now the case of a 100% increase in the fiscal deficit financed by issuing public bonds. In this case, the fiscal shock requires only a 2% increase in the stock of public debt. The short and long-run effects are reported in Table 3.6. The results indicate that the increase in the fiscal deficit will induce a slight increase in the interest rate and the price level. Because the interest rate rises, the rise in inflation required to maintain the portfolio equilibrium is much lower than under the money-financed deficit. The dynamic behavior of the interest rate and the price level after a bond-financed fiscal shock are depicted in Figures 3.8 and 3.9 respectively.

In summary, these results suggest that the main impact of a change in the fiscal deficit occurs in the first quarter. The only exception is the gradual rise in prices when the fiscal deficit is financed by domestic borrowing. In addition, the exercises show a small impact on interest rates and prices of a debt-financed deficit. This result reflects the specific features of the sample period of our estimates. In particular, the transfer payments to the private sector implied by the social security reform and the quasi-fiscal operations are the main factors behind the small impact of debt-financed fiscal deficits on interest rates and prices.

TABLE 3.5

EFFECTS OF MONEY-FINANCED INCREASE IN FISCAL DEFICIT

	SHORT RUN	LONG RUN
Change in Interest Rate (Percentage Points)	-0.385	-0.265
Change in Price Level (100 d log p)	7.326	7.245

TABLE 3.6

EFFECTS OF PUBLIC DEBT-FINANCED INCREASE IN FISCAL DEFICIT

	SHORT RUN	LONG RUN
Change in Interest Rate (Percentage Points)	0.090	0.053
Change in Price Level (100 d log p)	0.280	0.551

