III Exploring The Slowdown

Introduction

3.1 The recent deceleration in the Indian economy has generated considerable concern with some apprehensions about the deepening of the slowdown and delay in revival. Several factors are attributed to the loss of growth. Infrastructural constraints, variability and shortfalls in agricultural output, erosion in the quality of public services and gaps in technology and human development are insidiously becoming binding constraints on growth. At the same time, recent developments indicate some cyclicity in output behaviour with the current phase of the cycle reflecting the general deficiency in aggregate demand, the inadequate response of private investment to reforms, deceleration in public investment, inventory accumulation, excess capacity and some evidence of consumption smoothing. In the current year, indicators of real activity, with the exception of agriculture, have underperformed in relation to the preceding year. A few positive signs are, however, visible in the improved capital flows and the steady build-up in the foreign exchange reserves. The principal policy, instruments, *i.e.*, fiscal and monetary policies have been shifted into counter-cyclical mode and the stance of policies is clearly in favour of further adjustments, if necessary, to create a congenial environment for the awaited upturn. There is also a growing recognition that the existing level of structural reforms is succumbing to the inexorability of diminishing returns, and bolder and more intensified reforms are required in the 'difficult areas' - agriculture, labour market, bankruptcy and exit procedures, social sector and legal reforms.

3.2 The persistence of the slowdown for the second year in succession has provoked intense debate on the underlying causes of the downturn. Although the views traverse a wide spectrum, a broad categorisation helps to place the debate in proper perspective.

3.3 There is an influential viewpoint which attributes the deceleration to forces operating on demand such as, low aggregate demand and adverse investment climate (NCAER, 2001), the sharp deceleration in the two major components of industrial demand-exports and investment (Acharya, 2001), the contractionary features inherent in public policies pursued in the 1990s (Shetty, 2001), and specifically, anti-cyclical fiscal policies, and the inappropriate budgetary stance (Rakshit, 2000). All of the above are reflective of a demand-constrained economy (Patnaik, 2001). Within the 'demand constraint' side of the debate, there is also the view that the declining trend in growth is to be attributed to demand recession as well as global slowdown (Institute of Economic Growth, 2001). The impact of contemporaneous global developments has also been emphasised as the overwhelming reason; one view cautions the government to be ready to handle the adverse consequences of continuing global slowdown (Venkitaramanan, 2001), while another suggests that "the government can do very little about it" (Economic Times,

2001). The contrarian viewpoint argues that the impact of the global slowdown on the domestic output growth may be minimal and the current phase may be temporary (Bhalla, 2001; Bhattacharya, 2001; Rao, 2001).

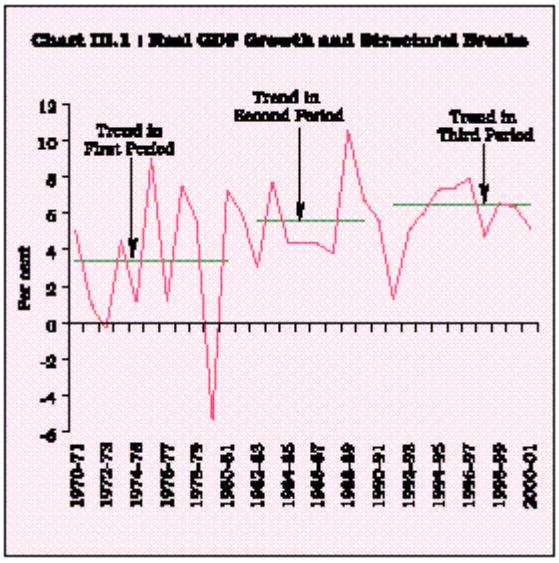
3.4 The other side of the debate ascribes the slowdown to factors operating primarily on aggregate supply. The slide in the pace of growth is attributed essentially to the growth of the commodity producing sectors— agriculture and manufacturing (Chandrasekhar, 2001). Pointing to the institutional impediments to growth, it is argued that the main reasons for the current slowdown are structural and should be addressed accordingly (Karnik, 2001). The slowing down of growth is also regarded as reflecting the effects of various shocks, such as, the Asian financial crisis, international oil prices, 'patchy' monsoon and natural calamities along with deeper structural factors at work, including infrastructure constraints, regulatory constraints in industry, agriculture and trade, and high real interest rates (IMF, 2001) as well as slow pace of reforms (International Finance Corporation, 2001). The current decelerating phase is also associated with relatively high unemployment, poor human and social development and ecological degradation (GoI, 2001). Finally, there is the view that the recent slowdown in economic activity seems to reflect a combination of both cyclical and structural factors with different weights assignable to either, depending on the changing conditions in the growth process (Reserve Bank of India, 2001).

3.5 Against the backdrop of the current deceleration, the impassioned debate generated in India and the diversity of views about the downturn, this Chapter undertakes an analytical examination of the dynamics of India's growth performance. The approach is exploratory and empirical with the objective of presenting the findings of a series of integrated analytical exercises on various facets of the deceleration for contributing to informed public judgement and choice. The following section deals with the macroeconomics of growth, in terms of aggregate demand and cyclical influences thereon, factors underlying the behaviour of aggregate demand such as consumption, saving, investment and net exports. Sections II and III address specific structural constraints on aggregate supply in agriculture and industry, respectively. Section IV examines the role of services as a lever of growth. Section V profiles the regional dimensions of the growth process. This is followed by concluding observations.

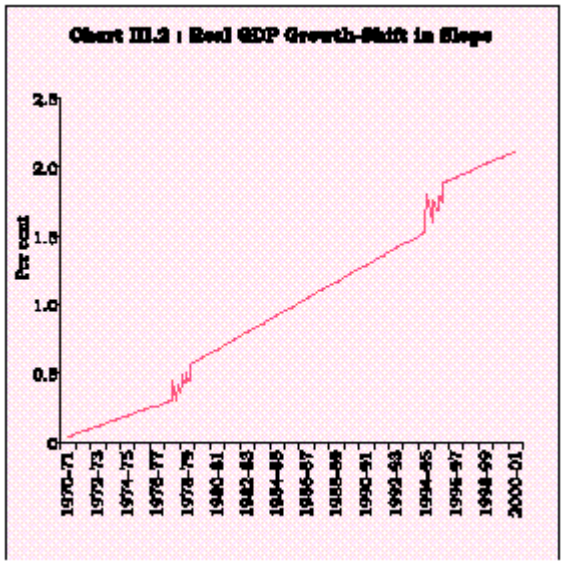
I. MACROECONOMICS OF GROWTH

3.6 As a starting point, it is useful to date the important turning points in the time path of the Indian economy. Real GDP at factor cost represents a summary measure of economic performance. The growth profile of real GDP in India has not been smooth and evenly paced. The Markov-switching model (Goldfeld and Quandt, 1973) can be employed to capture the dynamic patterns underlying switches or shifts in regimes which are independent over time. This procedure represents an improvement over the conventional techniques that rely on prior knowledge of the existence of those shifts. The exercise reveals that the growth of GDP encountered the first 'break' in 1981-82 followed by a second 'break' in 1990-91. The first break occurred in the wake of the second oil shock and a severe drought. The response to these supply shocks resulted in a step-up in the growth process with the trend growth rate rising from 3.4 per cent during 1970-81 to 5.6 per cent during 1981-90. The second break is detected amidst the unprecedented balance of payments crisis associated with the Gulf war in 1990. In a similar

sequence, the simultaneous implementation of structural reform and stabilisation brought about a quantum jump in the trend growth to 6.5 per cent in the ensuing years (Chart III.1).

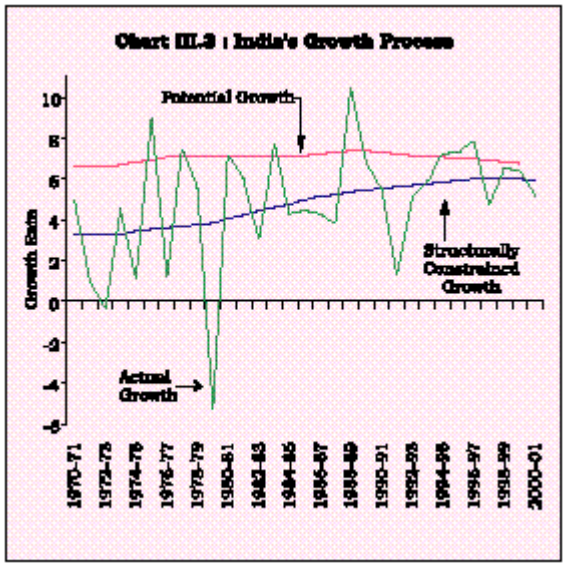


3.7 There is no evidence of a structural break in the trend growth during the 1990s when judged from levels; however, the growth process has also been subject to variations in pace as indicated by the recent downturn. Using the switching regression technique which employs consecutive trial searches over the entire sample period to identify acceleration/ deceleration in real GDP growth in terms of rates of change, an inflexion is discernible in 1978-79 showing an acceleration and again in 1995-96 with the wearing-off of the preceding high growth phases. These experiences suggest that the current phase represents a loss of speed rather than a 'break' in growth (Chart III.2).



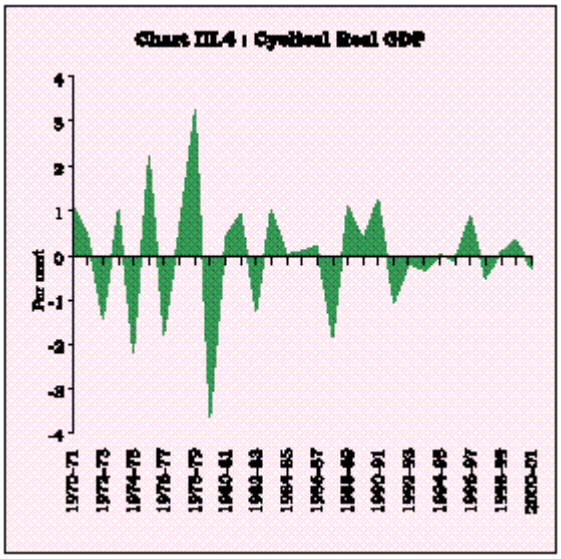
3.8 Taking the diagnosis further, an incision can be made into the growth path of real GDP by decomposing it into its 'time-series' components - trend, seasonal, cyclical and irregular

elements–depending upon the frequency and regularity of their recurrence. Seasonal components are discernible in monthly and quarterly data but not in the annual data. The cyclical and irregular components are collected together and removed by 'filtering' real GDP through the commonly employed Hodrick-Prescott (HP) filter over the period 1970-71 to 2000-01. Separating out cyclical and irregular influences from the actual growth of real GDP yields what can be termed as the 'structurally constrained' growth path of the economy determined by its production structure, institutional characteristics and the various impediments acting on aggregate supply. The path of structurally constrained growth has undergone a distinct upward shift in the early 1990s as liberalisation unlocked hidden capacities and unleashed repressed productive forces. In the following years, the impetus for growth was not sustained and the structurally constrained path tended to slope downwards in the second half of the 1990s. These movements have had a fundamental influence on the potential growth path of the Indian economy, *i.e.*, the growth which is realisable with the full utilisation of productive capacities in the economy. Empirical studies conducted in India show the sensitive nature of the estimates of potential growth to the choice of methodology (RBI, 1999). Applying the OECD (1995) method, the potential growth path is generated from the actual data on real GDP by obtaining a locus of the peak growth rates achieved in the period of study and then smoothing it with a three-year moving average. Movements in the potential growth are found to respond to the behaviour of the structurally constrained growth path. The liberalisation 'hump' of the early 1990s shifts the potential growth path upwards; again the dipping of the potential growth path appears to be associated with the slowing down of structurally constrained growth (Chart III.3). Thus, by releasing the structural constraints, it is possible to shift the long run growth to a higher trajectory.

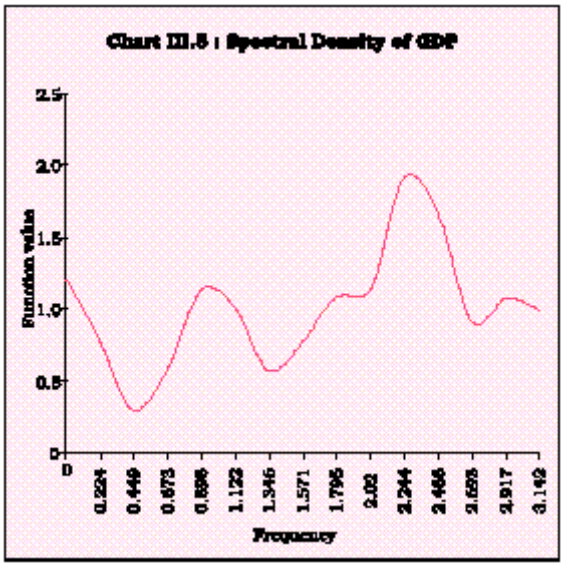


3.9 The exercise also provides some insights into the characteristics of cycles in the Indian economy. Cyclical and irregular components (which were jointly separated by using the HP filter) are disentangled further by using a conventional business cycle filter, *i.e.*, the Band-Pass filter (Baxter and King, 1999) which produces a smooth cycle by eliminating the outliers over the 'band' of frequencies. The cyclical component of real GDP is depicted in Chart III.4. Its behaviour suggests that during the 1970s and early 1980s, cyclical fluctuations were frequent and

sharp in magnitude, varying in the range of -3.6 per cent to 3.3 per cent, and emanating mainly from supply shocks (such as agricultural failures, terms of trade shocks and war). In the 1990s, the amplitude of cyclical fluctuations has become relatively small, varying in the range of -1.0 to 1.3 per cent. With the gradual weakening of the cycle, the behaviour of the structural component of growth has dominated the overall growth process.



3.10 Spectral analysis enables further examination of the underlying nature of cycles in the Indian economy. A spectral density function using "Bartlett" weights in the estimation of long-run variances in time series over the frequency domain is fitted to data on real GDP (first differences of logarithmically transformed series) to ascertain the significance of the presence of cycles as well as to measure the duration and amplitude of the fluctuations. The spectral density function indicates the presence of short- to medium-term cycles (Chart III.5). It has a peak value corresponding to 2.8 years (2.2 in terms of frequency), suggesting that cycles in India are of a three-year duration which corroborates the use of a three-year moving average to obtain potential output from peak rates in the preceding exercise. The relative importance of permanent and transitory components of real GDP growth can be assessed from the spectral density over a long horizon (*i.e.*, at zero frequency) (Cochrane, 1988). The transitory component, representing cyclical effects, appears to account for up to one-third of the total variations in real GDP growth over the entire sample period (1970-2000).



Cyclical Influences on Aggregate Demand

3.11 In order to track the origins of cyclical patterns of activity, it is necessary to undertake the macroeconomic accounting of sources of aggregate demand. This makes it possible to reflect on the relative importance of various components of aggregate domestic demand -consumption and investment - and net exports in the growth process.

3.12 Decennial movements in domestic demand suggest that although private consumption has provided the underlying foundations of the growth process, it is investment which has enabled phases of acceleration and stability in periods of slowdown. The average relative contributions of government consumption increased in the 1980s but has remained stagnant in the 1990s (Table 3.1).

Table 3.1: Select Components of Domestic Demand: Relative Contributions to Growth

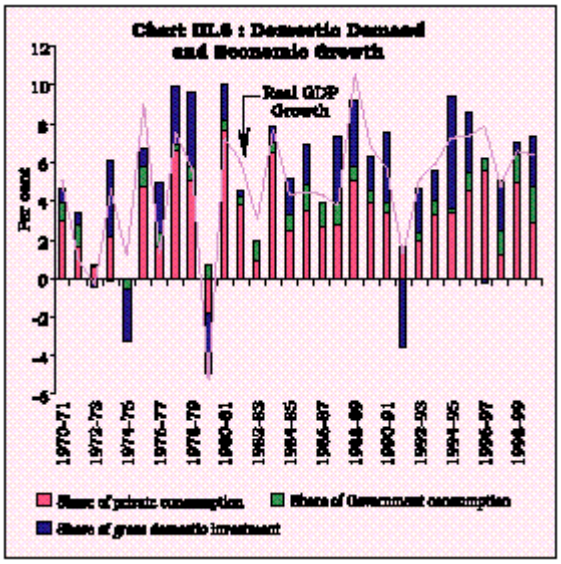
(Per cent)

Period	Private Consum-ption	Govern-ment Consum-ption	Inves-tment	Overall Growth
1 2		3	4	5
1970-71 to 1979-80	2.3	0.5	0.9	2.9
1980-81 to 1989-90	3.9	0.9	1.6	5.8
1990-91 to 1999-2000	3.3	0.8	1.9	5.8

Note : The relative contributions of the components will not add up to the total on account of statistical discrepancies and non-availability of net exports in real terms.

3.13 The relative contributions of the domestic demand components, except government consumption, have a pro-cyclical relationship with growth; periods of high growth are associated with higher growth of private consumption and domestic investment and lower growth in periods of downturn. Government consumption has a relatively small impact on the growth process. In the second half of the 1990s, especially since 1997-98, the deceleration in growth occurred on

account of slowdown in private consumption and investment demand. Since 1997-98, the slowdown in private consumption has been substantial; the average contribution to growth has slipped to 3.0 percentage points during 1997-98 to 1999-2000 as compared with 4.5 percentage points during the period 1994-95 to 1996-97. In the case of investment demand, its contribution to growth has slipped to 2.0 percentage points which is lower than that of 2.9 percentage point during the high growth phase 1994-95 to 1996-97. On the contrary, government consumption has witnessed a counter-cyclical movement, indicating that discretionary fiscal stabilisers in the form of the Pay Commission awards have had a role in the limited context of holding up aggregate demand over the period of the downturn (Chart III.6).



3.14 A robust association between aggregate output and demand components emerges from the synchronous movement of their cyclical components. The correlation coefficient between the cyclical components (estimated by using pure cyclical components involving two stage filtering process to remove irregular components) of the sources of domestic demand between (private consumption, investment and government consumption) and the cyclical component of GDP is higher between private consumption and GDP than between investment and GDP, indicating the primacy of consumption in generating effective demand in the Indian economy. Government consumption has negative, *albeit* low and insignificant contemporaneous correlation with GDP, but has positive correlation after a lag. Thus, an increase in government consumption may depress aggregate demand initially and it will be some time before the intended demand boost takes effect. These differentials in associations have critical relevance for designing the timing and stance of counter-cyclical policies (Table 3.2).

Table 3.2: Correlation Coefficients of the Cyclical Components of Demand with Cyclical GDP

	GDP	Private Consum-ption	Govern-ment Consum-ption	Gross Dom-estic Invest-ment
1	2	3	4	5
GDP	1.00			

Private Consumption	0.84	1.00		
Government Consumption	-0.08	0.17	1.00	
Gross Domestic Investment	0.34	0.02	0.20	1.00

Saving Behaviour

3.15 By developing country standards, India's saving rate continues to be fairly impressive; by the yardstick of some East-Asian economies, however, there is a considerable scope for improvement (Table 3.3).

3.16 The Indian savings experience has been marked by varied oscillations in the saving rate (Ray and Bose, 1997). After the initial phases of low saving, it reached a high during 1976-77 through 1979-80, reflecting, *inter alia*, the spurt in foreign remittances. Financial saving started assuming importance as a result of the financial deepening following bank nationalisation in 1969 (Table 3.4). After some lull during the first half of the 1980s reflecting deterioration in public savings as well as a step-up in the households' demand for consumer goods, the saving rate started recovering. The high growth phase of 1994-95 through 1996-97 is also accompanied by a high saving phase with the average saving rate touching a high of 24.4 per cent. The inflexion discernible in the growth rate in 1996-97 is also noticeable in the saving rates.

Table 3.3: Saving Rate in India *vis-a-vis* Select Asian Countries

(Per cent)

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	**1990-99***
1	2	3	4	5	6	7	8	9	10	11	12
India	**23.1**	**22.0**	**21.8**	**22.5**	**24.8**	**25.1**	**23.2**	**23.5**	**22.0**	**22.3**	**23.0**
Singapore	43.4	44.7	45.1	45.3	47.3	49.7	49.5	50.4	50.6	49.9	**47.6**
Malaysia	34.4	34.1	36.7	39.1	39.6	39.7	42.9	43.8	48.5	47.0	**40.6**
Hong Kong	35.4	33.8	33.8	34.6	33.1	30.5	30.7	31.1	30.2	29.9	**32.3**
China	38.7	39.2	40.1	41.7	42.7	42.5	41.1	41.5	40.8	39.0	**40.7**
Republic of Korea	37.2	37.2	36.3	36.0	35.4	35.6	34.0	33.7	34.2	34.2	**35.4**
Indonesia	32.3	33.5	35.3	32.5	32.2	30.6	30.1	31.5	28.4	19.5	**30.6**

***** Average for the period.
Source **:** Asian Development Bank.
Note **:** Data for India is for April-March and for others on calendar year basis.

3.17 Several factors influencing saving behaviour such as income, interest rates and other variables have been explored in the empirical literature, using cross-section and time series data. Real GDP growth has generally been found to have exerted a positive effect on the savings rate (Fry, 1980; Giovannini, 1985). Contrary to conventional wisdom, some empirical studies have found a negative effect of real interest rate on savings (Giovannini, 1985). The transformation of domestic savings into additional income *via* accumulation of capital was found to be not only operative, but a significant factor in the growth of incomes in developing countries (Gersovitz, 1988). Saving is not just about accumulation but about smoothing consumption in the presence of liquidity constraints and uncertainties including those associated with the full stream of income on part of the individual households, typically in developing economies (Deaton, 1990). The issues pertaining to the effect of various determinants of savings are, thus, yet to be fully resolved.

3.18 In the Indian context, income is identified as an important variable in explaining savings rate, particularly for the household sector (Krishnaswamy, Krishnamurty and Sharma, 1987). Granger causality tests found evidence for growth influencing savings and not *vice-versa*. Other important determinants of savings behaviour are found to be the size of the working population, dependency ratio, financial deepening and taxation (Mulheisen, 1997). The studies on the effect of interest rate on savings in India have showed mixed results. A disaggregated analysis on the effect of the real interest rate on saving found a favourable impact of the rate of interest on some components of savings, *i.e.*, currency and bank deposits (Pandit, 1985), and of the real interest rate on the savings rate of the households as well as for the economy as a whole (Krishnaswamy, Krishnamurty and Sharma, 1987), whereas other studies have yielded inconclusive results relating to the interest sensitivity of savings behaviour in India (Bhattacharya, 1985). Besides, spread of banking has been found to have a significant impact on savings (Krishnaswamy, Krishnamurty and Sharma, 1987).

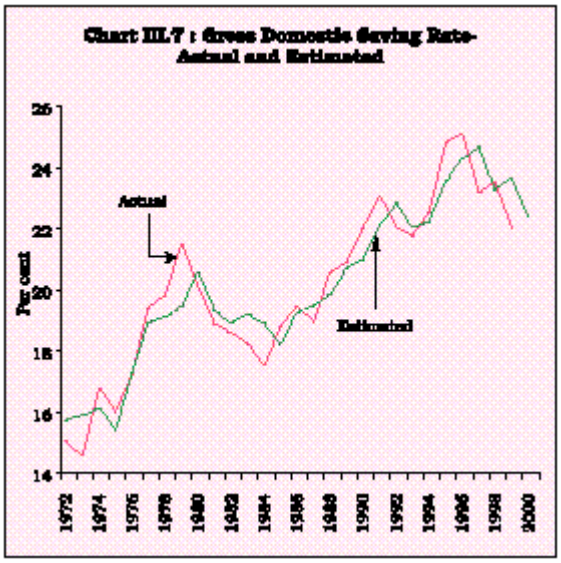
Table 3.4: Behaviour of Aggregate and Sectoral Savings

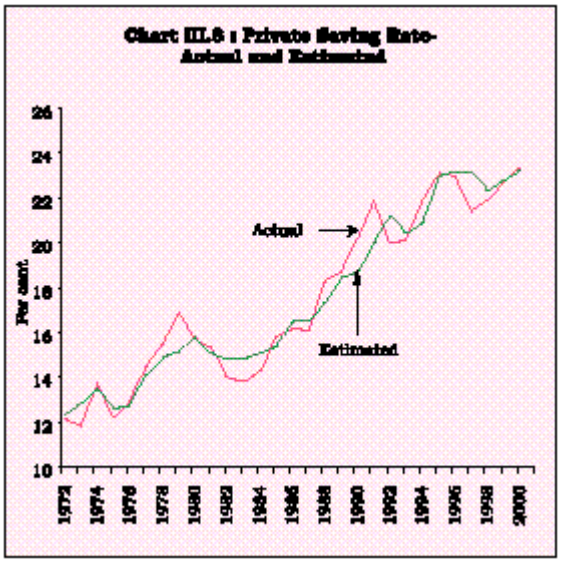
(As percentage of GDP at current market prices)

Period / Year	Households			Private Corporate	Public	Gross Domestic Saving
	Financial	Physical	Total			
1	2	3	4	5	6	7
1976-77 to 1978-79	5.7	8.5	14.3	1.4	4.6	20.2
1979-80 to 1984-85	6.1	7.1	13.3	1.6	3.8	18.7
1995-86 to 1992-93	7.9	8.9	16.7	2.3	2.1	21.1
1993-94	11.0	7.4	18.4	3.5	0.6	22.5
1994-95	11.9	7.8	19.7	3.5	1.7	24.8
1995-96	8.9	9.3	18.1	4.9	2.0	25.1
1996-97	10.3	6.7	17.0	4.5	1.7	23.2
1997-98	9.9	8.0	17.8	4.2	1.5	23.5
1998-99	10.9	8.2	19.1	3.7	-0.8	22.0
1999-2000	10.5	9.2	19.8	3.7	-1.2	22.3

Source : Central Statistical Organisation.

