Optimal Export-Product Mix Under Domestic Resource and Foreign Exchange Constraints : An Exercise for Indian Economy

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Certified that the dissertation entitled OPTIMAL EXPORT-PRODUCT MIX UNDER DOMESTIC RESOURCE & FOREIGN EXCHANGE CONSTRAINTS: AN EXERCISE FOR INDIAN ECONOMY. submitted by KRISHNENDU GHOSH DASTIDAR in partial fulfilment for the award of the degree of Master of Philosophy (M.Phil) of this University, is his original work and may be placed before the examiners for evaluation. This dissertation has not been submitted for the award of any other degree of this University or of any other University.

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Lastly I must confess that only I am to be blamed for the loopholes in my work.

Krishnendu Ghosh Dastidar.

KRISHNENDU GHOSH DASTIDAR

CHAPTER 1

INTRODUCTION

Introduction

(I) Economics is an evolving science, it must solve emerging puzzles and grapple with current dilemmas of public policy. For the planners of the Indian economy the recurring headache has been scarcity of capital resouces, lack of sufficient energy generating capacity, huge budgetory deficts and deficts in the balance of trade. The objective of our whole study is to figure out the optimal export/product mix in the Indian economy when one tries to minimise capital formation requirement /energy use in reaching a target of balanced trade in a situation of limited (but increasing) export potential and given final domestic demand. In carrying out this exercise we would rather be right than exciting. Moreover we will try to be clear. Nietzsche once complained about the "offensive simplicity of the style" of the nineteenth century economist J. S. Mill. We would love to be indicted for that offence.

Before coming to the main thread of our argument let us spell out why have we taken up these issues in the Indian context. The first exercise of investment minimisation under foreign exchange and final demand constraint is really very important given that we are simultaneously facing

a) A resource problem domestically and

b) A foreign exchange problem,

while political situation would not permit any reduction in final demand. Let us discuss these problems in a little more detail.

(II) CAPITAL FORMATION IN INDIA.

Capital formation or investment has been treated as one of the most crucial factors in economic growth.

In the Indian context a careful analysis of data on domestic capital formation, despite its non-comparability over the years, clearly suggests that during the three and half decades of economic planning the rate of domestic capital formation (investment) has risen considerably. Let us have a brief look at this rise.

In the first year of the First Plan the rate of investement was as low as 10% per annum. During first 15 years of planned development in India, the rate of investment gradually increased and in 1966-67 was as high as 19.7% of the gross domestic product. For an economy which was caught in a low level equilibrium trap on account of its colonial exploitation and thus had suffered a long spell of stagnation, this was no mean achievement. The rate of investment declined after 1966-67 as a result of the poor performance of the economy during the third plan period. The recovery started in 1969-70. The rate of domestic capital formation in the fourth plan could, however rise only to 20%. During the fifth plan period investment rate

fluctuated around 21% of the gross domestic product. In 1978-79 the investment rate shot up to 23.3%. The next decade saw a drop in this rate and only in the last two years there has been a marginal rise. In 1988/89 the ratio of gross capital formation to GDP stood at 23.9%.[1]

(III) A LITTLE DIGRESSION

To those who are trained to analyse problems of economic growth in the framework of the Harrod - Domar model, a paradoxical situation emerged in the country during the 1970s. Since 1973-74 rates of net domestic saving and net domestic capital formation had steadily risen for six years and even now are considerably higher than those in the late sixties, yet the rate of economic growth remains somewhat low. This is a puzzle which has attracted many studies but this is not a part of our discussion. But one may allude to a recurring suspicion - is India indulging in a wrong export/product mix ? (Wrong in the sense that it leads to higher capital costs). Given the importance of capital formation and given the scarcity of capital in an under developed country like India it is imperative we use our scarce capital resources prudently to achieve our target. This is one of the reasons why we have taken up this exercise of minimising capital costs while aiming for our desired goal.

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1. These figures are taken from Economic Survey (1989-90)

(IV) In case of capital formation it can be said that public investment is more important than private investment for developmental purposes in an under developed country because private investments are generally channelled into areas where returns are quick and high whereas public investment is mainly pursed on welfare grounds and for infrastructure development, where the gestation period is long and initial returns are low. In view of this fact the question of financing public investment outlays presents the principal problem facing the Indian mixed economy.

There are broadly three sources from which resources are raised for the public sector plans. These are (i) internal sources, (ii) deficit financing (ii) foreign aid.

Among the internal sources taxation provides the main basis for current revenue blance and is invariably relied upon for additional resource mobilisation. In the earlier phase of planned development, tax revenue constituted only a small proportion of the country's national income. For example, in 1950-51 the governments revenue collection through taxation was only 6.6% of the national income. However it rose to 13% in 1968-69 and to 21.6% in 1986/87. In our taxation pattern some interesting features are notable. First one may note the vanishing small importance of revenue derived from ownership of land. Such revenue as accruing from the rural sector are all in the form

of taxes on particular commodities, used either as articles of consumption or as inputs into the production process. It reflects a profound sociological fact : the emergence and consolidation of a rural elite who have gained from public investment manyfold without having to bear the cost of such investment. Secondly one can note that while-tax-income ratio has increased, taking the planning period as a whole, the relative share of direct taxes has diminished drastically. The consequence of the changing pattern of budgetory revenue has been the emergence of a system of indirect taxation which is higly biased in favour of a few selected items known as 'universal intermediaries' and a class of commodities generally known as luxaries. It is often argued that this method of raising resources for the public sector plan is likely to have minimal adverse effects on the investment plan in the private sector. This approach is, however, erroneous as it completely ignores the interests of the weaker sections of the society. It is based on an underlying assumption that growth is an end in itself and rejects the more rational view that growth is to be treated as a means to human welfare.

