The Industrial Sector in India
A Quantitative Analysis

Ashok Kumar Lahiri

Srinivasa Madhur

Dipankar Purkayastha

Prannoy Roy

This paper attempts an empirical investigation of the factors affecting output, prices, wages and raw material costs in the factory sector of Indian industry. It forms part of a larger system of equations which together constitute a macro-econometric model of the Indian economy.

The focus of the study is on the price-quantity adjustment mechanism in Indian industry with specific attention to the role of government policies and international trade in the determination of output and prices. Since there has been considerable diversity in the behaviour of the different constituents of the industrial sector in India, the model is constructed in a disaggregated four-sector framework classified on the basis of end-use: consumer goods, capital goods, basic goods and intermediate goods.

Section II of the paper discusses the structure of the model and its properties; section III reports on sources of data and related problems; sections IV and V discuss the estimated structure and the quantitative implications; and sectionVI presents a summary of the conclusions.

I
Introduction

THIS paper is an empirical investigation of the factors affecting output, prices, wages and raw material costs in the factory sector of Indian industry. It forms part of a larger system of equations which together constitute a macro-econometric model of the Indian economy.[1]

The focus of this study is on the price-quantity adjustment mechanism in Indian industry with specific attention to the role of government policies and international trade in the determination of output and prices. Since there has been considerable diversity in the behaviour of the different constituents of the industrial sector in India, our model is constructed in a disaggregated four-sector framework classified on the basis of end-use: consumer goods, capital goods, basic goods and intermediate goods.[2,3]

Earlier attempts at modelling Indian Industry [Ahluwalia (1979), Bhattacharya (1982), Chakrabarty (1977), Krishnamurthy (1964), Pandit (1973), Pani (1977) and Srivastava (1981)] have been at the aggregate all-industry level. The findings of our study, which reveal substantial differences in the behaviour among the four sectors, suggest that the excessive aggregation of earlier studies may have led to some misleading generalisation and inappropriate policy implications.

Earlier studies of Indian industry have differed substantially in modelling the response of industrial prices and output to changes in demand.[4] For example, Krishnamurthy's (1964) model is in real terms and only industrial output varies with changes in demand, what happens to industrial prices is not specified. Although the processes are quite different in Pani's (1977) model, again industrial prices are not directly affected by demand. These prices are rather affected by industrial output *via* his wage and unit cost specifications.

For both Bhattacharya (1982) and Ahluwalia (1979) the impact of demand changes on industrial price depends, rather unusually, on the source of the variation in demand. A closer scrutiny of Bhattacharya's (1982) eclectic model, incorporating 'elements of Keynesian, neo-classical and dual economy theories of aggregate economic activity', reveals that output and private employment in the manufacturing and allied sector depend only on lagged values of output, employment and capital stock in this sector and the exogenously given public sector employment. Thus, in the short run, output and employment get determined, in a rather peculiar way, by a self-contained system of two equations which is impervious to any contemporaneous decisions of either the government in the nature of a policy or the private agents.[5] In fact all the sectoral outputs in his model satisfy the aforementioned property. Manufacturing prices depend only on money-supply, import prices, lagged prices, output and employment. Therefore, in the short-run, only money-supply-induced changes in demand affect manufacturing prices; variations in demand stimulated by non-monetary factors do not affect them. In Ahluwalia's (1979) model, on the other hand, if government expenditure initiates a change in demand it affects output (through the production function and capacity utilisation function) and industrial prices (through a quantity-theory type price equation). However, if demand changes are initiated by other sources, the impact is not very clear in the model.

Pandit's (1973) model is more straightforward than the others and is perhaps more satisfactory, in that a change in demand leads to variations in both industrial output and prices. Output varies *via* the aggregate demand function and prices also change since they depend on wages which in turn depend on output. However, Pandit unfortunately relates prices to output levels *per se* rather than to levels of capacity utilisation.

In our investigation into the speed of adjustment in industrial prices and output we have attempted to explicitly incorporate factors like short-run "price inertia" [see Hicks, (1977), (1974), Okum (1981)]. Work in this area has been carried out earlier by Esposito and Esposito (1971), and for India by Sawhney and Sawhney (1973) and Katrak (1980) among others. Prices in our specification are formulated in a partial adjustment framework where each year's desired level is dependent on demand conditions and international price movements.

In our model the first round impact of a change in demand is on output—the short run supply function is, therefore, horizontal — but, thereafter, prices adjust as desired levels alter in response to the new level of capacity utilisation. A rise in price leads to a wage-price spiral once the model adjusts fully to the initial demand shock, both prices and output levels have changed. In that sense, therefore, the long run supply curve is upward sloping.[6]

Most earlier models have neglected the role of credit availability in determining industrial output and prices. This is perhaps a major gap for two reasons: first, since most of the interest rates in the Indian economy are administered, one would expect the basic channel through which monetary policy affects real variables to be the availability of funds;[7] second, since government is severely constrained in financing its expenditure by raising tax revenue, government borrowing and consequently credit planning, may emerge as

a more feasible and effective policy instrument in the near future. We have attempted to incorporate the role of commercial bank credit and development bank credit in the determination of prices and output in Indian industry through their impact on inventories and investment respectively.

The other main areas which we address are:

(i) The link between industry and agriculture: in which (a) agricultural income affects the demand for consumer goods (and by a derived demand, the output of the other three sectors); (b) non-food agricultural prices affect raw material costs and hence industrial prices; (c) food prices affect wages and consequently prices in all the four sectors.

(ii) The link between the fiscal sector and the industrial sector: (a) government expenditure affects industrial output in two ways — government consumption expenditure affects the demand for consumer goods and government investment expenditure affects output in the capital goods sector; (b) Excise taxes influence prices systematically in all the four industry sectors.

(iii) The link between Indian industry and the world economy: (a) export demand affects output levels of consumer goods; (b) imports and exports of machinery and equipment affect the output in the capital goods sector; (c) import prices of capital and intermediate goods affect raw material costs and hence industrial prices; and (d) desired mark-up levels and hence prices are influenced by international prices in all the four industry sectors.

The plan of the paper is as follows: Section 2 discusses the structure of the model and its properties; Section 3 reports on sources of data and related problems: Sections 4 and 5 discuss the estimated structure and the quantitative implications; Section 6 is a summary of the conclusions.

II

The Model

In this section we outline very briefly the characteristics of the model, its properties and specifications. Each equation is discussed in greater detail in Section 4. In the latter part of this section, we choose the consumer goods sector to illustrate some of the dynamic adjustment processes of the model.

Each of the four sectors is modelled separately with a set of four equations explaining output, ex-factory prices, money wages and raw material costs. In addition to these 16 equations the output equations in the consumer and capital goods sector contain a consumption function and an investment function respectively.

Output in the model is essentially demand determined, and the availability of funds rather than the rate of interest, plays a crucial role in linking the monetary sector with real variables. The consumption function incorporates a Duesenberry (1949) type ratchet-effect in consumer spending.

Investment, in the present model, is determined by availability of internally generated funds and credit for capital expenditure provided by development banks.[8] The theoretical foundation for this specification lies in Duesenberry's (1958) marginal cost of funds theory of investment behaviour.

In this framework the output equations for each of the four sectors are specified as demand functions. The specific arguments in each of the four output equations are discussed in detail in Section 4, which aim at explaining the diverse trends in output growth of the four sectors (see Figure 1).

Prices are determined in the model in a 'cost plus mark up' framework. However, even a casual look at the mark-up rates in the four sectors of Indian industry reveals intersectoral and intertemporal variations (see Figure 2).

Consequently, mark-up rates in our model are not assumed to be constant over time. Unlike the constant mark-up model which takes no account of demand conditions, our specification makes the desired mark-up level

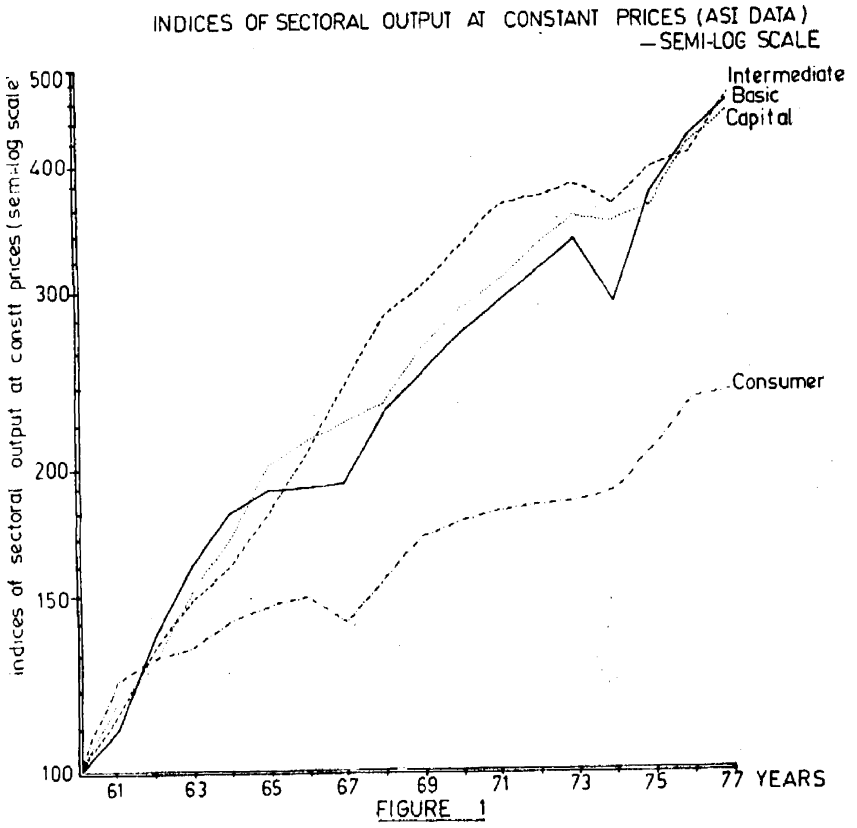


FIGURE 1

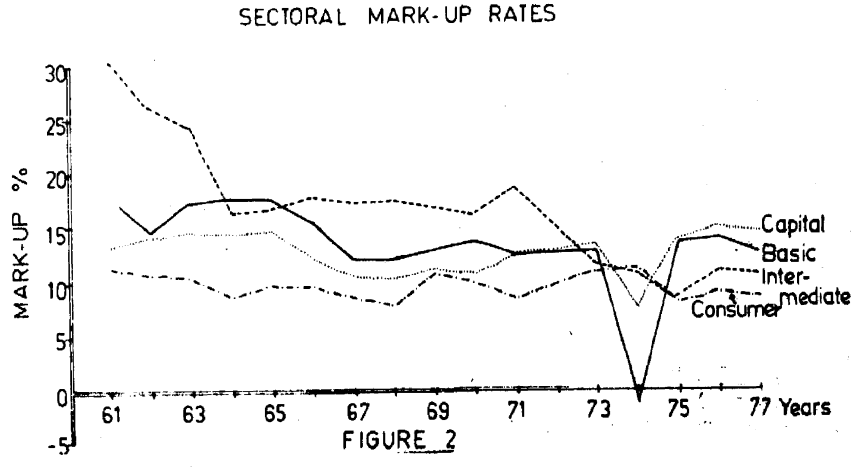


FIGURE 2

[illegible] on demand and world price condi[illegible]

Prices in the collusive oligopolistic structure of Indian industry are set on the basis of certain signals obtained from the domestic and international markets. Sawhney and Sawhney (1973) and Katrak (1980) have found strong relations between price-cost margins and seller concentration, import competition and related factors for India, while Bhalla (1981) has shown the significance of world inflationary conditions in the transmission of inflation to the Indian economy. In attempting to incorporate some of these factors in the determination of prices and variable mark-up rates in India we assume:

(2.1) $P_t^* \equiv \beta_t^* . C_t^*$

(2.2) $\beta_t^* = \beta_0 + \beta_1 U_{t-1} + \beta_2 IP_{t-1}$

(2.3) $P_t - P_{t-1} = \lambda(P_t^* - P_{t-1}) \quad 0 < \lambda \leq 1$

where P = ex-factory price
C = Unit cost
β = (1 + mark-up rate)
U = Capacity utilisation
IP = international price of the commodity.

Asterisk denotes "desired", and subscript t, is for time.

This convention holds for the rest of this paper.

