A CONSISTENCY MODEL OF INDIA'S FOURTH PLAN*

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PART I: THE MODEL AND INTERPRETATION OF RESULTS[1]

> I am aware that many of my contemporaries maintain that nations are never their own masters here below, and that they necessarily obey some insurmountable and unintelligent power, arising from anterior events, from their race, or from the soil and climate of their country. Such principles are false and cowardly; such principles can never produce aught but feeble men and pusillanimous nations. Providence has not created mankind entirely independent or entirely free. It is true, that around every man a fatal circle is traced, beyond which he cannot pass; but whithin a wide verge of that circle he is powerful and free; as it is with man, so with communities. The nations of our time cannot prevent the conditions of men from becoming equal; but it depends upon themselves whether the principle of equality is to lead them to servitude or freedom, to knowledge or barbarism, to prosperity or wretchedness.
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> —*Toqueville* (1835).

1.1. Introduction

1.1.1. This paper summarizes some projections based upon a 30-sector inter-industry model for the year 1970-71, the last year of India's Fourth Plan. The general object was to examine the effect on output levels and on imports of alternative assumptions regarding the growth of aggregate consumption and of investment. With the same data, we have also examined the effect of alternatives with respect to: (a) the capital-output ratios assumed for agriculture and (b) the degree of import substitution within the machine building industries.

1.1.2. One of the most significant insights obtained from the numerical exercise is this: everything does not depend upon everything else. At least within the Indian economy, it appears that there is an almost block-angular structure of current account transactions. The bulk of such transactions takes place within two virtually independent complexes: one based upon agriculture and the other upon mining, metals, machinery, and forestry products. The first of these sectors is the predominant source of consumption goods. The second is the source of investment goods, and appears to be the strategic point for import substitution. A third and smaller complex produces items that may be described as "universal intermediates" —fuel, power, transport, and chemicals —items that are consumed within virtually all sectors of the economy.

1.1.3. From the standpoint of India's strategy for the Fourth Plan (the five fiscal years ending on March 31, 1971), the block-angular structure is of particular significance. This structure of current account transactions implies short-run (but not long-run) independence between agriculture and the investment goods sector. Block-angularity suggests that success or failure in raising agricultural output will have an immediate impact upon the supply of consumption goods, but only second-order effects via the income generation process upon the agriculturists' demand for industrial products. That is, the output targets for the key industrial sectors depend primarily upon whether the government is sufficiently bold to maintain a high rate of aggregate investment—come what may during the Fourth Plan in agriculture. This course of action entails a distinct risk of inflation, but might nonetheless be

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[1] While the model was jointly worked out by Alan S. Manne and Ashok Rudra, this part has been written by Alan S. Manne and he alone takes responsibility for the interpretation of the results presented here.

worth while from the long-term viewpoint of growth in productive capacity—both outside and inside agriculture.[2]

1.2. Model formulation

1.2.1. Although the terminology of activity analysis is retained for presentation purposes, the model actually used here is of the "consistent requirements" type, a conventional Leontief inter-industry model with a few embellishments for the endogenous treatment of capital formation. Each choice between alternate activities has been removed—either by specifying the proportionate mix or else the absolute level of all but one alternative.

1.2.2. There were two considerations that led to the adoption of a "consistency" rather than an activity analysis framework here: (1) The computing machinery available within India during 1964 would have severely limited the size of any linear programming matrix, but did not impose a serious limitation upon a consistency model. (2) Even before the numerical analysis, enough was known about relative scarcities within the Indian economy so that a number of choices could be eliminated, e. g., superficially there is a wide range for choice between domestic production, exports and imports. However, after a closer scrutiny of India's tight balance-of-payments, most observers would conclude that if a model were to specify *realistic* upper bounds on import substitution and on export possibilities for each branch of the economy, then virtually each of these upper limits would become effective constraints.[3] A similar viewpoint was adopted with respect to the choice between alternate domestic techniques of production: thermal versus hydroelectric power, and plantation versus synthetic rubber. Thus, instead of specifying an objective function for a linear programming calculation, the consistency model is one in which all choice has been removed through *a priori* specification of a square activity matrix, a basis.

1.2.3. The algebraic formulation is one which supposes that (five years in advance) planners are free to set the 1970-71 domestic output targets for each branch of the economy.[4] In view of the well-publicized organizational difficulties of increasing the output of certain items (e.g. foodgrains and steel), this may be altogether too cheerful a viewpoint to adopt. There is no technological justification, however, for assuming time lags in excess of five years for these sectors. Indeed, if one adopts the pessimists' counsel of a predetermined 1970-71 output levels for key individual sectors, this implies that five-year planning is an exercise in futility, and that the time horizon should be extended to a minimum of, say, ten years.

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[2]An attempt has been made to quantify the magnitude of the second order inflationary effects for different alternative assumptions for the rates of growth of agriculture and industry. See Rudra (1964). All references to literature pertaining to Part I are listed on page 74.

[3]"Virtually *every* kind of export-increasing or import-saving type of production which is even reasonably sensible seems to be needed to get the balance of payments on to a viable basis: indeed, it seems to be necessary to press all of them forward about as fast as is permitted by the market or by practical considerations on the supply side." (W. B. Reddaway, 1963, p. 71).

[4]There are just two instances in which the model takes as predetermined the absolute level of domestic output for 1970-71: crude oil (where domestic production should really be regarded as a random variable —only partially influenced by the volume of exploratory drilling) and plantation rubber (where there is a long biological time lag between input and output).

1.2.4. In what follows, it is understood that the "target year" is 1970-71, and that the "base year" refers to 1960-61. Two alternative treatments of capital formation during the target year will be reported upon : one in which this entire item is determined exogenously and one in which the bulk of capital formation is calculated endogenously through multiplying each sector's output increase over the decade by its own capital-output ratio and a stock-flow conversion factor of 17%. For further details on the stock-flow conversion factor, see the section immediately following this algebraic formulation :

unknowns

x_j = annual rate of domestic production, process j, target year

y_i = annual import rate, item i, target year

z_i = demand for investment good i induced by output increase, total for decade

w = annual rate of deficit on merchandise account, target year

coefficients

a_{ij} = current account output (+) or input (−), item i, process j, target year

b_{ij} = capital coefficient for item i, process j, induced cumulated fixed investment per unit of annual output

c_{ij} = import of item i required per unit of process j, target year, for $i \neq j$

c_{ii} = import of item i per unit of domestic output of item i.

constants

x_j^0 = annual rate of domestic production, process j, base year, for $i \neq j$

current flow of item i, 1970-71

$$\begin{bmatrix}\text{domestic output,}\\ \text{net of}\\ \text{inter-industry demands}\end{bmatrix} + [\text{imports}] = \begin{bmatrix}\text{final demand for}\\ \text{households, government,}\\ \text{exports, and exogenous}\\ \text{fixed investment.}\end{bmatrix} + \begin{bmatrix}\text{induced fixed}\\ \text{investment rate}^5\\ \text{stock-flow}\\ \text{conversion factor .17}\end{bmatrix} + \begin{bmatrix}\text{induced inventory}\\ \text{investment}^6\text{; not}\\ \text{applicable to}\\ \text{service sectors}\end{bmatrix}$$

$$\sum_j a_{ij}x_j \quad + \quad y_i \quad = \quad [\,..\,] \quad + \quad .17\,z_i \quad + \quad .04(x_i - x_i^0)$$

fixed investment demand for four capital goods i induced by output increase over decade

$$\sum_j b_{ij}(x_j - x^0_j) = z_i$$

foreign exchange balance, 1970-71

$$\begin{bmatrix}\text{exogenous}\\ \text{merchandise}\\ \text{imports}\end{bmatrix} + \begin{bmatrix}\text{endogenous}\\ \text{merchandise}\\ \text{imports}\end{bmatrix} = \begin{bmatrix}\text{exogenous}\\ \text{merchandise}\\ \text{exports}\end{bmatrix} + \begin{bmatrix}\text{deficit on}\\ \text{merchandise}\\ \text{account}\end{bmatrix}$$

$$[\,..\,] \quad + \quad \sum_i Y_i \quad = \quad [\,..\,] \quad + \quad w$$

[5]This component is omitted whenever it is intended that all fixed investment be set exogenously for the target year.

[6]Inventory investment for the target year is approximated by supposing that each commodity-producing sector holds a three-month supply of its product, i.e. has a ratio of inventory to gross output of .25. (For a more detailed analysis of inventory investment, see A.K. Sen (1964)). The coefficient .04 is derived as follows:

$$.04 = \begin{bmatrix}\text{stock-flow}\\ \text{conversion factor}\end{bmatrix} \times \begin{bmatrix}\text{ratio of inventory}\\ \text{to gross annual output}\end{bmatrix}$$
$$= (.17) \times (.25)$$

The import variables y_i may be eliminated from the above equations through noting :

$$y_i = \sum_j c_{ij} x_j$$

$$\therefore \quad \sum_i y_i = \sum_i \sum_j c_{ij} x_j = \sum_j x_j \sum_i c_{ij}$$

After this elimination is performed, we are left with 30 variables x_j, 4 variables z_i, and one variable w, exactly as many degrees of freedom as there are equations. Existence and uniqueness of a solution may be proved if the following analogue to Hawkins-Simons conditions (See R. Solow, 1952) is satisfied for each domestic production process j :

$$(1) \quad (a_{ij} - .17b_{ij} + c_{ij}) \leqslant 0 \qquad (\text{all } i = j)$$

$$(2) \quad (a_{jj} - .17b_{jj} + c_{jj} - .04) > -\sum_{i \neq j} (a_{ij} - .17b_{ij} + c_{ij}).$$

Even if conditions (1) and (2) are satisfied, it takes still further restrictions to guarantee non-negativity of the various unknowns. (In fact, it makes perfectly good economic sense for the merchandise deficit variable w to take on negative values.) To bypass further discussion of this point, we shall simply assume that the model is sufficiently well-behaved so that $x_j \geqslant x_j^0 \geqslant 0$.

1.3. Stock-flow conversion factors

1.3.1. In order to establish a relation between the investment activity in the target year and the total investment activity over the preceding decade, we have relied upon stock-flow conversion factors. This approach facilitates the analysis of investment demand as an endogenous element. Even though a finite-horizon model is employed, the formulation avoids "edge effects" and contains a built-in rationale for investment activity during the target year. (See Sandee, 1960 ; and Manne, 1963).

1.3.2. A stock-flow conversion factor is a device for numerical extrapolation, and is based upon the assumption that the flow of investment rises *smoothly* from the base to the target year.[7] Then if one has an order-of-magnitude estimate for r, the annual rate of investment increase, there is a close relation between the flow during the target year and the investment cumulated over the preceding decade. The relation may be calculated as follows :

Let $\quad e^{rt}$ = index of gross annual investment rate at t years after the base date, with annual growth rate r.

Therefore, $\quad e^{10r}$ = index of gross investment rate at the target date.

Also, $\quad \int_{t=0}^{10} e^{rt}\, dt$ = index of accumulated gross investment over decade.

[7] There are conditions (e.g. a wartime mobilization) in which it would be quite incorrect to assume that the investment flow keeps rising steadily from year to year. In a model built to analyze such conditions, time-phasing becomes more delicate, and it would be inappropriate to employ stock-flow conversion factors in the manner suggested here.

Therefore, $$\frac{e^{10r}}{\int_{t=0}^{10} e^{rt}\,dt} = \frac{r}{1-e^{-10r}} = \text{target year's stock-flow conversion factor at growth rate } r \text{ for a decade.}$$

1.3.3. For projection purposes in India, the stock-flow conversion factor is taken to be 15% (neglecting, for the moment, the complications that arise because of lags between investment and output). That is, of the total investment taking place within the Third and Fourth Plans, it will be supposed that 15% occurs during 1970-71, the target year. According to Table 1, this 15% factor is applicable only if investment grows smoothly at 8.7% per year.[8] Nevertheless, it remains a tolerably good approximation at other annual growth rates within the broad range of 5.0 to 12.0%.

TABLE 1

growth rate, r, % per year	0	5.0	8.7	12.0
stock-flow conversion factor, $\frac{r}{1-e^{-10r}}$, %	10.0	12.7	15.0	17.2

1.3.4. Now if it is supposed that there is a time lag of θ years between investment and output, this complicates the stock-flow relation. Our model is phrased in terms of $(x_j - x_j^0)$, the increase in output from time zero to 10. With capital coefficients of b_{ij}, the cumulated induced investment demand for item i is $\sum_j b_{ij}(x_j - x_j^0)$. Note, however, that this investment demand is spread out over the decade extending from time $-\theta$ to $10-\theta$. With a lag of θ years, the stock-flow conversion factor is therefore modified as follows :

$$\frac{\text{induced investment rate at time 10}}{\text{cumulated investment induced by output increase; investment occurs during decade from } -\theta \text{ to } 10-\theta} = \frac{e^{10r}}{\int_{t=-\theta}^{10-\theta} e^{rt}\,dt} = \frac{re^{\theta r}}{1-e^{-10r}}$$

$$\therefore \text{ induced investment rate in item } i \text{ at time } 10 = \left[\frac{re^{\theta r}}{1-e^{-10r}}\right]\left[\sum_j b_{ij}(x_j - x_j^0)\right].$$

1.3.5. Assigning a numerical value of two years to θ, the *average* lag between investment and output, and keeping the investment growth rate r in the neighbourhood of 8.7% per year, the stock-flow conversion factor works out to 17% of induced investment :

$$\text{induced investment rate in item } i \text{ at time } 10 = .17 \sum_j b_{ij}(x_j - x_j^0) = .17 z_i.$$

[8] A smooth growth rate of 8.7% per year over the entire decade ending in 1970-71 is not necessarily consistent with what is already known about the first three years of the Third Plan.

1.4. The base year transactions table

1.4.1. The base for our projections is a 30-sector inter-industry transactions table for 1960-61 constructed expressly for the purpose of this model. (See Part III(A) for details about methodology, source of data etc. pertaining to this table.)

In preparing the model for machine computation, it appeared worthwhile to take advantage of any triangularity in the current account transactions matrix. Upon suitable arrangement of the sectors for this purpose, it was noticed that the base year transactions table had a virtually block-angular structure. That is, the 30 sectors could be divided into three major complexes, of which neither the first nor the second had significant inter-industry sales outside itself. (Table 2 indicates the details on the regrouping of the 30 original sectors.) For short, the three complexes will hereafter be abbreviated as MM, FF, and UI:[9]

MM—mining, metals, machinery, and construction

FF—food and fibre production and processing

UI—universal intermediates

1.4.2. Table 3a contains an aggregation of the base year transactions matrix into the three major groups. Note that the current account flows from MM into FF and UI are virtually negligible, and that this also holds for flow from FF into MM and UI. It would be of considerable interest to know whether a similar form of block-angularity also holds true for other nations at a more advanced state of economic development.[10]

1.4.3. In more affluent societies, it is almost certain that the structure of *final demand* would differ from that indicated here. One of the major differences would be the composition of the household consumption vector. According to Table 3b, the food and fibre sector provides an overwhelming fraction of India's household consumption. (This sector is also the country's principal earner of foreign exchange through exports.)

1.4.4. At all stages of economic development, it appears likely that the sector MM is the principal source of fixed capital formation. For India during the years ahead, this sector has an additional role to perform : import substitution. This is the sector that absorbed the bulk of the foreign exchange available during 1960-61.[11] If the foreign exchange bottleneck is to be broken, domestic production within this sector will have to expand even more rapidly than the aggregate volume of investment.

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[9] The reader will note that these groupings have their counterpart in India's governmental structure. The complex MM is *roughly* comparable to the jurisdictional scope of the Ministry of Steel, Mines and Heavy Engineering. The bulk of sector FF lies under the jurisdiction of the Ministry of Food and Agriculture.

[10] Karl Fox (1962) has already suggested that a similar structure is typical of the U.S.A.

[11] Table 3b indicates that during 1960-61 a significant share of India's imports consisted of food and fibres (Rs. 322.0 crores). However, approximately half this quantity consisted of non-commercial transactions, P.L.480 imports from the U.S.A.

Re.1 crore = Rs.10 millions = \$ 2.1 millions = £ .75 millions.

TABLE 2. GROUPING OF 30 SECTORS INTO THREE COMPLEXES

MM : mining, metals, machinery, and construction	construction, industrial and urban construction, rural electrical equipment transport equipment non-electrical equipment iron and steel iron ore cement other metals other minerals glass, wooden and nonmetallic mineral products forestry products
FF : food and fibre production and processing	plantations leather and leather products animal husbandry and fishery food industries foodgrains cotton and other textiles jute textiles other agriculture chemical fertilizers
UI : universal intermediates	motor transport petroleum products crude oil rubber products rubber chemicals railways electricity coal

TABLE 3a. SUMMARY OF INTER-INDUSTRY TRANSACTIONS, 1960-61
(1959-60 producers' prices ; value in Rs. crores)

absorbing sectors / producing sectors	MM	FF	UI	sub-total	final demand[1]	gross output
MM: mining, metals, and machinery	1063.3	26.7	44.1	1134.1	2138.2	3272.3
FF: food and fibre	10.5	2057.3	38.5	2106.3	7753.4	9859.7
UI: universal intermediates	136.6	171.3	335.9	1086.8[3]	496.0	1582.8
value added[2]	2061.9	7604.4	1164.3		−10830.6	0
gross output, sectors 1-30	3272.3	9859.7	1582.8		0	14714.8

Notes : [1] Final demand plus "others".
[2] Value added plus "others" plus margin for trade and transport.
[3] Includes Rs. 443.0 crores' worth of motor and rail transport services (produced in UI complex) charged here against the using sector in the row for margin (included in "value added").

TABLE 3b. SECTORAL DISTRIBUTION OF FINAL DEMAND, 1960-61
(1959-60 producers' prices ; value in Rs. crores)

producing sectors	household consumption	government consumption	gross fixed capital formation	additions to stock	exports	imports	others	total final demand[1]
MM : mining, metals, and machinery	248.6	197.8	2002.2	20.1	56.3	–550.0	163.3	2138.2
FF : food and fiber	7189.8	104.0	0	197.0	388.1	–323.0	194.7	7753.4
UI : universal intermediates	503.7	32.0	0	7.1	16.4	–240.1[4]	170.9	490.0[4]
value added[2]	4662.8	1045.3	276.0	0	172.1	–11.1	0	6145.1
GNP component	12601.0	1380.0	2278.0	231.1	632.9	–1090.6[5]	529.9[3]	16560.3

Notes: [1]Final demand plus "others"

[2]Value added plus "others" plus margin for trade and transport.

[3]This column total is not a GNP component.

[4]Includes Rs. 53.6 crores of taxes on petroleum products.

[5]Excludes Rs. 33.6 crores of taxes on petroleum products. See Section 3.10 for consideration of GNP

1.4.5. To sum up : If the block-angular structure of Table 3a is characteristic of other economies, this provides a shortcut description of production—one that should prove useful to the policy-maker and the theorist alike. Table 3a lends support to the view that a two—or a three sector model (with only limited shiftability of capital from one to another sector) is a fruitful way to theorize about the process of economic growth. For immediate policy purpose within India, this table suggests the likely consequences of a shortfall in expanding output within the various sectors. A shortfall in organizing food and fibre output is bound to have a first order impact upon household consumption. A shortfall in mining, metals, and machinery will have a first order impact upon the investment programme and upon the process of import substitution. And a shortfall in the universal intermediates (transport, power, fuel) will have an effect that is diffused widely throughout the entire economy.

1.5. Projections of coefficients for 1970-71

1.5.1. Together with the transactions matrix for the base year 1960-61, a considerable number of parameters are needed in order to apply the consistency model. These are discussed in detail in Part IIIB. At all stages in the process of projection for 1970-71, heavy reliance was placed upon the work summarized in Perspective Planning Division (1964). Any errors or biases in the PPD figures are likely to be reflected in our model together with the errors and biases for which we are directly responsible ourselves.

1.5.2. a_{ij}, *current account inputs and outputs.* Of the approximately 240 coefficients in this group, three-fourths were taken over directly from the 1960-61 transactions matrix. The balance of these norms were altered in the light of independent information from the PPD on anticipated changes in the product and technology mix. The following sectors are the ones whose 1970-71 output levels are directly and significantly affected by the norm changes : chemical fertilizers, motor transport, petroleum products, electricity and coal[11].

1.5.3. b_{ij}, *capital coefficients.* These are defined in terms of capital per unit of incremental annual output in each of the 30 domestic production sectors. The coefficients are measured in producers' prices for four sectors-of-origin : industrial and urban construction, rural construction, transport equipment, and other equipment. All capital coefficients are reproduced in Section 3.15 along with details regarding their estimation. Calculation of replacement investment requirements are also described in the same Section.

1.5.4. c_{ij}, *import coefficients.* A complete list of the import coefficients applied here is provided in Table 28b. None of these coefficients were easy to estimate. On the basis of the available information, they constitute best guesses as to *minimum* import requirements for 1970-71. In most cases, it is assumed that there will be a significant structural change from the base year. For example, this is one of the major reasons for the sharp output rise projected by the model for the domestic iron and steel industry (sector 6). The base and target year ratios of imports to domestic production for this sector are :

	1960-61 actual (from base year transactions matrix)	1970-71 projection (from Appendix Table 28b)
$c_{6,6} = \dfrac{\text{imports of iron and steel}}{\text{domestic production of iron and steel}}$	.450	.050

It is to be noted that even though the imports are classified into the same census category as domestic "iron and steel" this does not necessarily mean that the imported items are economically interchangeable with those produced domestically. In virtually all sectors, the imported products are of specialized types.

1.5.5. *Exogenous exports and imports :* Exports are determined exogenously, and are projected at a value of Rs. 1,078 crores for 1970-71. (See Tables 31 and 20). This represents a moderately optimistic increase over the base year's export level, and is equivalent to a growth rate of 5.5% per year. Some explanations about the export projections are provided in Section 3.8.

1.5.6. A minor volume of imports is tied to specific commodities as a result of bilateral clearing agreements. In order to allow for these agreements, the 1970-71 projection allows for Rs. 95 crores' worth of exogenous imports. This leaves Rs. 983 crores' worth of foreign exchange available to cover the import requirements generated endogenously.

[11] No norm changes were attempted for inputs from the heterogeneous industry termed "chemicals" (sector 27). As a result, it is believed that the 1970-71 output, imports, and investment projections for this sector have a serious downward bias.

1.5.7. The model places no *formal* constraint upon the deficit on merchandise account. It must be admitted, however, that the import coefficients c_{ij} and other parameters were adjusted during the course of numerical experimentation, and that they were set in such a way that the resulting trade deficit lies within tolerable limits from the viewpoint of India's ability to secure foreign loans and grants.

1.6. Projections of final demand

1.6.1. This consistency model is of the "open" rather than "closed" type. In order to apply it, the first step is to project the principal components of gross domestic expenditure, and to translate these into final demands for individual commodities. The model's job is then to deduce an internally consistent set of sectoral output levels, imports, and investment requirements. Unlike a closed model, no explicit feedback link is provided here from the process of production back to the generation of incomes and in turn back to the principal components of gross domestic expenditure.