Keeping in view the above facts and the fact that there is widespread poverty and the overall low per capital income, there is not much scope left for raising still larger resources either by imposing new

taxes or by raising the rates of existing taxes.

Another source of additional resources mobilisation in our country is deficit financing. Deficit financing in India refers to the excess of total expenditure over total budgetory receipts on current and capital accountss together. According to H.W. Singer,[2] a government deficit thus created will be inflationary to the extent that no room is made for it by one or the other of the following changes (or of course a combination of these):

"a) a voluntary reduction of private consumption (increased propensity to save), without an increase in private capital formation or in export surplus,

b) a voluntary reduction of private capital formation, without an increase in private consumption,

c) an increase in private incomes without an increase in private consumption or private capital formation,

d) a foreseen or pre-arranged reduction in the export surplus or increase in import surplus".

Absence of these adjustments while deficit financing is undertaken will necessarily generate inflationary pressures, but the presence of these adjustments is not enough to ensure absence of inflationary pressures. In underdeveloped countries, since it is not easy to make these adjustments,

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2. H.W. Singer, "Deficit Financing of Public Capital Formation" in A.N. Aggrawal and S.P. Singh (ed.) : Accelerating Investment in Developing Economies.

inflationary pressures develop as a result of deficit financing. Further, completion of development projects generally takes a long time. Over this period indulgence in deficit financing creates conditions of excess demand, as the supply increases only after the projects are completed. Thus deficit financing often creates conditions for what is characterised as the demand pull inflation. The process of price rise thus started not only hurts the fixed income groups, but also disturbs cost estimates of various projects which eventually distorts the whole planning activity in the country.

In India, great reliance has been placed on deficit financing for mobilising resources for the plans. In recent years deficit financing has been carried on a massive scale. A look at the picture for the last decades in table-1A will corroborate this.

Even, without submitting to a monetarist's position, one cannot deny that in the Indian situation, there are limits to the amount of public investment that can be financed by borrowing from the RBI.[3] There need not be any mechanical correlation between increase in money supply made possible by increase of

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3. The Economic Survey (1989-90) has noted that the budget deficit as conventionally reported is only a partial measure of the fi scal imbalance that has built up over the years. What matters is the monetised deficit i.e, the increase in net RBI credit to the Central Government.

TABLE - 1A

BUDGETARY TRANSACTIONS OF THE CENTRAL AND STATE GOVERNMENTS & UNION TERRITORIES

(Rs. Crores)

	1980-81	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89 (BE)	1988-89 (RE)	1989-90 (BE)
I.Total Outlay	36845	60829	72825	83961	100790	112169	127780	132081	149223
II.Current Revenue	24563	40989	47098	56773	64823	73485	86036	84849	103623
III.Gap	12282	19840	25727	27188	35967	38884	41744	47280	45600
IV.Capital Receipts	8831	17705	20522	23749	26817	33180	33388	38427	37394
V. Overall Budgetary Deficit	3451	2135	5105	3439	9150	5504	8356	8853	8206

Source : Economic Survey 1989-90

net lending by the RBI to the government and the increase in price level but a broad positive relation cannot be denied. This implies that the present method of financing public outlays which is getting increasingly dependent on a large volume of deficit financing needs a major overhaul.

Another source of mobilisation is foreign aid. In absolute terms India has been one of the biggest recipients of foreign aid for developmental purposes but the position is not enviable if we consider the amount of aid in relation to its population.

For evaluation of the role of external assistance in the capital formation in the public sector during the planning period we must consider the ratio of aid to overall investment in this sector.

During the second and third plan periods the external assistance had accounted for 25% of the total investment in the puvblic sector. Subsequently, under the three Annual Plans contribution of external assistance to investmnet in the public sector rose to 40%. Thereafter the relative importance of external assistance in Indian plans declined . Between 1951-56 and 1967-68 the ratio of aid to import surplus was also high which implied that a major part of the aid was spent on meeting the deficit. During the fourth plan period, on account of recession in the industrial sector, investment activity did not reflect buoyancy. Hence the country did not require aid on the same scale

as on the Third Five Year Plan and the three Annual Plans. Further, a major part of the aid received in this period was spent on financing the imports and thus its contribution to domestic capital formation was at best marginal. Under the fifth plan external assistance did not rise in percentage terms. Yet the absolute amount of aid was considerably larger than that under the Fourth Plan. According to original scheme of financing of the Sixth plan the government hoped to raise Rs. 9929 crores through external assistance. In percentage terms this was approximately one tenth of the resources required for the plan. As against these contemplated external assistance the total foreign aid received during the plan period was Rs. 8529 crores. Thus over time the role of external assistance in the domestic capital formation has declined.

