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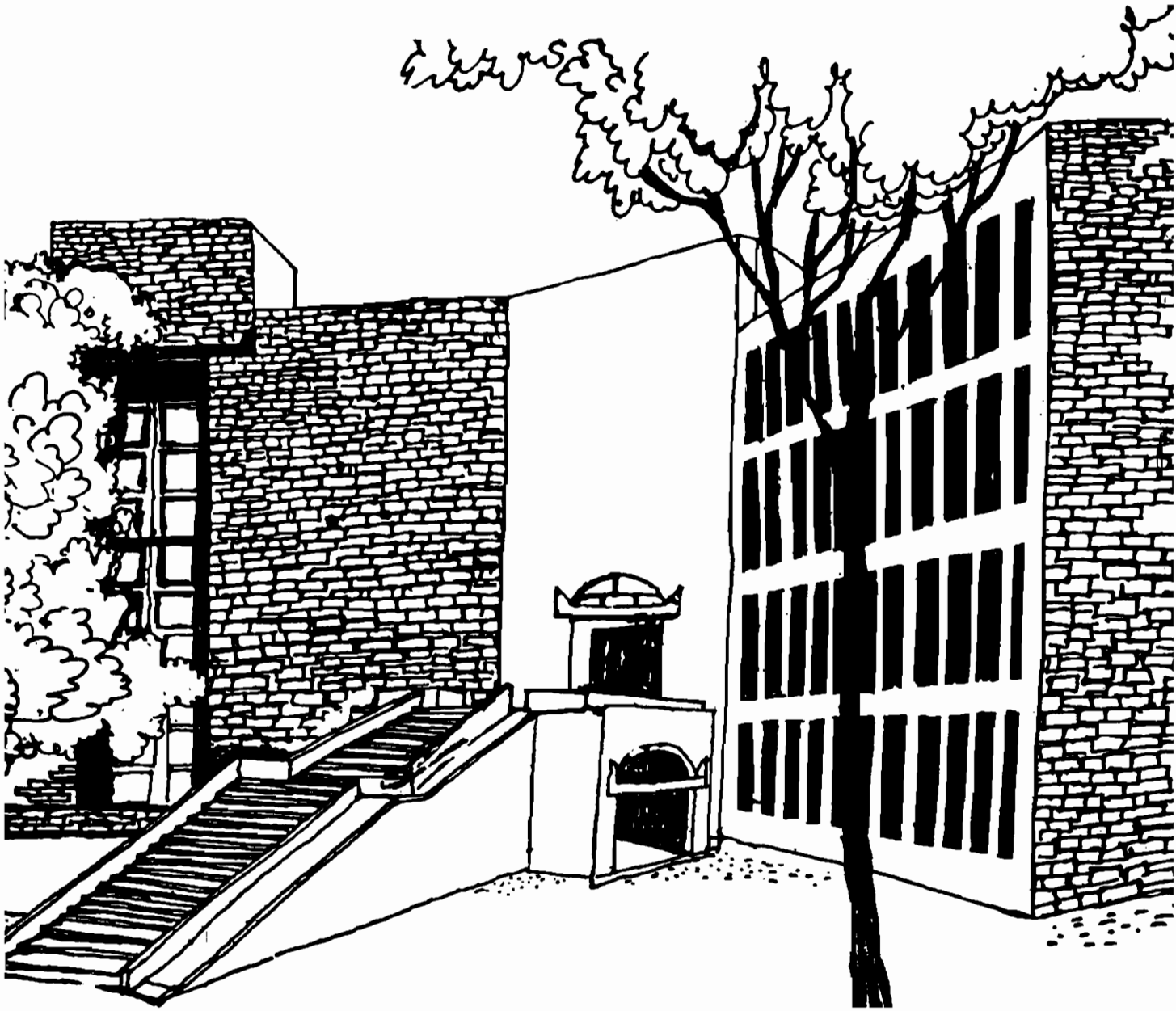

# INDIAN MANUFACTURING INDUSTRY: THE GROWTH EPISODE OF THE EIGHTIES AN EMPIRICAL STUDY

By

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W P No. 1098
April 1993



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## PREFACE

This study is the outcome of my research as Visiting Faculty at the Industrial Policy Management Group of the Indian Institute of Management Ahmedabad (IIMA), from September 1992 to February 1993. I am extremely thankful to the IIMA for having given me this opportunity.

As one who practises as a management consultant and professes to be an economist, I have tried to bring together the policy and the managerial points of view. I have benefited immensely from interaction with several of my colleagues at the IIMA, especially Profs. J. C. Sandesara and G. S. Gupta who gave me constant guidance and encouragement. I also received invaluable research assistance from Ms. Shreya Bakshi and secretarial help from Shri Anthony D'Silva and Shri C. J. Verughese. Naturally, none of them is responsible for any deficiencies in the study.

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Bombay
March 1993

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# 1. INTRODUCTION

## Historical Background

In many ways, the decade of the eighties was one of the most interesting periods in the history of Indian manufacturing industry. During this period, it broke loose from a state of stagnancy that had persisted for much of the two previous decades. The rate of growth achieved was high not only by Indian standards, but comparable to that of star performers like Malaysia, Thailand and Turkey and only slightly lower than that of super-stars like Korea and Indonesia. There were certain interesting qualitative features too. Unlike during the first three five year plans, growth during this period was not externally induced. It came naturally, in response to a relaxation in policy based constraints to growth and set in motion a number of highly desirable outcomes. Even so, this growth episode was terminated rather abruptly at the end of the decade, when the government resorted to a programme of demand contraction and import compression to tackle a balance-of-payments crisis of unprecedented magnitude.

A sharp rise in crude oil prices following Iraq's annexation of Kuwait in 1990 brought about a precipitate fall in foreign exchange reserves and proved to be the last straw. But the balance-of-payments crisis had been brewing

for some time. It was part of a general worsening in the finances of the State characterised by increasing fiscal deficits, rising inflation, falling real rates of exchange, declining NRI remittances and mounting external borrowings at exorbitant rates of interest. And all this was happening at a time when, judged by real parameters, the economy was doing very well. Agricultural output, industrial growth and commodity exports had reached an all-time high.

## Purpose and Scope of the Study

Since Dr. Manmohan Singh took over as the Finance Minister, economic measures announced by the government have generally added up to a consistent strategic approach. His three fiscal budgets have been refreshingly different. They have given a new direction to the economy in general and industry in particular. They have been holistic and each has built on the foundation laid by the previous one.

This study attempts a quick review of the growth in Indian manufacturing during the eighties. The main purpose is to understand the genesis and characteristics of the growth episode, if there are any lessons to be learnt and to what extent these are incorporated in the strategic approach being followed by the government. The emphasis is on exploring, in empirical terms, the broad inter-linkages

between growth and the various aspects that impinge on it, like demand, productivity, costs and prices, investment and employment, structural change and balance of commodity trade.

The recent balance-of-payments crisis has often been blamed on the relaxation of controls and the quickening of industrial growth in the eighties. For reasons explained earlier, this proposition cannot be examined fully except by analysing the interaction between the financial and industrial sectors of the economy. This is beyond the scope of this study. However, insofar as it explores the empirical link between industrial growth and commodity trade, the study does throw some light on this aspect.

## Arrangement of the Study

The study is presented in four parts. Chapter 2 proposes a theoretical framework for the empirical analysis that follows. Chapter 3 explains the methodology and data sources for empirical analysis. Chapter 4 presents the findings. Chapter 5 brings together the strands of thought emerging from earlier discussions to provide the broad outlines of a strategy for the future.

## 2. THE THEORETICAL FRAMEWORK

### Demand as a Function of Affordability

An average car in India today costs less than US $ 7000. In the U.S., it rarely costs less than $ 15000. Yet in India only 150,000 cars are sold every year, compared with 15 million in the US. The reason is obvious. While in India $ 7000 represent 3 years' income of the average buyer, in the US $ 15000 represent less than half year's. In other words, except at a very high level of per capita income what determines the demand for industrial products is "affordability" or the ratio of per capita income to the price of industrial products. At a very low level of income, nothing is affordable. As income rises in relation to industrial prices, affordability starts increasing. In the intermediate stage of development, the ability of an economy to achieve a high rate of industrial growth thus depends on how rapidly it is able to increase per capita income in relation to industrial prices over time, not only by increasing income, but also by reducing industrial prices in relation to overall prices.

### Rigidity in Industrial Prices

Demand and price would obviously not be relevant in explaining industrial growth (or the lack of it) if, as in the neoclassical system, aggregate output (and therefore

income) were determined by resource availability and the maximum possible output of all goods were achieved by relative prices adjusting to "market clearing' levels. But in reality, costs set a floor to industrial prices which need not be market clearing. Hall & Hitch[1] were the first to point out, based on substantial empirical evidence, that in setting cost-based prices "prime..... cost per unit is taken as the base, a percentage addition is made to cover overheads... and a further conventional addition.... is made for profits". Subsequently, several other empirical studies[2] have confirmed that minimum prices are cost based, although there are various approaches to fixing the ceiling. As Hicks[3] puts it, "prices ..... must cover costs" and "a thing will not be produced unless it is profitable to produce it". Obviously, this minimum price cannot be market clearing unless costs are sufficiently low. Keynes built his theory on the assumption of rigid money wages. Kaldor[4] and Chakravarti[5] have pointed out that real wages in terms of food can also be rigid. One can think of other examples of inflexible costs like administered input prices or imports. Not surprisingly, there is substantial empirical evidence of the existence of rigid prices.[6] Solow[7] pleads that one should "accept the apparent evidence of one's senses and take it for granted that wages do not move flexibly" and indicates that his "own inclination is to go further and claim that commodity prices are sticky too, at least downwards".

## Industrial Output with Rigid Prices - the Static Model

Given a cost-based floor price, and depending on market structure, industrial prices, may fall towards market clearing levels, but only until the floor is reached. Thereafter, prices would remain fixed and output would tend to adjust to the volume of demand that exists at that level of income and prices. As Kaldor[8] shows, short run equilibrium will be reached at a point where output of the industrial sector, after meeting its own demand created in the process of generating that output, leaves a surplus which exactly equals the given demand from outside the industrial sector. Symbolically,

$$Q_i = \frac{1}{1-S} \times D_e, \qquad \ldots\ldots \quad (1)$$

where, $Q_i$ is industrial output, $D_e$ the given demand for industrial output from the non-industrial sector, S the proportion of industrial income expended on industrial output and 1/1-S the resultant multiplier (Kaldor's "foreign trade multiplier"). The above is an identity, any difference between the desired and actual values of S being reflected in changes in inventory levels. As Hicks[9] points out, the "storable" nature of manufactured goods which makes possible "the existence of stocks has a great deal to do.... with the possibility of keeping prices

fixed.... a market in which stock changes substitute for price changes.... is readily intelligible". Demand, owing to the rigidity in costs and prices thus becomes the operating constraint on industrial output.

**The Dynamic Sequence:**

To see how such a system works over time, it will be useful to introduce price terms and re-write equation (1) as follows:

$$P_i \cdot Q_i \ (1-S) = A \cdot P_e \cdot Q_e, \qquad \ldots\ldots \qquad (2)$$

where, $Q_i$, $P_i$, $Q_e$ and $P_e$ are the quantities and prices of the outputs of the industrial and non-industrial sectors, and S and A the proportions of the income of the industrial and non-industrial sectors spent on industrial output. If Q and P be the quantity and the weighted average of prices of the economy's aggregate output, we get :

$$P_e \cdot Q_e = P \cdot Q - P_i \cdot Q_i \qquad \ldots\ldots \qquad (3)$$

If N be the population, combining (2) and (3) and with minor manipulations, we get,

$$Q_i/N = \frac{Q}{N} \times \frac{P}{P_i} \times \frac{A}{1-S+A} \qquad \ldots\ldots \qquad (4)$$

Alternatively,

$$gQ_i/N = f\ (gQ/N\ \&\ gP/P_i), \qquad \ldots\ldots \qquad (5)$$

where, $gQ_i/N$ and $gQ/N$ are the rates of growth of per capita industrial and aggregate output at constant prices, and $gP/P_i$ the rate at which industrial prices fall in relation to overall prices. The terms S and A are omitted, because they represent structural variables with whom $gQ/N$ and $gP/P_i$ interact to bring about changes in $gQ_i/N$. However, the rate of resultant change in the value of S (hereafter referred to as the "self dependence ratio") is important, because it indicates the rate at which the industrial sector's ability to sustain its own growth is increasing. The change in the value of S is brought about by changes in both demand and technology and is part of the structural transformation process discussed later.

We may now interpret equation (5) to summarise the dynamic sequence. Faced with the prospect of increasing input costs, firms will try to protect their profitability by estimating future costs and sales volumes and setting prices at a level which, at the estimated sales volume, will cover estimated costs plus a desired return on capital. If no price resistance is foreseen, they will be inclined to "play safe", make "conservative" estimates of costs and sales volumes, and set prices high. If there are no major barriers to entry, they will take a more "optimistic" view of their marketing and cost control efforts and try to

discourage competition by keeping prices low. In either case, at the given rates of increase in the aggregate real income and in industrial prices (relative to overall prices), demand for industrial goods will grow at a rate determined by income and price elasticities, and output growth will adjust to it.

## Macro-economic Policy and the Dynamic Sequence

In this situation what role can macro-economic policy play to aid long term industrial growth? An expansionary policy can certainly provide an initial stimulus by increasing aggregate money demand. But unless, this translates into an increase in gQ/N, there will not be any real income effect. Rising P will soon lead to cost increases and a rising $P_i$, so that other things being equal there may not be any price effect also. If there are no external supply bottlenecks, rising money demand may enable the industrial sector to utilise idle productive capacity and bring down costs. This could lead to an increase in Q/N and $P/P_i$ and thus favourable income and price effects. But this is possible only for a temporary period, because continued growth will need an expansion in factor inputs eventually. A contractionary policy will have not only an unfavourable income effect, but also an unfavourable price effect, owing to downward rigidity in input costs.

## The Dynamic Sequence and Productivity

Empirical studies[10] by Kaldor, Fabricant, Salter and Kennedy indicate that a high rate of growth in manufacturing is associated with a high rate of growth in labour productivity. This has been verified by us, using recent cross-country data (Table 2.1).

Salter's findings further indicate that in an efficient industry high productivity is not limited to labour alone, but extends to all inputs, including materials. This finding is corroborated by Chenery[11] who uses cross-country data to relate growth in total factor productivity to growth in output. Fabricant also finds, re-confirmed by Salter, that productivity increase is associated with a decline in production costs and the latter with a fall in selling prices, and that "selling price has dropped most precipitately in industries in which output has climbed most rapidly". The negative link between increases in selling price and output of manufactured goods has been validated by us statistically, using recent cross-country data (Table 2.2).

We would interpret the above empirical evidence as follows. At a certain level of per capita income, demand for manufactured consumer goods, and through backward linkages the demand for manufactured capital and

Table - 2.1

**GROWTH IN LABOUR PRODUCTIVITY IN MANUFACTURING AS A FUNCTION OF GROWTH IN MANUFACTURING OUTPUT - A CROSS COUNTRY ANALYSIS**

(Average growth rate 1980-89, % p.a.)

| | Manufacturing output (X) | Manufacturing employment | Labour productivity (Y) |
|---|---|---|---|
| Australia | 2.3 | 0.9 | 1.4 |
| Bangladesh | 3.0 | 1.9 | 1.1 |
| Cyprus | 4.3 | 1.7 | 2.6 |
| Greece | 0.5 | 1.4 | -0.9 |
| India | 6.8 | 0.5 | 6.3 |
| Indonesia | 11.9 | 10.0 | 1.9 |
| Korea | 12.4 | 6.9 | 5.5 |
| Malaysia | 8.0 | 3.4 | 4.6 |
| Mexico | 0.7 | 3.4 | -2.7 |
| Pakistan | 7.6 | 2.6 | 5.0 |
| Singapore | 5.7 | 0.8 | 4.9 |
| Sri Lanka | 4.7 | -0.6 | 5.3 |
| Thailand | 7.8 | 3.2 | 4.6 |
| Turkey | 7.1 | 3.2 | 3.9 |

Regression Output :

$Y = 0.27 + 0.48\ X$
$\quad\quad\quad (0.16)$

| | |
|---|---|
| Std. Err of Y Est. | 2.07 |
| R Squared | 0.44 |
| No. of Observations | 14 |
| Degrees of Freedom | 12 |

Source:

(1) United Nations, New York, "National Accounts Statistics : Main Aggregates & Detailed Tables" (various issues).

