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Inflation, investment and growth: the role of macroeconomic policy in India

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This chapter examines the relationship between growth and inflation in the long-run. Although positive in the short-run, cross-country studies indicate a negative relationship between the two in the longer run. There is now considerable evidence to show that investment is one of the most important determinants of the long-run rate of growth. Recent developments in the theory of investment behaviour have focused on the role of instability and uncertainty in determining investment. Inflation as an indicator of macroeconomic instability is hypothesised to have an adverse impact on investment and hence on growth. Our estimates of the private investment function in the manufacturing sector support this hypothesis. The private investment function for agriculture points towards the role of public investment and credit in encouraging private investment in this sector. Tradeoffs between inflation and growth that emerge in the medium run, as a result of government policies relating to consumption and investment, are also examined using an economy-wide econometric model. The analysis suggests that higher growth can be achieved by controlling inflation and increasing public investment.

Inflation, investment and growth: the role of macroeconomic policy in India

We will examine the relationship between growth and inflation in India. In the short run, the relationship between growth and inflation is usually positive. Policies that raise output (for example, expansionary fiscal and monetary policies) also raise prices. Inflation is undesirable because it adversely affects some sections of the population (especially the poor and those whose earnings are not indexed to prices), distorts relative prices, leads to an appreciation of real exchange rates, erodes the value of the financial assets and creates instability. The ultimate policy objective is a higher level of well-being for the population, but a conflict arises in the means of achieving it—by higher growth or by lower inflation. There is a trade-off involved and both cannot be achieved together.

A tightening of fiscal and monetary policies may achieve lower inflation but only at the cost of growth. The government needs to find the right balance between contractionary and expansionary policies to maximise the well-being of its people.

However, some recent cross-country evidence suggests that long-term growth requires macroeconomic stability, which includes low inflation. The idea that a stable macroeconomic environment is conducive to investment, and therefore also for growth, underlies the International Monetary Fund–World Bank stabilisation and structural adjustment programs. It is only recently that this issue has been addressed formally to establish the empirical relationship between the two. Low inflation, sustainable budget deficits, realistic exchange rates and appropriate real interest rates are among the indicators of a stable macroeconomic environment. Though it is too early for the debate to be resolved, a number of studies suggest that low inflation is positively related to higher investment and long-term growth. As an indicator of a stable macroeconomic environment, the inflation rate assumes greater importance. The role of macroeconomic stability has been found to be of particular importance under a reform program. Sustainable government policies are more likely to attract private investment, both foreign and domestic, than higher growth in output. Even though higher short-term growth may be achieved by allowing high inflation, the new approach suggests that lower inflation may be chosen, even if accompanied by lower growth, because it creates an environment conducive to higher long-term growth. The emphasis on investment and the ensuing role of public investment in infrastructure and agriculture, along with macroeconomic stability, lower budget deficits and inflation, creates new trade-offs. In developing countries, resources are limited and government borrowing and/or inflationary financing of public investment can also crowd out private investment.

Some countries have had consistently high rates of inflation, while others, which are generally low-inflation countries (inflation below 20 per cent for more than a decade) have experienced short bursts of high inflation. These are usually caused by an external shock (such as the oil price rise for oil-importing countries), or by a devaluation necessitated by the consequences of poor terms of trade, higher interest rates or weather (as in the case of India). Such bursts of inflation are sometimes unavoidable, but it is their brevity that matters. It is important that inflationary expectations do not set in and that the fundamental commitment of the government to low inflation is clearly established (Cordon 1990). This has been the case in India, where brief episodes of high inflation (due to droughts or external shocks) did not stimulate inflationary expectations because of the government's low inflation reputation. However, it is important that the inflation rate be kept stable even when it is low, as evidence indicates that the adverse effect of inflation variability on investment is higher than (Fischer 1993).

We examine the impact of inflation on investment and growth in light of some recent evidence which suggests an adverse effect on inflation on investment and the trade-offs that emerge when public investment, which contributes to the capital accumulation and growth, is financed by inflationary means.

Inflation, macroeconomic stability and growth

Macroeconomics has, until recently, focused on the positive short-term relationship between the rate of increase in prices, and output. Recently there has been an exploration into the nature of the long-term relationship between inflation and long-term growth in

output. Developments in growth theory have resulted in both a theoretical and an empirical analysis of the effect of inflation on long-term growth. Theoretically the relationship has been located in the effect of inflation on investment. If investment is assumed to be the engine of growth in a model of endogenous growth, an adverse impact of inflation on investment implies an inverse relationship between inflation and growth. Empirical evidence supports the hypothesis of an inverse relationship between inflation and long-term growth. This is in contrast to the short-term experience, where inflation and output growth occur together.

Cross-country evidence

Some recent studies have found cross-country evidence supporting the view that long-term growth is adversely affected by inflation (Kormendi and Meguire 1985; Fischer 1983, 1991, 1993; De Gregorio 1993; Gylfason 1991; Roubini and Sala-i-Martin 1992; Grier and Tullock 1989; Levine and Zervos 1992). Countries (especially in Latin America) that have experienced high inflation rates, have also witnessed lower long-term growth (Cardoso and Fishlow 1989; De Gregorio 1992a,1992b). This literature is part of the endogenous growth literature, which tries to determine the causes of differences in growth rates in different countries. There is now considerable evidence that investment is one of the most important determinants of long-term growth (Barro 1991; Levine and Renelt 1992). It has often been suggested that a stable macroeconomic environment promotes growth by providing a more conducive environment for private investment. This issue has been directly addressed in the growth literature in the work by Fischer 1991, 1993; Easterly and Rebelo 1993; Frenkel and Khan 1990; and Bleaney 1996. Among the reasons why high inflation is likely to be adverse for growth are

- Economies that are not fully adjusted to a given rate of inflation usually suffer from relative price distortions caused by inflation. Nominal interest rates are often controlled, and hence real interest rates become negative and volatile, discouraging savings. Depreciation of exchange rates lag behind inflation, resulting in variability in real appreciations and exchange rates.
- Real tax collections do not keep up with inflation, because collections are based on nominal incomes of an earlier year (the *Tanzi effect*) and public utility prices are not raised in line with inflation. For both reasons, the fiscal problem is intensified by inflation, and public savings may be reduced. This may adversely affect public investment.
- High inflation is unstable. There is uncertainty about future rates of inflation, which reduces the efficiency of investment and discourages potential investors.

The effect of macroeconomic instability on growth comes largely from the effect of uncertainty on private investment. Multi-country panel data studies on investment report that measures of macroeconomic instability, like the variability in the real exchange rate or the rate of inflation, have an adverse impact on investment (Serven and Solimano 1992).

In a study of 17 countries, Cordon (1990) finds that although there are outliers, evidence generally supports the view that high growth is associated with low inflation. This is suggested both by cross-country evidence and comparison over time for countries where the rate of growth has fallen in relation to an increased as the rate of inflation.

Fischer (1993) examines the role of macroeconomic factors in growth. He found evidence that growth is negatively associated with inflation and positively associated with good fiscal performance and undistorted foreign exchange markets. Growth may be linked to uncertainty and macroeconomic instability where temporary uncertainty about the macroeconomy causes potential investors to wait for its resolution, thereby reducing the investment rate (Pindyck and Solimano 1993). Uncertainty and macroeconomic stability are, however, difficult to quantify. Fischer suggests that, since there are no good arguments for very high rates of inflation, a government that is producing high inflation is a government that has lost control. The inflation rate thus serves as an indicator of macroeconomic stability and the overall ability of the government to manage the economy.

Fischer finds support for the view that a stable macroeconomic environment, meaning a reasonably low rate of inflation, a small budget deficit and an undistorted foreign exchange market, is conducive to sustained economic growth. He presents a growth accounting framework in which he identifies the main channels through which inflation reduces growth. He suggests that the variability of inflation might serve as a more direct indicator of the uncertainty of the macroeconomic environment. However, he finds it difficult to separate the level of inflation from the uncertainty about inflation, in terms of their effect on growth. This is because the inflation rate and its variance are highly correlated in cross-country data. Evidence is in favour of the view that macroeconomic stability, as measured by the inverse of the inflation rate and the indicators of macroeconomic trends, is associated with higher growth.

To examine the mechanism through which macroeconomic variables affect growth, Fischer regresses the rate of capital accumulation on these variables. The coefficient of the rate of inflation is found to be negative, suggesting that an important route through which inflation affects growth is the reduction of capital accumulation. Fischer further finds that the inflation rate is negatively correlated with the rate of productivity growth measured by the Solow residual. He also examines the possibility that the above results are due to the inclusion in the sample of countries with very high inflation rates. When the inflation rate is broken into three categories—low (up to 15 per cent), medium (15 to 40 per cent) and high (above 40 per cent)—results show that, contrary to what might have been expected, the association between inflation and growth and its determinants on average weakens as inflation rises. This supports the results obtained by Levine and Zervos (1992). Thus it is not the case that high inflation outliers are responsible for the overall negative correlations between inflation and growth, capital accumulation and productivity growth. Rather, Fischer's results suggest that the association between growth, inflation and capital accumulation is stronger at the low and moderate levels than at high inflation.