3.19 The savings behaviour in the Indian context is analysed for the period 1970-71 to 1999-2000 by estimating savings functions at the aggregate level, and also for private saving. The empirical estimates indicate that real per capita income and financial deepening have significant positive effects on the aggregate saving rate (gross domestic saving rate) and are its main determinants[1]; other things remaining the same, a one per cent increase each in income and intermediation ratio (secondary issues to primary issues ratio, as used in flow of funds accounts) would induce an increase in aggregate savings rate by 6.6 percentage points and 3.4 percentage points, respectively. The interest rate, *i.e.*, real deposit rate, has a lesser but positive impact on gross savings rate; implying that as much as 12 percentage points change in the real interest rate is required to increase aggregate savings rate by one percentage point. The results indicate that the dynamic response of the private saving rate to per capita income (per capita disposable income is the relevant scale variable in studying private saving behaviour) works out to 7.8. The in-sample fits of the estimated equations for aggregate and private savings rates, are reported in Charts III.7 and III.8.



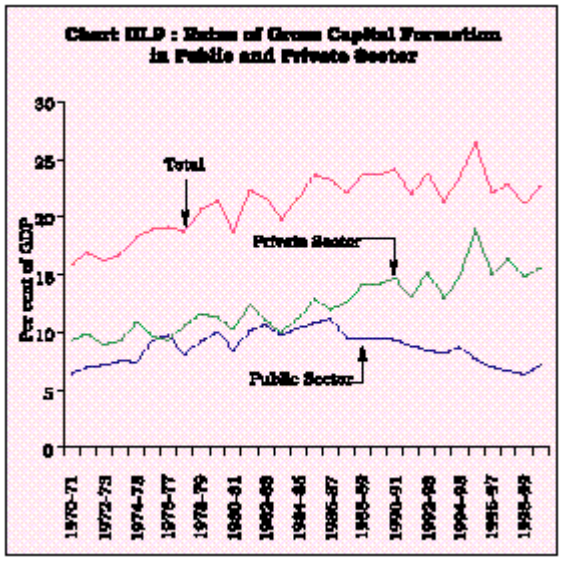


Investment Behaviour

3.20 The relationship between investment (*i.e.*, capital formation) and output assumes special importance in the case of capital-deficient developing countries, especially in the reinvigoration of growth. Studies have typically shown that capital accumulation contributes up to 60-70 per cent of the growth in per capita output (IMF, 2000) and continues to be the primary engine of growth. In India, the deceleration in growth in the second half of the 1990s is associated with slowing rate of investment. It is in this context that a study of investment behaviour in India assumes importance.

3.21 The rate of nominal gross capital formation (GCF) rose from 15.8 per cent in 1970-71 to 22.7 per cent in 1999-2000 undergoing two phases of deceleration, first in the early 1980s and again in the second half of the 1990s. The rate of capital formation has been rising in the private sector while in the public sector, it has been generally declining in the 1990s (Chart III.9). An

analysis of the behaviour of GCF in terms of industry of origin in the 1990s indicates that the rate of capital formation in agriculture exhibited a slow decline from 2.0 per cent in 1992-93 to 1.7 per cent in 1998-99. The rate of capital formation in industry underwent a steep fall from 1995-96 onwards. There was a declining trend in the rate of capital formation in the services sector in the 1990s until 1999-2000. In all, a clear slowdown in the investment demand across the sectors was visible in 1990s, especially in the mid-1990s. This has been reflected in the downturn of growth.



3.22 In order to assess the investment behaviour of the economy in relation to growth, it is necessary to study investment behaviour in real terms. The real investment rate (adjusted for errors and omissions) moved up from an average of 21.8 per cent in the 1980s to 27.2 per cent in 1995-96 before decelerating to 26.0 per cent in 1999-2000 (Table 3.5).

Table 3.5: Behaviour of Real Aggregate Investment Rates and Growth Rates

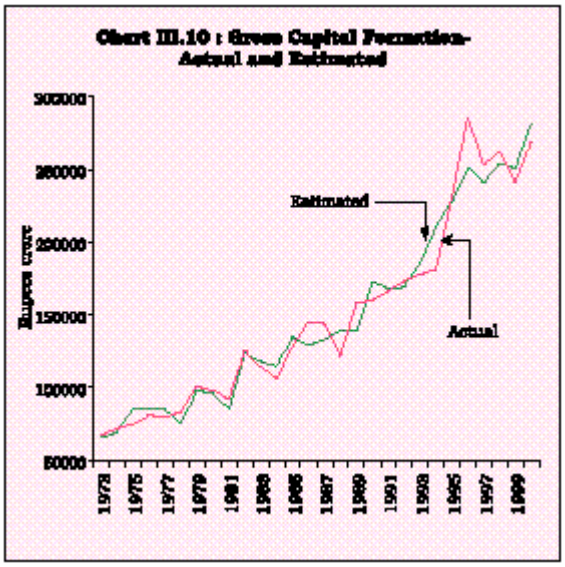
(Per cent)

Period/Year	Rate of Real Gross Capital Formation	Rate of Real Gross Domestic Captial Formation @	Growth of Real GDP at factor Cost
1	2	3	4
1970-71 to 1979-80	21.9	21.1	2.9
1980-81 to 1989-90	22.6	21.8	5.8
1990-91	23.2	25.4	5.6
1991-92	21.4	22.0	1.3
1992-93	23.0	22.9	5.1
1993-94	21.3	23.1	5.9
1994-95	23.7	26.4	7.3
1995-96	26.9	27.2	7.3
1996-97	22.7	25.1	7.8
1997-98	24.2	26.4	4.8
1998-99	23.4	25.4	6.6
1999-2000	25.4	26.0	6.4

@ Adjusted for errors and omissions.
Source : Central Statistical Organisation

3.23 The traditional view of investment in the context of growth cycles is in terms of its replacement cost. In a developing economy, apart from the rate of output growth, and replacement cost (or cost of capital), the rate of capacity utilisation, liquidity constraints faced by firms, and macroeconomic stability have been identified as major determinants of investment (Schimidt-Hebbel, Seren, and Solmano, 1996). An important issue in the study of investment in India is the relation between public and private investment, particularly in the context of the vacation of public investment in several areas to create space for private investment as part of the structural reforms in the 1990s. In India, the broad consensus favours a crowding-in relationship between public and private investment (Sundarajan and Thakur, 1980). The major determinants of corporate investment in India have been found to be credit availability and cost of capital (Athukorala and Sen, 1996).

3.24 An econometric investigation has been undertaken to estimate the behaviour of aggregate GCF, as well as private investment in various constituent sectors by industry of origin, *i.e.*, agriculture, manufacturing and services, over the period 1970-2000 in the conventional accelerator framework specifying lagged structures for output effects. Besides real GDP, important determinants of investment are postulated to be the real bank lending rate, and public investment in the services sector to capture possible 'crowding-in' effects[2]. The in-sample fits of the investment rates are presented in Chart III.10. Two findings emanate from the exercise. First, the aggregate investment is positively and significantly influenced by income, both contemporaneously and with a lag reflecting the operation of the acceleration principle, *i.e.*, investment demand is induced by past output. Secondly, public investment in services favourably impacts private investment in manufacturing and services, corroborating the operation of a crowding-in phenomenon between appropriate types of public and private investment.



Nurturing Short-run Growth Impulses

3.25 In the tradition of growth models, investment simultaneously contributes to effective demand in the economy and augments the productive capacity, thus, providing the static

Keynesian analysis with a dynamic perspective. In this section, the analysis hopes to provide pointers for the allocation of resources in support of reviving growth. For this purpose, working out investment multipliers and accelerators as well as multiplier-accelerator interaction becomes crucial for gauging the strength and duration of virtuous cycles of investment and output so as to direct the deployment of investible resources. The multiplier determines the initial injection of investment that is necessary to generate a desired increase in income. The accelerator measures the response of investment to changes in demand conditions. The multiplier and accelerator together capture the simultaneous interaction of investment and income (demand).

3.26 A simple econometric investigation of the real private final consumption expenditure in relation to real GDP at factor cost over the period 1970-71 through 1999-2000 yielded the marginal propensity to consume with respect to current income of about 0.60, implying a multiplier value of 2.5. Thus, a one per cent increase in, say, government spending or autonomous private investment would raise income by 2.5 per cent (Table 3.6).[3]

Table 3.6: Estimated Multipliers

Variable	Multiplier
1	2
Private Final Consumption	2.5
Government Final Consumption	1.2
Overall Consumption	3.9

3.27 Increases in government spending and private investment could induce greater utilisation of the economy's productive capacity which, in turn, may increase income levels more than implied by the static multiplier. The inter-temporal effects of the initial stimulus to aggregate demand feeds into the income stream through a series of complex interactions between consumption behaviour and investment spending to produce cumulative expansions in income which have been described in the literature as 'super multiplier' (Rangarajan and Dholakia,1999). Illustratively, an initial injection of spending in the form of government expenditure generates an increase in income *via* the conventional static multiplier. The increased income can induce changes in consumption demand as well as expansion in the demand for productive capacity (*i.e.*, investment demand), both private and public. Thus, fiscal policy intervention in the form of expenditure on consumption and investment is now determined within the dynamics of the income-expenditure propagation process (super multiplier) rather than exogeneous to it. This brings in the key issue of the sustainability of the envisaged growth path and the role of fiscal policy. Specifically, there emerges a critical limit up to which 'pump-priming' can be undertaken without rendering the growth process unstable.

From the empirical exercise conducted here, the upper limit for counter cyclical deployment of government consumption can be worked out as close to 15-17 per cent of GDP. Given that the current ratio of government consumption to GDP is at 14 per cent, there appears to be very little leeway for any further pump-priming through government consumption. Beyond the limit, pump-priming would impart instability to the growth process.

3.28 The accelerator theory of investment focuses directly on the motivation for and purpose of investment expenditures to maintain and/or increase productive capacity so as to meet the future demand for the commodities produced by the firms. Specifically, the acceleration principle

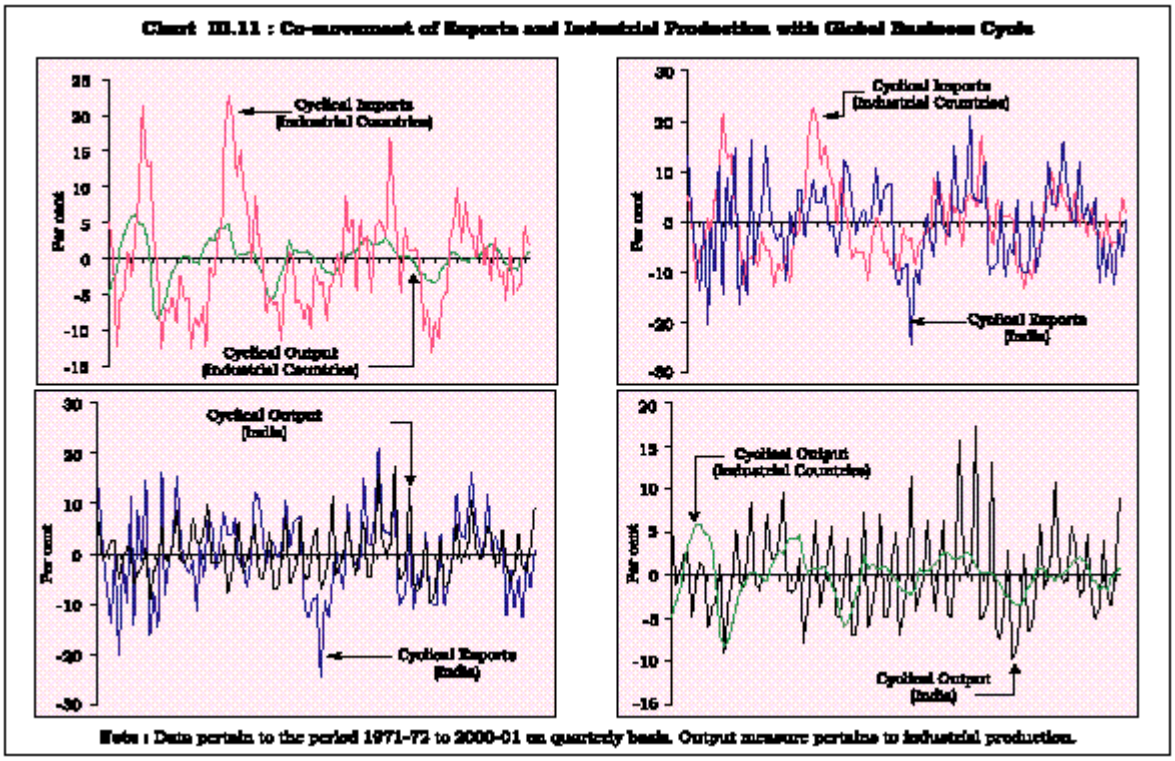
relates the desired investment demand to the changes in output in the previous period. The interaction of the multiplier along with the accelerator generates a dynamic income path in response to a shock to an autonomous component of demand. The accelerators, as derived from the earlier specifications of both aggregate investment as well as sectoral investments in the private sector are presented in Table 3.7. Two features follow from the estimates. First, the estimated values of marginal propensity to consume and accelerator generated stability of the income path. Thus, the multiplier and accelerator interaction in the Indian economy would generate stable and converging cycles, thereby making room for counter cyclical policies. Secondly, sectoral accelerators show that greater investment needs to be directed towards manufacturing so as to revitalise growth. Illustratively, assuming a target growth path of 8 per cent, the multiplier-accelerator interactions suggest that a unit increase in government spending yields highest dynamic income multiplier effect for manufacturing at 4.73, followed by services at 4.12 and agriculture at 3.89.

Table 3.7 : Estimated Accelerators

Type of Investment	Accelerator
1	2
Private Investment in Agriculture	0.04
Private Investment in Manufacturing	0.61
Private Investment in Services	0.21

Net External Demand

3.29 External demand has played a relatively small role in influencing the course of the business cycles in India, given the low degree of openness. The empirical evidence, however, suggests that trade flows provide conduits for global integration which are stronger and larger than what any conventional measure of net exports would suggest. This is increasingly evident in India with the pattern of exports and industrial production exhibiting certain degree of co-movement with the global business cycle (Chart III.11).



3.30 'Granger' causality provides a simple test of the direction and intensity of causal relationships. Empirical analysis indicates that cyclical output in industrial countries 'Granger' causes imports of these countries unidirectionally, implying that cycles in the advanced economies have significant effects on their import demand. The causality between cyclical imports of advanced countries and India's exports is significant and strongly bi-directional. Cyclical output of advanced countries has unidirectional causal effects on cyclical output in India (Table 3.8).

3.31 In the 1990s, however, traditional measures of net external demand have lost operational relevance especially in view of the dominance of financing flows in the balance of payments. Moreover, the net capital flows are no longer viewed in a passive financing role. Considerations of reserve adequacy have ensured that the movements of capital are no longer dictated by current account outcomes (IMF, 1997). Growth in the volume of cross-border capital flows, however, clearly dominated every other form of cross-border transaction during the 1990s. Capital flows have emerged as the predominant engine of globalisation and growth convergence across nations. It is in this context that Chapter VI of the Report devotes itself to an examination of the obverse of net exports, *i.e.*, capital flows.

Table 3.8 : Global Business Cycle, Domestic Exports and Output: Granger's Causal Analysis

Null Hypothesis of Non Causality	'F' statistics	Inference
1	2	3
Cyclical Output does not Granger cause Cyclical Import in Advanced Economies	18.95*	Reject the Null
Cyclical Import does not Granger cause	2.27	Accept the Null

Cyclical Output in Advanced Economies		
Cyclical Import of Advanced economies does not Granger cause Cyclical Exports of India	23.47*	Reject the Null
Cyclical Exports of India does not Granger Cause Cyclical Imports of Advanced Economies	12.44*	Reject the Null
Cyclical Exports does not Granger Cause Cyclical Output in India	2.65**	Reject the Null
Cyclical Output does not Granger Cause Cyclical Exports in India	4.65*	Reject the Null
Cyclical Output of Advanced Economies does not Granger Cause Cyclical Output of India	2.88*	Reject the Null
Cyclical Output of India does not Granger cause Cyclical Output of Advanced Economies	1.26	Accept the Null

* and ** Significant at 5 % and 10% level, respectively.
Empirical analysis is based on quarterly data for the period 1971-72 to 2000-01.

II. STRUCTURAL CONSTRAINTS IN INDIAN AGRICULTURE

3.32 There has been a growing concern in recent years about the constraints on growth on account of the high variability of agricultural output on one hand, and the deceleration of the agricultural output in the 1990s in relation to the high growth phase of the 1980s, on the other. There has been a near stagnation in yield levels and limits seem to have been reached in further expanding the area under cultivation. Equally important is a growing anxiety that the process of reforms has by-passed the agricultural sector (Reddy, 2001). Accordingly, extending reforms to the farm sector and achieving robust growth in the agriculture holds the key to reversing the industrial slowdown[4]. The search for realisation of the full growth potential of the agricultural sector has motivated extensive research in India. The critical constraining factors cited in these studies are declining public sector capital formation in agriculture (Gulati and Bathla, 2001); the low agricultural supply response to price incentives in the form of higher procurement prices (Balakrishnan, 2000); excessive dependence on input subsidies-particularly fertiliser, power, water and credit (GoI, 2000a); weak rural credit institutions and declining effectiveness of formal credit arrangements for agriculture (Vyas, 2001); the implicit indirect tax on agriculture as measured by the aggregate measure of support to agriculture (Hanumantha Rao, 2001); and overpopulation in agriculture and the resultant increase in the number of small sized farms which are economically unviable. Besides these studies, various impediments to agricultural progress have been identified by official assessments (GoI, 2000a, RBI, 2001): continued rain dependency of agriculture; poor adoption of new technology and its unsuitability to the varied soil and moisture conditions; inappropriate rural infrastructure; and weak marketing structure; and archaic land holding and tenancy laws. Accordingly, a growing consensus is emerging in India for prioritising policies for the modernisation of Indian agriculture (Rao and Jeromi, 2000).

3.33 International experience suggests that high agricultural growth and productivity generally precedes or accompanies industrial growth in most successful cases of economic development. Agriculture's contribution to the overall growth process of an economy has traditionally been in the form of: (a) supplying the surplus labour to the non-farm sector, (b) making available wage-goods at reasonable prices to sustain the labour force in the non-farm sector, (c) generating savings for investment in the non-farm sector, (d) earning foreign exchange through exports to finance critical imports, and (e) creating demand for the output produced in the non-farm sector.

The changing mix and the continuous interaction between the farm and the non-farm sector assumes critical importance in the growth process as it offers opportunities for internalising the synergetic growth impulses even in a period of decline in the share of agriculture in real GDP.

3.34 In India, agriculture occupies a special position in the development process. It continues to provide a ratchet to the overall GDP growth, in view of the continued dependence of up to two-thirds of the population on agriculture. In this section, an attempt is made to identify the constraints to higher agricultural growth. Drawing from an overview of the changing pattern of growth and productivity of Indian agriculture over the past three decades, an analysis of the major determinants of agricultural growth in India is undertaken to identify bottlenecks choking the growth prospects of Indian agriculture and to suggest proximate solutions.

Changing Patterns of Growth and Productivity

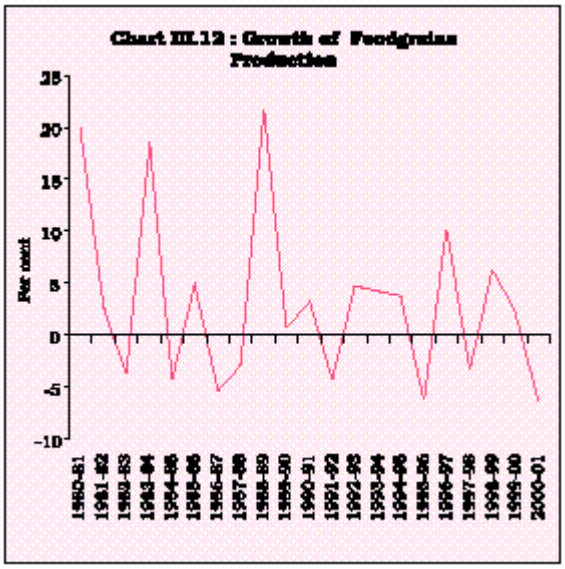
3.35 Agricultural output growth registered a sharp increase in the immediate post-green revolution phase largely due to a growth in yields; however, the growth pattern has not been uniform with a tendency towards deceleration in the 1990s (Table 3.9 and Charts III.12 and III.13).

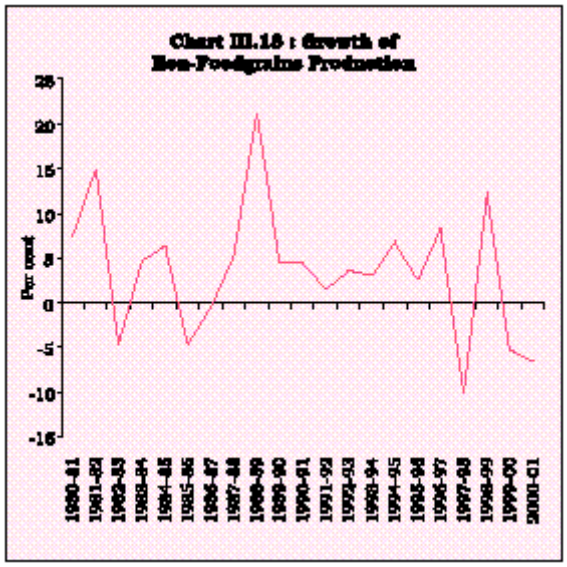
Table 3.9: Trend Growth Rates in the Indices of Area, Production and Yields of Foodgrains, Non-Foodgrains and All Crops during 1970-71 to 2000-01

(per cent)

Period	Foodgrains			Non-Foodgrains			All Crops		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
1	2	3	4	5	6	7	8	9	10
1970-71 to 2000-01	-0.03	2.52	2.13	1.46	3.31	1.66	0.35	2.83	1.93
1970-71 to 1979-80	0.44	1.91	1.06	1.10	2.15	1.00	0.59	1.99	1.03
1980-81 to 1989-90	-0.22	2.81	2.71	1.11	3.70	2.28	0.09	3.13	2.52
1990-91 to 1999-2000	0.07	1.98	1.30	1.29	2.77	1.08	0.41	2.30	1.19

Note : Trend Growth Rates are based on semi-logarithmic function.





3.36 The yield pattern in case of both foodgrains and non-foodgrains indicates that highest growth in yield levels occurred during the 1980s. Much of the growth in agricultural production in India is yield-driven as the growth in area is marginal; however, Indian agriculture suffers from lower yield levels *vis-à-vis* major agricultural producers in the world, despite India being one of the largest producers of most of the major crops (Table 3.10). The yield of 6,059 kg per hectare attained in China during 1998 in the production of paddy was more than double that of 2,890 kg per hectare in India. Similarly, wheat yield in China stood at 3,667 kg per hectare in 1998 in comparison with 2,578 kg per hectare in India.

Table 3.10 : India's Global Rank in Major Agricultural Crops

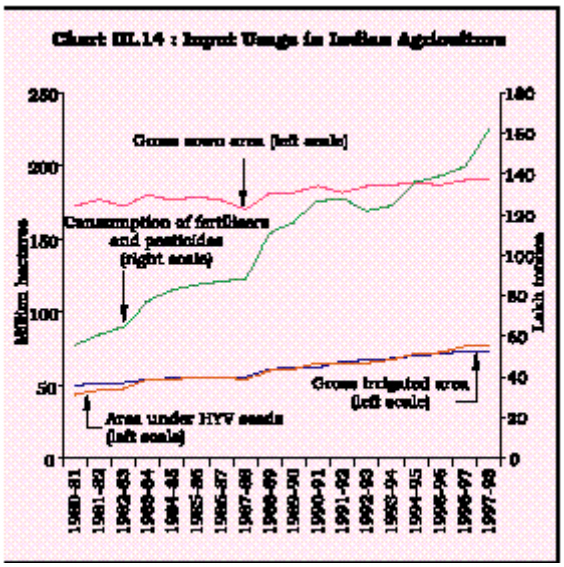
Crop	Rank in 2000		
	Area	Production	Yield
1	2	3	4

Rice (Paddy)	1	2	52
Wheat	1	2	38
Coarse Grains	3	4	125
Pulses	1	1	138
Oil Crops (Primary)	2	5	147
Cotton Seed	1	4	77
Jute and Jute Like Fibres	1	1	7
Tea	2	1	13
Coffee (Green)	7	7	14
Sugarcane	2	2	31

Source : Food and Agricultural Organisation.