1.6.2. Within the Indian context, there is more than a minor technical issue involved in the choice between an open and a closed model. By working with an open one, we are in effect assuming that the government has sufficient fiscal power so that it is unconstrained by the feedback link that operates in a market economy from the production process back to the distribution of incomes, savings and the generation of domestic expenditures. The point can be translated into plain language as follows : If the goods can be produced, the domestic finances can be found.[13]

1.6.3. This view is one that is not altogether congenial to the more orthodox of India's financial planners. They take pride in the low rate of price inflation that has thus far accompanied India's development effort. For a critique of the orthodox view, see Lewis (1963, pp. 100-107). The issue seems to boil down to this : An ambitious programme for the mobilization of physical resources also implies an ambitious programme of taxation and of raising the rate of return yielded by public enterprises. If the financial mobilization is less vigorous than the physical effort, inflation—whether open or repressed—is a likely consequence.

1.6.4. With these broad policy issues as a background, our model explores the implications of two alternative views of aggregate development : (A) an ambitious programme that is premised upon vigorous government action and (B) a considerably more modest programme. Alternative A is derived from the objectives set forth on p. 2, Perspective Planning Division (1964) :

"(a) to ensure a minimum consumption of Rs. 20 per capita per month to the entire population by the end of the Fifth Five Year Plan, and in particular to improve the amenities of life in the rural areas ;

[13]Compare the following statement in Perspective Planning Division (1964), p. 26 : "Indeed, the right approach is to investigate closely the nature of the problems to be tackled, the nature of solution to be sought, the concrete tasks to be carried out, the physical resources, skills, and organisational effort to be mobilised for the purpose. If these appear to be operationally feasible, it should be possible to devise policies by which the finances can be found to facilitate the process of mobilisation of the real resources."

(b) to ensure that the economy will be capable of sustaining an average annual rate of growth of the order of 7 per cent even after 1975-76 without depending on foreign aid;

(c) to achieve a significant increase in the employment opportunities during the next decade; and

(d) to promote a social order which affords equality of opportunity, and which at the same time prevents excessive disparity in income and wealth."

1.6.5. In almost all respects, projection B is more pessimistic than A. View B has no governmental status, but was suggested by an individual economist on the New Delhi staff of one of the major aid-giving nations. (See Table 4.) The two views represent altogether different evaluations of the prospects for rural development in India—hence differ strikingly with respect to the assumed rate of growth of aggregate household consumption : 5.4 versus 3.6% per annum (with population growing at a compound annual rate of 2.4%).[14]

TABLE 4. AGGREGATE PROJECTIONS
(Rs. crores at 1959-60 market prices)

1960-61 (from interindustry transactions table)			1970-71				equivalent compound annual growth rate	
			alternative A		alternative B		alternative A	alternative B
gross fixed capital formation	2,278		6,000		5,000			
additions to stock	231		400		300			
gross capital formation		2,509		6,400		5,300	9.8%	7.8%
government consumption		1,380		3,400		3,400	9.4	9.4
household consumption		12,605		21,400		17,900	5.4	3.6
gross domestic expenditure		16,494		31,200		26,600	6.6	4.9

The two projections are identical in one item : government consumption. For this, projection A (equivalent to 9.4% growth per annum) was taken over directly and incorporated in B. Note that in India—as elsewhere—the government vector has a much lower percentage content of commodities and a higher content of services than does household consumption. (Refer back to Table 3b.)

1.6.6. For 1970-71, estimates A and B of gross fixed capital formation are Rs. 6.0 and 5.0 thousand crores respectively. Implicit in these two numbers is a rather different *aggregate* capital-output ratio : 2.4 versus 2.9. These ratios are derived by applying a stock-flow conversion factor of 17% to the two estimates of investment during the target year. (See Table 5.)

[14] See Part IIIB for the projections of final demand.

TABLE 5. IMPLIED AGGREGATE CAPITAL OUTPUT RATIOS

	alternative A	alternative B
(a) 1970-71 gross fixed capital formation (Rs. crores)	6,000	5,000
(b) (a)/.17 = implied capital investment during decade 1958-59 to 1968-69 (Rs. crores)	35,300	29,400
(c) increase in gross national product from 1960-61 to 1970-71; virtually identical to increase in gross domestic expenditures (Rs. crores)	14,700	10,100
(d) (b)/(c) = implied aggregate capital-output ratios	2.4	2.9

1.6.7. The numerical experiments have been based upon two alternative treatments of fixed capital formation:[15] one in which this entire item is predetermined exogenously and one in which the bulk of capital formation is calculated endogenously through multiplying each sector's output increase over the decade by its own capital-output ratio and a stock-flow conversion factor of 17%. For short, these two treatments will be referred to hereafter as "totally exogenous" and "partially endogenous" investment.

1.6.8. In the totally exogenous cases, the aggregate figure is identical with that of investment projections A or B : Rs. 6000 or 5000 crores. In the partially endogenous cases, the predetermined investment figure refers only to replacement plus housing, roads, education and research, etc. These are the sectors in which it appeared particularly hazardous to project investment requirements through capital-output ratios. Accordingly, a lump-sum allowance was made for these predetermined items : Rs. 2327 crores at producers' prices and Rs. 2403 crores at market prices during the target year. (See Table 29.)

1.7. Totally exogenous cases

1.7.1. For totally exogenous investment, three alternatives have been considered. The first two cases, known as 1A and 1B, are based directly upon the final demand projections A and B. The third, known as 1AB, is a hybrid. It provides for gross fixed capital formation at the high rate of programme A, but for household consumption at the low level of programme B. The numerical solution of the consistency model is summarized in Table 6.[16] This indicates the production implications for some major sectors of the economy. A complete set of activity levels is available in Table 10. Just as one might have been led to suspect from the block-angular appearance of Table 3a (the three-sector aggregation of the base year transactions matrix), there is a distinct pattern to the output levels of the target year. The

[15] In every case, inventory investment has been determined endogenously through the relation: induced inventory investment in item $i = .04(x_i - x_i^0)$.

[16] The electronic computations were made possible through the courtesy of Indian Institute of Technology, Kanpur. For a description of the computing routine see the accompanying paper by V. C. Sabherwal.

output of machinery and steel is primarily determined by the level of investment outlays, foodgrains and cotton textiles are entirely determined by household consumption outlays, and petroleum products and electricity depend upon both. All of this is common sense plus numerical quantification.

1.7.2. The block-angular structure of production has a direct consequence for the strategy of the Fourth Plan. The hybrid case 1AB suggests that the capacities required for producing steel, machinery, and other items in the MM sector depend specifically upon the investment expenditures component rather than upon the aggregate volume of gross domestic expenditures. Case 1AB would be typical of a situation in which the government has pressed ahead with an ambitious programme of capital formation but in which agricultural production has failed to respond immediately to the investment inputs into irrigation schemes, tubewells, tractors, chemical fertilizers, etc.

TABLE 6. THREE ALTERNATIVES, TOTALLY EXOGENOUS INVESTMENT
(Rs. Crores)

	1960-61 (from inter-industry transactions table)	1970-71 alternatives		
		1A	1AB	1B
assumed levels of aggregate spending :				
gross fixed capital formation	2,278	6,000	6,000	5,000
household consumption	12,605	21,400	17,900	17,900
consistent targets for gross domestic output :				
machinery (including transport and electrical)	071	2,386	2,297	2,031
iron and steel	209	1,207	1,193	1,037
foodgrains	3,074	6,330	5,820	5,820
cotton and other textiles	800	1,460	1,156	1,156
petroleum products	237	938	860	833
electricity	103	435	400	381

1.7.3. In turn, agriculture's failure to meet ambitious Fourth Plan targets would imply holding down household expenditures on food and fibres to the level at which the supplies of these items are available. The curtailment of consumption has consequences that are politically unpalatable : price inflation, rationing of these items, or taxes to reduce aggregate purchasing power. *In the aggregate*, however, consumers would still enjoy as much real purchasing power in case 1AB as in the more orthodox 1B. The difference lies in the fact that the investment rate is higher—with the consequent benefit of increased capacity within all branches of production in the future beyond the 1970-71 target year.

1.7.4. To slow down the pace of investment because of agricultural setbacks reminds one of Schumpeter's dictum about inflations followed by deliberately engineered deflations : "If a man has been injured by an automobile running over him, this does not mean that his health will be improved by backing up the auto."

1.8. Effect of agriculture's capital output ratio

1.8.1. In all subsequent comparisons, we shall proceed as though there were no insurmountable obstacles to expanding production in individual major sectors of the economy.[17] As a corollary to this viewpoint, it becomes reasonable to suppose that investment levels are determined endogenously through multiplying together the sectoral capital-output ratios and the output increases. In all remaining cases, it is therefore understood that investment is "partially endogenous".

1.8.2. The benchmark against which all comparisons will be made is identified as case 2A. This is the same as case 1A (ambitious final demand programme), except for the endogenous component of investment. According to the calculations of case 2A, it turns out that this endogenous component—added together with the lump-sum allowance for replacement, housing, roads, etc.—slightly exceeds the total previously specified in case 1A. The target year total of endogenous plus exogenous investment becomes Rs. 6450 versus the totally exogenous figure of Rs. 6000 crores. (See Table 7.)

TABLE 7. EFFECT OF AGRICULTURE'S CAPITAL OUTPUT RATIO

case identification	2A	12A
agriculture's capital-output ratio	1.50	1.00
	(Rs. crores)	(Rs. crores)
replacement, housing, roads, and other exogenous fixed investment, 1970-71	2,403	2,403
induced fixed investment, excluding agriculture, 1970-71	2,759	2,691
induced fixed investment in agriculture, 1970-71	1,288	853
gross fixed capital formation at market prices, 1970-71	6,450	5,947

1.8.3. The first comparison with the basic case 2A is to measure the effects of an alternate capital-output ratio for agriculture.[18] This coefficient appeared to be one of the least reliable factors in the analysis and yet it purports to be applicable to a sector which produced approximately half the total value added in the Indian economy during the base year 1960-61. In case 2A, a value of 1.50 had been assigned to this capital coefficient. For 12A, the coefficient was set at 1.00, more closely resembling the number implicit in India's Third Plan document, (Reddaway, 1963.)

[17] There remain two minor sectors in which the 1970-71 domestic production levels are predetermined: crude oil and plantation rubber.

[18] "agriculture" here includes the following sectors:

13. animal husbandry and fishery
16. foodgrains
18. other agriculture
21. forestry products

1.8.4. Table 7 indicates the direct and indirect consequences of varying this coefficient. If the factor had moved up from 1.00 to 1.50 in recent years, this in itself would have had a significant effect upon the induced component of investment—raising both the overall rate and also agriculture's percentage share of the total. It follows that an upward shift in agriculture's capital coefficient has a stimulating effect upon output targets within the mining, metals, and machinery sector, but that the rest of the economy is barely affected. (See Table 10.)

1.9. AN EXPERIMENT WITH BLOCK-ANGULARITY

1.9.1. If inte-rindustry transactions can be simplified into a block-angular structure, this would considerably facilitate the process of data collection and of numerical analysis. For the linear programming implications of such decomposability, see Dantzig (1963, chapter 23).

1.9.2. Case 22A measures the consequences of supposing that the model for 1970-71 is block-angular. All conditions remain the same as the benchmark case 2A—except that the current flow coefficients a_{ij} are set equal to zero for transactions between the following complexes :

producing sector	absorbing sector
MM : mining, metals, etc.	FF : food and fibre
MM : „ „ „	UI : universal intermediates
FF : food and fibre	MM : mining, metals, etc.
FF : „ „	UI : universal intermediates

Note that in this experiment, the capital coefficients b_{ij} are kept unchanged to the extent of the transactions implied by these coefficients, there still remains linkage from the producing complex MM to the absorbing complexes FF and UI. For example, case 22A continues to allow for the agricultural machinery absorbed by the food and fibre sectors, even though it omits the spare parts and maintenance requirements.

1.9.3. For aggregative analysis, case 22A strongly favours the hypothesis of block-angularity. On the average, there is only a slight difference between the gross output levels of cases 2A and 22A. (See Table 10 for details.) The following summary is obtained by adding up the sectoral results into totals for the three complexes :

	1970-71 gross output (Rs. crores)		percentage difference
	case 2A	case 22A	
MM : mining, metals, etc.	11,080	10,662	4
FF : food and fibre	16,500	16,422	1
UI : universal intermediates	5,103	5,000	2

1.9.4. For detailed sectoral balances, the block-angular simplification is not uniformly satisfactory. In most industries, it performs quite well indeed. In the following five, however, there is a difference of more than 5% between the gross output levels of cases 2A and 22A. One way out might be to reclassify several of these sectors, transferring them into the UI group :

	1970-71 gross output (Rs. crores)		percentage difference
	case 2A	case 22A	
non-electrical equipment	1,527	1,432	6
other minerals	150	129	19
jute textiles	189	148	22
glass, wooden, and non-metallic mineral products	1,155	1,091	6
forestry products	506	430	15

1.10. Effects of the machinery import substitution programme

1.10.1 A major purpose of constructing the model was to explore some implications of the programme for replacing imports with domestic production of machinery. Two views are explored : an optimistic and a pessimistic one with respect to the 1970-71 ratio of imports to domestic production. The specific ratios within each of the three branches are as follows :

(Ratio of imports to gross domestic production)

	1960-61 actual (from base year transactions table)	1970-71	
		pessimistic	optimistic
electrical equipment	.45	.25	.15
transport equipment	.34	.25	.15
non-electrical equipment	.67	.35	.25

1.10.2. For the benchmark case 2A, the optimistic machinery ratios had been used. Case 3A is identical with 2A, except that the pessimistic import ratios are applied. For reference purposes, there is also included a second pair of cases (labelled 2B and 3B respectively). This pair is identical with 2A and 3A, except that the consumption vector is set at the level corresponding to the modest programme B rather than the ambitious programme A. Note that in all four of these cases, the investment requirements are partially endogenous. In other words, the model allows for the fact that it takes machinery to make machinery. Table 8 indicates the principal results of these four alternative cases. (See also the detailed activity levels in Table 10.) The results may be interpreted as follows :

(1) It makes a significant difference (approximately Rs. 150 crores) in the minimum trade deficit whether one is optimistic or pessimistic with respect to the machinery import substitution programme. As far as concerns the trade deficit, this is of the same order of magnitude as the difference between the ambitious *aggregate* programme A and the modest programme B.

(2) Although success or failure in machinery import substitution has a sizable effect upon the output requirements for metals, this programme has a comparatively minor impact upon other domestic production sectors.

(3) Even though it takes machinery to make machinery, the import substitution programme has only a barely perceptible effect upon the total volume of investment.

TABLE 8. EFFECTS OF MACHINERY IMPORT SUBSTITUTION

case identification	2A	2B	3A	3B
		(Rs. crores)		
view on machinery import substitution	optimistic		pessimistic	
assumed level of household consumption	21,400	17,000	21,400	17,000
consistent requirements for 1970-71 :				
minimum deficit on merchandise account	164	5	347	164
domestic iron and steel output	1,442	1,288	1,388	1,241
gross fixed capital formation at market prices	6,450	5,617	6,337	5,518

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A CONSISTENCY MODEL OF INDIA'S FOURTH PLAN

PART II : RESULTS

2.1. The answers given by the model to different questions posed to it are presented in this part in Tables 10 to 14. Table 9 below is meant to provide identification of the different questions posed.

TABLE 9. IDENTIFICATION OF CASES

case identification	projection of household + government consumption	treatment of investment	view on machinery import substitution
1A	A	totally exogenous	optimistic
1B	B	totally exogenous	optimistic
1AB	B	totally exogenous	optimistic
2A	A	partially endogenous	optimistic
2B	B	partially endogenous	optimistic
3A	A	partially endogenous	pessimistic
3B	B	partially endogenous	pessimistic

12A same as case 2A, except for following changes in capital-output ratios for agriculture and forestry (sectors 13, 15, 18, 21):

	construction, industrial and urban	construction, rural	equipment, excluding transport	total
case 12A	.55	.30	.15	1.00
case 2A	.80	.50	.20	1.50

22A same as case 2A, except that all current flow coefficients a_{ij} in following blocks marked "O" are set equal to zero.

producing sector / absorbing sector		MM, sectors 1-10, 20, 21	FF, sectors 11-19	UI, sectors 22-30
MM, sectors	1-10, 20, 21	no change	0	0
FF, sectors	11-19	0	no change	0
UI, sectors	22-30	no change	no change	no change

TABLE 10. ACTIVITY LEVELS

(Rs. crores)

		1960-61 actual	1970-71 cases								
			1A	2A	3A	12A	22A	1AB	1B	2B	3B
1.	construction, urban	1201	3045	3823	3777	3505	3761	3045	2829	3472	3433
2.	construction, rural	418	1094	656	655	536	644	1094	911	537	536
3.	electrical equipment	126	477	550	492	527	537	461	409	477	426
4.	transport equipment	201	642	700	716	777	777	623	553	698	633
5.	non-electrical equipment	344	1267	1527	1374	1458	1432	1213	1069	1309	1177
6.	iron and steel	269	1207	1442	1388	1363	1404	1193	1037	1288	1241
7.	iron ore	7.8	43	47	40	45	46	42	39	44	43
8.	cement	53	149	177	175	164	173	149	128	159	157
9.	other metals	32	219	257	237	246	238	211	180	225	208
10.	other minerals	45	142	159	154	153	129	136	125	143	138
11.	plantations	196	301	301	301	301	301	283	283	283	283
12.	leather and leather products	189	378	379	378	378	376	272	271	272	272
13.	animal husbandry	1130	2084	2084	2084	2084	2073	1665	1665	1665	1665
14.	food industries	1323	2094	2095	2095	2095	2058	1858	1857	1859	1859
15.	foodgrains	3974	6330	6331	6331	6331	6327	5820	5820	5820	5820
16.	cotton and other textiles	800	1460	1461	1461	1461	1436	1156	1156	1157	1156
17.	jute textiles	130	183	189	188	187	148	176	172	179	178
18.	other agriculture	2097	3404	3408	3407	3400	3357	3001	2998	3002	3001
19.	chemical fertilizers	20.7	348	348	348	348	346	315	315	316	315
20.	glass, wooden, etc.	398	1004	1165	1142	1082	1091	955	836	1009	997
21.	forestry products	180	440	506	496	477	430	420	371	445	436
22.	motor transport	325	1069	1127	1115	1104	1104	976	936	999	988
23.	petroleum products	237	938	979	971	964	966	860	833	877	870
24a.	crude oil, domestic[1]	3.2	71	71	71	71	71	71	71	71	71
24c.	crude oil, imports	40.4	102	109	108	106	107	87	82	90	89
25.	rubber products	68	182	192	188	190	190	150	144	154	161
26a.	synthetic rubber	—	16	19	18	18	18	8	6	9	8
26b.	plantation rubber[1,3],	15.5	30	30	30	30	30	30	30	30	30
27.	chemicals	284	878	911	900	890	897	747	726	760	750
28.	railways	454	990	1044	1032	1022	1022	904	867	925	915
29a,b.	electricity	103	435	464	454	454	452	400	381	411	402
30.	coal	109	242	268	260	257	259	224	208	233	228
31.	construction, urban and industrial[2]		9051	9680	9620	8360	9524	7496	6956	7825	7593
32.	construction, rural[2]		2449	2483	2478	1773	2413	1770	1744	1783	1778
33.	equipment, excluding transport[2]		6466	7385	7068	6829	7070	6018	5040	5989	5731
34.	transport equipment[2]		2348	2550	2514	2475	2476	2011	1866	2094	2055
35.	deficit on merchandise account	458	19	164	347	126	113	−61	−134	5	164

Notes : [1]1970-71 activity level was predetermined.
[2]Investment required for output increase over the decade.
[3]Also includes reclaimed rubber.