De Gregorio (1993) presents evidence from 12 Latin American countries over the period 1950–85. He finds a significant negative correlation between inflation and growth. Though both inflation and its variance have negative effects on growth, since they are highly correlated in cross-country evidence, the results cannot discriminate whether it is the level or the variability that negatively affects growth. Even when high inflation countries were eliminated from the regression, the impact of inflation was both negative and significant. However, though results suggest a negative relation between inflation and investment in physical capital and foreign investment, the relationship is not

significantly different from zero. Though Fischer's results suggest that inflation affects the level of investment, De Gregorio finds that it is the efficiency of investment that is affected and that is what leads to the effect of inflation on growth. This result is supported by cross-country evidence presented in Levine and Renelt (1992).

Bleaney (1996) finds that poor macroeconomic policy, measured by fiscal balance and real exchange rate volatility, appears to be negatively correlated with growth. In his sample, inflation is positively correlated with the real exchange rate and when included in the same regression inflation does not appear to have a negative influence on growth. Since the two are correlated, this suggests that the choice of one of the two variables may depend on the degree of openness and the relative influence of the domestic and foreign prices for investment decisions.

High inflation rates also tend to be volatile and the associated negative and unpredictable real interest rates discourage domestic financial savings. Unanticipated high inflation erodes the real value of financial assets and the volatility of inflation increases the risk associated with holding them. Conversely, low-to-moderate inflation, particularly at stable rates, encourages financial savings. Fry (1988) and Gleb (1989) find, from pooled cross-economy time series data, a consistently positive and significant relationship between economic growth and the real rate of interest. To separate the effects of inflation in a financially repressed regime from those of real interest rates, a World Bank study re-estimates the equations (World Bank 1993). Evidence from a sample of twenty countries, for the impact of the real interest rate and the inflation rate on the GNP growth rate is reported. The real interest rate has a statistically significant and positive impact on growth. But when inflation is included, the coefficient for the real interest rate is no longer statistically significant, while the negative coefficient on the rate of inflation is. This suggests that the positive relation between real rate of interest and growth was actually reflecting a negative relation between inflation and growth in financially repressed regimes, where nominal interest rates are kept fixed. Perhaps that is why, for a subsample of economies for which real interest rates are positive, the coefficients of both the real interest rate and inflation are negative, indicating that lower real interest rates may have had a positive impact on growth. The study also suggests that another condition that was particularly important to investment was public investment in infrastructure. If inflation reduces public saving, public investment is likely to fall.

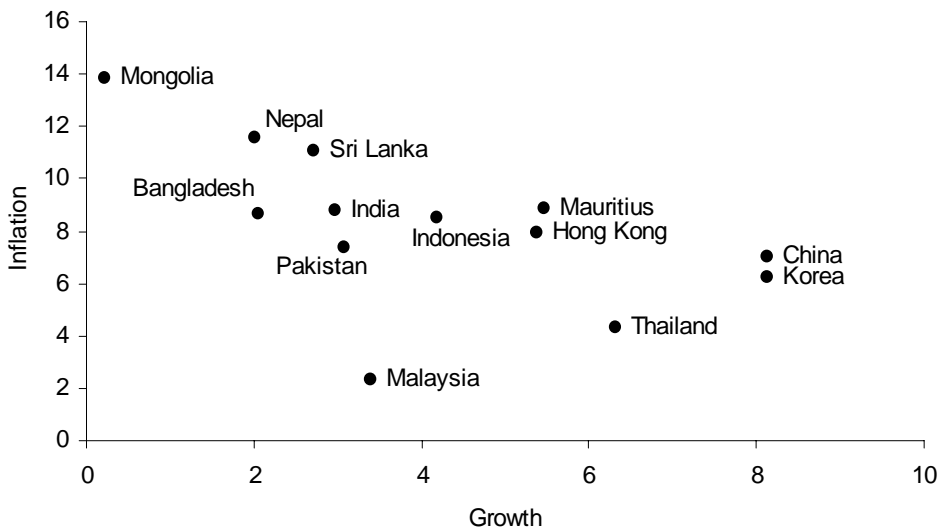
The Asian experience

Figure 4.1 shows growth and inflation in some Asian economies over the period 1980 to 1993. Cross-country evidence appears to support a cross-country negative relationship. In general, countries with higher growth are those with lower inflation rates. A World Bank study finds that the high-performing East Asian countries, that have had sustained high growth for the last three decades, have each had a stable macroeconomic environment that fostered high rates of investment and economic growth (World Bank 1993). Macroeconomic stability has been defined as inflation being kept under control, internal and external debt remaining manageable, and resolving the macroeconomic crisis that emerged within a year or two. According to the study, this was achieved by adhering to orthodox policy prescriptions—in particular, holding budget deficits to

levels that could be prudently financed. Keeping public deficits within limits the economy could absorb, allowed these economies to restrain inflation and manage both internal and external debts. This in turn facilitated realistic exchange rates and avoided appreciation which elsewhere undermined export competitiveness. Developing countries which were less successful in containing deficits within bounds had more trouble managing inflation, debt and exchange rates. It is argued that low or moderate inflation for long periods provides a favourable environment for growth.

Although cross-country evidence from Asia generally indicates that higher inflation reduces growth, the relationship between growth and inflation is not robust for small changes. An economy with a slightly higher inflation rate can have a higher growth rate (for example, Korea compared to Thailand). Among the many countries that have low inflation and low growth, India is noted to be the most important case. Turkey and Brazil are among the high-growth, high-inflation countries. Low or moderate inflation may be a necessary condition for growth but it is not a sufficient condition. While Korea and Indonesia fall into the moderately low inflation category, others (Malaysia, Singapore, Thailand and Taiwan) have been long-term low inflation economies. International experience suggests that inflation below 20 per cent can be maintained for long periods without generating macroeconomic instability (Dornbusch and Fisher 1993). The study observes that the fast-growing East Asian economies were well within this limit (World Bank 1993).

Figure 4.1 Growth and inflation in Asian economies (per cent)



Once a conducive macroeconomic environment and the necessary infrastructure are provided, other policies, such as deregulation or subsidies, can be effective. To encourage growth the government should control inflation by limiting deficits. This means cutting spending, since high taxes discourage investment. Further, the government should increase investment expenditure on infrastructure. This implies that the government should switch expenditure from government consumption spending to public investment. When resources are limited, in addition to public investment the government could encourage private (domestic and/or foreign) investment in infrastructure. The right balance has to be found, in order to keep inflation low and stable to provide a macroeconomic environment that stimulates investment and to prevent infrastructural bottlenecks. Once these necessary conditions for growth are satisfied, other more direct policies for accumulation in both physical and human capital and growth in exports and technology may be more effective in encouraging growth. Over the long run, as growth feeds back into the economy, this can propagate a cycle of low inflation and growth in a stable economic environment.

Though the cross-country evidence suggests a negative correlation between inflation and growth, a distinction is not made between open and closed economies among these countries. It may be that the negative correlation is strong in the case of open market economies which rely on private foreign and domestic investment that is encouraged by low inflation and where maintaining export competitiveness and preventing capital flight have a larger role to play. In a closed planned economy, where the reliance on public investment is substantial and financed by inflationary means, the relationship between growth and inflation may even be positive for long periods of time. As India moves from a closed planned economy to an open one, where private domestic and foreign investment is expected to be the engine of growth, it is relevant to examine the impact of inflation on investment.

Growth and inflation in the Indian economy 1980–96

In this section we discuss the experience of India relating to output growth and inflation. The first section discusses fiscal policy in the period leading up to the crisis. The next section discusses Indian experience in the post-reform period.