The Role of Technology in Indian Agriculture

3.37 One of the main reasons for the low levels of yield attained in India is the unsatisfactory spread of new technological practices, including cultivation of High Yielding Varieties (HYV) of seeds. The adoption of new technology, mainly the cultivation of HYV seeds requires intensive use of fertilisers and pesticides under adequate and often assured water supply. The use of HYV seeds entails a higher yield risk (as measured by variance in yield) as compared with the traditional seed varieties, in the absence of proper irrigation facilities (Ganesh Kumar, 1999; Saha, 2001). The lower spread of new technological practices to a wide variety of crops other than wheat and rice as also across regions could be attributed to the higher yield risk associated with the cultivation of HYV seeds, caused by inadequate spread of irrigation facilities. There is considerable co-movement between the area under HYV seeds and area under irrigation, probably on account of reduction in yield risk due to irrigation facilities (Chart III.14).



3.38 It is mainly paddy and wheat, which are cultivated under the HYV seeds, while the areas under HYV seeds for other cereal crops are very low and vary across different States of the country. Low growth experienced during the past two decades in the production of coarse cereals (0.5 per cent) and pulses (0.8 per cent) in comparison to rice (2.8 per cent) and wheat (4.0 per cent) is on account of lower adoption of HYV seeds or non-availability of appropriate seeds

(apart from the usual dry-land farming accorded to these crops), given the diverse soil and moisture profiles of different parts of the country. The pattern of adoption of HYV seeds across various states has accordingly been disparate (Table 3.11).

3.39 One significant factor limiting the adoption of HYV seeds is the generally low level of irrigation cover for most of the crops as compared with rice and wheat. Nearly 64 per cent of the total cultivated area in the country is rain-fed. In fact, as compared with 79.1 per cent of the total geographical area as drought prone, the irrigation coverage of 38.2 per cent is quite unfavourable. The Ninth Plan document placed the irrigation potential at 139.89 million hectares. With this irrigation potential, the cropping intensity coefficient can be raised up to 149.0 as against the current level of 134.20.

Table 3.11 : State-wise Coverage of Area Under HYV Seeds for Cereals during 1996-97

(Lakh hectares)

State	Paddy	Wheat	Jowar	Bajra	Maize	Ragi	**Total Cereals**
1	2	3	4	5	6	7	**8**
Andhra Pradesh	36.99	0.07	5.99	0.72	3.22	—	**46.99**
Assam	14.22	1.03	—	—	0.12	—	**15.37**
Bihar	35.00	25.00	—	—	7.50	—	**67.50**
Gujarat	5.33	4.10	1.80	7.95	2.11	—	**21.29**
Haryana	5.15	19.38	—	3.58	0.12	—	**28.23**
Karnataka	10.16	1.34	14.01	2.70	3.53	10.45	**42.19**
Kerala	4.00	—	—	—	—	—	**4.00**
Madhya Pradesh	34.71	30.00	7.88	0.34	5.08	—	**78.01**
Maharashtra	12.93	7.40	47.91	18.70	2.62	—	**89.56**
Orissa	30.27	0.15	0.02	—	0.98	—	**41.42**
Punjab	20.41	32.30	—	0.03	1.47	—	**54.21**
Rajasthan	0.43	17.42	0.13	20.32	0.24	—	**38.54**
Tamil Nadu	21.20	—	5.20	1.86	0.69	1.01	**29.96**
Uttar Pradesh	50.18	88.83	—	4.67	6.04	—	**149.72**
West Bengal	44.63	3.51	—	—	—	—	**48.14**
All India	**333.99**	**237.26**	**82.94**	**60.98**	**37.64**	**11.47**	**764.28**

Source : Ministry of Agriculture, Government of India.

It has been found that the States of Rajasthan, Gujarat and Jammu and Kashmir have a higher probability (in excess of 20 per cent) of the incidence of drought in any given year. Moreover, agriculturally important States such as Andhra Pradesh, Uttar Pradesh, Haryana and Punjab have been found to have more than 10 per cent probability of the incidence of drought in any year (Sinha Ray and Shewale, 2001). Of these, only Punjab has a good irrigation cover, while Haryana has a moderately good irrigation coverage (Table 3.12). Wheat and rice among foodgrains and sugarcane among non-foodgrains enjoy the maximum irrigation coverage across all States. Even in the States with lesser irrigation coverage, such as Karnataka, Madhya Pradesh, Kerala, *etc*., the irrigation cover for rice and wheat is much higher in comparison with other crops. Thus, in India irrigated area generally tends to be used for the growing of rice and wheat, while the other crops are grown mostly in rain-fed and unirrigated conditions.

Table 3.12 : State-wise Percentage coverage of Irrigated Area Under Principal Crops during 1997-98

(Per cent)

State	Rice	Wheat	Pulses	Total Food-grains	Oil Seeds	Sugarcane	Cotton	**All Crops**

1	2	3	4	5	6	7	8	**9**
Andhra Pradesh	96.4	72.7	1.2	55.1	19.7	95.2	18.9	**42.5**
Bihar	40.4	89.0	2.1	47.8	20.2	30.6	—	**46.6**
Gujarat	61.2	75.6	10.7	32.2	26.0	100.0	37.7	**34.3**
Haryana	99.6	98.3	22.5	77.5	70.0	97.9	98.9	**78.6**
Karnataka	69.2	38.2	3.9	22.5	21.3	100.0	19.3	**24.9**
Kerala	52.2	—	—	49.3	16.0	100.0	—	**14.0**
Madhya Pradesh	23.6	69.2	18.5	30.4	5.7	98.6	39.4	**25.0**
Maharashtra	28.1	69.6	7.3	13.3	11.1	95.0	2.8	**14.5**
Orissa	36.2	100.0	5.0	26.7	11.0	100.0	—	**26.8**
Punjab	95.0	94.8	89.8	93.8	62.2	75.1	99.6	**91.7**
Rajasthan	41.5	94.7	7.7	23.6	43.9	100.0	98.0	**29.9**
Tamil Nadu	93.2	—	6.4	62.0	40.9	100.0	34.6	**53.7**
Uttar Pradesh	62.7	91.7	27.7	64.7	39.5	95.0	91.7	**65.9**
West Bengal	25.9	73.0	4.5	27.6	63.5	30.8	—	**27.1**
All India	**50.2**	**85.0**	**11.8**	**40.6**	**24.4**	**92.6**	**36.3**	**38.2**

Source : Ministry of Agriculture, Government of India.

3.40 In such a scenario, the technological development in terms of the adoption of HYV seeds is mostly limited to the cultivation of rice and wheat on account of higher yield risk imparted by these seeds. It is pertinent to note in this connection that the foodgrains production in 1999-2000 was at a record high of 208.9 million tonnes despite acute drought conditions in the central stretch of India, mainly on account of record production of rice and wheat. Most of the other crops - mainly oilseeds - suffered significant fall in production in that year. This could be indicative of the disproportionate adoption of technology and irrigation benefits, underscoring the need for spreading the irrigation benefits to all crops.

3.41 Another important factor affecting the dissemination of modern technology in general and HYV seed technology in particular is the small size of average farms in India. It has been argued that the small size of land holdings limits the adoption of new technology due to reasons other than the scale of operation. Share-cropping, which is generally undertaken by the small and marginal farmers, limits the scope for adoption of new technology as the farmer has to pay a fraction of (generally around half) the production to the land-owner, while the whole cost of adoption of the green revolution inputs such as HYV seeds and fertilisers will have to be borne by the tenant. In such an arrangement, it is imperative that the gains in marginal product due to adoption of these inputs should at least be twice that of the investment for the farmer to break even. Such dramatic increases in production are difficult to come by in the absence of other infrastructural facilities and hence, the scope for adoption of green revolution inputs by the share-cropper is clearly undermined.

3.42 The per hectare consumption of fertilisers and pesticides is quite low in India in comparison with international standards and there is a lot of scope for improvement in this sphere. For instance, the per hectare consumption of fertilisers in India at 88.6 kg was much lower than 256.6 kg and 110.4 kg in China and USA, respectively, in 1997-98. The growth in the consumption of fertilisers during the past two decades has also quite varied across different States (Table 3.13). Another factor that is responsible for lower productivity of Indian agriculture is the skewed distribution of N:P:K (Nitrogen : Phosphorus : Potassium) fertiliser mix. Currently, the N:P:K ratio stands at 6.9:2.9:1.0, which is quite skewed in comparison to the optimal mix of

4:2:1. The skewed consumption of fertiliser accentuates the risk of salination and leaching of soil, thus hampering the long-term productivity of the land. This skewed fertiliser consumption pattern is the result of high subsidies extended to the urea producers.

Table 3.13 : State-wise Trend Growth Rates of Area Under HYV Seeds and per Hectare Fertiliser Consumption

(per cent)

State	Area under HYV seeds	Per Hectare Fertiliser Consumption
1	2	3
Andhra Pradesh	1.15	6.21
Assam	2.74	10.63
Bihar	2.09	8.03
Gujarat	0.68	5.18
Haryana	1.09	6.80
Himachal Pradesh	2.12	3.97
Jammu & Kashmir	2.16	5.02
Karnataka	5.68	5.27
Kerala	-4.83	3.51
Maharashtra	3.63	7.10
Madhya Pradesh	5.99	8.36
Orissa	6.14	7.40
Punjab	1.77	1.81
Rajasthan	2.72	9.26
Tamil Nadu	1.62	3.54
Uttar Pradesh	3.40	4.53
West Bengal	5.50	6.62
All-India	3.10	5.29

Notes : 1) The growth rates for area under HYV seeds pertain to 1980-81 to 1996-97, and those for per hectare consumption of fertilisers relate to 1980-81 to 1999-2000.
2) Trend Rates are based on semi-logarithmic function.

Capital Formation

3.43 Notwithstanding the view that the extent of capital formation in agriculture, particularly in the public sector is underestimated (ICRA, 2001), the declining capital formation in agriculture has emerged as an issue of paramount concern (Table 3.14). This has been compounded by the decline in the share of public sector investment in agriculture to total public sector investment (Chart III.15). The lack of new capital assets has slowed down the pace and pattern of technological change in agriculture, thus having adverse effect on Total Factor Productivity (TFP). Fixed capital formation in agriculture seems to respond positively to public sector capital formation in canal irrigation. Indian farmers devote a small proportion of both own and borrowed funds for fixed capital formation, as private sector capital formation in agriculture responds positively to technical progress and availability of institutional credit and negatively to rainfall (Dhawan and Yadav, 1995).

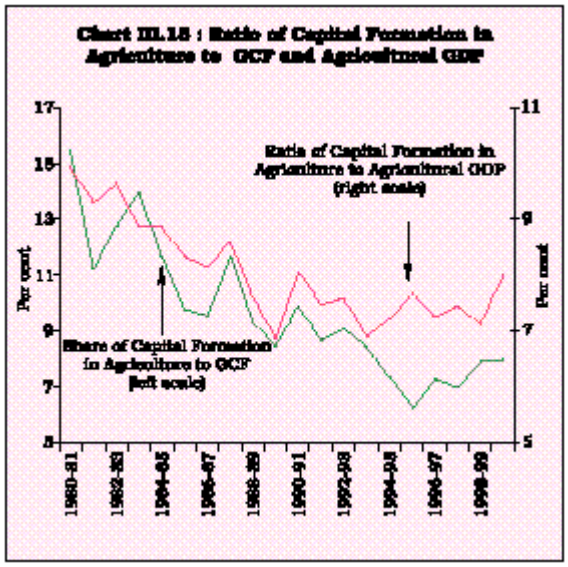


Table 3.14 : Gross Capital Formation in Agriculture (1993-94 Prices)

Year	Ratio of Capital Formation in agriculture to	
	GCF	Agricultural GDP
1	2	3
1970-71	14.27	7.08
1980-81	15.44	9.92
1981-82	11.19	9.29
1985-86	9.76	8.33
1990-91	9.88	8.03
1991-92	8.66	7.46
1992-93	9.06	7.57
1993-94	8.42	6.87
1994-95	7.30	7.20
1995-96	6.22	7.68
1996-97	7.26	7.22
1997-98	7.00	7.42
1998-99	7.88	7.13
1999-00	7.96	8.02

Source : Ministry of Agriculture, Government of India.

3.44 Unlike the 1970s and the 1980s when the foodgrain-led growth pattern was dependent to a large extent on the public sector capital formation, agricultural growth seems to have been driven more by market considerations and demand in the 1990s (Gulati and Bathla, 2001). The relative decline in the importance of public sector capital formation in the 1990s, however, does not undermine the role of such investments, given their complementarity with private sector capital formation in agriculture, even though by allowing greater role for market forces - as could be evidenced through the evolution of terms-of-trade with declining intervention in the price formation process - the degree of dependence of agricultural growth on public sector investment could be contained without affecting the prospects of growth in agriculture.

Storage, Processing and Marketing

3.45 The lack of proper storage and marketing facilities at the village level results in distress sales, particularly by the small and marginal farmers which adversely affect their incomes. This has a direct bearing on their ability to invest in agriculture. Indian agricultural marketing scenario is characterised by the existence of segmented markets on the one hand and inter-linked markets on the other (Reddy, 2001). There is a geographical market segmentation characterised by lack of market access to farmers, while there are inter-linkages in factor and product markets, which lead to lower and exploitative prices. It has been argued that the interlinked markets result in a suboptimal situation by denying the producer an economic and market determined price for his product (Gangopadhyay, 1994). The inter-linkage between factor and product markets contributes significantly towards limiting the adoption of new technological inputs by way of reducing the farmer's income. Similarly, the inter-linkages in the factor markets (for instance, between credit and labour markets) limits the technology adoption by the small farmers, by way of putting extra-economic demand on farmer's labour at the crucial time, say sowing: thus it contributes to lower production and hence lower income of the small farmers[5].

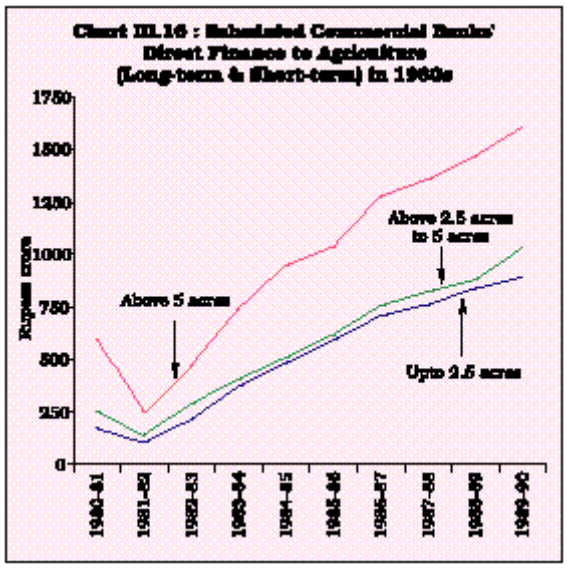
3.46 Other important factors adversely affecting the efficiency of agricultural markets are the lack of proper futures markets, the absence of price discovery and the failure of the market in providing proper price signals. In the absence of proper price signals, the farmers' decision to cultivate any crop may depend on less efficient criteria such as administered prices, rather than demand and supply, leading obviously to inefficient resource allocation. Further, the existence of a large section of unregulated middlemen and traders reduces the market efficiency to a significant level. Bringing these middlemen into the framework of institutional market mechanism with proper regulatory ambit will result in transforming the middlemen into market facilitators, while direct marketing (by producers) provides an opportunity to minimise the role of middlemen (Reddy, 2001).

Agricultural Credit

3.47 Institutional credit to small and marginal farmers plays an important role in replacing informal credit market mechanisms and the inter-linkages arising between informal credit and other factor/product markets. The deceleration in the growth of loans outstanding for the small land holdings during the 1990s as compared with the 1980s is indicative of a combination of better repayment of loans in the 1990s (since most of these loans are of small values and in the nature of crop loans, *etc.*) as well as low disbursement rate. For small and marginal farmers, the deceleration in the credit disbursal has been the maximum in the 1990s. Small and marginal farmers, thus, continue to be both credit and demand constrained.

3.48 The lack of capital has been a primary factor impeding the adoption of new technological inputs, which are capital intensive. The size and flow of financial resources to agriculture, both in terms of investment and working capital have shrunk significantly. Despite the stipulation of sub-targets for agriculture at 18 per cent under priority sector, credit has not flowed to the desired extent. There exist many escape routes with regard to priority sector lending targets, such as the option to invest in RIDF and place deposits with SIDBI. Direct finance to small and marginal farmers (with land holdings up to two hectares) has been slowing down in recent years

(Table 3.15). The average growth in loans outstanding to marginal farmers has decelerated sharply during the 1990s as compared with the growth recorded in the 1980s (Charts III.16 and III.17).



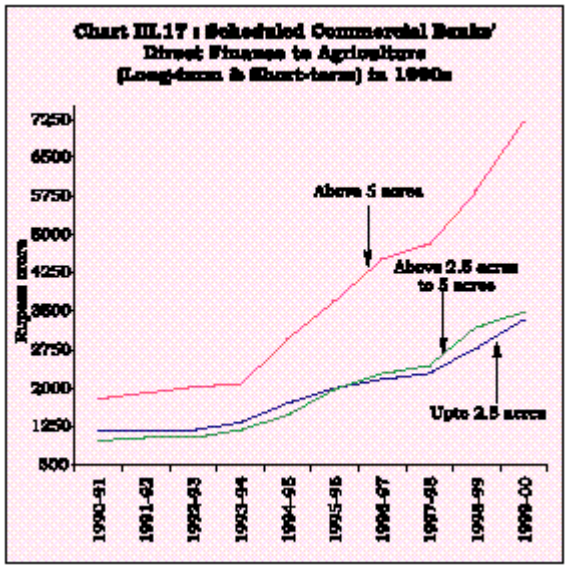


Table 3.15 : Trend Growth Rates of Scheduled Commercial Banks' Direct Finance to Farmers(Short-term and long-term loans)

(Per cent)

Year (July-June)	Up to 2.5 acres		Above 2.5 acres to 5 acres		Above 5 acres		Total	
	Accounts	Amount	Accounts	Amount	Accounts	Amount	Accounts	Amount
1	2	3	4	5	6	7	8	9
Loans Outstanding								
1980s	8.61	19.33	11.80	21.48	7.41	16.96	9.17	18.39

1990s	-3.69	7.65	-1.58	8.95	-0.92	8.05	-2.27	8.17
Loans Disbursed								
1980s	7.51	18.38	11.45	21.55	7.21	17.51	8.51	18.61
1990s	2.16	11.84	5.72	15.88	8.55	16.31	4.95	15.01

Note: Trend Growth Rates are based on semi-logarithmic functions.

Public Distribution System (PDS)

3.49 The PDS has attracted considerable debate in recent years on the ground that the benefits of PDS are not reaching the poor on account of, *inter alia*, poor targeting and leakages in the system, despite its restructuring in 1997 (Mooij, 1999, GoI 2000b, 2000c and 2000e). It has also been argued that despite the huge food subsidy and the large-scale of intervention, the food security of many households is still marginal or insufficient. In recent years there has been a substantial rise in procurement of foodgrains by the public sector agencies on account of consistent increases in Minimum Support Prices (MSP), despite the recommendations of the Commission for Agricultural Cost and Prices to freeze the same (GoI, 2000d). It is argued that consistent increases in the MSP have distorted relative prices between alternate agricultural activities, land use patterns as well as the consumption of inputs (ICRA, 2001). The stock of 59.14 million tonnes at the end of November 2001 is around two and a half times the norm of 24.30 million tonnes for end-September 2001 (Table 3.16).

3.50 Considerable concern regarding the mounting stocks has been expressed of late, as substantial amount of food credit and food subsidy have been required to finance these operations.

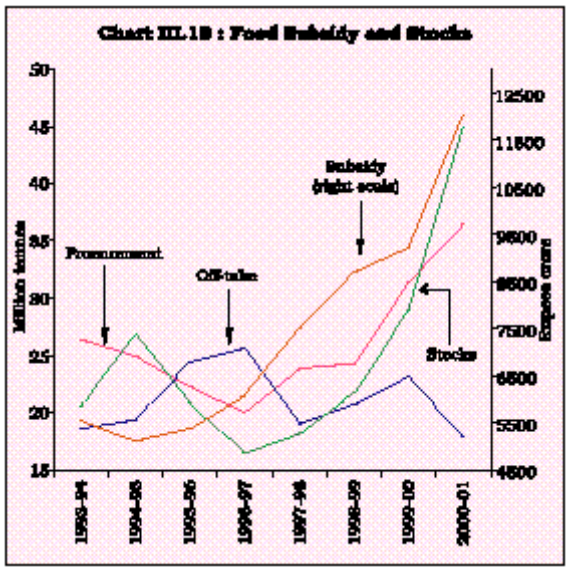
Table 3.16 : Procurement, Off-take, Stocks and Food Subsidy

Year	Procurement (Million Tonnes)	Off-Take (Million Tonnes)	Stocks (Million Tonnes)	Food Subsidy (Rupees crore)
1	2	3	4	5
1993-94	26.40	18.61	20.54	5537
1994-95	24.99	19.44	26.80	5100
1995-96	22.24	24.35	20.82	5377
1996-97	20.03	25.63	16.41	6066
1997-98	23.82	18.96	18.12	7500
1998-99	24.22	20.73	21.82	8700
1999-00	31.43	23.05	28.91	9200
2000-01	36.47	17.95	44.98	12042
2001-02 (up to end-November, 2001)	34.83	16.15	59.14	N.A.

N.A. : Not available

Food subsidy, which amounted to Rs.6,066 crore in 1996-97, has increased to Rs.12,042 crore in 2000-01. During 1997-98 to 2000-01, the outstanding food credit witnessed a rise from Rs.7,597 crore to Rs.39,991 crore, indicating a phenomenal average annual growth of 51.9 per cent (Chart

III.18). The share of consumer subsidy in food subsidy has been declining over these years, indicating that much of the increase in food subsidy goes towards carrying costs. Carrying cost of foodgrains increased to Rs.220.35 per quintal in 2000-01 from Rs.158.26 per quintal in 1996-97. Consumer subsidy on rice for below poverty line



(BPL) consumers declined to Rs.565.00 per quintal in July 2000 from Rs.589.33 per quintal in 1997-98. Similarly, the consumer subsidy on wheat for BPL consumers decreased to Rs.415.00 per quintal in July 2000 from Rs.536.35 per quintal in 1997-98. Given the present scenario, the effectiveness of food subsidy in supporting the public distribution programme has been questioned (GoI, 2000e).

3.51 A gradual reduction of the food stock to scale down outstanding food credit and food subsidy needs to be considered. Measures to increase the off-take of foodgrains such as Food for Work Programme and increased open market sales including exports, may help to achieve the objective of gradual scaling down of stocks. There is also a need to streamline the procedure for evaluating the quality of stocks, as this will have an impact on the outstanding advances of commercial banks to the Food Corporation of India.

3.52 Free and fair international trade in agricultural commodities can act as an engine of growth for the economy as a whole. It is interesting to note that agriculture was placed for the first time on the negotiating agenda of the Uruguay Round (1986-1993) (Box III.1).

Determinants of Agricultural Growth

3.53 In view of the many shades in the growing consensus seeking the reform of agriculture, it is useful to undertake an empirical verification of the determinants of agricultural output in the context of the country specific conditions. The determinants considered for this excercise are area under cultivation (chosen over gross sown area so as to take cognisance of the relative importance of various crops through explicit weights in the index), labour and "technology indicators" such as irrigation intensity (ratio of gross irrigated to net irrigated area), cropping

intensity and ratio of area under HYV seeds to gross sown area, rainfall, and time trend.

Box III.1
WTO and Indian Agriculture

The Agreement on Agriculture (AoA), which aimed at the liberalisation of the world trade in agricultural commodities was negotiated and signed by India, along with other countries in April 1994 at Marrakesh, Morocco as a part of the Final Act of the Uruguay Round and was made effective from January 1, 1995. The AoA aims at removing the distortions in world trade in agriculture arising from excessive protection and subsidisation of agriculture. AoA contains provisions with respect to three areas: market access, export subsidies and domestic support. Existing non-tariff barriers in agriculture, which are considered trade-distorting, are to be abolished and converted into tariffs so as to provide the same level of protection and subsequently the tariffs are to be progressively reduced by a simple average of 36 per cent by the developed countries over 6 years (year ending 2000) and by 24 per cent by the developing countries over 10 years (year ending 2004) (Table 3.17). The minimum market access opportunities are to be provided at 3 per cent of the domestic consumption in 1986-88 (to be established by the year 1995) and rising up to 5 per cent by the end of the implementation period.

