THE FINANCING OF ECONOMIC GROWTH AND DEVELOPMENT:

THE CASE OF MEXICO

by

FANNY WARMAN

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To my parents

Juan and Flora Warman

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ABSTRACT

This thesis examines general and specific aspects of the financing of the Mexican economy during the 1960-1990 period from both internal and external sources. The thesis focuses on two fundamental questions, the first of which is the analysis of the interrelationship between financial variables and real variables of the economy in order to asses the scope of the financial liberalisation policy being currently implemented in Mexico. Secondly, the thesis examines the impact of foreign capital flows on the domestic economy and the extent to which the expansion of the economy is constrained by the balance of payments.

Following a general description of the Mexican economy presented in chapter one, which focuses on the evolution of financial variables and the financial policy implemented during the 1960-1990 period, chapter two analyses the theory of financial liberalisation, the hypothesis of which are tested for Mexico in chapters three and four. Chapter three examines the effects of financial variables, especially of real interest rates, on the level of total savings, financial savings, the level of investment, and economic growth. Chapter four takes into consideration the hypothesis that the allocation of resources through market forces under a liberalised financial system improves the productivity of investment. For this purpose, the chapter analyses the role of the financial sector under a liberalised environment and then attempts to measure the productivity of both private and public investment and examines the relationship between them.

The theoretical and empirical effects of foreign capital inflows on domestic savings, investment and economic growth are examined in chapter five; in this context, the chapter develops a model in which both the effects of inflows and outflows of foreign capital are considered in order to estimate the net effect of foreign borrowing on economic growth. Finally, chapter six finds that the long-run rate of growth of the Mexican economy is closely approximated by the balance of payments equilibrium growth rate. Conclusions to be drawn from this thesis are presented in chapter seven.

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INTRODUCTION

This thesis examines the financing of the Mexican economy's growth between 1960 and 1990. The three decades under study describe and analyse at least three phases that the economy went through, which at various stages coincided with certain turning points of the country's push towards economic development.

The objective of this thesis is to examine two fundamental questions. The first of which is to analyse the interrelationship between financial variables and real variables of the economy in order to assess the scope of the current financial policy and the means by which it is being implemented. The second question the thesis examines is the impact that foreign capital flows have on the domestic economy and the extent to which the expansion of the economy is constrained by the balance of payments.

Both domestic and foreign financing are considered. As far as domestic financing is concerned, emphasis is given to the role played by the financial sector and to the interrelationship that exists between financial variables, such as the real interest rate, and the real variables of the economy such as savings, investment and growth. The analysis keeps in view the changes that took place in the financial sector at the end of the 1980's. As in the rest of the economy, the financial sector was affected by the liberalisation process that has been taking place since 1982. There has been a gradual shift in the overall strategy of economic policy from being state-directed towards a market forces-led economy under which the participation of the private sector in economic activity is enhanced.

In 1982, the economic disorders that resulted in Mexico declaring a moratorium of payments on its external debt, led to a redefinition of overall economic policy. The economic development strategy changed from being inward oriented, based on import substitution, to an outward oriented export-led strategy. This year also marked a change in the political leadership of the country. Increased state intervention in economic activities was seen by the new government as one of the causes of the 1982 economic crisis. The reduction of the public sector's deficit and of inflationary financing became a priority objective of economic policy which aimed at increasing the level of total domestic savings.

In the process of increasing domestic savings, the financial sector was seen as playing a prominent role. The need to increase domestic sources of finance arose when foreign financing abruptly fell in 1982, marking the beginning of the debt crisis and bringing to an end more than two decades of continuous net capital inflows. The availability of external capital inflows has set to a large extent the pace at which the economy could grow. As in the majority of developing countries, the Mexican economy faces the financing of necessary imports to increase its productive capacity as the ultimate constraint to accelerate the rate of economic growth.

Chapter one sets out to describe an overall perspective of the Mexican economy over the three decades from 1960 to 1990, highlighting its main characteristics and shortcomings. It specifically focuses on both the evolution of financial variables and the orientation of the financial policy followed during the same period.

Within the 1960-1990 period, three phases can be distinguished as far as the sources of finance for growth are concerned. The first phase - the 1960's decade - was characterised by a stable domestic and foreign economic environment in which growth was mainly financed with domestic non-inflationary resources. During the second phase, from 1971 until 1981, the economy began to rely increasingly on foreign capital inflows as a source of finance. In general, this period is characterised by an expansionary fiscal and monetary policy and a resort to inflationary finance. Until 1981, the rate of growth of output was positive. In the third phase, from 1982 onwards, the economy had to adjust to the lack of foreign financing. Inflationary financing was curtailed while economic policy veered towards the objective of increasing domestic savings. From 1982 until 1988, low and even negative rates of growth were experienced as a consequence of the stringent foreign conditions, a net outflow of financial resources, and the tight fiscal and monetary policies. From 1989, the economy showed signs of recovery after the net transfer of resources abroad was reduced from representing an average of 6 percent of GDP between 1983 and 1988 to 2 percent after 1989 (OECD, 1992).

Chapter two takes into consideration the theoretical aspects of financial liberalisation. After introducing the debate on the causality between financial development and economic growth, the chapter sets out to describe the models of Mckinnon (1973) and Shaw (1973) in both of which financial liberalisation is considered as a necessary condition for economic development, based on the classical assumption that prior savings is necessary to finance investment and economic growth. Following from this, both the models supporting and criticising financial liberalisation are described and analysed. Among the criticisms, the most significant is probably that of the post-Keynesian school, which considers the possibility of financial liberalisation, and the implied rise in real interest rates, discouraging investment and growth since it assumes that it is not savings that determines investment but the other way round. Finally, the chapter describes the capacity of the commercial banking system to create credit, which is not considered in any of the financial liberalisation models and yet is an important function of banks in the process of economic development.

Chapter three analyses the interrelationship between the real interest rate, savings, investment and economic growth in Mexico during the 1960-1990 period. The chapter distinguishes between financial savings and total domestic savings, for both of which the determinants are analysed empirically in order to test the hypotheses considered by the financial liberalisation models. Regarding investment, the chapter develops a model in which both demand and supply side determinants are considered in order to find the net effect that changes in the real interest rate have on investment. The last part of the chapter links the theory of financial liberalisation to the process of economic growth by using a savings and growth model in which the effects of financial variables are highlighted.

Chapter four is related to the analysis undertaken in the preceding chapters as it takes into consideration the hypothesis stating that the allocation of resources through market forces under a liberalised financial system improves the productivity of investment. While chapter three considers the quantitative effects of financial variables on savings and investment, chapter four enquires into the qualitative effects that financial variables might have on investment. For this purpose, the chapter analyses the role of the financial sector under a liberalised environment. It then attempts to measure the productivity of both public and private investment in Mexico and examines the relationship between public investment and private investment. In the last part, the chapter analyses the determinants of the incremental capital-output ratio.

In chapter five foreign savings are considered. The chapter analyses theoretically and empirically the effect that foreign savings has on domestic savings, investment and economic growth. It undertakes an analysis of the debate on foreign savings as either complementing or substituting domestic savings, and then shows the empirical evidence obtained in the case of Mexico. Concerning economic growth, the chapter develops a model in which both the effects of inflows and outflows of foreign capital are considered in order to estimate the net effect of foreign borrowing on growth.

Finally, chapter six looks at the constraint that the balance of payments imposes on the long run rate of growth of output. The chapter develops and estimates for the case of Mexico Thirlwall's (1979, 1982) balance of payments constrained growth model. The model argues that the rate of growth of output of an open developing economy is determined, in the long run, by the performance of exports, by the rate of growth of capital inflows and by the economy's dependence on imports to expand output.

The main sources of data used in the thesis are the Bank of Mexico and the Mexican National Institute of Statistics (INEGI). Additionally, data are obtained from the following sources: the International Monetary Fund's 'International Financial Statistics'; the IMF's 'Balance of Payments Statistics'; the United Nations Economic Commission for Latin-America; the United Nations 'National Accounts Statistics'; the Statistical Abstract for Latin-America; Economía Aplicada A.C., and the OECD's Economic Surveys.

CHAPTER I

THE MEXICAN ECONOMY AND THE FINANCIAL SYSTEM: 1960-1990

I.1 Introduction

The objectives of this chapter are two fold. The first is to provide a general description of the development of the Mexican economy since 1960 until 1990, highlighting its main characteristics and weak points. The second is to analyse the development of the financial system, the financial and credit policy, and the main financial indicators during the same period. Within these thirty years, three sub-periods can be distinguished: from 1960 to 1970; from 1971 to 1981; and from 1982 until 1990. The first sub-period, from 1960 to 1970, called the 'Stabilising Development Period'[1], is characterised by rapid growth with domestic financial stability and external equilibrium. It is chosen as a point of departure for the ensuing analysis because during this period the financial sector played an increasingly important role in achieving both domestic financial stability and external equilibrium. Further, it was during this decade that many of the so-called structural problems of the economy originated or deepened.

The second period, from 1971 to 1981, is characterised, in general, by a large expansion of the public sector; increasing foreign capital inflows and the consequent accumulation of external debt; high rates of economic growth, and inflation. It is during this period that the exchange rate, which had been fixed since 1954, was devalued in 1976 after the current account deficit of the balance of payments became unsustainable. This crisis gave rise to the establishment of contractionary economic policies which were

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[1] The 'Stabilising Development Period' is sometimes considered to include the 1959-1970 period'.

implemented in the following two years, and saw the intervention of the International Monetary Fund. However, by 1978, the rise in the international price of oil and the discovery of large oil reserves in Mexico virtually eliminated the external constraint and marked the beginning of the period known as the 'Oil Boom'. This period lasted until mid 1982 when the external debt crisis began.

The third period, from 1982 until 1990, is characterised by economic recession. Since 1982, Mexico has experienced low and even negative rates of growth of GDP, a sharp fall in the levels of savings and investment, of real personal income, and in the standard of living of the majority of the population. It is only after 1989 that the rate of growth of the economy shows some signs of recovery, but still, however, remains below the average growth rate experienced during the last thirty years.

The three decades spanning from 1960 to 1990 can also be more broadly distinguished by describing the strategy followed by economic policy as being either inward or outward oriented. In this sense, the 1960-1982 period can be seen as a period during which economic policy was inward oriented. Even though macroeconomic conditions were not the same during this period, the basic industrialisation policy followed was import substitution. After 1982, the economy veered to an outward oriented economic policy which gave emphasis to the performance of exports. During this period, the economy gradually became more open (Mexico joined the General Agreement for Trade and Tariffs, GATT in 1986), culminating in the Free Trade Agreement which is currently being established between Canada, the United States, and Mexico.

As far as capital inflows are concerned, it will be seen how, to a large extent, the availability of external capital set the pace at which the economy could grow, by relaxing or tightening the balance of payments constraint, a trend which is especially noticeable during the 1970 and 1980 decades.

I.2 The Mexican Financial Sector

What follows is a brief overview of the Mexican financial sector which will serve as an introduction to the following sections which discuss and analyse the role of financial institutions and the evolution of financial and credit policy during the 1960-1990 period in Mexico.

Beginning in 1988, the government undertook a thorough financial sector liberalisation programme. The government's task was made easier due to the two earlier phases of institutional and administrative reforms in the financial sector. In the mid-1970s, the institutional structure of the financial system was modernised and in addition the government initiated the creation of a treasury bill market. After the 1982 devaluation and the subsequent weakening of the financial position of private sector commercial banks, which had a large share of dollar denominated deposits, the outgoing administration nationalised the commercial banks. Albeit, with the aim of reviving private sector confidence in the government, the new administration (beginning of 1983) negotiated the resale of one-third of the banks' assets and invited the recently dispossessed members of the private banking sector to operate the brokerage houses. The result of this was an unprecedented growth in the activities of the brokerage houses, which operated in an unregulated financial framework, i.e. they were not subject to compulsory reserve requirements. This process led to a two-tiered financial sector, one liberalised composed of the brokerage houses, and one repressed, composed of the government-owned commercial banks, which were strictly regulated.

The relative success enjoyed by the private brokerage houses in comparison to the poor performance of government-owned banks was an early justification for a comprehensive liberalisation of the banking sector, in April 1989.

The government's liberalisation policies resulted in the eventual re-privatisation of the commercial banks, which are the largest financial intermediaries and the main providers of credit to the private sector. Section IV.3 in chapter IV analyses the distribution of credit given by commercial banks to the public and private sectors during the period analysed.

At the time of writing, Mexico's financial system consists of the Central Bank (Banco de México), eighteen commercial banks (of which only three remain government-owned), seven government-owned development banks, five government-owned trust funds and twenty eight privately owned brokerage houses.

During the 1970s the government created the basis for a full service commercial banking system. During the 1960s and early 1970's a wide variety of specialised credit institutions - commercial banks, mortgage banks and 'financieras' for trade and commerce - had proliferated as a result of regulatory market segmentation. In 1974 the government allowed the merger of these institutions into full-service commercial banks.

Until 1989, commercial banks operated under quantitative credit and interest rate controls. Extensive sectoral credit targets and a complex system of reserve and liquidity requirements channelled credit to administratively determined priority uses, leaving less than fifty percent of credit not subject to sectoral targets and interest rate controls. Additionally, a system of special loan tranches operated through which commercial banks lent at subsidised rates a fixed percentage of their deposit liabilities to the agricultural, exports, industrial and housing sectors. The following table shows the commercial banks' reserve and liquidity requirements. The table gives as an example the reserve rates for three years: before commercial banks nationalisation (1980), during the period when commercial banks were nationalised (1987), and after financial liberalisation (1990).

Table I.1

Compulsory Reserve Requirements * (%)			
	1980	1987	1990
Cash Reserves	1.7	-	-
Deposits in the Central Bank (1)	38.8	10.0	-
Treasury Bills	-	-	30.0
Credit to the Federal Government	-	35.0	-
Credit to Agriculture	5.4	4.7	-
Credit to the Housing Sector	7.8	8.5	-
Credit to the Industrial Sector (2)	4.1	4.9	-
TOTAL	57.8	63.1	30.0

Notes:

* On the stock of domestic currency denominated deposit liabilities of commercial banks. Foreign currency liabilities were subject to higher reserve rates.

(1) Interest yielding deposits in the Central Bank

(2) Small and medium size enterprises

In 1980, 38.8 percent of total commercial banks' deposit liabilities in domestic currency had to be deposited in the Central Bank (interest yielding deposits); 5.4 percent had to be allocated in credits to agriculture, 7.8 percent in credits to the housing sector; and 4.1 percent in credits to the industrial sector (small and medium size enterprises). After subtracting the above percentages from total credit only 42.2 percent of total credit given by commercial banks remained to be freely allocated, determined by market forces. The already controlled credit allocation did not change dramatically after the commercial banks nationalisation in 1982. The percentage of credit allocated by market forces (not through selective credit controls) remained on average, similar to the pre-nationalisation period. This may have been partly due to the fact that the incoming administration (end of 1982, beginning of 1983) acted quickly after banks were nationalised, ensuring that internal banking practices of the previously private banks would remain unchanged, as banks were being prepared for re-privatisation.

As the above table shows, with the liberalisation of the financial system the allocation of credit given by commercial banks changed as reserve requirements and selective credit controls were reduced. After 1989, commercial banks were required to invest 30 percent of their deposit liabilities (denominated in domestic currency) in treasury bills, as opposed to the complicated scheme of credit loan tranches and compulsory reserve requirements of the previous years (see Table I.1).

The major part of credit given by development banks, which are owned by the government, is given to finance the deficit of the public sector. Section IV.3 in chapter IV analyses the distribution of credit given by development banks to the public and the private sectors. Development banks are subject to much lower reserve requirements than commercial banks as the major part of their lending is to the public sector. Government owned development banks and trust funds (which are financed by the Central Bank) had served partly overlapping functions and provided credit for housing, mining, tourism, infrastructure projects, agriculture, exporters and a variety of large - often state owned -as well as small and medium sized enterprises. After the liberalisation of the financial system, the number of development banks and government trust funds was reduced through mergers and closures. Of the nine government-owned trust funds existing in 1985, only five remain at present. These trust funds provide credit at subsidised rates to the agriculture sector, the housing sector, commercial activities and to the tourism sector.

The role of the Central Bank in credit allocation and financial policy is analysed in detail in chapter I. Additionally, chapter IV section 2 analyses the changes in the role of the central bank from a regulated financial system to a market-forces led economy.

I.3 The Stabilising Development Period: 1960-1970

Given that domestic financial stability and external equilibrium were under control, the main goal of economic policy during this period was to achieve a rapid rate of growth of the economy. In fact, the average real rate of growth of output was 6.6 percent. This was to be reached through a fast process of industrialisation since it was believed that industrialisation was the only means by which Mexico could grow and the standard of living of its population could be increased by increasing its productivity. For this purpose, private and public investment were favoured. The industrial sectors considered as the most important for economic development enjoyed a favourable fiscal, financial and external environment with a high level of protection.

As stated earlier, the strategy to follow for industrialisation was via import substitution. For example, it was necessary to substitute durable consumer goods which required for their production imported capital and intermediate goods that kept the current account of the balance of payments in a deficit situation (Villarreal, 1977). Even though exports from the agricultural and manufactured goods sectors rose, the country had to borrow from the external sector to finance its deficit. The public sector's external debt rose from US$384 million in 1965 to US$983 million in 1970, and the ratio of the public sector's external debt to GNP rose from 2.0 percent in 1965 to 3.5 percent in 1970 (Source of data: IMF, International Financial Statistics Yearbook, 1992).

The role played by the agricultural sector was of major importance. Primary good exports financed the imports of capital and intermediate goods. However, it is argued that the agricultural sector began to be neglected by economic policy during this period. This is reflected in the proportion of credit received by this sector, which fell from 14.6 percent of total financing given by the banking system in 1960 to 9.6 percent in 1969. This process, it is argued, led the country to cease to be self sufficient in agricultural products. On the other hand, credit given to the industrial sector averaged 50 percent of total credit given by the banking sector from 1960 until 1970.

Table I.2

Main Indicators of the Mexican Economy						
Year	Real Rate of Growth of Output (%)	Inflation (%) (1)	$M4$ Real Stock (Bill. Pesos) (2)	$\frac{M4}{GDP}$ (%) (3)	Public Sector Deficit / GDP (%) (4)	Current Account Deficit (Mill. Dollars)
1960	8.0	4.8	110.1	18.2	0.3	-419.7
1961	4.9	0.0	126.4	18.9	-0.8	-343.7
1962	4.7	2.3	145.7	20.7	-0.7	-249.6
1963	8.0	0.4	174.1	22.3	-0.7	-226.1
1964	11.7	5.5	197.6	22.6	-0.7	-444.7
1965	6.5	0.2	227.3	23.9	-3.1	-442.9
1966	6.9	2.9	266.3	26.0	-1.2	-447.8
1967	6.3	1.7	310.7	28.2	-1.6	-603.0
1968	8.1	2.0	356.0	29.8	-1.5	-775.4
1969	6.3	4.9	404.7	32.1	-2.3	-708.4
1970	6.9	4.7	457.0	34.0	-1.4	-1187.9
1971	4.2	5.0	495.9	35.0	-2.5	-928.9
1972	8.5	5.6	553.8	35.7	-4.9	-1005.7
1973	8.4	21.4	520.6	33.2	-6.9	-1528.8
1974	6.1	20.6	509.7	29.9	-7.7	-3226.0
1975	5.6	11.3	580.6	30.9	-10.0	-4442.6
1976	4.2	27.2	521.5	28.2	-9.9	-3683.3
1977	3.4	20.1	563.2	27.4	-6.7	-1596.4
1978	8.3	16.2	657.5	29.2	-6.7	-2693.0
1979	9.2	20.0	758.1	30.6	-7.6	-4870.5
1980	8.3	29.9	838.7	31.3	-7.9	-10739.7
1981	8.8	28.7	953.3	33.9	-14.8	-16052.1
1982	-0.6	98.8	687.4	37.2	-17.8	-6221.0
1983	-4.2	80.8	692.9	34.1	-9.0	5418.4
1984	3.6	59.2	782.7	35.3	-8.7	4238.5
1985	2.6	63.8	732.6	33.3	-10.0	1236.7
1986	-3.8	105.8	737.1	41.2	-16.8	-1672.5
1987	1.7	159.2	737.0	43.7	-16.5	3966.5
1988	1.4	51.7	792.9	34.5	-13.0	-2442.6
1989	3.2	19.7	999.7	40.2	-6.2	-3960.2
1990	3.9	25.2	1179.5	43.7	-3.5	-5254.2

Notes:
(1). December-December Inflation. National Consumer Price Index Base 1978=100
(2). The Real Stock M4[2] is the Nominal M4 Stock deflated with the National Consumer Price Index

[2] The average exchange rate is used to convert the foreign currency component of M4 into Mexican pesos.

(1978=100)

(3). The $\frac{M4}{GDP}$ ratio is calculated considering the nominal values of $M4$ and GDP

(4). Public Sector nominal financial deficit over nominal GDP

Source of Data: The public sector's deficit data for the 1960-1970 period were obtained from Gomez Oliver (1981). The rest of the data were obtained from Banco de México, and INEGI.

I.3.1 Financial and Credit Policy

It is well documented that the financial system played a decisive role in economic growth during the 1960's. The country's economy grew with very low levels of inflation (4 percent on average) and with a fixed exchange rate that eliminated financial speculation associated with uncertainty over future movements in the price of currency. The exchange rate was kept fixed at the level of 12.49 Mexican pesos per dollar from 1954 until 1976.

The rapid growth in economic activity required a greater degree of financial intermediation, a process that led to the expansion and consolidation of the financial system. The establishment of a fixed exchange rate and the low levels of inflation experienced during this decade gradually enhanced the confidence of the wealth holders in the domestic financial system.

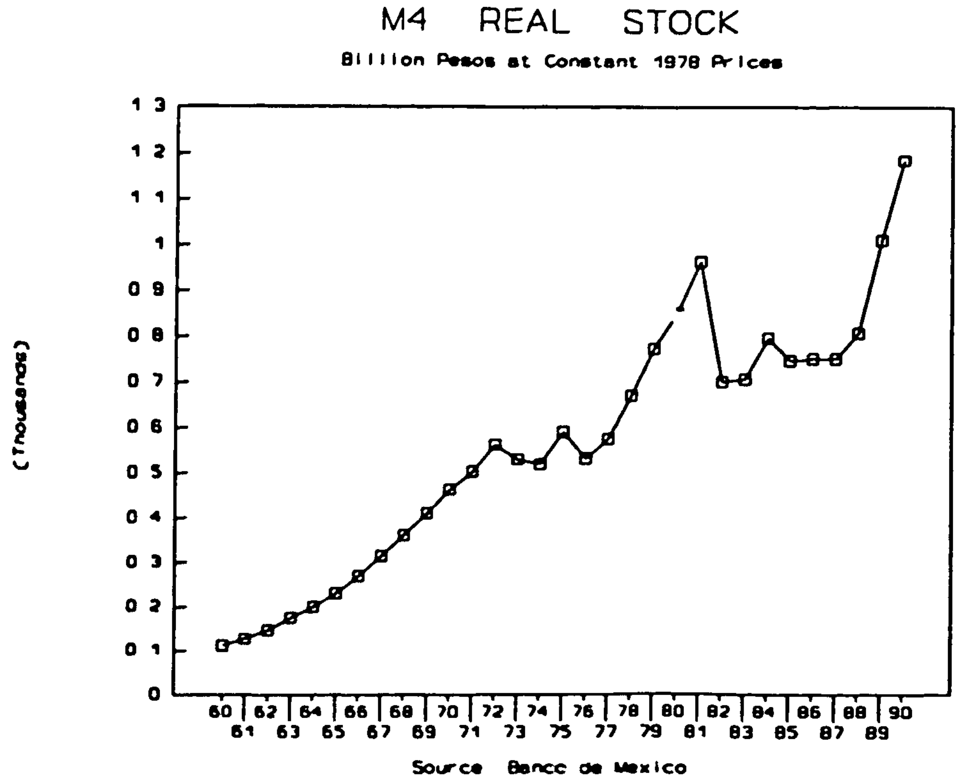
Before the Stabilising Policy was implemented and the exchange rate was fixed, devaluations of the Mexican peso had a strong effect on the public's expectations. Devaluations increase expectations of further devaluations and spur the withdrawal of financial resources away from the institutional financial system. Thus, the pegging of the exchange rate, among other monetary policy measures, permitted the expansion of the financial system by creating a stable domestic financial environment.

It is worthwhile to mention that the Mexican financial system is relatively new. It was not until 1925 that the Central Bank, Banco de México, was created with the purpose not only of controlling and coordinating the financial system but also of forming and organising one (Brothers and Solis, 1966). After the foundation of the Central Bank many development banks and trust funds were created with the purpose of channelling resources to specific sectors of the economy, mainly funded by the Central Bank. By 1960 the financial system was expected to provide 'an institutional framework for the mobilisation of savings and the channelling of these savings into productive investment, as well as to promote continuous augmentation of the aggregate volume of savings and capital formation while at the same time serving as a principal vehicle for exercise of control over resource allocation. The system also bears primary responsibility for maintenance of stability in the domestic economy and in the country's international financial relations' (Brothers and Solis, 1966).

The above mentioned factors reflect the contribution of the financial system to overall economic growth and development. That is, by providing conditions of domestic financial stability and an equilibrium in the balance of international payments, the financial system can create an appropriate environment to generate or increase financial resources and improve the allocation of credit.

The positive trend and increasing level of the monetary aggregate M4 (which is the broadest monetary aggregate) during the entire decade is shown in Table I.2, measured both in real terms and as a proportion of GDP, and in graph 1. The increasing trend of the monetary aggregate, which is an indicator of the degree of financial intermediation, reflects the financial policy and environment of the period, as the rise in the level of financial savings became a major objective of the monetary authorities. For the purpose of financing growth, the rise in the level of savings, and more precisely, the deviation of savings towards the financial system was part of the economic policy objectives. During this decade, non-inflationary domestic financing was the main source of financial resources (see Thompson, 1979).

Graph 1



Various factors can be distinguished to explain the dynamic behaviour of financial savings. Firstly, the level of total net domestic savings, public and private, rose from 7.7 percent of GDP in 1959 to 12.7 percent in 1970. Secondly, economic policy instruments were oriented to attract savings into the financial system. For this purpose two main variables were used: the real rate of interest offered by the banking system on deposits and the degree of liquidity of the financial system. During the whole decade the banking system offered a positive real rate of interest on its deposits suggesting a high correlation between financial savings and the real interest rate. The annual real rate of interest[3] moved between the range of 3 percent to 10 percent, averaging 5.4 percent in the decade.

[3] The real interest rate considered is the annual accumulated one. The method of calculation is shown in Appendix III.A1 in the third chapter.

The capacity of the financial system to redeem almost any obligation at any time, regardless of its maturity, was another factor that attracted resources towards financial institutions. In the 1960's, when the lack of liquidity of the financial system of many developing countries acted as a major obstacle to channelling potential resources to investment (Brimmer, 1971), 'in at least one developing country -Mexico- the lack of liquidity [was] not a problem because the financial institutions [stood] ready to repurchase most of their financial instruments at par at any time'. (Brimmer, 1971, p.783). The Central Bank guaranteed that financial obligations could be paid to savers at any time by financial institutions.

While some argue that a high degree of liquidity of the financial system represents a threat to the stability of prices (Brothers and Solis, 1966), others argue that the rise in the demand for interest bearing financial assets acts as a restraint on inflation since the public gradually demands more long term financial assets, which are less liquid, instead of increasing their monetary balances (Thompson, 1979).

Even though increased liquidity of the system was probably a threat to the stability of prices, since redemption of a significant amount of financial assets could augment monetary balances and increase the pressure on prices, it only remained as a threat since inflation did not rise to serious levels.

Table I.3

Percentage Structure of Financial Assets (%)					
Year	Monetary Assets M1 (1)	Interest Bearing Financial Assets			
		Total	Short Term Banking Financial Assets (2)	Non-Banking Financial Assets (3)	Long term Financial Assets (4)
1960	62.9	37.1	37.1	-	-
1961	58.5	41.5	41.5	-	-
1962	56.1	43.9	43.9	-	-
1963	54.1	45.9	45.9	-	-
1964	52.6	47.4	47.4	-	-
1965	48.4	51.6	51.6	-	-
1966	44.6	55.4	55.4	-	-
1967	40.4	59.6	59.6	-	-
1968	38.9	61.1	61.1	-	-
1969	36.1	63.9	63.9	-	-
1970	33.7	66.3	66.3	-	-
1971	31.9	68.1	68.1	-	-
1972	32.3	67.2	67.2	-	-
1973	36.4	63.6	63.6	-	-
1974	37.0	63.0	63.0	-	-
1975	35.3	64.6	64.6	-	-
1976	42.0	58.0	58.0	-	-
1977	40.2	59.8	54.8	-	5.0
1978	39.1	60.9	51.8	0.3	8.8
1979	37.8	62.2	50.9	1.9	9.4
1980	35.2	64.8	53.9	2.8	8.1
1981	31.6	68.4	60.2	3.3	4.9
1982	27.7	72.3	61.7	7.2	3.4
1983	23.5	76.5	63.1	6.8	6.6
1984	22.3	77.7	64.0	7.0	6.7
1985	22.6	77.4	60.5	6.9	10.0
1986	18.8	82.2	59.4	9.0	12.8
1987	16.7	83.3	56.1	14.6	12.6
1988	16.6	83.4	48.5	25.9	9.0
1989	15.5	84.5	46.2	28.5	9.8
1990	17.2	82.8	44.4	25.4	13.0

Notes:
(1) Coins, currency and demand deposits (M1). (From the end of 1989 view deposits yield interest.)
(2) Banking financial assets under one year redemption period
(3) Treasury Bills and other government bonds
(4) Banking financial assets and government bonds over one year redemption period
Source: Banco de México

On the other hand, and in relation to the second argument presented above, the effects of a stable financial environment together with a positive real interest rate were reflected in the public's demand for financial assets as it shifted from monetary (M1) to interest bearing financial assets (M2, M3 and M4).

Table I.3 shows the gradual shift in demand from monetary assets to interest yielding financial assets, which, during the 1960's were all bank financial assets with a redemption period of less than one year.

It must be mentioned that the attractiveness of bank financial instruments resulting from the high levels of liquidity and positive real interest rates inhibited the development of a stock market, since it was difficult for private enterprises to compete with the financial instruments from the banks given their virtually risk-free nature and their high yields. The fact that the stock market failed to expand left banking credit as the main source of finance to the private sector (besides self-financing).

I.3.1.1 The Monetary Base

Considering the asset position of the Central Bank, the monetary base can be divided into two components: the domestic and the external component. The domestic component consists of total credit given by the Central Bank to the public sector and to other financial intermediaries which consist of: development banks, commercial banks and official trusts. The external component consists of the international reserves held at the Central Bank.

Table I.4 shows the monetary base components in real terms. The expansion of credit to the public sector is outstanding, increasing from 32.1 billion pesos (in constant 1980 prices) to 210.0 billion in 1971, and increasing its share in the monetary base from 39.5 percent in 1960 to 68.7 percent in 1971. On the other hand, the level of gross international reserves also increased in real terms, but its share in the total monetary base

Table I.4

Monetary Base Billion Pesos (at constant 1980 prices)					
Year	Monetary Base	International Reserves	Financing to the Public Sector	Financing to Other Fin. Interm.	Net Position
1960	81.4	31.6	32.1	21.6	-3.9
1961	88.1	30.5	32.7	32.7	-7.8
1962	100.0	31.0	33.2	43.5	-7.6
1963	118.0	37.9	49.8	37.4	-7.0
1964	142.0	39.5	67.1	36.4	-1.0
1965	157.8	36.8	114.9	12.8	-6.6
1966	172.8	35.8	130.6	12.4	-6.0
1967	198.2	39.1	137.2	19.0	2.9
1968	224.9	41.1	158.4	12.9	12.4
1969	249.1	42.5	197.2	8.5	0.9
1970	269.9	47.7	207.9	14.4	0.0
1971	305.8	61.8	210.1	19.7	14.0
1972	347.7	74.1	251.0	16.7	5.9
1973	383.2	70.9	302.2	23.5	-13.4
1974	396.4	56.9	334.0	27.7	-22.3
1975	458.9	54.7	391.1	27.7	-14.7
1976	522.6	63.8	433.9	83.5	-58.6
1977	514.4	78.4	454.7	53.2	-71.9
1978	562.7	78.1	476.6	44.0	-36.0
1979	642.9	88.9	525.4	49.0	-20.3
1980	718.1	93.1	559.1	69.5	-3.6
1981	814.0	103.2	646.8	65.0	-1.0
1982	975.4	86.8	979.1	187.4	-277.6
1983	763.9	172.6	726.0	25.1	-159.7
1984	711.7	229.9	551.5	14.3	-84.0
1985	530.0	199.5	535.2	-29.1	-175.6
1986	420.5	311.4	494.3	-70.2	-315.0
1987	308.8	655.1	213.3	-90.0	-469.5
1988	209.5	151.7	317.6	-45.2	-214.6
1989	193.1	152.4	320.1	-38.0	-241.3
1990	206.8	201.0	266.1	-15.7	-244.6

Source: Banco de México
Notes: Nominal values deflated with the National Consumer Price Index 1980=100

decreased from 38.8 percent in 1960 to 20.2 percent in 1971. The rising trend in the stock of credit given to the public sector reflects the expansionary credit policy implemented during this period.

I.3.1.2 Credit Policy

The amount of total credit given by the banking sector to both the public and the private sector increased simultaneously with financial savings. Although credit given by the Central Bank to the public sector increased, the proportion of public debt financed by the Central Bank decreased from 73.1 percent in 1955 to an average of 29.7 percent in the 1962-1970 period (Gomez Oliver, 1981), while the proportion financed by private commercial banks increased. The following table shows the levels and the percentage structure of total financing from the banking sector to both the Federal Government and the private sector, from 1960 to 1970.

Table I.5

Financing from the Banking Sector
Billion Pesos (at constant 1980 prices)
1960-1971

Year	Total	To Private Sector		To Federal Government	
	Stock	Stock	Share (%)	Stock	Share (%)
1960	220.4	189.1	85.81	31.3	14.19
1961	255.1	224.8	88.11	30.3	11.89
1962	290.5	260.0	89.50	30.5	10.50
1963	331.6	283.1	85.38	48.5	14.62
1964	381.5	315.6	82.73	65.9	17.27
1965	446.2	341.7	76.57	104.6	23.43
1966	519.6	383.6	73.83	136.0	26.17
1967	591.2	444.4	75.17	146.8	24.83
1968	664.0	495.6	74.65	168.4	25.35
1969	788.8	588.5	74.60	200.3	25.40
1970	900.6	682.3	75.76	218.3	24.24

Notes: Nominal values have been deflated with the National Consumer Price Index, 1980=100.
Source: Banco de México

Total financing grew at an average rate of 15.1 percent per year in real terms; financing to the private sector grew, on average, 12.1 percent per year; and financing to the Federal Government grew at an average rate of 23.1 percent per year, increasing its share in total financing from 14.2 percent in 1960 to 24.2 percent in 1970.

Concerning external financing, data for the 1960-1970 period show that the ratio of the public sector's external debt to GNP rose to 3.5 percent in 1970. If, however, this value is compared with a ratio of public and publicly guaranteed external debt to GNP equal to 16.5 percent in 1976; 25 percent in 1982; and 50 percent in 1986, it can be said that during the Stabilising Development Period, the external debt of the Federal Government did not represent a financial burden. In nominal terms, the external debt of the Government rose from 4.8 billion pesos in 1965 to 12.3 billion in 1970 (source of data: IMF, International Financial Statistics Yearbook, 1992)

It has been recognised that the expansion of credit to both the public and private sectors encouraged economic growth during the 1960's. Through credit controls and the reserve requirement, the financial system directed public investment towards the industrial, agricultural and commercial sectors of the economy to promote development of economic activities considered as priority and into which private investment was not attracted. Public investment was mainly oriented to the promotion of industry. Within this sector, the oil industry (including petrochemicals) received half of total credit to the industrial sector.

The expansion of credit is reflected in total investment, which increased at an average real rate of 7.5 percent per year. This relationship suggests a correlation between financial savings, the financing given by the banking sector, and investment - a relationship which will be further analysed in the third chapter.

The reserve requirement is the basic instrument of control of the amount of credit. It was established as a legal obligation of commercial banks to keep reserves in the

Central Bank in cash and securities equal to a specific percentage of their deposits and other selected liabilities. Its use allows the Central Bank to control the composition of claims acquired by commercial banks and thereby to influence the allocation of credit resources between alternative applications. Throughout the 1960's, the Central Bank used the reserve requirement as a fundamental instrument of its monetary and credit policy, with the purpose of 'regulating the level of liquidity and deviating or channelling the banking system resources towards national priority fields' (Banco de México, 1969). Through this means it was possible to encourage productive activities of both the public and private sectors. Fixed percentages of banks' liabilities were compulsorily channelled at subsidised rates to activities to which the government gave priority. At the same time, however, reserve requirements were remunerated by the Central Bank at market rates covering the financial and administrative costs to banks. In this sense, the reserve requirement can be thought of as a risk-free (compulsory) credit from commercial banks to the government.

Development banks, which belong to the public sector, are subject to less strict reserve requirement regulations than private commercial banks. Credit given by development banks was mainly channelled to the public sector at subsidised loan rates. On the other hand, development banks could compete with commercial banks in attracting financial savings from the private sector. The difference between the interest rate offered on deposits and the subsidised rate charged on loans, i.e. the financial margin of development banks, caused significant losses to development banks which were covered by the government (Ghigliazza, 1990).

It is argued by some authors that the single most important financial innovation of the Stabilising Development period was the use of the private banking system to finance the government debt (Thompson, 1979). As mentioned above, the burden of financing the government debt shifted from the Central Bank to the private banking system. This was done through the flexible reserve requirement scheme, which empowered the Central

Bank to vary average reserve requirements on average deposits of the banks and to impose a reserve requirement of up to 100 percent of increases in deposits. During this period the reserve requirement could be lowered if private banks invested in specified assets such as government bonds, which were acquired mainly as an official procedure since they did not offer attractive yields. The Central Bank was capable of regulating the monetary base according to the government's deficit financing needs. The government enjoyed priority access to the banking system. Thus, when public debt financing needs grew, commercial banks were squeezed through the imposition of higher levels of reserve requirements. In this sense it can be said that monetary policy was subordinated to fiscal policy.

During the 1960's the idea of intervention from the financial authorities in the economy, through reserve requirements, the employment of differential discount rates and the interest rate, was fully supported. It was argued that in an economy with a narrow financial market, as compared to the developed countries, the only way to make financial resources reach basic areas for the development of the economy was via an explicit intervention of the authorities. For example, it was said that 'monetary policy is the most appropriate means for subsidising the public sector and thereby for influencing the allocation of investable resources in a manner deemed appropriate for promoting the desired rate and type of economic growth' (See Brothers and Solis, 1966). In this way the activities of the financial institutions, mainly of the Central Bank, consisted of more than the 'traditional' ones concerned only with the regulation of commercial banks and the money supply. Through its intervention the financial system played a crucial role by allocating credit for development purposes.

I.4 The Period of Public Sector Expansion: 1971-1982

The 1971-1982 period covers two six-year presidential administrations during which the economy went through several different phases. However, a common denominator of the economy during this period was the fast expansion of the public sector coupled with high rates of economic growth. The 1971-1981 period can be sub-divided into two periods marked by the duration of the political administrations, which coincided with significant events in the economy. The first period ended in 1976 with the devaluation of the peso after more than twenty years of a fixed exchange rate. The second period, beginning at the end of 1976, covers the 'Oil Boom' period and ended in 1982, when the debt crisis began. The analysis of this period will be undertaken in two different stages, first from 1971 until 1976 and then from 1977 until 1982, in order to simplify the study of the main characteristics of the economy during this period.

I.4.1 The Inflationary Financing Period: 1971-1976

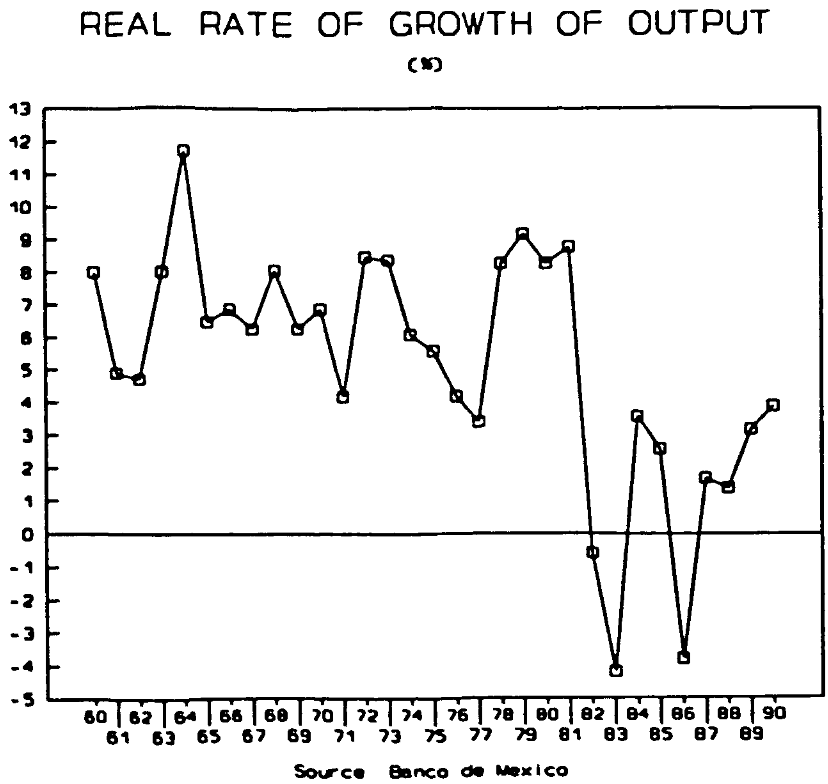
The 1960's was the last period of financial stability and external equilibrium experienced in Mexico. Nevertheless, the decade finished with a deteriorated agricultural sector, a weakened balance of payments[4], and, as argued by Lustig (1990), with a protected industry that somehow failed to increase productivity in spite of the economic dynamism created by the import substitution process. This failure, Lustig argues, was due to the lack of pressure from the government to demand industries to 'meet performance criteria in exchange for the benefits of protected markets' (Lustig, 1990, p.78).

With the new administration, beginning at the end of 1970, the economy entered a period of recession during 1971, which can be explained by both internal and external factors. The main external factor was economic recession in the United States in 1971,

[4] The deficit on current account increased from $708.4 million in 1969 to $1187.9 million in 1970, representing the sharpest rise and the highest figure of the decade.

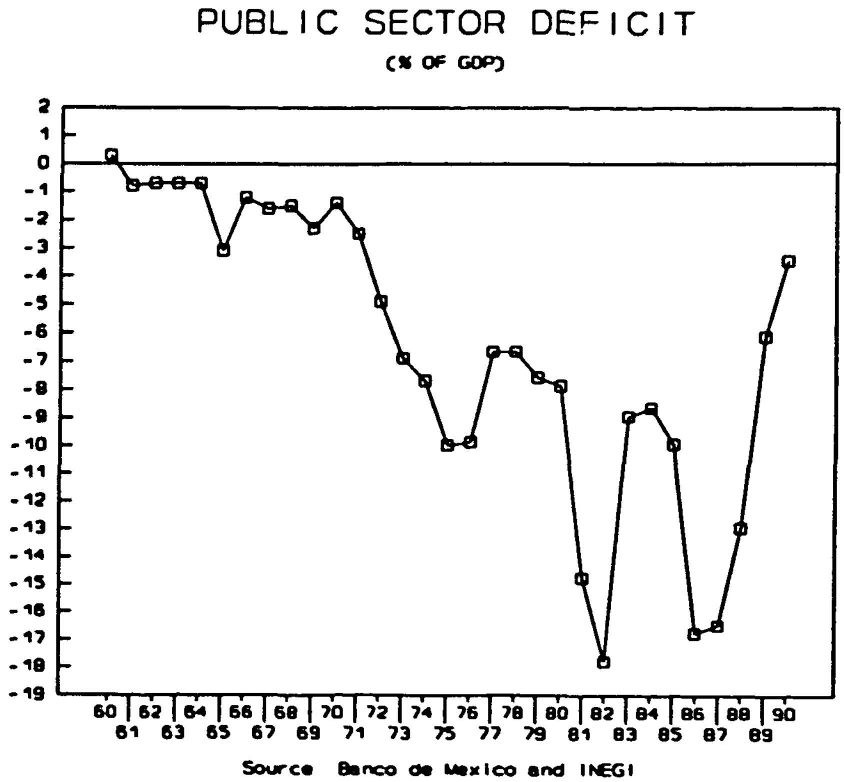
the year in which the fixed parity system established at Bretton Woods in 1944 broke down (Gomez Oliver, 1978). The main internal reason seems to have been the sharp reduction in public expenditure and in public investment during the year. The reduction in public expenditure was implemented, together with other economic policy measures, in order to slow down import growth, to reduce the current account deficit and inflation (Banco de México, 1971).

Graph 2



The real rate of growth of output fell from 6.9 percent in 1970 to 4.2 percent in 1971 (measured at constant 1980 prices). This fall in the rate of growth, which averaged more than 6 percent in the 1960's, worried the government and led them to react with a significant increase in public expenditure in order to resume economic growth. The expansion of public expenditure remained the main characteristic of economic policy until 1976. The public sector's financial deficit doubled between 1971 and 1972, and increased from 2.5 percent of GDP in 1971 to 9.9 percent in 1976. The real rate of growth of output remained high during the whole period, averaging 6.2 percent; inflation averaged 15.5 percent, and the exchange rate was kept fixed until 1976 when it could no longer be sustained because of balance of payments pressures.

Graph 3



Concerning the behaviour of real variables of the economy, several points can be emphasised. The first is that the real rate of growth of output was high during the whole period, ranging from 4.2 percent in 1971 and in 1976, to 8.4 percent in 1973. The second is that although there exists an argument among different authors surrounding the issue, it can be said that growth was mainly led by the increase in public investment, since its real rate of growth, 12.4 percent per year on average, was higher than for private investment, which averaged only 5 percent per year. It is often argued in this context that the public sector had to increase expenditure on investment because of the stagnation of private investment. Thirdly, external disequilibrium began to accentuate in 1973, and became unsustainable in 1976. Finally, there was a broad expansion of the public sector and increased public sector intervention in economic activity.

The expansion of output and the real appreciation of the peso (as the exchange rate was fixed and inflation accelerated) caused the deficit on current account to increase from US$929 million in 1971 to $4443 million in 1975, financed mainly by long term capital inflows. It is argued that inflation, the appreciation of the peso and the accumulation of external debt triggered capital flight from 1973 onwards. By 1976, the increasing capital outflow made the maintenance of the fixed exchange rate unsustainable and the peso was devalued.

I.4.1.1 Financial and Credit Policy

The period under analysis marks the beginning of strong fluctuations in financial variables. For the first time since 1960, the stock of financial assets fell in real terms in 1973. The ratio of broad money (M4) to GDP had a lower value in 1976 than in 1971. This process, also known as financial disintermediation, has been attributed by some authors (Ghigliazza, 1990) to the negative real interest rates that prevailed after 1973. According to our calculations, financial savings were negative during 1973, 1974 and 1976 (see Table 3, chapter III). However, financial savings increased significantly in 1975 when the nominal interest rate offered on deposits was raised for this purpose (Banco de México, 1975).

The correlation between the real interest rate and financial savings seems to be apparent during this period. The real interest rate became negative in 1973 and remained negative until 1976. Even in 1975, when the interest rate rose, it remained negative in real terms. The negative real interest rate after 1973 also explains the shift from interest bearing financial assets to monetary assets that took place especially in 1976, as shown in Table I.3.

Some authors argue that the decline in financial assets held in the banking sector narrowed the supply of credit available to the private sector (Gomez Oliver, 1978), which in turn, negatively affected private investment during this period.

Concerning credit to the public sector, it can be seen in Table I.4 that the behaviour of the monetary base is characterised by the expansion of credit from the Central Bank to the government. The expansion of internal credit to the government represented 78.7 percent of the total monetary base on average from 1971 to 1976, reaching a maximum of 85.2 percent in 1975.

The reserve requirement continued to be the main instrument through which credit from the banking sector was allocated either to the public or private sector. It was first lowered in 1972 as part of the expansionary policy in order to release resources to the private sector, but from 1973 onwards, the reserve ratio was raised as commercial banks' liabilities fell. As stated in the Central Bank's annual report: 'reserve requirements were not higher only because a higher percentage of bank liabilities devoted to finance the government's deficit with non-inflationary resources would have left the private sector without credit' (Banco de México, 1975).

It was compulsory for commercial banks to have cash deposits in the Central Bank. As part of the requirement, banks could invest in public bonds. The percentage of investment in public bonds depended on: the kind of financial intermediaries (for example, development Banks virtually had no reserve requirements), the part of the country in which the bank is situated, and the type of deposits (deposits in foreign currency are subject to much higher reserve ratios). Until 1978 government bonds had a fixed price, but in 1978, Treasury Bills were introduced with a variable price fixed in open market operations. Concerning commercial banks' reserves kept in interest yielding deposits in the Central Bank - the interest rate paid by the Central Bank was set periodically in a negotiation process with commercial banks and according to the interest rate that commercial banks paid on the public's deposits (Calderón, Cárdenas and Ize, 1981).

I.4.2 Economic Crisis and the 'Oil Boom' Period: 1977-1982

After the economic crisis of 1976, the economy underwent a brief adjustment process. During 1977, the aim of economic policy was to reduce both the public and the external deficit and to control inflation. For this purpose, the peso was further devalued and public expenditure was reduced. Another important policy change in this year was the rise in nominal domestic interest rates to curtail the capital flight that had been occurring since 1973.

The year ended with: a reduced current account deficit, which decreased from $3683.3 million in 1976 to $1596.4 million in 1977; inflation that dropped from 27.2 percent in 1976 to 20.1 percent in 1977; and a reduction of the public sector deficit from 9.9 percent of GDP in 1976 to 6.7 percent in 1977. It is not coincidental that this year recorded the lowest rate of growth of output since 1960. The gross domestic product grew 3.4 percent and the ratio of gross fixed investment to GDP fell from 21.6 percent in 1976 to 19.3 percent in 1977.

By the end of 1977, expectations about future economic growth changed with the discovery of major oil-reserves. The magnitude of this was enormous; the proven oil-reserves rose from 6.4 billion barrels at the end of 1975 to 16 billion by 1977 (Zedillo, 1986, p. 970). From this year, the dependence of the economy on oil revenues increased. By 1977, crude oil exports had doubled to $987.3 million from $420.0 million in 1976. By 1981, Mexican crude oil exports amounted to $13,305.2 million and by 1982, they represented 74 percent of total exports. Together with the increasing volume of exported oil, there was a rise in its international price. The price of oil rose from $13.4 per barrel in 1977 to $19.6 in 1979, reaching its highest level, $33.2 per barrel, in 1981. The government became too confident and optimistic about the international price of oil.

These facts explain why the period from 1978 to 1981 is known as the 'Oil-Boom' period. The economy grew at more than 8.0 percent per year during these four years, averaging 8.6 percent. The ratio of Gross Capital Formation to GDP rose from 22.1 percent in 1978 to 26.4 percent in 1981. GDP per capita rose from $1143 in 1975 to $1426 in 1981 (Dollars at 1970 prices, source of data: ECLAC, 1981).

Economic policy during this period successfully accomplished its main goals: to expand and diversify the productive sector of the economy and to create employment at a faster rate than the growth of the active population. The main economic instrument used by the government was public expenditure, or more precisely, public investment expenditure, of which the major part was invested in the oil sector. The Central Bank in its 1979 Annual Report states that the goal of economic policy was the consolidation of output growth, employment and investment. This goal was accomplished with the expansion of public expenditure and the positive reaction of private investment. The effects of the expansion of investment on the rest of the economy were the main cause of the generalised growth in demand experienced during this period (Banco de México, 1979). The real rate of growth of public expenditure was over 17 percent per annum on average for the period.

As far as the composition of public expenditure is concerned, the share of public investment in total expenditure rose from 25.3 percent in 1977 to 32.5 percent in 1981. On the other hand, the percentage share of interest payments on public debt (a payment that is part of the current expenditure of the public sector) was kept around 10 percent during the whole period, rising to 18.5 percent in 1982.[5]

The public sector financial deficit as a proportion of GDP rose from 9.9 percent in 1976 to 14.8 percent in 1981, reaching its highest level in 1982 when it rose to 17.8 percent of GDP.

During this period the increase in the public sector's expenditure was accompanied by an increase in the private sector's expenditure in investment and consumption, which

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[5] Data on public sector expenditure from 1977 to 1990 are shown in Tables IV.4, IV.5 and IV.6 in chapter IV.

showed high rates of growth from 1977 until 1981. According to Banco de México, private investment was encouraged by the expansion of the public sector's spending. Also, the increase in the level of profits of the private sector, the increase in bank credit to the private sector, and the expansion of the internal market made possible the high levels of private investment reached during this period (See Banco de México, 1979). Every component of demand expanded during these four years. It must be highlighted that this expansion, particularly public investment, was mainly due to the expansion of the oil industry.

However, the expansion of the economy worsened both the internal and external balances. The public sector's financial deficit almost trebled in real terms between 1978 and 1981 and the balance of payments current account deficit also increased enormously, in spite of the rapid growth of oil exports. The rate of growth of imports was much higher than the rate of growth of exports. The expansion of imports is explained by the fast rate of growth of output, the overvaluation of the peso and the reduction of tariffs that took place from 1977 until 1981. Concerning exports, although oil and oil-derived products increased significantly, non-oil manufactured goods exports did not increase. Furthermore, the international competitiveness of non-oil manufactured goods eroded during this period 'because production and investment were geared to satisfying the internal market' (Lustig, 1990, p.81).

One of the most important aspects of the economy during this period was the availability of foreign credits. The international financial situation, characterised by an excess of liquidity, together with the enhanced expectations of the international banking system about the future evolution of the Mexican economy, made Mexico an attractive location for foreign capital. Indeed, the external debt more than trebled during this period, rising from $29111 million in 1977 to $87600 million in 1982 (Source of Data: ECLAC, 1985).

In 1981 both the public deficit and the current account deficit were accentuated, and as a consequence the external debt rose. In 1981 alone, the external debt increased more than $27 billion. The level of inflation remained high from 1977 until 1981, at levels between 20 and 30 percent per year, but soared in 1982 to 98.9 percent.

The combination of the above mentioned facts and the overvaluation of the peso gave rise to a massive capital flight. In February 1982, the peso was devalued with the aim of reducing imports and controlling capital flight. Nevertheless, capital flight continued and the exchange rate was sustained at the expense of foreign exchange reserves and the 'last voluntary credit available to Mexico' (Zedillo, 1986, p.978).

By mid 1982, Mexico had lost its credit worthiness with private foreign banks and the supply of international loans fell sharply. Between August and September 1982, the peso was again devalued from 48.2 to 69.5 pesos per dollar. Dollar denominated deposits in the Mexican banking system were made payable only in domestic currency, and, having completely exhausted the supply of foreign currency, Mexico declared a three month moratorium on payments of principal on its external debt.

Moreover, in an attempt to regain control of the financial market, especially of the foreign exchange market, the private commercial banks were nationalised and foreign exchange controls were established for the first time during the period under analysis.

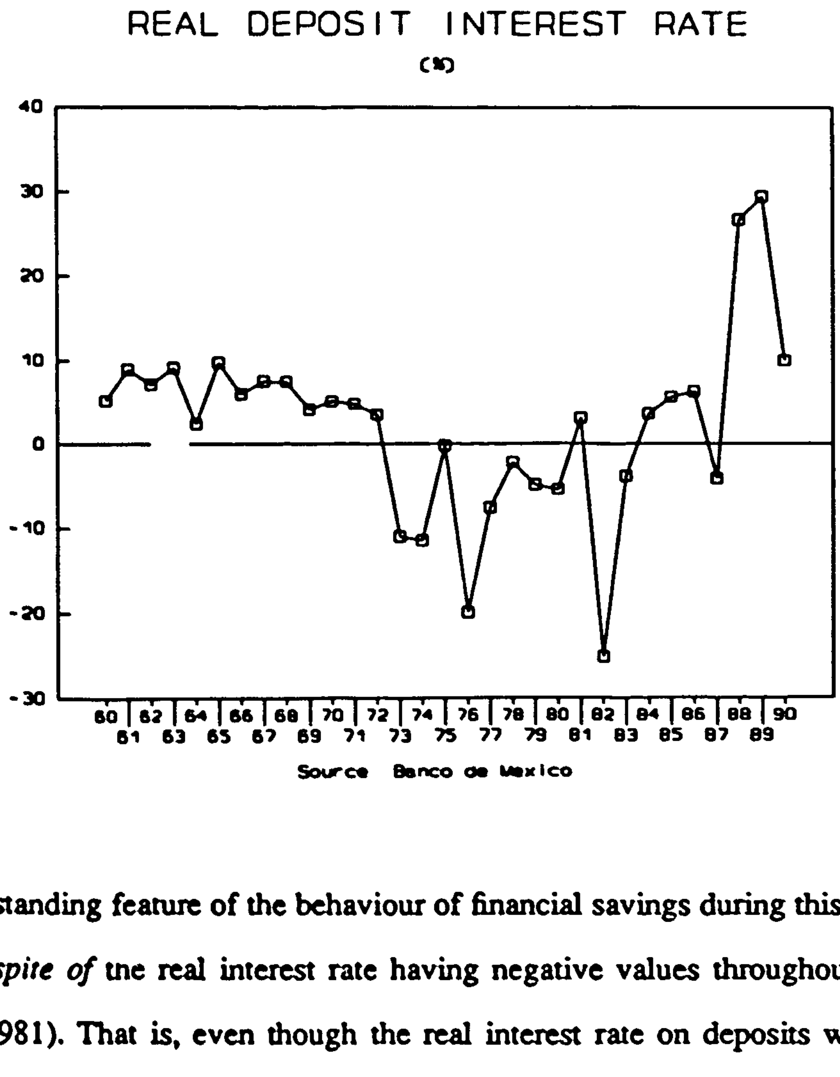
I.4.2.1 Financial Policy

The main objective of monetary and financial policy during this period was to provide the necessary flow of financial resources for the expansion of the productive sector.

Between 1978 and 1981, both internal and external financial resources increased, and so did credit to the public and private sector. The financial sector expanded as total financial resources deposited in the financial sector, especially in the banking sector, grew, and as total credit given by the banking sector increased. It is also during this period, after 1974, that the banking system is reorganised, passing from a specialised banking system to a 'multibank' system which intensified the integration of different types of bank activities into a single unit.

The positive rates of growth of the real stock of M4 and of the $\frac{M4}{GDP}$ ratio show an enhanced activity of financial intermediaries and a recovery of the financial intermediation process.[6]

Graph 4



An outstanding feature of the behaviour of financial savings during this period is its increase *in spite of* the real interest rate having negative values throughout the period (except in 1981). That is, even though the real interest rate on deposits was negative, financial savings grew in real terms. Increasing financial savings despite real interest

[6] The process of financial intermediation is defined by Fry (1989) as the 'activity of obtaining funds from lenders to pass on to borrowers' (p.234). Smith (1978) defines it as 'an essential feature of the borrowing-lending process' (p.124). Other works also use this term, see for example Zedillo (1986), or the Annual Reports of the Bank of Mexico.

rates being negative, seem to contradict one of the main hypotheses of the theory of financial liberalisation - which supports the need for positive real interest rates offered on deposits in order to increase savings and, more specifically, to increase financial savings which would be further channelled into investment projects.

It is nevertheless true that during 1978 and 1979 one of the objectives of both monetary and financial policy was to 'simplify and make more effective the instruments of monetary and credit regulation' as well as to 'increase the flexibility of the financial system' (Banco de México, 1979). The measures taken towards achieving this objective included the substitution of direct control mechanisms on key variables such as the rate of interest. Indirect mechanisms were established by the Central Bank. These consisted of weekly revisions of the interest rates offered on bank deposits, which would allow the interest rate to approach its market level (See Banco de México, 1979). However, the real interest rate did not become positive. Ghigliazza (1990) argues that although the real interest rate did not become positive, the mechanism established by the Bank of Mexico fundamentally transformed 'a system of infrequent and isolated adjustments to one of periodic revisions, taking the first step towards introducing interest rate flexibility' (Ghigliazza, 1990, p.341).

Interest rates offered on deposits rose in nominal terms becoming less negative in real terms in 1977 and 1978; decreasing in 1979 and 1980; and becoming positive only in 1981. In 1982, the real interest rate fell due to the high level of inflation.

However, financial savings increased in real terms from 1977 until 1981, showing the highest increase in 1981 when the real interest rate had its highest and only positive level. In 1982, financial savings collapsed as did the rest of the economy.

A possible explanation of the evolution of financial savings could be the high rates of growth of economic activity, income and savings during this period. It must be mentioned that both total savings and private savings as a proportion of GDP reached their highest level in three decades in 1980 and 1981.

The relevant issue to be highlighted here is the coincidence of growing financial savings with negative real interest rates on the one hand, and a fast growth of income and of savings on the other. The combination of high levels of inflation, negative values of the real interest rate offered on deposits, rising levels of financial savings in real terms and the expansion of financial intermediation[7], show that the fast growth of economic activity during this period seems to have offset the effect of negative real interest rates on the financial system.

As far as the structure of monetary aggregates is concerned, it can be seen that the public's demand for monetary assets decreased throughout the whole period. Meanwhile the demand for interest bearing financial assets increased. Demand for long term financial assets (with a redemption period of over one year) fell, as the percentage of total monetary demand decreased in the years that inflation reached its highest levels. It seems that the rise in the levels of inflation and the expectations derived from it caused a shift in monetary demand from long term assets to short term assets.

In 1978 Treasury Bills were introduced for the first time as an alternative source of finance of the public sector's deficit. Even though during the period analysed they were still not significant compared to banking finance, their participation increased.

An important factor that allowed the growth of financial savings, especially during the years of high inflation, was the acceptance of deposits in foreign currency in the domestic banking system. The overvaluation of the peso against the dollar increased throughout the period since the exchange rate was kept fixed and inflation was increasing. The domestic currency's overvaluation enhanced expectations about a future devaluation and spurred capital flight. Foreign currency deposits inside the country partially helped to control the capital flight. After 1976 deposits in dollars in the domestic banking system began to grow. The proportion of foreign currency-denominated financial assets to total

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[7] The financial intermediation ratio $\frac{M4}{GDP}$ rose from 27.4 percent in 1977 to 37.2 percent in 1982.

interest bearing financial assets rose from 13.4 percent in 1976 to 25.4 percent in 1981. As the proportion of dollar denominated deposits increased, so did the vulnerability of the banking system to external shocks. As Ghigliazza (1990) argues: by creating dollar denominated deposits, the financial system was in effect issuing dollars which the ultimate borrower, i.e. the Mexican government, may not have for repayment.