FIGURE 3.5 : SEIGNORAGE REVENUE

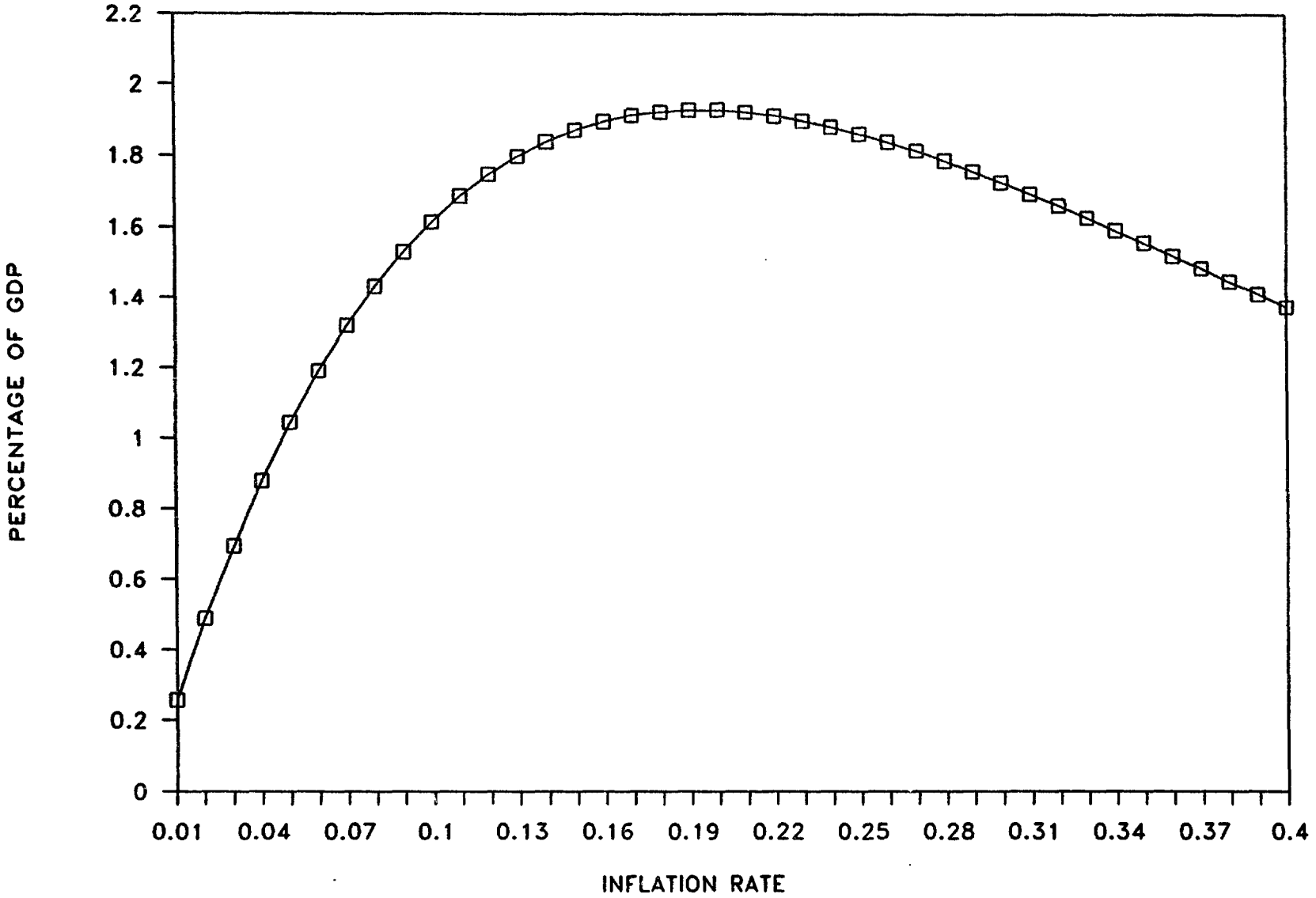


FIGURE 3.6 : INTEREST RATE

EFFECT OF A MONEY FINANCED DEFICIT

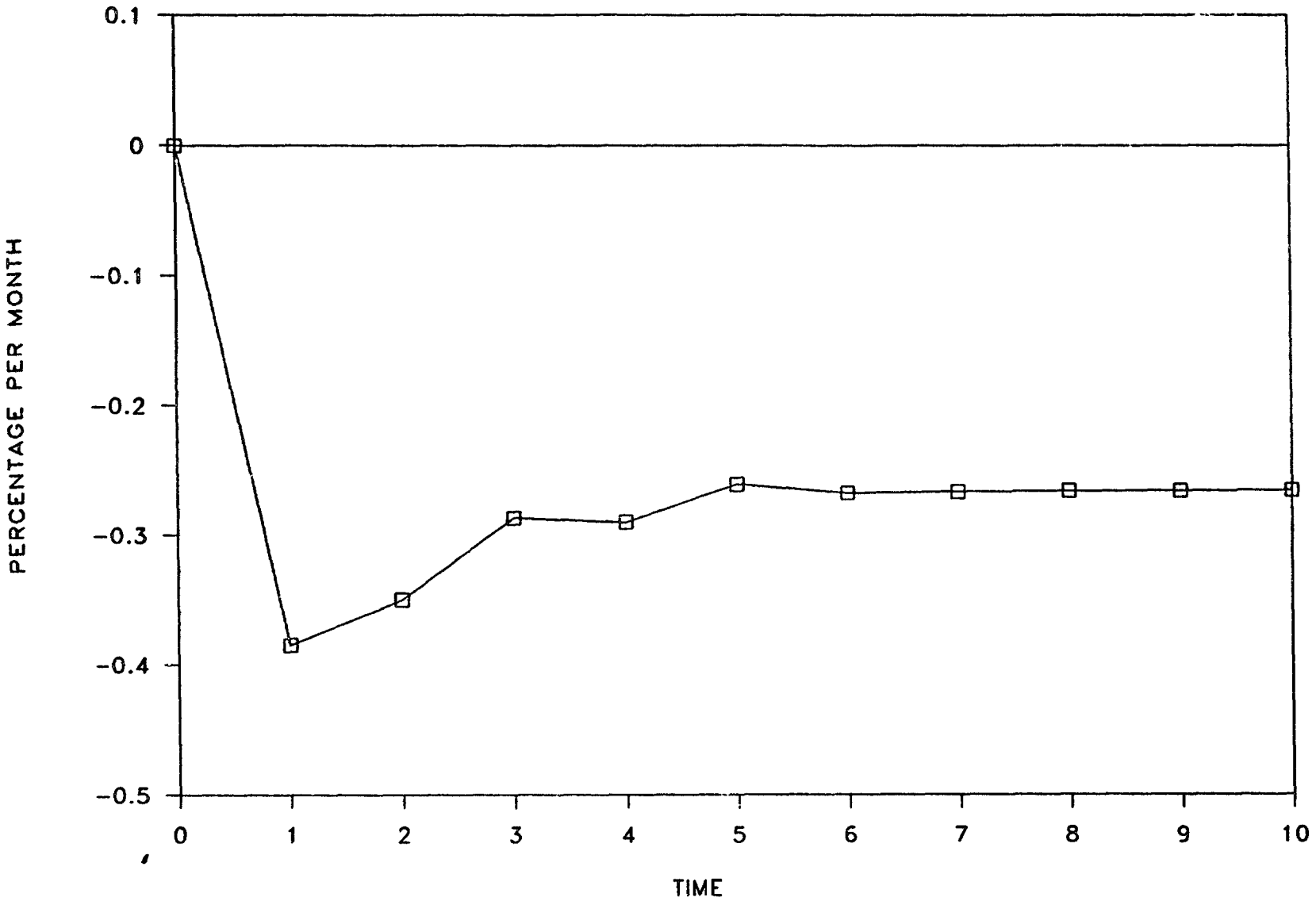


FIGURE 3.7 : PRICE LEVEL

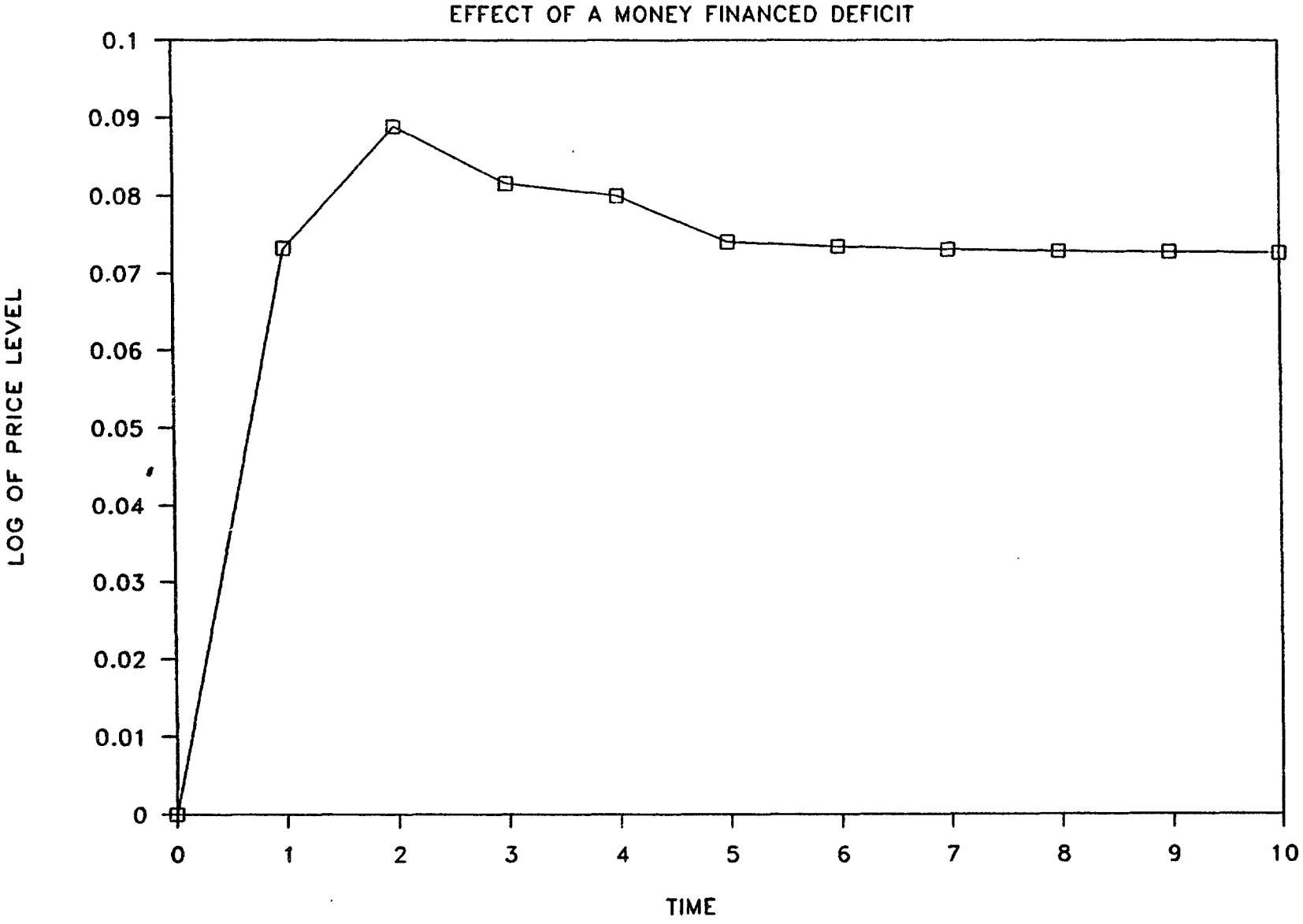


FIGURE 3.8 : INTEREST RATE

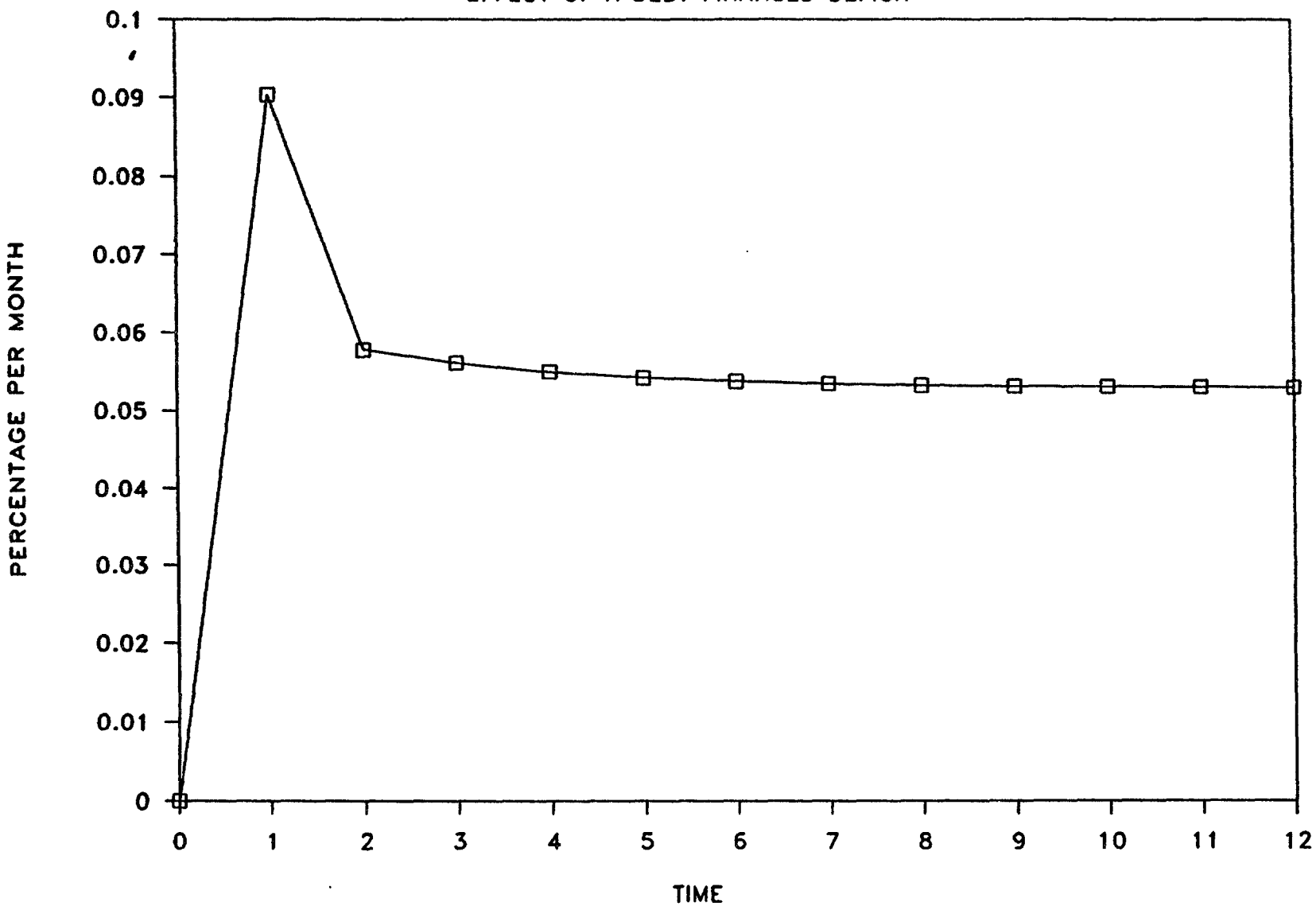
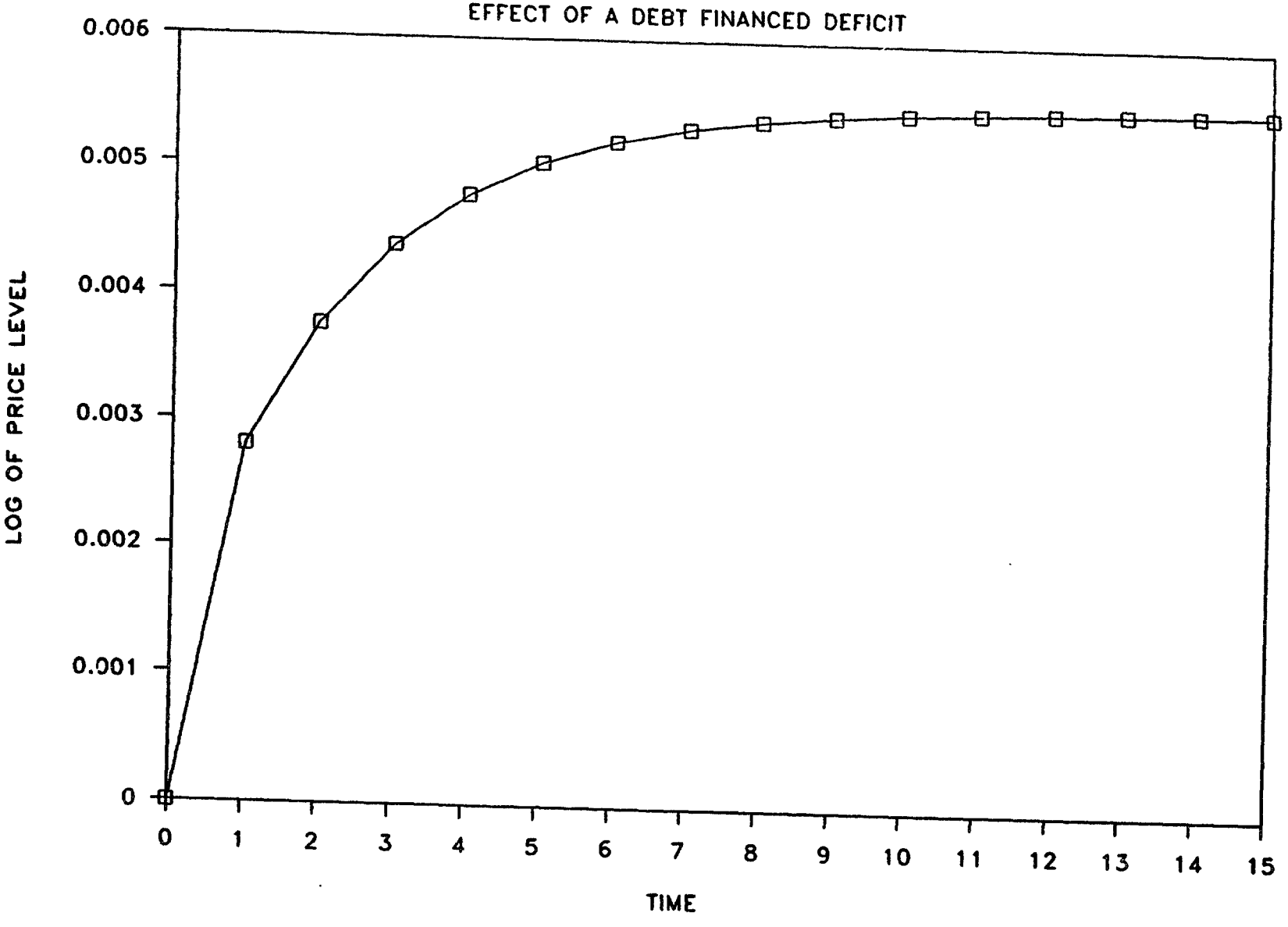


FIGURE 3.9 : PRICE LEVEL



4. PRIVATE CONSUMPTION AND PRIVATE INVESTMENT

This section goes a step further in analyzing the macroeconomic implications of public sector deficits by assessing the impact of the public sector on private sector spending in Chile. Therefore the focus is on the sensitivity of private consumption and investment to fiscal variables, in addition to indirect effects of them via interest rates, inflation or private disposable income. How private saving and capital formation are affected by fiscal policies has significant implications for both short-term stabilization issues and long-run growth prospects.

Figures 4.1 and 4.2 show the evolution of the private consumption to private disposable income ratio and the private investment to GDP ratio during the last three decades.

Not surprisingly, private consumption has tended to be counter-cyclical, i.e. consumption does not decline as strongly as private disposable income during recessions, such as those of 1975 and 1982-1983. Two high consumption episodes coincided with the fiscal-monetary expansion of the early seventies and the foreign-financed private spending boom of 10 years later. A distinct structural change takes place after 1984: private consumption as a ratio of disposable income reaches the lowest values in three decades, and stays there throughout the 1985-1988 recovery - an important counterpart to the significant current account adjustment which took place in the 1980s.

The private investment rate shows wild swings during the 1960-1988 period in Chile. After a historical decline to 5% of GDP during the early 1970s, it starts a continuous recovery, to boom in the early 1980s. Then private capital formation took a dive coincident with the 1982-83 recession and subsequent policy uncertainty. Investment remained low in 1984-1986 before picking up again in 1987 and 1988. It is estimated that the private investment rate could surpass 16% of GDP in 1990.

4.1 Private Consumption

This subsection, significantly based on a framework developed by Corbo and Schmidt-Hebbel (1991), addresses the effects of public policies on consumption in Chile.

Direct effects of fiscal policies on consumption or saving operate through public saving (or the deficit) and its composition. If the stringent conditions required for Ricardian equivalence are satisfied, a rise in public saving, if it is done via lower public spending, is exactly offset by an increase in consumption. As disposable income does not change, the reduction in private saving matches the increase in public saving. A rise in public saving does no affect consumption at all if it is made possible via higher taxes. But as disposable income is reduced by the size of the tax, the reduction in private saving also matches the increase in public saving (the latter being macroeconomically equivalent to issuing more public debt). The opposite results are predicted by the Keynesian (and permanent income without Ricardian equivalence) hypotheses: current (permanent) taxes matter for consumption, not current (permanent) public spending levels.

The Ricardian hypothesis has been widely rejected in empirical studies for industrialized countries. Most of these studies identify the existence of pervasive borrowing constraints as the main cause for its rejection.[12] A study for a set of developing countries by Montiel and Haque (1987) tests for two different causes which could explain a deviation from Ricardian equivalence: higher private than government discount rates (due to Blanchard-Yaari infinite-lived households facing a mortality probability) and liquidity constraints. They find significant evidence for the latter causing a deviation from Ricardian equivalence without much support for the former.

