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ENGLISH

METHODS OF PROMOTION OF INDUSTRIAL DEVELOPMENT IN INDIA -/

by

Ashok V. Desai
Professor of Applied Economics
Jadavpur University
Calcutta, India

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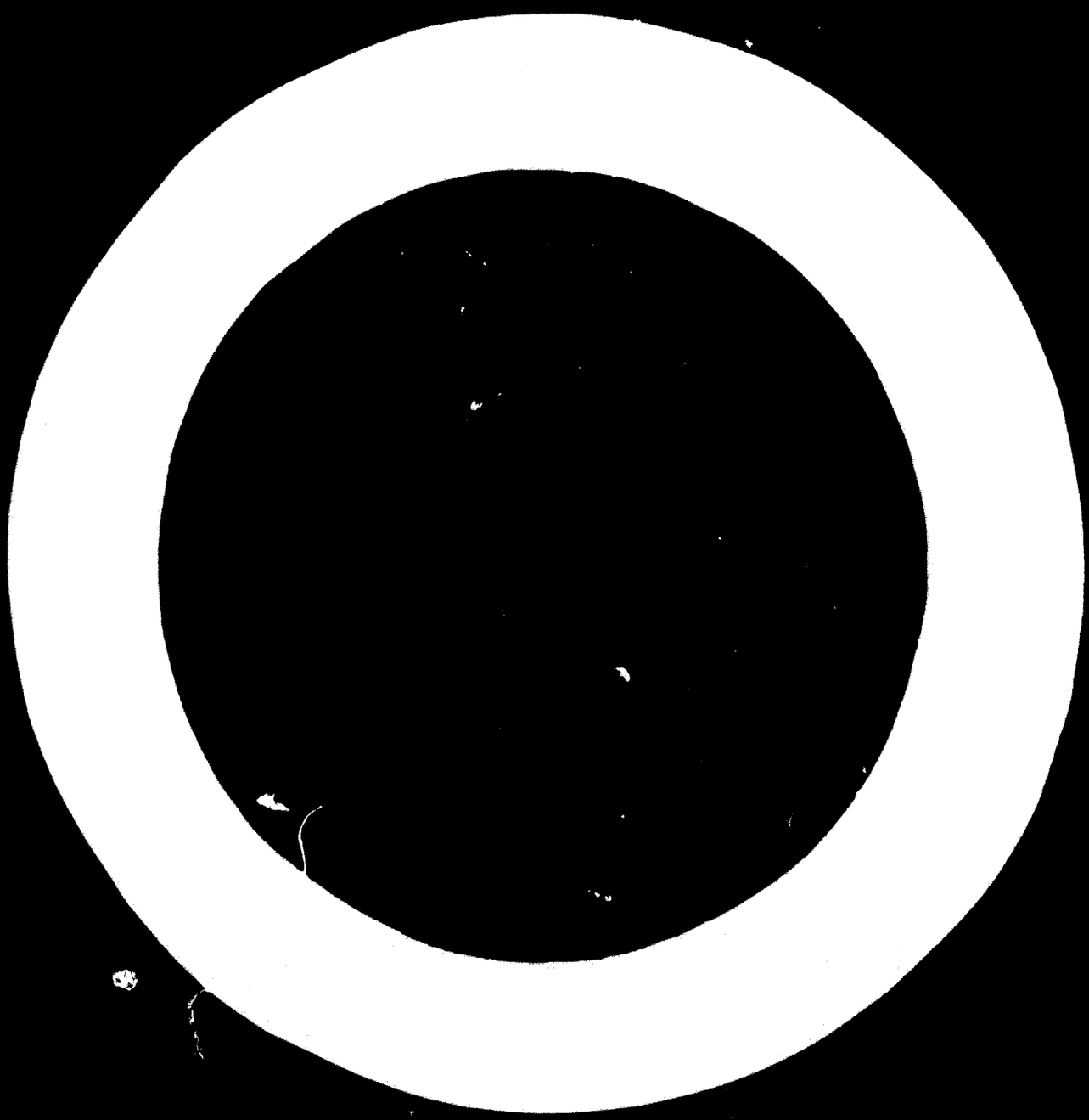


METHODS OF PROJECTION FOR INDUSTRIAL DEVELOPMENT IN INDIA

Summary

The purpose of the present paper is to give a critical review of the methods of forecasting of demand and supply in Indian industries. The Five-Year-Plans exert a very strong influence on the course of future industrial expansion and income generation. Naturally, therefore, the methods of forecasting used by the Planning Commission is of major importance.

The Planning Commission uses an aggregated macro-economic model for broad dimensional forecasting of a consistent type on the basis of certain desirable rates of growth of the economy. To get the detailed breakdowns of various

sectors [illegible] and are approved in terms of [illegible].