Since 1973 the Mexican economy has suffered from private capital flight which was strongly accentuated in 1981 and 1982. Pastor (1990) estimates a capital outflow from Mexico in the period from 1973 to 1987 of $60,970 million, equal to 63.9 percent of the change in external debt during the same period. Zedillo (1986) estimates $28,950 million between 1977 and 1982. The above estimates indicate that more than half of the external debt was used in effect to compensate for private capital flight.

The combination of high inflation, an overvalued exchange rate, the differentials in yields between domestic and external financial assets and the expectations of future devaluation, caused massive capital outflows in 1981. Nevertheless, internal financial savings increased during this year. In fact, the stock of M4 money had in 1981 its highest increase in real terms. This is a striking result in the sense that financial savings might be expected to decrease when capital flight occurs especially to the extent it did in 1981.

The events that happened in 1982, particularly the nationalisation of private banks and the cessation of dollar denominated deposits, which were made payable only in domestic currency at a rate that implied a loss to savers, eroded the private sector's confidence in the government and in the financial sector.

I.4.2.2 Credit Policy and the Monetary Base

The monetary base expanded during the 1978-1982 period due to higher levels of credit required by the public sector and increasing international reserves. In real terms, the monetary base grew between 9.0 and 12.0 percent per year. Despite high levels of the external deficit, gross international reserves increased until 1981 because of foreign capital inflows. Internal credit to the public sector remained high even though its participation in the monetary base decreased (except in 1982); its real rate of growth averaged 10.8 percent per year. In 1982, when foreign capital inflows fell, internal financing recorded its highest rate of growth, 21 percent in real terms, and reached higher nominal levels than the monetary base itself. Furthermore, the monetary base decreased in real terms during 1982, due to the exhaustion of international reserves.

In its 1979 Annual Report, the Central Bank stated that the main objective of monetary policy was to satisfy the demand for credit to finance investment projects. Both internal and external credit expanded between 1978 and 1981. The inflow of foreign credit, together with the revenues obtained from oil exports, practically eliminated the foreign exchange constraint. Foreign exchange resources were enough to support the huge external deficit on the current account, to increase the level of international reserves and, in addition, to finance the capital flight.

The reserve requirement of commercial banks was lowered between 1977 and 1981 and its procedure was simplified by establishing a fixed rate differentiating only between domestic and foreign currency deposits. In 1980, for example, commercial banks had to deposit 70 percent of their foreign currency deposits in the Central Bank, out of which 3.5 percent would be used to finance exports and 26.5 percent could be used to finance other activities. Domestic currency deposits were subject to a lower ratio equal to 37.5 percent.

Selective credit controls continued to be an important credit instrument during this period. A fixed percentage of commercial banks' liabilities was directed to finance industry and agriculture with subsidised interest rates. In 1980, for example, 4.7 percent of all commercial banks' domestic currency liabilities was used to finance the agricultural sector, 2.3 percent was used to finance small industries and 4.2 percent for housing projects.

Credit channelled through the official trusts also increased. Administered by the Central Bank, official trusts' subsidised credit was directed mainly to the agricultural and industrial sectors, to finance export activities, housing projects, and tourism.

I.5 The Period of Adjustment and Structural Change: 1983-1990

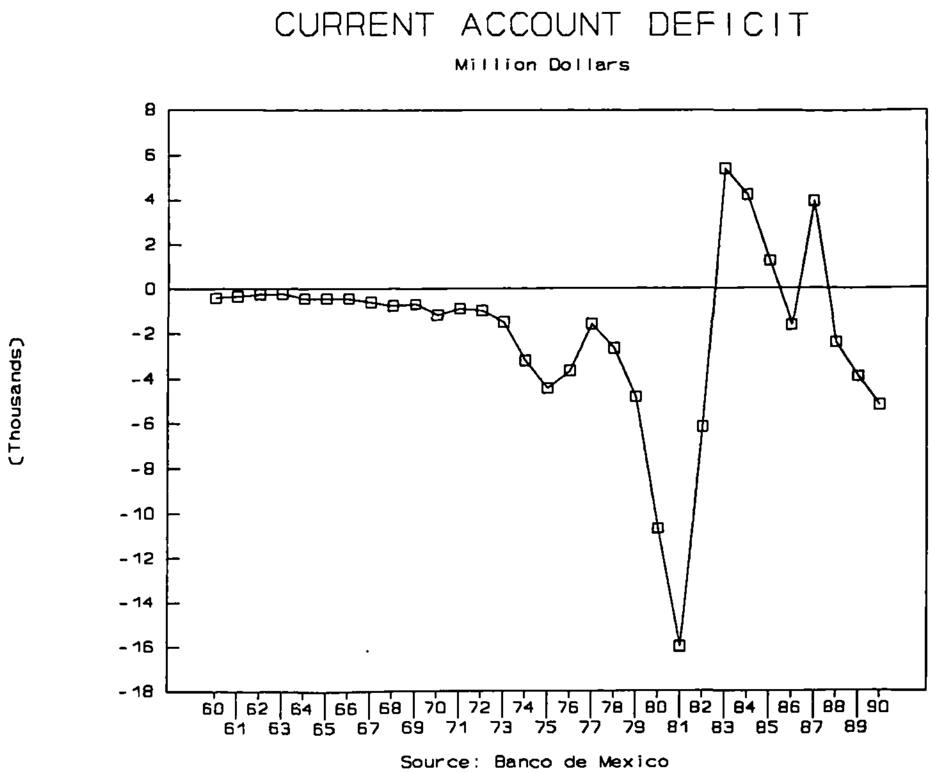
Since 1982, the Mexican economy has experienced low and even negative rates of growth in some years. The average rate of growth of output from 1983 to 1990 was approximately one percent, the lowest rate was -4.2 percent in 1983 and the highest rate 3.9 percent in 1990 when the economy started to recover. Both domestic and external factors explain the long recession. As far as the domestic causes is concerned, the contractionary fiscal and monetary policy imposed after 1982 was soon reflected on negative and low rates of growth of output. Concerning the external causes, two main factors explain the crisis: the abrupt end of external financing and the fall in the international price of oil on which economic growth was so dependent. The adjustment of the economy to these events meant years of recession that deeply damaged the standard of living of the majority of the population.

1982 represents a turning point for Mexican economic policy. The import substitution strategy was abandoned, and the development strategy changed to outward orientation. Exports were expected to undertake a leading role, and legal and administrative requirements were relaxed in order to attract foreign private investment.

The structural adjustment implied a reduction of the state's participation in economic activity and a major reliance on the private sector. One of the objectives of economic policy became to allow market forces to allocate resources in order to increase the 'general efficiency of the economy' (Banco de México, 1990). The major part of the public sector's enterprises was to be sold to the private and foreign sectors. The structural change implied that the rules derived from protectionism and state interventionism in the economy were to be replaced by liberalisation, privatisation and deregulation.

In late 1982 an agreement was signed with the IMF. For the first time in the post-war period, Mexico was required to generate a net annual transfer of resources abroad of nearly 6% of GDP (Ghigliazza, 1989). The main objectives of economic policy became to re-establish macroeconomic equilibrium and to reduce inflation, for which contractionary fiscal and monetary policies were implemented. The exchange rate was depreciated in nominal and real terms. Its nominal value passed from 80.51 pesos per dollar in December 1982 to 3000.00 pesos per dollar in 1990. Associated with the depreciation of the peso were significant levels of inflation, ranging from 50 to 160 percent between 1983 and 1988.

Graph 5



An immediate result of the contractionary economic policy was a drastic fall in imports. A surplus on the current account of the balance of payments during 1983, 1984, 1985 and 1987 was a consequence of the slowdown in economic activity and the real exchange rate depreciation.

During 1986 the collapse of the international price of oil (dropping from $25.4 per barrel in 1985 to $11.9 in 1986) caused export earnings to decrease, leading to a further reduction in foreign currency resources and thus a further reduction in economic activity. The slowdown in economic activity was widespread. To recover from the sharp fall of the oil price, the peso was substantially devalued against the dollar to favour non-oil exports.

As far as the public sector's fiscal deficit is concerned, despite the fact that its reduction stood at the core of the adjustment policies, high levels of public deficit persisted until 1988. Even though a surplus in the primary fiscal balance was obtained, the financial deficit remained high (the primary fiscal balance excludes all interest payments, both internal and external). Real interest payments on the public debt increased sharply between 1983 and 1988. Between 1987 and 1990 interest payments accounted for almost half of total public expenditure. Interest paid on the public sector domestic debt became larger than the interest paid on the external debt. The lack of external financing forced the government to rely on internal resources to finance its deficit. The sources of internal finance of the public sector's deficit required exceptionally high interest rates; hence, the high level of internal interest payments, and the further growth of the public sector's domestic debt.

Meanwhile, the share of public investment in total public expenditure was continually decreasing. Total public investment declined in real terms throughout the period from 1983 to 1988. The drastic fall in public investment might have damaged economic growth since the economy's growth strategy had relied heavily on public investment and expenditure for more than two decades.

Concerning private investment, the data show that its real rate of growth fluctuated markedly and averaged less than 2.0 percent per annum, which is much lower than in the preceding periods analysed.

Thus, until 1987 the contractionary economic policy, aimed at reducing both the external and internal deficits and to control inflation, proved to be successful only as far as the current account deficit is concerned, mainly because of the fall in imports. The fiscal deficit and the inflation rate were not reduced. By the end of 1987 a new disinflation programme was introduced. Its main target was to reduce the public sector's financial deficit and to reduce inflation, for which strict monetary and fiscal policies were emphasised. Towards the end of 1988, a general freeze was placed on the prices of a wide range of goods and services. Moreover, the main instrument to control inflation was the establishment of a fixed exchange rate from April to December 1988, and then controlled depreciation from 1989 onwards. In addition, trade liberalisation was accelerated with the purpose of 'allowing internal prices to be governed by external prices and in this way reduce inflation' (Ghigliazza, 1989). It must be mentioned that the conjunction of a fixed exchange rate (which implied a revaluation of the real exchange rate) and the progressive elimination of the trade barriers (in 1986 Mexico joined the GATT), caused imports to grow and a subsequent deficit on the current account.

During 1988 and 1989 inflation was reduced from almost 160 percent in 1987 to 20 percent in 1989. In 1988 nominal interest rates were reduced and the public sector's financial deficit decreased from 16.5 percent of GDP in 1987 to 6 percent in 1989 and to 3.5 percent in 1990, since its borrowing requirement decreased.

I.5.1 Financial Policy

The relative lack of external resources from 1983 forced Mexico to rely on domestic resources to finance economic growth. Economic policy was oriented to increase both public and private internal savings and to encourage a major participation of the private sector in all economic activities. The financial system was affected by the privatisation tendency throughout this period. The banking system was nationalised in 1982 and for a long period of time, until 1990, it was believed that the banking system could not be privatised again. Commercial banks had to get rid of their brokerage houses as a result of the 1982 nationalisation. These brokerage houses later became the major private sector financial institutions. The overall tendency of economic policy towards privatisation affected the nationalised banking system by contracting its participation in the financial intermediation market and allowing a spectacular growth of the stock exchange and the brokerage houses. The latter became increasingly important as a parallel banking system and as agents for the sale of government bonds to the private sector.

The enhancement of the unregulated financial institutions (mainly brokerage houses) was to some extent encouraged by the financial and monetary policies of this period. Interest rate ceilings on traditional banking financial assets were maintained and high reserve requirements were imposed on the commercial banks. At the same time brokerage houses were allowed to offer non-banking instruments, mainly government bonds, at market determined rates of return, normally higher than those offered on banking deposits. This caused a shift in monetary demand from traditional banking financial assets to non-banking financial instruments dealt by the private brokerage houses. This process took place from 1984 until late 1988, but accelerated especially after 1987.

In 1984, considerable alterations were made to the regulations affecting the banking system. These alterations included the establishment of an annual maximum ceiling for public sector financing from the Central Bank, and the virtual replacement of the reserve requirement by operations on the open market as an instrument of monetary regulation. Both measures pointed towards further reliance on open market operations as the main instrument of monetary control. Moreover, they tended to strengthen the capital market and to encourage the development of brokerage houses. Even though the elimination of reserve requirements did not take place until April 1989, their effectiveness and importance kept decreasing as banking deposits declined. Thus, it can be said that during this period two different financial markets coexisted. On the one hand, the 'repressed' banking system, and on the other hand, a 'liberalised' private financial system which consisted mainly of brokerage houses.

Banks worked under interest rates ceilings, while at the same time reserve requirements were raised both to limit liquidity, with the aim of controlling inflation, and to channel a larger portion of bank resources to the public sector. The remuneration that the Central Bank offered on the reserve requirement was raised, so whenever commercial banks had excess liquidity due to a poor credit demand from the private sector, banks increased their deposits in the Central Bank and obtained a profitable margin. In this way, the rate of remuneration on the reserve requirement deposited in the Central Bank became a subsidy to the nationalised banking system.

Meanwhile, the government bond market expanded. Among government bonds offered the most important until 1988 were the Treasury Bills (CETES). The CETES rate of return became the leading rate in the financial market. Its value was decided in an auction after the government announced the amount to be issued. The rate of return offered on the CETES was thus more flexible than the interest rate offered on bank deposits. In fact, it was used by the monetary authorities to fix the interest rate ceilings.

In spite of the efforts made to retain financial savings in the domestic market (a positive real interest rate was offered on deposits from 1984 until 1986), and despite the growth of non-banking financial assets in the hands of the public, total financial resources collected from the public (M4) contracted in real terms from 1983 and did not rise above the level reached in 1981 until 1989. Possible explanations for the decline in financial assets held in this period are the slow rate of growth of output and/or the capital flight that continued throughout the period.

Under the extreme volatility of the real exchange rate and the real interest rates, the continuous depreciation of the nominal exchange rate and the high rates of inflation, the private sector's expectations did not favour the internal financial system as capital flight continued. Estimates of capital flight show a figure of more than US$30 billion between 1983 and 1988 (see Pastor, 1990). Capital flight worsened in 1987 and 1988 after the stock exchange collapsed in October 1987. The real rate of return on the limited equity-investment market increased disproportionately during 1987 even though one third of the companies registered in the stock exchange incurred losses according to the ECLA's estimates. Financial speculation took place against a background of declining economic activity (ECLA, 1987).

At the end of 1987 a major devaluation of the exchange rate took place and a new disinflation programme was established. The most important measures adopted, as far as monetary and financial policies are concerned, were: the elimination of the Central Bank's financing of the public sector's fiscal deficit; a ceiling to commercial banks' financing of the private sector, and an increase in interest rates. It must be highlighted that the main anchor of this disinflation programme was a fixed exchange rate. These measures reinforced the role of open market operations. Moreover, they left the Central Bank only with the role of regulating the money market but not as a source of finance of the government's fiscal deficit. The contraction of credit from the Central Bank to the government can be seen in the fall in the monetary base from 979.1 billion pesos in 1982 to 266.1 billion in 1990 (at constant 1980 prices). As far as the commercial banks are concerned, from 1988 they were allowed to issue 'bank acceptances' with a market determined interest rate. This measure was taken in order to enable commercial banks to compete with the brokerage houses. The only restrictions imposed on these acceptances was that 30 percent of the resources collected through these should be invested in government securities. The issuance of bank acceptances further restrained the traditional tools of monetary control: interest rate ceilings and the reserve requirement. By April 1989, the monetary authorities decided to engage in a major liberalisation programme, providing free determination of interest rates on all types of bank liabilities and eliminating the reserve requirement. Thirty percent of total bank deposits had to be allocated freely between government bonds and deposits at the Central Bank. Moreover, directed credit controls and bank obligations to grant subsidised credit to preferential sectors were virtually abolished. 'If banks are to operate under a profit rule, they must have the freedom to invest their resources in the most profitable sectors and to adjust interest rates as necessary to attract savings' (Ghigliazza, 1990).

During 1988 and 1989, in an effort from the monetary authorities to attract financial resources, the real interest rate offered on deposits reached its highest level in three decades, rising from -4.1 percent in 1987 to 26.7 and 29.4 percent in 1988 and 1989 respectively, as a result of the rise in nominal interest rates and the decline of inflation. Financial savings reacted positively to the rise in real interest rates. The financial intermediation ratio $\frac{M4}{GDP}$ rose above 40 percent after 1986 (except in 1988) and the real stock of M4 reached its highest level in 1989 and 1990.

CHAPTER II

THE THEORY OF FINANCIAL LIBERALISATION

II.1 Introduction

Based on the original models of Mckinnon and Shaw (1973), several developing economies undertook a financial liberalisation process in the 1970's and 1980's, motivated primarily by the need to increase the internal sources of finance. Also the liberalisation process reflected an increasing role of the private sector in the economy. The larger the reliance of the economy on the private sector, the larger the need for an efficient financial sector.

The success of the financial liberalisation process in some countries and its failure in others has provoked an intense theoretical discussion about its nature and content.

R.I. Mckinnon states (1988): 'Without retreating to the older view which elevates repressive financial measures to being potentially desirable instruments of public policy, we now recognize that our knowledge of how best to achieve financial liberalization remains seriously incomplete' (p.9). Even though the essential theoretical issues remain unchanged, he stresses the importance of the order in which the monetary system is stabilized in comparison to the pace of deregulation of banks and other financial institutions.

There are two economic approaches to the relationship between financial development and the overall economic growth and development: the prior-saving approach and the investment-led approach. The prior-saving approach argues that financial development encourages economic growth by increasing the amount of lendable funds, increasing credit, and thus increasing investment. 'It stresses the importance and the need for policies to raise the level of savings which would automatically find investment outlets' (Thirlwall, 1989, p.266). The investment-led approach argues that growth of the financial sector is a function of real output growth: as the economy grows it generates additional and new demands from the financial system.

The major part of the critical discussion remains within the prior-saving approach, where investment is determined by the level of savings. It may be said that even the 'neo-structuralist approach' to the financial liberalisation model is also within this analytical framework. As will be further analysed in this chapter, the neo-structuralist's (Van Wijnbergen (1983) and Buffie (1984) for example) main criticism is limited to the argument that financial liberalisation might reduce the amount of loanable funds of the whole financial sector (including the curb markets[1]). A higher real interest rate offered by banks on deposits can attract the funds deposited in the curb market into the formal banking sector. While banks are subject to reserve requirements (or other forms of compulsory lending to the public sector through the acquisition of Treasury Bills for example) the curb market is not subject to any restrictions imposed by the monetary authorities. Thus, the total amount of lendable funds might be reduced if financial resources are withdrawn from the curb market and deposited in the banking sector. The curb market can freely lend all of its funds to the private sector whereas the banks are restricted by reserve requirements and compulsory credit allocations. By reducing the amount of loanable funds, the financial sector constrains productive investment and slows economic growth.

The recent appearance of the Keynesian criticism to the financial liberalisation model, focuses on more traditional matters. The basic argument of the post-Keynesian authors (such as Burkett (1991), Davidson (1986) and Dutt (1991)) concerning the financial liberalisation model is that investment is not supply determined but, on the contrary, the level of investment is what determines savings via the income multiplier effect. They argue that high real interest rates negatively affect the growth of output by discouraging both aggregate consumption and investment, therefore reducing the level of aggregate demand.

[1] Curb market is defined as an unofficial money and capital market (World Bank, 1989).

Although the discussion of the causality between financial development and economic growth remains unresolved (see Patrick 1966, and Mckinnon 1988), the general tendency in many developing economies, among them Mexico, has recently shifted towards the support of the prior-saving approach (see World Bank, 1989). Despite the uncertainty of a successful result, financial liberalisation stands as a central policy prescription to developing economies from international funding institutions such as the IMF and the World Bank. The implications of this shift of economic policy are clear and direct. Developing economies have been directing their economic policy towards the liberalisation of their financial sector in order to: restrict the regulation imposed by the government on the financial system; encourage the participation of the private sector; and allow the free operation of market forces.

In this chapter we review, analyse and discuss the approach to financial liberalisation from different theoretical frameworks. The chapter is organised as follows. Firstly, the original Mckinnon and Shaw theory is reviewed. Then the extensions of the original model are analysed. Following this, a study of the neo-structuralist models is carried out, the basic argument of which relies on the importance of curb markets in developing economies. The neo-structuralist models assume, as the neo-classical models, a prior-savings approach to investment and economic growth. For this reason both sets of models have been grouped under the liberalisation framework.

In section three, the so-called 'renewed' debate on financial liberalisation is analysed. This debate takes into consideration bank lending behaviour under risk situations. In a way, it deals with more operative matters. It is argued that financial markets are subject to implicit market imperfections because of the nature of the 'goods' they deal with. Credit is not a normal good, but a 'promise' of payment. As will further be seen, this gives credit markets special characteristics. In section four we consider the post-Keynesian approach to financial liberalisation models. Although of recent appearance, they present the consequences of financial liberalisation on investment and growth under the assumption that investment is not supply determined but determined by effective demand. The post-Keynesian view highlights the effect of real interest rate movements on effective demand and output growth. In section five the possibility of commercial banks *creating* credit, without a prior need to increase their deposits, is discussed. This possibility is not considered in any of the models analysed.

Before undertaking the major analysis, the concepts of financial repression and financial liberalisation must be defined. The former is understood as a situation in which government and Central Bank regulations tend to distort financial markets. These regulations mainly refer to: reserve requirements on commercial banks, interest rates ceilings and compulsory credit allocations with or without subsidised interest rates. It is argued that the consequences of financial repression constrain the growth of savings, investment and growth. Financial repression causes the flow of lendable funds to decrease in the formal financial sector, forcing potential investors to rely more on self finance. It distorts credit allocation and causes inefficiencies in the productive sector. It encourages wealth holders to acquire physical assets instead of financial assets. It encourages capital flight. And the process of self-finance is itself impaired. If the real yield on deposits is not attractive, firms cannot accumulate liquid assets to undertake investment.

In contrast, financial liberalisation signifies a substantial reduction of government intervention in setting interest rates and allocating credit either by doing away entirely with the interventionist regime or by gradually reducing it. The objectives of financial liberalisation are mainly to increase both the total level of savings and financial savings, with the aim of making this saving available for productive investment purposes. Market forces are supposed to maximise the availability of savings for investment as well as its allocative efficiency, a prescription which, as argued by FitzGerald (1993), is a 'logical consequence' of the neoclassical assumption that 'the market mechanism is the best mechanism for an efficient allocation of resources' (p.9).

II.2 The Liberalisation Models

II.2.1 The Mckinnon and Shaw Theories

Based on the assumption that a repressed financial system hampers economic growth and development, R.I. Mckinnon (1973) and E. Shaw (1973) wrote in support of financial liberalisation in developing economies. They argued that by fixing nominal interest rate ceilings the monetary authorities slowed the growth of the financial system, and impaired savings, investment and economic growth.

In a financially repressed economy, it is assumed that the growth of output is constrained by savings. Nominal interest rates ceilings might lead, in an inflationary environment, to low or even negative real interest rates that encourage present consumption and reduce savings. A low level of savings constrains the level of investment and of capital accumulation. 'The real rate of interest as the return to savers is the key to a higher level of investment and as a rationing device to greater investment efficiency' (Fry, 1988, p.19). Under this line of thought, the effect of a rise in the real interest rate is two-fold: it increases savings and, by discouraging low yielding investment, it raises the average efficiency of investment (efficiency meaning a high rate of return and productivity). Both effects interact to achieve a higher quantity and quality of investment.

R.I. Mckinnon wrote in 1973 on the importance of a unified capital market in less developed economies. Market fragmentation, intra- and inter-sectoral, is a characteristic of developing economies. Individual firms or households are so isolated that they face different prices, including interest rates, and have an unequal access to technology. The existence of a fragmented economy (including capital market fragmentation) leads to an inefficient allocation of capital since the isolation of economic agents retains economic resources mainly within the firm-household sector, and surplus units cannot allocate their resources in more productive areas. Capital market fragmentation, by constraining firms and households to self finance, distorts the allocation of resources, hence the importance of a unified capital market.

Together with economic agents being confined to self-finance, the 'lumpiness' of investment expenditures and their *indivisibility* leads Mckinnon to formulate a Complementarity Hypothesis between money and capital. Potential investors must accumulate money balances prior to their investment expenditure. In turn, money (broadly defined) accumulation is encouraged by high interest rates offered on deposits. The money demand function can thus be expressed as a function of income, investment, and the real rate of interest as follows:

$$(M/P)^d = f\,(Y,\ I/Y,\ d-\pi^e) \tag{2.1}$$

where: M/P is the real stock of money (using the broadest definition of money); Y is real gross national product and represents the transactions motive for holding money; I/Y is the ratio of gross investment to GNP; and $(d-\pi^e)$ is the real deposit interest rate (π^e is expected inflation). If r, the return on capital is included in the money demand function, the partial derivative of $(M/P)^d$ with respect to r, would be positive, $\frac{\partial(M/P)^d}{\partial r} > 0$, because a rise in r is associated with an increase in the investment ratio.

It has been argued that Mckinnon's Complementarity Hypothesis is difficult to test empirically due to the correlation that both the stock of financial assets and investment have with the level of income.[2]

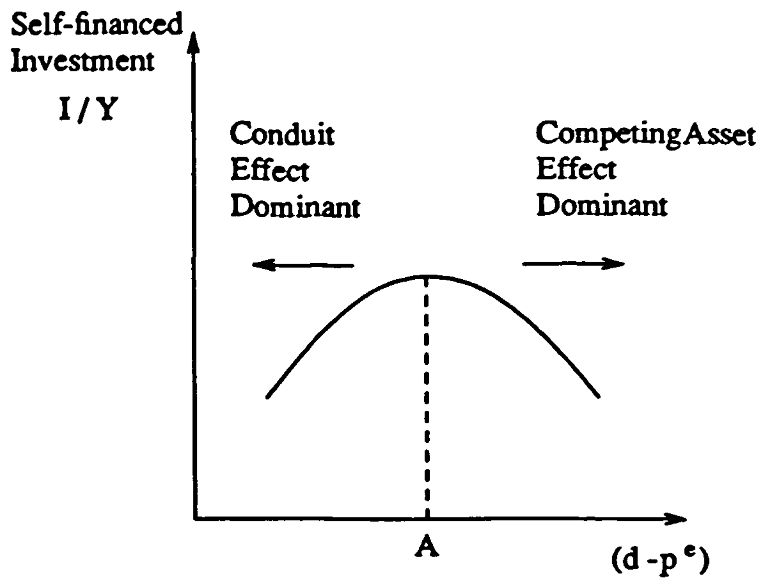
Complementarity between money and capital runs both ways: a rise in desired investment increases money demand and a rise in the real return on holding money will increase self-financed investment. This can be expressed by partial derivatives as follows:

$$\frac{\partial(M/P)}{\partial(I/Y)} > 0 \quad \text{and} \quad \frac{\partial(I/Y)}{\partial(d-\pi^e)} > or < 0 \qquad (2.2)(2.3)$$

[2] Fry (1988) concludes that empirical support for Mckinnon's Complementarity Hypothesis is 'tenuous at best'.

Nevertheless, the positive relation between investment and the real deposit interest rate is maintained only up to the point where the 'conduit effect' offsets the 'competing asset effect' of money on capital. This is graphically explained by Mckinnon as follows:

Figure 1



Up to point A money acts as a conduit to investment, and the relation between the real interest rate and investment is positive. After point A the real interest rate turns more attractive than the real yield on investment, hence investment is reduced. Complementarity between money and capital exists only if the real interest rate is lower than the real return on investment, otherwise, money and capital are substitutes. Mckinnon stresses the importance of positive real interest rates to enhance self-financed investment. Positive real interest rates fulfill several functions concerning savings and investment: first, as a store of value because wealth held as financial assets at least keeps its real value; second, to increase the proportion of savings held as financial assets; and third to increase private savings and investment given their sensitivity to the real return on holding money. Furthermore, positive real interest rates, through the 'competing asset effect' will reduce investments whose rates of return are negative 'because individuals will not hold non-monetary assets on which the return is less than that earned on highly liquid balances'

(Mckinnon, 1973, p.62). By increasing the average rate of return on investment the quality of the capital stock is increased.

Edward Shaw (1973) argues that in a financially repressed economy investment is constrained by a shortage of savings. He proposes that financial deepening -the process of increasing the size of the financial sector relative to the rest of the economy- resulting from financial liberalisation and development is a way to eliminate the savings constraint: 'Measures to raise real rates of return on financial assets, to reduce the variance of returns, and to improve financial technology, along with measures in non-financial areas, extend savers horizons over both space and time' (Shaw, 1973, p.73). According to Shaw, the scarcity of wealth in less developed economies gives no reason to expect that the substitution effect of interest rates on savings will be offset by the income effects. Further, financial deepening permits unification of a segmented capital market by reducing differences in investment yields. The unification of the capital market makes large investment projects feasible by pooling savings into the same market.

Shaw's **Debt Intermediation View** develops an alternative theory[3] of the role of the financial system in economic development, where he stresses the importance of a liberalised financial system as a means to increase savings, investment and investment efficiency. It strongly opposes any kind of government intervention in the financial system and criticises the argument that market forces do not work in LDCs: 'Market forces are ready to work toward development if given the opportunity' (Shaw, 1973, p.107).

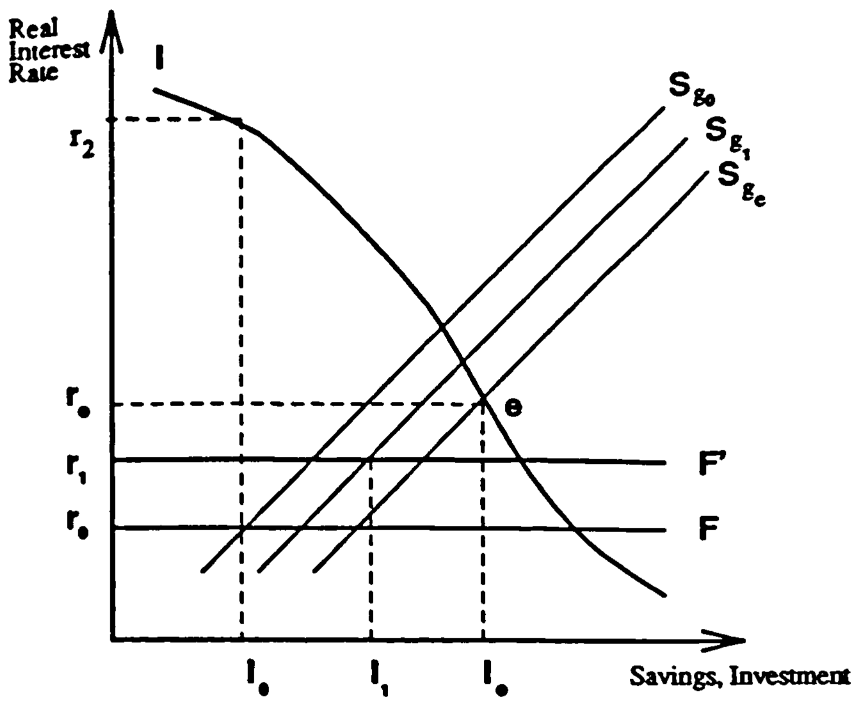
Although both Mckinnon and Shaw argue that real interest rates should be positive and that interest rate ceilings should be abolished, their reasoning for doing so is different. Mckinnon states that the accumulation of money balances is a necessary condition for investment expenditure, given the assumption that investment in less developed

[3] The Debt Intermediation View contradicts the Neo-classical and Keynesian assumption of substitutability between money and capital. If it is assumed that money and capital are substitutes, financial deepening would represent a threat to capital accumulation.

economies is mostly self-financed. Accumulation of money balances is encouraged by high real interest rates. On the other hand, Shaw argues that the increased liabilities of the banking system resulting from higher real interest rates enable the banking system to lend more resources to productive investment. Shaw doesn't consider investment to be primarily self-financed.

Fry (1988) illustrates the essential common elements of the Mckinnon and Shaw models in the following figure:

Figure 2



Financial repression, through interest rate ceilings (depicted by the horizontal line F) sets the real interest rate r_0 below its equilibrium level r_e. Investment is constrained by savings to I_0. If the loan interest rate is not subject to a ceiling the borrower would face a loan interest rate equal to r_2. In this case the supply of funds would be short and expensive. The rise of the real deposit interest rate from r_0 to r_1 increases the quantity of savings (and hence the quantity of investment) and also shifts the savings curve from S_{g_0} to S_{g_1}. The shift of the savings curve occurs when the rate of economic growth increases (from g_0 to g_1) as a consequence of the improvement in the productivity of investment: the rise of the real interest rate increases the productivity of investment by making attractive only those investment projects with a yield higher than r_1. Investment projects that yield a lower rate than r_1 cease to be profitable. With no financial repression the real interest rate achieves its equilibrium level r_e further increasing savings, investment and growth to S_{g_e}, I_e and g_e respectively.

II.2.2 Extensions of the Mckinnon-Shaw Model

In this section the common features of the neo-classical[4] models of financial liberalisation will be analysed.

The Mckinnon-Shaw model and those developed by Kapur, Mathieson and Fry among others, consider that the output growth maximising deposit rate of interest is the competitive free-market equilibrium rate. The rise in the real rate of interest will increase financial savings thus raising the real supply of credit and hence the rate of economic growth by increasing investment.

II.2.2.1 The Demand for Money Function

The money demand function is specified as a positive function of both the real deposit rate of interest and the level of income:

$$\frac{M^d}{P} = f(d - \pi^e, Y) \tag{2.4}$$

$$\frac{\partial(\frac{M^d}{P})}{\partial(d - \pi^e)} > 0 \text{ and } \frac{\partial(\frac{M^d}{P})}{\partial Y} > 0$$

[4] Even though Mckinnon and Shaw contradict the neo-classical assumption of substitutability between money and capital, they remain neo-classical in the sense that savings is needed prior to investment.

where: $\frac{M^d}{P}$ is real monetary demand, $(d - \pi^e)$ is the real deposit rate of interest and Y is the level of income.

In order for the money demand to be positively related to the real interest rate, 'money' must be considered in its broad definition so as to include interest yielding deposits. If the definition of money was limited to narrow money (M1) the relationship between the demand for money and the real rate of interest could be expected to be negative since coins and currency do not yield interest. The demand for broad money (M2, M3 or M4)[5] in real terms varies positively with the nominal interest rate and negatively with inflation. If interest rates ceilings exist, the real interest rate can become negative with inflation and discourage the demand for money (broadly defined). Some authors include other explanatory variables besides income and the deposit rate of interest in the demand for money function. For example, Shaw includes a trend term to reflect the stimulating effect on the demand for money that technological improvement in the money industry has. As well, he includes the rate of return on physical wealth to indicate the opportunity cost of holding money. Since physical wealth is heterogeneous due to market segmentation (or fragmentation), the rate of return on physical wealth should be interpreted as a vector of rates of return. (Shaw, 1973, p.62).

II.2.2.2 Supply of Credit Functions

Within the financial liberalisation models the supply of loans or credit offered by the banking sector is determined by the financial resources procured by the banking sector. The resources procured by the banking system - coins and currency, view deposits, time and savings deposits plus other financial assets - are the liabilities backing the assets

[5] M1 includes coins, currency and view deposits; M2 includes M1 plus short term banking financial instruments; M3 includes M2 plus non-banking financial instruments (such as Treasury Bills and other government bonds); includes M3 plus long term banking financial instruments. M1 is a narrow definition of money and does not consider money as a store of value.

of the banks (i.e. credit and reserves). Thus, the amount of loanable funds is determined by the liabilities of the banking system, that is, by the monetary aggregate that includes all monetary and financial assets deposited in the banking system. The supply of loans can be expressed as a function of the monetary stock M:

$$L^s = f(M) \tag{2.5}$$

Thus the supply of loans can be maximised if the real interest rate offered on deposits is at its market determined equilibrium level in order to increase the banking sector's liabilities.

The **reserve requirement** imposed by the Central Bank on the commercial banks' liabilities lowers the amount of credit available to the private sector. The reserve requirement has been commonly used by Central Banks in developing countries as an important source of finance (if not the most important) of the public sector's deficit (Welsh, 1986). If $(1-q)$ is the reserve ratio, the supply of loans is equal to the proportion q of the monetary stock M : $L^s = qM$. The higher the reserve ratio $(1-q)$ the lower is the proportion of financial resources that is available to be lent to the private sector. These models consider that the diversion of resources to the public sector through the reserve requirement leads to its inefficient allocation since it is not determined by the market. The reserve requirement, as an instrument of financial repression, reduces and misallocates savings (Chandavarkar, 1990). Considering an economy in which credit supply is restricted, 'government reliance on this source of financing is likely to squeeze the private sector from which the bulk of investment must come' (Brimmer, 1971).

The reserve requirement sets an upper limit to the deposit interest rate. This can be seen in Kapur's model (1976) in which it is assumed that: banks are in competitive equilibrium with zero profits; the government pays no interest on bank reserves; and the costs of the monetary system are a constant fraction z of the real money stock M/P. Under these circumstances, the deposit rate of interest is determined by the reserve requirement q, the loan rate of interest l, and the banks' intermediation costs z:

$$d = ql - z \tag{2.6}$$

It is further assumed that the real loan interest rate $(l - \pi)$ has to be lower than the real rate of profit r since otherwise loan demand would fall to zero:

$$(l - \pi) < r \tag{2.7}$$

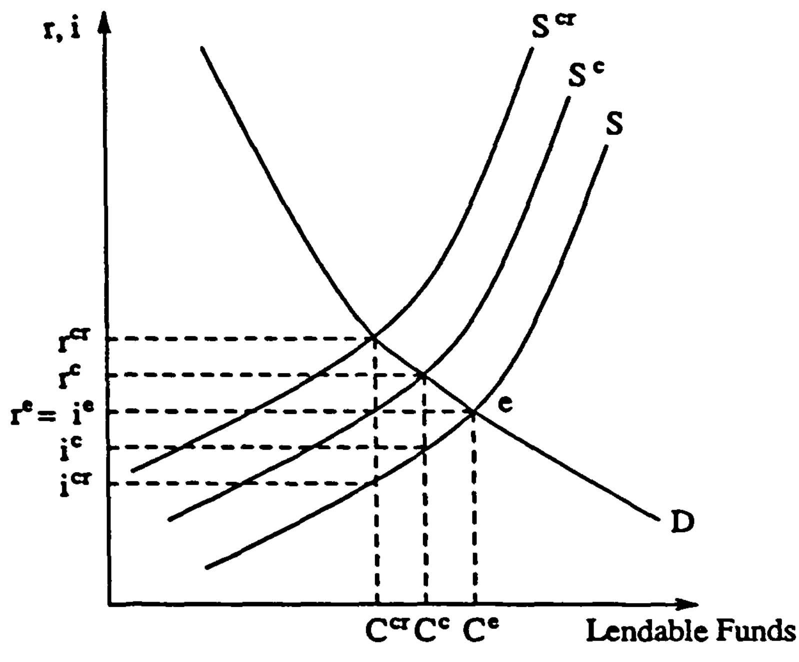
The latter implies that the deposit rate of interest has an upper bound determined by:

$$d < q\,(r + \pi) - z \tag{2.8}$$

Thus the higher the reserve ratio, the lower is the deposit rate.

The effect of reserve requirements on the supply of credit can be graphically depicted as follows:

Figure 3



The supply of credit S is a positive function of the interest rate offered on deposits i. The demand for credit D is a negative function of the loan rate r. Equilibrium at point e exists if there are no regulations and no transaction costs; in this case, the loan rate would be equal to the deposit rate: $r^e = i^e$. The costs implied by financial intermediation shift the supply curve to the left to S^c. To cover transaction costs financial intermediaries charge r^c on loans and pay i^c on deposits. The intermediation ratio is then $(r^c - i^c)$. The amount of credit supplied is reduced to C^c. If the Central Bank does not pay any interest on reserve requirements, commercial banks are forced to increase the spread between the lending and the deposit rate to cover the higher costs (price effect on credit) at the same time that the supply of credit is reduced (quantity effect on credit). The existence of non-interest yielding reserve requirements further shifts the supply curve to the left to S^{cr}; increases the spread to $(r^{cr} - i^{cr})$, and lowers the supply of credit to C^{cr}.

It is thus suggested as a growth-enhancing economic policy either the reduction of the required reserve ratio $(1-q)$ or the payment of the market clearing loan rate on required reserves. It has been argued, therefore, that the abolition of the reserve requirement will maximise the rate of growth of output (Fry, 1988).

II.2.2.3 Savings Functions

One of the objectives of financial liberalisation is to increase the aggregate level of savings. The higher real interest rate achieved through financial liberalisation is intended to increase savings by discouraging present consumption. It is assumed that the substitution effect on savings caused by a change in the real interest rate will be larger than the income effect.

Although the encouragement of savings is clearly stated as an objective of financial liberalisation policy, some models, such as Kapur's (1976) and Mathieson's (1980), do not explicitly state a savings function. In their models, it is the money demand that is affected by the real interest rate and not the level of savings. There seems to be a confusion about three different concepts: money demand (broadly defined), financial savings and total aggregate savings. Some models consider the three concepts as the same thing. For the neo-classical models (Mathieson and Kapur), financial savings equal total aggregate savings. Fry introduces a definition of financial savings as the process of accumulating financial assets. He defines financial savings as the difference in the real stock of money (broadly defined) held in the financial sector between period t and period t-1: $M_t - M_{t-1}$. Hence financial savings is defined as a 'change in stock' and might be comparable to the 'flow' of savings. The World Bank defines financial savings as 'the portion of total wealth held in the form of financial assets' (World Bank, 1989). Nevertheless, financial savings, either defined as the stock or as the change in the stock of money deposited in the financial system, is only one of the forms in which the flow of savings can be held. While saving is defined as the difference between disposable income and consumption, financial savings can be thought of as the proportion of total savings that is channelled through the domestic financial system.

The analysis of financial liberalisation models is sometimes confusing in the sense that often it is not clearly specified which relevant variable, financial savings or aggregate savings (private or total), is to be affected by interest rate movements. It must be stressed that the behaviour of financial savings is not necessarily the same as private or total savings. Financial savings respond faster to movements in the interest rate than total savings. There is wide evidence that financial savings have been strongly responsive to real deposit rates of interest (see Chandavarkar, 1990). However, since aggregate savings is subject to two opposite effects (income and substitution effects), the total effect of changes in the real interest rate on savings is indeterminate. 'Changes in real rates of interest affect the two major types of savings (i.e. financial and real) differently and to some extent these effects may neutralise each other' (i.e. no significant change in aggregate savings arises) (Gonzalez Arrieta, 1988, p.597). As Dornbusch and Reynoso (1989) argue: '...it is surprising, therefore, to find so strong a belief in the ability of higher interest rates to mobilise savings' (p.205).

It cannot be assumed that the rise in financial savings implies an increase in total savings. Furthermore economic policies that encourage financial savings might deter savings growth if they adversely affect investment. Thus it must be clearly specified if the relevant variable is either total savings or financial savings, since it is mistaken to consider them as being the same concept.

Fry develops a life-cycle type savings function (Fry, 1988). The life-cycle hypothesis of consumption and savings presumes that changes in population growth should have substantial effects on the level of savings through changes in the age structure of the population. Under the life-cycle hypothesis savings takes on a general age-specific form. The utility maximisation behaviour leads the individual to dissave during youth and old age in order to maintain the level of utility, and to save when the level of income is high. The life-cycle's savings ratio function is assumed to be influenced by the following variables: the growth of real income (g); the dependency ratio (DR); foreign savings as a proportion of GNP ($\frac{S_f}{Y}$); the real deposit interest rate ($d - \pi^e$); the world real rate of interest (r_w); the expected real return on investment (r^e), the ratio of net domestic credit to the government sector to total domestic credit ($DCGR$); and the ratio of external debt to GNP (DT/Y). These last variables are included to test the effect of the government's budgetary position on national saving. The savings ratio function can be expressed as:

$$S_r = S_n/Y = f(g,\ DR,\ S_f/Y,\ d - \pi^e,\ r_w,\ r^e,\ DCGR,\ DT/Y) \qquad (2.9)$$

where the expected signs of the partial derivatives would be:

$$\frac{\partial S_r}{\partial(g)} > 0 \quad \frac{\partial S_r}{\partial(DR)} < 0 \quad \frac{\partial S_r}{\partial(S_f/Y)} < 0$$

$$\frac{\partial S_r}{\partial(d - \pi^e)} > 0 \quad \frac{\partial S_r}{\partial(r_w)} < 0 \quad \frac{\partial S_r}{\partial(r^e)} > 0$$

$$\frac{\partial S_r}{\partial DCGR} > or < 0 \quad \frac{\partial S_r}{\partial DT/Y} < 0$$

The dependency ratio (DR) (defined as the ratio of people below and above a certain age that do not earn any income, over the total of the population [6]) is likely to negatively affect the savings rate. A higher foreign savings ratio (S_f/Y) will tend to reduce the domestic interest rate, probably because the public sector's borrowing requirement declines. The decrease of the domestic real interest rate causes the saving ratio to fall.

The real rate of interest on financial assets ($d - \pi^e$) will increase the savings rate if the substitution effect outweighs the income effect. It is possible, theoretically, that the income effect could outweigh the substitution effect causing consumption to increase. 'There is, however, no plausible basis for expecting such a preference structure; consequently one anticipates that a rise in the domestic real interest rate would increase the rate-of-growth effect' (Fry, 1988, p.50). He defines the rate-of-growth effect as the situation in which the lifetime resources of young savers exceed those of old dissavers and there is positive aggregate saving.

Following this argument, the author does consider the possibility of the income effect outweighing the substitution effect on savings caused by a change in the real interest rate. In this case he argues that 'a higher real interest rate may not raise the true saving rate but rather free more resources for productive investment. Its true effect may be on the average efficiency of investment, not on its volume' (Fry, 1988, p.50). Thus, the effect of the real interest rate on investment and growth will be positive despite its effect on savings, due to its effect on the average efficiency of investment.

In Fry's argument it is not clearly stated if the relevant variable to be affected by a higher real interest rate is total savings or financial savings. He clearly specifies that savings must be prior to investment: 'Domestic investment can be financed from both national and foreign saving, but everywhere national saving provides the bulk of resources for investment. Hence saving behavior is a crucial element of the process of

[6] An age limit is not specified since in some developing countries the average age of consuming and the average age of earning an income are not well defined.

economic growth' (Fry, 1988, p.131). He does, however, then argue that 'any observed association [between real interest rates and savings] may indicate that there is substitution between saving embodied in physical goods that are not recorded as investment in the national income accounts and saving embodied in financial assets which does finance investment' (Fry, 1988, p.50). Therefore, in accordance with the above argument financial savings appear as the relevant variable to be affected by changes in the real interest rates, since financial savings do finance investment while real savings do not. When the savings ratio equation is empirically tested, Fry reaches the conclusion that the national savings rate is increased by about 0.1 percentage point for each 1 percentage point rise in the real deposit rate of interest, implying thus that the substitution effect caused by a change in the real interest rate is greater than the income effect.

Considering the effect of the 'world interest rate' (r_w, which could be LIBOR or Prime Rate) on the savings rate, the expected sign of the partial derivative is negative. Since a higher external real interest rate (compared to the domestic one) might provoke capital outflows, legal or illegal, it may reduce national saving.

To the extent that investment is self-financed, the expected real return on investment r^e affects the savings rate. A higher r^e will cause investors to accumulate financial assets to undertake an investment project. The relevant variable in this case might be financial savings and not the savings ratio. This argument reflects Mckinnon's Complementarity Hypothesis.

The effect of the government's domestic budgetary position (*DCGR*) on the savings ratio is expected to be negative. As the government's domestic debt increases, he argues that taxes are expected to increase thus causing households to remove their savings abroad to evade taxation. The same argument applies to the government's external debt (*DT*). If the external debt rises, households may well anticipate increased future tax burdens for its servicing. They will therefore have an increasing incentive to transfer assets abroad (Fry, 1988).

II.2.2.4 Investment Functions

It is not the objective of increasing savings *per se* that interests economic theory, but increasing savings as a prior condition to increase investment. As in classical theory, the models of financial liberalisation rely on the assumption that savings is a pre-requisite of investment. They are also characterised by 'a belief that savings will readily find investment outlets' [through variations in the rate of interest] (Thirlwall, 1989, p.266) and that all investment should be financed from voluntary and/or involuntary savings without inflationary finance involved.

In classical theory, investment is specified as a negative function of the rate of interest. An increasing interest rate means a higher price of funds and therefore a decline in the demand for investment. Savings, or the supply of funds, is a positive function of the interest rate. The level of investment (and savings) is determined in the lendable funds market at the level at which the interest rate equals the supply of and the demand for lendable funds. If the interest rate is below its equilibrium level, investment demand is constrained at a lower level by the supply of savings. Under these circumstances, a rise in the interest rate would increase the supply of funds and therefore investment. A positive relation exists between the interest rate and investment up to the point where the interest rate, or the price of lendable funds, reaches its equilibrium level. If the interest rate is above its equilibrium level, investment falls as the price of lendable funds increases. The relationship between the level of investment and the interest rate becomes negative if investment is not constrained by the supply of savings.

In financial liberalisation models, the equilibrium interest rate is not explicitly considered as a switching point in the relationship between investment and the interest rate.[7]

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[7] Mckinnon (1973) does consider the equilibrium real interest rate as a switching point in the relationship between self-financed investment and the interest rate, as he distinguishes between the conduit effect of the interest rate on investment when the interest rate is below its equilibrium level, and the competing asset effect when the interest rate is above its equilibrium level.

Complementarity between money and capital is the concept backing the positive relationship between investment and the real interest rate. As opposed to the classical and the Keynesian theories of investment, both of which consider money and capital as being substitutes and not complementary, financial liberalisation theorists assume that the accumulation of money (or financial asset) stocks is a precondition for investment.

Financial liberalisation models consider that there are two ways in which financial repression can negatively affect investment: firstly, since financial repression deters savings, the resources available for investment decline. Hence the quantity of investment is affected. Secondly, artificially low real rates of interest and selective credit controls lead to an inefficient allocation of the existing savings, affecting the quality of investment. The positive impact of financial liberalisation on investment is through the freeing of resources to be mobilised through market forces in order to increase both the quantity and the quality of investment.

First the theoretical impact of financial liberalisation on the quantity of investment will be analysed. As previously explained, interest rate ceilings and reserve requirements lower the amount of lendable funds. In practice, this means a reduction in credit availability to the private sector and hence lower investment. Investment, assumed to be supply determined, is stated as a function of credit.

In Kapur's model (1976), for example, the supply of loans appears as the main determinant of investment. He assumes that there is unused fixed capital in the economy and that output is constrained by working capital.[8] The ratio of working capital to total utilised capital K is $(1 - \alpha)$. Banks provide a fraction θ of the cost of replacing depleted working capital. The cost of keeping working capital at a constant level is expressed as: $\Delta P\, \theta\, (1 - \alpha)K$, where ΔP is the change in the price level. The net addition of total utilised capital or investment is:

[8] Working capital includes: labour, intermediate inputs and raw materials.

$$\Delta K = Inv = \frac{1}{(1-\alpha)}\left[\frac{\Delta L - \Delta P\,\theta(1-\alpha)K}{P}\right] \qquad (2.10)$$

where ΔL is the nominal increase in bank loans. The term in brackets can be interpreted as the net quantity of real credit available for total capital expansion (fixed and working capital). The higher the proportion of working capital to total utilised capital $(1-\alpha)$, the lower the accumulation of capital.

Given that commercial banks' liabilities consist only of deposits while assets consist of loans and reserves, the amount of money held in the banking system is a determinant variable for the supply of loans. The elimination of credit ceilings increases the supply of loans. There is a positive relation between the deposit rate of interest, credit and the quantity of investment. On the other hand, the lower the proportion of required reserves out of total assets, the higher the credit supply.

Mathieson (1980) assumes that a percentage θ of all additions to capital (fixed and working capital) are financed by borrowing from the financial system (composed only of banks). This determines the total real demand for loans:

$$\frac{L^d}{P} = \theta K \qquad (2.11)$$

where L^d is nominal demand for loans, P is the price level and K is the capital stock. In addition to this financing decision, capitalists must decide on what additions they will make to the existing stock of capital. It is assumed that additions to the stock of capital are explained as a function of the level of income and of the firms' savings ratio. Given that firms finance θ percent of all capital stock additions through bank borrowing, the savings ratio will be sensitive to changes not only in the return on capital (r_k) but also to the real loan rate $(r_l - \pi^e)$ (Mathieson, 1980):

$$\Delta K = Inv = s(r_k - r_l + \pi^e)Y \tag{2.12}$$

$$\frac{\partial s}{\partial(r_k - r_l + \pi^e)} > 0$$

This relationship determines not only the growth of the total capital stock but also the demand for new loans. The supply of loans is determined by the real demand for deposits (D/P) and the required reserve ratio ($1-q$):

$$\frac{L^s}{P} = q\,(D/P) \tag{2.13}$$

Considering that demand for deposits is a function of the real deposit rate ($d - \pi^e$) and of real output (Y):

$$D/P = f(d - \pi^e)\,Y \tag{2.14}$$

equilibrium in the loan market and money market is achieved when the supply of loans equals the demand for loans and implies that:

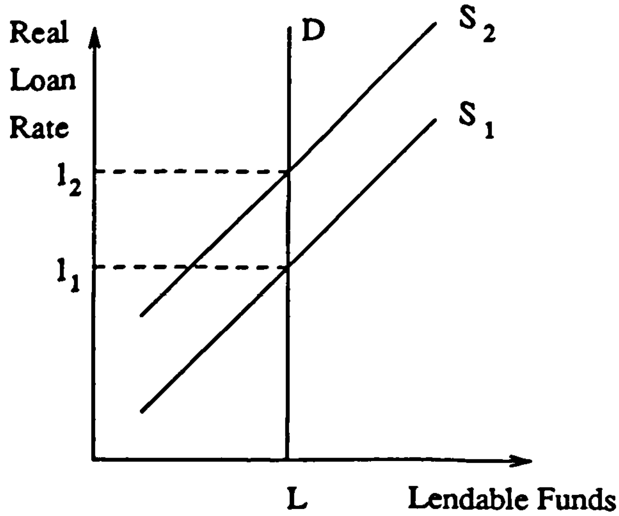
$$L^d = L^s \tag{2.15}$$

$$=> \quad \theta K = q\,(D/P) \tag{2.16}$$

$$=> \quad D/P = \frac{\theta}{q}K = f(d - \pi^e)\,Y \tag{2.17}$$

To support the level of loans θK, deposits must equal $\frac{L^s}{q}$. 'The deposit rate should be set at a level that yields not only the level of savings that will allow the financial system to satisfy the initial excess demand for credit but also to generate a sustained flow of financial savings over time' (Mathieson, 1980, p.387). A higher reserve ratio ($1-q$) lowers the proportion of bank assets devoted to the supply of loans to the private sector q and hence the supply of loans L^s. Since the total real demand for loans is interest inelastic ($L^d = \theta K$), (as in figure 4),

Figure 4



the shift to the left of the supply of loans curve, from S_1 to S_2 caused by a rise in the reserve ratio increases the loan rate from l_1 to l_2 and lowers investment ΔK.

Fry (1988) includes credit to the private sector as an explanatory variable in the investment ratio equation. He specifies the following equation:

$$I/Y = f[\gamma, \gamma_{t-1}, TTG_{t+1}, TTG, TTG_{t-1}, DC_p/y_{t-1}, DT/Y, DC_g/DC, r_w, (I/Y)_{t-1}] \quad (2.18)$$

where: (γ) is the rate of change of real output; (TTG) is the terms of trade[9]; (DC_p) is credit to the private sector; (DT/Y) is the ratio of government's public debt to GNP; (DC_g/DC) is the ratio of public credit to total credit; and (r_w) is the external real interest rate. 'One prediction of this model of financial repression is that a rise in the deposit rate towards its free-market equilibrium level will increase the availability of private sector domestic credit in real terms and hence stimulate investment' (Fry, 1988, p.56).

[9] The terms of trade are supposed to affect investment in three ways: first, a terms of trade improvement that is anticipated raises investment in the period before the improvement occurs (modelled by including the next period's terms of trade variable TTG_{t+1}); the contemporaneous effect (TTG_t); and the subsequent adjustment (TTG_{t-1}).

Financial repression also affects the quality of investment. The inefficient allocation of savings in a financially repressed economy leads to investment's inefficiency since low real loan interest rates (subsidised rates) allow low levels of marginal return and productivity in the sector or industry where they are allocated. By inefficient allocation of savings it is meant that the market forces are not being allowed to reflect the scarcity of capital; thus savings are not channelled where the productivity of capital is highest. Raising the real interest rate to its equilibrium level will deter investment projects with low yields and will raise the average productivity of investment. If the levels of marginal productivity and of the marginal return on investment are equalised among different sectors of the economy it implies that savings are being allocated efficiently.

The nature of this hypothesis makes it difficult to test empirically since the marginal return on capital is difficult to measure. Nevertheless, there are some studies that support this hypothesis. Cho (1988), for example, argues that the best way to measure the allocative efficiency of savings is to compare the marginal rates of return on capital investment across different sectors. Due to the difficulty of measuring the marginal rates of return on investment, Cho assumes that the marginal rate of return on investment is equal to the firm's marginal cost of borrowing. This assumption leads him to conclude that a reduction in the variance of the average cost of borrowing in different sectors of the economy reflects a major efficiency in savings (credit) allocation.

II.2.3 The Neo-Structuralist Models

This section will analyse the main aspects of the neo-structuralist models (Van Wijnbergen (1983) and Buffie (1984)) of financial liberalisation. Although the neo-structuralist models question the advantages of financial liberalisation, describing financial liberalisation as 'a risky undertaking, a step in the dark given the present state of empirical knowledge' (Buffie, 1984, p.306); we consider that these models can be placed under the liberal theoretical framework since they do not dispute the essential arguments of the financial liberalisation model, in the sense that they do not question the prior-savings approach and assume that savings is a prior step to investment. These models mainly deal with the relative role of the curb market in the financial system and its impact on real sector variables of less-developed financially repressed economies.

Financial repression rations credit availability from the banking sector to the private sector. This credit rationing causes the curb market to grow as the increasing demand for credit needs to be satisfied. The domestic financial system hence consists of the regulated banking sector and the non-regulated curb market. In the banking sector, the supply of loans is determined by deposits and the required reserve ratio. Bank loan rates are pegged at low real rates and it is assumed that firms are more than willing to absorb the available supply of subsidised finance, as it is offered at below market interest rates. Loans in the curb market make up the difference between the demand and supply of bank credit.

In Buffie's model, a rise in the required reserve ratio $(1-q)$ exerts a contractionary effect since it reduces the supply of loans, thus increasing the demand for loans in the curb market, which, in turn, raises the curb market interest rate.

The elimination of interest rate ceilings will increase the demand for deposits from the banking system, as stated in the function:

$$D/P = f\,(i_d,\, i_c,\, Y)\,W \tag{2.19}$$

$$\frac{\partial f}{\partial i_d} > 0 \quad \frac{\partial f}{\partial i_c} < 0$$

where: D/P is real demand for deposits; i_d is the deposit rate of interest; i_c is the curb market interest rate; Y is output; and W is total wealth. The increase in the deposit rate of interest will attract savings kept as non-banking financial assets [10] into the banking system. The substitution from non-banking financial assets constitutes an increase in the total supply of loans *if* the funds transferred into the banking sector were not formerly kept as curb market loans. If financial resources are transferred from the curb market into the banks, the total supply of loans will be reduced because banks are subject to reserve requirements. 'If curb loans constitute a large share of total loanable funds and are relatively good substitutes with demand deposits, the total supply of credit in the economy can contract. For financial liberalisation to succeed, demand deposits must be much better substitutes with currency and foreign bonds than with curb loans' (Buffie, 1984, p.312).

Focusing on the different effects that financial liberalisation has in the long-run and in the short-run, Buffie considers the possibility of financial liberalisation yielding successful results in the long run. It is possible that in the long run total savings may increase as a result of higher deposit interest rates, which in turn causes total wealth to increase. The increase in total wealth, and hence the increase in the demand for both curb market loans and bank deposits, might be enough to offset the unfavourable substitution that takes place from curb market loans to bank deposits which cause the total supply of loans to contract. Nevertheless, it is implied that in the short run total savings cannot increase so as to affect the total amount of wealth.

Van Wijnbergen (1983) develops an IS-LM model in which, in the steady state, the banking interest rate offered on deposits does not affect the IS curve (the locus of points depicting equilibrium in the goods market), but does change the financial asset portfolio people are willing to hold, as asset holders move out of currency and curb market loans

[10] Buffie assumes that wealth is kept either in currency, deposits, foreign bonds or curb loans. Curb loans are modelled as the demand for an asset stock.

into time deposits. The direction of the shift of the LM curve (the locus of points depicting equilibrium in the money market) will depend on the relative sensitivity of the demand for the two alternative assets (currency and curb market loans) to changes in time deposit interest rates.

Since loans are modelled as an asset, the demand for loans in the curb market is:

$$L^d = f\,(i_d, i_c, Y)\,W \tag{2.20}$$

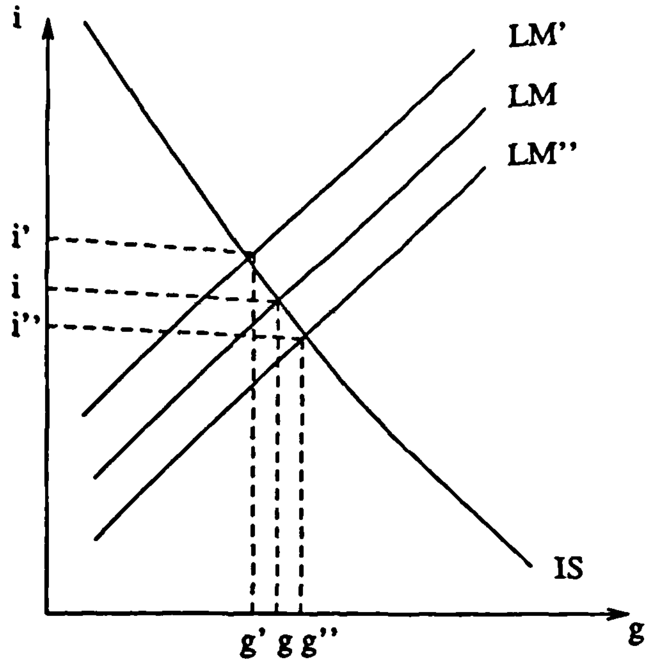
$$\frac{\partial f}{\partial i_d} < 0 \quad \frac{\partial f}{\partial i_c} > 0$$

where: (L^d) is the demand for loans in the curb market; (i_d) is the interest rate offered on bank deposits; (Y) is real income; and (W) is wealth.