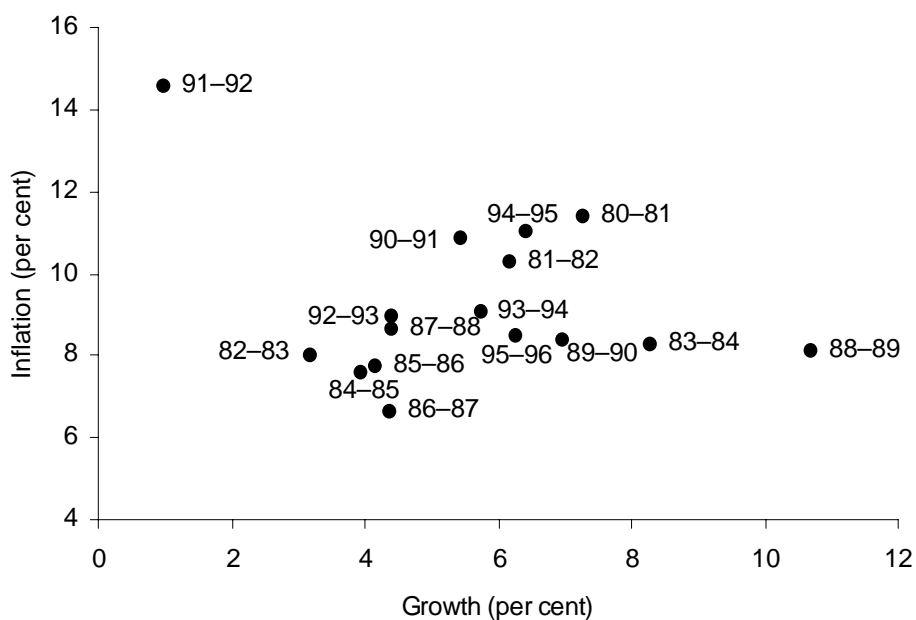
The 1980 to 1991 crisis

The growth rate of GDP in India rose from 3.5 per cent in the 1970s to 5.5 per cent in the 1980s. This increase in growth has been attributed to both demand and supply-side factors. But it has been suggested that ‘Keynesian expansion’, or the increase in aggregate demand due to higher government spending and larger fiscal deficits, was primarily responsible for pushing up growth rates (Joshi and Little 1994). In the early 1980s public investment was growing rapidly, but in the second half of the decade it slowed down and government consumption expenditure grew at a much faster pace. The revenue deficit grew, indicating that government consumption was being financed by borrowing, which entailed interest and repayment commitments. The success of expansionary fiscal

policies in raising output growth, at least in the short run, can partly be attributed to the under-utilisation of productive capacity in the preceding years. By the end of the 1980s, when output was above trend levels, fiscal policy continued to be expansionary creating excess demand in the system (Joshi and Little 1994).

On the supply side there is also evidence of increased productivity in the private sector, import liberalisation and decline in capital-output ratios. Growth in the industrial sector rose to 7.8 per cent, compared to 4.4 per cent in the 1970s. There is some evidence of an increase in import intensity. However, the growth in imports was slower than in the 1970s and imports as a function of GDP fell. Export growth was slow, especially in the first half of the 1980s, partly due to the appreciation in the real exchange rate following the oil crisis and inflation in 1979–80. 1979 also saw a rise in United States' interest rates and LIBOR raising the burden of servicing the existing external debt. Exports were also constrained by the recession in most industrialised countries and the loss of the rupee market in the former Soviet Union and the east European countries. Export growth picked up in the second half of the 1980s, especially in manufacturing, but the balance of trade continued to be in deficit. As a per cent of GDP, however, the trade deficit did not deteriorate. The deficit was increasingly financed by loans from commercial and non-concessionary sources. India's total outstanding foreign debt increased from US\$18.7 billion in 1980 to US\$56.3 billion in 1989 and debt to private creditors increased from about US\$2 billion to US\$21.4 billion during the 1980s. It has been argued that it was not the balance of trade and import liberalisation but the developments in the capital account and the increasing element of higher interest short-term loans that were responsible for the increasing balance of payment difficulties (Debroy 1993).

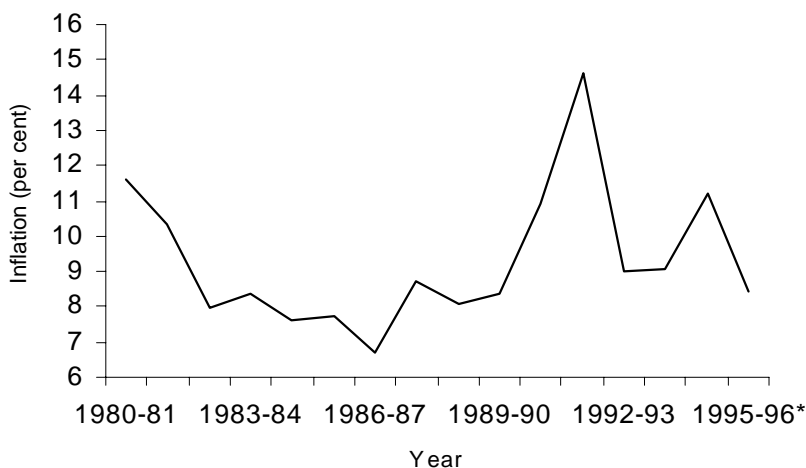
Figure 4.2 Growth and inflation in India, 1980–96 (per cent)



Despite the higher growth, inflation in the 1980s was under control (Figure 4.2). After the economy recovered from the crisis years of 1979–81, which were characterised by inflation caused by supply shocks (mainly the oil price increase and the drought), inflation was controlled by various supply measures and during 1981–89 it remained single digit (Figure 4.3). In the second half of the 1980s when growth was also high, inflation averaged about 7 per cent. Subsequently it was seen that the expansionary fiscal policy could not sustain high rates of output growth and low inflation and small temporary shocks threw the country into a serious macroeconomic crisis. This led to the realisation that the economy required supply-side measures or structural adjustment to sustain high growth.

In August and September 1990 the annual rate of inflation, as measured by the wholesale price index on a point-to-point basis, was only about 7 per cent. In September 1990 there was a sharp rise in the value of oil imports due to a rise in world oil prices resulting from the Gulf crisis. The return of Indian workers from Kuwait also led to a reduction in remittances. United Nations trade embargoes on Iraq reduced exports to West Asia. High debt-to-export ratios, due to the large build-up of external debt over the 1980s, reduced India's credit rating. This resulted in short-term credits beginning to dry up and an outflow of NRI deposits from the beginning of October 1990. The above trends led to a balance of payment crisis in June 1991. India was left with only two weeks imports' worth of foreign exchange. Its credit rating fell sharply and foreign private lending was cut off. For the first time there was a serious possibility of default. Faced with this crisis, the government was forced to act.

Figure 4.3 Inflation in India, 1980–96 (per cent)



* Estimate

Import compression and devaluation had a further adverse impact on inflation. When faced with a poor food grain crop, imports could not be used to supplement supplies. The rise in the prices of fuel, lubricants and primary goods generated inflationary expectations which spread to all sectors and encouraged inventory accumulation. Rising fiscal deficits and monetisation of an increasing part of the deficit in the late 1980s had created not only of excess demand pressures but a liquidity overhang in the system also. From October 1990 an inflationary spiral began and the annual rate of inflation, as measured by the wholesale price index, rose to 13.7 per cent in February 1991 and peaked at 16.7 per cent in August 1991.

Short-term stabilisation measures were undertaken to restore macroeconomic balance, mainly by reducing aggregate demand and longer-term structural adjustments to the economy to increase productivity. The immediate aims of these measures were to bring the current account deficit to 2.7 per cent of GDP and inflation down to 9 per cent. Loans were negotiated with the IMF and the World Bank for stabilisation and structural adjustment. The reforms, as outlined in the letters of intent from the finance minister to the IMF and the World Bank, were designed to remove impediments to domestic and foreign private investment and to deregulate industry. The import regime was drastically simplified, tariffs were reduced, export subsidies were simplified and the rupee was made convertible on the current account, thus letting market forces determine the exchange rate. This trade and exchange rate liberalisation was also accompanied by tax reform and reform of public sector enterprises and the financial sector which had direct implications for the fiscal deficit. The tax reform consisted of a cut in import duties, a streamlining of personal taxes—a cut in tax rates and a reduction in exemptions—restructuring of capital gains and wealth taxes. New measures include a reduction in generous depreciation allowances that had tended to encourage capital-intensive methods of production, a tax on the gross interest receipt of banks, increases in excise duties, and a reduction in the rates of import duties.²

The reform of the financial sector consists primarily of a reduction in the statutory liquidity ratio and a rationalisation of subsidised credit to priority sectors, relaxation of interest controls and restrictions on firms' access to capital markets, and more autonomy for public sector banks. The major reform in the case of public sector enterprises consisted of eliminating privileges such as protection from external and domestic competition and preferential access to budget and bank resources. Though the condition relating to an effective 'exit policy' for the closure or restructuring of money-losing firms in the private and public sector has not been fulfilled, the reforms made have largely been in line with the program's objectives.

There was an opening-up of the economy to foreign capital and the removal of exchange restrictions on imports. Consequently, in 1994 India attained Article VIII status and joined the ranks of the 96 other such member countries of the IMF.³ The first major step towards current account convertibility was taken with the unification of the exchange rate and the removal of exchange restrictions on imports through the abolition of foreign exchange budgeting at the beginning of 1993–94. Relaxation in payment restriction, in the case of a number of invisible transactions, followed in the budget for 1994–95. In August 1994, the final step towards current account convertibility was taken in the further liberalisation of invisible payments and acceptance of the obligations under

Article VIII of the IMF. Under these obligations, India is committed to forsake the use of exchange restrictions in current international transactions as an instrument in managing the balance of payments.

After a temporary decline in output growth and a sharp rise in prices in 1991–92 due to the drastic measures taken both on the fiscal and on the import front, the Indian economy recovered from the crisis. The thrust of the structural adjustment program was to achieve growth through increasing efficiency in production.

