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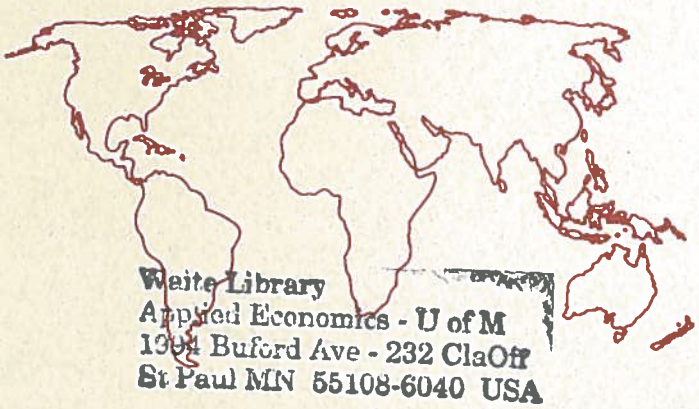

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THE ECONOMIC DEVELOPMENT OF TAIWAN, 1980 TO 1993

MACROECONOMIC POLICY: OVERZEALOUS OR INFLEXIBLE?[1]

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June 1996

Abstract

This paper analyzes the macroeconomic policies of Taiwan since 1980, to set the framework in which trade and industrial policy took place. When Taiwan's strategy for rapid economic development was being put in place during the 1950s and early 1960s, macroeconomic policy was central to the thinking of Taiwanese policymakers. The first major policy changes were the rise of real interest rates in the early 1950s, followed by the devaluation and unification of the exchange rate towards the end of the decade. Over the next two decades, sound macroeconomic policy was a hallmark of Taiwan's development. By the 1980s, however, it appeared that policymakers may have overdone conservative macroeconomic policies. Domestic saving grew as investment fell relative to GNP; exports exceeded imports by growing margins; and foreign reserves accumulated to the point of wasteful investment. The major question is whether policymakers intended to accumulate reserves or whether this was a result of mismanagement. It is evident that the stringent macroeconomic policies of the late 1970s were maintained too long. Even if policymakers' aim was to accumulate reserves, they pushed the policy so far that a sharp correction was inevitable and may have been forced on Taiwan by U.S. pressure. The post-1986 correction was also overdone. Private credit expansion was too rapid, the government, uncharacteristically, began running large deficits, and these policies may have exacerbated the stock market bubble of the late 1980s.

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[1] This paper is to be one of the opening chapters of a volume on trade and industrial policy in Taiwan since 1980; the volume is to be one of four on Taiwan, jointly written by HIID and CIER.

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Our objective is to analyze the macroeconomic policies of Taiwan since 1980, to set the framework in which trade and industrial policy took place. When Taiwan's strategy for rapid economic development was being put in place during the 1950s and early 1960s, macroeconomic policy was not at the forefront of development thinking in either the academic world or in the developing countries. But it was central to the thinking of Taiwanese policymakers. The first major policy changes were the rise of real interest rates in the early 1950s, followed by the devaluation and unification of the exchange rate towards the end of the decade. Over the next two decades, sound macroeconomic policy was a hallmark of Taiwan's development. Other countries in Asia, from Korea to Indonesia, also built their rapid economic development on a foundation of sound fiscal, monetary and exchange rate policies. Indeed, one of the fundamental lessons from Asian development is that internal and external macroeconomic balance are necessary conditions for rapid economic growth.

This conclusion has by now become commonplace. During the 1980s, macroeconomic adjustment became a condition on which IMF financing and much development aid was based throughout the world. This emphasis has been supported in the work of Stanley Fischer (1993), whose econometrics suggest that low inflation, low budget deficits, and low black market exchange rate premia are closely correlated with rapid growth; and that the causal direction appears to run from the policies to rapid growth, rather than the other way around.

Thus Taiwan led the way in placing macroeconomic policies at the forefront of their development strategy. By the 1980s, however, it appeared that policymakers may have overdone conservative macroeconomic policies. Domestic saving grew as investment fell relative to GNP; exports exceeded imports by growing margins; and foreign reserves accumulated to the point of wasteful investment. The core of this chapter focuses on these imbalances in the early 1980s and their eventual correction in the late 1980s. The major question, posed in the title, is whether policymakers intended to overbalance the economy towards external surplus or whether this was a result of mismanagement. Before dealing with this episode, however, it will be useful to recount briefly the pattern of macroeconomic policies established by Taiwan from the pioneering days of the 1950s through the oil shocks of the 1970s.

1. ANTECEDENTS: MACROECONOMIC POLICY FROM 1950 TO 1980

In the late 1940s, production in Taiwan was still only half the level before World War II and rapid inflation, reaching 500% a year at the end of the decade, was seen as the most serious problem facing economic policymakers. By the end of the 1950s, inflation had been contained and policymakers began to implement a strategy of export-led growth, starting with exchange rate reforms. In the 1970s, macroeconomic policy necessarily dealt with the oil price shock and subsequent destabilizing influences from abroad. This sections deal with each of those episodes in turn.

a. Land Reform

It may seem strange to begin a discussion of macroeconomic policy with land reform, but it played an important role in Taiwan's macroeconomic management. In the late 1940s and early 1950s, Taiwan was an agricultural country whose main products, for domestic consumption and export, were rice and sugar. Although land reform was carried out for other reasons, it had an important impact on price stabilization and, subsequently, on industrialization.

Land reform was carried out in three stages. A rent reduction program, begun in 1949, reduced the rent share of annual production from a range 50 to 70% to a maximum of 37.5%. From 1948 to 1953, publicly owned farmland was sold, mostly to tenants and farmhands. And in 1953 government began acquiring farmland from landlords for 2.5 times the annual yield of its main crop and alalocating it to tillers. The purchase price was about 60% of the market value and payment was split between land or commodity bonds (70%) and shares in public enterprises (30%), the latter of which depreciated in value. Thus there was an element of expropriation in the transfer of land from landlords to small farmers.

Land reform created strong incentives for the new farmer-owners to invest in their land. Farm productivity and output increased sufficiently to contribute to the eventual stabilization of food prices. Rising agricultural productivity helped create a work force for the rapid industrialization that began in the 1960s, while growing rural incomes contributed to the increased saving that financed Taiwan's rapid development. And the reforms played a major role in creating and maintaining one of the world's most equal income distributions throughout Taiwan's development, a factor that in turn made rapid change and macroeconomic austerity more acceptable to the population. Thus land reform was one of the pillars of Taiwan's development and helped make possible its characteristic approach macroeconomic management.

b. Interest Rate and Financial Policy

In March, 1950, the Government of Taiwan created the Preferential Interest Rate Deposits Scheme (PIR), which at first paid a nominal 7% a month on one-month deposits. At the time, inflation was running at 10% a month (225% a year) after five years of extremely high inflation rates. Within a few months PIR plus other savings and time deposits had risen from under 2% to 7% of the money supply and inflation had fallen to 6% a month. By the middle of 1952, PIR deposits earned real interest rates over 3% a month, interest-earning deposits accounted for over half the money supply, and prices were stable. (Tsiang, 1984: 314, 324)

A policy of high deposit rates was a break from the practice in developing countries at the time and for two or three decades after. Though most economists urged that interest rates be set at, or be freed to seek, market-clearing levels, most developing countries suppressed interest rates as a way of reducing the costs of borrowing and thus promoting investment. Taiwan's policy makers recognized early, however, that the interest rate is both a supply and a demand price and that suppressed rates would discourage savers from channeling their assets through the banking

system, which would frustrate borrowers. They may also have believed that higher deposit rates would encourage households to save a higher share of their income, though later research on many countries has called this assumption into question (Fry, 1995: 162-9).[2]

Tsiang (1984: 318) implies that policy makers also used high interest rates on deposits as the main weapon against inflation. Inflation was a preoccupation with the Kuomintang government, which had learned at great cost the implications of hyperinflation on the mainland and which faced dramatic price rises when it fled to Taiwan (Ranis and Mahmoud, 1992: 119). Inflation fell dramatically within a few months of the introduction of the PIR deposit scheme. But monetary policy was also restrained. By March 1952, when prices finally stabilized (and for a time began to fall), the real money supply (M2) was 20% below its level two years earlier. High deposit rates tightened liquidity even more, however. Interest-bearing deposits had grown to 31% of the money supply by March 1952. It is arguable that, with real rates on deposits running at 25 to 40% a year, savings deposits were not highly substitutable for cash and checking deposits in consumers' minds, so that M1 rather than M2 was a better indicator of liquidity. Real M1 had fallen by more than 40% from March 1950 to March 1952.[3]

The resumption of United States aid after the outbreak of the Korean War also helped to staunch inflation. This was accomplished through the increased supply of imported goods and the sterilization of a substantial part of the proceeds from the sale of U.S. goods. U.S. counterpart funds were partly used to finance budget deficits, which had previously been financed by central bank borrowing; and partly impounded in counterpart accounts in the Bank of Taiwan. By July 1954 these sterilized funds amounted to 40% of the money supply, a strongly contractionary feature of monetary policy (Tsiang, 1980).-

Thus, from the very beginning, Taiwan's policy makers established monetary and especially interest rate policy as a foundation for economic management and development strategy. Throughout the period to 1980, real interest rates remained positive and high (Ranis and Mahmound, 1992: 120). From 1955 to 1965, real rates on deposits ranged from 6 to 20% a year (Kuo, 1983: 17). In the years after 1965, real deposit rates were positive in all but three years and ranged from 4 to 11% a year.[4] Non-preferential rates on secured loans were generally 2 to 8 points higher.

However, Taiwan did not leave the cost and allocation of loan finance entirely to market forces. In July 1957, when banks were charging 20% a year on secured and 22% on unsecured loans, the Bank of Taiwan began offering loans at 12% to manufacturers who were attempting to

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[2] Our own regressions on Taiwan, reported below, find significant but small the coefficients (elasticities) on real interest rates, but these do not cover the early 1950s.

[3] These figures are approximations based on incomplete data supplied by Tsiang, 1984: 324.

[4] Unless otherwise noted, calculations are based on data from the Republic of China (1994).

penetrate export markets, a facility that expanded during the 1960s and 1970s using a rediscount facility at the central bank (Myers, 1990: 35-6).

Even in this notable use of directed, subsidized credit, Taiwan distinguished itself from other most other developing countries. First, as in Japan before and Korea shortly after, directed credit contained a targeted subsidy for exporters rather than being offered indiscriminately to manufacturers in general and import substituters in particular, as in other countries. Because three large, government-controlled banks dominate the banking system, in Taiwan, as in Korea, it was relatively easy for the authorities both to control interest rates and to subsidize credit directed at export firms (Cheng, 1986: 154; Emery, 1991: 243).

However, because the bulk of Taiwan's exports came from small firms, it is unlikely that directed credit was the decisive factor in financing export growth. A second distinguishing feature of Taiwan's directed credit program is that it coexisted with a well developed informal credit or curb market. Nominal interest rates in this market were nearly double those on unsecured loans from commercial banks (Myers, 1990: 35). And the curb market was large. Loans by enterprises and household rose from 20 to 31% of domestic financial assets from 1965 to 1983, while securities issued by enterprises, some of which may have been traded in the curb market as well, declined from 35 to 26% of total financial assets over the same period (Cheng, 1986: 146). It is thus possible that the curb market mobilized as much finance as the formal financial system. The government even supported curb market activity by making post-dated checks, the most often used instrument in that market, legally enforceable; indeed, it was a criminal offense to bounce a post-dated check (Cheng, 1986: 149).

Thus Taiwan made its mark on financial market strategies in developing countries by pioneering high interest rates as an instrument of both stabilization and credit allocation; by directing credit towards (probably large-scale) exporters; and by encouraging the informal financial market to become an major financial intermediary. The strategy seems to have succeeded in all respects. Inflation was kept low throughout the period from 1962 to 1973, when the wholesale price index averaged less than 2% growth a year. Even during the 1970s, when prices rose by 10% a year, this was below the rates in the industrial countries (Myers, 1990: 43). Even though interest rates probably get little credit, savings was high as a share of GNP, rising from 15% in 1952 to 33% in 1979. And this large flow of savings was channeled into productive investment: as a rough indicator, from 1965 to 1980 approximately 27% of GNP was channeled into investment, yielding GNP growth of 10% a year and giving a capital-output ratio of less than 3, well below that for most developing countries.

But not all observers applaud Taiwan's approach. Cheng (1986: 152-3) argues that interest rate policy was not stabilizing, because bank loans rates were adjusted slowly relative to inflation and sometimes counter to it. He notes that Taiwan did run a partially repressed financial policy, diverting domestic savings into the largely unregulated and therefore riskier curb market and presumably reducing investment from its optimal rate given free markets. In December 1975 the authorities began to develop a money market that traded in bills issued by the

Ministry of Finance under market-determined rates. It was not until the late 1980s that formal credit markets were deregulated, banks became more competitive, and loan rates became more flexible (Emery, 1991: 269; Kuo, 1993: 5)

c. Exchange Rate Policy

A third distinguishing feature of Taiwan's macroeconomic policy has been its approach to exchange rate management. During a relatively brief period of import-substituting industrialization, a dual exchange was maintained, with a basic rate for some importers and a higher (more depreciated) rate for other importers and for exporters. By April 1958 the rates had become overvalued. Government then devalued the basic rate from 15.55 to 24.58 NT$/US$ and permitted exporters to earn exchange surrender certificates (ESCs) that could be sold to importers at market prices. In August 1959, the rates were unified at NT$38.08 per US$, then allowed to drift up to NT$40 in 1960 and pegged there until 1973. (Tsiang, 1984: 307-8)

The devaluation and unification of the NT dollar was a major incentive for exporters, but two additional components were needed to realize Taiwan's potential for rapid export growth. First, the price stability of the 1960s, promoted by responsible monetary policies and high interest rates, kept the real exchange rate at rewarding levels for exporters. Second, a gradual relaxation of controls and tariff rates on imports of direct concern to exporters, combined with a duty rebate scheme and the preferential loans to larger exporters, helped to cement the incentive system and set off the export boom of the 1960s (Myers, 1984: 46-7). In 1971, it was estimated that exporters on average received incentives of NT$5.71 above the official exchange rate from interest subsidies and tax rebates (Schive, 1987: 320-1). From 1960 to 1970, exports nearly tripled as a share of rapidly rising GNP and by 1980 exports, at 53% of GNP, were five times the relative level 20 years earlier.

