

## 6. *Impact of Government Purchases on Sectoral Outputs*

### **Introduction**

It is common knowledge that government expenditure creates additional demands for goods and services in the economy through multiplier effects and thereby induces a rise in the aggregate level of output. The 'first round effects' occur in those industries which directly supply their products to the government. The subsequent 'round effects' occur when these suppliers place orders on other industries for intermediate goods. Besides, there are multiplier effects through demand linkage. Thus, increased output (as a result of government demand) augments factor income in the respective industries which causes a rise in private consumption. Similarly, a portion of the government expenditure paid as wages and salaries also augments private consumption. The increase in private consumption as a result of the above two generates a sequence of output effects. Knowledge about sector-wise total impact (direct as well as indirect) of government expenditure on output is of immense utility for tailoring expenditure policy to achieve a desirable degree of inter-sectoral balance in the economy.

This chapter purports to work out first the commodity composition of Central government expenditure and then estimate the sector-wise direct and indirect impact of Central government expenditure in India for 1977-78. It is confined to the expenditure on goods and services and excludes all types of transfer payments (such as loans and grants-in-aid) as well as wages and salaries. Transfer payments and wages and salaries have been excluded because we are interested in measuring the impact of government demand and not the impact of induced private demand. The decision regarding the reference year was largely based on the availability of input-output data.

### **Review of Literature**

Studies relating to the measurement of the impact of govern-

ment expenditure on the rest of the economy have generally employed the inter-industry framework. While most of the studies, especially those conducted in the Indian context, concentrated on the measurement of only the output effects, a few went a step further and attempted to measure the impact on factor incomes, import needs and the balance of payments.

Studies made by Peacock and Stewart (1958), Roskamp (1969) and Jones and Kabursi (1973) are concerned with the direct and indirect impact of government expenditure on factor shares, import needs and the balance of payments. Peacock and Stewart (1958) considered a six-sector open-end Leontief model for UK and computed the impact of government commodity expenditures on factor incomes for 1954. Roskamp (1969) made a similar study for West Germany using a 55-sector input-output table for 1954. He quantified the effect of changes in the composition of government expenditure on the budget deficit, growth of income, change in the factor shares and balance of payments deficit. All these studies, although illuminating and useful, have been made only in respect of aggregate government expenditure and not in respect of function-wise disaggregated expenditures. They are criticised, therefore, on the ground that the analysis of function-wise disaggregated expenditures might be more useful than the analysis of aggregate expenditure. According to Jones and Kabursi (1973, p.87), a realistic consideration of composition of government expenditure should be in terms of different expenditure programmes (defence, education, etc.) rather than of aggregate expenditure. They suggested a programming model whereby government purchases grouped by functions are optimised.

Some studies have been made on the impact of government expenditure in India too. Important among them are those of Mathur (1963), Bhalla (1971), Paithankar (1973) and Sarma and Tulsidhar (1980). The earliest one is that of Mathur (1963). His problem was to estimate the commodity-wise direct and indirect requirements for an important component of public expenditure, namely, defence. Since there was no input-output table for India at that time, he constructed a 17-sector input-output table for the year 1959. The commodity-wise defence expenditure was collected from the Directorate General of

Supplies and Disposals (DGS&D). While estimating the total direct and indirect requirements for defence expenditure for two years, 1957-58 and 1958-59, he considered not only the expenditures on goods and services but also the expenditure on wages and salaries.

Bhalla (1971) estimated the direct and indirect income effects for Punjab for 1957 and for India for 1959. He used a 17-sector input-output table for Punjab and a 29-sector table for India. He considered a modified version of Leontief's open end model. He treated imports as part of the structural matrix by attributing total imports to the competitive sectors by means of negative entries. Thus, the columns in the inverse give "domestic outputs in each sector that are associated with one unit of final demand (excluding imports) in each sector" (p. 212). He then computed the direct and "induced income multipliers"<sup>1</sup>.

An attempt to study the economic impact of government commodity expenditure in detail was made by Paithankar (1973). He estimated the commodity requirements of individual ministries of the Central government as well as the whole government sector for 1961-62 through 1965-66. His study was also confined to commodity expenditures. For analysing the impact, he employed a 65-sector input-output table for 1963<sup>2</sup>. However, the ministry-wise details of Central government expenditure were not readily available and therefore he constructed government vectors with the information collected from various sources, such as, *Detailed Demands for Grants (DDG)*, *Directory of Government Purchases (DGP)* published by the DGS&D and *Economic and Functional Classification of the Central Government Budget*. His main findings are: (i) the total (direct+indirect) demand is roughly one-and-a-half-times the direct demand; (ii) the direct demand does not differ from the total direct and indirect demand for most of the sectors and (iii) among the sectors for which the total requirements differ from the direct demand, construction is the important sector.