The post-reform period

After an initial slowdown, due to the severe compression in both government spending and imports, growth in the Indian economy has picked up. The emphasis this time is on structural adjustments within the economy which can increase efficiency and production due to the improvements on the supply side. The first year of reform (1991–92) saw a decline in industrial output of 1.7 per cent, while in the same year agricultural output fell by 2 per cent. In 1992–93 GDP grew by 5.1 per cent, with agricultural growth of 4.1 per cent and industrial growth of 2.3 per cent. Industrial growth picked up over the following two years and was 6 per cent in 1993–94 and 8.6 per cent in 1994–95. 1995–96 estimates indicated that industrial growth may have been as high as 12 per cent. Since agricultural growth was also good at 3.6 and 4.6 per cent, GDP growth rose to 5 per cent in 1993–94 and 6.3 per cent in 1994–95 (Table 4.1). During 1993–94 and 1994–95, exports grew at 18–20 per cent in real terms and in 1995–96 again showed an impressive growth of about 21 per cent in dollar terms (Table 4.2).

Table 4.1 Sectoral growth rates in India, 1980–96 (constant prices)

Year	Industry	Agriculture	Total GDP
1980–85	6.4	6.0	5.7
1986–90	8.5	4.1	5.6
1990–91	7.0	4.2	5.4
1991–92	-1.7	-2.0	-0.8
1992–93	2.3	4.1	5.1
1993–94	6.0	3.6	5.0
1994–95	8.6	4.6	6.3
1995–96	12.0	3.0	6.2

Source: *Economic survey*, 1995–96. Ministry of Industry, India.

Table 4.2 Growth rates for India's exports and imports, 1980–96 (US\$ million)

Year	Exports	Imports
1980–85	4.5	6.2
1986–90	11.6	8.2
1990–91	9.2	13.5
1991–92	-1.5	-19.4
1992–93	3.8	12.7
1993–94	20.0	6.5
1994–95	18.0	21.3
1995–96	21.4	28.7

Source: *Economic survey*, 1995–96. Ministry of Industry, India.

The average rate of inflation from 1991–92 to 1993–94 was 10.8 per cent. In 1994–95 it rose to about 12 per cent, mainly due to a sharp rise in money supply (Table 4.3). Measures to counter the inflation included making NRI deposits less attractive, raising cash reserve ratio, putting a cap on the issue of *ad hoc* treasury bills or central government borrowing from the Reserve Bank of India, allowing imports of some commodities (like sugar and edible oils) that had production shortfalls and not raising administered prices. Consequently, the following year (1995–96) saw a decline in the rate of inflation (Figure 4.2).

Export growth in dollar terms has picked up sharply since the economic recovery in the major industrialised countries. While an appreciation of the real exchange rate could be harmful for exports, a depreciation of the nominal exchange rate would further push up prices of basic inputs that are imported (such as crude oil and petroleum products, fertilisers and capital goods) if the price increase is passed on. A policy to control inflation thus acquires greater importance when export growth is expected to constitute a significant element of demand. High export growth of requires a slowdown in the growth rate of prices.

Cutting fiscal deficits to curtail inflationary pressures, by reducing demand and growth in the money supply, was one of the objectives of the government when it undertook the reform. However, while fiscal deficit as a percentage of GDP was reduced in the first two years of the reform, it soon rose again (Table 4.4). This was primarily due to the government’s failure to cut the revenue deficit. Even though expenditure (especially on capital) was curtailed, revenue as a percentage of GDP fell, partly due to the fall in custom revenues from 10.7 per cent in 1991–92 to 9.4 per cent in 1994–95.

Sustainability of high growth depends on the ability of the economy to provide both the necessary infrastructure and the required growth of the agriculture sector, which provides food, raw materials and domestic demand to industry. Due to the public good character, large outlays and long gestation periods, public investment in both agriculture and infrastructure has been important. A slowdown in public investment has been observed since the 1980s.

Public investment as a proportion of total government outlay has been declining since the early 1980s and especially in the post-reform period (Table 4.5 and Figure 4.4). One reason for this is the emphasis on cutting fiscal deficit, which is easier to reduce by spending less on investment as the effects are unlikely to be felt immediately. However, in 1994–95 there appears to have been a realisation of this, with increasing attention focused on the infrastructural constraints facing the growth of industry. Consequently,

Table 4.3 Inflation and growth in money supply in India, 1980–96

Year	WPI	Money supply
1980–85	9.3	14.8
1986–90	6.7	15.5
1990–91	10.3	15.8
1991–92	13.7	19.3
1992–93	10.1	15.7
1993–94	8.4	18.4
1994–95	10.9	22.2
1995–96	8.0	13.4

Note: Percentage changes in wholesale price index (WPI) and money supply are on annual averages.
Source: *Economic survey and Report on Currency and Finance* (1994–95), June 1996, Ministry of Industry.

Table 4.4 Deficits and interest payments in India, 1980–96
(percentages of GDP)

Year	Fiscal deficit	Revenue deficit	Interest payments
1980–85	6.2	1.2	2.4
1986–90	8.2	2.6	3.4
1990–91	8.3	3.5	4.0
1991–92	5.9	2.6	4.3
1992–93	5.7	2.6	4.4
1993–94	7.5	4.1	4.6
1994–95	6.1	3.3	4.7
1995–96 (RE)	5.9	3.1	5.0

Source: *Economic survey, 1995–96* and *Budget at a Glance 1996–97*. Ministry of Industry, India.

Figure 4.4 Public sector investments in India as a proportion of total government outlay, 1970–95 (per cent)

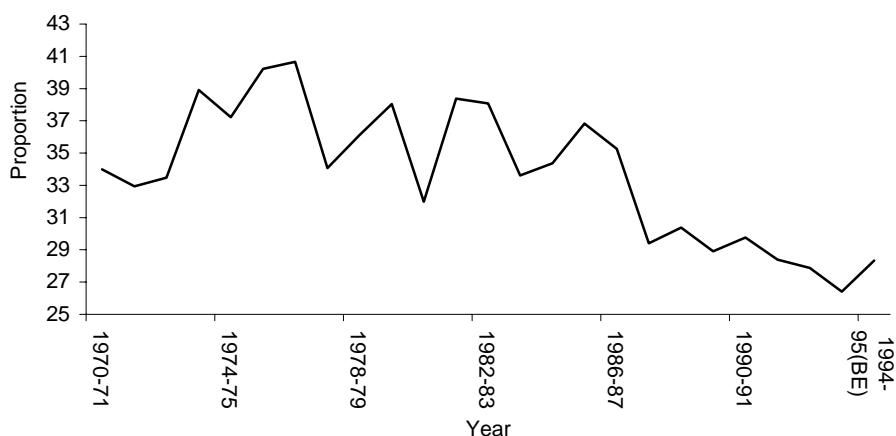


Table 4.5 Public consumption and investment in India, 1980–95

Year	Government consumption	Public investment
1980–85	64.8	35.2
1986–90	67.9	32.1
1990–91	70.5	29.5
1991–92	71.7	28.3
1992–93	72.2	27.8
1993–94	73.7	26.3
1994–95	71.8	28.2

Notes: Figures expressed are in terms of percentages of total outlay of the government. Government consumption has been obtained as the difference of total outlay and public investment expenditure.

Sources: *Economic survey 1995–96* and *National Accounts Statistics*, Ministry of Industry, India, (various issues) and advance estimates of the Central Statistics Office for 1994–95 data.

investment expenditures rose.

Table 4.6 shows the sectoral allocation and growth rates of investment spending by the government. The sharp decline in investment in agriculture and infrastructure is a cause for concern, as these are essential for sustained growth in the economy. An important mechanism by which inflation was kept under control in the post-reform period was the prevention of administered price rises. Since administered prices formed an important element of the cost, this measure restrained inflation arising from cost-push. However, in the long run it is not possible to keep administered prices below the cost, as it puts a burden on the budget. An increase in the price of petroleum products was announced in July 1996. This will raise the inflation rate. Further issue prices have not been raised in line with the higher procurement prices, resulting in a higher food subsidy. If and when these are raised, there will be a further rise in the cost of living and cost of production. This could result in higher wages and further increases in costs and prices (Pandit 1992).

Table 4.6 India: growth in public sector investment by industry, 1981–93 (constant prices)

Year	Agriculture	Manufacturing	Infrastructure	Services	Total
1981–85	-0.94	43.77	11.96	9.72	11.30
1986–90	-6.39	-2.76	7.66	7.60	3.48
1990–91	0.92	22.65	2.33	0.50	4.60
1991–92	-13.56	1.97	0.21	-17.56	-7.20
1992–93	4.41	-6.70	-15.80	28.90	2.08

Source: *National Accounts Statistics* (various issues).

Private investment

Until recently the most important means by which the government influenced growth was public investment and regulation and licensing of private investment. Under the reforms, the private sector has been deregulated and government spending and financing decisions are expected to have a much greater effect than before on private investment. Government policy is expected to have an impact on the investment behaviour of the private sector through public investment, the mode of financing public spending and the consequent availability of credit to the private sector and the general stability or otherwise of the macroeconomic environment.