Equation (2.1) postulates that there exists a desired mark-up rate in each period, t, which, when related to costs, specifies the desired price level to be set by the manufacturer. The partial adjustment equation (2.3) indicates that this desired level of prices is not achieved instantaneously, but adjustments are made gradually in the face of institutional constraints and government restrictions. Equation (2.2) specifies that the desired mark-up rate is dependent on demand conditions — represented by the level of capacity utilisation[9] — and world prices of that commodity (or, in this case, group of commodities).

Manufacturing costs consisting of wage and raw material cost are inputs in the price equation. Wage cost per unit of output is defined as the ratio of money wage rate and productivity (output per worker) of labour. The latter is exogenous in the model.

Wage rates are determined from a labour supply function which relates the money wage rate to the consumer price index for industrial workers and to the productivity of labour:[10]

.4) $W_t^* = \alpha_0 + \alpha_1 CPI_t + \alpha_2 LP_{t-1}$

..5) $W_t - W_{t-1} = \mu(W_t^* - W_{t-1}) \quad 0 < \mu \leq 1$

where, W = money wage rate.
CPI = consumer price index for industrial workers.
LP = productivity of labour.

Equation (2.4) is to be interpreted as a wage-determination process in which the money wage is negotiated one period in advance on the basis of the demonstrated productivity of labour and the consumer price level. Real wages are not constrained to be constant over time as money wages and prices do not necessarily move proportionately in our model. Equation (2.5) postulates that there is some stickiness in the adjustment of the actual money wage to its desired level.

The raw material costs per unit of output depends on (i) input-output coefficients, and (ii) the price of inputs, both imported as well as domestically produced. Let us assume that at time t, for every unit of output, $a_{1t}, a_{2t}, \ldots a_{nt}$ units of inputs 1,2 . . . , n which are priced at $P_{1t}, P_{2t}, \ldots P_{nt}$ are needed. Then r, the raw material cost per unit of output is clearly:

(2.6) $r_t = a_{1t} P_{1t} + a_{2t} P_{2t} + \ldots + a_{nt} P_{nt}$

We can concentrate on the, major inputs ($m < n$) and neglect the others and rewrite an approximation to equation (2.6) as

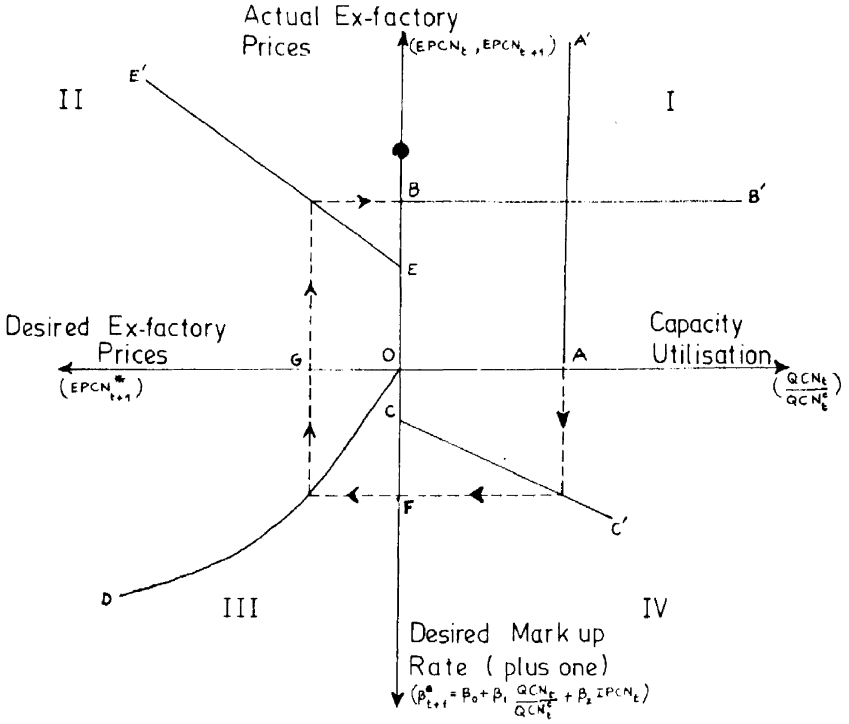


FIGURE 3

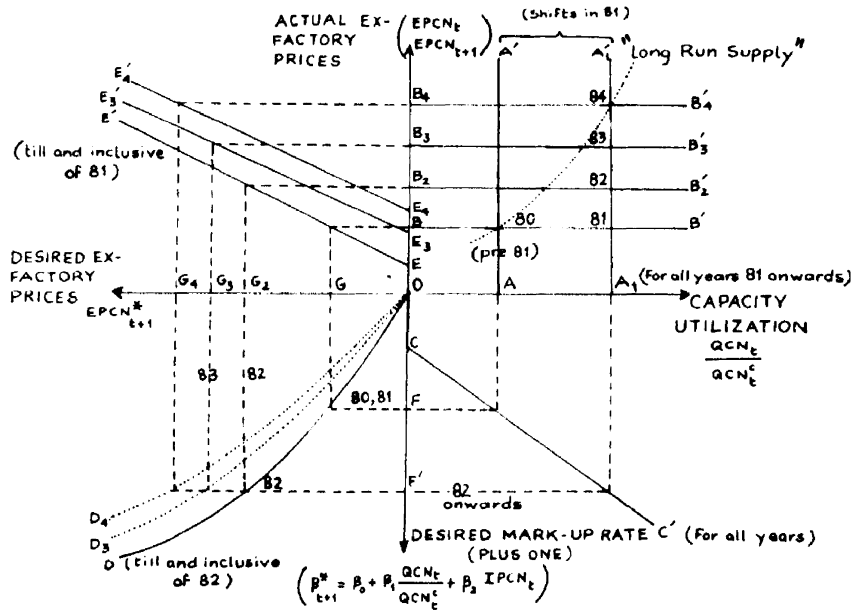


FIGURE 4

(2.7) $r_t = a_0 + a_{1t}P_{1t} + a_{2t}P_{2t} + \ldots + a_{mt}P_{mt}$

where, without loss of generality, we have assumed that the first m of the n inputs are the major ones. The term a_0 captures the contribution of the omitted (n – m) inputs. Since the productivity of factor inputs change over time with change in technology we postulate

(2.8) $a_{it} = \frac{a_i}{t}$ $\quad i = 1,2,\ldots m.$

where t, is time in calendar years.[11]

These equations interact simultaneously in all the four sectors to generate a dynamic adjustment process for Indian industry which we shall briefly describe with the use of a diagram. We select the consumer goods sector to trace the impact of certain exogenous shocks on output and prices.

In the dynamic adjustment process outlined here, other sectors and variables in the economy with which the industry sector interacts are kept constant unless otherwise specified. Consequently, the dynamics illustrated are strictly within a partial equilibrium framework.[12]

The consumer goods sector consists of the following relations. The abbreviations used below are explained in Appendix III.

Output

(2.9) $QCN_t = \alpha_0 + \alpha_1 CPVT_{t-1} + \alpha_2 CCB_t + \alpha_3 AE_{t-1}$

Prices

(2.10) (a) $EPCN_t - EPCN_{t-1} = \lambda(EPCN_t^* - EPCN_{t-1})$ $\quad 0 < \lambda \leqslant 1$

(b) $EPCN_t^* = (\beta_0 + \beta_1 \frac{QCN_{t-1}}{QCN_t^C} + \beta_2 IPCN_{t-1})\, UCCN_t$

Unit Costs[13]

(2.11) $UCCN_t = d.WCN_t + RCN_t + FIXCN_t$

Wages

(2.12) (a) $WCN_t - WCN_{t-1} = \mu(WCN_t^* - WCN_{t-1})$ $\quad 0 < \mu \leqslant 1$

(b) $WCN_t^* = \gamma_0 + \gamma_1 CPI_t + \gamma_2 LPCN_{t-1}$

Raw Materials

(2.13) (a) $RCN_t = \delta_0 + \delta_1(t) MPIT_t + \delta_2(t) PNF_t$

(b) $\delta_1(t) = \delta_1/t$

(c) $\delta_2(t) = \delta_2/t$

Price Linkages

(2.14) (a) $CPI_t - CPI_{t-1} = \theta(CPI_t^* - CPI_{t-1})$ $\quad 0 < \theta \leqslant 1$

(b) $CPI_t^* = \varepsilon_0 + \varepsilon_1 PFD_t + \varepsilon_2 MPCN_t$

Equation (2.9) postulates that output in the consumer goods industry is dependent on private final consumption expenditure[14] (which in turn, is explained by a consumption function — see Section 4), autonomous demand consisting of government consumption expenditure and exports, and inventory demand which is related to commercial bank credit for working capital requirements. The rationale behind equations (2.10)—(2.13) have been discussed earlier in this section. Equation (2.14) is a link equation that relates the overall consumer price index to the market price of goods produced in the consumer goods sector and the wholesale price of food articles. The linkages is specified in a partial adjustment framework.

The system of equations in the consumer goods sector is shown in Figure 3.

Quadrant 1 in Figure 3 represents the demand and supply equations in the context of a given capital stock and, therefore a given full capacity output which is assumed fixed throughout this discussion. AA denotes equation (2.9), which is clearly inelastic to price and hence is vertical.[15]

The supply equation BB' is independent of the current period's capacity utilisation, since from equation (2.10), (a) and (b) we get

(2.15) $EPCN_t = \lambda(\beta_0 + \beta_1 + \beta_2 IPCN_{t-1}).\, UCCN_t + (1-\lambda) EPCN_{t-1}$

Quadrant IV relates the desired mark-up rate in time "t + 1" to the demand conditions in time 't' — as reflected by the degree of capacity utilisation.

(2.16) $\beta_{t+1}^* = \beta_0 + \beta_1 \frac{QCN_t}{QCN_t^C} + \beta_2 IPCN_t$

For a given international price, equation (2.16) is represented by CC' where the intercept is $(\beta_0 + \beta_2 IPCN_t)$ and the slope is β_1. Changes in world prices of consumer goods would, therefore, cause parallel shifts in CC'.

From equation (2.10) (b) it is clear that desired prices are related to unit costs through the desired mark-up rate:

(2.17) $EPCN_{t+1}^* = \beta_{t+1}^*.\, UCCN_{t+1}$

Unit costs include wage costs as one component [equation (2.11)]. Wage costs are, however, related to the consumer price index [equation (2.12)] which in turn is dependent on the actual and, therefore, desired price of consumer goods [equation (2.14)].

From equations (2.11), (2.12) and (2.14) we get:

(2.18) $UCCN_{t+1} = d\mu\gamma_0 + d\mu\gamma_1\theta\varepsilon_0 + d\mu\gamma_1\theta\varepsilon_1(PFD_{t+1})$

INCOME, CONSUMPTION AND RATCHET EFFECT

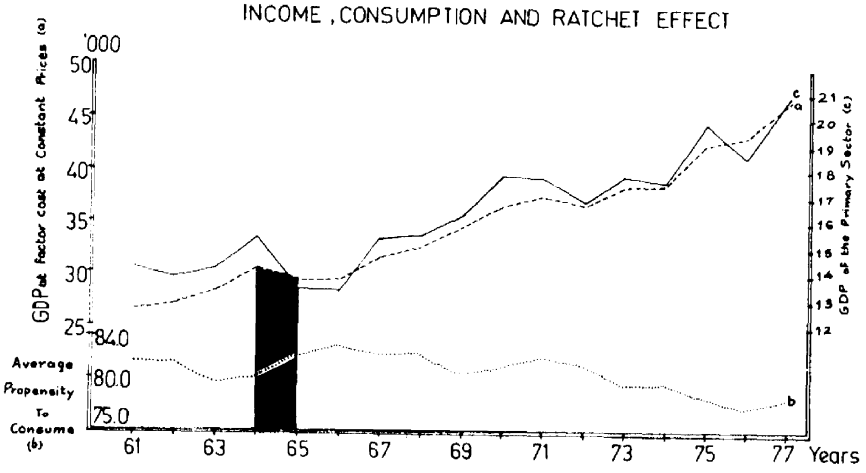


FIGURE 5

CAPACITY UTILISATION IN THE FOUR SECTORS

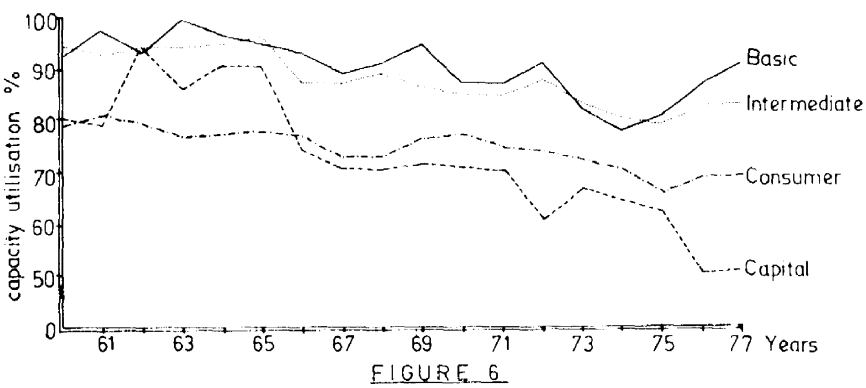


FIGURE 6

$$+ \delta\mu\gamma_1\theta\varepsilon_2 (MPCN_{t+1}) + \delta\mu\gamma_1(1-\theta)CPI_t + \delta\mu\gamma_2 (LPCN_t) + \delta(1-\mu) WCN_t + RCN_{t+1} + FIXCN_{t+1}$$

If we assume that fixed cost per unit of output is negligible, then $FIXCN_{t+1} = 0$. Furthermore, it follows by definition that market price of consumer goods is unity plus excise rate times the ex-factory price of consumer goods, ie.