TABLE 11. INDUCED INVESTMENT OVER THE DECADE; INCREMENT IN OUTPUT MULTIPLIED BY FIXED CAPITAL COEFFICIENT

(Rs. crores)

		2A	3A	2B	3B
1.	construction, urban	367	361	316	312
2.	construction, rural	—	—	—	—
3.	electrical equipment	276	238	228	196
4.	transport equipment	412	361	348	302
5.	non-electrical equipment	1,184	1,031	906	834
6.	iron and steel	2,757	2,630	2,395	2,284
7.	iron ore	129	126	119	116
8.	cement	296	282	245	240
9.	other metals	675	615	579	528
10.	other minerals	187	179	161	153
11.	plantations	95	95	78	78
12.	leather and leather products	67	66	29	29
13.	animal husbandry	1,431	1,431	803	803
14.	food industries	293	293	204	203
15.	foodgrains	3,636	3,636	2,769	2.769
16.	cotton and other textiles	483	463	261	260
17.	jute textiles	37	37	31	30
18.	other agriculture	1,967	1,965	1,358	1,356
19.	chemical fertilizers	491	491	441	441
20.	glass, wooden, etc.	402	484	973	389
21.	forestry products	489	474	398	384
22.	motor transport	1,203	1,185	1,011	905
23.	petroleum products	371	367	320	316
24.	crude oil	466	466	466	466
25.	rubber products	62	60	43	42
26	synthetic rubber	35	33	17	15
27.	chemicals	652	641	495	485
28.	railways	1,367	1,329	1,083	1,060
29.	electricity	2,213	2,152	1,888	1,833
30.	coal	314	303	248	238
	total (producers' prices; based on rounded activity levels)	22,327	21,713	17,609	17,158

TABLE 12. INVESTMENT SUMMARY
(Rs. crores at 1959-60 prices)

	2A	3A	2B	3B	
	induced investment over the decade ending 1968-69				
construction urban and industrial	9,880	9,020	7,835	7,593	
construction, rural	2,483	2,478	1,783	1,778	
equipment, excluding transport	7,385	7,088	5,980	5,731	
transport equipment	2,559	2,514	2,094	2,065	
total at producers' prices	22,316	21,700	17,691	17,167	
add 15% margin on equipment	1,492	1,440	1,212	1,168	
total at market prices	23,808	23,140	18,903	18,325	
	investment during 1970-71				
induced investment at market prices (17% of totals for decade ending 1968-69)	4,047	3,934	3,214	3,115	
replacement (15% of total for decade ending 1970-71)	779	779	779	779	from Table 29; market prices
housing, roads, and other exogenous fixed investment (15% of total for decade ending 1970-71)	1,024	1,024	1,024	1,024	
total gross fixed capital formation	6,450	6,337	5,617	5,518	

TABLE 13. COMPOSITION OF IMPORTS BY SECTOR OF ORIGIN
(Rs. crores)

		1960-61	1970-71			
			2A	3A	2B	3B
3.	electrical equipment	57.0	82.5	122.9	71.5	106.5
4.	transport equipment	69.2	118.5	179.1	104.6	168.1
5.	non-electrical equipment	228.7	381.8	481.0	327.4	412.1
6.	iron and steel	120.9	73.1	69.4	64.4	62.0
8.	cement	0.1	—	—	—	—
9.	other metals	40.3	126.0	118.7	112.7	104.1
10.	other minerals	10.0	69.0	68.3	62.3	61.8
11	plantations	8.5	—	—	—	—
12.	leather and leather products	0.3	—	—	—	—
13.	animal husbandry	19.2	—	—	—	—
14.	food industries	9.5	—	—	—	—
15	foodgrains	144.9	—	—	—	—
16.	cotton and other textiles	4.0	—	—	—	—
17.	jute textiles	0.1	—	—	—	—
18.	other agriculture	124.8	82.5	82.5	66.8	66.6
19.	chemical fertilizers	10.7	—	—	—	—
20.	glass, wooden, etc.	10.6	—	—	—	—
21.	forestry products	5.1	—	—	—	—
23.	petroleum products	82.8	39.2	38.8	35.1	34.8
24.	crude oil	40.4	109.1	107.5	90.4	89.0
25.	rubber products	3.3	—	—	—	—
26.	synthetic rubber	2.3	—	—	—	—
27.	chemicals	111.2	63.6	62.2	53.0	52.1
30.	coal	0.1	—	—	—	—
31.	base year adjustment	-22.5	—	—	—	—
	sub-total	1090.5	1146.9	1330.4	988.2	1147.1
	plus exogenous imports	—	95.0	95.0	95.0	95.0
	total imports	1090.5	1241.9	1425.4	1083.2	1243.1
	less deficit on merchandise account	-457.6	-163.9	-347.3	-5.0	-164.0
	= exports	632.9	1078.0	1078.0	1078.0	1078.0

TABLE 14. PHYSICAL OUTPUT LEVELS AND PRODUCTION INDICES—SELECTED INDUSTRIES

		unit of measurement	actual 1960-61	implicit targets for 1970-71[1] 2A	3A	2B	3B
3.	electrical equipment	index number	100	437	391	379	338
4.	transport equipment	index number	100	393	356	347	315
5.	non-electrical equipment	index number	100	445	400	381	343
6.	iron and steel	million metric tons of steel ingots	3.35	17.96	17.29	16.04	15.45
7.	iron ore	million metric tons	10.87	65.50	64.10	61.32	59.93
8.	cement	" " "	7.93	26.68	26.38	23.97	23.67
9.	other metals	'000 metric tons (aluminium and copper ingots)	27.6	221.7	204.4	194.1	179.4
11.	plantations	'000 metric tons of tea	317	487	487	458	458
15.	foodgrains	million metric tons	80.97	128.99	128.99	118.58	118.58
16.	cotton and other textiles	million yards of cotton cloth	7317	13363	13363	10573	10573
17.	jute textiles	'000 metric tons	1042	1515	1507	1435	1426
18.	other agriculture	index number	100	162.5	162.5	143.2	143.1
19.	chemical fertilizers	'000 metric tons N	99	1664	1664	1506	1506
		P_2O_5	54	908	908	822	822
23.	petroleum products	million metric tons	5.8	25.1	24.9	22.5	22.3
24.	crude oil	" " "	0.45	10.0	10.0	10.0	10.0
26.	railways	railway freight originating, in million metric tons	156.3	359.3	355.5	318.4	314.9
29.	electricity	billion Kwhrs generated[2]	20.1	90.6	88.0	74.9	80.2
		installed capacity million KWs	5.6	22.05[3]	22.16[3]	18.73[3]	20.05
30.	coal	million metrics ton	55.5	135.4	132.4	118.7	116.1

Notes: [1]Implicit physical targets have been derived by multiplying index number of gross value of domestic output (1960-61 = 100) by physical production of the commodities in the base year. The figures thus derived are approximate, especially so in the sectors with product-mix difficulties, e.g., "iron and steel".

[2]Including captive plants.

[3]Based on PPD's assumptions that 1 KW installed will generate 4000 Kwhrs in 1970-71.

PART III : DATA

IIIA : TRANSACTIONS MATRIX FOR 1960–61

3.1. Coverage

3.1.1. The basis for the projection of the structure of the Indian economy in 1970-71 is the inter-industry current flows matrix for the year 1960-61 reproduced in Table 25 which was constructed specifically for the purpose. It is a 30-sector table representing quantity flows, the unit of measurement being the producer's prices of 1959-60. The 30-sectors cover only such parts of the economy for which direct estimation of the values of output and input are possible. In comparison with the coverage of the National Income estimates prepared by the Central Statistical Organization (CSO) the 30-sector scheme leaves out the following sectors: professions and services, trade and commerce, transport other than railways and motor transport, house property and domestic services, banking, insurance and communications. The transactions of these sectors get accounted in the two residual rows "industries not included elsewhere" and "trade, transport and indirect taxes" and the one residual column "others" which coincides in coverage with the two residual rows.

3.1.2. The entries in these two rows and the column are based on direct estimation only in a few cases. In many cases they are obtained as residues from definitional identities. It is to be stressed that no direct estimates of output or value added in the sectors left out of our 30-sector scheme are possible and it is for this reason that we do not show any figures against the rows for "trade, transport and indirect-taxes" and "industries not included elsewhere" representing their value of output and

TABLE 15. VALUE ADDED 1960-61 : COMPARISON WITH OFFICIAL ESTIMATES
(Rs. crores)

		value added according to CSO			value added in our transactions table
		at 1960-61 prices		at 1959-60 prices gross of depreciation	
		net	gross of depreciation		
1.	agriculture, animal husbandry, and fishery	6700	6945	6743	6413
2.	forestry	110	110	110	171
3.	mining	160	167	171	137
4.	industries	2440	2684	2649	2322
5.	railways	360	360	363	378
	sub-total (1-5)	9660	10266	9026	9421
6.	other commerce and transport	1760[2]	—	—	173[1]
7.	professions, domestic services and house property	1460			
8.	government	910			
9.	communications	60			
10.	banking and insurance	160			
	total	14210		14276	

[1] Motor transport only.

[2] Inclusive of motor transport.

no figure in the column "others" representing value added. In Table 15 a comparison is made of the sectoral breakdown of value added according to our inter-industry table and that according to the CSO national income estimates. Only the first six sectors of the National Income classification scheme have got counterparts in our table. On the other hand in our table we have provided an estimate for value added in the "motor transport" sector whereas in the CSO estimates this is merged with the estimate for the sector "other commerce and transport." Of the CSO estimates for the sectors not covered by our table, only the figures for "banking and insurance" and "communications" may be treated as dependable. Those for professions, trade and commerce, transport other than motor transport, house property and domestic services are subject to severe limitations that are well known. It is because of this appreciation of ours that we have chosen to do without these sectors in our model. The fact that we have left these sectors out of account and yet drawn quite a number of valid conclusions about the economy only emphasises the fact that one can very well do without national income calculations of the sort we have in India; that it suffices to have a measure of value added in the material goods producing sectors alone.

3.1.3. The differences among the first five sectors between the CSO estimates and our estimates are partly due to the different coverages of the sectors themselves. Thus we have left out of account the values of the minor products and bye products of the agriculture and animal husbandry sectors (e.g. sugarcane tuft, hay, cow dung, bones) whereas imputed values for them are included in the CSO national income estimates. Once again our reason for making these omissions is that estimates for these items are extremely bad whereas their importance to the study of inter-industrial relations is not so crucial. Further explanations are provided in paragraph 3.4.9 below.

3.1.4. While all the 30-sectors of our table are non-overlapping, the sectors (22) and (28) standing for motor transport and railways are in principle covered by the residual sector "trade, transport and indirect taxes." The costs of the different inputs into any given sector are measured at their market prices whereas our table measures them in producer's prices. The difference between the values of input at these two prices added for all the input items amounts to the indirect payment by the output sector to the trade and transport sector (and indirect taxes) and that is the way the entries of the row "trade, transport and indirect taxes" have been arrived at. This, of course, includes payment to the railways and motor transport, but they cannot be separated out. Hence the rows (22) and (28) corresponding to the output sectors (1) to (30) are left blank and the railways and motor transport inputs into the sectors are kept merged in "trade, transport and indirect taxes." The justification, all the same, for distinguishing the sectors "motor transport" and "railways" in our table is that if we cannot show flows from them into the columns (1) to (30) we can do so for the flows into the final demand columns; also that the inputs into these two sectors can be estimated independently. Information is indeed available as to the goods carried by the railways and motor transport—and the information may be used, as we have done (see Section 3.14) to write down equations connecting the demand for freight traffic by railways and motor transport to the levels of output in the other sectors. This information is, however, not useful from the point of view of the needs of the inter-industry table. For, the value of freight earnings by the railways or motor transport from the carrying of any particular commodity does not represent an item in the cost of production of the sector producing the commodity.

3.1.5. The inter-industry table is thus incomplete—it has been deliberately left so by refraining from filling up real statistical gaps with pure inventions, as is done in the national income estimates of the CSO It is, of course, possible to complete the table by assuming as correct the CSO estimate of gross value added and showing the difference between this total and the total of the value added in the 30 sectors of our table as the value added in the "others" sector. However, it would be misguiding to do so, for one might get the impression that our inter-industry table yields independently the same estimate for gross value added as the CSO white paper on National Income.

3.2. Sectors

3.2.1. The sector scheme has been expressly designed so as to bring out most sharply the particular type of dependency relationship between them which gets expression sometimes in the triangular and sometimes in the block-angular structure of the transactions matrix. Mere skilful ordering is, of course, not enough—given an arbitrary sector classification scheme it may not be possible to achieve much of triangular or block-angular pattern, however one may arrange or order them. The dividing lines between the different sectors have themselves to be drawn in such a way as to bring out the pattern.

3.2.2. The other consideration that was kept in mind was to resort to such aggregation and disaggregation as to incorporate within the 30-sector scheme as many such sectors as possible, the output of which constitute the more important and indicative of the individual plan targets. Thus, production targets in physical units are derivable for the following 12 sectors of our model : iron and steel, iron ore, cement, foodgrains, jute textiles, chemical fertilizers, motor transport, crude oil, rubber, railways, electricity and coal.

3.2.3. Construction has been divided into two sectors to take account of the significant differences in capital, labour and raw material input patterns of urban-industrial works and rural works. Iron and steel includes not only pig iron and finished steel but also ferrous alloys, castings and forgings, aluminium, copper and zinc sheets, structural fabrications, pipe tubes, bolts and nuts, rivets etc. This grouping of iron and steel products with some other metal products has been done in view of their common use pattern. It would have been more convenient if leather could be separated from leather products but limitation of information did not permit it. Foodgrains milling is an industry very different from the other food industries; as such it was not lumped together with the latter. But it is also not of sufficiently large size to constitute a sector by itself so that we have lumped it together with foodgrains production. Jute textiles has been made to incorporate coir products as well.

3.2.4. No distinction has been maintained between large scale production and small scale production. Account has been taken of small scale production in the following sectors : electrical equipment, non-electrical equipment, transport equipment, iron and steel, leather and leather products, foodgrains (milling), cotton and other textiles, glass, wood, non-metallic mineral products, rubber products, and chemicals.

3.2.5. As mentioned before, the agriculture and animal husbandry sectors in our table have a smaller coverage than in the national income estimates.

3.3. Methods of estimation

3.3.1. The sectoral output levels, excepting for the two construction sectors, are directly estimated on the basis of official statistics regarding commodity production and prices. The estimates for the output of these first two sectors are made by us independently by following the same approach as of the CSO paper "Estimates of Gross Capital Formation in India (1961)." The approach is to build up the estimate by adding together the values of materials going into construction along with value added in construction activities. While in the CSO paper certain arbitrary proportions of the total supply of iron and steel, cement and other materials are assumed to flow into construction, we could almost completely do away with such arbitrary assumptions, as our own table yielded in several cases estimates of the amounts of left-over after other uses of the material had been accounted for. Brief notes on the sources used for making the other output estimates are provided in Section 3.4 below.

3.3.2. The flows in the table are estimated by following three different methods suitable in three different situations. Some of the flows are directly estimated by us by using various coefficients; some other estimates are readily available from official sources; and a third category have been deduced as residues or balancing items from the condition of equality between demand and supply. Examples of the first are quite a number of the inter-sectoral current input flows. These have been worked out by multiplying output levels by technological input coefficients independently estimated by us. Similar approach has been taken in estimating the entire row for "trade, transport and indirect taxes" : inputs at market prices have been converted to inputs at producers' prices by applying to them factors representing the relation between market price and producers' price. Examples of flow estimates directly available from official sources are : the flows of electricity and coal into all the final demand columns and into the sector "others", all the flows into the sectors "Government", "Export" and "Import"; all the flows out of the sectors "crude oil" and "iron ore"; all the flows into the sectors railways, electricity, and coal. Examples of flows estimated by the residual approach are : most of the entries in the columns for construction, capital formation, household consumption, and "others", and the row for "value added."

3.3.3. Notes regarding the basic source and method of estimation of the various flows are provided in the sections that follow.

3.4. Output levels

3.4.1. The output levels of all sectors other than the first two are estimated by obtaining the physical quantities of individual commodities produced and evaluating them by using the producers' prices of 1959-60. Marginal adjustments for unspecified commodity groups and for the products of small scale units have been done in value terms alone without any quantity counterparts. The outputs of the first two sector are estimated by the residual approach described in Section 3.9. (see in particular 3.9.21).

3.4.2. The following Government of India publications were used to obtain quantity figures : (abbreviations for these publications used elsewhere in this paper are indicated within parenthesis)

(i) *Selected Plan Statistics*, Planning Commission, 1963, (SPS).

(ii) *Programmes of Industrial Development* 1961-66, Planning Commission, (PID).

(iii) *The Third Plan Mid-term Plan Appraisal*, Planning Commission, (TPM).

(iv) *Third Five Year Plan*, Planning Commission, (TFYP).

(v) *National Income Statistics*, Central Statistical Organization, 1961, (Blue Book).

(vi) *Indian Minerals Year Book*, Indian Bureau of Mines, (MYB).

(vii) *Public Electricity Supply*, All India Statistics, Central Water and Power Commission, (PES).

(viii) *Department of Technical Development*, Ministry of Economic and Defence Coordination, (DW).

(ix) *Annual Survey of Industries*, Central Statistical Organization, (ASI).

(x) *Development of Chemical Industry*, mimeographed paper, Perspective Planning Division, Planning Commission, (DCI).

3.4.3. The prices have been estimated on the basis of the sources numbered (v), (vi), (vii), (viii), (ix) and (x) above.

3.4.4. The large-scale sector consists only of those factories employing 50 or more workers if using power and 100 or more workers if not using power. The residual category forms the small-scale sector which is again divided into two parts ; (i) factories employing 10 or more but less than 50 workers, if using power and 20 or more but less than 100 if not using power; and (ii) the remaining small-scale factories. These two will be referred to as small-scale sectors (i) and (ii) respectively.

3.4.5. The value of output in case (i) is directly based on the Sample Sector Report of ASI, 1959 (ASI 1960 report was not available at the time these calculations were made).

3.4.6. Estimates for the units of category (ii) of the small scale sector are based on sources which inherently contain large margins of error. In the cases of "leather and leather products" and "glass," "wood and non-metallic mineral products", the net value added figures from Blue Book for the years 1959-60 and 1955-56 respectively are converted into gross value of output by taking the approximate gross to net ratio from the *Final Report of the National Income Committee*, Ministry of Finance, 1954. The net value added, as given in the Blue Book, for the group "Metal Manufacturing and General Engineering" for the year 1955-56 is inflated in the same way to get the corresponding gross value of output which is divided into non-electrical equipment and transport equipment (carts, tongas, etc.). 17% of this is taken as transport equipment and the rest as non-electrical equipment. This distribution is done on the basis of NSS Draft Report No. 21 on Small Scale Manufacturing Establishments. The estimates for 1960-61 are obtained by way of extrapolation.

3.4.7. The estimates for the small scale sector's output shown in some of the tables that follow are often less than their true values; this has been deliberately done to avoid duplication. Thus the footwear figures given in Table 16 below under "leather and leather products" include both large scale and small scale manufacture of footwears. An estimate of the proportion of small scale and large scale production is also available, and the small sector's value of output has been estimated and subtracted from the total value of output of small scale sector based on the Blue Book.

3.4.8. Small scale food industries were handled as follows :

The value of output of vegetable oils includes the production of both the small scale sector and the large scale sector. The value of output of gur (which is mainly produced in the small scale sector) is obtained by multiplying the sugarcane available for gur production (after deducting from cane output the requirements for sugar refineries, household consumption and seed) by the value of output of gur per unit inputof sugarcane. The small sector values for the remaining items of the food processing sector are estimated on the basis of National Sample Survey Draft Report No. 21.

3.4.9. Table 16 shows the commodity composition of the aggregative sectors 3 to 30 in their physical quantities as well as values. The table also presents the producers' prices of 1959-60 used to evaluate them. Brief notes below the table indicate the sources of the value, quantity and price figures.

3.4.10. In comparing our output estimates with other estimates for comparable sectors, the following points may be borne in mind :

(a) Our agriculture sector leaves out of account the following items included in the CSO national income estimates : fodder crops, straw, rice bran and husk, farmyard wood, sugarcane tuft and grass.

(b) Our animal husbandry sector leaves out of account the following : dung, horns and hoofs, goat hair, camel hair, pig bristles and bones. Out of the products of fishery only fish is considered.

(c) Our forestry sector leaves out of account firewood. We have based our estimate of the other products of forestry on the Blue Book rather than on the White Paper on National Income.

(d) Our estimate, independently made by us, of the value of output of mines differs from that of the White Paper on National Income but agrees with that of the Blue Book.

TABLE 16. OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
3. *electrical equipment*				
3.1 electrical transformers (upto 33KV)	mil. KVA	30/KVA	1.39	5.0
3.2 control gear and switch gear	—	—	—	4.0
3.3 auxiliary equipment	—	—	—	3.0
3.4 house service motors	mil. nos.	40/no	0.50	2.0
3.5 VIR and PVC cables	mil. meters	271/meter	195	5.3
3.6 ACSR conductors	'000 tons	2623/ton	23.3	6.1
3.7 bare copper conductors	'000 tons	4100/ton	10.7	4.4
3.8 winding wires	'000 tons	5580/ton	4.6	2.6
3.9 paper insulated cables	kilometers	9375/kilometer	992	0.9
3.10 dry core cables	kilometers	6250/kilometer	1077	0.7
3.11 storage batteries	'000 nos.	25/no.	634	1.6
3.12 arc-welding electrodes	mil. meters	0.24/meter	110	2.6
3.13 air-conditioners	'000 nos.	2002/no	10.7	2.1
3.14 water coolers	'000 nos.	1780/no	2.2	0.4
3.15 refrigerators	'000 nos.	971/no	11.4	1.1
3.16 radio receivers	'000 nos.	204/no	320	6.5
3.17 electric fans	'000 nos.	101/no	1060	10.7
3.18 fluorescent lamps	mil. nos.	2.62/no	1.71	0.4
3.19 dry batteries	mil. nos.	0.21/no	214	4.5
3.20 electrical steel sheets	'000 tons.	2500/ton	14	3.5
3.21 electric lamps	mil. nos.	0.533/no	63.87	3.4
3.22 electric motors	mil. HP	99/HP	0.73	7.2
3.23 others	—	—	—	18.0
3.24 small scale (i)	—	—	—	30.0
total	—	—	—	126.0

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	k—(2)	(3)	(4)	(5)
4. *transport equipment*				
4.1 steam locomotives	nos.	386000/no	272	10.5
4.2 wagons	nos.	12800/no	11768	15.1
4.3 passenger coaches	nos.	102400/no	609	6.2
4.4 ship building	'000 tons	2000/ton	20	4.0
4.5 cars	nos.	11200/no	19096	21.4
4.6 *commercial vehicles*	nos.	24000/no	27518	66.0
4.7 jeeps and station wagons	nos.	11500/no	5501	6.3
4.8 automobile ancillaries	—	—	—	9.0
4.9 motor cycles	nos.	2110/no	3908	0.8
4.10 scooters	nos.	1430/no	12800	1.8
4.11 three-wheelers	nos.	4725/no	496	0.2
4.12 mopeds	nos.	747/no	856	0.1
4.13 trailers	nos.	3230/no	2012	0.6
4.14 bicycles	'000 nos.	127/no	1307	16.6
4.15 bicycle parts	—	—	—	5.1
4.16 small scale (i)	—	—	—	3.0
4.17 small scale (ii)	—	—	—	34.0
total	—	—	—	200.7
5. *non-electrical equipment*				
5.1 industrial machinery	—	—	—	33.8
5.2 coated abrasives	'000 reams	122/ream	139.2	1.7
5.3 industrial boilers	—	—	—	0.4
5.4 diesel engines	'000 nos.	1968/no	43	8.5
5.5 power driven pumps	'000 nos.	206.3/no	105	2.2
5.6 air compressors	—	—	—	1.5
5.7 machine tools	—	—	—	7.2
5.8 railway signalling equipment	—	—	—	3.0
5.9 grinding wheels	'000 tons	7830/ton	2.0	1.6
5.10 twist drills	'000 nos.	4.50/no	1536	0.7
5.11 shuttles and bobbins	'000 nos.	40/no	500	2.0
5.12 typewriters	'000 nos.	844/no	23.5	1.9
5.13 precision instruments	—	—	—	3.6
5.14 ball and roller bearings	mil. nos.	5.78/no	3.2	1.8
5.15 surgical instruments	—	—	—	0.2
5.16 clocks	'000 nos.	41/no	51.3	0.2
5.17 road rollers	nos.	42824/no	384	1.6
5.18 sewing machines	'000 nos.	114/no	297	3.4
5.19 razor blades	mil. nos.	0.14/no	565	7.9
5.20 cranes	'000 tons	4000/ton	1.5	0.6
5.21 others	—	—	—	46.3
5.22 small scale (i)	—	—	—	55.0
5.23 small scale (ii)	—	—	—	159.0
total	—	—	—	343.5

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
6. *iron and steel*				
6.1 pig iron	'000 tons	160/ton	1100	17.6
6.2 finished steel	'000 tons	465/ton	2400	111.6
6.3 alloy and special steel	'000 tons	3500/ton	40	14.0
6.4 ferro-manganese	'000 tons	765/ton	89.3	6.8
6.5 ferro-silicon	'000 tons	1500/ton	7	1.0
6.6 steel castings and forgings	'000 tons	1500/ton	69	10.4
6.7 aluminium sheets, rods, etc.	'000 tons	6155/ton	18	11.1
6.8 brass, copper sheets etc.	'000 tons	4100/ton	31	13.0
6.9 zinc sheets etc.	'000 tons	3701/ton	3	1.1
6.10 steel structural fabrications	'000 tons	1608/ton	225	36.2
6.11 steel pipes and tubes	'000 tons	768/ton	110	8.4
6.12 cast iron pipes	'000 tons	500/ton	209	10.5
6.13 bolts, nuts, rivets	'000 tons	2529/ton	43	10.9
6.14 small scale (i)	—	—	—	15.0
total	—	—	—	263.5
7. Iron ore	'000 tons	7.314/ton	10680	7.8
8. cement	mil. tons	67.4/ton	7.8	52.6
9. *other metals*				
9.1 aluminium	'000 tons	3353/ton	18	6.0
9.2 copper	'000 tons	3395/ton	8.8	3.0
9.3 lead	'000 tons	1394/ton	3.7	0.5
9.4 non-ferrous alloys	'000 tons	4000/ton	21.5	8.6
9.5 small scale (i)	—	—	—	14.2
total	—	—	—	32.3
10. *other minerals*				
10.1 manganese ore	'000 tons	81.1/ton	1200	9.70
10.2 lime stone	'000 tons	4.2/ton	12500	5.25
10.3 gypsum	'000 tons	7.4/ton	1000	0.74
10.4 bauxite	'000 tons	10.3/ton	381	0.39
10.5 salt	'000 tons	18.9/ton	3440	6.50
10.6 copper ore	'000 tons	53.8/ton	448	2.41
10.7 mica	'000 tons	859.0/ton	29	2.49
10.8 others	—	—	—	18.00
total	—		—	45.48