Modeling private investment

Blejer and Khan (1984) point out that there is a gap between the theory of investment and the models that have been specified for developing countries. This gap is due to the institutional and structural features of developing countries. The absence of well-developed financial markets, the greater role of the government in investment, the lack of data on capital stock, distortions created by foreign exchange constraints and other market imperfections are the characteristics of developing countries which have hindered the application of theories of investment in these countries.

Recognising these problems, an alternative approach to modeling investment behaviour was proposed by McKinnon (1973) and Shaw (1973). This approach viewed

private investment in developing countries as a positive function of accumulation of domestic real money balances. The basic assumption underlying this hypothesis was that private investors must accumulate money balances before undertaking investment projects because of their limited access to credit and equity markets. As real deposit interest rates have a direct bearing on real money balances, this approach visualises a positive relation between real interest rates and private investment. This is in contrast to the neo-classical approach where real interest rates exert a negative influence on private investment via the user cost of capital.

Despite these problems of conflicting theoretical formulations, there have been attempts to incorporate features of neo-classical investment theory when specifying investment functions for developing countries. The works of Sundararajan and Thakur (1980), Wai and Wong (1982) and Blejer and Khan (1984) are notable among such attempts. These studies (with the exception of Sundararajan and Thakur, who specify a private investment function for India) deal with aggregate investment behaviour in other developing countries. The investment functions specified in the models of Krishnamurty, Pandit and Sharma (1989), Pradhan, Ratha and Sarma (1990) and Saibaba (1994) deal specifically with investment behaviour in India.

Investment behaviour in macro models for India has been specified as demand for investment goods. Specification for investment has to contend with the fact that public and private investment are equally important and respond to different sets of variables or instruments. In the context of developing countries there is no consensus on determinants of investment, particularly private investment.

Consequently, the major disaggregation of total investment is in terms of private and public investment. In a few studies, a break-up of investment into construction and machinery is also considered. Generally public sector investment is considered as an exogenous policy-determined variable, the major exception being Ahluwalia and Rangarajan (1986), where public investment is an endogenous variable. Savings in the public sector and market borrowing by the public sector are explanatory variables for public investment in this study.

The work of Sundararajan and Thakur (1980) is an adaptation of the Jorgenson's neo-classical theory of investment. Their model deals with India and Korea and examines the relationship between public and private investment. The model consists of relationships explaining the behaviour of private investment, savings and growth and it incorporates several channels through which public investment influences private investment. Private investment is a function of the user cost of capital, public investment, savings available to the private sector and the previous year's capital stock. After simulating the model, Sundararajan and Thakur infer that although public investment does crowd out private investment in the short run, it also raises the output expectation and hence the investment needs of the private sector, by raising the productivity of private capital stock and generating demand for private sector output. One weakness of this approach is that private investment is a function of only private sector output. The overall economy's output and its impact on private investment is captured only indirectly. It also does not consider investment at a disaggregated level, for example investment in agricultural and non-agricultural activities, the determinants of which may vary.

Using a modified version of the flexible accelerator theory of investment, Wai and

Wong (1982) test the hypothesis that private investment in developing countries depends on government investment, change in net credit to the private sector and net inflow of foreign capital to the private sector. Their results confirm that government investment, change in bank credit to private sector and foreign capital inflow are important determinants of private investment.

Blejer and Khan (1984) and Green and Villanueva (1991) also single out public investment and changes in private sector output as key determinants of investment. However, in specifying the investment function, Blejer and Khan distinguish between public investment in infrastructure (long-term) and other government investment (short-term). This distinction rests on the premise that the impact of government investment on private investment will depend upon the type of investment. Their results indicate that in a developing country the government can influence the pattern of investment by altering its investment strategy. Availability of funds also turns out to be a significant variable influencing investment, implying that by varying the flow of credit to the private sector, the government can influence investment decisions.

Most of the studies discussed above deal with private investment at a very high level of aggregation, with the exception of the study by Krishnamurty et al. (1989). The latter differs from most of the other studies, not only with respect to the level of aggregation but also in terms of specification of private investment functions. Investment functions have been specified keeping in mind the imperfect nature of capital markets. The explanatory variables in aggregate investment function are capital goods imports, the real savings rate, the nominal resource gap and government investment. These variables are specified as ratios of GDP. Investment in agriculture, manufacturing and infrastructural sectors are allotted through separate investment functions. Empirical results indicate that the impact of public sector investment on private sector investment is more pronounced in the areas of agriculture and infrastructure than in manufacturing. A nominal resource gap (defined as the difference between nominal government investment (gross) and nominal government savings (gross)) exerts a negative influence on investment. The widening of this gap can be attributed to higher public investment, leading to crowding-out.

The empirical modeling of investment has not only been difficult in developing countries but also in industrialised countries. Dixit and Pindyck (1994) note that the explanation of aggregate and sectoral investment spending has been one of the less successful endeavours in empirical economics. In fact, a need for a new theory to explain investment behaviour has emerged from the failure of neo-classical investment theory to provide good empirical models that explain or predict investment spending. Apart from the failure to predict movements of investment, variables that, in theory, should have strong explanatory power (such as Tobin's q or various measures of the cost of capital), in practice do not (Chirinko 1991; Kopcke 1985, 1993).

Dixit and Pindyck (1994) attempt to explain the failure of neo-classical models to provide good empirical models of investment behaviour in terms of the effect of the irreversibility of investment, the role of uncertainty and the timing of investment spending. The opportunity to invest is like holding an 'option' which is exercised when the irreversible investment decision is undertaken. This lost option value is an opportunity cost that must be included as part of the cost of the investment. This opportunity cost is

very sensitive to uncertainty over the future value of the project, so that changing economic conditions that affect the perceived riskiness of future cash flows can have a large impact on investment spending. This impact may be larger than the impact of a change in interest, therefore resulting in the relative ineffectiveness of the real interest rate to explain investment behaviour. Though the models developed by Dixit and Pindyck (1994) suggest a much greater role for uncertainty as a determinant of investment than do traditional models because of the irreversibility of investment, they note that unfortunately, incorporating irreversibility into econometric models of aggregate investment spending is not simple. One problem is that equations describing optimal investment decisions are non-linear and it can be difficult to measure the variables or parameters that reflect the key components of risk. There are additional problems if we seek to explain the long-term equilibrium effects of uncertainty on investment spending.

The Mundell-Tobin effect suggested that the positive impact of inflation on capital accumulation occurs as a result of the portfolio shift away from money when the rate of return on money falls. Subsequent contributions, noting various complementarities between real balances and capital—whether through the production function or because of a cash-in-advance constraint—predicted that higher inflation would reduce capital accumulation. Stockman (1981) has shown that inflation reduces capital accumulation by increasing the cost of capital.

Conway (1988) focuses on private investment rather than aggregate investment, augmenting the regression for a standard investment function for Turkish data by adding a proxy for instability: the standard deviation of the real interest rate. This proxy comes out with a negative and highly significant coefficient. When the level of the real rate of interest is included, the result is statistically insignificant. The strongest effects are observed in manufacturing investment.

Private investment in India

Before discussing the empirical results we will briefly examine the pattern of public and private sector investment in India. The growth rate of public sector investment declined steadily during 1970–95. The average annual growth rates were 7.6 per cent, 6.1 per cent and 4 per cent for the 1970s, 1980s and early 1990s (1990–91 to 1994–95) respectively. In contrast to this, private investment has grown at an increasing rate. The average annual growth rate of private investment increased from 2.1 per cent in the 1970s to 8.1 per cent in the 1980s. During the early 1990s the growth rate marginally declined to 7.8 per cent per annum. Figure 4.5 plots the investment data (in 1980–81 prices) for these two sectors.

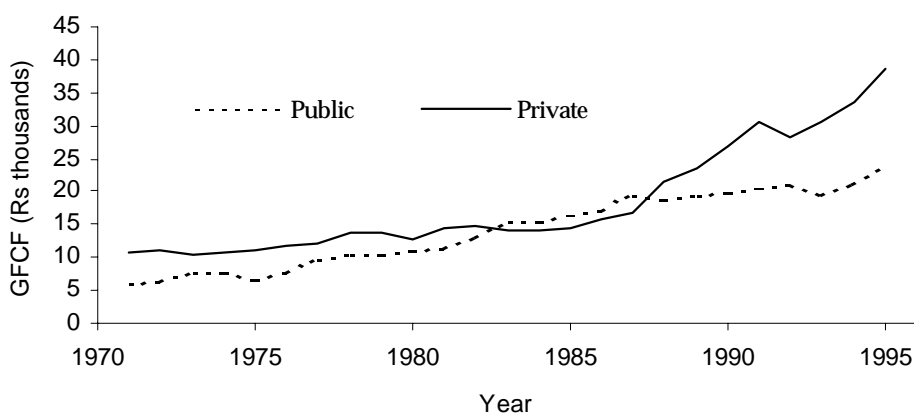
Private investment includes investment in manufacturing, agriculture, infrastructure, construction and services. Since the forces governing each of these is different in a developing country, no single model seems to fit the data well. However, when disaggregated by sector, investment in manufacturing and agriculture can be explained by various forces at work.