Sarma and Tulsidhar (1980), in a similar exercise, aimed at measuring the impact of government expenditures on both goods and services and wages and salaries for 1971-72. They, like Paithankar (1973), mainly attempted to construct a reliable government commodity expenditure vector. They attempted to

marry the information given by the DGS&D with that contained in the DDG. Basically, all identifiable commodity-wise expenditure in DDG was deduced from DGP vector itemwise. The rest, namely, the unallocable expenditure of DDG, was apportioned among the corresponding items using the DGP pattern. The commodity pattern of expenditure on wages and salaries was arrived at by combining the information on the distribution of salaries given in the *Census of Government Employees, 1971-72* and the all-India sectoral consumption pattern given in the *Fifth Plan Technical Note*. A comparison of the major results of this study with our results is given later in this chapter.

### **Objectives and Data Sources**

Our objectives in undertaking this exercise are two-fold. First, we would like to work out the commodity composition of the Central government expenditure on goods and services. Our review of the earlier studies shows that so far it has not been possible to work out a detailed and accurate commodity classification of government expenditure. The commodity classification itself will indicate the direct demand by the government for sectoral output. Hence we have spent a considerable amount of effort and time in obtaining as accurate a commodity-wise breakdown of government expenditure as possible.

The second objective of our exercise is to work out the indirect demand for the outputs of different sectors arising from government expenditure. For working out the indirect demand we need an input-output table for the Indian economy. The latest available input-output table for 1977-78 was made available to us by the Planning Commission.

#### *a. Government Commodity Expenditure*

The vector of commodity expenditure which we have constructed covers expenditure on goods and services by general government and departmental undertakings. All types of expenditures on goods and services are included without making any distinction among final consumption, intermediate consumption and capital formation expenditures. The data pertain to the Central government budget.

We could not use for our purpose the public consumption vector in the input-output table for 1977-78, because it related

to the commodity expenditure by the Central and State governments as well as public undertakings. Besides, the government consumption vector of the 1977-78 input-output table reflects the pattern of public expenditure as of 1972-73, because the latter has been derived merely by updating the earlier table for price-changes. Indeed, detailed commodity-wise classification of the expenditure of the Central and State governments, taken together or separately, has not been worked out so far. Our intention has been to make an exploratory venture in this direction. In order to work out the commodity composition of Central government expenditure, we have mostly used the information contained in the following sources: (i) *Detailed Demands for Grants* (DDG), (ii) *Directory of Government Purchases* DGP; (iii) *An Economic and Functional Classification of the Central Government Budget*, (iv) Railway Board's publication, *A Compendium of Statistical Information on Materials Management* (the compendium); (v) *Annual Reports of Post and Telegraphs* and (vi) *Annual Reports and Performance Budgets* of different Ministries.

b. *Input-output table*

The input-output table for 1977-78 is an 89-sector commodity by industry matrix. To suit our purpose, we have aggregated the 89 sectors into 20 larger sectors, namely, (1) food items, (2) minerals, (3) edible oils, (4) beverages, (5) narcotics, (6) cotton textiles, (7) woollen and silk textiles, (8) jute textiles, (9) wood and wood products, (10) paper and paper products, (11) leather and leather products, (12) rubber and rubber products, (13) petroleum products, (14) chemicals and chemical products, (15) construction materials, (16) metal and non-metal products, (17) non-electrical machinery and transport equipment, (18) electrical machinery, (19) gas, electricity, water supply and communications, (20) other services. It may be noted that the 1977-78 table is only the 1968-69 table updated for price changes. We have nevertheless used it because of our desire to work out the impact of government expenditure for a fairly recent year.

## Construction of Government Commodity Expenditure Vector

### a. *Methodology*

The DDG for each Department or Ministry give details of expenditure for that Department/Ministry during the year classified under various major and minor heads. The details of the estimates relating to each programme/organisation in respect of which the amount involved is not less than Rs 10 lakh is given under a number of detailed heads which indicate the categories and nature of the concerned expenditures. But this break-up enables us only to identify expenditure on commodities and services and on factor payments. The details do not contain a commodity-wise classification. However, a careful scanning of the hundred-odd Demands yielded information on the expenditure on 15 commodity groups. The rest of the expenditure on goods and services is lumped together as office expenses or lumpsum expenditure on subsidiary offices, on schemes and programmes and on materials and supply and other expenditure. The details of expenditure under Defence are not provided. Thus one cannot derive a comprehensive commodity-wise classification of expenditure from DDG.

The most important source of information on government purchases is DGP. This is an annual publication of the Directorate General of Supplies and Disposals (DGS&D), which is the main agency through which the Central departments procure goods. Though DGS&D acts as a purchasing agency for the Central government departments, departmental commercial undertakings, non-departmental undertakings and quasi-government bodies, its purchases are mainly on behalf of the Central government departments; it is understood that 80-85 per cent of DGS&D purchases are for these departments.

Apart from the purchases made through the DGS&D, the departments also make purchases directly from the market, as they have been given powers to make purchases upto specified limits.