There are several problems relating to external assistance. Firstly it appears on the basis of scattered indirect information that over the years the share of non-project aid in the external assistance to this country has increased has compared to project aid. It has been noted the non-project aid is often utilised by the borrowing countries for less essential imports which obviously does not help in capital formation. Here it may be said that a large part of the aid is spent on financing the deficit in balance of trade which has grown almost frantically over the years. A

look at the balance of trade scenario over the years in table -1B will prove our point. As noted in Economic Survey (1989-90), " with the decline in the role of supluses in the invisibles account and given the contracts on the disbursement of concessional aid an increasing part of trade deficit has been financed by external commercial borrowings, non-resident deposits and decline in foreign exchange reserves".

This has led to growing stocks of medium and long term external liabilities, higher debt service ratios and significant depletion of foreign exchange reserves. During the first four years of the Seventh Plan foreign exchanged reserves have declined by SDR 2,289 million. Regarding debt servicing it can be said that it has become another major problem relating to external assistance. The data provided in table-1C clearly indicate how rapidly the burden of external debt servcing has increased in this country during the planning period. They, however do not reflect fully the gravity of the situation in recent years. The debt servicing charges have accounted for 50% of the total external assistance. Their burden on the economy can be realised from the simple fact that now approximately one per cent of the national income regularly flows out on account of external debt servicing. All this shows that financing capital formation through external assistance is no more a rosy proposition.

Our discussion till now points to the fact that

TABLE - 18

EXPORTS - IMPORTS AND TRADE BALANCE (Rs. crore)

Year	Exports (incl.Re - exports)	Growth rate in percent	Imports	Growth rate in percent	Trade Balance
1970 -71	1535		1634		-99
1971 -72	1608	4.755700	1825	11.68910	-217
1972 -73	1971	22.57462	1867	2.301369	104
1973 -74	2523	28.00608	2955	58.27530	-432
1974 -75	3329	31.94609	4516	52.82571	-1187
1975 -76	4036	21.23760	5265	16.58547	-1229
1976 -77	5142	27.40336	5074	-3.62773	68
1977 -78	5408	5.173084	6020	18.64406	-612
1978 -79	5726	5.880177	6811	13.13953	-1085
1979 -80	6418	12.08522	9143	34.23873	-2725
1980 -81	6711	4.565285	12549	37.25254	-5838
1981 -82	7806	16.31649	13608	8.438919	-5802
1982 -83	8803	12.77222	14293	5.033803	-5490
1983 -84	9771	10.99625	15831	10.76051	-6060
1984 -85	11744	20.19240	17134	8.230686	-5390
1985 -86	10895	-7.22922	19658	14.73094	-8763
1986 -87	12452	14.29095	20096	2.228100	-7644
1987 -88	15741	26.41342	22399	11.45499	-6658
1988 -89	20295	28.93081	28194	25.87169	-7899

Source : Economic Survey (1989-90)

TABLE -1C

External Debt Servicing

(Rs. Crores)

Period		Amortisation	Interest Payments	Total Debt Servicing
First Plan	(1951-56)	10.5	13.3	23.8
Second Plan	(1956-61)	55.2	64.2	119.8
Third Plan	(1961-66)	305.6	237	542.6
Annual Plans	(1966-69)	606.8	375.7	982.5
Fourth Plan	(1969-74)	1584.2	860.8	2445
Fifth Plan	(1974-79)	2539.4	1236	3874.4
Annual Plan	(1974-79)	503.9	296.9	800.7
Sixth Plan	(1980-85)	2905.9	1903.3	4809.2
1985-86		775.8	590.8	1366.6
1986-87		1175.7	853.4	2029.1
1987-88*		1290.6	794.1	2084.7

* Estimated

Source : Economic Survey (1987-88)

the scope of resource mobilisation for capital formation either domestically or through external assistance is quite limited. It is an elementary fact that in a mixed economy, the government cannot directly commandeer resources for its own use. Neither can it regulate the ratio prices to wages to keep the level of aggregate demand in step with the money value of output. In the context of accelerated capital formation in a backward agrarian economy, there is the additional pressing fact that the level of labour productivity in agriculture is barely close to the level of subsistence consumption requirements. An economy under these circumstances can grow in a non-inflationary manner only if the real "slacks" provided by the system in the form of wasteful consumption of upper classes as well as redundant labour is made use of to generate additional investable resources which can lead to greater capital formation. Moreover political situation would not permit any reduction in final demand. It can be metioned here that government consumption expenditure which is a large part of total final demand has shown exponential rising trend over the years.

V. POSSIBLE WAY OUTS OF THIS IMPASSE

On the face of the above constraints viz domestic resource contraint, external assistance problems and present political scenario (which denies any scope of

reduction in final demand) there seems to be only a few way outs.

The first way out is greater degree of political determination in regard to collecting taxes including service charges and electricity and water rates, reducing regressive subsidies and substantially widening the tax base. Given the present socio-political structure of our economy this way out is improbable. As Pranab Bardhan has noted, "when diverse elements of dominant coalition of the propriety classes pull in different directions and when none of them is individually strong enough to dominate the process of resources allocation, one predictable out come is the proliferation of subsidies and grants to placate all of them with the consequent reduction in available surplus for capital formation".