During the 1970s, Taiwan's international competitiveness had become well established when the end of the Bretton Woods system of fixed exchange rates was followed by the first oil crisis. Although Taiwan continued to peg its exchange rate, it was permitted to appreciate in two steps before 1980, when it reached NT$35.96 per US$. An index of the real rate, based on the CPI and trade shares of the United States, Japan and China, followed closely. In 1978 the authorities formally introduced a managed float (Myers, 1990: 51), but it remained a heavily managed rate until the late 1980s, when controls over both current and capital account payments were relaxed (Kuo, 1993: 6).

Taiwan's legacy in exchange rate management, at least until 1980, has been to adopt a unified nominal rate that gives an incentive to actual and potential exporters of non-traditional products; to add tax rebates and credit incentives; then to maintain a steady real rate through prudent monetary management that focuses on maintaining high interest rates. In this it differs from Korea, which permitted much faster inflation during the 1960s and moved its nominal rate substantially to maintain exporters' real incentives. The legacy does not include a classically open trade account. Import duties and effective rates of protection were low on average (Balassa,

et al., 1982: Table 1-5) and Taiwan's trade regime was probably more open that that of most developing countries of the 1960s and 1970s. But there was substantial variance in effective tariff rates among sectors and a set of formal and informal restraints that hindered imports (Wade, 1990: 55-6, ch. 5). Whatever barriers to trade did exist, the government tried to insulate exporters from them through the incentives mentioned and through duty-free export zones.

Fei (1992: 6-7) takes a darker view of this regime. He writes of "persistent undervaluation to favor exporters [who] quickly became the dominant vested interest group in which 'Everything for Export' was sloganized to represent a social consensus." Fei sees the foreign exchange rate as a political instrument in an essentially command economy, one that created windfall profits for an entrepreneurial class by political favoritism. If so, it can at least be said that Taiwan's favored class of exporters produced more for its economy and its population than the entrepreneurial classes favored in other countries where import substitution ruled until growth ground to a halt. And the important lesson for the remainder of this chapter, consistent with all observers' views of Taiwan's exchange rate strategy, is that the rate was always seen by the authorities as an incentive to exporters.

d. Managing the Oil Shocks, 1973 to 1980

The oil price shock of 1973-74 was a major test of macroeconomic management for all economies, but particularly those, like Taiwan, that imported oil and other raw materials and exported manufactures. In 1972, 63% of Taiwan's imports were raw materials, including petroleum, and 83% of exports were manufactures. The impact of oil shocks can be seen in the share of minerals in total imports, which went from 7.5% in 1972 to 11.6% in 1975 and 23.6% at the peak of oil prices in 1980. The balance of trade (goods and services), which turned positive in 1970, was in deficit for only three years thereafter: 1974, which the deficit reached 7.8% of GNP, 1975 (3.4%), and 1980 (1.2%). The first shock was particularly harsh, as the trade balance worsened by 12% of GNP from 1973 to 1974. It hit as Taiwan's development was gathering momentum. GNP grew by 11% a year from 1965 to 1973, while exports and imports both rose rapidly as a share of GNP, from around 20% to over 30%.

Though the abrupt shift in the external balance must have seemed very threatening to the authorities, they did not take precipitate action. The money supply continued to increase by 10 to 12% of GNP throughout the first crisis. A sharp fall in reserve accumulation was offset by greater increases in private domestic credit. Nominal interest rates changed very little, so real rates turned sharply negative in 1974, then recovered as inflation was brought under control. Government expenditure was cut severely in 1974, from almost 20% of GNP to 16%, but was restored to 20% the year after. As the revenue share of GNP hardly changed, the budget was close to balance except for 1974, when it ran a 4% surplus. The nominal exchange rate was actually appreciated by 5% from 1972 to 1974, possibly a reaction to the structural changes that were making Taiwan increasingly competitive in world markets. The real exchange rate based on consumer price indices appreciated more sharply, but the rate based on world prices of

tradables depreciated by 5% in the face of the world commodity price boom. Taken together, these measures do not suggest panic on the part of policy makers.

The economy did respond to this gentle medicine. In 1974 there was a spike in imports to almost 50% of GNP, while the export share declined and the trade deficit was reached 7.8% of GNP. The import spike was deliberate, as the government encouraged manufacturers to stock up on imported raw materials by suppressing real interest rates and keep the exchange rate from depreciating. Inventory investment shot up to 10% of GNP. But by 1976, trade balance had been restored with exports reaching a new plateau of over 45% of GNP. Wholesale prices, which rose 23% in 1973 and 41% in 1974, declined by 5% in 1975 and rose by about 3% a year for the next three years. The oil shock did interrupt the previously steady growth of saving and investment as shares of GNP. Investment spiked because of the inventory surge in 1975, then returned to lower levels that were nevertheless above the pre-shock shares of GNP. Saving, especially private saving, fell sharply during the crisis but soon recovered to a plateau between 30 and 35% of GNP. Thus the first oil price boom, however unsettling it was at the time, now appears as a sharp but short disruption in Taiwan's steady economic growth and macroeconomic balance.

The second shock had a similar but somewhat muted impact. The trade balance did deteriorate by 7.6% of GNP from 1978 to 1980, but was then in deficit by only 1.2% of GNP. This time the export share did not fall and, though imports once again shot up to 45% of GNP in 1980, they then began a steady decline that is an important part of the story of the 1980s. Saving remained high and investment actually rose through the second shock. This time, however, monetary policy was relatively tight. While net foreign assets once again stopped growing, this time the authorities did not sterilize changes in reserves but instead put a damper on private domestic credit, so that monetary growth fell from over 15% of GNP in 1978 to only 5% in 1979 and 10% in 1980. Once again government expenditures were cut and the budget went from deficit to surplus, with a swing of about 3% of GNP. The nominal exchange rate appreciated slightly during 1977 to 1979, contrary to expectations. Wholesale prices rose rapidly during 1979-81, with inflation averaging 15% a year, but then fell during the early 1980s. As oil prices began to recede, the economy was under tight macroeconomic control and began generating the large external surpluses that marked one of the more unusual episodes of macroeconomic management among developing countries.

2. ACHIEVING EXTERNAL SURPLUSES, 1980 TO 1987

By 1980, Taiwan had established itself securely as a newly industrializing country, whose per capita GNP had been growing by over 7% a year for two decades. Saving had gained steadily and by the late 1970s was consistently exceeding 30% of GNP, enough to finance gross investment and generate a foreign surplus. Policy makers had established their capacity to manage the economy soundly. They had overcome domestic inflation during the 1950s; unified and deval-

ued the exchange rate by the early 1960s; then overcome the recession of the first oil crisis and resumed rapid income growth by 1976.

From the perspective of 1980, however, Taiwan's economy appeared to be in trouble. The second oil crisis hit in 1979 and had, by 1980, contributed to a 10% fall in the terms of trade, equivalent to a 4% decline in national income,[5] and a small external deficit. Per capita income growth declined to an eight-year low of 1.7% in 1981.

The authorities moved decisively and effectively to counter these tendencies. By 1982 the economy had recovered to grow by over 6% per capita and growth of national income averaged 8% a year for the rest of the decade. The surplus of saving over investment expanded rapidly, peaking at more than 20% of GNP by 1986, when the economy had accumulated foreign reserves of $47 billion, equivalent to 1.5 years' worth of imports.

How was this reversal achieved? The erosion of oil prices helped: Taiwan's terms of trade improved steadily throughout the 1980s, rising by 22% from 1981 to 1986, a gain of about 8% of GNP. But policies played a distinctive role. In this section we explore the components of national income and the indicators of macroeconomic policy change, in an attempt to explain an economic recovery so dramatic that Taiwan's massive accumulation of international reserves precipitated new domestic and international problems and forced the authorities to change their approach after 1986.

The framework for this analysis is the national income identity, [6]

$$Y = C_p + C_g + I + E - M$$

which, with saving defined as

$$S = Y - (C_p + C_g),$$

results in the identity between the saving-investment balance and the current account balance,

$$S - I = E - M.$$

A simple model would make saving and imports functions of income; saving and investment fuctions of real interest rates, r, (or monetary policy); and exports and imports functions of the real exchange rate, p:

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[5] Imports were about 40% of GNP during the 1980s.

[6] The symbols have the usual meanings: Y = gross national income, C = consumption of private agents (p) or government (g); I = gross investment; E = exports of goods and services; M = imports of goods and services; and S = gross national saving.

$$S(Y, r) - I(r) = E(p) - M(Y, p),$$
$$\quad + + \quad - \quad + \quad + -$$

with the signs indicating the direction of change.[7]

It Taiwan before the mid-1980s, both the nominal exchange rate and nominal interest rates were managed by the authorities. We could, then, treat these as exogenous variables, at least in the short term. However, if these nominal rates were being used to target the real exchange and interest rates, then the latter would be the independent variables. The data on the real exchange rate for the period up to 1980 suggests such targetting, and we know that, from the early 1950s, the authorities were concerned to keep real interest rates positive. Thus we treat the real, not the nominal, rates as exogenous.

Thus Taiwan's economic recovery in the early 1980s, especially its generation of large external surpluses, required policies that increased the internal savings and external trade balances simultaneously, using both monetary (interest rate) and exchange rate policies. In the next two sections we examine each of these balances separately to help answer two questions: Can economic policies explain these outcomes--indeed, were policies even consistent with the outcomes--or were underlying, long-term structural changes involved? If policies were effective, did policymakers intend to generate such large surpluses or did the policies adopted to generate recovery in 1980 simply go too far?

a. Internal Balance

That 1980 was a watershed in Taiwan's economic history can be seen readily in Figure 1. In the two decades before 1980, gross national saving had been more or less in balance with gross capital formation: higher in some years, notably 1971-3 and 1976-8; lower in others (1968-9, 1974-5);[8] but in reasonable balance on the average. From 1980 on, however, saving exceeded investment consistently and by a wide margin: the saving surplus grew to a peak of 21% of GNP in 1986 and declined only gradually thereafter. From 1982 to 1986 the surplus of saving over investment averaged 10% of GNP.

Figure 1 shows that, at least until 1986, the growing internal surplus was due as much to rising saving as to falling domestic investment. Figure 2 provides a clear picture of the sources

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[7] A more realistic model would allow for the influence of monetary policy on the trade balance and possibly for the impact of exchange rate changes on investment. Although we experimented with these more complete specifications, the results were either statistically insignificant or gave counterintuitive signs. Thus in what follows, the simpler structure is emphasized.

[8] In 1974-5 government encouraged the import of raw materials to build inventories as a defense against the uncertainties of the oil crisis. Inventory investment exceeded 10% of GNP in 1974.

of rising national saving. Gross national saving was 32% of GNP in 1980. It first fell, then rose to 38% of GNP by 1986. Saving by government and its enterprises fluctuated as a share of GNP from 1980 to 1986, but was lower at the end of the period than at the beginning. Private saving, however, rose from below 20% of GNP in 1980 to a two-year peak of 28 to 29% in 1986 and 1987, after which it fell back to the range of 19 to 23% that was the norm for most of the 1980s. Private enterprise saving, including allowance for depreciation, fell then rose as a share of GNP, ending the period only slightly higher than it had begun. It was household saving, which rose from 11 to 19% of GNP, that contributed most to the rise in gross national saving from 1980 to 1986. In nominal terms, private saving accounted for 84% of the increment in gross national saving from 1980 to 1986 and household savings alone accounted for 61%. If the rise in national saving was an aim of government, it must have been carried out by indirect means through the private sector.

FIGURES 1 AND 2 HERE

Interest rates moved in the right direction. Although nominal interest rates on three-month deposits fell from 10% a year in 1980 to 4% in 1986, inflation also fell sharply from the double-digit levels of the second oil crisis.[9] The net result was that the real interest rate on three-month deposits soared from negative 7% in 1980 to a high of 6.5% in 1984 and was still over 3% in 1986.

Conventional macroeconomic policy instruments, especially short-term ones, generally have weak impacts on private saving (Fry, 1995: 162-9). In the regressions reported in the appendix to this chapter, however, we found a statistically significant elasticity of the saving-GNP ratio with respect to the real deposit rate[10] of +0.9. As explained in the appendix, if we allow for the gradual adjustment of the saving rate to higher values of the real interest rate, for the six years from 1980 to 1986, the 5.8% rise in $1+r_d$ could have been responsible for a rise in the saving rate of only 11%, while the actual rate increased by 50%. Coefficients from the first-difference regressions give lower estimates, accounting for a rise in S_p/Y of 7% at most. It appears that, although interest rate policy may have had an impact, it cannot explain much of the rise in saving rates during the early 1980s..

High private saving has been a notable feature of economic development in East Asia. Tibor Scitovsky (1990), in comparing saving rates in Taiwan and Korea, pointed to the absence of social security and other formal pension mechanisms as a major factor contributing to private saving in both countries. Other writers have pointed to the importance in household budgets of privately financed education which, with other expenditures on the young, would detract from measured household saving (McGinn, *et al.,* 1980: 70-1). In this spirit, we included in the saving regressions two variables for dependency ratios, that of children under 15 years of age and that of

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[9] The wholesale price index averaged a 14% annual rise over 1979-81, then was stable for the next five years; the consumer price index rose 15% during the first period and less than 1% a year thereafter.