If people shift mainly out of curb market loans after a rise in the time deposit rate, the total supply of funds to the private sector will decline 'as funds are shifted from the curb market which provides one for one intermediation (no reserve requirements) into the banking system which provides only partial intermediation: partial because a fraction is syphoned off into required and free reserves rather than passed on to firms' (Van Wijnbergen, 1983a, p.439). As a result of this substitution the curb market interest rate rises to i' and economic activity decreases to g' (see figure 5).[11] If people shift from currency (or any other unproductive financial asset) into banking deposits, then the banking sector will partially pass these funds into the private sector and the supply of funds will increase. This increase causes the interest rate in the curb market to fall to i'' and the rate of growth to increase to g''.

[11] Van Wijnbergen (1983) measures the rate of growth of output g on the horizontal axis (p.439).

Figure 5



Interest rate policies affect investment and growth through the supply of loans. Neo-structuralist models stress the importance of credit in less developed economies: 'It is an institutional fact in most LDC's that commercial bank credit is used almost exclusively for business loans to finance working and fixed capital requirements. This results in a direct transmission mechanism between domestic credit and production' (Van Wijnbergen, 1983b, p.63).

Neo-structuralist models have been criticised for presenting the same propositions as the Mckinnon-Shaw models (see Cho, 1990). Both seek the expansion of a liberalised financial sector to promote savings and growth; both argue that liberalised financial systems are more efficient and both suggest the elimination of reserve requirements. 'The difference is that the Mckinnon-Shaw group wants to liberalize a repressed sector (the banking sector) on the grounds that it is the only organized market, and that the organized market is more efficient than the unorganized sector. The neo-structuralists, on the other hand, argue that there is already a liberalized and efficient sector (the curb market) and that more funds flow through it' (Cho, 1990, p.478).

It must be mentioned that the neo-structuralist models completely neglect the possibility of reserve requirements having productive uses through financing public expenditure. It is well known that in developing economies reserve requirements are one of the main sources of financing the public sector's deficit. Reserve requirement funds might be used to finance public investment. In this case, the diversion of funds through reserve ratios would increase the stock of capital and economic growth. There is no *a priori* reason to argue that funds diverted through reserve ratios are unproductive. Reserve ratios might reduce the total supply of loans to the private sector but not the whole credit supply if we consider that credit given to the public sector can have productive uses.

E. Shaw (1973) estimates that savings channelled into the curb market, into inventories of real assets and into foreign assets 'must be a multiple of savings that flow on a voluntary basis to repressed monetary systems' (p. 136). U Tun Wai (1980) argues that curb markets or unorganised credit markets predominate in rural areas. Moreover, he says that curb markets can be equated with rural credit markets (p. 169). He estimated for thirteen developing countries that a proportion of between thirty and forty percent of credits given by the curb market were given to finance consumption expenditures and the rest was used for productive purposes in the agricultural sector at very high interest rates.

Even though little information is available regarding the curb market in developing economies, it is sensible to think that the curb market is more important in rural areas where financial institutions' branches are sparse. As well, it is difficult to assume that curb market loans are mainly used to finance industrial working capital as assumed by the neo-structuralist models. If, curb market loans are used to finance consumption, the neo-structuralist argument of a decrease in the aggregate supply of loans and hence of investment as a consequence of financial deepening, is weakened.

II.3 Market Failures, Macroeconomic Stability and Bank Supervision

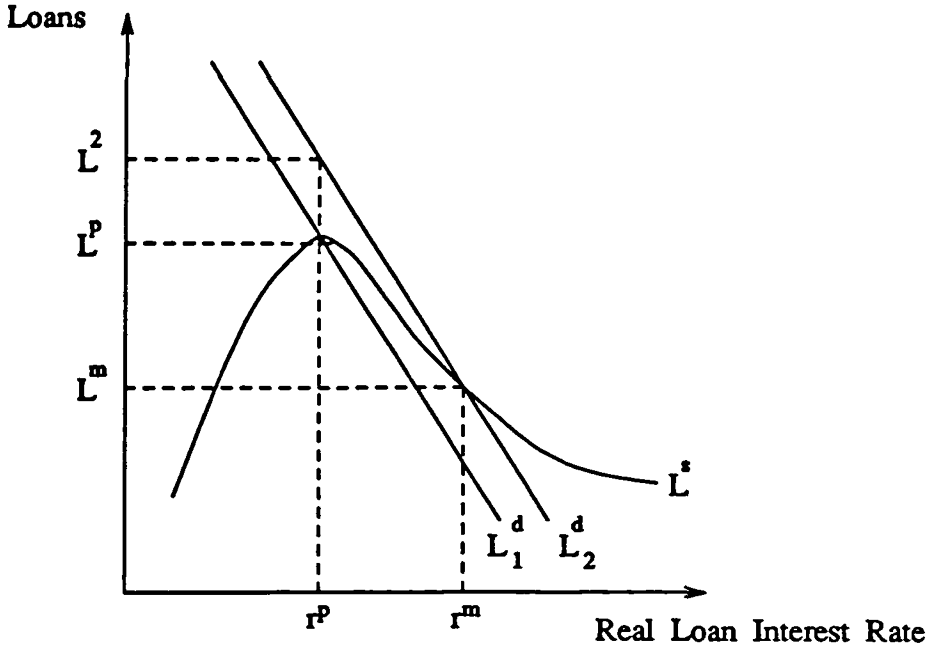
Much of the failure of financial liberalisation has been explained by some authors (Mckinnon (1988), Villanueva and Mirakhor (1990), Sundararajan and Baliño (1990) for example) as the result of macroeconomic instability and weak bank supervision. It is argued that certain characteristics were common to the relatively successful countries that liberalised their financial sector: firstly, an appropriate macroeconomic framework (low inflation and low public deficit); secondly, the prudential supervision of the banking system; and thirdly a proper pace of deregulation. Countries in which these characteristics were present avoided sharp increases in interest rates, bankruptcies of financial institutions and loss of monetary control, for example Singapore, Korea and Taiwan (See Villanueva and Mirakhor, 1990).

The 'renewed' debate on financial liberalisation states that the removal of credit and interest rates ceilings, rather than leading to a more efficient, healthy and dynamic financial system will open up the possibility of greater market imperfections. Regulation imperfections are replaced by market imperfections such as imperfect information and banking distress, which are implicit in the financial system.

II.3.1 Imperfect Information

In the credit market, borrowers have greater information about their own default risks than lenders (banks) do. Stiglitz and Weiss develop a model to show that this asymmetric information limits the rise in interest rates and the supply of loans (See Gibson and Tsakalotos (1991), and Villanueva and Mirakhor (1990)). 'The basic intuition of Stiglitz and Weiss is that, while moderate increases in the lending interest rate normally would elicit a higher volume of lending, further rate increases beyond a certain level would prompt a lower level of lending activity by changing adversely the quality of the pool of borrowers in favor of those in the high risk category' (Villanueva and Mirakhor, 1990, p.4). Banks seek to maximise their profits (net of defaults). Very high interest rates might lower overall banks' returns by triggering two effects: firstly, credit worthy borrowers would be discouraged, and, secondly, borrowers would be induced to choose projects with a higher probability of default because projects with higher expected profits are riskier. There is a limit to the real interest rate charged on loans beyond which the bank's expected return of such loan declines. This limit is not necessarily the same as the market clearing level.

Figure 6



As observed in figure 6, the loan supply L^s is a positive function of the real loan interest rate up to $r = r^p$. At this point banks maximise profits (π). Profits are a function of the loan interest rate (r) and of the probability of loan repayment (θ):

$$\pi = f(r,\ \theta)L \tag{2.21}$$

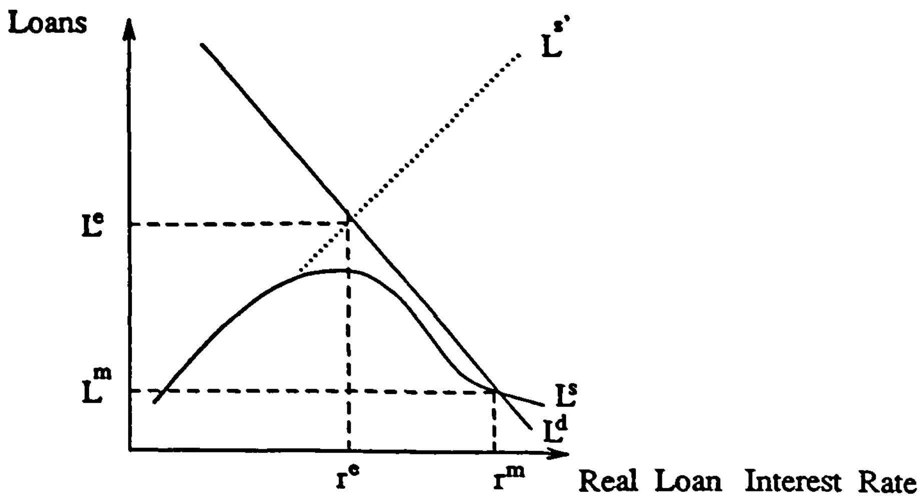
$$\frac{\partial\pi}{\partial r} > 0 \quad \text{if } r < r^p$$
$$\frac{\partial\pi}{\partial r} < 0 \quad \text{if } r > r^p$$
$$\frac{\partial\pi}{\partial r} = 0 \quad \text{if } r = r^p$$

$$\frac{\partial \pi}{\partial \theta} > 0$$

The bank profit maximising interest rate r^p might coincide with the market clearing interest rate if loan demand is L_1^d. If, however, loan demand is higher, say L_2^d, the market clearing rate r^m is higher than r^p. In this case, there will be an excess demand for loans equal to $(L^2 - L^p)$. The profit maximising interest rate r^p is both 'optimal and efficient, because bank profits are at a maximum level and because risky borrowers are rationed out' (Villanueva and Mirakhor, 1990), even though it is below the market clearing level. 'It therefore appears that although credit rationing is a potentially adverse effect of financial repression, it is also a problem in liberalised financial markets' (Gibson and Tsakalotos, 1991).

It is interesting to notice that the inverse U-shape of the supply of loans curve forces the market clearing interest rate r^m (see figure 7) to be higher than the equilibrium rate if the probability of default is not considered by the banks (as in the traditional literature). The supply of loans $L^{s'}$ does not consider the probability of default by borrowers. In this case the real interest rate is lower ($r^e < r^m$) and the amount of loans is higher ($L^e > L^m$) at the market clearing level than if risk is considered in the loan supply function. Therefore, market failures tend to constrain the supply of loans.

Figure 7



It is worthwhile to mention that these studies (Mckinnon (1989) and Villanueva and Mirakhor (1990) for instance) do not mention the positive effect that high interest rates have on the productivity of investment projects (an argument that stands at the core of the financial liberalisation models). It can be said that this 'renewed' debate deals with a more operative view of the functioning of credit markets.

II.3.2 Macroeconomic Stability and Bank Supervision

Financial liberalisation implies a structural reform of the banking system. This reform has led several developing countries to financial or banking crisis [12] (for instance Argentina, Chile, Malaysia, Philippines, Thailand and Uruguay). The failure of banking deregulation has been associated with an unstable macroeconomic environment, banking distress and weak bank supervision.

A banking crisis is characterised by some or all of the following: first, an intense demand for reserve money that could not be satisfied for all parties simultaneously in the short run; second, credits must be liquidated; third, a condition where borrowers, who in other situations were able to borrow without difficulty, become unable to borrow on any terms (a credit market collapse); fourth, a forced sale of assets due to liability structures that are out of line with market determined asset values and the consequent further decline in assets values; and last, sharp reduction in the value of banks' assets resulting in the apparent or real insolvency of many banks (see Sundararajan and Baliño, 1990).

Banking distress, which might cause a banking crisis, is defined as the situation where the advent of deposit insurance or implicit guarantees has allowed an insolvent financial institution to stay in business so long as its liquidity position remains manageable (mainly because of Central Bank assistance). Continuing banking distress perpetuates situations in which banks alone could not stand without the intervention of the

[12] When dealing with developing economies, the terms financial and banking system are used indistinguishably because of the predominance of banks in the financial system.

Central Bank. If banks do not behave efficiently, distress prolongs resource misallocations that might have precipitated the distress conditions. This provides incentives for further risk taking. The decision of banks to undertake risky lending in the presence of deposit insurance is sometimes referred to as **moral hazard.** If banks are insured, or otherwise protected by the government, they undertake riskier loans than if they were not. The larger the share of risky loans, the bigger the possibility of default and of bank crisis.

Inadequate bank supervision can lead to moral hazard. The role of banking supervision is to develop procedures for both creditors and supervising institutions to monitor financial fragility and vulnerability to shock, identify the exposure to moral hazards, and formulate standards for evaluating the appropriateness of particular levels of risk exposure (see Sundararajan and Baliño, 1990).

The combination of an unstable macroeconomic environment and inadequate bank supervision can lead to a financial crisis when the financial sector is reformed (liberalised). When the financial sector is liberalised under the circumstances described above, loan interest rates might rise to excessively high risky levels, especially under an inflationary environment. Moreover, the institutional structure of the banking system emerging from regulatory changes could lead to monopolistic or oligopolistic structures.

The liberalisation of interest rates implies a change of instruments for monetary control. It is argued that 'monetary authorities might lack an adequate set of instruments of monetary control to influence interest rates or might follow a hands-off policy in the erroneous belief that domestic rates would automatically converge to international rates' (Sundararajan and Baliño, 1990, p.15). Moreover, if reserve requirements are not eliminated, forcing banks to hold low-yield reserves or government securities, credit to the private sector can be tightened and cause excessively high real lending interest rates. Furthermore, it is argued that the supervisory institutions might not be prepared to deal with a more liberalised financial system. Therefore, the administrative infrastructure must be adapted to deal more with bank solvency and credit risk than with organising selective credit regulations and maintaining interest rates ceilings. The authors conclude that 'sound financial policies, vigilant bank supervision and well designed prudential regulations would limit financial crisis and help reduce the vulnerability of a financial system to the vagaries of the macro-environment' (Sundararajan and Baliño, 1990, p.17).

In Chile, for example, the combination of high inflation, high real loan rates and inadequate bank supervision resulted in defaults of outstanding bank credits that led to bankruptcy of virtually all of Chile's financial intermediaries. As far as macroeconomic stability is concerned, Mckinnon (1988) concludes that 'sustained stability in the domestic price level is a necessary condition for achieving high real financial growth without undue risk of some major financial panic or collapse (Mckinnon, 1988, p.26). Concerning bank supervision, he even suggests that 'the government should probably impose a ceiling on standard loan (and deposit) rates of interest to overcome banks' tendency to provide risky loans at high interest rates in the expectation that large losses will be covered by deposit insurance provided by the government' (Mckinnon, 1988 b, p.408).

Macroeconomic stability also implies a low and controlled public sector deficit. If financial liberalisation takes place when the public sector's internal debt is high and rising, the rise in real interest rates will increase the public deficit. This could lead to a vicious circle of rising public deficits and macroeconomic instability. 'The financial liberalisation literature itself now argues that control of the public deficit is a precondition to successful liberalisation' (Gibson and Tsakalotos, 1991). High interest rates paid on the domestic debt will cause inflation if money is created to pay the interest charges. The consequences of financial liberalisation on the public sector's role in financing development will be further considered in chapter four.

The analysis developed above can be summarised as follows. The failure of financial liberalisation in several countries has been attributed to market failures and to an inadequate bank supervision. Under unstable macroeconomic conditions, firms will probably need to borrow credits no matter what the loan interest rate is, for instance to refinance maturing debts. When moral hazard is present and bank supervision is weak, banks are willing to lend at high and risky interest rates, because the government would rescue them from bankruptcy. At the end, it seems, banks do go bankrupt and the government does have to rescue them. Therefore, the policy to follow is, first, to liberalise the financial sector under a stable macroeconomic environment and second, to establish an adequate bank supervision.

II.3.3 The Case of Non-positive Market Clearing Real Interest Rates

The possibility of non-positive market clearing real interest rates is considered in Beckerman's article 'Upward Financial Repression' (1988). Market clearing real interest rates can fall to non-positive values when: investment demand is low and the propensity to save is high; when price dispersion is severe due to inflation; and when wealth holders face discouraging prospective yields on alternative assets to money. 'Where there are anticipations of non-positive future yields on existing capital assets, the economy's desired capital stock may be less than what exists. Dissaving and net capital depreciation would then be what the market wants, and non-positive real rates would signal the appropriate incentive' (Beckerman, 1988, p.235).

Beckerman (1988) argues that forcing real rates above anticipated inflation (upward financial repression) cause financial institutions to attract more resources than they can lend, increasing the commercial banks' liabilities. He further argues that the capacity of banks' to meet interest payments on their liabilities can be doubtful and can lead banks to require injections of inflationary resources to maintain their liquidity. Hence, the consequences of upward financial repression could be stagflation and the financial system's decapitalisation. If high real interest rates are funded with inflationary resources, the attempt to achieve positive real rates might become 'futile as well as counterproductive': a forced rise in nominal interest rates increases inflation and lowers the real interest rate, a process that might develop into a vicious cycle.

Economic non-financial distortions can be the cause of non-positive market clearing real interest rates. These distortions may cause expectations which induce a decline in credit demand (for instance, no desire to invest because of a narrow market). Beckerman gives the example of an overvalued exchange rate that causes expectations of a sharp devaluation, which reduces the demand for credit. Once expectations are restored, then real rates should come under upward pressure, when the demand for investable funds rises again. In this case, the negative real interest rate might be appropriate given the distorted exchange rate.

Upward financial repression can be used by governments to retain financial resources in the domestic financial system and to avoid capital flight. 'If funds are retained within a nation by paying yields above their market clearing level, then, by definition, the financial system cannot acquire sufficient domestic assets to fund the interest. The financial system can pay the higher yields only by decapitalising itself, acquiring questionable assets, or obtaining inflationary finance. To the extent that inflation is used to finance the higher rates, the real rates will be correspondingly reduced' (Beckerman, 1988, p.244).

This argument leads the author to actually 'support' capital flight by arguing that placing the funds abroad when they are not used internally can be a good thing, since wealth will increase in real terms and will be available for investment when prospects improve.

When speaking of financial liberalisation, a positive level of real interest rates is implied. This study shows that the market clearing level, where the supply of funds equals demand, might be non-positive under certain circumstances. Although seen from the opposite side, financial liberalisation is supported as the means to avoid upward financial repression: 'the appropriate principle for administering financial rate levels is that they should be set as nearly as possible where responsible, undistorted markets would equilibrate the supply of and demand for financial resources'.

II.4 The Post-Keynesian Models

The Post-Keynesian models consider the effects of financial liberalisation under the assumption that investment is not supply determined but demand determined. It is not savings that determines investment but, on the contrary, investment determines aggregate savings through the income multiplier effect or income redistribution. The Keynesian view is opposed to the belief that investment and output growth are constrained by savings.

Under the Keynesian theoretical framework, the level of income of the economy is determined by effective demand. Effective demand is the sum of aggregate consumption, investment and the government's deficit (plus exports minus imports in an open economy). Savings is determined by the level of income and will equal investment *ex-post*.

Economic policy is oriented towards the rise of effective demand, as opposed to the neo-classical view that stresses the importance of arising the level of savings. Moreover, under the Keynesian framework 'inflation itself can encourage investment by raising the nominal rate of return on investment and by reducing the real rate of interest' (Thirlwall, 1989). Since capital assets and financial assets are substitutes and not complementary, a reduction in real interest rates will encourage investment as a consequence of the real return on investment being higher than the real yield of financial assets. The effect of high real interest rates and of economic policies promoting savings might deter investment, consumption, effective demand and economic growth.

Burkett and Dutt (1991) develop a model to analyse the effects of an increase in the real deposit rate of interest. Interest rates affect both consumption and investment. As opposed to the liberalisation models, they highlight the relevance of the possible negative effect on consumption, on demand, and hence on economic growth. Consumption (C) is a function of income (Y) and the propensity to save (s_{i_d}):

$$pC = [1 - s\,(i_d)]\,Y \qquad (2.22)$$

It is assumed that interest rates do affect savings:

$$s'(i_d) > 0 \tag{2.23}$$

Investment is determined by expectations of the yield on capital assets net of prospective borrowing costs:

$$I = I(r,i) \tag{2.24}$$

$$\frac{\partial I}{\partial r} > 0 \quad \frac{\partial I}{\partial i} < 0$$

where: r is the rate of profit and i is the loan interest rate. Investment decisions are not directly affected by an increase in the supply of loans but by its effect on the loan interest rate. In the credit market, the supply of loans L^s is a function of the level of deposits held in the banking system, D, the reserve ratio $(1-q)$[13], and the proportion of free reserves which banks lend to firms (α). The proportion α varies positively with the loan interest rate:

$$L^s = \alpha(i)(q)D \tag{2.25}$$

Deposits held in the banking system are a function of wealth and of the real deposit interest rate:

$$D = b(i_d)W \qquad b'(i_d) > 0 \tag{2.26}$$

The model follows the assumption that a higher interest rate will increase the availability of credit. The demand for loans is fixed in the short run by the difference between nominal capital stock (pK) minus the total wealth of firms F:

$$L^d = pK - F = \bar{L} \tag{2.27}$$

Investment is either self-financed or financed through bank credit. Loan demand is inelastic to the loan interest rate in the short run. Nevertheless the loan rate can affect

[13] The terminology used here is made consistent with the previous models presented in this chapter.

investment through expectations.

Equilibrium in the credit market implies:

$$L^s = L^d \tag{2.28}$$

$$\alpha(i)(q)D = pK - F = \bar{L} \tag{2.29}$$

Since $D = b(i_d)W$

$$=> \ \alpha(i)\, q\, b(i_d)W = \bar{L} \tag{2.30}$$

$$=> \ \alpha(i) = \frac{\bar{L}}{q\, b(i_d)W} \tag{2.31}$$

$$i^e = \alpha^{-1}\left[\frac{\bar{L}}{q\, b(i_d)W}\right] \tag{2.32}$$

The equilibrium interest rate varies positively with the loan demand and the reserve ratio $(1-q)$ and negatively with the proportion of free reserves lent to firms, the deposit interest rate and wealth. An important result is that an increase in the deposit rate of interest will cause the equilibrium rate to fall (because it increases the supply of loans).

In the goods market, output X equals aggregate consumption C plus investment I:

$$X = C + I \tag{2.33}$$

Substituting the consumption and investment equations, (2.22) and (2.24) respectively:

$$X = [1 - s(i_d)]Y + I(i,\ r) \tag{2.34}$$

Since income Y is either earned by labour (w) or by interest on deposits:

$$X = [1 - s(i_d)](w + i_d D) + I(i,\ r) \tag{2.35}$$

Once the equilibrium interest rate is set, equilibrium in the goods market is determined by effective demand (the intersection point where aggregate demand meets aggregate supply):

$$X^e = [1 - s(i^e)](w + i^e D) + I(i^e, r) \tag{2.36}$$

Both an income and a substitution effect caused by a rise in the deposit rate of interest on consumption are implicit in this equation[14]. An increase in i^e will increase total income $(w + i^e D)$, causing consumption and output to grow. The substitution effect causes an increase in the propensity to save and decreases consumption. The total effect on consumption will depend on the relative magnitude of these effects.

A rise in the deposit rate increases the supply of loans and causes the loan interest rate to decrease. This causes expectations of net returns on capital to increase hence investment grows. The effect on total output depends on the magnitude of these three different effects. The effect on output can be negative if consumption decreases more than investment increases. In turn, the effect of interest rate movements on consumption depends on the propensity to save, and the effect on investment depends on its sensitivity to the loan interest rate. A lower sensitivity of investment to the loan interest rate increases the likelihood of a negative effect on output. As well, if investment is more sensitive to changes in the rate of profit than in the loan rate of interest, then the effect of a rise in i^d can be negative on investment.

The relevance of the effect of a rise in the real deposit interest rate on consumption distinguishes the post-Keynesian models from the neo-classical ones. The post-Keynesian models explicitly state the possibility of a reduction in effective demand as a consequence of a rise in the real deposit rate of interest. Nevertheless, the possibility of an increase in the real deposit rate to increase output also exists. This happens because of three assumptions taken in the model: firstly, the assumption that savings and consumption are interest rate elastic allows the possibility of an increase in consumption as a consequence of a rise in the real deposit rate (income effect on consumption). Secondly, the supply of loans increases when the real deposit rate increases. And thirdly, the real

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[14] These effects are not explicitly considered in the model.

loan rate decreases when the supply of loans grows.

There are several aspects worthwhile mentioning concerning the post-Keynesian models. Firstly, financial liberalisation can have the same positive results on savings, investment and growth as claimed by the neo-classical models because of the assumptions highlighted above. Secondly, financial liberalisation implies an increase, not a decline, in the real loan interest rate. Interest rate ceilings apply to both deposit and loan rates hence the neo-classical argument stating that investment's productivity increases when the financial sector is liberalised. A decline in the loan rate, as supposed by the post-Keynesian models, actually abolishes one of the advantages proposed by the pro-financial liberalisation models. Thirdly, Keynesian theory opposes the view that prior-savings are needed for investment. There is no need to increase the funds available for investment via increases in the real interest rate. 'Prior saving has no more tendency to release funds available for investment than prior-spending has' (Keynes, 1939). Even though credit is needed for investment, credit is not determined by savings: 'Credit expansion provides not an alternative to increase savings, but a necessary preparation for it. It is the parent, not the twin, of increased saving' (Keynes, 1939).

An increase in savings will probably be needed in the long term to finance investment...'the provision of long term finance at reasonable terms and thus the achievement of higher investment, may, in certain circumstances, be contingent on the expectation of a substantial increase in the flow of savings into the securities market' (Asimakopoulos, 1986, p.88). Credit from the banking system will generate the flow of savings through the growth of investment and income. These savings will be needed to finance investment in the long run.

This section can be concluded by quoting Asimakopoulos: 'The possible relations between finance (credit), investment and saving in the post-Keynesian approach are thus complex. They very much depend on particular historical circumstances, and no general statement about their relationship which does not recognise these circumstances adequately represent the post-Keynesian position'.

II.5 Credit Creation by Commercial Banks

Banks have the capacity to *create* credit. 'The ability of an economic system to create credit is important because: first, it can compensate for the failure of the economic system to equalise planned saving and investment; second, it provides the means by which growth is financed. This is the real significance of the invention of paper money and credit: permitting the economic system to expand in response to the continual opportunities for growth provided by technical progress' (Thirlwall, 1989, p.271).

The capacity of commercial banks to create credit according to its demand by the private sector means that investment can be liquidity constrained, not savings constrained, if banks refuse to create bank loans. The function of the banking system is to create additional finance when investors wish to increase the flow of real investment.

None of the models analysed so far consider this capacity. As argued by Davidson (1986) all that is needed to initiate additional real investment is finance provided by an increase in total bank loans with no need of increased savings '...as long as the banker can create new finance via acceptable bank accounting practices' (Davidson, 1986, p.105). Or, as argued by Asimakopoulos (1986), the investment market can become congested through shortage of cash but it can never become congested through shortage of saving. As soon as the producing firm hires unemployed resources paid out of increases in bank credit, aggregate real investment increases. 'The mere fact that previously idle resources are now producing real investment goods which cannot be used by households for consumption means that, out of the increased income flow, a greater real savings flow must be pari-passu occurring' (Davidson, 1986, p.105). The production of capital goods implies that savings are generated since these goods cannot be consumed. The author concludes that 'the solution to any scenario in which liquidity constraints limit investment no matter how much the public desires to save out of income ex-ante, ex-post or ex-anything, is for the monetary authorities to provide via the banking system all the liquidity the public desires'.

Chick (1986) argues that the different views that explain the determination of bank loans (if they are determined by deposits or if they can lend money 'they haven't got') depends on the stage of development of the banking system. She distinguishes five different stages of development. It is only in the first stage, when banks are only used as savings depositaries but are not involved with transaction purposes, that the supply of loans is dependent on the deposits held by the bank. In this case the supply of credit is exogenous. After stage two, when banks keep money also for transaction purposes they adopt a means-of-payments function. Loans given by banks will end up deposited in banks to a large extent. This means that it is not the amount of deposits which determines loans, but the reverse, it is the amount of loans given which determines deposits. The supply of loans becomes endogenous. From stage three onwards, the Central Bank assumes the responsibility of lender of last resort. Reserves virtually disappear as a constraint on bank behaviour and banks become able to meet any reasonable demand for loans. Banks can expand their loans despite their reserves and their deposits.

According to this argument, it seems to be that financial liberalisation models suppose the banking system in less developed economies is still at stage one of development. It is indeed a necessity of a country, especially in an inflationary environment as in many developing economies, to use the banking system as both a savings depositary and for transaction purposes. Nevertheless, banks might be constrained by reserve requirements and this might represent a shortage of funds to be lent to the private sector, especially if reserves diverted to finance the public sector are interest yielding, since banks earn profits without any risk involved.

II.6 Conclusions

This chapter has undertaken a review and analysis of financial liberalisation theories. The main issues of the different theoretical models and their criticisms have been outlined.

There are several conclusions to be derived from the analysis. One of the main hypotheses of the pro-financial liberalisation models is the rise of total savings and investment as a consequence of financial liberalisation. It has been seen that theoretical support for the hypothesis that savings increase as a consequence of high real interest rates is weak. However, theory argues that the positive correlation between real interest rates, investment and growth is due, also, to the effect that high real interest rates have on the quality of investment. It is supposed that high real interest rates will exclude low-yielding (hence low productive and inefficient) investment projects. Nevertheless, we have seen that real interest rates may not rise after being repressed even if the market is not regulated. Credit markets are subject to imperfections that set limits to the loan rate of interest and to the amount of credit supplied.

The above argument leads us to conclude that the hypothesis of increased savings and investment as a consequence of having liberalised the financial system does not have a strong theoretical support and has been severely weakened. Furthermore, imperfect information and a weak bank supervision do justify a government's intervention in the financial system to prevent a banking crisis. There is no evidence that market forces will operate more efficiently than regulated financial systems because market forces have to be supervised by an entity. Usually this entity is the Central Bank. Past experiences from different countries show that no regulation of the financial system leads to financial distress and to financial crisis under weak supervision and unstable macroeconomic environments. In this sense, the government's intervention is justified in order to prevent a financial crisis that might trigger or aggravate an overall economic crisis.

One effect that a rise in the real interest rate does seem to have is to increase financial savings. Financial savings do increase with higher yields offered on financial assets. If financial savings are considered as total savings (as in some neo-classical models), then total savings do rise. Nevertheless, total savings and financial savings are not the same concept; it is a misconception to consider them the same. A rise in financial savings does not imply an increase in total savings.

An increase in financial savings can have a positive impact on the supply of credit to the private sector. Especially if the banking system is at an early stage of development, an increase in real deposits means an increase in the supply of loans. But when banks are capable of creating new credit without having to increase their deposits before, an increase in financial savings may not make any difference to the amount of total credit given to the private sector. This means that the total amount of credit given is determined not by the supply of loans but by its demand. In turn, demand for loans is determined by investment decisions. How the supply of credit responds to the interest rate, and how investment is affected by the supply of credit and interest rates becomes very much an empirical question which is investigated in the next chapter for the specific case of the Mexican economy.

CHAPTER III

FINANCIAL LIBERALISATION, SAVING, INVESTMENT AND GROWTH

III.1 Introduction

The lack of external credit since 1982 has led developing economies such as Mexico to implement economic policies directed to raise the internal level of savings and with it, to increase the non-inflationary internal sources of finance. In this process the financial sector plays a fundamental role.

Long periods of economic growth in Mexico were achieved with interest rate ceilings, credit controls and high reserve requirements. After the debt crisis in 1982, interest rates were allowed to move more flexibly and ceased to be negative[1] after a whole decade of negative real values. Despite the real interest rate being negative, the value of total financial assets held in the financial sector increased (see Data Appendix).

Nevertheless, it was not until April 1989 that the financial system was fully liberalised. One reason for the liberalisation, apart from the theoretical one, was the fast growth of an unregulated financial sector, mainly Brokerage Houses, between 1982 and 1989 (see Marcos, 1990). Furthermore, with the aim of enhancing the role of the private sector, the commercial banks are currently being re-privatised after their nationalisation in 1982.

This chapter undertakes an empirical analysis of the basic hypothesis considered by the financial liberalisation models in order to assess the scope of implementing a successful financial liberalisation policy. It examines the determinants of financial savings; the total level of domestic savings of the economy; the level of private savings; the level of investment and of economic growth for the case of Mexico. In order to specifically test

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[1] Since 1982 the real interest rate offered on bank deposits has been positive, except in 1983 and 1987.

the effect of financial variables on the 'real' variables, such as savings, investment, and growth, special interest is given to the responsiveness of these variables to movements in the real interest rate.

All variables are measured in real terms. Total savings, private savings, investment and the Gross Domestic Product are deflated by the relevant implicit deflators. It should be mentioned at the outset that the way in which domestic savings is calculated may reduce the statistical significance of the estimates (see Balassa, 1990). As Balassa argues, in developing countries such as Mexico, estimates of savings are usually obtained as the difference between domestic investment and foreign savings, both of which are observed with error. Fixed investment is customarily estimated from data on the importation and the domestic production of machinery and on materials used in construction, which are subject to error. Whereas foreign saving is derived as the difference between exports and imports of goods and services which are also subject to error. Thus calculating domestic savings as a residual can 'magnify the error of estimate' and may result in a reduced statistical significance of estimated coefficients in a regression where domestic savings is the variable to be explained.[2]

The interest rate used is the average interest rate offered by the banking system on the different bank deposits (short and long term deposits). The real interest rate used in the estimations is the twelve month accumulated one.[3]

The period of estimation begins in 1960 and ends in 1990, using annual observations. The source of the data is Banco de México and the National Institute of Statistics (INEGI). All the regressions are estimated using the Ordinary Least Squares technique, and corrected with the Cochrane-Orcutt procedure in cases where auto-correlation of the

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[2] A long time-series of savings from the National Accounts System does not exist in Mexico. The savings series considered in this paper were constructed by the Central Bank on the basis of the National Accounts System.

[3] The calculation of the twelve month accumulated real interest rate is shown in Appendix IIIA.1.

errors was found. The t-statistics are reported in brackets in all the equations. In addition to the R^2, Durbin-Watson and 'F' statistics, we report the Chi-square values for the diagnostic tests of: autocorrelation, functional form, normality and heteroscedasticity. This last set of tests can improve the reliability on the estimators found, since they test the validity of the assumptions taken with respect to the econometric model. The estimated Chi-square values for each test must be lower than the respective critical values[4] to consider the assumptions as valid. It must be mentioned that when using the Cochrane-Orcutt procedure to correct auto-correlation of the errors, the diagnostic tests are not reported.

III.2. The Determinants of Financial Savings

Firstly, financial savings -the process of accumulating financial assets- can be defined as the change in the real stock of the broadest monetary aggregate (M4[5] in this case) without considering coins, currency and time deposits (M1). That is, we define financial savings as:

$$FS_t = (M4RS - M1RS)_t - (M4RS - M1RS)_{(t-1)} \tag{3.1}$$

where: $M4RS$ is the real stock of M4 deflated by the National Consumer Price Index (NCPI) and $M1RS$ is the real stock of M1 deflated by the NCPI.

The rationale for not including M1 (Coins, Currency and Time Deposits) in the definition of financial savings is that, since it does not yield any interest there is no reason to expect a response of M1 to changes in the real interest rate compared to interest yielding financial assets. Including M1 as part of financial savings might reduce the

[4] The Chi-square critical values are 3.84 and 5.99 with one and two degrees of freedom respectively at the 5 percent significance level.

[5] M4 includes: Coins, Currency and Demand Deposits (M1) + Short term banking instruments (M2) + Non-Banking Financial Instruments (M3) (such as: Treasury Bills, other government bonds and commercial paper) + long term banking instruments and government bonds.

estimated effect that the real interest rate has on the demand for financial assets.

If domestic credit is the primary asset backing the monetary liabilities of the banking system, then it is financial savings, the change in the *real* stock of the monetary aggregate, ($\Delta\,(M4RS-M1RS)$), which indicates the extent to which the supply of credit given by the financial system can be increased in the period considered (see Fry, 1988).

Financial savings measure the amount of total real savings that is channelled via financial assets. Since total domestic savings is a flow, it is the change in the stock of the monetary asset $\Delta\,(M4RS - M1RS)$ that measures the 'flow' of savings into the financial system.

The following analysis will test the sensitivity of financial savings to both the level of real income (GDP) and the domestic real interest rate (r). To take account of the attractiveness of holding domestic financial assets relative to foreign financial assets, the differential between the domestic real interest rate and the real yield on foreign financial assets[6] is included as an explanatory variable. Since the real yield on foreign financial assets is equal to the real interest rate abroad r_{us} plus the real rate of depreciation/appreciation of the domestic currency with respect to the dollar (Mexican pesos per dollar), $\dot{e}$, the real yield differential is expressed as: $(r - r_{us} - \dot{e})$. Uncertainty about the future yield on domestic assets may also discourage financial savings. Financial instability, as represented by high inflation rates and depreciation of the currency, undermines the holding of savings in domestic currency. Therefore, uncertainty, here approximated by the standard deviation of the monthly inflation rate in Mexico (year by year), $\dot{p}_v$, is also included as an explanatory variable of financial savings. Its inclusion in the equation picks up the effects of the economic crisis after 1982 and the consequent downturn of expectations.

[6] The real interest rate on foreign financial assets is approximated by the real return on six months U.S. government bonds (taken from the IMF Financial Statistics).

Since financial saving is part of total saving of the economy, we expect it to be positively correlated to the level of real income. As income increases, savings increase given the propensity to save. The domestic real interest rate and the real interest rate differential are expected to have a positive and statistically significant coefficient in explaining changes in financial savings, since the public's allocation of savings reacts to changes in the yield of different forms of holding savings. As the real interest rate offered on domestic deposits increases so does the attractiveness of holding savings as domestic financial assets. On the other hand, if the real yield on foreign assets is higher than the domestic yield, domestic financial savings can be reduced while capital flight increases. The estimation results are the following:

$$\underset{(-1.36)}{FS = -20.9} + \underset{(4.89)}{0.025\,GDP} + \underset{(2.17)}{1.85\,r} + \underset{(3.12)}{1.41\,(r - r_{us} - \dot{e})} - \underset{(-4.59)}{38.70\,\dot{p_v}} \tag{3.2}$$

$$R^2 = 0.80 \quad DW = 2.31 \quad F_{(4,25)} = 24.91 \quad n = 30$$
$$\textit{Serial Correlation}: \chi^2_{(1)} = 0.97$$
$$\textit{Functional Form}: \chi^2_{(1)} = 1.99$$
$$\textit{Normality}: \chi^2_{(2)} = 21.45$$
$$\textit{Heteroscedasticity}: \chi^2_{(1)} = 0.001$$

where: FS is financial savings expressed in billion pesos; r is the annual real interest rate (%); GDP is real GDP (in billion pesos); $(r - r_{us} - \dot{e})$ is the yield differential (%); and $\dot{p_v}$ is the uncertainty variable.

The results obtained show that the explanatory variables have the expected signs and are statistically significant. The coefficient on r shows that a one point increase in the domestic real interest rate yields, on average, to a 1.85 billion pesos increase in financial savings when the differential between the real return on Mexican and U.S. financial assets is held constant[7], while the positive estimated coefficient on the real interest rate

[7] Excluding the interest rate differential from the financial savings equation gives an estimated coefficient on the real interest rate of 3.97, with a t-statistic value of 6.71.

differential, equal to 1.41, indicates that domestic financial savings are sensitive to real financial yields abroad, leading to substantial capital flight movements. On the other hand, the estimated coefficient of *GDP* shows that a one million pesos (in constant terms) change in real income will induce, on average, a 25 million pesos change in financial savings. Uncertainty, measured by the standard deviation of inflation, adversely affects the level of financial savings. It indicates that if the confidence of the public in the capability of the financial system to increase or maintain the real value of the assets held within the financial system is undermined, financial savings, which can be highly volatile, can leave the domestic financial system and turn into capital flight, as happened especially during 1982 and after (see Chapter I).

When testing a dynamic specification of the equation, we found the lagged dependent variable not to be statistically significant, which suggests a relatively rapid adjustment process of financial savings to changes in the real domestic interest rate, in the real interest rate differential and in income.

Considering the results of the diagnostic tests, it can be seen that the normality test is not satisfied since the Chi-square value of the test is higher than the critical value, $\chi^2_{(2)} > 5.99$. The normality test is based on the skewness and kurtosis tests, which test the third and fourth moments of the residuals. (see Harvey, 1990, p.159). If the specification fails the normality test, it could probably mean that the residuals cannot be assumed to be normally distributed and it could undermine the confidence we have in the results of the tests of hypothesis. Nevertheless, when the assumptions of linearity and homoscedasticity of the residuals (the first and second moments) are maintained, as in the case of this equation, there is an error of specification only in the third and fourth moments of the residuals. It is argued that the optimal strategy to follow in such a case would be to propose a different kind of statistical distribution of the errors, which goes beyond the scope of this thesis (see Cassoni, 1990).

Thus, considering the equation as being correctly specified we can conclude that financial savings is positively correlated with the real domestic interest rate, the real interest rate differential and real income, and adversely affected by uncertainty. For the purpose of this work, it is important to highlight that a rise in the real interest rate is a potent instrument to attract resources into the financial system.

III.3. The Determinants of Total Domestic Savings and of Private Savings.

The financial liberalisation models emphasise that the real level of domestic savings increases with a higher real interest rate, particularly private savings (See Fry, 1988 or World Bank, 1989, for example). Many empirical studies have been done concerning the determinants of real savings and the results show that 'if the effect [of the real interest rate on savings] exists at all it is relatively small' (Fry, 1988, p.132).

Fry (1978), for instance, finds that the real interest rate exerts a positive influence on the ratio of domestic savings to GNP for a sample of seven Asian less developed countries during the 1962-1972 period. He estimates an equation for the savings ratio using as explanatory variables: the rate of growth of income, the level of per capita income, the real interest rate, the foreign savings ratio and the lagged domestic savings ratio. Giovannini (1983) estimates the same specification as Fry (1978) for the same countries but for a different time period. He finds that the coefficient of the real interest rate is never statistically significant, and is negative in six out of eight cases, not reproducing the results Fry obtained for a different time period. As Giovannini argues, these results 'cast serious doubts on the view that the interest elasticity of savings is significantly positive and easy to detect in developing countries' (p.603).

Gupta (1987) tests real aggregate savings as a function of permanent real income, transitory real income, the expected rate of inflation, the nominal rate of interest and the financial intermediation ratio. Using pooled time-series cross-section data, he estimates the model for twenty two Asian and Latin American countries for the 1967-1976 period. He finds that in terms of the total sample, there is little support for the 'repressionist hypothesis' which asserts that the positive substitution effect dominates the negative income effect of real interest rates on savings in developing countries. When considering the Asian countries separately, he finds that the nominal interest rate did show a positive and significant sign in explaining aggregate real savings but that the inflation coefficient showed the wrong sign, thus finding only partial support for the repressionist hypothesis in this case. In the case of the Latin American countries, the nominal interest rate coefficient and the inflation coefficient had the correct sign (positive and negative respectively) but neither were statistically significant. In the case of both sets of countries, Gupta finds that income growth is an important determinant of real savings.

Ocampo et.al. (Gonzalez Arrieta, 1988) test the importance of financial conditions in explaining aggregate savings performance for Colombia during the 1950-1980 period. The explanatory variables they include are: real income, transitory income, the real rate of interest, the money supply ratio to GNP as a measure of liquidity and the rate of inflation. The authors conclude that the hypothesis of higher interest rates affecting savings is not supported for the Colombian case: although the estimated coefficients were positive, the t-values were never higher than 1.4.

Another study referring to a Latin American economy was done by de Melo and Tybout (1985-86) for the case of Uruguay during the 1962-1983 period. The specification they use is the following: they test the domestic savings ratio to GDP as a function of real growth of income, the real deposit interest rate, the foreign saving ratio and the lagged dependent variable. When the whole period is considered, 1962 to 1983, they find a positive but weak correlation of the real interest rate and the savings rate (the t-ratio of the estimated coefficient is 1.41). When they consider the sample period to be from 1962 to 1973, before the financial reform in Uruguay took place, they find a positive and significant coefficient of the real interest rate, but not so for the period after the financial reform. De Melo and Tybout conclude that although the propensity to save increased in Uruguay after financial liberalisation took place, it was not entirely as envisioned by the proponents of financial deregulation, since no evidence was found of a positive effect of the real interest rate on aggregate savings after the 1973 financial reforms.

Despite the weak empirical evidence, the positive effect of the real interest rate on savings is a basic assumption behind the financial liberalisation theory.

In the following equation the hypothesis to be tested is that the level of real domestic savings in Mexico is significantly determined by the level of real income and by the real interest rate. In addition, the real interest rate differential between the U.S. and the Mexico as well as the variable measuring uncertainty are included in the equation to test if the effect these variables have on financial savings is reflected in the level of domestic savings. We expect total domestic savings to be highly and positively correlated with real income. Nevertheless, the expected sign and significance of the coefficient on the real interest rate variable will depend on the net result of the income and substitution effects of the interest rate on savings. In this equation a dummy variable is included for the year 1986 when the level of both private and total domestic savings fell sharply owing to the intensification of the austerity measures imposed by the government as a consequence of the fall in the price of oil to half its value in 1985. The equation was estimated in logarithms[8] instead of levels because the statistical tests indicated a better specification.

The estimation results are the following:[9]

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[8] Except for the real interest rate and the differential yield because they include several negative values.

[9] The equation was estimated using the Cochrane-Orcutt procedure to correct the first order autocorrelation of the errors. The diagnostic tests are not reported in the case when the Cochrane-Orcutt technique is used.

$$\log DS = -2.79 + \underset{(10.38)}{1.09}\log GDP - \underset{(-1.02)}{0.003}\, r - \underset{(-0.039)}{0.0006}\,(r - r_{us} - \dot{e}) \qquad (3.3)$$
$$\quad (-3.29)$$

$$- \underset{(-4.03)}{0.08}\,\dot{p_v} - \underset{(-9.08)}{0.82}\,DU86$$

$$R^2 = 0.97 \quad DW = 1.98 \quad F_{(6,23)} = 139.9 \quad n = 31 \quad \hat{\rho} = \underset{(3.69)}{0.64}$$

where: DS is the real total net domestic saving (public and private) expressed in billion pesos, and the other variables are as before.

The results obtained show the dominating effect of the level of income in determining domestic savings, while neither the domestic real interest rate or the real rate differential between the domestic and the external interest rate are statistically significant. Inflation volatility, however, measuring uncertainty, has a negative and significant estimated effect, as in the financial savings equation, and the dummy variable for 1986 is negative and significant as expected. The evidence does not support the hypothesis that a higher real interest rate raises domestic savings and suggests that the income effect of a change in the real interest rate at least offsets the substitution effect on savings.

It is interesting to notice that the estimated income elasticity of domestic savings is almost 1 in the period analysed. According to this result, the average propensity to save (S/Y) is equal to the marginal propensity to save ($\frac{\partial S}{\partial Y}$)[10]. In turn, this result implies a constant propensity to save over time. To support this result we estimated the average and marginal propensity to save by regressing domestic savings on real income for the 1960-1990 period. The estimated equation is the following:

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[10] If $S = f(r, Y)$, where S is savings, r is the real interest rate, and Y is income, then the income elasticity of savings equal to 1, $\frac{\partial S}{\partial Y} * \frac{Y}{S} = 1$ implies that $\frac{\partial S}{\partial Y} = \frac{S}{Y}$.

$$DS = -0.19 + \underset{(11.73)}{0.12}\,GDP \qquad (3.4)$$
$$(-0.005)$$

$$R^2 = 0.83 \quad DW = 1.74 \quad F_{(1,29)} = 137.7 \quad n = 30$$

The results of this equation are consistent with the estimated income elasticity of savings and support the result of a constant propensity to save out of income, equal to 0.12 for the 1960-1990 period, since the constant term is not significantly different from zero.

Changes in the real interest rate affect public savings. The higher the domestic public debt, the greater the impact of changes in the real interest rate on public savings. An increase in interest rates will increase the government's debt service payments and further increase the budget deficit, thus reducing public savings. Since the private sector receives the interest paid by the public sector on its domestic debt, total domestic savings will remain constant if the propensity to save out of income is the same for both the public and private sectors.

To test this hypothesis we limit the period of estimation of the last equation to the 1973-1988 period, when the public sector's deficit was at its highest levels (see Table 2 in Data Appendix). The results obtained are:

$$\log DS = \underset{(-4.45)}{-7.34} + \underset{(8.20)}{1.61}\log GDP - \underset{(-1.77)}{0.009}\,r + \underset{(0.49)}{0.001}\,(r - r_{us} - \dot{e}) \qquad (3.5)$$

$$- \underset{(-2.16)}{0.10}\log \dot{p}_v - \underset{(-4.49)}{0.70}\,DU86$$

$$R^2 = 0.92 \quad DW = 1.88 \quad F_{(5,10)} = 24.5 \quad n = 16$$

$$\textit{Serial Correlation}: \chi^2_{(1)} = 0.01$$
$$\textit{Functional Form}: \chi^2_{(1)} = 0.08$$
$$\textit{Normality}: \chi^2_{(2)} = 2.96$$
$$\textit{Heteroscedasticity}: \chi^2_{(1)} = 0.09$$

In this equation it can be seen that the real interest rate coefficient is negative and statistically significant at a 5 percent level of significance when the sample period is reduced.[11] A one point increase in the real interest rate reduces total domestic savings, on average, by 3.8 billion pesos. This result is probably due to the effect of a higher real interest rate on public savings, and suggests that the propensity to save out of income is lower for the private sector than for the public sector.

In neither of the equations considered using domestic savings as the dependent variable, was the lagged dependent variable statistically significant, which suggests a relatively fast adjustment of total domestic savings to changes in the real interest rate and in real income.

The relevant results for our purposes are: firstly, that the relation between the real interest rate and the real level of total domestic savings is either not statistically significant or negative; and secondly, that savings is strongly determined by the level of real income, supporting the Keynesian savings function.

To examine the determinants of real private savings (households and enterprises) we run the same regression with real private savings as the dependent variable. A dummy variable is introduced for the year 1986 for the same reason as in equation (3.5):

$$\underset{}{\log PS} = \underset{(-1.12)}{-2.04} + \underset{(4.13)}{0.91} \log GDP + \underset{(0.81)}{0.007}\, r - \underset{(-0.93)}{0.05}\,(r - r_{us} - \dot{e}) \tag{3.6}$$

$$- \underset{(1.73)}{0.18} \log \dot{p}_v - \underset{(-16.39)}{5.57}\, DU86$$

$$R^2 = 0.94 \quad DW = 1.99 \quad F_{(5,20)} = 68.6 \quad n = 26$$

[11] When the variables $(r - r_{us} - \dot{e})$ and $(\dot{p}_v)$ are excluded from this equation, the t-statistic on the domestic real interest rate is -2.43.

$$Serial\ Correlation: \chi^2_{(1)} = 0.00$$
$$Functional\ Form: \chi^2_{(1)} = 1.55$$
$$Normality: \chi^2_{(2)} = 59.7$$
$$Heteroscedasticity: \chi^2_{(1)} = 0.54$$

where *PS* are real private savings in billion pesos.

We find that private savings do not seem to be sensitive to changes in the real interest rate but again are strongly determined by the level of real income. When testing the dynamic specification of the equation, the following result is obtained:

$$\log PS = \underset{(-1.40)}{-1.75} + \underset{(4.88)}{0.75} \log GDP + \underset{(0.62)}{0.004}\, r - \underset{(-0.32)}{0.001}\,(r - r_{us} - \dot{e}) - \underset{(-1.08)}{0.07} \log \dot{p}_v \qquad (3.7)$$

$$+ \underset{(5.53)}{0.20} \log PS_{(t-1)} - \underset{(-25.46)}{5.54}\, DU86$$

$$R^2 = 0.98 \quad h\text{–}durbin = 1.45 \quad F_{(6,18)} = 144.1 \quad n = 25$$

$$Serial\ Correlation: \chi^2_{(1)} = 2.44$$
$$Functional\ Form: \chi^2_{(1)} = 0.40$$
$$Normality: \chi^2_{(2)} = 4.29$$
$$Heteroscedasticity: \chi^2_{(1)} = 2.63$$

In the case of real private savings, the highly significant coefficient of the lagged dependent variable and the improved results in the tests of hypothesis suggest that private savings adjust slowly to changes in real income and the rate of interest. The long run income elasticity of private savings[12] is equal to 0.93 while the short run income elasticity is lower, equal to 0.75.

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[12] From the savings equation: $\log S = a_0 + a_1 \log Y + a_2 \log S_{(t-1)}$, the long run income elasticity of savings can be calculated as $\varepsilon^Y_S = \dfrac{a_1}{1 - a_2}$.

Even though the real interest rate is not significant in explaining changes in the real level of private savings, it must be mentioned that it is possible for increases in the real interest rate to have a negative effect on private savings through the effect that interest rates have on the private sector's debt with the financial sector. A rise in real interest rates increases interest payments on accumulated debt from the private sector to the financial sector and might cause the former's savings to decrease.

The main results obtained concerning real savings behaviour show that the effect of the real interest rate is either not statistically significant in explaining the level of real savings (total or private), or is negative, when limiting the estimation sample to the period when the public sector's deficit was at its highest levels. Although it can be argued that the relevant variable is private savings, since financial liberalisation is intended to encourage the private sector to save, it seems that the effect of the real interest rate on public savings cannot be neglected. Since the real interest rate does not seem to affect private saving and can have a negative effect on total real domestic saving, it implies that real public savings decreases when the real interest rate rises. This might be due to the higher real cost of financing the public sector's deficit when the real interest rate increases. Nevertheless, the relevant result for this part of the analysis is that a rise in the real interest rate does not increase the level of real savings, private or total. There seems to be no reason to expect a rise in the real level of savings as a consequence of a higher real interest rate. This result contradicts one of the main propositions of the financial liberalisation theory. On the other hand, more saving is channelled through financial assets due to the rise in the real interest rate. This process does increase the availability of non-inflationary resources, and can improve the efficiency of their allocation in the sense that non productive holdings of wealth could be invested productively through financial intermediation.

A plausible explanation of the simultaneous process of increasing financial savings while total internal savings are not rising is that a substitution process between assets is taking place. That is, a higher domestic real interest rate attracts some of the capital deposited abroad or non-financial forms of savings into the domestic financial sector. Another explanation can be that although total savings is not rising, there is a transfer of resources from the public sector to the private sector through the high real interest the government pays on its internal debt to the private sector. The process of income redistribution, not only from the public sector to the private sector but also within the private sector from borrowers to creditors, can explain the simultaneity of rising financial savings and decreasing total savings.[13]

III.3.1 The Financial Deepening Hypothesis.

Shaw's financial deepening hypothesis argues that financial deepening, or the accumulation of financial assets at a pace faster than the accumulation of non-financial wealth, will tend to increase real savings: 'Measures to raise real rates of return on financial assets, to reduce the variance of returns, and to improve financial technology, along with allied measures in nonfinancial areas, extend the saver's horizons over both space and time' (Shaw, 1973, p.72). A positive and significant relation between the 'size' of the financial system, measured by the ratio of $M4$ to GDP, and real domestic savings would be expected. However, the interpretation of the financial intermediation ratio's ($M4/GDP$) coefficient in explaining the level of savings remains ambiguous. Quoting Gupta (1987): 'The difficulty with this variable [the financial intermediation ratio] lies in the interpretation of its coefficient. What meaning can be attached to it? Even if the sign of the coefficient could suggest the direction of the effect of financial development on

[13] Borrowers are forced to borrow more when interest rates rise to cover their debt payments in favour of creditors, thus causing both financial assets and liabilities to rise. In this case there is neither an increase in total savings nor a favourable shift from idle resources to financial assets. The UNCTAD report (UNCTAD, 1991) goes further by arguing that 'there is no reason to view in a positive light an increase in the debtor-creditor relationship if it is not associated with rising levels of production and investment: it may indicate, rather, increased fragility in the financial system' (p. 122).

savings, it is not clear whether we could go further and say that if financial assets as a proportion of GNP increase by a certain amount, aggregate savings will increase by a specific amount. Given this ambiguity we use [this ratio] as indicating only a *directional* effect rather than attaching any meaning to the size of its coefficient' (p. 304).

To test the financial deepening hypothesis, the ratio of M4 (the broadest monetary aggregate) to Gross Domestic Product (as a measure of financial deepening) is introduced as an explanatory variable in the total real domestic saving equation:[14]

$$\log DS = -1.48 + 0.94 \log GDP - 0.002\, r + 0.165 \log(M4/GDP) - 0.79\, DU86 \qquad (3.8)$$
$$(-1.34)\ (8.37) \qquad (-1.17) \qquad (0.73) \qquad (-7.73)$$

$$R^2 = 0.95 \quad DW = 1.95 \quad F_{(5,24)} = 109.4 \quad n = 30$$

The financial variable $M4/GDP$ is not statistically significant in explaining the level of total domestic real savings. To eliminate the possibility of correlation between *logGDP* and $log\,(M4/GDP)$ we dropped *logGDP* from the equation, and let the real level of domestic savings be explained by changes in the real interest rate and the intermediation ratio alone. The result obtained is the following:

$$logDS = -1.51 - 0.001\, r + 1.41 \log(M4/GDP) - 0.84\, DU86 \qquad (3.9)$$
$$(9.04) \quad (-0.61) \quad (1.68) \qquad (-9.04)$$

$$R^2 = 0.94 \quad DW = 2.08 \quad F_{(4,25)} = 105.6 \quad n = 30$$

Although the t-value of the financial intermediation ratio's coefficient rose, it is still not statistically significant at the 5 percent significance level but it is statistically different from zero at the 10 percent level of significance. This result allows us to argue that although a positive relation exists between the financial intermediation ratio and the level

[14] The estimation was done using the Cochrane-Orcutt technique to correct the first order autocorrelation of the errors.

of domestic savings, the relation is weak. It cannot be concluded that financial deepening has an independent effect on the level of real savings.

III.4. Determinants of Investment.

In accordance with the financial liberalisation models, where investment is determined solely by conditions of supply, i.e. by the level of saving, the correlation between the real interest rate and investment is expected to be positive. There are two different effects that explain the positive relation between the real interest rate and investment. The first one is the effect that the real rate of interest has on the total quantity of credit supplied to the private sector and through this on investment. The second one is the effect that the real interest rate has on the real level of savings and thus on the real rate charged on loans by the banking sector, i.e. the price of credit. It is argued that 'the lower the real deposit rate, the smaller the volume of saving and hence the higher the market clearing loan rate of interest. In such a case, the real deposit rate could act as an inverse proxy for the real loan rate and should have a positive impact on the investment rate' (Fry, 1988, p.144).

As far as the first effect is concerned, it has been found that changes in the real interest rate do have a positive impact on financial savings and thus on the real stock of financial assets held in the banking sector. Since domestic credit is the main asset backing the banking system's liabilities (i.e. financial assets deposited in the banking system), we expect a high and positive correlation between the real stock of credit and the real stock of total financial assets held by the private sector (M4) in the banking system. To test this relation we regress the total stock of credit given by the banking sector on the stock of financial assets deposited in the banking system:[15]

[15] The regression was estimated using the Cochrane-Orcutt technique to correct first-order autocorrelation of the errors.

$$\log CPS = -4.85 + 1.51 \log M4RS \qquad (3.10)$$
$$(-2.8) \quad (7.3)$$

$$R^2 = 0.95 \quad DW = 1.82 \quad F_{(2,27)} = 285 \quad n = 30$$

where: CPS is the real stock of credit given by the banking sector to the private sector deflated by the National Consumer Price Index expressed in billion pesos and $M4RS$ is the real stock of M4 in billion pesos. The results show that the real stock of money has a positive and significant coefficient in explaining the real stock of credit given to the private sector.

If we consider that financial savings indicate the extent to which the supply of credit can be increased we test the change in credit given to the private sector as the dependent variable and financial savings as the explanatory variable:[16]

$$\Delta CPS = 1.83 + 0.5\, FS \qquad (3.11)$$
$$(0.13) \quad (6.28)$$

$$R^2 = 0.687 \quad DW = 1.89 \quad F_{(2,26)} = 28.6 \quad n = 29$$

where: $\Delta CPS = (CPS_t - CPS_{(t-1)})$ is the change in the real stock of credit to the private sector and FS is financial savings. On average, a one billion pesos increase in financial savings increases the amount of credit given to the private sector by 0.5 billion pesos.

It must be mentioned that although strongly determined by the total amount of financial assets in the banking system, credit given to the private sector was also a function of the reserve ratio imposed by the Central Bank on commercial banks until 1989. It is left as a matter for further study in the following chapter how the reserve ratio, as an instrument of credit allocation, affected public and private investment.

[16] We did not estimate the equation in logarithms because of negative values in both the dependent and the independent variable. The regression was estimated using the Cochrane-Orcutt technique to correct first-order autocorrelation of the errors.

We now analyse the determinants of the level of gross fixed investment for the 1960-1990 period. Two hypotheses will be tested. The first one is to test the effect that changes in the real interest rate have on investment considering both the effect that the real interest rate has on the amount of credit and the effect that the real deposit interest rate, as a proxy of the price of credit, has on the level of investment. According to the financial liberalisation models a positive coefficient of the real interest rate in explaining the level of investment would be expected for two reasons. Firstly, the higher the real deposit interest rate is, the larger the amount of savings and thus the larger the supply of credit. As the supply of credit increases, the market clearing interest rate decreases, lowering the price of credit. Hence, investment should increase. Secondly (and more important), classical theory argues that the relation between investment and the real interest rate depends on the level of the real interest rate relative to its equilibrium level. If the real interest rate is below equilibrium, investment is assumed to be constrained by saving, and investment and the rate of interest should be positively correlated. On the other hand, the interest rate above the equilibrium level may discourage investment by making the yield on financial assets more attractive than the rate of return on investment. To distinguish between below and above equilibrium real interest rates, the model includes a 'switching' variable (see Rittenberg, 1991) of the type $(r - r^e)D$, where r^e is the equilibrium interest rate (or switching point) and D is a dummy variable which takes the value 1 where $r > r^e$ and zero where $r \leq r^e$. The equilibrium real interest rate was searched for by a trial and error process, experimenting for real interest values ranging from -5 to 5 percent and reporting the result which minimised the sum of squared residuals of the regression. The value which minimises the SSR is $r^e = 0$.