The second way out is the alternative of pursuing the path of privatising of public investment outlay. But this is also not feasible because private funds would not get attracted towards projects with low initial returns.

The third way out which we propose is to select of proper export-product mix which will minimise capital formation requirements while we aim for a balanced trade under limited (but increasing) export potential. The target of balanced trade if achieved will do away with the problem of financing imports from external assistance, thus freeing foreign exchanges for vital

developmental programmes. However, given the propensity to import, the target of balanced trade is achievable only if there is an increase in our export potential. In the exercises which we will carry out in the latter chapters we will try to figure out the optimal export-product mix which will minimise capital formation requirements.

Let us now switch over to the energy front.

VI. ENERGY

"There is no substitute for energy, the whole edifice of modern life is built upon it. Although energy can be bought and sold like any other commodity, it is not just another commodity, but the precondition of all commodities, a basic factor equally with air, water and earth". This quote from Schumacher[4] pithily sums up the overwhelming importance of energy in any economy .

Research in the field of economic development recognise the special role of energy input assum ed in furthering economic growth. Considering the strategy for development in the general framework of unbalanced growth for a developing economy, Hirschman distinguished between Social Overhead Capital (SOC) and Directly Productive Activities (DPA). Power supply was an important element in the SOC category. Hirschman

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4. Taken from "Schumacher on Energy" ed. by Kirk(G)

argued that there was aminimum critical point, indicated by a critical ratio of SOC/DPA, where productive activities in an economy could only be increased if the power capacity could be expanded. Provision of adequate supply of power at reasonable prices could ensure expansion of power intensive activities on which the growth of the economy depended. Tynes observed that India had been continually near the limiting ratio of SOC/DPA with regard to energy resources over the past decades. He demonstrated through regression analysis based on data for national income and consumption of commercial energy in India over the years 1953-54 to 1970-71, that there was a close correspondence between the two variables in India during the time.[5]

Regarding the energy front in India we will mainly concentrate on electricity which is one of the major sources of commercial energy. In the seventh plan out of the total public sector outlay energy accounted for 30.8% and electricity itself accounted for 20% of the above outlay. In India during the past three and half decades energy has been developed on a considerable scale. The total installed capacity in the country was around 5940.38 MW at the end of March 1989 as against 2350 MW in 1950. This development though quite impressive in itself, left a gap between the demand for

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5. This part is entirely based on D.K.Bose's "Energy Economics" (ICSR).

and the supply of electricity. Consequently power shortages have become a normal phenomenon in almost every part of the country. This shows that as in the case of capital formation India should look for more productive uses of electricity and cannot afford to have wastages. So we have set upon ourselves the task of finding the optimal export-product mix to reach our desired goal with minimum electricity use.

VII. In carrying out our exercises we will take recourse to an input-output type of model allowing flexibility in the trade pattern and choices in the level of sectoral gross output.

In plain verbal terms our objective function will be to minimise either capital formation requirements or electricity use such that, sum of (exports minus imports) is greater than are equal to zero in a situation of limited export potential and given final domestic demand.

We have to formalise our problem in terms of a model. The next chapter will go on with the calibration of the model. The following two chapters after the chapter on model will see the calculations and generations of the required coefficients, matrices and vectors for the empirical validation of our model. In the fifth chapter we will discuss the results and interpretations of our optimal solutions from the exercises. In the last chapter we will ponder over the feasibility and practicability of the whole scenario.

CHAPTER 2

THE MODEL

THE MODEL

(I) A Brief Prelude :

In this chapter we intend to provide a snapshot of the economy through a model. In this respect we will hang on to the input-output scaffold which is largely the creation of W.W.Leontief.

The theory of input-output has at least three important aspects. Firstly, it is of interest to an economic theorist because it provides the simplest form of Walrasian general equilibrium ; its form is so simple that it holds out the hope of empirical statistical measurement. Secondly, input-output is of interest to the national income economist because it provides a more detailed breakdown of the macroaggregate and money flows. Thirdly, the theory of input-output can also be regarded as a peculiarly simple form of linear programming. In the simplest Leontief system, in which no substitutions of inputs are technologically feasible, the optimising solution is the one and only efficient solution possible.

Without further ado let us now delve into the building up of the model. We will first conceptualise the situation theoretically and then go in for the empirical exercises.

(II) Outline and Assumptions of the Model :

Suppose there are n sectors in the economy producing n goods. Our output-input framework seeks to take account of the interdependence of the production plans and activities of the n sectors which constitute the economy. This interdependence stems out of the fact that each industry employs the outputs of the other industries as its raw materials. Its output, in turn, is often used by other producers as a productive factor, sometimes by those very industries from which it obtained its ingredients. Steel is used to make railroad cars and railroad cars are in turn, used to transport steel and the coal and pig iron which are used in its manufacture. Other examples should come to mind at once.

The basic problem, then, is to see what can be left over for final consumption and how much of each output will be used up in the course of the productive activities which must be undertaken to obtain these net outputs.