Private investment in the non-agricultural sector has been specified at various levels of aggregation for the Indian economy. Although most studies estimate investment functions at the aggregate level, a few have estimated functions for the manufacturing sector as dependent upon the non-wage income of the industry, total public expenditure

(to capture the crowding-in effect) and the gap between overall savings and private investment. In Pani's model (1984) private investment in manufacturing is estimated as a function of total government investment, lagged capital stocks in the manufacturing sector and overall activity (captured through real net domestic product) in the economy.

In the Indian context, investment in agriculture has been found to be influenced by factors such as public investment in agriculture and terms of trade between agriculture and non-agriculture. Ganesh Kumar (1992) modified the agricultural investment function in the model developed by Narayana, Parikh and Srinivasan (1991). In his work, the share of agricultural investment in total investment is specified as a function of terms of trade (ratio of price deflator in agriculture to non-agriculture) and ratio of GDP in agriculture to overall GDP. Krishnamurthy, Pandit and Sharma (1989) specified agricultural investment as a function of government investment in agriculture and the ratio of prices in agriculture to overall price level.

Figure 4.5 Real investment in the public and private sectors in India, 1970–95



Private investment in manufacturing in India

In this section we present an estimate of private investment in the manufacturing sector. We examine the effect of inflation on investment and of crowding-out by public investment in manufacturing. We also attempt to capture the impact of changes in resource availability to the private sector. We first check for the level of integration of the variables. Since all the variables involved are non-stationary, we construct an error correction model.

P, the level of prices, is taken to be defined by the GDP deflator. Other variables are defined in real terms. We define the log of private investment in manufacturing as a function of the log of output in the manufacturing sector, the rate of change of prices (measured by the GDP deflator) and government investment in the manufacturing sector and the log of ratio of the resource gap to GDP. The first difference of the log of prices (DLP) approximates the rate of inflation. The estimated equation is given below. D denotes first differences.

$$DLI_t = 0.525 + 0.88 DLY_t - 0.28 DLG_t - 2.37 DDLP_t - 0.24DLRG_t - 1.20 u_{t-1}$$

(1.80) (1.92) (-3.797) (-7.09) (-1.27) (-5.95)

R-squared = 0.90, DW-statistic = 2.30

where

LI_t = log of private investment in manufacturing

LY_t = log of output in manufacturing sector

DLP_t = rate of change of prices

LG_t = log of government investment in manufacturing

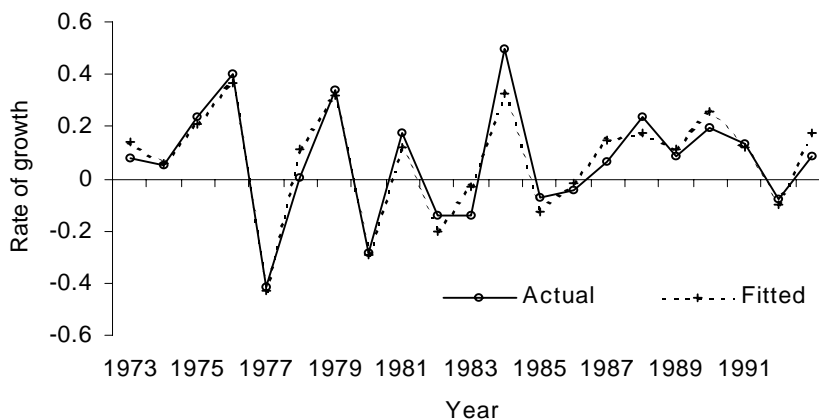
LRG_t = log of ratio of resource gap (nominal) to GDP (nominal)

u_{t-1} are the lagged residuals from the equation in levels.

Figure 4.6 shows the plot of actual and predicted values of private sector investment in the manufacturing sector.

The major results from the above estimation may be summarised as follows. The rate of investment declines when there is an increase in the rate of inflation. This suggests that since inflation adversely affects investment it will also adversely affect long run growth. Further, the short-term response of investment to output is insignificant. Since a substantial amount of fluctuation in output appears to be transitory and it is costly to install capital, adjusting capital stocks to transitory shocks is sub-optimal (Serven and Solimano 1992). If investors are not extremely myopic, investment should not be very responsive to output in the short run. Given the usually positive short term relationship between output and inflation, this implies that output growth in the short term may need to be sacrificed to achieve higher long-term growth. This may be the case when output growth is demand-driven and accompanied by inflation. Our results also suggest that public investment in manufacturing crowds out private investment. Also, a larger fiscal deficit crowds out private investment, perhaps because it creates a resource crunch as government borrowing increases.

Figure 4.6 Private investment in manufacturing in India, 1973–91



Private investment in agriculture in India

An examination of the growth of investment in agriculture indicates that the rate of real investment growth which was over 10 per cent in 1970s fell to -1.6 per cent in the 1980s and further declined to -3.2 per cent per annum during 1990–91 to 1992–93. Private sector investment, which fluctuated in the 1980s, has shown a consistent rising trend since 1987–88. Figure 4.7 tracks the public and private sector investment in agriculture from 1970–71 to 1992–93.

Empirical studies on private investment in agriculture point towards its dependence on public investment in agriculture. The impact of terms of trade in agriculture compared with non-agriculture and availability of institutional credit is also found to be significant. Notable among these are studies by Krishnamurty et al. (1989), Gandhi (1990) and Kumar (1992). Kumar (1992) estimates investment in agriculture (share in total investment) as a function of terms of trade and ratio of agriculture to non-agriculture income. Krishnamurty et al. (1989) have specified agricultural investment as a function of government investment in agriculture and the ratio of agricultural price to overall price. Gandhi (1990) modifies the neo-classical function to incorporate special features of developing countries, such as the role of credit and public investment in the private investment function for agriculture. We draw upon these studies to specify the private investment function for agriculture.

We specify private investment in agriculture as a function of lagged public investment, output expectations in agriculture, prices in agriculture *vis-à-vis* overall prices and availability of institutional credit to the agricultural sector. The estimated equation is

$$\begin{aligned} \text{Log}(\text{PRINVAG}) = & -7.1674 + 0.0925*\text{Log}(\text{GINVAG})_{-1} + 1.1693*\text{Log}(\text{ZYA})_{-1} \\ & (5.3) \qquad \qquad \qquad (2.17) \qquad \qquad \qquad (8.96) \\ & + 1.6827*\text{Log}(\text{PA/PALL})_{-1} + 0.2235*\text{Log}(\text{AVGCR}) \\ & \qquad \qquad \qquad (3.56) \qquad \qquad \qquad (2.26) \end{aligned}$$

Note: figures in parenthesis are the t-ratios

R-squared = 0.93, DW=2.12

where PRINVAG = private investment in agriculture
GINVAG = government investment in agriculture
ZYA = GDP in agriculture
AVGCR = average real institutional credit to agriculture (current and one period lagged)
PA/PALL = ratio of price deflator in agriculture to overall price deflator

All the explanatory variables are significant, have the expected signs and explain the 93 per cent variation in private investment. The plot of actual and fitted values is shown in Figure 4.8. Public sector investment in agriculture, which is mainly in irrigation and infrastructure, has a positive impact on private sector investment, although its elasticity is only 0.1. This is quite low compared to the elasticity noticed in other studies. One reason for this could be the inclusion of more recent data in our estimation. Recent data indicates a weakening of the relationship between investment by the public and private sectors. Higher output expectations with an elasticity of 1.16 and favourable prices for the agricultural sector with an elasticity of 1.68 do impact on private investment significantly.

Figure 4.7 India: investment in agriculture in India, 1971–93
(1980–81 prices)

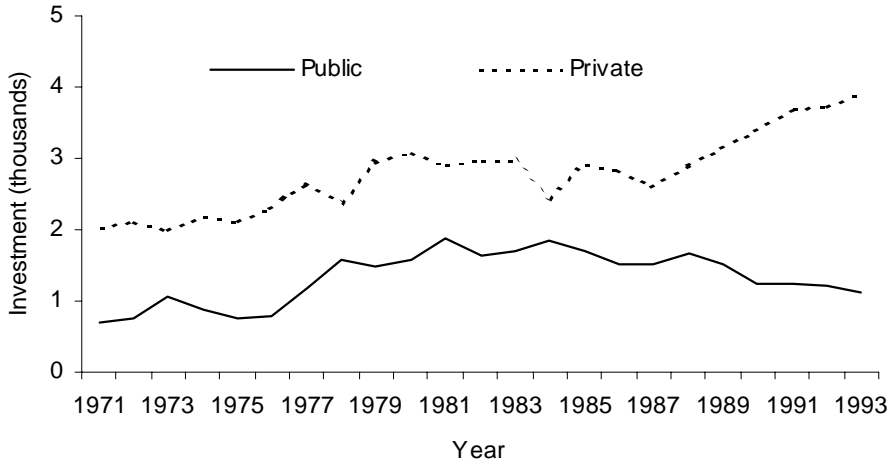
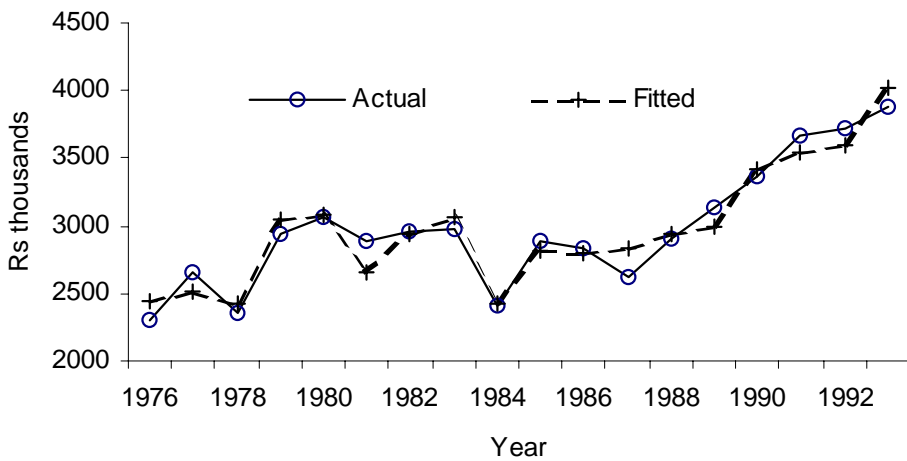