(2.19) $MPCN_{t+1} = (1+e_{t+1}) EPCN_{t+1}$

where e_{t+1} is the rate of excise tax on consumer goods.

Thus, we can simplify (2.18) and write

(2.20) $UCCN_{t+1} = \delta\mu\gamma_0 + \delta\mu\gamma_1\theta\varepsilon_0 + \delta\mu\gamma_1\theta\varepsilon_1 (PFD_{t+1}) + \delta\mu\gamma_1\theta\varepsilon_2 (1+e_{t+1}) EPCN_{t+1} + \delta\mu\gamma_1(1-\theta) CPI_t + \delta\mu\gamma_2 LPCN_t + \delta(1-\mu) WCN_t + RCN_{t+1}$

Note that from (2.10) (a) we get:

(2.21) $EPCN_{t+1} = \lambda EPCN^*_{t+1} + (1-\lambda) EPCN_t$

Substituting (2.20) and (2.21) in (2.17) we get:

(2.22) $EPCN^*_{t+1} = [\delta\mu\gamma_0 + \delta\mu\gamma_1\theta\varepsilon_0 + \delta\mu\gamma_1\theta\varepsilon_1 (PFD_{t+1}) + \delta\mu\gamma_1(1-\theta) CPI_t + \delta\mu\gamma_2 (LPCN_t) + 1-\mu) WCN_t + RCN_{t+1} + \delta\mu\gamma_1\theta\varepsilon_2 (1+e_{t+1}) (1-\lambda) EPCN_t] / [1-\delta\mu\gamma_1\theta\varepsilon_2 \lambda(1+e_{t+1}) \beta^*_{t+1}]$

It is easy to check that (2.22) defines a relation between $EPCN^*_{t+1}$ and β^*_{t+1} which passes through the origin and is positive, monotonic and convex under very minimal assumptions.[16] This is represented by OD in quadrant III.

We complete the diagram by posting the relation between $EPCN_{t+1}$ and $EPCN^*_{t+1}$, i e, equation (2.10) (a) or (2.21), in quandrant II as EE'. Note that EE' has got intercept OE = $(1-\lambda)$ $EPCN_t$ and slope λ

The system is initially in equilibrium which can be checked by noting that at time t, capacity utilisation (QCN_t/QCN^C_t) and ex-factory price $(EPCN_t)$ get determined at OA and OB by the intersection of AA' and BB' in quadrant I. Capacity utilisation OA leads to a desired mark-up rate (β^*_{t+1}) at time t+1 of OF *via* relation CC' in quadrant IV. This in turn leads to a desired ex-factory price $(EPCN^*_{t+1})$ at time t+1 of OG along the OD curve in quadrant III. Relation EE' in quadrant II shows that at time t+1 corresponding to a desired ex-factory price of OG, actual ex-factory price is OB. Thus the ex-factory price remains unchanged at OB from one period to the next, i e, $EPCN_t = EPCN_{t+1} = \ldots$, and capacity-utilisation stays unchanged at OA. Thus the system indeed is in equilibrium.

We can analyse the effect on output and prices, of changes in variables such as (i) demand factors like private final consumption expenditure (CPVT), credit (CCB), or government consumption and exports (AE); (ii) international prices of articles such as finished consumer goods (IPCN), intermediate goods (IPIT); (iii) domestic prices of food articles (PFD) and non-food agricultural articles (PNF).

For example, consider a once and for all change in private final consumption expenditure at time t. The effect of this change is portrayed in Figure 4. We assume that the system was in equilibrium till time period t-1. For ease of exposition let us assume t = 1981. Till 1980 the system's position is as given in Figure 3. In 1981 as a result of the change in consumption expenditure, AA' shifts by α_1 units to the right to A_1A_1'. Note that A_1A_1' remains at this position. The relation BB' remains unchanged in 1981 as it is a function of lagged capacity-utilisation and thus output of the previous year only. Thus in 1981 capacity-utilisation goes upto OA_1 and actual ex-factory price remains unchanged at OB.

Price starts changing from 1982. Note that CC' the relation between capacity-utilisation and desired mark-up (plus unity) remains unperturbed as a result of the change in consumption. However, the higher capacity utilisation at OA_1, leads to a higher desired mark-up rate (plus unity) i e, β^*_{1982} at OF'. It is easy to check that relation OD, ie, (2.22) and EE' will remain undisturbed at its 1980 position in 1981. Thus, the desired price in 1982 EPCN* (reading off OD) and actual price EPCN (reading off EE') will be at OG_2 and OB_2 respectively.

Note that because of the vertical and unvarying nature of A_1A_1' capacity utilisation and desired mark-up plus unity remain unchanged year after year from 1982 onwards at OA_1 and OF'. However, the relations OD and EE' change over time. Relation (2.22) between the desired ex-factory price and desired mark-up rate plus unity is dependent on actual ex-factory price in the previous year. Since the actual ex-factory price starts rising from 1982 onwards, the curve OD will start shifting to the left to OD_3, OD_4 ... every year. Similarly the line EE' giving the relation between actual and desired ex-factory price which has its intercept $(1-\varepsilon)$ $EPCN_t$, starts rising from 1983 onwards to E_3E_3', E_4E_4'... etc. Consequently, the ex-factory

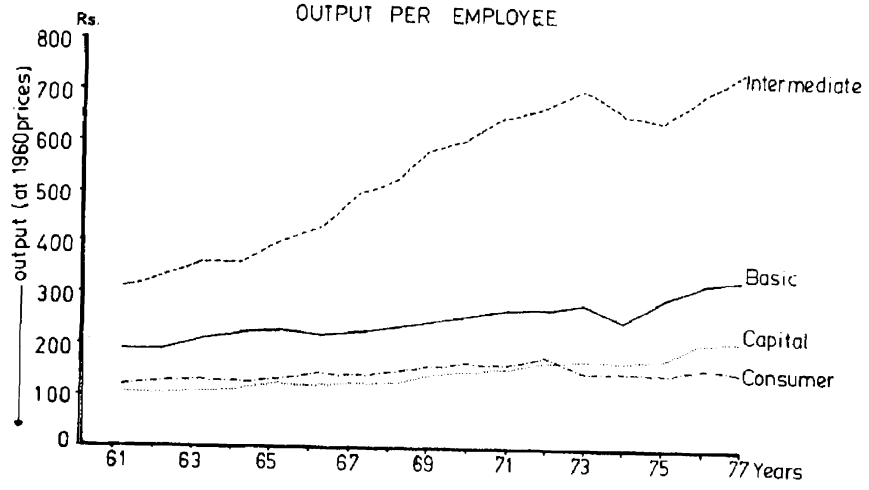


FIGURE 7

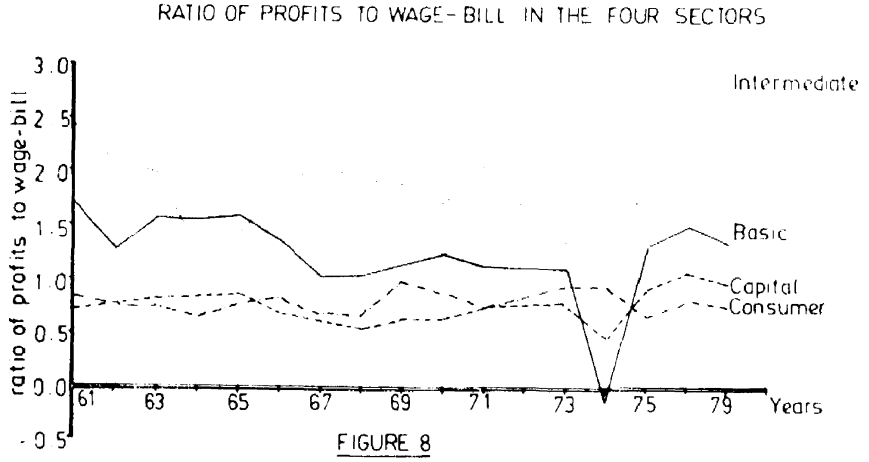


FIGURE 8

price will start moving from OB to OB_2, OB_3, OB_4,... over time.

In essence, therefore, after a rise in private consumption expenditure, output and capacity-utilisation got up and stay put at their higher value from 1981 onwards, but price, which remains stationary during the period when the change is introduced starts rising from the second period onwards, ie, 1982. Whether it converges to the finite value or not depends on the stability properties of the model which again are dependent on the estimated parameters of the system as a whole.

Changes in credit, government or export demand have effects similar to that brought about by a change in private final consumption expenditure. Similar exercises can be carried out for analysing the effects of changes in domestic and international prices. Such price changes lead to dynamic price adjustments over time resulting in a higher industrial price with output and capacity-utilisation unchanged.

The effect of similar changes on capital, basic and intermediate goods in a partial equilibrium framework can be carried out in an analogous fashion. In point of fact, the analysis of the effects of such changes on output and prices for these other sectors is considerably simpler because OD, the relation between desired price and desired mark-up rate (plus unity) is linear and not affected by any feedback from price to the consumer price index and to costs.

An important limitation of the model on which further work is required lies in its unsatisfactory treatment of the distributional aspects of wage and profit incomes. Even if we abstract from the question of differential propensities to save from wage and profit incomes, given the importance of internally generated funds in determining investment, a disturbance in the profit to non-profit income ratio will have important repercussions on the source of changes in demand. Although the model does not constrain profits and wages to rise proportionately, the implications of a change in profits on the current period's internally generated funds — which enters the investment function in a distributed lag form along with earlier year's funds — has not been explicitly formulated.[17]

III
Data: Problems and Sources

There are three official published sources of data on Indian industry: (i) the National Accounts Statistics (NAS); (ii) the Annual Survey of Industries (ASI); (iii) the Indices of Industrial Production (IIP).[18] For our model we need detailed data on output, prices, different types of costs in the various industries. The first and third sources, ie NAS and IIP, do not provide data on costs and cannot be used in our analysis. This leaves us only with the Annual Survey of Industries (ASI) to deal with.

In a recent publication entitled "Wages and Productivity in Selected Industries", the CSO (1981) has published data on wages, employment, emoluments and prices for the years 1960-1977 obtained from the results of the ASI, relating to the registered manufacturing sector, classified according to 20 broad industry groups (see Table 1). "These industry groups according to ASI 1977-1978 results accounted for 87 per cent of the value added, 83 per cent of the total employment and 93 per cent of the fixed capital in the registered manufacturing sector." [CSO (1981), p 2]. Thus, though the data do not cover unregistered manufacturing at all, it does cover the registered manufacturing sector fairly well.

The usefulness of this comprehensive slim volume, CSO (1981), derives from the fact that: "These 20 broad industry groups were further classified under the use-based classification system, ie, into basic goods, capital goods, intermediate goods and consumer goods industries. The basic industry group include items like primary metals, ores, etc. The capital goods industries include items of production which do not require further processing and are necessary for the manufacture of finished products. All the items not grouped under basic industries and which require further processing before their conversion into consumption goods are classified under intermediate goods categories. Similarly all items which are finished products and mainly used for the household consumption are brought together under consumption goods category." CSO [(1981), pp 1-2].