DGS&D gives information on the purchases it makes for the public sector in its publication DGP. It tries to obtain from the departments information on their direct purchases for inclusion in DGP so that the information given would be more comprehensive. One important limitation of DGP data is that

they pertain to the value of orders placed rather than to that of actual purchases. In using DGP data to obtain the commodity-wise break-up of government expenditure, we are implicitly assuming that the ratio of orders placed to actual purchases is more or less the same in respect of all the 20 commodity groups and also remains constant from year to year.

DGP also includes information on purchases for State governments. Data for the year 1977-78 had not yet been published and hence we directly obtained those data through the good offices of the Planning Commission.

Detailed commodity-wise information on the purchases made by the Railways and the Post and Telegraphs Department is available in the *Compendium* and the *Annual Reports* of the Post and Telegraphs, respectively. However, it has to be remembered that the Railways purchase somewhat more than 1/3rd of their requirements through DGS&D. Thus, in using the information from the various sources, it is necessary to make adjustments to avoid double-counting.

The commodity-wise break-down of expenditure obtained from DDG, DGP, the *Compendium* and other sources such as the *Performance Budgets* is presented in Table 6.2

The question now is how the information from various sources should be combined to derive the break-down of the goods and services expenditure of the government by commodity groups. We have to start with a correct total of goods and services expenditure by the Central Government. We have taken this as being equal to the expenditure on goods and services of administrative departments and departmental undertakings as given in the *Economic and Functional Classification of the Central Government Budgets*. This represents government consumption including the commodity portions of the expenditure on repairs and maintenance, intermediate consumption by the Departmental undertakings and the commodity portion of capital formation by the administrative departments and the departmental undertakings. The total of these expenditures amounted to Rs. 3518.3 crore in 1977-78 at purchaser's price (Table 6.1). It is this total which needs to be broken down.

As stated earlier, from the details presented in DDG, it was possible to identify expenditure only on 15 items. The total

expenditure on these items amounted to only 40 per cent of total DDG expenditure. But the figure of expenditure on some of the items given in DDG is exhaustive. These items are: (i) construction materials, (ii) papers, paper products and printing and (c) "office expenses" taken to cover (mainly) gas, electricity, water supply and communication expenses. We removed from Rs. 3518.3 crore the sum of expenditures on those items the expenditure on which could be identified. The problem then is reduced to that of allocation of the rest of the expenditure of Rs. 1956.83 crore.

TABLE 6.1

Estimation of Total Central Government Expenditure on Goods and Services from the Economic and Functional Classification (1977-78)

(Rs. crore)

<i>Name of the head</i>	<i>Amount</i>
1. Consumption expenditure on commodities and services	1775.7
2. Consumption expenditure of departmental commercial undertakings	
a. commodities and services	766.9
b. 1/2* of repairs and maintenance	241.4
3. Gross fixed capital formation	
a. 2/3* of expenditure on buildings and construction	435.1
b. 2/3* of expenditure on machinery and equipment	310.5
c. net increase in stocks	(—) 11.3
<b>TOTAL:</b>	<b>3518.3</b>

*Notes:* \*These ratios are the same as those used conventionally while preparing the economic and functional classification.

*Source:* Government of India, Department of Economic Affairs, Ministry of Finance (1979). *An Economic and Functional Classification of the Central Government Budget*, New Delhi.

We next combined the figures of commodity-wise purchases derived from DGP, the *Compendium* and other sources through the horizontal summation of columns 2, 3 and 4 of Table 6.2. In adding the expenditure by the Railways and the Post and Telegraphs to DGP purchases, some adjustments are made to avoid double-counting. For example, it is understood that roughly 1/3rd of the Railways' requirements of textiles, wood and wood products, metal products, leather and leather pro-



TABLE 6.2

## Sector-wise Purchases of Central Government Expenditure Derived from Different Sources

(Rs. crore)

	DDG	DGP	Rail-ways	Other sources
	(1)	(2)	(3)	(4)
1. Food items	56.86	136.11		2.45
2. Minerals		1.00	100.35	
3. Edible oils	51.56	1.37		0.50
4. Beverages		0.68		
5. Narcotics		0.21		
6. Cotton textiles	55.87	66.19	4.84	1.00
7. Woollen & silk textiles		29.19		
8. Jute textiles		40.83		
9. Wood and wood products	0.05	9.65	8.46	
10. Paper & paper products	55.09	29.98		32.13
11. Leather and leather products		7.75	6.42	
12. Rubber and Rubber products		22.87		
13. Petroleum products	5.10	100.53	143.89	
14. Chemicals & chemical products	557.73	74.73	28.13	
15. Construction materials	515.32	209.11	31.55	
16. Metal, non-metal products	15.61	52.10	78.49	
17. Non-electrical machinery & transport equipment	8.94	94.78	282.92	5.69
18. Electrical machinery	207.33	50.80	31.13	
19. Gas, electricity, water supply and communications	23.38			
20. Other services	8.63	10.68		

- Sources: 1. Government of India (1979-80). *Detailed Demands for Grants*, vols. I, II and III.
2. Government of India, Directorate General of Supplies and Disposals (Statistical Directorate). Department of Supply. *Directory of Government Purchases* and information directly supplied.
3. Government of India, Ministry of Railways (1979). *A Compendium of Statistical Information on Materials Management*.
4. Government of India (1979). Performance Budgets of various ministries (Home, Food and Agriculture and Post & Telegraphs).

ducts and petroleum products are purchased through DGS&D. Similarly, approximately 20 per cent of the equipment and paper and paper products bought by the Post and Telegraphs are procured through DGS&D. To avoid double-counting, these purchases were eliminated from the figures of purchases of the concerned items given in the *Compendium* and the *Annual Report* of the Post and Telegraphs.