Table 3.17 : Reduction Commitments Under AoA

	Developed Countries (1995-2000)	Developing Countries (1995-2004)
1	2	3
Tariffs (Base 1986-88) Average cut for all Agricultural products	36%	24%
Domestic support, Total AMS (Base 1986-1988):	20%	13%
Export Subsidies(Base1986-1990)	36%	24%
Budgetary outlays for export subsidies		
Volume of subsidised exports	21%	14%

The domestic support to farmers is divided into three categories, *viz.*, Amber Box, Blue Box and Green Box. All domestic support measures considered to distort production and trade (with some exceptions) fall into the category of Amber Box. Subsidies which do not, or at the most cause minimal distortion come under the purview of Green Box. The support under Amber Box directly affects the quantity produced by the producer and the price of the product, whereas the support under the other two heads are neutral in this respect. Subsidies like input subsidies for fertilisers, electricity, support in the form of lower interest rates and market price support fall under the Amber Box category. The Green Box support includes assistance given through environment assistance programmes, services such as research, training and extension, marketing information, certain type of rural infrastructure, *etc.* Subsidies under Blue Box include direct payment given to farmers in the form of deficiency payment (*i.e.*, the difference in the Government's minimum support price and market price is paid directly to farmers, as practiced in the USA), direct payment to farmers under production limiting programmes, *etc.*

The support under Green Box is excluded from any reduction commitments and is not subjected to any upper limit. Support under Blue Box is also exempted from any reduction commitments but it has an upper limit. The support under Amber Box is related to the trade distorting support, unlike that under the other two heads. AoA aims at removing this trade-distorting support. The trade distorting support, called as Total Aggregate Measure of Support (AMS) is expressed as a percentage of the total value of the agricultural output. The Agreement stipulates the reduction of total AMS by 20 per cent for the developed countries over a period of six years, while the developing countries are needed to reduce the total AMS by 13 per cent over a period of ten years. Reduction commitments refer to total levels of domestic support and not to individual commodities. Policies which amount to domestic support, both under product specific and non-product specific categories at less than 5 per cent of the value of production for developed countries and less than 10 per cent for developing countries are also excluded from any reduction commitments. Policies which have no, or at the most minimal trade distorting effects on production, are excluded from any reduction commitments.

The developed countries are required to reduce the volume of subsidised exports by 21 per cent over six years and the budgetary outlays for export subsidies by 36 per cent with respect to the base period of 1986-90. Developing countries are required to reduce the volume by 14 per cent and budgetary outlays by 24 per cent over 10 years.

Implications of AoA for India

In India, quantitative restrictions on agricultural imports imposed for balance of payments (BoP) considerations have been removed and these imports are placed in the open general license (OGL) list. In order to provide adequate protection to domestic producers in case of a surge in imports, India can raise the tariffs within the bound ceilings. In case of a few products such as primary products, processed products and edible oils, India had earlier raised the tariffs (during 1999 and 2000) adequately to protect the domestic producers. In case of some other products, India has successfully revised the binding levels through negotiations. However, India can take suitable measures under WTO's Agreement on Safeguards if there is a serious injury to domestic producers due to surge in imports or if there is any such other threat. The Government has already taken a number of measures to safeguard the agriculture sector in the context of the phase-out of quantitative restriction, *i.e.*, import duties on many agro and other items have been substantially increased and import of about 131 products have been subjected to compliance of mandatory Indian quality standards as applicable to domestic goods.

India's domestic support to agriculture is well below the limit of 10 per cent of the value of agricultural produce and therefore India is not required to make any reduction in it at present. The subsidies given for PDS are basically the consumer subsidies and are exempt from WTO discipline. India's system of Minimum Support Prices (MSP) as also the provision of input subsidies to agriculture are not constrained by the Agreement. Moreover, the agricultural developmental schemes can also be continued under AoA.

Reference

1. Government of India, (2001), *Focus*, Ministry of Commerce.
2. _____ (2001), Press Releases, Ministry of Commerce.
3. _____ (2001), *WTO and India*, various issues, Ministry of Commerce.
4. WTO (1995), *Agreement on Agriculture.*

3.54 Elasticities of agricultural output with respect to its various determinants are set out in Table 3.18. Elasticities have been highest, predictably, with respect to area and labour, followed by rain. The elasticity of agricultural production with respect to rain at 0.27 is found to be significant. However, the elasticities with respect to technology variables such as consumption of fertiliser and pesticides, cropping intensity, irrigation intensity and the share of area under HYV seeds to gross cropped area turn out to be very low, often statistically insignificant and hence are not reported. Inclusion of time trend taken as representative of technical progress in the estimation framework reduces the labour co-efficent apart from making it insignificant.

Table 3.18 : Estimated Elasticities of Agricultural Output

	Variable	Elasticity
1	2	3
Without Time Trend		
	Area	0.8243
	Labour	0.8618
	Rain	0.2667
With Time Trend		
	Area	0.9096
	Labour	0.1844*
	Rain	0.2376

	Time Trend	0.0174

* : Not significant.

3.55 Indian agriculture calls for reforms encompassing technology upgradation, creation of infrastructure, creation of a better marketing system, revival of the rural credit delivery system, and public sector capital formation in infrastructural facilities, particularly irrigation. In the context of extending reforms to agriculture, multilateral organisation have offered several suggestions drawn from cross-country experience (Box III.2).

Box III.2
International Institutions on Reforming Agriculture

Deceleration in agricultural growth has been a common feature of the growth pattern in the Asia Pacific region in the recent years. Global agricultural growth is also projected to decelerate to 1 per cent in 2000 after exhibiting modest recovery in 1999 (at 2.3 per cent) over 1998 (1.4 per cent). The generally sluggish growth conditions reflect a number of underlying weaknesses which, along with uncertain weather conditions, have stifled the prospects of agricultural growth. The underlying weaknesses continue to persist even after the observed shift in national policies away from public production and state administration in favour of the market.

According to the World Bank, a key aspect in the increasing market orientation of agricultural policies relates to the sequencing of agricultural reforms. Ideally, reforms that increase farmers cost of production by eliminating input subsidies should not precede those that can stimulate growth by raising output prices - such as elimination of regressive price controls and export taxes. Furthermore, supply response in agriculture to reforms may not be symmetrical. An assessment based on 50 agricultural adjustment loans of the World Bank reveals that in countries where agriculture was penalised/taxed, reforms helped in raising farm output. In turn, other countries where agriculture was heavily protected, liberalisation adversely affected agricultural output growth by hastening reallocation of resources away from agriculture. Supply response in agriculture to the overall structural reform measures, however, depends upon the level of agricultural development of a country. An enabling government policy may not prove very effective in the absence of adequate agricultural infrastructure - including roads, irrigation, power, and telecommunications - appropriate technology, credit, farmer education and an assured supply of inputs at right price. Prices for inputs that do not reflect any explicit/implicit subsidy, but which are determined in a competitive market condition and also remove barriers to convergence with international prices could represent good practice in agricultural pricing policy, if not the right price. In revamping the public expenditure programmes for agriculture as part of the overall reform process, however, countries must take adequate precaution to avoid major decline in agricultural growth. Recognising the underlying weaknesses of the agricultural sector in several countries, agricultural adjustment loans generally rely on a two prong approach. The first major aspect of the approach emphasises price reforms and market liberalisation so as to ensure that domestic prices are in line with world market prices, marketing and processing systems are efficient, with better access to efficient technology and public services. The second key aspect emphasises private production in a competitive environment.

The Asian Development Bank points out that in a market-based system for agriculture, the possibility for reaping the potential higher yield would depend on the actual return on agricultural investment and the overall condition for agricultural production (Mingsarn, Santikarn and Benjavan Rerkasem, 2000). In the past years, decline in net returns on food crops has forced farmers to explore alternative farming opportunities with higher returns - including oil crops, fruits and vegetables. The market mechanism, thus, seems to have altered the cropping pattern in favour of more profitable non-food crops. Environmental degradation - the result of faulty application of technology and agricultural policy- has, however, been a subject of concern which could threaten long-run agricultural sustainability. In Asia, water resource management has been fragmented and project based. As a result, both surface water and ground water are used excessively. Crop production in fragile land has also resulted in soil erosion, salinisation, water logging and desertification. Inappropriate technology has often been used to avoid/postpone reforms that may be economically and socially desirable but politically impracticable. While encouraging adoption of any technology for the agricultural sector, therefore, due care must be taken to improve field-level knowledge, better crop management, and proper communication between farmers and research and development (R&D)

officials.

The OECD stresses the importance of the response of the labour market in agriculture to the overall process of structural reforms, particularly to sustain the improved labour productivity in agriculture. Surplus labor in agriculture operates as a major impediment to attain the desired labour market adjustment. It also exerts pressures on the government to address their problems through various subsidies. More efficient farm structures under market conditions can therefore emerge only when preconditions to market efficiency could be ensured.

Keeping in view the alternative prescriptions, the future course of reforms in Indian agriculture may have to focus on the following critical areas.

- ? Agricultural yield can be increased through creating infrastructural facilities rather than by providing input subsidies. Fertiliser prices need to be streamlined further to reduce the skewed N:P:K ratio in fertiliser consumption.
- ? The tools of emerging bio-technology such as genetic engineering seem to offer significant possibilities for increasing yields. Bio-technological inputs such as bio-fertiliser and bio-pesticides are perceived to be scale neutral and can be adopted by even small farmers and provide scope for savings on use of chemical fertilisers and pesticides, apart from being eco-friendly.
- ? The practice of increasing the Minimum Support Price (MSP) may have to be re-examined as it has resulted in large procurement of foodgrains by the public sector agencies, leading to an increase in the procurement incidentals. It has also distorted the price formation process in the market.
- ? In view of the removal of quantitative restrictions under the WTO agreement, the agricultural prices will have to be aligned with the international prices to be competitive. Appropriate institutional reforms such as setting up of commodity exchanges are necessary to protect domestic producers from greater price volatility that generally characterises the international market for foodgrains and other crops.
- ? India is the second largest producer of fruits and vegetables in the world and is perceived to have comparative advantage, which needs to be reaped. Given India's diversified climatic and soil conditions, the growing demand for such items in the affluent parts of the world and the scope for developing the food processing industry explains the need for shifting the pattern of production in favour of fruits and vegetables.

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2. Mingsarn, Santikarn Kaoshard and Benjavan Rerkasem (2000), *Growth and Sustainability of Agriculture in Asia*, Asian Development Bank, Manila.
3. OECD (1999), *Agricultural Policies in Emerging Transition Economies*, Vol. 1.
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III. IMPEDIMENTS TO INDUSTRIAL GROWTH

3.56 The deceleration in economic activity in the second half of the 1990s is primarily attributed to industrial slowdown. Cyclical turns in activity have impacted on industrial output, accentuating the demand-supply imbalances. Structural factors have inhibited the growth of capacity creation/expansion in industry, eroded competitiveness and increased the vulnerability of the economy to adverse cyclical or exogenous shocks. Identified structural constraints are lack of adequate infrastructure development, low agricultural buoyancy, large fiscal imbalances and dearth of internal reforms.

3.57 Insufficient demand is regarded as the single most important factor inhibiting growth in manufacturing as well as other segments of the industrial sector. Apart from the global slowdown, the current deceleration in the manufacturing sector is ascribed to slowdown in investments, low business confidence and subdued capital market (NCAER, 2001;

Chandrasekhar, 2001; Shetty, 2001; ADB, 2001).

3.58 The growth of value added in the industrial sector in India slowed down in the 1990s after recording significant improvement in the 1980s, with similar trends at the sectoral level. The growth of the industrial sector is affected by intersectoral imbalances in the growth process. The significant deceleration in the growth rate of the mining and quarrying and electricity sectors during the 1990s affected the overall growth of industrial output. The mining and quarrying and the manufacturing sectors have also exhibited higher volatility in the growth rate during the 1990s. These fluctuations in the growth rates and imbalances across the sectors have implications for stabilising output growth at higher levels (Table 3.19, 3.20 and Charts III.19, 20, 21, 22).

Table 3.19 : Trend Growth of Industrial Production in India

(Per cent)

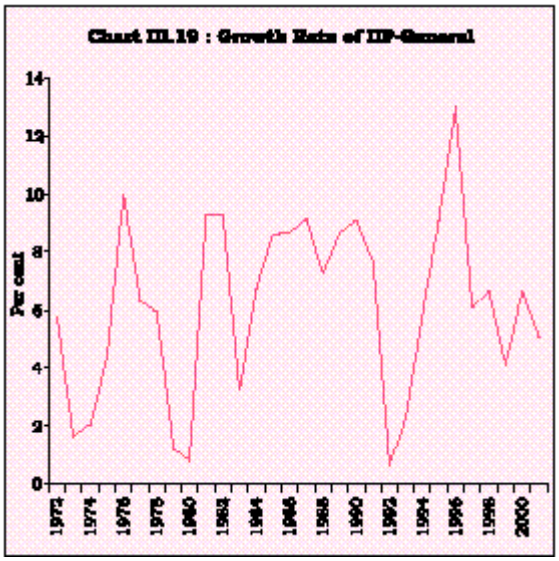
Period	Mining and Quarrying	Manufac-turing	Electricity	General
1	2	3	4	5
1970-1980	4.7	4.1	7.4	4.6
1980-1990	7.7	7.3	8.7	7.5
1990-2000	3.8	6.8	6.6	6.5

Note : The trend growth rates are derived from a semi- logarithimic function.

Table 3.20 : Coefficient of Variation of Industrial Production

(Per cent)

Period	Mining And Quarrying	Manufa-cturing	Electricity	General
1	2	3	4	5
1970-1980	110.1	85.0	67.4	72.9
1980-1990	53.0	32.3	21.2	23.7
1990-2000	125.1	62.2	21.4	55.7



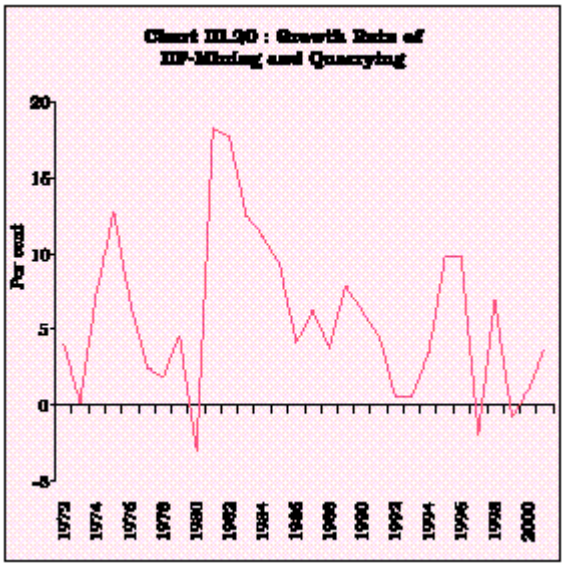


Chart III.90 : Growth Rate of
HP-Mining and Quarrying
Per cent
20
15
10
5
0
-5
1973
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000

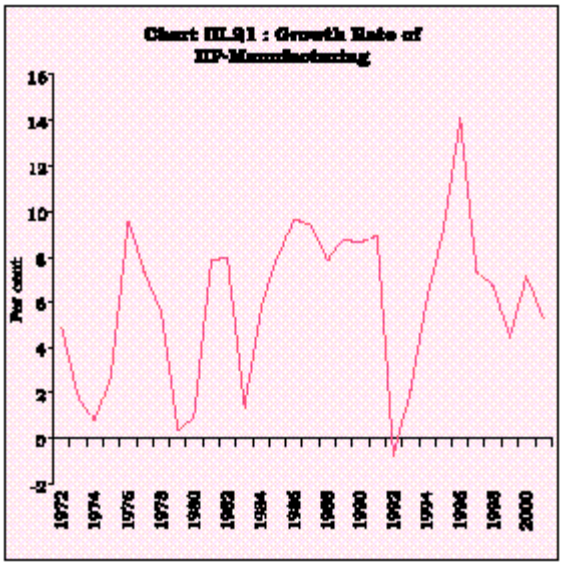
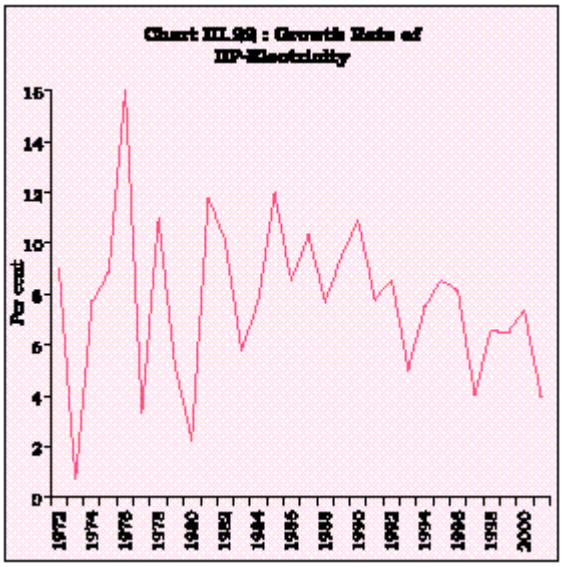


Chart III.91 : Growth Rate of
HP-Manufacturing
Per cent
16
14
12
10
8
6
4
2
0
-2
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000



3.59 In the post-liberalisation period, the cyclical fluctuations in industrial activity have been generated by the internal dynamics of the industrial sector apart from supply shocks. Evidence of cyclical behaviour of industrial production has led to the development of leading and coincident indicators of industrial activity (Box III.3).

Box III.3
Leading Indicators of Industrial Activity in India

The approach of leading indicators of economic activity has been widely used to track the phases of business cycles despite the criticism of lack of sound theoretical foundations. The leading indicator analysis of business cycles is woven around the view that economies experience cycles with "expansions occurring at about the same time in many economic activities, followed similarly by general recessions, contractions and revivals that merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic" (Burns and Mitchell, 1946). The framework of leading indicators provides early signals about turning points in economic activity, which is important for undertaking counter-cyclical policies.

Empirical work on the leading indicator approach originated from the National Bureau of Economic Research (NBER) in the 1930s, and subsequently numerous versions of leading indicators have been developed. The objective of constructing a composite index of leading indicators is to identify the cyclical behaviour of the reference indicator, *i.e.*, the series whose future movements are to be predicted. Reference indicators usually relate to a measure of aggregate real activity, such as aggregate output(GDP), investment and employment, *etc*. In the absence of high frequency data on aggregate measure of real activity, several studies have used industrial production as the reference series; the OECD indicator system uses the index of total industrial production as the reference series.

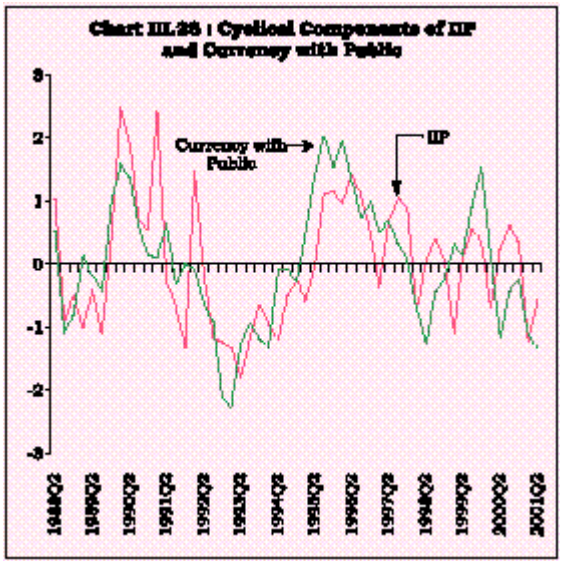
The composite index of leading indicators (CILI), being multivariate in nature, has been extensively used as it predicts cyclical turning points more effectively than any single indicator. The CILI is based on the premise that cycle of each component indicator has its unique characteristics as well as features in common with other cycles, but no single cause explains the cyclical fluctuation over a period of time in overall activity. The performance of individual indicators depends on the strength of causal relation with the reference indicator. Accordingly, the multivariate approach, as adopted for composite indicators, is necessary to combine various signals for possible causes of cyclical turning points.

Once the cyclical behaviour of the reference series has been established, the next step is to select an economic time series whose cyclical movements typically predate those of the reference series. The leading component indicators are evaluated on the basis of their relevance, cyclical behaviour and practical considerations relating to timeliness in

availability of high frequency information. On statistical consideration, the criterion of being leading indicators utilises the tests of peak-and-trough analysis, cross-correlation analysis, *etc*. Once a set of leading indicators has been selected, the component indicators are combined into a single composite index to reduce the risk of false signals and to provide a leading indicator with better forecasting and tracking qualities. In the empirical literature, a variety of leading indicators such as average work-week, index of overtime hours, application for unemployment compensation, new companies registered, new orders, vendor performance, construction, stock prices, money supply, change in sensitive material prices, index of consumer expectations, *etc*. have been used for constructing a multivariate index of business cycles.

In India too, attempts have been made at building leading/coincident indicators of economic/ industrial activity in recent years using the NBER methodology for constructing diffusion and composite indices for identifying growth cycles, the ECRI approach using the Bry Boshan algorithm for coincident economic indicators and a composite leading index for the manufacturing sector as the reference indicator of economic activity.

The construction of an appropriate CILI is constrained by data limitations; many important indicators of business performance of the corporate sector are not available at monthly/quarterly frequency. Despite these data gaps, a CILI has been constructed in terms of the variables that can best explain the turning points of the business cycle. The index of industrial production (IIP) is taken as the reference indicator to represent the industrial activity in the Indian context. The component variables considered were IIP for basic goods, food stocks, deposits of scheduled commercial banks, currency demand, non-food credit, total commercial bank credit, broad money supply, short-term interest rates, stock prices, exports, non-oil imports, WPI of manufacturing, WPI of primary articles, WPI of industrial raw material, WPI of minerals, WPI of fuel, power, light and lubricants, and freight loading of railways, besides the GDP of the United States as an indicator of external economic environment. Seasonally adjusted quarterly series for the period 1988:Q2 to 2001:Q2 are passed through the Hodrick-Prescott Filter to obtain the cyclical component of each series. The lead-lag relationship between the cyclical component of the reference series *vis-à-vis* other series are identified in terms of cross-correlation matrices at various lags and Granger causality tests with varying lags. Six indicators, *viz.*, non-food credit of commercial banks, currency with the public, prices of fuel group of commodities, freight loading of the railways, exports and non-oil imports emerge as significant.Chart III.23 to Chart III.28 show the cyclical component of the IIP and each of the series. The composite index is compiled for the period using the six variables having a lead of 2-3 quarters. Since the cyclical components of the various series have varying amplitudes, each of the series is standardised taking into account its mean and standard deviation.