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
11. *plantations*				
11.1 tea	mil. lbs.	2 120/lb.	708.0	151.0
11.2 coffee	mil. lbs.	2.500/lb.	150.0	38.0
11.3 rubber	'000 tons	2800/ton	25.0	7.0
total	—	—	—	196.0
12. *leather and leather products*				
12.1 leather footwear	mil. pairs	3.5/pair	102	35.7
12.2 tanned hides	mil. nos.	23.0/no.	19.5	44.8
12.3 tanned skins	mil. nos.	12.3/no	28.1	34.6
12.4 leather cloth	mil. meters	4/meter	5.8	2.3
12.5 "others"	—	—	—	4.0
12.6 small scale (ii)	—	—	—	67.6
total	—	—	—	189.0
13. *animal husbandry*				
13.1 milk	mil. tons	307/ton	22.0	873
13.2 meat	mil. tons	1249/ton	0.7	87
13.3 eggs	mil. nos.	0.082/no.	3000	25
13.4 wool	mil. lbs.	1.67/lb.	72.0	12
13.5 hides	'000 nos.	821/no.	25800	21
13.6 skins	'000 nos.	4.39/no.	42200	19
13.7 fish	mil. tons	668/ton.	1.4	93
total	—	—	—	1130
14. *food industries*				
14.1 salt	mil. tons	13.5/ton	3.6	4.9
14.2 sugar	mil. tons	767/ton	2.97	227.8
14.3 vegetable oils	mil. tons	1597/ton	1.61	257.3
14.4 coconut oil	mil. tons	1000/ton	0.15	23.7
14.5 cotton seed oil	'000 tons	1507/ton	23	3.7
14.6 solvent extraction	'000 tons	1607/ton	2.7	4.3
14.7 vanaspati	'000 tons	1895/ton	334.9	63.5
14.8 industrial hard oil	'000 tons	1895/ton	15.7	3.0
14.9 oil cakes	—	—	—	84.3
14.10 milk products	—	—	—	11.8
14.11 biscuit (largescale)	'000 tons	3000/ton	23.7	7.1
14.12 biscuit (small scale)	—	—	—	15.0
14.13 confectionery (large scale)	'000 tons	3650/ton	17	6.2
14.14 confectionery (small scale)	—	—	—	3.5
14.15 fruit and vegetable preservation (large scale)	'000 tons	1800/ton	40	7.0

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
14. *food industries*				
14.16 fruits and vegetable preservation (small scale)	—	—	—	10.0
14.17 fish preservation	—	—	—	20.5
14.18 bakery products	—	—	—	19.0
14.19 gur	—	—	—	350.0
14.20 cocoa chocolate	—	—	—	0.5
14.21 cashew nut processing	—	—	—	14.0
14.22 starch	—	...	—	6.3
14.23 other food preparations,	—	—	—	2.0
14.24 wine	—	—	—	15.4
14.25 breweries	—	—	—	2.1
14.26 soft drinks	—	—	—	5.7
14.27 bidies	—	—	—	39.6
14.28 cigarettes	bil. nos.	11.9/'000 nos.	37	44.0
14.29 other tobacco products	—	—	—	53.9
total	—	—	—	1323.0
15a. *foodgrains*				
15.1 rice	mil. tons	544/ton	33.7	1833
15.2 wheat	mil. tons	467/ton	10.8	504
15.3 coarse grains	mil. tons	386/ton	22.7	876
15.4 pulses	mil. tons	430/ton	12.5	538
total	—	—	—	3751
15b. *grains milled*				
15.1 wheat flour	'000 tons	418/ton	980	41.0
15.2 rice milling	'000 tons	514/ton	785	40.3
15.3 small scale (1)	—	—	—	142.0
total	—	—	—	223.3
16. *cotton and other textiles*				
16.1 cotton yarn	—	—	—	10.0
16.2 cotton cloth—mill	mil. yards	0.75/yd	5048	381.3
16.3 cotton cloth-handloom	mil. yards	0.80/yd	2269	202.2
16.4 woollen yarn	mil. lbs.	6.8/lb	15.1	10.3
16.5 worsted yarn	mil. lbs.	6.8/lb	12.7	8.6

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
16. *cotton and other textiles*				
16.6 woollen cloth	mil. yards	13/yd	14.6	19.0
16.7 artificial silk fabrics	mil. yards	1.75/yd	570.0	99.8
16.8 silk textiles				2.7
16.9 embroideries etc.				2.2
16.10 textiles dying etc.				4.0
16.11 thread making				2.5
16.12 carpet weaving				1.5
16.13 hosiery				1.7
16.14 cordage, ropes, etc.				2.0
16.15 cotton ginning				35.0
16.16 gas mantle				0.3
16.17 tents, etc.				0.9
16.18 others				1.3
16.19 small scale (i)				15.0
total				800.3
17. *jute textiles*				
17.1 jute textiles	'000 tons	1193/ton	1022	120.1
17.2 coir products	—	—	—	9.5
total			—	129.6
18. *other agriculture*				
18.1 groundnut	mil. tons	564/ton	4.5	254
18.2 castor seed	mil. tons	662/ton	0.1	7
18.3 sesamum	mil. tons	920/ton	0.5	46
18.4 rape and mustard	mil. tons	770/ton	1.0	77
18.5 linseed	mil. tons	667/ton	0.4	27
18.6 sugar cane	mil. tons	435/ton	10.4	452
18.7 cotton	mil. bales	404/bale	5.4	218
18.8 jute	mil. bales	107/bale	4.0	43
18.9 tobacco	'000 tons	2348/ton	307.0	72
18.10 fruits and vegetables	mil. tons		—	577
18.11 spices			—	161
18.12 other crops			—	173
total				2097
19. *chemical fertilizers*				
19.1 ammonium sulphate	'000 tons	1520/ton	97	14.74
19.2 superphosphate	'000 tons	1122/ton	53	5.95
total	—	—	—	20.69

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
20. *glass, wooden, and non-metallic mineral products*				
20.1 glass	'000 tons	600/ton	225	13.5
20.2 ceramic	'000 tons	500/ton	100	5.0
20.3 refractories	'000 tons	172/ton	550	9.5
20.4 enamelware	mil. nos.	1/no	14	1.4
20.5 asbestos	'000 tons	311/ton	205	6.4
20.6 plywood	mil. sq. meters	4/sq. meter	17	6.8
20.7 thermos flasks	'000 dozens	25/dozen	117	0.3
20.8 bricks and tiles			—	5.5
20.9 mica dust or processed			—	6.6
20.10 saw-milling			—	2.4
20.11 wooden containers			—	1.0
20.12 other wood making			—	0.3
20.13 manufacture of cork and other wood not elsewhere classified			—	0.6
20.14 furniture and fixtures			—	1.5
20.15 other mineral products			—	2.5
20.16 small scale (i)			—	35.0
20.17 small scale (ii)			—	300.0
total			—	393.3
21. *forestry*				
21.1 timber	mil. c.ft.	6.06/c.ft.	220.5	139
21.2 minor products			—	41
total			—	180
22. *motor transport*				
22.1 freight traffic	billion ton miles	0.15/ton-mile	11.0	165.0
22.2 passenger traffic	'000 buses.	27500/no*	58.0	160.0
total				325.0
23. petroleum products	'000 tons	411.7/ton	5759	237.1
24. crude oil	'000 tons	70.83/ton	446	3.2

* Carryings per bus

TABLE 16 (*Contd.*). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
25. *rubber products*				
25.1 rubber footwear	mil. pairs	2.0/pair	45	9.0
25.2 dipped rubber goods	mil. dozens	0.65/dozen	32.4	2.1
25.3 auto tyres	mil. nos	213/no.	1.5	32.0
25.4 auto tubes	mil. nos	23/no.	1.27	2.9
25.5 cycle tyres	mil. nos	4.15/no.	11.0	4.6
25.6 cycle tubes	mil. nos	1.91/no.	13.0	2.5
25.7 other tyres and tubes			—	2.1
25.8 others			—	7.0
25.9 small scale (i)			—	5.3
total			—	67.5
27. *chemicals*				
27.1 paper and paper board	'000 tons	1500/ton	345.0	51.80
27.2 newsprint	'000 tons	304/ton	23.0	0.70
27.3 oxygen	mil. cu. meters	2117/'000 cu. meters	20.4	4.32
27.4 acetylene	ml. cu. meters	6699/'000 cu.meters	2.5	1.67
27.5 matches	mil. gross	2.88/gross	33.9	9.80
27.6 rayon filament	mil. lbs.	1.68/lb.	47.0	7.90
27.7 staple fibre	mil. lbs.	1.68/lb.	48.0	8.10
27.8 sulphuric acid	'000 tons	150/ton	358.0	5.40
27.9 soda ash	'000 tons	363/ton	150.0	5.40
27.10 caustic soda	'000 tons	691/ton	100.0	6.90
27.11 calcium carbide	'000 tons	805/ton	10.0	0.80
27.12 hydrogen peroxide	'000 tons	2750/ton	1.17	0.30
27.13 industrial explosives	'000 tons	3142/ton	6.0	1.90
27.14 safety fuses	mil. nos.	0.40/no	3.20	0.20
27.15 dyestuffs	mil. lbs.	13.50/lb.	12.0	16.20
27.16 plastics	'000 tons	4500/ton	9.5	4.30
27.17 soap	'000 tons	1733/ton	142.0	24.60
27.18 synthetic detergents	'000 tons	3670/ton	1.63	0.60
27.19 paints and varnishes	'000 tons	1400/ton	52.5	7.67
27.20 alcohol	mil. litres	171/'000 litres	92.7	1.60
27.21 acetic acid	tons	2203/ton	3038.0	0.40
27.22 benzene	tons	570/ton	1179.0	0.10
27.23 naphthalene	tons	1400/ton	688.0	0.10
27.24 potassium chlorate	'000 tons	1309/ton	3.0	0.40
27.25 sodium bicarbonate	'000 tons	462/ton	8.0	0.40

TABLE 16 (Contd.). OUTPUT OF DIFFERENT SECTORS—1960-61

(value in Rs. crores)

sector/commodity	unit of quantity	price in rupees	quantity	value
(1)	(2)	(3)	(4)	(5)
27. *chemicals*				
27.26 bichromates	'000 tons	1600/ton	5.0	0.80
27.27 liquid chlorine	'000 tons	444/ton	32.0	1.40
27.28 carbon dioxide	mil. lbs.	460/ton	16.0	0.40
27.29 bleaching powder	tons	480/ton	5973.0	0.28
27.30 bleaching earth		588/ton	2800.0	0.16
27.31 zinc chloride	tons	1410/ton	1128.0	0.16
27.32 copper sulphate	tons	1620/ton	3870.0	0.63
27.33 sodium sulphide	tons	1157/ton	2302.0	0.27
27.34 alum	tons	302/ton	4843.0	0.15
27.35 hydrochloric acid	tons	201/ton	9693.0	0.20
27.36 nitric acid	tons	1600/ton	5200.0	0.84
27.37 aluminium sulphate	tons	305/ton	52285.0	1.59
27.38 titanium dioxide	tons	2778/ton	2678.0	0.74
27.39 ammonium chloride	tons	518/ton	13000.0	0.67
27.40 phosphorous chloride	tons	246/ton	130.0	0.03
27.41 sodium sulphate	tons	1120/ton	15440.0	1.73
27.42 drugs and pharmaceuticals				56.0
27.43 others				38.5
27.44 small scale (i)				18.0
total				284.1
28. *railways*				
28.1 freight traffic (net)	mil. ton kilometers	31.7/'000 ton kilometers	87750	278.2
28.2 passenger traffic	mil. passenger kilometers	17.4/'000 passenger kilometers	78001	135.9
28.3 other earnings				39.9
total				454.0
29. electricity				
total consumption of electricity	mil. kwh.	74.7/'000 kwh	13840	103.4
30. coal and coke				
30.1 coal	'000 tons	20.2/ton	52600	106.25
30.2 coke	'000 tons	55/ton	500	2.75
total				109.00

Notes on Table 16

SECTOR : 3

1. Quantities for items 3.1, 3.4, 3.5, 3.6, 3.9, 3.10, 3.18, and 3.22 are from SPS. The remaining quantities are from PID.
2. Prices for items 3.4, 3.5, 3.7, 3.8, 3.12, 3.14, and 3.22 are from DW. Those for items 3.1, 3.9, 3.10, and 3.20 are from DCI. Remaining prices are from ASI.
3. Values for items 3.2 and 3.3 are from PID and DCI respectively.
4. Values for "others" are on the basis of ASI.

SECTOR : 4

5. Quantities are from SPS.
6. Prices, except for item 4.14, are from DW. That for item 4.14 is from ASI.
7. Values for items 4.8 and 4.15 are from PID.
8. Small scale (ii) is on the basis of Blue Book. The Blue Book gives the figure for metal and engineering industries. 17% of the total is taken as transport equipment and the rest as non-electric equipment. This distribution is done on the basis of the NSS Draft Report No. 21.

SECTOR : 5

9. Quantities for items 5.10, 5.11, and 5.12 are from PID. That for item 5.10 is from DCI. Remaining quantities are from SPS.
10. Prices for items 5.4, 5.5, 5.10, 5.12, 5.14, 5.16, 5.18 and 5.19 are from ASI. Those of items 5.2, 5.9, 5.17 and 5.20 are from DW. That of item 5.11 is from DCI.
11. Values of items 5.1, 5.6 and 5.7 are from PID. Those of items 5.3, 5.8, 5.13, and 5.15 are from DCI. That of item 5.21 is based on ASI.

SECTOR : 6

12. Quantities for items 6.1, 6.2, 6.4, 6.5, 6.6 and 6.10 are from SPS. Those of items 6.7, 6.11, and 6.12 are from PID. Those of items 6.3, 6.8, 6.9 and 6.13 are from DCI.
13. Prices for items 6.1, 6.2 and 6.4 are from MYB. Those for items 6.3, 6.5 and 6.6 are from DCI. Remaining prices are from ASI.

SECTOR : 7

14. Quantity and price are from MYB.

SECTOR : 8

15. Quantity and price are from SPS and ASI respectively.

SECTOR : 9

16. For items 9.1 to 9.3, quantities and prices are from SPS and MYB respectively. Those of item 9.4 are from DCI.

SECTOR : 10

17. All figures are from MYB.

SECTOR : 11

18. Quantities are from TPM.
19. Prices of items 11.1 and 11.2 are from ASI. That of item 11.3 is from "Rubber in India".

SECTOR : 12

20. Quantities are from PID.
21. Prices for items 12.1 and 12.4 are from ASI. That of item 12.2 is from DW. That of item 12.3 is worked out by assuming that the ratio of prices of tanned hides and tanned skins will be same as raw hides and raw skins. That of item 12.5 is based on ASI.

SECTOR : 13

22. Quantities for items 13.1, 13.4 and 13.7 are from SPS. Those of items 13.5 and 13.6 are from PID. Those of items 13.2 and 13.3 are from DCI.

23. Prices are from Blue Book.

SECTOR : 14

24. Quantities for items 14.1 to 14.8, 14.11, 14.13 and 14.15 are from PID. That for item 14.28 is from DW.

25. All prices are from ASI. (Prices of cotton seed oil, solvent extraction are taken to be same as for vegetable oils ; price of industrial hard oil as that of vanaspati).

26. Value of item 14.9 is estimated on the basis of the ratio of oil cakes output to the output of oils as available from ASI.

27. For evaluating value of output of item 14.19, the input requirement of sugarcane for sugar is subtracted from the total output of sugarcane (seed and wastage are also subtracted), the relation between output of gur and input of sugarcane, as got from ASI, is applied to get the value of output of the item.

28. Values for items 14.12, 14.14 and 14.16 are based on NSS Draft Report No. 21. Those for items 14.10, 14.20, 14.23 and 14.25 are from ASI.

29. Values for items 14.17, 14.18, 14.24 and 14.27 are based on NSS Draft Report No. 21 (for small scale) and ASI (for large scale).

30. Value of item 14.29 is based on the availability of tobacco after its use in the manufacture of items 14.27 and 14.28.

SECTOR : 15a

31. Quantities are from TPM.

32. Prices are obtained from Blue Book for the year 1958-59 and then adjusted with the index numbers of wholesale prices during the harvest period.

SECTOR : 15b

33. Quantities of wheat flour and rice milling are from ASI respectively.

34. Prices are from ASI.

SECTOR : 16

35. Value for item 16.1 refers to only that part of the yarn which is used outside the textile industry.

36. Quantities, except for item 16.7 are from SPS. That for item 16.7 is from PID.

37. Price for item 16.3 is taken from "Handloom Weaving Industries with special reference to Madras—ILO". Other prices are from ASI

38. For items 16.8 to 16.18, the values have been taken from ASI.

SECTOR : 17

39. Quantity and price of item 17.1 are from PID and ASI respectively.

40. The export figure of item 17.2 is given in Coir Board Report. According to this report, the export is about 90% of the total output. This percentage is used to get the value of output of item 17.2.

SECTOR : 18

41. Quantities and prices are from SPS and Blue Book respectively (1958-59 prices are adjusted for 1959-60 with the index number of wholesale prices during the harvest period).

42. Values for items 18.10 to 18.12 are obtained on the basis of Blue Book.

SECTOR : 19

43. Quantities and prices are from SPS and ASI respectively.

SECTOR : 20

44. Quantities for items 20.1, 20.3 and 20.6 are from SPS. All other quantities are from DCI.

45. Prices for items 20.3 and 20.5 are from ASI. All other prices are from DW.

46 Values for items 20.8 to 20.15 are from ASI.

SECTOR : 21

47. All figures are based on Blue Book.

SECTOR : 22

48. Goods, ton-miles and number of buses are from TFYP.

49. Rate per ton-mile and earning per bus are based on the studies done by Perspective Planning Division, Planning Commission.

SECTOR : 23

50. All figures are taken from "Indian Petroleum Handbook—1962".

SECTOR : 24

51. All figures are taken from "Indian Petroleum Handbook—1962".

SECTOR : 25

52. Quantities for all items, except for item 25.2, are from PID. That for item 25.2 is from DCI.

53. Price of footwear is from ASI and all other prices are from DW.

54. Values for items 25.7 and 25.8 are from ASI.

SECTOR : 27

55. Quantities are taken from SPS and PID for items 27.1 to 27.20 and 27.21 to 27.41 respectively.

56. Prices are taken from ASI for items 27.2, 27.5, 27.9, 27.10, 27.14, 27.15, 27.17 and 27.19. All other prices are from DW.

57. Value for item 27.42 is taken from ASI.

58. Value of item 27.43 has been taken as the sum of those items not covered in items 27.1 to 27.42 and is based on ASI and DW.

SECTOR : 28

59. All figures are based on "Report by the Railway Board on Indian Railways".

SECTOR : 29

60. All figures are taken from PES.

SECTOR : 30

61. Quantities and prices for items 30.1, 30.2 are taken from MYB and DCI respectively.

3.5. Industrial consumption

3.5.1. The method followed in filling up the cells of the 30 × 30 sub-matrix of the transactions matrix (Table 25) was to work out a 30 × 30 matrix of input coefficients at producers' prices of 1959-60 and then multiply the coefficients of a column by the output level of the sector corresponding to it to obtain the entries of the corresponding column of the inter-industry table. This procedure holds formally true even for those items of flow for which direct estimates were available. The reason for adopting this procedure was that direct information about the flows was available only in a few cases; more information was available for flows from industry groups that constituted parts of the sectors. 1959-60 price system adopted as heavy reliance had to be made on ASI (1959).

3.5.2. Table 26 presents the matrix of input coefficients as estimated at market prices. (The matrix of coefficients at producers' prices was derived from it by adjusting for trade and transport.) In the following paragraphs explanatory notes are supplied regarding the sources and method of estimating the coefficients (or norms). Apart from the sources (ii), (v), (vi), (vii) and (ix) mentioned in paragraph 3.4.2., the following sources have been used:

1. *Census of Indian Manufactures*, 1957, Central Statistical Organization (CMI).
2. *Inter-Industry Table for* 1959, Inter-industry Unit, Planning Commission (IIT).

Other sources used are mentioned individually in the notes.

3.5.3. The flows into the sectors (1) and (2) were directly estimated for the inter-industry table as explained in Section 3.9 below. The coefficients of Table 26 were obtained from these flows and the output levels of the sectors.

3.5.4. *Electrical equipment.* Norms for fuel, iron and steel, electrical equipment, non-electrical equipment and other metals were obtained from ASI, 1959. The glass input as given in ASI, 1959 is inflated to include porcelain insulators as given in PID. Other norms are on the basis of the sector "General and Electrical Engineering" of CMI.

3.5.5. *Transport equipment.* Fuel, and iron and steel norms are from ASI, 1959. Eelctrical equipment, non-electrical equipment, glass, wood, etc. and jute textiles norms are from IIT. Rubber products norm is worked out on the basis of direct information about the corresponding flow available in PID which gives the utilization of tyres and tubes by the sector. Forestry products, other metals and self-input norms are taken on the basis of "Inter-industry Relations for Mining and Manufacturing Industries" by B. Dey and K. Biswas.* Chemical norm is taken to be the same as for electrical equipment.

3.5.6. *Non-electrical equipment.* The norms are separately calculated for large scale sector and small scale secter and then are combined by applying their 1960-61 values of output as weights. In the large scale sector, fuel, and 'other metals' norms are on the basis of ASI, 1959. Non-electrical equipment, electrical equipment, rubber products and glass and wooden products' norms are from IIT. Chemical norm is taken to be the same as for electrical equipment. The iron and steel norm as obtained from ASI, 1959 is adjusted by subtracting from this the norm of non-electrical equipment (which according to ASI, 1959 is included under iron and steel). The norms for small scale sector are based on NSS Report No. 42.

3.5.7. *Iron and steel.* Fuel (except coal) norms are on the basis of ASI, 1959. Coal norm is on the basis of ASI, 1960. Iron ore norm is based on MYB, 1960 which gives the utilization of iron ore during the year so that the flow of iron ore into iron and steel sector in Table 25 is a direct estimate. The norms for electrical equipment, non-electrical equipment and self-input are based on IIT (after making some adjustments due to the difference in the sectoral definitions adopted by us and by IIT). All other norms are based on CMI.