(2) International Labour Office, Geneva, "Yearbook of Labour Statistics" (various issues).

(3) The World Bank, Washington, "World Development Report" (various issues).

Table - 2.2

**GROWTH IN PER CAPITA MFG. OUTPUT AS A FUNCTION OF GROWTH IN PER CAPITA GDP & RELATIVE PRICES OF MFG. GOODS - A CROSS COUNTRY ANALYSIS**

(in % p.a., Period averages 1980-89)

| | Rate of growth of manufacture (Y) | Rate of growth of per capita GDP ($X_1$) | Rate of change in relative prices of manufactured goods ($X_2$) |
|---|---|---|---|
| Australia | 0.9 | 2.2 | -0.8 |
| Bangladesh | 0.4 | 1.1 | -2.4 |
| Cyprus | 3.1 | 4.7 | -0.3 |
| Greece | 0.1 | 1.2 | -0.3 |
| India | 4.7 | 3.3 | -0.3 |
| Indonesia | 9.8 | 3.1 | -1.9 |
| Korea | 11.2 | 8.1 | -2.0 |
| Mexico | -1.4 | -1.2 | 1.0 |
| Pakistan | 4.4 | 2.9 | 0.4 |
| Paraguay | -1.4 | -0.7 | 1.3 |
| Singapore | 4.5 | 4.8 | 0.5 |
| Sri Lanka | 3.2 | 2.5 | -1.1 |
| Thailand | 5.9 | 4.9 | 1.0 |
| Turkey | 4.7 | 2.8 | 0 |

Regression Output

$$Y = -0.17 + \underset{(0.26)}{1.22}X_1 - \underset{(0.53)}{0.62}X_2$$

Std. Err of Y Est. 2.10

R Squared 0.74

No. of Observations 14

Degrees of Freedom 11

Source:

(1) United Nations, New York, "National Accounts Statistics : Main Aggregates & Detailed Tables" (various issues).

(2) International Labour Office, Geneva, "Yearbook of Labour Statistics" (various issues).

(3) The World Bank, Washington, "World Development Report" (various issues).

intermediate goods, start picking up rapidly. If an economy is able to translate this demand impulse into a growth in output, the latter leads to an increase in productivity because of economies of scale and "endogenous" or growth-induced technical progress. If the gain from productivity increase is siphoned off through indirect taxes, it becomes additional income in the hands of the government and may or may not benefit industrial growth, depending on how it is spent. If the productivity gain is retained by industry as increased factor earnings, the resultant income effect on demand is diffused over all goods and not industrial goods alone. If the gain is reflected in falling industrial prices, there is a focussed impact on the demand for industrial goods, because the income effect is strengthened by a substitution effect. Three examples of how productivity improvement can expand demand by reducing prices are Henry Ford's `T' model cars in the 1910s, Courtald's viscose rayon during the 1920s and 1930s and electronics goods in the last two decades.

As Kaldor[12] points out, there are "large differences (in the rate of growth of industrial output and productivity) in the <u>same</u> period in <u>different</u> countries" and, one may add, with <u>similar</u> per capita incomes. This is because different countries respond differently to the initial demand impulse because of differences in contextual

factors like factor endowments, infrastructural support, government policy, entrepreneurial motivation, etc. For example, in some countries Government policy may choke off demand impulses. In others, entrepreneurs may not find it feasible or worthwhile to expand output, or to expand it efficiently, or to reflect the fruits of efficiency in falling prices.

## Productivity and Terms of Trade Between Industry and Agriculture:

How do we reconcile the phenomenon of falling industrial prices with the argument put forward by Chakravarty[13] and Mitra[14] that industrial stagnation can result from falling industrial profits owing to an unfavourable shift in the terms of trade from industry to agriculture? We do so simply by recognising that with sustained reduction in industrial costs through productivity improvements, such a shift can take place without any erosion in industrial profitability. In fact, Ishikawa[15] has pointed out. re-affirmed by Sau[16] in the Indian context, that in most Asian countries there has been a net flow of resources from industry to agriculture, both through changes in the terms of trade and through invisibles, capital transfers and subsidies. This is as it should be. If industrial output grows faster than agricultural output which is land-constrained, the capacity

of the agricultural sector to buy industrial goods will diminish in relation to the industrial sector's capacity to buy agricultural goods, unless sustained productivity improvements allow industrial prices to fall continuously in relation to agricultural prices.

## Recent Developments in Technical Progress

We would conclude our discussion on productivity with a brief description of a few recent developments in technical progress. Because materials constitute the largest proportion of product costs and because the ultimate source of materials is "land" which is in fixed supply, a lot of effort has always been devoted to the development of "land saving" technology which in effect increases the quantum of value added by industry per unit of natural resources used. Some of the major areas of thrust are energy efficiency, value engineering to eliminate "over-specification", material saving processes and development of processed materials with low natural resources content (e.g. treated metals, engineering plastics, wood-substitutes, composites, etc.). Economists, as a result of their pre-occupation with "value added" production functions have tended to under-estimate the contribution of land-saving technology in manufacturing industry.

The most exciting recent developments have, however, taken place in the area of "capital saving" technology. Since the days of Henry Ford, productivity has been associated with heavy capital investment, large production runs and economies of scale resulting from indivisibilities, division of labour, learning, etc. But as Womack, James & Roos[17] have pointed out, the recent revolution of "lean manufacture" which was pioneered by Toyota Motor Co. and is now replacing traditional "mass manufacture' the world over, was stimulated precisely by the need to produce economically in small batch quantities. Essentially, lean manufacture more than offsets the advantages of manufacture with high speed, single purpose machines by eliminating all buffers by way of inventory, factory space, re-work, machine capacity, workers, materials, etc. that are required to ensure uninterrupted running of such machines. This is achieved by reducing batch quantities and a dramatic collapsing of production cycles. Some important features of lean manufacture are the use of small, relatively low-cost, highly flexible and increasingly automated machines; addition of intelligent features to machines; quick job set-ups; a multi-skilled and responsible work force; and computerised planning systems that integrate the entire chain, from consumers to vendors.[18] Partly as a result of this, in the area of

"labour saving" technology, emphasis has shifted from capital intensity to human resources development and information technology.

It would appear that the traditional trade-off between different physical inputs is increasingly giving way to a trade-off between physical inputs on one side and investment in the generation and accumulation of knowledge on the other. This aspect has been formalised into a model of growth by Romer[19] in which all physical inputs yield increasing returns to scale and equilibrium is brought about by decreasing returns to investment in knowledge.

## Structural Transformation and Self Sustaining Industrial Growth

The cost of producing industrial goods thus has two elements : the fixed costs of investment in knowledge and capital assets, and the variable costs of other inputs. Generation of knowledge, whether in-house or through purchase, involves large investments which are subject to rapid obsolescence. Knowledge, capital and labour-intensive technologies therefore generally represent a descending order of fixed to variable cost ratios. As production volumes build up, it becomes possible to reduce costs by substituting variable by fixed costs and spreading the latter over increasing volumes.

The transition from labour to capital to knowledge intensive manufacture brought about by industrialisation manifests itself in a steady shift from what Hoffman[20] calls "primitive" to "capitalist" manufacture. Since the latter entails increasing use of capital and intermediate goods made by the industrial sector itself, these industries soon outstrip consumer goods industries and the industrial sector as a whole outstrips the primary sector. Bagchi[21] has argued that the above sequence may not always hold. There are indeed some exceptions, resulting from the planned economies attempting (rather unsuccessfully) to leap-frog or MNC's setting up production bases in developing countries to cater to global markets. However, recent empirical research by Chenery et al[22] confirms that by and large this process of "structural transformation" continues to hold, although the speed with which it takes place varies from country to country.

Structural transformation has two important consequences. It increases the industrial sector's capacity to sustain its own growth by increasing its "self dependence ratio" or the value of S in our equations (1), (2) and (4). It also enables the "factory" sector to grow at the expense of the "cottage" sector. As Ishikawa[23] has pointed out, the experience of several Asian countries shows that while institutional characteristics of household enterprises limit

their technology choice, factories employ modern technology and bring product prices down to a level where artisans cannot survive. This conclusion has been re-confirmed recently by Anderson.(24)

## Industrial Growth and Balance of Trade:

The process of structural transformation in an industrialising economy changes the pattern and balance of its external trade over time, by causing a steady shift in its "comparative advantage". When the domestic demand for a product "increases to a certain size, domestic production starts up, partly to substitute for imports and partly to meet the growing demand. Domestic production of the new good is made possible through economies of scale, productivity improvements and cost reductions that come about with the expansion of output. Exporting is an extension of the substitution of domestic products for foreign products in the foreign markets",(25) Typically, industrialisation starts with the production of labour-intensive consumer goods, initially for home consumption and later for exports. In the process, a domestic demand for capital and knowledge intensive intermediate and capital goods is created, which has to be met through imports. As the domestic market for these goods builds up, the same cycle of replacement of imports by domestic production, followed by exports is repeated. There is thus a positive

link between growth in the output and exports of industrial goods. The existence of such a link is substantiated by the empirical findings of Porter[26] who has identified domestic demand, factor endowment, supporting industries and inter-firm rivalry as the main sources of competitive advantage of nations in global markets. Obviously, these are the very factors that ensure industrial growth in the domestic context also.

The effect of all this on the balance of trade has been analysed in a recent cross-country study[27] which indicates that although most developing countries substitute import of consumer goods quickly, they become increasingly dependent on the import of intermediate and capital goods for industrial production. In general, the manufacturing sector continues to be a net drain on foreign exchange for a long time, because the export of industrial goods does not pick up until at a fairly advanced stage of industrialisation.

## NOTES TO CHAPTER 2

(1) See Hall & Hitch, p. 113.

(2) For a summary of empirical studies on pricing, see Silberston, especially pp 76-83. Some of the more interesting studies are those by Hall & Hitch (full cost), Andrews (normal cost), Balkin (full cost with strategic deviations), Hague (average cost) and Howe (full cost basic first step, with adjustments based on marginal costs in some cases).

(3) See Hicks (1985), p. 82.

(4) See Kaldor (1975), pp. 351 to 353.

(5) See Chakravarty (1984).

(6) Carlton (1986) after analysing data on actual transaction prices paid for a variety of products concludes that prices can remain unchanged for several years and "new theories are required to justify what looks like non market clearing bahaviour" (p 639). Also see Poterba, Rotemberg and Summers (1986).

(7) See Solow (1980), p. 8.

(8) See Kaldor (1975), pp. 353-354.

(9) See Hicks (1985), p. 82 for quote and chapters 8, 9 and 10 for his theory of "fixprice" equilibrium.

(10) For a summary and discussion of these, see Scott (1991), Chapters 12 and 13 pp. 336 to 391.

(11) See Chenery's article in Chenery, et al (1986), pp. 24-26.

(12) See Kaldor (1967).

(13) See Chakravarty (1984).

(14) See Mitra (1977), Chapter 10, pp. 141-165.

(15) See Ishikawa (1967), Chapter 4, pp. 290-347.

(16) See Sau (1974).

(17) See Womack, Jones & Roos (1990), especially chapters 3 to 6, pp. 48-168.

(18) For a description of these developments see Suzaki (1987), especially chapters 6 to 13, pp. 69-203.

(19) See Romer (1986).

(20) See Hoffman (1958), especially pp. 31-41.

(21) See Bagchi (1987), pp. 5-6.

(22) See Chenery, Robinson in Syrquin (1986), especially the article by Chenery and Syrquin, pp. 37-83.

(23) See Ishikawa (1967), Chapter 5, pp. 338-437.

(24) See Anderson (1982).

(25) See Yamaza and Watanabe (1988) for a statistical analysis of the effect of industrial restructuring on comparative advantage and external trade. The quote appears on p. 217.

(26) See Porter (1990), chapters 3 and 4, pp. 69-175.

(27) See the articles by Kubo, De Melo and Robinson (pp. 148-187) and by Kubo, De Melo, Robinson & Syrquin (pp. 188-225) in Chenery, et al (1986).

## 3. METHODOLOGY AND DATA SOURCES FOR EMPIRICAL ANALYSIS

### General

Before we present our empirical findings, we have to perform the rather mundane task of explaining how they have been arrived at. We must start by stressing that this is not an exercise in rigorous econometrics. The objective is to generate some indicative estimates to test our hypotheses. We are interested in uncovering the directional changes if any, and not in a precise measurement of these changes. The statistical techniques used are thus elementary and subject to many theoretical difficulties. Owing to data limitations, our data operations are also based on simplifying assumptions, occasionally bordering on the heroic. It is our hope that proper econometricians will take over from here and do a more thorough job of it.

### Sector and Sub-sector Classification

Our focus in this study is the "factory manufacturing sector" and its sub-sectors. The definition of sectors and subsectors is given in Table-3.1. After some hesitation, we have for reasons of convenience decided to look at the subsectors at a fairly high level of aggregation and to select a few brief but somewhat

Table - 3.1

BASIS FOR CLASSIFYING SECTORS AND SUB-SECTORS

| Sector/ Sub-sector | Coverage | Corresponding 2-digit NIC Code |
|---|---|---|
| Manufacturing sector | All groups classified under one-digit codes 2&3 by the National Industrial Classification (NIC 70) except Repair Services. | 20 to 38 |
| Factory sector | Units covered by the Annual Survey of Industries (ASI), ie. factories registered under the Factories Act, 1948. | |
| Cottage sector | Other units, described by the National Accounts Statistics (NAS) as "unregistered". | |
| Sub-sectors | | |
| (1) Edibles | (a) Food Products | 20-21 |
| | (b) Beverages, Tobacco & Tobacco products | 22 |
| (2) Textiles | (a) Cotton Textiles | 23 |
| | (b) Wool, Silk & Synthetic Fibre Textiles | 24 |
| | (c) Jute, Hemp & Mesta Textiles | 25 |
| | (d) Textile Products (including wearing apparel other than footwear). | 26 |
| (3) Other Agro | (a) Wood & Wood Products, Furniture & Fixtures. | 27 |
| | (b) Paper & Paper Products, Printing & Publishing. | 28 |
| | (c) Leather, Leather & Fur Products. | 29 |
| (4) Hydro-Carbons | Rubber, Plastic, Petroleum & Coal Products. | 30 |
| (5) Chemicals | Chemicals & Chemical Products (except products of Petroleum & Coal) | 31 |

Table - 3.1
(Cont'd)

| Sector/ Sub-sector | Coverage | Corresponding 2-digit NIC Code |
|---|---|---|
| (6) Silicates | Non-metallic Mineral Products. | 32 |
| (7) Metals | Basic Metal & Alloy Industries | 33 |
| (8) Engineering | (a) Metal Products and Parts except Machinery and Transport Equipments. | 34 |
| | (b) Machinery, Machine Tools & Parts except Electrical Machinery. | 35 |
| | (c) Electrical Machinery, Apparatus, Appliances & Supplies & Parts | 36 |
| | (d) Transport Equipments & Parts | 37 |
| 9) Unclassified | Other Manufacturing Industries | 38 |

unconventional terms to denote these subsectors. We however believe that our analysis is still at a meaningful level of disaggregation and the terminology is not excessively confusing.