By its very nature survey data are subject to problems of fluctuations and hence of coverage. Ahluwalia (1982) documents these problems meticulously but eventually concludes that NAS data are, with all its faults, preferable to other sources. In order to deal with changes in coverage Ahluwalia adopts a "correction factor", based on NAS, for ASI data at the two digit level. However, for a use-based classification of the kind we have used a greater level of disaggregation is needed and for this, NAS data are not available. Consequently, like Ahluwalia we have not adjusted for coverage in the data series on the use-based classification. But, in discussing this issue, Ahluwalia writes, "It is reassuring to note, however, that the differences in the results between the adjusted and the unadjusted data at the two digit level of disaggregation are very minor". [Ahluwalia (1982), p 20].

Although the reference period of ASI data has changed (the pre-1966 period refers to calender years and the post-1966 period to fiscal years) this may not, in fact amount to a significant alteration, because ASI data relate to accounting years of the companies whose year-end fall within the reference period. Consequently, in any case, the actual period of ASI for which the data refer to, depends on the distribution of accounting year-ends — on which no information is available. Ahluwalia and the CSO assume that the data correspond to fiscal years which implies that all accounting year-ends are March 31. While this may be true for a large proportion of the companies surveyed, the existence of companies with alternative year-ends (which is a fairly common phenomenon) in the survey would suggest that, on an average, the ASI data may refer to a period ending earlier than March 31 each year and December 31 may be a more reasonable assumption.

In CSO (1981), electric light and power is a constituent of basic industries. However, since in our macro model we have a separate sub-system for electric light and power we have excluded it from the basic industry group. This leaves us with 19 broad groups of industries classified into the four use based categories: consumer, capital, basic and intermediate goods industries.

CSO (1981) does not give data on output of the different industries. Data on output at

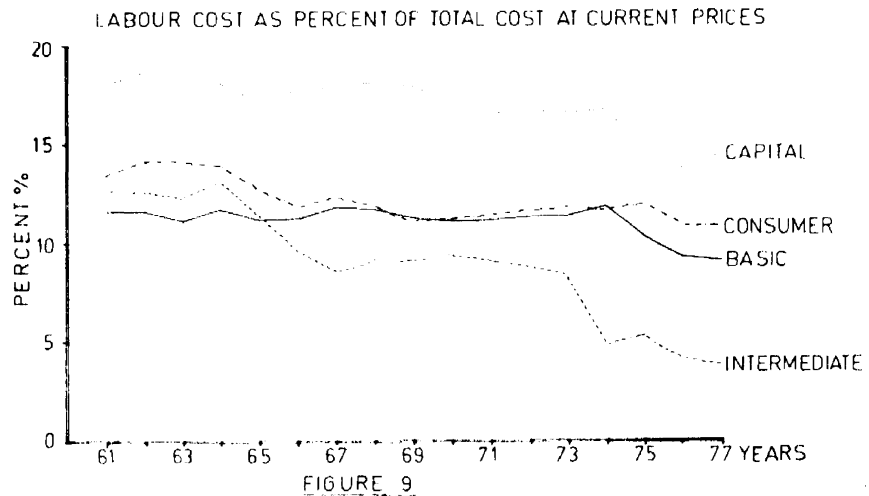


FIGURE 9

current ex-factory prices for the 19 major industries mentioned above, were collected from various volumes of the ASI summary tables.[19] These figures were then deflated by the wholesale price indices of the different industries published in CSO (1981). However, the wholesale price indices include indirect taxes and it is necessary to adjust for excise rates to derive output figures at constant ex-factory prices.

The excise rates cannot be easily calculated at the two and three digit levels of disaggregation of industry. However, from the time series data on commodity-wise excise revenues published by the Directorate General of Commercial Intelligence and Statistics, a reasonable measure of the total excise revenues realised from the four industrial sectors can be calculated. We divided these figures by the value of overall output at current ex-factory prices for the respective sectors to obtain the measures of excise rates. The rate (plus unity) was used to scale up the output figures at current ex-factory prices, deflated by wholesale price indices to obtain output at constant ex-factory prices.[20]

'Potential' or 'full-capacity' output in any sector was defined as the maximum output attained in any period previous to and including the period under consideration.[21] This is in accordance with the definition given by the Reserve Bank of India (1970). RBI (1970) has published the data on full-capacity output for the different industry groups for the period 1960-68. For the later years we have calculated it from various issues of the RBI Bulletin which give data on monthly indices of industrial production for the different constituent industries.[22] We have taken the peak outputs of the constituent industries in any use-based group and defined the weighted sum of maxima as capacity output.[23] We have defined capacity-utilisation as index of industrial production for the group as a proportion of its potential output. The data refer to calendar years.

Figures on (i) total wages and (ii) total raw material costs were collected for the 19 broad industrial groups from CSO (1981) and various issues of the ASI respectively. These money values were added up to get the total wages and total raw material costs in the four use-based industry groups. "Wages" as defined in this paper is exactly the same thing as "Emoluments" in CSO (1981), which again is defined as "Salaries and wages paid during the year to persons in employment". Total wage-bill was divided by the total number of employees defined as "persons engaged by the factory in work connected directly or indirectly with the manufacturing process and include all administrative, technical and clerical staff as also labour engaged in production of capital assets for factory's own use", to obtain estimates of wages ["emoluments" in CSO (1981)] in the four use-based categories.[24] Total raw material costs were divided by the value of output at constant ex-factory prices to obtain unit raw materials costs in any industry.

The unit cost figures for the four use-based industry groups was derived by dividing total costs in any group by value of output at constant ex-factory prices of the group. The figures for total costs were derived by adding up (i) total raw materials cost, (ii) total emoluments, and (iii) depreciation. The data on depreciation for the 19 major groups are available in CSO (1981). Figures on ex-

TABLE 1: CONSUMPTION AND INVESTMENT FUNCTIONS

Consumption Function

(1) $CPVT = \underset{(0.104)}{83.30394} + \underset{(7.798)}{0.87555}YPR + \underset{(2.625)}{0.43831}YNPR + \underset{(1.583)}{0.33922}\,YPR^{*}-1$

$\bar{R}^2 = 0.9643$; D W = 2.1114; D F = 12

(COCHRANE-ORCUTT)

*Investment Function**

(2) $KFPVT = \underset{(3.857)}{422.045} + \sum_{i=0}^{1}{}_{2,both)}\, a_i\, SPVT + \sum^{3}{}_{(2,both)}\, b_i\, CDB$

$\bar{R}^2 = 0.897$; D W = 1.4131; D F = 27; Sample Period = 1950-51 —1979-80

i	a_i	't' stat	i	b_i	't' stat
0	0.6337	4.419	0	0.4121	5.548
1	0.6337	4.419	1	0.6181	5.548
			2	0.6181	5.548
			3	0.4121	5.548
	1.2674			2.0604	

* The form $\sum_{i=0(p,q)}^{t} a_i x$ is interpreted : i = lag period; p = degree of polynomial; q = both = both end points constrained to zero.

TABLE 2: OUTPUT EQUATIONS

(1) *Consumer Goods*

$CN = \underset{(0.839)}{326.5540} + \underset{(3.075)}{0.6608}(10^{-1})\, CPVT_{-1} + \underset{(2.726)}{0.3866}\, CCB + \underset{(2.035)}{0.2960}\, AE^{(-1)} - \underset{(1.942)}{440.683}\, DUM70$

$\bar{R}^2 = 0.9591$; D W = 1.6842; D F = 12

(2) *Capital Goods*

$QCP = \underset{(2.66)}{569.52} + \underset{(5.358)}{0.5631}\, KFPVT + \underset{(5.32)}{0.52529}\, KFPUB + \underset{(6.562)}{0.92445}\, XMT$

$\bar{R}^2 = 0.9688$; D W = 1.2630; D F = 14

(3) *Basic Goods*

$QBS = \underset{(1.043)}{-215.05} + \underset{(3.108)}{0.61791}\, QCP + \underset{(1.908)}{0.41894}\, YCN + \underset{(2.760)}{0.38412}\, CCB - \underset{(2.666)}{586.298}\, DUM70$

$\bar{R}^2 = 0.9735$; D W = 2.4299; D F = 12

(4) *Intermediate Goods*

$QIT = \underset{(2.584)}{-287.66857} + \underset{(3.202)}{0.38643}\, YTSC - \underset{(2.783)}{0.41311}\, IPFL + \underset{(4.484)}{0.59983}\, QIT\text{-}1$

$\bar{R}^2 = 0.9861$; D W = 2.0881; D F = 13

factory prices were derived by dividing value of output at current ex-factory prices by value of output at constant ex-factory prices. Market prices were obtained by multiplying ex-factory prices by a factor of unity plus excise rate. Figures on productivity of labour were obtained by dividing output at constant ex-factory prices by number of employees. The data for the year 1972 are not available for any of the variables mentioned above from the CSO (1981). We, however, assumed a linear growth rate for all the variables between 1971 and 1973, and calculated averages of these two years for all the variables to obtain the values for 1972.

The import data, as available at one digit level of Standard International Trade Classification, was categorised into the four use-based categories as in Appendix II.

The unit value indices for the different use-based categories were divided by adding imports at current prices and imports at constant prices for the different constituent sub-categories. For both imports (value as well as unit values) and exports, the source is various issues of 'Basic Statistical Material on Foreign Trade, Production and Prices', published by the Ministry of Commerce. The figures relate to fiscal years, ie, April 1 to March 31.

The wholesale price indices and the consumer price index relate to calendar years. The sources are Chandhok (1978) and various issues of Indian Labour Journal (Published by the Labour Bureau, Simla).

The data on national macro-aggregates such as gross domestic fixed capital formation by the private sector and the public sector, gross domestic products of the primary and non-primary sectors, private final consumption expenditure, government final consumption expenditure, etc, are collected from the various issues of the National Accounts Statistics published by the CSO. All these data relate to fiscal years.

Credit sanctioned by the development banks were available from the various issues of the annual reports of the Industrial Development Bank of India. Data for "commercial bank credit to commercial sector" are collected from the various issues of RBI Bulletins and Reports on Currency and Finance published by the Reserve Bank of India. These data relate to scheduled and non-scheduled commercial banks.

TABLE 3: PRICE EQUATIONS

(1) *Consumer Goods*

$$DEPCN = \underset{(9.608)}{1.0901}\ UC.CU1CN + \underset{(4.721)}{0.6848\ (10^{-3})}\ UC.IPCN_{-1} - \underset{(9.261)}{0.8022}\ EPCN_{-1}$$

$\bar{R}^2 = 0.8331$, D W = 2.4508, D F = 14

which implies: $EPCN^* = \beta_1^*\ UCCN_1$

$\beta_1^* = 1.3588\ CU1CN + 0.8536\ (10^{-3})\ IPCN_{-1}$ and

$(EPCN - EPCN(-1)) = 0.8022\ (EPCN^* - EPCN_{-1})$

(2) *Capital Goods*

$$DEPCP = \underset{(4.496)}{0.7379}\ UC.\ CU1CP + \underset{(3.156)}{0.1111\ (10^{-2})}\ UC.\ IPCP_{-1} - \underset{(3.842)}{0.5513}\ EPCP_{-1}$$

$\bar{R}^2 = 0.5211$, D W = 1.2911, D F = 14

which implies: $EPCP^* = \beta_1^*\ UCCP$

$\beta_1^* = 1.3385\ CU1CP + 0.2016\ (10^{-2})\ IPCP_{-1}$ and

$(EPCP - EPCP_{-1}) = 0.5513\ (EPCP^* - EPCP_{-1})$

(3) *Basic Goods*

$$DEPBS = \underset{(8.572)}{0.8263}\ UC.CU1BS + \underset{(3.046)}{0.3014\ (10^{-3})}\ UC.IPIT_{-1} - \underset{(7.433)}{0.6708}\ EPBS_{-1}$$

$\bar{R}^2 = 0.8221$, D W = 1.4298, D F = 14

which implies: $EPBS^* = \beta_1^*\ UCBS$

$\beta_1^* = 1.2318\ CU1BS + 0.4493\ (10^{-3})\ IPIT_{-1}$, and

$(EBPS - EPBS_{-1}) = 0.6708\ (EPBS^* - EPBS_{-1})$

(4) *Intermediate Goods*

$$DEPIT = \underset{(29.094)}{1.2480}\ UC.CU1IT + \underset{(2.540)}{0.1629\ (10^{-3})}\ UC.IPIT_{-1} - \underset{(26.010)}{0.9607}\ EPIT_{-1}$$

$\bar{R}^2 = 0.9897$, D W = 1.9843, D F = 14

which implies: $EPIT^* = \beta_1^*\ UCIT$,

$\beta_1^* = 1.2991\ CU1IT + 0.1695\ (10^{-3})\ IPIT_{-1}$, and

$(EPIT - EPIT_{-1}) = 0.9607\ (EPIT^* - EPIT_{-1})$

(5) *CPI Link Equation*

$$CPI = \underset{(1.007)}{3.2513} + \underset{(8.090)}{1.2190}\ PFD + \underset{(2.147)}{0.1168}\ MPCN + \underset{(3.347)}{0.1636}\ CPI_{-1}$$

$\bar{R}^2 = 0.9972$, D W = 0.8685, D F = 13

Note: All $\bar{R}^2$ have been computed allowing for regression without a constant term.