*Paper submitted to Second Conference on Research in National Income.

3.5.8. *Iron ore and other minerals.* Total material input norm as given in the paper. "Production, Utilization and Cost Structure of Mining in India" [Indian Statistical Institute (ISI), Planning Unit, Working Paper 208] is broken into different items of input on the basis of IIT.

3.5.9. *Cement.* Minerals and fuel (excluding fuel oils) norms are from ASI, 1959. Fuel oil and jute textiles norms are on the basis of CMI.

3.5.10. *Other metals.* Fuel, and ores norms are from ASI, 1959. Self-input norm is from ASI, 1960. All other norms are on the basis of CMI.

3.5.11. *Plantations.* For tea and coffee, fuel norms are from ASI, 1959. For rubber fuel consumption is assumed to be nil. Fertilizers into tea are from "Eighth Administration Report of Tea Board". Norm for fertilizers into rubber is from "Report of the Plantation Enquiry Commission, 1956 Part III—Rubber", and the same norm is assumed for coffee. Jute textiles norm for coffee is from ASI, 1959 and for rubber is based on individual schedules of the CMI. Plywood (wooden products) norm for tea is from the above mentioned report of Tea Board. Chemical norm for tea is based on individual schedules of CMI, and the same norms are assumed for coffee and rubber. Norms are combined by applying the weights 6 : 1 : 1 to tea, coffee and rubber.

3.5.12. *Leather and leather products.* The self-input norm is obtained by dividing the independently estimated corresponding flow in Table 25 by the output of the sector. The norms for fuel and animal husbandry are based on ASI, 1959. Other norms are on the basis of CMI.

3.5.13. *Animal husbandry.* The norms are on the basis of inputs and output during the year 1958-59. The animal husbandry sector uses foodgrains, oil cakes and drugs and pharmaceuticals. These inputs are given in the Blue Book. (Straw etc. are neither included in the output of the sector 'other agriculture' nor treated as inputs into this sector).

3.5.14. *Food industries.* Norms are calculated separately for different items of output of the sector. These norms are combined into a single vector by taking the values of their outputs in the base year as weights. The norms for major items of inputs are from ASI, 1959. Norms for chemicals, packing materials and other minor inputs are from CMI.

3.5.15. *Foodgrains and grains milled.* The norms are calculated separately for foodgrains and grains milled, and are combined by taking the values of their output in the base year as weights. In the case of foodgrains, all the norms (except for self input) are based on Blue Book. The availability of inputs into agriculture is divided by the output of 'foodgrains' and 'other agriculture' taken together. Items like farm yard manure are absent as input norms of animal husbandry into agriculture as these items are left out of account in our model. The norms into 'foodgrains' and 'other agriculture' are assumed to be the same except for self inputs. Self-input norm is on the basis of seed rates available in Indian Agriculture in Brief, 1957. Jute textiles norm is based on CMI. All other norms for grains milled are based on ASI, 1959.

3.5.16. *Cotton and other textiles*. Fuel, cotton fibres, and self-input norms are on the basis of ASI, 1959. Wool consumption is derived from the figure for domestic production plus net imports; hence the flow in Table 25 from animal husbandry into this sector is a direct one. The norm for food industries (starch), jute textiles and wooden products are on the basis of CMI. Those for chemicals are based on ASI, 1959 as well as CMI.

3.5.17. *Jute textiles*. Fuel, other agriculture and jute textiles norms are on the basis of ASI, 1959. All other norms are taken from CMI.

3.5.18. *Other agriculture*. Except for self input, all norms are the same as for foodgrains. Self input norm is on the basis of seed rates available in Indian Agriculture in Brief, 1957.

3.5.19. *Chemical fertilizers*. All input norms except that for packing material are from ASI, 1959. The norm for packing material is based on the "Annual Report of Fertilizer Corporation of India—1961-62." It is assumed that the packing material used is jute textiles.

3.5.20. *Glass, wooden and non-metallic mineral products*. The norms are separately prepared for wooden products and glass and non-metallic mineral products. They are then combined using base year outputs as weights. For wooden products, forestry products norm is from ASI, 1959 and all other norms are from CMI. In the case of glass and non-metallic mineral products, cement, non-electrical equipment, textiles, and fuel norms are from ASI, 1959. All other norms are based on CMI. Minerals norm as given in ASI, 1959 is reduced by subtracting those items of input which are not covered by our mining sector.

3.5.21. *Forestry products*. Blue Book gives 5% as the percentage of material input to gross value of output. As the nature of these inputs is not known, this norm is used and classified under 'others'.

3.5.22. *Motor transport*. Input norms into buses are based on "Annual Report of State Transport Undertakings 1958-59". This report gives gross earnings together with the inputs of petroleum and rubber products. Rubber input norm for trucks is assumed to be the same as for buses. The petroleum products norm for trucks is based on a working paper of the Perspective Planning Division, Planning Commission (PPD). Petroleum norm for the entire sector has been worked out by combining the norms for trucks and buses.

3.5.23. *Petroleum products*. All norms except for non-electrical equipment (packing material) are on the basis of ASI, 1959. Norms are worked out per ton of input of crude oil and then multiplied by the total quantity of consumption of crude oil and divided by the total value of output of petroleum products which was taken from a source other than ASI. This complicated procedure was called for as the ASI, 1959 figures for value of output of petroleum products and crude oil input into them did not agree with information available on them from other more reliable sources. Non-electrical equipment norm is based on individual schedules of the CMI.

3.5.24. *Crude oil.* The paper "Production, Utilization and Cost Structure of Mining in India", indicates that 10% of the value of this sector's output is spent on current material inputs. As the nature of these inputs is not known, these have been classified under 'others'.

3.5.25. *Rubber products.* Fuel norms are from ASI, 1959. Rubber norm is based on Rubber in India which gives annual data on consumption of rubber by the rubber industry. This quantity is evaluated directly at producer's prices for home produce and import prices for imported rubber. Hence the estimates of rubber flow in this sector in Table 25 is a direct estimate. Chemicals, non-electrical equipment and textiles norms are based on individual schedules of CMI. Self input norm is taken from the paper "Inter-industry Relations for Mining and Manufacturing Industries" by B. Dey and K. Biswas.*

3.5.26. *Chemicals.* Fuel forestry, animal husbandry, and vegetable oil norms are on the basis of ASI, 1959. All others are on the basis of CMI.

3.5.27. *Railways.* The report "Indian Railways" of the Ministry of Railways gives fuel consumption, cost of staff, other miscellaneous expenditures and also the corresponding earnings. All the flows into this sector in Table 25 are therefore direct estimates.

3.5.28. *Electricity.* Norms are worked out from the profit and loss accounts as given in the "Public Electricity Supply—All-India Statistics" of the Central Water and Power Commission, which gives expenditure on coal, oil, and others. The value of electricity sold is also given. The value is divided into thermal and hydro-electricity in the ratio of the quantity of output of the two kinds of electricity. Values of coal and oil are divided by the value of output of thermal electricity to get the coal and oil norms for thermal electricity. 'Others' is divided by the total value of output of electricity, and identical norm is assumed for thermal as well as hydro-electricity. Since output is defined in terms of electricity sold, no separate norm is needed for self input (transmission losses). The current flows of electricity as shown in Table 25 are thus also all direct estimates.

3.5.29. *Coal.* Norms are first framed separately for coal and coke, and then combined by assuming the proportion of 10 : 1 between coal and coke. Coal and electricity norms for coal are taken from "Annual Report of Chief Inspector of Mines, 1959" so that the flows of these two items into electricity in Table 25 are direct estimates. Those for coke are from ASI, 1959. Petroleum products into coke are from ASI, 1959 and the same is assumed for coal. Non-electrical equipment and 'others' norms into coal are on the basis of "Report of Coal Price Revision Committee" : 'Others' into coke is from ASI, 1959.

3.6. Government current consumption

3.6.1. Table 17 "Government expenditure on goods and services, 1960-61," gives details of expenditure of the government on all goods and services (exclusive of payment to government servants); the former accounts for Rs. 475 crores while

*Paper submitted to Second Conference on Research in National Income.

the latter accounts for an expenditure of Rs. 65 crores. Payment to Government services which is equivalent to "the net output of government administration" gives a figure of Rs. 910 crores during 1960-61 as presented in "White Paper on National Income", CSO. Thus the total expenditure on goods and services at current market prices during 1960-61 is equal to Rs. 1450 crores.

TABLE 17. GOVERNMENT EXPENDITURE ON GOODS AND SERVICES, 1960-61

commodity	expenditure (rupees lakhs)
capital goods	11967
1. electrical equipment and power generating machinery	2107
2. transport equipment	6870
3. conveying, hoisting, excavating and construction machinery	629
4. industrial and other machinery	853
5. machine tools	429
6. other capital goods	1079
intermediate goods	16090
1. raw materials—mineral and quarry products	1757
2. raw materials—others	763
3. mineral fuel, oils and lubricants	2738
4. iron and steel	2420
5. manufactures other than iron and steel	6049
6. other intermediate goods	2303
durable consumer goods	3729
1. cotton textiles—mill made	1080
2. cotton textiles—khadi	237
3. woollen textiles	319
4. silk textiles	9
5. electrical goods	419
6. mechanical goods	61
7. other consumer durable goods	1598
consumer non-durables	14706
1. food products and drinks	12668
2. non-food products	2038
unclassified	1000
total commodities	47492
services	
1. telephone charges	3008
2. postage stamps	913
3. hired conveyance	195
4. stitching charges	95
5. cycle repairs	36
6. hire/repair of hot and cold	106
7. hire/repair of office machines	838
8. casual labour	640
9. others	804
grand total	53927

3.6.2. Broadly speaking, the allocation to our sectors of the above categories is done as follows :

sectors	commodity items included (from Table 17)
3. electrical equipment	items 'electrical equipment and power generating machinery' and 'electrical goods'.
4. transport equipment	items 'transport equipment'
5. non-electrical equipment	items 3, 4, 5 and 6 under "capital goods" ; and items 6 and 7 under "durable consumer goods"
14. food industries	item 'food products and drinks'
16. cotton and other textiles	items 1, 2, 3 and 4 under durable consumer goods.
23. petroleum products	mineral fuel, oils and lubricants

3.6.3. The expenditure on electricity is estimated directly with the aid of data supplied by "Public Electricity Supply—All India Statistics", 1960-61. The source gives the quantity of energy sold in million kwhrs. during 1960-61 to various classes of utilization of energy. The quantities sold to the two classes, public lighting and irrigation, are taken as the public consumption in quantity of electricity. The source also gives the producer's price of electricity during 1959-60 per kwhrs which immediately gave us the value of electricity consumption.

3.6.4. The estimate of expenditure on construction, urban and industrial, is reached in the following manner. Table 17 gives the expenditure on materials going into construction. The items taken into account are (i) raw materials—minerals and quarry products (ii) iron and steel. The total expenditure on these materials is inflated by the ratio of the total value of urban construction to the value of materials used as shown in the CSO paper, "Estimates of Gross Capital Formation 1949-50 to 1961-62", so as to arrive at the expenditure on construction.

3.6.5. The amount left over after taking into account the eight items of government consumption, is shown against "industries not included elsewhere".

3.6.6. The expenditure figures are in 1960-61 market prices. These are translated to 1959-60 market prices by applying the index number of wholesale prices for these sectors for 1959-60 with 1960-61 as base. These are then brought down to their values at factor cost by applying the sectoral trade and transport deflators.

3.7. Imports and exports

3.7.1. Import and export figures are obtained from the March 1961 issue of the *Monthly Statistics of Foreign Trade in India* (MSFT). For some sectors, figures are not the same as one finds in the summary table of the journal on account of the sector definitions being different. The adjustments made to achieve comparability with our sector definitions are shown in Table 18.

3.7.2. Imports of crude oil as given in MSFT is Rs. 20.15 crores (2.7 million tons), which is about fifty per cent of that available in other sources like *Programme of Industrial Development* (PID) and *Indian Petroleum Handbook* (IPH) as is evident from Table 19.

TABLE 18. ADJUSTMENTS FOR IMPORTS AND EXPORTS

(Rs. crores)

sectors	imports at c.i.f. prices	exports at f.o.b. prices
(1)	(2)	(3)
3. *electrical equipment*	57.05	1.29
according to MSFT adjustments for	56.15	1.18
(i) lighting apparatus	0.90	0.11
5. *non-electrical equipment*	228.70	4.38
according to MSFT adjustments for	201.31	1.89
(i) furniture	0.10	0.12
(ii) sanitary wares	0.02	0.03
(iii) heating apparatus	0.13	0.02
(iv) instruments	5.80	0.25
(v) clocks and watches	0.70	—
(vi) manufacture of metals	20.46	2.07
6. *iron and steel*	120.93	15.29
according to MSFT adjustments for	120.30	9.72
(i) iron and steel scrap	0.63	5.57
9. *other metals*	49.28	0.39
according to MSFT adjustments for	47.10	0.25
(i) non-ferrous metal scrap	2.07	0.14
(ii) silver and platinum	0.11	—
27. *chemicals*	111.22	11.07
according to MSFT adjustments for	75.10	7.16
(i) chemical wood pulp	5.99	—
(ii) oils and fats	0.13	1.25
(iii) paper and paper board	11.74	0.63
(iv) cinematographic films	4.27	—
(v) artificial silk yarn	13.65	1.92
(vi) synthetic fibres	0.25	0.11

In the inter-industry table import of crude oil is shown as Rs. 40.47 crores which is obtained from the quantity of crude oil imported as given in PID using the price of Rs. 70.88 per tonne as arrived at from IPH. In doing so the total value of all commodity imports as given in MSFT (Rs. 1070.16 crores) is raised by Rs. 20.32 crores to Rs. 1090.48 crores.

TABLE 19. IMPORT OF CRUDE OIL BY DIFFERENT SOURCES

source	period	import		implicit price rupees per tonne
		million tonnes	rupees crores	
(1)	(2)	(3)	(4)	(5)
MSFT	1960-61	2.701	20.15	74.60
PID	1960-61	5.709	39.25	68.75
IPH	1960	5.723	40.57	70.88

3.7.3. Value of imports for all sectors appear in the inter-industry table at c.i.f. prices, whereas those of exports are at 1959-60 ex-factory prices. Value of exports at 1960-61 f.o.b. prices (col. (2) of Table 20) were first deflated to 1959-60 levels by using the index number of wholesale prices for 1959-60 with 1960-61 as base year (see Section 3.12 below for explanations regarding the index numbers). Then from these the ex-factory (1959-60) values were obtained by deflating them, using trade and transport deflators (see Section 3.11 below for explanations regarding the deflators).

TABLE 20. EXPORTS–INDIA 1960-61

(Rs. crores)

sectors	exports at	
	f.o.b. prices (1960-61)	ex-factory prices (1959-60)
3. electrical equipment	1.3	0.8
4. transport equipment	0.7	0.5
5. non-electrical equipment	4.4	2.9
6. iron and steel	15.3	10.1
7. iron ore	16.8	2.4
8. cement	0.6	0.3
9. other metals	0.4	0.2
10. other minerals	29.4	24.3
11. plantations	130.8	109.5
12. leather and leather products	27.6	23.7
13. animal husbandry	28.5	20.6
14. food industries	48.9	36.1
15. foodgrains	0.1	—
16. cotton and other textiles	70.7	54.5
17. jute textiles	143.8	94.4
18. other agriculture	56.1	49.3
19. chemical fertilizers	—	—
20. glass and wooden products	3.2	2.4
21. forestry products	18.4	12.4
23. petroleum products	4.1	4.1
24. crude oil	—	—
25. rubber products	0.7	0.6
26. synthetic rubber	—	—
27. chemicals	11.1	9.9
30. coal	3.3	1.8
others	7.7	7.3
total	633.0	468.1

3.8. Capital formation

3.8.1. There are five entries in the capital formation column against the sectors 1 to 5. They have been independently estimated by us, by working upon the material presented by the CSO in the papers (1) Estimates of Gross Capital Formation in India (1961) and (2) Estimates of Capital Formation in India (1962) by Tiwari, Kumar and Kumar of the CSO.

3.8.2 The output of the two construction sectors were evaluated independently by us by following steps described in Section 3.9. The entire volume of output of construction, rural, is allocated to capital formation, but that of construction, urban and industrial, is distributed among the sectors "capital formation", "government consumption" and "others". The entry for "government consumption" is estimated independently as explained in Section 3.6. The allocation between "others" and "capital formation" is done as follows. In the paper of Tiwari, Kumar and Kumar cited above, the value of repairs and maintenance and other works not constituting capital formation, is shown as Rs. 122 crores at current prices as against a total of Rs. 941 crores for urban type of construction. Using the same proportion we obtain the figure of Rs. 153 crores shown in our "others" column. The residue of Rs. 944 crores is shown against capital formation.

3.8.3. There is actually some underestimation of capital formation and overestimation of consumption by "others" involved in our method. That is because government consumption of construction is partly of the type of repair and maintenance, and partly of the nature of other small building activities as does not constitute capital formation. Hence it is not correct to show the entire volume of "repairs and maintenance" under "others"; but we did not have any means of splitting the amount between government and non-government parties.

3.8.4. The equipment component of gross fixed capital formation was worked out by the residual method as explained in Section 3.9.

3.8.5. The estimates of stock formation are based mostly on the *Monthly Statistics of Production of Selected Industries in India* (MSPSI). The exceptions are the sectors (i) plantations, (ii) foodgrains, (iii) other agriculture and (iv) rubber.

3.8.6. The stock figures directly available in the above mentioned official source refer to only part of the production of each sector. The addition to stock has been evaluated by using 1959-60 producer's prices and then the value so obtained increased in the same proportion as the ratio of the value of output of the sector to the value of the items covered.

3.8.7. For foodgrains the estimation is based on the paper by Tiwari, Kumar and Kumar; for "other agriculture" the sources are *Cotton in India* and *International Textile Bulletin*; for rubber and plantations, the sources are the three Boards concerned with rubber, tea and coffee.

3.8.8. The entry in the "stock" column against sector "electricity" is only a balancing residue, representing overestimation of electricity consumption in industries in the table as compared with the exact figures supplied by the Central Water and

Power Commission for all industries. In the case of other sectors, such a residue is shown in the column for "others". But in the case of electricity, we have a direct estimate of electricity consumed by "others" which corresponds to the category "commercial" of electricity consumption as provided in the statistical reports of the Central Water and Power Commission. It was desired to preserve intact this estimate of commercial consumption of electricity and therefore, the error due to overestimation of industrial consumption of electricity is shown in the blank space available in the row for stocks.

3.9. Residual sectors : household consumption construction and others

3.9.1. The entries into household consumption, "others" and the two modes of construction are made largely on the basis of the residual approach; that is, the left-over of total supply, after meeting all the other demands, were taken to be available for these four columns. Allocation as between the four columns was done by taking into account the nature of the supplies left over and the nature of demands represented by the columns. Notes for treatment of each sector with regard to these five residual columns are provided in the paragraphs below :

3.9.2. *Sector* 1 : A given proportion of the residue after deduction of government consumption from total output is allocated to "others" representing repairs and maintenance. Further details have been given in paragraph 3.8.2.

3.9.3. *Sectors* 3 *and* 4 : The residue is allotted to households and capital formation. The split is based upon the commodity composition of the sector's output and imports.

3.9.4. *Sector* 5 : The amount shown in columns 1 and 2 are based on the paper by Tiwari, Kumar and Kumar referred to in paragraph 3.8.2. The residue is shown in the household column. The split between urban and rural types of construction is made for this as for all other materials by assuming a fixed proportion (11%) for the rural part.

3.9.5. *Sector* 6 : The residue is found to be Rs. 235.8 crores. The amount going to the construction sectors is made equal to the amount shown by Tiwari, Kumar and Kumar by putting Rs. 4.1 crores in the "others" column.

3.9.6. *Sector* 8 : The only industrial consumption of cement, that in the sector "glass, wooden and non-metallic mineral products" is deducted from the total availability of cement and the residue divided between the urban and rural construction in fixed proportions.

3.9.7. *Sectors* 9 *and* 10 : Trade and transport deflators are worked out to yield balance between outflow and inflow and the amounts Rs. 1.0 crores and Rs. 1.2 crores representing rounding off errors are shown under "others".

3.9.8. *Sector* 11 : The entire residue is shown under household consumption. Some parts of the products (tea and coffee) would of course go to the catering services (restaurant, hotel etc.) under "others"; but no information is available on it.

3.9.9. *Sector* 12 : Rs. 18.3 crores represents residue of leather and Rs. 90.0 crores that of leather products. The latter is shown under households and the former under others.

3.9.10 *Sectors* 13, 14, 15, *and* 16 : The entire residual amount are shown under household consumption.

3.9.11. *Sector* 17 : The entire residual amount is allotted to "others".

3.9.12. *Sector* 18 : The residual amount is divided into two parts and allotted to households and "others", food items going into the former and non-food items to the latter.

3.9.13. *Sector* 19 : Residual amount is all shown under "others".

3.9.14. *Sector* 20 : The allocation to the construction sectorsis decided upon in such a way that the sum total of consumption of the products of sectors 20, 21, and 23 equal the amount shown in Tiwari, Kumar and Kumar under the category "other products". The residual part is shown under households.

3.9.15. *Sector* 21 : Residual of timber is shown under construction, that of miscellaneous forestry products under "others". Firewood has been ignored in our model, hence no entry under households.

3.9.16. *Sectors* 22 *and* 28 : Entries under household are based on the NSS consumption estimates. The residues are shown under "others". The entries in column (31) standing for total industrial consumption represent freight earnings.

3.9.17. *Sector* 23 : The entry under urban construction represents the total value of production of bitumen; that under "others" and household consumption, the total availability of kerosene plus residues after industrial consumption of other petroleum products. The flow analysis has been done on the basis of individual commodities.

3.9.18. *Sector* 25 : Consumer goods and residue of such goods as tyres and tubes are shown under household consumption whereas residue of other type of goods are shown under "others".

3.9.19. *Sector* 27 : The entire residue is shown under household consumption.

3.9.20. *Sectors* 29 *and* 30 : The flows into household consumption and "others" are based on direct information (see Section 3.4 and paragraphs 3.5.28 and 3.5.29 for sources); "others" for electricity represents "commercial" consumption of electricity; for coal it includes bunkers.

3.9.21. The value of output of the two construction sectors is made up by adding the material inputs arrived at by the method described in the paragraphs above to wages and salaries in the same proportion as in the paper by Tiwari, Kumar and Kumar.

3.10. Value added

3.10.1. Table 25 is deliberately left incomplete so that the accounting identity between gross domestic expenditure and gross domestic product with adjustments for import surplus and indirect taxes is not seen on the body of the table. As has been remarked earlier, completion of the table would require arbitrary assumptions being made regarding the residual groups of activities covered by the rows "industries not included elsewhere" and "trade transport and indirect taxes" and the column "others". The residual group includes services, trade, transport and indirect taxes. While the total incidence of indirect taxes is known, the same is not true of the output of either the trade or the transport sector.