"Food, beverages and tobacco" are frequently clubbed together and the term "edibles" describes them well enough. It is quite usual to treat "textiles" as one group. "Other agro" (-based industries) is a convenient residual classification. The term "hydrocarbons" is used to describe "rubber, plastic, petroleum and coal Products" which are hydrocarbon-based. Almost all important products classified conventionally as "non-metallic mineral Products" (e.g. glass, ceramics, cement, abrasives, etc.) are really "silicates". The term "engineering" is more conventional. But "metals" have been separated from this group, because we wish to distinguish the metallurgical process from the process of converting metals into products.

Annual Rates of Change

All annual rates of change (g) are exponential rates, calculated by regressing time series data on time (t) to yield the following equation :

$$\text{Log } Y_t = \text{Log } Y_o + g.t \qquad \ldots\ldots \qquad (6)$$

## Price Indices

All price indices used are based on those "implicit" in the National Accounts Statistics (NAS), produced by the Central Statistical Organization (CSO), with 1980/81 as the base. We preferred these to wholesale price indices for the following reasons :

(1) The base for wholesale price indices is 1981/82. Since the starting point of our analysis is 1980/81, we prefer to use this year as the base.

(2) NAS provides implicit deflators for services as well as goods. For calculating changes in input costs we need both.

(3) For the manufacturing sector, NAS uses fixed weight wholesale price indices as deflators for two-digit industry groups and the deflators that emerge at higher levels of aggregation reflect shifting weights. Since most of our analysis is at a higher-than-two-digit level of aggregation, we prefer to follow the same method.

In view of point (3) above, all deflation of current to constant prices (of consumption and output values and input costs) has, to the extent possible, been done at

the two-digit level and constant price data thus obtained aggregated to obtain data for subsectors and the manufacturing sector as a whole. Price indices at the level of subsectors and the manufacturing sector as a whole have emerged from the two-digit level constant price data.

## Measures of Growth

In line with usual practice, we have used Gross Value Added (GVA) at constant prices as reported by the NAS as a measure of growth of the manufacuring sector and its subsectors. However, this is not very satisfactory. As David[1] observes, "In view of the potentially nasty index number problem raised by the residual deflation procedure..... the simple device of employing an index of the prices of the industry's output to render the income it generates into constant dollars may take on momentary appeal. However, the procedure..... in effect conceives of the payment to the factors being made in the commodities they produce, valued in the prices of the base year. If one is content to assume that people do not exchange their income-in-kind for other goods, why not also assume that they would be content to retain the currency they receive, and thereby circumvent the entire problem of deflation?" In view of the above as well as other analytical reasons which will become obvious later, we have used two additional

measures of growth. Growth in production is measured by changes in the Value of Gross Output (VO) at constant prices, which is a similar but more comprehensive measure than the frequently used "index of industrial production". As a measure of growth in demand we have used changes in Apparent Domestic Consumption at constant prices.

Apparent Domestic Consumption:

Subsector-wise estimates of apparent domestic consumption at current market prices (C) have been based on the following equation :

$$C = O_F + T + O_C + M + D - E \quad \ldots\ldots \quad (7)$$

where, $O_F$ and $O_C$ are the VO of Factory and Cottage Sectors, M and E CIF import and FOB exports, and T and D, the value of indirect taxes levied by the Central Government on domestic production and imports. We have had to assume away changes in stocks and state-level levies, as the necessary data could not be generated. However, since the central taxes equalise the market prices of imports and domestic production and the state levies made thereafter, the omission of the latter may lead to a slight underestimation of C, but not a distortion in the relative shares of its various components.

$O_P$ is available from the NAS, M and E from the March issues of the Monthly Statistics of Foreign Trade of India published by the Directorate General of Commercial Intelligence Services (DGCIS), and T and D from the annual budget documents of the Ministry of Finance. Data on $O_C$ are not directly available and have had to be estimated.

Value of Gross Output of the Cottage Sector:

The NAS reports subsector-wise GVAs for the Cottage or "unregistered" manufacturing sector. The latest published input-output tables relating to the Indian economy was published for 1983/84 by the CSO and tallied with GDP at market prices for that year, as reported in NAS 1989. Using the economy-wise estimates of VOs and GVAs of various subsectors as given in these inputs-output tables, as well as the NAS 1989 estimates of GVAs of "registered" and "unregistered" sectors and VOs of the former, we have derived the GVA : VO ratios for the various subsectors of the Cottage sector for 1983/84. Not unexpectedly, these ratios are much higher than the corresponding ratios for the Factory sector, because production in the former is labour rather than material intensive. These ratios, after some "reasonability" tests have been assumed to have remained constant during the 80s and used to rate up the GVAs of the various subsectors of the Cottage sector into their corresponding VOs.

The only exception to this approach is the unclassified group where a more direct method is available. All of India's exports of gems, jewellery and handicrafts is from the Cottage sector and the very substantial GVA generated through this is shown in the unclassified group. For gems and jewellery exports, the value of exports would correspond to VO. The GVA from such exports has been estimated by deducting from this, the value of imports of "precious stones" and 5% of the value of exports as other expenses. For handicrafts exports also, the value of exports is the VO. The corresponding GVA has been assumed to be 80% of this. The residual GVA (after deducting the GVA from the export of gems, jewellery and handicrafts) has been rated up to VO by assuming a GVA to VO ratio of 80%. All these ratios are based on trade estimates.

Indices of Market Prices of Output:

At the two-digit level of industry classification, the NAS uses wholesale price indices to deflate VO and GVA to constant prices[2]. Since these really represent market prices, indices of market prices of output ($P_m$) can be calculated as follows:

$$P_m = \frac{O_F \text{ at current prices}}{O_F \text{ at constant prices}} \times 100 \quad \ldots\ldots \quad (8)$$

**Demand Equations:**

For each subsector, as well as the manufacturing sector as a whole, time series data of C and $P_m$ have been used to generate the following double logarithmic demand function which corresponds to equation (5) :

$$\text{Ln}\ (Q_i/N) = K_i + e_i.\text{Ln}(Q/N) + e_{ii}.\text{Ln}(P_i/P) \ldots\ldots \quad (9)$$

where, $Q_i/N$ is the per capita domestic consumption of $i^{th}$ good at constant prices; $K_i$, $e_i$ and $e_{ii}$ are constants, the latter two being interpreted as income and own price elasticities; $P_i$ (corresponding to $P_m$) its price; Q/N the aggregate per capita expenditure on all goods and services at constant prices (or per capita GNP at constant market prices); and P the GNP deflator.

Brown and Deaton[3] call this the "pragmatic approach". This has been used extensively, but is nonetheless subject to several difficulties, because income and price do not vary independently in time series data and the interactive effect of the two cannot be separated with any degree of accuracy. However, after considering the other alternative of analysing complete demand systems they conclude : "Most of the more successful work with dynamic

models rests on the single equation pragmatic approach... the problems of allowing for dynamic effects are sufficient in themselves without complicating matters by worrying over much about the (exact) specification of price effects".

However, since one of our objective is to examine the importance of relative changes in price in explaining growth, we have used two other checks. First, we have also regressed demand growth on income alone to see if the introduction of price as an additional variable increases the explanatory power of equation (9) significantly. Secondly, the effects of income and price changes have been estimated separately by resorting to a two-stage analysis, where at each stage one variable is held constant and the other allowed to change. The relevant equations are :

$$\text{Ln}(P_iQ_i/N) = K_i + e_i \ \text{Ln}(PQ/N) \quad \ldots\ldots \quad (10)$$

and

$$\text{Ln}(Q_i/N) - e_i \cdot \ln(Q/N) = K_{ii} + e_{ii} \ln(P_i/P) \ \ldots \quad (11)$$

## Growth of the Factory Sector due to Share Gains

Growth in $Q_F$ could result not only from a growth in C, but also a fall in $O_C$ or M relative to C (gains from the Cottage Sector or import substitution), or a rise in E (gain from export expansion). The contribution of these

three factors has been estimated by dividing C into four components, viz. ($O_F$+T), ($O_C$), (M+D) and (E) and expressing each component as a percentage of C. The changes in these percentages each year, as a percentage of the share of ($O_F$+T) in C in the previous year, would provide year-by-year estimates of growth of the Factory Sector due to gains from the Cottage Sector, import substitution and export expansion. From these annual figures, we can work out the trend rates of gain per annum. This is really an extension of Chenery's[4] method of calculating growth due to import substitution.

## Analysis of Costs & Prices

The basic accounting identity underlying our analysis of costs and prices is given below :

$$P_O.O = I.P_I + F.P_F + L.w + (K_F.P_{FK}+K_W.P_{WK})\ r \quad .... \quad (12)$$

where, O, I, F, L, $K_F$ and $K_W$ are the quantity of output and inputs of material, fuel, labour, fixed capital and working capital; $P_O$, $P_I$, $P_F$, $P_{FK}$ and $P_{WK}$ are the prices of output, materials, fuel, fixed capital and working capital; and w and r are the wage rate and the gross rate of return on capital (PBDIT as a ratio of total capital employed). For reasons of data availability, all inputs except fuel, labour

and capital have been classified as materials. We can focus on the determinants of $P_O$ better by rewriting equation (12) as follows :

$$P_O = \frac{I}{O}.P_I + \frac{F}{O}.P_F + \frac{L}{O}.w + \left(\frac{K_F}{O}.P_{FK} + \frac{K_W}{O}.P_{WK}\right).r \quad .. \quad (13)$$

The rate of change in $P_O$ over time will thus be the result of three rates of change, in input prices, input-output ratios or productivity, and the gross rate of return on capital employed. Our cost analysis attempts to segregate the effect of these three aspects.

## Advantages of the Cost Accounting Framework

The use of the cost accounting framework has several advantages. It allows us to do an input-wise analysis without getting involved with the problems of partial elasticities of substitution. In particular, it enables us to see the impact of material cost increases and savings, which account for the largest proportion of total costs. The accuracy of our results are not as critically dependent on the accuracy of fixed capital stock estimation as in productivity studies using "value added" production functions. Our approach also allows us to bypass the more basic "duality" problems associated with such functions.

Domar[5] has pointed out that value added functions, by reallocating the weight enjoyed by intermediate goods to capital and labour, are likely to lead to exaggerated estimates of total factor productivity. As he puts it, "we are interested in ..... shoes made from leather by labour and machines, with the help of electric power. The output..... is clearly shoes, familiar physical objects, and not shoes lacking leather and made without power". In a more recent publication,[6], Bruno and Diewert in two separate articles analyse the biases inherent in using single and double deflated value-added in place of the correct gross output in production function and factor productivity studies and point out that correct estimates will emerge only under any of three possible hypotheses. In a third article Denny & May test these hypotheses empirically and reject all of them, thus raising doubts on the validity of the use of the value added specification.

It is worth pointing out that theoretically our estimates of total productivity will be the same as one would get by assuming a five-input Cobb-Douglas production function, constant returns to scale, Hicks-neutral technical progress and payments to factors according to their marginal revenue products.

## Data Source for Cost Analysis

The basic source of data for cost analysis is the Annual Survey of Industries (ASI), conducted by the National Sample Survey Organization (NSSO) and published by the CSO. As the ASI provides data relating to the Factory sector only, this analysis is limited to the Factory sector. ASI data have been used to work out, for each two-digit industry group, yearly data on total employment; values at current prices of gross output, material inputs (total inputs minus fuels), fuels consumed, employment costs, PBIDT, net fixed assets, gross fixed investment (changes in net fixed assets plus depreciation), and working capital employed; and the wage rate (employment cost per employee). NAS data of VO and GVA of two-digit industry groups in the Factory sector are compiled by adjusting the ASI data for non-response and exclusions (notably defence production). All the above data compiled by us from the ASI have therefore been rated up at the two-digit level, by a factor of "GVA as reported by NAS divided by GVA as obtained from ASI" to enable comparison over time and aggregation into subsectors and the sector as a whole.

## Ex-Factory and Output Price Indices

To convert the current price data into constant prices, we have derived indices of ex-factory prices of output ($P_o$) for each two-digit industry group from indices of market prices of output ($P_m$) as follows :

$$P_o = P_m \; / \; \frac{O_{P+T}}{O_F} \qquad \ldots\ldots \qquad (14)$$

The values of $P_o$ thus obtained have been used to derive a series with 1980/81 as 100.

## Input Price Indices

We have also constructed three input price indices by taking weighted averages of price indices of the various components of each input. These relate to materials, fuels and gross fixed investments. Weights have been assigned on the basis of CSO's input-output tables as well as detailed ASI tables for 1983/84 (Tables 3.2 to 3.7).

Wage rate indices simply reflect movements in employment costs per employee (and thus ignore any changes in the qualitative composition of employment). To render the current value of working capital into constant values,

Table 3.2

WEIGHTS FOR PRICE INDICES
- MATERIAL INPUTS

| Industry Code | Primary Sector Inputs | Manufactured Inputs | Service Inputs |
|---|---|---|---|
| 20-21 | 0.644 | 0.192 | 0.164 |
| 22 | 0.302 | 0.384 | 0.314 |
| 23 | 0.279 | 0.437 | 0.284 |
| 24 | 0.067 | 0.690 | 0.243 |
| 25 | 0.479 | 0.258 | 0.263 |
| 26 | 0.012 | 0.706 | 0.282 |
| 27 | 0.682 | 0.130 | 0.188 |
| 28 | 0.051 | 0.670 | 0.279 |
| 29 | 0.205 | 0.528 | 0.267 |
| 30 | 0.632 | 0.222 | 0.146 |
| 31 | 0.073 | 0.653 | 0.274 |
| 32 | 0.061 | 0.638 | 0.301 |
| 33 | 0.057 | 0.655 | 0.288 |
| 34 | - | 0.759 | 0.241 |
| 35 | 0.006 | 0.721 | 0.273 |
| 36 | - | 0.744 | 0.256 |
| 37 | 0.005 | 0.766 | 0.229 |
| 38 | 0.016 | 0.708 | 0.276 |

Table 3.3

WEIGHTS FOR PRICE INDICES
: PRIMARY SECTOR INPUTS

| Industry Code | Food Crops | Sugar-cane | Oil Seeds | Cotton | Jute Mesta & Hemp | Tea & Coffee | Tobacco | Rubber | Other Crops | Animal Husbandry | Forestry & Logging | Fishing | Coal & Lignite | Petroleum & Natural Gas | Metallic Minerals | Non-metallic Minerals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-21 | 0.05 | 0.21 | 0.28 | - | - | 0.09 | - | - | 0.22 | 0.14 | - | 0.01 | - | - | - | - |
| 22 | 0.06 | - | - | - | - | 0.01 | 0.68 | - | 0.25 | - | - | - | - | - | - | - |
| 23 | - | - | - | 1.00 | - | - | - | - | - | - | - | - | - | - | - | - |
| 24 | - | - | - | 0.10 | - | - | - | - | - | 0.90 | - | - | - | - | - | - |
| 25 | - | - | - | - | 0.99 | - | - | - | 0.01 | - | - | - | - | - | - | - |
| 26 | 0.09 | - | - | 0.62 | - | - | - | 0.05 | 0.01 | 0.22 | - | - | - | - | - | 0.01 |
| 27 | - | - | - | - | - | - | - | - | - | - | 1.00 | - | - | - | - | - |
| 28 | - | - | - | - | - | - | - | - | 0.08 | - | 0.80 | - | - | - | - | 0.12 |
| 29 | - | - | - | - | - | - | - | 0.06 | - | 0.85 | 0.09 | - | - | - | - | - |
| 30 | - | - | - | - | - | - | - | 0.04 | - | - | - | - | 0.05 | 0.91 | - | - |
| 31 | 0.22 | - | - | - | - | - | - | 0.01 | 0.39 | 0.01 | 0.10 | - | - | 0.10 | - | 0.17 |
| 32 | - | - | - | - | - | - | - | - | - | - | 0.04 | - | - | 0.01 | - | 0.95 |
| 33 | - | - | - | - | - | - | - | - | - | - | 0.02 | - | - | 0.01 | 0.97 | - |
| 34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35 | - | - | - | - | - | - | - | - | - | - | 1.00 | - | - | - | - | - |
| 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 37 | - | - | - | - | - | - | - | - | - | - | 1.00 | - | - | - | - | - |
| 38 | 0.01 | - | - | - | - | - | - | - | 0.15 | 0.26 | 0.36 | 0.01 | 0.21 | - | - | - |