The second hypothesis to be tested is that the real level of investment is demand determined. To do so, we include in the regression the lagged change in output $(\Delta\overline{GDP}_{t-1})$. Assuming investment is sensitive to changes in demand, the lagged accelerator is expected to be positive and significant. Including the lagged accelerator as an explanatory variable assumes that entrepreneurs take time to adjust the capital stock to the new level of demand for output.

The investment function then looks like:

$$I = a_0 + a_1 r + a_2 (r - r^e) D + a_3 \Delta GDP_{t-1} + a_4 CPS \qquad (3.12)$$

with $a_1 > 0$, $a_2 < 0$, $a_3 > 0$ and $a_4 > 0$.

If $r \le r^e$, then:

$$I = a_0 + a_1 r + a_3 \Delta GDP_{t-1} + a_4 CPS \qquad (3.13)$$

and if $r > r^e$, then:

$$I = (a_0 - a_2 r^e) + (a_1 + a_2) r + a_3 \Delta GDP_{t-1} + a_4 CPS \qquad (3.14)$$

with the expectation that $(a_1 + a_2) < 0$.

Two dummy variables are included in the regression: one for 1981 when there was unusually high investment due to the 'oil-boom', and one for 1983 when the effects of the external debt crisis were felt on the level of investment (see Table 1 in the Data Appendix). Equation (3.12) was estimated in logarithms since the tests statistics suggested this as a superior specification. The estimated equation[17] is:

$$\log GFI = \underset{(10.74)}{5.70} - \underset{(-0.75)}{0.00165}\, r - \underset{(-0.66)}{0.0023}\, (r - r^e) D + \underset{(2.29)}{0.0004}\, (\Delta GDP_{(t-1)}) \qquad (3.15)$$

$$+ \underset{(3.54)}{0.192} \log CPS + \underset{(3.57)}{0.22}\, DU81 - \underset{(-3.37)}{0.20}\, DU83$$

$$R^2 = 0.98 \quad DW = 1.84 \quad F_{(7,20)} = 124.9 \quad n = 29 \quad \hat{\rho} = \underset{(22.8)}{0.91}$$

where: GFI is real gross fixed investment in billion pesos; r is the real interest rate;

[17] The equation was estimated using the Cochrane-Orcutt technique to correct first order auto-correlation of the errors.

$(r - r^e)D$ is the switching variable; CPS is real credit to the private sector; $\Delta GDP_{(t-1)} = GDP_{t-1} - GDP_{t-2}$ is the lagged accelerator; and $DU81 \& DU83$ are the dummy variables for 1981 and 1983. The estimation results show that the sign on the real interest rate is not positive but negative, but statistically insignificant. The coefficient on $(r - r^e)D$ has the expected negative sign but is also insignificant. Experimenting over the range of real interest rates failed to produce a positive sign on r, which suggests either that the true equilibrium value of r has been below the minimum experienced, or that savings is not related to the real interest rate, as found in the domestic saving equation. Therefore, the investment equation is reestimated without the switching variable, obtaining the following results:

$$\underset{(11.04)}{\log GFI = 5.63} \underset{(-2.15)}{- 0.003\, r} \underset{(3.69)}{+ 0.0004} (\Delta GDP_{(t-1)}) \underset{(2.47)}{+ 0.20 \log CPS} \underset{(3.96)}{+ 0.23\, DU81} \underset{(-3.36)}{- 0.18\, DU83} \quad (3.16)$$

$$R^2 = 0.98 \quad DW = 1.85 \quad F_{(6,21)} = 149.7 \quad n = 29$$

It is shown that real investment is negatively affected by the real interest rate holding constant the supply of credit, and that both supply side determinants (credit) and demand side determinants (the lagged accelerator) are significant. The lagged accelerator is the most significant of the explanatory variables, and supports the hypothesis that investment responds to changes in demand. As far as the two supply side effects described above are concerned, we find that there is a positive effect from the real interest rate to investment through the level of credit given to the private sector, but there is a negative effect from the real deposit interest rate on real investment if, as stated above, this is considered as a 'proxy' for the real rate charged on loans. This result is not consistent with Mckinnon's Complementarity Hypothesis between money and capital, but shows support for the assumption that money and capital are substitutes, which implies that a rise in the real deposit interest rate discourages productive investment.

According to the results obtained from this equation, it seems that investment is affected by both demand and supply factors. Concerning the effect of the real interest rate on investment, it is found that the interest rate might affect investment in two opposite directions. To work out the net effect of the interest rate on investment, we first need to calculate the magnitude of the two separate effects which are being dealt with. The first effect is the impact of an increase in the real interest rate on investment if the former is considered as a proxy of the price of credit. From equation (3.16), we find the partial derivative of investment with respect to the real interest rate[18]:

$$\frac{\partial GFI}{\partial r} = (-0.003) * (\overline{GFI}) = -1.95 \tag{3.17}$$

According to our results, a one point increase in the real rate of interest causes investment to decrease, on average, by 1.95 billion pesos.

The second effect is the impact the real rate of interest has on investment through changes in the supply of credit. To calculate this effect, it must be taken into consideration the effects that the real interest rate has on financial savings, which in turn affects the supply of credit. To do so, the chain rule will be used, as follows:

$$\left(\frac{\partial GFI}{\partial r}\right)_{(C)} = \frac{\partial GFI}{\partial C} * \frac{\partial C}{\partial FS} * \frac{\partial FS}{\partial r} \tag{3.18}$$

The impact coefficient of credit on investment is derived from equation (3.16):

$$\frac{\partial GFI}{\partial C} = (0.20) * \left(\frac{\overline{GFI}}{\bar{C}}\right) = 0.61 \tag{3.19}$$

where $\overline{GFI}$ and $\bar{C}$ are the mean values of gross fixed investment and of the real stock of credit respectively over the 1960-1990 period. Then, the impact coefficient of a change in financial savings on the stock of real credit is calculated by regressing the stock of

[18] The derivation of impact coefficients and elasticities from a semi-log model as the one presented here is explained in Appendix IIIA.2. We understand by a semi-log model one in which the dependent variable is expressed in logarithms and the independent variables are expressed in both levels and logarithms. In textbooks, however, a semi-log model is defined either as $y_t = f(\log x_1 + \log x_2 + \ldots + \log x_n)$ or $\log y_t = f(x_1 + x_2 + \ldots + x_n)$.

credit on financial savings:

$$C = 277.2 + 0.14\,FS \tag{3.20}$$
$$(5.18) \quad (1.80)$$

$$R^2 = 0.81 \quad DW = 1.78 \quad F_{(3,24)} = 33.89 \quad n = 30$$

from which we get:

$$\frac{\partial C}{\partial FS} = 0.14 \tag{3.21}$$

Lastly, from the equation that explains the behaviour of financial savings (in section III.2), we get the impact coefficient of a change in the real interest rate on financial savings:

$$\frac{\partial FS}{\partial r} = 3.97 \tag{3.22}$$

Thus, the effect of the real interest rate on investment through the supply of credit is given by:

$$\left(\frac{\partial GFI}{\partial r}\right)_{(C)} = (0.61) * (0.14) * (3.97) = 0.34 \tag{3.23}$$

Adding the two effects then gives the net effect of the real interest rate on investment as:

$$\frac{\partial GFI}{\partial r} + \left(\frac{\partial GFI}{\partial r}\right)_{(C)} = -1.95 + 0.34 = -1.61 \tag{3.24}$$

Although there is a positive effect from the supply side of the real interest rate on investment via credit, it seems that this effect is offset by the negative impact that the rate of interest has on investment when the supply of credit is held constant. The net effect of interest rates on investment appears to be negative. Thus the evidence for Mexico does not seem to support the financial liberalisation model hypothesis of a positive relation between the real interest rate and investment. The results of a positive and significant lagged accelerator, together with a negative net effect of real interest rates on investment is more consistent with the post-Keynesian models discussed in chapter II, which allow for a negative effect of the real interest rate on investment.

III.5. Determinants of Economic Growth

This section analyses the determinants of economic growth using an endogenous saving model based on Mckinnon's (1973) virtuous circle model on savings and growth.

Mckinnon develops a model to explain the virtuous circle developed between savings and the rate of economic growth, in which the effects of financial variables are highlighted. Based on the Harrod-Domar model of growth, the following functions are established:

- Real output Y is a function of the stock of capital K:

$$Y = \sigma K \tag{3.25}$$

where σ is the output/capital ratio, and is assumed to be constant.

- Saving (S) is a fixed proportion of real income, which in equilibrium is equal to investment (I):

$$S = s\,Y = \frac{\partial K}{\partial t} = I \tag{3.26}$$

where s is the propensity to save out of income.

- The equilibrium percentage rate of growth of output is obtained by differentiating (3.25) with respect to time and substituting (3.26):

$$\frac{\partial Y}{\partial t} = \sigma \frac{\partial K}{\partial t} = \sigma s Y \tag{3.27}$$

$$=> \; g = \sigma s \tag{3.28}$$

The rate of growth of the economy is determined by the product of the output/capital ratio σ and the marginal propensity to save s.

- The propensity to save s is itself assumed to be partly determined by the rate of growth of output g, together with the real rate of interest offered on deposits r and some 'other variables' ρ:

$$s = s(g, r, \rho) \tag{3.29}$$

Substituting (3.29) in the output growth equation gives:

$$g = \sigma s(g, r, \rho) \tag{3.30}$$

The dependence of savings on growth is what Mckinnon calls the **portfolio effect** which then generates a virtuous circle in which there is an interdependence between savings and growth:

$$\frac{\partial g}{\partial s} > 0 \quad \text{and} \quad \frac{\partial s}{\partial g} > 0 \qquad (3.31)(3.32)$$

A higher growth rate requires a higher savings ratio in order for the ratio of money balances to income to remain at a constant level. In other words, the public's wish to maintain their ratio of financial assets to income intact when income rises, leads them to increase their savings, '...that is, they are induced not to consume all of their incremental income because they want their assets position to rise commesurately. Their propensity to save out of income is thereby increased' (Mckinnon, 1973, p.124). The effect of growth on the propensity to save (portfolio effect) depends in turn on the financial conditions of the economy. The more developed the financial system the higher the financial assets/income ratio is likely to be and the higher the value of the propensity to save s. For the portfolio effect to influence the rate of economic growth, a developed and healthy financial system is needed, including a positive real interest rate offered on deposits, so that the public is attracted to hold their savings in the form of financial assets.

The economy reaches an equilibrium rate of growth when the actual rate of growth of output g generates desired savings sufficient to support the investment necessary to maintain that rate of growth. For the model to have a stable equilibrium solution the portfolio effect of growth on savings $\frac{\partial s}{\partial g}$ must be less than the capital/output ratio[19]:

[19] In Mckinnon's model, this condition assures the stability of the equilibrium rate of growth

$(\frac{\partial s}{\partial g}) < \frac{1}{\sigma}$.

Introducing additional explanatory variables into the savings propensity function as part of the 'other variables' in ρ, we include export performance and foreign capital inflows:

$$s = s\,(g,\, r,\, x,\, S_f) \tag{3.33}$$

where x is the rate of growth of exports and S_f is the foreign savings ratio to income. Both, the rate of growth of exports and foreign savings relieve the foreign exchange constraint on investment and growth that affects developing countries, therefore influencing the savings behaviour. Mckinnon (1973) argues that trade liberalisation and an equilibrium exchange rate will increase exports on the one hand and will lessen financial repression on the other hand. Trade liberalisation implies the elimination of subsidised credits to importers or exporters and an equilibrium exchange rate implies that neither exports nor imports are punished.

Papanek (1973) argues that the rate of growth of exports also affects positively the propensity to save through the income distribution. He argues that exports often produce highly concentrated incomes with a high propensity to save. Moreover, he argues, exports are administratively easier to tax than wages or profits thus increasing public savings as well.

Foreign savings S_f relieves both the foreign exchange and the savings constraints on investment and growth. Hence foreign savings affect both the propensity to save and the rate of growth of output. It has been argued that capital inflows from abroad may reduce the domestic saving effort. Papanek (1973) finds that the relation between foreign savings

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of output. It implies that the slope of the actual rate of growth of output function is lower than unity and assures its intersection with the 45 degree line from the origin that depicts the product of the 'intended' or ex-ante propensity to save and the output/capital ratio σ (See Mckinnon, 1973, Chapter 9).

and domestic savings is negative only when foreign savings includes net transfers received by the government plus official long term borrowing. However, he argues, if private direct investment and net private transfers are included, the relationship between foreign savings and domestic savings becomes uncertain.

Let private savings, PS, be a function of real income Y:

$$PS = sY \tag{3.34}$$

Substituting the propensity to save s from equation (3.33), gives:

$$PS = (\alpha_1 g + \alpha_2 x + \alpha_3 r + \alpha_4 S_f)Y \tag{3.35}$$

From the national accounts, we have the identity:

$$Y = C + I + X - M \tag{3.36}$$

where Y is aggregate income, C is aggregate consumption, I is investment, X is exports and M is imports.

Since total savings S equals aggregate income Y minus aggregate consumption C, we have:

$$S = I + (X - M) \tag{3.37}$$

$$S = PS + PuS = PS + (T - G) \tag{3.38}$$

where PS is private savings and PuS is public savings (total public income T minus total public expenditure G). From equations (3.37) and (3.38):

$$=> \quad PS = I + (X - M) - (T - G) \tag{3.39}$$

$$=> \quad I = PS + (M - X) + (T - G) \tag{3.40}$$

The sources of finance of investment are: private savings (PS), public savings ($T - G$), and foreign savings ($M - X$). Substituting (3.34) in (3.40) gives:

$$I = sY + (T - G) + (M - X) \tag{3.41}$$

Differentiating (3.25) with respect to time and substituting $I = \frac{\partial K}{\partial t}$ (from (3.26)), we get:

$$\frac{\partial Y}{\partial t} = \sigma I \tag{3.42}$$

Substituting (3.41) in (3.42):

$$\frac{\partial Y}{\partial t} = \sigma\,[sY + (T - G) + (M - X)] \tag{3.43}$$

which in turn gives:

$$g = \sigma s + \sigma S_G + \sigma S_f \tag{3.44}$$

where g is the percentage rate of growth of output, S_G is the public savings ratio, and S_f is the foreign savings ratio.

If $s = \alpha_1 g + \alpha_2 x + \alpha_3 r + \alpha_4 S_f$, then the rate of growth of output is determined by:

$$g = \beta_1 x + \beta_2 r + \beta_3 S_G + \beta_4 S_f \tag{3.45}$$

where:

$$\beta_1 = \frac{\sigma\alpha_2}{(1 - \alpha_1\sigma)} \tag{3.46}$$

$$\beta_2 = \frac{\sigma\alpha_3}{(1 - \alpha_1\sigma)} \tag{3.47}$$

$$\beta_3 = \frac{\sigma}{(1 - \alpha_1\sigma)} \tag{3.48}$$

$$\beta_4 = \sigma\frac{(1 + \alpha_4)}{(1 - \alpha_1\sigma)} \tag{3.49}$$

Equation (3.45) shows the reduced form from which we can solve for the structural parameters α_1, α_2, α_3, and α_4 given the value of σ, the productivity of investment.

III.5.1. Estimation Results

The result of estimating equation (3.45) for the 1961-1990 period with annual observations is the following:

$$g = 5.23 + 0.058\,x - 0.0035\,r + 0.33\,S_G + 0.67\,S_f \qquad (3.50)$$
$$(5.51) \quad (2.18) \quad (-0.08) \quad (3.73) \quad (3.13)$$

$$R^2 = 0.66 \quad DW = 2.04 \quad F_{(4,25)} = 12.48 \quad n = 30$$
$$\textit{Serial Correlation}: \chi^2_{(1)} = 0.153$$
$$\textit{Functional Form}: \chi^2_{(1)} = 2.00$$
$$\textit{Normality}: \chi^2_{(2)} = 0.92$$
$$\textit{Heteroscedasticity}: \chi^2_{(1)} = 0.15$$

where: g is the real rate of growth of output (%); x is the real rate of growth of exports (%); r is the real interest rate offered on deposits (%); S_G is the public savings ratio (defined as the public's sector financial deficit over GDP) (%); and S_f is the foreign savings ratio (calculated as the negative of the current account balance of the Balance of Payments over GDP)(%).

We find that only the real interest rate is not statistically significant in explaining real output growth, while the other variables are. Hence we do not find empirical support for a positive and significant effect of real interest rates on economic growth. This result is consistent with the earlier results of a negative and/or non-statistically significant coefficient of the real interest rate on the total savings and investment equations. Moreover, when undertaking the Granger causality tests between the growth of output and the real interest rate we found no support for causality in any direction; that is, there seems to be no Granger causality either from the real interest rate to the growth of output or from the rate of growth of output to the real interest rate as shown by the following equations:

$$g_t = 2.26 + 0.47r_{(t-1)} + 0.52g_{(t-1)} \tag{3.51}$$
$$(2.22) \quad (0.89) \qquad (3.29)$$
$$R^2 = 0.3 \quad DW = 1.86 \quad durbin-h = 0.75 \quad F_{(2,27)} = 5.89$$

and:

$$r_t = 5.11 - 0.74g_{(t-1)} + 0.46r_{(t-1)} \tag{3.52}$$
$$(1.60) \quad (-1.48) \qquad (2.80)$$
$$R^2 = 0.3 \quad DW = 2.24 \quad durbin-h = -1.62 \quad F_{(2,27)} = 4.92$$

The lagged independent variables are not statistically significant in any of the equations, thus implying no Granger causality between the two variables.[20]

The rate of growth of exports, as expected, has a positive and statistically significant coefficient. The increase in exports earns foreign currency needed to finance imports of capital and intermediate goods necessary in the production process in most less developed countries. As well, a virtuous circle is developed between exports and growth in the sense that investment in the export sector can lead to a rise in productivity and to product diversification so that the income elasticity of demand for exports rises (see Thirlwall, 1982 and Thirlwall and Hussain, 1982).

The results obtained concerning the effects of public savings and of foreign savings on the rate of growth of output show that foreign saving (S_f) has a stronger impact on growth than public savings (S_G). The foreign savings coefficient is double that of the public savings coefficient. This means that, other things remaining equal, the productivity[21] of foreign savings ($\frac{\partial g}{\partial s_{S_f}} = \sigma_{S_f} = 0.67$) is double the productivity of public savings ($\frac{\partial g}{\partial s_{S_G}} = \sigma_{S_G} = 0.33$). According to Papanek (1973) this is a reasonable result since

[20] It should be mentioned that we did not expect a statistically significant coefficient of the lagged rate of growth of output $g_{(t-1)}$ in determining the real interest rate r_t since real interest rates were exogenously set by the monetary authorities until April 1989.

[21] From equation (3.28) $g = s\sigma$, differentiating g with respect to s gives the productivity of capital: $\frac{\partial g}{\partial s} = \sigma$

foreign savings can fill the foreign exchange constraint as well as the savings constraint. Also, according to Mckinnon (1973) foreign savings are expected to have a greater impact on output growth than domestic savings. He argues that financial repression restrains domestic savings within less developed economies and generates pressure for reliance on foreign capital to supplement domestic saving and to provide a more efficient allocation of resources capable of identifying high return investment projects that otherwise would not take place.

Using equations (3.46) to (3.49) we now proceed to calculate the coefficients α_i; $i = 1,\ldots,4$ that determine the propensity to save in equation (3.35). Since the system of equations is under-identified (because σ is unknown as well), the value of σ, the productivity of capital, was estimated independently. An incremental capital/output ratio (ICOR) was calculated equal to 2.95 by finding the coefficient of the incremental output (ΔY) in a regression where investment (ΔK) is the dependent variable. The calculated ICOR gives an estimated productivity of capital $\hat{\sigma} = 0.34$. It was also found, by calculating the average of the *recursive* coefficient of ΔK on ΔY, an average ICOR for the 1960-1990 period in Mexico of 3.01, which, in turn gives an average $\bar{\sigma} = 0.33$. This result enables us to consider the value of $\hat{\sigma} = 0.34$ as quite stable over the period analysed.

Knowing that: $\hat{\beta}_1 = 0.058$, $\hat{\beta}_2 = -0.0035$, $\hat{\beta}_3 = 0.33$, $\hat{\beta}_4 = 0.67$ and $\hat{\sigma} = 0.34$, we find the following values for the coefficients α_i:

$$\hat{\alpha}_1 = \frac{1}{\hat{\sigma}} - \frac{1}{\hat{\beta}_3} = -0.062 \tag{3.53}$$

$$\hat{\alpha}_2 = \frac{\hat{\beta}_1}{\hat{\beta}_3} = 0.176 \tag{3.54}$$

$$\hat{\alpha}_3 = \frac{\hat{\beta}_2}{\hat{\beta}_3} = -0.010 \tag{3.55}$$

$$\hat{\alpha}_4 = \frac{\hat{\beta}_4}{\hat{\beta}_3} = 1.014 \tag{3.56}$$

which gives the propensity to save equation as:

$$s = -0.062g + 0.176x - 0.010r + 1.014S_f \tag{3.57}$$

We find no empirical support for the portfolio effect of growth on the propensity to save since its coefficient is negative and close to zero. Consistent with the previous results obtained, we also find that r does not affect positively the propensity to save since its coefficient is, again, negative and close to zero. However, the rate of growth of exports and foreign savings do have a positive impact on the propensity to save. Exports seem to affect savings positively, either through the income distribution effect and/or the foreign exchange constraint relaxation. As well, foreign savings appear to have a positive (and virtually equi-proportional) impact on the propensity to save, not supporting the hypothesis that foreign savings reduce the domestic savings effort. The values of the estimated coefficients of the propensity to save ($\hat{\alpha}_i$, $i = 1, 2, 3, 4$) satisfy the stability condition of the Mckinnon model of being less than the capital/output ratio.

III.6 Conclusions

This chapter has examined the determinants of financial savings, the level of total and private domestic savings, investment and output growth in Mexico. The analysis was undertaken with special emphasis on the effects of the real interest rate on these variables, since it plays a central role as the key to the relief of financial repression. It is believed that the rise in the real interest rate will increase not only financial savings but also total saving, and thus the non-inflationary sources of finance will be enhanced.

The results obtained are clear as far as the effect of the real interest rate on financial savings and on total savings is concerned. We found that financial savings are positively and highly correlated to the real interest rate. We also found that financial savings are sensitive to the level of real output. This explains the fact that financial savings were growing while there were long periods of negative real interest rates. During this period (1977-1981), the Mexican economy experienced a high rate of growth of output. Financial liberalisation, through the rise in real interest rates, does have a positive impact on financial savings, and thus, on the total sources of non-inflationary domestic finance.

The effect of real interest rates on the total level of domestic savings is statistically insignificant. That is, the real interest rate appears to have no effect on the total level of domestic savings. Total domestic saving primarily is a function of the level of real income. This result implies that a rise in financial savings does not necessarily mean a rise in the total level of domestic savings of the economy. Financial savings can rise because the public substitutes other forms of savings (real assets or financial assets deposited abroad) into domestic financial assets, when the real yield of the latter is higher. Thus, there is no reason to expect that a rise in the real interest rate, caused by financial liberalisation, will increase the level of total savings. It can even cause total savings to decline as a consequence of the effect it has on the public sector's borrowing requirement.

The results shown here, together with the weak results of other research on the relation between interest rates and savings, leads us to think that it is a shortcoming of the theory behind financial liberalisation to believe that total savings will increase, when it seems to be that financial savings is the relevant variable.

An interesting question to raise is what are the consequences of a rise in financial savings even though total savings do not increase. We might think that it does represent a more efficient use of idle resources if these resources find productive investment outlets, but on the other hand, financial savings can remain in the financial sector for speculation purposes and not lead to any productive investment. It cannot be assumed that financial savings will automatically find investment outlets.

We also found a positive correlation between credit given by the banking sector to the private sector and the financial asset stock held in the financial system, even though credit given to the private sector depends on the reserve requirement that the Central Bank imposes on commercial banks. As well, we have seen that this credit does affect in a positive way the total level of investment.

This might lead to the conclusion that financial liberalisation can have a positive effect on the level of investment *if* savings channelled through the financial system can find productive outlets easier and faster than any other form of wealth holding. Nevertheless, if the only way to raise credit is by raising the real interest rate, the higher levels of the real interest rate might have a negative impact on the level of investment.

Concerning the rate of growth of output, we found no empirical support for the portfolio effect of growth on savings. Consistent with the previous results, it seems that changes in the real interest rate do not have any effect on economic growth working through savings. However, it appears to be that output growth is positively affected by the rate of growth of exports, which, as well, increases the propensity to save. An interesting result obtained concerns the productivity of public savings compared to the productivity of foreign savings. We found that the productivity of foreign savings is double that of public savings, which is an important result for a country like Mexico that has relied so much in the past on foreign capital. According to our results, public savings would have to be twice as much as foreign savings to give the same impact on economic growth.

As a final conclusion we can say that even though financial liberalisation will increase the flow of resources into the financial sector, it is not clear that this process will increase total saving and investment and thus economic growth. The productivity of investment would have to rise, a question that is undertaken in chapter IV.

DATA APPENDIX

TABLE 1: Real Sector Variables of the Mexican Economy *

Year -	GDP -	Rate of Growth of GDP (%)	Total Domestic Savings(1)	Private Savings	External Savings(2)	Gross Fixed Investment
1960	1197.1	8.00	130.7	n.a.	34.4	221.0
1961	1256.1	4.93	140.7	n.a.	27.9	221.9
1962	1314.8	4.67	142.8	n.a.	19.6	232.8
1963	1419.8	7.98	182.8	n.a.	17.3	262.0
1964	1585.8	11.69	214.6	n.a.	33.7	314.7
1965	1688.7	6.49	216.4	151.1	32.2	337.2
1966	1805.7	6.93	216.0	155.3	34.5	369.0
1967	1918.9	6.27	237.9	157.9	42.1	420.6
1968	2075.1	8.14	234.8	143.7	53.3	460.3
1969	2206.3	6.32	266.4	169.0	46.8	494.4
1970	2359.0	6.92	287.6	178.3	73.6	495.4
1971	2457.4	4.17	264.8	168.4	54.5	480.4
1972	2666.0	8.48	281.3	200.8	54.3	563.1
1973	2890.2	8.41	328.2	179.7	72.1	624.9
1974	3066.8	6.11	347.1	206.2	134.8	665.0
1975	3238.8	5.61	339.9	273.8	166.2	749.9
1976	3376.1	4.24	337.9	209.5	123.1	773.5
1977	3492.4	3.44	404.8	236.9	52.8	678.1
1978	3780.5	8.25	452.2	240.8	79.5	800.5
1979	4126.6	9.15	533.0	288.4	125.4	973.2
1980	4470.1	8.32	606.7	291.2	223.8	1106.8
1981	4862.2	8.77	616.5	520.5	310.0	1342.6
1982	4831.7	-0.63	618.9	393.7	20.8	1057.0
1983	4628.9	-4.20	673.4	262.4	-137.9	651.0
1984	4796.1	3.61	601.8	224.5	-110.5	738.0
1985	4920.4	2.60	610.1	257.2	-59.7	812.9
1986	4735.7	-3.75	259.3	1.2	11.4	756.1
1987	4817.7	1.73	566.6	95.2	-81.6	709.5
1988	4884.2	1.38	397.2	312.3	32.3	749.9
1989	5040.9	3.21	582.5	358.5	57.9	798.7
1990	5236.3	3.88	683.9	275.0	70.9	905.7

Notes:

* All variables are expressed in real terms; The GDP, savings and investment values were deflated with the relevant implicit price index. They are all measured in Billion Mexican Pesos.

(1). We consider the Net Total Value of Domestic Savings (Net Total Domestic Savings= Gross Total Savings - Depreciation - External Savings).

(2). External Savings = (-) Balance of the Current Account of the Balance of Payments.

Source of Data: Banco de México and INEGI.

TABLE 2: Public and Foreign Savings Ratios (%)

Year	Public Savings/GDP (1)	Foreign Savings/GDP (2)
1960	0.33	3.26
1961	-0.76	2.48
1962	-0.69	1.66
1963	-0.67	1.35
1964	-0.68	2.28
1965	-3.05	2.06
1966	-1.55	2.02
1967	-1.62	2.31
1968	-1.46	2.69
1969	-2.34	2.24
1970	-1.43	3.33
1971	-2.47	2.36
1972	-4.93	2.22
1973	-6.86	2.74
1974	-7.72	4.42
1975	-10.01	4.95
1976	-9.89	3.76
1977	-6.74	1.90
1978	-6.68	2.54
1979	-7.61	3.49
1980	-7.85	5.00
1981	-14.75	5.96
1982	-17.82	0.51
1983	-8.99	-3.93
1984	-8.71	-2.59
1985	-9.95	-1.30
1986	-16.80	0.41
1987	-16.54	-3.03
1988	-12.97	1.32
1989	-6.15	2.29
1990	-3.50	2.21

Notes:

(1). The public savings ratio is calculated as the ratio of the public sector's nominal financial deficit over nominal GDP. A negative value reflects a public sector deficit.

(2). The foreign savings ratio is calculated as the ratio of external savings ((-) the Balance of the Current Account of the Balance of Payments) over nominal GDP.

Source of Data: The public sector's deficit data for the 1960-1970 period was obtained from Gomez Oliver (1981). The rest of the data was obtained from Banco de México, Economia Aplicada A.C., and INEGI.

TABLE 3: Financial Sector Variables of the Mexican Economy					
Year - -	Nominal Interest Rate (%)(1)	Real Interest Rate (%)(2)	Financial Savings (Bill. Pesos)(3)	M4 Real Stock (Bill. Pesos)(4)	Real Stock of Credit to the Priv. Sect.(5)
1960	8.15	5.22	n.a.	110.1	55.5
1961	8.62	8.97	12.8	126.4	64.3
1962	8.74	7.11	11.3	145.7	72.7
1963	8.71	9.11	15.9	174.1	86.0
1964	8.59	2.39	13.9	197.6	101.8
1965	9.20	9.75	23.7	227.3	121.1
1966	9.15	6.00	30.2	266.2	142.1
1967	9.15	7.54	37.3	310.7	167.3
1968	9.15	7.47	32.2	356.0	194.5
1969	9.93	4.17	40.9	404.7	230.8
1970	10.18	5.13	44.4	457.0	272.8
1971	9.86	4.82	35.2	495.9	289.1
1972	9.64	3.53	34.4	553.8	315.4
1973	10.28	-10.98	-41.2	520.6	284.4
1974	11.36	-11.42	-9.9	509.7	263.1
1975	11.97	-0.18	53.8	580.6	279.8
1976	12.12	-19.90	-72.8	521.5	257.1
1977	14.04	-7.52	31.6	563.2	270.1
1978	15.88	-2.16	63.8	657.5	332.5
1979	17.52	-4.89	71.1	758.1	382.1
1980	24.25	-5.44	72.5	838.7	389.0
1981	31.81	3.07	103.9	953.3	432.5
1982	46.12	-25.18	-196.5	687.4	295.7
1983	56.44	-3.78	57.4	692.9	204.8
1984	47.54	3.63	86.1	782.7	236.6
1985	65.66	5.63	-38.5	732.6	199.6
1986	95.33	6.28	33.7	737.1	154.4
1987	104.29	-4.06	16.9	737.0	144.1
1988	45.48	26.74	50.3	792.9	194.5
1989	40.11	29.44	183.2	999.7	344.8
1990	29.23	10.00	90.8	1179.5	469.0

Notes:

(1). The Annual Nominal Interest Rate considered is the end of period value of the weighted average interest rate offered by the banking system on the different bank deposits.
(2). The Annual Real Interest Rate is the 12 month accumulated real rate of interest (December value).
(3). Financial Savings = $\Delta(M4RS - M1RS)$ where: $M4RS$ is the Real Stock of M4; and $M1RS$ is the Real Stock of M1.
(4). The Real Stock M4[22] is the Nominal M4 Stock deflated with the National Consumer Price Index (1978=100).
(5). The Real Stock of bank credit given to the private sector is deflated with the NCPI (1978=100).
Source of Data: Banco de México.

[22] The average exchange rate is used to convert the foreign currency component of M4 into Mexican Pesos.

APPENDIX IIIA.1

Calculation of the Accumulated Real Interest Rate.

The twelve month accumulated real interest rate is calculated as follows:

$$i_{r_a} = [((1 + i_{r_t}) * (1 + i_{r_{t+1}}) * \ldots * (1 + i_{r_{t+12}})) - 1] * 100$$

where:
i_{r_a}: accumulated real interest rate in twelve months
i_{r_t}: real interest rate in month t

In turn, the monthly real interest rate is calculated as:

$$i_{r_t} = [\frac{1 + \frac{i_{n_a}}{1200}}{1 + \frac{CPI_t}{CPI_{t-12}}} - 1] * 100$$

where:
i_{r_t}: real interest rate in month t
i_{n_a}: annual nominal interest rate
CPI_t: Consumer Price Index in month t

APPENDIX IIIA.2

Calculation of Impact Coefficients and Elasticities.

From a multiplicative model like the following:

$$Y = A\,x^{\beta_1} e^{\beta_2 r}$$

which is expressed in logarithmic form as:

$$\log Y = \log A + \beta_1 \log x + \beta_2 r$$

The impact coefficient of r on Y is:

$$\frac{\partial Y}{\partial r} = A\,x^{\beta_1} e^{\beta_2 r} \beta_2 = \beta_2 \bar{Y}$$

where $\bar{Y}$ is the average value of Y, and the elasticity of Y with respect to r is:

$$\frac{\partial Y}{\partial r} * \frac{r}{Y} = \beta_2 \bar{r}$$

where $\bar{r}$ is the average value of r. The impact coefficient of x on Y is:

$$\frac{\partial Y}{\partial x} = A\,\beta_1 x^{\beta_1 - 1} e^{\beta_2 r} = \beta_1 \frac{\bar{Y}}{\bar{x}}$$

and the elasticity of Y with respect to x is β_1

CHAPTER IV

CREDIT ALLOCATION AND THE PRODUCTIVITY OF INVESTMENT

IV.1 Introduction

The purpose of this chapter is to analyse the efficiency of the allocation of financial resources in Mexico over the period 1970 to 1990. The chapter is divided into six sections, but four main areas of analysis can be identified. First, the role of the public sector in financial policy. Secondly, the allocation of credit given by banks (commercial and development banks) between the public and the private sector. Thirdly, the relationship between public and private investment and the productivity of the two types of investment, and fourth, the effect of financial variables (the real interest rate and the financial deepening ratio) on the productivity of investment.

The first section analyses the different roles played by the public sector in financial policy, under a direct intervention in credit allocation scheme and under a financial liberalisation environment. It is argued by the financial liberalisation model that one of the conditions for a liberalised financial system to work efficiently is the reduction of the public sector's deficit. A low public sector deficit stands now at the core of Mexican economic policy. One of the objectives of a low public sector borrowing requirement is not to distort financial markets. It is argued that a high public sector deficit needs massive financing which distorts financial markets. If the public sector's financing needs are high, the government makes use of policies and instruments, such as credit ceilings and reserve requirements, that divert financial resources to the public sector. This set of instruments and policies conform to what is understood as financial repression. But this leaves open the question of how public resources are used and whether public investment is more or less productive than private investment.

The reduction in public spending in Mexico during the last decade has affected public investment overall. The evolution of credit given to the public sector and to the private sector is described in section IV.3. One of the purposes of this section is to highlight what happened in Mexico during the 1970-1990 period: credit given to the public sector increased its percentage share in total credit after 1982, coinciding with the period when the participation of public investment in total public expenditure fell sharply. Credit given to the public sector after 1982 was mainly devoted to finance interest payments on the domestic public debt.

After analysing the allocation of credit between the public and private sectors, section IV.4 analyses the productivity of investment in both the public and the private sectors with the aim of testing the hypothesis that financial resources diverted by non-market forces are inefficiently allocated, which implies that public investment is less productive than private investment. Section IV.4 includes a discussion of theoretical issues concerning the concept of productivity and previous empirical work done on the productivity of public and private investment in developing countries. It then presents the methodology and the estimation results obtained for Mexico during the 1970-1990 period.

After considering the efficiency of the allocation of resources, the analysis proceeds to another controversial issue surrounding public and private investment. Section IV.5 analyses the effect that a change in public investment has on private investment. This is a controversial issue because the effect of public investment on private investment is subject to both a complementarity effect and a substitution or crowding-out effect. Following the presentation of a discussion and previous empirical work done on this topic, two recursive models are developed to find estimates of the *net* effect of a change in public investment on private investment: the contributory effect less the crowding-out effect.

Section IV.6 presents an empirical analysis of the financial liberalisation model hypothesis of positive real interest rates and high financial deepening ratios as the means to increase the productivity of investment. This hypothesis has to be a strong argument behind the financial liberalisation models, given the weak theoretical and empirical evidence found of a positive relationship between real interest rates and financial deepening on the one hand and the level of aggregate savings (and the quantity of investment) on the other. That is, the hypothesis stating that financial variables affect positively the productivity or quality of investment stands stronger, at least at a theoretical level, than the hypothesis of real interest rates affecting positively economic growth through a rise in the quantity of savings and investment. To test this hypothesis, we examine the effect that these financial variables have had on the incremental capital-output ratio (ICOR). Additionally, this analysis includes the effect of the real rate of growth of output on the ICOR, and tests the hypothesis stating that the ICOR does not remain constant in the short run, but is determined by output growth and the degree of capacity utilisation of the economy. Finally, the conclusions derived from the empirical evidence found in this analysis are presented.

IV.2 The Role of the Public Sector in Financial Policy

Deregularisation of the financial system implies significant modifications of the role of public policy in the mobilisation of financial resources. Not more than a decade ago, the main objective of financial and monetary policy in many developing economies was to achieve a high rate of economic growth by providing a stable financial environment and by inducing desired changes in the amount and allocation of the country's credit resources.

Direct instruments of monetary control were the main means by which credit was allocated. These instruments of intervention in monetary and credit markets often included some or all of the following: direct controls on interest rates, bank credit ceilings, selective credit controls, preferential central bank refinance, facilities to direct credit to priority sectors, and reserve and liquid asset requirements.

In the case of Mexico, the use of instruments and policies of direct intervention in the market was widespread. Direct intervention in financial markets played a determinant role in the allocation of credit, as analysed in the first chapter of the thesis. The financial sector provided long-term finance to the public and the private sector at low cost with the aim of promoting investment and industrialisation.

Direct government intervention in financial markets enables the public sector not to be constrained by its own savings and to mobilise financial resources by borrowing from the private sector and from the banking sector to finance the budget deficit. The public sector can, in this way, mobilise a large share of the economy's financial resources in excess of its own revenue. In Mexico, commercial banks channelled part of their financial resources at subsidised rates to activities to which the government gave priority. The reserve requirement ratio was generally high and acted as an instrument both for monetary control and for financing the deficit of the public sector. Development banks and trust funds were created and enlarged in order to make the support to preferential sectors more effective, and the government had sole access to the Central Bank as a source of financial resources.

Direct credit allocation in priority sectors - priority being determined by a set of economic and political goals - was considered as the means to finance projects that would not attract financial resources guided through market forces: 'because of the divergence between social and private returns[1], interventionist credit policy is necessary to remove market distortions and to impel financial intermediaries to better allocate their resources' (Khatkhate and Villanueva, 1978). Direct intervention was considered essential when distortions prevailed in an imperfect credit market; market imperfections being under-

[1] Social returns differ from the rate of return expected by a private investor since all the benefits and costs of the investment project are computed, even those that do not accrue to the owner of the project (see Leite and Sundararajan, 1991).

stood as a wide term implying lack of information among production and consumption units in the economy, indivisibilities and fragmentation of the economy. It is argued that, if properly designed and executed, direct intervention policies can strengthen the process of financial intermediation by improving the allocation of financial resources. As Khatkhate and Villanueva (1978) suggest, in less developed economies direct intervention policies 'appear to be necessary to remove the one weakness of the financial intermediation process: sub-optimal allocation of resources. Financial institutions receive incorrect market signals in imperfect markets, and their perspectives are narrow, which impede the flow of their resources to socially productive sectors' (p.987).

The view of economic policy on the role of the public sector in the allocation of credit has gradually changed in Mexico during the 1980-1990 decade. It is now widely considered that direct government intervention in financial markets damages the efficiency of the economy, by reducing financial intermediation and distorting the allocation of resources. In its 1990 Annual Report, the Central Bank states that the actual economic strategy followed in Mexico has as a central issue the re-definition of the role of the state in the economy. It is argued that by increasing the role that market forces play in the allocation of resources, the overall efficiency of the economy will increase (Banco de México, 1990).

If the government is to be helpful in bringing about a faster rate of economic growth, 'it must always be on guard not to be itself a major source of misallocation of resources' (Tanzi, 1976). Within the financial liberalisation framework of economic policy, this means that the government should not make use of financial restriction measures to transfer a high proportion of funds from the financial system to the public sector. Leite and Sundararajan (1991) argue that misallocation of financial resources by the public sector would not happen if the funds to finance the government budget deficit are raised in the financial market on equal terms with the private sector, and, if the social return of the government's investment projects financed by these funds exceeds the market interest rate.

It is argued that direct instruments of monetary control are difficult and costly to design and implement efficiently, besides causing distortions in the allocation of resources, since these resources may not be directed into those activities expected to yield the highest returns 'and less productive activities may be supported to the detriment of economic growth' (see Johnston and Brekk, 1991). It is further argued that direct controls in credit allocation inhibit the development of money and capital markets which are necessary for an efficient allocation of resources.[2]

If direct government intervention in the financial market is considered to cause a decline in financial intermediation and an inefficient allocation of resources into low productivity activities, the role of the public sector in allocating financial resources needs to be redefined. Economic policy under a market oriented framework states that, 'the government has to provide an appropriate environment for the well-functioning of the financial market and for a competitive financial structure' (Johnston and Brekk, 1991, p. 99). Polizatto (1991) points out that the role of financial policy in a market economy is: to control the supply of money, to prevent systemic financial instability and to meliorate concerns about the efficiency and equity of financial intermediation. The World Bank states that the role of the government is to ensure that financial institutions are acting honestly by providing 'a system of laws and regulations needed to promote the use of contracts that are clear about the rights and obligations of contracting parties' in order to 'foster responsible and prudent behaviour on both sides of the financial transaction' (World Bank, 1989, p.84). 'It is the role of financial authorities (the Central Bank) to promote a safe, stable and efficient financial system' (World Bank, 1989, p. 92).

[2] Johnston and Brekk (1991) argue that the lack of an effective investment channel outside the banking system means that only those investment projects that satisfy the criteria set by bankers may be able to obtain finance at reasonable interest rates.

Ghigliazza (1990) distinguishes three categories of action through which the Central Bank can promote an efficient financial system. First, the Central Bank participates by defining directly or indirectly the regulatory framework within which financial intermediaries operate. It sets guidance to induce competition among market participants, to avoid undue risk-taking by institutions and to provide guarantees to avoid bank runs. Secondly, the Central Bank can play a critical role in expanding the financial market by establishing trading patterns and promoting new instruments of monetary control. For the case of Mexico in particular, the development of a public debt market (mainly Treasury Bills) has facilitated the use of open market operations as a means of monetary control. And thirdly, the category comprising policy actions promoting price stability.

It can be argued that under a market oriented economic framework, financial policy deals solely with prudential regulation. In contrast to economic regulations, such as reserve requirements and directed credit, which concern policies and instruments designed to achieve economic goals, prudential regulation concerns the set of laws, rules and regulations designed to minimise risk and to ensure the safety and soundness of the financial system (see Polizatto, 1991).

Two types of regulation are required to ensure the establishment of an effective financial system: preventive and protective regulation (Sheng, 1991). Preventive regulation covers measures such as a minimum capital requirement sufficient to absorb unusual losses and to reduce the banks' potential for failure. Asset diversification which enables banks to achieve a better combination of risk and returns. Furthermore, the establishment of limits to loans offered to 'insiders' (the bank's shareholders) and detailing permissible activities for banks (stating as non-permissible activities: commercial activities, ownership of equities in firms and enterprises, and participation in non-banking financial activities) are considered preventive regulations. Finally, the establishment of minimum standards for the scope, frequency and content of external audits on commercial banks (see Polizatto, 1991 and Sheng, 1991).

Protective regulation includes deposit insurance measures, the primary objectives of which are to prevent bank runs and to protect the stability of the banking system. However, deposit insurance can cause moral hazard (see section II.3.2 in chapter II), which might affect the banking sector by providing a 'false sense of security [to bank owners and to the consequent undertaking] of imprudent and unacceptable risks' (Polizatto, 1991, p.183).

Interestingly, among the set of policies recommended by Bhatt and Meerman (1978) to ensure a sound development of financial institutions, are: bank supervision, deposit insurance and 'the imposition of ceilings on deposit rates' (p.53).

The importance of bank supervision is emphasised in a market oriented financial system, since inappropriate bank supervision can lead to banking distress and banking crisis (see section II.3.2).

Effective bank supervision needs a well trained administrative infrastructure that can end up being as difficult and as costly to implement as organising selective credit regulations. In order to assess risk adequately, the supervising agency has to periodically revise the financial situation of every bank, identifying the main changes in financial ratios, foreign exchange risks and interest rate risks. Also, major credit files must be studied in order to assess lending procedures and the quality of loans (see World Bank, 1989). Additionally, it is stated that the effectiveness of a bank supervisory body 'depends ultimately on its leadership and independence from political influence' (Polizatto, 1991, p. 189), which, although a matter that goes beyond the scope of this thesis, seems somehow difficult to achieve.

The main instrument of monetary control in a deregulated financial system is open market operations. The existence of a developed government bond market is a precondition to financial liberalisation, so that the public sector can finance the budget deficit directly from the private sector without having to turn to direct financing from the Central Bank or to compulsory lending from commercial banks. The strengthening of the money market[3] is encouraged by the government so that monetary and credit control can be achieved through open market operations.

In turn, it is argued that a low level of the public sector borrowing requirement is a condition for the effective functioning of open market operations as a monetary control instrument. If the budget deficit is large, requiring massive financing, sales of government bills tend to be the dominant influence in financial markets, seriously limiting the use of open market operations as a monetary control instrument. Market oriented models argue that an efficient financial market can be brought about only if the government reduces its budget deficit to a level that would permit it to borrow directly from the financial market without recourse to special regulations (see Johnston and Brekk, 1991). Since the government has an important role in promoting competition and in ensuring that its financing operations do not distort market rates, the financial position of the government must be improved, that is, the public sector borrowing requirement has to be lowered.

A direct implication of the above argument is a reduction in public expenditure. In the case of Mexico, the contraction of public expenditure has affected public investment above all. The public sector deficit was reduced from 16.7 percent of GDP in 1986 to 6.2 and 3.5 percent in 1989 and 1990 respectively (see Table 2 in chapter III). Investment expenditure as a share of total public expenditure has been reduced from 32.4 percent in 1981 (its peak level) to 8.6 and 13.6 percent in 1989 and 1990 respectively (Banco de México, 1991).

[3] The money market is defined by the World Bank as the market in which short-term securities such as Treasury Bills, certificates of deposits and commercial bills are traded (World Bank, 1989).

IV.3 The Allocation of Credit

This section analyses the evolution of credit given by the banking sector over the 1970-1990 period, with the aim of distinguishing the distribution of credit among the public sector and the private sector. Table IV.1 shows the levels of credit given by commercial banks in real terms, as well as its percentage composition. On average, 81 percent of credit was given to the private sector[4], while 19 percent was given to the public sector during the 1970-1990 period. There is a clear shift in the distribution of credit before 1980 and after 1984. Before 1980, the average percentage share of credit given to the public sector was 8.9, and after 1984 it rose to 33.2 percent. The average percentage share of credit given by commercial banks to the private sector decreased from 91.1 percent for the 1970-1980 period, to 69 percent in the 1984-1990 period.

Table IV.2 shows the distribution of credit given by development banks to the public and the private sector.[5] After 1987, the proportion of credit channelled through development banks decreased compared to that of commercial banks. Although the major part of credit was given to the public sector, its average share in total credit increased after 1984: before 1977 credit given to the public sector represented, on average, 69 percent; after 1984 it rose to 84 percent.

Considering credit given by both commercial and development banks, it can be observed from Table IV.3 that while total credit given to the public sector shows an increasing trend during the whole period (only beginning to decline after 1988), there is a clear shift of its share in total credit from the 1970-1978 period to the 1984-1990 period. The average share of credit given to the public sector by both commercial and develop-

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[4] Unfortunately, data on credit per sector are not available for 1981, 1982 and 1983 in the case of commercial banks.

[5] In the case of development banks, information of credit per sector is not available from 1978 until 1983.

ment banks increased from 35 percent in the first period to 57 percent in the second period. In the case of credit given to the private sector, its average share in total credit decreases more than 20 percent over the periods considered. It is only during 1989 and 1990 that its real level and percentage participation increased.

Having considered the distribution of credit between the public and the private sector, we now turn to analyse the use of funds effected by the public sector by examining the destination of public expenditure[6]. Table IV.4 shows the real levels of the different uses of public expenditure. First, current expenditure is divided between interest payments (including both interest paid on the domestic debt and on the external debt), separated from government consumption, current transfers and other current expenditure (included in the 'others' column). Then, investment expenditure is divided between public works and other investment expenditure, the latter including capital transfers to public enterprises plus other expenditures.[7]

It can be observed from Table IV.4 that public investment increased in real terms from 1977 until 1981, when it reached its peak level. After 1981, public investment kept falling until 1989, slightly rising again in 1990. In 1989, public investment was one sixth of its 1981 value, showing a larger fall in public works than in investment in public enterprises.

Investment in public works (which include roads, water, sewage, etc.) was more than ten times lower in 1990 than in 1981, its percentage share in total expenditure decreasing from 23.78 percent in 1980 to a minimum of 2.24 percent in 1989 (see Table IV.5).

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[6] Data on the uses of public expenditure are not available for the 1970-1976 period.

[7] The addition of the current expenditure sub-total and the public investment sub-total does not coincide with total public expenditure because an 'other expenditure' item ('ajenas netas') is not included in the table.

On the other hand, public expenditure devoted to interest payments was the only item to rise after 1981, both in real terms and as a share of total expenditure. During the 1977-1981 period, the average share of public expenditure devoted to interest payments was 10.7 percent. During the 1982-1990 period, it increased to an average of 36 percent. Thus, while public current expenditure (other than interest payments) and public investment decreased, interest payments increased.

The issue that deserves to be highlighted is the coincidence of: the upward shift in the real level and share of credit given by commercial and development banks to the public sector; the rise in public expenditure devoted to interest payments; and the decline of public investment from 1982 onwards. In turn, the percentage composition of interest paid by the public sector on the domestic debt and on the external debt also changed, the former increasing from 58.7 percent in 1981 to 79.8 percent of total interest payments in 1990 (see Table IV.6). Thus, after 1981, the public sector's use of financial resources was mainly devoted to interest payments on its domestic debt, mainly due to the rise in the real interest rate over this period (see Table 3, Chapter III).

Table IV.1

Credit Given by Commercial Banks					
Year	To the Public Sector		To the Private Sector		Total
	Bill. Pesos	% Part.	Bill. Pesos	% Part.	Bill. Pesos
1970	6.3	7.70	75.2	92.30	81.5
1971	7.9	8.49	85.0	91.51	92.9
1972	9.9	10.02	89.1	89.98	99.0
1973	9.0	9.58	84.9	90.42	93.9
1974	7.9	8.76	81.8	91.24	89.6
1975	7.7	8.33	85.2	91.67	92.9
1976	9.2	9.56	87.0	90.44	96.2
1977	9.2	10.44	78.8	89.56	88.0
1978	8.6	8.22	95.9	91.78	104.5
1979	11.0	8.93	112.2	91.07	123.2
1980	11.6	8.39	126.6	91.61	138.2
1981	-	-	-	-	174.4
1982	-	-	-	-	178.7
1983	-	-	-	-	132.4
1984	49.1	33.58	97.0	66.42	146.1
1985	68.6	41.31	97.4	58.69	166.0
1986	97.4	51.44	91.9	48.56	189.3
1987	89.7	46.98	101.2	53.02	190.8
1988	36.7	29.79	86.4	70.21	123.0
1989	30.9	17.72	143.5	82.28	174.4
1990	26.5	11.35	207.4	88.65	233.9

Source of Data: Banco de México

Notes: Stocks deflated by the Implicit Price Index for Gross Capital Formation, Base 1970=100.

Table IV.2

Credit Given by Development Banks					
Year	To the Public Sector		To the Private Sector		Total
	Bill. Pesos	% Part.	Bill. Pesos	% Part.	Bill. Pesos
1970	30.3	62.31	18.3	37.69	48.7
1971	35.5	61.18	22.5	38.82	58.0
1972	43.8	68.14	20.5	31.86	64.2
1973	47.7	70.71	19.8	29.29	67.4
1974	44.7	68.55	20.5	31.45	65.2
1975	48.7	71.71	19.2	28.29	67.9
1976	71.8	77.92	20.4	22.08	92.2
1977	65.1	72.20	25.1	27.80	90.2
1978	-	-	-	-	101.3
1979	-	-	-	-	105.8
1980	-	-	-	-	109.4
1981	-	-	-	-	147.0
1982	-	-	-	-	225.5
1983	-	-	-	-	145.5
1984	117.0	82.91	24.1	17.09	141.1
1985	145.6	84.03	27.7	15.97	173.2
1986	199.0	87.21	29.2	12.79	228.1
1987	209.9	87.76	29.3	12.24	239.2
1988	117.2	82.83	24.3	17.17	141.5
1989	108.8	81.58	24.6	18.42	133.3
1990	83.3	77.73	23.9	22.27	107.2

Source of Data: Banco de México

Notes: Stocks deflated by the Implicit Price Index for Gross Capital Formation, Base 1970=100.

Table IV.3

Credit Given by Commercial and Development Banks					
Year	To Public Sector		To Private Sector		Total
	Bill. Pesos	% Part.	Bill. Pesos	% Part.	Bill. Pesos
1970	36.6	28.13	93.5	71.87	130.1
1971	43.4	28.74	107.5	71.26	150.8
1972	53.7	32.89	109.6	67.11	163.3
1973	56.7	35.13	104.7	64.87	161.4
1974	52.5	33.93	102.3	66.07	154.8
1975	56.4	35.09	104.4	64.91	160.8
1976	81.0	43.02	107.4	56.98	188.4
1977	74.3	41.71	103.8	58.29	178.1
1978	-	-	-	-	205.8
1979	-	-	-	-	228.9
1980	-	-	-	-	247.6
1981	-	-	-	-	321.5
1982	-	-	-	-	404.2
1983	-	-	-	-	277.9
1984	166.0	57.81	121.2	42.19	287.2
1985	214.1	63.13	125.1	36.87	339.2
1986	296.4	70.99	121.1	29.01	417.5
1987	299.6	69.67	130.4	30.33	430.0
1988	153.9	58.17	110.7	41.83	264.6
1989	139.7	45.39	168.1	54.61	307.8
1990	109.9	32.20	231.2	67.80	341.1

Source of Data: Banco de México

Notes: Stocks deflated by the Implicit Price Index for Gross Capital Formation, Base 1970=100.

Table IV.4

Destination of Public Expenditure							
Billion Pesos Stocks. 1970 Constant Prices.							
Year	Current Expenditure			Investment Expenditure			Total
	Interest Payments	Others	Sub-Total	Public Works	Other Investment	Sub-Total	
1977	21.4	135.7	157.1	40.4	12.8	53.2	210.5
1978	23.8	147.3	171.1	52.4	13.2	65.6	237.4
1979	28.4	163.6	192.0	63.0	18.9	81.9	276.3
1980	34.1	191.4	225.4	77.0	15.9	92.9	323.6
1981	51.5	221.5	273.0	95.1	38.3	133.4	411.1
1982	85.6	262.1	347.8	81.0	24.9	106.0	463.8
1983	116.6	194.7	311.3	50.2	20.3	70.5	386.7
1984	111.8	189.3	301.1	47.3	15.9	63.2	369.2
1985	109.8	201.8	311.7	44.5	13.4	57.9	375.5
1986	142.0	185.0	327.0	39.8	12.0	51.8	385.4
1987	178.6	175.9	354.5	38.9	11.3	50.2	406.4
1988	144.4	155.6	300.0	32.6	5.2	37.8	338.3
1989	104.4	91.2	195.6	4.7	13.3	18.0	210.7
1990	82.5	88.0	170.5	8.3	17.9	26.2	192.6

Source: Banco de México

Notes:

Flows deflated by the National Consumer Price Index. Base 1970=100.

Current Expenditure Sub-Total plus Investment Expenditure Sub-Total does not coincide with Total Public Expenditure because an 'other expenditure' item ('Ajenas Netas') is not included in the Table.

Table IV.5

Destination of Public Expenditure						
Percentage Composition (%)						
Year	Current Expenditure			Investment Expenditure		
	Interest Payments	Others	Sub-Total	Public Works	Other Investment	Sub-Total
1977	10.17	64.45	74.62	19.18	6.09	25.27
1978	10.03	62.06	72.09	22.08	5.55	27.63
1979	10.28	59.21	69.49	22.82	6.82	29.64
1980	10.52	59.14	69.66	23.78	4.91	28.69
1981	12.54	53.87	66.41	23.13	9.32	32.45
1982	18.46	56.52	74.98	17.47	5.37	22.85
1983	30.14	50.35	80.49	12.98	5.26	18.24
1984	30.28	51.28	81.56	12.82	4.31	17.13
1985	29.27	53.74	83.01	11.85	3.57	15.42
1986	36.84	47.99	84.84	10.31	3.11	13.42
1987	43.96	43.27	87.23	9.56	2.79	12.35
1988	42.70	46.00	88.70	9.63	1.54	11.17
1989	49.55	43.26	92.81	2.24	6.34	8.58
1990	42.83	45.69	88.52	4.31	9.32	13.63

Source: Banco de México

Notes:

Current Expenditure Sub-Total plus Investment Expenditure Sub-Total does not add 100 percent because an 'other expenditure' item ('Ajenas Netas') is not included in the table.

Table IV.6

Interest Payments by the Public Sector Percentage Composition (%)		
Year	Domestic	External
1977	72.1	27.9
1978	63.2	36.8
1979	63.1	36.9
1980	67.9	32.1
1981	58.7	41.3
1982	59.8	40.2
1983	62.5	37.5
1984	66.9	33.1
1985	68.1	31.9
1986	73.3	26.7
1987	77.8	22.2
1988	78.6	21.4
1989	77.8	22.2
1990	79.8	20.2

Source: Banco de México

IV.4. The Productivity of Public and Private Investment

Chapter I has given a broad description of the evolution of public and private investment in Mexico during the last three decades. It was argued that public investment played a leading role in promoting economic growth (during the seventies), based on the observation that the rate of growth of public investment was higher, on average, than that of private investment (Table IV.7).

In this section, the productivity of public and private investment will be analysed. The purpose of the analysis is to test the hypothesis underlying financial liberalisation models which states that resources allocated through direct policy intervention in financial markets are inefficiently used, and hamper, rather than help, the process of economic growth. This hypothesis implies that public investment, which is allocated mainly on economic planning/non-market based criteria, and using direct instruments of credit control, is less productive than private investment.

Even though the concepts of efficiency and productivity are not precisely the same, they are closely related (Shone, 1981). Efficiency is concerned with how best to utilise resources in the production process. Efficiency of production is also referred to as the minimisation of unit costs of all factors of production by applying better techniques (Nadiri, 1970). Productivity is concerned with the output to input relation. Shone (1981) refers to efficiency as a more all-embracing concept than productivity; he argues that it is possible to define them in such a way that they are synonymous, but 'this would not be useful because we would soon find that we would require a concept to go beyond productivity as conventionally understood' (p.125). Nevertheless, he adds, efficiency is not a simple concept, it is far from clear, and it is difficult to measure. Since the interest of this analysis lies in the effect of investment on output growth, efficiency will be understood as productivity.

Table IV.7

Investment Billion Pesos at Constant 1970 Prices			
Year	Total Investment	Private Investment	Public Investment
1970	88.7	59.4	29.2
1971	87.1	64.7	22.5
1972	97.8	66.3	31.5
1973	112.2	68.3	43.9
1974	121.1	76.1	45.0
1975	132.3	77.6	54.7
1976	132.9	82.3	50.6
1977	124.0	76.8	47.2
1978	143.1	80.3	62.8
1979	171.7	99.0	72.7
1980	197.4	112.5	84.9
1981	230.0	125.9	104.1
1982	189.5	105.7	83.8
1983	134.8	81.4	53.4
1984	143.7	88.1	55.6
1985	155.9	100.5	55.3
1986	136.8	88.6	48.1
1987	136.1	94.2	41.9
1988	144.6	104.6	40.0
1989	154.3	113.7	40.6
1990	175.6	130.2	45.4

Source: National Institute of Satistics, INEGI

Despite the importance of the relationship between public and private investment on the one hand and economic growth on the other, there are few empirical studies on this topic. Khan and Reinhart (1990) point out that 'there is virtually no empirical evidence that can be called on to support or disprove the notion that private investment is in some sense 'better' than public investment insofar as long-run growth is concerned' (p.20).

Perhaps one of the reasons for the scarcity of this kind of study is the difficulty of the interpretation of the resulting productivity estimates, since public investment, which has an autonomous behaviour, can have positive and/or negative effects on private investment, thus affecting the latter's productivity.

Bearing in mind that the estimation results can be weak and that care should be taken in their interpretation, this section proceeds to analyse the methodology and results of calculating the productivity of investment. The following section (IV.5) will analyse the complementarity and substitution (crowding-in and crowding-out) effects of public and private investment.

Different arguments exist surrounding the issue of public and private investment productivity. Newlyn (1977) argues that there is no a priori reason to consider public investment less productive than private investment. The World Bank (1989) states that public or private enterprise ownership can cause significant differences in the enterprise's performance. In practice, they argue, public enterprises have a limited independence since they are subject to orders from different government institutions, which can cause inefficiency and lack of innovation. Tanzi (1976) argues that public investment can be considered as a kind of input for private investment and that the productivity of private investment is closely related to both the level and the quality of investment in the public sector. In general, he argues, 'with the exception of investment in public enterprises, the direct contribution of most public investment to potential output is not high. It is generally its effect on the productivity of private investment that makes public investment worthwhile' (p.911).

In their assessment of the financial liberalisation theory, Collier and Mayer (1989) state that the economy would gain by liberalising its financial sector since 'in the presence of financial repression, the government expands its control over resources which would otherwise be allocated by the market [...] The government allocates resources to investment but its selection of projects is poor' (p.7).