The intransigence of the empirical materials and the computational problems have forced on input-output analysis a number of simplifying assumptions, of which two are particularly noteworthy. Our first assumption is that each sector produces only one homogenous output. But this restriction can be somewhat relaxed by interpreting this good as a composite commodity which is made up of several items produced in fixed

proportions. Such a compound good can, for example, consist in packages of chewing gum and fertilizer in which there are always ten sticks of gum and one kilogram of fertilizer.

Our second assumption is perhaps more serious. It states that in any productive process all inputs are employed in rigidly fixed proportions and the use of these inputs expands in proportion with the level of output. This is a special case of an assumption of constant returns to scale. But the fixed proportions assumption is far more restrictive. Constant returns to scale is perfectly consistent with the substitution of one factor for another. A linear homogenous production function permits both labour - intensive and capital - intensive processes. Not so the Leontief fixed proportions premise which requires that a manufacturing process which is labour intensive offer no option of capital - intensive alternative.

(III). Core of the Model :

Let $X = \begin{bmatrix} X1 \\ X2 \\ . \\ . \\ Xn \end{bmatrix}$ be the (n X 1) column vector of gross output of the n sectors measured in rupee terms at some constant prices.

Let $A = \begin{bmatrix} a11 & a12..a1n \\ a21 & a22..a2n \\ & . \\ & . \\ an1 & an2..ann \end{bmatrix}$ be the (n X n) input coefficient matrix, where aij = amount of the ith good measured in rupee terms to produce one rupee worth of the jth good.

Let $C = \begin{bmatrix} C1 \\ C2 \\ . \\ . \\ Cn \end{bmatrix}$ be the (n X1) column vector of private final consumption expenditure on each good measured in rupee terms of some constant prices.

Similarly let Inv. G, E and M be the vectors of investment expenditure (which includes both fixed capital formulation and changes in stocks of inventories) governmental final expenditure, final export demand and imports respectively.

From the basic annals of national income accounting we know that the vector of total final net demand is

$$(C + Inv. + G + E - M)$$

AX is the vector of intermediate demand. Now gross output in each sector should be enough to sustain intermediate and final demand. i.e gross output = intermediate demand + final demand

$$\text{i.e. } X = AX + (C + Inv. + G + E - M)$$

We could have as well put an $\geq$ sign instead of the equality one. However since Inv. vector takes care of the changes in stock of inventories the equality sign is valid.

Let C + Inv. + G = F (vector of final domestic demand). Therefore we can write our equation as

$$X - AX = F + E - M$$

$$\text{i.e. } (I - A) X = F + E - M \quad ....(1)$$

(net output) = (Final domestic demand)+(net export demand)

Relationship (1) is the fundamental input output balance of our system. We will now make certain assumptions (hopefully realistic) regarding the M vector.

We assume that import of a commodity is proportional to the gross output of that commodity.

i.e $M_i = W_i X_i$ (i = 1...n)

Which in other words means that the propensity to import is given for each commodity.

Here let $W = \begin{bmatrix} W_1 & 0 & \cdots & 0 \\ 0 & W_2 & \cdots & 0 \\ \vdots & & \ddots & \vdots \\ 0 & \cdots & & W_n \end{bmatrix}$ be the (n X n) diagonal matrix of import/ gross output coefficients (Wis)

Obviously it follows M = W X

So, from (1) we have (I - A) X = F + E - W X with a little manipulation we get

$$X = (I - A + W)^{-1} (F + E) \quad \ldots\ldots\ldots\ldots (2)$$

Relation (2) consist of our fundamental input output balance, when we assume M = W X.

Now suppose K = (K1, K2,.....Kn) be the (1 X n)row vector of ICORs of each sector.

Here Ki = increment in capital stock required to produce one rupee increment in gross value added of the ith sector (i = 1,2....n)

Let $\overline{X}$, $\overline{F}$, $\overline{E}$ be the vectors of gross output, final domestic demand and exports in the initial period. And

let X be an target vector (where the nature of a target will be defined a little later)

Hence, $X - \overline{X}$ = Vector of target change in gross output.

And, $KV(X - \overline{X})$ = Capital formation required to achieve this target.

Now what is the target ? The nature of the target and the contraints was specified in the previous chapter.

Recalling that $X = (I - A + W)^{-1} (F + E)$, we keep on F same as before, i.e. $F = \overline{F}$. Now we let the exports vary in such a way that trade at least balances

i.e. sum of (exports minus imports) $\geqslant 0$

i.e. $(E - M) \geqslant 0$

i.e. $S (E - W X) \geqslant 0$ [Where $S = (1....1)$ & $M = WX$

Since $X = (I - A + W)^{-1} (F + E)$

$(I - A + W) X = F + E$

i.e. $E - W X = (I - A) X - F$

i.e. $S (E - W X) = S (I - A) X - S F$

so $S (E - W X) \geqslant 0$

implies $S (I - A) X \geqslant S F$

i.e. $S(I - A) (I - A + W)^{-1} (F + E) \geqslant S F$

i.e $SZ F + SZE \geqslant S F$ [where $Z = (I-A) (I-A+ W)^{-1}$]

i.e. $SZE \geqslant S F - S Z F$

Hence sum of (exports minus imports) $\geqslant 0$

implies $SZE \geqslant S F - SZF$.