## WEIGHTS FOR PRICE INDICES
## : MANUFACTURED INPUTS

| Industry Code | Sugar | Other Food Products | Beverages & Tobacco | Cotton Textiles | Wool, Silks Synthetic | Jute Textiles | Textile Products | Wood Products | Paper Products | Leather Products | Plastic & Rubber Products | Petroleum Products | Coal Products | Chemicals | Non-metallic Minerals | Metals | Metal Products | Non-electrical Machinery | Electrical Machinery | Transport Equipment | Misc. Manuf. Activity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20-21 | 0.19 | 0.51 | - | 0.01 | - | 0.03 | - | 0.02 | 0.02 | - | 0.01 | - | - | 0.11 | 0.01 | 0.01 | 0.07 | 0.01 | - | - | - |
| 22 | 0.05 | 0.07 | 0.36 | 0.01 | - | 0.01 | - | 0.01 | 0.09 | - | 0.03 | - | - | 0.07 | 0.13 | 0.01 | 0.09 | 0.05 | - | - | 0.02 |
| 23 | - | 0.01 | - | 0.72 | 0.03 | 0.03 | 0.01 | - | 0.01 | - | - | - | - | 0.14 | - | - | 0.02 | 0.03 | - | - | - |
| 24 | - | - | - | 0.12 | 0.58 | 0.02 | 0.02 | - | 0.02 | - | - | - | - | 0.22 | - | - | 0.01 | 0.01 | - | - | - |
| 25 | - | 0.01 | - | 0.01 | 0.01 | 0.64 | 0.13 | - | 0.01 | - | - | - | - | 0.11 | - | 0.02 | 0.04 | 0.02 | - | - | - |
| 26 | - | - | - | 0.42 | 0.14 | 0.02 | 0.30 | 0.03 | 0.01 | - | 0.02 | - | - | 0.02 | - | 0.01 | 0.01 | 0.01 | - | - | 0.01 |
| 27 | - | - | - | 0.01 | - | - | 0.01 | 0.79 | 0.01 | - | 0.02 | - | - | 0.06 | 0.01 | 0.02 | 0.03 | 0.02 | - | - | 0.02 |
| 28 | - | 0.01 | - | 0.01 | - | 0.01 | 0.01 | - | 0.73 | - | 0.01 | - | - | 0.14 | - | 0.04 | 0.03 | 0.01 | - | - | - |
| 29 | - | 0.02 | - | 0.01 | - | 0.01 | 0.04 | 0.01 | 0.02 | 0.61 | 0.14 | - | - | 0.13 | - | - | 0.01 | - | - | - | |
| 30 | - | - | - | 0.01 | 0.03 | - | 0.01 | - | 0.01 | - | 0.18 | 0.30 | 0.03 | 0.36 | 0.01 | 0.01 | 0.05 | - | - | - | - |
| 31 | - | 0.04 | - | 0.03 | - | 0.02 | - | 0.01 | 0.05 | - | 0.02 | 0.05 | 0.01 | 0.67 | 0.02 | 0.02 | 0.05 | 0.01 | - | - | - |
| 32 | - | - | - | - | - | 0.15 | - | 0.01 | 0.02 | - | 0.01 | 0.06 | 0.01 | 0.08 | 0.44 | 0.12 | 0.06 | 0.03 | - | - | 0.01 |
| 33 | - | - | - | - | - | - | - | - | - | - | - | - | 0.05 | 0.03 | 0.01 | 0.74 | 0.16 | 0.01 | - | - | - |
| 34 | - | - | - | - | - | - | - | 0.01 | 0.01 | - | - | - | - | 0.03 | - | 0.85 | 0.08 | 0.01 | - | - | 0.01 |
| 35 | - | - | - | - | - | - | - | 0.01 | - | - | 0.02 | - | - | 0.02 | - | 0.54 | 0.04 | 0.31 | 0.03 | 0.01 | 0.02 |
| 36 | - | - | - | - | - | - | - | 0.02 | 0.02 | - | 0.02 | - | - | 0.08 | 0.02 | -.42 | 0.03 | 0.01 | 0.33 | - | 0.05 |
| 37 | - | - | - | - | - | - | - | - | 0.01 | - | 0.09 | - | - | 0.05 | - | 0.43 | 0.05 | 0.04 | 0.03 | 0.29 | 0.01 |
| 38 | - | - | - | - | - | 0.01 | - | 0.03 | 0.03 | - | 0.03 | - | - | 0.10 | 0.06 | 0.34 | 0.03 | 0.01 | 0.05 | 0.07 | 0.24 |

Table 3.5

WEIGHTS FOR PRICE INDICES
= SERVICE INPUTS

| Industry Code | Construction | Passport & Communications | Trade | Banking & Insurance | Other Services |
|---|---|---|---|---|---|
| 20-21 | 0.02 | 0.16 | 0.65 | 0.09 | 0.08 |
| 22 | 0.08 | 0.10 | 0.37 | 0.05 | 0.40 |
| 23 | 0.01 | 0.15 | 0.56 | 0.08 | 0.20 |
| 24 | 0.01 | 0.16 | 0.43 | 0.11 | 0.29 |
| 25 | 0.01 | 0.23 | 0.54 | 0.11 | 0.11 |
| 26 | 0.04 | 0.13 | 0.42 | 0.05 | 0.36 |
| 27 | 0.02 | 0.18 | 0.64 | 0.10 | 0.06 |
| 28 | 0.02 | 0.19 | 0.39 | 0.18 | 0.22 |
| 29 | 0.02 | 0.14 | 0.60 | 0.12 | 0.12 |
| 30 | 0.02 | 0.23 | 0.58 | 0.14 | 0.03 |
| 31 | 0.02 | 0.19 | 0.50 | 0.15 | 0.14 |
| 32 | 0.03 | 0.31 | 0.46 | 0.07 | 0.13 |
| 33 | 0.05 | 0.27 | 0.44 | 0.12 | 0.12 |
| 34 | 0.04 | 0.24 | 0.38 | 0.12 | 0.22 |
| 35 | 0.03 | 0.16 | 0.29 | 0.12 | 0.40 |
| 36 | 0.03 | 0.16 | 0.38 | 0.17 | 0.26 |
| 37 | 0.04 | 0.16 | 0.38 | 0.16 | 0.26 |
| 38 | 0.02 | 0.21 | 0.30 | 0.06 | 0.41 |

Table 3.6

WEIGHTS FOR PRICE INDICES
- FUEL INPUTS

| Industry Code | Coal | Mineral Oil | Electricity | Firewood & Charcoal |
|---|---|---|---|---|
| 20-21 | 0.20 | 0.34 | 0.40 | 0.06 |
| 22 | 0.28 | 0.44 | 0.22 | 0.06 |
| 23 | 0.20 | 0.28 | 0.51 | 0.01 |
| 24 | 0.19 | 0.33 | 0.46 | 0.02 |
| 25 | 0.15 | 0.31 | 0.54 | - |
| 26 | 0.09 | 0.42 | 0.46 | 0.03 |
| 27 | 0.10 | 0.37 | 0.44 | 0.08 |
| 28 | 0.41 | 0.15 | 0.43 | 0.01 |
| 29 | 0.10 | 0.44 | 0.45 | 0.01 |
| 30 | 0.08 | 0.48 | 0.43 | 0.01 |
| 31 | 0.17 | 0.37 | 0.46 | - |
| 32 | 0.44 | 0.22 | 0.31 | 0.03 |
| 33 | 0.27 | 0.28 | 0.44 | 0.01 |
| 34 | 0.09 | 0.47 | 0.43 | 0.01 |
| 35 | 0.15 | 0.43 | 0.41 | 0.01 |
| 36 | 0.04 | 0.46 | 0.50 | - |
| 37 | 0.08 | 0.49 | 0.43 | - |
| 38 | 0.08 | 0.42 | 0.49 | 0.01 |

Table 3.7

WEIGHTS FOR PRICE INDICES
- GROSS FIXED INVESTMENT

| Industry Code | Plant & Machinery | Transport Equipment | Tools | Land & Building |
|---|---|---|---|---|
| 20-21 | 0.67 | 0.05 | 0.03 | 0.25 |
| 22 | 0.58 | 0.09 | 0.09 | 0.24 |
| 23 | 0.80 | 0.01 | 0.01 | 0.18 |
| 24 | 0.85 | 0.02 | 0.03 | 0.10 |
| 25 | 0.88 | 0.01 | 0.06 | 0.05 |
| 26 | 0.65 | 0.06 | 0.07 | 0.22 |
| 27 | 0.64 | 0.10 | 0.03 | 0.23 |
| 28 | 0.83 | 0.01 | 0.02 | 0.14 |
| 29 | 0.66 | 0.06 | 0.05 | 0.23 |
| 30 | 0.49 | 0.01 | 0.04 | 0.46 |
| 31 | 0.89 | 0.02 | 0.03 | 0.06 |
| 32 | 0.72 | 0.04 | 0.03 | 0.21 |
| 33 | 0.73 | 0.02 | 0.03 | 0.22 |
| 34 | 0.78 | 0.04 | 0.04 | 0.14 |
| 35 | 0.76 | 0.03 | 0.08 | 0.13 |
| 36 | 0.69 | 0.02 | 0.07 | 0.22 |
| 37 | 0.74 | 0.02 | 0.07 | 0.17 |
| 38 | 0.59 | 0.03 | 0.10 | 0.28 |

we have used the respective ex-factory output price indices on the assumption that working capital is nothing but a stock of final output at various stages of completion.

## Estimation of Capital Stock

The theoretical difficulties in aggregating and deflating fixed capital stock are so insurmountable that we would ideally have liked to avoid this exercise.[7] But even in our cost accounting framework this is unavoidable, although as we have said before, the accuracy of final results are nowhere as critically dependent on the accuracy of capital stock estimates as in total factor productivity studies based on "value added" production functions. In two recent comprehensive productivity studies, Goldar[8] and Ahluwalia[9] have used similar methods. Both rightly reject ASI estimates of net fixed assets on the ground that the depreciation provisions are exaggerated. Both start with a benchmark figure of gross fixed capital and add to it gross fixed investment at constant prices to derive estimates of growth in the gross stock of fixed capital. However, the two start with different benchmark estimates and while Goldar provides for a positive rate of discard over the years, Ahluwalia prefers to assume zero discard. For reasons of convenience, rather than any conceptual reasons, we have followed Ahluwalia's method. We have started with Hashim & Dadi's[10] estimates (for two-digit industries) of

gross value of fixed capital assets for 1960 at 1960 prices. Since this is also the starting point for Ahluwalia,[11] we have applied to these figures her estimates of rate of growth in capital stock at constant prices from 1959/60 to 1979/80 to arrive at capital stock figures at the end of 1979/80. These have then been reflated to 1980/81 prices by using the wholesale price index for machinery and equipment. Annual estimates of gross fixed capital stock thereafter have been derived by adding to this base figure annual figures of gross investment at 80/81 prices. The latter have been derived by deflating the corresponding current price figures by the price indices for gross fixed investment constructed by us.

**Fixed Capital Price Index**

From the above data and the book value of net fixed assets, we can now work out a notional price index for fixed capital input with 1980/81 as the base. Since for costing purposes the gross rate of return on capital is calculated on the basis of current (or book) value of capital employed this notional price index is in fact the relevant index of increase in the price of fixed capital input. Conceptually, it encompasses increases in the purchase price of new fixed capital over time as well as a fall in relation to new capital in the value of fixed capital acquired in the past because of obsolescence. For

reasons explained by Scott,[12] depreciation provisions should be seen as a "write off" for obsolescence rather than physical wear and tear and actual discard. Physical wear and tear is usually taken care of by repairs and maintenance, the cost of which is charged to revenue expenditure.

**Sources of Output Price Increase**

The current price data have been converted into constant prices by using the appropriate output and input price indices. The constant price data give us annual changes in input-out ratios, or productivity. We can also calculate, for each year the value of `r' and changes in this value. The impact of changes in input prices, input-output ratios and `r' on output price each year can now be worked out by applying the rates of change in these to the previous year's shares in total costs of each input. We can also calculate period averages by using average annual rates of change in all these variables over the entire period and the average share of each input in total costs for the period as a whole.

**Export and Import of Manufactured Goods:**

Annual values of export and import of manufactured goods by subsectors have been compiled from the March volumes of DGCIS. Since the basis of classifying

commodities was changed in 1986/87, it has been necessary to reconcile the data at fairly detailed levels of disaggregation. The basis of classification adopted by us, pre- and post- 1986/87 is given in Table-3.8.

## Exports of the Factory Sector

All export of gems, jewelleries and handicrafts have been assumed to have been made by the Cottage sector. Accordingly, this has first been removed from both total exports of manufactured goods and the VO of the Cottage sector. The residual exports by subsectors have then allocated between the Factory and Cottage sectors in proportion to their VOs.

## Import Intensity of Manufacture

Import intensity of manufacture for the Factory sector has been measured in terms of the rupee value (CIF) of import of materials, fuels, and plant and equipment for every 100 rupees worth of GVA generated. This has been calculated for each subsector and the Factory manufacturing sector as a whole in both gross and net terms, the latter being net of the rupee value (FOB) of exports. All figures are at current prices.

Table 3.8

**BASIS FOR CLASSIFYING FOREIGN TRADE DATA - MANUFACTURED ITEMS**

| | Divisions as per ITC Rev 2 (80/81 to 86/87) | Chapters as per ITC-HS (86/87 to 89/90) |
|---|---|---|
| Edible | | |
| - Dairy Products | 02 | 04 |
| - Vegetable Oils | 42 | 15 |
| - Meat & Fish Prep | 014 & 037 | 16 |
| - Sugar | 06 | 17 |
| - Cocoa Products | 072 | 18 |
| - Cereal Products | 046 to 048 | 19 |
| - Preserved Fruits & Veg. | 056 & 058 | 0711 to 0713 & 20 |
| - Beverages | 11 | 22 |
| - Animal Feeds | 08 | 23 |
| - Tobacco Manufacturers | 122 | 24 |
| - Miscellaneous Foods | 09 | 21 |
| Textiles | 266, 267, 65 & 84 | 54 to 63 |
| Other Agro | | |
| - Wood Products | 24 & 63 | 44 to 46 |
| - Paper Products | 25 & 64 | 47 to 49 |
| - Leather Products | 612, 613, 83 & 85 | 42, 43 & 64 |
| Hydro Carbons | | |
| - Plastic Products | 58 | 39 |
| - Rubber Products | 23 & 62 | 40 |
| - Petroleum Products | 334 | 2710 |
| - Coal Products | 32 | 2701 to 2708 |

Table 3.8
(Cont'd)

| | Divisions as per ITC Rev 2 (80/81 to 86/87) | Chapters as per ITC-HS (86/87 to 89/90) |
|---|---|---|
| Chemicals | 51 to 59 | 28 to 38 |
| Silicates | 66, except 667 | 68 to 70 |
| Metals | 67 to 69 except 695 | 72 to 81 except 7204 & 83 |
| Engineering | | |
| - Metal Products | 695 | 82 |
| - Non-electrical Machinery | 71 to 74 | 84 |
| - Electrical Machinery | 75 to 77 | 85 |
| - Transport Equipment | 78 & 79 | 86 to 89 |
| Unclassified | | |
| - Gems & Jewellery | 667 & 897 | 71 |
| - Handicrafts | 896 | 97 & 9991 |
| - Others | 81, 82, 87 to 89 except 896 & 897 | 65 to 67 & 90 to 96 |

All imports (Table 3.9) of crude petroleum, chemical grade non-metallic minerals (basically sulphur, phosphates and potassium), other non-metallic minerals, metallic ores and scrap and coking grade coal are assumed to have been used as inputs by the hydrocarbons, chemicals, silicates and metals (last three items) subsectors respectively. These have been allocated to the Factory and Cottage sectors in proportion to their VOs. In these categories, the Cottage sector however has a negligible presence.