The proportions of expenditures on the different commodity groups in the total combined purchases of DGP, the *Compendium* the *Annual Report* of Post and Telegraphs and the *Performance Budgets*, were then applied to the unallocated expenditure on good and services to derive the break-down of that part of expenditure. The break-down thus derived was added to that of the expenditure from DDG which we had derived earlier.

Thus the commodity break-down of the entire expenditure of Rs. 3518.3 crore was obtained. Table 6.3 presents the break-down of the purchases by the Central government, inclusive as well as exclusive of the purchases of the departmental undertakings (the Railways being the most important of the three).

If Central government expenditure excluding departmental undertakings is considered, it is seen that the largest share of expenditure (17.6 per cent) goes to construction materials (mainly road dressing and roof materials). This is followed by the share of non-electrical machinery and transport equipment (14.9 per cent) followed by the shares of food items and petroleum products (12.2 and 12.0 per cent, respectively). Thus the above-mentioned four groups of items account for 56.7 per cent of total expenditure. Other groups whose shares exceed 5 per cent were chemical products, metals and non-metal products, electrical machinery and cotton textiles. If these are added to the first four groups, the combined share will amount to 81.2 per cent. Thus over 80 per cent of total Central government expenditure creates direct demand for the products of just eight broad groups of industries.

Now, if Central government expenditure including departmental undertakings is taken, it is seen that the largest share of expenditure (19.70 per cent) goes to non-electrical machinery and transport equipment, (mainly automobiles and spares, machine tools and accessories and earth-moving machinery

**TABLE 6.3**  
**Commodity Composition of Central Government Expenditure**  
**on Goods and Services**  
**(1977-78)**

(Amounts in Rs. crore)

Sl. No.	Items	Central government purchases		Central government purchases excluding railways and other departmental undertakings	Railways and other departmental undertakings	
		Amount	Per cent of total			
		(1)	(2)	(3)	(4)	(5)
1.	Food items	334.91	9.52	334.91	12.18	
	Cost of ration	334.90	9.52	334.90	12.18	
	Fodder	0.01	neg.	0.01	neg.	
2.	Minerals	224.79	6.39			
	Coal	100.35	2.85			100.35
	Petroleum crude					
	Others	124.44	3.54	124.44	4.53	
3.	Edible oils	4.65	0.13	4.65	0.17	
4.	Beverages	1.74	0.05	1.74	0.06	
5.	Tobacco & tobacco products	0.58	0.02	0.58	0.02	
6.	Cotton textiles	174.14	4.95	159.30	5.79	14.84
7.	Woollen & silk textiles	70.64	2.01	70.64	2.57	
8.	Jute textiles	98.55	2.80	98.55	3.58	
9.	Wood & wood products	43.89	1.25	35.43	1.25	8.46
10.	Paper & paper products	55.09	1.57	50.16	1.82	4.93
11.	Leather and leather products	34.31	0.98	27.89	1.01	6.42
12.	Rubber & rubber products	55.24	1.56	55.24	2.01	
	Tyres & tubes	33.14	0.94	33.14	1.21	
	Hoses	1.08	0.03	1.08	0.04	
	Contraceptives	13.44	0.38	13.44	0.49	
	Rubberised fabrics	2.64	0.07	2.64	0.10	
	Others	4.94	0.14	4.94	0.18	
13.	Petroleum products	474.75	13.49	330.86	12.03	143.89
14.	Chemicals & chemical products	225.31	6.40	197.18	7.17	28.13
	Drugs & pharmaceuticals	76.62	2.18	67.05	2.44	9.57
	Paints & varnishes	18.83	0.54	16.48	0.60	2.35

TABLE 6.3 (Contd.)