Ize (1989) points out that privatisation of industries is one of the measures recommended by the World Bank and the IMF to countries wanting to raise the overall efficiency of investment, adding for the case of Mexico that the country has made a 'remarkable' progress in the last years as far as privatisation is concerned.

Khan and Reinhart (1990) test the relationship between public and private investment and economic growth in developing countries, to determine, based on empirical evidence, if policies designed to encourage private investment at the expense of public investment will help the growth rate.

The authors formulate a growth model that separates the effects of public and private investment. The model is based on an aggregate production function where output y depends on the stock of capital K, the labour force L, 'other variables' affecting growth Z and total factor productivity A:

$$y = A\,f\,(K, L, Z) \tag{4.1}$$

Expressed in growth terms:

$$\frac{\partial y}{y} = [A\,\frac{\partial y}{\partial K}]\,\frac{\partial K}{y} + [A\,\frac{\partial y}{\partial L}\,\frac{L}{y}]\,\frac{\partial L}{L} + [A\,\frac{\partial y}{\partial Z}\,\frac{Z}{y}]\,\frac{\partial Z}{Z} + \frac{\partial A}{A} \tag{4.2}$$

Writing it for estimation purposes as:

$$\frac{\Delta y}{y_{t-1}} = \alpha_0 + \alpha_1\,\frac{I}{y_{t-1}} + \alpha_2\,\frac{\Delta L}{L_{t-1}} + \alpha_3\,\frac{\Delta Z}{Z_{t-1}} \tag{4.3}$$

where:

$$\alpha_0 = \frac{\partial A}{A} \quad \alpha_1 = A\,\frac{\partial y}{\partial K} \quad \alpha_2 = A\,\frac{\partial y}{\partial L}\,\frac{L}{y} \quad \alpha_3 = A\,\frac{\partial y}{\partial Z}\,\frac{Z}{y} \quad \text{and } I = \partial K \tag{4.4}$$

The constant term α_0 is assumed to capture the growth in productivity, α_1 is the marginal productivity of capital (assumed constant over countries), α_2 is the elasticity of output with respect to labour and α_3 is the elasticity of output with respect to other variables affecting growth.

Considering the productivity of capital calculation, the authors specify that the incremental capital-output ratio, ICOR, can be estimated from the equation expressed above if $\alpha_0 = \alpha_2 = \alpha_3 = 0$. In this case, $\frac{1}{\alpha_1}$ would be the estimated actual ICOR: 'In the empirical analysis of growth in developing countries, a simpler form of the equation is sometimes used in which $\alpha_0 = \alpha_2 = \alpha_3 = 0$. The result is the familiar incremental capital-output relationship, ICOR. The ICOR is also the key relationship employed in the basic model utilized by the World Bank to calculate external financing needs for developing countries' (p. 20). However when $\alpha_0 \neq 0$, $\alpha_2 \neq 0$ and $\alpha_3 \neq 0$, the coefficient $\frac{1}{\alpha_1}$ would be the estimated *net* ICOR, which considers the partial effect of investment on output when the other variables (L and Z) are held constant.[8]

To test the differential effects of public and private investment on the growth rate, total investment is then divided into public (I_{pbl}) and private (I_{prv}) investment:

$$\frac{\Delta y}{y_{t-1}} = \beta_0 + \beta_1 \frac{I_{pbl}}{y_{t-1}} + \beta_2 \frac{I_{prv}}{y_{t-1}} + \beta_3 \frac{\Delta L}{L_{t-1}} + \beta_4 \frac{\Delta Z}{Z_{t-1}} \tag{4.5}$$

The relative values of β_1 and β_2 would indicate either that the respective marginal productivities are equal, $\beta_1 = \beta_2$, or that the marginal productivity of public investment is higher than that of private investment, $\beta_1 > \beta_2$, or that the marginal productivity of private investment is higher than that of public investment, $\beta_1 < \beta_2$.

[8] In the next section (IV.4.1) the different types of ICOR are defined (See Leibenstein, 1957, 1966).

The authors stress that caution should be taken in interpreting the marginal productivity estimates, since public investment can have indirect effects on private investment, and there is uncertainty about whether these indirect effects are positive or negative.

In specifying 'other variables (Z)', Khan and Reinhart include the rate of growth of exports (X) and of imports (M) as explanatory variables in two separate equations:

$$\frac{\Delta y}{y_{t-1}} = \beta_0 + \beta_1 \frac{I_{pbl}}{y_{t-1}} + \beta_2 \frac{I_{prv}}{y_{t-1}} + \beta_3 \frac{\Delta L}{L_{t-1}} + \beta_4 \frac{\Delta X}{X_{t-1}} \tag{4.6}$$

and:

$$\frac{\Delta y}{y_{t-1}} = \beta_0 + \beta_1 \frac{I_{pbl}}{y_{t-1}} + \beta_2 \frac{I_{prv}}{y_{t-1}} + \beta_3 \frac{\Delta L}{L_{t-1}} + \beta_4 \frac{\Delta M}{M_{t-1}} \tag{4.7}$$

The results of estimating these equations for a cross-section of 24 developing countries, among them Mexico, over the 1970-1979 period, show that the estimated marginal productivity of private investment has consistently higher statistical significance than that of public investment. Moreover, the estimated marginal productivity of public investment, although not statistically significant, has a negative sign in the two specified equations. The estimated marginal productivity of private investment is between 0.158 and 0.209 with t-statistics higher than 3 in each case; while the estimated marginal productivity of public investment is either equal to -0.108 (with a t-statistic equal to 1.02) when growth of exports is included as an explanatory variable, and equal to -0.182 (t-statistic equal to 1.55) when the rate of growth of imports is included as an explanatory variable.

Public investment is then excluded from the explanatory variables due to its lack of statistical significance, resulting in a rise in the coefficient and the statistical significance of the private investment ratio. The authors do not report any result where the public investment ratio is included instead of the private investment ratio.

Concerning their results, Khan and Reinhart argue that 'public sector investment in developing countries has no direct effect on growth, which in itself is, of course, an important result. On the basis of these estimates there is little doubt that the direct effects of private investment on growth outweigh the direct effects of public sector investment' (p. 23).

Sarmad (1990) tests the Khan and Reinhart model for two different periods of time. Firstly, he does so for the 1970-1979 period in order to compare his results with those of Khan and Reinhart, who estimate the model for the same period. Secondly, the model is tested for the 1980-1987 period. He finds that for a sample of 15 developing countries (instead of 24 countries used in the original work)[9] during the 1970- 1979 period the results obtained by Khan and Reinhart are confirmed as far as the marginal productivity of public and private investment is concerned. That is, the effect of public investment on the rate of growth of output is not statistically significant, while the effect of private investment on output growth is positive and statistically significant. The estimated coefficient of private investment is 0.214 (t-statistic = 2.12) and the estimated coefficient of public investment is 0.019 (t-statistic = 0.15) when the rate of growth of labour and of exports are included as explanatory variables in the equation. When the rate of growth of imports replaces export growth as an explanatory variable, the coefficient of public investment becomes negative (-0.021) and remains statistically insignificant (t-statistic = 0.17). However, the results obtained by Sarmad for a sample of 24 developing countries during the 1980-1987 period show a different pattern. Public investment shows a positive and statistically significant estimated coefficient equal to 0.263 (t-statistic = 3.05) when the rate of growth of labour and of exports are included as explanatory variables, and equal to 0.245 (t-statistic = 2.65) when import growth is included instead of export growth. The estimated marginal productivity of private investment is lower than public

[9] Sarmad limits the sample to 15 countries because of lack of data (see Sarmad, 1990, p.5)

investment in both cases, but remains positive and statistically significant, equal to 0.161 (t-statistic = 2.62) in the case where export growth is included and equal to 0.164 (t-statistic = 2.51) when import growth is included.

Sarmad concludes that 'the role of public investment in the growth process in developing countries appears to be no less important than that of private investment, though the pattern of public investment contribution to growth has changed significantly during the past two decades' (p.10). A possible explanation for the change in the impact of public investment on economic growth during the last two decades, he argues, is that public investment was used in projects with a long gestation and in many cases unproductive which might have negatively affected the contribution of the public sector to aggregate growth.

IV.4.1. Methodology and Estimation Results

Following the Khan and Reinhart's (1990) model, the productivity of public and private investment in Mexico is estimated by including them as separate variables of the output function.

Considering the level of real output Y as a function of capital K:

$$Y = \sigma K \tag{4.8}$$

where σ is the productivity of capital, and differentiating it with respect to time, we get:

$$\frac{\partial Y}{\partial t} = \sigma \frac{\partial K}{\partial t} \tag{4.9}$$

Expressing it for estimation purposes as:

$$\Delta Y_t = \sigma I_t \tag{4.10}$$

since $\frac{\partial K}{\partial t} = I$, where ΔY is the change in real output and I is total investment.

If we consider, in turn, that the stock of capital K consists of a public and a private component:

$$K = K_{pbl} + K_{prv} \tag{4.11}$$

output can be expressed as a function of:

$$Y = \sigma (K_{pbl} + K_{prv}) \tag{4.12}$$

where K_{pbl} is public capital stock and K_{prv} is private capital stock.

Differentiating with respect to time, gives:

$$\frac{\partial Y}{\partial t} = \sigma (\frac{\partial K_{pbl}}{\partial t} + \frac{\partial K_{prv}}{\partial t}) \tag{4.13}$$

Since we are interested in testing the hypothesis of different values of σ for private and public capital, then:

$$\frac{\partial Y}{\partial t} = \sigma_1 \frac{\partial K_{pbl}}{\partial t} + \sigma_2 \frac{\partial K_{prv}}{\partial t} \tag{4.14}$$

Expressing it for estimation purposes as:

$$\Delta Y_t = \sigma_1 I_{pbl_t} + \sigma_2 I_{prv_t} \tag{4.15}$$

where I_{pbl} is public investment and I_{prv} is private investment.

Taking the basic equation of Harrod's growth model: $g = s\,\sigma$, where g is the rate of growth of output, s the propensity to save and σ the productivity of capital; and considering that in equilibrium savings are equal to investment:

$$\frac{S}{Y} = \frac{I}{Y} = s, \tag{4.16}$$

then, output growth can be expressed as a function of the ratio of investment to output as:

$$g_t = \sigma \frac{I_t}{Y_t} \tag{4.17}$$

If we consider that total investment is equal to public plus private investment:

$$I_t = I_{pbl} + I_{prv} \tag{4.18}$$

then:

$$g_t = \sigma_1 \frac{I_{pbl_t}}{Y_t} + \sigma_2 \frac{I_{prv_t}}{Y_t} \tag{4.19}$$

Equations (4.10), (4.15), (4.17) and (4.19) are estimated in order to compare the estimated coefficients between total, public and private investment productivity. To calculate the different sectors' investment productivity, two different methods of measurement are used, with the aim of comparing their results. Firstly, econometric methods are used (Ordinary Least Squares) to estimate the marginal productivity value as the coefficient of investment when using the change in output as a dependent variable (in equations (4.10) and (4.15)), or, as the coefficient of the investment to output ratio when using the rate of growth of output as the dependent variable (in equations (4.17) and (4.19)). Secondly, the incremental capital-output ratio ICOR was calculated on an annual basis, obtaining then the average ICOR for the period, and calculating the average productivity of investment as the reciprocal of the average ICOR, which is sometimes referred to as the incremental output-capital ratio or IOCR.

Three types of ICORs are distinguished (see Leibenstein, 1957, 1966). Firstly, the *actual* ICOR, which is the one considered in this analysis, accounts for the ex-post relation between investment and changes in output. Secondly, the *net* ICOR, which considers the change in output due to a change in the capital stock net of changes in other factors of production. Thirdly, the *adjusted* ICOR, which considers the effect of investment on output growth given specific changes in other factors of production. The net and the adjusted ICORs would allow us to isolate the effect of increases in investment on increases in output. When using the actual ICOR, all changes in output are attributed to changes in the stock of capital, since changes in other factors of production are not being considered.

Hence, our results will be underestimating the ICORs and overestimating the productivity of investment (see Thirlwall, 1989).

All the equations include an intercept term in their estimation, thus allowing the average and the marginal productivity to differ. The average productivity of capital is defined as the output-input ratio for each level of output and the corresponding level of input (K):

$$\text{Average Productivity} = \frac{Y(K)}{K}$$

The marginal productivity of capital is the addition to total product attributable to the addition of one unit of capital:

$$\text{Marginal Productivity} = \frac{\partial Y(K)}{\partial K}$$

If $Y(K) = \alpha + \sigma K$ and $\alpha \neq 0$, then the marginal productivity differs from the average. The resulting coefficients $\hat{\sigma}_i$ are thus estimates of the marginal productivity of investment, which is independent of the level of input (K). The independence of the estimated productivity from the level of investment is important in this case since the level of public investment is lower than the level of private investment during the period analysed (Table IV.7). If $\alpha = 0$, the result $\hat{\sigma}_1 > \hat{\sigma}_2$ might partly reflect a lower average level of public investment compared to the average level of private investment.

Tables IV.8 and IV.9 show the estimated coefficients. Table IV.8 shows the results of estimating equations (4.10) and (4.15) using Ordinary Least Squares and correcting with the Cochrane-Orcutt procedure in the presence of autocorrelation of the errors. Table IV.9 shows the results of estimating equations (4.17) and (4.19) using the same methods. In addition to the R^2, the Durbin-Watson (DW), and the F statistics, the Lagrange Multiplier test of auto-correlation of the errors (SC_{LM}) are reported in the Tables.[10]

[10] The Chi-square value of this statistic must be lower than the critical value $\chi_{(1)}^2 = 3.84$ to ac-

Regressions are done using annual data for the 1970-1990 period. The estimated results of equations (4.10), (4.15), (4.17) and (4.19) show high residuals for the years when the growth of output is negative (1982, 1983 and 1986, see Data Appendix Chapter III). For this reason, we include three dummy variables in the regressions for the years when output growth is negative.

Tables IV.8 and IV.9 include the results obtained (including and excluding the dummy variables) with the purpose of showing the sensitivity of the estimated coefficients to the inclusion or exclusion of variables.

Table IV.8

Estimated Marginal Productivity of Total, Public and Private Investment

Equations (4.10) and (4.15)

$$\hat{\sigma} = \frac{\Delta Y}{I}$$

Constant Term	Total Invest.	Public Invest.	Private Invest.	DU82	DU83	DU86	R^2	DW	F	$\chi_{(1)}^2$ SC_{LM}
2.36 (0.08)	- -	0.46 (1.15)	-0.005 (-0.01)	- -	- -	- -	0.10	1.22	1.01	3.31
-0.50 (-0.02)	- -	0.78 (3.16)	-0.07 (-0.28)	-58.3 (-6.44)	-78.7 (-8.16)	-53.9 (-6.57)	0.93	1.46	29.40	-
-6.04 (-0.2)	0.227 (1.28)	- -	- -	- -	- -	- -	0.08	1.19	1.64	3.58
-23.0 (-1.0)	0.38 (2.78)	- -	- -	-55.3 (-5.83)	-76.4 (-7.21)	-49.6 (-5.94)	0.91	1.77	28.31	-

Notes: t-statistics in brackets.

cept the null hypothesis of no auto-correlation of the errors.

Table IV.9

Estimated Marginal Productivity of Total, Public and Private Investment										
Equations (4.17) and (4.19)										
$\hat{\sigma} = \frac{g}{(I/Y)}$										
Constant Term	Total Invest.	Public Invest.	Private Invest.	DU82	DU83	DU86	R^2	DW	F	$\chi_{(1)}^2$ SC_{LM}
-0.22 (-3.9)	- -	0.53 (1.71)	1.82 (3.81)	- -	- -	- -	0.58	1.62	12.30	-
-0.08 (-2.0)	- -	0.77 (3.87)	0.68 (1.90)	-0.07 (-4.14)	-0.08 (-3.31)	-0.06 (-4.04)	0.87	1.30	20.16	2.98
-0.15 (-3.25)	0.98 (4.24)	- -	- -	- -	- -	- -	0.49	1.24	17.96	3.43
-0.09 (-3.26)	0.74 (5.28)	- -	- -	-0.07 (-4.31)	-0.08 (-4.61)	-0.06 (-3.50)	0.87	1.34	26.79	2.60

Notes: t-statistics in brackets.

A common feature that can be observed from the tables considered is that including the dummy variables for 1982, 1983 and 1986 improves the estimation results as shown by the statistical tests. The t-statistic, the R^2, and the F statistic increase when the dummy variables are included. The estimated productivity coefficients can be thus considered to be more reliable in the case where the dummy variables are included.

The estimated coefficients of public, private and total investment in Table IV.8, when $\hat{\sigma} = \frac{\Delta Y}{I}$, show the productivity of total investment as a weighted average of the productivity of public and private investment; a positive estimated productivity of public investment ($\hat{\sigma}_1 = 0.78$) and statistically significant (t-statistic= 3.16); while the estimated productivity of private investment is negative ($\hat{\sigma}_2 = -0.07$) and not statistically significant (t-statistic= -0.28). This result is perhaps due to the presence of multicollinearity in the regression. Multicollinearity of the variables can be expected since the explanatory variables are interrelated. In these cases, it becomes very difficult to obtain precise estimates of the separate effects of the variables involved. Coefficients may not appear significantly different from zero, not because they have no effect on the dependent variable but because the sample and specification may be inadequate. Estimates of coefficients may be very sensitive to additions or deletions of variables (see for example Judge, Griffith, Carter and Lee, 1980). However, taking these results at their face value, they are opposite to those obtained by Khan and Reinhart (1990) in the sense that a negative productivity would be conferred, not to public investment as in their case, but to private investment.

Table IV.9 shows the estimated $\hat{\sigma}_i$ values when $\hat{\sigma} = \frac{g}{(I/Y)}$. In this case, the constant term is statistically significant in all the estimations reported. The results obtained when the dummy variables are included are interesting since both the coefficients of the public and the private investment ratio have positive and statistically significant values. The estimated productivity of public investment is 0.77 (t-statistic= 3.87) and the estimated productivity of private investment is 0.68 (t-statistic= 1.90). The estimated productivity of total investment is a weighted average of public and private investment equal to 0.74.[11]

Since the object of this section of the analysis is not to investigate the determinants of output growth, but to find estimates of the productivity of investment in the public and private sectors of the economy, no other variables were introduced in the equation to try to improve the estimation. Further empirical evidence is given by estimating separately the relationship between public investment and output growth on the one hand, and private investment and output growth on the other hand:

[11] The estimated values of total productivity differ from those estimated in Chapter III. This can be due to differences in the sample period, since Chapter III considers the 1960-1990 period. Another reason affecting this result is the difference in the base of the data used. Chapter III uses data base 1980=100 and in this chapter we use data base 1970=100 for convenience reasons. The real values of GDP and investment were modified in the original source (see for example Banco de Mexico's Annual Report for 1985 which includes the data with base 1970=100, and the 1990 Annual Report which includes data with base 1980=100).

$$\Delta Y = \sigma_1 I_{pbl} \text{ and } \Delta Y = \sigma_2 I_{prv} \qquad (4.20)(4.21)$$

or,

$$g = \sigma_1 \frac{I_{pbl}}{Y} \text{ and } g = \sigma_2 \frac{I_{prv}}{Y} \qquad (4.22)(4.23)$$

The results of estimating equations (4.20) to (4.23) are shown in Tables IV.10 and IV.11. A constant term is included in all equations so that the marginal productivity of investment can be estimated. As in the previous estimations, we include dummy variables for the years when output growth is negative (1982, 1983 and 1986). Including the dummy variables improves the test statistic values for all equations, except in the case of equation (4.23), where the F statistic does not improve.

Considering the estimated coefficients of public and private investment, it can be seen from Tables IV.10 and IV.11 that the coefficient of public investment is positive and statistically significant in both tables when the dummy variables are included. The estimated coefficient of private investment, although positive, lacks statistical significance except in the case of equation (4.23) in Table IV.10 when the dummy variables are excluded from the equation.

Table IV.10

Estimated Marginal Productivity of Public and Private Investment

Equations (4.20) and (4.21)

$$\hat{\sigma} = \frac{\Delta Y}{I}$$

Constant Term	Public Invest.	Private Invest.	DU82	DU83	DU86	R^2	DW	F	$\chi_{(1)}^2$ SC_{LM}
2.10 (0.12)	0.46 (1.46)	- -	- -	- -	- -	0.10	1.22	2.14	3.30
-5.21 (-0.41)	0.75 (3.67)	- -	-57.8 (-6.72)	-77.9 (-8.65)	-53.3 (-6.97)	0.93	1.52	37.7	-
2.38 (0.27)	- -	0.27 (0.83)	- -	- -	- -	0.04	1.20	0.69	3.35
-5.76 (-0.17)	- -	0.41 (1.43)	-56.1 (-5.01)	-82.4 (-6.70)	-49.4 (-5.03)	0.88	1.69	19.70	-

Notes: t-statistics in brackets.

Table IV.11

Estimated Marginal Productivity of Public and Private Investment									
Equations (4.22) and (4.23)									
$\hat{\sigma} = \frac{g}{(I/Y)}$									
Constant Term	Public Invest.	Private Invest.	DU82	DU83	DU86	R^2	DW	F	$\chi_{(1)}^2$ SC_{LM}
-0.05 (-1.13)	1.23 (2.22)	- -	- -	- -	- -	0.45	1.81	6.89	-
-0.02 (-0.77)	0.95 (3.36)	- -	-0.07 (-4.92)	-0.09 (-6.22)	-0.06 (-4.91)	0.91	1.54	26.73	-
-0.21 (-3.67)	- -	2.09 (4.43)	- -	- -	- -	0.51	1.60	19.95	0.78
0.03 (0.42)	- -	0.17 (0.30)	-0.07 (-3.51)	-0.10 (-4.71)	-0.06 (-3.53)	0.82	1.68	12.90	-

Notes: t-statistics in brackets.

Table IV.12 shows the calculated annual ICOR coefficients for total, public and private investment, their period averages and the calculated average productivities. It is interesting to notice the decrease in the estimated productivity values from the 1970-1981 period to the debt crisis period 1982-1990.

According to our results, the estimated productivity of public investment does not seem either negative or lower than the productivity of private investment. The estimation results show higher productivity values for public investment than for private investment. The estimated productivity of public investment lies within the $0.75 < \hat{\sigma}_1 < 0.95$ range for the 1970-1990 period, and the estimated productivity values of private investment are within the range $-0.07 < \hat{\sigma}_2 < 0.68$.[12]

Hence, the empirical evidence does not support the hypothesis that the productivity of public investment is lower than private investment, or that public investment is unproductive.

[12] Considering only the equations where the dummy variables (1982, 1983 and 1986) are included (see Tables IV.10 to IV.11).

Table IV.12

Calculated Annual ICORs = $\frac{I}{\Delta Y}$			
Year	$\frac{I}{\Delta Y}$	$\frac{I_{prv}}{\Delta Y}$	$\frac{I_{pbl}}{\Delta Y}$
1970	3.08	2.07	1.02
1971	4.69	3.48	1.21
1972	2.49	1.69	0.80
1973	2.66	1.62	1.04
1974	3.64	2.28	1.35
1975	4.08	2.39	1.69
1976	5.15	2.39	1.96
1977	5.66	3.51	2.16
1978	2.64	1.48	1.16
1979	2.63	1.52	1.12
1980	3.05	1.74	1.31
1981	3.44	1.88	1.56
1982	-38.68	-21.57	-17.11
1983	-2.83	-1.71	-1.12
1984	4.58	2.81	1.77
1985	6.31	4.07	2.24
1986	-4.23	-2.74	-1.49
1987	8.61	5.96	2.65
1988	11.04	7.99	3.05
1989	5.57	4.11	1.47
1990	4.84	3.59	1.25
Period Averages			
1970-90	1.83	1.40	0.43
1970-90*	4.67	3.05	1.62
1970-81	3.60	2.24	1.36
1982-90*	6.82	4.75	2.07
$\hat{\sigma} = \frac{1}{ICOR}$			
1970-90	0.546	0.714	2.325
1970-90*	0.214	0.328	0.617
1970-81	0.277	0.226	0.735
1982-90*	0.146	0.211	0.483

Notes:
The calculated productivity values of private and public investment are higher than for total investment because the output measure used is the same. Hence their values reflect the average levels of public, private and total investment.
* Excludes 1982, 1983 and 1986, during which the rate of growth of output was negative.

IV.5 The Effect of Public Investment on Private Investment

The effect of public investment on private investment is ambiguous at a theoretical level since two opposing effects can occur simultaneously: a complementary or contributory effect and a substitution or crowding-out effect. Public investment is complementary to private investment if an initial increase in public investment leads to an increase in private investment. Public investment crowds-out private investment if the latter decreases as a result of an increase in the former.

There are several reasons why there might be a complementary relation between public and private investment. If there are unemployed resources, an increase in public investment raises the level of aggregate demand and widens the size of the market for private production of goods and services. Furthermore, a high percentage of public investment is devoted to public works in infrastructure (see Table IV.5), creating economies of scale and increasing the productivity and profitability of private investment. Private investment is thus stimulated by the rise in the expected rate of return.

However, the contributory effect of public investment on private investment may be offset by the crowding-out effect. It is argued that public investment can crowd-out private investment in both physical and financial terms. In physical terms if public investment produces marketable output that competes with private output, then private investment may be 'physically' crowded-out (see Khan and Reinhart, 1990). Also at full employment public investment will crowd out private investment. In financial terms we distinguish two ways in which financial crowding-out can take place. The first one refers to the case where a higher real interest rate crowds-out a certain amount of private investment that would otherwise have taken place. If the higher real interest rate is a function of the level of public investment, then, a rise in public investment can cause private investment to decline. The real interest rate may be expected to rise as a result of the higher demand for credit by the public sector needed to finance additional public investment. The second way considers the case where the financing of public investment lowers the availability of financial resources to the private sector, thus hampering private investment. If public investment is financed, say, by diverting funds from commercial and development banks through reserve requirement increases, then credit to the private sector may be limited.

U Tun Wai and Wong (1982) develop a recursive model to estimate the net effect of public investment on private investment, that is, the contributory effect less the crowding-out effect. Private investment is specified in their model as a function of public investment (IG_t), the change in the stock of credit given to the private sector (domestic and net foreign capital inflows) (FP_t), and the lagged stock of capital of the private sector ($KP_{(t-1)}$):

$$IP_t = c_0 + c_1 IG_t + c_2 FP_t + c_3 KP_{(t-1)} \tag{4.24}$$

The contributory effect of public investment on private investment is measured by the public investment coefficient, c_1. To take into account the financial crowding out effect, credit given to the private sector is then specified as a residual of total credit F_t, less credit given to the public sector FG_t:

$$FP_t = F_t - FG_t \tag{4.25}$$

while credit to the public sector is specified as a function of public investment IG_t:

$$FG_t = g_0 + g_1 IG_t \tag{4.26}$$

Substituting equation (4.26) in equation (4.25), and in turn, substituting FP_t in equation (4.24) leads to a reduced form equation which considers credit to the private sector as an endogenous variable in the model:

$$IP_t = k_0 + k_1 IG_t + k_2 F_t + k_3 KP_{(t-1)} \tag{4.27}$$

The resulting coefficient of public investment, $k_1 = c_1 - c_2 g_1$, indicates the existence or non-existence of a crowding-out effect. The estimations obtained by U Tun Wai and Wong suggest, in the case of Mexico, the existence of a crowding-out effect that completely offsets the contributory effect of public investment for the sample period 1965-1975, since the estimated coefficient of public investment in the reduced equation is negative, $k_1 < 0$, i.e. $c_2 g_1 > c_1$. They find a positive net effect of public investment on private investment for the case of Greece, Korea and Malaysia.

The analysis undertaken by FitzGerald, Jansen and Vos (1992) links the crowding-in and crowding-out effects of public investment on private investment with the impact of the external debt variables. To do so, the authors develop an externally constrained accelerator model in which private investment is specified as a function of the change in GDP, $(Y_t - Y_{t-1})$, lagged public investment $(I_{g_{t-1}})$, the domestically financed budget deficit (Z_t), the net inflow of external capital to the private sector (F_{p_t}), and the lagged dependent variable:

$$I_{p_t} = k_1 (Y_t - Y_{t-1}) + k_2 I_{g_{t-1}} + k_3 Z_t + k_4 F_{p_t} + k_5 I_{p_{t-1}} \tag{4.28}$$

where the expected signs of the coefficients are: $k_1 > 0$, $k_2 > 0$, $k_3 < 0$, $k_4 > 0$ and $k_5 > 0$. The public investment coefficient k_2 measures the stimulus to private investment provided by public investment, and k_3 measures the impact of priority budgetary claims on domestic resources and thus any credit rationing.

Further, the link between foreign exchange constraints and the fiscal balance with foreign trade and foreign financial flows is specified in the following equations:

$$Y_t = A + \frac{1}{m} M_t \tag{4.29}$$

where M_t, the import capacity, is equal to the sum of exports X, net capital inflows to the public sector F_g, and net capital inflows to the private sector F_p, less the interest payments on the external debt $(i\, DF_{t-1})$:

$$M_t = X_t + F_{g_t} + F_{p_t} - i\,DF_{t-1} \tag{4.30}$$

Public investment is specified as a function of net foreign borrowing:

$$I_{g_t} = j_0 + j_1 F_{g_t} \tag{4.31}$$

And the public sector's domestic borrowing requirement Z is the sum of public investment I_g, foreign debt service $i\,DF_{t-1}$ and net foreign borrowing of the public sector:

$$Z_t = I_{g_t} + i\,DF_{t-1} - (F_{g_t} + f\,Y_t) \tag{4.32}$$

By substituting the last set of equations into the private investment function (4.28), the authors arrive at the following reduced form equation in which private investment is only determined by external sector variables:

$$\begin{aligned} I_{p_t} = b_0 + b_1 X_t + b_2 X_{t-1} + b_3 F_{g_t} + b_4 F_{g_{t-1}} + b_5 F_{p_t} \\ + b_6 F_{p_{t-1}} + b_7\, i\,DF_{t-1} + b_8\, i_{(t-2)} DF_{t-2} + b_9 I_{p_{t-1}} \end{aligned} \tag{4.33}$$

The net effect of a rise in public investment on private investment is given by the constant term $b_0 = (k_2 + k_3) j_0 + k_3 f A$. The results of estimating this equation for a sample of 22 developing countries shows that $\hat{b_0}$ is positive in 26 out of 29 estimated equations. This result leads FitzGerald, Jansen and Vos to conclude that although the foreign financing of the public sector's expenditure can have a negative effect on private investment by increasing the external debt burden and undermining the private sector's confidence, it is offset by the positive effect that foreign financing has in reducing the claim of the public sector on the domestic financial markets, thus releasing the domestic credit constraint on private investment.

Galbis (1978) tests the relationship between public and private investment for a sample of sixteen Latin-American countries from 1961 to 1973. The ratio of private investment to income is specified as a function of: the deposit interest rate, inflation, the rate of return on capital and the ratio of public investment to income. Although the deposit interest rate and the rate of return on capital are omitted in the estimations because of unavailability of data, the results of the time-series regressions indicate both a complementary and a substitution relation between public and private investment in Latin-American economies. For the specific case of Mexico he finds a complementary relation. Galbis concludes that the lack of a general pattern of behaviour suggests that 'the institutional arrangements specific to each country are more important than general principles' (p. 430).

Pradhan, Ratha and Sarma (1990) develop a general equilibrium model for the case of India, with the purpose of analysing the complementary and crowding-out effects of public investment on private investment, making reference to the modes of financing and the manner of allocating public investment. They find that in spite of the way in which public investment is financed and allocated, private investment falls when public investment increases. However, they argue, total investment and economic growth increase despite the fall in private investment. In this sense, they conclude, crowding-out need not be undesirable.

Greene and Villanueva (1991) analyse a private investment function for a sample of 23 developing countries (including Mexico) from 1975 until 1987. To test the relation between public and private investment they divide the set of countries into two groups according to their private investment ratio: the first one includes the countries where the private investment ratio to gross domestic product is over 12 percent, while the second group includes the countries where the ratio is below 12 percent. By analysing the public and private investment ratio to GDP in both sets of countries, they find that a complementary relation seems to exist between public and private investment, since, on average, the public investment ratio is higher in the first group of countries, than in the second set of countries, which have a lower private investment to GDP ratio. Then, Greene and Villanueva specify a private investment function to test econometrically the determinants of private investment and the effect that public investment has on it. The ratio of private investment to GDP is specified as a function of the following variables: the real deposit interest rate, the lagged percentage change in real GDP per capita, the ratio of public investment to GDP, inflation, the lagged level of per capita GDP, the lagged ratio of debt service payments to exports and the lagged ratio of the country's stock of external debt to its nominal GDP. Estimating the equation for the 23 countries in the sample, they find that the estimated coefficient of the public sector investment ratio is positive and significant in explaining private investment, suggesting complementarity between public and private investment. According to Greene and Villanueva's results, private investment is determined positively by the lagged rate of growth real per capita GDP and public investment, while the real interest rate, inflation, the lagged ratio of debt service payments to exports and the lagged ratio of the stock of debt to GDP have a negative effect on private investment.

IV.5.1 Methodology and Estimation Results

In this section we develop two models to test the net effect of public investment on private investment considering the two ways in which public investment can financially crowd-out private investment, which are then estimated for the case of Mexico during the 1970-1990 period.

The first model considers the case when private investment is crowded-out through an increase in the real interest rate derived from the increased demand for credit by the public sector. Taking the total investment function specification from Chapter III to explain private investment, and adding public investment as an explanatory variable gives the equation:

$$I_{prv} = a_0 + a_1 I_{pbl} + a_2 r + a_3 CPrS + a_4 \Delta GDP_{t-1} \tag{4.34}$$

where: I_{prv} is the level of real private investment, I_{pbl} is the level of real public investment, r is the real interest rate, $CPrS$ is the stock of real credit given by the banking sector (commercial and development banks) to the private sector and ΔGDP_{t-1} is the lagged change in real gross domestic product.

The coefficient of public investment a_1 measures the contributory effect of a rise in public investment on private investment. This coefficient a_1 can overestimate the total effect since the financial crowding-out effect is not being explicitly considered (see U Tun Wai and Wong, 1982). With the purpose of measuring the crowding-out effect and then being able to estimate the net effect of public investment on private investment, the following recursive model is proposed:

Stating the real interest rate as a positive function of public investment:

$$r = b_0 + b_1 I_{pbl} \tag{4.35}$$

and substituting (4.35) into (4.34) gives:

$$I_{prv} = a_0 + a_1 I_{pbl} + a_2 (b_0 + b_1 I_{pbl}) + a_3 CPrS + a_4 \Delta GDP_{t-1} \tag{4.36}$$

$$\Rightarrow \quad I_{prv} = (a_0 + a_2 b_0) + (a_1 + a_2 b_1) I_{pbl} + a_3 CPrS + a_4 \Delta GDP_{t-1} \tag{4.37}$$

obtaining the reduced form equation:

$$I_{prv} = c_0 + c_1 I_{pbl} + c_2 CPrS + c_3 \Delta GDP_{t-1} \tag{4.38}$$

where:

$$\begin{aligned} c_0 &= a_0 + a_2 b_0 \\ c_1 &= a_1 + a_2 b_1 \\ c_2 &= a_3 \\ c_3 &= a_4 \end{aligned}$$

The coefficient c_1 measures the *net* effect of public investment on private investment. If c_1 is lower than a_1, then there is crowding-out working through the real interest rate. However, if $c_1 > 0$ the net effect is positive. If $c_1 < 0$, crowding-out offsets the contributory effect and the net effect of public investment on private investment is negative.

The second model also considers equation (4.34) as the private investment function, taking into account that private investment can be crowded-out by public investment if the public sector increases its demand for credit and reduces the availability of credit to the private sector. If credit to the public sector ($CPuS$) is stated as a positive function of public investment:

$$CPuS = \beta_0 + \beta_1 I_{pbl} \tag{4.39}$$

and credit to the private sector is determined as the residual of total credit given by the banking sector (TC) (commercial and development banks) less credit given to the public sector:

$$CPrS = TC - CPuS \tag{4.40}$$

Substituting (4.39) and (4.40) into (4.34) gives:

$$I_{prv} = a_0 + a_1 I_{pbl} + a_2 r + a_3 (TC - \beta_0 - \beta_1 I_{pbl}) + a_4 \Delta GDP_{t-1} \tag{4.41}$$

$$=> \; I_{prv} = (a_0 - a_3\beta_0) + (a_1 - a_3\beta_1) I_{pbl} + a_2 r + a_3 TC + a_4 \Delta GDP_{t-1} \tag{4.42}$$

Leading to the reduced form equation:

$$I_{prv} = \delta_0 + \delta_1 I_{pbl} + \delta_2 r + \delta_3 TC + \delta_4 \Delta GDP_{t-1} \tag{4.43}$$

where:

$$\begin{aligned} \delta_0 &= a_0 - a_3\beta_0 \\ \delta_1 &= a_1 - a_3\beta_1 \\ \delta_2 &= a_2 \\ \delta_3 &= a_3 \\ \delta_4 &= a_4 \end{aligned}$$

If $\delta_1 < a_1$ there is financial crowding out working through a reduction in the availability of credit to the private sector. If $\delta_1 < 0$, the crowding out effect offsets the contributory effect.

Equation (4.34) is estimated in logarithms, since the statistical tests suggested this as a superior specification. Estimation is done by Ordinary Least Squares over the period 1970-1990. Dummy variables for 1986 and 1988 are included in the regression because it seems to be that private investment in particular was significantly affected by the intensification of the austerity measures imposed by the government after the drastic fall in the price of oil in 1986, and in 1988 private investment seems to have been affected by the establishment of a 'deal' between the public and the private sector fixing key prices of the economy such as the minimum wage and the exchange rate in December 1987.[13]

The main purpose of this and the following equations is to test the effect of a change in public investment on private investment considering the indirect effects that the former has on the latter through the real interest rate and through the availability of credit to the private sector in the financial market. Therefore, the real interest rate and the real stock of credit given to the private sector are included as explanatory variables. To be consistent with the total investment function used in the previous chapter, and to test the sensitivity of private investment to changes in aggregate demand, the lagged change in the real level of GDP is also included as an explanatory variable.

[13] It must be mentioned that when the two dummy variables for 1981 and 1983 were included in the equation (as done in section III.4 for the case of total investment), their estimated coefficients were not statistically significant.

The estimated results of equation (4.34) are:

$$\log I_{prv} = \underset{(0.39)}{0.17} + \underset{(0.54)}{0.001}\, r + \underset{(3.21)}{0.23} \log I_{pbl} - \underset{(-0.34)}{0.0002}\, \Delta GDP_{t-1} \qquad (4.44)$$

$$+ \underset{(6.31)}{0.71}\, logCPrS + \underset{(0.59)}{0.05}\, DU86 + \underset{(2.91)}{0.29}\, DU88$$

$$R^2 = 0.91 \quad DW = 2.08 \quad F_{(6,14)} = 24.12 \quad n = 21$$

$$\textit{Serial Correlation} : \chi^2_{(1)} = 0.11$$

$$\textit{Functional Form} : \chi^2_{(1)} = 2.94$$

$$\textit{Normality} : \chi^2_{(2)} = 0.39$$

$$\textit{Heteroscedasticity} : \chi^2_{(1)} = 0.02$$

where:

I_{prv}: Real Private Investment. Billion Pesos. 1970 Prices.

r: Real Interest Rate (%)

I_{pbl}: Real Public Investment. Billion Pesos. 1970 Prices.

ΔGDP_{t-1}: Lagged change in GDP. Billion Pesos. 1970 Prices.

$CPrS$: Real Stock of Credit given to the Private Sector. Billion Pesos. 1970 Prices.

According to the estimated coefficients, private investment is positively affected by a change in public investment. The estimated impact coefficient[14] of a change in public investment on private investment is $a_1 = 0.39$, while the estimated elasticity of private investment with respect to public investment is $\hat{\varepsilon}_{a_1} = 0.23$. A 10 percent increase in public investment is associated with a rise in private investment of 2.3 percent on average. Credit given to the private sector does seem to have a considerable positive effect on private investment, while the estimated coefficients of the real interest rate and of the lagged change in GDP are not statistically significant. Probably, the demand side effect is being captured by public investment, reducing the statistical significance of the lagged accelerator.

[14] See Appendix III.A2 in Chapter III for the calculation of impact coefficients and elasticities out of a semi-log model.

Financial crowding-out of private investment working through rises in the real interest rate is measured by the estimated results of equation (4.38):

$$\log I_{prv} = \underset{(0.19)}{0.07} + \underset{(3.52)}{0.21} \log I_{pbl} - \underset{(-0.48)}{0.0003} \Delta GDP_{t-1} \tag{4.45}$$

$$+ \underset{(8.50)}{0.74} \log CPrS + \underset{(0.75)}{0.06} DU86 + \underset{(4.11)}{0.33} DU88$$

$$R^2 = 0.91 \quad DW = 1.99 \quad F_{(5,15)} = 30.31 \quad n = 21$$
$$\textit{Serial Correlation}: \chi^2_{(1)} = 0.005$$
$$\textit{Functional Form}: \chi^2_{(1)} = 3.08$$
$$\textit{Normality}: \chi^2_{(2)} = 0.15$$
$$\textit{Heteroscedasticity}: \chi^2_{(1)} = 0.002$$

The equation is well determined and shows the expected signs. The impact coefficient of a change in public investment on private investment derived from this last equation is $c_1 = 0.21\,(\frac{\overline{I_{prv}}}{\overline{I_{pbl}}}) = 0.36$, where $\overline{I_{prv}}$ and $\overline{I_{pbl}}$ are the average values of private and public investment respectively. Comparing the coefficient c_1 derived from the reduced form equation, with the coefficient of public investment a_1 in equation (4.34), we find that c_1 is positive and lower than a_1; i.e. $0 < c_1 = 0.36 < a_1 = 0.39$. However, considering the estimated elasticities of private investment with respect to public investment, $\hat{\varepsilon}_{a_1} = 0.23$ in equation (4.34), and $\hat{\varepsilon}_{c_1} = 0.21$ in equation (4.38), a test was undertaken to see if $\hat{\varepsilon}_{a_1}$ and $\hat{\varepsilon}_{c_1}$ are statistically different. Knowing that the standard error of $\hat{\varepsilon}_{c_1}$ is $\hat{s}_{\hat{\varepsilon}_{c_1}} = 0.058$, and the critical t-value $t_{(n-k-1)}$ at a 5 percent significance level is $t_{(15);0.95} = 1.746$, we find that the statistic $Z = \frac{\hat{\varepsilon}_{c_1} - \hat{\varepsilon}_{a_1}}{\hat{s}_{\hat{\varepsilon}_{c_1}}} = 0.33$ lies in the range where the hypothesis of $\hat{\varepsilon}_{c_1} \neq \hat{\varepsilon}_{a_1}$ is rejected. According to these results, c_1 and a_1 are not statistically different which does not support the hypothesis that there is crowding-out of private investment working through a rise in the real interest rate, caused, in turn, by increased public investment.

The result of estimating equation (4.43) is as follows:

$$\log I_{prv} = \underset{(4.57)}{1.37} + \underset{(3.31)}{0.006r} + \underset{(2.28)}{0.18\log I_{pbl}} + \underset{(2.78)}{0.002\Delta GDP_{t-1}} \tag{4.46}$$

$$+ \underset{(5.76)}{0.43\,logTC} \underset{(-2.84)}{- 0.27\,DU86} + \underset{(0.12)}{0.01\,DU88}$$

$$R^2 = 0.89 \quad DW = 1.49 \quad F_{(6,14)} = 20.9 \quad n = 21$$
$$\textit{Serial Correlation}: \chi^2_{(1)} = 0.17$$
$$\textit{Functional Form}: \chi^2_{(1)} = 0.76$$
$$\textit{Normality}: \chi^2_{(2)} = 2.58$$
$$\textit{Heteroscedasticity}: \chi^2_{(1)} = 0.26$$

The comparison of the coefficient of public investment $\delta_1 = 0.18\,(\frac{\overline{I_{prv}}}{I_{pbl}}) = 0.31$ with $a_1 = 0.39$ would seem to indicate that there is crowding-out of private investment working through the availability of credit to the private sector. Nevertheless, testing the hypothesis of the estimated elasticity of private investment with respect to public investment in equation (4.34) being statistically different from that in equation (4.43), we find that the statistic $Z = \frac{\hat{\varepsilon}_{\delta_1} - \hat{\varepsilon}_{a_1}}{\hat{s}_{\hat{\varepsilon}_{\delta_1}}} = 0.62$ (where the standard error of $\hat{\varepsilon}_{\delta_1}$ is $\hat{s}_{\hat{\varepsilon}_{\varepsilon_1}} = 0.0805$), remains within the range where the null hypothesis, $\hat{\varepsilon}_{\delta_1} = \hat{\varepsilon}_{a_1}$ is accepted since $Z < t_{(14);0.95} = 1.761$. Hence, according to the empirical results obtained, it cannot be concluded that a rise in public investment crowds out private investment by reducing the availability of credit to the private sector.

The empirical evidence obtained in this section of the analysis suggests that there is no financial crowding-out of private investment caused by a rise in public investment either working through a rise in interest rates or through the availability of credit to the private sector. In both cases, the net effect of a change in public investment on private investment is not statistically different from the total effect, which leads us to conclude that the dominant relation between public and private investment is one of complementarity.

IV.6 The Relation Between Financial Variables and the Productivity of Investment

This section analyses the effect of financial variables (the real interest rate and the financial deepening ratio) on the productivity of investment.

The hypothesis stating that positive real interest rates increase the average productivity of investment is probably the strongest theoretical argument supporting the liberalisation of the financial system, given the theoretical and empirical weakness of the positive relationship between real interest rates and financial deepening on the one hand, and aggregate savings on the other, as discussed in Chapter III. The effect of interest rates on the efficiency of investment is considered to be more effective than its effect on the amount of savings (and investment), since the latter depends on the final result of the substitution and income effects. The true effect of real interest rates, Fry (1982) argues, is 'on the average efficiency of investment, not its volume' (p.737). Mckinnon (1989) points out that 'apparently the quality, if not the quantity of investment improves significantly when interest rates are positive and financial intermediation is robust' (p.34). Quoting Collier and Mayer (1989): 'As both Fry and Mckinnon note, if the gains from savings are modest, the substantial gains hypothesized for domestic financial liberalisation stand or fall by improvements in investment allocation' (p.7).

In Chapter II, we analysed the theory behind the relation between financial variables and the productivity of investment. This section is thus limited to the empirical analysis of the effectiveness of the real interest rate and the financial deepening ratio as determinants of the productivity of investment. The quality of investment is determined by many economic and non-economic variables. Our main interest lies in the role of financial variables.

Fry (1979 and 1989) tests the effect of the real interest rate on the incremental capital-output ratio ICOR for the case of Turkey over the period 1950-1977. He does so by regressing the ICOR on the real interest rate measured as the difference between the deposit interest rate and expected inflation. He argues that 'if average investment efficiency is monotonically related to the incremental output-capital ratio (IOCR) σ, a positive association between the IOCR and dis-equilibrium real deposit rates would support the efficiency analysis [where the real interest rate affects investment efficiency by discouraging those investment projects whose real rate of return is lower than the real interest rate offered on deposits] (Fry, 1989, p.147). The estimation results obtained by Fry (1979) are[15]:

$$\frac{\Delta K}{\Delta Y} = v = \underset{(5.84)}{2.53} - \underset{(-3.10)}{24.87}\,(d - i) \qquad (4.47)$$

$$R^2 = 0.253 \quad DW = 1.93$$

where v is the incremental capital-output ratio, d is the nominal deposit rate and i is inflation. Based on these results, Fry concludes for the case of Turkey over the years 1950-1977 that a change in the real deposit rate positively affects the productivity of investment: a one percentage point increase in the real interest rate raises the incremental output-capital ratio (IOCR) by 0.249.

Polak (1989) devotes a chapter of his book "Financial Policies and Development" to stress the importance of market determined equilibrium real interest rates on the determi-

[15] t-statistics in brackets.

nation of the level and quality of investment. No government intervention in financial markets is the only way, he argues, in which a country can devote the resources at its disposal to the best investment projects, where best means the investment with the highest marginal contribution to output. By these means, he continues, the country can block off projects with low or negative marginal productivity, because projects that could not pay the market cost of capital (the real loan interest rate), would be screened out of the market. 'Self-investment projects that promised less than the prevailing market yield would not be undertaken, since the saver would have the alternative opportunity of earning the market yield by using any one of the available channels for intermediation' (Polak, 1989, p.56). Polak argues that in less developed countries, artificially set low real interest rates lead to the fragmentation of the capital market and to the inefficient allocation of savings into low yield investment projects. Setting real interest rates at an artificially low level makes 'room in the queue of savings for projects that would automatically be disqualified on the basis of an equilibrium real interest rate, controls on real interest rates cause the use of part of the available scarce savings for the execution of sub-optimal investment projects and the concomitant exclusion of a larger amount of more deserving projects' (Polak, 1989, p.60). The level of real interest rates, he argues, is an indicator of the fragmentation of the capital market, and at the same time, one of the causes of it. The greater the distance between an equilibrium market clearing rate and the actual level at which controlled interest rates are set, the stronger the forces toward a distorted capital market.

To support empirically the argument that artificially set real interest rates and distorted capital markets hamper the rate of growth of output, Polak reports the result of work done by the World Bank, where, for a sample of 40 developing countries, from 1960 to 1980, an increase in the real interest rate (*RRI*) is associated with a higher growth rate (y):[16]

[16] t-statistics in brackets.

$$y = 5.21 + 0.27\,RRI \qquad (4.48)$$
$$(15.3) \quad (4.5)$$
$$\bar{R}^2 = 0.32$$

IV.6.1 Methodology and Estimation Results

Financial liberalisation theory predicts a negative relationship between the real interest rate and the ICOR: the higher the real interest rate, the higher the expected rate of return of investment projects, which assumes a higher level of productivity. Concerning self-financed investment, entrepreneurs will not invest if the expected yield of the project is lower than the real deposit interest rate offered in financial markets, thus forcing the investment projects to be realised to have a high expected rate of return, and hence, it is assumed, a high level of productivity. Concerning investment projects financed by the banking system, lenders will not be willing to finance projects the expected yield of which is not enough to cover payments. This process forces those investment projects to be financed by banks, to have a high expected rate of return and productivity.

It is also argued that financial depth contributes to growth by improving the productivity of investment. Provided that intermediaries are good at selecting viable projects, greater intermediation will ensure that the better investments are financed and will therefore increase average productivity (see World Bank, 1989). The larger the amount of resources channelled to the financial system, the larger the amount of investable funds that can be efficiently allocated.

In addition to the financial variables, we include the rate of growth of output g as an explanatory variable to test the hypothesis of g having a negative effect on the ICOR (a positive effect on the productivity of investment). According to Leibenstein (1966) the ICOR cannot be assumed to remain constant over time. On the contrary, he argues, the value of the ICOR in the short run is determined by the rate of growth of output and the degree of capacity utilisation (see Thirlwall, 1989). If the economy is coming out of a recession, a rise in g, (which implies $\Delta Y_t > \Delta Y_{t-1}$) will take place with low investment (ΔK) since there is spare capacity, and the ICOR ,$\frac{\Delta K}{\Delta Y}$, will have a relatively low value. On the other hand, when the rate of growth of output is decreasing, $\Delta Y_t < \Delta Y_{t-1}$, and investment remains stable, the ICOR increases. Hence, a negative relationship is expected between the rate of growth of output and the ICOR. It is assumed that investment ΔK varies less than output ΔY, that is, investment is considered to have a more stable behaviour than output. According to Leibenstein, the investment rate is more stable than growth for the following reasons: firstly, government investment is likely to change slowly. Public investment has an autonomous behaviour independent of the rate of growth of output, 'a zero growth rate will not reduce government investment to zero' (Leibenstein, 1966, p.21). Secondly, private investment may take place for defensive purposes as well as for expansion. Firms invest to defend their relative position with other firms even if the absolute position of the industry as a whole does not improve.

To test these hypotheses, we specify the ICOR as a function of the real interest rate, the financial deepening ratio (calculated as the ratio of nominal M4 over nominal GDP), and the rate of growth of output g:

$$ICOR = f(r, M4/GDP, g) \tag{4.49}$$

Dummy variables for the years with a negative rate of growth of output (1982, 1983 and 1986) are included in the equation.[17] If growth g is negative and $\Delta Y < 0$, then $ICOR < 0$. But a negative rate of growth of output does not imply necessarily that investment has had a negative productivity. A negative rate of growth of output can be due to factors other than the productivity of investment. Thus, including the ICOR values when output growth is negative, might bias the estimated results.

[17] The regression without the dummy variables shows high residuals for these years.

The result obtained for the case of Mexico over the 1970-1990 period is as follows:

$$ICOR = \underset{(3.87)}{9.6} + \underset{(0.91)}{0.03\,r} - \underset{(-0.41)}{0.03\,(M4/GDP)} - \underset{(-6.09)}{0.74\,g} \tag{4.50}$$

$$- \underset{(-27.5)}{47.1DU82} - \underset{(-8.53)}{15.3DU83} - \underset{(-9.78)}{15.5DU86}$$

$$R^2 = 0.99 \quad DW = 1.53 \quad F_{(6,14)} = 241.0 \quad n = 21$$

$$\begin{gathered} \textit{Serial Correlation}: \chi^2_{(1)} = 1.34 \\ \textit{Functional Form}: \chi^2_{(1)} = 14.5 \\ \textit{Normality}: \chi^2_{(2)} = 6.61 \\ \textit{Heteroscedasticity}: \chi^2_{(1)} = 0.12 \end{gathered}$$

where $ICOR$ is the incremental capital-output ratio of total investment, calculated annually (see Table IV.12), r is the real interest rate (%), $(M4/GDP)$ is the financial deepening ratio, where $M4$ is the broadest monetary aggregate in nominal terms and GDP is the gross domestic product in nominal terms, and g is the real rate of growth of output (%).

According to the above results, we find that neither the coefficients of the real interest rate or of the financial deepening ratio are statistically significant. The rate of growth of output g has the expected sign and is statistically significant, supporting Leibenstein's hypothesis that the ICOR varies inversely with the rate of growth of output. On the other hand, the evidence does not support the hypothesis which predicts a significant effect of financial variables, such as the real interest rate and the financial deepening ratio, on the productivity of investment.

From the empirical results obtained, it cannot be concluded that financial variables determine the productivity of investment.[18]

[18] When the rate of growth of output is excluded from the ICOR equation, the estimated coefficients of the real interest rate r and of the financial deepening ratio $(M4/GDP)$ show that the latter has some significant effect on the determination of the productivity of investment:

$$\underset{(2.13)}{ICOR = 14.15} - \underset{(-0.20)}{0.009\,r} - \underset{(-1.75)}{0.23\,(M4/GDP)} - \underset{(-21.4)}{42.1\,DU82} - \underset{(-4.5)}{7.3\,DU83} - \underset{(-7.3)}{11.01\,DU86}$$

$$R^2 = 0.98 \quad DW = 1.58 \quad F_{(6,13)} = 96.2 \quad n = 21 \quad \hat{\rho} = 0.86 \qquad (5.1)$$

IV.7 Conclusions

The theoretical role of the public sector in financial policy under a liberalised financial system is one limited to the surveillance of the money and capital markets. It can be argued that under a liberalised financial system, the developmental role of the Central Bank is reduced, if not abandoned. Its main objective ceases to be the allocation of credit to preferential sectors of the economy with the aim of promoting economic growth. Instead, financial policy is oriented towards the maintenance of price and exchange rate stability, to the development of a money market and to the supervision of the financial system.

Market oriented economic policies imply a reduction in public expenditure. This reduction has affected mainly public investment for the case of Mexico. In this chapter we have analysed how public investment was reduced in real terms and as a percentage share of total public expenditure after 1982, despite the fact that total credit given to the public sector by commercial and development banks was increased. We have emphasised that it was only after 1982 that credit given to the public sector was higher than that given to the private sector. It was also after 1982 that public investment was reduced sharply, and credit to the public sector was mainly used to finance interest payments on the domestic public debt. Moreover, it is precisely during the years when public investment is very low, that the public sector increases its share in total credit given by commercial and development banks.

According to the empirical evidence obtained in this chapter concerning the productivity of public and private investment, there is no statistical evidence that public investment is less productive than private investment. The data also suggest a decline in the levels of the productivity of investment, both public and private, after the debt crisis in 1982. This decline in productivity coincides with the fall in the levels of investment after 1982, especially of public investment, as analysed in Chapter I.

The results obtained as far as the net effect of public investment on private investment is concerned, suggest that public investment is not at the expense of private investment: no evidence of financial crowding-out of private investment by public investment was found. The two categories of investment are complementary.

As an overall conclusion to this chapter, we can say that there is no reason to believe that a rise in public expenditure will crowd-out private investment. It seems that a rise in public investment can encourage private investment and raise the levels of productivity of investment. At least, a rise in public investment seems to be a better source of improving both the quantity and the quality of investment, if compared to the effects that financial variables, such as the real interest rate and the financial deepening ratio, have on the aggregate level of investment, either its quality or its quantity.

CHAPTER V

FOREIGN CAPITAL INFLOWS, DOMESTIC SAVINGS, INVESTMENT AND ECONOMIC GROWTH

V.1 Introduction

The dependence of an open developing economy on foreign capital inflows as a source of finance sets to a large extent the pace at which the recipient country's economy can grow. Especially after the rise in the price of oil during the early 1970's, when the supply of international credit expanded, developing economies increased their reliance on foreign funds. This trend can be seen in Mexico, whose main export is oil, when the availability of foreign exchange expanded during the 1970's and the beginning of the 1980's as a consequence of both the rise in the price of oil and the increased supply of foreign loans. During the 70's, the Mexican economy relied heavily on foreign loans as reflected in the rise of the foreign debt stock from US$6000 million in 1970 to US$91200 million in 1982 (World Bank, 1985). After 1982, the deterioration in the terms of trade - the fall in the price of oil - and the fall in the supply of foreign loans led Mexico to become a net exporter of capital in order to service[1] the external debt. The stock of external debt kept increasing after 1982 reaching US$107600 million in 1987. The debt burden became an obstacle to economic growth. The reduction of external net transfers became one of the main objectives of the government's economic policy: 'In each of the past few years [1983 to 1989] Mexico has transferred abroad resources equivalent to 6 percent of the country's output. Decreasing these transfers to 2 percent of GDP will free resources necessary to finance the productive investment essential for economic growth' (Aspe,

[1] The service on the external debt includes amortisation plus interest payments.

1990, p.128). In 1990, after the debt-renegotiation process, the Mexican external debt was reduced by US$7000 million and financial flows to Mexico were partially resumed.

This chapter consists first of an analysis of the theory and empirical findings concerning the effect of foreign capital inflows on domestic savings, investment and economic growth. It then examines the case of Mexico. The effect of capital inflows on domestic savings and investment is analysed considering foreign savings both as a homogeneous flow and disaggregated into its different components (debt creating flows and foreign private investment). Concerning economic growth, a model is developed considering not only foreign capital inflows but also taking into account the loss of domestic savings caused by capital outflows i.e. interest payments on the external debt, remitted earnings and capital flight. It is shown that provided net foreign capital inflows exceed the loss of domestic savings, the effect of foreign capital inflows on growth is positive.

Finally, the chapter explores the relationship between net transfers of resources and growth performance taking into consideration the estimated values of capital flight as a transfer from the country to abroad.

The source of the data used in this chapter is the Banco de México's Balance of Payments Statistics and the Statistical Abstract of Latin America. Regression analysis is done using Ordinary Least Squares applying the Cochrane-Orcutt technique in the case of auto-correlation of the errors. Besides reporting the R^2, DW and F statistics the work shows the results of the serial correlation, functional form, normality and heteroscedasticity tests.[2] When the Cochrane-Orcutt technique is used the auto-correlation coefficient is reported.

[2] The Chi-square value of the serial correlation, functional form, normality and heteroscedasticity tests should be lower than the critical values of χ^2 at acceptable levels of significance. At a 5 percent significance level, the critical values are $\chi^2_{(1)} = 3.84$ and $\chi^2_{(2)} = 5.99$ with one and two degrees of freedom respectively.

V.2 The Impact of Foreign Capital Inflows on Domestic Savings

Macroeconomic theories of foreign capital inflows can be divided into two main frameworks. First, the traditional view, in which foreign savings are regarded as a *supplement* to domestic resources. This view has been incorporated into the dual-gap analysis, which has been put forward mainly by H. Chenery and co-authors (Chenery and Strout, 1966, Chenery and Bruno, 1966, Chenery and Adelman, 1966 for example). One of the main assumptions of this model, sometimes referred to as the "Orthodox Model", is that all foreign capital inflows are devoted to investment. The second framework considers that foreign savings *substitute* domestic savings by encouraging domestic consumption. This view considers that foreign savings can be used either for consumption or for investment purposes. The second framework, known in the literature as the "Savings Debate", was first put forward by Griffin (1970, 1978) and Weisskopf (1972).

The literature devoted to the study of the effect of foreign capital inflows on the recipient country's domestic savings is now very large, and it can be said that until now no definite conclusion has been reached. Some authors have even argued that the study of the relation between foreign and domestic savings has received more attention than it deserves (Polak, 1990). Ultimately, as Thirlwall (1989) contends, if the interest lies in the effect that foreign capital inflows have on economic growth, the important issue is the effect it has on investment and not on domestic savings.

The following section will discuss firstly the dual-gap analysis, followed by the savings debate and an updated review of new evidence found on this topic.

V.2.1 The Dual-Gap Theory

The dual-gap model considers that foreign assistance can make possible a fuller use of domestic resources and accelerate economic growth by relieving the savings constraint and/or the foreign exchange constraint. Based on a Harrod-Domar model of growth, the dual-gap model considers output growth as a function of the level of investment, which in turn is financed by savings, either domestic or foreign. At the same time, investment requires a proportion of inputs (capital and intermediate goods) which are not produced domestically and have to be imported. If savings fall short of the required investment to achieve a target growth rate, growth is said to be constrained by savings (this situation is also known as investment limited growth). If the level of exports of the country is lower than the level of required imports needed for investment, then growth is constrained by foreign exchange (trade limited growth).

One of the basic assumptions of the dual-gap model is the lack of substitutability between domestic and foreign resources. A developing country is unable to transform its surplus in domestic resources into foreign currency, so that the only way in which a country can finance its deficit on current account in the short run is through foreign borrowing since domestic savings cannot be used to finance the external deficit. In the long run, however, one of the objectives of economic policy is to change the structure of the economy to reduce or eliminate its dependence on foreign resources. This is done by increasing the propensity to export or by reducing the propensity to import out of income (through import substitution).