Estimation of imported manufactured inputs (including petro-based fuels) is much more difficult. Imported manufactured goods are used not only as inputs for the manufacturing sector, but also as inputs for other sectors as well as for meeting final demand. We have therefore used the following indirect procedure which in our view would yield approximate but usable estimates. Using equation (7) we can work out for each category of manufactured imports the proportion of M in C or the CIF import-to-consumption ratio (Table 3.10). Consumption is measured at market prices because except for export production firms pay market prices for their inputs. The second step is to calculate on the basis of input-output tables, what proportion of materials, fuels and gross fixed investment in each subsector is accounted for various

Table 3.9

IMPORT OF NON-MANUFACTURED INPUTS
- BASIS FOR CLASSIFICATION

| | Divisions as per ITC Rev 2 (80/81 to 86/87) | Chapters as per ITC-HS (86/87 to 89/90) |
|---|---|---|
| Crude petroleum | 333 | 2709 |
| Non-Metallic minerals for chemicals | 271 & 274 | 2503 & 2510 |
| Non-metallic minerals for other industries | 27, except 271 & 274 | 25, except 2503 & 2510 |
| Ores & Scrap | 28 | 26 & 7204 |
| Coking coal | 32 | 2701 to 2708 |

Table 3.10

BASIS FOR CALCULATING IMPORT INTENSITY OF MANUFACTURE
CIF IMPORTS AS PERCENTAGE OF MARKET VALUE OF CONSUMPTION
OF MANUFACTURED INPUTS

| | 1980/81 | 1981/82 | 1982/83 | 1983/84 | 1984/85 | 1985/86 | 1986/87 | 1987/88 | 1988/89 |
|---|---|---|---|---|---|---|---|---|---|
| Material Inputs | | | | | | | | | |
| Edibles | 5.7 | 4.2 | 2.9 | 3.7 | 4.8 | 4.5 | 3.3 | 3.1 | 2.3 |
| Textiles | 1.2 | 1.9 | 1.8 | 1.8 | 1.0 | 1.1 | 0.8 | 0.6 | 0.8 |
| Other Agro | 3.2 | 4.1 | 2.7 | 3.0 | 4.0 | 4.6 | 5.4 | 6.5 | 7.5 |
| Hydrocarbons | 18.3 | 14.0 | 12.2 | 10.3 | 12.3 | 8.8 | 6.1 | 7.1 | 9.1 |
| Chemicals | 10.9 | 7.2 | 6.5 | 7.9 | 11.6 | 11.1 | 9.2 | 6.9 | 9.2 |
| Silicates | 5.6 | 3.8 | 2.8 | 3.6 | 1.3 | 1.5 | 1.4 | 1.2 | 1.6 |
| Metals | 14.1 | 13.5 | 11.6 | 11.0 | 8.5 | 10.2 | 10.1 | 9.0 | 10.0 |
| Engineering | 9.5 | 8.1 | 10.5 | 11.7 | 9.8 | 11.2 | 11.5 | 10.2 | 8.7 |
| Unclassified | 7.2 | 7.6 | 8.2 | 9.7 | 8.4 | 9.8 | 8.4 | 7.5 | 9.4 |
| Fuel Inputs | | | | | | | | | |
| Mineral Oils | 24.1 | 16.6 | 15.2 | 14.0 | 17.6 | 9.7 | 5.3 | 7.4 | 9.3 |
| Fixed Investments | | | | | | | | | |
| Machinery & Tools | 11.4 | 11.9 | 13.5 | 16.8 | 14.3 | 15.9 | 16.3 | 13.9 | 12.8 |

categories of manufactured inputs. By applying these two ratios to the annual subsector-wise actual figures of materials and fuels consumption and gross fixed investment, an estimate of import of manufactured inputs can be derived for each subsector.

## Self Dependence Ratios

The estimation procedure for Self Dependence Ratios is the same as for imported manufactured inputs, with two differences. For obvious reasons, only the second of the two ratios described above has been applied to actual figures of consumption of materials and fuels and gross fixed investment. Secondly, 19.3% (that being the relevant figure in the 1983/84 input-output table) of gross value addition by each subsector has been assumed to have been spent on manufactured consumer goods via factor earnings.

## Period Covered

The starting year for all analyses is 1980/81. The disaggregated statements in NAS and the ASI data are available for all years upto 1989/90 and 1988/89 respectively. The terminal year for our analyses is one of these two years, depending on the data source used.

## NOTES TO CHAPTER 3

(1) See David (1962).

(2) See Central Statistical Organisation (1989), p. 83. Also chapters 7 and 8 for a description of how NAS data on the manufacturing sector are compiled.

(3) See Brown & Deaton, p. 189 for the quote and pp. 182-190 for a general discussion of the "pragmatic approach".

(4) For a description of Chenery's method see Kubo, Robinson and Syrquin, pp. 130-132, in Chenery et al (1986).

(5) See Domar (1961), pp. 724-726.

(6) See the three articles in Fuss & Mcfadden (1972).

(7) For a discussion of the conceptual problems involved in measuring capital stock, see Goldar (1986), pp. 50-56.

(8) See Goldar (1986), pp. 61-65.

(9) See Ahluwalia (1984), pp. 186-188.

(10) See Hashim & Dadi (1973), p. 31. Also see pp. 13-32 for a description of the methodology and data relating to their estimates of the capital series.

(11) See Ahluwalia (1984), Appendix V, p. 213.

(12) See Scott (1991), pp. 14-33.

# 4. EMPIRICAL FINDINGS

## Genesis of the Growth Episode

The genesis of the high growth episode of the eighties in Indian manufacturing is best explained in a historical perspective, by dividing the post-independence period into three phases : a high growth phase upto mid-sixties (phase I), a low growth phase from the mid-sixties to the end-seventies (phase II), and a high growth phase in the eighties (phase III). Table 4.1 compares some salient features of the three phases. Growth during phase I was externally induced, by heavy public investment in the capital and intermediate goods sectors and, as pointed out by Bhagwati & Desai[2], by extensive import substitution in all sectors, especially consumer durables and intermediate goods. While many explanations have been advanced for the deceleration in phase II[3], the most plausible line of reasoning seems to be as follows. The external impulses to growth started petering out, as public investment in industry slowed down and the potential for import substitution was increasingly exhausted. At the same time, an expansionary supply response to the rising demand for consumer goods was impeded by increasing levy of indirect taxes, a restrictive industrial policy and poor infrastructural support [4]. This led to a recession in the capital and intermediate goods sectors also. The low domestic output of consumer goods could not support the

Table - 4.1

GROWTH AT CONSTANT PRICES

(% p.a.)

| | 1959/60 to 1965/67 | 1965/66 to 1979/80 | 1980/81 to 1988/89 |
|---|---|---|---|
| Value Added by the Factory Manufacturing Sector | 8.7 | 4.9 | 7.8 |
| - Intermediate goods | 10.3 | 4.3 | 6.3 |
| - Consumer non-durables | 4.9 | 4.7 | 6.9 |
| - Consumer durables | 13.1 | 7.7 | 12.5 |
| - Capital goods | 14.5 | 6.5 | 7.7 |
| Per Capita GNP | 2.1 | 1.4 | 3.1 |

Sources :

Value added by the manufacturing sector :

(1) First two periods : Ahluwalia's[1] estimates, converted into exponential rates.

(2) Third period : Our estimates, based on 3-digit level ASI data.

Per Capita GNP : Various issues of NAS.

capacity created for the production of capital and intermediate goods. Much of this capacity was too inefficient to be competitive in export markets.

During phase III, not only did the demand for consumer goods pick up (as reflected in the growth in per capita GNP), but a change in policy orientation allowed this increase in demand to be met with an expansionary supply response. The output of both consumer durables and non durables grew rapidly. This in its turn started pulling up the output of capital and intermediate goods. Thus, the distinguishing feature of this phase is that the growth was demand-induced.

As we shall see later, indirect taxes as a proportion of selling prices of manufactured goods remained on the whole stable during the eighties and did not choke off demand impulses. Changes in industrial policy encouraged an expansion in supply both by removing obstacles to production and encouraging competition. Specifically, there was delicensing, broad-banding and endorsement of industrial capacity; greater freedom to larger producers through an increase in the asset limit for MRTP purposes and an expansion in the Appendix I list; encouragement to financial and technical collaboration agreements as well as to foreign investment from OPEC countries and NRIs on a

fully repatriable basis; and full or partial decontrol of the pricing and distribution of a number of commodities. Ahluwalia[5] has pointed out that industrial production was also aided by a distinct improvement in infrastructural support, both due to higher public investment in infrastructure and increased efficiency.

## Growth & Entrepreneural Outlook

Interestingly, the high growth phase of the eighties may also have brought about a change in the outlook of entrepreneural classes in India. In the words of Bhagwati & Desai[6], historically "their primary origin from trading and moneylending classes . . . . have imparted a strong tendency towards sales and financial, rather than production, acumen and . . . . even a tendency towards quick gain rather than long term profit maximisation . . . . few of the industrial groups appear to have been interested in providing for systematic research. In this respect, the Indian experience has been contrary to the Japanese and this lacuna . . . . has continued in an attenuated form . . . . for different reasons arising primarily from the operation of industrial and trade policies". There seems to have been four distinct behavioural categories : the traditional business groups who have taken advantage of licensing restrictions to profit from large, pioneering investments, but have not managed their operations very efficiently;

groups that have expanded mainly by acquiring companies from the multinationals vacating India after the introduction of FERA and have profited more from asset appreciation than growth in output; the multinationals who have fought shy of large new investments, but have managed to maintain profitability through attention to operational efficiency and the protection afforded by brand names, international know-how and licensing restrictions; and the small and medium-sized entrepreneurs who have essentially been niche-players, often acted in a supporting capacity vis-a-vis large enterprises and have been unwilling to grow for fear of losing family control. The eighties saw the emergence of a fifth category, the "progressive" entrepreneur, drawn from within and without the existing entrepreneural classes who combine the capacity to take long term risks with production-orientation and an awareness of the need to run business efficiently.

Growth by Subsectors

As explained earlier, the initial stimulus to growth in the eighties was provided by increasing demand for consumer goods which was met with an expansion in supply. This led to an increase in the demand for and supply of capital and intermediate goods also. There was thus balanced growth in the domestic consumption of all manufactured goods.

The subsectors that grew most rapidly were chemicals, engineering, silicates and unclassified (Table 4.2). This is probably because these subsectors enjoy a wide demand base, catering as they do to the demand for consumer, intermediate and capital goods. On the otherhand, subsectors like textiles, other agro-based industries and metals which cater to a narrower demand base in this sense, registered relatively low growth. The consumption of non agro-based consumer goods would seem to have grown more rapidly than that of agro-based consumer goods. However, since we have not attempted any detailed disaggregated analysis, these comments must be regarded as speculative and not conclusive.

## Growth of the Factory Sector

Output of the Factory Sector grew faster than domestic consumption, due largely to a gain from the Cottage Sector and, to a smaller extent, from export expansion (Table 4.3). The relative contraction of the cottage sector which has been pronounced in the more traditional subsectors, correspond to the Ishikawa-Anderson hypotheses. Export expansion came from textiles, other agro-based industries (leather goods) and light chemicals. The effect of import substitution was on the whole neutral, gains in some subsectors (notably hydrocarbons) being matched by losses in others (notably wood pulp, heavy chemicals and engineering).

Table - 4.2

MANUFACTURING SECTOR:

GROWTH BY SUBSECTORS AT CONSTANT PRICES
(1980/81 TO 1989/90)

(% p.a.)

| Sub-sector | Apparent domestic consumption | Factory Sector | |
|---|---|---|---|
| | | Gross output | Gross value added |
| Edibles | 5.6 | 7.0 | 8.6 |
| Textiles | 3.8 | 4.8 | 3.9 |
| Other Agro | 3.2 | 7.5 | 6.6 |
| Hydrocarbons | 7.0 | 8.9 | 14.9 |
| Chemicals | 9.1 | 8.9 | 8.4 |
| Silicates | 10.3 | 11.2 | 11.2 |
| Metals | 3.5 | 3.9 | 2.0 |
| Engineering | 8.3 | 8.2 | 8.0 |
| Unclassified | 10.4 | 10.1 | 14.1 |
| Manufacturing | 6.5 | 7.4 | 7.7 |

Table - 4.3

FACTORY SECTOR:

SOURCES OF GROWTH IN GROSS OUTPUT
(1980/81 to 1989/90)

(% p.a.)

| Sub-sector | Total Growth | Growth in domestic consumption | Gain from Cottage sector | Import substi-tution | Export expans-ion |
|---|---|---|---|---|---|
| Edibles | 7.0 | 5.6 | 1.1 | 0.3 | - |
| Textiles | 4.8 | 3.8 | 0.6 | 0.1 | 0.3 |
| Other Agro | 7.5 | 3.2 | 4.3 | (1.2) | 1.2 |
| Hydrocarbons | 8.9 | 7.0 | - | 1.5 | 0.4 |
| Chemicals | 8.9 | 9.1 | - | (0.4) | 0.2 |
| Silicates | 11.2 | 10.3 | 0.6 | 0.3 | - |
| Metals | 3.9 | 3.5 | - | 0.4 | - |
| Engineering | 8.2 | 8.3 | - | (0.1) | - |
| Unclassified | 10.1 | 10.4 | (0.1) | (0.2) | - |
| Manufacturing | 7.4 | 6.5 | 0.7 | - | 0.2 |

Note: Figures in brackets are negative figures.

## Factory Sector : Effect of Growth on Productivity

Productivity of the Factory Sector increased in response to the growth in output. Table 4.4 establishes a statistical relationship between the two. The values of the intercept and x-coefficient of -1.51 and 0.41 respectively imply that productivity growth is negative until the rate of growth in output reaches 3.7% p.a. Thereafter, productivity increases by 0.41% with every 1% growth in output. This finding is similar to Ahluwalia's[7], who has used data for 62 subsectors going back to 1959/60, total factor productivity estimates based on value-added production functions, import substitution as an additional independent variable and a dummy variable for the period starting 1980/81. Her estimates for the 1980/81 to 1985/86 period of the corresponding values of the intercept and x-coefficient are -1.23 and 0.51 respectively.