We also assume that there is an upper bound on the export of each item, which simply means that our export potential is limited. This can be depicted as

$E \leqslant \bar{E}(1+r)$, which simply shows that we cannot export more than a certain fraction r over and above the initial exports ($\bar{E}$ = initial exports)

In a nutshell the nature of our target X vector is as follows :

$$X = (I - A + W)^{-1} (F + E)$$

$F = \bar{F}$ (final domestic demand is same as before)

$E \leqslant \bar{E}(1 + r)$ (Export potential is limited)

and $SZE \geqslant S F - SZF$ (Trade must at least balance)

Our objective is to reach this target with minimum capital formation.

Therefore our exercise is to

min. $K V (X - \bar{X})$

st. $E \leqslant \bar{E}(1 + r)$

$SZE \geqslant S\bar{F} - SZ\bar{F}$. (Since $F = \bar{F}$)

Now minimising $K V (X - \bar{X})$

--> min. $K V X$ (as $\bar{X}$ is given)

--> min $K V (I - A + W)^{-1} (\bar{F} + E)$

--> min $K V (I - A + W)^{-1} E$ (as $\bar{F}$ is given)

Here the whole exercise boils down to

min. $K V (I - A + W)^{-1} E$

st $E \leqslant \bar{E}(1 + r)$

and $SZE \geqslant S\bar{F} - SZ\bar{F}$.

By solving this linear programming problem, we will get an optimum E vector from which we can generate the X vector using the relationship

$$X = (I - A + W)^{-1} (F + E)$$

and see what is the optimum product mix to achieve our target. We can do a similar exercise with respect to electricity. Let e = (e1,e2,.....en), where ei is equal to to the electricity in KWH required to produce one rupee worth output of the ith sector.

Obviously electricity required to produce a target gross output vector X is eX. Our objective function then boils down to minimising eX subject to the same set of constraints as in the investment minimisation exercise.

Now, min. $eX \rightarrow$ min. $e(I - A + W)^{-1}(F+E)$

$\rightarrow$ min. $e\,(I-A+W)^{-1}\,E$ [as $F = \bar{F}$, given]

Hence, our exercise in this case is to

$$\min.\ e\,(I-A+W)^{-1}\,E$$

such that $E \leq \bar{E}\,(1+r)$

and $sZE \geq s\bar{F} - sZ\bar{F}$

Solving the above linear programming problem we will get an optimum E vector. Then we can compare the two optimum E vectors obtained from solutions of investment/electricity minimisation exercise and see how the product mix changes as we switch over from capital formation minimisation exercise to electricity minimisation exercise. We can also vary r i.e., vary our export potential and see how the optimum solution changes with changes in export potential.

So far, we have been playing around within a theoretical framework. Now we will come down to the world of hard reality and carry out our exercises on the empirical front. In order to do that we have to generate all the relevant vectors and matrices in the Indian context. How do we go about doing that will be unfolded in following chapters.

CHAPTER 3

GENERATION OF SOME RELEVANT MATRICES AND VECTORS

GENERATION OF SOME RELEVANT MATRICES AND VECTORS

I. As promised earlier we will now generate the relevant matrices and vectors for our empirical exercises. Our first task is to calculate the A matrix (which is the input-output coefficient matrix). For this we have taken the help of Input-Output Transactions Table of the Indian economy for the year 1978-79, published by the C.S.O.

II. THE TRANSACTION MATRIX

In the above mentioned publication the input-output transactions (commodity x commodity), 1978-79 in rupees lakhs is given for 60 sectors of the Indian economy. These sectors are enlisted in table 3A.

Let us denote the elements of this transaction matrix by Tij (i=1,2,....60, j=1,2,....60)
where Tij = Amount of ith commodity bought for the production of the jth commodity by the jth sector.

Since 60 sectors may prove to be a little too unwieldly in our latter course of study we have reduced the number of sectors from 60 to 35 by clubbing some of them together. For example sector number 1 to 7 (i.e. food crops to fishing) has been clubbed together and renamed agriculture, forestry and fishing. Similarly, sector no.52 to 60 (i.e. trade to public administration and defence) has been added together under the heading "other services". Care has been taken so as not to

miss out the important details. Our 35 sector and the clubbing which has been done to arrive at these is reproduced in table 3B. Our new input-output transactions table is of the dimention(35 x 35). Let us denote the elements of this new table by Hij (i=1,2.....35, and j=1,2,.....35). How the relevant clubbing has been done will be clear from the example given below.

As noted earlier we have clubbed together sectors 1 to 7 in the original table to sector 1 in our new classification. Therefore, H11 = $\sum_{i=1}^{7}\sum_{j=1}^{7} T_{ij}$
Again, sector 8 in the original table is coal and lignite. We have kept it as it is and it is our sector 2 in the new classification. Here, H12 = $\sum_{i=1}^{7} T_{i8}$
In this way all the relevant adding togethers and consequent groupings had been done to arrive at the new input-output transactions table. In the original matrix the gross value added, gross output, private final consumption expenditure, Government expenditure, gross capital formation, exports and imports of all sectorshave been given. We have again added up the relevant sectors to arrive at the figures under different heads of expenditure according to our new classification. One can have alook at this whole transactions matrix in table 3C. Here, it must be noted that all the relevant calculations had been done on the computer; using the software package, LOTUS-123.