[10] The variable used was $1+r_d$, where r_d is the deposit rate.

people over 65 years of age. In the log-linear form of the regression (only), both coefficients are significant and negative. However, the increase in the share of the ageing population counteracts the decline in the share of the young population, leaving the rise in saving to be explained by other factors. The coefficient on over-65 dependency, though statistically significant, is implausibly large, casting some doubt on this regression.

There remains the possibility that a fourth explanatory variable (in addition to the real interest rate and the two dependency rates), the growth rate of per capita income, might account for the spike in the savings rate in 1986 and 1987. During those years the growth rate soared to an average of 11% a year from the previous six-year average of 5.4% a year. Both log-linear and log-difference regressions show significant coefficients for the income growth term. Using the estimated short-run coefficients, the surge in income growth could account for only a 4% rise in the saving rate, and an 8% rise in the long term. Taken together, the explanatory variables in the log-linear regression explain less than 40% of the rise in S_p/Y if we use the steady-state estimates of the elasticities and about half of this is due to shifts in the interest rate.

While saving was rising as a share of GNP, investment was falling. Gross domestic capital formation, which peaked at 34% of GNP in 1980, fell to half that level by 1986, after which it rose back to a plateau averaging 22.6% of GNP from 1988 to 1992 (Figure 1). The decline was general, affecting both public and private investors. As Figure 3 shows, though government investment declined only slightly from 1980 to 1986, public enterprise investment plummeted from 12 to just over 3% of GNP and private investment fell from 17 to 10%.

FIGURE 3 HERE

The steep decline in investment by government enterprises suggests a deliberate policy. But to what end? One possibility is a decision to reduce government's role in favor of the private sector. During the Eighth Four-Year Plan, 1982-1985, the government did intend to reduce public enterprise investment slightly to free more finance for private investment.[11] But the actual fall was far steeper than planned. Most of it may instead be attributed to the delay or suspension of several large industrial projects in the face of new environmental concerns and government controls.[12]

If the government's aim was to encourage private investment, then its monetary policy would have encouraged relatively low real interest rates. But we have already noted that, although the nominal rates on deposits fell, so did inflation, causing a net rise in real deposit rates. The corresponding picture on loan rates was the same: nominal rates on secured loans fell (from 15% in 1981 to 10.75% the following year and 9% in 1986), while the sharp decline in inflation

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[11] Conversation with Yeh Wang-an, CIER, 8/26/94.

[12] The projects included a nuclear power plant, naptha cracker, steel mill, and petrochemical plant.

allowed real rates to soar from slightly negative during the second oil crisis to a range of 8 to 10% in the five years from 1982 to 1986.

In the regressions reported in the appendix, equations using the contemporaneous interest term yield negative and large short-term elasticities (-3 in the log-linear form and -1.3 in the log-difference form), suggesting a rather rapid response by investors to changes in interest rates. Allowing for gradual adjustment from one level of interest rates to another, the observed shift in rates and the higher elasticity estimate are able to explain considerably more than the observed fall in the investment rate. The more credible elasticity estimate of -1.3, however, only explains a drop of 18%, compared the observed decline of 40% in I_p/Y from 1980 to 1986.

The monetary policy behind these shifts in interest and inflation rates appears to have been lax, as Figure 4 shows a steady rise of the increment in M-2 as a share of GNP throughout the period from 1980 to 1987. However, the rise was from a low base. Money supply had grown relatively slowly in late 1970s, bringing annual increases in M-2 down from 15% of GNP in 1977 to only 5% in 1978.[13] The steep rise in annual increments from 1978 to 1988 can be seen as a return (with some overshoot) to the previous trend of rising ratios of increments in M-2 to GNP. A regression of the *stock* of M-2 as a share of GNP on GNP per capita confirms this: the residuals for 1979 to 1984 are all negative.

Almost three-fourths of the rise in nominal money during the early 1980s was due to an increase in net foreign assets. Because government decreased its net debt to the banking system, there was still room for some nominal expansion of private credit, which accounted for almost 40% of rise in nominal M-2. But increases in private credit fluctuated as a share of GNP, rising from 1980 to 1983, then falling precipitately until 1986, after which it rose even more steeply (Figure 4).

FIGURE 4 HERE

There is some evidence, then, that private domestic credit grew relatively slowly during a three-year period from 1984 to 1986, when increments in net foreign assets rose steeply as a share of GNP. Was this deliberate? In an interview with the authors, central bank officials stated that the bank did intend to sterilize 80% of the increase in reserves by expanding domestic credit at lower rates.[14] However, they believed that private liquidity was adequate during this period and was not a constraint on investment. Exporters who sold foreign exchange to the banking system of course owned the resulting local currency deposits and presumably had ample and growing liquidity. Other firms might have been squeezed if they depended mostly on the banks

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[13] The second rise in oil prices contributed to a drop in the accumulation of foreign reserves, while the growth domestic credit also slowed. As real interest rates were not especially high during those years, the reduction in net dometic credit can probably be attributed to a fall in demand for credit rather than in tight monetary policies.

[14] Interview with Paul Chiu, Deputy Governor, Bank of Taiwan, January 1994.

for credit. But it is also likely that the liquid export firms advanced credit to other companies, either directly via trade credit or indirectly by lending through the curb market.

Bank officials cite the stock market boom as further support for their view that domestic credit was not a binding constraint on investment. Stock prices rose by 72% from 1981 to 1986, but this was only slightly more than nominal GNP. The real boom, an explosion of the index by a factor of nine in three years, began only in 1986, at the end of this period.

An attempt to raise international reserves through tight monetary policy would have to be backed up by tight fiscal policy. Reduced government consumption or increased revenues would contribute to increased saving, while budget surpluses could be used to reduce net government indebtedness to the banking system and thus curb money growth. Government expenditure did indeed fall as a share of GNP from 1980 to 1986, as Figure 5 shows. But tax revenue fell and the net result, the government balance as a share of GNP, fluctuated between balance and a deficit equivalent to 2% of GNP, with no trend until 1988. Fiscal policy appears to have been approximately neutral; it does not seem to have been supporting a tight monetary policy.

FIGURES 5 AND 6 HERE

Thus domestic credit policy was tight enough during the first half of the 1980s, and real interest rates rose enough, to have caused half and possibly much more of the fall in private investment relative to GNP. Were there structural factors in Taiwan that might have contributed to lower investment even while household savings were rising? One possibility is that Taiwan's underlying comparative advantage was changing in the 1980s, as wages rose relative to productivity, the work force was becoming better educated, and the stock of investible funds was rising relative to income. Taiwan's entrepreneurs could have responded to these influences in two ways. First, they could have invested overseas, taking their labor-intensive technologies to countries with more abundant, less skilled labor forces. This they began to do, but not until after 1986. Second, they could have begun to invest domestically in new industries that used human and physical capital more intensively. It is plausible that such a shift might have taken place with a several-year lag, during which private investment would have been insufficient to absorb rising private saving. Some government economists believed this was the case,[15] but what is the evidence for it?

Table 1 presents data on the growth of real wages per unit output and of investment by industry for two periods, 1978-1985 and 1985-1993. The growth in real wages per unit of output--the efficiency wage--measures the rate at which real wage growth has exceeded labor productivity growth.[16] If Taiwan's comparative advantage was shifting from labor- to skill- and

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[15] Conversation with Yeh Wang-an at CIER, 26 August 1995.

[16] Real wages per unit of output is $W/Q = (wL)/Q = w/(Q/L)$ or the real wage divided by labor productivity.

capital-intensive industries, we would expect the growth of real wages per unit output to be faster in the former than in the latter branches of industry. Efficiency wages rose for manufacturing as a whole and for every branch of manufacturing, over both periods, with the exception of chemical products for the first period. But, consistent with the hypothesis of shifting comparative advantage, from 1978 to 1985 they rose substantially faster than average in food products, beverages and tobacco, textile mill products, fabricated metals, precision instruments and miscellaneous manufactures, all of which are labor-intensive; and slower than average in pulp and paper, industrial chemicals, and chemical products, which are capital-intensive. The slow growth of efficiency wages in apparel and leather products is not consistent with the hypothesis, however. From 1985 to 1993, most branches confirm the hypothesis of shifting comparative advantage, with the exceptions of textile products (slow growth in efficiency wages) and the two chemical industries (fast growth). Broadly speaking, then, data on wages and productivity confirm the notion that investors may have been shifting from one set of industries to another.

TABLE 1 HERE

The data on investment growth in Table 1 give more mixed results, however. Consistent with the idea that the shift in comparative advantage caused investors to hesitate for a period, investment in manufacturing as a whole did grow slowly during the first period, 3% per annum, and accelerated to 6% from 1985 to 1993. But the changes for individual branches of industry do not give consistent results. Textiles and leather had rapid investment growth from 1978 to 1985, while investment grew slowly or declined in chemicals, rubber, basic metals, and non-electrical machinery, contrary to expectations. During 1985 to 1993, the growth of investment is generally higher in the non-labor-intensive industries, as expected. Regressions of investment growth on efficiency wage growth show no significant correlation for the first period, but give the anticipated strong negative correlation for the second period. It does not appear that the early period changes in efficiency wages caused the investment pattern of the later period: the correlation of $g(I)_2$ on $g(W/Q)_1$ is not signficant. If anything, causality runs the other way: a regression of $g(W/Q)_2$ on $g(I)_1$ yields a negative coefficient that just fails to be significiant at 5%, so that faster growth of investment in period 1 may have led to slower growth of efficiency wages in period 2, an equally plausible hypothesis.

Thus the suggestion that a shift in comparative advantage caused a temporary slowdown in investment finds some support in the data, but results are not totally convincing. The data give stronger support after 1985 than before, even though the slowdown occurred in the early 1980s, and investment in the early period may help explain productivity changes in the second, which does not support the hypothesis.

b. External Balance

Monetary and interest rate policy may thus have been both deliberate and partly successful in creating a saving surplus, mostly from the investment side of the ledger. What can be said about the corresponding surplus in the current account of the balance of payments? Figure 7 shows

the components of external balance. Exports (of goods and services) balanced imports in 1980. Thereafter, exports rose gently as a share of GNP until 1987, while imports fell sharply, then partially recovered. Throughout this period, reserves rose steeply, reaching a peak of 60% of GNP in 1987.

FIGURE 7 HERE

First, what happened to the principal policy instrument for external balance, the real exchange rate? From 1972 until 1980, the nominal exchange rate against the U.S. dollar had been permitted to appreciate by 10%, from NT$ 40 to 36 per US$. From 1981 to 1983, however, this trend was reversed by a gradual devaluation back to NT$40, where the rate remained until the end of 1985. Thereafter the Taiwan dollar was again allowed to appreciate to a low of NT$25 by December 1990.

Although the nominal exchange rate is the policy instrument available to a government to alter relative prices between foreign and domestic goods and services, it is the real exchange rate--which governments cannot control directly--that matters to producers and traders. The real exchange rate is conventially defined as:

$$RER = eP^*/P,$$

where e is an index of the nominal exchange rate in local currency per unit of foreign currency; P^* is a measure of foreign prices and P is a measure of domestic prices. As conventionally measured, P^* and P are the consumer price indices of the foreign trade partner and the home country, respectively. Generally a weighted average *RER* is calculated for the major trading partners, using either export or import weights.

For Taiwan, a weighted average of *RER's* for the United States, Japan and China covers the major trading partners and a majority of the export trade, while data for only the U.S. and Japan are required to cover over half of the import flows. Figure 8 shows that, based on the conventional measures using consumer price indices, both the export and import *RERs* depreciated with the nominal rate after 1980, the export rate rising by 10% and the import rate by about 25% to 1986. (In these charts, a rise in the index is a depreciation.) From 1986 onward, however, both real rates appreciated substantially, the export rate by 39% and the import rate by 20% to 1991. Over the decade of the 1980s, the import rate remained much more depreciated than the export rate, principally because the yen, which was appreciating during the period relative to both the U.S. and NT dollars, has a much greater weight in the import index (nearly 60% compared to only 20%).

FIGURE 8

However, the conventional measure of the *RER,* using foreign consumer price indexes, is a poor measure of the real exchange rate. Both trade and macroeconomic theory suggest that the

proper measure of international competitiveness is a comparison between the prices of tradables and nontradables, or

$$RER = eP_t^*/P_n,$$

where P_t^* is a measure of tradable prices in foreign currency and P_n is a measure of nontradable prices. The home country's CPI is not a bad measure of P_n, although it includes tradable goods, but the foreign CPI is a poor measure of tradable prices because nontradables have a heavy weight in most consumer goods baskets. The International Monetary Fund now gives price indices for exports and imports for the industrial countries. Using these instead of the the CPI for Taiwan's trading partners gives a very different picture for the two *RERs*. As shown in Figure 9, the real export rate, which uses partners' import prices, appears to have been quite steady from 1965 to 1980, with some tendency to depreciate in the late 1970s, but then shows no signs of depreciation after 1980 despite the nominal depreciation of the NT dollar. The import rate, which uses partners' export prices, shows a general tendency to appreciate through the period from 1965 to 1991 and shows none of the sharp post-1980 depreciation of the CPI-indexed *RER*. Other measures of the real rate, using imputed domestic prices of tradables and nontradables from Taiwan's national accounts, are more erratic but show similar trends.[17]

FIGURE 9 HERE

Until recently, economists have used the CPI-indexed real rate because better measures were not generally available. Hence policymakers in Taiwan during the late 1970s would almost certainly have tracked the CPI-indexed version. So it is quite possible that policymakers did target the real rate, using nominal devaluation as their policy tool, and intended the kind of depreciation that the CPI-indexed rate showed. But it is not clear that the change in incentive was being transmitted to Taiwan's producers, because in their markets on average the NT dollar was not depreciating at all.

However, say for the sake of argument that producers were sensitive to the CPI-indexed real rate. Would the depreciation of the early 1980s have led to the observed trade surplus? The regressions reported in the appendix give unstable and contradictory results. The most plausible estimate for exports shows a short-term elasticity with respect to the CPI-based real exchange rate of 0.5. This estimate implies that, allowing for gradual adjustment over six years from 1980 to 1986, the real devaluation could have explained an 18% rise in the ratio of exports to GNP, compared to the actual rise of 26%. The import equations, however, do not give plausible coefficients.