---

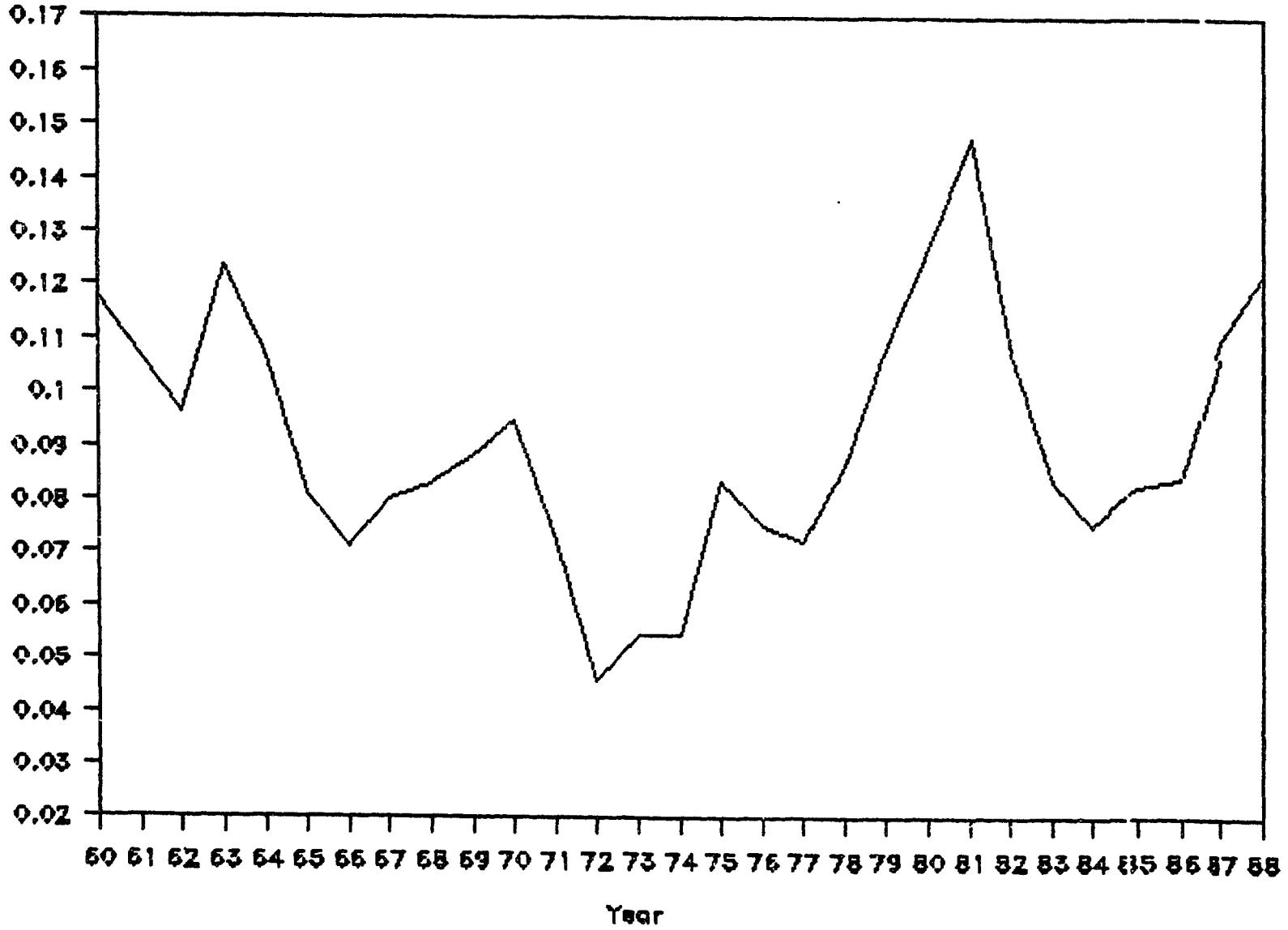
[12]For Ricardian equivalence to hold, the main conditions to be satisfied jointly are: absence of liquidity constraints, equal rates of discount for the public and private sectors, and certainty on future income, tax and public sector expenditure flows. For a further discussion of these conditions and surveys of empirical studies see Hayashi (1985), Hubbard and Judd (1986), Bernheim (1987), and Leiderman and Blejer (1989).

FIGURE 4.1

Chile: Private Consumption to Private Disposable Income Ratio
(C/YD)

FIGURE 4.2

Chile: Private Investment to GDP Ratio
(I/Y)



Borrowing constraints, proxied by current income or financial asset holdings, are also major determinants in the cross-developing country studies for private consumption and household saving by Rossi (1989) and Schmidt-Hebbel, Webb and Corsetti (1991), respectively.

Indirect effects of public (fiscal-monetary) policies on consumption operate via the impact of public deficits and their financing on major prices affecting private consumption: real interest rates, inflation, and the real exchange rate. Real interest rates affect private consumption only if the well-known substitution, income and wealth effects do not cancel each other. This seems not to be the case, judging from the growing evidence which shows that consumption is not sensitive to real interest rates.[13] While inflation's first order effect is on the composition of the savings stock and not on saving or consumption flows, it may have second-order effects reducing saving if it is associated to capital flight or increasing (precautionary) saving if it raises uncertainty. An expected devaluation reduces the consumption-based real interest rate and leads to capital flight - the first effect could increase actual consumption while capital flight raises the measured consumption to income ratio if capital flight reduces measured income.[14]

Substitution effects from fiscal policies could arise when fiscal spending on privately appropriated services (education, health, nutrition) and direct transfers to households reduce the need for private consumption expenditure on these categories, hence leading to possible declines in aggregate private consumption (see Easterly et al., 1989).

---

[13]Among the studies on the interest-insensitivity of saving in developing countries see, for instance, Giovannini (1985), Corbo and Schmidt-Hebbel (1991), and Schmidt-Hebbel, Webb and Corsetti (1991). For an alternate view, see Fry (1988) and Balassa (1989).

[14]For the theory and the Latin American experience on the role of consumption-based real interest rates on intertemporal consumption allocation see Dornbusch (1983, 1985), and for the relation between saving and capital flight see Dornbusch (1989).

Monetary policy and financial reform affect the aggregate of monetary and quasi-monetary assets. Higher holdings of broad money tend to increase consumption for two reasons: first they are a major component of private financial wealth and second they tend to reduce the incidence of borrowing constraints faced by at least a subgroup of consumers. Another form of liquidity constraints are those imposed by foreign lenders. Particularly after 1982 foreign saving tends to reflect the foreign resource constraint imposed by foreign lenders and not the excess of income over unconstrained domestic absorption.

Let's start the discussion of a relevant framework for assessing the impact of public policies on private consumption by referring to a standard linear form for testing the Ricardian equivalence proposition, based on Bernheim's (1987) survey:

$$(4.1) \quad C_{pt} = \alpha_0 + \alpha_1 (YN_t - T_t + i_t D_t) + \alpha_2 (T_t - E_{Gt} - i_t D_t) + \\ + \alpha_4 D_t + \alpha_5 W_t + v_{2t}$$

where C_P is private consumption, YN is national income, T is tax revenue net of transfers and subsidies to the private sector, i is the nominal interest rate, D is government (domestic) debt, E_G is public spending, W is private wealth, and v_2 is a stochastic error term. Hence the first right-hand determinant is private disposable income and the second is the nominal or total government surplus.

Three simple null hypotheses can be tested with this specification:

(i) Keynesian hypothesis: $\alpha_0 > 0$, $\alpha_1 > 0$, other coefficients 0;

(ii) Permanent income hypothesis without Ricardian equivalence:

$\alpha_4 > 0$, $\alpha_5 > 0$, other coefficients 0;

(iii) Ricardian equivalence: $\alpha_1 = \alpha_2 > 0$, other coefficients equal to 0.

However, the specification in equation 4.1 presents various shortcomings.[15] First, public saving and not the public surplus should be the relevant determinant in 4.2, because public investment adds to real capital and therefore constitutes "net wealth" (Barro, 1974). Under inflation, only the real component of domestic interest payments should enter both the private disposable income and the government surplus (saving)[16]. Third, permanent, not current private disposable income and public surplus (saving) should enter equation (4.1) for a fair test of the Ricardian proposition. Finally, additional potential consumption determinants, such as foreign payments, the real interest rate or inflation, should be included.

The following specification for the private consumption to private disposable income ratio takes care of the above mentioned shortcomings. In addition, the scaling of non-stationary variables to private disposable income reduces the incidence of non-stationarity problems:

$$(4.2)\qquad \frac{C_{pt}}{DY_{pt}} = \beta_0 + \beta_1 \frac{PDY_{pt}}{DY_{pt}} + \beta_2 \frac{PS_{gt}}{DY_{pt}} + \beta_3 r_{ct} + \beta_4 \pi_{ct} + \beta_5 \frac{P_{cmt}}{P_{cnt}} + \beta_6 \frac{CPTR_t}{DY_{pt}} + \beta_7 \frac{H_t}{DY_{pt}} + \beta_8 \frac{FS_t}{DY_{pt}} + \nu_t$$

where DY_p is current private disposable income, PDY_p is permanent private disposable income, PS_g is permanent public saving, r_c is the consumption-based real interest rate, π_c is consumption inflation, P_{cm} and P_{cn} are prices for imported and national private consumption goods, respectively, CPTR is

---

[15]Bernheim (1987) addresses the third and fourth limitations discussed below.

[16]The inflation component of interest payments on the public debt, which compensates for the loss in principal due to inflation, is put back into public bond holdings by private investors aiming at maintaining constant real holdings of public debt.

the sum of public expenditure on privately appropriated services and direct transfers to consumers, H is base money, FS is foreign saving, and v is a stochastic error term.

Again, β_0, β_1, and β_2 are associated to the corresponding Keynesian, permanent-income and Ricardian hypotheses. Note, however, that β_2 could be positive due to a financial market structure giving preferential access to bank credit to the public sector and hence allocating the residual to private consumption (and investment). This direct form of crowding out of private saving by public sector saving behavior has obviously nothing to do with Ricardian unconstrained, forward-looking private consumers internalizing the government's intertemporal budget constraint.

Expected signs of the coefficients are the following: $\beta_0, \beta_1, \beta_2, \beta_7, \beta_8 > 0$; $\beta_6 < 0$; $\beta_3, \beta_4, \beta_5 <> 0$.

Permanent private disposable income and permanent public saving are consistent with the following definitions for their corresponding current values:

$$(4.3) \quad DY_{Pt} \equiv GDP_t - NFP_{Pt} - T_t + r_t D_t$$

$$(4.4) \quad S_{Gt} \equiv T_t - C_{Gt} - NFP_{Gt} - r_t D_t$$

where GDP is gross domestic product, NFP_P is net foreign payments made by the private sector, S_G is current public saving, C_G is public consumption, and NFP_G is net foreign payments made by the public sector. Note that D refers now only to the domestic public debt.

For the "permanent" values of any variable (private disposable income and public saving in this section, and other variables in the investment section below) we specify two alternatives. The first is defining expectations of the permanent values consistent with partial perfect foresight, defined

as the simple average of the contemporaneous variable and two periods into the future, for any variable x:

(4.5a) $Px_t = [x_t + x_{t+1} + x_{t+2}]/3$

where Px defines the expected permanent value of variable x.

The second alternative is the simple static expectations specification which allocates a 100% weight to the contemporaneous value in (4.5a), as follows:

(4.5b) $Px_t = x_t$

Similar assumptions are made with respect to expected consumption inflation (and expected investment inflation in section 4.2 below). A first alternative takes actual inflation between today and tomorrow as the relevant proxy for rationally expected inflation. The second alternative is static, specifying the expected price change to be equal to the actual price change between yesterday and today.

Equation 4.2 was tested using annual data covering the 1960-1988 period, which is the sample period used in most of sections 4 and 5 of this study. This is a relatively long period in Chilean recent economic history, characterized by significant structural breaks and policy regime changes, which due to their intensity introduces a note of caution when interpreting the statistical results presented below.

Table 4.1 presents a selected number of empirical results for the consumption function, separately for the static and partial perfect foresight (PPF) versions for all expectations. Lines 1.1 and 2.1 of the table present results for the complete specification of equation 4.2. In general, the

results of the static expectations version dominate statistically those related to the partial perfect foresight case.[17]

The average Chilean consumer appears to be partly Keynesian, partly PIH forward looking: under the static version, her marginal propensity to consume out of current private disposable income is approximately 0.70 and her marginal propensity to consume out of permanent income is around 0.30. Under the PPF version the corresponding propensities are of a similar magnitude, close to 0.50. Interestingly, she does not react to permanent public saving; i.e., the consolidated public sector deficit (abstracting from public investment) has no effect on private consumption. The policy implication is clear: an increase in public sector saving has a strong effect on national saving, not neutralized by a decline in private saving.

Of all relevant prices, only the real exchange rate (given by the relative price of imported to national consumption goods components of aggregate consumption), affects private consumption. A 10% real devaluation, which would affect directly this relative price, would reduce aggregate consumption by approximately a 1 percentage point of private disposable income. However, neither the real interest rate nor the inflation rate have any consistently significant, separate effects on private consumption, corroborating previous studies on the interest insensitivity of consumption in Chile (Schmidt-Hebbel, 1987, 1988, Arrau, 1989).

In addition, there is no evidence of a substitution effect of public spending on privately appropriate services (education, health) and transfers on aggregate consumption.

Monetary holdings and foreign saving flows exert significant positive influences on private consumption. While higher base money holdings tend to relax domestic borrowing constraints faced by consumers, higher foreign saving is associated to weaker foreign resource constraints. The effect

---

[17]This results mimics the quarterly structural consumption function results for Chile in Schmidt-Hebbel (1988), which are stronger for the backward than for the forward-looking expectations specifications.

of the latter variable on private consumption is very strong: from the results one can infer that between 42% and 71% of the dramatic current account correction which took place after 1981 was borne by private consumers.