	(1)	(2)	(3)	(4)	(5)
Gases	20.25	0.58	17.72	0.64	2.53
Insecticides	34.67	0.98	30.34	1.10	4.33
Soaps	5.72	0.16	5.01	0.18	0.71
Polythene fibres	34.56	0.98	30.24	1.10	4.32
Others	34.65	0.98	30.34	1.10	4.31
15. Construction materials	515.17	14.64	483.62	17.59	31.55
Road dressing & roof materials	497.97	14.15	467.48	17.00	30.49
Others	17.19	0.49	16.14	0.59	1.05
16. Metals, non-metals & products	252.34	7.17	173.85	6.32	78.49
Gold	3.63	0.07	1.81	0.07	0.82
Silver	0.04	neg.	0.03	neg.	0.01
Others	249.67	7.10	172.01	6.25	77.66
17. Non-electrical machi- nery & transport equipment	693.08	19.7	410.16	14.91	282.92
Machine tools and accessories	158.28	4.5	93.67	3.41	64.61
Earth-moving machi- nery & spares	131.97	3.7	78.10	2.84	53.87
Cranes, hoists, lifting jacks, etc.	20.50	0.58	12.13	0.44	8.37
Road-rollers & spares	28.13	0.8	16.65	0.61	11.48
Business & accounting machines	13.09	0.37	7.75	0.28	5.34
Welding electrodes	6.98	0.20	4.13	0.15	2.85
Welding sets & gas cutting sets	5.93	0.17	3.51	0.13	2.42
Computers, accessories & spares	8.87	0.25	5.25	0.19	3.62
Automobiles & spares	211.9	6.02	125.40	4.56	86.50
Marine equipment	40.39	1.15	23.90	0.87	16.49
Rail transport equipment	3.97	0.11	2.35	0.09	1.62
Hospital equipment & others	63.06	1.79	37.32	1.35	25.74
18. Electrical machinery	172.69	4.91	141.56	5.15	31.13
Power transformers	4.87	0.14	3.99	0.14	0.88
Electric lamps & fittings	13.21	0.37	10.83	0.39	2.38
Fans	21.91	0.62	17.96	0.65	3.95
Electronic equipment	20.77	0.59	17.03	0.62	3.74
Cables & wires	16.57	0.47	13.58	0.49	2.99

TABLE 6.3 (Contd.)

	(1)	(2)	(3)	(4)	(5)
Refrigerators & air conditioners	20.87	0.59	17.11	0.62	3.76
Power-plant equipment & switch-gears	19.08	0.54	15.64	0.57	3.44
Storage batteries	23.77	0.67	19.49	0.71	4.28
Furnaces, ovens, blowers etc.	8.37	0.24	6.86	0.25	1.51
Others	23.25	0.66	19.06	0.69	4.19
19. Gas, electricity & water supply, etc	23.38	0.66	23.38	0.85	
20. Other services	25.87	0.74	23.87	0.86	2.00
<b>TOTAL</b>	<b>3518.33</b>	<b>100.00</b>	<b>2750.01</b>	<b>130.00</b>	<b>768.32</b>

*Note :* Individual items may not add up to the totals of the sub-heads and the sub-head also may not add-up to the total, as the expenditure vector and the total expenditure are divided separately from independent sources. Since the resultant discrepancy being negligible at about 1 per cent, no attempt has been made to correct it.

and spares). The next largest share is that of construction materials (14.64 per cent) followed by petroleum products (13.49 per cent), food items (9.52 per cent), metals, non-metals and products (7.17 per cent) and minerals (6.39 per cent). These six items constitute 71 per cent of government purchases. Among the others, textiles (cotton, woollen and silk, and jute) and chemicals and chemical products are important, forming about 16 per cent of government purchases.

### Computation of Indirect Demand for Sectoral Output

#### a. Methodology

For quantifying the effect of Government expenditure on the economy, an open-end Leontief model is considered to be well suited, particularly in the short-run with no possibility of substitution among the factors of production and with average input coefficients equal to marginal ones. The model in matrix notation consists of the following:

$x = (n \times 1)$  vector representing the value of output of each of the industries

$A = (n \times n)$  fixed technical coefficients matrix

$G = (n \times 1)$  vector of government expenditure coefficients

$g =$  a scalar representing total government commodity expenditure

$C = (n \times 1)$  vector of private consumption coefficients

$c =$  a scalar of private consumption

$F = (n \times s)$  matrix of  $s$  other final demand coefficients including investment, inventory and exports

$f = (s \times 1)$  vector of values of other final demands

$B = (v \times n)$  a matrix of  $v$  primary input coefficients

$y = (v \times 1)$  vector of total values of primary inputs (imports, indirect taxes, wages and non-wage income)

$H = (v \times 1)$  direct primary coefficients vector associated with government expenditures

$D, E =$  similar matrices of direct primary coefficients associated with the other final consumption vector.

The static open-end Leontief model can be conveniently expressed in the two identities as given below:

$$x = Ax + Gg + Cc + Ff \quad (1)$$

$$y = Bx + Hg + Dc + Ef \quad (2)$$

From the two identities various types of impact of different final demands on outputs, incomes, imports or employment of primary inputs can be quantified. However, our interest is only in the impact of the demand of the government sector; we intend to study:

- (i) direct impact on sectoral outputs;
- (ii) total impact on sectoral outputs; and
- (iii) impact on demand for impacts.

The value of purchases of goods and services made by the government directly from each of the production sectors forms the first impact or direct impact. This impact is equivalent to  $Gg$  vector itself.