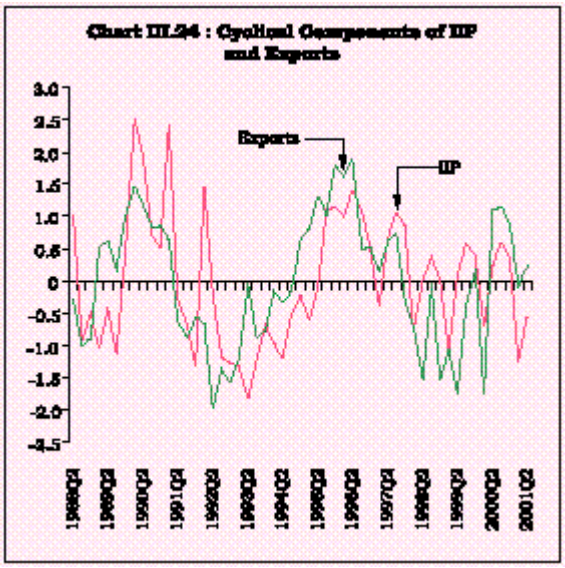


Chart III.24 : Cyclical Components of IIP and Exports
Exports
IIP
3.0
2.5
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
-2.5
1990Q1
1990Q3
1991Q1
1991Q3
1992Q1
1992Q3
1993Q1
1993Q3
1994Q1
1994Q3
1995Q1
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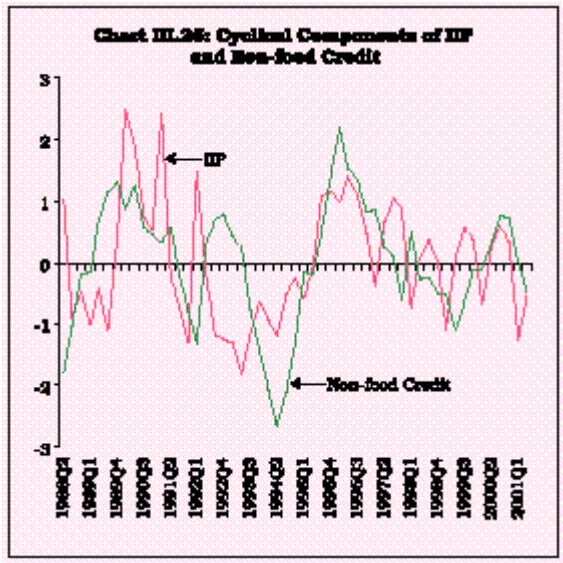
Chart III.26: Cyclical Components of IIP and Non-food Credit
IIP
Non-food Credit
3
2
1
0
-1
-2
-3
1990Q1
1990Q3
1991Q1
1991Q3
1992Q1
1992Q3
1993Q1
1993Q3
1994Q1
1994Q3
1995Q1
1995Q3
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1997Q3
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1999Q1
1999Q3
2000Q1
2000Q3
2001Q1

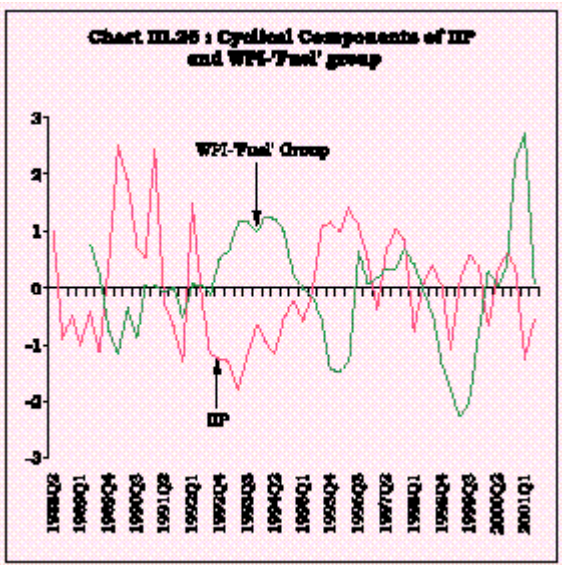


Chart III.26 : Cyclical Components of IIP and WPI-'Fuel' group
WPI-'Fuel' Group
IIP

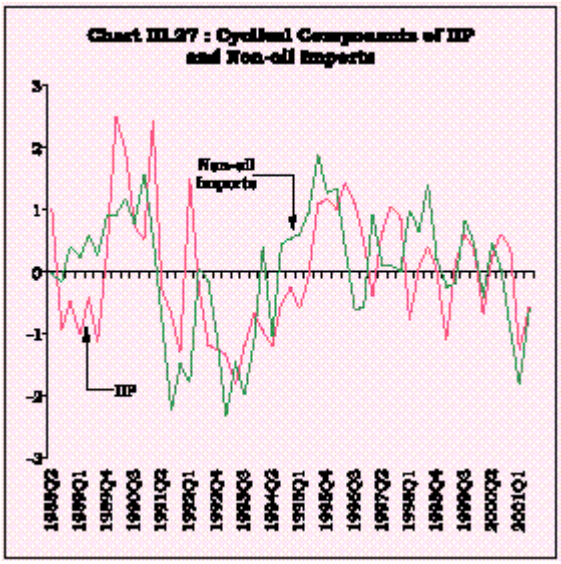
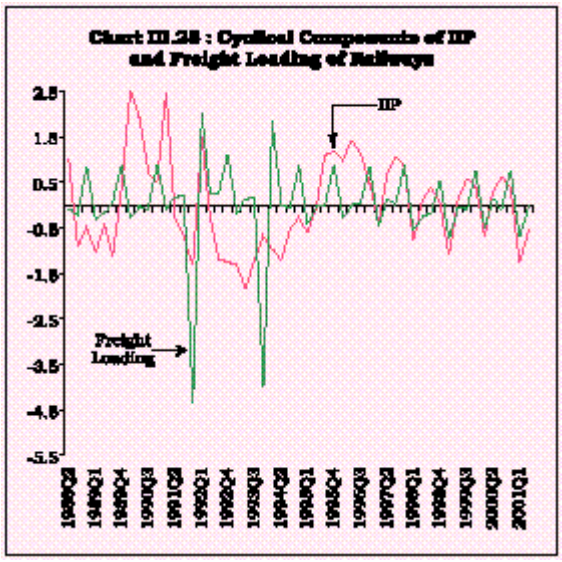
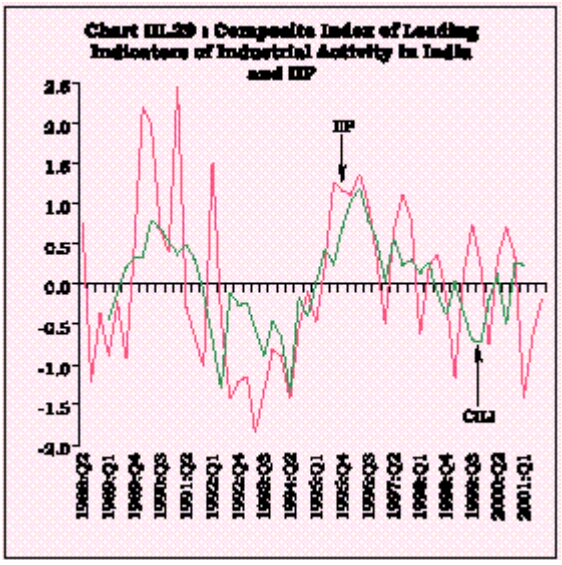


Chart III.27 : Cyclical Components of IIP and Non-oil Imports
Non-oil Imports
IIP



An unweighted index of these six series is compiled to forecast the turning points of industrial activity in India with implicit assumption that industrial sector is undergoing rapid changes and the production cycles may change over time. The CILI for the industrial activity leads the actual IIP by two quarters. The CILI, particularly since the early 1990s is able to capture the turning points of the IIP about two quarters in advance (Chart III.29).



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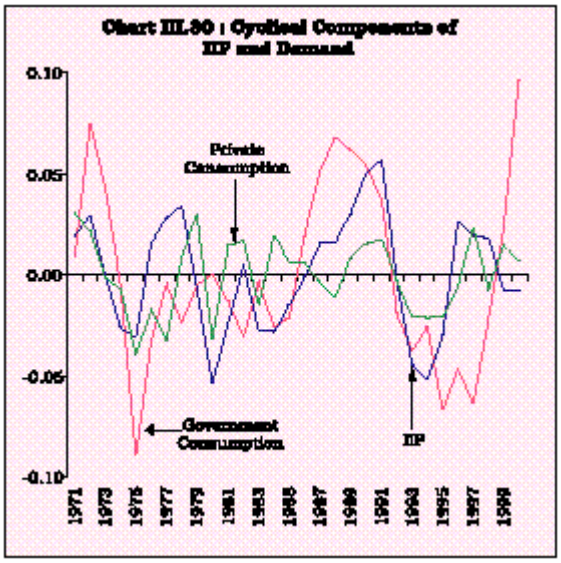
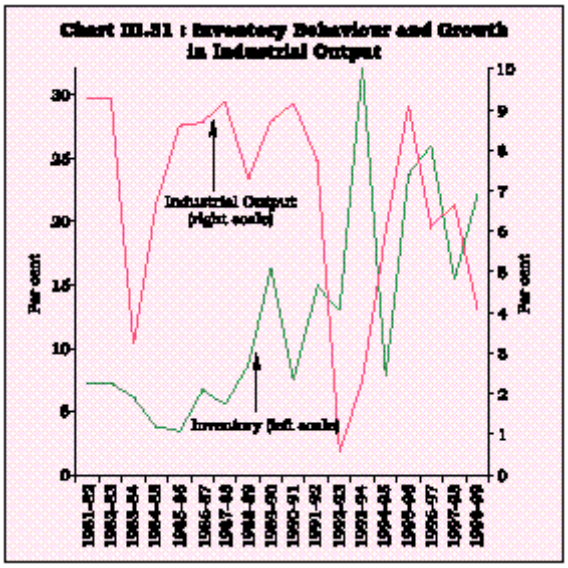
Demand Constraints in the Industrial Sector

3.60 It is essential to identify the role of the demand side factors in contributing to the declining industrial output. Of the important components of the demand for industrial goods, government consumption demand has been used in India as a counter-cyclical measure during the downturn in industrial activities, as the private consumption tends to be pro-cyclical.

3.61 A clear pattern emerges between the real private consumption expenditure and the industrial output during the 1980s and the 1990s. During the 1980s and the early 1990s, high growth in industrial output was associated with sustained growth in real private consumption demand. In contrast, during the downturn the latter half of the 1990s, real private consumption demand has decelerated. While the cyclical component of the private final consumption expenditure generally exhibits pro-cyclical movements with the industrial production, government final consumption expenditure exhibited counter-cyclical movements (Chart III.30).



3.62 An important factor explaining the fluctuations in economic activity and industrial output during the phases of business cycle is the changes in inventory holdings. The credit view on the role of inventories in explaining industrial output postulates that the impulses of a restrictive monetary policy are transmitted immediately through higher carrying cost on inventory investment, which in turn would affect the level of output through backward linkages with the industrial sector (Gertler and Gilchrist, 1994; Bernanke and Gertler, 1995). Although inventory investment may constitute a small part of the total value of output in the industrial sector, it may significantly explain the output changes. Changes in inventory holdings are found to be closely associated with cyclical turning points in economic activity in India (Darbha, 1999). On the basis of the observed trends in the inventory holdings and growth in industrial output, changes in inventory show generally pro-cyclical movement, implying that adjustment in the inventories leads the variations in industrial output (Chart III.31).



3.63 The sectoral inter-linkages between agriculture and industry provide the basis for analysing the industrial slowdown. An analysis of the inter-linkages shows that the significant improvement in industrial output in the 1980s was accompanied by an improvement in the growth rate of per capita real income in agriculture. In the 1990s, with decline in the per capita real GDP growth in agriculture to 1.3 per cent, the average industrial output growth declined to 6.0 per cent (Table 3.21).

3.64 Slow growth in agricultural output adversely impacts on the industrial production by affecting the surplus of wage goods, supply of inputs, and demand for industrial goods. On the demand side, the hypothesis of 'agricultural drag' inhibiting growth of industrial output has been a subject of considerable empirical research. It is observed that while the growth of wage goods has not been a factor constraining industrial output, the slow growth of agricultural income impacts on consumer demand for industrial goods (Ahluwalia, 1991).

Table 3.21: Per Capita Real GDP in Agriculture and Real GDP Growth in Industry

(Per cent)

Period	Per Capita Real GDP Growth in Agriculture	Real GDP growth in Industry
1	2	3
1970-80	-0.9	4.4
1980-90	2.5	7.4
1990-2000	1.3	6.0

Private consumption demand is, to a large extent, determined by the levels of farm incomes. Analysis covering the post-Green Revolution period yields two agricultural factors that limited the forward thrust to industrial growth in India, *viz.*, volatility in the growth of agriculture output and low growth in the per capita agricultural income.

Capacity Utilisation and Output Growth

3.65 Industrial output is significantly influenced by the rate of capacity utilisation in industry. The low rate of capacity utilisation in Indian industry indicates underutilisation of factor inputs which can impose an enormous growth constraint on the economy. The declining rate of capacity utilisation also indicates the sluggish growth in demand during the downturn in economic activity, and the adjustment of supply to underlying demand conditions. The direct measurement of capacity utilisation is often constrained by the availability of information on the installed capacity in industry. The literature on capacity utilisation suggests various measures, such as, the Wharton Index of Capacity Utilisation and the Minimum Capital-Output Ratio Method (Klein and Summers, 1966). These measures and their variants have been widely used to analyse capacity utilisation in industry. In the absence of direct measures, the common traits in the behaviour of these indirect measures can provide some insights into capacity utilisation.

Wharton Index

3.66 In the Wharton Index, the capacity of a firm/industry in the short run is represented by the maximum sustainable level of production under normal working conditions when the firm is operating its existing capital stock at its customary level of intensity. However, it is argued that the peaks so identified may not truly reflect the capacity output of the industry (Paul, 1974) and that the capacity expansion takes place in a smooth and gradual manner which may not be true (Phillips, 1963). Despite some limitations, the method has been widely used to assess the capacity utilisation in industrial sector. Under this method, seasonally adjusted monthly values of indices of output are averaged into quarterly data which are used for identifying peaks as indicators of capacity output. The estimates based on the Wharton Index for the Indian manufacturing sector for the period 1971 to 2001 indicate that there has been an improvement in capacity utilisation in the manufacturing industries as a group during the 1980s. Capacity utilisation, however, showed deterioration in the 1990s, except for some brief spells. The electricity sector, unlike the manufacturing sector, witnessed an improvement during the 1990s over the 1980s and 1970s, mainly attributed to rising demand. The capacity utilisation in the mining and quarrying sector, however, witnessed deterioration over the decades with rising gaps in the 1990s. The impact of slackening demand in the recent years resulted in lower capacity utilisation (Chart III.32 to III.34).

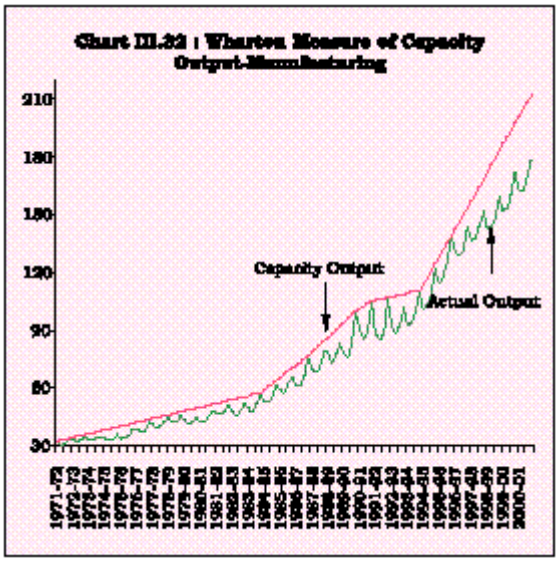


Chart III.32 : Wharton Measure of Capacity
Output-Manufacturing
210
180
150
120
90
60
30
Capacity Output
Actual Output

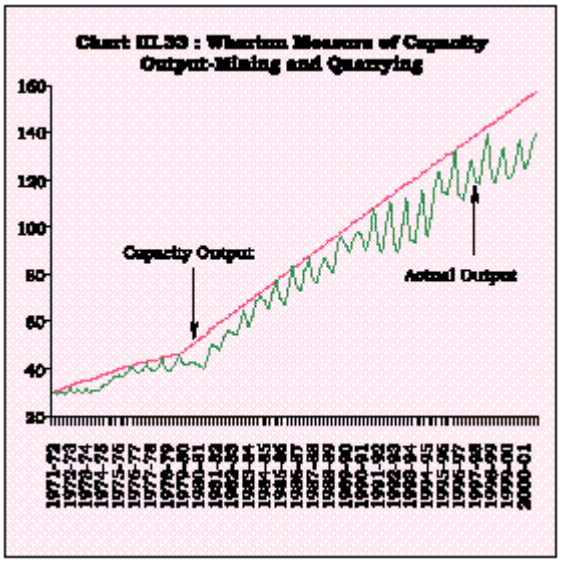
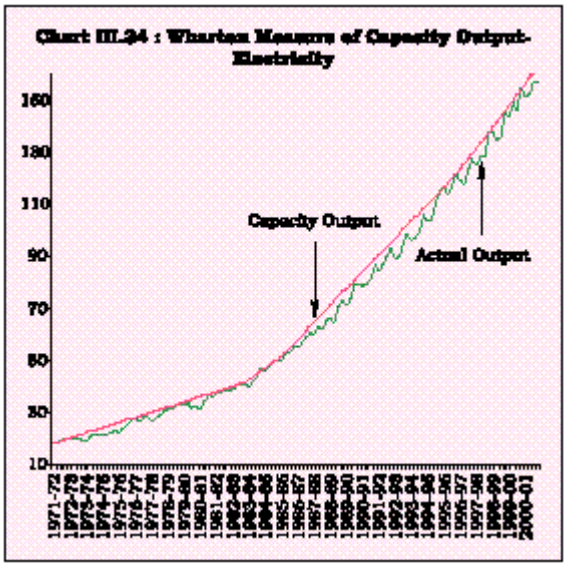


Chart III.33 : Wharton Measure of Capacity
Output-Mining and Quarrying
160
140
120
100
80
60
40
20
Capacity Output
Actual Output



Minimum Capital-Output Ratio Measure

3.67 As per this method, developed by the National Industrial Conference Board of the USA, a benchmark year is selected on the basis of lowest capital-output ratio (in real terms). The output corresponding to the lowest capital-output ratio is taken as the capacity output. The measure of capacity utilisation is obtained by deflating real fixed capital stock by the minimum capital-output ratio.

Table 3.22 : Capacity Utilisation (CU) in Industry : Minimum Capital-Output Measure (C/O)

Period	Manufacturing		Mining and Quarrying		Electricity	
	C/O	CU (Per cent)	C/O	CU (Per cent)	C/O	CU (Per cent)
1	2	3	4	5	6	7
1970-71 to 1974-75	2.8	98.6	1.4	95.0	11.8	80.7
1975-76 to 1979-80	2.9	94.8	1.9	69.9	11.5	82.5
1980-81 to 1984-85	3.2	84.8	2.6	50.6	12.3	77.3
1985-86 to 1989-90	3.1	88.1	3.4	38.0	11.6	81.9
1990-91 to 1994-95	3.0	90.6	3.3	38.7	10.7	88.6
1995-96 to 1999-2000	3.7	75.7	3.2	41.0	9.9	96.6

The estimates of capacity utilisation in the manufacturing sector in India for the period 1970-71 to 1999- 2000 indicate that some improvement in the capacity utilisation occurred towards the late 1980s and the first half of 1990s, *i.e.*, during the period associated with acceleration in the industrial growth rate. The mining and quarrying sector recorded significant decline in capacity utilisation. In the electricity sector, capacity utilisation rose steadily up to the 1990s. These sectoral imbalances in the capacity utilisation have implications for the overall industrial growth (Table 3.22).

3.68 In the context of developing economies, capacity utilisation is determined by both demand as well as supply side factors. Among the demand side factors, inventories in relation to sales of the firm is important. Among the supply side factors, raw material, energy, transport, credit, *etc*. are recognised (Sastry, 1980; Rangarajan, 1990; Ajit, 1993).

3.69 An empirical exercise is conducted in order to identify the proximate determinants of capacity utilisation in the manufacturing sector within a behavioural approach. Demand factors embodied in real private final consumption have a strong positive impact on capacity utilisation[6]. On the supply side, energy prices, which affect the cost of production of the industry, have a dampening effect. The dummy variable for the liberalisation period of the 1990s indicates that capacity utilisation could have declined in the post-liberalisation period, indicative of a cyclical catch-up (IMF, 2000). The actual level of capacity utilisation adjusts to the desired level fairly quickly, *i.e.* within a year(Table 3.23).

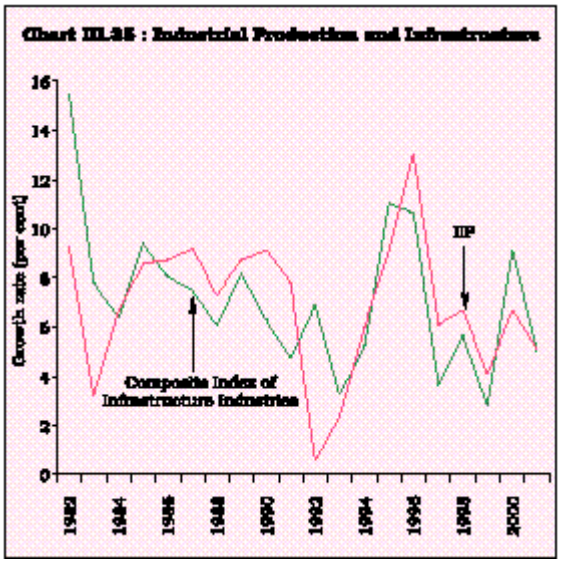
Table 3.23 : Elasticities of Capacity Utilisation in Manufacturing in India

	Elasticities	
	LPFCE	LWPIFUEL
1	2	3
Short-run	0.583	-0.288
Long-run	1.123	-0.555
LPFCE	=log of real private final consumption expenditure	
LWPIFUEL	= log of WPI of fuel, power, light and lubricants	

Infrastructural Constraint on Growth

3.70 Among the institutional and other structural factors underlying industrial growth, infrastructure is recognised as the most important source of output growth because of its simultaneous impact on capacity creation and improvement in productivity of capital. The infrastructural sectors such as transport, power and telecommunications provide critical inputs for the manufacturing sector of the economy. The capital-intensive nature of such services requiring lumpy investment and long gestation periods, characteristics of pure public goods, underscores the role of Government in provision and management of infrastructure. As infrastructure services constitute direct inputs to production, a reduction in cost of such inputs improves the profitability of producing enterprises. Increasing availability of infrastructure facilitates the efficient use of other factors of production like labour and capital. It is argued that though higher output growth leads to higher investment in infrastructure, certain minimum investment in infrastructure is required to achieve a sustainable level of growth. Various studies have estimated the impact of infrastructure on economic growth (Aschauer, 1989; Munnel 1990a, 1990b). In the Indian context, elasticities of output with respect to various stocks of infrastructure indicate that transport and communication sectors play a dominant role in explaining the variations in gross domestic product and in other sectors (Sahoo and Saxena, 1999).

3.71 Industrial output growth in India has closely tracked the movements in the composite index of infrastructure industries during the 1980s and 1990s. This observed relationship between infrastructure growth and industrial performance in India has implications for sustaining the higher output growth and narrowing the output gap over the medium term (Chart III.35).



3.72 Empirical evidence points to a robust relationship between infrastructure investment and productivity growth in the manufacturing sector (Ahluwalia, 1991). The high growth performance of infrastructure sector during the 1980s can be attributed to a strong resurgence in the growth of infrastructure investment during the Sixth and the Seventh Plans. The public sector dominates in the power sector, water supply, railways and roads, *etc*., while the private sector is predominantly in the transport sector, mainly road cargo transport. The India Infrastructure Report (1996) projected infrastructure investment requirement at 8.0 per cent of GDP over a medium term (Table 3.24). The requirements of funds for infrastructure are estimated to rise and an increasing proportion of gross domestic investment would have to be earmarked for financing the infrastructure.

Table 3.24 : Projected Investment Requirements for Infrastructure (Macro Estimates)

(Rupees billion)

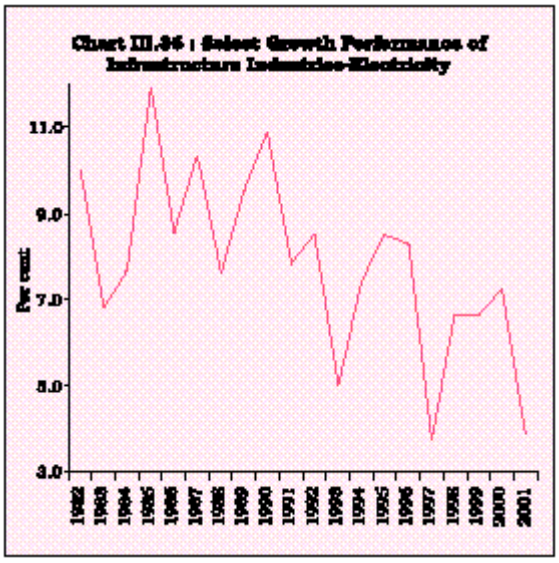
Year	Gross Domestic Investment (GDI)	GDI in Infrast-ructure	GDI in Infrastr-ucture as % of GDP	GDI in Infrastr-ucture as % of - total GDI
1	2	3	4	5
1990-91	1448.5	287.4	5.4	19.8
1995-96	2825.5	598.6	5.5	21.2
2000-01	4512.0	1076.0	7.0	23.8
2003-04	5938.8	1472.3	7.6	24.8
2004-05	6523.4	1639.0	7.8	25.1
2005-06	7179.5	1826.1	8.0	25.4

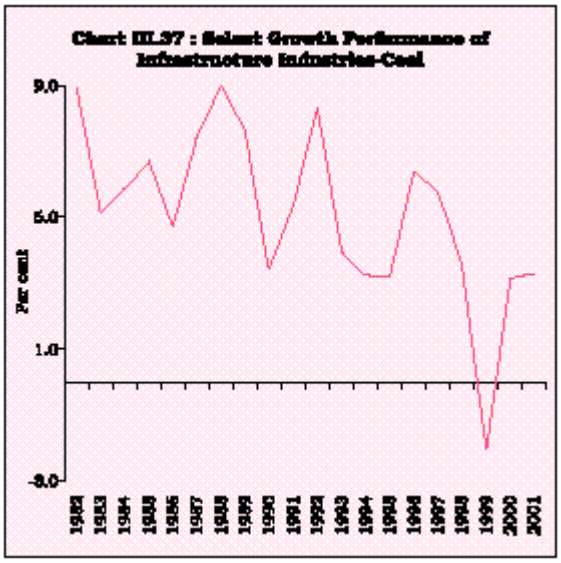
Note : The data for GDP, Projected GDI and GDI in infrastructure from 1995-96 onwards are at1995-96 prices.
Source: The India Infrastructure Report (1996)

Sectoral Imbalances and Gaps in Infrastructure

3.73 Sectoral imbalances in infrastructure impose constraints on the growth of industrial output.

Juxtaposed with the slowdown in the growth of the infrastructure sector between the 1980s and 1990s, the persistence of sectoral imbalances in the infrastructure sub-sectors has simultaneously posed challenges for capacity expansion as well as utilisation of the existing capacity. The sectoral performance during the 1990s reveals that the average growth of all infrastructure industries, except for the steel sector, has remained significantly lower than in the 1980s. The decline in the overall growth of infrastructure sector in the 1990s in relation to the 1980s emanated mainly from a decline in growth of electricity, coal and petroleum. The stylised facts highlight the importance of the energy sector in sustaining higher growth of industrial output (Chart III.36, 37, 38, 39, 40).