The policy implications of our results are quite clear. In the first place, there is no evidence of a direct effect of the public deficit on private consumption; consumers are neither Ricardian nor directly crowded out by public spending in Chile. A transitory deficit reduction financed by a transitory tax hike reduces private disposable income, and hence private consumption and saving. If the tax hike is permanent, private consumption will take the brunt of the reduction in (current and permanent) private disposable income, without private saving being significantly affected.

On the other side, there are no indirect effects of domestic financing via changes in the real interest and inflation rates on consumption. However, if inflation reduces real base money, private consumption would be affected.

Foreign adjustments have strong effects on private consumption in Chile. The combination of lower foreign saving and a higher real exchange rate has a strong negative effect on private consumption expenditure, as evidenced during the post-1982 adjustment period.

4.2 Private Investment

Following Easterly et al. (1989) and empirical investment studies for Chile by Solimano (1990) and Morocco by Schmidt-Hebel and Mueller (1990), we specify a behavioral function for private investment which will depend on neoclassical profit and cost variables, liquidity constraints, and risk determinants. To avoid again spurious correlation, we scale all non-stationary variables to GDP. Therefore we specify the following generic equation for the private investment to GDP ratio:

TABLE 4.1

PRIVATE CONSUMPTION (CHILE, 1960-1988)

Dependent Variable: Private Consumption to Private Disposable Income Ratio (Cp/DYp)

Equations	C	$\frac{PDYp}{DY_p}$	$\frac{PSg}{DY_p}$	r_e	π_e	$\frac{Pcm}{Pcn}$	$\frac{CPTR}{DY_p}$	$\frac{H}{DY_p}$	$\frac{FS}{DY_p}$	Rho	R^2A	DW
1. Static Expectations												
1.1 OLS	0.71 (10.4)	0.28 (4.1)	0.18 (0.8)	0.05 (1.7)	-0.02 (-0.5)	-0.14 (-3.0)	0.12 (0.4)	0.29 (3.2)	0.24 (1.7)	-	0.79	1.77
1.2 OLS	0.74 (9.8)	0.25 (3.2)	0.36 (1.6)	-	-	-0.13 (-5.2)	-	0.23 (2.6)	0.37 (2.5)	-	0.72	1.52
1.2A ML	0.66 (10.0)	0.26 (3.7)	0.29 (1.2)	-	-	-0.08 (-2.2)	-	0.45 (3.8)	0.41 (2.8)	0.59 (3.5)	0.90	1.75
1.3 OLS	0.72 (9.4)	0.27 (3.5)	-	-	-	-0.13 (-5.0)	-	0.24 (2.6)	0.48 3.6)	-	0.70	1.38
1.3A ML	0.67 (10.0)	0.27 (3.9)	-	-	-	-0.09 (-2.4)	-	0.44 (3.7)	0.42 (2.8)	0.57 (13.4)	0.89	1.50
2. Partial Perfect Foresight												
2.1 OLS	0.49 (2.6)	0.49 (2.8)	0.002 (0.005)	0.0004 (0.0008)	0.08 (1.2)	-0.19 (-3.6)	0.04 (0.09)	0.28 (1.5)	0.87 (4.0)	-	0.63	1.32
2.1A ML	0.38 (2.9)	0.50 (3.6)	0.38 (0.8)	-0.03 (-0.6)	0.03 (0.4)	-0.11 (-2.1)	0.24 (0.5)	0.52 (3.0)	0.68 (4.1)	0.67 (4.1)	0.89	1.39
2.2A ML	0.42 (3.4)	0.48 (3.7)	0.14 (0.4)	-	-	-0.10 (-2.4)	-	0.58 (4.8)	0.71 (4.6)	0.62 (3.9)	0.89	1.41
2.3A ML	0.43 (3.5)	0.48 3.80	-	-	-	-0.10 (-2.6)		0.57 (4.9)	0.73 (4.9)	0.60 (3.7)	0.90	1.43

Note: Rho is the first-order residual correlation coefficient.

$$(4.6)\quad \frac{I_{pt}}{Y_t} = \frac{I}{Y}\Big(PUCK_t, P\Big(\frac{K_{pt-1}}{Y_t}, \frac{P_{ipmt}}{P_{ipnt}}, \frac{PCOT_t}{Y_t}, \frac{K_{gt-1}}{Y_t}, \frac{PRO_t}{Y_t}, \frac{FC_t}{Y_t},$$

$$\underset{(-)}{} \quad \underset{(-)}{} \quad \underset{(?)}{} \quad \underset{(-)}{} \quad \underset{(+)}{} \quad \underset{(+)}{} \quad \underset{(+)}{}$$

$$\frac{H_{t-1}}{Y_t}, \frac{FS_t}{Y_t}, VUCK_t, VY_t\Big)$$

$$\underset{(+)}{} \quad \underset{(+)}{} \quad \underset{(-)}{} \quad \underset{(-)}{}$$

where I_p is private fixed-capital investment, Y is GDP, UCK is the user cost of capital and PUCK is the estimated permanent UCK, K_{-1}/Y is the private sector capital output ratio and PK_{-1}/Y is its permanent estimate, P_{ipm}/P_{ipn} is the price ratio of imported and national private investment components, COT is corporate tax revenue and PCOT is its permanent estimate, K_g is the public sector capital stock, PRO is corporate profits, FC is banking credit flows to firms, H is base money, FS is foreign saving, VUCK is the coefficient of variation of UCK, and VY is the coefficient of variation of GDP. Expected signs of partial derivatives are denoted below each variable in equation (4.6).

The current real user cost of capital is defined as:

$$(4.7)\quad UCK_t = (P_{It}/P_t)\,[(i_{Ft} - P\hat{}^e_{It})(1+P\hat{}^e_{It}) + \delta]$$

where P_I is the private investment deflator, i_F is the nominal interest rate on banking loans to firms, $P\hat{}^e_{It}$ is the expected rate of change of the private investment deflator, and δ is the (real) capital depreciation rate.

The private sector capital output ratio, the inverse of the average product of capital, stands for both the neoclassical marginal product of capital (which is a linear transformation of the marginal

product under a Cobb-Douglas technology) and for the Keynesian potential to actual output ratio. Note that private and public capital add up to obtain the total domestic capital stock:

$$(4.8) \quad K_t = K_{Gt} + K_{Pt}$$

Expected investment inflation is based on an estimated AR structure. All expected permanent variables are specified according to the two hypotheses mentioned in section 4.1: the partial perfect foresight alternative of equation (4.5a) and the static version of equation (4.5b). Finally, the two coefficients of variation are defined as five-period moving variances, two periods back, the current period, and two into the future.

The empirical results for the private investment functions are presented in tables 4.2A and 4.2B, also for the static and PPF expectation alternatives for all relevant right-hand variables. The final results reported in the tables exclude three variables appearing in equation (4.6): the relative price of the two aggregate investment components, corporate taxes, and firm credit. The exclusion of the first variable from preliminary results was decided on its implausibly high coefficient, which affected many other parameters. The latter two variables were not included due to lack of data.

The permanent user cost of capital (PUCK) appears to be positive in all and significant in most equations reported in table 4.2A. This seems to be a reflection of the extremely strong structural breaks occurred during the 1960-1988 period with regard to the functioning of Chilean financial market, the determination and the levels of the real interest rate, and hence the dependence of investment on the cost of domestic financial capital. Two attempts were done to face this problem. First, multiplicative dummies for the PUCK were specified, separately for the sixties (D60s) and early seventies (D70s) in table 4.2A. Second, the original specification was tested for the 1976-1988 period, which starts after the 1974-75 domestic financial market and interest liberalization took place. The

corresponding results for the latter sub-period are shown in table 4.2B. However, the brevity of this more homogeneous period suggests to exercise caution in interpreting the results of this table due to the small number of degrees of freedom.

The coefficients of the period-specific dummies in table 4.2A tend to present the correct negative sign, and are significant in some of the reported results. Take for instance line 2.2. While the coefficient of PUCK is still positive for the 1974-1988 period (0.16), it is close to zero for the early 1970s (0.16-0.15) and it is negative for the sixties (-0.03 = 0.15 - 0.18). However, for the static expectations alternative and the 1976-88 period, the user cost of capital is negative and significant although of small magnitude in the best results presented in table 4.2B.

The lagged capital to current output ratio appears to be negative and highly significant in most reported results. This is not a surprising result: private investment is strongly procyclical (see also Solimano, 1990).

More surprise causes the consistently negative influence of the public sector capital stock on private investment. Due to the fact that we only have a theory for a positive effect of this variable (crowding-in of private investment due to positive externalities of higher public past investments in infrastructure and other public goods), we excluded this variable from the final results.

Among liquidity constraint variables, their influence depends strongly on the chosen period. This is absolutely consistent with the change in the role of interest rates and hence of the user cost of capital during the 1960-1988 period: while quantity constraints were of higher importance before domestic financial liberalization, their influence was weakened afterwards. Precisely this is the case of own firm profits and foreign saving, which have a strong influence on investment during the 1960-88 period as a whole, while disappearing from the scene during the 1976-1988 period. On the other side, base money plays an ambiguous and unstable role: while in most sub-periods and specification

TABLE 4.2A

PRIVATE INVESTMENT (CHILE, 1961-1988)

Dependent Variable: Private Investment to GDP Ratio (Ip/Y)

Equation	C	D60s	D70s	PUCK	$\beta\left(\frac{K_{t-1}}{Y}\right)$	$\frac{K_{t-1}}{Y}$	$\frac{PRO}{Y}$	$\frac{H_{-1}}{Y}$	$\frac{FS}{Y}$	VUCK	VY	Rho	R^2	DW
1. Static Expectations														
1.1 OLS	0.22 (3.5)	0.06 (0.8)	-0.10 (-1.5)	0.12 (2.3)	-0.05 (-1.5)	-0.11 (-2.2)	0.17 (2.0)	-0.11 (-1.4)	-0.07 (-0.5)	-0.01 (-1.8)	-0.01 (-0.1)	-	0.62	1.29
1.2 ML (AR1)	0.17 (2.7	-0.03 (-0.5)	0.05 (0.1)	0.04 (1.1)	-0.05 (-1.8)	-0.07 (-1.6)	0.26 (2.8)	-0.11 (-1.6)	0.05 (0.4)	-0.002 (-0.7)	-0.27 (-1.3)	0.79 (5.9)	0.59	1.93
1.3 ML (AR1)	0.10 (1.7)	-0.08 (-1.2)	0.05 (1.6)	0.01 (0.5)	-0.07 (-1.9)	-	0.25 (2.5)	-	0.13 (1.4)	-	-0.26 (-1.2)	0.81 (6.2)	0.51	1.72
2. Partial Perfect Foresight														
2.1 OLS	0.21 (3.4)	-0.27 (-2.4)	-0.09 (-0.8)	0.04 (0.8)	0.04 (0.8)	-0.18 (-3.1)	0.03 (0.3)	0.22 (0.9)	-0.11 (-0.9)	-0.02 (-1.3)	-0.15 (-0.7)	-	0.71	1.19
2.2 ML (AR1)	0.18 (2.7)	-0.21 (-2.1)	-0.15 (-1.7)	0.16 (3.1)	-0.02 (-0.2)	-0.12 (-2.0)	0.16 (1.7)	-0.10 (-0.4)	-0.06 (-0.05)	-0.001 (-1.1)	-0.18 (-0.8)	0.63 (3.2)	0.67	1.81
2.2 ML (AR1)	0.20 (2.5)	-0.09 (-1.0)	-0.001 (-0.002)	0.08 (2.0)	-0.12 (-2.3)	-	0.17 (1.8)	-	0.17 (2.0)	-	-0.46 (-2.2)	0.80 (5.9)	0.57	1.96

TABLE 4.2B

PRIVATE INVESTMENT (CHILE, 1976-1988)

Dependent Variable: Private Investment to GDP Ratio (Ip/Y)

Equation	C	PUCK	$P\left(\frac{Kp-1}{Y}\right)$	$\frac{Kg-1}{p}$	$\frac{PRO}{y}$	$\frac{H-1}{y}$	$\frac{FS}{Y}$	VUCK	VY	Rho	R^2A	DW
1.1 Static Expectations												
1.1 OLS	0.35 (4.1)	0.05 (0.7)	-0.09 (-1.8)	-0.14 (-2.2)	0.02 (0.14)	0.51 (1.7)	-0.02 (-0.1)	0.003 (0.5)	-0.26 (-1.0)	-	0.88	3.69
1 OLS	0.36 (0.5)	-0.06 (-2.0)	-0.17 (-7.3)	-	-	0.26 (1.1)	-	-	0.56 (-2.3)	-	0.82	2.95
1.3 ML (AR1)	0.37 (16.9)	-0.07 (-3.1)	-0.18 (-11.7)	-	-	0.36 (1.9)	-	-	-0.65 (-3.3)	-0.51 (-1.9)	0.95	2.19
1.2 Partial Perfect Foresight												
1.1	0.52 (2.6)	0.16 (1.3)	-0.19 -1.0)	-0.07 (-0.5)	-0.24 (-1.2)	-0.32 (-0.5)	-0.05 (-0.2)	0.001 (0.1)	-0.27 (-0.5)	-	0.86	2.91
1.3 ML (AR1)	0.45 (13.8)	0.10 (3.2)	-0.24 (-11.1)	-		-0.49 (-2.5)	-	-	-0.55 (-2.9)	-0.37 (-1.1)	0.95	2.09

alternatives it exerts a negative, non-significant role, it presents a positive and significant, although minor influence only in line 1.3 (static expectations) for the 1976-88 period (table 4.2B).