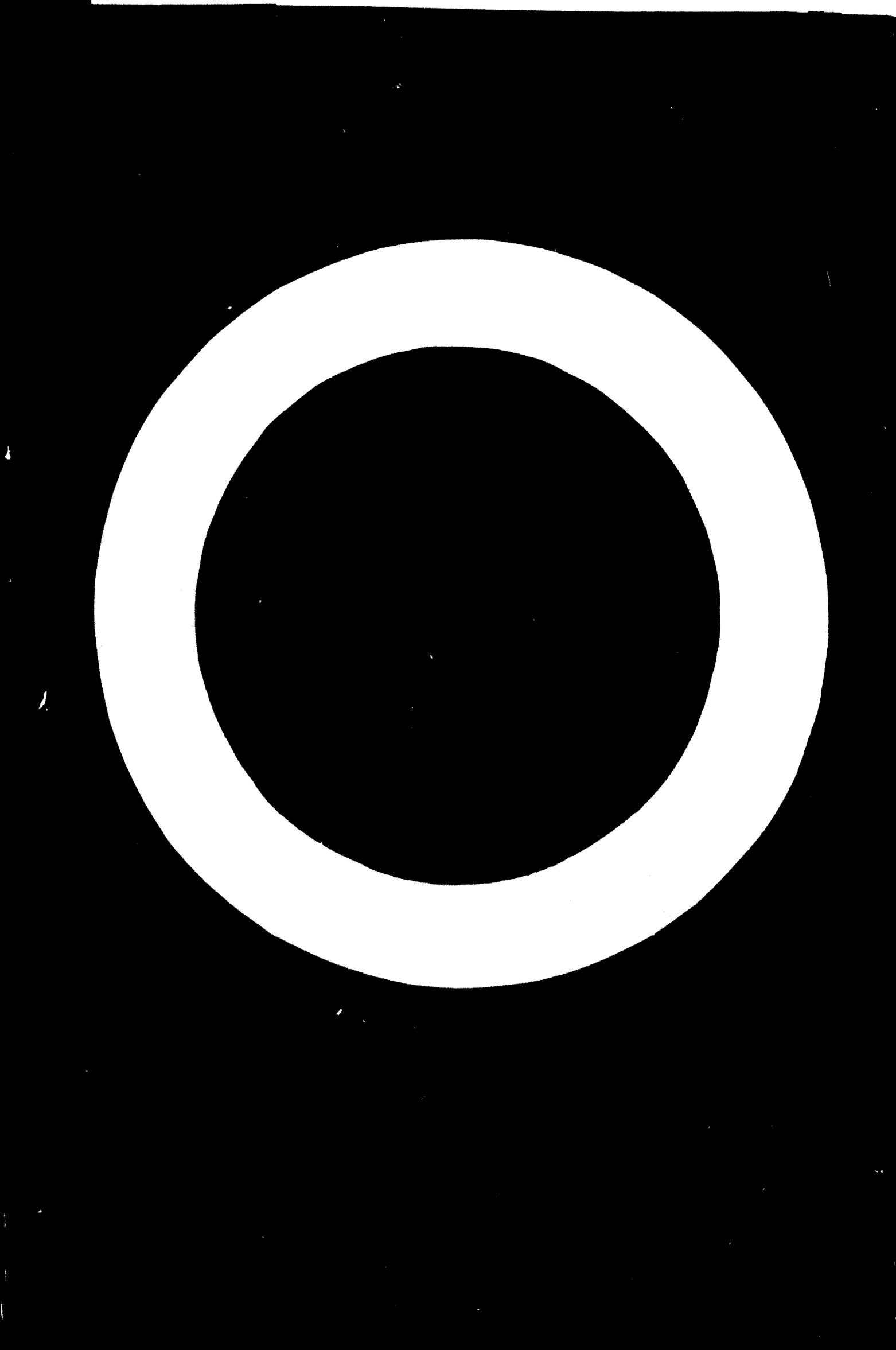
[illegible] being discussed on the likely commodity targets private and public sector [illegible] at broad levels made their forecasts partly by the end use method and partly by independent assessment through market surveys. The results are also checked by [illegible] analysis of various type.

For detailed breakdown, functional categories are specified and different methods are used for different types of goods e.g. basic commodities, capital goods or consumer goods.

A technical flaw of the [illegible] method public or private, is that very little [illegible] is made of norms or technical coefficients [illegible] to the forecasts.

It is suggested that [illegible] plan should be confined to broad aggregates and key sectors and detailed planning left to implementing authorities. A vigorous and sustained programme of research should also be taken up on the technical coefficients relating to production and investment.

Contents



Introduction

Any system of forecasting of the demand and supply of commodities in an economy has to start with the decision making mechanism of the economic system and its nature of operations. The main decision making mechanism in capitalist economies, so called, is the totality of entrepreneurs and final users operating in the market. The case is rather different in the socialist economies where the decision making mechanism is the political organisation of the community itself i.e. the state. In India, the position is half way between the two. The state planning organisation i.e. the Planning Commission has direct and complete control over a fairly large range of activities of the economy, their operation being determined by state policy. But there is an even larger field of private sector activities where the state planning organisation plays generally a very important role and sometimes, a crucial role. To understand, therefore, the system of forecasting of demand and supply one has to consider the nature of operation of the planning machinery, the way it gives direction to the units of production and the way the units in public and private sector react to such guidance.

Private sector investments are substantially influenced

By this government programmes and investment processes have to take into account private sector reactions in formulating the plans.

Setting up the national economy in two broad production sectors i.e. private and government, one can describe the system in an input-output format as follows:

$$X_g = a_{gg} \cdot X_g + a_{gp} \cdot X_p + b_{gg} \cdot \lambda_g + b_{gp} \cdot \lambda_p + X_g^a$$

$$X_p = a_{pg} \cdot X_g + a_{pp} \cdot X_p + b_{pg} \cdot \lambda_g + b_{pp} \cdot \lambda_p + X_p^a$$

X_g, X_p - refers to outputs in government and private sector

λ_g, λ_p - refer to the rate of change of outputs in government and private sectors over time.

X_g^a, X_p^a - refers to the autonomous elements of investment in the two sectors.

$a_{gg} \cdot a_{pp}$ are referred to as interindustry coefficients relating the sectors.

In effect, these equations state that output of a sector (any private) is determined by the output of that sector, the output of the government sector, the rate of growth of these outputs and the autonomous elements in the outlay of both the sectors. The figure 1 illustrates the process.

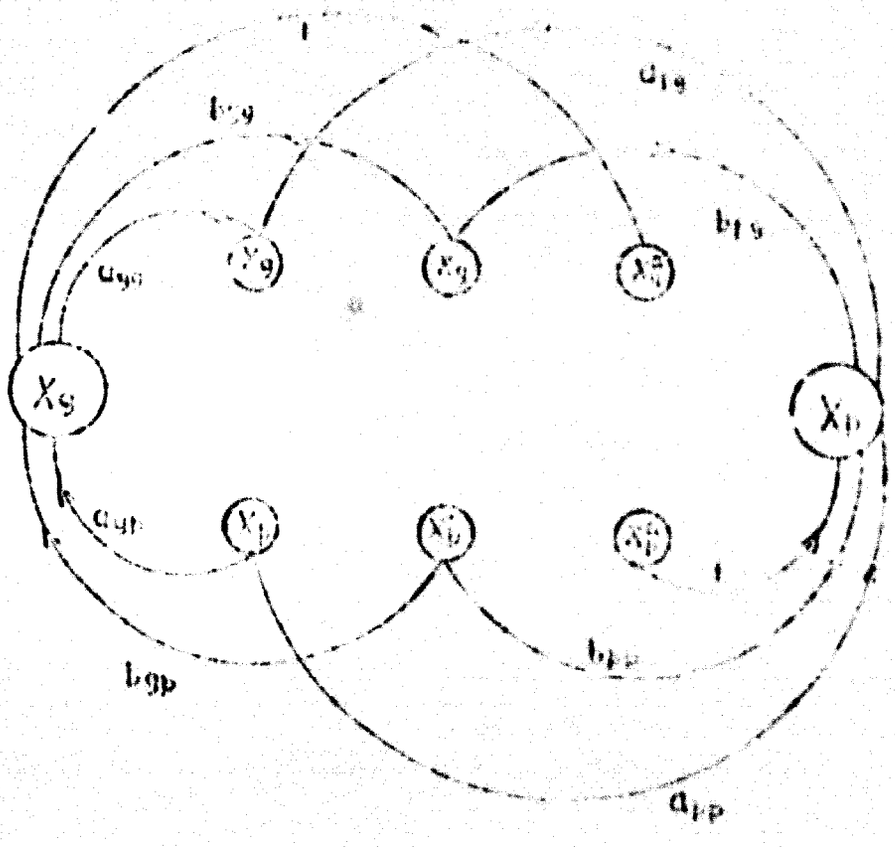


Fig. 1.