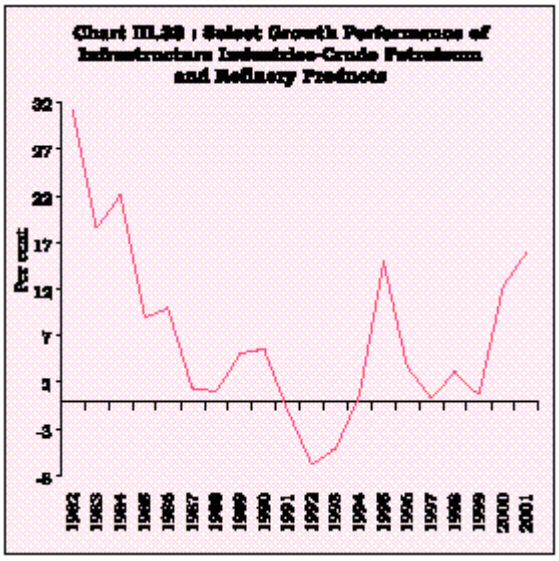


Chart III.38 : Select Growth Performance of Infrastructure Industries-Crude Petroleum and Refinery Products
Per cent
32
27
22
17
12
7
2
-3
-8
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001

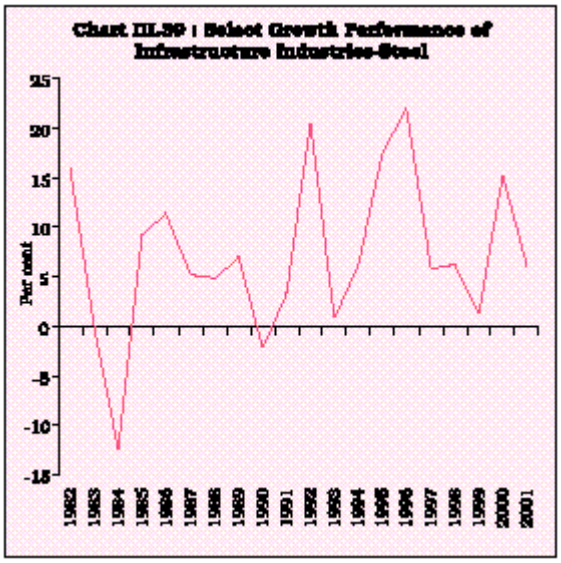


Chart III.39 : Select Growth Performance of Infrastructure Industries-Steel
Per cent
25
20
15
10
5
0
-5
-10
-15
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
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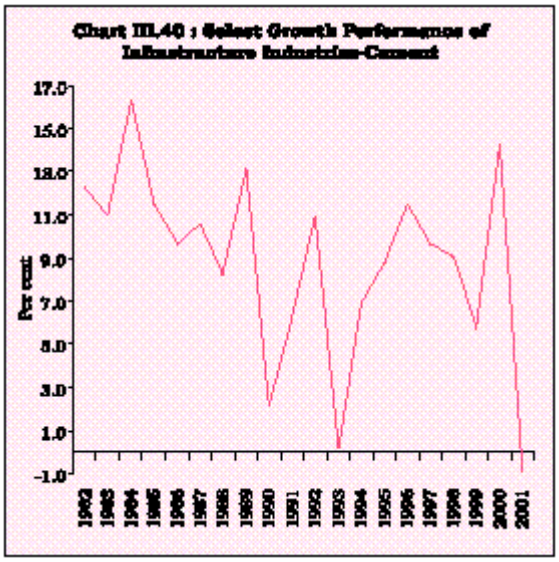
2000
2001



3.74 Identification of sectoral infrastructure gaps assumes critical importance. The deficit in the existing availability of various infrastructure services *vis-a-vis* the potential demand provides a measure of the infrastructure gap. Among the important sub-sectors, the power sector has grown at a rate of 6.6 per cent during the 1990s as against 9.2 per cent in the 1980s. Simultaneously, the gap between demand and supply has remained significant, notwithstanding the fact that several reforms, including private participation, have been undertaken to boost growth of the power sector to fill the gap. The demand-supply gap in power widened to 11.5 per cent by 1996-97 from 7.9 per cent in 1990-91, although there was some decline thereafter. Poor performance of State Electricity Boards (SEBs), with increasing financial strain emanating from low average tariffs and high cross subsidies to agriculture and household sectors has stunted the growth of the power sector (Table 3.25).

3.75 In the telecommunications sector, the demand-supply gap has significantly narrowed from 27.9 per cent in 1991-92 to 12.2 per cent in 2000-01, reflecting the impact of reorientation of policies followed in the sector (Chart III.41). A sharp narrowing in the demand-supply imbalances in this sector notwithstanding, the extent of gap remains higher than the power sector.

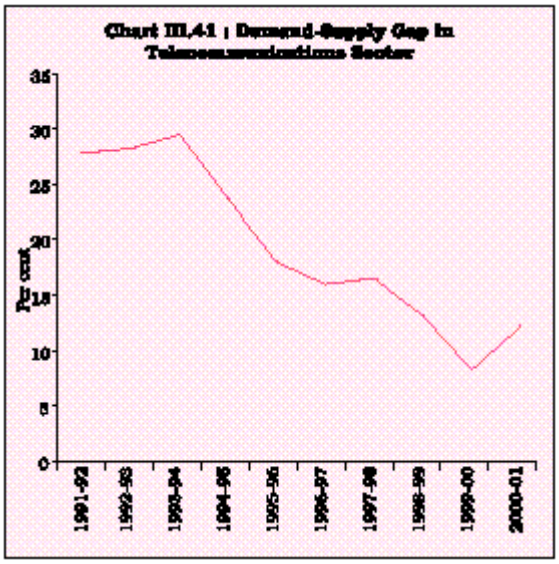


Table 3.25 : Demand-Supply Gap in the Power Sector in India

(Million units)

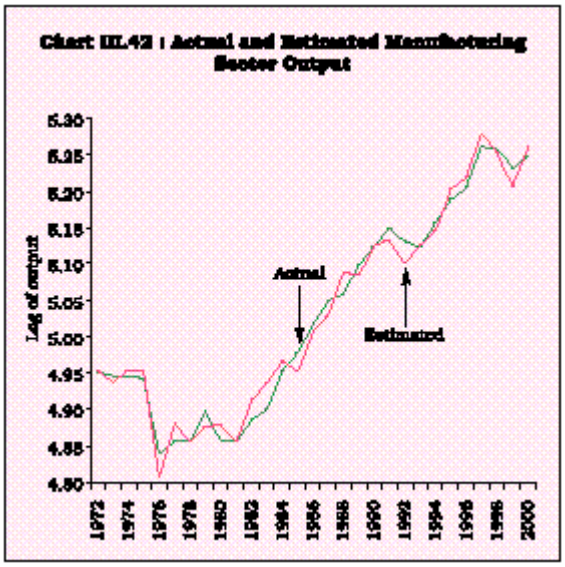
Year	Requirement	Availability	Deficit	Deficit as % of Requirement
1	2	3	4	5
1990-91	2,67,632	2,46,560	21,072	7.9
1991-92	2,88,974	2,66,432	22,542	7.8
1992-93	3,05,266	2,79,824	25,442	8.3
1993-94	3,23,252	2,99,494	23,758	7.3
1994-95	3,52,260	3,27,281	24,979	7.1
1995-96	3,89,721	3,54,045	35,676	9.2
1996-97	4,13,490	3,65,900	47,590	11.5
1997-98	4,24,505	3,90,330	34,175	8.1
1998-99	4,46,584	4,20,235	26,349	5.9
1999-2000	4,80,430	4,50,594	29,836	6.2
2000-01	5,07,213	4,67,401	39,812	7.8

Source: Annual Reports, Ministry of Power, Government of India, various issues.

Although entry of the private sector has led to some increase in service expansion, the rollout of services has not begun as quickly as expected. The existing gaps in the telecom sector have implications for the technical efficiency and productivity growth in the industrial sector.

3.76 The role of public capital in infrastructure in explaining the growth in productivity and output is well recognised. Keeping in view the stylised facts on the performance of infrastructure and demand-supply mismatches, the role of public capital in mitigating these gaps needs some assessment. With a view to exploring the role of public capital in infrastructure in explaining the output growth, a logarithmic form of the Cobb-Douglas production function for the manufacturing sector is estimated with public capital stock as an additional argument (Chart III.42). The public capital in infrastructure emerges as the most dominant factor in explaining output growth in the manufacturing sector with a positive elasticity of 0.76. These estimates highlight the role of public infrastructure investment in sustaining higher output growth in the

long term.



The Sources of Industrial Growth

3.77 The growth process of the industrial sector during the decade of the 1990s has underscored the need for identifying the sources of growth for achieving higher output growth over the medium term. The classical growth theories recognised the role of physical capital accumulation as a determinant of growth. The Harrod-Domar model of growth emphasised the influences of physical capital and savings in creating effective demand as well as productive capacity in explaining the growth process. The role of productivity in the growth process was recognised by Solow (1957) in a growth accounting framework. Evolution of the endogenous growth theory towards the end of the 1980s drew attention to the role of continuous advances in human skills and technology along with factor accumulation to off-set the dampening effect of diminishing returns in sustaining the growth process.

3.78 Factor productivity as a source of industrial growth and trade competitiveness of nations has been well recognised. The total factor productivity (TFP) growth, on an average, accounted for nearly 50 per cent of the output growth for a group of developed countries, whereas the contribution of the same in the case of developing countries was only 31 per cent (Chenery, Robinson and Syrquin, 1986). This was, to a large extent, on account of a much faster growth of factor inputs in developing economies than in the developed economies (Pack, 1988). More recent empirical studies on sources of output growth in developing countries suggest that about 60-70 per cent of per capita growth is explained by capital accumulation, while human capital accounts for 10-20 per cent and the remaining on account of improvement in the total factor productivity (IMF, 2000). Notwithstanding varying evidence, some empirical work on the contribution of factor productivity to output growth in the East Asian economies reveals that the TFP accounted for about 50-55 per cent of the output growth. These diverse findings lead to a broad inference that the growth experience is country specific. It emerges, however, that while capital accumulation is a critical factor for achieving rapid growth, other factors are also important.

3.79 In the Indian manufacturing sector, the analysis of the sources of growth between 1959-60 to 1985-86 indicates that overall long-term annual growth of 5.3 per cent in value added in the manufacturing sector was associated with rapid growth of capital (8 per cent), moderate growth of employment (3 per cent) and negative growth in TFP at 0.4 per cent (Ahluwalia, 1991). These findings suggest that till the mid-1980s, the entire growth was led mainly by the capital accumulation and the contribution of productivity growth was negligible, reflecting the low efficiency of factor use. A synoptic view of the studies conducted on the Indian manufacturing sector indicates that even though an increasing trend in labour productivity has been witnessed in case of most of the industry groups, the level of labour productivity in India is abysmally low and its convergence to international standards seems to be a difficult proposition in the near future (Table 3.26).

3.80 In these studies, factor productivity growth obtained through the single deflation approach is lower than the double deflation approach, implying that the relative prices of inputs and output have increased over time[7]. Firm level panel evidence, however, indicates a strong evidence of a decline in productivity growth rates in the 1990s as compared with the 1980s. Productivity growth of firms in the manufacturing sector could have been adversely affected by the poor performance of the efficiency component in productivity (NCAER, 2001). For small-scale industries, there is a decline in labour productivity growth during the1990s (1990-96) to 3.7 per cent from 6.2 per cent in the 1980s and a decline in capital productivity growth to -1.6 per cent from 2.6 per cent during the same period (SIDBI, 2000).

Table 3.26 : Trends in Factor Productivity in the Manufacturing Sector in India- Alternative Estimates

(Per cent per annum)

Study	Period Covered	TFPG (Single Deflation Method)	TFPG(Double Deflation Method)
1	2	3	4
Brahmananda (1982)	1950-51 to 1980-81	-0.2	
Ahluwalia (1985)	1959-60 to 1979-80	-0.6	
Ahluwalia (1991)	1959-60 to 1985-86	-0.4	
Balakrishnan and Pushpangadan (1994)	1970-71 to 1988-89	0.5	3.1
Majumdar (1996)	1950-51 to 1992-93	1.7*	
Rao, M.J. (1996)	1973-74 to 1992-93	1.3@	2.2
Pradhan and Barik (1998)	1963-64 to 1992-93	0.6	
Trivedi *et al* (2000)	1973-74 to 1997-98	1.95	3.7
NCAER (2001)	1980-81 to 1996-97	-0.05 to 0.04#	

* The estimates are reported only for the sub-period 1973-74 to 1992-93, out of the total period of the study spanning 1950-51 to 1992-93.

@ Growth rate of TFP is obtained indirectly from the estimates of TPG.

\# Represent different econometric estimates of TFPG based on the firm level panel data set.

3.81 In the context of the growing degree of openness of the economy, the level and growth rates of productivity of labour and capital have to be compared with some benchmark levels. Comparative levels of value added per person in manufacturing in 1987 revealed that for India, the ratio was only 7.2 per cent of that of the United States and 10.3 per cent of that of the West Germany (Ark, 1996). This indicates that the level of productivity in India is relatively low and would require considerable improvement to achieve convergence to the international levels.

3.82 Sources of productivity growth in India could broadly comprise infrastructure, reorientation in the trade and industrial policies, foreign direct investment along with technology transfers, reforms in the labour market to impart necessary flexibility and supply response, changes in exit procedures through appropriate legislation on industrial sickness, the Companies Act and industrial disputes and bankruptcy laws. The supply side response would depend upon raising investment in infrastructure, hastening of disinvestment process and restructuring of public enterprises.

Technological Progress and Industrial Growth

3.83 Productivity growth is the combined effect of pure technical progress as well as the improvement in the overall efficiency of factor use. Technological change involves an improvement in technology, knowledge and work efficiency. Technological progress is recognised as the key to maintaining productivity growth, and the driving force behind economic growth (Solow, 1957).

3.84 Attempts have been made in recent years to examine the role of technology expenditure on growth of productivity and output. Empirical findings support the view that science and technology play a critical role in the growth process of major industrialised countries (Sveikauskas, 1983). The hypothesis that research and development (R&D) fosters productivity growth through advances in technology has also gained support at the empirical level (Scherer, 1983). While explaining the differences in growth rates of labour productivity in the industrialised countries, it is found that technological development in the form of the growth of R&D expenditures and technology gap explain the growth rate of labour productivity in the industrial countries (Rensman and Kuper, 2000). In the case of newly industrialised countries, rapid growth in productivity and output is found to be the outcome of the ability to acquire advanced technology (Rothwell and Zegveld, 1985). These findings have important implications for the developing countries aiming for higher productivity growth since technological progress is based mainly on the import of technology.

3.85 Given that the Indian firms do not spend much on R&D, import of capital goods and machinery has had a significant impact on corporate performance. Capital deepening (*i.e.*, rise in capital-output ratio) was not found to be favouring the performance of larger firms, implying that up to a certain point, capital deepening might help growth and profits, beyond that further increases in the capital-sales ratio prove counterproductive to growth and profits (Siddharthan, 1992). These empirical findings, though relate to the pre-liberalisation period, lend support to the role of technological progress in enhancing productivity and growth. In the context of the technology gap in Indian industry during the 1980s, the per firm expenditure on technology imports revealed a steady rise, while the R&D expenditure continued to remain meagre (Swaminathan, 1993).

3.86 The impact of the reform process on technological improvement can be evaluated by comparing these indicators to the outcome of the 1990s. In the case of public limited companies in India, the ratio of R&D expenditure to their total output was as low as 0.08 per cent in 1985-86, increasing to 0.31 per cent in 1990-91 and remaining almost at that level in 1999-2000. This reflects considerably low level of R&D expenditure in the production process as compared with

industrialised countries. One of the factors for inadequate growth in R&D expenditure during the post-liberalisation period is the liberalisation of technology import and foreign investment policy (Table 3.27).

3.87 The sectoral break up of R&D expenditure suggests that the maximum investments are recorded in chemical and pharmaceutical groups, followed by engineering, motor vechicles, transport and information technology. The R&D expenditure on electricity generation and supply witnessed sharp decline during the 1990s. The low level of R&D expenditure in the Indian industry may have implications for productivity growth, competitiveness and export performance; however, the unfavourable impact can be, to a certain extent, mitigated through technology imports and foreign collaboration.

Table 3.27 : Research and Development Expenditure in Public Limited Companies

(Per cent of total output)

	Industry	1985-86	1990-91	1995-96	1999-2000
	1	2	3	4	5
	Aggregate	**0.08**	**0.31**	**0.28**	**0.29**
1.	Tea,Sugar, Jute	0.02	0.09	0.1	0.04
2.	Cotton Textile & Rayon	0.01	0.05	0.13	0.08
3.	Engineering, Motor vehicles, Transport *etc*.	0.11	0.38	0.31	0.31
4.	Chemicals & Pharmaceuticals *etc*.	0.08	0.33	0.39	0.39
5.	Cement	0.04	0.16	0.11	0.12
6.	Rubber and Paper Products	0.05	0.2	0.2	0.23
7.	Electricity Generation and Supply	—	0.53	0.07	0.01
8.	Information & Technology	—	—	—	0.28

Source: Selected Financial Statistics of Public Limited Companies, RBI

3.88 An important feature of technological progress in India since 1991 has been the growth in foreign collaborations. The Indian experience shows that FDI has increasingly moved into priority areas such as power generation, oil refining, telecommunications, electronics and food processing, *i.e.*, the sectors where domestic investment is inadequate. The trends in FDI inflow reflect an increasing trend in the 1990s; however, FDI inflows to India continue to remain marginal when compared with the aggregate flow to the emerging economies and the gap between FDI approvals and actual inflows continues to remain wide (Table 3.28).

Table 3.28 : Number of Foreign Collaboration Approvals and FDI

Year	No. of Foreign Collaboration approvals	FDI in India (US $ Million)	FDI to All Developing Countries (US $ Million)	FDI to India as % of FDI to all Developing Countries
1	2	3	4	5
1981	389	92	12293	0.7
1986	957	118	9482	1.2
1991	950	74	35494	0.2
1992	1520	277	47130	0.6
1993	1476	550	66574	0.8
1994	1854	973	90036	1.1
1995	2337	2144	106990	2.0
1996	-	2426	131451	1.8
1997	-	3577	172571	2.1

1998	-	2635	176764	1.5
1999	-	2169	185408	1.2
2000	-	-	178004	-

Source : Reserve Bank of India and Global Development Finance, World Bank.

3.89 There is no empirical evidence of complementarity between technology import and domestic technological efforts and export performance of FDI firms (Subrahmanian, *et al*,1996). Accordingly, strategic interventions by using the country's comparative advantage in R&D and other inputs are considered necessary to strengthen linkages between multi-national corporations and Indian firms for domestic technological progress, and non-equity forms of tie-ups can be used for acquiring advanced technologies with greater scope for local adaptations, improvements and innovations.

3.90 Apart from the state of technology, efficiency improvements, which are endogenous to the firm, are critical in achieving outward shifts of the production frontier. The mean technical efficiency of Indian firms taken together seems to have declined in the 1990s as compared with the pre-reform period, particularly in the manufacturing sector (NCAER, 2001).

3.91 Cyclical variations in activity superimposed upon a persistent slowdown, underutilisation of capacity in various industries and the tightening of structural impediments have combined to produce a drag on industrial growth. A higher level of output growth can be sustained only by considerable improvements in the existing levels of infrastructure, particularly telecommunication and power. FDI can be an important conduit for technology transfer in India, although it currently operates only at the margin. In the case of public enterprises, productivity improvement would essentially require setting a clear path for restructuring and privatisation. The institutional environment in which the public sector operates would require significant reforms. A conducive environment for industrial growth hinges upon the rationalisation of labour legislations, changes in exit procedures through appropriate legislation relating to industrial sickness, and modifications in the Companies Act and industrial disputes and bankruptcy laws to impart necessary flexibility and supply response in the labour market. These measures would reduce the implicit cost of labour in production process.

IV. SERVICES IN THE INDIAN GROWTH PROCESS

3.92 The phenomenal expansion of services world-wide led to services being regarded as an engine of the growth and even as a necessary concomitant of economic growth. In development economics, seminal works on phases of growth (Fisher, 1935; Clark, 1940; Rostow, 1960; Kuznets, 1971) suggest that development is a three-stage process. The dominance of the services sector in the growth process is usually associated with the third stage of growth. In this context, the ascendancy of services even in developing countries has been regarded as a mutation of growth. During the 1980s and 1990s, services accounted for a share of close to or above 70 per cent of GDP in industrialised countries and about 50 per cent in developing countries. In India, services accounted for 38.6 per cent of the GDP in the 1980s and 44.3 per cent in the 1990s.

The Stylised Evidence

3.93 The growth of services sector has imparted resilience to the economy, particularly in times

of adverse agricultural shocks as also during cyclical downturns in industry. The share of services sector has been steadily increasing, with a fairly rapid growth in the 1990s (Table 3.29 and Chart III.43).

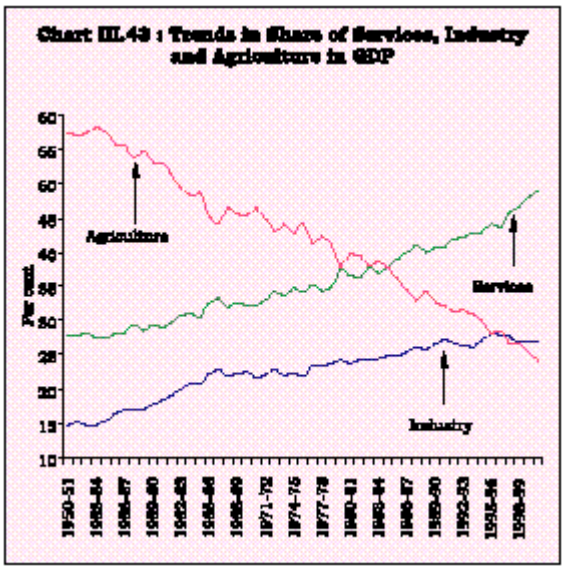


Table 3.29 : Sector-wise Average Shares, Growth Rates and Contribution to GDP Growth

(Per cent)

Period	Services			Industry#			Agriculture		
	Share in GDP	Growth Rate	Contribution to GDP Growth	Share in GDP	Growth Rate	Contribution to GDP Growth	Share in GDP	Growth Rate	Contribution to GDP Growth
1	2	3	4	5	6	7	8	9	10
1950-51 to 1959-60*	28.2	4.1	32.2	16.0	5.7	25.3	56.0	2.3	42.5
1960-61 to 1969-70	31.4	4.9	38.1	21.1	6.5	32.9	47.8	2.5	29.2
1970-71 to 1979-80	34.4	4.5	52.7	22.8	3.7	28.7	42.8	1.3	18.6
1980-81 to 1989-90	38.6	6.6	43.6	25.0	6.8	28.9	36.4	4.4	27.5
1990-91 to 2000-01	44.3	7.6	57.6	27.1	5.9	27.6	28.6	2.9	14.8

\# Inclusive of construction

* 9 year data for growth and weighted contribution since data for 1949-50 are not available.

Due to rounding off, sectoral data may not add up to 100.

Source : National Accounts Statistics, CSO.

3.94 The weighted contribution of the services sector to GDP growth has been rising since the 1960s except during the 1980s when industry and agriculture recorded substantial acceleration, which led to erosion in their contribution to GDP growth. However, a resurgence of services in the 1990s with a growth of 7.6 per cent enabled services sector to contribute 57.6 per cent to GDP growth.