3.10.2. It is, however, possible to leave a few gaps and all the same write out an accounting identity with the gaps shown. In the gross domestic expenditure components, we have estimates for gross fixed capital formation (Rs. 2278.0 crores) and government consumption (Rs. 1380.0 crores) at market prices. The estimate of "addition to stocks" at producers' prices is Rs. 231.1 crores. We can add to it Rs. 40.0 crores representing trade transport and indirect taxes margin (assuming roughly the same proportion for it as that holding for total intermediate consumption). We cannot, however, make any justifiable estimate of the consumption by households of the products of "industries not included elsewhere" (which includes services) nor of the trade, transport and indirect taxes margin on household consumption.

3.10.3. Let X stand for the (unknown) sum of these two. Then we can write as follows :

	Rs. crores
household consumption at market prices =	$7942.1+X$
government consumption at market prices =	1380.0
gross fixed capital formation at market prices =	2278.0
addition to stocks at market prices =	271.1
gross domestic expenditure (Z) at market prices	$11871.2+X$

3.10.4. The total value of output of the residual sectors, that is trade, transport other than railways and motor transport, and "industries not included elsewhere" plus "indirect taxes" may now be built up as follows; assuming that there is no self consumption of the sector "others" (that is, the entries into column 32 of rows 31 and 34 are zero).

receipts from sectors 1 to 30	468.3
	768.0
minus receipts by railways and motor transport	−165.0
	−278.0
receipts from households	X
receipts from government	185.3
	860.0
receipts from capital formation	270.0
	40.0
receipts from exports	7.3
	104.8
minus imports of the product "industries not included elsewhere"	−11.1
plus indirect taxes on import of petroleum products	33.6
	$2349.8+X$

3.10.5. Value added in the residual sector R plus indirect taxes may now be obtained as :

gross output of residual sector plus indirect taxes	$2349.8+X$
minus material input into the residual sector	-529.9
gross value added in residual sector plus indirect taxes $(R+I)$	$1819.9+X$

3.10.6. The estimate of gross value added (Y) plus indirect taxes (I) in the economy then is :

value added in sectors 1 to 30	9593.6
value added in the residual sector plus indirect taxes	$1819.9+X$
gross value added plus indirect taxes $(Y+I)$	$11413.5+X$

3.10.7. We may now arrive at the gross domestic expenditure from the income angle by adding to the above the surplus of imports (c.i.f.) over exports (f.o.b.).

gross value added plus indirect taxes	$11413.5+X$
import (c.i.f.)	1090.5
export (f.o.b.)	-632.9
gross domestic expenditure (Z)	$11871.1+X$

3.10.8. For different values of X there will be different values of Z, Y and R. Hence it is not possible to make independent assumptions about them. Our inter-industry table may be completed by making a single assumption about gross value added or gross domestic expenditure, or household consumption of the products of the residual sector, but not by making more than one assumption at the same time.

3.11. Trade and transport margins

3.11.1. In preparing the inter-industry table we have had to use some basic data that were expressed in market prices and we had the problem of changing them over to producer's price units. This problem arose for most of the current inputs as well as for exports. The problem naturally did not arise for such cases where direct estimates were available both of flows in physical units and of producer's prices. As for instance, in the case of electricity its sale to different categories of consumers and the differential prices charged are both known.

3.11.2. The problem was tackled by calculating a series of price deflators defined as follows :

$$1+m = \frac{\text{purchasers' price}}{\text{producers' price}}$$

and dividing values expressed in purchasers' prices by the factor $(1+m)$. Care was taken to take account of the fact that quite often the factor would vary according to the purchaser. Thus, the price paid by the railways for coal is different from that paid by industries; the price paid by steel mills for iron ore is different from the f.o.b. price paid by foreign importers. In some sectors its own products for self input would have a deflation ratio of zero or in any case lower than what it would be when purchased by other sectors; for some other sectors the ratio would be the same in the two cases.

3.11.3. The deflators actually used by us are presented in Table 21 with brief indications about their bases. For homogeneous commodities with fixed prices like coal, cement and electricity, the ratios are exact. But for the more heterogenous sectors the notion is difficult even conceptually, for the ratio has to be some kind of a weighted average of different prices for the same commodity. It is to be remembered that price data show very great variations even for the same commodity, from market to market and week to week, and adequate statistics do not exist either for the prices or for the quantity weights to be associated with them. We have worked out ratios for ourselves for some of the more homogeneous sectors and consulted the ratios used in the preparation of other inter-industry tables (e.g. the 1955 table of the ISI; the 1959 table of the Planning Commission) and in any situation of doubt or scanty knowledge we have taken full freedom in setting a figure for the deflation ratio that would ensure input-output balance in the inter-industry table. This method works quite satisfactorily when we can make an independent estimate of the total inflow at market price and outflow at producer's price. However, whenever some of the products goes to households, and we have no direct estimate of how much, we cannot determine the deflation ratio in a unique fashion by matching the outflow and inflow. In such cases, we had to determine the ratio so as to leave a residue for household or "others" consumption that appeared plausible. While we did not take the NSS estimates of household consumption for filling up column 33 we did consult it at every stage to satisfy ourselves that the entries made by us in the column were plausible.

3.11.4. It may be noted in this connection that as we did not make use of any household consumption data we did not require any deflator applicable to retail prices. It is to be emphasised that the ratios presented in Table 21 are applicable to wholesale prices and also only to specific purchasers, and they may not be used as general purpose indices and in particular not in relation to household consumer goods. Not only the prices of individual commodities are different for different purchasers, the commodity composition of the purchases by different purchasers from the same sector would also be extremely different. Thus, there cannot be the same price deflator for the exports and household consumption of agricultural products.

TABLE 21. TRADE AND TRANSPORT DEFLATORS

sector	category of purchaser	price deflator for trade and transport margin	sources for deflators
(1)	(2)	(3)	(4)
3. electrical equipment	all industries and export	1.43	"Estimates of Gross Capital Formation in India—1961" Central Statistical Organization Government of India.
4. transport equipment	all industries and export	1.43	same as for (3)
5. non-electrical equipment	all industries and export	1.43	same as for (3)
6. iron and steel	all industries and export	1.50	same as for (3)
7. iron ore	other industries exports	3.00 6.92	based on actual prices paid by industrial and foreign buyers.
8. cement	other industries and export	2.00	same as for (3)
9. other metals	all industries and export	1.20	based on the value of output and import, and the value of export and industrial consumption; both estimated independently.
10. other minerals	other industries and export	1.30	same as for (9)
11. plantations	other industries and export	1.10	based on wholesale producers' margin of NSS.
12. leather and leather products	all industries and export	1.10	same as for (9), leaving a plausible residue for households.
13. animal husbandry	other industries and export	1.30	same as for (12)
14. food industries	all industries and export	1.35	same as for (12)
15. foodgrains	self other industries and export	1.00 1.05	 same as for (12)
16. cotton and other textiles	all industries and export	1.35	same as for (12)
17. jute textiles	all industries and export	1.15	same as for (9)
18. other agriculture	self other industries and export	1.00 1.05	same as for (12)
19. chemical fertilizers	plantations and agriculture	1.25	same as for (9)
20. glass, wooden, etc. products	all industries and export	1.25	same as for (3)
21. forestry products	other industries and exports	1.33	same as for (3)
25. rubber products	all industries and export	1.15	same as for (12)
26. rubber	other industries	1.25	same as for (9)
27. chemicals	all industries and export	1.15	same as for (12)

TABLE 21 (*Contd.*). TRADE AND TRANSPORT DEFLATORS

sector	category of purchaser	price deflator for trade and transport margin	sources for deflators
(1)	(2)	(3)	(4)
29. electricity			based on actual prices charged.
	other industries	0.73	
	railways	0.60	
	agriculture	0.91	
	households and others*	2.19	
30. coal	self	1.00	same as for (29)
	other industries and export	1.80	
	railways	1.40	

*Commercial consumption of power.

3.12. Price adjustments

3.12.1. All our calculations are done in the prices of 1959-60 whereas we had often to make use of data expressed in prices of other years. It was therefore, necessary to have a set of indices for effecting price conversions for non-homogeneous commodity groups. For homogeneous commodities like coal, electricity, cement etc. we could, of course, revalue them by multiplying quantity figures by the actual prices prevailing in 1959-60. We had by and large to fall back upon the wholesale price indices as published by the Directorate of Economics and Statistics in *Index Number of Wholesale Prices in India—Annual Number* 1962. These refer to consumer commodities and have 1952-53 as base. Suitable groups were taken of these commodities and fresh indices worked out with 1959-60 as base. The use of wholesale price indices for retail prices (when making use of them for adjusting household demand as explained in Section 3.16) is not very grave; but much more serious is the use of the same set of price indices with respect to commodities destined to household consumption, government consumption, exports or even capital formation. However, there was not much we could do about overcoming this drawback as we could not undertake the preparation of a fresh series of price indices for the purpose of the model from raw price data.

3.12.2. We had also to have an index number for construction, urban and industrial, and this we derived by using the two series of estimates of construction provided in the "Estimates of Capital Formation in India for 1950-51 to 1961-62" by Tiwari, Kumar and Kumar of the CSO, one at current prices and the other at the constant prices of 1960-61.

IIIB : PARAMETERS — 1970-71

3.13. Constants and coefficients

3.13.1. The parameters of the model are the following coefficients : current account output or input coefficients a_{ij} valid for 1970-71; capital output ratios b_{ij} valid for the period 1960-61 to 1970-71; import coefficients c_{ij} valid for 1970-71; and the following constants: the base year levels of output x_j^0; the exogenously determined components of final demand for 1970-71. Of these, the base year output levels have already been discussed from the point of view of estimation. We have now to present and discuss the other items.

3.13.2. All the coefficients of the model find place in the matrix of detached coefficients presented in Table 27. The current input coefficients of this table are different from those of the matrix of Table 26 in many ways. Firstly, in Table 26 they are expressed in market prices whereas the coefficients in Table 27 are measured in producers' prices. Secondly, some substantive changes have been made in certain coefficients to take account of anticipated or planned technological changes. Thirdly, in the matrix for 1960-61 the coefficients stand strictly for input to output ratios whereas Table 27 stands for the matrix of detached coefficients derived from the technological coefficients matrix valid for 1970-71. Further explanations are given below in Section 3.14.

3.13.3. The notion of import coefficients has been explained earlier in paragraph 1.5.4. The numerical values of the coefficients are provided in Table 28b. These values are mostly based on the targets for production and import as set in the "Notes on Perspective of Development 1960-61—1975-76" of the Perspective Planning Division of the Planning Commission.

3.13.4. The capital-output ratios used by us have been independently estimated by us for the purpose of the model. They find place in the rows 31 to 34 and columns 1 to 30 of the matrix of Table 27. Detailed explanations about the way they have been estimated are provided in Section 3.15.

3.13.5. Among the constants, apart from the base year levels of output, we have household consumption, government consumption, exports, exogenously determined items of imports and the exogenously treated part of capital formation. We also have predetermined levels of output for the sectors crude oil and plantation (and reclaimed) rubber. The way all these constants get compounded to yield the right hand side constants of the equation system is shown in Table 31. Projections of household consumption for 1970-71 are explained in Section 3.16. Those of government consumption, exports and the exogenously determined part of capital formation are commented upon in Section 3.17.

3.14. Matrix of detached coefficients

3.14.1. In transferring the equations into a convenient format for electronic computation, the terms have been rearranged so that all unknowns appear on the left hand side giving rise to the matrix of detached coefficients of Table 27, and all constants appear on the right hand side (Table 29). The convention on algebraic signs is one which minimizes the use of negative signs in the computer's input data.

3.14.2. Wherever the above system contains more than one activity for producing a specified commodity, the choice between activities is specified exogenously. Examples : (a) machinery imports are taken to be a predetermined fraction of domestic machinery output ; (b) the electric power activity (29 a, b) refers to a mix of thermal and hydro in predetermined proportions of 60% and 40% respectively for 1970-71 ; (c) in the case of crude oil, the absolute level of domestic output is predetermined, and imports are taken to be whatever is needed to fill the gap between the demand and the domestic output.

3.14.3. In rows 1-30 of the matrix, the *diagonal* coefficients consist of the sum of four elements. A detailed breakdown of these four components is included in Table 28a.

3.14.4. In row 35 of the matrix the foreign exchange costs include both "competitive" and "non-competitive" imports. A detailed breakdown by sector-of-origin of these imports is included in Table 28b.

3.14.5. In Table 27 the rail transport requirements are each related to the industry *producing* the commodity. For example, in column 7 (iron ore), row 28 (railways) there is a coefficient of 1.551. This means that for each crore's worth of iron ore in producers' prices at the pithead, there will be 1.557 crore's worth of railway services required to get the iron ore to the consumer. This treatment of transportation is of course inconsistent with the convention of charging up all inputs to the *consuming* sector. However, it is a necessity enforced by the available sources of data on commodity transport.

3.14.6. In predicting the output of the motor transport sector, we have assumed that this will be 108% of the rail sector's output in 1970-71. This is accomplished within the matrix by setting the entry of row 22, column 28 at the value of 1.080. This coefficient is not therefore to be interpreted literally as a purchase of motor transport by the railway sector.

3.14.7. In order to reflect technological change, some major revisions in the coefficients were made between the 1960-61 and 1970-71 matrices. For example, the input norm of electricity into "other metals" was increased from .019 to .147. (Compare Table 27, column 9, row 29 with the corresponding cell in Table 26.) This reflects an anticipated change in the product-mix : away from rolling and drawing imported copper ingots and toward domestic aluminium production. The latter process consumes far more electricity per unit of output than does the former.

3.14.8. In converting the 1960-61 matrix to 1970-71, only a few increases were made in the norms of chemical inputs to other sectors. As a result, it is believed that the model seriously underestimates the 1970-71 domestic output of chemicals, the investment in this branch, and also the imports. For example, no allowance is made for the consumption of plastics, synthetic fibres, and certain other petrochemicals, whose 1970-71 output is estimated to be of the order of Rs. 200 crores.

3.14.9. Except for five rows, all others are measured in domestic producers' prices. In rows 22, 23, 28 and 29, market prices are used. Row 35 refers to foreign exchange costs (f.o.b Indian ports).

3.14.10. *Columns* 1–30 (normalized per unit of gross annual domestic production).

(a) *Rows* 1–30 : Off diagonal coefficients refer to current account inputs. The diagonal coefficients summarize the net effect of the following elements. (Details in Table 28a)

one unit of gross domestic production less intra-industry current account inputs less .04 for inventory investment (does not apply to production of services) plus addition to total supply from foreign exchange expenditure on "competitive" imports.

(b) *Rows* 31–34 : These are capital account inputs per unit of gross annual domestic production. The coefficients are identical with those shown in Table 28a.

(c) *Row* 35 : These are foreign exchange costs associated with the production of one unit of gross domestic output. Includes both "competitive" and "non-competitive" imports. (Details in Table 28b).

Columns 31–34 : These are normalized per unit of gross investment required for the output increases taking place over the decade. The diagonal coefficients are therefore 1.000. The coefficients in rows 1-5 are ·170, the stock-flow conversion factors. The conversion factors shown for column 33 (equipment excluding transport) are derived by supposing that 25% of this category is electrical equipment (row 3), and the balance is non-electrical (row 5).

Column 35 : This unit vector is normalized so as to measure the deficit in the balance of payments on merchandise account during 1970-71.

3.15. Fixed capital coefficients

3.15.1. Following components of the fixed capital coefficients for each of the 30 sectors of the model have been worked out :

(1) equipment, excluding transport/total output,

(2) equipment, transport/total output,

(3) construction, urban and industrial/total output, and

(4) construction, rural/total output.

Corresponding to the components (1), (2) and (3) the replacement requirements over the decade 1960-61 to 1970-71 have also been estimated for all the 30 sectors (see Section 3.17). As to component (4), it is assumed that the notion of replacement has no relevance in relation to it. The first three terms correspond to the notion of net investment whereas the fourth to that of gross investment.

3.15.2. The relevant data have been taken from the numerous studies (mimeographed or otherwise) released or undertaken by the various official and non-official agencies. Among these agencies are : the Perspective Planning Division, Industry Division and Agriculture Division of the Planning Commission, Planning Unit of the Indian Statistical Institute, Central Statistical Organisation, Development Wing of the Ministry of Commerce and Industry, and the Reserve Bank of India.

3.15.3. It was not too infrequent when no detailed explanation was available to substantiate the data given by the above mentioned agencies. Naturally, in all such cases one had to use one's own judgement. Hence, the assumptions and limitations detailed below should not be taken too rigorously. They simply point out the general nature of the assumptions made while conducting this study. No primary study, viz., conducting a fresh inquiry or special tabulation was envisaged for this purpose.

3.15.4. All coefficients are incremental (or marginal) rather than average. They represent the value of investment directly required per unit of additional output. The value of output includes both value added and inputs from other sectors. It is direct, tangible and total. Although capacity-equivalent output is a more meaningful concept than actual output in the context of working out capital coefficients, the former has not been used as it is more difficult to estimate.

3.15.5. The first three components of fixed investment/capital coefficients are net rather than gross; replacement requirements are worked out separately and were not considered while working out these coefficients. Thus in order to arrive at the gross fixed investment during a period, one has to add these replacement requirements to the fixed investment implied by the coefficients and the increment in total output.

3.15.6. Both coefficients and replacement requirements are worked out at 1959-60 or 1959 (producer's) prices. Original data are, of course, in market (or purchaser's) prices which include erection or installation cost, and expenditure on engineering, architectural, legal and other services, besides the producer's cost, indirect taxes and the trade and transport margin. According to our scheme, the construction component is inclusive of the expenses on installation, engineering, architectural, legal and other services, but exclusive of housing. Thus the market price data were netted only for indirect taxes (which are nominal on capital goods) and the trade and transport margin. All fixed assets other than plant, machinery and equipment form part of construction.

3.15.7. The split between urban and industrial construction and rural construction is according to the nature of the construction rather than its location in urban, industrial or rural area. In other words, the input requirements of the materials like iron and steel, cement, glass, timber, etc. are relatively much less in rural construction than those in urban and industrial construction. The component "equipment, excluding transport" is inclusive of the value of motor vehicles in all the sectors except in the two transport sectors, viz., railways and motor transport.

3.15.8. The term "replacement" means precisely that. Obviously, it differs from the accountant's term "depreciation".

3.15.9. Some of the major assumptions and limitations relating to our estimates are given below.

(1) The capital per unit of output is measured under steady-state conditions i.e., after "teething troubles" in production have been overcome.

(2) No significant change is assumed in the existing practice of "number of shifts per day", "average duration of a shift" and "number of working days in a year".

(3) The coefficients are representative of new units and expansions for the entire sector, irrespective of any change in size-composition, location, technology, management, etc.

(4) The output of a sector refers to the change in the total value of the product-mix of that sector between the terminal year (1970-71) and the base year (1960-61). In this respect perhaps no sector except generation and transmission of "hydro" and "thermo" electricity, iron ore, cement, and synthetic rubber has a strictly homogeneous product. It is to be remembered that the composition of the incremental product of a non-homogeneous sector would be different from its product composition at the beginning or at the end of the incremental period.

(5) Paucity of data did not permit us to follow rigorously the industrial classification adopted in the current flow matrix.

(6) In principle, both output and investment are estimated at 1959-60 or 1959 producers' ex-factory, pit head, or wholesale prices during the harvest season. But use of these uniform prices was frequently limited owing to their non-availability. It is particularly true for the deflation of reported capital expenditure.

(7) Some coefficients have been derived from data pertaining only to the Fourth Plan proposals.

(8) Given the same degree of ignorance, a higher value of a capital coefficient was chosen, mainly to offset the general tendency of underestimating it in the country.

(9) The distinction between market price and producers' price is made only for the equipment components and not for the construction components.

(10) Rural construction is assumed to require no construction machinery.

(11) For housing, roads, education and research, etc., replacement is already included in the term "exogenous gross fixed investment".

(12) Estimates of the replacement requirements are invariably weaker than of the corresponding capital coefficients. Further, its components are still weaker than the total. However, since one is interested only in the components of the grand total of replacement requirement for the entire economy, the relative margin of error would be much less than that for an individual sector.

(13) The scope and coverage of gross or net fixed capital formation as well as of output may vary from sector to sector depending upon the sources of data. In the manufacturing industries, both the organized and the small-scale sectors of production have been included. Coverage of the latter is by no means satisfactory.

(14) The reliability of the capital coefficients or replacement requirements also vary from sector to sector.

(15) Outside motor transport industry, it was not possible to estimate the cost of motor vehicles in fixed investment. For these sectors, it is believed to be approximately 3% of the total "equipment, excluding transport", and is included in it.

(16) All the fixed capital coefficients are supposed to be exclusive of investment in housing, since the latter is an exogenous activity in the model.

(17) These capital coefficients include an allowance for self-generating electric power plants.

(18) The capital coefficient worked out for the agriculture group on the basis of our experience in the Second Plan, anticipation in the Third Plan, and projections, made by Perspective Planning Division, for the Fourth Plan was considered to be low, and so was replaced by the number 1.5 (fixed capital to total output ratio). The identical ratio is applied to all sectors within this group, including animal husbandry, fishery, and forestry.

(19) Most of the coefficients are based either on project reports or on proposals made by various working groups for the Fourth Plan, or on other statistics pertaining to the recent experience in organised manufacturing industries in our country. Occasionally resort was made to the use of balance sheet data, suitably smoothed over time.

(20) The sectors "petroleum products" and "electricity" cover not only the activity of production but also that of distribution. Rural electrification is, however, not considered to constitute a cost-component of the electricity sector. It is treated as a part of government expenditure.

3.15.10. The main steps in arriving at the required fixed capital coefficient and its components at the 1959-60 producer's prices were as follows :

(a) Estimate the fixed capital coefficient at market prices.

(b) Adjust the above coefficient to 1959 or 1959-60 prices.

(c) Work out the share of installed plant and machinery component in fixed capital coefficient (b).

(d) Work out the ratio of ex-factory/c.i.f. cost of plant and machinery to its installed cost.

(e) Apply the above ratio (d) to (c) in order to get the share of ex-factory/c.i.f. cost of plant and machinery in fixed investment at market prices.

(f) Obtain the construction component as a residual by substracting (e) from (b).

(g) Subtract the trade and transport margin and indirect taxes on the plant and machinery component (c) from the construction component (f).

(h) Add (e) and (g) in order to get the fixed capital coefficient at 1959-60 producer's prices.

3.15.11. The fixed investment, particularly in the case of coal, iron ore and manufacturing industries have been worked out as the weighted average of the increments in the installed capacity in the new units and the substantial expansion of the existing units, either during the period of the Third and Fourth Plans, or during the Fourth Plan alone when the Third Plan data were not available. In certain cases, these coefficients are nothing more than norms generally used for such purposes.