It may be that the explanation for the growing export share of GNP lies in a very different exchange rate story. The real exchange rate based on trade partners' import price indexes was

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[17] The shortcomings of the conventionally measured *RER*, and the misleading behavior of the Japanese CPI in particular, have been pointed out by Radelet (1996), who urges use of some trade-based price index instead.

remarkably stable from 1965 to 1984, helping to establish a dependable environment favorable for investment in export industries. Following this incentive, investors established an efficient manufacturing structure that became increasingly competitive in world markets, so that Taiwan specialized to a growing extent in manufactring for export. The steep appreciation of the real exchange rate after 1984 could have resulted both from larger, and increasingly low-cost, supplies of exportables from Taiwan and from policy decisions made feasible, or even necessary, as a consequence of past investments in exports. This story cannot be tested with our simple econometric model, because we would be trying to explain export growth with a variable that was stationary for a long period. Nor can the efficiency wage data in Table 1 be used to test this proposition. But the finding that investment in the earlier period (1978-85) is correlated with lower efficiency wages in the later period (1985-93) is consistent with this story.

Monetary policy appears to have supported reserve accumuation. We have alread noted that monetary policy had been stringent during 1979 to 1981, so that the rapid money growth from 1982 through 1987 only served to bring the ratio of M-2 to GNP back to the trend established before 1979 (Figure 4). A possible interpretation is that the demand for liquid assets was growing faster than the money supply during the 1980s, so that rapidly growing foreign reserves did not lead to inflation. Rapid increases in the money supply did not begin to dampen reserve accumulation until 1988.

Whatever our revisionist view of the real exchange rate or our econometric results may prove, policymakers at the time were concerned about the impact of the exchange rate on exports. During interviews conducted in 1994, the authors learned that government officials at the time believed, and acted as if, the exchange rate was a crucial determinant of exporters' profitability and of export growth. As it became necessary to let the rate appreciate during the latter half of the 1980s, policymakers monitored export firms' profits to ensure that export growth would not be endangered.[18]

Participants in the economic policy debates of the 1980s offer different views of policymakers' intentions towards external balance. S.C. Tsiang, writing in 1987, argued that it was the trade surplus that drove saving and investment, rather than the reverse. But the surplus was not so much an objective of policy as a condition forced on Taiwan by the large U.S. budget deficit that in turn generated a large trade deficit. Tsiang notes that both Japan and Germany began to run larger surpluses with the U.S. from 1982 to 1986, once the U.S. budget deficit rose from $80 billion in 1981 to over $200 billion from 1983 to 1986. Tsiang was right that Taiwan's surplus was due largely to its bilateral trade with the United States: in 1985 and 1986, Taiwan ran a large deficit with Japan, roughly balanced its trade with Germany, and ran a smaller surplus with Hong Kong and China (CIER, 1994).

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[18] Interview with Paul Chiu, Deputy Governor, Central Bank, January 1994.

Nevertheless, the government had two options available if it chose not to accept the burden of validating the U.S. trade deficit and financing its budget deficit (by accumulating Treasury bills as part of its growing reserves). First, it could have allowed the exchange rate to appreciate during the early 1980s, rather than supporting a depreciated real rate. Second, it could also have reduced tariffs, liberalized imports, and removed currency controls. Tsiang argued eloquently for precisely this course in his 1987 paper. However, he appears to accept the argument that, from the perspective 1982 to 1986, the U.S. twin deficits appeared to be temporary, that the "normal" situation--more balanced trade at something like the existing exchange rate--would reassert itself, and that an appreciation would cause unwanted structural change in the economy. Tsiang also acknowledges a strong mercantilist tilt among Taiwanese policymakers who wished to protect both exporters from appreciation and import-competing firms from reduced protection.

Another participant in the policy debates of the early 1980s suggests the economic managers recognized the need to change their approach to external balance as early as 1984, but were unable to implement a new policy regime until 1986.[19] The real devaluation and monetary restraint of the early 1980s were a continuing response to the second oil price rise, though one that may have been carried too far. Taiwan's economic managers had long taken a conservative approach to monetary and exchange rate management and it had served them well. A time of historically high energy prices was no time to abandon it. Moreover, in 1983 and 1984 a series of failures in the financial industry diverted the attention of key economic decisionmakers.

By 1984, however, there was a growing consensus among macroeconomic policymakers that exchange rate appreciation, import liberalization, and a relaxation of foreign exchange controls were necessary and Premier Yu Kuo-li announced such a policy. But by mid-1984 President Chiang Ching-kuo was ill and inactive. Without the authority of the president to support the reformers, a wider consensus among ministers was needed to implement so basic a policy shift. The acknowledged mercantilism among some in the cabinet and the genuine concern about the viability of export firms were obstacles in gaining broad agreement. Sensing indecisiveness within the government, private interest groups also mobilized against the reforms. It was not until 1986, in the face of intensifying pressure from the United States, that the proponents of change were able to implement the new policy regime.

APPRECIATION AND OFFSHORE INVESTMENT, 1987 - 1993

From 1986 on, Taiwan pursued macroeconomic policies consistent with a more liberal trade policy. Macroeconomic data suggest different turning points for different policies and their outcomes. Appreciation of the exchange rate versus the dollar began in 1986 as the NT dollar was allowed to float: all indicators of the real exchange rate, with the minor exception of the

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[19] Discussion with Weh Yang-an at CIER, August 1994.

CPI-based real import rate, appreciated steadily from 1986 through 1991 (Figures 8 and 9). Exports retreated from around 50% of GNP to around 40% by 1992, while imports rose modestly to reduce considerably, but not quite to close, the current account surplus (Figure 7). Reserve accumulation continued to be high through 1987, reaching 20% of GNP in each of 1986 and 1987. But from 1988 through 1992 the increase in never exceeded 5% of GNP.

By 1987, as reserve accumulation dropped precipitately, the central bank began to stimulate private domestic credit. Increments in private credit rose dramatically as a share of GNP, from levels below 10% of GNP during the early 1980s to a range of 15 to 30% of GNP between 1988 and 1992 (Figure 4). Net credit to government also expanded over this period, but it was the offsetting movements of reserves and private credit that determined money supply. The ratio of increases in M-2 to GNP rose sharply from 1984 to 1987; then plunged back to the 1984 low by the end of 1990 with the collapse of reserve accumulation; but reached an historic high by 1992 under the main influence of expanding private credit. Monetary ease was reflected in declining real interest rates, which had exceeded 7.5% a year on secured loans from 1982 to 1988, but fell steadily to 3.6% by the end of 1992.

Monetary policy may well have played a role in the stock market boom that began in 1986, topped out in 1989, and ended in 1991 with the market still four times its 1986 level. Figure 10 shows the phasing of private saving and money creation. The peak in the private saving ratio occurred in 1986, just as the stock boom was getting started, but the saving rate then began a steady decline as stock prices were moving up sharply. It was the rise in net private domestic credit that appeared to preshadow the rise of the stock market, peaking a year before the stock index. Increases in private domestic credit (and in broad money, not shown in Figure 10) then fell precipitately as a share of GNP, declining about a year ahead of stock prices.[20]

The expansive posture of credit policy was reinforced by fiscal policy. Government expenditure soared during 1989, rising from 20 to over 30% of GNP in one year, and remained high through 1992 (Figure 5). The deficit averaged over 6% of GNP during that period, a marked departure from previous levels (Figure 6). Much of this growing deficit appears to have been monetized: changes in net domestic credit to the government shifted from negative territory before 1989 to a range of 2 to 5% of GNP thereafter.

Although all components of government expenditure expanded as a fraction of GNP after 1988, those categorized as "economic development" expanded most rapidly (Figure 11).[21] The

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[20] Quarterly data would have been better suited for this analysis, but the annual data are roughtly indicative of the trends.

[21] The 1989 peak in economic development expenditures evident in Figure 4.12 was due to the purchase of private land that was to be reserved for government's future use.

rise in government and public enterprise investment, however, was gradual (Figure 3), suggesting major increases in recurrent expenditures.[22]

FIGURE 11 HERE

As the foreign balance was compressed, the saving-investment surplus was reduced . through both a decline in saving and a rise in investment as shares of GNP (Figure 1). Enterprise saving was in decline by 1987; household saving followed a year later; and government saving was falling by 1990 (Figure 2). The rise in capital formation consisted of a spike in private investment from 1986 to 1990 and the steadier, more gradual rise in government and public enterprise investment from 1986 onward.

Within the shrinking foreign and domestic balances, however, lay another story. From 1988 to 1990, an unprecedented share of Taiwanese saving--from 3.5 to 4.5% of GNP--went into direct investment abroad (Figure 12). Prior to 1987, such investment had been negligible and by 1992 it was again down to 0.5% of GNP. But at its 1989 peak, Taiwan invested as much as a quarter of its private saving abroad. Behind this outflow is a story of shifting comparative advantage that is documented in other chapters. As incomes, wages, education, and the capital stock rose in Taiwan, and as the real exchange rate appreciated, manufacturers of textiles, clothing, footwear, and other labor-intensive exports sought more profitable sites in China and Southeast Asia.

FIGURE 12 HERE

CONCLUSIONS

For Taiwan, the 1980s was both a decade of overshooting and a decade of maturing economic policies. Whether or not the authorities intended to generate external surplus up to 1986, it is evident that the stringent macroeconomic policies of the late 1970s were maintained too long. This point is evident if policymakers merely stumbled into surpluses they did not intend to generate. But even if their aim was to accumulate reserves, they pushed the policy so far that a sharp correction was inevitable and may have been forced on Taiwan by U.S. pressure. The post-1986 correction was also overdone. Private credit expansion was too rapid, the government, uncharacteristically, began running large deficits, and these policies may have exacerbated the stock market bubble of the late 1980s.

The 1980s also saw the end of Taiwan's export- and growth-oriented macroeconomic policies, which had served so well from the late 1950s through the two oil crises. Before 1980, policymakers' interest in sustained, rapid growth was served by high interest rates and an ex-

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[22] The spike of economic development expenditure in 1989 was a consequence of the government's purchase of private land for future public use.

change rate policy designed to promote export growth. Although this chapter does not deal with import protection, it can be argued that restrictive policies towards imports countered any impact of undervaluation on import-competing industries (Wade, 1990). By the mid-1980s, however, Taiwan's export drive had been so successful that it could no longer pursue a pure export-oriented policy so single-mindedly. Large trade surpluses called for both exchange rate appreciation and import liberalization, and the country's major trading partner insisted on such a policy shift. As in mature economies, the exchange rate, along with fiscal and monetary policies, became a tool of macroeconomic balance, rather than a means of promoting exports. In that context, import liberalization was probably necessary to restrain an appreciation that could seriously erode export competitiveness. By the 1990s, Taiwan was being managed more like an open, industrial economy.

APPENDIX: POLICY REGRESSIONS

This chapter raises the question of whether policymakers were using instruments such as the real interest rate and the real exchange rate deliberately to generate the external surpluses of 1980 to 1986. Based on the behavior of the policy variables and on interviews with participants, the answer turns out to be ambiguous. However, assuming that the authorities did intend to use interest and exchange rates to achieve external surpluses, could they have been effective in doing so? To test this we ran a series of regressions relating private saving and private investment to the real interest rate and other variables; and relating exports and imports to the real exchange rate and other variables. The results are reported here.

Private saving and investment were measured as a share of GNP, S_p/Y or I_p/Y, and regressed on the current growth rate of GNP per capita, $g(Y/P)$, one plus the real interest rate on deposits ($1+r_d$ for saving) or loans ($1+r_l$ for investment), and the lagged dependent variable.[23] In addition, the saving regressions were augmented by two rates of dependency: the share of the population under 15 years and the share over 65 years. OLS regressions were run in logarithms and in differences of logarithms. Various lagged structures were tried. Table A1 shows the best results from the regressions.

The saving regressions gave good results when the contemporaneous values of GNP growth and the one-period lagged values of the other dependent variables were used. The log-linear regression gives significant coefficients, at the 5% level or better, for all independent variables, a high adjusted R-squared, and a satisfactory Durbin-Watson statistic. Adjusted Dickey-Fuller tests of nonstationarity allow us to reject nonstationarity at the 1% level for both the GNP growth rate and the real interest variable and not to reject it at the 10% level, but only barely, for the dependent variable. The ADF statistics for the dependency rates suggest nonstationarity, as is expected.

In the regressions using first differences of logarithms, the coefficients on the real interest variable were significant at 5% and very close to the value in the log-linear regression. The best fit in log-differences occurs when the lagged first difference of the saving rate is included, raising the adjusted R-squared to 0.54 and making the GNP growth coefficient both significant and similar in magnitude to that in the log-linear form. However, inclusion of the lagged dependent variable is questionable on economic grounds, because it implies that, in the steady state, the ratio of saving to GNP would have to change (rise or decline) at a constant rate, which is impossible over the long run.

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[23] We used $1+r$ because regressions were in logarithms and real interest rates were negative in some years.