The nature of the interdependence between the two sectors is very well illustrated by the following comments made in connection with forecasting by agencies on behalf of private organisation. In making demand forecast of steel casting the forecasters comment thus:

"So far as target for industrial products are concerned it goes without saying that in a planned economy like ours with a strong central agency drawing up the Five Year Plans we have to accept and in fact are entitled to accept the target determined by them" [1]

In forecasting the demand for machine tools the forecaster has this to say:

"It is apparent that the demand for machine tools would be greatly influenced by investment allotted to the machinery manufacturing industry (in the Plan)" [2]

One can say that in Indian condition the State Planning Organisation plays the part of the conductor to an orchestra in a very real sense and, more, or, less determines the pace and tempo of activity and participation of each member.

This influence does not imply either success, or, failure of the plan. The plan may succeed, or, fail but in both cases its impact on all sectors of production is profound.

7.0 THE MODUS OPERANDI OF THE PLANS

The five year plans seek to determine the lines of development of both the private and public sectors of the entire economy. Ideally, this should be done in the framework of an input-output system where the interdependence can be fully brought out between intermediate demands and final demands consisting of consumption and investment public or private as also foreign trade.

The Planning Commission does, in fact, prepare an input-output table for overall balancing, but this table is rather small for operational purpose, either in determining targets, or, in creating new capacity.

"The problem, therefore, is examined by way of partial analysis within the overall macro-economic framework by using the method of material balances" [3]

This macro-economic framework is of the input-output type with final demands estimated on assumption of specific desirable growth rate of the total economy and certain statistical parameters relating that growth to other components.

The main procedure used by the Planning Commission is to arrive at production targets by the application of end-use analysis within the broad macro-economic assumptions

of the Plan and its overall inter-sectoral balance. The approach thus involves a process of convergence or iteration to an overall inter-sectoral balance of the economy developing according to a preassigned pattern.

The national planning model in India is a demand oriented model in the sense that there is an assumption that if a particular type of investment, or, output is required the government has sufficient powers to see that it is done at least for specific sectors, or, groups of sectors. [4]

Given the five-four-Plans, specific industries public, or, private start spelling out their future demands and supply positions within this broad framework. It is, of, course, obvious that specific industries, private or public, has some degrees of freedom even within this broad framework depending on the nature of their market. While some industries may have its demand very closely determined by plan targets there are others where free market decisions still play an important part and therefore forecasting for such industries is not enhanced by a replication of the corresponding five year plan at the plant level. In such cases, private decisions and government decisions have to be dovetailed in a certain way. Naturally, this dovetailing is decided by

the nature of the product, its role in

2.0 FUNCTIONAL CLASSIFICATION OF COMMODITIES AND SOURCE OF DATA

Commodities classification:

The most important factor in forecasting, is the functional classification of the commodity. Broadly speaking, commodities can for this purpose classed as:

1. Basic commodities
2. Semi-manufactured intermediate commodities
3. Capital goods and durable consumer goods
4. Consumer goods of the non-durable type.

Basic commodities are commodities that enter into very large range of other products already, or, indirectly like steel in the metal based industries of all types, aluminium or copper in the non-ferrous group of industries, sulphuric acid in the chemical industry and so on.

The intermediate commodities in the next group are those that enter into other industries after considerable processing has been done on them. These groups include examples castings, forgings, springs, bolts, nuts, screws in the metal based group, paints and varnishes and similar products in the chemical group and so on.

The most major items of goods are capital goods of various types. Some of them, of course, are also listed as durable consumer goods and have a final consumer market as important as their role in the expansion of capacity.

Finally, come various types of manufactured consumer goods.

Source of primary data:

For basic information regarding the demand and supply of these commodities primary sources of data are generally the Five Year Plans and their associated publications and working papers, the reports of Annual Survey of Industries, reports of Railway Boards, public sector projects, annual reports of firms, Tariff Commission reports, special market surveys, reports and round-ups of ministries, foreign trade statistics etc. While the range of information is often quite impressive, their consistency with each other is not always assured and conclusions may have to be made on the basis of conflicting information. Some sectors, particularly of the small and medium scale, are badly represented and too often their problems are ignored in these forecasting exercises.

5.0 The General Methods of Forecasting

Depending on the nature of commodities the commonly used techniques are as follows:

1. Trend fitting by selecting suitable curves or even graphically projecting the variable as a function of time of linear or non-linear type as illustrated below:

(i) $y(t) = a + b.t$

(ii) $y(t) = a + b.t + c.t^2$

(iii) $y(t) = A\ e^{b.t}$

Here, y(t) represents the commodity, t represents time and a, b, c, A are constants fitted from historical series.

2. The second technique, also commonly used, consists in finding a functional relation between the commodity whose demand is to be projected and other variables (one or more) which, it is believed, have great influence on the commodity. These determinants can be general economic variables, or other variables which are closely associated with it in some way. Production of automobiles for example, has been fitted as a function of per capita income and time,

$$y = a + bx + c.t$$

where y is the production of automobiles, x is the income per capita and t is time.

A method often taken recourse to, in the absence of specific information in the country is to use data relating to other countries where the demand for that particular commodity has been seen to be growing in a specific way at a comparable level of development of the economy.

3. Finally, the method most popular with forecasters is the end-use method. This method has generally wide acceptance as it enables the demand to be built up in great details operationally meaningful to the industry. The stages involved in end-use analysis are as follows:

1. Identification of major consuming sectors and sub-sectors, their current production and the plan targets.
2. Determination of input-norms, on the basis of observed data and adapting it for the future in the light of relevant technical information.
3. Calculation of material requirements from the target of production of consuming sectors with the input norms.
4. Estimation of other unspecified uses and addition to stocks.

4.0 SPECIFIC TECHNIQUE OF [illegible] : THE PLANNING FOR BASIC COMMODITIES

The relevant units of the Planning Commission has been making continuous projection of the basic goods in quantity and value. The specific technique adopted by the planning unit to project the demand for these goods is the end-use method with suitable consistency checks.

As already explained the end use method is rather like a single input-output transaction for only one sector going into great details. If a_{ij} is the requirement of ith commodity per unit of commodity produced in jth sector the total production of sector i may be estimated from the demand side as $\sum_j a_{ij} x_j = X_i$, where x_j are the production targets of sectors i, j.

Naturally, the end use method involves the estimates of a_{ij}, the input requirements per unit of output of j from sector i. This is the so called norm, here expressed in physical units rather than in value terms as in conventional input-output models.