IV

Estimates

The estimated model is given in the tables accompanying the text in this section. The sample period for these equations runs from 1961 to 1977 except for the investment function for which the sample period is from 1950-51 to 1979-80. The method of estimation used is ordinary least squares (OLS). Only in the case of the investment function is an Almon (1965) polynomial distributed lag model used for estimation. Where applicable, Cochrane-Orcutt's (1949) method has been used to circumvent the problem of autocorrelation. We have not tried to remove the simultaneity bias with the help of methods such as two stage least squares. In order to test for alternative hypotheses on price formation in the industrial sector, we used non-linear least squares with restrictions on the coefficients, but the OLS estimates were preferred and only these are presented here.

We shall discuss the results of the estimated equations in the following sequence:

(i) The Consumption Function and the Investment Function (Table 1)

(ii) Output Equations (Table 2)

(iii) Price Equations (Table 3)

(iv) Money Wage Rate Equations (Table 4)

(v) Raw Material Equations (Table 6)

CONSUMPTION AND INVESTMENT FUNCTIONS

There have been a large number of studies, starting with Raj (1962) and more recently Krishnamurthy and Saibaba (1982), which suggest that the primary and non-primary sectors in India have substantially different propensity to consume. In our consumption function specification we have attempted to incorporate this propensity differential between the sectors.

For the period 1960-77, a comparison of private final consumption expenditure, income from agriculture, and the overall overage propensity to consume is given in Figure 5. The vertical axis on the left measures both (a) GDP at factor cost at constant prices and (b) the average propensity to consume on the appropriate scales; the vertical axis on the right measures (c) GDP of the primary sector on a different scale. It is clear that the average propensity to consume

has displayed a mild tendency to fall over time and is marked by considerable fluctuations. These fluctuations, as noted by others, can be partly explained in terms of changing composition of agricultural and non-agricultural incomes. However, there is another interesting feature that we observe from Figure 5. Gross domestic product has been going up by varying amounts in all the years except 1965-66 and 1972-73. In these two years it went down by 5.2 per cent and 1.1 per cent, respectively. There is clear evidence that the average propensity to consume registered a rise — from 0.8025 to 0.8213 — in 1965-66, the only year when the gross domestic product went down in the Indian economy by an appreciable amount. This behaviour of consumption is perhaps explained by the ratchet-type effect suggested by Duesenberry (1949) in his relative income hypothesis. We have built this hypothesis into our consumption function.

During the period under study non-primary income never fell. Primary sector income, however, fluctuated erratically, often downwards. In order to incorporate a Duesenberry ratchet effect, we included the previous peak income of the primary sector in the consumption function. This specification yielded better results (in terms of the usual test statistics) than the current income variable in the consumption function. The hypothesis of the existence of a ratchet effect is not rejected.

The results indicate that there is a substantial difference in the marginal propensity to consume between the primary and the non-primary sectors. Although a higher propensity to consume may be expected in the primary sector, these estimates may exaggerate the difference since gross income and not personal disposable income has been used. The incidence of higher taxation in the non-primary sector is, therefore, not reflected.

Most of the existing specifications of investment behaviour in India is in the accelerator framework. The accelerator theory assumes a perfect capital market. In India the assumption of a perfect market is a sharp contradiction of reality. In view of this it is probable that a specification as suggested by the marginal cost of funds theory *à la* Duesenberry (1958) may perform better than the existing specifications. It is important to note that the marginal cost of funds theory, which emphasises the role of internally generated funds, does not need imperfections in the capital market for its validity and has been found to be quite satisfactory in countries such as the US where the degree of imperfection of the capital market is minimal compared to India, see, eg, Bischoff (1971). The imperfect of the capital market, however, strengthens the applicability of this theory. In India, Pandit (1981) is perhaps the only researcher who has tried to investigate the role of funds position in the determination of investment behaviour. However, he incorporates this factor in the form of demand deposits in the economy which undoubtedly is far from satisfactory. We identify the gross savings of the private business sector and the credit extended by development banks such as IDBI, ICICI, etc, as the two important variables determining investment.

The investment function relates private sector investment in machinery and equipment to the gross savings of the private corporate sector and the credit sanctioned by the development banks using a polynomial distributed lag.[25] Alternative lag structures were estimated for both the explanatory variables, with lag periods of one upto five years and with various restrictions on end-point conditions. In addition, we estimated polynomials of different degrees before selecting the reported structure of the impact of lagged values on current investment.[26]

A polynomial lag structure of degree two in both cases and order two and four for gross domestic savings by the private corporate sector at 1970-71 prices and credit sanctioned by the development banks at 1970 prices, respectively with constraints on both ends appears to perform the best.

The chosen investment function shows that, although internally generated funds are very significant in influencing investment behaviour, development bank credit has a more powerful role in determining the level of investment. This may be expected because part of corporate savings may be used for other purposes besides investment, whereas development bank credit is probably earmarked only for specific investment projects. Although money is undoubtedly fungible, the application and receipt of development bank credit is by and large a prior indicator that the borrowing firm has already made certain investment decisions and has a project plan already formulated.

TABLE 4: MONEY WAGE RATE EQUATIONS

(1) *Consumer Goods*

$$WCN = -551.79 + 7.48685\ CPI + 6.4432\ LPCN_{-1} + 0.35934\ WCN_{-1}$$
(1.825) (3.756) (2.494) (2.123)

$\bar{R}^2 = 0.9855$, D.W. = 1.159, D.F. = 13

(2) *Capital Goods*

$$WCP = -1102.361 + 7.70666\ CPI - 9.33739\ LPCP_{-1} + 0.64171\ WCP_{-1}$$
(3.143) (3.893) (2.108) (6.891)

$\bar{R}^2 = 0.9952$, D.W. = 2.0583, D.F. = 12

(3) *Basic Goods*

$$WBS = -1371.71 + 13.35412\ CPI + 5.69012\ LPBS_{1} + 0.50151\ WBS_{1}$$
(2.403) (4.164) (1.771) (4.053)

$\bar{R}^2 = 0.9914$, D.W. = 1.6080, D.F. = 13

(4) *Intermediate Goods*

$$WIT = -45.055 + 8.79471\ CPI + 0.55041\ WIT_{1}$$
(0.342) (4.707) (5.042)

$\bar{R}^2 = 0.9804$, D.W. = 1.6313, D.F. = 14

TABLE 5: ELASTICITY OF MONEY WAGE RATE WITH RESPECT TO CONSUMER PRICE INDEX (CPI) AND LABOUR PRODUCTIVITY

Sector	CPI		Labour Productivity	
	Short Run	Long Run	Short Run	Long Run
Basic	0.536	1.075	0.284	0.570
Capital	0.353	0.985	0.311	0.868
Intermediate	0.500	1.110		
Consumer	0.527	0.822	0.336	0.525

OUTPUT EQUATIONS

Private final consumption expenditure enters as one of the explanatory variables in

the output equation of the consumer goods industry (Table 2, equation 1). Two other significant factors in explaning the demand for consumer goods are: (i) autonomous expenditure which is the sum of government final consumption expenditure and exports and (ii) commercial bank credit to commercial sector in real terms.

Output of the consumer goods sector has, according to ASI data grown far more slowly than any of the other three sectors (see Figure 1).[27,28] A number of economists have pointed to this "problem" sector as being the major contributer to the oveall stagnation and deceleration in the industrial sector [Shetty (1978), Nayyar (1981) among others]. Since the consumer goods sector has by far the highest weight in total industrial output (0.32, compared to 0.20, 0.21, and 0.04 for the capital, basic and intermediate goods sector respectively) its stagnation has a significant impact on the overall industrial picture.

The ASI data, of course, refers only to the registered manufacturing sector and it is possible that this sector of consumer goods is growing slowly in the face of competition from units in the unregistered sector. Given the generally larger scale of production required in the other three sectors it is unlikely that the unregistered sector provides much competition in these sectors. However, even casual empiricism indicates that the unregistered sector is becoming increasingly important in the Indian industrial scene. It is plausible that most of the growth in the consumer goods sector is in fact in the unregistered sector and the stagnation reflected in the ASI data for this sector provides a misleading impression of overall stagnation.[29]

The unregistered consumer goods sector has not grown very quickly either — the average rate of growth between 1970-71 and 1977-78 is only 5.73 per cent. However, we may suspect under-reporting of output and income in this sector in the national accounts data, and the growth rates may be underestimated, if under-reporting has increased over time. We suggest, as a plausible hypothesis, that the stagnation in registered consumer goods is due to stiff competition from the unregistered sector. A definitive answer to this issue will have to await further research.

The elastically of consumer goods output with respect to private final consumption expenditure and government consumption is found to be 0.61 and 0.21 (Table 3, Equation 1). The first figure is a little surprising as it implies that the industrial consumer goods is an inferior good as it has an Engel's elasticity of less than unity. One reason for this result may again be that there is a considerable amount of substitution between consumer goods produced by the factory sector and those produced by smaller units outside the factory sector.

Private corporate investment in machinery and equipment enters as an explanatory variable as part of the overall demand for capital goods in the capital goods output equation (Table 2, equation 2). The other constituents of demand for capital goods are government investment in machinery and equipments and export demand (net of imports). The results suggest that the effect of public sector investment on capital goods output is approximately the same as that of private sector investment. The elasticities of

TABLE 6: RAW MATERIAL COST EQUATIONS

(1) *Consumer Goods*

$$RCN = \underset{(3.766)}{13.3783} + \underset{(3.219)}{287.54483}\,\frac{MPIT}{ZTIME} + \underset{(8.301)}{1576.73556}\,\frac{PNF}{ZTIME}$$

$\bar{R}^2 = 0.9844$, D W = 2.1208, D F = 15

(2) *Capital Goods*

$$RCP = \underset{(2.938)}{5.59450} + \underset{(1.375)}{91.86078}\,\frac{IPCP}{ZTIME} + \underset{(19.345)}{1088.01307}\,\frac{MPBS}{ZTIME}$$

$\bar{R}^2 = 0.998$, D W = 1.3293, D F = 15

(3) *Basic Goods*

$$RBS = \underset{(6.627)}{11.16329} + \underset{(13.735)}{571.92087}\,\frac{PMIN}{ZTIME}$$

(COCHRANE ORCUTT)

$\bar{R}^2 = 0.9260$, D W = 1.8819, D F = 14

(4) *Intermediate Goods*

$$RIT = \underset{(3.387)}{-31.24497} + \underset{(4.123)}{573.84571}\,\frac{IPIT_{-1}}{ZTIME_{-1}} + \underset{(3.845)}{656.19084}\,\frac{MPBS}{ZTIME}$$

$\bar{R}^2 = 0.9547$, D W = 1.4779, D F = 14

TABLE 7: LINK-UP EQUATIONS FOR EVALUATION OF MULTIPLIERS[1]

	Estimated Regressions	
(1)	$YNPR = \underset{(4.211)}{4837.64} + \underset{(2.735)}{2.11269}\,QCN + \underset{(2.923)}{3.18894}\,QCP + \underset{(1.004)}{0.78349}\,(QBS + QIT)$	$\bar{R}^2 = 0.9927$, D W = 1.5838, Sample Period = 1961-77
(2)	$YCN = \underset{(1.877)}{312.98} + \underset{(9.098)}{0.08085}\,YNPR$	$\bar{R}^2 = 0.8364$, D W = 0.4312, Sample Period = 1961-77
(3)	$YTSC = \underset{(-3.121)}{-146.07} + \underset{(19.403)}{0.12343}\,YNPR$	$\bar{R}^2 = 0.9591$, D W = 1.2903, Sample Period = 1961-77

[1] The numbers within parentheses are t-values.