3.15.12. Almost all relevant data are available in market rather than producers' prices. Adjustment made for the trade and transport margin and indirect taxes on the equipment components of the fixed capital coefficient to reduce them to the producers' prices was largely arbitrary. The deduction made was 20% of market price (25% of producers' price) in the case of motor vehicles, 7.5% to 25% in other cases depending upon :

(a) the rough extent of indirect taxes—custom duty, excise duty, sales tax, etc.,

(b) whether imported on an actual user's licence or otherwise,

(c) whether imported or purchased by the government in bulk, and

(d) any other relevant consideration.

3.15.13. The capital-output ratios estimated by us are to be found in the rows 31, 32, 33 and 34 of Table 27 excepting those for crude oil, hydro-electricity and thermal-electricity. The coefficient for crude oil does not find a place in the matrix as this sector's output is treated exogenously. As to the coefficients for the two electricity sectors, their weighted average is included in Table 27. The table below gives the capital output ratios for these three sectors:

	sector	fixed capital coefficients		
		total	construction, industrial and urban	equipment excluding transport
(1)	(2)	(3)	(4)	(5)
24.	crude oil	6.87	4.00	2.87
29a.	thermal-electricity	5.75	2.80	2.95
29b.	hydro-electricity	6.70	4.80	1.90

The weights assumed for thermal- and hydro-electricity are .57 and .43 respectively which are the same as is assumed by the Perspective Planning Division in its projections.

3.16. PROJECTIONS OF HOUSEHOLD CONSUMPTION

3.16.1. The 1970-71 projections are obtained by applying certain multipliers to the components of household consumption for 1960-61 as in the inter-industry table (Table 25).

3.16.2. These multipliers are based upon certain specific assumptions with respect to the 1970-71 composition of households ; the urban-rural split and the degree of inequality with respect to expenditures. It is assumed that in 1970-71 a household will distribute its spending among items in the same way as was reported for urban and rural households at different expenditure levels in the National Sample Survey (NSS), 13th round, June 1957 to May 1958.

3.16.3 The NSS data provide details of expenditure on a large number of commodities, in rupees per capita per month, for different population groups. For some of the commodities, the classification of population is done according to per capita expenditure levels; and for some others, the classification is according to household expenditure levels. But in the latter case also the expenditure is available in rupees per capita per month.

3.16.4. The data are given separately for rural and urban areas. These were pooled together for each of the per capita expenditure classes by using appropriate population weights. Using these data one could draw Engel curves and the consumption of different items at various per capita expenditure levels could be easily read off.

3.16.5. It was found that the lognormal distribution gave a good fit to the 1957-58 distribution of population by total per capita expenditure levels. The value of the Lorenz ratio from the fitted distribution was found to be 0.33. It appeared reasonable to assume that the lognormal distribution would adequately represent the expenditure distribution for the year 1960-61, the concentration ratio remaining the same.

3.16.6. The overall per capita expenditure in 1960-61, obtained from the National Income White Paper, was first scaled down by means of a consumer price index, to 1957-58 price levels. The expenditure distribution was then obtained and represented in fractile groups of population, giving the per capita monthly expenditure for each class. Assuming that the consumption pattern for 1960-61 was the same as for 1957-58 and using the demand curves at 1960-61 expenditure levels, the total expenditures on the different items of consumption were obtained.

3.16.7. The total consumption expenditure according to the aggregate projections A and B for 1970-71 at 1960-61 prices were first expressed in rupees per capita per month and then scaled down to 1957-58 price levels by using the same consumer price index as before. The breakdown of this total expenditure into the commodity groups was accomplished on the basis of the following three assumptions :

(i) the distribution of population by per capita expenditure levels will be of the lognormal form in 1970-71;

(ii) the inequality coefficient will be reduced purposely over the decade to 0.28 from the 1957-58 level of 0.33;

(iii) the demand curves for the commodities will remain the same in 1970-71 as in 1957-58.

3.16.8. Under these assumptions the average expenditures in 1970-71 of the population deciles were obtained. By reading off the demand curves at these expenditure levels, the expenditure on the different commodities were obtained for each class. Multiplying by the corresponding population and adding up for the whole year, the total annual expenditures were obtained.

3.16.9. The demands as obtained above from the NSS based demand curves were at 1957-58 prices. They were all inflated by means of price indices (see Section 3.12 for further particulars) and were expressed in terms of the 1959-60 price levels. The results for projection A are presented in Table 22.

3.16.10. Up to this stage the demand projections are made according to the NSS classification of the commodity groups. A regrouping had, therefore, to be done to make the groups conform broadly to the 30 sectors of the model. This necessitated a further break-down of some of the NSS commodity groups into their components. The necessary information was also obtained from the NSS report. As for instance, the report gives the cash expenditure on electricity, coal and coke, kerosene and matches, which are some of the components of the 'fuel and light' group. The percentage break-down of the 'fuel and light' group so obtained was assumed to hold for 1960-61 as well as for 1970-71.

3.16.11. The estimates of consumption in 1960-61 as obtained from the NSS, however, have not been used in the construction of the inter-industry table. (In particular, the NSS estimate of expenditure on foodgrains exceeds by a large margin that obtained from the production figures.) The device adopted was to work out indices of growth of consumption for the decade applicable to the estimates of consumption in 1960-61 as given in the inter-industry table. Table 23 shows the 11 commodity classes into which the NSS commodity groups were rearranged. As explained above the regrouping was done to achieve conformity with the sector-classification adopted for the inter-industry table. For example, the chemicals group consists of (i) matches from the fuel and light group of NSS; (ii) washing soap from sundry goods; (iii) toilet soap and hair lotions from the toilets group and (iv) medicines.

3.16.12. Table 24 shows the actual multipliers which were used for the projections and the particular group indices on which they are based. For some sectors the indices have been raised to allow for substitution effect. For sectors 3,4 and 5 the equipment multiplier of Table 23 has been raised from 2 to 3.5, 3 and 2.5 respectively. For petroleum products, the multiplier of the fuel and light group, viz. 1.6, was upgraded to 3 to take into account increased use of kerosene to replace cowdung, and to cover the demand for motor spirit. Electricity multiplier was also similarly obtained.

TABLE 22. DEMAND PROJECTIONS (NSS COMMODITY CLASSIFICATION)

(in Rs. crores at 1959-60 prices)

	demand in 1960-61	demand in 1970-71	per cent growth
(1)	(2)	(3)	(4)
1. foodgrains	4318.6	6253.8	144.8
2. edible oils	330.4	552.1	167.1
3. sugar	487.5	845.8	173.5
4. milk and milk products	1138.3	2083.8	183.1
5. meat eggs and fish	397.1	682.0	171.7
6. vegetables and fruits	467.2	773.8	165.6
7. salt	20.7	26.6	128.5
8. spices	368.2	535.7	145.5
9. beverages	414.3	626.1	151.1
10. clothing	1092.6	2009.0	183.9
11. fuel and light	718.5	1119.7	155.8
12. conveyance	226.1	419.2	185.4
13. toilets	128.7	215.8	167.7
14. furniture	21.2	42.9	202.4
15. domestic utensils	63.5	125.2	197.2
16. other durables (including ornaments)	394.9	843.1	213.5
17. sundry goods (including washing soap)	122.1	211.8	173.5
18. pan etc.	112.4	180.8	160.9
19. tobacco	222.7	328.4	147.5
20. drugs and intoxicants	64.4	109.4	169.4
21. medicines	221.4	414.2	187.1
22. others (residual)	1313.2	2945.2	224.3
total	12644.0	21344.0	

TABLE 23. INDICES FOR REGROUPED COMMODITY CLASSES

(demand in Rs. crores at 1959-60 prices)

	commodity classes	demand in 1960-61	demand in 1970-71	index
(1)	(2)	(3)	(4)	(5)
1.	*equipment*	306	617	201.6
	1.1 furniture	21	43	—
	1.2 domestic utensils	64	125	—
	1.3 other durables (excluding ornaments)	168	357	—
	1.4 sundry goods (excl. washing soap)	53	92	—
2.	beverages (tea and coffee only)	93	141	151.1
3.	foot wear	111	237	213.5
4.	animal husbandry products	1535	2766	180.2
	4.1 milk and milk products	1138	2084	—
	4.2 meat eggs and fish	397	682	—
5.	*food products*	1447	2347	162.1
	5.1 edible oil	330	552	—
	5.2 sugar	488	846	—
	5.3 salt	21	27	—
	5.4 refreshments and beverages (excluding tea and coffee)	321	485	—
	5.5 tobacco	223	328	—
	5.6 drugs and intoxicates	64	109	—
6.	foodgrains	4319	6254	144.8
7.	cotton and other textiles	1093	2009	183.9
8.	*other agricultural products*	947	1491	157.3
	8.1 vegetables and fruits	467	774	—
	8.2 spices	368	536	—
	8.3 pan etc.	112	181	—
9.	conveyance	226	419	185.4
10.	fuel and light	718	1120	155.6
11.	*chemicals*	414	738	178.3
	11.1 matches	29	45	—
	11.2 soap-washing	69	120	—
	11.3 soap-toilet	22	37	—
	11.4 medicines etc.	221	414	—
	11.5 hair lotions etc.	73	122	—

TABLE 24. MULTIPLIERS ACTUALLY USED FOR PROJECTION A

sector code/name	multiplier	based on groups of Table 2
3. electrical equipment	3.50	1
4. transport equipment	3.00	1
5. non-electrical equipment	2.50	1
11. plantations (tea and coffee)	1.55	2
12. leather and leather products	2.14	3
13. animal husbandry	1.80	4
14. food industries	1.60	5
15. food grains	1.45	6
16. cotton and other textiles	1.84	7
18. other agriculture	1.55	8
20. glass, wooden etc. products	2.00	1
23. petroleum products	3.00	10
25. rubber products	2.00	3 and 9
27. chemicals	1.78	11
28. railways	1.65	9
29. electricity	2.00	10
30. coal and coke	1.50	10

3.17. Other final demand projections

3.17.1. The Committee for Studies on Economic Development in India and Japan, Indian Statistical Institute, in its study titled "India's Export Trade in Agricultural Commodities" gives projections of the volume of exports expected of all the principal agricultural commodities of India during 1970-71. These projections were in general made in two steps. The first step was to estimate the possible world import demand for these commodities by 1970-71. For this purpose the estimates of world demand as presented by the FAO and other agencies were made use of. The second step was to arrive at the Indian share in world import demand by 1970-71 by studying the trends of Indian export. These export projections are in quantities. They have been translated to value at 1959-60 prices and allocated to our sectors.

3.17.2. There were no readily available export projections for non-industrial goods. The ones used in our model have been worked out by us on lines similar to those followed by the above mentioned committee for agricultural products, but naturally in a much more hurried fashion. They are, therefore, even less dependable.

3.17.3. For government consumption, the total expenditure on current consumption was taken from the Perspective Planning Division projections. It was then broken up in its sectoral components by using the same proportions as in the inter-industry table for 1960-61. Our assumption therefore, is that the commodity composition of government current consumption will remain the same in the terminal year of the plan as in the base year.

3.17.4. We have allowed, on the basis of the present pattern of imports, for certain fixed small amounts of non-competitive imports of consumer goods. They are distributed among the sectors: foodgrains (15), other agriculture (18), animal husbandry (13), cotton textiles (16), glass, wooden etc. products (20) and forestry products (21). They are partly luxury goods, partly various food items imported from neighbouring countries and partly industrial raw materials serving various miscellaneous industries. It was not considered correct to eliminate these completely nor did we have any means of treating them endogenously. These amounts are shown in Table 31.

3.17.5. Exogenous treatment of capital formation concerns replacement requirements for all the 30 sectors of our model and the entire volume of capital formation in all the sectors left out of our model. The latter is dealt with in a very rough fashion. Capital formation in these sectors during the base year and its break-up in their component categories are estimated and simply increased to a certain over-all level, keeping the proportions fixed. The quantities so arrived at are shown in Table 29.

3.17.6. The replacement requirements of each sector were set equal to a rough estimate of the investment in the periods (1965-t) and (1970-t) where t is the expected life of the capital goods in question. In most cases, the expected life of machinery was taken as 15 years and that of the buildings and other construction as 30 years. It was further assumed that the replacement during the two five-year plan periods ending 1965-66 and 1970-71 respectively is four times the replacement in the terminal years. The results of this exercise are presented in Table 30. These estimates of the components of gross fixed capital formation required for replacement are added to the fixed capital requirements of sectors not covered by our model in Table 29 and the way they are taken into account in the equation system as constants of the right hand side is shown in Table 31.

TABLE 25. INTER-INDUSTRY TRANSACTIONS (INDIA) 1960-61
(1959-60 producers' price; Rs. crores)

producing sector \ absorbing sector	construction urban & industrial	construction rural	electrical equipment	transport equipment	non-electrical equipment	iron and steel	iron ore	cement	other metals	other minerals	plantations	leather and leather products	animal husbandry
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. construction, urban and industrial													
2. construction, rural													
3. electrical equipment			2.3	0.6	1.6	1.0							
4. transport equipment				7.0									
5. non-electrical equipment	23.0	3.0	6.0	1.0	6.0	2.7	0.2			1.1			
6. iron and steel	214.0	26.0	4.0	22.0	71.0	43.0							
7. iron ore						5.0							
8. cement	44.0	5.4											
9. other metals			10.0	3.0	44.0	12.0			8.3				
10. other minerals			0.3			6.7		5.7	5.4				
11. plantations													
12. leather and leather products			0.3							0.2		46.0	
13. animal husbandry												42.0	
14. food industries												2.0	55.0
15. food grains													97.0
16. cotton and other textiles			0.3										
17. jute textiles			0.5	0.4		0.6		7.8			1.0	0.2	
18. other agriculture													
19. chemical fertilizers											6.3		
20. glass, wooden, and non-metallic mineral products	280.0	35.0	2.1	0.6	1.0		0.1			0.3	3.3		
21. forestry products	61.3	7.6	10.5	11.0					0.1			9.0	
22. motor transport													
23. petroleum products	13.5		0.8	2.0	1.0	2.4		0.3	0.3		0.4	0.6	
24. crude oil													
25. rubber products			0.3	8.0	0.1								
26. rubber													
27. chemicals			2.8	4.4	5.2	6.0			0.4		1.6	12.0	19.0
28. railways													
29. electricity			1.5	3.0	4.0	6.0	0.1	3.1	0.6	0.8	0.2	1.3	
30. coal			0.1	0.4	2.5	11.4		5.8	0.4		0.6	0.2	
31. industries not included elsewhere			40.0	27.0	27.5	14.3	0.3	3.7	0.1	1.7	11.4	5.5	
32. total, rows 1-31	635.8	77.0	71.8	90.4	163.0	111.7	0.7	26.4	15.7	4.1	24.8	118.8	171.0
33. value added	314.4	308.7	45.4	90.6	129.7	110.8	7.0	19.5	12.8	40.8	168.0	47.3	932.0
34. trade, transport and indirect taxes	250.8	30.3	8.8	20.0	49.9	46.5	0.1	6.7	3.5	0.5	3.2	22.9	27.0
35. value of output	1201.0	416.0	126.0	201.0	343.5	269.0	7.8	52.6	32.0	45.4	196.0	189.0	1130.0

TABLE 25 (Contd.). INTER-INDUSTRY TRANSACTIONS (INDIA) 1960-61
(1959-60 producers' price ; Rs. crores)

producing sector \ absorbing sector	food industries	food grains	cotton and other textiles	jute textiles	other agriculture	chemical fertilizers	glass, wooden and non-metallic mineral products	forestry products	motor transport	petroleum products	crude oil	rubber products	rubber
	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
1. construction, urban and industrial													
2. construction, rural													
3. electrical equipment													
4. transport equipment													
5. non-electrical equipment	6.6			0.5			1.2			7.7		0.3	
6. iron and steel													
7. iron ore													
8. cement							3.2						
9. other metals													
10. other minerals							6.0						
11. plantations												15.5	
12. leather and leather products			4.0										
13. animal husbandry	16.4		10.0										
14. food industries	48.4		5.6										
15. food grains	23.0	421.0											
16. cotton and other textiles			18.0	0.4			0.4					7.0	
17. jute textiles	6.6	2.9	3.9	3.0		0.9							
18. other agriculture	772.0	2.7	300.0	61.0	84.0								
19. chemical fertilizers		15.0			9.0								
20. glass, wooden, and non-metallic minerals products	0.9		6.4				8.4						
21. forestry products							59.0						
22. motor transports													
23. petroleum products	4.5	11.9	7.2	0.3	6.3	0.1	10.0		104.1	0.1		0.1	
24. crude oil										43.6			
25. rubber products									16.8			0.7	
26. rubber	7.3	3.8	34.0	2.9	2.1	4.2	26.0			1.2		1.4	
27. chemicals												4.4	
28. railways													
29. electricity	5.8	5.6	22.0	3.5	2.2	0.3	7.0			2.4		0.8	
30. coal	2.9	0.4	6.4	0.5		1.2	6.4					0.1	
31. industries not included elsewhere	90.0	8.9	72.0	6.0		3.1	30.0	9.0	28.8	25.0	0.3	5.0	
32. total, rows 1-31	984.4	472.2	489.5	78.1	103.6	9.8	106.6	9.0	149.7	80.6	0.3	35.3	
33. value added	271.2	3489.0	277.0	48.6	1992.0	9.2	108.0	171.0	172.9	55.6	2.9	24.7	
34. trade, transport and indirect taxes	67.4	12.8	33.5	3.3	1.4	1.7	33.4		2.4	2.8		7.5	
35. value of output	1323.0	3974.0	800.0	130.0	2097.0	20.7	398.0	180.0	325.0	237.1[4]	3.2	67.5	

TABLE 25 (*Contd.*). INTER-INDUSTRY TRANSACTIONS (INDIA) 1960-61

(1959-60 producers' price; Rs. crores)

producing sector \ absorbing sector	chemicals	railways	electricity	coal	sub-total, col. 1-30 intermediate consumption	others	household consumption	government consumption	exports	imports	gross fixed capital formation	stocks	output
	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)
1. construction, urban industrial						153.0		104.0			944.0		1201.0
2. construction rural											416.0		416.0
3. electrical equipment					6.1		33.4	16.9	0.8	−57.0	124.0	1.8	126.0
4. transport equipment					7.0		39.2	45.9	0.5	−69.2	173.0	4.6	201.0
5. non-electrical equipment	1.7			3.8	64.8		112.8	31.0	2.0	−228.7	345.0	15.7	343.5
6. iron and steel					380.0	−4.2			10.1	−120.9		4.0	269.0
7. iron ore					5.0				2.4			0.4	7.8
8. cement					52.6				0.3	−0.1		−0.2	52.6
9. other metals	3.1				80.4	−1.0			0.2	−49.3		1.7	32.0
10. other minerals	8.2				32.3	−1.2			24.3	−10.0			45.4
11. plantations					15.5		73.7		109.5	−8.5		5.8	198.0
12. leather and leather products					50.5	18.3	96.0		23.7	−0.3		0.8	189.0
13. animal husbandry	2.8				71.2		1057.4		20.6	−19.2			1130.0
14. food industries	10.9				121.9		978.0	93.6	36.1	−9.5		102.3	1323.0
15. food grains					541.0		3520.1			−144.9		57.8	3974.0
16. cotton and other textiles	0.3				26.4		702.6	11.3	54.5	−4.0		9.2	800.0
17. jute textiles	1.7				29.5	4.6			94.4	−0.1		1.6	130.0
18. other agriculture	0.3				1220.0	172.0	761.4		40.3	−124.8		19.1	2097.0
19. chemical fertilizers					30.3	−0.2				−10.7		1.3	20.7
20. glass, wooden and non-metallic mineral products	0.8				344.9		63.2		2.4	−10.6		−1.9	398.0
21. forestry products	12.5				161.0	11.7			12.4	−5.1			180.0
22. motor transport					165.0[3]	63.0	97.0						325.0
23. petroleum products	2.8	23.0	2.0	0.1	194.7	12.4	81.4	27.3	4.1	−82.8[7]			237.1[6]
24. crude oil					43.6					−40.4			3.2
25. rubber products					25.9	4.2	39.9		0.6	−3.3		0.2	67.5
26. rubber					1.4					−2.3		0.9	
27. chemicals	63.0				200.3[3]		179.2		9.9	−111.2		5.8	284.0
28. railways					278.0	87.0	89.0						454.0
29. electricity	0.2	3.4		3.2	83.0	6.3	11.1	4.7				−2.1[1]	103.0
30. coal	3.1	31.7	13.7	7.3	94.9	4.0	6.1		1.8	−0.1		2.3	109.0
31. industries not included elsewhere	14.0	17.7	12.7	4.7	468.3.			1045.3[2]	7.3	−11.1			
32. total, rows 1-31	137.4	75.8	20.1	19.1	4352.0[4]	520.9	7942.1	1380.0	468.1	−1124.1	2002.0	231.1	
33. value added	121.8	378.0	65.5	89.2	9593.0								
34. trade, transport and indirect taxes	24.8	0.2	8.4	0.7	768.0				164.8	33.6	276.0		
35. value of output	284.0	454.0	103.0	109.0	14714.8			1380.0	632.9[8]	−1090.6[9]	2278.0		

Notes: [1]Represents adjustment for exaggerated industrial consumption shown in table.
[2]Inclusive of trade and transport and indirect taxes.
[3]No interindustry transactions shown for rows 22 and 28. Subtotal for row 32 is, therefore, less than subtotal for column 31 by 443.0.
[4]Total for row 32, columns 1-30.
[5]Petroleum products measured at market prices inclusive of indirect taxes.
[6]Includes Rs. 98.1 crores of taxes on petroleum products.
[7]Includes Rs. 33.6 crores of taxes on petroleum products.
[8]Export, f.o.b.
[9]Imports, c.i.f.