TABLE A-1: REGRESSION RESULTS FOR SAVING AND INVESTMENT
(t-ratios in italics; coefficients significant at the 5% level in boldface; OLS except where noted)

Depend. variable	Const.	g(Y/P)	Lagged value of 1+r	Lagged value of Under 15	Lagged value of Over 65	Lagged value of Depend.	Adjusted R^2	Durbin-Watson
Log S_p/Y	**-4.065**	**0.050**	**0.875**	**-3.095**	**-1.601**	**0.532**	0.757	1.634
	1.084	*2.506*	*3.160*	*-3.573*	*-3.432*	*3.952*		
(TSLS)	**-4.096**	0.0426	**0.924**	**-3.202**	**-1.599**	**0.552**	0.730	1.618
	-3.033	*1.766*	*3.033*	*-2.919*	*-2.735*	*3.825*		
Δ Log S_p/Y	-0.028	0.039	**0.798**	-4.459	-0.463		0.331	1.598
	-0.526	*2.194*	*3.267*	*-1.233*	*-0.205*			
	-0.003	**0.056**	**0.812**	-3.497	-1.669	0.363	0.537	1.792
	-0.062	*2.948*	*3.479*	*-1.001*	*-0.720*	*2.012*		
Log I_p/Y	-0.127	-0.035	**1.834**			**0.868**	0.490	1.634
	-0.834	*-1.046*	*3.495*			*4.411*		
	-0.529	**0.155**	***- 3.090**			**0.435**	0.577	1.774
	-4.457	*2.996*	*-4.391*			*2.942*		
(TSLS)	**-0.534**	**0.332**	***-5.052**			**0.538**	0.334	2.046
	-3.392	*3.267*	*-4.102*			*2.269*		
Δ Log S_p/Y	0.005	**0.040**	**0.805**				0.344	1.464
	0.543	*2.275*	*3.330*					
	0.003	**0.055**	**0.812**			0.327	0.410	1.617
	0.351	*2.914*	*3.466*			*1.876*		
	0.003	**0.117**	***-1.320**				0.271	1.526
	0.258	*3.360*	*-2.768*					
	0.002	**0.123**	***-1.242**			0.232	0.287	1.673
	0.216	*3.448*	*-2.513*			*1.196*		

* Contemporaneous variable.

Although the regressions generally track the course of saving well, they do a poor job of reproducing the sharp rise of saving from the late 1970s to the mid-1980s, as Figure A.1 shows for the log-linear regression. From 1980 to 1986 the saving rate rose by 50%, while the lagged value of $1+r_d$ (*i.e.*, from 1979 to 1985) rose by only 5.8%. On the basis of the coefficient of $1+r_d$, which estimates the short-term elasticity, and the coefficient on the lagged dependent variable, we can calculate the elasticity of the saving rate with respect to the interest rate over

any period.[24] For the six years from 1980 to 1986, the 5.8% rise in the real interest rate term would have been responsible for a rise in the saving rate of only 11%. Coefficients from the first-difference regressions give lower estimates, accounting for a rise in S_p/Y of 7% at most. It appears that, although interest rate policy may have had an impact, it cannot explain much of the rise in saving rates during the early 1980s.

On the basis of the short-term elasticities in the log-linear format, the 10% decline in the under-15 dependency ratio would have increased the private saving rate by a third from 1979 to 1986, but this was offset by the 24% rise in the over-65 dependency ratio, which would have lowered the saving rate by 30%.

Regressions of the investment rate, using $g(Y/P)$, $1+r_l$ and the lagged dependent variable, give poorer fits than the saving regressions and have similar problems in tracing peaks and valleys (see Figure A.2). When the lagged values of the real interest term are used, they give significant coefficients of the wrong (positive) sign. Contemporaneous values of the interest variable, however give signficant, negative coeffcients and, in the log-linear form, an extremely high elasticity of -3.1. The other coefficients in this format are also significant at the 5% level and of the right sign. Although nonstationarity cannot be rejected for the dependent variable, it can be rejected at the 1% level for the explanatory variables. In the difference-of-logs format, the sign of the interest rate term is also significant and negative for contemporaneous values only, although the growth term gives positive and signficant coefficients in all forms. The magnitude of the interest rate elasticity is much lower, however, the higher estimate being -1.3.

Using the highest available (log-linear) estimate of the interest elasticity, the rise in $1+r_l$ *of 11%* from 1980 to 1986 can explain a fall in the investment-GNP ratio of 59% over six years, much more than the actual decline of 40%. Even the log-difference regression, which yields a much lower (and more believable) elasticity coefficient, suggests that the observed rise in interest rates could have accounted for almost half the rise in the saving rate over six years (18% *versus* 40%). Thus interest rate policy appears to have been a more effective in influencing investment than saving in Taiwan.

For **exports and imports**, the ratios to GNP, expressed in dollars, gave generally poor regression results. Instead, we used the more time-honored formulation of exports, *E,* and imports, *M,* expressed in current U.S. dollars, against GNP in 1986 dollars and an index of an appropriate measure of the real exchange rate, with 1986 = 100. Two measures of the real exchange rate were explored, using (1) the consumer price indexes of Taiwan's main trading partners as a proxy for world prices and (2) the import or export price deflators, respectively, of Taiwan's trading partners for world prices.

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[24] If the regression equation is $Y = aX + bY_{-1}$, then the formula for a change in Y given any change in X over n years is $\Delta Y/Y = a[(1-b^n)/(1-b)](\Delta X/X)$.

As discussed in the text, the CPI-based formula is the one most likely to have watched by policymakers, but is not the best concept to measure the impact of the exchange rate and world prices (the terms of trade) on producers and cosumers of tradables in Taiwan. However, the more appropriate measure of the price signals for exports and imports, based on tradables price deflators for partner countries, behaves differently from the CPI-based measure and, in particular, shows no depreciation during the critical period from the late 1970s to the mid-1980s. Hence the the CPI-based index is the only measure of the real rate that has any potential to show whether exchange rate policy might have been effective in developing Taiwan's large trade surplus and is the one reported in Table A-2.

TABLE A-2: REGRESSION RESULTS FOR EXPORTS AND IMPORTS
(t-ratios in *italics:* coefficients significant at the 5% level or better in **boldface.**)

Dependent variable	Estimation technique	Constant	GNP	RER (CPI)	Lag depend. variable	Adusted R^2 *Durbin-Watson*
Log E	OLS	-1.178	0.414	**0.459**	**0.836**	0.995
		-1.672	*1.806*	*2.170*	*8.847*	*2.063*
	TSLS	-1.029	0.376	0.407	**0.842**	0.995
		-1.432	*1.606*	*1.828*	*8.621*	*2.139*
	OLS	-1.166	0.400	* **0.697**	**0.848**	0.997
		-1.848	*1.941*	*3.330*	*9.999*	*2.040*
	Johansen	**8.738**	**2.939**	**-4.792**		
	Cointegration	*7.306*	*7.609*	*2.318*		
	Stock-Watson	**-7.246**	**2.454**	0.441		0.991
	GMM	*-6.950*	*11.281*	*0.400*		*0.568*
Δ Log E	OLS	-0.003	**2.456**	0.439		0.610
		-0.109	*3.702*	*1.609*		*1.233*
Log M	OLS	-1.035	0.469	* **1.180**	**0.751**	0.995
		-1.331	*1.795*	*3.684*	*6.486*	*1.812*
	TSLS	-0.571	0.234	* **1.293**	**0.808**	0.994
		-0.701	*1.191*	*3.987*	*6.789*	*2.036*
	Johansen	3.516	0.933	10.110		
	Cointegration	*0.327*	*0.650*	*0.740*		
	Stock-Watson	**-4.792**	**1.988**	-1.353		0.976
	GMM	12.872	*8.492*	*-0.346*		*0.404*
Δ Log M	OLS	**-0.102**	**4.812**	**-1.880**		0.583
		-2.711	*4.968*	*-5.345*		*1.839*

* In these regressions, RER is lagged one period.

Five estimates of the determinants of exports are shown in the table. All are flawed. The first two, log-linear OLS estimate using the logarithms of GNP, the RER (contemporaneous in the first equation, lagged one period in the second) and lagged exports as explanatory variables, give the most believable coefficients, a high R^2, and a Durbin-Watson statistic that rejects positive autocorrelation at the 5% level. The elasticity of dollar exports with respect to GNP is 0.4 in both equations, but fails the t-test at 5%, though would pass it at the 10% level. The elasticity on the contemporanoues RER is 0.4 and on the lagged RER is 0.7; both are significant at 0.5%.

However, the adjusted Dickey-Fuller test does not reject the hypothesis that all variables in these regression are non-stationary and the Johansen test finds a single cointegration equation. The Johansen cointegration equation and an alternative specification by Stock and Watson are shown in Table A-2, along with an estimate using the first differences of the logarithms of the three variables. These regressions yield statistically significant and consistent estimates of the income elasticity which are, however, too high to be plausible; and inconsistent estimates of the real exchange rate elasticity. The only significant coefficient on RER among the three is not plausible because it is high and negative.

Thus the the only estimates that make economic sense come from the log-linear regressions. The regression using the one-period lagged real exchange rate has the higher elasticity, 0.7, while the contemporaneous real rate yields an elasticity of 0.4. From 1980 to 1986, the export-GNP ratio, with GNP expressed in dollars at the 1986 official exchange rate, fell 26%. Over that interval, the one-period lagged real exchange rate did not change, so it cannot be used to explain the fall in the export ratio. The unlagged real rate fell by 10% from 1980 to 1986, sufficient to explain a six-year rise of 18% in the export-GNP ratio, compared to the actual rise of 26%. But is this plausible? Figure 8 shows that the CPI-based real export exchange rate was appreciating steadily from 1976 to 1981, and only then began to depreciate for the next five years. To take these calculations at face value, we would have to assume that exporters, observing an appreciating rate in 1980, somehow foresaw the five-year depreciation that would begin a year later and based their plans on it. This seems unlikely.

The regressions are less satisfactory for imports. The log-linear regression has good statistics, but the RER coefficient has the wrong sign. Neither Johansen nor Stock-Watson regressions yield signficant estimates for the exchange rate elasticity. The difference-of-logs estimates are significant and have the right signs, but their magnitudes are implausibly large. The import-weighted, CPI-based RER depreciated by 25% from 1980 to 1986, more than sufficient to explain the actual drop of 24% in the ratio of imports to GNP in 1986 U.S. dollars. But over the same period, the 60% rise in GNP would have raised the import ratio by much more than the fall due to the depreciation. Thus the log-difference equation yields results that are contrary to the experience of the early 1980s.

The log-linear and log-difference regressions for imports were run with a variable indicating the tightness of monetary policy. The indicator was the residual of a regression of the money supply on GNP. These residuals were negative during the early 1980s, indicating tight monetary

policy that may have helped dampen the demand for imports. However, none of the coefficients on the money residual came close to significance.

Because the four dependent variables-saving-GNP, investment-GNP, exports and imports--are are interdependent, we reestimated the four key regressions in two-stage least squares to confirm the values of the coefficients, especially those on the interest and exchange rate variables. These results are reported in Tables A.1 and A.2. In the log-linear saving regression, the TSLS estimate of the interest elasticity is slightly higher than the OLS estimate. For the log-linear investment regression, the TSLS estimate is considerably lower (more negative). These results broadly confirm the conclusion that interest rate policy could have had a large effect on investment and a much smaller one on saving. In the log-linear export regression,the TSLS estimate of the exchange rate elasticity is somewhat lower than the OLS estimate and not quite significant at 5%. The TSLS regression of the log-linear import equation confirms the wrong sign on the exchange rate coefficient. These estimates broadly confirm the conclusions reached using OLS estimates.

These results are not conclusive. The best we can say from these regressions is that macroeconomic policy variables seem to work most effectively on investment and less so on saving. The strong response of exports to the real devaluation does suggest that macro policy could have been effective in generating a trade balance, but this would be more convincing if it were based on a traded-good price index instead of the CPI index. On the basis of these results, it might appear that the authorities, had they wanted to create large trade surpluses, should have used interest rate policy to generate the saving-investment surplus and allowed trade flows to adjust, with the outside possibility that the exchange rate might have had an impact on exports.

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Figure 1: Saving and Investment
(Percent of GNP)