TABLE 8: MULTIPLIER EFFECTS ON NON-PRIMARY INCOME

Period	YPR	AE	KFPUB	CCB	CDB
0	0	0	2.0612	1.1940	0.9105
1	0.1306	0.6680	2.2452	1.3007	2.3556
2	0.1422	0.7277	2.2913	1.3273	3.4084
3	0.1452	0.7426	2.3158	1.3415	4.9308
Final Multipliers	0.1493	0.7637	2.3561	1.3649	5.1916
Final Elasticity	0.1337	0.0901	0.1341	0.060	0.06948

capital goods output with respect to public investment and private investment work out to 0.62 and 0.5 respectively.

The output equations of the basic and intermediate goods sector are essentially derived demand specifications which need no further explanation [Table 2, equation (3) and (4)].[30] The basic goods output is dependent on demand from the capital goods and construction sectors for which the elasticities are fainly high at 0.55 and 0.42 respectively. The intermediate goods sector output equation, estimated in a partial adjustment scheme reflect short run elasticities of 0.88 with respect to gross domestic product in the transport and storage sector and — 0.08 for the import price of mineral fuel and lubricants.[31]

The commonly held but as yet untested view that commercial bank credit availability affects industrial output derives partial support from the output equations. Credit by commercial banks (to the commercial sector) plays an important role in determining output in the consumer and the basic goods sectors. However, this variable always came out with a statistically insignificant coefficient in the capital and the intermediate goods output equations. The elasticities of output of basic goods (0.173) was higher than the consumer goods (0.098) with respect to credit. The significant asymmetric effect of commercial bank credit on the different industrial sectors is an important finding and deserves more detailed investigation in future research in the area. One reason for this asymmetric effect may be the disparities in bank financed inventory demand across sectors. Another explanation could be the aggregative nature of the credit variable that we have used — commercial bank credit to the commercial sector as a whole. A more relevant variable could be the commercial bank credit to each of the four sectors. Such a break-up of commercial bank credit is, however, not available at present.

Price Equations

The price equations are given in Table 3. Note that these are all estimated with the dependent variable in first difference form. The rationale behind the specifications have been discussed in Section II.

In all the four sectors, demand conditions, represented by capacity utilisation, and international price movements play a significant role in determining prices. However, the estimated results suggest that domestic demand conditions play a more important role in industrial price determination than international prices.

Considerable variations exist between the four sectors in the speed at which prices adjust to desired levels. The capital and basic goods sectors, perhaps owing to the higher proportion of public sector units in them, have the most inertia in adjusting their prices. The intermediate goods sector which has faced substantial upheavals in prices reports the fastest adjustment of actual to desired prices, as is to be expected.

Since capacity utilisation enters with a lag in the price equations, any increase in demand would first affect output levels, and prices would start rising only after a year's lag. This would perhaps not be realistic under conditions of full capacity, where prices would respond faster than output. Although this feature certainly needs to be incorporated

Appendix I

Major Industries in the Four Use-Based Categories (19—Industry Classification)*

Use-Based Category		Major Industries	Weight in the General Index of Industrial Production
Basic Goods	(1)	Chemical and Chemical products	10.90
	(2)	Cement	1.17
	(3)	Iron and Steel	7.04
	(4)	Non-ferrous basic metals	1.80
			20.91
Capital Goods	(5)	Machinery except electrical	5.55
	(6)	Electrical machinery appliances and supplies	4.92
	(7)	Shipbuilding and repairing	0.52
	(8)	Railroad equipments	2.99
	(9)	Motor vehicles	3.03
	(10)	Repair of motor vehicles	0.07
	(11)	Metal products except machinery and transport equipment	2.54
			19.62
Intermediate Goods	(12)	Rubber Products	1.78
	(13)	Petroleum Refinery Products	1.62
	(14)	Structural clay products	0.65
			4.05
Consumer Goods	(15)	Spinning weaving and finishining of textiles	16.84
	(16)	Pulp paper and paper board	2.22
	(17)	Miscellaneous food products	7.53
	(18)	Tobacco manufacture	2.22
	(19)	Sugar factories	2.79
			31.60
		All Industries	76.18

*CSO (1981) — Electric light and power has been excluded.

Appendix II

Use-Based Classification of Import Data

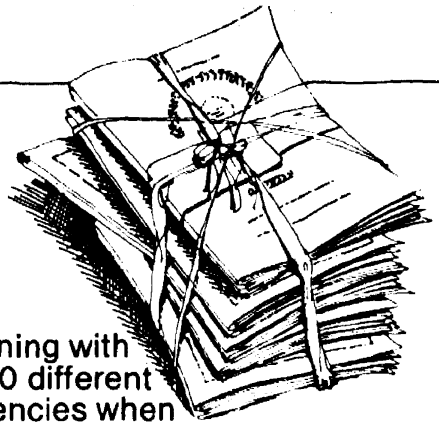
SITC No	Group	Use-Based Classification
0	Food	Consumer
1	Beverages and Tobacco	Consumer
2	Crude Materials Inedible except Fuels	Intermediate
3	Mineral Fuels and Lubricants	Intermediate
4	Animal And Vegetable Oils and Fats	Consumer
5	Chemicals	Intermediate
6	Manufactured Goods Classified Chiefly by Material	Intermediate
7	Machinery and Transport Equipment	Capital
8+9	Miscellaneous Manufactured Articles	Capital

Appendix III

ABBREVIATIONS FOR VARIABLES

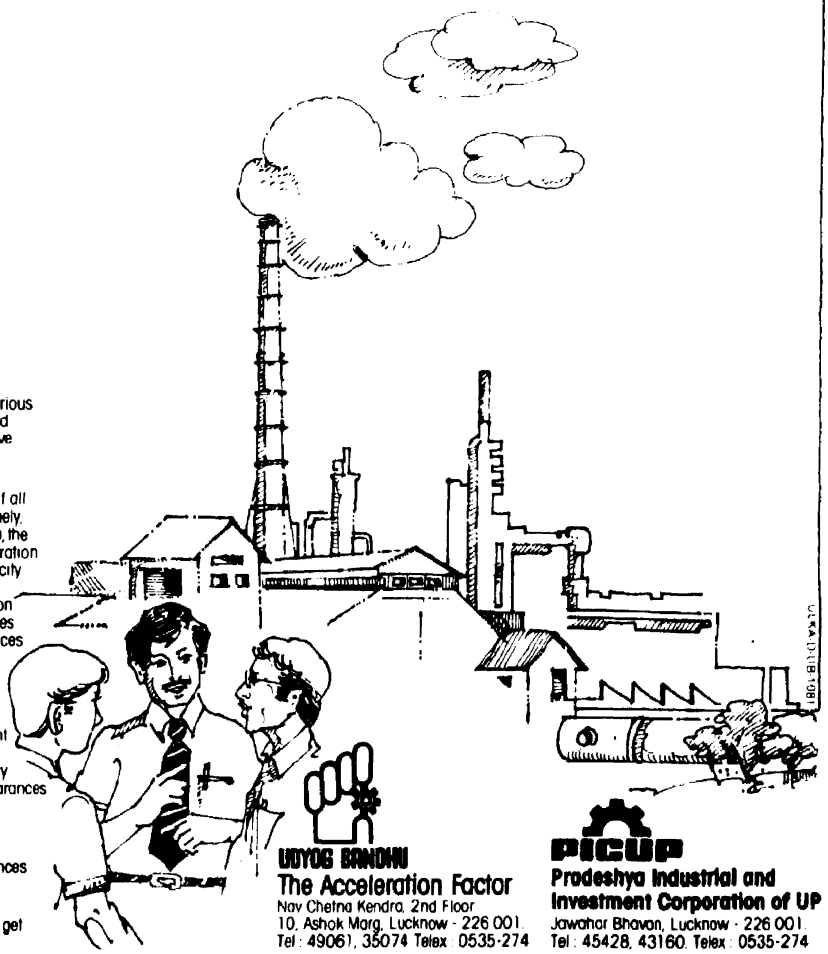
AE	:	Autonomnus Expenditure = The sum of Government final consumption expenditure excluding payments on wages and salaries, at constant prices and total value of exports at constant prices, both in Rs crore.
CCB	:	Change in commercial bank credit to the commercial sector at constant prices over the previous year.
CDB	:	Credit sanctioned by the development banks at 1970 prices.
CPI	:	Consumer price index (calendar year figures) Base: 1970 = 100.
CPI*	:	Desired CPI
CPVT	:	Private final consumption expenditure at 1970-71 prices, Rs crore
DEPBS	:	Change in ex-factory prices in the basic goods sector over the previous year = ($EPBS_t - EPBS_{t-1}$)
DEPCN	:	Change in Ex-factory prices in the consumer goods sector over the previous year = ($EPCN_t - EPCN_{t-1}$)
DEPCP	:	Change in Ex-factory prices in the capital goods sector over the previous year = ($EPCP_t - EPCP_{t-1}$)
DEPIT	:	Change in Ex-factory prices in the intermediate goods sector over the previous year = ($EPIT_t - EPIT_{t-1}$)
DUM70	:	Dummy variable. It takes values of 1 for 1970-71 and zero for all other years to capture the effect of revisions in data in commercial bank credit to commercial sector introduced in 1970-71.
EPBS	:	Ex-factory price of the basic goods sector = output of basic goods sector at current prices divided by output of basic goods sector at 1960 prices.
EPBS*	:	Desired EPBS.
EPCN	:	Ex-factory price of the consumer goods sector = output of consumer goods sector at current prices divided by output of consumer goods sector at 1960 prices.
EPCN*	:	Desired EPCN
EPCP	:	Ex-factory price of the capital goods sector = output of capital goods sector at current prices divided by output of capital goods sector at 1960 prices.
EPCP*	:	Desired EPCP
EPIT	:	Ex-factory price of the intermediate goods sector = output of intermediates goods sector at current prices divided by output of intermediate goods sector at 1960 prices.
EPIT*	:	Desired EPIT
FIXCN	:	Depreciation costs in the consumer goods sector.
IPCN	:	Unit value index of import of consumer goods. Base: 1968-69 = 100, fiscal year figures.
IPCP	:	Unit value index of import of capital goods. Base: 1968-69 = 100, fiscal year figures.
IPFL	:	Unit value index of import of mineral fuel and lubricants. Base: 1968-69 = 100, fiscal year figures.
IPIT	:	Unit value index of import of intermediate goods. Base: 1968-69 = 100, fiscal year figures.
KFPUB	:	Gross Domestic Fixed Capital formation in the public sector in "Machinery and Equipment" at 1970-71 prices, Rs crore.
KFPVT	:	Gross Domestic Fixed Capital formation in the private sector in "Machinery and Equipment" at 1970-71 prices, Rs crore.
LPBS	:	QBS per employee in the basic goods sector (in Rupees).
LPCN	:	QCN per employee in the consumer goods sector (in Rupees).
LPCP	:	QCP per employee in the capital goods sector (in Rupees).
LPIT	:	QIT per employee in the intermediate goods sector (in Rupees).
MPBS	:	Market price of basic goods sector output = EPBS (1 + Excise rate in the basic goods sector).
MPCN	:	Market price of consumer goods sector output = EPCN (1 + Excise rate in the consumer goods sector).
MPCP	:	Market price of capital goods sector output = EPCP (1 + Excise rate in the capital goods sector).
MPIT	:	Market price of intermediate goods sector output = EPIT (1 + Excise rate in the intermediate goods sector).
PFD	:	Wholesale price index of food article, calendar year figures. Base: 1970 = 100.
PMIN	:	Wholesale price index of minerals, calender year figures. Base: 1970 = 100.
PNF	:	Wholesale price index of non-food articles, calendar year figures. Base: 1970 = 100.
QBS	:	Ex-factory output at 1960 prices in the basic goods sector, Rs crore calander year figures.
QCN	:	Ex-factory output at 1960 prices in the consumer goods sector, Rs crore calender year figures.
QCN^c	:	Full capacity output at 1960 prices in the consumer goods sector.
QCP	:	Ex-factory output at 1960 prices in the capital goods sector, Rs crores, calendar year figures.
QIT	:	Ex-factory output at 1960 prices in the intermediate goods sector, Rs crore calender year figures.
RBS	:	Raw material costs at current prices in the basic goods sector as a proportion of output (at 1960 prices) in the basic goods sector.
RCN	:	Raw material costs at current prices in the consumer goods sector as a proportion of output (at 1960 prices) in the consumer goods sector.
RCP	:	Raw material costs at current prices in the capital goods sector as a proportion of output (at 1960 prices) in the capital goods sector.
RIT	:	Raw material costs at current prices in the intermediate goods sector as a proportion of output (at 1960 prices) in the intermediate goods sector.
SPVT	:	Gross domestic savings by the private corporate sector at 1970-71 prices, Rs crore
UCCN	:	Unit cost in the consumer goods sector = Total cost in the consumer goods sector divided by Output at 1960 prices in the consumer goods sector.
UCCP	:	Unit cost in the capital goods sector = Total cost in the capital goods sector divided by Ouptut at 1960 prices in the capital goods sector.
UC.CU1BS	:	(Unit cost in the basic goods sector) × (Capacity Utilisation ratio in the basic goods sector with one year lag).
UC.CU1CN	:	(Unit cost in the consumer goods sector) × (Capacity Utilisation ratio in the consumer goods sector with one year lag).
UC.CU1CP	:	(Unit cost in the capital goods sector) × (Capacity Utilisation ratio in the capital goods sector with one year lag).
UC.CU1IT	:	(Unit cost in the intermediate goods sector) × (Capacity Utilisation ratio in the intermediate goods sector with one year lag).
UC.IPBS	:	(Unit cost in the basic goods sector) × (Unit value index of import of basic goods sector, Base: 1968-69 = 100, one year lag).
UC.IPCN	:	(Unit cost in the consumer goods sector) × (Unit value index of import of consumer goods sector, Base: 1968 – 69 = 100, one year lag).
UC.IPCP	:	(Unit cost in the capital goods sector) × (Unit value index of import of capital goods sector, Base: 1968-69 = 100, one year lag).
UC.IPIT	:	(Unit cost in the intermediate goods sector) × (Unit value index of import of intermediate goods sector, Base: 1968-69 = 100, one year lag).
WBS	:	Wage rate per annum per employee (in Rs, at current prices) in the basic goods sector.
WCN	:	Wage rate per annum per employee (in Rs, at current prices) in the consumer goods sector.
WCN*	:	Desired WCN