The total (i.e., direct + indirect) impact of government purchases on sectoral outputs can be obtained with the help of equation (1). Rearranging the terms we get

$$x = (I - A)^{-1} [Gg + Cc + Ff] \quad (3)$$

That part of output which can be attributed to government demand is

$$Xg = (I - A)^{-1} Gg \quad (4)$$

Since we assume a static model, the marginal coefficients are equal to the average and the sectoral output multipliers of government demand can be obtained as

$$\Delta x_g / \Delta g = x_g / g = (I - A)^{-1} G \quad (5)$$

The impact on imports arises because the additional demand on the production of various sectors causes additional demand also for imports.

Substituting for  $x$  in equation (2), we get:

$$y = B(I - A)^{-1} [Gg + Cc + Ff] + Hg + Dc + Ef \quad (6)$$

The impact of government demand on imports can be quantified as:

$$Y_{1g} = B_1 [I - A]^{-1} Gg + H_{1g} \quad (7)$$

where  $Y_{1g}$  is that part of  $Y_1$  attributable to  $Gg$ ,  $Y_1$  being the import element of  $y$  - vector.  $B_1$  is a row of import coefficients.  $H_1$  represents the total direct imports. The multipliers can be computed as:

$$\Delta Y_{1g} / \Delta g = Y_{1g} / g = B_1 (I - A)^{-1} G + H_1 \quad (8)$$

It should be noted that sectoral disaggregation of additional import demand  $y_{1g}$  cannot be obtained directly through the above analysis. For example,  $y_{1g}$  is a scalar number and represents the total imports rather than sector-wise import demands. This problem, however, can be circumvented by interpreting the concerned row in  $B$  matrix as a separate matrix of  $(n \times n)$  dimension which has the elements of the original row vector as diagonal elements and zeros for all off-diagonal elements. Thus the imports row  $B_1$  originally is  $(b_{11}, b_{21}, \dots, b_{n1})$ . This row can be replaced by the matrix  $B_1$ :

$$B_1 = \begin{bmatrix} b_{11} & 0 & 0 & \dots & 0 \\ 0 & b_{21} & 0 & \dots & 0 \\ 0 & 0 & b_{31} & \dots & 0 \\ 0 & 0 & 0 & \dots & b_{n1} \end{bmatrix}$$

The resultant  $y_{1g}$  will be a column vector representing the sector-wise additional import demand generated by government purchases.

To facilitate further analysis, the sectoral impact is also expressed as proportion to sectoral output.

*b. Estimates of direct and indirect demand*

Our measurement of total demand for sectoral output emanating from the government through the use of the input-output matrix yielded the following results. Central government purchases worth Rs. 2536.75 crore<sup>3</sup> generated an additional indirect demand worth Rs. 4063.66 crore making a total demand of Rs. 6600.41 crore (Tables 6.4 and 6.5). Aggregate output multiplier works out to approximately 2.6 (Table 6.6) and the domestic multiplier works out to 2.2. That is, if government spends Rs. 100 crore on goods and services, the total demand for output in the economy would go up by Rs. 220 crore.

The pattern of total (direct and indirect) demand generated resembles little that of direct demand arising from government expenditure. While the major portion of direct demand is on machinery and transport equipment, petroleum products, construction materials and food products, the major portion of indirect demand is on minerals (22.24 per cent) including petroleum crude and coal, edible oils (10.75 per cent), chemicals and chemical products (20.8 per cent), metal and non-metal products (15.4 per cent), petroleum products (17.19 per cent), and construction materials (10.87 per cent).

By comparing the direct demand pattern vector with indirect demand pattern vector, we can classify the 20 groups of commodities into three categories: (i) commodities for which indirect demand is high even though direct demand is low<sup>4</sup> (ii) commodities for which indirect demand is low even though direct demand is high<sup>5</sup> and (iii) commodities for which direct and indirect demands are more or less similar.<sup>6</sup>

Prominent among the first category are coal and other minerals, edible oils, tobacco and tobacco products, beverages, wood and wood products, rubber and rubber products, public utilities, namely, gas, electricity, water supply, and communications as well as other services. Other sectors that fall into



this category are jute textiles, leather and leather products, and metal and non-metal products. These are intermediate commodities which are needed in the production of most of the commodities. Thus, indirect demand for them is high though government does not purchase them directly. The second category includes woollen and silk textiles, food, non-electrical machinery and transport equipment. These are mainly final consumption goods. The third category covers petroleum products, construction materials and electric machinery.