Figure 4.8 India: private investment in agriculture, 1976–93
(actual vs fitted)



Other sectors

While private investment in infrastructure is marginal, investment in services includes trade, hotels and restaurants, transport, insurance, real estate and business services. Since the nature and purpose of such investment is quite different, so are the forces governing them. When taken together, the impact of various forces was not very clear and it was difficult to construct a model to explain the causes of changes in the rate of investment. A sensible model may be possible when the investment data is more disaggregated by purpose and agents in these sectors.

Policy implications

The policy implications of our results for the manufacturing sector are mainly that the rate of inflation should be kept stable at low levels to raise investment and hence the long-term growth potential of the economy. Fiscal deficits should be contained since they crowd out private investment. Public investment in manufacturing should be reduced to increase private investment. Though we have not been able to capture the impact of public investment in infrastructure because of the long lags involved, in a developing country with infrastructural constraints, economic theory suggests that investment in infrastructure should raise the marginal productivity of private investment and therefore encourage private investment. This suggests that public investment should be diverted from manufacturing to infrastructure.

Our estimates of the private investment function in agriculture also have policy implications. Public investment in agriculture has been falling in real terms in the last few years. As noted earlier, public investment in agriculture is mainly in irrigation and infrastructure projects for which private investment may not be forthcoming due to the long gestation period. Moreover, as private investment is mainly done by households, it will not be possible for them to undertake such investment. This may adversely affect private investment in agriculture in the long run and hamper agricultural growth. Thus the government should step up investment in this sector. The positive coefficient of real credit to agriculture indicates that private investment in agriculture can be encouraged by making more credit available to this sector.

A framework for policy analysis

In certain cases the policy implications for the overall economy may not be clear. This is when there is a conflict between maintaining low inflation and promoting growth by higher public investment. To examine the impact of changes in the level of public spending we present a medium-term model designed to assess the economy-wide effect of changes in public investment and budget deficits and the accompanying changes in prices, private investment and output. Among other issues, the model below investigates the implications of public investment financed by inflationary means.

The model

This section discusses the macroeconometric model that has been used to analyse the impact of changes in government expenditures and their modes of financing on inflation

and growth. It is a modified version of the econometric model developed at the National Council of Applied Economic Research for medium-term forecasting (Joshi et al. 1995). The model incorporates various interrelationships in the economy such as those between output, investment, prices, trade and budgetary transactions of the government. The model also considers the dynamic link between investment and output captured through the update of capital stock by investment. The emphasis of the model is, however, on the supply side, thus recognising the supply constraint as the key factor for sustained growth of the economy in the medium to long-run. These features make the model suitable for medium-term analysis of the economic system with respect to various government policies relating to consumption and investment expenditures.

Before discussing the simulations carried out using this model, we will highlight the special features of the model in relation to determination of output, investment, prices, money supply and trade. This will bring out the sources of inflation and growth in the model. The key features of the model are

- the economy is considered to be primarily supply-constrained
- the model distinguishes between three agents: the public sector, private sector and the foreign sector
- disaggregation of the economy into agricultural and non-agricultural (manufacturing, construction, infrastructure and services)
- dynamic linkage between investment and output
- the link between budgetary operations of the government, prices and money supply
- linkage between real and monetary sectors
- crowding-in and crowding-out aspects of public investment
- prices respond both to cost-push and demand-pull factors.

Output and investment

In the model, investment is the main driving force behind growth. Public investment, which is a major component of overall investment, has been recognised as an engine of growth in the past. Although favourable to growth, public investment can have adverse effects too: it has an inflationary potential and can also crowd out resources available for private investment. Other factors affecting private investment decisions are output expectations and inflation. In the agricultural sector, public investment is primarily in irrigation and related activities which not only crowd in private investment but also raise agricultural yield. These aspects have been kept in mind when specifying private investment functions for agricultural and non-agricultural sectors. Public investment has been exogenously specified.

Output in the agricultural sector responds to weather conditions, intensity of irrigation, remuneration (proxied by output prices) *vis-à-vis* input prices and a trend variable to capture the productivity changes. Output in the non-agricultural sector is primarily supply-determined. This feature has been built into the model by making output in the non-agricultural sector a function of the capital stock. This specification implies that the economy is operating at full capacity and if the capital stock does not increase then it acts as a drag on the output.

Prices, money and trade

Prices are determined both by cost-push and demand-pull factors. Agricultural prices are influenced by the supply position of food grains, government intervention (captured through procurement prices), food grain imports and overall demand in the economy. Prices in the manufacturing sector respond to cost of imports, monetary pressures (captured through M3/GDP ratio) and prices in the infrastructure sector (fuel and power). Government revenues are endogenously determined in the model. Direct (household and corporate) tax and indirect (sales and excise) tax collections are affected by the level of activity in the economy. Customs revenue collections respond to the level of imports and tariff rates. The gap between the revenues and expenditure which is met by deficit financing determines reserve money and hence the money supply. Growth in money supply *vis-à-vis* GDP growth generates inflationary pressures. The cost of imports is captured through the UVI of imports which is determined in the trade block. The importance of wage rates is also recognised when modeling prices in labour-intensive sectors like construction and services. Wage rates are indexed to the consumer price index, which in turn is linked to prices in the agriculture and manufacturing sectors. The wage price nexus is thus captured. Prices of fuel and power which are exogenously specified have been modeled to impact on the prices of other sectors.

Simulations and analysis of the results

We have used the model to carry out the following counterfactual exercises to analyse the efficacy of government expenditure patterns over a period of five years including the impacts of an increase in government consumption expenditure and an increase in government investment expenditure under alternate modes of financing (through deficit financing and cut-in-consumption expenditures).

An increase in government expenditure manifests itself in the form of higher deficits. This raises reserve money and via the money multiplier, the money supply (M3). The growth in money supply in relation to GDP growth influences prices. Government expenditure can be for either consumption or investment and each type of expenditure may have a different impact on the macro parameters. In our model, increases in consumption expenditure raise prices via their impact on money supply as they do not increase growth. Gross domestic product growth may decelerate due to a fall in private investment as a result of a higher resource gap. In contrast, an increase in government investment expenditure raises deficits but also promotes growth (by raising capital stocks) and the prices may rise or fall depending upon the growth in money supply relative to GDP. In this section, we report simulations carried out using the macroeconomic model to analyse the impact of increases in government consumption and investment expenditure and their modes of financing on inflation and growth in the economy over the medium-term.

Simulation 1: increase in government consumption expenditure by Rs220 billion in nominal terms, spread over a period of five years. This increase in expenditure is financed through higher budgetary deficits.

Simulation 2: increase in government investment expenditure by Rs220 billion in nominal terms, spread over a period of five years. This increase in expenditure is financed through higher budgetary deficits.

Simulation 3: increase in government investment expenditure by Rs220 billion in nominal terms, spread over a period of five years. This increase in expenditure is financed through cuts in government consumption expenditure.

The base run was obtained by keeping all the exogenous variables at their original level for the period 1988–93. Then the exogenous variables of interest (consumption and investment expenditures) were modified for this period and endogenous variables were obtained through dynamic simulations. The results have been reported as percentage change (average over a five-year period) in key endogenous variables over the base run. Table 4.7 documents the results of these simulations.

Table 4.7 Policy simulations (per cent change over base)

Variables	Simulation 1	Simulation 2	Simulation 3
GDP (REAL)	-0.04	1.15	1.17
GDP deflator	1.11	0.18	-0.59
Resource GAP	6.94	6.38	0.00
GFCF	-0.46	4.57	4.88
Budget deficit	34.00	31.22	0.00
Trade deficit	2.37	10.48	8.66
Money supply	3.82	1.33	-1.47

Note: The expenditure of Rs220 billion is equal to the additional expenditure by the government if it invests at the rate of 5 per cent per annum in real terms over a five year period from 1988–93.