III. THE COEFFICIENT MATRIX

After having generated the relavent transactions matrix we will now calculate the input-output coefficient matrix A. We may recall that Hij = amount of the ith commodity in rupees lakhs bought for the production of jth commodity by the jth sector.

Then Hij/(gross output of the jth commodity) is equal to the amount of ith commodity in rupees to produce one rupee worth of the jth commodity. This is nothing but aij, an element of the A matrix. By calculating Hij/(gross output of the jth commodity)for all sectors that is for all i's and j`s we will get all the aij's which constitute the A matrix. This matrix is reproduced in table 3D.

IV. THE VALUE ADDED COEFFICIENT MATRIX

Let us denote the value added of the ith sector by (GVA)i ; i=1,2,.....35.

Now (GVA)i/(gross output of the ith commodity) gives our gross value added per unit of gross output of the ith sector. This is our Vi = [(GVA)i/(gross output of the ith commodity)]. We can calculate these Vi's and generate the V matrix which is the diagonal matrix consisting of the Vi's. These Vi's are listed in table 3E.

V. THE F,E,M & X VECTORS: FOR THE INITIAL YEAR

Till now we have created the A & V matrices. The coefficients of these matrices are at 1978-79 prices because the original input-output transactions table as published by the C.S.O. was for the year 1978-79 and the figures there were given at that years current prices. We will now try to generate the vectors of final domestic demand (F), exports (E), imports(M) and gross output (X) for the initial year at 1978-79 prices.

VI. CHOICE OF THE INITIAL YEAR

The initial year is taken to be 1984-85. There is nothing holy in this choice but one crucial fact necessitated the convergence on to this choice. The fact is that it is easier to calculate the relevant vectors for 1984-85 due to availability of some important information. Since the structure of final demand for the year 1984-85 has been given in "A technical note on the seventh plan of India (1985-90)" published by the perspective planning division of the Planning Commission, it is convenient for us to calculate the required vectors for this year.

VII. STRUCTURE OF FINAL DEMAND

In the above publication the structure of final demand is given for 50 sectors. But we have to reduce

this to our classification of the 35 sectors. Before doing that let us just allude to what the figures given in the structure of final demand means. An example will make it clear. For the sector"Paper and paper based industries", the figure given under the heading Private Consumption is 0.006677. It means that private consumption expenditure on paper accounted for fraction of 0.006677 (or 6.677%) of the total private consumption expenditure on all goods in that year. The other figures in the table have similar meanings.

As noted alittle earlier we have to reduce the 50 sectors as given in the Technical Note on the 7th plan to our classification of 35 sectors. Simple clubbing together as we did while generating the A matrix would not do because the definition of the sectors given in the Technical Note on the 7th plan does not tally exactly with the sectors given in the input-output table. Since our classification of the sectors are in line of the input-output table(published by C.S.O.) where our sectors are either the same or a simple clubbing together of a few sectors given there. However, we have serious problems regarding the reduction of the 50 sectors of Technical Note to our classification of 35 sectors.

For this we have to resort to a little manipulation. In some cases a simple adding can do the trick. For example, sectors 1 to 10 in the Technical

Note corresponds to our sector 1 (Agriculture, forestry and fishing). In this case a simple clubbing together of the sectors 1 to 10 in the Technical Note is enough for our purpose. But the hitch lies elsewhere. For example, the sectors 31 to 33 in the Technical Note corresponds to our definition of sectors 16 and 18(heavy chemicals and fertilizers respectively). Here, a simple adding up is not sufficient. So what we have done is that we have added up the relevant figures under different heads for the sectors 31 to 33 in the Technical Note. Then we have disaggregated this added up figure among our sectors 16 and 18 and the pattern of disaggregation is the same as it was in the year 1978-79. Let us explain this in a little more detail. From the transactions table we can get the total private consumption expenditure of the sectors 16 and 18 combined. From this we can calculate what fraction of this total of two sectors goes to sector 16 and what fraction goes to sector 18. Recall that we have added the sectors 31 to 33 in the Technical Note. Now the added up the figure (say P) under the head private consumption means that the private consumption expenditure on sectors 31 to 33 together account for a fraction P of the total private consumption expenditure of that year. Since sector 31 to 33 correspond to our classification of sectors 16 and 18, we now know that private consumption expenditure on the

sectors 16 and 18 (according to our definitions) together account for a fraction P of the total private consumption expenditure of that year. Now we have to break up this P into the relevant fractions for the sectors 16 and 18. And this is done according to the distribution pattern in 1978-79 which we referred to a little earlier.