With regard to the risk variables (the coefficients of variation of the user cost and of GDP), the first one plays a negative although rarely significant role during the complete 1976-88 period, which disappears during the second sub-period. Much more important is the variability of GDP, which affects private investment consistently and negatively during the entire period, and particularly strongly during the more recent years.

From the empirical results we can draw the following policy implications. The financing of the public deficit via debt issuance is increasingly felt by private investors in Chile due to its upward pressure on domestic real interest rates (see section 4), which affects negatively private capital formation since the mid-1970s. The other side of the coin is the weakening role of both domestic and foreign liquidity constraints: while firm profits and foreign saving where important investment determinants before financial liberalization, they vanished afterward.

No evidence was found on public investment crowding in effects on private investment. The relevant variable, which is the public capital stock, does not affect positively private capital formation.

The foreign adjustment has affected private investment negatively via the relative price of investment goods, which has increased due to the real devaluations, hence increasing the user cost of capital.

Finally, investment is negatively affected by the variability of GDP. Therefore a more stable external environment and stable domestic macroeconomic policies exert a positive influence on private capital formation.

5. RELATIVE EXTERNAL PRICES AND THE TRADE BALANCE

This section focuses on the impact of fiscal policies on the external sector, especially with regard to the trade deficit and the real exchange rate. The framework applied here is derived in two steps. The first involves determining the relative prices of exportables and importables from the equilibrium condition in the non-traded goods market, and the second implies deriving an equation for the trade balance. Public spending, deficits and debt stocks are important codeterminants of the behavior of these external sector variables.

Based on an appropriate framework, this section assesses the impact of fiscal variables on Chile's external sector based on empirical findings related to the 1960-1988 period.

Figures 5.1 and 5.2 depict the evolution of relative export and import prices, and the trade surplus to GDP ratio, respectively, during the last three decades in Chile.

The relative price of exports to non-tradeables is strongly correlated with the international copper price, which is the main determinant of the country's external export prices and terms of trade. The price of imports to non-tradeables is a more useful measure of the real exchange rate relevant for spending and production (other than copper) decisions. However, both measures of the real exchange rate tend to move together during 1975-1988, a period of smaller terms of trade fluctuations than those experienced during 1960-1975.

The two periods of massive real exchange rate appreciations - the early 1970s and the early 1980s - coincide with the policy-induced spending frenzy of the Allende government and the foreign-financed private spending spree of Pinochet's "plata dulce". Trade deficits, depicted in figure 5.2, reach their highest levels during those years - the most dramatic observation being the 10% (of GDP) trade deficit observed in 1981.

FIGURE 5.1

Chile: Relative Export and Import Prices
(Px/Pn, Pm/Pn)

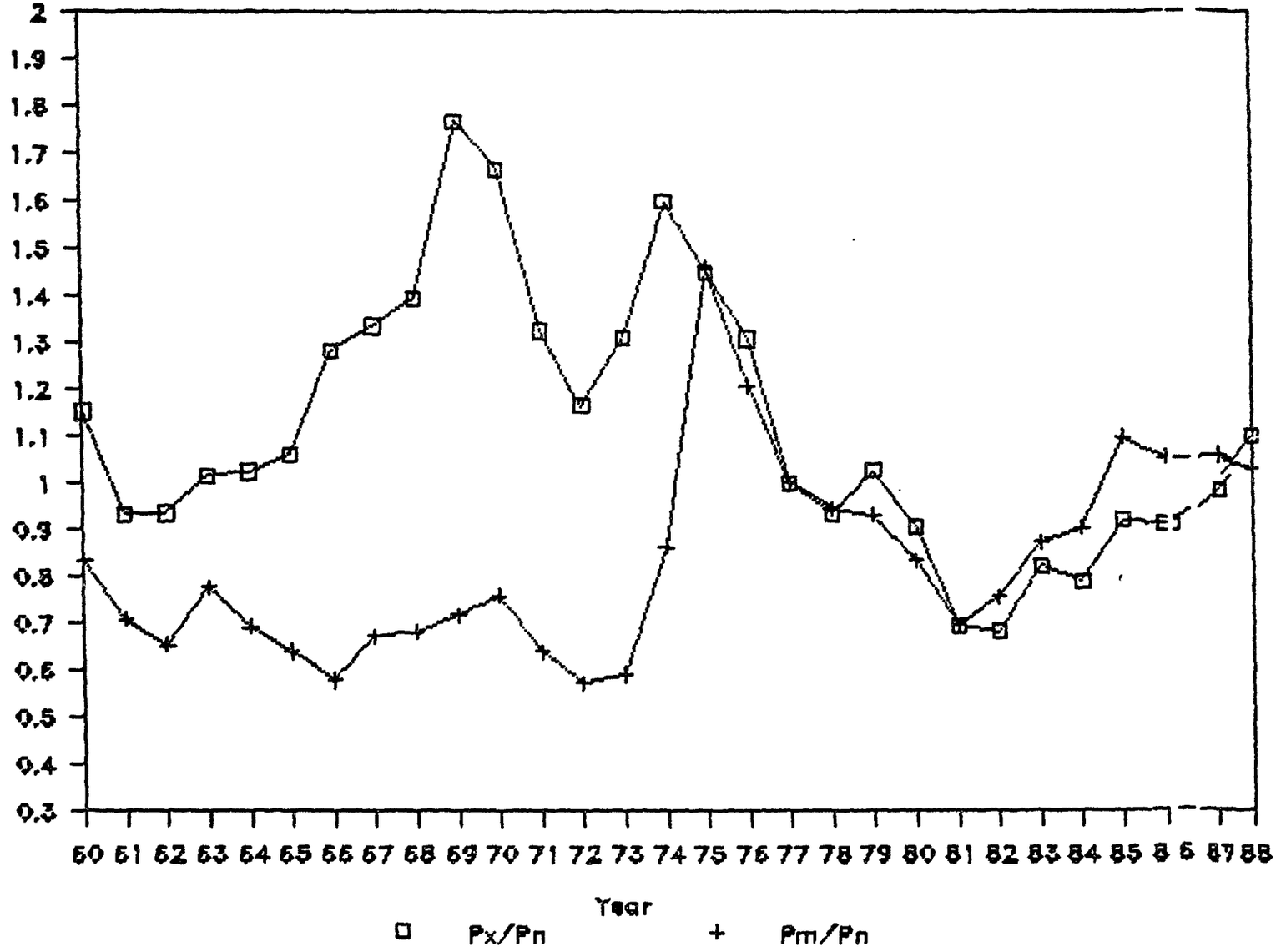
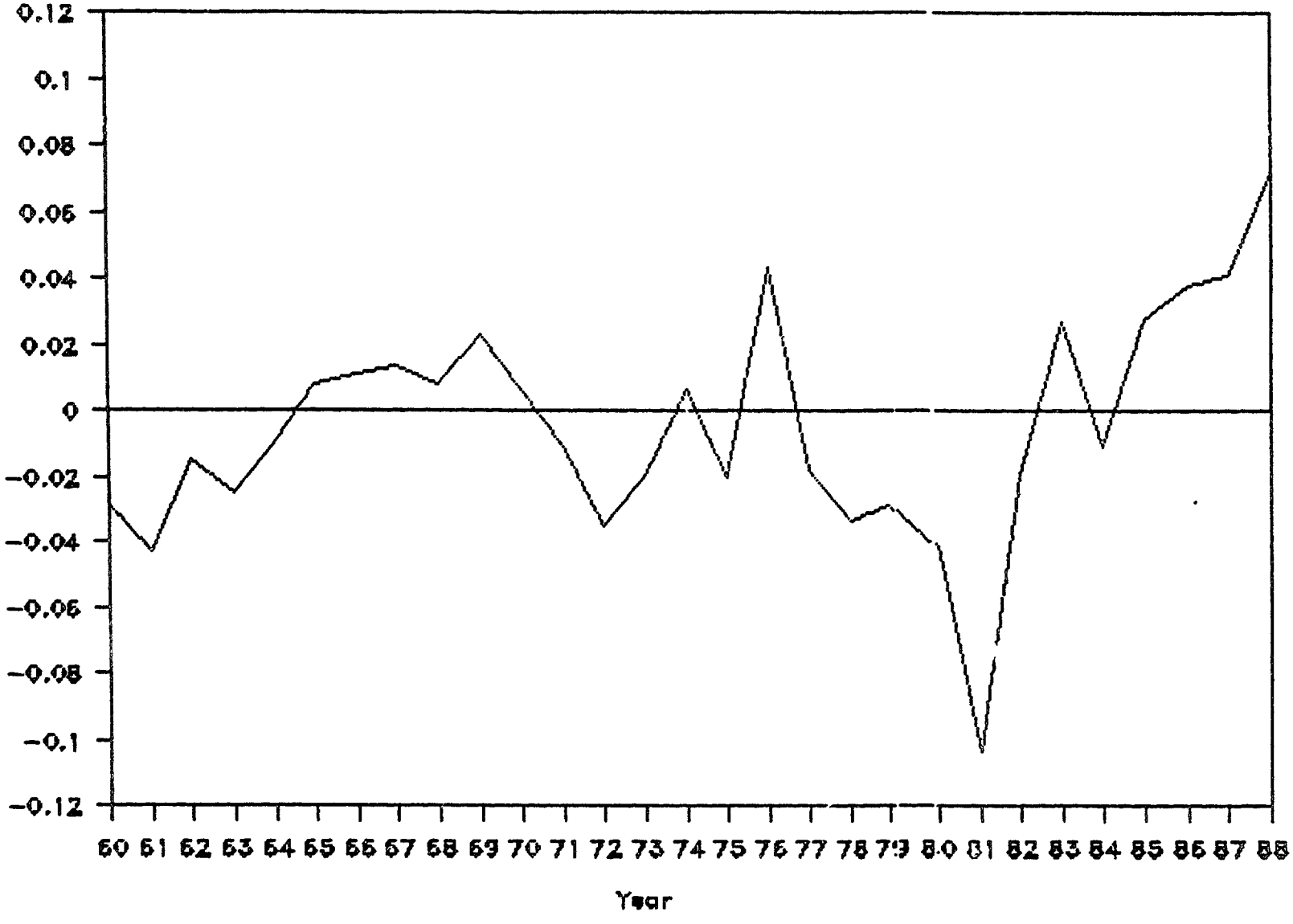


FIGURE 5.2

Chile: Trade Surplus to GDP Ratio
(TS/Y)



The required current account corrections after 1973 and 1981, respectively, led to fast reversals of the trade deficits as a result of massive exchange rate depreciations and reductions in domestic spending. However, a distinct feature of the post-1984 external adjustment is the achievement of massive trade surpluses, exceeding 6% of GDP in 1988. These are the counterpart of the significant decline in private consumption as a share of income (discussed in Section 4) and a progressive correction in public sector deficits (discussed in section 2).