## Sources of Productivity Increase

The sources of productivity increase show a fairly consistent pattern across subsectors (Table 4.5). Although the reduction in material input per unit of output was not very large in percentage terms, in absolute terms the contribution of material savings to productivity increase was the largest, owing to the preponderance of materials in total costs. The next highest contribution

Table - 4.4

**FACTORY SECTOR:**

**RELATIONSHIP BETWEEN OUTPUT AND PRODUCTIVITY GROWTH**

(% p.a.)

| Sub-sector | Average Rates of Growth, 1980/81-1988/89 | |
|---|---|---|
| | Gross Output (X) | Productivity (Y) |
| Edibles | 7.0 | 1.8 |
| Textiles | 4.8 | 1.4 |
| Other Agro | 7.5 | 1.1 |
| Hydrocarbons | 8.9 | 1.6 |
| Chemicals | 8.9 | 1.8 |
| Silicates | 11.2 | 2.5 |
| Metals | 3.9 | (0.8) |
| Engineering | 8.3 | 2.0 |
| Unclassified | 10.1 | 3.7 |
| Manufacturing | 7.4 | 1.7 |

Regression Output

$Y = -1.51 + 0.41\ X$
$\quad\quad\quad\quad (0.11)$

| | |
|---|---|
| R-Squared | 0.65 |
| Std. Error of Y est | 0.71 |
| No. of Observations | 10 |
| Degrees of Freedom | 8 |

Table - 4.5

FACTORY SECTOR:

SOURCES OF PRODUCTIVITY INCREASE
(Period Averages, 1980/81 to 1988/89)

(% p.a.)

| | Changes in Input:Output Ratios | | | | | Productivity Increase | | | | | Total increase |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Material | Fuels | Labour | Fixed capital | Working capital | Material | Fuels | Labour | Fixed capital | Working capital | |
| Foodstuffs | (1.4) | 0.2 | (9.6) | (1.9) | 0.5 | 1.2 | (0.1) | 0.6 | 0.1 | - | 1.8 |
| Textiles | (0.8) | 2.5 | (5.7) | (0.2) | (4.1) | 0.6 | (0.2) | 0.9 | - | 0.1 | 1.4 |
| Other Agro | (0.4) | 1.7 | (5.7) | (0.9) | (3.1) | 0.3 | (0.1) | 0.7 | 0.1 | 0.1 | 1.1 |
| Hydrocarbons | (1.9) | 8.4 | (5.2) | 0.5 | (2.3) | 1.6 | (0.2) | 0.2 | (0.1) | 0.1 | 1.6 |
| Chemicals | (1.6) | 0.6 | (6.0) | (3.6) | 0.2 | 1.1 | (0.1) | 0.5 | 0.3 | - | 1.8 |
| Silicates | (3.1) | 1.9 | (8.5) | (3.6) | 1.7 | 1.5 | (0.4) | 1.0 | 0.5 | (0.1) | 2.5 |
| Metals | 1.1 | 2.9 | (2.9) | 1.7 | (6.3) | (0.7) | (0.4) | 0.3 | (0.1) | 0.1 | (0.8) |
| Engineering | (1.2) | - | (5.9) | (1.8) | (3.3) | 0.9 | - | 0.8 | 0.1 | 0.2 | 2.0 |
| Unclassified | (2.6) | 1.4 | (6.3) | (8.0) | (5.0) | 1.7 | - | 0.9 | 0.7 | 0.4 | 3.7 |
| Manufacturing | (1.3) | 1.5 | (6.6) | (0.6) | (3.9) | 0.9 | (0.1) | 0.7 | - | 0.2 | 1.7 |

Nc. Figures in brackets are negative figures.

came from labour, in percentage terms the reduction in labour input per unit of output being the biggest of all inputs. There has also been a significant reduction in working capital input. On the whole, there has not been any significant change in fixed capital input (or the "capital-output ratio"), although there are variations by subsectors. Fuel input has gone up consistently, probably as a substitute for human energy. All subsectors except metals have shown an increase in productivity.

Ahluwalia's[8] estimates of productivity increase for the 1980/81 to 1985/86 period are not comparable with ours because of the different methodologies used. But the thrust of the findings is similar : there was an increase in productivity, productivity of labour increased substantially and there was not much change in the productivity of capital.

## Production Characteristics of New Investment

Table 4.6 analyses by subsectors the performance of incremental investment in terms of the incremental output and employment generated. Even in a relatively high-growth period the incremental capital-output ratio has been rather high, but this is largely explained by a low rate of growth

Table - 4.6

FACTORY SECTOR:

PRODUCTION CHARACTERISTICS OF NEW INVESTMENT
(Period Averages, 1980/81 to 1988/89)

| | Gross investment/ GVA % (a) | GVA growth at constant prices (% p.a.) (b) | Empl. growth (% p.a) (c) | Incremental capital-output ratio (a)/(b) | Employment elasticity of growth (c)/(b) | Employment growth per 1% gross investment (c)/(a) |
|---|---|---|---|---|---|---|
| Edibles | 25.4 | 9.3 | (3.0) | 2.7 | (0.32) | (0.12) |
| Textiles | 28.7 | 3.9 | (0.5) | 7.4 | (0.13) | (0.02) |
| Other Agro | 41.7 | 6.8 | 2.1 | 6.1 | 0.31 | 0.05 |
| Hydrocarbons | 41.0 | 15.7 | 1.9 | 2.6 | 0.12 | 0.05 |
| Chemicals | 40.0 | 8.4 | 2.4 | 4.8 | 0.29 | 0.06 |
| Silicates | 63.2 | 11.8 | 4.3 | 5.4 | 0.36 | 0.07 |
| Metals | 52.2 | 2.0 | - | 26.1 | - | - |
| Engineering | 25.0 | 7.6 | 2.6 | 3.3 | 0.34 | 0.10 |
| Unclassified | 24.8 | 15.0 | 7.9 | 1.7 | 0.53 | 0.32 |
| Manufacturing | 35.1 | 7.8 | 0.7 | 4.5 | 0.09 | 0.02 |

Note: Figures in brackets are negative figures.

in certain subsectors (e.g. textiles, other agro-based industries and metals). Not unexpectedly, the incremental employment-investment ratio has been low in most of the subsectors. This is more so in the case of the more traditonal subsectors like edibles, textiles and metals which are probably overmanned, than for the less traditional ones like engineering, chemicals and unclassified. An important reason for the low growth in employment would thus seem to be increased utilisation of the "slack" in labour force. If this is true, we should expect sustained growth in output, especially in the non-traditional subsectors, to bring about a more rapid growth in employment once the slack is taken up. It is also possible that the employment figures reported by the ASI are somewhat understated because of an increasing resort to contract labour.

## Productivity and Industrial Prices

Rising input costs were partially offset by improving productivity (table 4.7). For the manufacturing sector as a whole, about 10% of the productivity gain was retained as increased return on capital employed and the balance passed on as a reduction (or lower increase) in ex-factory prices.

Table - 4.7

FACTORY SECTOR:

SOURCES OF INCREASE IN EX-FACTORY PRICES
(Period Averages, 1980/81 to 1988/89)

(% p.a.)

| | Proportion of total cost | Input Prices % change | Impact | Productivity % change | Impact | Return on capital Emp. % change | Impact | Total |
|---|---|---|---|---|---|---|---|---|
| Materials | 0.72 | 7.3 | 5.2 | (1.3) | (0.9) | | | 4.3 |
| Fuels | 0.07 | 7.1 | 0.5 | 1.5 | 0.1 | | | 0.6 |
| Labour | 0.10 | 12.1 | 1.2 | (6.6) | (0.7) | | | 0.5 |
| Fixed Capital | 0.07 | 9.3 | 0.6 | (0.6) | - | } | | |
| | | | | | | } 1.4 | 0.2 | 0.9 |
| Working Capital | 0.04 | 6.3 | 0.3 | (3.9) | (0.2) | } | | |
| Total | 1.00 | | 7.8 | | (1.7) | | 0.2 | 6.3 |

Note: Figures in brackets are negative figures.

As Table 4.8 indicates, the fall in ex-factory prices was reflected in a fall in market prices (relative to input costs and overall prices). The effect of the incidence of indirect taxes on prices was on the whole neutral, increases in some subsectors being matched by decreases in others. Consequently, in all subsectors except metals market prices increased less rapidly than input costs. The difference was quite substantial in some of the subsectors.

A comparison of the average return on total capital employed (ROC) earned in various subsectors indicates that this varies widely, from 14.6% to 36.7% (Table 4.9). There has also not been any tendency for it to equalise across subsectors over the period, as indicated by the rate of change in ROC by subsectors. In general, profitability has been high in the high growth subsectors. As indicated by the value of the intercept, at a zero rate of growth average ROC (including depreciation) is about 12% which is lower than the average long (14%) and short term (17%) rates of interest that prevailed during the eighties. The value of the x-coefficient of 1.8 indicates that on an average break-even was achieved at a positive rate of growth of 3-4%. This conclusion is not surprising in view of the positive link between growth in output and productivity.

## Table - 4.8

## FACTORY SECTOR:

## SOURCES OF INCREASE IN MARKET PRICE
(Period Averages, 1980/81 to 1988/89)

(% p.a.)

| | Total price increase | Impact of change in | | | |
|---|---|---|---|---|---|
| | | Indirect taxes | Input prices | Product-ivity | Return on capital |
| Edibles | 6.1 | (0.2) | 7.7 | (1.8) | 0.4 |
| Textiles | 5.8 | 0.1 | 7.4 | (1.4) | (0.3) |
| Other Agro | 6.5 | (0.1) | 7.7 | (1.1) | - |
| Hydrocarbons | 5.4 | (0.9) | 7.2 | (1.6) | 0.7 |
| Chemicals | 5.4 | 0.3 | 6.8 | (1.8) | 0.1 |
| Silicates | 6.2 | 0.5 | 9.0 | (2.5) | (0.8) |
| Metals | 9.2 | (0.2) | 8.4 | 0.8 | 0.2 |
| Engineering | 6.4 | - | 8.4 | (2.0) | - |
| Unclassified | 4.7 | (0.7) | 8.5 | (3.7) | 0.6 |
| Manufacturing | 6.3 | - | 7.8 | (1.7) | 0.2 |

Note: Figures in brackets are negative figures.

## Table - 4.9

### FACTORY SECTOR:

### RETURN ON CAPITAL EMPLOYED (ROC)
(1980/81 to 1988/89)

(Period Averages, % p.a.)

| | ROC | Rate of change in ROC | Rate of growth in gross output |
|---|---|---|---|
| | (Y) | | (X) |
| Edibles | 33.7 | 5.1 | 7.0 |
| Textiles | 23.1 | (4.1) | 4.8 |
| Other Agro | 20.4 | (0.1) | 7.5 |
| Hydrocarbons | 29.6 | 8.5 | 8.9 |
| Chemicals | 24.6 | 0.6 | 8.9 |
| Silicates | 26.7 | (4.5) | 11.2 |
| Metals | 14.6 | 1.7 | 3.9 |
| Engineering | 28.0 | 0.1 | 8.2 |
| Miscellaneous | 36.7 | 3.2 | 10.1 |
| Manufacturing | 24.3 | 1.4 | 7.4 |

Note: Figures in brackets are negative figures.

Regression Output

$Y = 12.25 + 1.79\ X$
$\quad\quad\quad\quad\ (0.79)$

| | |
|---|---|
| Standard Error of Y Estimate | 5.28 |
| $R^2$ | 0.39 |
| No. of Observations | 10 |
| Degrees of Freedom | 8 |

## Effect of Falling Industrial Prices on Growth in Demand

In all subsectors except silicates, falling prices have had a stimulating effect on demand (Table 4.10). In metals, prices have risen and this has had a dampening effect on demand. That price did have an effect on demand is indicated by the fact that for all subsectors the two variable regression equation with price as an additional variable has a better explanatory power than the single variable equation with income as the only independent variable. For several subsectors introduction of price improves the explanatory power substantially. This view is further strengthened by the findings summarised in Table 4.11. If we measure the effect of each variable on demand separately, holding the other constant at each stage, the effect of price would seem to have been statistically significant in all but two of the subsectors. We must however explain that since the statistical analysis has been done with only ten years' data, one should not expect the precise values of the elasticities to hold over long periods of time.

The period average rates of change in per capita incomes and prices (Table 4.12) have been applied to the income and price elasticities implicit in the two variable

Table - 4.10

DETERMINANTS OF GROWTH IN PER CAPITA DOMESTIC CONSUMPTION OF MANUFACTURED GOODS
(1980/81 to 1989/90)

| | Two Variable Regression Analysis | | | One-Variable Regression Analysis | |
|---|---|---|---|---|---|
| | X-Coefficients (Std. error of X-Coeff.) | | | X-Coeff. (Std. error of X-Coeff.) | |
| | Growth in per capita income | Change in relative prices | $R^2$ | Growth in per capita income | $R^2$ |
| Edibles | 0.73 (0.07) | -0.93 (0.10) | 0.98 | 1.06 (0.20) | 0.78 |
| Textiles | 0.27 (0.11) | -0.72 (0.20) | 0.85 | 0.47 (0.15) | 0.55 |
| Other Agro | 0.17 (0.16) | -0.64 (0.42) | 0.58 | 1.39 (0.55) | 0.45 |
| Hydrocarbons | 1.05 (0.45) | -0.59 (0.52) | 0.92 | 1.52 (0.18) | 0.90 |
| Chemicals | 1.83 (0.60) | -0.47 (0.83) | 0.95 | 2.15 (0.18) | 0.94 |
| Silicates | 2.66 (0.27) | 0.37 (0.33) | 0.95 | 2.48 (0.21) | 0.94 |
| Metals | 0.74 (0.36) | -0.49 (0.50) | 0.52 | 0.42 (0.16) | 0.45 |
| Engineering | 1.83 (0.11) | -0.45 (0.28) | 0.98 | 1.92 (0.11) | 0.97 |
| Unclassified | 0.18 (0.61) | -2.91 (0.73) | 0.97 | 2.50 (0.28) | 0.90 |
| Manufacturing | 0.98 (0.13) | -1.13 (0.35) | 0.98 | 1.34 (0.10) | 0.96 |

## Table - 4.11

## DETERMINANTS OF GROWTH IN PER CAPITA DOMESTIC CONSUMPTION - RESULTS OF TWO-STAGE REGRESSION ANALYSIS

(1980/81 to 1989/90)

| | Growth in per capita money consumption as a function of growth in per capita money income | | Residual growth in real consumption as a function of change in relative prices | |
|---|---|---|---|---|
| | X Coeff. (Std. error of X-Coeff.) | $R^2$ | X Coeff. (Std. Error of X Coeff.) | $R^2$ |
| Edibles | 0.92 (0.02) | 0.99 | -0.80 (0.12) | 0.85 |
| Textiles | 0.75 (0.03) | 0.99 | -0.27 (0.31) | 0.08 |
| Other Agro | 0.73 (0.04) | 0.98 | -1.05 (0.51) | 0.35 |
| Hydrocarbons | 0.97 (0.05) | 0.97 | -0.72 (0.19) | 0.64 |
| Chemicals | 1.14 (0.05) | 0.98 | -1.37 (0.26) | 0.78 |
| Silicates | 1.31 (0.10) | 0.93 | -0.77 (0.52) | 0.17 |
| Metals | 1.02 (0.05) | 0.98 | -0.95 (0.23) | 0.68 |
| Engineering | 1.21 (0.04) | 0.99 | -1.26 (0.55) | 0.43 |
| Unclassified | 1.22 (0.06) | 0.98 | -1.70 (0.23) | 0.88 |
| Manufacturing | 1.01 (0.02) | 0.99 | -1.07 (0.17) | 0.84 |

## Table - 4.12

### AVERAGE RATES OF INCREASE
(1980/81 to 1989/90)

| | (% p.a.) |
|---|---|
| GNP at 1980/81 market prices | 5.3 |
| Population | 2.1 |
| GNP per capita at 1980/81 market prices | 3.2 |
| Overall prices (National Income Deflator) | 7.5 |
| Relative Prices | |
| Manufacturing | (0.9) |
| Edibles | (1.0) |
| Textiles | (0.9) |
| Other Agro | (0.7) |
| Hydrocarbons | (2.3) |
| Chemicals | (2.1) |
| Silicates | (1.4) |
| Metals | 2.0 |
| Engineering | (0.7) |
| Unclassified | (2.4) |

Note: Figures in brackets indicate negative figures.

equations to arrive at an estimate of the contribution of each factor to growth in demand over the decade as a whole (Table 4.13). For the manufacturing sector as a whole, price would seem to have contributed about a quarter of the growth in demand (in per capita terms). For some of the subsectors, the contribution was much higher, indicating the importance of price in determining the demand for manufactured goods.

## Effect of Growth on Self Dependence

Over the decade, growth of the manufacturing sector did increase its ability to sustain its own growth to some extent, as reflected in a small increase in its "self dependence ratio" (Table 4.14). The increase came essentially from an increase in investment in machinery and equipment, in most subsectors, while the other components of self dependence remained more or less static. In particular, there was no significant increase in the share of manufactured intermediates.