The relation between the foreign savings ratio and economic growth is defined using the Harrod-Domar growth model $g = \sigma s$, where g is the growth rate, s is the domestic savings ratio and σ is the incremental output-capital ratio. If a is the foreign saving ratio, then growth can increase to $g = (s + a)\sigma$, provided $a > 0$, and s and σ do not fall. Similarly, growth can be expressed as a product of the ratio of imports to income $i = \frac{M}{Y}$, and the incremental output-import ratio $m' = \frac{\Delta Y}{M}$, as $g = i\,m'$. With a net foreign capital inflow equal to a, growth increases to $g = (i + a)\,m'$. If the country sets a target rate of growth equal to r, the required savings ratio to support this rate of growth is equal to

$s* = \frac{r}{\sigma}$ and the required import ratio is equal to $i* = \frac{r}{m'}$. If the actual domestic saving ratio s falls short of the required savings ratio $s*$ the savings gap appears equal to $s* - s = a$. If imports required to achieve the growth rate are more than the level of imports that can be financed with export earnings, the country's foreign exchange gap appears equal to $\frac{M}{Y} - \frac{X}{Y} = i* - i = a$. To achieve the target growth rate r, foreign capital inflows a must fill the dominant (binding) gap. While ex-post the savings gap $(I - S)$ is equal to the foreign exchange gap $(X - M)$ by definition from the national accounts, ex-ante they do not have to be the same (see Thirlwall, 1989, chapter 13). Since the two gaps are not additive, when the binding constraint is covered by foreign capital inflows, the other constraint is automatically covered.

V.2.2 The Savings Debate

From the equation $g = (s + a)\sigma$, it can be seen that foreign capital inflows can have a positive effect on growth as long as the domestic savings ratio s and the productivity of capital σ do not decrease. The assumptions that s and σ remain constant were challenged by Griffin (1970) and Weisskopf (1972). Griffin argued that the inflow of foreign capital does have a negative impact on the domestic saving rate s and on the productivity of capital σ. Firstly, he points out, there is no a priori reason to believe that all foreign savings will be devoted to investment. It is likely that a share of foreign savings is consumed. If α is the proportion of foreign savings devoted to consumption, then, output growth does not increase by '$a\sigma$' but by '$(1 - \alpha)a\sigma$', which is lower than $a\sigma$ provided that $0 < \alpha < 1$ as normally assumed. This result still allows for a positive effect of foreign savings on growth since $(1 - \alpha)a\sigma$ is positive. It is further argued by Griffin that foreign savings can reduce the saving effort of a country (reduce s), both in the public sector and in the private sector. In the presence of a large supply of foreign capital, the public sector might reduce its saving effort by relaxing taxation and increasing its consumption expenditure. Private savings may be reduced because 'easy-finance' (low interest loans) may reduce the incentive to save of local investors: 'foreign capital may pre-empt the most profitable investment opportunities, and the strong, direct competition faced by local investors may tend to reduce the supply of indigenous entrepreneurship and savings' (Griffin, 1978, p.66). Furthermore, foreign savings may reduce domestic savings by stimulating imports, since the availability of foreign exchange may induce the government to keep an overvalued exchange rate, encouraging imports and discouraging exports.

Griffin does not consider the possibility of growth being constrained by the availability of foreign exchange. In the long run, he contends, a country's economy must be flexible enough to earn foreign exchange. He argues that if the foreign exchange gap is binding, it is because of the incapacity of the country's government to implement import reduction or export expansive economic policies. The source of the problem, he argues, is the unwillingness of the government to introduce policies to reduce consumption (in order to increase savings, reduce imports and increase exports). Hence, there can ultimately be only one constraint on investment in the long run, which is the amount of savings. Therefore, if foreign capital inflows reduce domestic savings, the rate of growth of the economy is curtailed.

Concerning the effect of foreign capital inflows on the productivity of capital σ, Griffin argues that the ICOR (the inverse of the productivity of capital σ) may increase for the following reasons. Foreign capital tends to be invested in economic infrastructure projects like transport facilities and electric energy, which are projects with high ICORs. According to Griffin, the investment of foreign capital inflows is biased against directly productive activities which will tend to lower the aggregate output-capital ratio. Moreover, it is also argued that foreign capital is sometimes used to finance projects with a political rather than an economic purpose. In this way, the positive effect that foreign savings can have on the rate of growth of the recipient country can be more than offset by the reduction in the propensity to save s and the decrease in the average productivity of capital caused by foreign capital inflows. Kennedy and Thirlwall (1971) summarise this effect in the following equation:

$$g_f = \frac{s + (1 - \alpha)a}{c + q} - \frac{s}{c}$$

where g_f is the rate of growth due to foreign capital inflows, s is the original domestic savings ratio, a is the capital inflows ratio, α is the proportion of capital imports consumed, c is the ICOR and q is the amount by which the ICOR changes due to capital inflows. g_f can be very low, or become negative, if α is high and q is sufficiently high to offset the addition to savings.

Kennedy and Thirlwall (1971) criticise Griffin's model. The main criticism they make is that the model does not recognise the possibility of growth being constrained by foreign exchange and the difficulty of relaxing the foreign exchange constraint in the short run without reducing the rate of growth of output. If no foreign capital is available, then the only way to earn foreign exchange and relax the foreign exchange gap is by depressing the domestic levels of consumption, in both the public and private sectors.[3] Kennedy and Thirlwall also argue that the productivity of investment not only does not fall, as argued by Griffin, but it can rise as a consequence of foreign exchange enhancing the possibility of a more productive use to be made of capital resources as a whole, by allowing necessary imports of capital and intermediate goods. Moreover, they argue that infrastructure investment projects, which do have high ICOR values, increase the productivity of other sectors of the economy by the effect of externalities, and the overall ICOR of the economy, which is the relevant one to consider in this case, may be reduced.

Weisskopf (1972) develops a model in which a goodness of fit criterion allows him to assign countries as either being savings constrained, foreign exchange constrained, or

[3] This was clearly the case in many Latin-American countries after the debt crisis in 1982. When the supply of foreign capital fell, countries like Mexico had to reduce their level of domestic consumption in order to reduce the deficit in the current account of the Balance of Payments.

both. For those countries being constrained by savings, he argues that foreign capital inflows can exert a negative impact on domestic savings and therefore on growth. The reason he gives why a negative relation between domestic savings and foreign savings can be expected is that to the extent foreign capital inflows are used to increase consumption there will be a decline in intended domestic savings, for domestic income remains unchanged. The extent to which foreign capital inflows substitute for domestic savings is given by the regression estimated for the 17 developing countries he found to be savings constrained over the 1953-1966 period[4]:

$$S = a + \underset{(6.59)}{0.183\,Y} - \underset{(-5.3)}{0.227\,F} + \underset{(4.6)}{0.176\,E}$$

where S is domestic savings, Y is Gross Domestic Product, F is foreign savings (calculated as imports less exports) and E is exports. The estimated coefficient of F (equal to 0.227) measures, according to Weisskopf, the marginal propensity to consume out of additional external resources. This coefficient must be non-positive. If all external resources are used for investment, this coefficient would be equal to 0, and domestic savings would remain unaffected by foreign savings. If the coefficient is negative, it means that a share of foreign capital, equal on average to the coefficient of F, is being consumed. In this case, 23 percent of foreign capital inflows substitute for domestic savings. For those countries in which the trade gap was found to be binding, Weisskopf argues that foreign savings can have a positive effect on domestic savings since external resources help to relieve the limitations imposed by a shortage of imports.

Much of the debate surrounding the impact of foreign savings on domestic savings is based on the econometric results of equations of the type of:

$$DS = f(\ldots, SF, \ldots)$$

[4] Figures in parentheses are t-statistics.

where DS, domestic savings, is the dependent variable and SF, foreign savings, is an explanatory variable. The major part of the studies done on the relationship between domestic and foreign savings find a negative association between these two variables. As Thirlwall (1989) points out, 'care must be taken in interpreting this relationship because owing to the way saving is defined a negative relationship is bound to be found as long as a portion of capital imports is consumed' (p.304).

Domestic savings DS is defined as the difference between gross capital formation (or investment) I less foreign savings[5] SF:

$$DS = I - SF \tag{5.1}$$

If all foreign capital inflows are invested, then investment increases by the same amount as foreign savings ($\Delta I = \Delta SF$) and domestic savings remain constant. If a proportion of foreign capital is consumed, then $\Delta SF > \Delta I$ which would cause savings to fall to maintain the identity. An existing negative statistical correlation does not imply a reduction of the savings effort of a country.

Newlyn (1985) argues that in an equation such as:

$$DS = a + bY + cSF \tag{5.2}$$

the correct interpretation of the coefficient of foreign savings c should be the marginal propensity to consume out of foreign savings, while $(1 - c)$ measures the propensity to save out of foreign savings.

It is worth expanding on this result. The interpretation of the $\hat{\beta}$ coefficient in the equation:

$$\frac{DS}{Y} = \alpha + \beta\left(\frac{SF}{Y}\right) \tag{5.3}$$

[5] From national accounts: $Y = C + I + X - M$. Assuming that foreign savings is equal to the negative of the deficit in current account: $X - M = -F$ then, $Y = C + I - F$. Since $S = Y - C$, then: $Y - C = S = I - F$, where Y is income, I is investment, X is the level of exports, M is the level of imports, F is foreign savings, and S is domestic savings.

depends on the assumptions taken with respect to the role SF plays in the definition of aggregate consumption and savings. Assuming that consumption C is a function of total income, which includes SF as additional resources to domestic income Y:

$$C = a + b(Y + SF) \qquad 0 \leq b \leq 1 \tag{5.4}$$

where b is the marginal propensity to consume out of income. Two possible cases are considered. In the first case domestic savings DS is calculated as the difference between total income, which considers SF as part of available resources $(Y + SF)$, and aggregate consumption C, thus:

$$DS = Y + SF - C \tag{5.5}$$

Substituting equation (5.4) in (5.5):

$$\begin{aligned} & DS = Y + SF - a - b\,Y - b\,SF \\ => \quad & DS = -a + (1-b)Y + (1-b)SF \\ => \quad & DS = -a + d\,Y + d\,SF \end{aligned} \tag{5.6}$$

Suppressing the intercept term and dividing by Y to write the expression in a ratio form:

$$\frac{DS}{Y} = d + d\left(\frac{SF}{Y}\right) \qquad 0 \leq d \leq 1 \tag{5.7}$$

where d is the marginal propensity to save out of foreign savings ($d = 1 - b$).

However, if domestic savings DS are calculated as the difference between income Y and consumption C, without considering SF as additional resources to domestic income, then we have the second case expressed as:

$$DS = Y - C = Y - a - b(Y + SF) \tag{5.8}$$

$$=> \quad DS = -a + (1-b)Y - bSF$$

$$=> \quad DS = -a + d\,Y - b\,SF \tag{5.9}$$

where $d = 1 - b$.

Suppressing the intercept term and dividing by Y:

$$\frac{DS}{Y} = d - b\left(\frac{SF}{Y}\right) \qquad 0 \leq b \leq 1 \tag{5.10}$$

In this case the coefficient b (or β in equation (5.3)) is the marginal propensity to consume out of foreign savings. Hence, according to the way domestic savings are calculated, either as a function of $(Y + SF)$ or as a function of (Y), the coefficient β in equation (5.3) measures either the propensity to save out of income or the propensity to consume out of foreign savings, respectively.

Let us now consider the way domestic savings are defined and calculated from national accounts. From the identity:

$$Y = C + I + X - M \tag{5.11}$$

and assuming that:

$$SF = M - X \tag{5.12}$$

then,

$$\Rightarrow \quad Y = C + I - SF \tag{5.13}$$

From equation (5.13), domestic saving can be defined as the difference between gross investment and foreign savings:

$$DS = Y - C = I - SF \tag{5.14}$$

According to the definition of domestic savings and its calculation, it seems that the correct interpretation of the $\hat{\beta}$ coefficient in equation (5.3) is that $\hat{\beta}$ is the marginal propensity to consume out of foreign savings, as in case two, and not the marginal propensity to save, as in case 1. Considering equation (5.10), where b is the propensity to consume out of foreign savings, it can be seen that if $\hat{b} = 1$, all SF are consumed, if $\hat{b} = 0$ all SF are invested. The empirical results of estimating an equation like (5.3), must then show a $\hat{\beta}$ coefficient within the range value $-1 \leq \hat{\beta} \leq 0$ because $\hat{\beta} = -b$ and $0 \leq b \leq 1$.

Chandavarkar (1990) goes further by arguing that 'the national account linkage of domestic savings, investment and foreign savings *invalidates* the conventional statistical correlation between *SF* and *DS* because these two variables cannot be treated as independent variables' (p.28). Polak (1987) says that the negative statistical correlation between foreign savings and domestic savings is 'essentially worthless' (p.113) for both statistical and economic reasons. The statistical reason is the one given above: the linkage in national accounts of *SF* and *DS*. There are economic reasons that establish a negative association between *SF* and *DS*, without implying any causality relation from *SF* to *DS*. According to Polak (1987), these reasons are: first, if a country invests its foreign resources productively, domestic savings would rise over time and less foreign capital would be needed. Second, if foreign resources (mainly aid) are allocated on a basis of need, and if that need is measured by the domestic savings ratio, a negative correlation between *DS* and *SF* would appear and the causality would run from *DS* to *SF* in this case. Kennedy and Thirlwall (1971) make this point too, suggesting that countries receive foreign savings (aid) '*because* they save a low proportion of their national income' (p.136).

Papanek (1972) has argued that it could be misleading to treat foreign savings as an homogeneous flow when it is made up of different components: aid (loans or grants), foreign private investment, commercial borrowing and changes in foreign exchange reserves. Each of these components can have a different impact on domestic savings and growth. As aid constitutes a large share of foreign savings, it is possible, he argues, that domestic savings and foreign capital are simultaneously determined by exogenous factors related to the general economic situation of the country. As an example, he mentions the possibility of a fall in the terms of trade of a country, which might lower domestic savings at the same time that more foreign resources are needed to sustain growth, without implying a causality from foreign savings to domestic savings.

The results obtained by Papanek (1973) concerning the effect of the components of foreign capital inflows (aid, foreign private investment and other inflows) on domestic savings show that all foreign resource inflows have negative and statistically significant coefficients:

$$\begin{gathered} DS = 11.4 - 1.00\,AID - 0.65\,FPI - 0.38\,FI + 0.20\,PX + 1.50\,X \\ (12.1)\quad (-7.1)\qquad (-3.5)\qquad (-1.6)\qquad (5.4)\qquad (7.0) \\ R^2 = 0.62 \qquad F = 28.4 \end{gathered}$$

where *FPI* is foreign private investment, *FI* is other foreign capital inflows, *PX* is primary exports, and *X* is other exports. He contends that the negative correlation between aid and savings is likely to be the result of exogenous factors affecting both variables rather than a causal relationship. However, the significant negative correlation between savings and *FPI*, is more difficult to explain. He suggests that it might be for statistical reasons: since *FPI* may be overestimated (in order to justify greater repatriation of profits or capital), it might cause the estimated domestic savings to be lower, given the level of income.

Many studies have tested the hypothesis of foreign and domestic savings being determined simultaneously by exogenous variables. If this hypothesis is correct, foreign savings cannot be treated as an exogenous variable in the determination of domestic savings. Some of these studies are analysed below.

Morisset (1989) tests the effect of foreign savings on domestic savings using time series data for Argentina. He first tests the hypothesis relating domestic savings and foreign savings without including any other explanatory variable:

$$\frac{DS}{Y} = \alpha + \beta \frac{SF}{Y}$$

If $\hat{\beta} < 0$, some foreign saving is devoted to consumption. If all foreign saving is invested, then $\hat{\beta} = 0$. He finds that $\hat{\beta}$ is negative and statistically significant for the case of Argentina during the 1960-1981 period. Morisset then proceeds to estimate a savings function, arguing that the exclusion of important explanatory variables (such as the level of income and the rate of growth of exports) might bias the estimated coefficient of foreign saving on domestic saving. We present two of his estimated equations of the savings function for Argentina during the above sample period. The first equation is:

$$DS = -1.92 + \underset{(8.74)}{0.244\,Y} - \underset{(-1.23)}{0.241\,SF} + \underset{(0.29)}{0.0034\,r} + \underset{(5.56)}{0.013\,\pi}$$
$$(-1.81)$$

$$DW = 1.98 \quad R^2 = 0.951$$

where DS is real domestic saving, SF is real foreign saving, r is the real interest rate, and π is the rate of inflation, and the second equation is:

$$DS = \underset{(1.16)}{1.523} + \underset{(3.55)}{0.175\,Y} - \underset{(-0.91)}{0.982\,AID} + \underset{(0.11)}{0.098\,FPI} - \underset{(2.63)}{0.0168\,r} + \underset{(-0.84)}{0.856\,X} + \underset{(2.54)}{0.0076\,\pi}$$

$$DW = 1.77 \quad R^2 = 0.952$$

when aid and foreign private investment (FPI) substitute SF as explanatory variables, and the rate of growth of exports is also included as an explanatory variable.[6] The results show that SF loses its statistical significance and in neither of the two equations does SF, AID or FPI appear to have an effect on DS. He thus finds support for the hypothesis that excluding explanatory significant variables from the equation might bias (overestimate) the calculated effect of SF on DS.

To test the hypothesis that DS and SF are being simultaneously affected by other variables (i.e. SF is not exogenous), Morisset regresses DS and SF independently on the rate of growth of the money supply, the public deficit, external interest rates and the terms of trade, which are internal and external factors that can affect both domestic and foreign savings (see Morisset, 1989). He finds that the budget deficit and the rate of growth of the money supply significantly affect both foreign and domestic savings. He concludes that as long as exogenous factors such as monetary and fiscal policies can

[6] Morisset does not include the rate of growth of exports when SF is included as an independent variable to avoid multicollinearity between exports and SF which is defined as $(X - M)$.

affect *SF* and *DS* simultaneously, one is not able to interpret the traditional empirical results properly (i.e. domestic savings as a function of foreign savings).

Snyder (1990) tests the hypothesis of both domestic savings and foreign aid inflows being determined by the level of income per capita of a country. By regressing the savings ratio $(\frac{S}{Y})$ on income per capita $(\frac{Y}{N})$ and the ratio of aid to output $(\frac{A}{Y})$ on the one hand, and then regressing the ratio of aid to output on income per capita and the savings ratio on the other hand:

$$\frac{S}{Y} = \alpha_0 + \alpha_1 (\frac{Y}{N}) + \alpha_2 (\frac{A}{Y})$$

and

$$\frac{A}{Y} = \beta_0 + \beta_1 (\frac{Y}{N}) + \beta_2 (\frac{S}{Y}),$$

Snyder finds that for a sample of 50 developing countries from 1960 to the early 1980's, the coefficient of income per capita is positive and statistically significant in explaining both the savings ratio and the aid ratio. The coefficients $\hat{\alpha}_1$ and $\hat{\beta}_1$ are positive and statistically significant, while $\hat{\alpha}_2$ and $\hat{\beta}_2$ are not statistically significant. Snyder thus concludes that since both aid and savings seem to be determined by the level of income per capita, the negative relation between foreign saving (aid) and domestic saving conforms more to a simultaneous process determined by the level of income per capita than to a negative effect of foreign aid on domestic savings.

Further evidence on the causality from *SF* to *DS* is given by Bowles (1987). According to Griffin the causality runs from *SF* to *DS*, and *SF* is considered an exogenous variable. Bowles argues that this causality is not 'universally accepted': causality running from *SF* to *DS* has been challenged by many studies which consider the possibility of foreign savings being determined by the economic situation of the country of which the domestic saving rate is one indicator. Using time series data from 1961 to 1981 for 20 less developed countries, Bowles tests the causality between *SF* and *DS* using

Granger causality tests:

$$(\frac{S}{Y})_t = c + \alpha(\frac{A}{Y})_{(t-1)} + \beta(\frac{S}{Y})_{(t-1)}$$

and

$$(\frac{A}{Y})_t = c + \gamma(\frac{S}{Y})_{(t-1)} + \lambda(\frac{A}{Y})_{(t-1)}$$

where $(\frac{S}{Y})$ is the domestic savings ratio and $(\frac{A}{Y})$ is the aid ratio. The results show that in 10 out of the 20 countries analysed, a significant correlation between *DS* and *SF* does not exist, lending no support to the view that a causal relationship between *SF* and *DS* exists. In 3 countries $\hat{\gamma}$ was found positive and statistically significant implying that causality runs from domestic savings to foreign savings. In 5 countries $\hat{\alpha}$ was found negative and statistically significant, implying that *SF* has a negative effect on *DS*, and finally, in 2 countries, Bowles finds that causality runs in both directions (both $\hat{\alpha}$ and $\hat{\gamma}$ are statistically significant). These results show the inconclusiveness of the relationship between foreign savings and domestic savings, and indicate that the effect of foreign savings on domestic savings varies from country to country.

V.3 Foreign Capital Inflows and Investment

The relationship between foreign capital inflows and investment seems to be less controversial than the one with domestic savings or with economic growth. The more general acceptance of a positive effect of capital imports on investment is probably the reason why studies on this topic are scarcer compared to those analysing the effect of foreign assistance on savings and growth.

The effect that foreign capital has on investment is probably the most relevant when it comes to assessing the impact of foreign capital inflows on economic growth. A positive association between capital imports and investment means that foreign capital must finance additional growth. Various studies reveal a positive effect of foreign capital inflows on investment. Some of them will be reviewed in this section.

Massell, et. al. (1972) consider that inasmuch as foreign assistance provides the means to relieve the foreign exchange constraint present in many developing countries and allows the expansion of the level of imports, it is an important determinant of capital formation. To test this hypothesis they regress the change of investment (ΔI) on the change of: exports (ΔX), net public capital inflows (ΔG) and net private capital inflows (ΔP). They do so in order to test if different sources of foreign capital may differ in their impacts on investment, in line with Papanek's hypothesis. Additionally, the one year lagged values of the regressors are included as explanatory variables. They obtain the following result for a sample of 11 Latin-American countries from 1955 to 1966:

$$\underset{(1.38)}{\Delta I_t = 0.23} + \underset{(1.43)}{0.093\,\Delta X_t} + \underset{(1.27)}{0.36\,\Delta G_t} + \underset{(1.39)}{0.38\,\Delta G_{(t-1)}} + \underset{(6.88)}{0.545\,\Delta P_t} + \underset{(3.03)}{0.422\,\Delta P_{(t-1)}}$$

$$R^2 = 0.382$$

Only current and lagged net private capital inflows have statistically significant coefficients. Private inflows seem to be designated for investment projects. Massell et. al. argue that because public capital inflows are mainly devoted to long maturity investment projects, they appear non-statistically significant in the short run. According to these results, private capital inflows seem to affect investment in the short run while public inflows seem to affect investment in the long run. The latter effect could probably be captured by introducing lagged public foreign capital inflows for which a long time-series sample is needed.

Similar results are obtained by Ahmed (1987) for the case of Pakistan. He specifies investment as a function of changes in gross national product, bank credit to the private sector, the lagged level of investment, and private and public foreign capital inflows. The estimated coefficients of the regression, for the period from 1963 to 1985 in Pakistan, show that private capital inflows exert a positive and significant effect on investment while public capital inflows, although the coefficient is positive, is not statistically significant.

Levy (1987) examines the effect of concessionary aid flows on the investment rate of low-income developing countries. To assess the relation between aid inflows, savings rates and investment rates, he estimates the following equation for a sample of 46 countries from 1968 to 1980:

$$\frac{I}{Y} = \alpha + \beta \frac{S}{Y} + \Gamma \frac{A}{Y}$$

where A is official development assistance (ODA)[7], I is investment, S is domestic savings and Y is Gross Domestic Product. He finds an estimated coefficient $\hat{\Gamma} = 0.86$ (t-statistic equal to 4.1), which implies that on average, 86 percent of concessionary aid in low-income countries is invested. By adding the log of income per capita Z in the equation as a measure of development:

$$\frac{I}{Y} = \alpha + \beta \frac{S}{Y} + (\Gamma_0 + \Gamma_1 Z) \frac{A}{Y},$$

Levy finds that the links between aid and investment vary among countries in relation to their level of development, which gives support to the hypothesis that a higher share of aid is invested the higher the level of income per capita of a country, since low income per capita countries might have a greater tendency to use aid to maintain a subsistence level of consumption.

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[7] ODA is defined as those official flows from one country to another aimed at economic development or welfare improvements that have at least a 25 percent grant element (Norton, Ortiz and Pardey, 1992).

However, there is no consensus in the literature on the impact of foreign capital inflows on the productivity of investment. As argued earlier, the assumption that the incremental output-capital ratio (IOCR) remains constant as considered by the dual-gap models was challenged by authors like Griffin (1970) and others (for instance, Rana and Dowling, 1988) who argue that foreign capital inflows can reduce the IOCR value and offset any positive effect on growth caused by the additional available foreign resources. On the other hand, Thirlwall (1972, 1989) contends that foreign capital inflows can raise the productivity of capital.

Few empirical studies have been made on the impact of foreign capital inflows on the productivity of investment. The World Bank (1985) stresses that although foreign capital allows a country to invest more than it could if it only used national savings, its effect on growth is strongly determined by the efficiency with which they are used. Public sector investment, they argue, 'requires careful appraisal, taking reasonable precautions for domestic risks. Private sector investment projects need a framework of incentives which encourage efficient investment. Failures in these two areas can be a primary cause of slow growth' (p.44). Closely related to the debate surrounding public vs. private investment, the World Bank's argument is directed against regulation and protection of industries. They argue that protection of public investment, where a large percentage of foreign capital goes, leads to economically inefficient investment projects, with a low contribution to growth. They consider that foreign capital inflows would lead to efficient investment projects in an unregulated economy, in which market determined interest and exchange rates would be maintained.

Rana and Dowling (1988) measure the effect of the different components of foreign capital inflows on the incremental output-capital ratio. Using pooled cross-section and time-series data for nine Asian developing countries during the period 1965-1982, they find that only foreign private investment has a positive effect on the incremental output-capital ratio, while aid has a negative impact. These results, they argue, are because aid introduces inappropriate technologies or finances capital intensive projects.

As argued earlier in this chapter, it is possible that foreign capital inflows invested in long maturity projects, like infrastructure, have high ICOR values. However, this does not mean their contribution to growth is negative because none of the externalities effects on other economic sectors are being considered. Investment projects in infrastructure, health or education projects, often undertaken by the public sector, might not have an immediate positive effect on growth. The long-run effect of this kind of project on the productivity of investment can be difficult to capture econometrically. As Thirlwall (1989) contends: 'there is no convincing evidence that countries with a high ratio of capital inflows to national income have a higher capital-output ratio than other countries' (p. 304).

V.4 The Impact of Foreign Capital Inflows on Growth

Although foreign capital inflows make possible additional investment in the recipient country, its effect on growth is not clearly defined in the literature given the uncertain effect of capital inflows on domestic savings and the productivity of investment. In this section recent literature written on this topic will be analysed. It will be seen that even though foreign capital inflows may partially substitute domestic savings, the total effect on growth is positive.

It is argued that single equation models that estimate the rate of growth as a function of the ratio of foreign capital inflows among other variables overestimate the effect of capital inflows on growth because they do not take into consideration the possible negative impact on domestic savings, which would cause growth to decrease. Gupta and Islam (1983) develop a simultaneous equation model to estimate the direct and indirect (via the negative impact of foreign capital on domestic savings) effects of foreign capital inflows on savings and growth. Stating the savings ratio as a function of per capita income (y), the rate of growth of income (g), the dependency ratio (DR) and the foreign capital inflows ratio ($\frac{F}{Y}$):

$$\frac{S}{Y} = a_0 + b_0 y + c_0 g + d_0 DR + e_0 \frac{F}{Y}, \tag{5.15}$$

and stating growth as a function of foreign and domestic savings:

$$g = a_1 + b_1 \frac{S}{Y} + c_1 \frac{F}{Y}, \tag{5.16}$$

they arrive at the following reduced form equation for growth by substituting (5.15) in (5.16):

$$g = \frac{1}{(1 - c_0 b_1)} [(a_1 + b_1 a_0) + b_1 b_0 y + b_1 d_0 DR + (b_1 e_0 + c_1) \frac{F}{Y}] \tag{5.17}$$

The model assumes that domestic savings and growth are jointly determined. Domestic savings is a positive function of growth (equation (5.15)) and growth is a positive function of domestic savings (equation (5.16)). Both domestic savings and growth are affected directly and indirectly by foreign capital inflows. The direct effect of foreign capital inflows on savings is expected to be negative ($e_0 < 0$). However, the indirect effect (via the positive effect of capital inflows on growth) can be positive if growth exerts a positive impact on the domestic savings rate.[8] The direct effect of foreign capital inflows on growth is expected to be positive ($c_1 > 0$) while the total effect, given by ($b_1 e_0 + c_1$) can vary according to the values of the coefficients whose expected values are: $b_1 > 0$, $e_0 < 0$, and $c_1 > 0$. If $c_1 > b_1 e_0$, the total effect on growth is positive, and if $c_1 < b_1 e_0$ the total effect is negative. According to this model, as long as foreign capital exercises a negative effect on the domestic savings rate, the total impact on growth is

[8] It is worth mentioning that in Chapter III (section III.5) where Mckinnon's portfolio effect is tested, there was no evidence of the rate of growth affecting positively the propensity to save for the case of Mexico during the 1960-1990 period.

smaller than the direct effect. The model is estimated using a sample of 52 developing countries for two time periods, 1950 to 1965 and 1965 to 1973, in order to compare results between both periods. The sample of 52 countries is divided on the one hand by income per capita groups to differentiate the stage of development, and on the other hand by geographical regions. On this basis, they find that domestic savings and foreign capital make a positive impact on growth but that the former is more important (given the magnitude and the statistical significance of the coefficients in equation (5.16)) than the latter. The domestic savings coefficient maintains its significance in all the samples considered. Too long to be presented to detail, the estimation results concerning the impact of foreign capital inflows on growth show that, in general, the direct effect (from equation (5.16)) is positive and that although the direction of the total effect (from equation (5.17)) is parallel to the direction of the direct effect, its values are smaller. Based on this conclusion, Gupta and Islam argue that single equation models tend to overestimate the effect of foreign capital on growth. In terms of the model's notation, this means that since the coefficient $b_1 e_0$ tends to be negative, then $c_1 > (c_1 + b_1 e_0)$, the direct effect is higher than the total effect.

Rana and Dowling (1988) develop a similar simultaneous equation model. Growth and domestic savings are specified as:

$$g = a_0 + a_1 AID + a_2 FPI + a_3 DS + a_4 CX + a_5 LF \tag{5.18}$$

and:

$$DS = a_6 + a_7 AID + a_8 FPI + a_9 CX + a_{10} y + a_{11} g \tag{5.19}$$

where CX is the ratio of change in exports to income, LF is the rate of growth of the labour force and y is income per capita, from which the reduced form looks like:

$$g = \pi_0 + \pi_1 AID + \pi_2 FPI + \pi_3 CX + \pi_4 LF + \pi_5 y \tag{5.20}$$

and:

$$DS = \pi_6 + \pi_7\, AID + \pi_8\, FPI + \pi_9\, CX + \pi_{10}\, LF + \pi_{11}\, y \qquad (5.21)$$

They estimate the structural and the reduced forms of the model for a sample of 9 Asian developing countries during the 1965-1982 period. The empirical results show that growth is positively and significantly affected by foreign private investment (*FPI*), labour force growth (*LF*) and by income per capita (*y*), while savings seem to be only affected by income per capita. When calculating the total effects (direct and indirect from the structural and reduced forms respectively) they find that the total effect of foreign capital inflows on growth is lower than the direct effect, reaching similar conclusions to Gupta and Islam.

V.4.1 Capital Imports, External Debt Service and Economic Growth.

Although external borrowing can make possible a higher rate of economic growth in the recipient country, the terms of external borrowing may have offsetting effects on growth, as has been demonstrated in many developing countries during the debt crisis of the last decade. To examine this offsetting effect the concept of net transfers of resources becomes important, since it considers not only the net foreign capital inflows into a country but also the interest payments or service on the accumulated external debt (see Bacha, 1992). Net transfers (N) are defined from the Balance of Payments as the difference between net capital inflows (F)[9] and net factor payments abroad (J): $N = F - J$, which is equivalent to the trade balance ($M - X + J$) where M is imports of goods and services and X is exports of goods and services. Net factor payments abroad are equal to the difference between total factor payments and the income received from factor services abroad. Factor payments abroad include: remitted and reinvested earnings

[9] F includes the change in international reserves held at the Central Bank, entering the definition of F with a negative sign.

and interest payments on the external debt of the the banking, public and private sectors.

Bacha (1992) argues that both net capital inflows and net factor payments abroad are largely determined by factors beyond the control of the indebted country's government, so that net factor payments abroad is 'given' from the developing country's perspective. To consider the net addition of foreign savings to domestic resources, Bacha suggests that 'as net factor payments to abroad are beyond local policy control, they should be subtracted from net capital inflows to obtain an appropriate measure of the limitations that financial transactions with the rest of the world are imposing on the investment rate of debt-ridden developing countries' (p.1185). Considering the national income identity:

$$Y = C + I + X - M - J \tag{5.22}$$
$$\Rightarrow \quad Y = C + I - N \tag{5.23}$$

Solving for investment:

$$I = (Y - C) + N$$
$$\Rightarrow \quad I = S + N \tag{5.24}$$

where S is domestic savings. Investment is financed by domestic savings and net transfers. If domestic savings remain constant, variations in foreign transfers will be reflected in investment and economic growth.

The model of foreign capital inflows and growth derived from the debate between Ball (1962) and Massell (1964) (see Thirlwall, 1989) is based on the concept of net transfers since investment and growth are affected not only by capital inflows but also by interest payments abroad. One of the basic characteristics of this model is the distinction between domestic output and national income. From the definition of domestic output (GDP) and national income (GNP)[10] the model develops as follows. National Income is

[10] Gross Domestic Product (GDP) equals the total value of output accruing *within* a country. Thus, it includes factor income generated by foreign investors or suppliers in the country but excludes factor income invested or supplied abroad by normal residents of the country. Gross National Product (GNP) equals the total value of output accruing *to* a country. Thus, it excludes factor income earned by foreign investors or suppliers in the country but includes factor income

defined in this model as:

$$Y = C + I + X - M - rD \tag{5.25}$$

where C is consumption, I is investment, X is export earnings, M is import expenditure, r is the external interest rate and D is the stock of foreign debt. The model assumes that the country does not hold any foreign assets so that income from factor services abroad are not considered, leaving only interest payments abroad as the only component of net factor payments (see Ball, 1962). Domestic output Q is defined as:

$$Q = C + I + X - M \tag{5.26}$$

so that $Q = Y + rD$; the difference between domestic product and national income is net factor payments abroad. Consumption is expressed as a function of income:

$$C = (1 - s)Y \tag{5.27}$$

where s is the marginal propensity to save out of income. Based on a Harrod-Domar model, the change in output is defined as a function of investment:

$$\Delta Q = \sigma I \tag{5.28}$$

where σ is the productivity of investment. And finally, the long-run[11] Balance of Payments equation is expressed as:

$$X - M = rD - \Delta D \tag{5.29}$$

where ΔD is the increment of foreign debt.

Using the last set of equations to solve for investment:

$$\begin{gathered} Y + rD = (1 - s)Y + I + rD - \Delta D \\ \Rightarrow \; sY = I - \Delta D \\ s(Q - rD) = I - \Delta D \\ \Rightarrow \; I = sQ - srD + \Delta D \end{gathered} \tag{5.30}$$

earned in other countries by normal residents of the country.

[11] Movements in foreign exchange reserves are not considered in the model because they are short-run capital movements.

Substituting in equation (5.28):

$$\Delta Q = \sigma (s\,Q - srD + \Delta D) \tag{5.31}$$

From which the expression for economic growth is:

$$g = \frac{\Delta Q}{Q} = \sigma s + \sigma \left(\frac{\Delta D - srD}{Q}\right) \tag{5.32}$$

Growth will be higher with foreign capital inflows than without if the following condition is met:

$$\sigma \left(\frac{\Delta D - srD}{Q}\right) > 0 \tag{5.33}$$

$$\Rightarrow \quad \Delta D > srD \tag{5.34}$$

This condition states that the effect of net capital inflows on economic growth will be positive as long as capital inflows are higher than the interest payments abroad that would otherwise have been invested domestically.

To examine the effects of foreign capital inflows and interest payments abroad on the rate of growth of income (Y), the relation $Q = Y + rD$ is substituted in the investment equation (5.30):

$$I = s\,(Y + rD) + \Delta D - srD \tag{5.35}$$

Substituting in equation (5.28) gives:

$$\Delta Y + r\,\Delta D = \sigma\,[(s\,Y + srD) + \Delta D - srD\,] \tag{5.36}$$

since $\Delta Q = \Delta Y + r\,\Delta D$. Solving for the rate of growth of income:

$$\frac{\Delta Y}{Y} = \sigma s + \frac{(\sigma - r)\,\Delta D}{Y} \tag{5.37}$$

The rate of growth of income will be higher with net capital inflows than with a balanced current account if the productivity of foreign capital inflows is higher than the rate of interest on foreign loans ($\sigma > r$). That is, investment is profitable only if the rate of return on investment exceeds the interest rate.

V.5 The Empirical Evidence for Mexico

Foreign borrowing is one of the factors that has allowed Mexico to achieve high rates of economic growth, especially between the early 1970's and 1981. By 1982, circumstances changed when the international price of oil fell and international interest rates went up, harming the economy (see Chapter I). It was first thought by the Mexican government and the international financial community that the price of oil would rise again and that the debt problem of Mexico was a temporary one. By mid-1982 it became clear that the debt crisis was not transitory, and the availability of easy foreign finance ceased in 1982. Domestic economic policy rapidly changed to enhance the economy's ability to generate foreign exchange to meet the service of the external debt. Economic policy was aimed at reducing the levels of domestic consumption in order to increase savings, increase exports, reduce imports and generate a trade surplus. If a country generates a trade surplus it becomes a net exporter of resources (negative net transfers). The cost of doing so, as pointed out by Bacha (1992), is that 'investment rates have to contract, thus lowering output growth rates' (p. 1185). In Mexico, net transfers of resources became negative after 1982. The fall in foreign capital inflows and the effect of contractionary policies were soon felt on the level of investment and on the rate of economic growth.

V.5.1 The Effect of Capital Imports on Domestic Savings and Investment

This section analyses the effect of foreign capital inflows on domestic savings and investment in Mexico during the 1960-1990 period. In order to do so, it is necessary to specify savings and investment functions.

Real domestic savings are specified as a function of the real level of output (real Gross Domestic Product, GDP) and the real level of foreign savings SF[12]:

$$DS = f(GDP,\ SF) \tag{5.38}$$

Output has already been shown to be a determinant variable of the level of domestic savings (see Chapter III). The coefficient of foreign savings is expected to be either negative (or not statistically significant), since it measures the propensity to consume out of foreign savings according to the explanation given above. The equations are estimated using Ordinary Least Squares applying the Cochrane-Orcutt technique to correct for auto-correlation of the errors where appropriate. A dummy variable for 1986 is included in the savings equations, a year in which contractionary economic policies became more stringent after further drops in the international price of oil. The estimation result is as follows[13]:

$$\underset{(-0.29)}{DS = -13.0} + \underset{(10.7)}{0.12\,GDP} - \underset{(-0.96)}{0.13\,SF} - \underset{(-6.6)}{307.9\,DU86} \tag{5.39}$$

$$R^2 = 0.93 \quad DW = 1.84 \quad F_{(4,25)} = 83.5 \quad n = 31 \quad \underset{(2.25)}{\hat{\rho} = 0.42}$$

Estimated in logarithmic form to test for a better specification of the equation[14]:

[12] Foreign savings are calculated as the negative of the current account deficit.

[13] In the case of using the Cochrane-Orcutt technique to correct for auto-correlation of the errors, as in this case, we report the value of the auto-correlation coefficient $\hat{\rho}$. The t-statistic is reported below, in parenthesis.

[14] Foreign savings cannot be expressed in logarithms because of several negative values in the series.

$$\log DS = -2.22 + 1.01\, logGDP - 0.0003\, SF - 0.78\, DU86 \qquad (5.40)$$
$$(-3.64)\ (13.4) \qquad (-0.91) \quad (-7.7)$$

$$R^2 = 0.96 \quad DW = 1.87 \quad F_{(4,25)} = 135.4 \quad n = 31 \quad \hat{\rho} = 0.41$$
$$(2.25)$$

The results of estimating the equation in a logarithmic form improve the overall significance of the equation since the F statistic value is higher. According to the results obtained, domestic savings are strongly determined by real income, as expected from the Keynesian savings function. Concerning the effect of foreign savings on domestic savings, we find that although the sign of the coefficient is negative, it is not statistically significant, indicating that the effect of foreign savings on domestic savings is negligible.

Estimated in a ratio form, the results show that the foreign savings ratio to GDP is not statistically significant in explaining the domestic savings ratio:

$$\frac{DS}{Y} = 11.7 + 0.03\,\frac{F}{Y} - 6.24\, DU86 \qquad (5.41)$$
$$(19.8)\ (0.30) \quad (-7.44)$$

$$R^2 = 0.77 \quad DW = 1.93 \quad F_{(4,25)} = 28.22 \quad n = 31 \quad \hat{\rho} = 0.68$$
$$(5.04)$$

In the light of the literature reviewed, the results obtained show that foreign savings are mainly saved rather than consumed, since we find no statistical significance for the foreign savings coefficient. This means that the propensity to consume out of foreign savings is negligible and that, presumably, foreign savings has been devoted to investment.

An analysis of the composition of foreign capital inflows in Mexico reveals that the main component has been long term capital inflows to the public sector. Table V.A.1 in the Appendix shows the values of Mexican capital imports from 1960 until 1990, classified as foreign private investment[15], gross long term capital inflows to the public

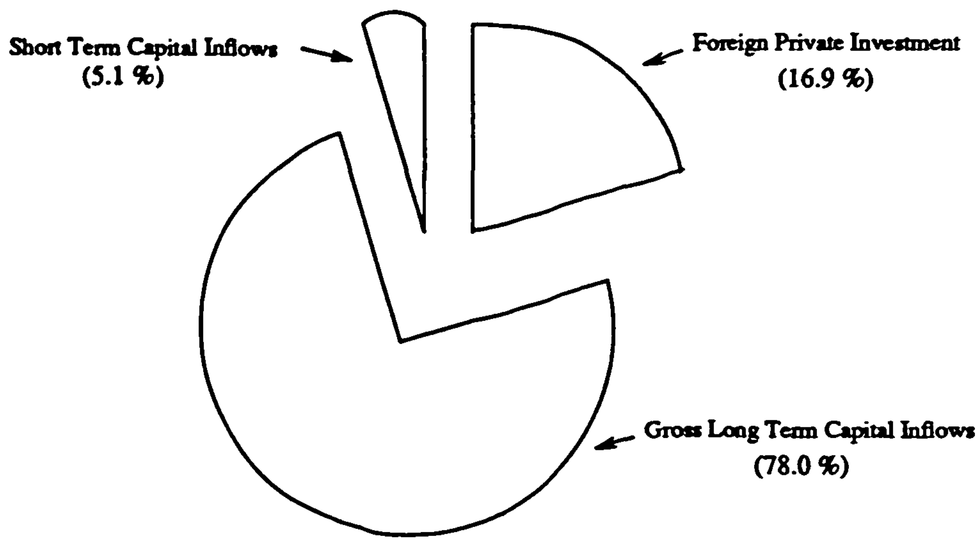
[15] Foreign private investment is composed of direct foreign investment. Only in 1989 and 1990

sector (without subtracting debt amortisation payments) and short term capital inflows (see Table V.A.1 in the Appendix). The following figure (V.1) shows the percentage composition of the accumulated values of these variables during the last 30 years:

Figure V.1

Foreign Capital Inflows

Percentage Composition



Source : Banco de Mexico and Statistcal Abstract for Latin-America

Although during the last four years (from 1987), the participation of foreign private investment has been increasing[16], the major source of foreign financing has been long term credits given to the public sector. The next equation analyses the impact of foreign capital inflows on domestic savings considering its components. Following Papanek's

are portfolio investment figures included, years during which portfolio investment increased and became a significant proportion of foreign private investment. Before 1989, figures of portfolio foreign investment are not available. Direct foreign investment includes all business enterprises in which foreign investors have a controlling interest or an important voice in management (usually a 25 percent minimum of voting stock).

[16] During 1989 and 1990, the rise in foreign private investment is partly due to the increase in portfolio investment, which represented 14 percent of total foreign private investment in 1989 and 43 percent in 1990.

hypothesis which suggests that the components of capital inflows can have a different effect on the recipient country's economy, domestic savings is first specified as a function of disaggregated foreign savings[17], i.e. foreign private investment (*FPI*), and debt creating flows (*DCF*) which are composed of net total long term capital inflows (to the public[18] and to the private sector) (*LTC*)[19], and short term capital inflows to the public and private sectors.[20] The level of real income and the dummy variable for 1986 are also included in the regression.

The result of estimating the equation in a logarithmic, which proved a better specification, is:

$$\underset{(-6.15)}{logDS = -2.52} + \underset{(17.56)}{1.07\,logGDP} - \underset{(-1.58)}{0.07\,logFPI} + \underset{(1.11)}{0.0002\,DCF} - \underset{(-6.22)}{0.74\,DU86} \quad (5.42)$$

$$R^2 = 0.96 \quad DW = 1.43 \quad F_{(4,26)} = 145.7 \quad n = 31$$
$$Serial\ Correlation : \chi_{(1)}{}^2 = 2.23$$
$$Functional\ Form : \chi_{(1)}{}^2 = 0.73$$
$$Normality : \chi_{(2)}{}^2 = 7.53$$
$$Heteroscedasticity : \chi_{(1)}{}^2 = 1.46$$

Real income remains as the main explanatory variable, while the components of foreign savings show no statistical significance at this level of disaggregation. However, if debt creating flows *DCF* is in turn divided into its components: total net long term

[17] All foreign saving components are measured for estimation purposes in billion Mexican pesos at constant 1980 prices. The series have been converted from dollars into pesos using the average exchange rate (which in turn is based on monthly averages of the exchange rate). The series in current prices were deflated with the implicit price index of capital formation (Base 1980 = 100) to obtain the series at constant 1980 prices. The source of the Balance of Payments data is Banco de México: 'Indicadores Economicos', except foreign private investment (FPI) during the 1960-1979 period, which was taken from the 'Statistical Abstract for Latin-America', whose methodology coincides with the one followed by Banco de México from 1980 onwards.

[18] Capital inflows to the public sector include capital imports of the banking sector (commercial and development banks and the Central Bank).

[19] To estimate the effect of long term financing on domestic savings, the net figures will be used (amortisation payments on the external debt are subtracted from total inflows).

[20] Net short-term capital inflows include the public, banking and private sectors.

(LTC) and short term capital (STC) inflows, we find that long term capital inflows show a weak but statistically significant positive coefficient as shown below:

$$\begin{aligned} logDS = & -2.22 + 1.03\, logGDP - 0.05\, logFPI + 0.0005\, LTC \\ & (-4.78) \quad (14.78) \qquad (-1.23) \qquad (1.75) \\ & + 0.0002\, STC - 0.71\, DU86 \\ & \quad (-0.48) \qquad (-5.99) \end{aligned} \tag{5.43}$$

$$R^2 = 0.96 \quad DW = 1.36 \quad F_{(5,25)} = 120.5 \quad n = 31$$
$$\textit{Serial Correlation}: \chi_{(1)}{}^2 = 2.74$$
$$\textit{Functional Form}: \chi_{(1)}{}^2 = 0.94$$
$$\textit{Normality}: \chi_{(2)}{}^2 = 4.03$$
$$\textit{Heteroscedasticity}: \chi_{(1)}{}^2 = 1.02$$

The equation is well determined and shows the predominance of GDP as an explanatory variable of savings. The estimated coefficient of net long term capital inflows is statistically significant at 5 percent significance level, while foreign private investment and short term capital inflows do not seem to affect the level of domestic savings. The impact coefficient of LTC on DS, calculated from the estimated coefficient and the mean values of the dependent (DS) and independent (LTC) variables, is equal to 0.19. This coefficient indicates that, on average, a 10 billion pesos rise in LTC increases domestic savings by 1.9 billion, which is a low value given the average annual flow of domestic savings equal to 380 billion pesos at constant 1980 prices.

Further enquiring into the effects of long term capital inflows on domestic savings, the latter are disaggregated into net long term foreign borrowing by the public sector (LTC_{pbl}) and by the private sector (LTC_{prv}) in order to separate their effects. In the light of the literature reviewed, foreign credit to the public and to the private sectors have separate effects on domestic savings. It is argued that foreign funds borrowed by the public sector might reduce the government's savings effort and reduce public savings. Concerning the effect of foreign credit to the private sector, it is argued that availability of foreign loans may reduce the incentive to save of domestic investors. The following equation tests this hypothesis:

$$\underset{(-4.91)}{logDS = -2.23} + \underset{(15.01)}{1.02\, logGDP} - \underset{(-0.83)}{0.04\, logFPI} + \underset{(0.55)}{0.0002\, LTC_{pbl}} \tag{5.44}$$

$$+ \underset{(2.08)}{0.002\, LTC_{prv}} - \underset{(-1.27)}{0.0006\, STC} - \underset{(-5.86)}{0.69\, DU86}$$

$$R^2 = 0.96 \quad DW = 1.59 \quad F_{(6,24)} = 105.5 \quad n = 31$$
$$Serial\ Correlation : \chi_{(1)}{}^2 = 0.88$$
$$Functional\ Form : \chi_{(1)}{}^2 = 0.89$$
$$Normality : \chi_{(2)}{}^2 = 5.35$$
$$Heteroscedasticity : \chi_{(1)}{}^2 = 0.66$$

The results show no evidence of substitution of domestic savings by any of the components of foreign savings. The major part of capital imports during the 1960-1990 period has been loans given to the public sector, as shown in figure V.1 and Table V.A.1 in the Appendix. Considering only long term borrowing by the public and private sectors, foreign loans to the public sector represent 92.4 percent of total accumulated long term loans for this period, while foreign credit to the private sector amounts to 7.6 percent. According to our results, net foreign loans to the public sector do not seem to have any effect on domestic savings. Interestingly, foreign loans given to the private sector have a positive and significant effect on domestic savings. The calculated impact of LTC_{prv} on DS is equal to 0.75[21], which, given the average annual flow of net foreign capital to the private sector of 12.3 billion pesos, represents on average a 9.1 billion rise in domestic savings. The percentage composition of total foreign long term loans between credit given to the public and to the private sector has varied during the period analysed. During the 1960's long term credit to the public sector constituted 70.2 percent while 29.8 percent was given to the private sector. From the early 1970's until 1982, the proportion of

[21] Calculated from the estimated coefficient and the mean values of DS and LTC_{prv}.

loans to the public sector increased to 86.3 percent. Analysing the data shown in Table V.A.1, it can be seen that net long term capital inflows to the private sector became negative from 1985 until 1989. Given the positive association between this variable and domestic savings, it can be argued that the fall of foreign credit to the private sector is one of the factors explaining the sharp fall in private savings, and in total savings, after 1985 (See Table 1 in the Appendix of Chapter III).

The main conclusion derived from this section of the analysis is that either considered as an homogeneous flow or as separate components, foreign capital inflows do not seem to have a negative impact on the level of domestic savings. There is no empirical evidence of foreign savings substituting domestic savings in the case of Mexico. On the contrary the empirical evidence indicates that foreign savings do not affect the level of domestic savings, except for the positive association found between net foreign borrowing by the private sector and domestic savings.

Investment (gross fixed investment *GFI*) is specified as a function of the lagged change in output ($\Delta GDP_{(t-1)}$), the real rate of interest r and foreign savings SF. By including the lagged change in GDP we test for the lagged accelerator effect on investment, and by including the real interest rate as an explanatory variable we test the direct effect of the real rate of interest on investment, as done in the third chapter of the thesis. The main objective of this equation is to test the relation between foreign savings and investment in Mexico for the 1960-1990 period. Three dummy variables are included in the equation, for the years 1981, 1983 and 1986. 1981 and 1983 were years of unusual behaviour of the economy just before and after the debt crisis began. During 1981, investment levels were unusually high because of the 'Oil-Boom', and during 1983, the investment level dropped once the economy felt the consequences of the debt crisis. The dummy variable is included for 1986 since investment was affected by the tightening of monetary and fiscal policies after the second large fall in the price of oil (see Chapters I and IV). The resulting equation is[22]:

$$GFI = 1033.4 + 0.17\,\Delta GDP_{(t-1)} - 2.86\,r + 0.93\,SF \qquad (5.45)$$
$$\quad (2.79) \quad (2.22) \qquad\qquad (-3.25) \quad (4.28)$$

$$+\,143\,DU81 - 119\,DU83 - 88\,DU86$$
$$(2.83) \qquad (-3.17) \qquad (-2.50)$$

$$R^2 = 0.98 \quad DW = 1.60 \quad F_{(6,21)} = 123.41 \quad n = 29 \quad \hat{\rho} = 0.95$$
$$(24.77)$$

where:

GFI: Gross Fixed Investment. Billion Pesos at constant 1980 prices.

$\Delta GDP_{(t-1)}$: Lagged change in GDP. Billion Pesos at constant 1980 prices.

r: Real deposit interest rate (%).

SF: Foreign Savings. Billion Pesos at constant 1980 prices.

Consistent with the results obtained in chapter III, the lagged accelerator is positive and statistically significant, indicating that investment responds to past changes in demand. A rise in the real interest rate exerts a negative impact on investment, supporting the hypothesis that money and capital are substitutes: a rise in the real deposit interest rate will encourage financial asset accumulation and discourage investment projects. Foreign savings, considered as an homogeneous flow in this case, shows an estimated positive and statistically significant coefficient. According to the estimated results, a 100 billion pesos increase in foreign capital inflows is associated with investment increasing, on average, by 93 billion pesos (at constant 1980 prices), which amounts to 15 percent of the annual average investment flow during the period analysed.

In the following equation we disaggregate foreign savings into foreign private investment (*FPI*) and net long term capital inflows to the public sector (*LTC*) to

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[22] The equation is not estimated in a logarithmic form because all of the explanatory variables have several negative values.

differentiate their impact on investment. We include three year lags of long term capital inflows in order to measure the long run effects of this variable on current investment. It has been argued that public sector capital inflows have a long term effect on growth rather than an immediate impact (see Massell et.al., 1972). One reason to expect a long term effect of *LTC* on investment is that the investment expenditure of a project can be distributed over several years. As well, public investment projects, in infrastructure or transport, can encourage further investment (as seen in chapter IV, a rise in public investment has a positive effect on private investment, increasing total investment and growth). The equation shows interesting results:

$$\underset{(4.87)}{GFI = 206.0} + \underset{(5.13)}{0.78\,\Delta GDP_{(t-1)}} + \underset{(0.60)}{1.75\,r} + \underset{(3.68)}{3.95\,FPI} + + \underset{(1.73)}{0.98\,LTC} \tag{5.46}$$

$$+ \underset{(0.41)}{0.15\,LTC_{(t-1)}} \underset{(2.82)}{1.12\,LTC_{(t-2)}} + \underset{(3.20)}{1.09\,LTC_{(t-3)}}$$

$$R^2 = 0.91 \quad DW = 1.24 \quad F_{(7,20)} = 27.54 \quad n = 28$$

$$\textit{Serial Correlation} : \chi_{(1)}{}^2 = 3.67$$
$$\textit{Functional Form} : \chi_{(1)}{}^2 = 0.17$$
$$\textit{Normality} : \chi_{(2)}{}^2 = 0.17$$
$$\textit{Heteroscedasticity} : \chi_{(1)}{}^2 = 3.53$$

The lagged accelerator remains a significant determinant of investment and the real interest rate loses its statistical significance when net long term capital inflows to the public sector are lagged. Foreign private investment seems to have a large positive impact on current investment. According to the estimated results, a 10 billion pesos (at constant prices) increase in foreign private investment is associated with a rise in total gross fixed investment of almost four times that value. However, the average value of private foreign investment is much lower than that of long term capital inflows, as shown in Figure V.1 and in Table V.A.1 in the Appendix. Concerning the effect of net long term capital inflows on investment, it can be observed that, according to the estimated results, the effect of the two and three year lagged variables is higher than the current period impact, while the one period lag is not statistically significant. These results give empirical support to the hypothesis that long term capital inflows have a positive effect on investment not only during the current period but also in the long-run.

V.5.2 Foreign Inflows and Outflows of Capital and Economic Growth

This section analyses the impact of foreign capital inflows on economic growth considering the offsetting effects of the outflow of financial resources from the recipient country, Mexico, to abroad. The model we develop for this analysis is based on the model derived from the debate between Ball (1962) and Massell (1964) presented above in section V.4.1. The model is expanded in several ways. Capital imports are considered to be formed not only by debt creating flows (net long term and short term capital inflows) but also by private foreign investment. It considers not only interest payments on the external debt, but net factor payments abroad, which include interest on the external debt of the public, private and banking sectors plus remitted earnings. Movements in the international reserves held at the Central Bank are also considered since they play an important role in short-term financing. Finally, the model incorporates 'capital flight' (or non-registered capital outflows from the private sector) as a leakage of financial resources from the country, which, as such, might have an offsetting effect on the domestic rate of economic growth. Quoting Cardoso and Dornbusch (1987): 'Capital flight is important in a developing [country] context because they represent savings not available for domestic capital formation' (p.1422). Or considering Pastor's (1990) point of view, capital flight hampers growth 'partly because investment has been diverted abroad but also because necessary imports are limited by the foreign exchange drain from capital flight' (p.1).

V.5.2.1 Definition and Measurement of Capital Flight

There are various ways of defining and measuring capital flight. It is agreed that capital flight is a 'response to a perceived risk of holding domestic assets' (Gibson and Tsakalotos, 1990, p.4). However, since no unique definition concerning the components of capital flight is given by economic theory, it is considered that an appropriate definition will be one that is consistent with the kinds of economic and policy questions under consideration (Cumby and Levich, 1987). The analysis undertaken in this chapter is concerned with the loss of domestic savings resulting from capital flight. The instability of the Mexican economy during the last two decades, characterised by inflation and several devaluations of the Mexican peso with respect to the U.S. dollar (see chapter I), led to considerable outflows of capital from Mexico. As a portfolio decision taken during this period, Mexican investors preferred to hold foreign assets abroad seeking markets or other units of account to preserve purchasing power, rather than looking for quick profits from short-term speculative movements of capital. The above considerations suggest that in the case of Mexico a broad definition and measure of capital flight is the appropriate one.

The broadest definition of capital flight is the one used by the World Bank (1985) and by Morgan Guaranty (Anthony and Hughes, 1992). These definitions do not distinguish between normal capital outflows and 'abnormal' capital outflows or capital flight. The World Bank (1985) measures capital flight as the difference between the sources and the uses of foreign capital. The difference between the addition of net capital inflows in the form of increases in the external debt and foreign direct investment and the addition of the current account deficit plus the change in international reserves, gives an approximate measure of capital flight. This definition assumes that foreign capital inflows in excess of that required to finance the deficit on current account and the change in international reserves is an increase in net foreign claims by the private sector and can be considered as capital flight.

The Morgan Guaranty definition (Anthony and Hughes, 1992) is a modification of the World Bank method. In addition to the current account deficit and the changes in the international reserves they also subtract the increase in short-term foreign assets of the banking system from total inflows. They do not consider the acquisition of foreign assets by the commercial banks as capital flight.

The definitions of capital flight used by Dooley (Cumby and Levich, 1987) and Cuddington (Cumby and Levich, 1987) distinguish between normal capital outflows and capital flight. Dooley defines capital flight as the stock of foreign claims that do not generate income reported in the balance of payments accounts. This definition assumes that the interest earned on legal and normal capital outflows would be reported in the balance of payments. Capital flight is then estimated by calculating the stock of 'legal' foreign assets from the stream of reported income and subtracting this from total external claims.[23] Additionally, Dooley adds the reported errors and omissions as part of capital flight and the difference between the World Bank's figures on external debt and the domestic balance of payments data on external liabilities. The rationale underlying these adjustments is that errors and omissions reflect capital flight and that the World Bank's debt data are more accurate than the data reported on the domestic balance of payments accounts.

Cuddington focuses only on short-term capital flows rather than all private sector acquisitions of foreign assets. He defines capital flight as the acquisition of short-term external assets by the non-bank private sector, which is calculated by adding errors and omissions to selected short-term capital items. Cuddington considers errors and omissions as unrecorded short-term capital movements and argues that errors and discrepancies arising from the capital and current accounts data collection are likely to be zero on average over a long period.

[23] According to Dooley's definition, regardless of the amount of capital outflows, if they were all reported (by reporting the earnings in the domestic balance of payments accounts) there would not be any capital flight.

Table V.1 shows the capital flight values for Mexico using different methods of estimation for the 1972-1988 period. As expected, these estimates vary considerably (see Anthony and Hughes (1992) for a discussion on these inconsistencies). For example, if the figures for the 1976-1988 period are added and compared, it can be noticed that the total varies from US$26600 million when Dooley's methodology is used, to US$69160 million when the World Bank's method is used. A US$43 billion difference arises between the two methodologies, in spite of their desire to measure the same concept. This discrepancy arises because of the way capital flight is defined and calculated.

This chapter estimates capital flight using a 'residual' approach, as the one used by the World Bank. Estimates rely on the domestic balance of payments account's data on net indebtedness.[24] The sources of foreign finance considered are: Net long-term capital of the public, private and banking sectors (subtracting amortisation payments on the external debt and long term assets); short-term liabilities of the public, private and banking sectors; foreign private investment and the change in international reserves (a net gain is recorded as a debit (-) and a net loss is recorded as a credit (+)).[25] The use of foreign finance is the financing of the deficit on current account of the balance of payments. The differences between the sources and the uses of foreign finance are the estimates of capital flight, which are shown in Table V.2 for the 1960-1990 period.[26] Capital Flight estimates show a total of US$41241 million for the 1973-1990 period. These estimates are lower than the total estimated by the World Bank's approach. This difference is due, firstly, to the different source of the debt-creating flows data.[27] Secondly, to be con-

[24] The source of the World Bank's estimates is from the World Debt Tables.

[25] The change in international reserves can be considered as a use of foreign exchange if a net rise is considered positive and a net loss is considered negative.

[26] Even though before 1973 capital flight was not a problem, the 1960-1972 period is included for consistency in the estimated model.