5.1 Relative Prices of Exports and Imports

Following Easterly et al. (1989) and Rodriguez (1989), the real exchange rate, defined as the relative tradable/non-tradable goods price, is derived from the continuous market-clearing condition for non-tradable goods in the Salter-Swan-Corden-Dornbusch small open economy tradition. Extending this paradigm to a three-sector distinction between exportables, importables, and non-tradeables, the market clearing condition can be rewritten as either one of the following functions for the relative prices of exportables and importables:[18]

[18]For the same reason discussed in the preceding section (to avoid spurious correlation) we scale non-stationary variables (such as the trade surplus, government expenditure, or net foreign assets) to appropriate scale variables in equations 5.1 - 5.3.

$$(5.1) \qquad ex_t \equiv \frac{P_{Xt}}{P_{Nt}} = ex\ (TT_t^*, t_{Mt}, \frac{TS_t}{Y_t}, \frac{G_t}{Y_t}, \frac{G_{Nt}}{G_t})$$
$$(+)\ (?)\ (+)\ (?)\ (-)$$

$$(5.2) \qquad em_t \equiv \frac{P_{Mt}}{P_{Nt}} = em\ ([TT_t^*, t_{Mt}, \frac{TS_t}{Y_t}, \frac{G_t}{Y_t}, \frac{G_{Nt}}{G_t})$$
$$(-)\ (+)\ (+)\ (?)\ (-)$$

where ex and em are the relative prices of exportables and importables, respectively; P_X, P_M, and P_N are the absolute prices of exportables, importables, and non-tradables; TT* is the foreign terms of trade, t_M is the ad valorem tariff rate for imports, TS is the current-price trade surplus; G is current-price (general) government spending (public consumption plus public investment); G_N is current-price (general) government spending on nontradeable goods; and Y is current-price GDP.

The above framework was applied to Chile using annual data for the 1960-88 period. The results are reported in table 5.1 for both equations. They tend to favor the relative export to non-traded goods price interpretation as the relevant reduced-form equation for the equilibrium in the non-tradable goods market.

The external terms of trade are an important determinant of both export and import prices, although their numerical influence is much stronger on the former. The average tariff rate

TABLE 5.1

RELATIVE EXPORT AND IMPORT PRICES (CHILE, 1960-1988)

Equation	C	TT^*	t_N	$\frac{TS}{Y}$	$\frac{G}{Y}$	D75	Rho	R^2A	DW
1. Relative Export Price (ex)									
1.1 OLS	-0.21 (-1.2)	0.63 (8.5)	-0.04 (-0.8)	2.48 (4.0)	3.64 (3.0)	0.51 (4.5)	-	0.86	1.29
1.2 ML (AR1)	0.01 (0.04)	0.59 (6.9)	-0.05 (-0.9)	2.22 (3.4)	2.50 (1.7)	0.38 (4.0)	0.52 (3.0)	0.77	1.76
1.3 ML (AR1)	-0.02 (-0.01)	0.56 (7.7)	-	2.39 (3.8)	2.80 (2.0)	0.37 (4.0)	0.51 (3.0)	0.77	1.74
2 Relative Import Price (em)									
2.1 OLS	1.20 (6.7)	-0.15 (-2.0)	-0.09 (-1.9)	2.10 (3.4)	-0.62 (-0.5)	0.61 (5.4)	-	0.75	1.03
2.2 ML (AR1)	1.26 (5.4)	-0.14 (-1.8)	-0.09 (-1.7)	2.00 (3.3)	-1.09 (-0.8)	0.47 (5.7)	0.62 (3.9)	0.72	1.65
2.3 ML (AR1)	1.09 (10.7)	-0.13 (-1.7)	-0.09 (-1.6)	2.04 (3.5)	-	0.47 (5.7)	0.60 (3.6)	0.72	1.62
2.4 ML (AR1)	1.08 (9.8)	-0.18 (-2.5)	-	2.26 (3.8)	-	0.46 (5.5)	0.66 (4.6)	0.70	1.58

has a negative (although not significant) influence on both relative prices, which is surprising in the case of the import price, which should be positively affected by tariffs.

The trade surplus to output ratio has an extremely high, consistent and symmetric effect on both relative prices: a one-percent of GDP increase in the trade surplus implies a 2.0 - 2.5% devaluation of the real exchange rate.

Aggregate government spending has a strongly positive impact on the relative export price and a non-significant negative influence on the relative price of imports - in general, its influence could be of either sign. Unfortunately, it was not possible to include as an additional determinant the non-traded component of public spending due to lack of data.

Finally, 0.38-0.61 of the massive 1975 devaluation could not be explained by any of the preceding variables, and hence was treated as an outlier.

5.2 The Trade Balance

The trade balance is both the difference between output and absorption and the goods markets counterpart to the accumulation of net foreign assets. Depending on which is the underlying paradigm, the trade surplus is specified as reflecting optimal output and absorption decisions or optimal foreign asset accumulation decisions.

In Rodriguez (1989) and Easterly et al (1989), the trade surplus is directly related to the accumulation of net foreign assets (NFA). Private net foreign asset accumulation depends on the difference between desired and actual (that is, actual lagged) private NFA holdings, the former substituted by its main determinants: the covered interest differential between domestic and foreign rates, domestic public debt, the terms of trade, and income. Public NFA accumulation will reflect directly, with a negative sign, the (operational) public sector deficit, for given stocks of domestic

public debt and base money. Hence under this foreign asset accumulation version, the generic equation for the trade balance can be written as follows:[19]

$$(5.3a) \quad \frac{TS_t}{Y_t} = \frac{TS}{Y}\Big(\underset{(+)}{C}, \underset{(-)}{\frac{i-(i^*+\hat{E}^e+i^*\hat{E}^e)}{1+(i^*+\hat{E}^e+i^*\hat{E}^e)}}, \underset{(-)}{\frac{NFA_{t-1}}{Y_t}}, \underset{(-)}{\frac{B_{t-1}}{Y_t}}, \underset{(+)}{TT_t^*}, \underset{(-)}{\frac{OD_{gt}}{Y_t}} \Big)$$

where Y is current-price GDP, C is a constant, i is the average annual domestic nominal interest rate (average of active and passive rates), i^* is the average annual nominal external interest rate paid on net foreign assets, $\hat{E}^e$ is the expected rate of nominal devaluation (defined below), B_{-1} is current-price domestic public sector debt (at the end of the preceding period), NFA_{-1} is current-price net foreign assets (total foreign debt less international reserves at the end of the preceding period), and OD_g is the current-price operational public sector deficit. Expected signs of partial derivatives are denoted in parenthesis below each variable in equation (5.3a).

An alternative view of the trade balance is to derive it from the macroeconomic equilibrium condition, and hence reflecting production, consumption and investment decisions which are behind the determination of the excess of output over absorption. This view links more explicitly the determination of the trade surplus in this section with that of private consumption and investment in the preceding section. However, in order to maintain a structure as close as possible to that postulated by the asset accumulation version above, we focus now mostly on those variables determining production and absorption which also appear in equation (5.3a).

---

[19]Current-price GDP is used as the relevant scale variable. Hence the positive sign of the constant term C reflects the hypothesized positive effect of income on the trade balance, when multiplying equation (3a) by the latter, and abstracting from the presence of multiplicative terms involving income and all non-scaled right-hand variables in eq. 5.3a.

The trade surplus in current prices, defined by the excess of exports over imports, equals the difference between current-price output and total absorption (A):

$$(5.4) \quad TS = P_x x - P_m m = Y - A$$

$$= Y + [r B_{-1} + i^* NFA_{g-1} - T] - OD_g - A_p$$

where r is the domestic real interest rate paid on government bonds, T is total taxes net of transfers paid by the private sector, A_p is private absorption (private consumption and investment expenditure), A_g is public sector absorption, and OD_g is the operational public sector deficit defined as:

$$(5.5) \quad OD_g = A_g + rB_{-1} + i^* NFA_{g-1} - T$$

Substituting functional forms for output and absorption into (5.4) obtain:

$$(5.4') \quad TS = \underset{(-)\,(-)}{Y(i^*, r, ...)} + [rB_{-1} + i^* NFA_{g-1} - T] - OD_g -$$

$$- A_p(\underset{(+)}{NFA_p}, \underset{(+,)}{B}, \underset{(0,+)}{NFA_g}, \underset{(?,-)}{i^*}, \underset{(?,-)}{r}, \underset{(+)}{TT^*}, \underset{(+)}{YP})$$

where the negative signs of the interest rates in output supply denote the effect of the cost of working capital on current production decisions (the Cavallo effect), and the two signs below domestic public debt and public NFA in private absorption reflect the non-Ricardian (the first sign) and the Ricardian (the second sign) hypotheses on the role of these assets (are they wealth?) in private consumption, while the two signs below the two interest rates in private absorption reflect their ambiguous effect on private consumption (the first) and their unambiguously negative effect on

private investment (the second). Finally, current terms of trade and permanent income affect positively A_p via private consumption.

Rewriting eq. (5.4') as a functional expression for the trade surplus after scaling all relevant variables to current-price GDP, obtain the following form, as an alternative to equation (5.3a):

$$(5.3b)\qquad \frac{TS_t}{Y_t} = \frac{TS}{Y}\Big(\underset{(+)}{C}, \underset{(?)}{\frac{i-(i^*+\hat{E}^e+i^*\hat{E}^e)}{1+(i^*+\hat{E}^e+i^*\hat{E}e)}}, \underset{(?)}{\frac{NFA_{t-1}}{Y_t}}, \underset{(?)}{\frac{B_{t-1}}{Y_t}},$$

$$\underset{(+)}{TT_t^*}, \underset{(-)}{\frac{OD_{gt}}{Y_t}}, \underset{(-)}{\frac{YP_t}{Y_t}}\Big)$$

Two differences arise between the asset accumulation version 5.3a and the macroeconomic equilibrium version 5.3b of the trade surplus: first, the effect of domestic public debt, net foreign assets, and the interest rate differential are ambiguous in eq. 5.3b, and second, the ratio of permanent to current output (an inverse measure of the business cycle) appear in the latter equation. The subsequent empirical application will test the relative relevance of these different approaches to the trade surplus for the Chilean economy.

The empirical results for the Chilean trade balance are shown in table 5.2.

Lines 1.1 and 2.1 present results for the complete specification. Of the right-hand determinants, the interest rate differential (IRD), the total net foreign asset holdings, and the stock of domestic public debt holdings present positive, mostly significant signs under both versions for expectations. To capture a possible break of the relation between the trade surplus and the stock of net foreign asset holdings in 1981, the multiplicative dummy D81 for NFA was included for 1981. The positive signs of the former three variables contradict the asset accumulation version of the trade

balance in eq. (5.3a), but are consistent with the ambiguous signs postulated by the output less absorption version of equation 5.3b.

The current external terms of trade have a consistently significant but low positive influence on the trade balance. However, the influence of the business cycle is not significant. A dummy for 1979-1982 (D7982) signals the particular regime of high access to foreign credit which characterized those years as opposed to all other subperiods. It reflects that the trade deficit was 2-3 percentage points of GDP higher during those years of easy access to foreign lending, unhindered by either domestic or foreign limits imposed to foreign borrowing.

Finally, the operational public sector deficit has a negative though not significant effect on the trade surplus under the static expectations complete specification for the dependent variable (line 1.1). To test for the influence of this variable when most others are omitted, we run the specification of line 1.2. Having in mind the variable exclusion bias, we may conclude that a 1 percent of GDP increase in the public deficit tends to reduce the Chilean trade surplus by a maximum of 0.29 percentage points of GDP.

TABLE 5.2

TRADE SURPLUS (CHILE, 1960-1988)

Dependent Variable: Trade Surplus to GDP (TS/Y)

Equation	C	IRD	D81	$\frac{NFA_{-1}}{Y}$	$\frac{B-1}{Y}$	TT*	$\frac{OD_g}{Y}$	$\frac{YP}{Y}$	D7982	Rho	R^2A	DW
Static Expectations												
1.1 OLS	-0.04 (-0.3)	0.01 (1.5)	-1.76 (-3.1)	0.50 (1.9)	0.04 (1.0)	0.03 (2.0)	-0.12 (-1.0)	-0.03 (-1.0)	-0.03 (-2.1)	-	0.68	1.84
1.1 OLS	0.006 (1.0)						-0.29 (-4.1)		-0.06 (-2.6)	-	0.39	1.84
Partial Perfect Foresight												
2.1 OLS	-0.08 (-0.5)	0.03 (1.9)	-1.61 (-2.6)	0.50 (2.4)	0.07 (2.0)	0.04 (3.3)	0.03 (0.2)	-0.02 (-0.1)	-0.02 (-1.4)	-	0.73	1.97

6. CONCLUSIONS

This section summarizes the main findings and lessons that emerge from the study of causes and consequences of budget sector deficits in Chile.