4.1 Forecasting the demand (2) of steel

The consuming industries for steel have been identified under broad categories as below:

Transport equipment consisting of steam and electric

locomotives, wagons and prime movers, automobiles, tractors etc. electrical equipment, consisting of generators, electric motors, transformers, refrigerators, etc. industrial machinery, consisting of machines for various purposes, pumps, compressors, cranes etc. containers, hollowares, other miscellaneous industries, construction industry consisting of construction in mining, oil, power stations, railway, private housing etc.

For the entire range of these industries the next step consists in determining the norms and the targets of production for a specified period. The table below shows the requirements as calculated on the basis of norms and target for two typical groups of the consuming industries.

Table - 4.7.7

Steel consuming sector	Unit of output of consuming industry	Product target of consuming industry	Steel consumption norm in tons per unit of output	Total quantity of steel required in 1000 tons.
Thermal power generator	Million m.	500	700	350
Steam locomotives	number	400	150	60

In each case such detailed norms have been established and used with proposed targets for consuming industries to arrive at the total requirement, as in the case of steel. The system of deriving the norms is sometimes reasonably rigorous but often quite crude as may be seen from the following description of how some of the norms were derived.

(i) Norms of steel use in construction:

Medium Capital Industries: Based on an unspecified assortment of factories including cement, spinning mills, sugar factory, and porcelain factory in the Five Year Plans.

Mining and Oil: Based on progress reports of plan projects giving the steel consumed per million tons of coal raising; capacity for pipe lines; the average cost per mile of pipe and for others, the steel requirement per million rupee of investment.

(ii) Norms of Steel use of other types:

Heavy Capital Industries: Based on steel requirement of workshops per square foot of plinth area, confirmed by actual data for one such factory e.g. a processing plant building of the super-phosphate factory.

(iii) Housing

Steel requirement for residential houses and for

schools based on construction of such buildings by the Public Works Departments of the Central Government.

Where even such limited information is not available U.N. reports as in the case of Merchantships, data from USSR industrial experience as in the case of Trailors, U.N. report as in the case of generators have been pressed into service.

An example of the extremely crude nature of adjustment is given by the estimated steel requirement of railways. It was pointed out that this was difficult to estimate at present since the Fourth Plan had been drastically changed and the Railway Board was not working out an alternative plan.

"So, on the basis of some observations regarding the goods traffic, the requirements was assumed to remain the same for the next five years". [5]7.

Direct estimates of the offtake of the remaining sectors in the past could not be made as there was no statistical record of 'construction' and 'small scale industry'.

To project the course of residual requirements, some idea of their behaviour in the past is essential. To do this the steel input coefficients have been multiplied by the outputs of the enumerated industries to get the

estimates of the industrial offtake of steel, adding to the total steel offtake by [illegible] and foreign trading on steel for each of the years [illegible] the estimate of industrial offtake from the total, the residual was arrived at for the base period.

Residual demand is finally estimated by taking the base figure to represent the probable consumption and postulating a five-yearly rate of growth of demand for each category based on its uses and the direction of substitution between it and other products.

The entire effect of changes in stocks is thus reflected in residual estimates. The annual estimate, therefore, is a poor indicator of residual offtake.

The input coefficients are assumed to be constant so that any change in the coefficients due to technical progress will be reflected in residual estimates and not in industrial figures.

The residual offtake is mainly by small scale industry since it always supplements the large scale industry. In time of recession small scale industry therefore is more affected than large-scale industry. This is not reflected in the procedure outlined above.

The above discussion makes it clear that (1) the

norms in most cases are derived not so much from systematic studies as from only a few casual case studies of special classes mainly of units in small and medium government control with a mode of operation quite different from that of the broad pattern of such units and (2) in more problematical cases when no data is available demand estimation is made on the basis of derivation of a residual offtake. Improvement would have been made by taking account of the rapid change in technology in the norms and by a more systematic effort at collecting information regarding small industries.

Independent comparison is generally made by trend and regression analysis of these end-use estimates on an aggregated basis. A set of parallel estimates in the case of steel, given below, is of interest as it shows the order of precision and nature of the bias of different types of estimation.

Linear and non-linear equations were fitted to estimate the demand for steel and the following systems were obtained [6]

(i) $y = 471.54 + .286.47\ t$

(ii) $y = 1791.3\ t^2 + 223.4\ t + 22.6$

(iii) $y = 7.3175\ x_1 + 15.2654\ x_2 + 1.0092\ x_3 - 663.5888$

where,

x_1 - index of industrial output

x_2 - index of constructional activity

x_3 - national income

y - the output of steel

t - time.

Table (4.1.2) gives the comparative performance of the different methods:

A comparison with the actual projection shows that the end use method overestimates the requirement most heavily, simple regression coming next. Constant revision, therefore, is in order in using these methods.

Projection of supply

Projection of supply for the steel industry is mainly done on the basis of existing capacities plus sanctioned new capacities. For existing capacities and new sanctioned capacities the anticipated total output of the major producers are put together and a rough assessment is made of secondary producers.

Thus for steel the anticipated production from the five main integrated production units - TISCO, IISCO, BHILAI, ROURKELA, DURGAPUR together amounting to 5.2 million tonnes in 1970-71 with secondary producer's share being 1.6 million tonnes amounting to a total of 6.85 million tonnes against

Table - 4.1.2

Projection of finished steel	Actual 1965-66	Projection	
		1965-66	1975-76
		(million tons)	
(1) Linear trend	4.903	5.907	7.337
(2) Non-linear trend	4.902	5.530	9.230
(3) Simple regression:			
(a) Industrial output	4.405	4.095	7.972
(b) National income	4.902	4.134	7.916
(4) Multiple Regression of Industrial output and construction	4.902	4.406	9.777
(5) End-use method	4.902	5.902	13.594 (70 - 71)

anticipated demand in 1[illegible] of 1[illegible] million tonnes leaving a deficit of 6.7 million tonnes.

Events did not turn out as anticipated and the total volume of output and of effective demand were eventually much less in 1971 owing to a recession in the industrial climate along with other difficulties.

4.2 The projection of the demand for coal

The comparative performance of the estimating methods outlined already is given below for the coal industry (5) to bring out the point that the nature of the bias found in the methods in the steel industry was not fortuitous. Table (4.2.1) gives the estimates by different methods for the coal industry.

The nature of the bias in the projection of coal output against actual shows that in 1965-66 the estimates were of the same order as actual both for the simple trend method and the end use method. But in 1970-71 all projections are over-estimates with the simple linear trend showing the least bias and end-use estimates the highest. As in the case of steel the end-use method compared to others show the highest over-estimation bias.