3.95 A notable feature of the structural transformation of the services sector has been the growth of skill intensive and high value added sectors, *i.e.*, software, communication and financial services. The rapid growth of services can be attributed, *inter alia*, to the advent of information technology (IT) and the knowledge economy. This has enhanced the growth of the high productivity segment of the services sector as well as a variety of service activities involving low productivity activities catering to a large mass of people. The phenomenal growth of low skilled

service activities has occurred due to reduced opportunities in the manufacturing sector, particularly in the unorganised sectors.

3.96 Trade, hotels, restaurants and transport and communication are the major segments in terms of their share within the services sector; however, their share in the value added in the services sector has remained constant at around 49 per cent during the 1970s and 1980s, before marginally declining in 1990s. The share of finance, insurance, real estate and business services witnessed significant improvement during the 1990s on account of the rapid pace of financial development (Chart III.44 and Table 3.30). The buoyancy in the services sector output is concentrated in the new economy sectors such as computer software and financial and business services. In the national income accounts, the contribution of the software industry in the real GDP is estimated at 0.78 per cent in 1999-2000. If raw materials in this sector are accounted for, contribution of the software sector (net of inputs) to GDP stands at about 1 per cent as per the estimates of the NASSCOM and the CMIE.

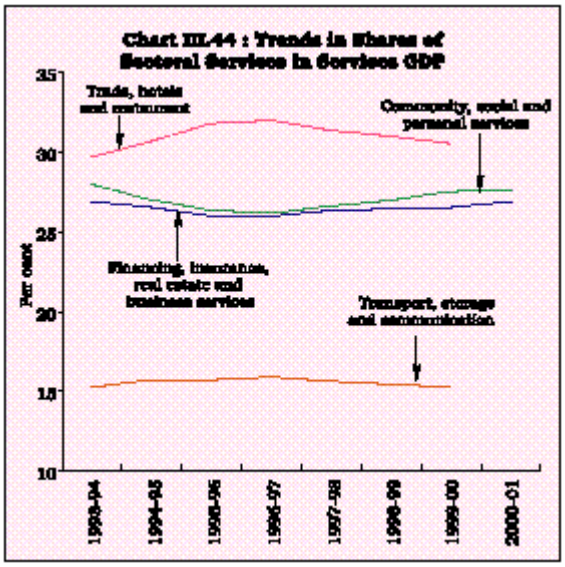


Table 3.30 : Average Share of Sub-sectors in Services Value-added (at constant prices)

(Per cent)

Period	Trade, Hotels, Transport and Communi-cation	Finance, Insurance, Real estate and Business services	Social and Personal services
1	2	3	4
1950-51 to 1959-60	44.3	23.0	32.8
1960-61 to 1969-70	48.2	19.5	32.3
1970-71 to 1979-80	49.1	18.4	32.5
1980-81 to 1989-90	48.7	20.4	30.9
1990-91 to 2000-01	46.3	26.1	27.1

3.97 Some of the activities in the services sector are multidimensional, being part of industry as well as services, such as information technology and construction. Service statistics in most

countries including India provide information on value-addition of various activities of business services, hotels, trade, financial services, *etc*. For an empirical analysis, sub-sectors including trade, transport and communication, financing, insurance, real estate and business services can be categorised as producer services with hotels and restaurants and other services as consumer services. Government services comprise public administration and defence services. During 1999-2000, producer services accounted for about 70 per cent of the total services followed by consumer services (17 per cent) and government services (13 per cent). The high share of producer services reflects the strong inter-linkages between services and goods producing sectors of the economy.

Income Elasticity of Demand for Services

3.98 A rising share of services in GDP is regarded as an outcome of higher income elasticity of demand for services. The empirical studies have shown that the income elasticity of demand for services could be greater than or equal to unity (Gemmell, 1982; Summers, 1985; Bergstand, 1991; Falvey and Gemmell, 1991). Income elasticity of demand for services increases with rising income which favours the fulfillment of more sophisticated desires. During the development process, distribution of GDP and employment register sectoral shifts. Such shifts may occur on account of the hierarchy of needs, distinguished into basic needs for food and shelter and needs for other material and non-material goods including services (Maslow, 1970). According to this view, income elasticity of demand depends on per capita income and differs across various sectors.

3.99 The empirical estimates of price and income elasticity for various categories of services in India are summarised in Table 3.31[8]. It is important to mention that the actual behaviour of the services sector in real GDP depends on the relative strength of the coefficients of income and price elasticity.

Table 3.31: Income and Price Elasticities for the Services Sector

Sector	Income Elasticity	Price Elasticity
1	2	3
Services	1.20 *	-0.68 *
1. Producer Services	1.22 *	-0.78 *
2. Consumer Services	1.00 *	-0.10
3. Government Services	1.41 *	-1.05 *

* Statistically significant at 1 per cent.

3.100 The income elasticity of demand is greater than unity and price elasticity is negative and significant for the total services, producer services and government services. In other words, demand for overall services rises with increase in per capita GDP and decreases with increase in prices of services. The higher income elasticity of demand in the case of producer services underscores its forward linkages. This is corroborated by the emergence of producer services comprising advertising, publicity, marketing and other IT-related activities in the recent period as important service industries in India. Therefore, producer services can be regarded as a major source of economic growth. Similarly, public administration, social services, rural extension services and defence sectors which together comprise government services, have a high income elasticity of demand. In the case of consumer services, the income elasticity is almost equal to unity and price responsiveness is not detected. It indicates that demand for consumer services

increases in same proportion to change in real per capita income and is price insensitive. In order to check for robustness of the empirical findings, the hypothesis of constant share of services in GDP is tested[9]. The results indicate that the share of overall services responds by 0.34 per cent to a unit change in per capita real GDP while producer and government services respond by 0.41 per cent and 0.27 per cent, respectively. On the other hand, in the case of consumer services, with a unit income elasticity and insignificant price elasticity, its share is found to increase by a marginal 0.08 per cent. However, the results need to be interpreted with caution as the coefficient of determination, *i.e.* adjusted R^2, is quite low in the case of consumer services (Table 3.32).

Table 3.32 : Service Share Regression Coefficients

	Coefficient	Adjusted R^2	D.W.
1	2	3	4
Services	0.34	0.92	1.55
1. Producer Services	0.41	0.94	1.38
2. Consumer Services	0.08	0.22	1.11
3. Government Services	0.27	0.43	0.48

Note : All the coefficients are significant at 1 per cent .

Services, Employment and Productivity

3.101 The level of employment in services is strongly correlated with the stage of economic development; while agricultural and manufacturing activities account for a major share of employment in developing countries, services activities account for a major portion of employment in most developed countries. Various studies have explored the sources of growth in services employment (Baumol, 1967; Fuchs, 1968). Lagging productivity in the services sector is considered as the main reason behind the rising share of service employment in total employment even though share of services in real GDP remains constant, implying the existence of Baumol's cost disease (Baumol, 1967).

3.102 In India, the services sector accounted for 18.1 per cent of the total employment during 1965-66, going up to 23.5 per cent in 1999-2000. Generally a substantial increase in the share of services in employment in most countries could imply a growth of low productive, low income, informal sector (Bhaduri, 1996). However, the increase in earnings per worker in the services sector compared with the industry could mean that at least part of the increase in employment in the services sector is in the formal, perhaps public sector, or in the new IT-related industries with higher use of capital per worker (Table 3.33).

Table 3.33 : Share of Services Sector in Total Employment

Period	Employment in Services Sector (in crore)	Total Employ-ment (in crore)	Share of Services in total Employ-ment (%)
1	2	3	4
1965-66	3.97	21.93	18.1
1970-71	4.82	24.09	20.0
1980-81	5.71	30.24	18.9
1990-91	8.70	35.68	24.4
1999-2000	10.29	43.81	23.5

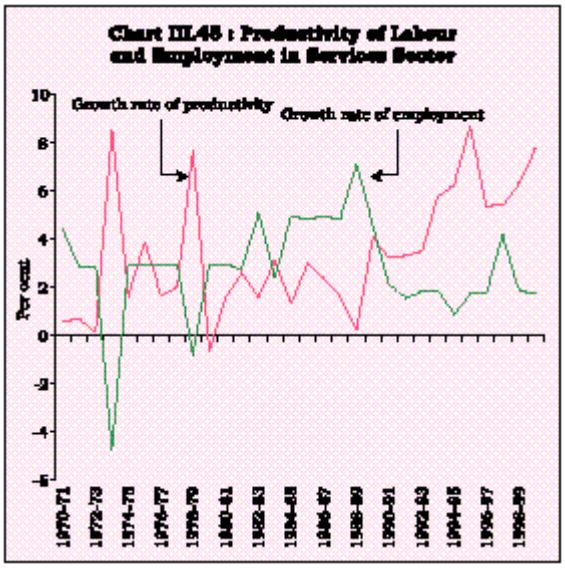
Source: National Sample Survey Organisation (various rounds) and Visaria,1996.

3.103 In order to focus upon the differences in growth rate of employment and gross value added in services sector since 1970-71, a difference of means test is employed with the following null hypotheses: (i) there is no difference in the growth rate of employment in services sector and growth rate of gross value added in services sector; (ii) there is no difference between labour productivity growth and employment growth in services sector. Labour productivity is defined as value added in services sector divided by total labour in services sector (Table 3.34).

Table 3.34 : Difference of Means Test for Differences in Growth Rates

Period		Null Hypothesis	Mean difference	Finding at 1% level of significance
1		2	3	4
i)	1970-71 to 1999-2000	No difference between the growth rates of Employment and gross value added in services sector	-3.5	Null hypothesis Rejected
ii)	1970-71 to 1999-2000	No difference between the growth rates of labour productivity and employment in services sector	0.7	Null hypothesis Accepted
a)	1970-71 to 1979-80	No difference between the growth rates of labour productivity and employment in services sector	0.7	Null hypothesis Accepted
b)	1980-81 to 1989-90	No difference between the growth rates of labour productivity and employment in services sector	-2.2	Null hypothesis Rejected
c)	1990-91 to 1999-2000	No difference between the growth rates of labour productivity and employment in services sector	3.6	Null hypothesis Rejected

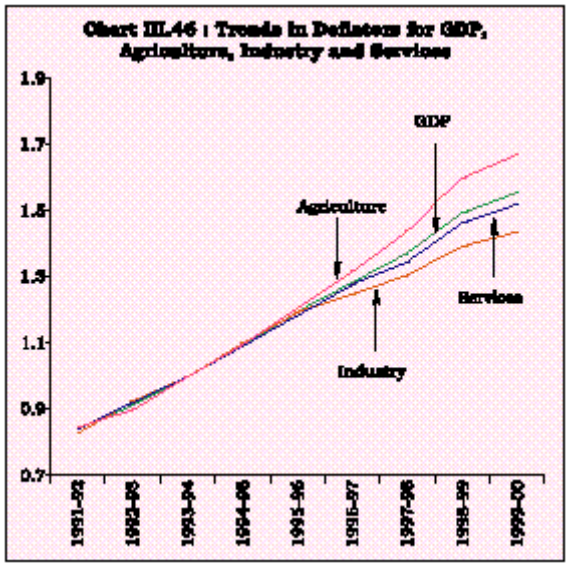
3. 104 The results show that hypothesis (i) can be rejected, *i.e.*, growth rates of employment and value added in services sector are statistically different from each other during 1970-71 to 1999 - 2000. As the mean difference is negative, the value added growth in services sector is, on an average, higher than employment growth in services sector, which confirms the finding of other studies that services sector has undergone a less than proportionate increase in employment in relation to output (Mitra, 1988; Bhattacharya and Mitra, 1990). The second hypothesis about the differences in productivity and employment growth in services has been tested decade-wise. Growth in services productivity for the whole period of 1970-2000 is observed to be higher but not statistically significant. The growth rate of productivity in services sector has been higher during the 1990s as the mean difference is found to be positive and statistically significant. Thus, unlike many other countries, growth of average productivity of labour in India has remained higher than employment growth in services sector during the post-reform period. The empirical findings are supported by the declining capital-output ratio in the services sector which can be interpreted as efficient use of capital by skilled labour and low contribution of services to total employment in contrast to its high contribution to overall GDP. This points towards a growth in total factor productivity in services (Chart III.45).



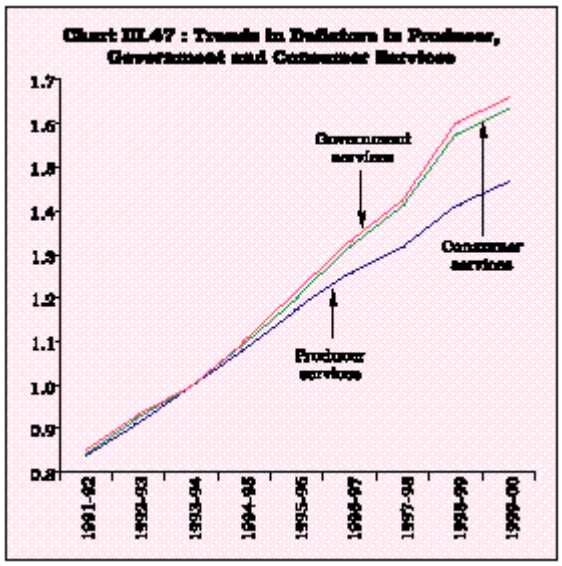
Terms-of-Trade

3.105 The services sector is not covered in the construction of Wholesale Price Index (WPI), leaving a major portion of economic activities outside the measurement of headline inflation. Therefore, the inter-sectoral terms-of-trade can only be studied with the help of sectoral deflators. However, such deflators have their inherent limitations, as they are available with low frequency.

3.106 There are divergent views on intersectoral terms-of-trade; nevertheless, the trend in sectoral deflators shows that terms-of-trade have remained in favour of agriculture *vis-a-vis* industry or services all through the 1990s. Thus, the gap between the sectoral deflators has been widening in favour of agriculture at the cost of services and industry. On the other hand, a comparison between services and industry shows that terms-of-trade have remained in favour of services (Chart III.46).

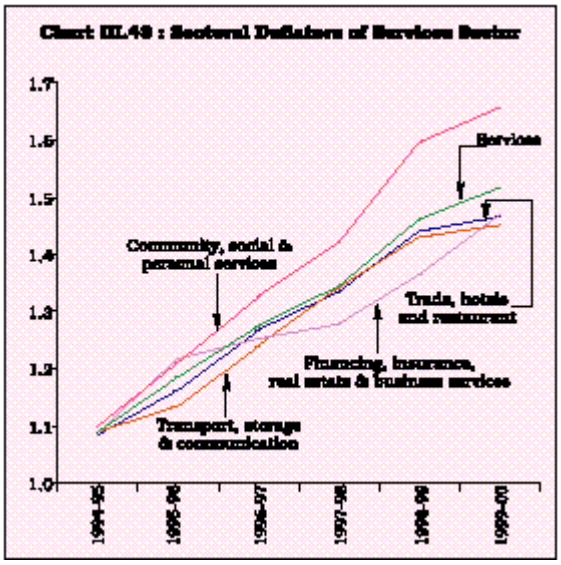


3.107 Within the services sector, the terms-of-trade have remained in favour of government services, closely followed by consumer services. The gap in the deflators between producer services, on the one hand, and consumer and government services on the other, has been widening since 1993-94. This is possibly due to the fact that for government services, which include public administration and defence, the behaviour of the deflator depends largely on government policies. The recent pay hike following the fifth pay commission's recommendation might have contributed to a relatively high deflator (Chart III.47).



3.108 The terms-of-trade have remained in favour of community, social and administration services since 1995-96 while the deflator of financing, insurance and business services is moving upward at a faster rate since 1998-99. Deflators of other two sub-sectors (transport, storage and communications and trade, hotels and restaurants) have been moving in close proximity of each other (Chart III.48). The behaviour of inter-sectoral and intra-sectoral terms-of-trade in services would have a bearing on India's position *vis-à-vis* the evolving multilateral framework for

international trade in services (Box III.4).



Box III.4
WTO and Services

The growing role of international services and their implications have come to be recognised in the General Agreement on Trade in Services (GATS) of the World Trade Organisation (WTO). The WTO rules on services trade, as embodied in the GATS and negotiated in the Uruguay Round, are the first ever set of multilateral, legally enforceable rules covering international trade in services. Like the agreements on goods, GATS operates on three levels: the main text containing general principles and obligations; annexes dealing with rules for specific sectors; and individual countries' specific commitments to provide access to their markets. Unlike in goods, GATS has a fourth special element: lists showing where countries are temporarily not applying the 'most favoured nation' (MFN) principle of non-discrimination. The temporary withdrawals of MFN treatment are also an integral part of GATS. A WTO council on services oversees the operation of the agreement. Under the framework of GATS Article, it covers all internationally traded services and the MFN clause applies to all services except the one-off temporary exemptions. It deals with foreign competition although the negotiations and commitments made can have a bearing on dismantling of domestic monopolies. The definition of what constitutes trade in services is currently a subject of multilateral negotiations.

India falls in the category of developing countries that show relatively strong position in earnings from labour and travel, with negative positions in trade in goods and most of other service categories excluding IT related services. During 2000-01, there was a surplus amounting to US$ 294 million and US $ 135 million on account of travel and insurance, respectively, in India's Balance of Payments while the deficit on merchandise account amounted to US $ 14,370 million.

The advocates who favoured inclusion of services in the Uruguay Round negotiations argued that free trade in goods is insufficient. On the other hand, many of the developed nations have opined that only those sectors (*e.g.*, banking, insurance and telecommunication) in which they enjoy a comparative advantage, should be brought under the purview of GATS. It is generally felt that India should strive for a liberalised deal in the case of professional services in general and software services in particular in which she has a comparative advantage. On the other hand, there is a need to tread cautiously in respect of some services sub-sectors like banking and insurance. Liberalisation in financial services sector could be introduced in a phased manner with some regulations, as unbridled liberalisation may affect the financial stability. However, keeping with its commitment to multilateral agreement on services, India has recently raised the limit for banking licenses in respect of foreign banks from 8 to 12 in the Financial Services Agreement. In addition to this, as a part of unilateral liberalisation, India has opened up its insurance sector and other financial services including financial consultancy for foreign investment with some limit on market

access. Thus, India's interest in the ongoing GATS negotiations is uniquely placed, given her comparative advantage in the professional services and her concerns for a well calibrated and cautious liberalisation of financial services.

The recently concluded Ministerial Conference of the WTO at Doha recognised the work already initiated since early 2000 under Article XIX of GATS and many countries have submitted proposals on a wide range of sectors and other issues as well as on movement of natural persons. Among the different modes of services supply, India is most interested in movement of natural persons and has also submitted a proposal at the WTO Council for trade in services. However, other modes, *viz.*, commercial presence, cross border supply and consumption abroad are also important for making the Indian service sector a major player in emerging international scenario.

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Sustainability of Services Sector Growth

3.109 Besides its direct contribution to GDP, services sector can be a source of productivity for other sectors and can thereby facilitate expansion in other sectors of the economy. In India, it is the services sector which has kept the GDP growth around 6.0 per cent in the 1990s when industry and agriculture sectors did not perform relatively well. The coefficient of variation of sectoral growth rates, used as a proxy for output variability, is found to be low for services as compared with other sectors (Table 3.35).

Table 3.35: Coefficient of Variation of Sectoral Growth Rates

(Per cent)

Period	Agriculture	Industry	Services
1	2	3	4
1970-71 to 1979-80	623.0	100.0	33.3
1980-81 to 1989-90	138.6	30.9	19.7
1990-91 to 1999-2000	125.0	58.7	26.3

3.110 As real per capita GDP grows, demand for services increases more than proportionately and this, in turn, reinforces GDP growth itself. Within the services sector, demand for producer and government services, which constitute mainly intermediate consumption, have strong multipliers impacting on real GDP. On the other hand, the demand for consumer services, which can be considered as final consumption, does not increase proportionately with the increase in real GDP. Therefore, producer and government services seem to be more important as future source of growth. Besides, there is now a general consensus on the vast potential in some segments of services sector for yielding increasing returns, particularly IT related and software services even though their shares are currently small. There has been a gradual shift towards use of IT both in the public sector and the private sector, particularly in education, medical services and exports. Accordingly, the Task Force on Human Resource Development in Information Technology set up by the Central Government has recommended government intervention in promotional activities like distributive services, financial services, business services, administration services, entertainment services and personal services which, in turn, would provide the much needed demand push for IT development from domestic sources. The growth of such dynamic service activities, which are intensive users of communication and information technology, will generate employment opportunities on a rising scale. Already, banking and

insurance sectors have started synergising with IT.

3.111 The financial services sector, with its significant share in services could turn out to be an influential source of growth. Export of services which, at present, contributes approximately 26.7 per cent of total exports can give a major boost to overall economic growth. With information technology-led global progress, trends are likely to be in favour of a major expansion of the world trade in services, particularly communication, financial services, computer and information services, technology transfers and different business services. India, with its large and expanding knowledge base, can explore the opportunities (Raipuria, 2001). The labour productivity in software is twice the ratio of India's manufacturing and 1.3 times that of the US (Arora and Athreye, 2001). The potential of its high capacity to generate wealth, foreign exchange and employment has been recognised at all levels. The global IT industry offers Indian companies unique opportunities in four broad areas: value-added IT services, software products, IT enabled services and e-business (Unni and Rani, 2000). As per NASSCOM projections, India's software and IT services sector is set to grow at a rate of 30 to 35 per cent during 2001-02. The IT industry is slated for a target revenue of US $ 87 billion by 2008 with a 7.5 per cent contribution to the GDP.

3.112 The process of economic growth has itself led to the emergence and expansion of new services such as advertising, publicity, marketing, *etc.* These sub-sectors provide essential service inputs to other sectors in the economy, thereby developing strong linkages with the rest of economy. Various studies have examined the expansionary potential of services sector in non-services industries and found strong forward linkages, as 50 per cent of the industries in the economy are found to be directly or indirectly service intensive (Dutta, 1989; Bhowmik, 2000).

3.113 Efficient delivery of services increases the productivity of both labour and capital in the economy as a whole. In general, services sector appears to be highly growth inducing with positive externalities for other sectors, making services a catalytic agent of growth. It needs to be recognised that the services sector in itself is not homogenous. Therefore, the expansion of these sectors needs to be calibrated and integrated simultaneously into the overall growth process to impart an element of sustainability.

V. REGIONAL DIMENSION OF ECONOMIC GROWTH IN INDIA

3.114 The regional dimensions of growth of the Indian economy are assuming increasing relevance in the context of the progressive diffusion of structural reforms at the sub-national level. The quality of growth is getting increasingly assessed in terms of durable improvement in the regional growth profiles in which the interface between public policies for accelerating development and standards of living is the greatest. Moreover, regional patterns of growth provide a gauge of the quality of public policies themselves and their impact on macroeconomic welfare. The various facets of the growth experience of States in India are critical for developing an understanding of the sources of demand generation as well as changes in productivity and growth. The growth performance in the States is often the outcome of institutional and non-economic factors interacting with the initial conditions which encompass various aspects of human capital development.

3.115 Varying degrees of reform in different States have yielded wide variations in growth performance. In this context, it has been pointed out that the popular characterisation of backward States such as Bihar, Madhya Pradesh (M.P.), Rajasthan, and Uttar Pradesh (U.P.) as a homogenous group of poor performers does not hold good in terms of recent economic performance (Ahluwalia, 2000). It has also been argued that reforms have unshackled a number of States like Andhra Pradesh (A.P.), Gujarat, Karnataka, Maharashtra and Tamil Nadu (T.N.) who could achieve their true economic potential in recent years (Bajpai and Sachs, 1999). From a completely different paradigm, the faster growth in select States has been interpreted as the operation of some kind of unbalanced growth with differing rates of catching up (Chaudhuri, 2000). Three other issues are raised in the context of Indian regional development, *viz.*, fiscal, infrastructure and human resources development (World Bank, 2000).

Regional Growth Profiles[10]

3.116 The State-wise profile of per capita State Domestic Product (SDP) drawn up for 15 major States (representing nearly 90 per cent of Indian population) exhibits significant variation. In 1980-81, there were only four States *viz.*, Maharashtra, Punjab, Gujarat and Haryana whose per capita real SDPs (at 1980-81 prices) were higher than the all-India per capita real GDP (Table 3.36). The trend remained more or less similar in 1990-91. In the 1990s, this group expanded to include Tamil Nadu. Relative rankings in terms of absolute SDP need to be evaluated against a comparison of growth rates. In terms of trend growth rate, Karnataka, West Bengal, Maharashtra, Tamil Nadu, Andhra Pradesh have done well in the 1990s (Chart III.49).