Structural transformation, as measured by a change in subsector-wise composition of the manufacturing sector, does not seem to have contributed much to the increase in the overall self dependence ratio. Of the subsectors with a higher-than-average self dependence ratio,

Table - 4.13

SOURCES OF GROWTH
IN PER CAPITA DOMESTIC CONSUMPTION

(1980/81 to 1988/89)

(Period averages, % p.a.)

| | Total Growth | Contribution of | | |
|---|---|---|---|---|
| | | Income | Price | Unexplained |
| Edibles | 3.5 | 2.3 | 0.9 | 0.3 |
| Textiles | 1.7 | 0.9 | 0.6 | 0.2 |
| Other Agro | 1.1 | 0.5 | 0.4 | 0.2 |
| Hydrocarbons | 4.9 | 3.4 | 1.3 | 0.2 |
| Chemicals | 7.0 | 5.8 | 1.0 | 0.2 |
| Silicates | 8.2 | 8.5 | * | (0.3) |
| Metals | 1.4 | 2.4 | (1.0) | - |
| Engineering | 6.3 | 5.9 | 0.3 | 0.1 |
| Unclassified | 8.3 | 0.6 | 7.0 | 0.7 |
| Manufacturing | 4.4 | 3.1 | 1.0 | 0.3 |

* Cannot be interpreted.

Note: Figures in brackets are negative figures.

Table - 4.14

FACTORY SECTOR:

EXTENT & SOURCES OF SELF DEPENDENCE

(% of gross output spent on manufactured goods)

| | Total | Materials | Fuels | Gross Investment in machinary & Equipment | Consumer Goods via factor earnings |
|---|---|---|---|---|---|
| 1980/81 | 48.5 | 37.6 | 1.8 | 5.1 | 4.0 |
| 1981/82 | 48.9 | 37.8 | 1.9 | 5.3 | 3.9 |
| 1982/83 | 48.1 | 37.0 | 2.0 | 5.3 | 3.8 |
| 1983/84 | 50.3 | 35.8 | 2.3 | 8.0 | 4.3 |
| 1984/85 | 47.3 | 35.6 | 2.2 | 5.4 | 4.1 |
| 1985/86 | 47.4 | 35.9 | 2.2 | 5.4 | 4.0 |
| 1986/87 | 48.9 | 37.2 | 2.4 | 5.4 | 4.0 |
| 1987/88 | 50.0 | 37.3 | 2.3 | 6.5 | 4.0 |
| 1988/89 | 51.7 | 38.1 | 2.1 | 7.5 | 4.0 |

four (chemical, silicates, engineering and unclassified) recorded a higher-than-average rate of growth (Table 4.15). But the other two (metals and textiles) recorded lower-than-average growth. Also, three subsectors with low self dependence ratios (hydro carbons, edible and other agro) recorded high growth.

## Effect of Growth on External Trade

Table 4.16 provides annual data on exports and imports of manufactured goods over the decade. Since much of the growth in exports came from gems, jewelleries and handicrafts which are made by the Cottage sector, the exports of the Factory sector are shown separately. Exports, both total and of the Factory sector, rose faster than imports, so that the trade deficit narrowed over the decade. As a proportion of VO exports fell upto 1986/87, but picked up rapidly thereafter. Imports as a proportion of VO also fell upto 1987/88 because of Bombay High and started rising thereafter. An analysis by subsectors (Table 4.17) indicates that not surprisinly, growth in imports came from a rising demand for capital and intermediate goods and has been reflected in high growth in imports of chemicals, engineering, unclassified and wood pulp (other agro). The low rate of increase in the import of hydrocarbons because

Table - 4.15

FACTORY SECTOR:

SUB-SECTOR WISE SELF DEPENDENCE RATIOS
(Period Averages, 1980/81 to 1988/89)

| | Self Dependence Ratio | Growth in gross output at constant prices |
|---|---|---|
| | | (% p.a.) |
| Edibles | 0.24 | 7.0 |
| Textiles | 0.51 | 4.8 |
| Other Agro | 0.45 | 7.5 |
| Hydrocarbons | 0.24 | 8.9 |
| Chemicals | 0.61 | 8.9 |
| Silicates | 0.57 | 11.2 |
| Metals | 0.58 | 3.9 |
| Engineering | 0.66 | 8.2 |
| Unclassified | 0.69 | 10.1 |
| Total | 0.49 | 7.4 |

## Table - 4.16

### IMPORTS AND EXPORTS OF MANUFACTURED GOODS
(1980/81 to 1988/89)

(Rs. Crores)

| | Imports (CIF) | Exports (FOB) | | (b) as % of (a) | (c) as % of (b) | (c) as % of (a) | As % of ex-factory value of output | |
|---|---|---|---|---|---|---|---|---|
| | | Total | Factory Sector | | | | Exports | Imports |
| | (a) | (b) | (c) | | | | | |
| 1980/81 | 7611 | 3996 | 2335 | 53 | 58 | 31 | 5.2 | 9.9 |
| 1981/82 | 7663 | 4724 | 2742 | 62 | 58 | 36 | 5.1 | 8.4 |
| 1982/83 | 8400 | 4853 | 2790 | 58 | 58 | 33 | 4.7 | 8.1 |
| 1983/84 | 9608 | 5501 | 3063 | 57 | 56 | 32 | 4.8 | 8.3 |
| 1984/85 | 11350 | 6354 | 3708 | 56 | 58 | 33 | 4.8 | 8.5 |
| 1985/86 | 13230 | 6755 | 3908 | 51 | 58 | 30 | 4.5 | 8.6 |
| 1986/87 | 13243 | 7362 | 3872 | 56 | 53 | 29 | 4.4 | 7.8 |
| 1987/88 | 13315 | 9759 | 5240 | 73 | 54 | 39 | 5.1 | 6.9 |
| 1988/89 | 17077 | 13998 | 7274 | 82 | 52 | 43 | 6.2 | 7.5 |
| 1989/90 | 21824 | 19771 | 11127 | 91 | 56 | 51 | 7.5 | 8.3 |

## Table - 4.17

## EXPORT AND IMPORT OF

## MANUFACTURED GOODS BY SUBSECTORS

(Period Averages : 1980/81 to 1989/90)

| Sub-sector | Share in Total (%) | | Rate of Growth (% p.a) | |
|---|---|---|---|---|
| | Imports | Exports | Imports | Exports |
| Edibles | 7.5 | 4.9 | - | 7.3 |
| Textiles | 2.2 | 29.1 | 1.2 | 11.0 |
| Other Agro | 4.6 | 6.2 | 20.9 | 26.2 |
| Hydrocarbons | 16.7 | 5.7 | 5.3 | 30.3 |
| Chemicals | 16.4 | 8.5 | 16.2 | 21.0 |
| Silicates | 1.0 | 0.6 | 1.4 | 7.1 |
| Metals | 17.0 | 4.2 | 9.5 | 12.3 |
| Engineering | 30.8 | 11.3 | 15.1 | 13.0 |
| Unclassified | 3.8 | 29.5 | 17.7 | 20.2 |
| Manufacturing | 100.0 | 100.0 | 11.2 | 16.0 |

of Bombay high is unlikely to be sustained in future years. Growth in exports has come primarily from labour intensive products, like leather goods, gems, jewellery and handicrafts, light chemicals (as reflected in the growth of chemicals and hydro carbons) and textiles. Engineering and metals have also registered fair growth in exports.

Of the possible general explanations for the healthy growth in manufactured exports in the eighties, two seem prima facie, more important than the others. For reasons explained in Chapter 2, the growth in output itself could have stimulated growth in exports. Secondly, there was a substantial fall in the foreign exchange value of the rupee especially during the second half of the decade and this might have increased the motivation and competitiveness of Indian exporters. These two hypotheses have been tested through a two variable regression analysis, where India's dollar exports have been expressed as a function of the rate of growth of output at constant prices and the fall in the dollar value of the rupee. The results are summarised in Table 4.18. In overall terms, growth in exports seems to have had a positive link with growth in output : for every 1% growth in real output, exports have increased by 2.25%. The fall in the dollar value of the rupee on the otherhand appears to have had a negative association with the dollar

Table 4.18

**MANUFACTURED GOODS : GROWTH IN EXPORTS AS A FUNCTION OF GROWTH IN OUTPUT AND THE FOREIGN EXCHANGE VALUE OF THE RUPEE**

| | X-Coefficients (Std. error of X-Coefficients) | | |
|---|---|---|---|
| | Growth in Output | Changes in Rs./US $ | $R^2$ |
| Edibles | 1.35<br>(1.53) | -1.02<br>(1.24) | 0.10 |
| Textiles | -0.71<br>(1.60) | 0.87<br>(0.88) | 0.35 |
| Other Agro | 2.89<br>(1.68) | 1.11<br>(0.81) | 0.91 |
| Hydrocarbons | 4.56<br>(1.63) | -2.30<br>(1.97) | 0.89 |
| Chemicals | 1.85<br>(2.76) | -0.37<br>(3.27) | 0.64 |
| Silicates | -0.45<br>(1.55) | 0.52<br>(2.06) | 0.02 |
| Metals | -1.65<br>(3.09) | 1.51<br>(1.74) | 0.16 |
| Engineering | 3.46<br>(0.92) | -3.10<br>(1.03) | 0.78 |
| Miscellaneous | 1.97<br>(0.41) | -1.67<br>(0.70) | 0.95 |
| Manufacturing | 2.25<br>(1.73) | -0.90<br>(1.57) | 0.75 |

Note:
The following regression equation has been fitted to annual data from 1980/81 to 1989/90

$LnY = a + b.LnX_1 + C.LnX_2$ ,

where Y, $X_1$ and $X_2$ represent exports in mill US $, gross output in Rs '000 crores at 80/81 prices and exchange rate in Rupees/US $ respectively.

value of exports. This presumably means that on the whole export values are fixed in rupee terms and a drop in the dollar value of the rupee leads to a fall in sales realisation in terms of dollars.

Of the six subsectors where the regression analysis has some statistical validity, four (i.e. hydrocarbons, chemicals, engineering and unclassified) conform to this general pattern. Exports of textiles, on the other hand, have benefited from the fall in the dollar value of the rupee. One may interpret this to indicate that here India is just one supplier in the global market where prices are fixed in terms of foreign exchange and a fall in the exchange value of the rupee enables India to reduce prices and pick up a more than proportionate increase in volume. Other agro-based products (essentially leather goods) seem to have benefited from both growth and the fall in the exchange value of the rupee.

From the point of view of assessing the effect of industrial growth on the balance of external trade, a more comprehensive and important indicator is changes in "the import intensity of manufacture" or the CIF value of imported inputs used per rupee of gross value added by the Manufacturing Sector. This can be measured either in gross terms or net of the value of FOB exports of manufactured

goods. For reasons of data availability, estimates of this figure have been possible only for the Factory Sector (Table 4.19). In gross terms, this figure has fallen from 47 p. in 80/81 to 30 p. in 88/89. This finding is consistent with unpublished estimates quoted by Jalan[9], according to which the value of imported inputs as a proportion of the value of "industrial outputs" were 15.7% and 11.2% for 1981/82 and 1987/88 respectively. Net of FOB exports, there has also been a similar fall, from 28 p. to 11 p. However, if one looks at a component-wise breakdown of this figure (Table 4.20), the position seems less satisfactory. In gross or net terms, the fall has come entirely from a reduction in the import of crude petroleum (because of Bombay High) which may not be sustainable. An increase in machinery and equipment and primary sector inputs (excluding crude oil) has been compensated by a fall in manufactured inputs. Of the subsectors hydrocarbons, silicates, metals and engineering are fairly import-intensive in net terms (Table 4.21). Contrary to popular belief, chemicals is not very import intensive in net terms.

## Table - 4.19

## FACTORY SECTOR:

## IMPORT INTENSITY OF MANUFACTURE

| | Input Imports (Rs. Cr. CIF) | | Input Imports as % of GVA | |
|---|---|---|---|---|
| | Gross | Net of FOB Exports | Gross | Net of FOB Exports |
| 1980/81 | 5.876 | 3.541 | 47 | 28 |
| 1981/82 | 6.623 | 3.881 | 45 | 26 |
| 1982/83 | 7.695 | 4.905 | 46 | 29 |
| 1983/84 | 8.062 | 4.999 | 39 | 24 |
| 1984/85 | 8.201 | 4.493 | 35 | 19 |
| 1985/86 | 9.556 | 5.648 | 36 | 21 |
| 1986/87 | 8.364 | 4.492 | 29 | 16 |
| 1987/88 | 9.629 | 4.389 | 29 | 13 |
| 1988/89 | 11.783 | 4.509 | 30 | 11 |

## Table - 4.20

## FACTORY SECTOR:

## COMPONENTS OF IMPORT INTENSITY OF MANUFACTURE

(% of GVA)

| | Total inputs imports | Crude petro-leum | Other non-manu-factured inputs | Manufac-tured inputs | Fuels | Machinery & Equipment |
|---|---|---|---|---|---|---|
| 1980/81 | 47 | 23 | 2 | 17 | 2 | 3 |
| 1981/82 | 45 | 23 | 2 | 15 | 2 | 3 |
| 1982/83 | 46 | 24 | 3 | 14 | 1 | 4 |
| 1983/84 | 39 | 17 | 2 | 13 | 1 | 6 |
| 1984/85 | 35 | 14 | 3 | 13 | 2 | 3 |
| 1985/86 | 36 | 13 | 4 | 14 | 1 | 4 |
| 1986/87 | 29 | 7 | 4 | 13 | 1 | 4 |
| 1987/88 | 29 | 9 | 3 | 12 | 1 | 4 |
| 1988/89 | 30 | 7 | 4 | 13 | 1 | 5 |

Table - 4.21

FACTORY SECTOR:

IMPORT INTENSITY OF MANUFACTURE BY SUB-SECTORS

(Input Imports as % of GVA)

| | Gross | | Net of FOB Exports | |
|---|---|---|---|---|
| | 80/81 | 88/89 | 80/81 | 88/89 |
| Edibles | 14 | 8 | (2) | (3) |
| Textiles | 8 | 10 | (33) | (35) |
| Other Agro | 12 | 17 | 4 | (13) |
| Hydrocarbons | 494 | 102 | 485 | 81 |
| Chemicals | 37 | 30 | 25 | 8 |
| Silicates | 24 | 21 | 17 | 18 |
| Metals | 43 | 48 | 30 | 35 |
| Engineering | 26 | 24 | 12 | 13 |
| Unclassified | 20 | 19 | (2) | 11 |
| Manufacturing | 47 | 30 | 28 | 11 |

Note: Figures in brackets are negative figures.

## NOTES TO CHAPTER 4

(1) See Ahluwalia (1991), Table 3.1, p 74.

(2) See Bhagwati & Desai (1970), p 91. They find that between 1951 and 1957, emphasis was on import substitution of consumer goods, followed by capital and intermediate goods. Betwen 1957 and 1963, the priority shifted to capital goods, followed by intermediate and consumer goods.

(3) For a summary of various views on the timing of and reasons for growth and deceleration see Sandesara (1992), pp 122-133.

(4) See Ahluwalia (1984), Chapters 5, 7 and 8.

(5) See Ahluwalia (1991), pp 85-88.

(6) See Bhagwati & Desai (1970), pp 49-50.

(7) See Ahluwalia (1991), pp 133-140.

(8) See Ahluwalia (1991), Table 3.2, p. 76

(9) See Jalan (1991), Note 15, p 152.

## 5. TOWARDS A STRATEGY FOR INDUSTRIAL DEVELOPMENT

### State as the Facilitator

Firms, and not economies, produce, sell, export, grow or perish. Success and failure at the macro level reflect the sum total of successes and failures of micro level enterprises. The recent changes in industrial policy, insofar as they allow greater freedom of action to such enterprises, have undoubtedly been a step in right direction. But quite clearly this is not enough. The state must also play a positive role as a facilitator, by setting strategic directions, seeing and communicating "the big picture", inculcating values, imparting education, creating environments, filling gaps and correcting fallacies of composition.