The advantage of the end use method in giving detailed projection is generally admitted but users of the method

Table - 4.1.1

Method of estimation	Output of coal in million tons		
	1955-56	1970-71	1975-76
Actual	37.726	64.000	-
Linear trend	62.467	80.297	93.379
Non-linear trend	77.176	111.604	153.843
Regression on industrial output	58.180	85.700	109.000
Regression on National income	64.100	83.500	106.800
Multiple regression with 5 variables	72.461	116.886	186.800
Multiple regression with 2 variables	68.854	89.574	107.264
End-use study (1)	80.510	146.990	199.930
End-use study (2)	69.000	101.000	193.000
End-use study (3)	91.000	170.300	-

(1) Demand for energy (1963-66)

(2) Planning Commission (1966)

(3) Planning Commission (1964)

should be cautioned to [illegible] against this pronounced over-estimation bias.

4.3 The demand for intermediate goods: alloy steel casting:

In analysing the demand for steel and its use in the private sector, the method of relating demand to total income or population etc. was not considered suitable. Country comparison was also avoided as in forecasting the demand for such intermediate products, type of final products needed e.g. the items of machinery to be manufactured is relevant and this is not the same from country to country. Hence end-use method was adopted with technical norms and production targets.

So far as targets for industrial products are concerned the forecasters accepted the targets determined by the 4th plan with adjustments. The following comments by the forecasting team is worth quoting:

"But there is great uncertainty about the size and scope of the 4th plan to-day t an ever before because the assumptions and projections made in the draft outline have been invalidated by the changed circumstances.

It is now officially admitted that there is bound to be a reduction of the proposed plan outlay of Rs.23.750 crores. It is also apparent that the annual plan for the next year may not even match that of the current year.

"In the circumstances there is no alternative before the national planning body but to revise the plan and fix priorities giving the highest place to agricultural and agro-industrial programmes. The Planning Commission is busy revising the various targets particularly in the industrial sector, which are now being considered either on the higher side or difficult to achieve in the present state of the economy"

"In such an eventuality and also in the absence of authentic data regarding modification of targets fixed earlier by the Planning Commission there was no other alternative left but to revise the original targets in the light of the experiences of various industrial sectors for the purpose of the exercise on demand forecasting" [7]

The market for alloy steel casting was divided into

1) organised manufacturing sector
2) small-non-household units
3) household units.

The physical targets of these sectors were ascertained from the production trends of these units and future growth possibilities. These were then combined with the norms established by surveys and questionnaires.

The figures have been compiled on the basis of market surveys, questionaires and personal discussion with

officers at executive level. Norms are worked out on the basis of existing practices in the private sector in developed countries. Fourth five year Plan projects were made with necessary adjustments in the light of experience and information available.

The method thus, implies a bottom to bottom relation of each demand and supply points separately. As an example, assessment of the requirement of steel castings by the cement industry is detailed below:

The first consideration is the cement target which was 8 million tons for the second five year Plan and 10.2 million tons in the Third Plan. Considering the uncertainty in the Fourth Plan the estimate was assessed at about 16 million tonnes as against 18 million tonnes in the Fourth Plan.

The norm established by previous enquiries is put at 29 tonnes of steel casting for 1 lakh tonne of cement (MCA&R) of which 60% are alloy steel castings. Other comparable estimates are 57 tonnes and 40 tonnes respectively given by independent agencies.

From these estimates a rough assessment was made of 17.5 tonnes per 1 lakh tonne (replacement) and 17.5 tonnes per one lakh (new) giving the figure of 35 tonnes per 100,000 tonnes of cement.

This procedure was carried out for every major consuming industry and the total demand added up.

Supply [illegible] on the basis of current producers and possible [illegible] licensed capacities as also possible installations and imports.

An interesting sidelight is given in the following comments showing the small knowledge problems that plague the forecasting process and call for qualitative assessment.

"A check up on the demand and supply position showed that the foundry industry is suffering from a shortage of demand while there is a significant import still going on. This is primarily due to the fact that the date of deliveries of the smaller units are generally not suitable for the big consumers" [1]

4.4 The demand of intermediate manufacturers: man-made fibr

The value added of man-made fibres (6) and fabrics relate more directly to the final consumer's market though it is not itself a final consumer goods. For projection of the demand for this class of goods, therefore, methods used in consumer demand analysis become more directly useful

Assuming that relative prices do not change two different types of demand projections were made for man-made fabrics. (1) By the use of time series data on per capita income over a period and (2) by the use of cross-section data relating to household expenditure and income.

The income elasticity of demand estimated by the

first method may be thought of as a short-period elasticity, during which time there is no change in the structure of income distribution while in the second case an implicit assumption is made, that the long period behaviour at different ranges of income will not be different from the cross-section data at the present.

The demand projections made, are based on the first method in the form:

$$\log y = a + b \log x$$

where y = annual expenditure in man-made fibre and fabrics per household including the value of components of man-made fibres and fabrics in the case of blended fabrics.

x = annual income (in Rs.) per household.

A further point is that, besides income, demonstration effect of the synthetic fibres or superfine cotton fabrics may also influence the demand for such fabrics. The demand projection, therefore, was made also on the following formula:

$$y_t = y_0 \left(1 + \frac{r}{100}\right)^t$$

where,

y_t is the per capita consumption of man-made fibre-fabrics for the year t.

y_0 is the per capita consumption of man-made fibre and fabrics (estimated) for the base year.

$\frac{r}{100}$ is the percentage rate of growth in the per capita real income from the base year to year t.

e is the income elasticity of demand for man-made fibre and fabrics.

Per capita consumption of man-made fibres as estimated as above and multiplying the estimated per capita consumption by the estimated population, aggregate internal demand for man-made fibre is computed. By adding export demand fitted as a time trend to this the total demand is projected.

There may be an underestimation in the above method of assessing demand based only on income elasticity assuming the constancy of other factors. Price is an important factor, since a fall in the relative price of man-made fibre and fabrics is likely to lead to a more than proportionate increase in demand for this commodity.

Secondly, these estimates do not include the quantity of smuggled synthetic yarn into India. It follows that the estimates of demand are likely to be lower bounds of the expected demand.

In summarising, it may be concluded that in these commodities, forecasting is a sort of balancing of both demand and supply on the basis of future needs and capacities. For commodities of the intermediate group various techniques have been used depending on the nature of the market it has and how far that market is responsive to other broad economic variables which affect final consumers and how far only its own consumer market is relevant to its projection.

5.0 THE DEMAND OF CAPITAL GOODS

Capital goods [illegible] increase in the output of other goods. The projection, therefore, for capital goods has to proceed on the basis of planned increase of output of the consuming industries together with demand generated by replacements and exports.

Let the demand for new capital goods (say motor-vehicles) be denoted by $D(c)$.