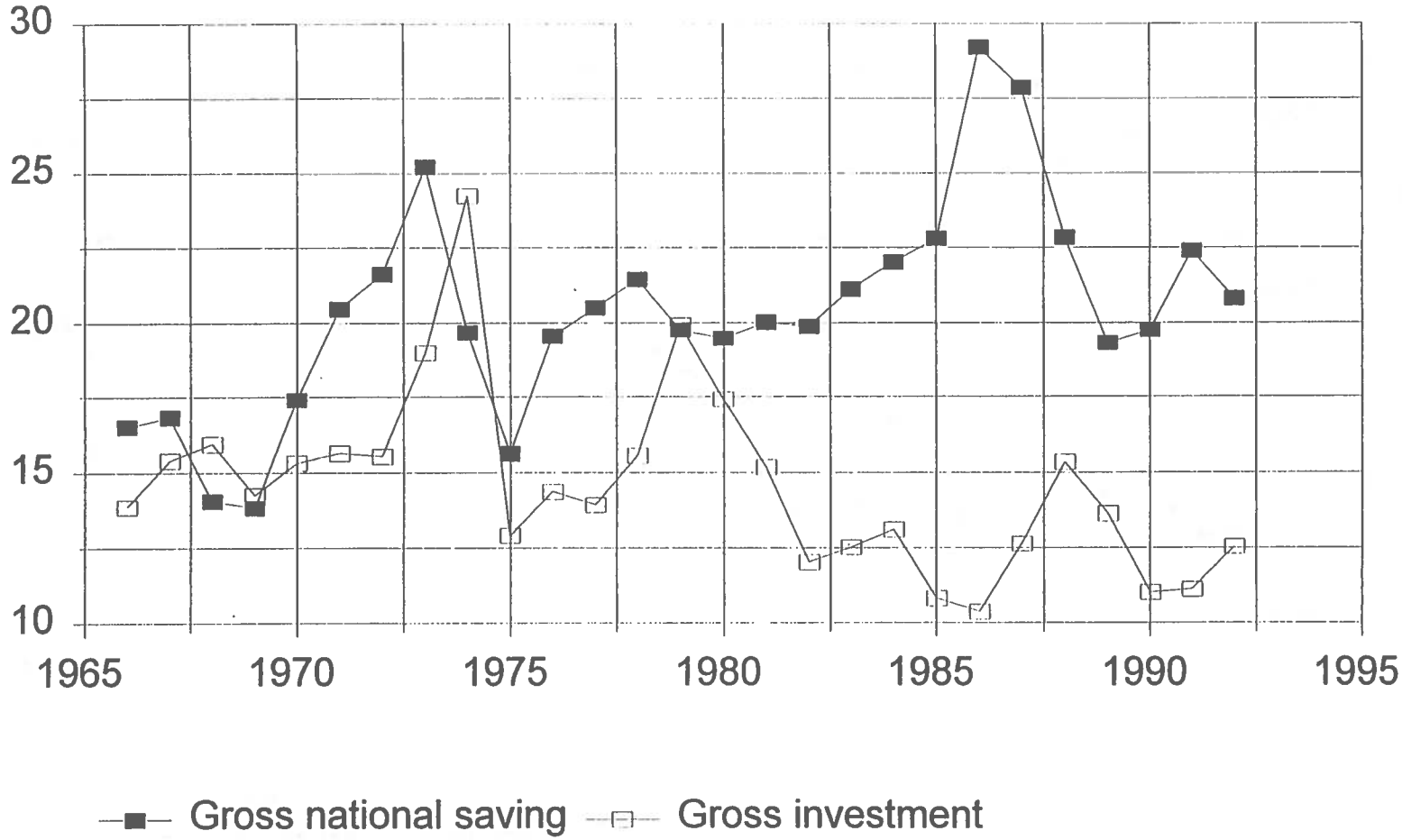

Figure 2: Components of Saving
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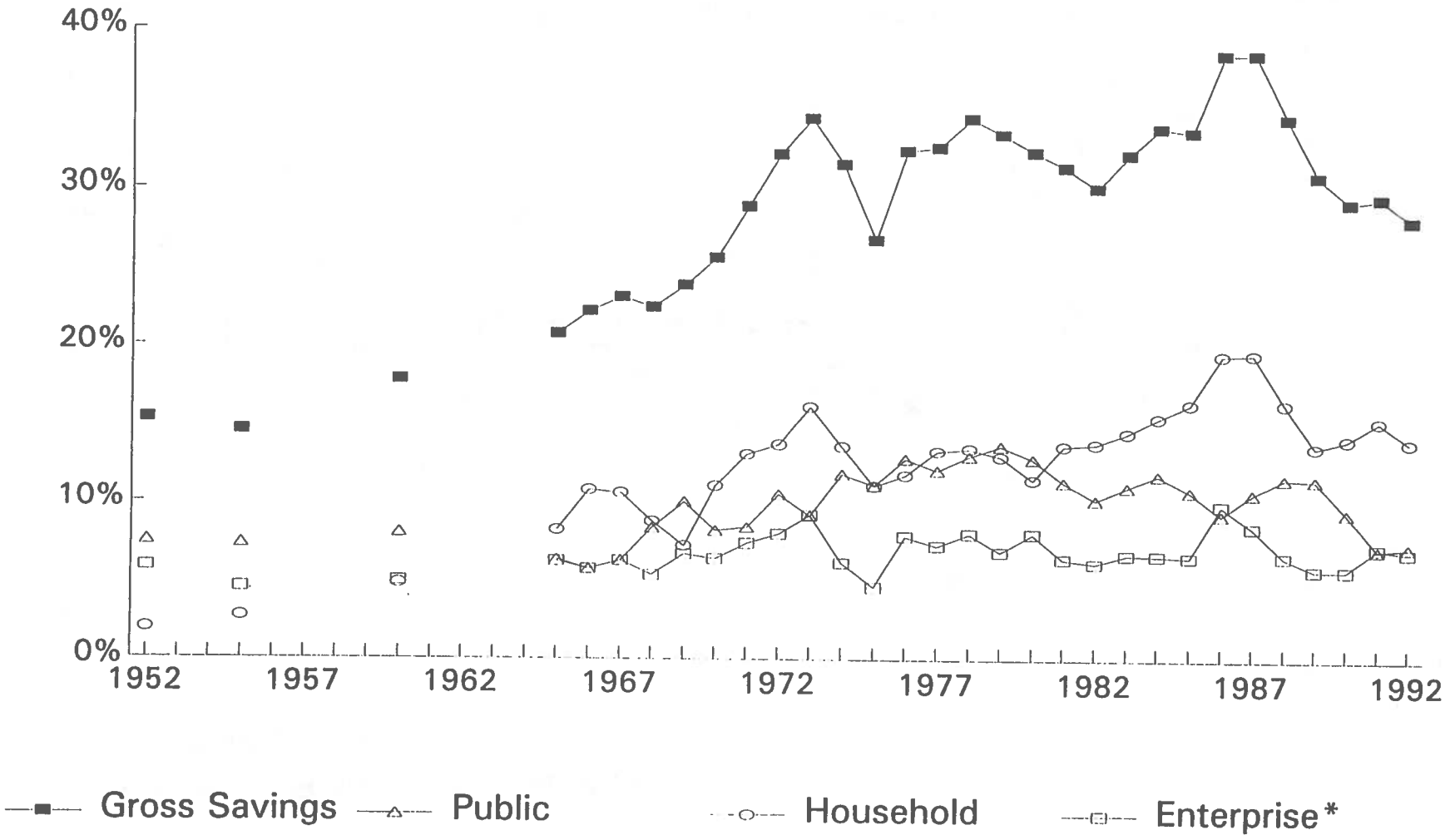

Figure 3: Gross Capital Formation
(Percent of GNP)

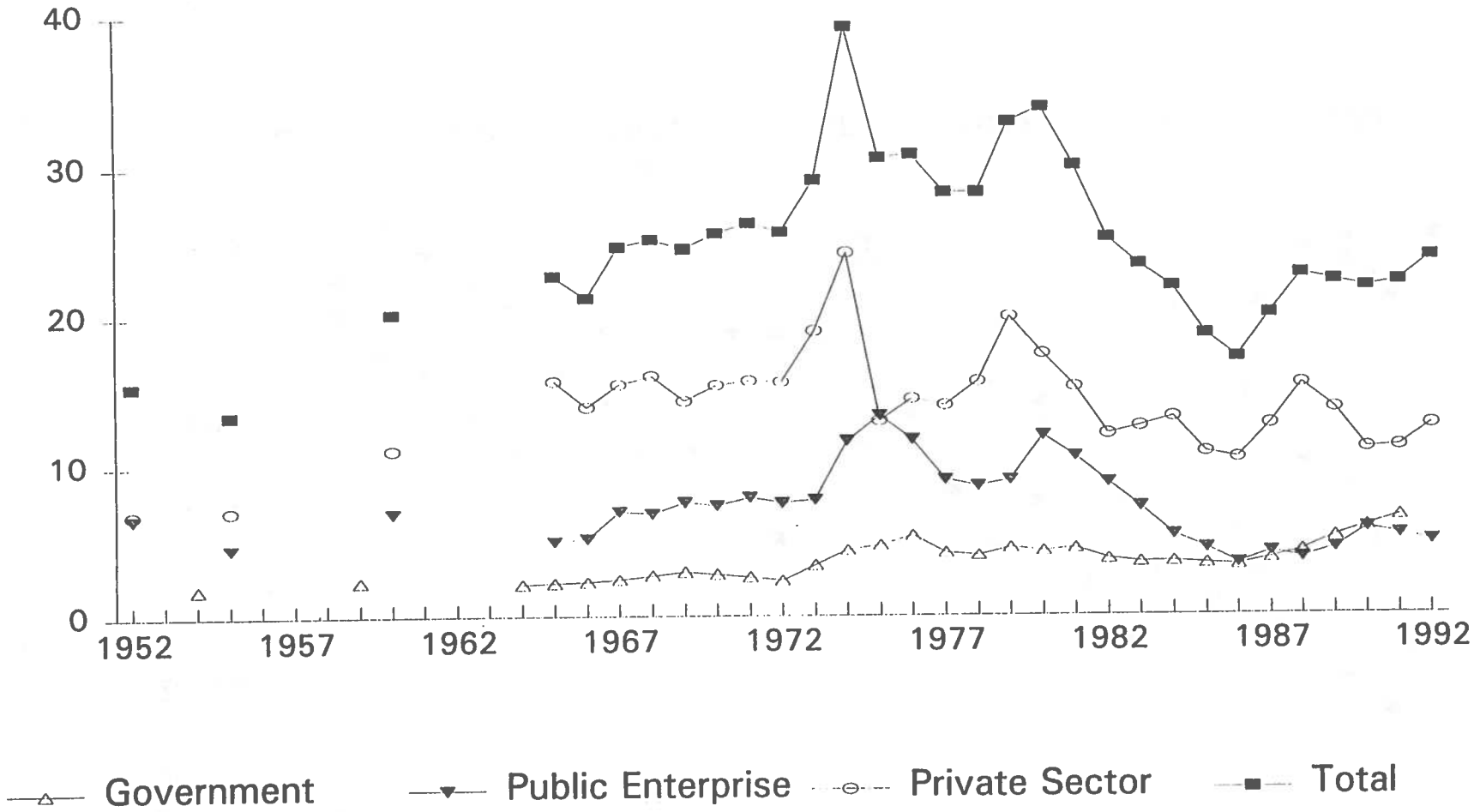

Figure 4: Change in Money Supply
(Percent of GDP)

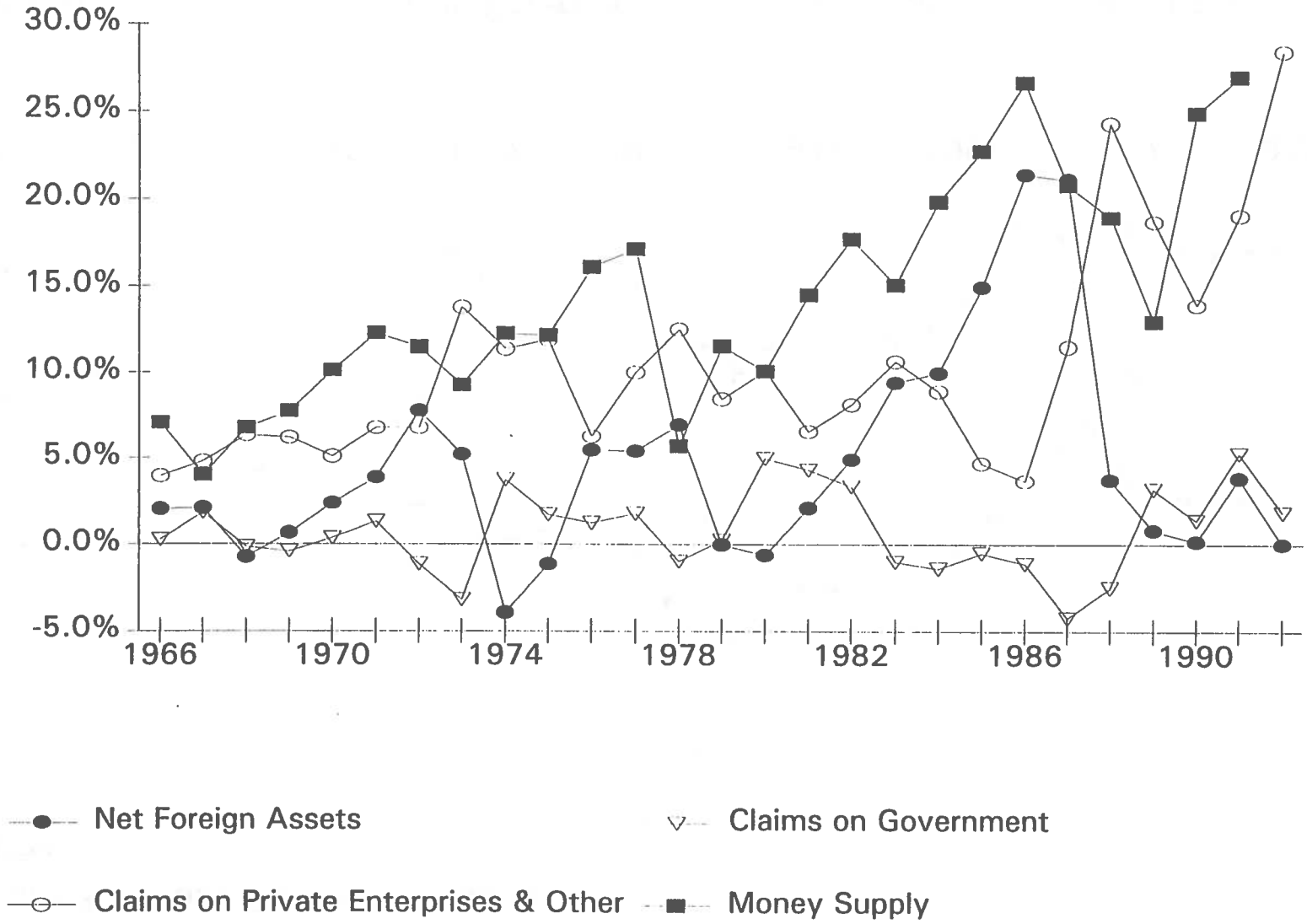

Figure 5: Govt. Revenue and Expend.
(Percent of GNP)