[27] See Zedillo (1987) for a discussion on the discrepancies arising from the sources of the data used concerning the external debt. Zedillo argues that the use of World Debt Tables data overestimates capital flight while the use of the domestic balance of payments data on external indebtedness is more consistent with other items of the balance of payments and more consistent over a period of time.

sistent with the Banco de México, which estimates a repatriation of capital during 1989 and 1990 (see Banco de México, Annual Reports, 1989 and 1990), long-term assets of the public, private and banking sectors are subtracted from total long-term liabilities[28].

Table V.1

Estimation of Capital Flight for Mexico
Using Different Methods of Calculation

Million Dollars

Year	(1)	(2)	(3)	(4)
1972	-	-	-	-673
1973	-	-	-	1031
1974	-	-	-	1053
1975	-	-	-	1443
1976	244	4413	3807	4154
1977	9578	4986	888	1307
1978	-310	1840	569	210
1979	2311	2704	1159	2175
1980	1972	7641	4799	3470
1981	-2578	6188	12218	10625
1982	-5744	6851	8891	10469
1983	9173	10782	3526	5895
1984	-1693	4722	2944	-
1985	-1187	6404	3018	-
1986	2927	3985	-994	-
1987	10156	9941	1045	-
1988	6737	-1297	1884	-

Notes:
(1) Dooley, taken from Anthony and Hughes (1992). Original source: Dooley, M.P. 'Capital Flight: A Response to Differences in Financial Risks', in *IMF Staff Papers*, Vol.35, 1988.
(2) World Bank, taken from Anthony and Hughes (1992)
(3) Cuddington, taken from Anthony and Hughes (1992). Original source: Cuddington, J.T. 'Capital Flight: Estimates, Issues and Explanations', Princeton Studies in International Finance, No.58, 1986.
(4) Zedillo (1986)

28 While long-term assets are relatively small during the whole period, reaching US$890 million in 1988, it has an outstanding value in 1990 equal to US$7427 million. The 1990 value of long-term assets corresponds to the public sector's external assets, not associated with the international reserves. This increase is due to the new bonds' guarantees which substituted the external debt with the commercial banks (Banco de México, 1990, p.153)

Table V.2

Estimated Capital Flight Million Dollars	
Year	Capital Flight*
1960	-198.0
1961	3.5
1962	27.8
1963	-8.9
1964	188.7
1965	-105.7
1966	125.4
1967	234.9
1968	36.3
1969	60.0
1970	-255.4
1971	-139.6
1972	-369.8
1973	1114.5
1974	1469.3
1975	1465.5
1976	3614.0
1977	1210.1
1978	1039.3
1979	1618.3
1980	1029.6
1981	13326.1
1982	2996.9
1983	1791.0
1984	2530.4
1985	2886.8
1986	-970.4
1987	2954.8
1988	5662.1
1989	-2084.2
1990	-43.5

* Figures are estimates.

V.5.2.2 Economic Growth with Foreign Inflows and Outflows of Capital

Stating the Balance of Payments equation as:

$$(X - M) + (FSAI - FPA) + LTC + STC + FPI + \Delta IR = 0 \qquad (5.47)$$

where:
X: Exports of goods and non-factor services
M: Imports of goods and non-factor services
$(X - M)$: Trade Balance
$FSAI$: Income from factor services abroad
FPA: Factor payments abroad (including interest payments)
LTC: Net long term capital
STC: Net short term capital
FPI: Foreign private investment
ΔIR: Change in International Reserves (a net loss is recorded as a credit (+) and a net gain is recorded as a debit (-))

If $LTC + STC + FPI + \Delta IR = F$ then, equation (5.47) is written as:

$$(X - M) + (FSAI - FPA) + F = 0 \qquad (5.48)$$

If we consider net factor payments abroad (J) as $J = FPA - FSAI$, then:

$$(X - M) - J + F = 0 \qquad (5.49)$$

Defining **capital flight**, or private non-registered capital outflows, as the difference between capital imports (including the change in international reserves) and the balance of the current account (see Zedillo, 1986 and Pastor, 1990):

$$KF = LTC + STC + FPI + \Delta IR - (M - X) - (FPA - FSAI) \qquad (5.50)$$
$$\Rightarrow \quad X + F + FSAI = KF + M + FPA \qquad (5.51)$$

The interpretation of equation (5.51) is that capital inflows and the change in international reserves (F), exports (X), and income from factor services abroad ($FSAI$) finance: imports (M), factor payments abroad ((FPA) which includes interest payments on the external debt) and capital flight (KF).

The Balance of Payments equation can then be expressed as:

$$=> \quad (X - M) - J - KF + F = 0 \tag{5.52}$$

To the extent that capital flight is a non-registered capital outflow and a leak of resources which is being invested abroad, we assume national income Y defined as:

$$Y = C + I + X - M - J' \tag{5.53}$$

where $J' = J + KF$: net factor payments abroad plus capital flight.

Domestic Output (Q) is defined as:

$$Q = C + I + X - M \tag{5.54}$$

where C is aggregate consumption, I is investment, X is exports of goods and non-factor services, and M is imports of goods and non-factor services.

The aggregate consumption (C) and output change (ΔQ) functions are given in equations (5.27) and (5.28) respectively. Dividing both sides of equation (5.28) by Q, the rate of growth of output is expressed as a function of investment and the productivity of investment (σ), without considering foreign capital movements, as:

$$g = \frac{\Delta Q}{Q} = \sigma s \tag{5.55}$$

since $S = I$ ex-post.

Using equations (5.27) and (5.52) to (5.54), to solve for investment:

$$\begin{aligned} Y &= (1 - s) Y + I - F \\ => \quad sY &= I - F \\ => \quad s(Q - J') &= I - F \\ => \quad I &= sQ + F - sJ' \end{aligned} \tag{5.56}$$

Substituting (5.56) into (5.28):

$$\Delta Q = \sigma (s\,Q + F - s\,J') \tag{5.57}$$

From which we get the expression for the rate of growth of output:

$$g^* = \frac{\Delta Q}{Q} = \sigma s + \frac{\sigma}{Q}(F - s\,J') \tag{5.58}$$

Substituting in turn $F = LTC + STC + FPI + \Delta IR$ and $J' = J + KF$:

$$g^* = \sigma s + \sigma\left(\frac{LTC + STC + FPI + \Delta IR - s\,J - s\,KF}{Q}\right) \tag{5.59}$$

From equation (5.59) it can be seen that the rate of growth of output considering net transfer of resources, g^*, is higher than $g = \sigma\,s$ if the following condition is met:

$$(LTC + STC + FPI + \Delta IR) > (s\,J + s\,KF) \tag{5.60}$$

That is, capital imports will have a positive effect on output growth only if net capital inflows are higher than the proportion s of net factor payments abroad and capital flight that would be invested domestically.

Applying the model to Mexican data for the 1960-1990 period, we first calculate the average rate of growth of output without considering foreign capital movements, as given by $g = \sigma\,s$. To do so, we refer to section V.5.1 in this chapter, where the average propensity to save out of income is estimated holding capital inflows constant. The value of s is calculated for the 1960-1990 period, by regressing net domestic savings on income (GDP) and foreign capital inflows (SF), finding an estimated value for s equal to $\hat{s} = 0.12$.

Chapter IV of this thesis gives some estimates of the value of the productivity of total investment σ. However, these calculations are done for the 1970-1990 period. Hence, here we estimate the average value of σ for the 1960-1990 period following the same methodology as in Chapter IV. The equations to be estimated are:

$$\Delta Q_t = \sigma I_t \quad \text{and} \quad g_t = \sigma \frac{I_t}{Q_t} \tag{5.61)(5.62}$$

from one of which the estimated $\hat{\sigma}$ will be chosen according to the test statistics results of both equations. Since 1982, 1983 and 1986 were years of negative growth of output, we include a dummy variable for each of these years in order not to obtain biased estimators of σ (see Section IV.4.1). The results are:

$$\begin{aligned} \Delta Q_t = &-42.5 + 0.31\, I_t - 321\, DU82 - 356\, DU83 - 290.9\, DU86 \\ &(-0.63)\ (3.85)\ \ (-7.34) \qquad (-7.31) \qquad (-7.58) \\ R^2 &= 0.89 \quad DW = 1.88 \quad F_{(5,23)} = 37.04 \quad n = 30 \quad \hat{\rho} = 0.72 \\ &\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (4.86) \end{aligned} \tag{5.63}$$

and:

$$\begin{aligned} g_t = &-5.52 + 0.57 \frac{I_t}{Q_t} - 7.0\, DU82 - 6.6\, DU83 - 6.5\, DU86 \\ &(-1.82)\ (3.77) \qquad (-3.90) \qquad (-3.24) \qquad (-3.86) \\ R^2 &= 0.80 \quad DW = 1.85 \quad F_{(5,24)} = 17.74 \quad n = 31 \quad \hat{\rho} = 0.38 \\ &\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (2.08) \end{aligned} \tag{5.64}$$

where:
Q: Real Gross Domestic Product. Billion Pesos
I: Real Gross Fixed Investment. Billion Pesos
g: Real rate of growth of output
$DU82$, $DU83$ and $DU86$: dummy variables

The results of the first estimated equation show higher values of the significance tests than the second one, specifically concerning the F statistic value. Relying thus on the estimated value of σ from equation (5.63), we consider $\hat{\sigma} = 0.31$ for the 1960-1990 period.

Given the values: $\hat{s} = 0.12$ and $\hat{\sigma} = 0.31$, the value for g (in percent) is $g = 3.72$, which gives the average rate of growth of output for the 1960-1990 period considering domestic savings as the only source of finance. We then calculate the average annual flow (in million dollars) of the variables included in condition (5.60) for the 1960-1990 period. We consider the average flow of: net long-term capital inflows of the public, private and banking sectors; foreign private investment, and the change in international reserves.[29] On the other hand, we calculate the average flows of net factor payments abroad and of the estimated capital flight. When fitted to condition (5.60) we get:

$$(\overline{LTC} + \overline{STC} + \overline{FPI} + \overline{\Delta IR}) = 3765.0 > s\,(\bar{J} + \overline{KF}) = 589.9 \qquad (5.65)$$

On average, the addition of the net inflow of capital and the change in international reserves has been higher than the loss of savings due to capital outflow. According to the model, we expect a higher average value of the actual rate of growth of output $\bar{g}^*$ than the one given by $\bar{g} = \sigma s$, $\bar{g}^* > \bar{g}$. For the whole period (1960-1990), the average actual rate of growth is equal to 5.20 percent. Thus, equation (5.59) and the implied condition (5.60) are satisfied and it can be said that on average, between 1960 and 1990 foreign capital inflows allowed the Mexican economy to grow at a faster pace than the achievable growth with only domestic savings as a source of finance. Having both foreign and domestic savings as sources of finance, the economy has grown, on average, 1.5 percent more per year than otherwise ($\bar{g}^* - \bar{g} = 1.5$).

Analysing equations (5.59) and (5.60) of the model on a yearly basis allows a more detailed test of the model. To be able to analyse how well the model adapts to annual data we had to estimate yearly values of the productivity of investment σ. These estimates (see Table V.3) are given by the inverse of the annual incremental capital-output ratio: $\sigma_t = \frac{\Delta Q_t}{I_t}$. Chapter IV of this thesis has analysed the determinants of the ICOR. It was found that the ICOR varies inversely with the rate of growth of output, and that the ICOR's value cannot be considered as a constant. Concerning the propensity to save out of income s, we have assumed $\hat{s} = 0.12$ as a constant value for the period analysed, given

[29] International reserves include: use of IMF credit, monetary gold, SDR's, foreign exchange and other claims. A net gain in international reserves is reported as a debit (-) and a net loss in international reserves is considered as a credit (+).

our findings on its stability (see Chapter III, section III.3). The resulting values of $g = \sigma s$ are shown in Table V.3. Except for 1982 and 1983, g is lower than the actual rate of growth g^*. Table V.3 also shows the annual values of the sum of net long-term and short-term capital inflows, foreign private investment and the change in reserves ($F = LTC + STC + FPI + \Delta IR$), as well as the estimated loss of domestic savings resulting from the regulated and unregulated capital outflows $s\,(J + KF)$. The last column of Table V.3 shows the difference between F and the estimated domestic savings loss. The first point to notice is that this value is positive for the whole period except for 1983, 1984 and 1987. During these three years, the net inflow of capital is negative due to a fall in foreign loans to the public sector and a negative net flow of foreign loans to the private sector. Excluding these three years, according to the estimations obtained, foreign capital inflows have been a net positive addition to domestic savings.

From 1960 until 1981 the model is satisfied: foreign savings represent a net addition to domestic savings ($F > s\,(J')$) and the actual rate of growth g^* is higher than $g = \sigma s$. However, for 1982, 1984 and 1987, the model's predictions are not satisfied. For 1982, the model predicts a higher g^* than g, when actually $g^*_{1982} = -0.60 < g_{1982} = -0.24$. In 1984 and 1987, when capital imports are negative, the model predicts $g^* < g$, and the data for these years show the opposite. It is possible that the value of σ for these years is underestimated and hence g is also underestimated. On the whole, equation (5.59) is satisfied in 27 out of 30 cases which gives a 90 percent accuracy.

Table V.4 shows period average values of g^*, g, F and $s\,(J')$. The first row shows the 1961-1970[30] period, or 'Stabilising Development' period, during which high rates of growth were achieved with internal and external balance (see Chapter I.3). The second row shows the period of expansionary economic policy, 1971 to 1981, during which the economy grew at a fast pace with a high average level of foreign capital inflows. In the third row, we show the 'Oil-Boom' sub-period (1978-1981) during which, with capital

[30] 1960 is excluded because of data unavailability.

imports at their highest level, the highest average rate of growth was achieved. The fourth row shows the period from 1982 until 1990 during which the low average growth of output, below 1 percent, coincides with a fall in capital inflows. Several issues deserve to be highlighted. First, it is noticeable the difference between g^* and g, $(g^* - g)$, achieved during the 1960's. The variable $(g^* - g)$ measures the amount by which the actual rate of growth is higher or lower than the calculated domestic savings financed rate of growth. During the 1960's this amount is quite large given that capital inflows were relatively low. According to the World Bank (1985) the contribution of capital inflows to growth during this decade is high because financing was directed to specific investment projects. Additionally, as exposed in Chapter I, growth during this period was encouraged by an expansion of domestic credit. Second, $(g^* - g)$ has the highest average value during the 'Oil-Boom' period (1978-1981) with the highest level of F for the period analysed. The World Bank (1985) argues that during this period, although a high proportion of borrowed resources continued to flow into specific investment projects, the availability of cheap foreign funds led to the rechanneling of funds into the financing of the fiscal and foreign deficits; a process that led, according to the World Bank, to a loss of the potential gains from borrowing. Thirdly, during the 1982-1990 period, the fall in F coincides with the lowest average growth and the lowest average level of $(g^* - g)$. Since 1982, available financing has been linked with debt-servicing and the balance of payments. For all periods, the model complies with the data inasmuch that a positive value of $(F - s\,(J^{\prime}))$ is associated with an actual rate of growth g^* higher than $g = \sigma s$. To estimate the extent to which the difference between g^* and g is affected by both capital imports F and loss of domestic savings $s\,(J^{\prime})$), $(g^* - g)$ is regressed on both F and $s\,(J^{\prime})$. A dummy variable for 1986 is included as the estimation results show a high residual value for this year. The resulting equation is:

$$(g^* - g) = 2.78 + 0.25F - 2.23s(J') - 5.53DU86 \qquad (5.66)$$
$$(7.89) \quad (4.46) \quad (-4.47) \qquad (-3.75)$$

$$R^2 = 0.63 \quad DW = 1.34 \quad F_{(3,26)} = 14.94 \quad n = 30$$
$$\textit{Serial Correlation}: \chi_{(1)}{}^2 = 2.16$$
$$\textit{Functional Form}: \chi_{(1)}{}^2 = 0.05$$
$$\textit{Normality}: \chi_{(2)}{}^2 = 1.05$$
$$\textit{Heteroscedasticity}: \chi_{(1)}{}^2 = 0.58$$

The equation is well determined, the coefficients show the expected sign and are statistically significant. A rise in capital imports F has a positive effect on $(g^* - g)$. According to the estimated coefficients, a 1 billion dollar rise in F increases $(g^* - g)$ by 0.25 percentage points while the loss in domestic savings due to capital outflows has a negative impact, larger in absolute terms. The positive effect of F on $(g^* - g)$ is partially offset by a rise in sJ'. On average, the impact of a rise in regulated and unregulated capital outflows on the rate of growth seems to be larger, and in opposite direction, than the effect of net foreign capital inflows. If the net addition to domestic savings $(F - sJ')$ is considered as the explanatory variable in order to compare its estimated coefficient with that of F in the last equation, the result is:

$$(g^* - g) = 1.80 + 0.14(F - s(J')) - 4.96DU86 \qquad (5.67)$$
$$(2.26) \quad (3.79) \qquad\qquad (2.53)$$

$$R^2 = 0.59 \quad DW = 1.81 \quad F_{(3,25)} = 12.24 \quad n = 30 \quad \hat{\rho} = 0.63$$
$$(3.68)$$

The estimated coefficient of $(F - sJ')$ is positive but lower than that of F in the previous equation. According to the results obtained, it can be argued that the loss of domestic savings as a consequence of capital outflows does reduce the effect that foreign capital inflows has on financing additional growth.

Bearing in mind the estimation errors involved in the calculation of the productivity of investment σ and hence on the calculated rate of growth $g = \sigma s$, the following can be concluded. It is found for the case of Mexico that the model is accurate in explaining that provided net foreign capital inflows are higher than the loss of savings caused by capital outflows, the rate of growth of output is higher than the growth rate obtainable with domestic savings as the only source of finance. However, the loss of savings due to capital outflows reduces the positive impact on growth.

Table V.3

Year	$\hat{\sigma} = \frac{\Delta Q}{I}$	$g = \hat{\sigma} s$ (%)	Actual g^* (%)	$g^* - g$	$LTC + STC + FPI + \Delta IR$ (Mill.Dlls.) (1)	$s(J + KF)$ (Mill.Dlls.) (2)	(1) - (2) (Mill.Dlls.)
1960	-	-	8.0	-	338.2	-9.14	347.3
1961	0.27	3.24	4.9	1.66	347.2	14.6	332.6
1962	0.25	3.00	4.7	1.70	277.4	18.7	258.7
1963	0.40	4.80	8.0	3.20	217.4	16.2	201.0
1964	0.53	6.36	11.7	5.34	633.4	43.7	589.7
1965	0.31	3.72	6.5	2.78	337.2	8.9	328.3
1966	0.32	3.84	6.9	3.06	573.2	41.2	532.0
1967	0.27	3.24	6.3	3.06	902.3	59.7	842.6
1968	0.34	4.08	8.1	4.02	811.7	42.7	769.0
1969	0.27	3.24	6.3	3.06	786.4	52.6	733.8
1970	0.32	3.84	6.9	3.06	932.5	26.8	905.7
1971	0.21	2.52	4.2	1.68	789.3	44.7	744.6
1972	0.40	4.80	8.5	3.70	645.8	21.9	623.9
1973	0.38	4.56	8.4	3.84	2665.5	212.3	2453.2
1974	0.27	3.24	6.1	2.86	4697.4	287.8	4409.6
1975	0.25	3.00	5.6	2.60	5944.0	351.0	5593.0
1976	0.19	2.28	4.2	1.92	7309.3	661.2	6648.1
1977	0.18	2.16	3.4	1.24	2807.5	377.2	2430.3
1978	0.38	4.56	8.3	3.74	3752.9	410.7	3342.2
1979	0.38	4.56	9.2	4.64	6528.4	598.8	5929.6
1980	0.33	3.96	8.3	4.34	11886.2	931.4	10954.8
1981	0.29	3.48	8.8	5.32	29341.9	2833.6	26508.3
1982	-0.02	-0.24	-0.6	-0.36	9086.1	1854.8	7231.3
1983	-0.23	-2.76	-4.2	-1.44	-3406.8	1326.8	-4733.6
1984	0.22	2.64	3.6	0.96	-1411.9	1511.3	-2923.2
1985	0.16	1.92	2.6	0.68	1990.6	1414.2	576.4
1986	-0.35	-4.20	-3.8	0.40	1430.4	807.7	622.7
1987	0.12	1.44	1.7	0.26	-428.9	1202.0	-1630.9
1988	0.09	1.08	1.4	0.32	8998.3	1533.5	7464.8
1989	0.18	2.16	3.2	1.04	4200.9	686.0	3514.9
1990	0.21	2.52	3.9	1.38	13732.3	904.0	12828.3

Source: Banco de México and Statistical Abstract for Latin-America

Notes:

LTC: Net long-term borrowing of the public, private and banking sectors
STC: Net short-term borrowing of the public, private and banking sectors
FPI: Foreign private investment
ΔIR: Change in international reserves (a net increase is recorded as a debit (-) and a net fall is recorded as a credit (+))
J: Net factor payments abroad = factor payments abroad - income from factor services
KF: estimated capital flight

Table V.4

Period Averages						
Period	$g = \hat{\sigma} s$ (%)	Actual g^* (%)	$g^* - g$	$LTC + STC + FPI + \Delta IR$ (Mill.Dlls.) (1)	$s(J + KF)$ (Mill.Dlls.) (2)	(1) - (2) (Mill.Dlls.)
1960-1990	3.72	5.20	1.48	3765.0	589.9	3175.1
1961-1970	3.94	7.30	3.40	581.9	32.5	549.4
1971-1981	3.60	6.82	3.22	6942.6	611.9	6330.7
1978-1981	4.10	8.70	4.60	12877.4	1193.6	11683.8
1982-1990	0.51	0.87	0.36	3799.0	1248.9	2550.1

Source: Banco de México and Statistical Abstract for Latin-America

V.5.3 Net Transfers, Capital Flight and Economic Growth.

This section explores the relationship between net transfers of resources, capital flight and economic growth in Mexico for the 1960-1990 period.

Net transfers of resources have been defined as the difference between net capital inflows F and net factor payments abroad J, which is equivalent to the trade balance. Capital flight (KF) is an unregistered capital outflow that, as Dornbusch points out, 'imposes a further transfer burden [on the domestic economy]' (Dornbusch, 1990, p.143). Especially after 1973, when capital flight figures became significant, it is important to consider this capital outflow as it represents a net resource transfer from the country. Hence, both net factor payments and capital flight are considered as negative transfers of resources ($J' = J + KF$).

Figure V.2 shows a comparison of the estimated average rate of growth obtainable with domestic savings alone for the 1960-1990 period, $\bar{g} = 3.72$, and the annual actual rate of growth g^*_t.

In 1977, and from 1982 until 1989, g^*_t is lower than $\bar{g} = 3.72$. Interestingly, yet not surprisingly, the relation between g^*_t and $\bar{g}$ coincides in direction with the value of $(F - J')$. That is, for the years when $(F - J') > 0$, the actual rate of growth is higher than $\bar{g}$, and for the years when $(F - J') < 0$, $g^*_t < \bar{g}$.

Figure V.2

Actual Rate of Growth of Output g*

and g = s

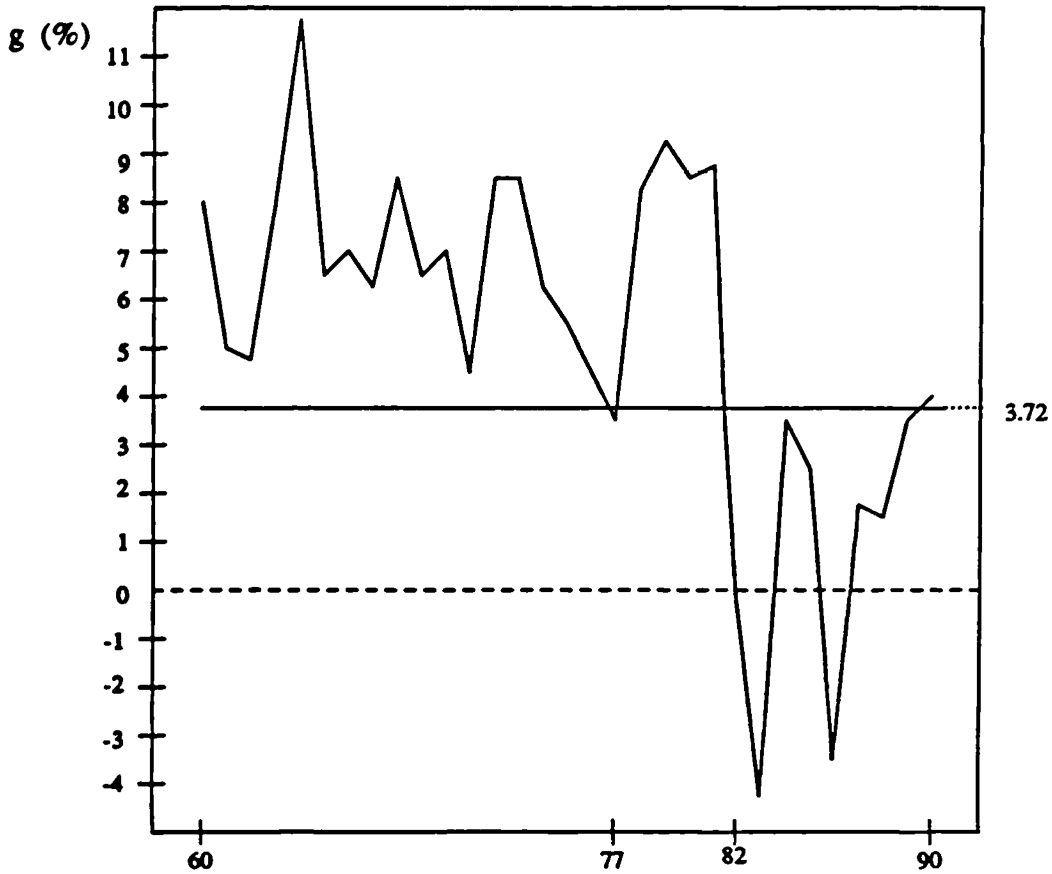

Table V.5 shows the estimated values of $(F - J')$ from 1960 until 1990. It can be seen that for 1977 and from 1982 until 1989, the value of $(F - J')$ is negative, years when the actual rate of growth is lower than $\bar{g}$. And for the rest of the years, during which $g^*_t > \bar{g}$, $(F - J')$ is positive. The visible relationship between net transfers of resources (including capital flight as a negative outflow) and economic growth shows that positive net transfers, by relaxing the foreign exchange constraint, allow for higher rates of growth. When net transfers are negative, the rate of growth of output does not exceed the calculated average rate of growth financed by domestic savings.

Table V.5

$(F - J')$ Million Dollars	
Year	$(F - J')$
1960	414.4
1961	225.7
1962	121.5
1963	82.6
1964	269.4
1965	263.2
1966	229.5
1967	405.1
1968	456.0
1969	348.0
1970	709.3
1971	416.7
1972	463.2
1973	896.5
1974	2299.4
1975	3019.3
1976	1799.2
1977	-335.5
1978	330.6
1979	1538.8
1980	4124.2
1981	5728.5
1982	-6370.2
1983	-14463.2
1984	-14006.2
1985	-9794.8
1986	-5300.6
1987	-10445.9
1988	-3780.8
1989	-1515.7
1990	6199.1

V.6 Conclusions

The discussion in the theoretical part of this chapter dealing with the effect that foreign capital inflows have on the recipient country's domestic savings indicates a lack of consensus on this issue. Disagreement exists on both statistical and theoretical levels concerning the interpretation of the estimated coefficient and the direction of the causality effect between capital imports and domestic savings. However, much of the debate seems to be based more on statistical rather than theoretical reasoning. Because of the way domestic savings are defined, a negative coefficient of domestic savings on foreign savings shows that a proportion of foreign savings is consumed without this implying a reduction of domestic savings. This statistical result does not imply that foreign savings substitute domestic savings, a result that undermines the argument put forward by the "Savings Debate" theorists.

For the case of Mexico, the results show that domestic savings are determined by the level of income, while the estimated foreign savings coefficient shows no statistical significance. No empirical evidence is found supporting a substitution effect of foreign savings on domestic savings, either considering the former as a homogeneous flow or at a disaggregated level.

Concerning the effect of foreign savings on investment, the empirical evidence found by many studies including this one suggests that foreign capital inflows do finance additional investment. The correlation between these variables is positive and significant. The results obtained show an estimated coefficient close to unity indicating that a very high proportion of foreign savings is invested, a result which is also supported by the non-statistically significant estimated coefficient of foreign savings in the domestic savings equation. At the same time, it is found that the level of investment is determined by demand factors since the lagged accelerator coefficient is statistically significant. Additionally, support is found for the hypothesis that the effect of foreign credit (long-term capital) on investment is larger in the long run than in the short run, due to the long-term nature of foreign loans destined for investment and to the externality effects that this investment has on inducing further investment projects.

As far as economic growth is concerned, the analysis shows that foreign capital inflows finance additional growth provided they exceed the loss of domestic savings provoked by capital outflows. For the Mexican economy, the conditions of the model are satisfied: on average, net foreign capital inflows exceed the loss of domestic savings at the same time that the actual rate of growth of output is higher than the calculated growth rate financed only by domestic resources. It is found that a net inflow of capital provides additional growth, but that capital outflows, regulated and unregulated, reduce this effect by causing a loss of domestic savings.

The evident relationship found between net transfers of resources (considering capital flight as a negative transfer) and economic growth performance indicates that economic growth is to a large extent determined by the availability of foreign exchange. If foreign exchange ceases to be available, the economy cannot grow faster than the growth rate determined by equilibrium on the current account of the balance of payments - also called the balance of payments equilibrium growth rate.

APPENDIX

Table V.A.1

Foreign Capital Inflows Million Dollars				
Year	Foreign Private Investment (1)	Gross Long-term Capital Inflows to the Public Sector (2)	Long-term Capital Inflows to the Private Sector (3)	Short-term Capital Inflows Total (4)
1960	67.9	352.1	27.5	70.7
1961	94.4	357.3	24.3	33.7
1962	127.0	400.9	33.2	1.1
1963	81.4	424.0	14.8	40.4
1964	112.1	752.1	133.5	60.3
1965	214.0	370.6	35.6	120.1
1966	183.0	598.6	113.7	168.1
1967	130.0	763.4	161.9	323.6
1968	227.0	818.3	99.1	277.5
1969	297.0	1041.3	101.6	-62.1
1970	323.0	828.2	119.9	330.2
1971	307.0	793.4	233.4	157.2
1972	301.0	1017.2	293.5	-95.4
1973	457.0	2110.6	486.3	635.6
1974	678.0	2766.4	471.8	1509.8
1975	609.0	4421.6	635.2	1281.6
1976	628.0	5417.9	340.6	1122.0
1977	556.0	6232.3	103.9	-1067.7
1978	824.0	8343.3	259.9	-960.1
1979	1337.0	10415.0	752.7	1710.9
1980	2155.0	10323.9	1668.4	2243.6
1981	2835.8	18587.5	2249.0	11710.5
1982	1657.5	13931.9	1356.6	-5930.9
1983	460.5	8257.2	545.6	-5062.8
1984	391.1	5488.6	386.5	-1972.0
1985	490.5	3401.7	-431.1	-751.9
1986	1521.9	3985.2	-469.5	-203.7
1987	3247.6	8796.0	-2285.8	-833.3
1988	2594.6	5855.0	-3065.1	183.7
1989	3530.3	5878.8	-1119.1	-47.1
1990	4627.7	10597.9	589.3	4354.3

Source: Banco de México and Statistical Abstract for Latin-America.

Notes:

(1). Foreign private investment is direct investment, only in 1989 and 1990 figures on portfolio investment are available and detached from direct investment. Portfolio investment is US $493.3 and US $1994.5 million in 1989 and 1990 respectively.

(2). Gross long-term capital inflows to the public and banking sectors (commercial and development banks and Central Bank), amortisation payments are not deduced. (3). Gross long-term capital inflows to the private sector (other than foreign private investment).

(4). Short-term capital inflows to the public, private and banking sectors. Short-term assets are not deduced.

CHAPTER VI

THE BALANCE OF PAYMENTS CONSTRAINT ON THE RATE OF ECONOMIC GROWTH

VI.1 Introduction

Unless a country is a net recipient of capital inflows, it cannot grow faster than the rate of growth of output consistent with balance of payments equilibrium on current account. Although long periods of a prevailing deficit in the current account have been experienced by many countries during the last three decades, the events of the 1980's exposed the unlikelihood of a country being permanently a net recipient of external capital, showing that sooner or later a country's economy must adjust to an equilibrium position in its current account. Starting from this proposition, Thirlwall (1979, 1982, 1989) has developed a model in which the long run rate of growth of output of an open economy, assumed to be in balance of payments equilibrium, is determined by its export capacity, measured by the real rate of growth of exports, and by its dependence on imports to expand output, measured by the income elasticity of demand for imports. How well the balance of payments equilibrium growth rate approximates the actual growth rate of a country is one test of the model.

The model assumes that output growth is driven by the expansion of the components of demand. In turn, the expansion of demand is determined by the constraint set by the balance of payments. Demand can expand up to the point where the necessary imports to expand output can be financed. Therefore, the balance of payments sets the ultimate constraint on output growth. In this sense, exports are distinguished from the other components of demand by being the only one that provides foreign exchange at the same time as inducing the expansion of demand. If the limit of demand expansion set by the balance of payments is exceeded, thus incurring an external deficit, demand has to be curtailed up to the point where imports can be financed. Thus, it is the level of income that adjusts to restore equilibrium in the balance of payments.

Thirlwall's model implies and assumes that in the long run the real terms of trade remain constant (or that terms of trade movements do not act as an efficient balance of payments adjustment mechanism). Consequently, the effects on output growth of capital inflows and of movements in the real terms of trade can be derived from the difference between actual growth performance and the rate predicted assuming balance of payments equilibrium and no change in the real terms of trade. In this chapter, the model is examined first theoretically and then tested for the specific case of Mexico.

The second section of this chapter develops the balance of payments constrained growth model and its modification for the case of developing countries where capital inflows play an important role. The section analyses the results reached by the model with and without including capital inflows, and elaborates on what these results imply concerning the effects that relative price movements have on the balance of payments and hence on growth. The third section reviews the results of applying the model to data of developed and developing countries, as well as some statistical tests on the predictive accuracy of the model. Section four examines theoretical aspects and empirical evidence regarding the estimation of the price and income elasticities of export and import demand. It reviews the specification of export and import demand functions as well as some of the elasticity values found, in order to compare them with the elasticity values estimated in this work. Section five contains in the first part the income and price elasticity estimates for Mexico, and in the second part the results of applying the model to the analysis of Mexico's growth experience from 1960 to 1990.

The sources of the data used in this chapter are: Banco de México's Economic Indicators, the Statistical Abstract for Latin America, the United Nations Economic Survey on Latin America and the IMF's International Financial Statistics. As in the previous chapters, regressions are done with the Ordinary Least Squares method applying the Cochrane-Orcutt technique in the case of auto-correlation of the errors. Besides reporting the R^2, DW and F statistics the study shows the results of the serial correlation, functional form, normality and heteroscedasticity tests.[1]

VI.2 The Balance of Payments Constrained Growth Model

The model developed by Thirlwall (1979, 1982, 1989) essentially argues that a country's rate of growth of output in the long run is determined by its capacity to export and its dependence on imports, measured by the rate of growth of exports and the income elasticity of demand for imports, respectively. The model is based on the trade multiplier developed by Harrod in 1933. The Harrod trade multiplier in its simplest form (see Harrod (1933), Kennedy and Thirlwall (1979), Thirlwall (1982)) assumes an economy where total income is derived from the production of goods for domestic consumption (C) and exports (X), while total expenditure is divided between home consumption goods (C) and imports (M). With a constant terms of trade, the equality between total income and expenditure implies equilibrium in the trade balance: $X = M$. If m is the proportion of income devoted to imports, then: $Y = \frac{1}{m}X$ or $\Delta Y = \frac{1}{m}\Delta X$, where $\frac{1}{m}$, the trade multiplier, represents the amount by which output changes to restore balance between imports and exports given an autonomous change in exports.

Keeping the assumption of a constant terms of trade, the static multiplier adopts a dynamic form if, using Harrod's equilibrium condition, we multiply the LHS of $\frac{\Delta X}{\Delta Y} = m$ by $\frac{Y}{X}$ and the RHS by $\frac{Y}{M}$:

[1] The Chi-square value of the serial correlation, functional form, normality and heteroscedasticity tests should be lower than the critical values of χ^2 at acceptable levels of significance. At a 5 percent significance level, the critical values are $\chi^2_{(1)} = 3.84$ and $\chi^2_{(2)} = 5.99$ with one and two degrees of freedom respectively.

$$\frac{\Delta X}{\Delta Y}\frac{Y}{X}=\frac{\Delta M}{\Delta Y}\frac{Y}{M} \tag{6.1}$$

By rearranging terms in the above equation and solving for $\frac{\Delta Y}{Y}$ we get the dynamic Harrod trade multiplier:

$$\frac{\Delta Y}{Y}=\frac{\frac{\Delta X}{X}}{\frac{\Delta M}{\Delta Y}\frac{Y}{M}} \tag{6.2}$$

or

$$y=\frac{x}{\pi} \tag{6.3}$$

where y is the rate of growth of real income, x is the rate of growth of exports and π is the income elasticity of demand for imports.

The dynamic Harrod trade multiplier can also be reached through the balance of payments constrained growth rate model. This model is derived in Thirlwall (1979, 1982, 1989), where the balance of payments equilibrium condition measured in domestic currency is expressed by:

$$P_{dt} X_t = P_{ft} M_t E_t \tag{6.4}$$

where P_{dt} is the domestic price level at time t, X_t is the volume of exports, P_{ft} is the foreign price level, M_t is the volume of imports and E_t is the exchange rate.

Exports and imports are specified as multiplicative functions of relative prices and income with constant elasticities as:

$$X_t=\left(\frac{P_{dt}}{P_{ft}E_t}\right)^{\eta} Z_t^{\varepsilon} \quad \text{and} \quad M_t=\left(\frac{P_{ft}E_t}{P_{dt}}\right)^{\psi} Y_t^{\pi} \qquad (6.5)(6.6)$$

where Z_t is the level of world income; Y_t is domestic income; η is the price elasticity of demand for exports ($\eta < 0$); ψ is the price elasticity of demand for imports ($\psi < 0$); ε is the income elasticity of demand for exports ($\varepsilon > 0$) and π is the income elasticity of demand for imports ($\pi > 0$).

Equations (6.5) and (6.6) are substituted into (6.4) to give:

$$\frac{P_{dt}^{\eta+1} Z_t^{\varepsilon}}{(P_{ft} E_t)^{\eta}} = P_{ft}^{(\psi+1)} \frac{E_t^{(\psi+1)}}{P_{dt}^{\psi}} Y_t^{\pi} \tag{6.7}$$

from which:

$$Y_t^{\pi} = \frac{P_{dt}^{1+\eta+\psi} Z_t^{\varepsilon}}{P_{ft} E_t^{(1+\eta+\psi)}} \tag{6.8}$$

$$=> \quad Y_t^{\pi} = P_{dt}^{(1+\eta+\psi)} Z_t^{\varepsilon} P_{ft}^{-(1+\eta+\psi)} E_t^{-(1+\eta+\psi)} \tag{6.9}$$

Taking natural logarithms of equation (6.9) and differentiating with respect to time gives:

$$\pi y_t = (1+\eta+\psi) p_{dt} + \varepsilon z_t - (1+\eta+\psi) p_{ft} - (1+\eta+\psi) e_t \tag{6.10}$$

where lower case letters represent rates of growth. Grouping terms and solving for y_t gives the rate of growth of income consistent with balance of payments equilibrium:

$$y_{Bt} = \frac{(1+\eta+\psi)(p_{dt} - p_{ft} - e_t) + \varepsilon z_t}{\pi} \tag{6.11}$$

This last equation expresses that, in the long run, the growth rate consistent with equilibrium in the balance of payments is positively affected by output growth abroad via its effect on export growth, inversely affected by the income elasticity of demand for imports, while the total relative price effect on growth depends on the value of the price elasticities η and ψ (see below).

To obtain the dynamic Harrod trade multiplier result, the assumption of constant relative prices measured in the same currency must hold in the long run, implying that $p_{dt} - p_{ft} - e_t = 0$ so that:

$$y_{Bt} = \frac{\varepsilon z_t}{\pi} \tag{6.12}$$

or:[2]

$$y_{Bt} = \frac{x_t}{\pi} \tag{6.13}$$

Assuming constant real terms of trade in the long run, an open economy's real rate of growth of output consistent with balance of payments equilibrium is determined by the rate of growth of exports divided by the income elasticity of demand for imports. This ratio $\frac{x_t}{\pi}$, which is equivalent to the dynamic Harrod trade multiplier, constitutes Thirlwall's basic result.

VI.2.1 Capital Inflows, Balance of Payments and the Rate of Growth of Income

To apply the Harrod trade multiplier to developing countries, the majority of which have had persistent deficits in current account over the last two decades, the model has to account for the effect of foreign capital inflows on growth. Expressing the balance of payments equation starting from disequilibrium on the current account as:

$$P_{dt} X_t + C_t = P_{ft} M_t E_t \tag{6.14}$$

where C_t measures net capital inflows in domestic currency, and taking rates of change, gives:

$$\frac{E}{R}(p_{dt} + x_t) + \frac{C}{R} c_t = p_{ft} + m_t + e_t \tag{6.15}$$

where $\frac{E}{R}$ and $\frac{C}{R}$ are the proportions of exports earnings and capital inflows, respec-

[2] The result $y_t = \frac{\varepsilon z_t}{\pi} = \frac{x_t}{\pi}$ is reached using equation (6.5) in rates of growth form where $x = \eta(p_{dt} - p_{ft} - e_t) + \varepsilon z_t$ or, $x = \varepsilon z_t$ if the real terms of trade remain the same i.e. $(p_{dt} - p_{ft} - e_t) = 0$.

tively, in total foreign exchange receipts[3], $(\frac{E}{R} + \frac{C}{R}) = 1$.

Taking natural logarithms of equations (6.5) and (6.6), and differentiating with respect to time gives:

$$x_t = \eta\,(p_{dt} - p_{ft} - e_t) + \varepsilon\, z_t \tag{6.16}$$

and

$$m_t = \psi\,(p_{ft} + e_t - p_{dt}) + \pi\, y_t \tag{6.17}$$

Substituting equations (6.16) and (6.17) into (6.15) and solving for y_t:

$$y_t = [(\frac{E}{R}\eta + \psi)(p_{dt} - p_{ft} - e_t) + \frac{E}{R} p_{dt} + \frac{E}{R}\varepsilon z_t + \frac{C}{R} c_t - p_{ft} - e_t]\,\frac{1}{\pi} \tag{6.18}$$

Since $\frac{E}{R} p_{dt} = (1 - \frac{C}{R}) p_{dt}$, then:

$$y_t = [(\frac{E}{R}\eta + \psi)(p_{dt} - p_{ft} - e_t) + (p_{dt} - p_{ft} - e_t) + \frac{E}{R}\varepsilon z_t + \frac{C}{R}(c_t - p_{dt})]\,\frac{1}{\pi} \tag{6.19}$$

Equation (6.19) expresses the balance of payments constrained growth rate starting from initial disequilibrium in the current account. The equation states that output growth in the long run is governed by the following determinants: the volume response of exports and imports to changes in relative prices measured in the domestic currency, represented by the first term on the right hand side of the equation; the rate at which the real terms of trade are changing $(p_{dt} - p_{ft} - e_t)$, or pure terms of trade effect; the effect that the rate of growth of the world economy has on domestic exports, εz_t; the rate of growth of real capital inflows measured in domestic currency, $(c_t - p_{dt})$; and lastly by the domestic economy's dependence on imports, π.

Concerning the pure terms of trade, a rise in the relative price ratio $(\frac{P_{dt}}{P_{ft} E_t})$, or

[3] These proportions are introduced in the equation to account for the appropriate weight of exports and capital inflows, since the base levels from where the rates of growth depart are not the same.

$(p_{dt} - p_{ft} - e_t) > 0$, has a positive effect on y_t other things remaining equal, and a deterioration in the terms of trade, $(p_{dt} - p_{ft} - e_t) < 0$, worsens the balance of payments and lowers the constrained growth rate y_t. However, the terms of trade effect is not complete without considering the volume response of exports and imports to changes in relative prices, which is given by the price elasticities η and ψ respectively. Assuming no capital inflows so that $\frac{E}{R} = 1$ and $\frac{C}{R} = 0$, equation (6.19) reduces to (6.11). Then, it can be seen more clearly that if the addition of the price elasticities of exports and imports is higher than unity in absolute terms, $|\eta + \psi| > 1$, the deterioration of the terms of trade, i.e. foreign prices rising faster than domestic prices $(p_{dt} - p_{ft} - e_t) < 0$ improves the balance of payments situation and increases y_t. As well, equations (6.11) or (6.19) reflect the Marshall-Lerner condition which states that depreciation of the domestic currency, $e_t > 0$, will improve the balance of payments and hence y_t, while appreciation $e_t < 0$ will worsen the balance of payments, provided that $|\eta + \psi| > 1$. But if η and ψ have low values and $|\eta + \psi| < 1$, then deterioration of the terms of trade will worsen the balance of payments and reduce the rate of growth consistent with equilibrium in the balance of payments.

Output growth abroad exerts a positive effect on domestic export and output growth. The magnitude of the effect of income growth abroad z_t on domestic growth will depend on the income elasticity of demand for exports ε which captures the non-price factors of export competitiveness in foreign market. A higher value of ε implies a stronger response of domestic exports to changes in foreign market growth rates.

Concerning the effect of capital inflows on growth, it can be seen that if the real growth rate is positive $(c_t - p_{dt}) > 0$ and $\frac{C}{R} > 0$, output growth will be higher than if y_t was constrained to maintain balance of payments equilibrium on current account.

Finally, as the income elasticity of demand for imports measures the dependency of the economy on imports, the equation reveals that the higher is π, the lower the value of the rate of growth of output consistent with equilibrium on the balance of payments.

Constant relative prices measured in a common currency is a strong theoretical assumption that nevertheless seems to reflect reality. Thirlwall (1979, 1982), Bairam (1990), Bairam and Dempster (1991) and Soukiazis (1990) accept the hypothesis that relative prices measured in a common currency tend to remain constant in the long run: $(p_{dt} - p_{ft} - e_t) = 0$. International price differences tend to be eliminated in the long run either because of international competition[4] or because depreciation of the exchange rate triggers domestic inflation eliminating the difference between p_{dt} and p_{ft} such that $e_t = p_{dt} - p_{ft}$. Although the assumption of real terms of trade being constant in the long run has been debated (McGregor and Swales, 1986), it is widely accepted that price elasticities of imports and exports of developing countries tend to have either a much lower absolute value than the income elasticities or are not statistically different from zero (Houthakker and Magee (1969), Bond (1985), Goldstein and Khan (1985), Marquez and McNeilly (1988)).

If the constant relative prices hypothesis is accepted, equation (6.19) becomes:

$$y_{Bt}^{*} = \frac{\frac{E}{R}\varepsilon z_t + \frac{C}{R}(c_t - p_{dt})}{\pi} \tag{6.20}$$

or, using equation (6.16):

$$y_{Bt}^{**} = \frac{\frac{E}{R}x_t + \frac{C}{R}(c_t - p_{dt})}{\pi} \tag{6.21}$$

since $x_t = \varepsilon z_t$ when $(p_{dt} - p_{ft} - e_t) = 0$. The balance of payments constrained growth rate, starting from initial disequilibrium and assuming constant relative prices, is determined in the long run by the weighted sum of the rate of growth of exports and the

[4] In highly competitive markets, price differences are not sustainable in the long run as expressed by the Law of One Price.

growth of real capital inflows, both divided by the income elasticity of demand for imports. Considering the world's output growth z_t, and the rate of growth of capital inflows, as exogenously determined for a developing country, it is only through improving export performance and/or reducing the economy's dependence on imports that the country can increase its rate of growth without falling into balance of payments disequilibrium. Otherwise, the rate of growth is conditioned by the rate of growth of capital inflows.

Since equation (6.19) is derived from a balance of payments identity, any deviation of the extended model $y_{Bt}*$ from the actual rate of growth y_t must reflect the effects of a change in the real terms of trade either relaxing or tightening the balance of payments constraint, according to the direction of movement in the real terms of trade and to the volume response of exports and imports offsetting or reinforcing the pure terms of trade effect.

From equations (6.19) and (6.20) it can be seen that if $y_{Bt}*$ overpredicts y_t, it implies that:

$$(y_{Bt}* - y_t) > 0 \tag{6.22}$$

$$=> \quad (\frac{E}{R}\eta + \psi + 1)(p_{dt} - p_{ft} - e_t) < 0 \tag{6.23}$$

And if $y_{Bt}*$ underpredicts y_t it implies:

$$(y_{Bt}* - y_t) < 0 \tag{6.24}$$

$$=> \quad (\frac{E}{R}\eta + \psi + 1)(p_{dt} - p_{ft} - e_t) > 0 \tag{6.25}$$

Four cases[5] can now be distinguished through which $y_{Bt}*$ over or underpredicts y_t:

Case 1.- A deterioration of the real terms of trade that is reinforced by an adverse

[5] Assuming the price elasticities η and ψ have normal values, i.e. $\eta < 0$ and $\psi < 0$.

volume response of exports and imports to changes in relative prices: $(p_{dt} - p_{ft} - e_t) < 0$ and $(1 + \frac{E}{R}\eta + \psi) > 0$, (which in turn implies that $|\frac{E}{R}\eta + \psi| < 1$), tightens the balance of payments constraint on growth. Hence, y_{Bt}* overpredicts y_t.

Case 2.- An improvement of the real terms of trade is reinforced by a low volume response of exports and imports: $(p_{dt} - p_{ft} - e_t) > 0$ and $(1 + \frac{E}{R}\eta + \psi) > 0$, thus relaxing the balance of payments constraint. Therefore, y_{Bt}* underpredicts y_t.

Case 3.- The deterioration in the real terms of trade is more than offset by the volume response of exports and imports: $(p_{dt} - p_{ft} - e_t) < 0$ and $(1 + \frac{E}{R}\eta + \psi) < 0$, implying that the price elasticities have the 'right' values $|\frac{E}{R}\eta + \psi| > 1$ (in the sense that they fulfill the Marshall-Lerner condition), relaxes the balance of payments constraint, leading to the underprediction of the real rate of growth y_t.

Case 4.- An improvement in the real terms of trade is more than offset by the volume response of exports and imports: $(p_{dt} - p_{ft} - e_t) > 0$ and $(1 + \frac{E}{R}\eta + \psi) < 0$, tightening the balance of payments constraint on growth, leading to overprediction of y_t.

Finally, if y_{Bt}* is a good predictor of y_t it means either that the volume response of exports and imports to changes in relative prices and the pure terms of trade effect have offset each other, as expressed by the following equation:

$$(\frac{E}{R}\eta + \psi)(p_{dt} - p_{ft} - e_t) = -(p_{dt} - p_{ft} - e_t) \tag{6.26}$$

or that relative price movements measured in the domestic currency have remained unchanged, $(p_{dt} - p_{ft} - e_t) = 0$.

Table VI.1 shows movements in the real exchange rate index over the 1968-1990 period.[6] Variations of the real exchange rate index are relatively smaller during the

[6] See section VI.5.1 below for the method of calculation of the real exchange rate index.

1970's than during the 1980's.

Table VI.1

Real Exchange Rate Index Base 1970=100	
Year	Real Exchange Rate Index
1968	98.4
1969	100.6
1970	100.0
1971	100.8
1972	104.5
1973	106.4
1974	96.9
1975	94.3
1976	103.3
1977	129.4
1978	124.0
1979	120.5
1980	107.8
1981	90.8
1982	124.2
1983	135.2
1984	110.9
1985	106.8
1986	155.9
1987	169.8
1988	140.3
1989	128.2
1990	128.0

Source: Banco de México

The level of the real exchange rate index in 1980 is only 7.8 percent higher than in 1970. Even though the real exchange rate index in 1985 is only 6.8 percent higher than in 1970, its volatility during the 1980's does not indicate a stable behaviour of relative prices measured in a common currency during this decade. This behaviour is reflected in the empirical results later where it is found that the Harrod trade multiplier model (with capital flows) predicts well when the terms of trade have been relatively constant, but badly when the terms of trade changed dramatically.

Let us now consider the relationship between the dynamic Harrod trade multiplier (equation (6.13)) and the extended model as expressed in equation (6.21), in both of which a constant real terms of trade is assumed. It can be seen that the dynamic Harrod trade multiplier y_{Bt} will equal y_{Bt}** if either there are no capital inflows, $\frac{C}{R} = 0$, or the rate of growth of exports equals the rate of growth of real capital inflows:

$$y_{Bt} = y_{Bt}^{**} \tag{6.27}$$

$$\Rightarrow \quad x_t = \frac{E}{R} x_t + \frac{C}{R}(c_t - p_{dt}) \tag{6.28}$$

$$\Rightarrow \quad x_t = c_t - p_{dt} \tag{6.29}$$

Otherwise, y_{Bt} will over or underpredict y_{Bt}** according to the relationship between x_t and $(c_t - p_{dt})$. If $x_t > (c_t - p_{dt})$ then y_{Bt} will overpredict y_{Bt}** and if $x_t < (c_t - p_{dt})$ then y_{Bt} will underpredict y_{Bt}**. The degree of overprediction is given by:

$$\frac{\frac{C}{R}(x_t - (c_t - p_{dt}))}{\pi} \tag{6.30}$$

and the degree of underprediction is given by:

$$\frac{\frac{C}{R}((c_t - p_{dt}) - x_t)}{\pi} \tag{6.31}$$

which are obtained by subtracting equation (6.21) from equation (6.13) in the first case, and by subtracting equation (6.13) from equation (6.21) in the second case.

VI.3 Empirical Evidence

The dynamic Harrod trade multiplier has proved to predict well the real rate of growth of developed countries where capital inflows do not play such an important role as in developing countries. Thirlwall (1979) shows that for a set of fifteen developed countries, the ratio $\frac{x_l}{\pi}$ gives, in general, a close approximation to the real rate of growth of these countries over a period of twenty years from the early 1950's to the mid 1970's. Using Houthakker and Magee's (1969) estimated price and income elasticities of imports and exports, Thirlwall finds that the foreign trade multiplier overpredicts by a low margin the actual rate of growth of the countries analysed. If correct, this overprediction would imply the accumulation of current account surpluses in these countries. However, Thirlwall argues that the overprediction is probably due to underestimation of the income elasticity of demand for imports which is estimated for a previous time period, as well as to the real terms of trade effect which cannot be completely neglected. The close approximation of the dynamic foreign trade multiplier to the actual rate of growth across countries, in spite of the restrictive assumptions it is subject to, has led the dynamic foreign trade multiplier to be considered as a governing law of long run output growth in open economies.

Bairam (1988) takes the same set of countries used by Thirlwall and tests the model for the 1970-1985 period finding support for the hypothesis that long term growth is determined by the dynamic foreign trade multiplier. Bairam tests the predictive power of this hypothesis using the equation:

$$y = \beta_i y_i^* \tag{6.32}$$

where y is the actual rate of growth, y_i^* $(i = 1, 2)$ are the estimated rates of growth consistent with balance of payments equilibrium: $y_1^* = \frac{\varepsilon z}{\pi}$ and $y_2^* = \frac{x}{\pi}$ for each country. The test of hypothesis is done on the β_i coefficient stating the null hypothesis as H_0: $\beta_i = 1$. If the null hypothesis is accepted then Thirlwall's theory is valid. Bairam's results show that the null hypothesis is rejected when y_1^* is used and accepted when y_2^* is used, arguing that in the former case y_1^* overpredicts the actual rate of growth due to unreliable estimates of the income elasticity of demand for exports ε. He concludes that $y_2^* = \frac{x}{\pi}$ accurately predicts the actual rate of growth supporting Thirlwall's simple rule.

Soukiazis (1990) estimates income and price elasticities for thirteen developed countries to test Thirlwall's simple model over the 1960-1985 period. Using the same test as Bairam, he finds that while $y = \frac{x}{\pi}$ underpredicts the actual rate of growth, the Harrod trade multiplier in the form of $y = \frac{\varepsilon z}{\pi}$ is a good predictor of y, accepting in this case the null hypothesis $\beta_1 = 1$. Soukiazis reports another test performed on the value of the income elasticity of demand for imports to test the accuracy of Thirlwall's model (see also Bairam and Dempster (1989)). The value of the income elasticity of demand for imports that by definition equates $y_i{*}$ to y is calculated as $\pi_1{}' = \frac{x}{y}$ or $\pi_2{}' = \frac{\varepsilon z}{y}$. If $\pi_i{}' = \pi$ then by implication it follows that $y_i{*} = y$. The null hypothesis H_0: $(\pi - \pi_i{}') = 0$ is tested using the statistic $t = \frac{\pi - \pi'}{s_{\pi}{}'}$ where $s_{\pi'}$ is the standard error of π'. Soukiazis finds that for nine out of thirteen countries of the sample, the difference between π and $\pi_2{}'$ is not statistically significant and accepts the null hypothesis. These results lead him to conclude that Thirlwall's model is valid for developed countries.

McCombie (1985) also estimates the balance of payments equilibrium growth rate[7] for six industrialised countries over two time periods: 1951-1973 and 1973-1980. He finds that the equilibrium growth rate does approximate the observed real rates of growth and concludes that the rate of expansion of exports is the most important determinant of long run growth of an economy since it is the only component of demand that provides foreign exchange at the same time that it expands the level of demand.

The empirical evidence seems to support the rule that long term growth in developed countries can be approximated by the ratio of export growth to the income elasticity of import demand, implying long run balance of payments equilibrium. In turn, this result implies that either the effects of relative price movements measured in a com-

[7] McCombie reaches the balance of payments equilibrium growth rate through the Hicks' super-multiplier.

mon currency and capital flows on growth are offsetting each other, which seems highly coincidental especially if several countries are being considered, or that relative price movements play only a minor role in the determination of output growth. The weakness of the effect of relative price movements indicates that it is mainly through changes in the level of income that the current account of the balance of payments equilibrates.

Given the reliance of developing countries on capital inflows as a source of development finance, it is expected that the simple ratio $\frac{x_t}{\pi}$ will not be a good approximation to their actual rate of growth since the balance of payments of these countries has been characterised by a persistent deficit on current account. If the deficit on current account can be financed by capital inflows, it is not equilibrium in the balance of payments that constrains output growth but the amount of capital that a country can attract from abroad.

Thirlwall and Hussain (1982) fit equations (6.13) and (6.21) to data for twenty developing countries during the 1950's, 1960's and 1970's. They find that the extended model in which capital inflows are incorporated gives on average a better approximation to the actual growth rate than the simple dynamic Harrod trade multiplier. To clarify the effect of relative price changes and of capital inflows on the rate of growth they analyse and elaborate the relationship between the estimated Harrod trade multiplier $y_{Bt} = \frac{x}{\pi}$ and the actual rate of growth of these countries y_t. They divide the country sample into two groups: the first one includes those countries where y_{Bt} underpredicts the actual rate of growth, and the second one includes those where y_{Bt} overpredicts the actual rate of growth. For the first group, they find, as expected, that the rate of growth of real capital inflows is higher than the rate of growth of exports for all countries, while for the second one they find the opposite. Then, they calculate the implied effect of relative price movements as the residual between the difference of the actual rate of growth and the rate of growth predicted by the extended model y_{Bt}^{**}. That is, the implied relative price effect equals $(y_t - y_{Bt}^{**})$. The interpretation of the above expression in the case of the first group is that if $(y_t - y_{Bt}**) > 0$, it means that on top of the effect of $(c_t - p_{dt})$ being higher than x_t, the balance of payments is further relaxed by a favourable effect of relative price movements. However, if $(y_t - y_{Bt}**) < 0$, it means that the effect on growth of $(c_t - p_{dt})$ being higher than x_t is offset by an adverse relative price effect. The same analysis is done for the second group of countries for which the trade multiplier overpredicts the actual growth rate.

On this basis, Thirlwall and Hussain find that on average, changes in the real terms of trade have adversely affected the actual rate of growth of the countries included in the sample. For the first group of countries, they estimate that the average contribution to growth of real capital inflows (by relaxing the balance of payments constraint) is 2.03 percent, which is partially offset by -0.65 percentage points because of adverse relative price movements. For the second group, they find that the overestimation of the real rate of growth is due more to the adverse effect of relative price movements tightening the balance of payments than to the real rate of growth of capital inflows being lower than the rate of growth of exports. On average, they estimate that for these countries, the difference between $(c_t - p_{dt})$ and x_t equals -0.80 percentage points, while the effect of relative price movements is equal to -1.61 percentage points.

Bairam (1990) estimates price and income elasticities for fifteen developing countries during different time periods to test the predictive accuracy of the Harrod trade multiplier. He finds that for nine out of the fifteen countries included in the sample, the null hypothesis $H_0 : \pi - \pi' = 0$ is accepted. Interestingly, four of the six countries for which the null hypothesis is rejected are oil exporting countries (Iran, Nigeria, S.Arabia and U.A. Emirates). For these countries, the Harrod trade multiplier overpredicts the actual rate of growth meaning that rather than being constrained by the balance of payments, these countries are 'generally supply constrained by labour and capital internal bottlenecks' (Bairam, 1990, p.714). Bairam finds support for Thirlwall's approach in the case of developing countries, except when the country under consideration is an oil exporting country with a surplus on current account.

Thirlwall, Fernandes and de Siqueira (1983) examine the Brazilian experience from 1965 until 1978. Brazil experienced a deficit on current account from 1967 and accumulated a large external debt. As expected, the Harrod trade multiplier considerably underestimates the actual rate of growth. Three reasons are given to explain this: significant inflows of capital, continuous depreciation of the national currency and substantial fluctuations of the real terms of trade. Besides estimating $\frac{x}{\pi}$, they fit equations (6.11)) and (6.21) to Brazilian data. Their estimations show that the price elasticities of imports and exports do not satisfy the Marshall-Lerner condition. Therefore, the deterioration of the real terms of trade would tighten the balance of payments constraint on growth. Thirlwall, Fernandes and de Siqueira show that on average, equations (6.11) and (6.13) give similar results considering the whole period (5.28 and 5.40 respectively) which reflects the importance of changes in the level of income to adjust equilibrium in the balance of payments. Both values underestimate the average actual real rate of growth equal to 9.32. However, the extended model (equation (6.21)) estimates a rate of growth consistent with overall balance of payments equilibrium equal to 10.8. These results show that capital inflows allowed Brazil to grow at a higher rate than the one compatible with equilibrium on current account of the balance of payments at the same time that the real terms of trade deteriorated and had adverse effects on growth.