The first, unavoidable observation is about the wild gyrations of public sector deficits during the last two decades in Chile. In fact, each decade comprises a complete cycle of fiscal and macroeconomic crisis, recovery and consolidation. The 1970s started with consolidated public sector deficits of 23.4% in 1970-73, which in conjunction with adverse foreign stocks forced a major stabilization effort, which was very successful on the fiscal side, culminating in a 5.4% surplus in 1980. In the early 1980s the conjunction of negative external developments and misguided domestic policies - this time, however, not on the fiscal side - caused a major macroeconomic crisis, which deteriorated public finances of both the financial and non-financial public sector. Quasi-fiscal rescue operations of domestic debtors and the private financial system by the Central Bank and emergency programs combined with a recession-induced fall of revenue in the case of the non-financial public sector were behind the large deficits of both public sector, running at 4.9% of GDP in 1986 for the former and at 4.6% of GDP in 1984 for the latter.

Public sector nationalization and reform are major causes of the variation in the non-financial public sector deficit: the tax reforms and public sector nationalization/privatization of the mid-1970s increased revenue, while the 1981 social security reform and the tax reductions in the mid-to-late 1980s destabilized public finances. The strong swings in the copper prices were traditionally the most destabilizing factors outside the control of policy makers, until the copper stabilization fund introduced a stronger separation between public spending and copper revenue.

An implication of the high quasi-fiscal deficits was the huge build-up of total public debt, which rose from $7.9 billion in 1981 to more than $22 billion. Nonetheless, our calculations show

that the solvency of the total consolidated public sector is not jeopardized by current deficit levels: a 1.5% deficit level - caused entirely by the Central Bank - is sustainable under normal macroeconomic conditions.

Section 3 of the paper explored the implications of domestic financing of public deficits for the interest rate and the price level in Chile. The effects of alternative strategies of domestic financing were discussed and contrasted in the context of a portfolio model with a partial adjustment structure for both the money and the public bonds markets.

The simulations based on the estimated portfolio model showed relatively conventional results: money-financed public deficits reduce interest rates and are strongly inflationary, while debt-financed deficits raise interest rates and are only weakly inflationary. Less conventional was the result that the moderate fluctuations of interest rates and price levels during the 1980s were the result of quasi-fiscal operations and a social security reform that implied a net transfer of resources to the private sector, which in turn provoked an increase in the demand for public debt. This private sector response is caused by institutional regulations of the social security funds and the banking system. Therefore, one should not generalize the experience with fiscal deficits in Chile during the eighties.

Section 4 of this paper went a step further in analyzing the macroeconomic implications of public sector deficits by assessing the impact of the public sector on private sector spending in Chile. Here the focus was on the sensitivity of private consumption and investment to fiscal variables, in addition to indirect effects of fiscal policies via interest rates, inflation, or private disposable income. Clear policy implications can be drawn from our empirical results on private consumption. In the first place, there is no evidence of a direct effect of the public deficit on private consumption; consumers are neither Ricardian nor directly crowded out by public spending in Chile. A transitory deficit reduction financed by a transitory tax hike reduces private disposable income, and hence private consumption and saving. If the tax hike is permanent, private consumption will take the brunt of the

reduction in (current and permanent) private disposable income, without private saving being significantly affected. On the other side, there are no indirect effects of domestic deficit financing via changes in the real interest and inflation rates on consumption. However, if inflation reduces real base money, private consumption will be affected. Foreign adjustments have strong effects on private consumption in Chile. The combination of lower foreign saving and a higher real exchange rate has a strong negative impact on private consumption expenditure. This was clearly observed during the post-1982 adjustment period, when private consumption fell to historical lows, while private investment reached historical heights.

From the empirical results for private investment behavior in Chile the following policy implications can be drawn. The financing of the public deficit via debt issuance is increasingly felt by private investors in Chile due to its upward pressure on domestic real interest rates, which affects negatively private capital formation since the mid seventies. The other side of the coin is the weakened role of both domestic and foreign liquidity constraints: while firm profits and foreign saving were important investment determinants before financial liberalization, they are not more significant investment determinants since the mid seventies. No evidence was found on public investment crowding in effects on private investment. The relevant variable, which is the public capital stock, does not effect positively private capital formation. The foreign adjustment has affected private investment negatively via the relative price of investment goods, which has increased due to the real devaluations, hence increasing the user cost of capital. However, the recent external adjustment period coincided with a strengthening of the development strategy and stable policy rules, reducing significantly policy uncertainty and actual output fluctuations. This reduction of systemic risk and of uncertainty of main macroeconomic variables affecting frequently irreversible investment decisions has had a major beneficial impact on private capital formation in Chile, as evidenced by our results and the record levels which this variable is achieving in the present.

The foreign adjustment in Chile during the 1980s has implied a massive real exchange rate depreciation and a 19 percentage point correction of the trade surplus to GDP ratio (from a 10% of GDP deficit in 1981 to a 6% surplus in 1988), required to ensure continuous debt servicing and supported by a massive fiscal correction culminating in a 4.9% of GDP public sector surplus in 1989. Our results reflect this sensitivity of the trade surplus to the public sector deficit; however, its low parameter also is consistent with the fact that a significant share of the trade surplus adjustment was borne by private consumption.

Which are the lessons from the Chilean experience with regard to fiscal policy management? Despite the fact that the Chilean experience does not provide an example of "quick fix" policy packages, there are some general conclusions which are noteworthy. First, a stable policy environment provides a solid stage for adjusting to internal and external shocks. Although difficult to quantify, there is little doubt that the economic reforms implemented in Chile before the 1982 debt crisis were an important stabilizing factor in the fast recovery of the Chilean economy during the 1980s. Second, another important lesson which emerges from the Chilean experience is related to the need for consistent policies. In particular, the macroeconomic environment must be supportive of economic reforms. Finally, investment in both physical and human capital is a key to economic growth: public sector focus on high-return investment in human capital and physical infrastructure, complementary with private investment which responds vigorously to a stable macroeconomy and market-induced incentives, is showing to be an effective high-growth road to development for Chile.

REFERENCES

Acevedo, J. and Vial, J. (1979): "Demanda por Dinero y Expectativas de Inflación: Chile 1976-1979", Estudios de Economía, 14.

Aedo, C. and Lagos, L. (1984): "Protección efectiva en Chile 1974-1979", in Documento de Trabajo #94, Universidad Católica de Chile.

Arrau, P. (1989): "Intertemporal Monetary Economics: Evidence from the Southern Core of Latin America", unpublished Ph.D. thesis, University of Pennsylvania.

Balassa, B. (1989): "The Effects of Interest Rates on Saving in Developing Countries", manuscript World Bank, Washington, D.C.

Banco Central (1990): Indicadores Económicos y Sociales 1960-1988.

Barro, R. (1974): "Are Government Bonds Net Wealth?", Journal of Political Economy, vol. 82.

Bernheim, B.D. (1987): "Ricardian Equivalence: an Evaluation of Theory and Evidence", in NBER Macroeconomics Annual 1987, MIT Press.

Buiter, W. (1988): "Some Thoughts on the Role of Fiscal Policy in Stabilization and Structural Adjustment in Developing Countries", NBER Working Paper 2603.

Carr, J. and M. Darby (1981): "The Role of Money Supply Shocks in the Short-Run Demand for Money", Journal of Monetary Economics, 8.

———— (1985): "Reforms and Macroeconomic Adjustments in Chile during 1974-1984", World Development 13, No 18.

Corbo, V. (1982): "Desequilibrio de Stocks, Shocks Monetarios y la Estabilidad de la Demanda por Dinero", Cuadernos de Economía, 48.

_____ (1989): "Public Finance, Trade and Development: the Chilean Experience", in V. Tanzi, ed., Public Finance and Economic Development.

Corbo, V. and J. de Melo (1989): "External Shocks and Policy Reforms in the Southern Cone: A Reassessment", in G. Calvo (ed.): Debt, Stabilization and Development, Basil Blackwell.

Corbo, V. and K. Schmidt-Hebbel (1991): "Public Policies and Saving in Developing Countries" Journal of Development Economics, forthcoming.

Dornbusch, R. (1983): "Real Interest Rates, Home Goods, and Optimal External Borrowing", Journal of Political Economy, vol.1, No.1, February.

_____ (1985): "Overborrowing: Three Case Studies", in G.W. Smith and J.T. Cuddington: International Debt and the Developing Countries, World Bank.

_____ (1985): "External Debt, Budget Deficits and Disequilibrium Exchange Rates", in G.W. Smith and J.Cuddington, eds., International Debt and the Developing Countries, World Bank.

_____ (1988): "Mexico: Stabilization, Debt and Growth", in G. de Menil and R. Portes, eds., Economic Policy: a European Forum, Cambridge University Press.

_____ (1989): "Capital Flight: Theory, Measurement and Policy Issues", manuscript, M.I.T., Cambridge, Mass.

Easterly, W.R. (1989): "Fiscal Adjustment and Deficit Financing during the Cost Crisis", in Husain, I. and I. Diwan (eds.): Dealing with the Debt Crisis, The World Bank, Washington D.C.

Easterly, W.R., C.A. Rodriguez, and K. Schmidt-Hebbel (1989): "Research Proposal: The Macroeconomics of the Public Sector Deficits", manuscript, The World Bank, Washington, D.C., March.

Edwards, S. and A.C. Edwards (1987). Monetarism and Liberalization: the Chilean Experiment, Ballinger Publishing Co.

Eyzaguirre, N. and C. Larranaga (1990): "Macroeconomia de los Operacione. `uasi-Fiscales en Chile", manuscript, ECLAC, Santiago, Chile.

Ffrench-Davis, R. and J. de Gregorio (1987): "Orígenes y Efectos del Endeudamiento Externo en Chile", El Trimestre Económico, 54.

Ffrench-Davis, R. (1984): "Indice de Precios Externos", in Coleccion de Estudios CIEPLAN #13, June.

Fry, M.J. (1988): Money, Interest and Banking in Economic Development, Johns Hopkins University, Baltimore.

Giovannini, A. (1985): "Saving and the Real Interest Rate in LDCs", Journal of Development Economics, vol. 18, August.

Haindl, E. (1986): "Trimestralización del PGB por origen y destino", in Estudios de Economía.

Hayashi, F. (1982): "The Permanent Income Hypothesis: Estimation and Testing by Instrumental Variables," Journal of Political Economy, Vol. 90, No. 5, October.

Hayashi, F. (1985): "Tests for Liquidity Constraints: A Critical Survey", NBER Working Paper 1720, Cambridge, Mass., October.

Hubbard, R.G. and K.L. Judd (1986): "Liquidity Constraints, Fiscal Policy, and Consumption", Brookings Papers on Economic Activity, 1.

Jadresic, E. (1990): "Trimestralización sin Uso de Series Relacionadas" manuscript, CIEPLAN.

Larranaga, O. (1989): "El Deficit del Sector Publico y la Politica Fiscal en Chile", manuscript, ECLAC.

Larraín, F. and Larraín, A. (1988): "El Caso del Dinero Desaparecido, Chile 1984-1986", Cuadernos de Economia, 75.

Leiderman, L. and M. Blejer (1988): "Modeling and Testing Ricardian Equivalence: A Survey", IMF Staff Papers, vol. 35, No. 1, March.

Le Fort, G. and Ross, C. (1985): "?", in Serie Investigcion #72, Depto. de Economia, Universidad de Chile.

Maddison, A. (1989). The World Economy in the Twentieth Century. Development Center Studies, OECD, Paris.

Marshall, J. and K. Schmidt-Hebbel (1989b): "Economic and Policy Determinants of Public Sector Deficits", PRE Working Paper No. 321, The World Bank, Washington, D.C.

Marshall, J. and K. Schmidt-Hebbel (1989a): "Un Marco Analítico Contable para la Evaluación de la Política Fiscal en América Latina", Serie Política Fiscal 1, CEPAL.

Matte, R. and Rojas, P. (1976): "Evaluación del Mercado Monetario Chileno y una Estimación de la Demanda de Dinero", manuscript, Banco Central de Chile.

Montiel, P. and N.U. Haque: "Ricardian Equivalence, Liquidity Constraints, and the Yaari-Blanchard Effect: Tests for Developing Countries, IMF Working Paper, IMF, Washington, D.C.

Morande, F. and K. Schmidt-Hebbel (1991): "Macroeconomics of Public Sector Deficits: The Case of Zimbabwe:, PRE Working Paper, The World Bank, Washington, D.C., forthcoming.

Morande, F. and Schmidt-Hebbel, K. (eds.) (1988): Del Auge a la Crisis de 1982: Ensayos sobre Estabilización Financiera y Endeudamiento en Chile, ILADES-Georgetown and Instituto Interamericano de Mercados de Capital, Santiago, Chile.

Mujica, P. (1990): "Financiamiento Doméstico del Déficit Fiscal y sus Efectos Macroeconómicos: Un Modelo para Chile, manuscript, ECLAC, Santiago, Chile.