Viewed this way, a viable strategy for industrial development must lay down the basis for a constructive partnership between the state and industry. It should encompass the roles to be played by each and these roles must be mutually re-inforcing. In what follows, we have tried to bring together some of the strands of thought thrown up by our earlier discussions and provide an outline of what seem to us to be the main priorities for both the state and industry.

## Basic Strategic Thrust

Experience has taught us the futility of trying to attain many objectives at the same time. Our analysis suggests that we are most likely to succeed if we concentrate on growth as the main plank of our strategy. If we are able to sustain a high rate of growth for some time many of the other desirable outcomes should follow. Like improving productivity, falling industrial prices, expanding markets, rising capacity of the rural sector to buy industrial goods, growing exports and increasing employment.

## Capitalising on Existing Demand Impulses

Demand, as we have noted already, is a critical determinant of industrial growth during the intermediate stage of development. For achieving quick results, we have to exploit the demand impulses that exist already. We should take a pragmatic view of the rising domestic demand for consumer goods, durables and non-durables, and convert it into growing output. This will pull up the demand for and output of capital and intermediate goods automatically. Rosen[1], after considering the views of several economists, stresses "the need to expand output of consumer manufactures in order better to utilise the existing and planned capacity of the basic and capital goods sectors and to provide opportunities for their future growth. There is a

substantial market within India for consumer goods of high quality at reasonable prices. The exploitation of that internal market, and the policy changes necessary for that exploitation, would as a by-product, improve India's export capability".

Why, it may be asked, should we not look to global markets to provide the stimulus to growth, as in some Asian Countries? While for reasons explained later, a major thrust on exports is essential, it will be unrealistic to expect global demand to become the prime engine of growth in India. The Indian economy is so vast that even a two or three fold increase in exports will not be a sufficient stimulus to growth. Secondly, the slowing down in world trade will probably persist for quite some time. Thirdly, the requirements of the domestic market are so different from those of the export markets that matter, that aligning our production structure to the latter could become counter-productive. A more sustainable sequence will be the other way around : growth in domestic demand to growth in output, to increase in productivity, to increase in exports. Some of the successful developers in recent times have followed precisely this sequence.

It may also be asked if this kind of "consumption led" growth is sustainable in view of the "narrowness" of the demand base[2]. The answer, to our mind, is an unequivocal "yes". As pointed out earlier, sustained growth should lead to falling industrial prices and a rising demand for industrial goods in the non-industrial sector, especially the agricultural sector. Growth should also increase the industrial sector's demand for its own output, through a process of structural transformation. Perhaps a more legitimate cause for concern is the so-called "social disarticulation" effect of market-driven growth. If the consumption patterns of the lower and upper income groups are very different, then any growth that caters mainly to the needs of the latter will make the former poorer. This danger should be taken care of directly, through <u>effective</u> poverty alleviation measures, and not by diluting the process of industrial growth. Also, we sometimes tend to overestimate this danger. There is enough evidence that the consumption pattern of urban working classes and large sections of farmers in India is becoming increasingly similar to that of the so-called "urban elite".

## <u>Eliciting an Expansionary Supply Response</u>

Rising demand will be translated into growing output only if firms are <u>motivated</u> and <u>enabled</u> to make their profits from volumes rather than prices. Motivation will

depend inter alia on two things : competition, both domestic and foreign and a non-inflationary environment. If there is inflation "in the air", there is no compulsion to produce more or produce efficiently, because profits can be made by raising prices and/or by buying cheap and selling dear. The ability of the East-Asian countries to keep inflation under control and the failure of the Latin American countries to do so have been a key reason for the difference in their economic performance.

The ability of firms to expand output will depend on speedy removal of policy and procedural hurdles and the availability of inputs, including infrastructural support. A good beginning has undoubtedly been made with re-orientation of policy, but implementation especially at the grass roots level leaves room for improvement. In view of difficulties in raising resources for public investment, infrastructure could well become a constraint to industrial growth, unless the private sector is persuaded to play an expanding role in infrastructural development. For this, investment in the infrastructural sector must become profitable, either directly or through its effect on final output. This will require a pragmatic approach to pricing and distribution control.

Not only must the state be concerned with removal of supply bottlenecks, but it should also provide a strategic direction to enterprise level efforts. This is important, because firms by their very nature are apt to miss the wood from the trees. A good example of the strategic role of the state is how the Japanese government stimulated the growth of a powerful 150 million tonne steel industry after World War II which enabled the Japanese automobile, ship-building and home appliances industries to become competitive in the world market. In recent times, they have catalysed the development of a highly efficient electronics industry which has lent a cutting edge to a number of other industries.

## Strengthening the Fall in Industrial Prices

As we have seen before, growth and competition may be expected to bring about a fall in ex-factory prices of industrial goods. But for this to be reflected in market prices and have an expansionary effect on markets, government must also pursue a policy of raising revenue from an increase in volumes rather than in the rates of indirect taxes. A useful start has been made in this direction with the 1993 fiscal budget. But a lot remains to be done. State governments are yet to fall in line. The tax rates

on many commodities are still very high. The cascading effect of taxes on prices has to be eliminated through resort to value added taxes. Also, tax rates must fall over time, as volumes increase.

## Technical Progress

The state should also play an active role in setting directions for technical progress in industry. There is much more to technical progress than manpower reduction. We have earlier noted some recent pathbreaking developments in capital-saving technology. The relevance of these in the Indian context is obvious. Equally, there is need for much greater attention to material-saving technology, especially with a view to reducing the consumption of imported materials like petroleum, wood, certain types of minerals, etc. To some extent the desired directional changes can be achieved by allowing prices to reflect the true scarcity values of inputs. Increase in interest rates and floating of the exchange value of the rupee are thus steps in the right direction. But a careful review of administered prices is overdue. There is also a lot to be done by way of getting communications right, through a more effective and continuous dialogue between government and industry who often seem to work at cross purposes.

As discussed in chapter 2, technical progress is becoming increasingly characterised by heavy initial investments in knowledge generation, much of which gets dispersed quickly. In view of the huge fixed costs and the high rates of obsolescence involved, our emphasis should be on cost effective transfer of basic technology through licensing arrangements, supported by innovative work on adaptations and improvements at the application stage. This is what the Japanese did with great success from the mid forties to the mid seventies, until they were ready to undertake basic research on their own. Undoubtedly, it will still be necessary to undertake some basic R&D work within the country, to cater to requirements specific to India. To the extent this is state-initiated, there is need for much greater commercial orientation than is the case now. In enlightened self interest, industry must also play a much more active role in commissioning and monitoring economically relevant fundamental research through competent research organisations. Much of the in-house research in industry today is nothing more than a tax avoidance measure.

## Management of Human Resources

Ohmae[3] has emphasised that if there is one factor that has given Japanese industry a decisive edge it is the quality of human resources at its disposal, developed

with great care by government and industry jointly. Potentially, this could have been our advantage as well, given the large numbers, the docility and intelligence of the Indian people, their capacity for hard work (as displayed by agricultural labour), and the respect for authority bred by a long tradition of benevolent paternalism. As Banuri and Amadeo[4] have shown, even in terms of institutional characteristics, Indian labour is quite similar to East Asian, and quite different from Latin American labour. The level of unionisation and urbanisation is low, unions are widely dispersed and their capacity to influence policy at the national level is not very high. Unfortunately, years of populism, industrial stagnation and indifferent management of human resources have led to a situation where industry regards human resources as a liability and industrial restructuring is seen as being synonymous with mass retrenchment.

What is not fully realised yet is that in Indian industry today we have a vast untrained, surplus of non-productive manpower, co-existing with an emerging shortage of trained personnel. Unfortunately, much of the existing surplus is incapable of filling the potential gap, in terms of both attitudes and skills. In the area of human resources management some of the immediate tasks would thus

seem to be a reduction in obsolete manpower, development of trained manpower, increasing accountability and involvement of people at all levels, improving team effort by promoting group harmony and developing a profit-linked remuneration policy. Much of this will have to be done at the firm level, but the firm-level efforts will need to be supplemented by the State.

Firms should be allowed to manage their affairs, without any external political interference. In a competitive environment where success depends on the quality and motivation of human resources, it is unlikely that they can indulge in unfair labour practices to any great extent. The state should therefore concentrate less on regulation and more on providing support to enterprise level efforts to upgrade the quality of human resources, by inculcating values, anticipating skill requirements, providing facilities for skill development through vocational and continuing education, acting as a channel of communication and ensuring that the efforts of the economic and HRD ministries are well co-ordinated.

## Industrial Investment

A high rate of industrial growth will require a high rate of industrial investment, used efficiently. This may prove to be a constraint. The rate of savings has tended to stagnate in recent years. There is also some substance in the view that a consumption led growth could have a dampening effect on savings. After the recent "scam", households have been averse to investing their savings in the stock market. In view of increasing rival demands on the capital market from other sectors including the central and state governments, industrial investment may also get "crowded out" to some extent.

There is a strong case for maintaining a high real rate of interest, to encourage savings and prevent wasteful use of capital. The state will need to restore investor confidence, by keeping a careful vigil over fund utilisation, enforcing prudential norms and ensuring accountability to small investors. To channel parallel market resources into productive investment, not only must the government persist with measures to make the official and parallel markets converge, but the channels of intermediation must also become more output (as distinct from speculation) oriented.

Efficient utilisation of investment requires that tax policies are not market-distorting, so that investment is based on basic economics and not tax shelters. We must also create an environment which encourages the shedding and/or upgrading of unproductive assets through rationalisation and restructuring. Here there are two problems. There is a "mindset" problem with entrepreneurs who are often sentimentally attached to their inefficient conglomerates, built over generations. Secondly, their capacity to restructure is limited by the absence of freedom to disband non-paying operations. Policy must therefore facilitate both freedom of entry and freedom to exit.

Our earlier discussions highlight the need for ensuring efficiency through adequate investment in facilitating areas like infrastructure, knowledge generation, human resources development (including housing, education, etc.) and information technology. Initially, firms may shy away from such investments. Government will therefore have to play a motivating role by educating, providing directions, facilitating collaboration between firms, removing obstacles and offering selective incentives.

## Foreign Trade

In a recent article, Rodrik[5] has emphasised the importance of "sustainability" in designing structural re-

adjustment programmes. From this point of view, perhaps the biggest question mark relates to India's ability to create a large enough trade surplus to service a rapidly increasing debt burden.

It will be unrealistic to expect a pick-up in world trade in the near future. The U.S.A. has been financing its large fiscal deficit through external borrowings which get translated into commodity imports. If President Clinton succeeds in reducing the fiscal deficit, this will have a dampening effect on U.S. imports. This in turn will reduce Japan's exports and consequently imports. The slowing down in world trade will heighten protectionism and competition. Our analysis suggests that if we are able to achieve a high rate of growth in manufacturing, exports of non-traditional manufactures should increase. But this may not be the case for traditional manufactures like textiles which still account for a large proportion of total exports. Growth, on the otherhand, will induce an increase in imports, especially of petroleum products and this could be aggravated by an increase in crude prices. We should therefore continue to take a cautious view of imports. Rather than physical controls, prime reliance should be on tariffs. While a further lowering of the general level of import tariffs will encourage competition and growth, some rationalisation in the tariff structure is called for. The tariff rate should increase at each successive stage in the

value addition process with a view to encouraging value addition within India. Secondly, there should be a long term thrust on efficient import substitution in some critical areas, like oil (by other forms of energy), metals, agro-based products and services.

## Foreign Investment

It seems likely that for the next few years India will continue to run a trade deficit which will have to be met by a net inflow of foreign capital. We have much to learn from the experience of the USA[6] and some Latin American countries, where price stability was maintained in the face of mounting fiscal deficits by borrowing abroad to finance commodity imports. Since our need is to use foreign capital for building a production base rather than commodity imports, we should attract foreign capital in the form of industrial investment, provided this does not lead to excessive imports by foreign affiliates. Unfortunately, our record of attracting foreign investment has been rather dismal so far. Clearly, we need to step up our efforts in this direction, based on a clear understanding of the needs and motivations of the foreign investor.

The Asian foreign investment scene is undergoing a metamorphosis currently. While Japan and the USA continue to be the largest sources of investment, Taiwan and South Korea are also emerging as big investors. On the otherhand, investors are becoming less interested in Malaysia, Thailand and Indonesia because of rising wages in these countries and are looking for new outlets for their capital surplus. China and Vietnam have been the main beneficiaries in recent years. China particularly so, because of its low wages and the potentially large market it offers. At the same time, there is considerable hesitation to invest in China, because of political uncertainties. Since India has the same advantages as China, it should be possible for us to create greater investor interest in India, provided we play our cards right.

Speedy removal of the well-known obstacles to foreign investment is essential. Like the FERA, procedural hassles, poor infrastructure facilities, restrictive labour laws and barriers to exit. Attitudinally, active opposition to foreign investment is only just beginning to give way to grudging acceptance. This reluctance shows in our dealings with potential investors. We need to market India more effectively by communicating with the right people abroad through the right channels.

Other Asian countries have persuaded foreign investors to use their economies as export platforms by offering investor-friendly packages. We too must base our packages on a thorough understanding of what motivates the foreign investor to set up such platforms and what makes them work.

While the internal market in India is seen to offer much potential, this has failed to attract foreign investment for two reasons. So far, there has been hesitation in allowing foreign companies to operate in the domestic market. Secondly, in industries like automobiles where some foreign investment has come in, returns have been poor. A growth-oriented policy with freedom to foreign companies to develop and exploit the domestic market will go a long way towards correcting this situation.

An important development during the eighties has been the internationalisation of equity markets[7], much like the internationalisation of banking during the sixties and the seventies. After the recent fall in stock prices, the price-earning ratio in India is low enough to be of interest to the foreign investor, especially in Japan. Of particular interest are the Japanese and U.S. investors for whom equity still represents a small proportion of total foreign holdings. Another interesting prospect is the

institutional investor abroad through whom small investors make their investments. We should develop appropriate packages to woo these groups.

## The Case for Balanced Reforms

A number of inter-related factors have contributed to the difficulties faced by several Latin American countries in recent years[8]. Their governments have depended on inflation to raise resources. Foreign capital has been used to finance commodity imports rather than building a production base for the future. Exchange rates have remained perpetually overvalued. The Indian economy too ran into very similar problems towards the end of the last decade.

The Latin American experience highlights the importance of growth without inflation and of balanced reform in all sectors of the economy. So far, our reforms in the external sector have outpaced reforms in the internal sector. And these have not been backed by any significant reforms in the financial sector. There has also not been any real breakthrough on the control of government expenditure. Perhaps this poses the most formidable of all challenges when, to quote Bardhan[9] "diverse elements of the loose and uneasy coalition of the dominant proprietary

classes pull in different directions and when none of them is individually strong enough to dominate the process of resource allocations". We must address ourselves to these unfinished tasks very soon.

## NOTES TO CHAPTER 5

(1) See Rosen (1988), pp. 106-107.

(2) For a discussion of objections to "consumption-led" growth, see Kelkar & Kumar (90).

(3) See Ohmae (1982), pp. 216-227.

(4) See Banuri & Amadeo (pp. 171-220) in Banuri (1991).

(5) See Rodrik (1990). Rodrik argues that if there is macro-economic instability (as indicated by an excessive difference between the highest and lowest values of parameters like GDP growth, fiscal deficit to GDP ratio, inflation and the real rate of exchange), structural adjustment programmes become unsustainable. He therefore suggest that policies that are sustainable should not be changed and changes that are not sustainable (like import liberalisation) should not be made.

(6) For an analysis of the recent U.S. experience, see the article by Mason in Calverly, et al (1987), pp. 137-151.

(7) For a discussion of internationalisation of equity markets, see the article by McRae (pp. 99-116) in Calverly, et al (1987).

(8) For a comparative analysis of Asian and Latin American economies, see the articles by Hughes & Singh (pp. 57-97) and Fishlow (pp. 149-170) in Banuri (1991).

(9) See Bardhan (1986), p. 61.

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