VI.4 Income and Price Elasticities of Export and Import Demand

This section reviews empirical evidence found on income and price elasticities of the demand for exports and imports and the functional form used in their estimation. It reveals high and statistically significant values of income elasticities while price elasticities are either not statistically significant or have the wrong sign, and generally have lower values than the income elasticities for both export and import demand. In general, these results support the balance of payments constrained growth model's assumption of weak price elasticity values and significant income elasticity values for both import and export demand.

Houthakker and Magee (1969) estimate import and export equations for 29 countries in a logarithmic form as a function of income and relative prices:

$$\log M = f(\log Y,\ \log(\frac{PM}{WPI})) \tag{6.33}$$

and

$$\log X = f(\log YW,\ \log(\frac{PX}{PXW})) \tag{6.34}$$

where Y is GNP, PM is the price index of imports, WPI is the domestic price index, YW is a weighted index of the world's output, PX is the index of the country's export prices and PXW is the index of export prices of the rest of the world. For the fifteen developed countries included in their sample, they find the income elasticity of imports to be always statistically significant within the range value of 0.90 to 2.19. The estimated price elasticity of imports is statistically significant in five cases out of fifteen with values of -0.76 to -1.66. Concerning exports, they find the income elasticity to be always significant with estimated values from 0.86 to 2.44, and the price elasticity is found to be statistically significant in seven cases, ranging from -0.58 to -2.27. As far as developing countries are concerned, they find the income elasticities of both exports and imports to be statistically significant in all cases. The income elasticity of imports has estimated values from 0.52 to 1.39, and for exports the values range from 0.34 to 4.00. They find non-statistically significant estimates of the price elasticity of imports, while only four of the price elasticities of exports were statistically significant out of a sample of eleven countries.

Thursby and Thursby (1984) test the appropriate functional form of import demand equations. They estimate the model $M = f(P,\ Y)$ for five industrial countries, where M is imports, P is the price of imports relative to all other goods and Y is income, including lagged dependent and independent variables in both linear and logarithmic forms. Their results show that the model including the lagged dependent variable as a regressor and specified in a logarithmic form performed best in the sense that it is the most often accepted model based on specific econometric tests.

Khan and Ross (1977) also find support for the log-linear import demand function including the lagged dependent variable as a regressor. They argue that a partial adjustment mechanism for imports should be specified to relax the continuous equilibrium assumption, in which the change in imports is related to the difference between the demand for imports in time t and the actual level of imports in the previous period:

$$\Delta M = \gamma(M_t^d - M_{t-1}) \qquad (6.35)$$

where γ is the adjustment coefficient. If import demand is specified as a function of prices and income such as:

$$M_t = \alpha_0 + \alpha_1 P_t + \alpha_2 Y_t \qquad (6.36)$$

then,

$$M_t = \gamma\alpha_0 + \gamma\alpha_1 P_t + \gamma\alpha_2 Y_t + (1-\gamma) M_{t-1} \qquad (6.37)$$

The authors conclude after estimating the last equation for three industrial countries that for estimating short and long run elasticities of import demand, the log-linear is the correct and convenient functional form.

Salas (1982) estimates an import demand function for the case of Mexico during the 1961-1979 period. It is different from the rest of the works reviewed here, and therefore not strictly comparable. It concentrates on estimating the private sector's import demand by type of good: capital, intermediate and consumption. The estimated function is of the type: $M = f(Q, P^m, P^d, E_t, O_t)$ where M is import demand in real terms, Q is national income (or a proxy variable consistent with the dependent variable), P^m is the price of imported goods and P^d is the price of domestic goods, E_t is the exchange rate (Mexican pesos per dollar) and O_t is a vector of other variables that affect the level of imports such as a capacity utilisation index and the lagged ratio of the current account to GDP. The equation is specified in a logarithmic form. Concerning private sector capital goods imports, the author finds estimates for the price[8] and income elasticities of -1.409 and 0.506 respectively, both statistically significant. In the case of intermediate goods imports, the estimated price and income elasticities are 2.302 and 0.422 respectively. These results lead the author to argue that the private sector's capital and intermediate goods import demand is of a 'semi-structural' nature, with both income and prices being important determinants of the level of imports. However, none of the estimated parameters are significant in the case of consumer good import demand.

With regard to export functions, Bond (1985) analyses the determinants of exports of developing countries classifying them in four different groups according to their export characteristics. She defines the following groups: low-income non-oil exporting countries, middle-income non-oil exporting countries, major exporters of manufactures net oil importers, and major exporters of manufactures net oil exporters. Mexico is classified in the last group as a manufacture and net oil exporter. The equation she estimates is specified as follows:

$$\ln XV^{ij} = d_0 + d_1 REER^{ij} + d_2 \ln GNP^j + d_3 \ln QT^i + d_4 \ln Z^i \qquad (6.38)$$

where XV^{ij} is the flow of exports from exporting group i to importing group j, $REER^{ij}$ is the real effective exchange rate, GNP^i is the importing group's GNP, QT^i is the deviation of output from trend in exporting group i and Z^i reflects other factors that influence exports from group i. For the 1972-1981 period, the author finds an estimated price and income elasticity of -1.35 and 1.97 respectively of exports from net oil exporter countries to industrial countries. In general for all countries, she finds income elasticity of export values from 0.51 to 2.91; the highest values corresponding to major exporters of

[8] The relative price variable is expressed as the ratio of the United States producer price index to the Mexican wholesale price index. The exchange rate is included as a separate regressor. Since the exchange rate remained fixed until 1976, its inclusion as a regressor resembles a dummy variable.

manufactures to industrial countries. Bond concludes that both the real effective exchange rate and output growth in importing countries play an important role in the determination of exports.

Finally, the estimated elasticities of export and import demand obtained by Soukiazis (1990) are reported. The author estimates equations (6.5) and (6.6) in logarithms for eleven European countries, Japan and the United States. Concerning import demand, he finds positive and significant estimates of the income elasticity ranging from 1.19 to 2.19, while the estimated price elasticity is not statistically significant in five cases and shows lower absolute values ranging from -0.34 to -0.83. As far as export demand is concerned, the income elasticity shows high values which go from 1.38 to 3.64, while the estimated price elasticity is not statistically significant in ten countries out of the thirteen countries included in the sample.

VI.5 Methodology and Estimation Results

VI.5.1 Estimation of Income and Price Elasticities of Import and Export Demand for Mexico

Table VI.2 shows the percentage structure of imports and exports of goods in Mexico for the 1975-1990 period. It can be seen that capital and intermediate goods account, on average for the whole period, for 90 percent of total imports. It is only after 1982 that capital imports' share in the total decreased from 31 percent to 18.7 percent in 1989, while there has been an increasing participation of consumption goods from 7.2 percent in 1983 to 16.3 percent in 1990. This pattern reflects the fall in real investment after the 1982 debt crisis (see Chapter III).

Table VI.2

Percentage Structure of Imports and Exports 1975-1990						
Year	Imports of Goods			Exports of Goods		
	Consumption (%)	Intermediate (%)	Capital (%)	Agriculture (%)	Extractive (%)	Manufactures (%)
1975	6.8	64.4	28.8	29.1	21.1	49.8
1976	8.9	60.4	30.6	32.2	20.5	47.3
1977	8.8	65.2	26.0	28.2	26.0	45.8
1978	8.2	66.8	25.0	24.8	32.8	42.4
1979	8.3	61.8	29.8	20.2	48.9	30.9
1980	13.0	59.7	27.3	9.9	70.6	19.4
1981	11.7	56.7	31.6	7.4	75.9	16.7
1982	10.5	58.3	31.2	5.8	80.0	14.2
1983	7.2	67.1	25.7	5.3	74.1	20.5
1984	7.5	69.6	22.9	6.0	70.8	23.1
1985	8.2	67.9	23.9	6.5	70.5	23.0
1986	7.4	66.8	25.8	13.1	42.5	44.4
1987	5.8	74.5	19.8	7.5	44.9	47.6
1988	9.5	70.7	19.9	8.1	35.9	56.0
1989	13.8	67.5	18.8	7.7	37.1	55.2
1990	16.3	62.0	21.7	8.0	40.0	52.0
Avg. 1975-1990	9.5	65.0	25.5	13.7	49.5	36.8

Source: Banco de México

Total exports' main component during the 1975-1990 period is extractive goods, mainly crude oil. However, there has been an increase in manufactured goods, and export diversification especially after 1986 when the price of oil dropped. Also noticeable is the decreasing share of agricultural products in total exports, falling from almost 30 percent in the mid 1970's to 8 percent in 1990.

From the above analysis, and according to the empirical evidence reviewed in the last section, high values of the income elasticity of imports and exports are expected for the case of Mexico. A high income elasticity of import demand is expected given the dependence of output growth on imports of capital and intermediate goods (see also chapter I), and a relatively high income elasticity of exports is expected because of the large share of oil and manufactures in total exports (see Bond, 1985).

Following Thirlwall's approach, and in the light of the works reviewed, export and import demand are specified as functions of relative prices measured in a common currency (to take account of movements in the exchange rate) and of income, as expressed by equations (6.5) and (6.6) respectively. Total imports and exports are measured in real terms as well as domestic income (real GDP) and income abroad.

Table VI.3 shows Mexico's major trading partners for the 1971-1988 period. The data reveal that the United States imports 63 percent, on average, of Mexican exports, while more than 64 percent of Mexican imports come from the United States.[9] Given the outstanding participation of the United States in Mexico's external trade, the variable Z_t, the world's output, is proxied in this study by the United States real GNP (taken from the International Financial Statistics, IMF).

Table VI.3

Mexico's Major Trading Partners
Percentage Share (%)

	U.S.		Japan		Germany		U.K.	
Year	**Exports**	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**	**Exports**	**Imports**
1971	63.0	61.4	4.4	-	1.8	-	0.6	-
1973	58.8	62.2	6.6	4.6	2.6	8.1	0.6	2.2
1976	60.9	62.5	5.1	5.1	2.6	7.0	0.8	3.1
1978	68.1	60.4	3.4	8.1	1.9	7.1	0.9	2.5
1979	69.6	62.6	2.8	6.5	2.4	6.4	0.5	2.4
1980	63.2	65.6	3.7	5.3	1.7	5.2	0.5	2.2
1981	55.3	63.8	6.0	5.0	4.6	4.9	1.2	1.8
1982	52.0	59.9	6.7	5.7	4.3	6.1	4.2	1.8
1983	58.4	60.5	6.8	3.9	1.2	4.0	4.1	1.9
1984	58.4	62.3	7.5	4.2	0.9	4.1	4.1	1.8
1985	60.4	66.6	7.7	5.4	1.3	4.0	3.1	2.1
1986	67.3	67.1	6.4	6.3	2.3	5.9	1.0	1.8
1987	69.2	73.1	5.5	7.0	1.4	4.1	1.3	1.6
1988	73.0	74.9	4.9	6.4	1.3	3.5	0.8	1.2
Average	63.0	64.4	5.6	5.7	2.2	5.4	1.8	2.0

Source: Statistical Abstract of Latin America

[9] It is expected for this share to increase, especially with the new trade agreements between Mexico, the United States and Canada.

For the relative prices variable we used the real exchange rate index calculated by Banco de México. This index is defined as the ratio of international prices (expressed in domestic currency) to domestic prices. The index is calculated considering the participation of each country in Mexico's foreign trade as the weighting measure (Banco de México, 1986, p.134). However, this index is calculated with consumer price indices instead of exports and imports price indices. It is a shortcoming of this analysis that aggregate indices of export and import prices are not published for Mexico.[10]

The equations are estimated in both static and dynamic specifications in logarithmic form, using the ordinary least squares method and correcting with the Cochrane-Orcutt technique in case of serial autocorrelation of the errors. The results of estimating the static specification of export (X_t) and import (M_t) demand are the following[11]:

$$\log X_t = \underset{(-0.17)}{-0.85} + \underset{(2.01)}{1.11}\log Z_t - \underset{(-2.03)}{0.19}\log\left(\frac{P_{dt}}{P_{ft}E_t}\right) \tag{6.39}$$

$$R^2 = 0.99 \quad DW = 1.24 \quad F_{(3,18)} = 542.7 \quad n = 23 \quad \hat{\rho} = \underset{(23.1)}{0.95}$$

and,

$$\log M_t = \underset{(-4.16)}{-6.16} + \underset{(9.40)}{1.62}\log Y_t - \underset{(-1.07)}{0.18}\log\left(\frac{P_{ft}E_t}{P_{dt}}\right) \tag{6.40}$$

$$R^2 = 0.95 \quad DW = 1.92 \quad F_{(3,18)} = 123.7 \quad n = 23 \quad \hat{\rho} = \underset{(1.95)}{0.46}$$

[10] The Economic Commission for Latin America (ECLA) calculates, since 1971, a real terms of trade index for Mexico (United Nations, 1980). Given the similar pattern of this index with the one calculated by Banco de México's (see Banco de México's Economic Indicators and United Nations' Economic Survey for Latin America), this work considers the latter in order to take advantage of the larger sample.

[11] The sample is 1968-1990 because of data unavailability for the 1960-1967 period.

The equations are estimated with the Cochrane-Orcutt correction for autocorrelation. Concerning export elasticities, it can be seen that both the income and the price elasticities have the expected signs and are statistically significant at the five percent confidence level, with the estimated average price elasticity with an absolute value equal to 0.19, and the average income elasticity of exports which shows an estimated value equal to 1.11. With regard to the elasticities of import demand, a positive and statistically significant average income elasticity is estimated equal to 1.62, while the estimated price elasticity is not statistically significant.

In the case of the dynamic specification of the export and import equations, a dummy variable is included in both. The export equation[12] includes a dummy for 1982, a year in which the economy practically veered from an inward to an outward oriented policy, exports then taking a leading role (see chapter I). The import equation includes a dummy variable for 1983 to take account of the effect that the exchange control and the higher tariffs established at the end of 1982 had on the level of imports. The estimating equations are, for the case of export and import demand respectively, as follows:

$$\log X_t = -2.85 + 0.66\log Z_t - 0.15\log\left(\frac{P_{dt}}{P_{ft}E_t}\right) + 0.74\log X_{t-1} + 0.16\,DU82 \qquad (6.41)$$
$$(-1.24)\quad (1.92)\qquad (-1.53)\qquad\qquad (7.12)\qquad\qquad (2.72)$$

$$R^2 = 0.99 \quad h\text{–}durbin = 0.38 \quad F_{(4,18)} = 585.2 \quad n = 23$$
$$Serial\ Correlation : \chi_{(1)}{}^2 = 0.08$$
$$Functional\ Form : \chi_{(1)}{}^2 = 1.09$$
$$Normality : \chi_{(2)}{}^2 = 0.27$$
$$Heteroscedasticity : \chi_{(1)}{}^2 = 0.14$$

[12] The dummy variable for 1982 is not statistically significant in the previous equation, therefore, it is not included in the static specification.

and,

$$\log M_t = -2.23 + 0.72 \log Y_t - 0.18 \log(\frac{P_{ft} E_t}{P_{dt}}) + 0.56 \log M_{t-1} - 0.36 DU83 \qquad (6.42)$$

$$(-2.00) \quad (2.86) \quad (-1.44) \quad (3.25) \quad (-3.85)$$

$$R^2 = 0.97 \quad h\text{-}durbin = 0.84 \quad F_{(4,18)} = 138.4 \quad n = 23$$
$$Serial\ Correlation : \chi_{(1)}{}^2 = 0.08$$
$$Functional\ Form : \chi_{(1)}{}^2 = 2.85$$
$$Normality : \chi_{(2)}{}^2 = 1.67$$
$$Heteroscedasticity : \chi_{(1)}{}^2 = 0.57$$

Both equations are well determined, show no sign of error autocorrelation and the estimated coefficients show the expected signs. However, the relative price variable is not statistically significant in either of the equations. According to these results, the calculated long run income elasticities are 2.54 in the case of exports and 1.64 in the case of imports. The long run income elasticity of exports seems to be much higher than the constant elasticity estimated with the static specification, while the long run income elasticity of imports demand appears to be almost the same. Considering either the static or the dynamic specifications, changes in income seem to have a larger effect on imports and exports than relative price movements, hence complying with the balance of payments constrained growth model's assumption concerning the effect of the movement of the real terms of trade on growth.

Either considering the static or the dynamic specification of the import and export equations, the low absolute values and the non-statistical significance of the price elasticities of both export and import demand suggest that the Marshall-Lerner condition is not satisfied for the case of Mexico during the period analysed.

Having the estimated values of the income and price elasticities of export and import demand, the balance of payments constrained model can now be estimated.

VI.5.2 The Balance of Payments Constraint and Economic Growth: the Case of Mexico

Tables VI.A.2 and VI.A.3 in the appendix show the annual data and results of the model. The first of these tables shows the results when the elasticity values $\pi = 1.62$ and $\varepsilon = 1.11$ are used, and the second table shows the results of the model when the long run elasticity values $\pi = 1.64$ and $\varepsilon = 2.54$ are used.[13] The tables show, from column (1) to (9) respectively, the annual values of the following variables: the share of export earnings in total foreign exchange receipts, $\frac{E}{R}$; the rate of growth of real exports (expressed in domestic currency), x_t; the share of real capital inflows in total receipts, $\frac{C}{R}$; the rate of growth of real capital inflows (expressed in domestic currency), $(c_t - p_{dt})$; the estimated dynamic Harrod trade multiplier result, $\frac{x}{\pi}$; the estimated dynamic Harrod trade multiplier result in the form $\frac{\varepsilon z_t}{\pi}$; the result of the extended model as expressed by equation (6.21), $y_{Bt}{**}$; the result of the extended model as expressed in equation (6.20), $y_{Bt}{*}$; and the actual real rate of growth.

Since the main interest lies on the long run results, the analysis concentrates on the average results obtained for the whole period under consideration, 1961-1990. However, as it is of interest to examine the results of the model before and after the debt crisis began, two sub-periods have been defined: the first one from 1961 to 1981 and the second one from 1982 to 1990.

Table VI.4 shows the average results of the model for the three periods: 1961-1990, 1962-1981 and 1982-1990, using the estimated elasticity values $\pi = 1.62$ and $\varepsilon = 1.11$.

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[13] It is assumed that the elasticity values estimated for the 1968-1990 period hold for the 1961-1990 period.

Table VI.4

Period Average Results $\pi = 1.62$ and $\varepsilon = 1.11$ (%)									
Period	$\frac{x}{\pi}$ (1)	$\frac{\varepsilon z}{\pi}$ (2)	y_{Bt}** (3)	y_{Bt}* (4)	Actual Growth (5)	Difference between extended and simple model (6) (3)-(1)	Difference between actual growth and and simple model (7) (5)-(1)	Implied relative price movement effect (8) (7)-(6)	Pure real terms of trade effect on growth (9)
1961-1990	4.9	2.2	5.7	3.4	5.1	0.8	0.2	-0.6	-1.3
1961-1981	5.1	2.4	6.4	4.3	6.9	1.3	1.8	0.5	0.1
1982-1990	4.5	1.9	4.5	1.9	0.9	0.0	-3.6	-3.6	-3.3

It can be seen that the simple Harrod trade multiplier gives a close approximation to the actual growth rate for the whole 1961-1990 period when the rate of growth of exports is used, $\frac{x}{\pi}$. The result of the trade multiplier when εz is used, however, clearly underestimates the actual rate of growth, leading us to think that $\varepsilon = 1.11$ underestimates the actual value of the income elasticity of exports. The same happens with the extended model. While y_{Bt}** (as in equation (6.21)) gives a close approximation to the actual growth rate, the value predicted by y_{Bt}* (as in equation (6.20)) is far from the actual average rate of growth of the 1961-1990 period.

Given the above, only the predictions resulting from the model using $\frac{x}{\pi}$ (column (1)) and $\frac{\frac{E}{R}x + \frac{C}{R}(c - p_d)}{\pi}$ (column (3)) will be considered in this case.

Although the predicted value by the trade multiplier is very close to the actual growth rate, it can be seen that the former slightly underpredicts the latter by 0.2 percentage points, while the extended model overpredicts it. This result implies that the rate of growth of real capital inflows should be higher, on average, than export growth, as expected by the results given in equations (6.30) and (6.31).[14] According to the model,

[14] The calculated average rate of growth of real capital inflows over the 1961-1990 period is 15.5 percent while the average rate of growth of exports for the same period is 8.0 percent.

capital inflows growing faster than exports, allowed, on average, for a 0.8 percentage points higher rate of economic growth, as shown in column (6). However, this effect is partially offset by adverse relative price movements. The implied relative price movement effect on growth, given in column (8), equals, on average for the 1961-1990 period, -0.6 percentage points. This same result can also be obtained as the difference between y_{Bt}** and the actual growth rate y_t. Hence, the results show that the positive effect of capital inflows relaxing the balance of payments constraint is partially offset by adverse effects of changes in the real terms of trade. Column (9) in table VI.4 shows the pure terms of trade effect on growth[15]; this value shows that, on average, the real terms of trade deteriorated, adversely affecting the rate of growth by -1.3 percentage points. Furthermore, comparing the pure terms of trade effect with the implied relative price movement effect, columns (9) and (8) respectively, it follows that the volume response of exports and imports to changes in the real terms of trade did not offset the pure real terms of trade effect on growth (according to the results obtained). This last result corresponds to *Case 1*, as explained in section VI.2.1.

During the 1961-1981 period, the average rate of growth of capital inflows, equal to 17.2 percent, is higher than the average rate of growth of exports by 8.9 percentage points. It is therefore not surprising to find a bigger difference between the extended model prediction and the prediction of the simple trade multiplier result. This difference amounts to 1.3 percentage points (column (6)), meaning that the rate of growth of output was allowed to grow 1.3 percentage points faster, on average, than if growth was constrained by equilibrium on the current account of the balance of payments. Moreover, according to the results obtained, the balance of payments constraint was additionally relaxed by the improvement of the real terms of trade, allowing growth to further increase by 0.5 percentage points as given by the implied relative price movement effect

[15] The pure real terms of trade effect on growth is calculated as the average rate of growth of the real exchange rate index, divided by the income elasticity of demand for imports.

on growth (column (8)).

The results show that on average for the 1961-1981 period, the balance of payments constraint on growth was relaxed by both capital inflows and a small but positive improvement in the real terms of trade, allowing a total 1.8 percentage points faster growth than otherwise. Additionally, as shown by the difference between column (8) and (9), the improvement in the real terms of trade was reinforced by the volume response of exports and imports to changes in the real terms of trade, corresponding to *Case 2* as previously explained.

Contrary to the results obtained above, the predictions of the model for the 1982-1990 period are far from good. Both the simple trade multiplier and the extended model predict the same growth rate of 4.5 percent, when the actual average growth rate for that period is 0.9 percent. Both models predict the same value because, according to the data, the average value of the share of capital inflows in total receipts for this sub-period equals zero, therefore $y_{Bt}^{**} = \frac{x}{\pi}$. The overprediction of actual growth by the trade multiplier is then explained in this case by the negative effect on growth of the deterioration of the real terms of trade. However, there is one point not explicitly contemplated by the model, which, if considered, could lead to different results. This question is now examined. Either in Table VI.A.2 or VI.A.3 in the appendix it can be observed that in 1983 and 1987, both the share in total receipts, and the real rate of growth of capital inflows, is negative. According to equations (6.20) and (6.21), these negative values imply a positive effect of the product $\frac{C}{R}(c_t - p_{dt})$ on growth. Nonetheless, is seems unlikely for either an increasing or a decreasing outflow of capital, as indicated by the negative share, to have a positive effect on output growth (see Chapter V). This issue can be incorporated in the analysis if equations (6.20) and (6.21) are re-specified as follows:

$$y_{Bt}{}^{*} = \frac{\frac{E}{R}\varepsilon z_t + \frac{C}{R}(c_t - p_{dt})}{\pi} \quad \text{if} \quad \begin{cases} \frac{C}{R} \geq 0 \text{ and } (c_t - p_{dt}) \geq 0 \\ \frac{C}{R} \leq 0 \text{ and } (c_t - p_{dt}) \geq 0 \\ \frac{C}{R} \geq 0 \text{ and } (c_t - p_{dt}) \leq 0 \end{cases} \tag{6.20}$$

and,

$$y_{Bt}{}^{*} = \frac{\frac{E}{R}\varepsilon z_t - \frac{C}{R}(c_t - p_{dt})}{\pi} \quad \text{if} \quad \frac{C}{R} < 0 \text{ and } (c_t - p_{dt}) < 0 \tag{6.20'}$$

Or for equation (6.21):

$$y_{Bt}{}^{**} = \frac{\frac{E}{R}x_t + \frac{C}{R}(c_t - p_{dt})}{\pi} \quad \text{if} \quad \begin{cases} \frac{C}{R} \geq 0 \text{ and } (c_t - p_{dt}) \geq 0 \\ \frac{C}{R} \leq 0 \text{ and } (c_t - p_{dt}) \geq 0 \\ \frac{C}{R} \geq 0 \text{ and } (c_t - p_{dt}) \leq 0 \end{cases} \tag{6.21}$$

and,

$$y_{Bt}{}^{**} = \frac{\frac{E}{R}x_t - \frac{C}{R}(c_t - p_{dt})}{\pi} \quad \text{if} \quad \frac{C}{R} < 0 \text{ and } (c_t - p_{dt}) < 0 \tag{6.21'}$$

The incorporation of equations (6.20), (6.20'), (6.21) and (6.21') allows for special consideration to be given to cases where both the share $\frac{C}{R}$, and the real rate of growth of capital inflows $(c_t - p_{dt})$, are negative. If this variation is included in the model, the average growth rate predicted by the extended model either in the form of equation (6.20) or (6.21), should be calculated as the average of the annual output growth rates predicted, i.e. $\overline{y_{Bt}{}^{*}}$ or $\overline{y_{Bt}{}^{**}}$, instead of calculating it as the result of the average values of the variables included in the model: $\overline{\frac{E}{R}}$, $\overline{x_t}$, $\overline{\frac{C}{R}}$, and $\overline{(c_t - p_{dt})}$. These two values are different. The resulting average growth rate calculated from the average values of the variables is equal to:

$$(1)\quad \overline{y_{Bt}^{**}} = \frac{\overline{(\frac{E}{R})_t}\,\overline{x_t} + \overline{(\frac{C}{R})_t}\,\overline{(c_t - p_{dt})}}{\pi}$$

And the average of the annual predicted growth rates is calculated as:

$$(2)\quad \overline{y_{Bt}^{**}} = \left(\overline{\frac{\frac{E}{R}x_t + \frac{C}{R}(c_t - p_{dt})}{\pi}}\right)$$

As shown in Appendix VI.A1, these values differ because the summation of a product is not equal to the product of a summation, i.e. $(\sum \frac{E}{R} x) \neq (\sum \frac{E}{R})(\sum x)$ (see Appendix VI.A1). If the average y_{Bt}^{**} is calculated as in form (1), which considers the average values of $\frac{C}{R}$ and $(c_t - p_{dt})$, the years when these variables are both negative cannot be given special consideration, therefore, $\overline{y_{Bt}^{**}}$ in these cases should be calculated as in form (2). Table VI.5 shows the results of the model using the same elasticity values as in the previous table $\varepsilon = 1.11$ and $\pi = 1.62$, but calculating y_{Bt}^{*} and y_{Bt}^{**} as the average of the predicted annual growth rates as in form (2).

Table VI.5

Period Average Results $\pi = 1.62$ and $\varepsilon = 1.11$ (%)									
Period	$\frac{x}{\pi}$ (1)	$\frac{\varepsilon z}{\pi}$ (2)	y_{Bt}^{**} (3)	y_{Bt}^{*} (4)	Actual Growth (5)	Difference between extended and simple model (6) (3)-(1)	Difference between actual growth and and simple model (7) (5)-(1)	Implied relative price movement effect (8) (7)-(6)	Pure real terms of trade effect on growth (9)
1961-1990	4.9	2.2	5.2	3.0	5.1	0.3	0.2	-0.1	-1.3
1961-1981	5.1	2.4	7.3	5.1	6.9	2.2	1.8	-0.4	0.1
1982-1990	4.5	1.9	0.4	-2.1	0.9	-4.1	-3.6	0.5	-3.3

In this case, the rate of growth values predicted by the extended model y_{Bt}^{**} are closer to the actual growth rate for the three periods than in the previous case. This can be especially noticed in the case of the 1982-1990 period for which the model predicts a rate of growth of 0.4 percent and the actual growth rate is 0.9 percent. On average for the whole 1961-1990 period, the difference in the growth rate value predicted by the simple trade multiplier and the extended model is very small, 0.3 percentage points, meaning that the actual long run growth rate has been, on average, consistent with equilibrium in the balance of payments. While during the 1961-1981 period, the rate of growth of capital imports had a positive effect on growth by relaxing the balance of payments constraint, equal on average to 2.2 percentage points, this effect became negative during the debt-crisis period, equal to -4.1 percentage points. According to the results obtained in Table VI.5, this negative effect explains the major part of the fall of the actual growth rate below the growth rate consistent with equilibrium on the current account of the balance of payments, during the 1982-1990 period.

Turning now to the results obtained using the estimated long run elasticity values $\varepsilon = 2.54$ and $\pi = 1.64$, Table VI.6 shows the outcome when form (1) is used to calculate the average values of y_{Bt}** and y_{Bt}*.

Table VI.6

Period Average Results $\pi = 1.64$ and $\varepsilon = 2.54$ (%)									
Period	$\frac{x}{\pi}$ (1)	$\frac{\varepsilon z}{\pi}$ (2)	y_B** (3)	y_B* (4)	Actual Growth (5)	Difference between extended and simple model (6) (4)-(2)	Difference between actual growth and and simple model (7) (5)-(2)	Implied relative price movement effect (8) (7)-(6)	Pure real terms of trade effect on growth (9)
1961-1990	4.9	5.0	5.6	5.7	5.1	0.7	0.1	-0.6	-1.3
1961-1981	5.1	5.4	6.3	6.6	6.9	1.2	1.5	0.3	0.1
1982-1990	4.5	4.2	4.5	4.2	0.9	0.0	-3.3	-3.3	-3.3

When the estimated long run income elasticities of exports and imports are used, the predictions given by equations (6.12) and (6.13) are similar as well as those given by equations (6.20) and (6.21). The analysis of Table VI.6 leads to similar conclusions as those derived from Table VI.4, with the difference that in Table VI.6 the predictions of the balance of payments constrained growth model approximate the actual rate of growth for the 1961-1990 period in both cases, either when x_t is used or when εz_t is used. As in Table VI.4, the estimated growth rate exceeds the actual value for the 1982-1990 period. To take into account the effect of the negative share in total receipts and the negative real rate of growth of capital inflows, the results of the model when equations (6.20') and (6.21') are included are given in Table VI.7.

Table VI.7

Period Average Results $\pi = 1.64$ and $\varepsilon = 2.54$ (%)									
Period	$\frac{x}{\pi}$ (1)	$\frac{\varepsilon z}{\pi}$ (2)	y_B** (3)	y_B* (4)	Actual Growth (5)	Difference between extended and simple model (6) (4)-(2)	Difference between actual growth and and simple model (7) (5)-(2)	Implied relative price movement effect (8) (7)-(6)	Pure real terms of trade effect on growth (9)
1961-1990	4.9	5.0	5.1	5.4	5.1	0.4	0.1	-0.3	-1.3
1961-1981	5.1	5.4	7.2	7.5	6.9	2.1	1.5	-0.6	0.1
1982-1990	4.5	4.2	0.4	0.5	0.9	-3.7	-3.3	0.4	-3.3

Of all the Tables analysed, Table VI.7 presents the most accurate predictions of the actual growth rate given by the balance of payments constrained growth model. Concentrating first on the 1961-1990 period, it can be seen that the four predicted values closely approximate the actual growth rate, with the value of the extended model's prediction $\overline{y_{Bt}}$** being actually the same as the growth rate. These results seem to confirm that in the long run, the rate of growth of output cannot exceed the rate of growth consistent with balance of payments equilibrium on current account. However, if the sub-period 1961-1981 is considered, the data show that the average growth rate exceeded the balance of payments equilibrium growth rate by 1.5 percentage points (column (7)). According to these results, economic growth could be higher because of real capital inflows relaxing the balance of payments constraint on growth. Finally, considering the 1982-1990 period, it can be seen that the low average actual growth rate seems to be due more to the effect of real capital inflows tightening the balance of payments than to relative price movements.

The analysis ends up with several findings. On the whole, the balance of payments equilibrium growth rate closely approximates the long run actual growth rate for the case of Mexico, supporting Thirlwall's basic proposition that in the long run no country can grow faster than the rate of growth consistent with balance of payments equilibrium on current account. When the shorter sub-periods are considered, it is found that the extended model approximates better to the actual growth rate, meaning that capital flows played an important role relaxing or tightening the balance of payments constraint hence promoting or hampering economic growth. As well, the results indicate that on average for the whole period, the real terms of trade effect on growth is low, suggesting that in the long run, relative prices measured in a common currency stay fairly stable.

VI.6 Conclusions

The chapter has analysed the balance of payments constrained growth model and estimated it for Mexico. Several approaches were followed to fit the model to Mexican data. Firstly, two different sets of estimated price and income elasticity values were used, one resulting from the static specification of the import and export demand functions, giving estimates of constant elasticity values, and one resulting from the dynamic specification from which the long run estimates of the elasticity values are derived. Secondly, special consideration had to be given to the specific situation where both the share in total receipts and the rate of growth of real capital inflows are negative, which, if neglected, could lead to biased predictions. In turn, this led us to calculate the average values predicted by the model in two different ways: one as the rate of growth resulting from the average values of the model, and the other one as the average of the annual predicted rates of growth, both of which lead to different results as shown in the appendix. These possibilities end up in four different tables displaying the average predictions of the simple Harrod trade multiplier and the extended model for the whole 1961-1990 period and the two sub-periods considered.

Excluding the predicted values given by the simple and the extended models when the constant income elasticities are used, which clearly underpredict the actual rates of growth (probably because the income elasticity of exports is underestimated), the average predicted growth rates, ranging from 4.9 to 5.7 percent, are very close to the average actual real rate of growth for the 1961-1990 period equal to 5.1 percent.

These results support Thirlwall's model, highlighting the importance of export capacity and the income elasticity of imports as determinants of long run growth, since they confirm that in the long run, the rate of growth of output should be compatible with the constraints imposed by the balance of payments. Moreover, the results imply that the long run effect of changes in the real terms of trade on growth is, if not insignificant, very small.

The results obtained for the 1961-1981 and 1982-1990 sub-periods are also interesting and much information about the economy can be derived. It is found that for the case of these sub-periods the extended model, which incorporates capital flows, approximates better to the actual average growth rates, especially when the years 1983 and 1987 are treated as special cases. According to the results it is shown that during the 1961-1981 period, capital inflows allowed a faster rate of growth (2.1 percent on average) than that compatible with equilibrium on the current account of the balance of payments. While during the 1982-1990 period, growth was curtailed by the conditions imposed by the external sector (by -3.7 percent on average). On the whole, capital flows have had a small positive effect on growth for the 1961-1990 period (on average equal to 0.4 percent).

Concerning the real terms of trade effect on growth, the data show a small but negative average effect on growth for the 1961-1990 period. However, the results obtained for the sub-periods are not very clear as far as the effect of the relative price movements on growth is concerned. That is, the results obtained are not consistent since they differ according to the method of calculation used to obtain the average predicted growth rate values. This inconsistency does not allow us to make conclusions on the relative effects that the pure terms of trade, and the volume response of exports and imports to changes in relative prices, have on growth during the 1961-1981 and 1982-1990 periods.

APPENDIX

Table VI.A.1

Total Exports and Imports Million U.S. Dollars				
Year	Total Exports	Merchandise Exports	Total Imports	Merchandise Imports
1960	1444.0	738.7	1863.7	1186.4
1961	1508.5	799.8	1852.2	1138.6
1962	1626.2	889.4	1875.7	1143.0
1963	1804.1	928.5	2030.2	1239.7
1964	1930.1	1003.6	2374.8	1492.9
1965	2062.6	1101.3	2505.5	1559.6
1966	2241.9	1169.9	2719.7	1602.0
1967	2309.8	1102.9	2912.9	1736.8
1968	2537.2	1165.0	3312.6	1917.3
1969	2853.3	1341.8	3561.7	1988.8
1970	3254.5	1289.6	4442.5	2328.3
1971	3532.0	1365.6	4460.9	2255.5
1972	4280.2	1666.4	5285.9	2762.1
1973	5405.9	2071.7	6934.6	3892.4
1974	6838.5	2853.2	10064.4	6148.6
1975	7134.8	3062.4	11577.4	6699.4
1976	8277.2	3655.5	11960.5	6299.9
1977	9177.1	4649.8	10773.5	5704.5
1978	11653.1	6063.1	14346.1	7917.5
1979	16263.5	8817.7	21134.0	11979.7
1980	22406.4	15511.8	33146.1	18896.6
1981	28014.0	20102.1	44066.1	23948.4
1982	28002.7	21229.7	34223.7	14437.0
1983	28944.5	22312.0	23526.1	8550.9
1984	32902.3	24196.0	28663.8	11254.3
1985	30774.4	21663.8	29537.7	13212.2
1986	24710.2	16030.9	25842.9	11432.3
1987	30568.6	20656.1	26602.1	12222.8
1988	32589.9	20565.1	35032.5	18898.2
1989	38137.1	22842.1	44141.2	25437.9
1990	45329.3	26950.3	51678.1	31090.0

Source: Banco de México

Table VI.A.2

The Balance of Payments Constrained Growth Model Estimated income elasticity values $\pi = 1.62$ and $\varepsilon = 1.11$									
Year	(1) Exports Share $\frac{E}{R}$	(2) Exports Growth x	(3) Capital Inflows Share $\frac{C}{R}$	(4) Capital Inflows Growth $(c_t - p_{dt})$	(5) $\frac{x}{\pi}$	(6) $\frac{\varepsilon z}{\pi}$	(7) y_{Bt}*	(8) y_{Bt}**	(9) Actual Growth y
1961	0.81	0.07	0.19	-0.18	0.04	0.01	0.02	-0.01	0.05
1962	0.87	0.09	0.13	-0.28	0.06	0.04	0.02	0.01	0.05
1963	0.89	0.08	0.11	-0.14	0.05	0.03	0.03	0.01	0.08
1964	0.81	0.08	0.19	0.93	0.05	0.04	0.15	0.14	0.12
1965	0.82	0.10	0.18	-0.04	0.06	0.04	0.05	0.03	0.07
1966	0.82	0.09	0.18	0.04	0.05	0.05	0.05	0.04	0.07
1967	0.79	0.00	0.21	0.22	0.00	0.02	0.03	0.04	0.06
1968	0.77	0.05	0.23	0.27	0.03	0.03	0.06	0.07	0.08
1969	0.80	0.16	0.20	-0.16	0.10	0.02	0.06	-0.01	0.06
1970	0.73	0.05	0.27	0.57	0.03	0.00	0.12	0.10	0.07
1971	0.79	0.04	0.21	-0.24	0.02	0.02	-0.01	-0.01	0.04
1972	0.81	0.16	0.19	0.04	0.10	0.04	0.09	0.04	0.09
1973	0.78	0.14	0.22	0.36	0.08	0.04	0.11	0.08	0.08
1974	0.68	0.00	0.32	0.67	0.00	-0.01	0.13	0.13	0.06
1975	0.62	-0.09	0.38	0.18	-0.05	-0.01	0.01	0.04	0.06
1976	0.69	0.17	0.31	-0.14	0.10	0.04	0.04	0.00	0.04
1977	0.85	0.15	0.15	-0.56	0.09	0.04	0.03	-0.02	0.03
1978	0.81	0.12	0.19	0.46	0.07	0.03	0.11	0.08	0.08
1979	0.77	0.12	0.23	0.53	0.07	0.02	0.13	0.09	0.09
1980	0.68	0.06	0.32	0.76	0.04	0.00	0.18	0.15	0.08
1981	0.64	0.12	0.36	0.32	0.07	0.01	0.12	0.08	0.09
1982	0.82	0.22	0.18	-0.51	0.13	-0.02	0.05	-0.07	-0.01
1983	1.23	0.14	-0.23	-1.85	0.08	0.02	0.37	0.29	-0.04
1984	1.15	0.06	-0.15	0.26	0.04	0.04	0.02	0.03	0.04
1985	1.04	-0.03	-0.04	0.71	-0.02	0.02	-0.04	0.00	0.03
1986	0.94	0.04	0.06	2.75	0.03	0.02	0.13	0.13	-0.04
1987	1.15	0.11	-0.15	-3.17	0.07	0.02	0.37	0.32	0.02
1988	0.93	0.05	0.07	1.51	0.03	0.03	0.09	0.09	0.01
1989	0.86	0.03	0.14	1.31	0.02	0.02	0.13	0.12	0.03
1990	0.88	0.05	0.12	0.02	0.03	0.01	0.03	0.01	0.04

Table VI.A.3

The Balance of Payments Constrained Growth Model
Estimated income elasticity values $\pi = 1.64$ and $\varepsilon = 2.54$

Year	(1) Exports Share $\frac{E}{R}$	(2) Exports Growth x	(3) Capital Inflows Share $\frac{C}{R}$	(4) Capital Inflows Growth $(c_t - p_{dt})$	(5) $\frac{x}{\pi}$	(6) $\frac{\varepsilon z}{\pi}$	(7) y_{Bt}*	(8) y_{Bt}**	(9) Actual Growth y
1961	0.81	0.07	0.19	-0.18	0.04	0.03	0.02	0.01	0.05
1962	0.87	0.09	0.13	-0.28	0.05	0.10	0.02	0.06	0.05
1963	0.89	0.08	0.11	-0.14	0.05	0.06	0.03	0.04	0.08
1964	0.81	0.08	0.19	0.93	0.05	0.08	0.14	0.17	0.12
1965	0.82	0.10	0.18	-0.04	0.06	0.10	0.04	0.08	0.07
1966	0.82	0.09	0.18	0.04	0.05	0.10	0.05	0.09	0.07
1967	0.79	0.00	0.21	0.22	0.00	0.04	0.03	0.06	0.06
1968	0.77	0.05	0.23	0.27	0.03	0.08	0.06	0.10	0.08
1969	0.80	0.16	0.20	-0.16	0.09	0.04	0.06	0.01	0.06
1970	0.73	0.05	0.27	0.57	0.03	0.00	0.12	0.09	0.07
1971	0.79	0.04	0.21	-0.24	0.02	0.05	-0.01	0.01	0.04
1972	0.81	0.16	0.19	0.04	0.10	0.09	0.09	0.08	0.09
1973	0.78	0.14	0.22	0.36	0.08	0.08	0.11	0.11	0.08
1974	0.68	0.00	0.32	0.67	0.00	-0.02	0.13	0.12	0.06
1975	0.62	-0.09	0.38	0.18	-0.05	-0.02	0.01	0.03	0.06
1976	0.69	0.17	0.31	-0.14	0.10	0.08	0.04	0.03	0.04
1977	0.85	0.15	0.15	-0.56	0.09	0.08	0.03	0.02	0.03
1978	0.81	0.12	0.19	0.46	0.07	0.07	0.11	0.11	0.08
1979	0.77	0.12	0.23	0.53	0.07	0.05	0.13	0.11	0.09
1980	0.68	0.06	0.32	0.76	0.04	0.00	0.18	0.15	0.08
1981	0.64	0.12	0.36	0.32	0.07	0.03	0.12	0.09	0.09
1982	0.82	0.22	0.18	-0.51	0.13	-0.04	0.05	-0.09	-0.01
1983	1.23	0.14	-0.23	-1.85	0.08	0.05	0.36	0.33	-0.04
1984	1.15	0.06	-0.15	0.26	0.03	0.10	0.02	0.09	0.04
1985	1.04	-0.03	-0.04	0.71	-0.02	0.04	-0.04	0.03	0.03
1986	0.94	0.04	0.06	2.75	0.03	0.04	0.13	0.15	-0.04
1987	1.15	0.11	-0.15	-3.17	0.07	0.05	0.36	0.35	0.02
1988	0.93	0.05	0.07	1.51	0.03	0.07	0.09	0.13	0.01
1989	0.86	0.03	0.14	1.31	0.02	0.04	0.12	0.14	0.03
1990	0.88	0.05	0.12	0.02	0.03	0.01	0.03	0.01	0.04

Appendix VI.A1

Calculation of the Average Value of the Extended Model y_{Bt}**

The first form of calculating the average y_{Bt}** implies:

$$(1)\quad \overline{y_{Bt}^{**}} = \frac{\overline{(\frac{E}{R})_t}\,\overline{x_t} + \overline{(\frac{E}{R})_t} + \overline{(c_t - p_{dt})}}{\pi}$$

This, in turn, is equal to:

$$\frac{\overline{(\frac{E}{R})_t}\,\overline{x_t} + \overline{(\frac{E}{R})_t} + \overline{(c_t - p_{dt})}}{\pi} = \frac{1}{\pi}\left(\frac{\sum\frac{E}{R}}{n}\,\frac{\sum x}{n} + \frac{\sum\frac{C}{R}}{n}\,\frac{\sum(c_t - p_{dt})}{n}\right)$$

By grouping terms in the last equation we get:

$$= \frac{1}{n^2\pi}\left(\sum\frac{E}{R}\sum x + \sum\frac{C}{R}\sum(c_t - p_{dt})\right)$$

This last result is different from the second form of calculating the average y_{Bt}**, which is given by:

$$(2)\quad \overline{y_{Bt}^{**}} = \overline{\left(\frac{\frac{E}{R}x_t + \frac{C}{R}(c_t - p_{dt})}{\pi}\right)}$$

which in turn equals:

$$= \frac{1}{n\pi}\left(\sum\left(\frac{E}{R}x\right) + \sum\left(\frac{C}{R}(c_t - p_{dt})\right)\right)$$

CHAPTER VII

CONCLUSIONS

The thesis has examined both general and specific aspects of the financing of the Mexican economy over the 1960-1990 period from both internal and external sources. While chapter one introduces an overall perspective of the Mexican economy, the findings of the rest of the chapters have been of a specific nature.

In historically tracing the financial policy followed by the government between 1960 and 1990, chapter one finds that not unlike other developing economies, the financing of Mexico's growth and development has depended on both domestic and foreign sources, and that to a large extent, the performance of the economy is associated with the availability of external financing.

The relative unavailability of external financing after the debt crisis began in 1982 led the Mexican economy to increase its reliance on domestic sources of finance. With the purpose of increasing domestic financing and improving the allocative efficiency of resources, the financial sector was gradually liberalised. After having examined the interrelationship between financial variables and real variables of the Mexican economy, the following are some of the results expected of the financial liberalisation process.

One of the main hypotheses of financial liberalisation models is that a rise in the real interest rate to its equilibrium level will increase the total level of savings and investment and will improve the productivity of total investment. However, the analysis undertaken in this thesis concludes that the effect of movements in the real interest rate on total savings, investment and economic growth is weak on both theoretical and empirical grounds.

Theoretically, the effect of a rise in the real interest rate on total savings is weak because it is subject to a substitution and an income effect that can offset each other and leave the level of total savings unchanged after a rise in the real interest rate. In the case of Mexico, the empirical evidence found showed that movements in the real interest rate do not significantly affect the level of total real domestic savings, the latter being primarily a function of the level of income. It was found that a rise in the real interest rate can have a negative impact on total domestic savings by negatively affecting public savings: a rise in the real interest rate increases the government's internal debt service payments. The higher the domestic public debt, the larger the impact of changes in the real interest rate on the level of total domestic savings. This was shown by the negative and statistically significant coefficient of the real interest rate during the period when the public sector's deficit was at its highest levels.

With regard to private domestic savings, which is a component of total savings that financial liberalisation is intended to encourage through raising real interest rates, there is no empirical evidence of the former reacting to changes in the latter. As in the case of total domestic savings, private savings are primarily determined by the level of income and hence there seems to be no reason to expect a rise in the real level of private or total domestic savings as a consequence of higher real interest rates.

However, movements in the real interest rate do affect the level of financial savings, i.e. the amount of savings that is channelled via financial assets. The study undertaken in chapter three demonstrates that there is a positive correlation between the real interest rate and financial savings. Nevertheless, periods of rising financial savings coinciding with negative real interest rates are also observed (for example between 1977 and 1981). This is because financial savings are also highly correlated with the level of income.

The results of the analysis undertaken in chapters two and three lead to the conclusion that a rise in financial savings does not necessarily imply a rise in total savings. Financial savings can increase when the interest rate rises not as a consequence of an increase in the total level of savings but as a result of a substitution process between alternative wealth holding assets, with the amount of total real savings remaining constant. The sensitivity of financial savings to the differential between domestic and foreign real interest rates shows that savings deposited abroad can be substituted for domestic financial savings.

Even though no evidence was found of financial liberalisation raising the level of total or private real savings, its effect on financial savings can have a positive impact on investment and growth if financial savings are more productive than other forms of savings. It is possible that idle resources find more efficient use through financial intermediaries if financial savings lead to productive investment and do not remain in the financial sector for speculation purposes. However, it cannot be assumed that savings automatically find productive investment outlets. This finding underlines the importance of a sound economic environment for private investment to take place. In the case of Mexico, besides the need for an expanding market and the expectation of high returns on investment, the confidence of the private sector in the government's economic policies plays a crucial role in the private sector's decisions to invest. Hence, it is important for economic policy to restore and maintain the confidence of the private sector in the government. In the aftermath of the debt crisis (1982) one of the major obstacles facing private investment within the country was the lack of confidence of the private sector in the government's economic policies. This led financial resources either to flee abroad or to remain in the highly unregulated domestic speculative sphere. With the onset of the government's liberalisation policies (including the financial sector's liberalisation in 1989), it appears that the confidence of the private sector in the continuation of the government's economic policies is in the process of being restored, as shown by the rise in private investment after 1989. To maintain the confidence of the private sector in the continuity of the government's economic policies, several actions have been taken by the government to anchor the continuation of a market-forces led economy. Among the most important measures are the negotiation of a free trade agreement with Canada and the United States and the recent independence of the Central Bank from the government.[1]

Empirical evidence shows a positive correlation between financial savings and the total amount of credit given by the banking sector to the private sector, even though the latter also depends on the reserve requirement that the Central Bank imposes on the commercial banks. Credit given to the private sector by the banking sector proved to be an important determinant of total investment. Therefore, if financial savings can find investment outlets easier and faster than other forms of holding savings, financial liberalisation and the implied rise in real interest rates can have a positive impact on total investment. However, the relationship between investment and the real interest rate has other aspects to consider. If the deposit real interest rate is taken as a proxy for the real loan interest rate, or if financial assets are considered as a competing asset with the accumulation of capital, then a rise in the real interest rate can hamper investment. Investment is thus subject to a positive effect from a rise in the real interest rate through an expansion of the availability of credit, but it is also subject to a negative effect. The results in chapter three show that in the case of Mexico, the latter effect is dominant, implying that the net effect of a rise in the real interest rate on investment is negative.

Real interest rates therefore should be at a level at which savings are attracted into the financial sector while ensuring that its level is not too high so that productive investment is discouraged. Additionally, the study has shown that both demand and supply factors are important in determining total investment. Investment demand is sensitive to the supply of credit and to changes in expected demand and profits.

Financial liberalisation and market oriented models argue that any form of credit

[1] In May 1993 the Mexican government granted autonomy to the Central Bank over monetary policy.

allocation which is not directed by market forces leads to an inefficient allocation of resources. It is implied, therefore, that the financing of public investment, which is not allocated by market forces, might lead to an inefficient allocation of resources. Chapter four has tested econometrically the productivity of public and private investment and no evidence was found of public investment being less productive than private investment during the 1970-1990 period.

More than two decades of high rates of economic growth with government intervention in economic activities, and the empirical evidence presented in chapter four, give no reason to think that public investment has been less productive than private investment. Moreover, empirical evidence which indicates that public investment has a positive effect on private investment lead us to argue that the stagnation of private investment after 1982 and until 1989 was partially caused by the drastic fall of public investment in this period. The relation between public and private investment is of a complementary nature and not of substitution, as the net effect of a rise in public investment on private investment is positive. Further, no clear evidence of public investment crowding out private investment was found either financially or physically.

Is is appropriate to raise the point that in a country like Mexico, where income is highly concentrated[2], the social costs of low public expenditure and of low public investment can be high and can put at risk the social and political stability of the country.[3] After almost a decade of falling public investment (1982-1988) the government responded in 1989 to the need to increase public investment and social expenditure. It did this by establishing a new institution with the responsibility of allocating credit to deprived sectors of the population. Through the National Solidarity Programme (Pro-

[2] In 1989, 10 percent of the population received 40 percent of total income (against 26 percent in OECD countries) while 20 percent live in extreme poverty earning 4.4 percent of total income (OECD, 1990).

[3] In the 1988 presidential elections there was widespread discontent with the government's policies with regard to providing basic amenities to the growing rural and urban poor, who constitute the base of the ruling party's political power.

grama Nacional de Solidaridad, PRONASOL) the state provides services to rural and urban communities. State funds are used to increase the number of schools and clinics, provide potable water, electricity, maintain and lay new roads and street paving. It has been established that PRONASOL receives its budget from resources obtained through the privatisation of state-owned banks and industries. The government claims that this institution responds to the new criteria of a smaller but more effective public sector by providing finance to specific needs of the population. Given the social and political success of PRONASOL's activities in the large disaffected urban and rural areas, it is clear that future economic policy will find ways and means of financing programmes long after the funds which are presently available from massive privatisation have dried up.

Past experience in developing countries has caused financial liberalisation theorists to consider the reduction of the public sector's deficit, and of the public sector's borrowing requirement, as one of the conditions to achieve macroeconomic stability, which in turn is considered as a necessary condition for successful liberalisation of the financial system. The Mexican government was successful in achieving this goal during the last two years of the period analysed. The reduction of the public sector's deficit reflects both a lower participation of the public sector in economic activity and a lower demand for financial resources by the public sector. Mention must be made that the latter was possible because of the massive privatisation programme undertaken by the government, which has been taking place since 1983 but intensified after 1989, allowing a rapid increase in the public sector's income. The financial sector is now operating with less regulations and less government intervention. A lower demand for financial resources by the public sector, together with a rise in financial savings, did allow an increase in the amount of credit given by the banking sector in the last two years of the period analysed (1989-1990) when the economy showed signs of recovery and total investment increased. At the moment of writing this conclusion, it remains to be seen if the public sector will sustain a surplus or a small deficit when income from the privatisation of public enterprises comes to an end. Otherwise, to finance a deficit balance, the public sector will have to resort either to the issuance of government bonds to the banking system and to the public through open market operations, or to compulsory lending from the commercial banks or to direct credit from the Central Bank.[4] Any form of financing of the public deficit should not constrain the supply of credit to the private sector, which proves to be, together with public investment, an important determinant of private and total investment.

Concerning the productivity of investment, no evidence was found of financial variables having a significant effect on the incremental capital-output ratio. This result undermines the hypothesis that a rise in the real interest rate and the financial deepening ratio necessarily improves the productivity of investment. On the other hand, chapter four has found empirical evidence to support the hypothesis that the productivity of investment is a function of the rate of growth of output. Further, one of the results obtained in chapter three, has shown that the productivity of foreign savings is high compared to that of public savings. This result is interesting for a country like Mexico which has relied heavily in the past on foreign financing and is relevant given that Mexico is currently pursuing a policy to attract foreign savings, especially in the form of direct foreign investment.

Chapter five examined the impact of foreign savings on domestic savings, investment and economic growth, and showed the empirical evidence obtained in the case of Mexico during the 1960-1990 period. The analysis undertaken in this chapter has pointed out the importance of foreign savings not only as complementing domestic savings but relieving the foreign exchange constraint. The empirical analysis gives support to the hypothesis that foreign savings supplement rather than substitute domestic savings. This

[4] In May 1993 the government ruled that the Central Bank will no longer be obliged to satisfy the public sector's financial requirements with direct credit. While this has been a recent development and a historic break in Mexico's financial tradition, it nevertheless falls out of the scope of enquiry of this thesis.

result applies to both foreign savings received by the public sector and by the private sector in the form of long term capital inflows, which has been the major form of foreign financing during the period analysed. The hypotheses that foreign savings reduce public savings by reducing the public sector's efforts to increase savings, and that private savings are reduced because foreign savings discourage the private sector to save, received no support from the empirical evidence in the case of Mexico during the 1960-1990 period.

Regarding the effect of foreign savings on investment, which is subject to less theoretical and empirical debate, the results for Mexico show that foreign savings have a positive impact on investment, as many other studies have shown for other countries. Moreover, among the components of foreign savings, the empirical evidence shows that a rise in foreign private investment has a larger impact on investment relative to the effects of foreign savings in the form of long term capital inflows. On the other hand, support was found for the hypothesis that long term capital inflows have a positive effect on investment not only during the current period but also in the long run, the nature of which makes it difficult to capture econometrically.

Unlike the 1970's and early 1980's when the major part of foreign capital inflows was used to finance the deficit of the public sector, the period after 1982 has been characterised by a search to attract capital inflows mainly in the form of foreign private investment. Since 1984 Mexico has progressively reduced existing impediments to foreign investment as part of the liberalisation policies by opening areas of the domestic economy to investors from abroad and by removing all restrictions of technology licencing. It was not until 1986 that foreign private investment was resumed following the sharp fall brought about by the debt crisis (1982). However, towards the end of the 1980's and until the present, foreign private investment gravitated towards the short-term speculative money market. For example, from 1989 to 1992, the ratio of portfolio investment to total foreign private investment rose from 14.0 percent to 71.6 percent. The huge increase in short-term capital inflows (which are mainly being invested in short-term government bonds), reflects, on the one hand, the high interest rates offered presently in Mexico relative to interest rates offered in foreign markets, but more importantly it reflects the uncertain expectations surrounding the performance of the Mexican economy and of future economic policy. In spite of this entry of capital into the domestic financial system bringing large amounts of foreign currency, its short-term nature makes it extremely vulnerable to any change in expectations. For instance, a real threat facing foreign and domestic investors is the possibility of a devaluation of the Mexican peso with respect to the U.S. dollar. Even though this has not prevented the entry of foreign capital, because of the decision of the government to peg the exchange rate, the growing size of the external deficit, especially after 1991, can be a disincentive to long term private capital inflows.

With regard to the rate of growth of output, it has been closely linked to the availability of foreign capital. Not surprisingly, the actual rate of economic growth in Mexico has been above or below the calculated rate of growth of output financed solely by domestic savings according to the net transfers of resources being positive or negative respectively.

The growth model developed in chapter five has found that on average, foreign capital inflows have had a positive effect on the rate of economic growth in Mexico for the 1960-1990 period. According to the specification of the model, this result implies that on average, net capital inflows have been higher than the proportion of capital outflows, both regulated and unregulated, that would otherwise have been invested domestically. That is, on average, the loss of savings due to capital outflows, which include net factor payments abroad and the estimated capital flight, has been lower than the average values of net capital imports. During the 1960-1990 period, foreign capital inflows allowed the Mexican economy to grow at a faster pace than the rate of growth achievable with only domestic savings as a source of finance. However, the results of the model have shown, as expected, that the high contributory effect of foreign capital inflows on output growth before 1982 was partially offset by the low and sometimes negative net transfer of resources after 1982. Moreover, not only was the amount of foreign capital inflows much lower after 1982 than before, but available foreign financing was linked more with servicing the external debt than with investment projects. On the other hand, the period in which the contribution of foreign capital inflows to growth was the highest was during the 1978-1981 period. According to the results obtained, during this period more than half the rate of growth of output was financed by foreign capital inflows.

The analysis in chapter five has shown that the positive effects of foreign savings on economic growth, either by increasing the overall level of productivity, by complementing domestic savings or by relieving the foreign exchange constraint on the balance of payments have been partially offset by the loss of savings through capital outflows. However, on average, the effect of foreign savings on growth during the period analysed has been positive.

In chapter six, emphasis is given to the role of foreign savings in relaxing the constraint imposed by the balance of payments on the rate of growth of output. Thirlwall's (1979, 1982) model, developed in chapter six, starts from the proposition that unless a country is a net recipient of capital inflows, it cannot grow faster than the rate of growth of output consistent with balance of payments equilibrium. Given that it is unlikely for a country to always be a net recipient of foreign capital, as has been demonstrated by the debt crisis, the long-run rate of growth of an open developing economy is determined by its capacity to export and its dependence on imports to expand output. The long run rate of growth of output is hence determined by the ratio of the rate of growth of exports to the income elasticity of demand for imports.

In the case of the Mexican economy, the growth rates predicted by the balance of payments constrained growth rate model are very accurate, supporting Thirlwall's model. For the 1960-1990 period, the predicted growth rate with overall equilibrium in the balance of payments was the same as the actual average growth rate. The closeness between the predicted growth rate from the extended model, in which foreign capital inflows were considered, and the growth rate predicted by the simple model imply that the effect of capital imports relaxing the balance of payments constraint on growth has been, on average for the 1960-1990 period, positive but small.

The accuracy of the balance of payments constrained growth model in predicting the growth rate supports the hypothesis that it is the level of income that adjusts to restore equilibrium in the balance of payments, and suggests a low effect of movements in relative prices measured in a common currency on the balance of payments and the long-run rate of growth.

The analysis undertaken in chapter six highlights the importance of improving the performance of exports and/or reducing the dependence of the economy on imports to expand output as the means to increase the rate of growth of output consistent with equilibrium in the balance of payments.

Starting from the beginning of the 1990's until the present has proved to be a severe testing period for the economic policies set into motion by the present administration. After four years, the euphoria which accompanied Mexico's liberalisation policies starting at the end of the last decade have begun to abate. Nevertheless, these policies seem to have restored the confidence of the private and foreign sectors in the country's economic future.

In spite of the resumption of capital inflows brought about by the reduction of previously existing barriers, the economy now faces the challenge of keeping the deficit on the current account of the balance of payments at a manageable level. Despite the rise and diversification of exports during the last decade, the growth of imports after 1988 has caused the deficit in current account to grow from U.S.$2.5 billion in 1988 to U.S.$22.8 billion in 1992. To avoid the external balance in current account causing a devaluation of the Mexican currency the government is currently implementing contractionary fiscal and monetary policies to slow down economic activity and the growth of imports.

One of Mexico's immediate economic concerns, however, is to ensure foreign long term direct investment and not speculative portfolio investment which can be highly volatile. While the ratification of the North American Free Trade Agreement negotiated in 1991 with the United States and Canada can help to bring about foreign direct investment, it is still necessary to maintain high levels of domestic investment. It may be mentioned in this context that while the liberalisation policies have elicited a positive response from the private sector, it is important that there is renewed participation of the public sector in the country's economic activities.

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