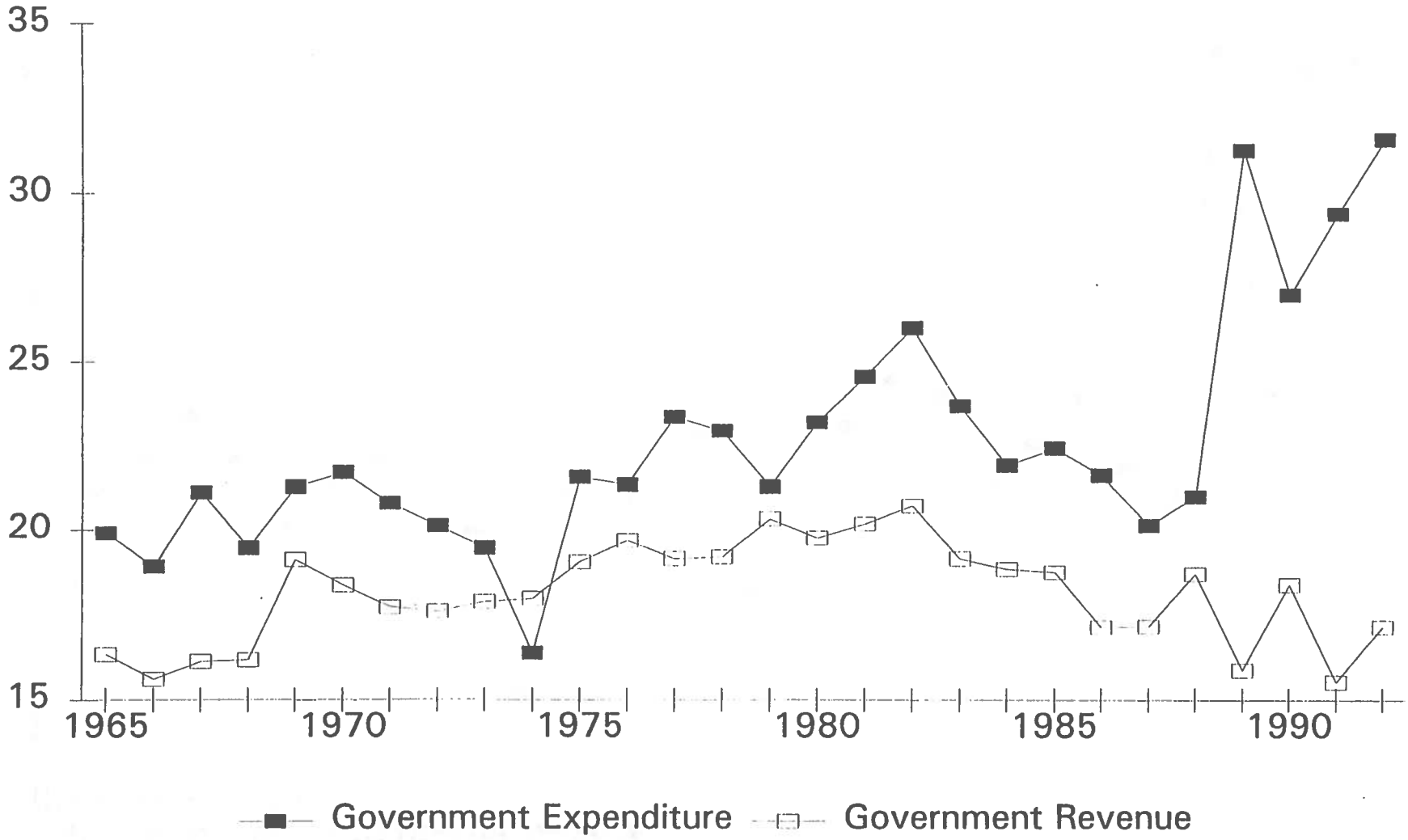

Figure 6: Government Budget Balance
(Percent of GNP)

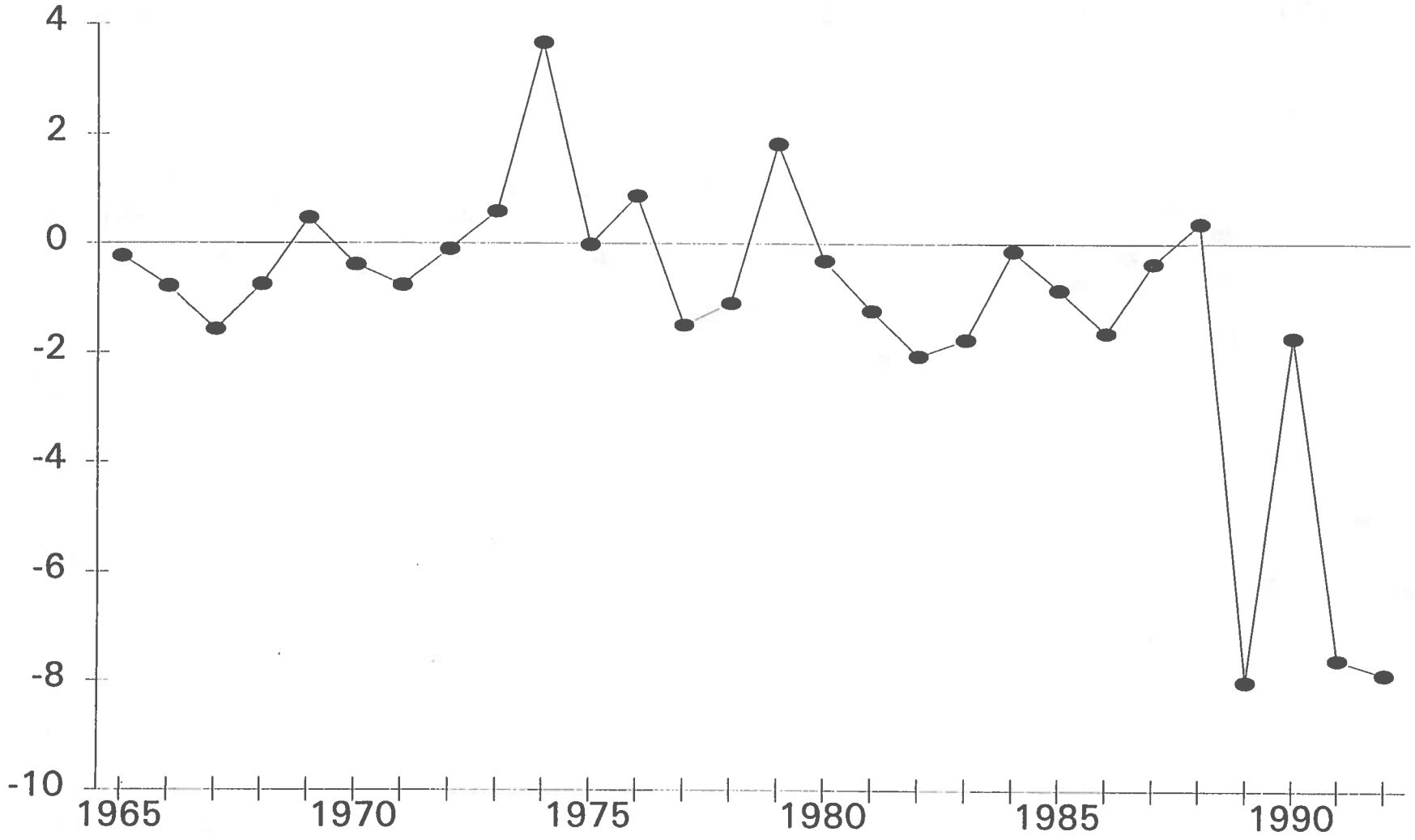

Figure 7: Trade and Foreign Reserves
(Percent of GNP)

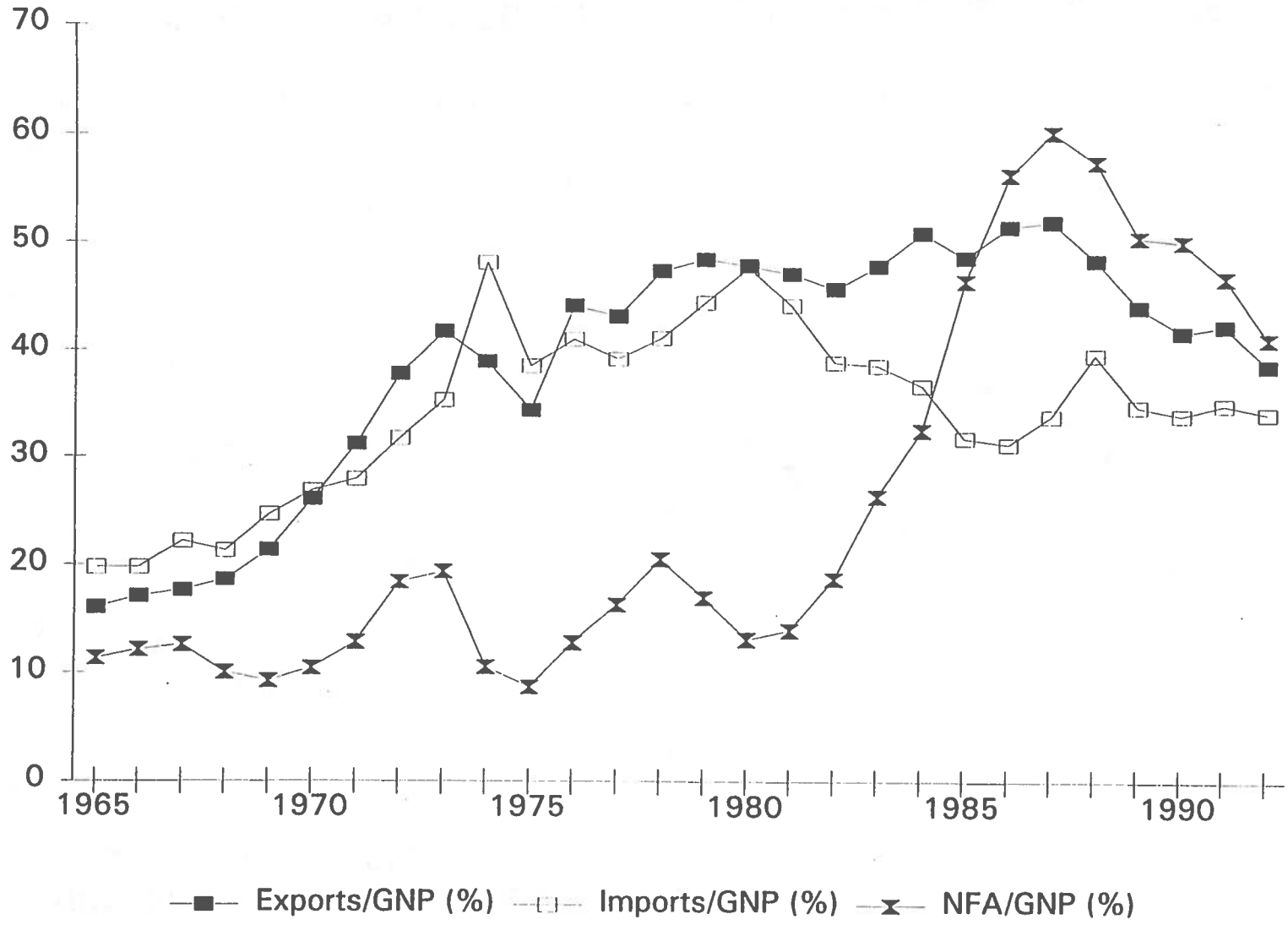

Figure 8: Nom. & Real Exchange Rates
(Index with 1980 = 1.00)

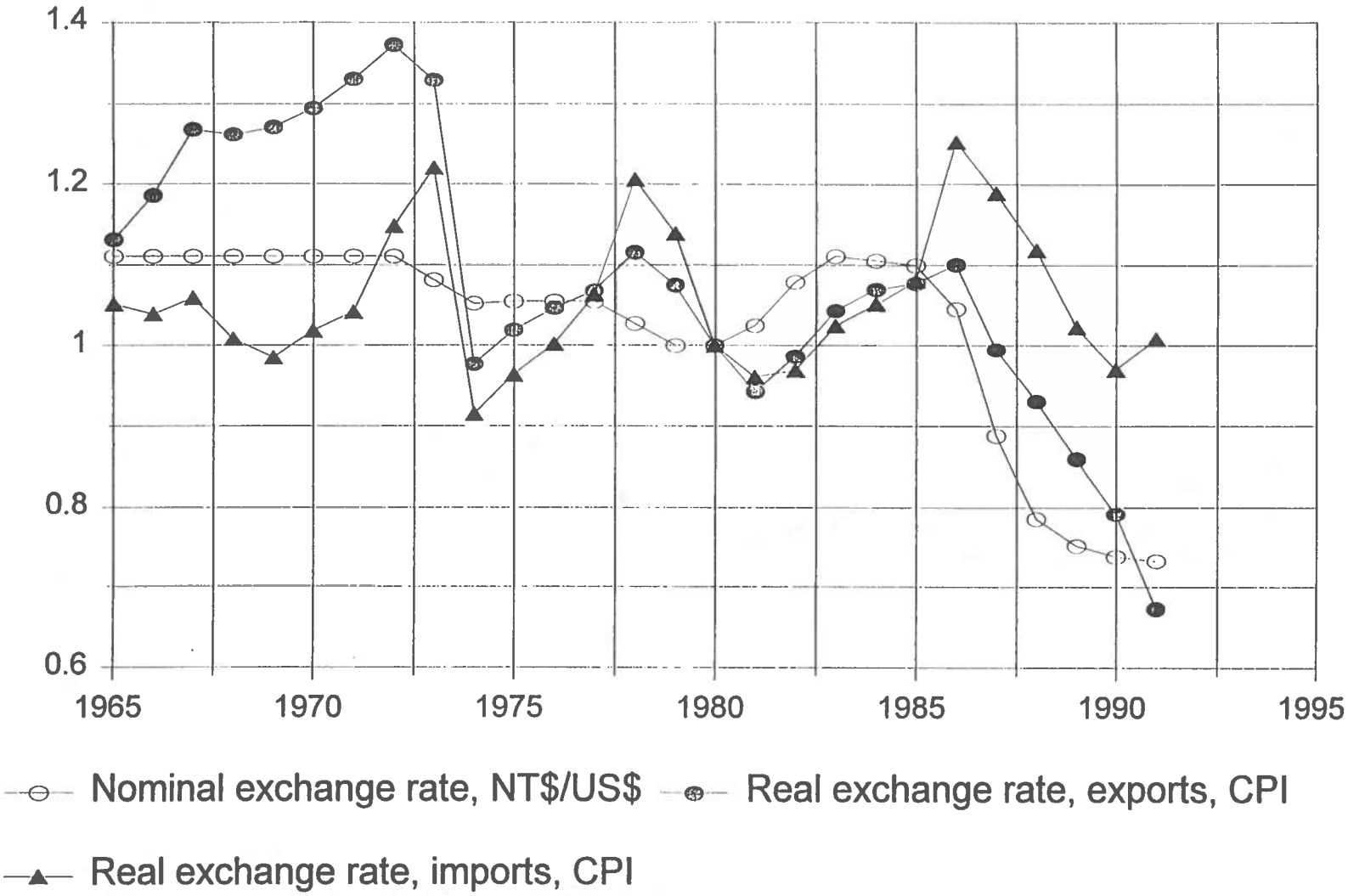

Figure 9: Other Real Exchange Rates
(Index with 1980 = 100)