(Contd)



Liaisoning with
10 different
Government agencies when
setting up a medium or large scale unit
can be a bit tiresome.

In Uttar Pradesh, a call to Udyog Bandhu cuts through all red tape



Very often, gathering information, getting licences and liaisoning with various government departments can be a deterrent for the entrepreneur. To avoid this, Uttar Pradesh has created Udyog Bandhu, a two tier structure, to give "effective liaison services" to the entrepreneur.

THE BUREAU

At the base of Udyog Bandhu is its bureau. A cell consisting of officers of all the government departments an entrepreneur will have to deal with. Namely, The Pradeshiya Industrial and Investment Corporation of UP Ltd. (PICUP), the Directorate of Industries (DI), the UP State Industrial Development Corporation Ltd. (UPSIDC), UP Financial Corporation (UPFC) and the UP State Electricity Board (UPSEB). Also a special cell of senior officers from the Industries, Housing, Excise, Forest, Revenue, Sales Tax departments and the Pollution Control Board are available every Friday from 11 am to 1 pm. The services offered include guidance, information, licencing and various liaison services not only with all these departments but also with other State and Central Government agencies.

THE HIGH POWER COMMITTEE

To carry the concept of total services further, the apex of Udyog Bandhu consists of a high power committee of various heads of state government departments under the Chairmanship of the Chief Minister of UP. This committee for large and medium industries deals with cases where policy modification and amplification is needed. All pending sanctions and clearances can also be put up to it for decisions at the highest level.

THE OPEN MEETING

The high power committee periodically holds an open meeting. Here the entrepreneur can put his problem directly to the Chief Minister. All grievances of delays, or mishandling can be cleared up at the highest level. Cutting across all intervening red tape.

So for any enquiries or detailed information that you may require, please get in touch with us.

UDYOG BANDHU
The Acceleration Factor
Nav Chetna Kendra, 2nd Floor
10, Ashok Marg, Lucknow - 226 001
Tel : 49061, 35074 Telex : 0535-274

PICUP
Pradeshya Industrial and Investment Corporation of UP
Jawahar Bhavan, Lucknow - 226 001
Tel : 45428, 43160 Telex : 0535-274

APPENDIX III (CONTINUED)

WCP	: Wage rate per annum per employee (in Rs, at current prices) in the capital goods sector.		1970-71 prices, Rs crore.
WIT	: Wage rate per annum per employee (in Rs, at current prices) in the intermediate goods sector.	YPR	: Gross Domestic product of the primary sector at factor cost, at 1970-71 prices, Rs crore.
XMT	: Net exports (exports minus imports) of machinery and transport equipment, Rs crore.	YPR*	: Value of this variable at year t is equal to the maximum value of YPR upto and including year t.
YCN	: Gross Domestic product from construction at factor cost, 1970-71 prices, Rs crore.	YTSC	: Gross domestic product from transport, storage and communication at factor cost, 1970-71 prices, Rs crore.
YNPR	: Gross Domestic product from non-primary sector at	ZTIME	: Time in calendar years.

into the price equations, it may not upset the results substantially since in the sample period full capacity utilisation has never been attained and utilisation rates have been failing consistently over time (see figure 6).

For further work on industrial prices see Madhur and Roy (1984).

MONEY WAGES RATE EQUATIONS

The money wage rate functions, given in Table 4, support the hypothesis that the wage rate in the industrial sector depends on the consumer price level and on labour productivity (lagged by one year). Table 5 presents the elasticities of the money wage rate with respect to the consumer price index and labour productivity.

The long run elasticity of money wages with respect to consumer prices is not significantly different from unity in all but the consumer goods sector. This indicates that although inflation erodes the worker's standard of living in the short run, over a longer period, money wages do adjust to compensate an increase in prices. Continuous inflation, of course, implies that the worker is always short-changed in the wage-price bargain — he is forever in a position of his wages attempting to "catch up" with prices. The continuous erosion of real wages implied by the consumer sector's low elasticity may be a reflection of its poor condition in terms of low and falling mark-up rates and depressed output levels. The speed of adjustment of wages to prices is, however, fastest in the consumer goods sector, which adjusts to desired levels in 1.5 years, while this process takes 2 years for basic goods, 2.2 years for intermediate goods and 2.8 years for the capital goods sector.

Except for the intermediate goods sector, we find that labour productivity (lagged by a year) has a significant effect on money wage rates.[32] However, it is important to note that in all the sectors the long run elasticity of money wage rates with respect to labour productivity is less than unity. Since during the sample period of our study labour productivity has grown in three of the sectors — capital, basic and intermediate (see Figure 7), this would imply that a part of this increased productivity has either gone to swell the profits in these industries and/or has gone as income to the suppliers of raw materials/non-labour inputs to these industries. If the former has happened one would expect the ratio of profits to the wage bill to have gone up in these industries. This, however, has not happened (see Figure 8). This indicates that a part of the increased labour productivity might have gone to swell the income of the suppliers of raw materials. A pointer to this effect is the consistent decline in the ratio of labour cost to total cost in these industries (see Figure 9). This decline is dramatic in the intermediate good sector — a sector in which we have found that labour productivity has no effect on the money wage rates. Thus, it appears that the rather steep increase in the labour productivity in the intermediate goods sector has largely gone to pay for the increased cost of raw materials — perhaps largely to meet the increasing cost of fuel imports.

RAW MATERIAL EQUATIONS

The unit raw material costs in the four sectors react to different prices in different ways. This is only natural as the input requirements vary across sectors. Market prices of intermediate goods and non-food agricultural commodities affect unit raw material costs in the consumer goods industry. International prices of capital goods and the basic goods price affect raw material costs in the capital goods sector. Prices of minerals affect the raw materials costs in the basic goods sector. The raw material costs in the intermediate goods sector are affected by world prices of intermediate goods and market prices of basic goods. The market prices of basic goods and intermediate goods, thus, have a tendency to feed back into the prices of other sectors through their raw material cost. As can be seen from Table 7, this feedback is substantial in magnitude. This is especially true of the price of basic goods. Raw material costs in capital as well as intermediate goods sector are found to be unitary elastic with respect to the basic goods price.

V

Dynamic Multipliers

What are the impacts of variables such as agricultural output, credit by commercial banks, credit by development banks, government consumption expenditure etc, on industrial output and prices? It is not possible to give accurate answers to these questions without taking into account the important linkages in the economy which can be done only in the context of an overall macroeconometric model. For example, fluctuations in agricultural output affects prices, credit and government expenditure affect money supply and hence prices, which cannot be captured in the framework of the estimated structure given above. However, even within our limited framwork it may be useful to evaluate the multipliers to get some insight into the relative impact of different policies and of exogenous shocks on the non-primary sector.

We evaluate these effects on output in terms of gross domestic product in the non-primary sector. This method of evaluation has the advantage that it gives an indication of the broad macro impact of policy changes and exogenous shocks. For this purpose apart from the equations already reported in Table 1 and Table 2 of Section 4 we need a few more link equations. These equations, reported in Table 7, give (i) the relation between the gross domestic product of the non-primary sector and the factory sector outputs of the four use-based categories, (ii) the relation between gross domestic product originating in the construction sector and gross domestic product of the non-primary sector, and (iii) the relation between the gross domestic product of the transport, storage and communication sector and the gross domestic product of the non-primary sector.

The need for an equation connecting industrial output of the four use-based groups in the factory sector to gross domestic product of the non-primary sector is self-evident since we want to evaluate the overall impact of policy changes and exogenous shocks on non-primary sector output. We felt that it is not realistic to assume that income originating in construction, transport, storage and communications remain unchanged when non-primary sector's income goes up. That explains equations (2) and (3) in Table 7. Admittedly the equations reported in Table 7 are rudimentary and are estimated only for the purpose of getting rough estimates of the multipliers.

Combining equations reported in Tables 1-2 and 7, we can solve for the non-primary sector output, in terms of (i) real income of the primary sector lagged by one year, (ii)

autonomous expenditure lagged by one year, (iii) government investment expenditure in machinery and equipment, (iv) commercial bank credit, (v) development bank credit, (vi) the lagged value of income from the non-primary sector, and (vii) international price of mineral fuels and lubricants. More specifically such an equation is of the form:[33]

$$(5.1)\ Y_t = C + aX_t + m_1 Y_{t-1} + m_2 Y_{t-2} + m_2 g Y_{t-3} + m_2 g^2 Y_{t-4} + \ldots$$

Where

X is the variable whose multiplier effect is to be evaluated.

Y is the income from the non-primary sector, with the t subscript denoting time.

'c' is a constant.

It is easy to verify

$m_1 = 0.089312$; $m_2 = 0.0143634$;

$g = 0.59983$

Equation (5.1) is a difference equation in non-primary sector's output and can be made to yield the dynamic multipliers in a fairly straightforward manner.

The estimated model of the industrial sector may be of some use in tracing the long run effects of a given change in an exogenous variable, such as credit from development banks, or primary sector income. For this purpose, we present in Table 8, the multipliers associated with each exogenous variable. Table 8 also presents the final elasticities of non-primary sector output with respect to each exogenous variable, computed at the sample means. A comparison of elasticities shows that autonomous expenditure, government investment and primary sector income (all in real terms) have almost the same long run effect on non-primary output, the elasticities ranging from 0.09 to 0.13. In contrast, the elasticity with respect to credit are much lower — 0.07 for development banks and 0.06 for commercial banks.

The relative efficacy of fiscal *versus* credit policy in affecting output is not obvious from this exercise. A policy maker such as the RBI wields direct control only on the nominal credit for instance, whereas our multipliers apply to the real magnitude. The net effect of a given nominal change will tend to be modified by the movement in the price deflator (if any), a variable over which the RBI has no control. To overcome this limitation, the multipliers would have to be derived from a complete macroeconometric model, which is beyond the scope of this paper.