Then $$D(c) = \sum_j f_j \cdot \Delta q_j + E$$

where Δq_j denotes the increment over the period of consuming industries

E denotes export,

f_j is the norm

Projection procedures for three different types of capital goods have been studied in this report. These are : (i) Textile machinery (9), (ii) Power generators (10) and (iii) Automobiles (11)

For projection of demand for industrial machinery it is necessary to project first the derived level of increased output in the future and to use it with a suitable norm. But there is often the possibility of un-utilised capacity existing in the industry. Actual expansion, therefore, depends on the increased demand visualised for the end-product, the ability of the industry to satisfy more by a fuller and

efficient utilisation of the existing capacities, and the need of replacement of old machinery. The demand for new machinery is given by

$$D(q) - S(q) + R$$

where D(q) denotes demand generated by increased output of consuming industry, S(q) denotes the underutilised capacity and R the replacement.

5.1 The demand for cotton-textile machinery

Cotton textile industry is divided into (1) Spinning industry and (2) Weaving industry.

(1) Spinning machinery

The demand for spindles is estimated by assuming a simple linear relationship between spindlage activity and yearn production. In working out the linear regression, spindle activity is chosen as a variable in the place of the number of spindles installed so as to allow for the existence of underutilised capacity. Also, since the production data refer to the year while the installed capacity in regard to spindles is given at the commencement of every year, for regression purposes, the number of spindles is taken as at the mid-point of every-year. The mathematical relationship between spindlage activity and yarn production enables one to estimate the demand for spindles.

A parallel estimate was also derived from the produc-

tion trend. The past data showed a generally declining trend in the output per spindle shift per annum. An average output per spindle was assumed to calculate the requirements of spindles.

Replacement: The replacement demand in the textile industry for different machines depends on the state of existing machines and the normal economic life of the machines in use. Data was collected through questionnaires on the economic life of the machines; an average life span for the different items of textile machinery was estimated and replacement needs derived.

The questionnaire may have an upward bias as the economic life of various machines is often found to be more than what is normally given in reply to questionaries and mills are often slow to replace worn out machinery.

Weaving machinery

In case of demand for weaving machines, the same method as adopted for the spinning machinery has been applied. The demand for weaving machines depends on the number of looms installed. On the basis of the past annual data regarding installed capacity of looms, the proportion of automatic looms, the production of cloth, the number of shifts worked and the percentage of loom shift. The likely average production per loomshift for the projected period is estimated. This enables one to estimate the requirements of looms

for the target output of electricity.

The replacement demand is estimated by assuming an average economic life of the existing machines as previously.

5.2 The demand for generators:

The projection of the demand for power generators involves as a first step the expected or derived output level of electricity. Having fixed these, the practice is to apply the end-use method. An inventory is made of the permanently installed equipment and their power generation, the size and age of the installations etc. Working out the relationship between numbers and types and sizes of the motors required in each use with the level of output the required number of installations at different points are derived.

These are supplemented by regression models as suitable relations have been found to exist between the quantity of electrical equipment of different types (valued at constant price) and the electricity generated in the form of an equation as below.

$$E = a.L + b.H + c.R$$

where E the electricity generated is estimated by the number of appliances for light, heat, refrigeration etc. and a, b, c are parameters. The composition of the appliances thus worked out from a study of the pattern of demand is also checked with the result of the end use method.

9.3 The demand for automobiles

Automobiles may be classed as partly a capital good and partly a durable consumer good.

Several public and private agencies have carried out this study using different methods.

An Ad-hoc Committee appointed by the Government calculated the demand of all vehicles on the basis of a simple projection of the national income.

The Chief-Engineer's group used the same technique only for passenger cars. The demand for other vehicles was estimated by them on the basis of the share of road transport in the total traffic generated in the country. An attempt was also made by a private agency (11) to assess the future growth of vehicle in India by fitting linear regression equations in standard statistical form.

The variable considered in this regression system are the stock of cars; income and prices in the forms S = f(I,P) where S is the stock of cars, I is income and P represents prices. Double log equation has also been fitted in the following form:

$$\log y(t) = a + b \log I(t-1) + c \log P(t)$$

where y represents the number of cars purchased, P represents the current price and I the lagged income.

These demand estimates are however subject to various

limitations both of a technical and statistical character. Some of these difficulties may be partially overcome.

An important problem is drawing up a fitted demand schedule of cars across classes because of great product disparity and price variation between the cars of different makes which defy all methods of analysis.

The second difficulty is the great variation in the nature of the consumer market.

The sources of demand for passenger cars are:

1) from households for personalized transport,

2) from business establishments and other institutions

and 3) for public transport purposes (taxis)

Demand from households and institutions depends on the disposable income of the buyer, and the price of the vehicle.

The demand for taxis depends on the size of the urban population, per capita income, price of the vehicle, price of the complementary inputs and the availability of the alternative modes of transport.

For passenger cars, therefore, the important factors which may also be considered are:

a) the growth of population and increase in the number of family units in the effective class

b) quality and price of the product

c) extent of the facilities available for the use of the product.

In case of cars, demand is influenced by the rate of growth of the urban population and the rise in per capita income.

For trucks, the demand is influenced by (i) volume or nature of material production, (ii) dispersal of industries, (iii) availability and quality of service rendered and (iv) the transportation rates charged by the different modes of transport.

There is also the problem of changes in stocks.

The replacement portion of the flow demand is largely dependent on the size, age composition and the average life of the cars which comprise the stock.

The demand for replacement is difficult to estimate since the past-life data does not provide a good basis of forecasting. The gross stock can be estimated by deriving the net accretions to stocks from the annual stock series and then the annual supply by adding the domestic production to the imported number of cars. The replacement is arrived at by deducting the increase in stocks from the new supply. But this estimation does not include the age composition and number of cars scrapped due to obsolescence.

Further, the derived stock series is a heterogeneous stockpile consisting of disparate age, quality and price, and it may not be correctly related to demand determinants. By using the used car prices the price is converted to a

homogeneous one but with the translation back the estimated values, reconverted into physical units, may not be correct because the replacement proportions may have undergone a change.

Finally, comes the more theoretical aspect of the difficulty e.g. on the question of the reversibility of consumption.

In the case of consumer durables an acquisition can always be postponed. A fall in income may signify a reduction in the acquisition of new units and not a reduction in consumption. Price elasticities of the regression model are assumed to be constant overall values of price and income. Without such an assumption the validity of the conclusion may be questioned. But there are problems to be faced by the model-builder in every field of economics.

6.0 THE DEMAND FOR CONSUMER GOODS

The consumer goods in India are still primarily the responsibility of the private sector. In this field, therefore, the market survey has a more important role. The standard method of demand forecasting in this group may be analysed by a study of the forecasting for (1) demand for camera, a new product and (2) soap.