Simulation 1: increase in government consumption expenditure

Government consumption expenditure is an exogenous variable in our model. In this simulation we raise it by Rs220 billion over a five year period. All other exogenous variables have been kept at the historical level. Increase in consumption expenditure has unpleasant effects—prices rise and GDP falls. The GDP deflator increases by 1.11 per cent over the base run. This is because the increase in consumption has been met through deficit financing. This raises money supply in the economy and hence the prices. A price rise has other effects as well. It worsens the trade deficit as a domestic price increase reduces the competitiveness of exports and makes imports cheaper. As a consequence, imports rise and exports fall. This relieves pressure on the money supply by reducing foreign exchange reserves. However, as the impact of increases in budget deficit on money supply outstrips the deflationary impact of reduction in foreign exchange reserves, prices rise. Real GDP marginally falls by -0.04 per cent. This impact comes via investment. A resource gap (which rises by 6.94 per cent), generated as a consequence of higher spending by government, reduces private investment. This leads to a reduction in capital stocks and hence in the output. This simulation points to the adverse effects of increases in government consumption expenditure.

Simulation 2: increase in government investment expenditure met through deficit financing

In this simulation, we raise government investment expenditure by Rs220 billion. This additional expenditure is met through deficit financing. An increase in capital expenditure raises the productive capacity of the economy by augmenting capital stocks and thus has a favourable impact on growth. Average real GDP over the reference period rises by 1.15 per cent. As the additional capital expenditure is met through

deficit financing, it can lead to monetary expansion and prices rises. But an increase in investment expenditure also raises revenue (tax revenues in the model are linked to the level of activity in the economy). This counteracts the impact of an investment expenditure increase on the budgetary deficit. Further, the growth that the economy experiences leads to higher imports, resulting in an increased deficit on the trade account. This counteracts the upward pressure on base money due to additional government expenditure. Thus the inflation that the economy experiences depends upon the extent to which the increases in revenue and imports offset the inflationary potential of this additional investment expenditure. As a net result of these counteracting forces, money supply in simulation two rises by only 1.33 per cent as compared with the situation in simulation one, where it increased by 3.82 per cent. This is because in simulation one, an increase in government consumption expenditure did not favour growth and hence there was no impact the revenues on budget deficit. Thus the ratio of money supply/GDP, which influences prices, does not increase by the same amount as in simulation one. This explains the increase in the GDP deflator by only 0.18 per cent compared with simulation one, where an increase in expenditure of the same magnitude resulted in a much higher price increase.

Simulation 3: an increase in government investment expenditure met through a cut in government consumption expenditure

In this simulation, government investment expenditure also increases by Rs220 billion but is financed through cuts in consumption expenditure. Budget deficit, which is endogenously determined in the system, was exogenously specified for this simulation and government consumption expenditure was endogenised. The budget deficit was kept at the base level. In this simulation, GDP registers almost the same increase as in simulation two, but the prices fall. Real GDP rises by 1.17 per cent and the GDP deflator shows a decline of -0.59 per cent. Prices fall because money supply relative to GDP falls. This is due to the increase in GDP and the decline in money supply. The fall in money supply can be explained by the impact of trade deficit (arising out of higher imports) on foreign exchange reserves, which leads to reduction in base money and consequently money supply.

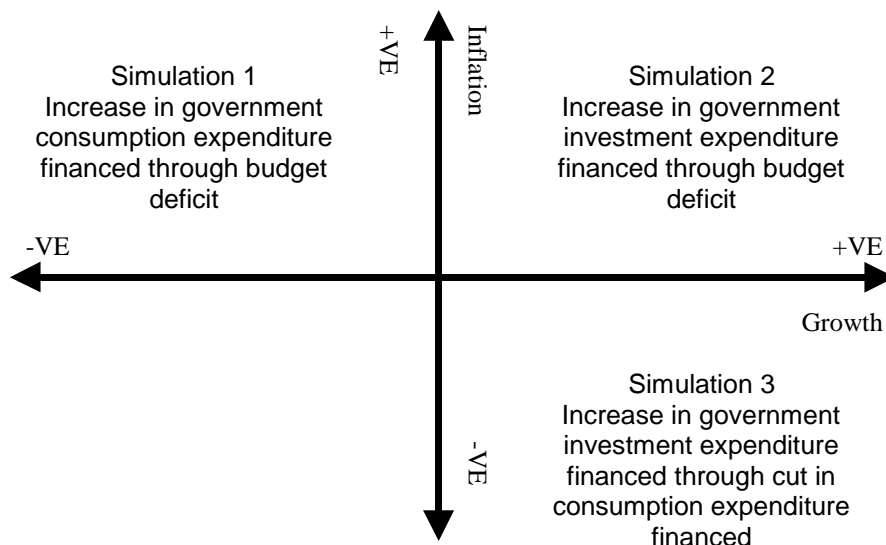
Policy implications

Increases in investment expenditure should be preferred to increases in consumption expenditure, even when both are deficit-financed, because the former promotes growth and raises revenues, thereby reducing the adverse impact on prices.

Since increases in government consumption are clearly inflationary and reduce growth in the medium and long-term, there is no conflict on this issue. The policy prescriptions are clearly in favour of reducing government spending financed by budgetary deficits. Similarly in simulation three there is growth and no inflation when the government switches expenditure from consumption to investment. Though this seems to be the ideal scenario, it is rarely an easy path to follow. If growth with some inflation is not unacceptable to the economy, then public investment can be financed through inflationary means. Thus there is a trade-off between inflation and growth when

the mode of financing the investment expenditure of the government shifts from a cut in consumption expenditure to deficit financing. Higher public expenditure that raises deficits, results in a higher level of inflation which in turn crowds out private investment. However, through its impact on output, it still crowds in private investment. This is in contrast to simulation one, where private investment declines. Funding investment expenditure through higher deficits (using inflation to promote growth) does not seem to have too much of an undesirable impact as GDP grows by 1.15 per cent and the GDP deflator shows an increase of 0.18 per cent (average over five years) over the base. But if capital inflows were endogenised in the model, higher growth might attract higher capital inflows from abroad, which would neutralise the effect of decreases in foreign exchange reserves observed in simulation two and could make inflation higher than observed. Thus simulation two serves to focus on a scenario where there is conflict between the objectives of growth and low inflation. Since growth-enhancing public expenditure is financed by inflationary means, policy prescriptions are not very clear. When growth is to be achieved at the cost of higher inflation, society has to face questions relating to the redistributive impact of inflation, the level of acceptable inflation and other issues that take on a political dimension. The trade-offs between growth and inflation under alternate modes of financing government expenditure are shown in Figure 4.9.

Figure 4.9 Growth and inflation trade-off simulations



Conclusion

Macroeconomic stability and the necessary infrastructure are among the preconditions for sustained growth. Among the ways inflation can affect growth, an important avenue is the effect of inflation on investment. Low or moderate inflation is an indicator of macroeconomic stability and creates an environment conducive for investment. A review of the existing cross-country international evidence, as well as evidence from Asia, indicates a negative relationship between inflation and long-term growth. Countries with low or moderate rates of inflation have higher growth rates over the long-term compared with countries with high inflation rates. However, low inflation does not constitute a sufficient condition for growth.

The Indian experience appears to support the above view. In India inflation has generally been kept under control. There have been two episodes of high inflation since 1980 but price rise has been controlled by various fiscal, monetary and administrative measures. Also, evidence from investment behaviour in private manufacturing suggests that an increase in the rate of inflation has a negative impact on private investment in manufacturing. The regression for private investment in agriculture points towards complementarities between public and private investment. Taking economy-wide linkages into account, the analysis suggests that higher growth can be achieved by controlling inflation and raising public investment.

To promote growth and keep inflation low, the government needs to control budget deficits. While simulations indicate that this can be achieved by switching public expenditure from consumption to investment, this may be a difficult policy to pursue, especially in a developing country with a multiparty democracy. It may be more realistic to choose 'tolerable' levels of inflation rate and achieve the maximum possible growth given that rate, by deficit-financed public investment. The model allows the policy maker to see the various trade-offs involved. The overall message is clear—the government should curtail unproductive expenditure, which is bad for both growth and inflation, in favour of investment. Providing stability and the necessary infrastructure can set the stage for the use of other more direct policy measures aimed at promoting growth.

Notes

- ¹ We wish to thank Dr S. Bhide for his guidance and comments throughout the preparation of this paper. All errors remain ours.
- ² 'Memorandum of economic policies for 1991–92 and 1992–93' in U. Kapila (ed.), *Recent Developments in the Indian Economy*, Part I:332.
- ³ International monetary arrangements after the Bretton Woods Conference required members of the IMF to restore current account convertibility. The obligation as defined in Article VIII, Sections 2, 3 and 4 stipulates that member countries should have no restrictions on current account payments and avoid discriminatory currency practices.

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