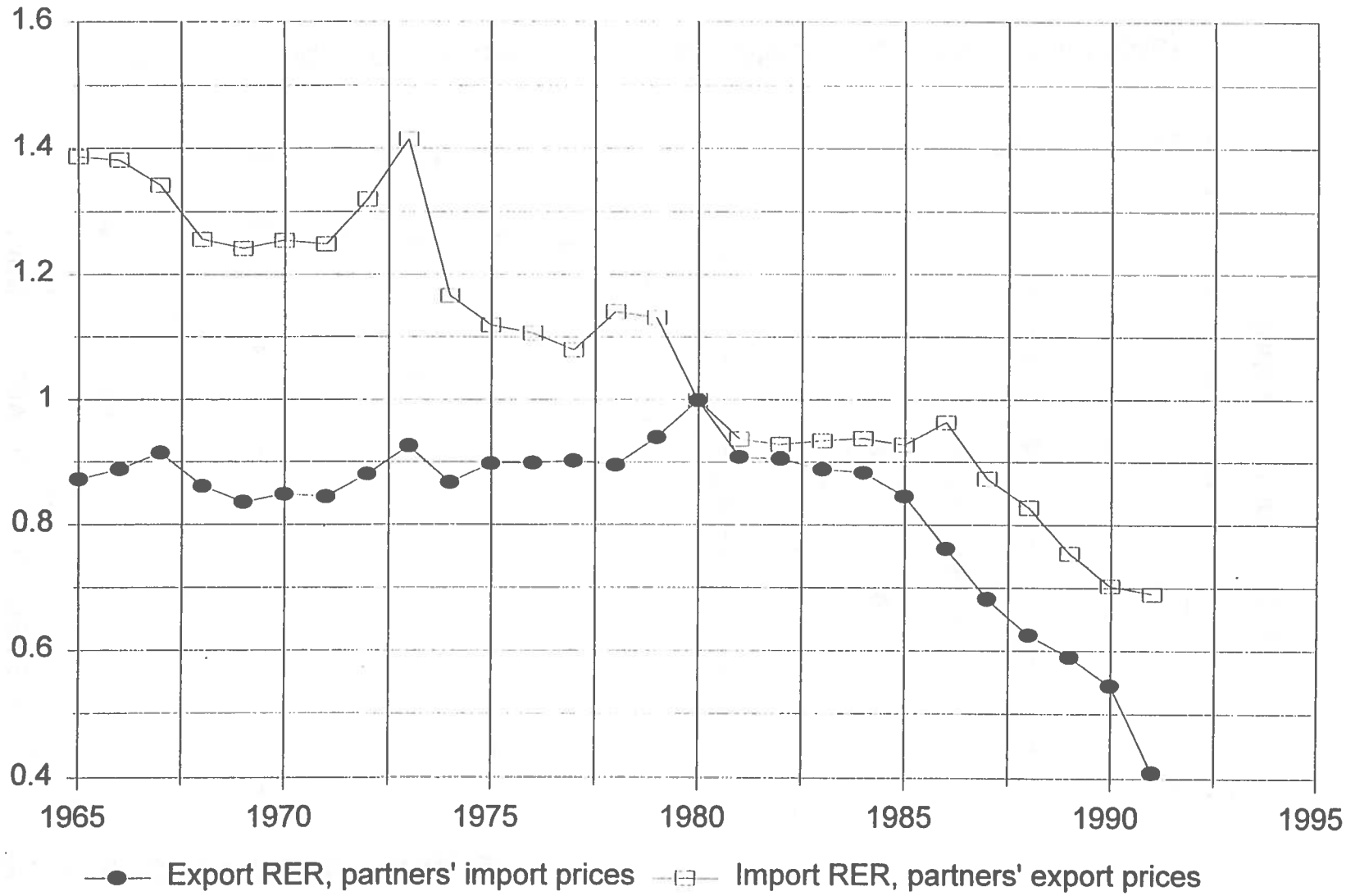

Figure 10: Stock Market Bubble

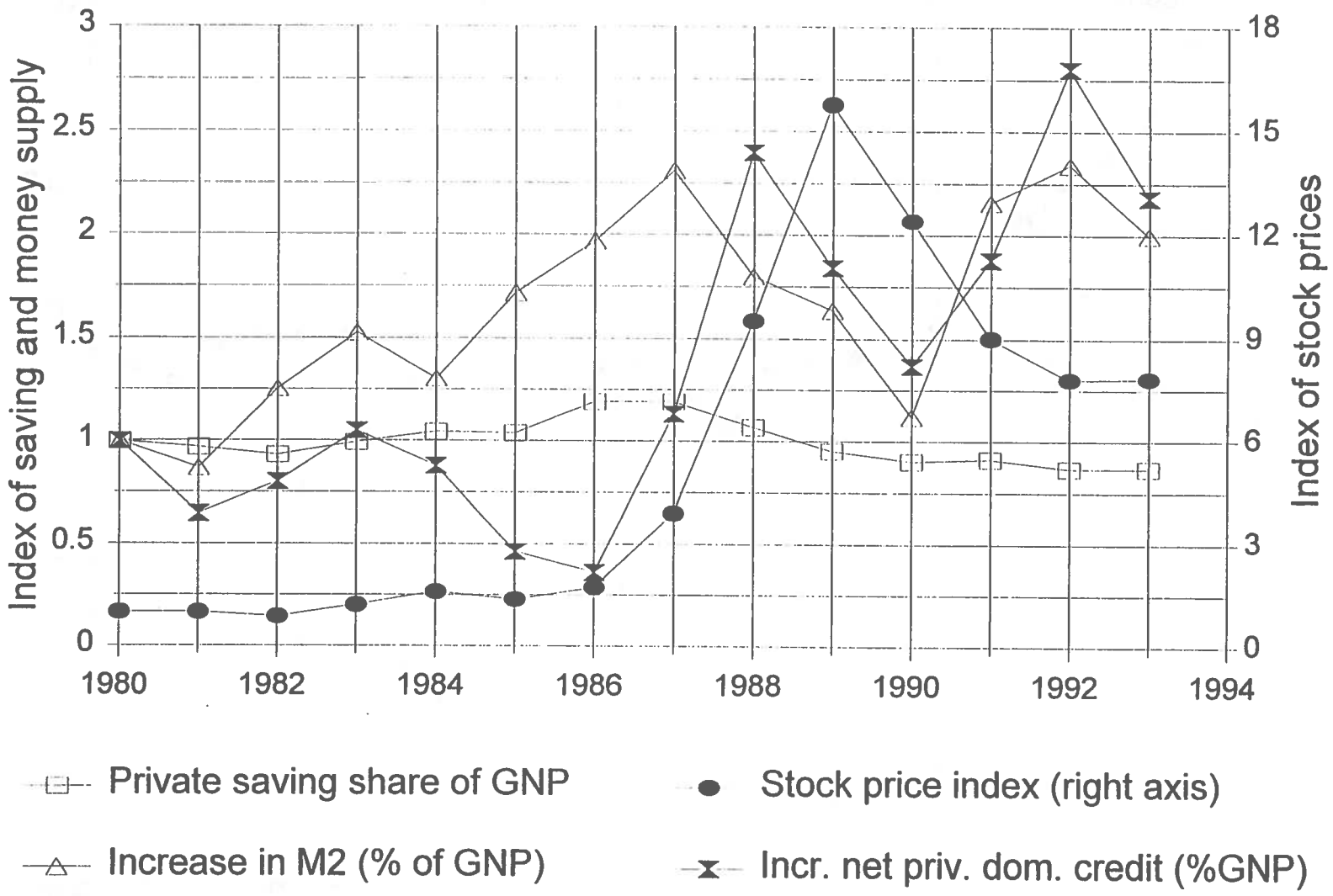

Figure 11: Government Expenditure
(Percent of GNP)

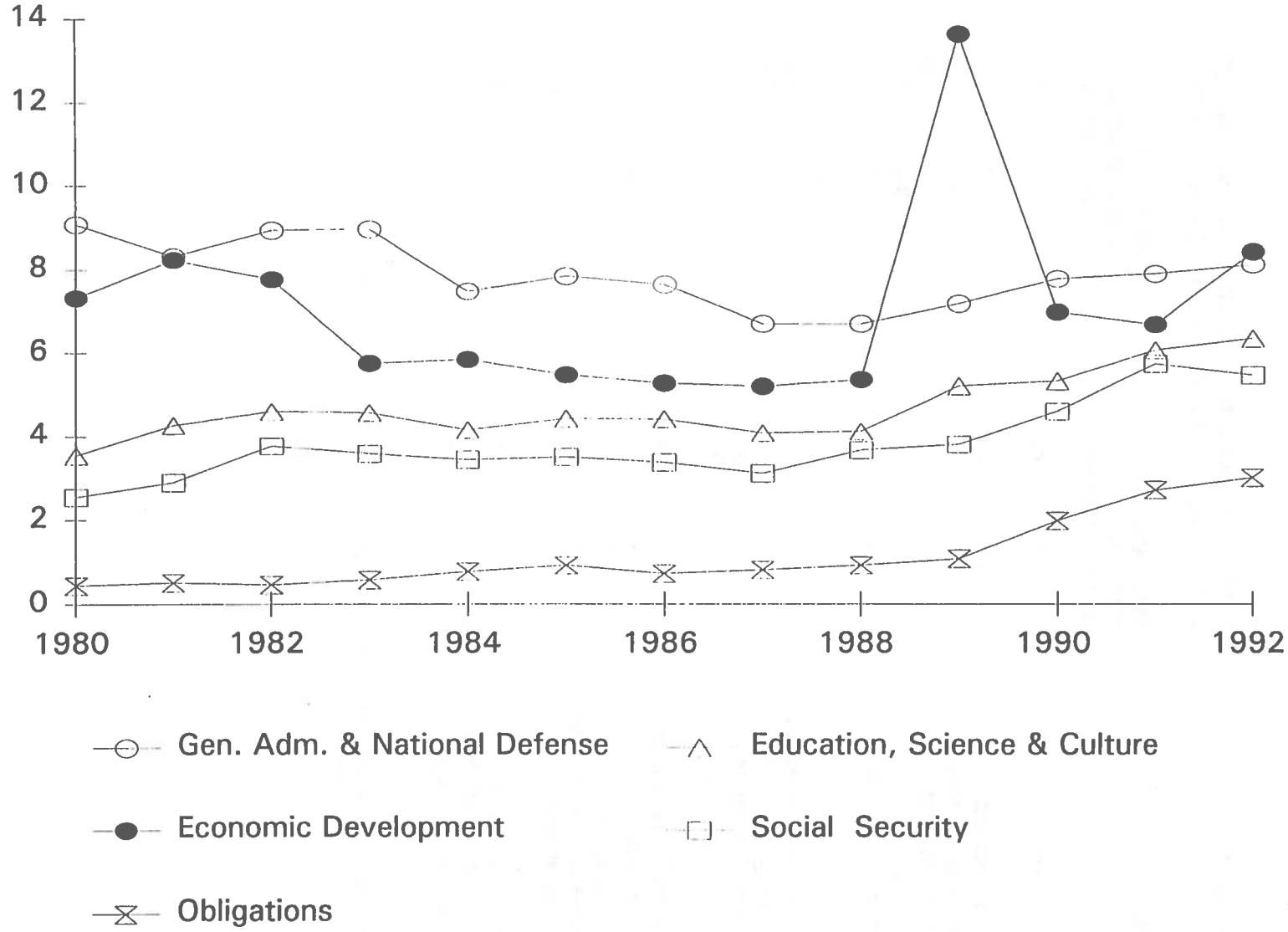

TABLE 1: GROWTH (% p.a.) IN REAL WAGES PER UNIT OUTPUT & INVESTMENT AT CONSTANT PRICES, 1978 - 1993

Industry	Real wages per unit output 1978-85	Real wages per unit output 1985-93	Investment at constant prices(a) 1978-85	Investment at constant prices(a) 1985-93
Manufacturing	5.2	4.5	3.0	6.2
Food products	8.8	7.4	6.0	3.9
Beverages & tobacco	9.9	12.1	-14.5	-48.6
Textile mill products	11.1	4.7	15.2	-1.0
Apparel	4.3	9.5	0.4	-3.4
Leather products	0.6	5.8	10.8	-6.4
Wood products	5.5	6.2	0.4	-3.5
Pulp and paper products	2.3	2.9	2.8	8.2
Industrial chemicals	0.8	5.5	-7.1	7.0
Chemical products	-0.3	6.7	(b)	(b)
Rubber products	5.1	3.8	1.0	7.6
Nonmet. mineral products	5.4	2.8	10.6	2.6
Basic metals	7.3	4.4	1.6	10.6
Fabricated metals	13.5	5.6	1.6	7.6
Non-electrical machinery	6.4	3.1	-2.4	8.3
Electrical equipment	5.1	2.9	7.3	8.9
Transport equipment	3.7	1.8	2.9	11.4
Precision instruments	9.0	4.4	n.a.	0.5
Misc. manufactures	9.2	4.2	0.2	-7.0

(a) Based on three-year averages centered on 1978, 1985 and 1993.
(b) Combined with industrial chemicals

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