6.1 The demand for camera

In camera, a new product to be manufactured such a

study was made of the potential future growth (7). Information was obtained from camera shops and camera clubs and professional artists and institutions as to their current use and future demand for camera, and the type of accessories and replacement they require.

Trends were studied of import licences for actual users and the import of photographic films.

Questionaires were sent to dealers to study the type of demand and the shortages they generally face.

An estimate was made of the growth rate of users considering the professionals, and institutions. The growth rate was considered to be about 5% annum c.g. the growth rate of g.n.p.

Replacement demand was placed at 60% from the results of an enquiry. The growth rate of the hobbyists was considered the same as the rate of growth of the city population e.g. 6%.

Dealer's estimates of annual rate of sale was also considered after adjustment of sales from one dealer to another to avoid double counting. Considering all these factors together a rate was built up of the growth of camera demand.

6.2 <u>The demand of Soap</u>

In the projection of demand for soap a non-durable consumer goods the following method was followed (12).

A relationship was built up between the average per capita annual expenditure per household and the average total household expenditure from national sample survey data in the form of a simple equation, of the type -

$$\log E_s = a + b \log E_t$$

where, E_s and E_t represent expenditure on soap and total expenditure respectively. The elasticity of expenditure on soap obtained in this way was then combined with the percentage increase of total household expenditure, so that when the elasticity is b and total expenditure increased by 100 x per cent the expenditure on soap would be $(100 (1 + x)^b - 1)$ per cent.

The size of sample varied from region to region and therefore, the precision was not uniform.

To check this cross section analysis, recourse was made to time series data from figures obtained independently by other researchers, where income and consumer expenditure over time has been calculated for different items. The elasticity of expenditure on soap against income was obtained for comparison with present figures.

A further check was obtained from the data supplied by a major soap manufacturer which gave rough estimates of soap production and was an estimate of the consumption from the supply side.

One may briefly conclude that the main projections are initially demand based. After demands have been forecast,

present capacity and future expansion needs are checked to see how much of demand in fact can be actually met. This is the case in most of the major units. Projection is heavily conditioned by the projected layout of expansion for the specific group as envisaged by the Plan supplemented by market survey and report of sales as also the size of the order books particularly for smaller units.

Occasionally, an association or a group of units do finance a more generalised study over a longer period when a little more organised analysis is made using the method of regression, trend analysis and partial input-output techniques.

The basic perspective is provided by the final demand projection of the plan and the expected income to be generated. These are then combined with income or expenditure elasticity which are calculated from time series data based on actual surveys carried out from time to time, or from cross section data to get at the likely demand that will be generated by the planned outlay. These are then checked against the build up obtained by analysis of trend of sales in the market over a number of years, the reports of the selling agents and the order book, the forecast of the individual selling agents or branch offices etc. From time to time attempt is also made to go into the market reaction to the products, the inroads of the competing firms, the changes in the taste etc, the effect of advertising and other promotional activities etc.

The model for consumer goods generally is of the form

$$D(q) = A \cdot p^{b} \cdot y^{c}$$

where D(q) is the demand in quantity, p and y are the price and income, b and c are elasticities.

The demand is generally estimated only with income elasticities treating the price factor as not responsible for a large shift. This is generally done due to the difficulty of estimating price elasticities.

Mass-scale surveys conducted by the National Sample Survey Organisation and several other bodies are extensively used with assumed income growth to project demand.

7.0 PROJECTION OF EXPORTS AND IMPORTS

Export forecasting is based mainly on two sources. One consists of the various reports emanating from trade attaches and consulates who are in direct touch with foreign markets. Such information, however, generally is of extremely short-range demand based on local enquiries, market study foreign advertising etc.

The second factor used to estimate both export and import is the trend analysis of various items of exports and imports on a country to country basis. For various items of exports the total imports of the importing foreign countries and the Indian share in such imports is estimated over time. Government to Government operations also play some part in providing the data on future trade through bilateral negotiations. The question of the shortage in local production and

the Government policy in substitution is also assessed from time to time.

5.6 FORECASTING THE SUPPLY

The Indian plan and its associated projections private and public are primarily demand based. The constraints come to its implementation (1) if the demand anticipated is not in fact coming and (2) if the necessary supply channels are not operating. Both the disturbances do indeed plague the industries. We have discussed the demand estimation problem. It may be useful to know, also broadly how far supply constraints operate.

Specific physical supply constraints for basic commodities are worked out through material balances which, in fact, not only consider a commodity from the demand side e.g. the elements in a row of the input-output matrix but also the column elements for key sectors so that possible bottlenecks are detected and pruning is done, if necessary. Supply projection thus is based on existing production and capacity, possible expansion and permissible imports. Supply projections in many cases are weaker and many bottlenecks are in fact realised but underestimated as large uncertainties in production plans, political instability, weather etc. are not generally taken into consideration adequately.

The emergence of bottle necks affect different sectors

in different ways. [illegible] of raw materials, or of [illegible] and create idle surplus elsewhere. This [illegible], appear in various sectors, upsetting the targets [illegible] competitive bidding for scarce resources may sharply rise in price are also undesirable allocation of resources.

To take care of these possible shortfalls, adjusters are sometimes provided in the plan consciously by defining a core plan and priority [illegible] has also grown up the almost normal practice of having spill-overs of the plan being taken into the next one which in fact is nothing but a recognition that the five year plan may not be finished in five years. In the extent, the plans do not materialise, private and public sector also fail to carry out their targets. Private sector tries to counter this possibility by adjusting the plan [illegible] to their notion of feasibility and occasionally seeking some concession from the government, where the Government is their main market.

Where such arrangements are not possible, private sector does suffer losses due to a shortfall in planned development. The more fortunate ones who produce scarce commodities get abnormal profits through a sharp price rise.

9.0 A REVIEW OF FORECASTING TECHNIQUE

It has been seen that in Indian economic forecasting to-day the most important part is played by the targets set

up by the Planning Commission for all sectors - on the one hand, it directs the endeavours of resources generating market demands. On the other hand, for a broad range of consumer goods it determines a primary economic variable as it determines substantially the level of income to be generated in the economy as a whole.

The government plan itself again is centered on the basic macro-economic model to which all specific forecasts are ultimately adjusted.

The question naturally arises as to how far such macro-economic models are or should be used as guides to official policy making. In the present stage of econometric model building, it must be admitted that many relations that are assumed, many variables that are measured, involve various crudities, approximations and errors. Naturally, therefore, to rely on such projections one must be cautious and be prepared for a wide margin of error.