**TABLE 6.4**  
**Sector-wise Purchases of Central Government**  
**1977-78**

(Rs. crore)

	<i>Commodity purchases at market prices</i>	<i>Commodity purchases at producer's prices</i>
	(1)	(2)
1. Food items	334.91	278.84
2. Coal and other minerals	224.79	155.79
3. Edible oils	4.65	3.30
4. Beverages	1.74	1.27
5. Tobacco and tobacco products	0.58	0.25
6. Cotton textiles	174.14	124.07
7. Woollen and silk textiles	70.64	50.24
8. Jute textiles	98.55	68.25
9. Wood and wood products	43.89	29.69
10. Paper and paper products	55.09	39.07
11. Leather and leather products	34.31	22.33
12. Rubber and rubber products	55.24	42.63
13. Petroleum products	474.74	351.41
14. Chemical and chemical products	225.31	150.97
15. Construction materials	515.17	330.60
16. Metal and non-metal products	252.34	184.46
17. Non-electrical machinery and transport equipment	693.08	527.24
18. Electric machinery	172.69	131.18
19. Gas, electricity, water supply and communications	23.38	19.28
20. Other services	25.87	25.88
<b>TOTAL:</b>	<b>3518.33</b>	<b>2536.75</b>

*Note:* Col. 1 is derived from sources given in Appendix I. Col. 2 is derived from Col. 1 after adjusting for the margins of trade, transport, etc. The price ratios for the purpose of conversion are obtained from Venkatramaiah, P., Kulkarni and Argade (1979).

TABLE 6.5

**Sector-wise Direct and Indirect Impact of  
Central Government Purchases  
(1977-78)**

	(Rs. crore)		
	<i>Direct demand</i>	<i>Indirect demand</i>	<i>Total demand</i>
	(1)	(2)	(3)
1. Food items	278.84	160.81	439.65
2. Coal and other minerals	155.79	564.25	720.04
3. Edible oils	3.30	272.66	275.96
4. Beverages	1.27	12.22	13.49
5. Tobacco and tobacco products	0.25	2.95	3.20
6. Cotton textiles	124.07	72.77	196.84
7. Woollen and silk textiles	50.24	11.18	61.42
8. Jute textiles	68.25	180.18	248.43
9. Wood and wood products	29.69	202.98	232.67
10. Paper and paper products	39.07	219.47	258.54
11. Leather and leather products	22.33	42.36	64.69
12. Rubber and rubber products	42.63	187.78	230.41
13. Petroleum products	351.41	436.17	787.58
14. Chemicals and chemical products	150.97	527.37	678.34
15. Construction materials	330.60	275.90	606.50
16. Metal and non-metal products	184.46	390.64	575.10
17. Non-electrical machinery and transport equipment	527.24	139.71	666.95
18. Electrical machinery	131.18	129.71	260.89
19. Gas, electricity, water supply and communications	19.28	95.01	114.29
20. Other services	25.88	139.54	165.42
<b>TOTAL</b>	<b>2536.75</b>	<b>4063.66</b>	<b>6600.41</b>

**TABLE 6.6**  
**Sector-wise Direct and Indirect Impact Per Rs. 100 of**  
**Government Purchases**  
**(1977-78)**

	(Per cent)		
	<i>Direct</i>	<i>Indirect</i>	<i>Total</i>
	(1)	(2)	(3)
1. Food items	10.99	6.23	17.22
2. Coal and other minerals	6.14	22.24	28.38
3. Edible oils	0.13	10.75	10.88
4. Beverages	0.05	0.48	0.53
5. Tobacco and tobacco products	0.01	0.12	0.13
6. Cotton textiles	4.89	2.87	7.76
7. Woollen and silk textiles	1.98	0.44	2.42
8. Jute textiles	2.69	7.10	9.79
9. Wood and wood products	1.17	8.00	9.17
10. Paper and paper products	1.54	8.65	10.19
11. Leather and leather products	0.88	1.67	2.55
12. Rubber and Rubber products	1.68	8.23	9.91
13. Petroleum products	13.85	17.19	31.04
14. Chemicals and chemical products	5.95	20.79	26.74
15. Construction materials	13.03	10.87	23.90
16. Metal and non-metal products	7.27	15.40	22.67
17. Non-electrical machinery and transport equipments	20.78	5.51	26.29
18. Electric machinery	5.17	5.11	10.28
19. Gas, electricity, water supply and communications	0.76	3.74	4.50
20. Other services	1.03	5.50	6.53
<b>TOTAL</b>	<b>100.00</b>	<b>160.89</b>	<b>260.89</b>

*Note:* Totals may not tally due to rounding off.

In the resultant pattern of total demand (Col. 3 of Tables 6.5 and 6.6), minerals, petroleum products, chemicals and chemical products, machinery and transport, construction, metal and non-metal products and food items come out to be prominent.

The demand for output as a result of government purchases constitutes approximately 8 per cent of total supply of goods and services in the economy (Table 6.7). Of this, direct demand by the government constitutes only 3 per cent and induced demand approximately 5 per cent.

### c. *Impact on import demand*

Though the direct government demand for imports is only Rs. 50 crore, indirect demand for imports generated in the economy as a result of government purchases is sizeable—Rs. 918 crore. Thus the total demand created for imports works out to be around Rs. 968 crore (Table 6.8). Machinery (electric and non-electric) and transport equipment (84 per cent), petroleum products (10 per cent) and metal and non-metal products (4 per cent) are the main commodities imported directly by the Central government. But the indirect import demand by the sectors which supply the goods and services to government mainly centre around minerals (39 per cent), petroleum products (18 per cent) and chemicals and chemical products (12 per cent).