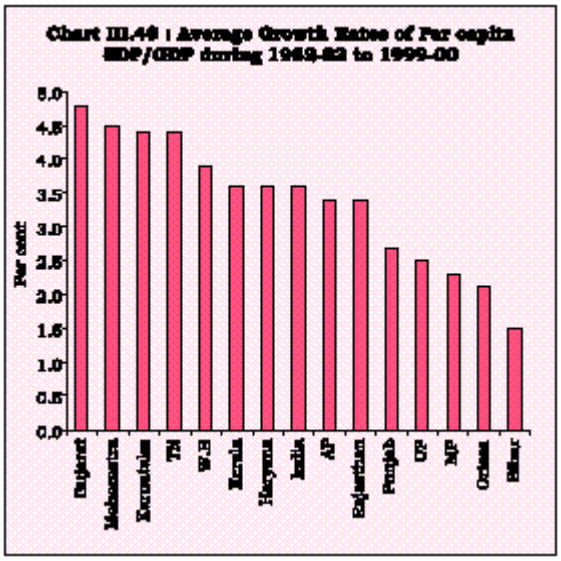

Table 3.36 : Trend Growth Rate of Per Capita SDP

(Per cent)

States		1980-81 = 100		1993-94 =100
		1981-82 to 1990-91	1981-82 to 1993-94	1993-94 to 1999-2000
	1	2	3	4
1	Karnataka	4.0	4.5	4.5
2	Gujarat	3.3	3.1	2.4
3	West Bengal	2.7	2.9	5.6

4	Kerala	4.3	3.7	3.5
5	Tamil Nadu	3.9	4.2	5.1
6	Orissa	3.2	3.7	5.8
7	Maharashtra	2.2	3.1	5.1
8	Andhra Pradesh	2.6	2.7	5.7
9	Punjab	3.4	3.2	3.7
10	Madhya Pradesh	2.0	2.0	4.6
11	Uttar Pradesh	4.0	3.6	2.5
12	Haryana	2.7	2.3	3.2
13	Bihar	2.4	1.7	2.0
14	Rajasthan	2.5	0.9	2.7
15	**India**	**3 .4**	**3.2**	**4.8**

Notes : 1. Due to non-availability of data the average growth rates reported under column 4 for Madhya Pradesh, Gujarat, and Kerala are calculated over the period 1993-94 through 1998-99.

2. The trend growth rates are calculated from semi-logarithmic function.

Source : Directorates of Economics and Statistics of respective State Governments.

3.117 The regional growth experience of the 1990s suggests that States pursuing reforms seemed to have experienced higher growth rates in recent years with some tendency towards convergence. At the same time, the regional growth experience is indicative of some kind of unbalanced and divergent growth (Box III.5).

Regional Dimension of Select Infrastructural Indicators

3.118 The convergence literature in India highlights the role of infrastructure-related facilities in fostering growth. A critical determinant of the divergence in growth profiles among regions is the inter-state differences in infrastructural facilities. Two select indicators of infrastructural conditions, *i.e.*, electricity and transport are examined below.

Box III.5
Convergence of Economic Growth

One of the basic predictions of neo-classical or endogenous growth theory is that economies with lower capital per person tend to grow faster in per capita terms. Thus, there will be convergence of growth rates. The notion of convergence has attracted recent attention in the endogenous growth paradigm. It has been interpreted in two distinct senses. The hypothesis that poorer economies tend to grow faster than the richer ones is often referred to as the notion of absolute convergence. The empirical evidence in favour of absolute convergence from cross-country growth regressions has received mixed support. In fact, in some sample of countries the growth trajectories have been found to be quite independent of the initial conditions. This, however, could be due to the presence of heterogeneity in the sample of countries. It is in this context, the notion of conditional convergence has been proposed whereby an economy tends to grow faster, the further it is from its own steady-state value. In other words, each economy is conceived to be converging to its own steady state value, and the speed of convergence varies inversely to the distance from the steady state.

How far are the predictions on convergence valid in the Indian regional set-up? There are divergent views in this regard. While a number of studies found out that the pattern of growth of per capita SDP has followed a divergent tendency in absolute terms, controlling for internal migration and centre-state grants, there is evidence in favour of convergence among Indian states. The speed of convergence has been, however, found to be quite low with estimate of the required time for a typical Indian state to close one-half of the gap between its initial per capita income and the steady-state per capita income at 45 years!

What explains the pattern and extent of divergence among the growth profiles of Indian states, if any? Incorporation of omitted variables in the growth regression across Indian states has attracted attention in recent years. In the determination of regional steady-state level of income and ensuring conditional convergence, a number of variables have been highlighted, *viz.*, literacy and per capita investment. In fact, it has been hypothesised that states with higher levels of income can undertake more ambitious infrastructure investment programmes, since they enjoy more fiscal revenues to pay from it. A contrary view regarding diverging tendency of per capita SDP growth is found as well. A number of reasons for such diverging trends has been cited, *viz.*, (a) differences in private investment and public expenditure, (b) differing distribution of state Government expenditure, (c) regressivity of implicit inter-governmental transfers, (d) lack of horizontal equity in inter-governmental transfers, and (e) regional policies.

In the ultimate analysis, while much of the evidence of growth differentials among Indian states hints at some operation of conditional convergence, the determination of steady-state growth rate for a State is by itself a serious policy question. Thus, any explanation for convergence of (or its lack) growth across Indian States needs to be sought in the interplay of all these control variables, perhaps along with the institutional set-up prevalent in the region.

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Power Supply

3.119 Electricity occupies a critical role in infrastructure. Various factors determine the demand and supply of this crucial input. The level of industrialisation, urbanisation, user cost and tariff structure, presence of subsidies, all could play a significant role in the determination of demand; on the other hand, technological and institutional arrangements are the crucial factors influencing supply. The electricity sector in various States suffer from endemic problems - unviable State Electricity Boards (SEBs), transmission losses and distortive subsidy structure. The relationship between the power situation and the regional growth in the 1990s reveals that there has been a general improvement in the power supply position in all the States in terms of deficit (*i.e.*, requirement *less* availability as a percentage of requirement). In fact, two States *viz.*, Orissa and West Bengal have managed to transform their power position from deficit to surplus (Table 3.37).

3.120 The existence of surplus power is, however, no indication of well being in the electricity sector. Out of the five States with deficits higher than the all-India average, three States, *viz.*, Karnataka, Gujarat, and Maharashtra were high growth States in the 1990s.

Table 3.37 : State-wise Power Supply Position

(in MUs)

State	1991-92	2000-01

		Requirement	Availability	Deficit (%)	Requirement	Availability	Deficit (%)
	1	2	3	4	5	6	7
1	Orissa	8065	7499	7.0	11710	12070	-3.1
2	West Bengal	11140	10140	9.0	18787	18958	-0.9
3	Punjab	17238	16177	6.2	27670	26923	2.7
4	Haryana	10326	10123	2.0	17275	16793	2.8
5	Rajasthan	13220	13030	1.4	25080	24178	3.6
6	Kerala	7440	7197	3.3	13564	12670	6.6
7	Bihar	7415	5215	29.7	9208	8563	7.0
8	Tamil Nadu	23210	22086	4.8	42702	39462	7.6
9	Andhra Pradesh	24015	22415	6.7	47792	44055	7.8
10	Karnataka	20350	15550	23.6	30242	27490	9.1
11	Gujarat	25505	24417	4.3	53038	47877	9.7
12	Maharashtra	42070	40166	4.5	79527	71184	10.5
13	Madhya Pradesh	21115	19942	5.6	39644	34747	12.4
14	Uttar Pradesh	31540	28280	10.3	46295	39556	14.6
15	**All India**	**288974**	**266432**	**7.8**	**507213**	**467401**	**7.8**

Note : MU = Million Unit, Minus sign indicates surplus
Source : Ministry of Planning and Programme Implementation.

In terms of availability of power, Maharashtra, Uttar Pradesh (U.P.), Gujarat, Andhra Pradesh (A.P.), and Tamil Nadu were leaders in 1990-91; in 2000-01, the front runners in terms of availability were Maharashtra, Gujarat, A.P., U.P., and Tamil Nadu. Excepting U.P, all other States are clearly the high growth states of the 1990s. This indicates that high growth is closely associated with demand- induced expansion in productive capacity. As the limits of capacity expansion are approached in the absence of significant technology and institutional reform, the power sector could emerge as a binding constraint on growth.

Roadways

3.121 Another aspect of infrastructure is the mode of transport. For the purpose of analysis, two distinct transport indicators have been taken into consideration, *viz.*, roadways and railways as proxy for State-wise availability of transport infrastructure. In terms of the share of roads of a particular state in the all-India total, a number of States like Maharashtra, Tamil Nadu, M.P, Orissa experienced a rise in their shares, relative to their positions in 1981 (Table 3.38).

3.122 The only State that crosses the ten per cent mark in this context is Maharashtra. Again a close association is discernible between shares in all-India roads and the growth record of industrial States in the 1990s. In terms of surfaced roads, taking the all-India average of 56.5 per cent as a benchmark, States like, Haryana, Gujarat, Punjab, Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Andhra Pradesh and Uttar Pradesh are found to be above the benchmark. By association, this list highlights the importance of infrastructure for growth.

Railways

3.123 In the case of railways, however, the distribution is explained in terms of geographical location as well as size of the State. Uttar Pradesh (undivided) accounted for the highest proportion of all-India railway routes, followed by Madhya Pradesh, Gujarat, Bihar and Andhra Pradesh (Table 3.39).

Table 3.38 : State-wise Roadways Development

State		Percentage Distribution of Total Roads			Intra-state share of Surfaced Roads		
		1981	1991	1997	1981	1991	1997
	1	2	3	5	6	7	8
1	Haryana	1.5	1.3	1.1	86.2	91.2	90.7
2	Gujarat	3.9	5.1	3.7	69.9	87.5	87.3
3	Punjab	3.1	2.7	2.6	76.9	78.1	81.5
4	Maharashtra	11.9	11.0	14.7	46.0	70.6	75.1
5	Karnataka	7.4	6.5	5.8	58.4	65.0	69.0
6	Tamil Nadu	8.2	9.7	8.4	76.5	15.6	68.0
7	Rajasthan	4.5	6.1	4.9	52.9	50.9	63.1
8	Andhra Pradesh	8.0	7.4	7.2	48.2	53.4	61.6
9	Uttar Pradesh	9.9	9.9	10.4	46.8	52.0	58.1
10	West Bengal	3.8	3.1	3.1	44.6	47.1	56.4
11	Madhya Pradesh	7.1	6.9	8.1	50.6	54.7	44.3
12	Bihar	5.6	4.2	3.6	34.3	36.1	37.3
13	Orissa	8.1	9.7	10.7	13.8	9.7	33.1
14	Kerala	7.0	6.7	5.9	22.4	27.8	31.1
15	**All India**	**100.0**	**100.0**	**100.0**	**46.0**	**51.8**	**56.5**

Source: Transport Research Wing, Ministry of Surface Transport, Government of India.

Table 3.39 : Distribution of Railway Routes in Major States

Per cent

	State	1980-81	1990-91	1995-96	1999-2000
	1	2	3	4	5
1.	Andhra Pradesh	7.7	8.1	8.0	8.1
2.	Assam	3.6	4.0	3.9	3.8
3.	Bihar	8.8	8.5	8.4	8.4
4.	Gujarat	9.2	8.5	8.5	8.5
5.	Haryana	2.4	2.4	2.3	2.5
6.	Karnataka	4.9	4.9	5.0	6.3
7.	Kerala	1.5	1.6	1.7	1.7
8.	Madhya Pradesh	9.4	9.4	9.5	9.4
9.	Maharashtra	8.7	8.7	8.7	8.6
10.	Orissa	3.2	3.2	3.5	3.7
11.	Punjab	3.5	3.5	3.4	3.3
12.	Rajasthan	9.2	9.3	9.4	9.4
13.	Tamil Nadu	6.4	6.4	6.4	6.7
14.	Uttar Pradesh	14.5	14.3	14.2	14.2
15.	West Bengal	6.1	6.1	6.1	5.9

Source: Ministry of Railways, Government of India.

Select Social Dimensions of Regional Development

3.124 Apart from infrastructure, human capital and various social indicators play a crucial role in fostering growth. The State-profile of literacy, as an indicator of State-level human capital, along with urbanisation is discussed below.

Literacy

3.125 As various empirical studies show, disparities in knowledge operate analogously with factors of production to determine divergences in growth profiles among regions. A number of stylised facts emerge from the trends of literacy between 1991 and 2001 in eighteen select Indian states (Table 3.40).

3.126 First, all States have experienced an upward secular movement in literacy rates during the 1990s. Considering the fact that the 1990s were also characterised by a higher per capita GDP for all the States (in levels), a higher income has been accompanied by an improvement in the knowledge base. This is indicative of the symbiotic relationship between knowledge and growth. Secondly, the ranking of the States between the 1991 and 2001 remained more or less unaltered, indicating the uniformity in this regard.

Table 3.40 : Literacy Rate in Indian States

(Per cent)

	State	2001 Census	1991 Census	Changes in the Literacy Rates during 1991-2001
	1	2	3	4
1	Kerala	90.92	89.81	1.11
2	Maharashtra	77.27	64.87	12.39
3	Tamil Nadu	73.47	62.66	10.81
4	Uttaranchal	72.28	57.75	14.53
5	Gujarat	69.97	61.29	8.68
6	Punjab	69.95	58.51	11.45
7	West Bengal	69.22	57.70	11.52
8	Haryana	68.59	55.85	12.74
9	Karnataka	67.04	56.04	11.00
10	Chhatisgarh	65.18	42.91	22.27
11	Madhya Pradesh	64.11	44.67	19.41
12	Orissa	63.61	49.09	14.52
13	Andhra Pradesh	61.11	44.09	17.02
14	Rajasthan	61.03	38.55	22.48
15	Uttar Pradesh	57.36	40.71	16.65
16	Jharkhand	54.13	41.39	12.74
17	Bihar	47.53	37.49	10.04
18	India	65.38	51.63	13.75

Source: *Provisional Population Totals: India* , Census of India 2001.

3.127 Finally, the States with literacy rates higher than the all-India average are also those with higher growth rate of per capita SDP during the 1990s *vis-a-vis* the 1980s. The correspondence between the rankings on account of literacy and per capita SDP growth is not one-to-one. Kerala ranked third in terms of per capita SDP growth during 1991-92 through 1999-2000 and it is the first as per literacy standards in India. This close association between literacy and growth is perhaps indicative of the role of human capital in fostering growth.

Urbanisation

3.128 In the tradition of the stages of growth theories, urbanisation is symptomatic of economic

development. An urban centre's primary function is to act as a service centre for the hinterland around it. Though urban development need not be always synonymous with economic growth, spatial distribution of growth is linked with the emergence of a formal manufacturing sector.

3.129 Interestingly, most of the States, either with higher per capita SDP growth than the all-India average, or those experiencing a rise in per capita growth rate during the 1990s *visa-vis* the 1980s are also the States with higher than all-India average urbanisation as per the 2001 census. There are, however, some exceptions like Punjab and Haryana with quite a high degree of urbanisation but which are placed relatively low in the growth ladder in the 1990s. Kerala, despite its high growth performance is somewhat low in terms of the percentage of urban population (Table 3.41).

Table 3.41 : Percentage of Urban Population of the Indian States in 2001

(Per cent)

	State	Percentage of Urban Population
	1	2
1.	Tamil Nadu	43.86
2.	Maharashtra	42.40
3.	Gujarat	37.35
4.	Karnataka	33.98
5.	Punjab	33.95
6.	Haryana	29.00
7.	West Bengal	28.03
8.	**India**	**27.78**
9.	Andhra Pradesh	27.08
10.	Madhya Pradesh	26.67
11.	Kerala	25.97
12.	Uttaranchal	25.59
13.	Rajasthan	23.38
14.	Jharkhand	22.25
15.	Uttar Pradesh	20.78
16.	Chhattisgarh	20.08
17.	Orissa	14.97
18.	Bihar	10.47

Source: *Provisional Population Totals: India.* Census of India 2001.

3.130 The regional growth profile during the 1990s suggests that higher income capabilities did not get translated into higher growth trajectories for all the States. In terms of a "before-after" comparison, most of the States with higher average per capita SDP growth rate during the 1990s (such as, Karnataka, Gujarat, Tamil Nadu, Maharashtra, or Andhra Pradesh) are those which embarked on reform programmes. The rank correlations of the States as per various indicators of development are given in Table 3.42.

Table 3.42 : Correlation between the Select Relative Rankings of States

	Growth	Electricity	Roads	Literacy	Urbanisation
1	2	3	4	5	6
Growth	1.00	0.22	0.18	0.57	0.48
Electricity		1.00	0.50	0.07	0.69

Roads	1.00	-0.08	0.13
Literacy		1.00	0.47
Urbanisation			1.00

Note:'Growth' refers to improvement in Growth Rate during 1991- 92 through 1999-2000, 'Electricity' refers to availability of electricity in 2000-01, 'Roads' refers to State-wise Roads as % to All India Roads in 1997, 'Literacy' refers to Literacy Rates in 2001, 'Urbanisation' refers to Urbanisation in 2001.

3.131 All the social and infrastructural indicators exhibit a high correlation with growth of per capita SDP reflecting the fact that in the quest for growth, the role of social and physical infrastructure is crucial. Rank correlations between growth and literacy, on the one hand, and growth and urbanisation, on the other, are found to be highly positive and significant. The relationship between ranking as per infrastructural indicators and ranking as per growth, though positive and significant, turns out to be low.

3.132 The growth profile of the Indian economy has many dimensions interacting with the heterogeneous nature of the growth efforts of various States. Given the vastness and diversity of the economy, it would be difficult to expect that all States would grow at the same rate (Ahluwalia, 2000). Reforms appear to be impacting on growth differentials of the States in the 1990s. This has implications for competition among States for scarce resources for the acceleration of growth. Despite an absence of a systematic evidence on the causal relationship between reform and growth, the strength of associations in the behaviour of growth at the level of the States suggests the possibilities of "growth arbitrage" being created by reforms.

VI. CONCLUDING OBSERVATIONS

3.133 The current slowdown in the Indian economy has become a subject of intense debate. Empirically the current phase appears to represent a loss of speed rather than a halt in growth. Cyclical patterns in activity are detected but these are of limited duration and impact. The Indian economy is characterised by stable and converging cycles which could be modulated with counter cyclical policies. The impulses for growth can be generated and nurtured primarily by releasing the structural constraints, which can shift the potential growth frontier outwards. So far, private consumption has been providing the predominant contribution to aggregate demand relative to investment. Discretionary fiscal stabilisers mainly in the form of government consumption have been holding up aggregate demand over the period of the downturn.

3.134 Capital formation has been slowing down across all three sectors of the economy. The size of accelerators suggests that greater investment needs to be directed towards manufacturing so as to revitalise growth. Manufacturing slowdown is reflecting as much a demand slack as a fall in capacity utilisation and gaps in availability of infrastructure, particularly power. Structural constraint to industrial growth are more dominant than cyclical variations. Productivity changes and technological progress have been identified in the 1990s as important sources of industrial growth.

3.135 Abstracting from measurement issues, capital formation in agriculture has been declining which is a matter of concern. The lack of capital has been a primary impediment to the adoption of new technology. Given the overall resource constraint, a conscious choice between subsidies and investment is being imposed on the conduct of public policies for agriculture. Integration of

Indian agriculture with international markets would be necessary in the context of commitments to WTO, complemented by well developed domestic future markets for agricultural commodities.

3.136 The services sector has imparted resilience to the economy, particularly in times of adverse agricultural shocks as also during cyclical downturns in industry. A notable feature of the structural transformation of the services sector has been the growth of skill intensive and high value added sectors. As growth gathers momentum, the demand for these services is expected to increase more than proportionately and this, in turn, would reinforce growth itself.

3.137 Issues relating to regional growth have added a new dimension to the size and quality of the growth process. Differential growth performances in the States is reflective of the varying degree of reform penetration. In some developing economies (Brazil, China), regional reforms have taken the lead. In India, given the federal structure, there are several areas where it is the States which can initiate reforms. In this context, it is necessary to emphasise the role of States in improving the provision and quality of the two key infrastructural services which would determine the sustainability of reforms: education and health. Greater involvement of the private sector in the production and distribution of health and education services in a cost-effective manner can have beneficial externalities for the growth process. These services, which currently account for about 5 per cent of GDP, help to develop the social and distributive infrastructure. They enrich the quality of human capital and expand demand for the output of other sectors. Improvements in delivery of health and education can generate a variety of specialised occupations with potential for synergisation. Investing in these sectors will not only improve quality of human capital but can also become a source of higher productivity and growth.

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[1] (1) GDSR = -25.75 + 6.61 LPINC + 0.08 RDRT + 3.4 IR + 0.74 AR(1) R^2 = 0.88, DW = 1.80
(2.78)* (1.91)* (2.12)* (5.90)*

(2) PVSR = -25.65 + 3.66 LRPDI + 0.05 RDRT + 3.84 IR + 0.53 PVSR(-1) R^2 = 0.95, Durbin's h = 1.45
(3.9)* (3.11)* (4.06)* (4.43)*

GDSR: Gross Domestic Saving Rate, LPINC : log of real per capita income (per capita GDP at factor cost at constant prices), RDRT : real deposit rate (*i.e.*, one year deposit rate less inflation rate derived form GDP deflator), IR : Intermediation Ratio, PVSR: Private Saving rate, LRPDI : log of real per capita disposable income. t- statistics are in parenthesis and * indicates significance atleast at 10 per cent level.

[2] Investment (Gross Capital Formation-GCF)

(1) GCF = 4807 + 0.20 GDPFC + 0.69 ? GDPFC(-1) - 699 rl + 12629D1 + 26938D2 R^2 = 0.96, DW=1.87
(14.02) (3.57) (-2.20) (2.95) (2.18)

(2) GCFa = 4018 + 0.04 ? GDPFC(-1) + 0.18 Ips R^2 = 0.66, DW=1.14
(2.0) (3.0)

(3) GCFm = -19261 + 0.61 ? GDPFC(-1) - 811 rl + 2.2 Ips R^2 = 0.76, DW=1.82
(2.4) (-2.4) (4.7)

(4) GCFs = -3889 + 0.22 ? GDPFC(-1) - 304 rl + 1.41 Ips R^2 = 0.84, DW=1.96

(2.6) (-2.02) (6.54)

GDPFC: GDP at factor cost, rl : real bank lending rate, D1: dummy for the 1980s, D2 : dummy for 1993-96, GCFa, GCFm and GCFs are private investments in agriculture, manufacturing and services, respectively, Ips : Public investment in services. All the t-statistics (presented in parentheses) are significant atleast at 10 per cent level.

[3] (1) PFCE=108913 + 0.60GDPFC + 0.8877 AR(1) R^2 = 0.999; DW=2.07
(23.32)* (9.4)*

(2) GFCE = -9541.66 + 0.14GDPFC + 0.7834 AR(1) R^2 = 0.988; DW=1.21
(14.2)* (5.3)*

PFCE : Private Final Consumption Expenditure, GDPFC: GDP at factor cost, GFCE : Government Final Consumption Expenditure. Figures in brackets represent t-statistics and * indicates significance atleast at 10 per cent level.

[4] Finance Minister's Address to Parliament Consultative Committee, November 6, 2001.

[5] Illustratively, in case a small farmer takes credit from a large farmer and is subsequently forced to sell his agricultural product at much lower price than post-harvest prices, he is said to be affected adversely by factor-product market inter-linkage. In case the borrowing farmer is forced to work on the creditor's land at critical period like sowing, then the exploitation is in terms of adverse factor - factor market inter-linkage.

[6] LCU = - 1.785 + 0.583 LPFCE - 0.288 LWPIFUEL + 0.481LCU{t-1} - 0.064 DUM91
(2.97) (-3.13) (3.70) (-4.32)

Where LCU: log of capacity utilisation index, LPFCE: log of real private final consumption expenditure, LWPIFUEL: log of WPI of fuel, power, light and lubricants, DUM91: dummy variable for post-1991 period. Figures in brackets are t-statistics. The coefficients are significant at 1 per cent level.

[7] The conversion of nominal value added into the real value added is done either with single deflation or double deflation method. In the case of single deflation method both nominal output and nominal material inputs are deflated by output price index, while under double deflation method, the nominal output is deflated by output price index and nominal material input is deflated by input price index.

[8] Log (RGDPs) = $a+a_1$ Log (RGDP) + a_2 Log (PDEFs / PDEFgdp)
RGDPs = Real GDP of Services Sector as a proxy for expenditure on services,
RGDP = real GDP,
PDEFs = Price Deflator in Services Sector and
PDEFgdp = Price Deflator of overall GDP

[9] Log (S) = b + b_1 Log (RPCGDP)
S = Share of services/ sub sectors in real GDP RPCGDP = Real Per Capita GDP

[10] There is no uniform series of real SDP over the period under consideration. While the real SDP from 1981-92 through 1993-94 are available with 1980-81 as the base, the data from 1993-94 through 1999-2000 are available with 1993-94 as the base. Hence, growth rates from 1981-82 through 1993-94 are calculated over the SDP numbers with 1980-81 base, while the same from 1994-95 through 1999-2000 are calculated over the SDP series with 1993-94 base.