TABLE 26. INPUT NORMS, MARKET PRICES, 1959-60

(rupees per thousand rupees of gross output)

	1	2	3	4	5a	5b	6	7	8	9
1. construction, urban and industrial										
2. construction, rural										
3. electrical equipment			27	5	18		8			
4. transport equipment				50						
5. non-electrical equipment	27	10	72	7	65		14	36		
6. iron and steel	267	93	53	160	105	381	240			
7. iron ore							57			
8. cement	74	26								
9. other metals			93	20	90	191	54			310
10. other minerals			2				33		140	220
11. plantations										
12. leather and leather products			2					4		
13. animal husbandry										
14. food industries										
15. foodgrains										
16. cotton and other textiles			2							
17. jute textiles			4	2			3		170	2
18. other agriculture										
19. chemical fertilizers										
20. glass, wooden, non-metallic mineral products	291	105	21	3	10			9		
21. forestry products	68	24	5	70						4
22. motor transport										
23. petroleum products	11		6	9	8		9		6	8
24. crude oil										
25. rubber products			2	47	1					
26. rubber										
27. chemicals			23	25	25	14	23			10
28. railways										
29. electricity			9	10	9	8	16	13	42	14
30. coal			2	4	8	10	76	1	200	21
31. others			315	137	191	14	53	37	70	4
32. value added	262	742	360	451	380	376	412	900	372	401
check sum,	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

TABLE 26 (*Contd.*). INPUT NORMS, MARKET PRICES, 1959-60

(rupees per thousand rupees of gross output)

	10	11	12	13	14	15a	15b	16	17	18
1. construction, urban and industrial										
2. construction, rural										
3. electrical equipment										
4. transport equipment										
5. non-electrical equipment	36				7				6	
6. iron and steel										
7. iron ore										
8. cement										
9. other metals										
10. other minerals										
11. plantations										
12. leather and leather products	4		265					5		
13. animal husbandry			200		16			17		
14. food industries			15	66	50			10		
15. foodgrains				90	18	65	835			
16. cotton and other textiles								30	4	
17. jute textiles		6	1		6		15	5	26	
18. other agriculture					613		13	394	490	40
19. chemical fertilizers		40				5.1				5.1
20. glass, wooden, non-metallic mineral products	9	21			1			10		
21. forestry products			65							
22. motor transport										
23. petroleum products		2	3		3	3	3	9	2	3
24. crude oil										
25. rubber products										
26. rubber										
27. chemicals		9	75	19	6	1		50	25	1
28. railways										
29. electricity	13	1	5		3	1	5	20	20	1
30. coal	1	6	2		4		4	14	7	
31. others	37	68	20		68		40	90	40	
32. value added	900	857	250	825	205	925	85	346	374	950
check sum,	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

TABLE 26 (*Contd.*). INPUT NORMS, MARKET PRICES, 1959-60

(rupees per thousand rupees of gross output)

	19	20	21	22	23	24	25	26	27	28	29n[2]	30
1. construction, urban and industrial												
2. construction, rural												
3. electrical equipment												
4. transport equipment												
5. non-electrical equipment		4			40		7		8			50
6. iron and steel												
7. iron ore												
8. cement		10										
9. other metals									13			
10. other minerals		18							38			
11. plantations												
12. leather and leather products												
13. animal husbandry									13			
14. food industries									50			
15. foodgrains												
16. cotton and other textiles		1					140		2			
17. jute textiles	48								7			
18. other agriculture									1			
19. chemical fertilizers												
20. glass, wooden, non-metallic mineral products									30			
21. forestry products		108							58			
22. motor transport												
23. petroleum products	7	25		320			1		10	50	54	1
24. crude oil					184							
25. rubber products				60			11					
26. rubber							312					
27. chemicals	236	75				6	75		256			
28. railways												
29. electricity	10	13			7		9		16	5		21
30. coal	103	20					4		20	73	308	67
31. others	140	98	50	88	100	94	74		49	30	123	43
32. value added	447	407	950	532	648[1]	900	307		429	833	425	818
check sum.	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

[1] Includes 414 of taxes ; [2] For hydro eletricity there is no input except Rs. 123 of "others".

TABLE 27. MATRIX OF DETACHED COEFFICIENTS FOR 1970-71

(as set up for cases 2A, 2B)

activity / item	1	2	3	4	5	6	7
1. construction, urban and industrial	-1.000						
2. construction, rural		-1.000					
3. electrical equipment			-1.091	.003	.000	.006	
4. transport equipment				-1.075			
5. non-electrical equipment	.025	.007	.050	.005	-1.180	.010	.025
6. iron and steel	.210	.062	.035	.107	.171	-.850	
7. iron ore						.019	-.960
8. cement	.040	.013					
9. other metals			.077	.017	.103	.046	
10. other minerals			.002			.025	
11. plantations							
12. leather and leather products			.002				.004
13. animal husbandry							
14. food industries							
15. foodgrains							
16. cotton and other textiles			.002				
17. jute textiles			.004	.002		.002	
18. other agriculture							
19. chemical fertilizers							
20. glass, wooden, non-metallic mineral products	.225	.084	.017	.003	.005		.007
21. forestry products	.050	.018	.004	.053			
22. motor transport							
23. petroleum products	.011		.006	.009	.005	.009	
24. crude oil							
25. rubber products			.002	.041	.001		
26. rubber							
27. chemicals			.020	.020	.019	.020	
28. railways						.081	1.551
29. electricity			.012	.014	.012	.036	.018
30. coal			.001	.002	.006	.034	.001
31. construction, urban and industrial	.040		.300	.300	.450	1.040	1.330
32. construction, rural							
33. equipment, excluding transport	.100		.350	.400	.550	1.310	1.970
34. transport equipment							
35. foreign exchange			.152	.152	.252	.052	

TABLE 27 (*Contd.*). MATRIX OF DETACHED COEFFICIENTS FOR 1970-71

(as set up for cases 2A, 2B)

item \ activity	8	9	10	11	12	13	14
1. construction, urban and industrial							
2. construction, rural							
3. electrical equipment							
4. transport equipment							
5. non-electrical equipment			.025				.010
6. iron and steel							
7. iron ore							
8. cement	-.960						
9. other metals		-1.202					
10. other minerals	.108	.169	-1.090				
11. plantations				-.960			
12. leather and leather products			.004		-.719		
13. animal husbandry					.223	.060	.012
14. food industries					.011	.032	-.923
15. foodgrains						.183	.017
16. cotton and other textiles							
17. jute textiles	.147	.001		.005	.001		.008
18. other agriculture							.574
19. chemical fertilizers				.032			
20. glass, wooden, non-metallic mineral products			.007	.017			.003
21. forestry products		.003			.049		
22. motor transport							
23. petroleum products	.006	.008		.002	.003		.003
24. crude oil							
25. rubber products							
26. rubber							
27. chemicals		.013		.007	.059	.010	.005
28. railways	.221	.020	.220	.009	.002	.003	.017
29. electricity	.058	.147	.018	.001	.007		.004
30. coal	.100	.012	.001	.003	.001		.002
31. construction, urban and industrial	1.100	1.470	.770	.300	.200	.800	.130
32. construction, rural				.100		.500	
33. equipment, excluding transport	1.140	1.530	.880	.500	.150	.200	.250
34. transport equipment							
35. foreign exchange		.501	.130	.001	.000	.001	.001

TABLE 27 (*Contd.*). MATRIX OF DETACHED COEFFICIENTS FOR 1970-71

(as set up for cases 2A, 2B)

item \ activity	15	16	17	18	19	20	21
1. construction, urban and industrial							
2. construction, rural							
3. electrical equipment							
4. transport equipment							
5. non-electrical equipment			.004			.003	
6. iron and steel							
7. iron ore							
8. cement						.008	
9. other metals							
10. other minerals					.003	.015	
11. plantations							
12. leather and leather products		.005					
13. animal husbandry		.013					
14. food industries		.007					
15. foodgrains	−.847						
16. cotton and other textiles		−.938	.003			.001	
17. jute textiles	.001	.005	−.937		.042		
18. other agriculture	.001	.325	.417	−.928			
19. chemical fertilizers	.032			.036	−.960		
20. glass, wooden, non-metallic mineral products		.008				−.939	
21. forestry products						.149	−.960
22. motor transport							
23. petroleum products	.006	.009	.002	.007	.030	.025	
24. crude oil							
25. rubber products							
26. rubber							
27. chemicals	.004	.039	.020	.004	.110	.059	
28. railways	.007	.006	.011	.006	.076	.019	
29. electricity	.006	.027	.027	.006	.167	.018	.040
30. coal		.008	.004		.027	.016	
31. construction, urban and industrial	.800	.190	.220	.800	1.000	.350	.800
32. construction, rural	.500			.500			.500
33. equipment, excluding transport	.200	.540	.410	.200	.500	.300	.200
34. transport equipment							
35. foreign exchange	.001	.054	.052	.001	.130	.006	

TABLE 27 (*Contd.*). MATRIX OF DETACHED COEFFICIENTS FOR 1970-71

(as set up for cases 2A, 2B)

item \ activity	22	23	24a	25	26a	27	28
1. construction, urban and industrial							
2. construction, rural							
3. electrical equipment							
4. transport equipment							
5. non-electrical equipment		.032		.005		.006	
6. iron and steel							
7. iron ore							
8. cement							
9. other metals						.011	
10. other minerals						.029	
11. plantations							
12. leather and leather products							
13. animal husbandry						.010	
14. food industries						.037	
15. foodgrains							
16. cotton and other textiles				.104		.001	
17. jute textiles						.006	
18. other agriculture						.001	
19. chemical fertilizers							
20. glass, wooden, non-metallic mineral products						.024	
21. forestry products						.044	
22. motor transport	−1.000						1.080
23. petroleum products	.320	−1.000		.001	.525	.021	.038
24. crude oil		.184	−1.000				
25. rubber products	.052			−.950			
26. rubber				.250	−.060		
27. chemicals		.003		.059		−.759	
28. railways		.040				.006	−1.000
29. electricity		.010		.012	.013	.039	.027
30. coal				.002		.011	.041
31. construction, urban and industrial		.280		.200	1.000	.440	
32. construction, rural							
33. equipment, excluding transport		.220		.300	.840	.600	
34. transport equipment	1.500						2.300
35. foreign exchange		.041	1.000	.006	.150	.022	

TABLE 27 (*Contd.*). MATRIX OF DETACHED COEFFICIENTS FOR 1970-71

(as set up for cases 2A, 2B)

item \ activity	20a, b	30	31	32	33	34	35
1. construction, urban and industrial			.170				
2. construction, rural				.170			
3. electrical equipment					.043		
4. transport equipment						.170	
5. non-electrical equipment		.035			.127		
6. iron and steel							
7. iron ore							
8. cement							
9. other metals							
10. other minerals							
11. plantations							
12. leather and leather products							
13. animal husbandry							
14. food industries							
15. foodgrains							
16. cotton and other textiles							
17. jute textiles							
18. other agriculture							
19. chemical fertilizers							
20. glass, wooden, non-metallic mineral products							
21. forestry products							
22. motor transport							
23. petroleum products	.032	.001					
24. crude oil							
25. rubber products							
26. rubber							
27. chemicals							
28. railways		.404					
29. electricity	−1.000	.029					
30. coal	.097	−.803					
31. construction, urban and industrial	3.600	1.100	−1.000				
32. construction, rural				−1.000			
33. equipment, excluding transport	2.630	.900			−1.000		
34. transport equipment						−1.000	
35. foreign exchange							−1.000

TABLE 28a. DIAGONAL ELEMENTS, ROWS 1-30

	one unit of gross domestic production	less intra-industry current account inputs	less inventory adjustment (does not apply to production of services	plus addition to total supply from foreign exchange expenditure on "competitive" imports	total ; diagonal coefficient shown in Table 27
1. construction, urban and industrial	−1.000				−1.000
2. construction, rural	−1.000				−1.000
3. electrical equipment	−1.000	.019	.040	−.150	−1.091
4. transport equipment	−1.000	.035	.040	−.150	−1.075
5. non-electrical equipment	−1.000	.030	.040	−.250	−1.180
6. iron and steel	−1.000	.160	.040	−.050	−0.850
7. iron ore	−1.000		.040		−.960
8. cement	−1.000		.040		− .960
9. other metals	−1.000	.258	.040	− .500	−1.202
10. other minerals	−1.000		.040	− .130	−1.090
11. plantations	−1.000		.040		− .960
12. leather and leather products	−1.000	.241	.040		− .719
13. animal husbandry	−1.000		.040		−.960
14. food industries	−1.000	.037	.040		− .923
15. foodgrains	−1.000	.113	.040		− .847
16. cotton and other textiles	−1.000	.022	.040		−.938
17. jute textiles	−1.000	.023	.040		− .937
18. other agriculture	−1.000	.032	.040		− .928
19. chemical fertilizers	−1.000		.040		− .960
20. glass, wooden, etc. products	−1.000	.021	.040		− .939
21. forestry products	−1.000		.040		− .960
22. motor transport	−1.000				−1.000
23. petroleum products	−1.000		.040	− .040	−1.000
24c. crude oil, imports				−1.000	−1.000
25. rubber products	−1.000	.010	.040		− .950
26a. synthetic rubber	−1.000		.040		− .960
27. chemicals	−1.000	.223	.040	− .022	− .759
28. railways	−1.000				−1.000
29. electricity	−1.000				−1.000
30. coal	−1.000	.067	.040		− .893

TABLE 28b. IMPORT COEFFICIENTS AND FOREIGN EXCHANGE COSTS, ROW 35[1]

domestic production activity *j* / sector-of-origin of imports *i*	"competitive" imports[2]	10. other minerals[3]	18. other agriculture[4]	27. chemicals	total: foreign exchange cost shown in Table 27, row 35[5]
3. electrical equipment	.150			.002	.152
4. transport equipment	.150			.002	.152
5. non-electrical equipment	.250			.002	.252
6. iron and steel	.050			.002	.052
9. other metals	.500			.001	.501
10. other minerals	.130[5]				.130
11. plantations				.001	.001
12. leather and leather products				.006	.006
13. animal husbandry				.001	.001
14. food industries				.001	.001
15. foodgrains				.001	.001
16. cotton and other textiles			.050	.004	.054
17. jute textiles			.050	.002	.052
18. other agriculture				.001	.001
19. chemical fertilizers		.139			.139
20. glass, wooden, etc. products				006	.006
23. petroleum products	.040			.001	.041
24c. crude oil, imports	1.000				1.000
25. rubber products				.006	.006
26a. synthetic rubber				.150	.150
27. chemicals	.022				.022

Notes: [1]None of these import coefficients are easy to estimate. On the basis of the available information, they constitute our best guesses as to the *minimum* import requirements for 1970-71.

[2]Among the categories of the inter-industry table, "competitive" imports have the identical sector-of-origin *i* as the domestic production sector *j*. (E.g., for each crore's worth of domestic production of electrical equipment, Table 28a indicates that there are to be .150 crores' worth of imports of electrical equipment.) This does not necessarily mean that the imported items are economically interchangeable with those produced domestically. Generally, the imported products are of specialized types.

[3]Includes rock phosphate.

[4]Includes cotton and jute fibers.

[5]Includes sulphur.

TABLE 29. EXOGENOUS GROSS FIXED INVESTMENT AND REPLACEMENT DURING THIRD AND FOURTH PLANS

(Rs. crores, 1959-60 prices)

	item	price[1]	total	construction: urban & industrial	construction: rural	equipment: excluding transport[2]	equipment: transport	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1.	transport and communications							exogenous gross fixed investment
1.1	railways	M	1450	1450	—	—	[3]	
1.2	roads	M	1450	1315	135	—	[3]	
1.3	shipping	M	200	—	—	—	200	
1.4	inland water transport	M	25	10	—	—	15	
1.5	ports	M	260	125	—	125	10	
1.6	lighthouses	M	30	15	—	15	—	
1.7	civil air transport	M	200	40	—	60	100	
1.8	other transport and tourism	M	150	20	—	—	130	
1.9	communications	M	310	185	—	110	15	
2.	education and research	M	900	715	—	180	5	
3.	health[4]	M	900	675	—	215	10	
4.	housing	M	4400	3040	1360	—	—	
5.	commercial buildings, etc.	M	350	300	50	—	—	
6.	others	M	200	150	15	30	5	
7.	total	M	10825	8040	1560	735	490	
8.	minus trade margin	—	190	—	—	92	98	
9.	total	P	10635	8040	1560	643	392	
10.	replacement	P	4875	2490	—	1585	800	replacement investment from Table 30
11.	plus trade margin	—	315	—	—	205	110	
12.	replacement	M	5190	2490	—	1790	910	
13.	grand total for decade, items (9)+(10)	P	15510	10530	1560	2228	1192	exogenous gross fixed investment + replacement
14.	1970-71 flow, 15% of item (13)	P	2327	1580	234	334[5]	179	

Notes : [1] M : at market prices
P : at producers' prices.

[2] In this column, approximately 3% of the total represents transport equipment in the form of motor vehicles.

[3] Replacement of railway rolling stock, railway construction, and motor vehicles are included in Table 30.

[4] Includes fixed investment in hospitals, medical education and training, water supply and sanitation, etc.

[5] 1970-71 flow, electrical equipment 84
non-electrical equipment 250

equipment excluding transport 334

TABLE 30. REPLACEMENT REQUIREMENTS DURING 1960-61 TO 1970-71

	sector	construction industrial and urban	equipment excluding transport[1]	transport equipment
(1)	(2)	(3)	(4)	(5)
1.	construction, industrial and urban	1	11	—
2.	construction, rural	—	—	—
3.	electrical equipment	5	5	—
4.	transport equipment	17	31	—
5.	non-electrical equipment	34	53	—
6.	iron and steel	132	192	—
7.	iron ore	12	25	—
8.	cement	45	62	—
9.	other metals	26	41	—
10.	other minerals	4	6	—
11.	plantations	6	8	—
12.	leather and leather products	2	4	—
13, 15, 18 &21.	agricultural group	1070	400	—
14.	food industries	40	75	—
16.	cotton and other textiles	28	125	—
17.	jute textiles	5	16	—
19.	chemical fertilizers	67	50	—
20.	glass, wooden and non-metallic mineral products	8	15	—
22.	motor transport	—	—	440
23.	petroleum products[2]	34	35	—
24.	crude oil	17	20	—
25.	rubber products	4	7	—
26.a	synthetic rubber	2	3	—
27.	chemicals	86	151	—
28.	railways	400	—	300
29.a	thermal electricity[3]	187	75	—
29.	hydro electricity[3]	94	60	—
30.	coal	102	115	—
	total	2490	1585	800

[1] In this column, approximately 3% of the total represents transport equipment in the form of motor vehicles.

[2] Including manufacture of lubricating oils and distribution of all petroleum products.

[3] Excludes expenditures on rural electrification; these are included in general government expenditures.

TABLE 31. FINAL DEMANDS, MISCELLANEOUS ADJUSTMENTS, AND RIGHT-HAND-SIDE CONSTANTS

(1959-60 producers' prices ; value in Rs. crores)

	household consumption		final demands (before reversal of algebraic sign) government consumption	exports	exogenous imports	exogenous gross fixed capital formation		
case identification	A	B	all	all	all	1, 2	3A, 4	3B
item number*								
1.			256			1580	2483	2067
2.						234	1004	911
3.	117	100	42	20		84	326	273
4.	118	98	113	12		179	455	379
5.	282	226	77	46		250	907	756
6.				28				
7.				18				
8.				1				
9.				21				
10.				31				
11.	114	97		103				
12.	205	130		27				
13.	1903	1633		25	–20			
14.	1566	1370	230	98	–20			
15.	5104	4752						
16.	1293	1012	28	63	– 5			
17.				97				
18.	1180	1043		71	–35			
19.								
20.	126	87		4	–10			
21.				19	– 5			
22.*								
23.	244	224	67	10				
24.								
25.	80	56		4				
26.								
27.	319	258		17				
28.	105	127						
29.	23	21	12					
30.	10	8						
31.								
32.								
33.								
34.								
35.				1078	–95			
GNP component	21400	17000	3400	1078			6000	5000

TABLE 31 (*Contd.*). FINAL DEMANDS, MISCELLANEOUS ADJUSTMENTS, AND RIGHT-HAND-SIDE CONSTANTS

(1959-60 producers' prices ; value in Rs. crores)

	miscellaneous adjustments (before reversal of algebraic sign)				
	demands by "others'		pre-deter mined[a] activity levels	base year inventories	base year capital stocks
case identification	A	B	all	all	all
item number[a]					
1.	306	306			
2.					
3.				−5	
4.				−8	
5.				−14	
6.				−11	
7.					
8.				−2	
9.				−1	
10.				−2	
11.			20	−8	
12.	39	39		−8	
13.				−45	
14.				−53	
15.				−159	
16.				−32	
17.				−5	
18.	267	267		−84	
19.				−1	
20.				−16	
21.				−7	
22.[a]					
23.	24	20		−9	
24.			−71		
25.	8	7		−3	
26.			−30		
27.				−11	
28.	268[i]	252[i]			
29.	13	13			
30.	6	6		−4	
31.			234		−7071 (−6120)[e]
32.					−3711 (−2234)
33.			204		−4098 (−3730)
34.					−1532 (−1532)
35.					

TABLE 31 (*Contd.*). FINAL DEMANDS, MISCELLANEOUS ADJUSTMENTS, AND RIGHT-HAND-SIDE CONSTANTS

(1959-60 producers' prices ; value in rupees crores)

	right-hand-side constants (after reversal of algebraic sign ; consistent with sign convention of Table 27)					
case identification	2A, 3A, 22A	1A	2B, 3B	1B	1AB	12A
1.	−2142	−3045	−2142	−2629	−3045	−2142
2.	− 234	−1094	− 234	− 911	−1094	− 234
3.	− 258	− 500	− 241	− 429	− 483	− 258
4.	− 414	− 690	− 304	− 504	− 670	− 414
5.	− 641	−1298	− 585	−1091	−1242	− 641
6.	− 17	− 17	− 17	− 17	− 17	− 17
7.	− 18	− 18	− 18	− 18	− 18	− 18
8.	1	1	1	1	1	1
9.	− 20	− 20	− 20	− 20	− 20	− 20
10.	− 29	− 29	− 29	− 20	− 29	− 29
11.	− 289	− 289	− 272	− 272	− 272	− 289
12.	− 263	− 263	− 188	− 188	− 188	− 263
13.	−1863	−1863	−1493	−1493	−1493	−1863
14.	−1819	−1819	−1623	−1623	−1623	−1819
15.	−4945	−4945	−4503	−4593	−4503	−4945
16.	−1347	−1347	−1066	−1066	−1066	−1347
17.	− 92	− 92	− 92	− 92	− 92	− 92
18.	−1390	−1390	−1262	−1262	−1262	−1390
19.	1	1	1	1	1	1
20.	− 104	− 104	− 65	− 65	− 65	− 104
21.	− 7	− 7	− 7	− 7	− 7	− 7
22[1].	0	0	0	0	0	0
23.	− 336	− 336	− 312	− 312	− 312	− 336
24.	71	71	71	71	71	71
25.	− 89	− 89	− 64	− 64	− 64	− 89
26.	30	30	30	30	30	30
27.	− 325	− 325	− 264	− 264	− 264	− 325
28.	− 433	− 433	− 379	− 379	− 379	− 433
29.	− 47	− 47	− 46	− 46	− 46	− 47
30.	− 12	− 12	− 10	− 10	− 10	− 12
31.	7687	7687	7687	7687	7687	5842
32.	3711	3711	3711	3711	3711	2234
33.	3894	3894	3894	3894	3894	3520
34.	1532	1532	1532	1532	1532	1532
35.	983	983	983	983	983	983

Notes : [1]Consists of Rs. 161 crores of passenger earnings from "others" plus unallocated goods earnings of Rs. 107 crores under aggregate projection A and Rs. 91 crores of goods earnings under projection B.

[2]Motor transportation output is taken at 108% of Railway output.

[3]Pre-determined activity levels for 1970-71 :
24a crude oil, domestic production = Rs. 71 crores
26b plantation rubber, domestic production = Rs. 20 crores
re-claimed rubber, domestic production = Rs. 10 crores

[4]This GNP component is endogenous.

[5]Identification of items 1-35 is identical with that of Table 27 the matrix of coefficients.

[6]Figures in brackets related to base year capital stock for Case 12A.