### **Comparison With Other Estimates**

Our estimate of output-multiplier of the Central government demand for goods and services at 2.6 for 1977-78, seems rather high when compared to those estimated by others for different years in the past. Mathur's (1962) output-multiplier of defence expenditure for the years 1957-58 and 1958-59 is 1.99. Paithankar's (1973) output-multiplier is 1.5 for the period 1965-66 to 1968-69. Sarma and Tulsidhar's (1980) output-multiplier is 1.6 for the year 1971-72. Strictly speaking, however, a straight comparison may not be valid. Firstly, the multipliers estimated by the quoted authors are for earlier years. Secondly, all of them are not multipliers relating to total Central government purchases; for example, Mathur (1962) was estimating the

TABLE 6.7

Proportion of Output in the Total Output Attributable to the Impact  
of Central Government Expenditure  
(1977-78)

(Per cent)

<i>Sl. No.</i>	<i>Items</i>	<i>Direct Demand</i>	<i>Indirect demand</i>	<i>Total demands</i>
		(1)	(2)	(3)
1.	Food items	0.03	0.03	0.08
2.	Minerals	0.46	1.67	2.13
3.	Edible oils	0.05	3.74	3.79
4.	Beverages	0.01	0.09	0.10
5.	Tobacco and tobacco products	—	0.03	0.03
6.	Cotton textiles	0.22	0.13	0.35
7.	Woollen and silk textiles	0.60	0.13	0.73
8.	Jute textiles	1.16	3.07	4.23
9.	Wood and wood products	0.25	1.69	1.94
10.	Paper and paper products	0.38	2.14	2.52
11.	Leather and leather products	0.26	0.50	0.76
12.	Rubber and rubber products	0.48	2.13	2.61
13.	Petroleum products	1.85	2.30	4.15
14.	Chemicals and chemical products	0.28	0.96	1.24
15.	Construction materials	1.23	1.02	2.25
16.	Metal and non-metal products	0.28	0.60	0.88
17.	Non-electric machinery and transport equipment	0.41	0.11	0.52
18.	Electrical machinery	1.06	1.05	2.11
19.	Gas, electricity, water supply and communications	0.02	0.12	0.14
20.	Other services	0.01	0.04	0.05
	All sectors	3.13	5.01	8.14

TABLE 6.8

**Direct and Indirect Import Requirements of Central  
Government Commodity Expenditure**

(Rs. crore)

<i>Sl.</i>		<i>Direct</i>	<i>Indirect</i>	<i>Total</i>
<i>No.</i>	<i>Items</i>	(1)	(2)	(3)
1.	Food items	—	4.32	4.32
2.	Minerals	Neg.	361.34	361.34
3.	Edible oils	—	140.32	140.32
4.	Beverages	—	0.01	0.01
5.	Tobacco and tobacco products	—	—	—
6.	Cotton textiles	—	0.44	0.44
7.	Woollen and silk textiles	—	0.98	0.98
8.	Jute textiles	—	0.27	0.27
9.	Wood and wood products	—	26.74	26.74
10.	Paper and paper products	—	0.07	0.07
11.	Leather and leather products	—	0.84	0.84
12.	Rubber and rubber products	Neg.	0.27	0.27
13.	Petroleum products	5.52	162.09	167.61
14.	Chemicals and chemical products	0.10	105.88	105.98
15.	Construction Materials	—	3.47	3.47
16.	Metal and non-metal products	2.20	46.43	48.63
17.	Non-electrical machinery and transport equipment	36.47	19.17	55.64
18.	Electric machinery	4.48	44.26	48.74
19.	Gas, electricity, water supply and communications	—	—	—
20.	Other services	—	1.94	1.94
TOTAL :		48.77	918.84	967.61

*Note:* Totals may not tally due to rounding off.

total demand generated by defence expenditure only and Pait-hankar's study covered not only the Central government expenditure but also the expenditure of other governments and government agencies, since he used DGS&D data without modifications. Thirdly, the method of estimation of government vector by them is different from ours. And lastly, the pattern of government expenditure must have changed substantially over time.

#### NOTES

1. The induced income multipliers are analogous to the Keynesian consumption multipliers. Assuming that the consumption function for each commodity is linear, the Leontief inverse is recomputed after bringing the household income and consumption into the structural matrix. The last row in the extended inverse, when multiplied with the government vector, yields induced income associated with a unit increase in the final demand for the respective sector. The last entry in the row gives the consumption multiplier.

2. Prepared at the Gokhale Institute of Politics and Economics. See Mathur *et. al.* (1965).

3. At producers' prices.

4. Ratio of indirect demand to direct demand is more than one.

5. Ratio of indirect demand to direct demand is less than one.

6. Ratio of indirect demand to direct demand is equal to or slightly more than one.