Rodriguez, C.A. (1989): "The External Effects of Public Sector Deficits:, PPR Working Paper, The World Bank, Washington, D.C.

Rossi, N. (1988): "Government Spending, the Real Interest Rate, and the Behavior of Liquidity-Constrained Consumers in Developing Countries", IMF Staff Papers, vol. 35, No. 1, March.

Schmidt-Hebbel, K. (1987): "Terms of Trade and the Current Account under Uncertainty," Análisis Económico, Vol. 2, No. 1, June.

Schmidt-Hebbel, K. (1988): "Consumo e Inversión en Chile (1974-1982): Una Interpretación 'Real' del Boom", in Morande and Schmidt-Hebbel (1988).

Schmidt-Hebbel, K. and T. Mueller (1990): "Private Investment and Saving in Morocco", PRE Working Paper, forthcoming, The World Bank, Washington, D.C.

Schmidt-Hebbel, K., S. Webb and G. Corsetti (1991): "Household Saving in Developing Countries", World Bank Economic Review, forthcoming.

Schmidt-Hebbel, K., F. Castro, and I. Leng, (1990) "Una Base de Datos Trimestrales para la Economía Chilena", Serie Investigacion #24, Ilades-Georgetown University.

Serven, L. (1990): "A RMSM-X Model for Chile", PRE Working Paper, The World Bank, Washington, D.C.

Solimano, A. (1990): "How Private Investment Reacts to Changing Macroeconomic Conditions: The Case of Chile in the 1980s", PRE Working Paper, The World Bank, Washington, D.C.

Summers, L. H. (1985): "Issues in National Savings Policy", NBER Working Paper 1710, Cambridge, Massachusetts.

Tanzi, V., M. I. Blejer, and M. O. Teijeiro (1987): "Inflation and the Measurement of Fiscal Deficits", IMF Staff Papers, Vol. 34, No.4, December.

van Wijnbergen, S. (1989): "External Debt, Inflation and the Public Sector: Towards Fiscal Policy for Sustainable Growth", World Bank Economic Review 3.

Vial, J. and Marín, C. (1986): "Series Monetarias Chilenas 1960-1985", in Estudios de Economía.

World Bank (1990): Second Report on Adjustment Lending, Washington, D.C.

World Bank: World Development Report, Oxford University, various issues.

APPENDIX 1: REDUCED-FORM COEFFICIENTS

This appendix defines the short-run coefficients of assets demand equations (3.7)-(3.8) and the coefficients of the reduced-form equations for the nominal interest rate and the price level (equations (3.9)-(3.10)) in terms of the structural coefficients of equations (3.2), (3.3), (3.5) and (3.6).

The coefficients of the asset demand are determined by the following combinations of structural parameters:

$$\phi_0 = \sigma\alpha_0 \qquad \Phi_0 = \mu\beta_0$$

$$\phi_1 = \sigma\alpha_1 \qquad \Phi_1 = \mu\beta_1$$

$$\phi_2 = \sigma\alpha_2 \qquad \Phi_2 = \mu\beta_2$$

$$\phi_3 = \sigma\alpha_3 \qquad \Phi_3 = \mu\beta_3$$

$$\phi_4 = 1\text{-}\sigma \qquad \Phi_4 = 1\text{-}\mu$$

$$\phi_5 = \Theta \qquad \Phi_5 = \cap$$

$$\phi_6 = \sigma \qquad \Phi_6 = \mu$$

The reduced-form coefficients are defined determined by the following combinations of structural parameters:

$$\Omega_0 = \frac{\sigma\alpha_0 - \mu\beta_0}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_0 = \frac{\sigma\mu(\alpha_2\beta_0 - \beta_2\alpha_0)}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_1 = \frac{\sigma\alpha_1 - \mu\beta_1}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_1 = \frac{\sigma\mu(\alpha_2\beta_1 - \alpha_1\beta_2)}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_2 = \frac{\sigma\alpha_3 - \mu\beta_3}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_2 = \frac{\sigma\mu(\alpha_2\beta_3 - \alpha_3\beta_2)}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_3 = \frac{1 - \sigma}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_3 = \frac{(\sigma-1)\mu\beta_2}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_4 = \frac{\mu - 1}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_4 = \frac{(1-\mu)\sigma\alpha_2}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_5 = \frac{- 1}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_5 = \frac{\mu\beta_2}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_6 = \frac{1 - \cap}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_6 = \frac{\sigma\alpha_2(\cap-1)}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_7 = \frac{\cap}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_7 = \frac{- \sigma\cap\alpha_2}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_8 = \frac{\Theta}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_8 = \frac{- \Theta\mu\beta_2}{\mu\beta_2 - \sigma\alpha_2}$$

$$\Omega_9 = \frac{\sigma - \mu}{\mu\beta_2 - \sigma\alpha_2} \qquad \pi_9 = \frac{\sigma\mu(\alpha_2-\beta_2)}{\mu\beta_2 - \sigma\alpha_2}$$

APPENDIX 2: DATA SOURCES

This appendix gives major sources of data used in the paper.

Chapter 3

The basic sources were: Indicadores Economicos y Sociales del Banco Central Chile (IES), Instituto Nacional de Estadistias (INE), International Monetary Fund Financial Statistics (IFS), Cortazar and Marshall (1980), Haindl (1986), Vial y Marin (1986), Le Fort y Ross (1985), Larranaga (1989).

i	Domestic nominal interest rate. The average of the effective monthly interest rate paid on short-term deposits (30-89 days). Source: IES.
i^*	Foreing interest rate. Monthly average London Interbank offered rate in U.S. dollars for 180 days deposit. Source: IFS.
δ	Expected devaluation rate of the nominal exchange rate. Source: for the 1975:1 - 1984:3 period Le Fort and Ross (1985) and for the 1984:4 - 1988:4 a univariate method based on the nominal exchange rate of the banking market (IES).
Ml	Narrow (Ml) money balances. The original series was deseasonalized using the SAMA command in TSP. Source: Vial and Marin (1986), IES.
D	Quarterly domestic public debt. Source: Annual data were obtained from Larranaga (1989) and correspond to the debt of the Central Bank with the private sector. The quarterly interpolation was performed following the method described in Jadresic (1990).
Y	Quarterly real GDP. Sources: Haindl (1986) and IES.
	Anticipated money was estimated assuming that actual money balances followed an autoregressive process of the fourth order.

Chapter 4

The basic sources were Indicadores Economicos y Sociales (IES), Solimano and Zucker (1989), Solimano (1989).

Cp	Private consumption. Source: IES.
CC	Public consumption. Source: IES.

Y	Annual real GDP. Source: IES.
I	Private fixed-capital investment. Source: from 1960 to the source was Solimano and Zucker (1989) and for the rest of the period Solimano (1989).
UCK	User cost of capital. Source: based on IES data base.
MPK	Marginal product of capital. Source: based on IES data base.
K	This series was elaborated based on Solimano and Zucker (1989) and Solimano (1989), using the pivotal method assuming a ratio between capital and GDP of 2.5. In addition, we assumed that the ratio between public and private capital was similar to the ratio between public and private investment.
H	Nominal base money stock. Source: IES.
	The rest of the variables were obtained directly from the IES or derived from the variables defined above according to the definitions provided in the text.

Chapter 5

The basic sources were: Indicadores Economicos y Sociales (IES), Schmidt-Hebbel, Castro, Leng (1990), French Davis (1984), Lagos and Aedo (1984).

Px/Pn	The relative price of exportable and non-tradable goods. Source: IES for the exportable goods and Schmidt-Hebbel, Castro and Leng (1990) for the non-tradable goods index.
Pm/Pn	The relative price of importable and non-tradable goods. Source: price of importable goods, IES.
tm	Nominal average tax rate on the importable goods. Source: 1960-1969: French Davis (1984). 1970-1973: current at the 1979 level. 1974-1979: Labos and Aedo (1984). 1980-1988: elaborated by the authors.
	The rest of the variables were obtained from the IES.

Chapter 6

The basic source were French Davis and Munoz (1990), Madison (1989) and ECLAC data base.

The data on GDP and Investment were obtained from French Davis and Munoz (1990) and the data on factor inputs from Madison (1989) and ECLAC data base

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS675	Are Buybacks Back? Menu-Driven Debt-Reduction Schemes with Heterogenous Creditors	Ishac Diwan Mark M. Spiegel	May 1991	S. King-Watson 33730
WPS676	Higher Education in the Republic of Yemen: The University of Sana'a	Viswanathan Selvaratnam Omporn L. Regel	May 1991	C. Cristobal 33640
WPS677	On Economic Transformation in East-Central Europe: A Historical and International Perspective	Andres Solimano	May 1991	E. Khine 39361
WPS678	onomic Growth: A Review of the Theoretical and Empirical Literature	David Renelt	May 1991	R. Luz 34303
WPS679	Poverty Alleviation in Mexico	Santiago Levy	May 1991	M. Stroude 38831
WPS680	On Hunger and Public Action	Martin Ravallion	May 1991	C. Spooner 30464
WPS681	Political-Economy Arguments for UniformTariff	Arvind Panagariya Dani Rodrik	May 1991	K. Cabana 37947
WPS682	Intertemporal Substitution, Risk Aversion, and Private Savings in Mexico	Patricio Arrau Sweder van Wijnbergen	May 1991	S. King-Watson 31047
WPS683	Vocational Schooling, Occupational Matching, and Labor Market Earnings in Israel	Shoshana Neuman Adrian Ziderman	May 1991	C. Cristobal 33640
WPS684	The Value of Intra-household Survey Data for Age-based Nutritional Targeting	Lawrence Haddad Ravi Kanbur	May 1991	J. Sweeney 31021
WPS685	Children and Intra-household Inequality: A Theoretical Analysis	Ravi Kanbur	May 1991	J. Sweeney 31021
WPS686	Lending for Learning: Twenty Years of World Bank Support for Basic Education	Adriaan Verspoor	May 1991	C. Cristobal 33640
WPS687	Brazilian Frozen Concentrated Orange Juice: The Folly of Unfair Trade Cases	Carlos Alberto Primo Braga Simac Davi Silber	May 1991	N. Artis 37947
WPS688	Macroeconomics of Public Sector Deficits: The Case of Zimbabwe	Felipe Morande Klaus Schmidt-Hebbel	May 1991	S. Jonnakuty 39074

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS689	Do Tax Policies Stimulate Investment in Physical and Research and Development Capital?	Anwar Shah John Baffes	May 1991	A. Bhalla 37699
WPS690	The Terms-of-Trade Effects from the Elimination of State Trading in Soviet-Hungarian Trade	Gabor Oblath David Tarr	May 1991	J. Smith 37350
WPS691	Can Debt-Reduction Policies Restore Investment and Economic Growth in Highly Indebted Countries? A Macroeconomic Framework Applied to Argentina	Jacques Morisset	May 1991	S. King-Watson 31047
WPS692	Health Financing in the Poor Countries: Cost Recovery or Cost Reduction?	J. Brunet-Jailly	May 1991	O. Nadora 31091
WPS693	Report on Adjustment Lending II: Lessons for Eastern Europe	Vittorio Corbo	May 1991	A. Oropesa 39075
WPS694	Labor Markets in an Era of Adjustment: An Overview	Susan Horton Ravi Kanbur Dipak Mazumdar	May 1991	M. Schreier 36432
WPS695	Long Term Prospects in Eastern Europe: The Role of External Finance in an Era of Change	Ishac Diwan Fernando Saldanha	June 1991	S. King-Watson 33730
WPS696	Macroeconomics of Public Sector Deficits: The Case of Chile	Jorge Marshall Klaus Schmidt-Hebbel	June 1991	S. Jonnakuty 39074
WPS697	Volatility Reversal from Interest Rates to the Real Exchange Rate: Financial Liberalization in Chile, 1975-82	Paul D. McNelis Klaus Schmidt-Hebbel	June 1991	S. Jonnakuty 39074
WPS698	Tax Policy Options to Promote Private Capital Formation in Pakistan	Andrew Feltenstein Anwar Shah	June 1991	A. Bhalla 37699
WPS699	Regulation and Deregulation in Industrial Countries: Some Lessons for LDCs	Ralph Bradburd David R. Ross	June 1991	E. Madrona 37496
WPS700	Trade Liberalization and the Transition to a Market Economy	Oleh Havrylyshyn David Tarr	June 1991	N. Castillo 37961
WPS701	Education and Adjustment: A Review of the Literature	Andrew Noss	June 1991	C. Cristobal 33640