VI

Summary and Conclusions

The major conclusions of the present study are as follows:

(1) Being essentially Keynesian in nature our model of the industrial sector tends to emphasise the role of demand factors. This is in contrast with the view that supply bottlenecks are more important for price and output fluctuations in Indian industry. While there is certainly a need to introduce the effect of supply bottlenecks we feel that this is often exaggerated. If bottlenecks in supply are predominant one would expect that when capacity utilisation falls secularly then mark-up rates should rise. However, the historical evidence shows that the falling trend in capacity utilisation has been accompanied by similar secular decline in mark-up rates (see Figures 6 and 2) in all the four sectors. This perhaps suggests that the ouput variations have by and large been due to demand factors.

(2) Our examination of the price-quantity adjustment mechanism in Indian industry shows that although variations in demand lead to variations in output in the short run, it also leads to variations in industrial prices in the long run. Besides these output-price repercussions in the product market, an increase in demand also leads to an increase in the money wage rate and hence initiates a dynamic 'wage-price' spiral in the industrial sector. Thus, the end-result of an increase in the demand for industrial output is an increase in industrial output, industrial prices and the money wage rate.

(3) Money wages are found to move in proportion with consumer prices in the long run, with the exception of the consumer goods sector. However, they move less than in proportion with labour productivity which has grown over the sample period. The benefits of higher productivity have, it may be inferred, swelled either profits or expenditure on raw materials. The relevant data shows that the latter has happened in fact, especially in the intermediate goods sector.

(4) The variables that we found to be the major determinants of industrial output are: (i) real government expenditure — both consumption and investment, (ii) real exports, (iii) real income of the primary sector and (iv) availability of credit — from commercial banks as well as from development banks. The first two are standard Keynesian determinates of aggregate demand and output. At the analytical level, the role of real income of the agricultural/primary sector as a source of demand for the industrial sector has been stressed by Raj (1976) and Chakravarty (1979). The present study provides the necessary quantitative evidence. Our finding that credit availability is an important determinant of industrial output lends support to a generally held but as yet untested hypothesis about the transmission mechanism of monetary/credit policy in India.

(5) Significant differences are found in the behaviour patterns of the four sub-sectors of the industrial sector. For example, (i) commercial bank credit affects only the output of consumer and basic goods without having any direct effect on the outputs of the capital and the intermediate goods; (ii) in the short run, prices are more 'sticky' in the capital and basic goods sectors though in the long run prices in all sectors hvae unit elasticity with respect to capacity utilisation; (iii) in the long run, money wages are proportional to consumer prices in all but the consumer goods sector where it is less than proportional; (iv) productivity affects money wages in all but the intermediate goods sector.

Notes

[We wish to thank The Policy Group for financial support and research assistance. We would also like to thank ICIM (International Computers Indian Manufacture) for financial support for a project to construct a macro-economic model of the Indian economy of which this paper forms part. We are grateful to H L Chandhok for his help and advice on data issues.]

1 Other sectors of the model include agriculture [see Lahiri and Roy, (1983)], money and credit [see Madhur, Nayak, Roy, (1982)], and trade [see Ghose, Lahiri, Wadhwa (1983)].

2 See Ahluwalia (1982), who documents that between 1959 and 1976 the value added in capital goods grew at 8.6 per cent per year, consumer goods at 4.6 per cent, intermediates goods at 4.0 per cent and basic goods at 6.3 per cent.

3 The major industries that are constituents of these four use-based sectors are given in Appendix I.

4 In this brief review of the price-quantity adjustment mechanism in earlier models, we neglect the dynamic supply-side effect of investment demand on capital stock and hence on capacity output which have been incorporated in some of these models. Hence the discussion is largely within the framework of short-run macro-economics in that it takes capacity output as given and neglects the growth-implications of variations in demand.

5 Except, of course, a change in public sector employment.

6 We have not endogenised full-capacity output in our model yet, but work is in progress to extend the model to incorporate this. Currently full-capacity output levels are assumed exogenous. They, however, enter the model with a lag; consequently this extension would not affect our results much.

7 See Jaffe (1971) for a theoretical exposition of the credit availability doctrine.

8 Such as IDBI, ICICI, IFCI, SFCs, SIDCs, IRCI, etc.

9 Capacity utilisation enters with a lag in this final specification; however, a number of alternative lag structures were tested (for international prices as well) and the lags as given in equation (2.2) performed better than the others.

10 The data actually refer to emolument rates — see section 3 — but for simplicity in exposition we refer to this

variable throughout as the wages rate.

11 Productivity, according to equation (2.8) increases linearly with time. It may be felt that an exponential or non-linear specification of productivity is desirable. However, it is important to note that since it is in calendar years, the input requirement changes only by $a_i(\frac{1}{t} - \frac{1}{t-1})$ each year, which say in 1980 is $a_i(\frac{1}{1980} - \frac{1}{1979}) = -0{\cdot}000000255\, a_i$. Input requirements per unit output according to (2.8) decrease at a slow and decelerating rate.

12 By this we mean that we have not taken into account all the linkages that exist in the industry model in particular and our overall macro model in general.

13 Note that d is the reciprocal of labour productivity or the labour to output ratio

14 The specification suggests that out of every rupee spent on consumption in the private sector, a certain proportion. α_1, is directed towards industrial consumer items. The rest $(1-\alpha_1)$ is channellised into non-processed food products, rent, fuel and power, taxes, domestic services, transportation, recreation, entertainment, education, cultural services, etc.

15 In section 4, we provide some evidence of the price being important in the face of competition from the unregistered consumer goods units. This would imply a downward sloping demand curve AA, which would not, however, alter the dynamics of adjustment greatly except in so far as the stability conditions would alter somewhat.

16 See Table A.

17 Changes in relative-price ratios and the consequent impact on the substitution between commodities has also not been explicity modelled. This, however, may be justifiable under very minimal assumptions: we may plausibly exclude the possibility of consumer goods being substituted for capital goods, or in general, for one sector's goods with another's, where substitution possibilities are infact fairly limited.

18 A good summary account of the data base of Indian industry is available in Ahluwalia (1982).

19 This actually meant going down to various two-digit and three-digit level (according to the National Industrial Classification — 1970) data. The output figures are available from the authors on request.

20 For example, let there be n industries at two or three digit levels of disaggregation in a sector, say, the basic goods sector. Let Y_{it} be the output of the i th industry $(i = 1,2,\ldots,n)$ in year t, evaluated at current ex-factory prices. Let P_{it} be the Wholesale Price Index relation to the ith industry at time t, E_t and e_t the total excise revenue and rate of excise taxes at time t, and x_t the value of output at constant ex-factory prices, then we define:

$$(3.1)\quad e_t = E_t / \sum_{i=1}^{n} Y_{it}$$

$$(3.2)\quad x_t = [\sum_{i=1}^{n} (\frac{Y_{it}}{P_{it}})(1 + e_t)]$$

21 Note that the definition results in a peculiar paradox — capacity is an ever-increasing function of time.

22 ASI data is available only on a yearly basis. It is clearly preferable to use monthly data for monitoring capacity and this leaves us only with the indices of industrial production.

23 There is a marginal difference between the industry coverage and weighting patterns used by RBI (1970) for constructing the series on capacity — output for the years 1960-68 and that used by us for the years 1969-77.

24 The number of workers or employees in ASI, is an average number per working day (days on which the manufacturing process was carried on). By dividing total wages by number of employees, rather than employee-days, we are implicitly assuming that the number of working days per year do not vary across industries.

25 For lack of reliable data on gross savings of the private business sector we have used the gross savings of the private corporate sector as a proxy.

26 Equations were selected first on the basis of standard statistical properties of the estimated (t-statistics, DW, etc) and the final equation was chosen using the standard error of estimate criterion.

27 A similar picture of stagnation in this sector is reflected in the data from the Index of Industrial Production.

28 Note also that the mark-up rates are the lowest in the consumer goods sector.

29 A possible test of the hypothesis that the apparent stagnation in the registered consumer goods sector is caused by competition from the unregistered consumer goods sector could be to include a relative price variable (measuring the price of consumer goods in the registered sector to that of the unregistered sector) in the demand function. Unfortunately, however, this test cannot be satisfactorily performed due to data limitations in the National Accounts which use the same commodity price indices to convert real output to nominal ouput in both the sectors. The only difference, therefore, in the two overall price indices is a result of compositional changes.

30 In these equations there is a problem of relating ASI output data to national accounts data. As mentioned in section 3, the true reference period of ASI data depends on the distribution of closing dates which is unknown. We tried to relate the output figures of the four use-based industries to the relevant National Accounts aggregates both with and without a lag. In the case of consumer goods, private final consumption expenditure and autonomous expenditure with a year's lag explain output better than the contemporaneous ones. Whereas for the outputs of the other three sectors contemporaneous private and public sector fixed investment in machinery and equipment, GDP originating in construction transport and storage have higher explanatory power than the lagged ones. One possible reason for this may be that the true reference period of consumer goods industry is somewhat behind the true reference periods of the other three sectors.

31 The long run elasticities are 2.20 and −0.20 respectively.

32 In the regressions for the intermediate goods sector, labour productivity always came out with a statistically insignificant coefficient and consequently we dropped it from the regression.

33 The equation is modified slightly for (v) and (vii) above.

TABLE A

Note that

$$\frac{\delta EPCN^*_{t+1}}{\delta \beta^*_{t+1}} = A \cdot \frac{1}{[1 - d\mu\gamma_1\theta\epsilon_2(1+e_{t+1})\beta^*_{t+1}]^2}$$

and

$$\frac{\delta^2 EPCN^*_{t+1}}{\delta \beta^{*2}_{t+1}} = +2A \cdot \frac{d\mu\gamma_1\theta\epsilon_2(1+e_{t+1})}{[1 - d\mu\gamma_1\theta\epsilon_2(1+e_{t+1})\beta^*_{t+1}]^3}$$

where $A = d\mu\gamma_0 + d\mu\gamma_1\theta\epsilon_0 + d\mu\gamma_1\theta\epsilon_1 PFD_t + d\mu\gamma_1(1-\theta)CPI_t + d\mu\gamma_2 LPCN_t + d(1-\mu)WCN_t + RCN_t + d\mu\gamma_1\theta\epsilon_2(1+e_{t+1})(1-\lambda)EPCN_t$

It is clear that

$$\frac{\delta EPCN^*_{t+1}}{\delta \beta^*_{t+1}} > 0 \text{ and } \frac{\delta^2 EPCN^*_{t+1}}{\delta \beta^{*2}_{t+1}} > 0 \text{ if } A > 0 \text{ and } 1 - d\mu\gamma_1\theta\epsilon_2(1+e_{t+1})\beta^*_{t+1} > 0$$

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China's 'Open' Cities

CHINA'S State Council has said that the 14 coastal cities chosen to open their doors wider to foreign investors would press ahead with development plans. The 14 cities, which are to expand their decision-making powers over foreign economic relations and trade, and offer preferential treatment to overseas investors are: Dalian, Qinhuangdao, Tianjin, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang and Beihai.

The Chinese government had announced in April that these cities had been chosen to join the four Special Economic Zones of Xiamen, Shantou, Zhuhai and Shenzhen and Hainan Island as centres of foreign economic relations along the coast. After the announcement was made, special work groups had been set up in the provinces and municipalities where the port cities are located. All the cities were located in economically developed areas, with a fairly good foundation of industry and science and technology.

The cities will not have the same status as special Economic Zones, but will be able to offer tax incentives to foreign firms which provide advanced technology in running joint ventures or co-production projects with Chinese enterprises, or projects with exclusive foreign investment. Machinery, equipment and other means of production imported for these enterprises will be exempt from import duty and consolidated industrial and commercial tax. Their products for export will be exempt from export duty, and a certain amount of products which require advanced techniques to make may be sold on the domestic market. In addition, the entry and exit procedures for foreign business chiefs to these 14 cities will be simplified for their convenience.

A number of economic and technical development districts are to be gradually set up in some of the cities which have developed higher technical and management skills and gained more experience in foreign economic activities. Income-tax for all the production enterprises in these development districts will be levied at 15 per cent, the same as in the Special Economic Zones. Preferential treatment practised in the Special Economic Zones will also be applied in the districts as regards imported equipment and export and domestic sales. The 14 cities would first import advanced techniques and technology for revamping existent enterprises, and build a number of small and medium-sized projects aimed at producing good economic results. The cities would, at the same time, carry out a series of reforms to make the system of management conform to the open policy. Some of the successful methods practised in the Special Economic Zones may also be tried out in the port cities.