But it may not be wise to go to the other extreme and depend on pure hunch or a rule of thumb approach. Such approach often fails to clearly state the underlying assumption on which the 'hunches' are based simply because no conscious formulation can be made of an unconscious weighing of pros and cons. While, therefore, 'rule of thumb' approach is not to be brushed aside, one should remember the peculiar limitations of such an approach. For a complex economy, such rule of thumb approach

leads increasingly to [illegible] compared to the more rigorous approaches in spite of their limitation.

The planning and projection effort in India as in most other countries is often a study of both success and failure. Some part of the failure is no doubt due to faulty planning just as some part is due to failures which are beyond the anticipation of the model builders.

The political and economic limits to what at best is a techno-economic projection model cannot be denied, particularly in areas of social instability. But such limitations do not necessarily make all planning exercise futile.

Reasons for failures in the plans are difficult to pinpoint specifically, as wars, severe droughts and adverse external conditions as also non-realisation of anticipations or false assumptions have often been mixed up together. But there is a general feeling that primarily the failure came from an underestimation of the gestation period, the laxity in implementing hard decisions, the general failure of management by a non-technical civil service unused to this kind of job as also the conflict of interest between the private and public sector objectives and similar imponderables. It is also felt that subsequent plans did not take due notice of the past lessons passing them off with platitudes.

The question has also been raised as to whether a centrally conceived model can accommodate the many small

factors [illegible] information and whether a single all embracing [illegible]-model can ever take into account the many difficulties that emerge when detailed implementation has to be done.

It is felt that the central plan should be confined to a simple national aggregative plan produced as a broad policy strategy outlining the path of income, consumption and investment over the planning period.

This should then be passed on to the implementing authorities or private sectors who will be asked to elaborate detailed models for their own sector or groups of sectors. With implementing experience they are in a position to consider the small imponderables carefully; being responsible for implementation they will also be more sensitive to various obstacles in the path. These partial plans should now be passed on to the centre for modification of its own guide-lines.

Another important question is the horizon of the Plan. Long run projection methodology is still too uncertain of itself and therefore making an operationally meaningful plan is very difficult to formulate over a long period. But many of the heavy capital using development simply cry out for a 10-15 years horizon at the shortest as the gestation period is long and considerable saving can be made by planning on a longer horizon and a larger scale. But these problems have rarely been given a close analysis in formulation of either the plans

of the course, or, the plans of the individual enterprises. This has often resulted in bottlenecks and wastages. The problems of long run projection are still far too much neglected by decision making authorities. It has been seen that plans are still very weak in the correct estimation of the norms. Detailed research and study on the question of norms should be taken up as a continuous programme for future projections.

The Reports of selling agents and branch offices in many of the private sector firms are often not carefully analysed over a number of years with reference to the actual situation to assess their efficiency in demand projections.

In most of the approach to demand forecasting a hand to mouth existence is accepted as the natural state of affairs. Considerable improvement could be made particularly by having forecasting exercise as a continuing programme so that sustained improvement can be made to forecasting techniques.

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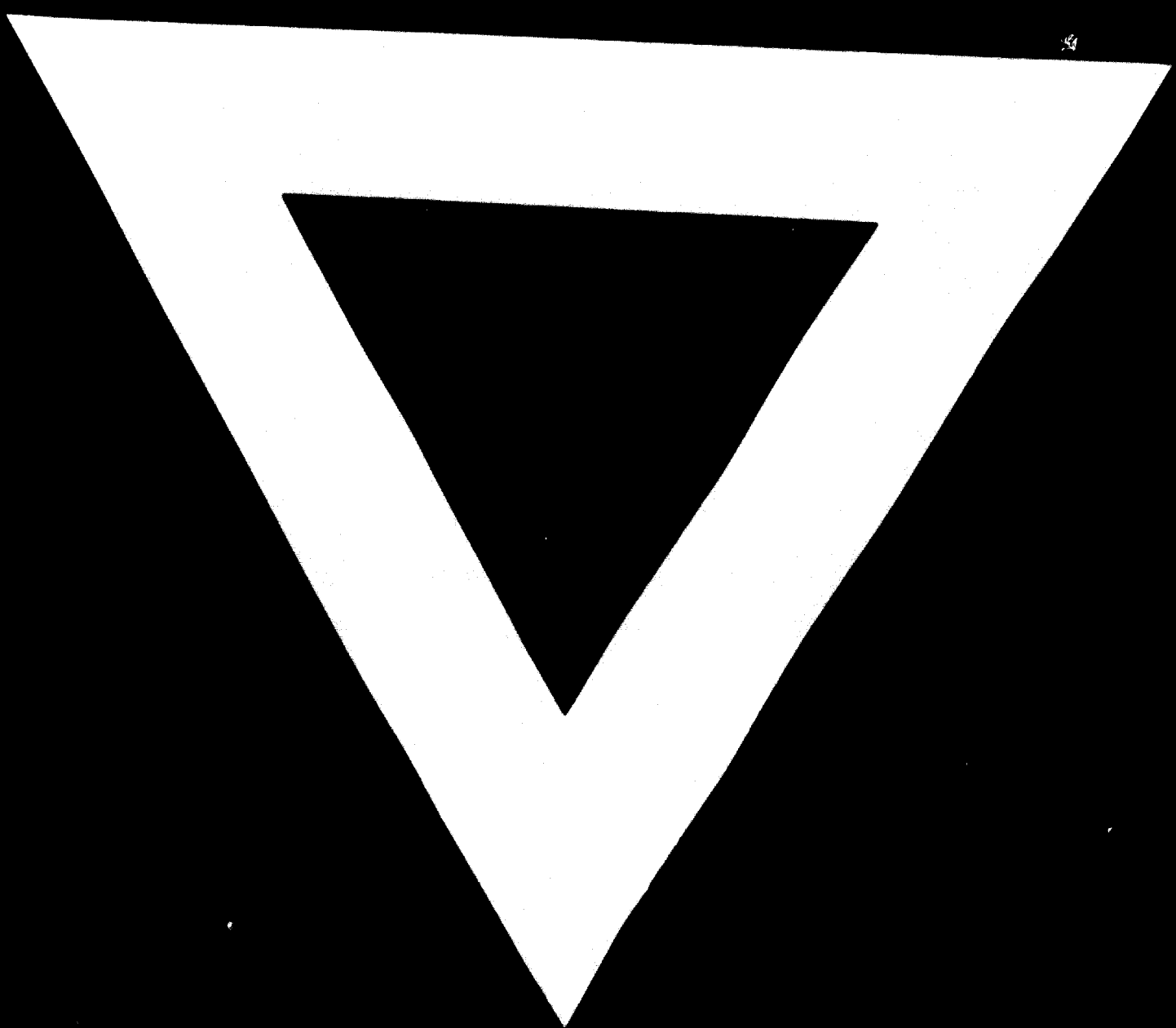
Note: N.C.A.E.R. is an abbreviation for National Council of Applied Economic Research (India)



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