In this way we can either club together or disaggregate(when the need arises) the sectors given in the Technical Note to arrive at the structure of final demand,1984-85, in accordance to our classification of sectors. This whole structure of final demand, 1984-85 is given in Table 3F. This our first step towards generating the vector F, E, X, M etc.,

VIII. THE C, Inv., G, E AND M VECTORS IN THE INITIAL PERIOD

From the National Accounts Statistics (1980-81 to 1986-87) published by C.S.O. we can get the figures for total private consumption expenditure, total gross capital formation, government consumption expenditure, exports and imports for the year 1984-85 at current prices. We can break up these total figures according to our structure of final demand (which we derived a little earlier) among the different sectors. So that now we have the detailed break up of the consumption expenditure, exports et al. for different sectors in 1984-85 at current prices. (Table 3G)

In the next step we have to deflate these figures to 1978-79 prices (since we have to reduce everything to some constant price). From the National Accounts Statistics we can derive the relevant price deflators. Then, we can use these deflators to bring down every thing to 1978-79 prices. The level of final demand of 1984-85 at 1978-79 prices is given in table 3H.

IX. THE GROSS OUTPUT VECTOR FOR THE INITIAL YEAR

Since, F = (C + Inv. + G), we can now generate the F vector for the initial period. Recall that from relationship (1) in our chapter on model we get the

$$X = (I - A)^{-1} (F + E - M)$$

Since we have the A matrix we can calculate (I-A) and then get $(I-A)^{-1}$ using the computer software packages LOTUS-123.

Then we can generate the X vector (the gross output vector) for the initial year. One can have a look at the $(I-A)^{-1}$ matrix in table 3I. The X vector for the initial year is given in table 3 H.

X. THE IMPORT COEFFICIENT MATRIX

We may recall that $Mi = Wi\ Xi \quad (i=1,2....35)$

Hence $Wi = Mi/Xi$

Since we have all the Mi's and the Xi's we can calculate the Wi's. Since Wi's go to form the W matrix

we can get that too. From relationship (2) we get that

$$X = (I - A + W)^{-1} (F + E)$$

Since the W matrix has been generated we can calculate the matrix $(I - A + W)^{-1}$ and arrive at the X vector by multiplying $(I - A + W)^{-1}$ with $(F + E)$. It can be easily checked the $X = (I - A)^{-1} (F + E - M)$

$$= (I - A + W)^{-1} (F + E),$$

which follows from definition.

Since, we will be needing the $(I - A + W)^{-1}$ frequently for our empirical exercises we have reproduced this matrix in table 3K. Till now we have partly fulfilled our promise of generating the relevant matrices and vectors. What remains to be done is to generate the k and the e vector (the vectors of ICORs and electricity coefficients respectively). We will take up this daunting task in the next chapter.

TABLE - 3A

Sectors of the Indian Economy as given in the
Input - Output Transaction Table (C.S.O.),1978-79

1 Food Crops	31 Paints,Varnishes &Lacquers
2 Cash Crops	32 Pesti. Drugs & Other Chemicals
3 Plantation Crops	33 Cement
4 Other Crops	34 Non Metallic Minerals
5 Animal Husbandry	35 Iron Steel & Foundries
6 Forestry and Logging	36 Other Basic Metal Industries
7 Fishing	37 Metal Products Excl. Machinery
8 Coal and Lignite	38 Agricultural Machinery
9 Crude Petro. & Natural Gas	39 Machinery for Textile & Other Industry
10 Iron Ore	40 Other Machinery
11 Other Minerals	41 Electronic,Elec. Machinery
12 Sugar	42 Railway Transport Equipment
13 Food Products Excl. Sugar	43 Other Transport Equipment
14 Beverages	44 Misc. Manuf. Industries
15 Tobacco Products	45 Construction
16 Cotton Textiles	46 Electricity
17 Wool,Silk,Synth.Textiles	47 Gas & Water Supply
18 Jute, Hemp &Mesta Textiles	48 Railway Transport Service
19 Textiles Products	49 Other Transport Service
20 Wood Products Excl. Furniture	50 Storage & Warehousing
21 Furniture,Fixtures	51 Communication
22 Paper,Paper Products	52 Trade
23 Print,Publ. & Allied Activites	53 Hotels & Restaurants
24 Leather, Leather Products	54 Banking
25 Ploastic Rubber Products	55 Insurance
26 Petroleum Products	56 Ownership of Dwellings
27 Coaltar Products	57 Education & Research
28 Inorganic Heavy Chemicals	58 Medical & Health
29 Organic Heavy Chemicals	59 Other Services
30 Fertilisers	60 Public Administration & Defence

TABLE - 3B

Classification of sectors as envisaged in our study

	Sectors
1	Agriculture,Forestry & fishing
2	Coal & lignite
3	Crude petroleum & Natural gas
4	Iron ore & other Minerals
5	Food,beverages & tobacco products
6	Cotton textiles
7	Wool,silk etc.
8	Jute,hemp & mesta
9	Textile product including weaving apparel
10	Wood & wood products
11	Paper & paper products
12	Leather & its products
13	Rubber & plastic
14	Petroleum products
15	Coal tar products
16	Heavy chemicals
17	Fertiliser
18	Paints,pesticides & other chemicals
19	Cement
20	Other non metallic mineral products
21	Iron & Steel
22	Other metals
23	Metal products excluding machinery & transport equipment
24	Non electrical machinery
25	Electrical machinery
26	Transport equipment
27	Other manufacturing Industries
28	Construction
29	Electricity
30	Gas & water supply
31	Railway transport service
32	Other transport service
33	Storage & Warehousing
34	Communication
35	Other services

TABLE - 3C

INPUT-OUTPUT TRANSACTIONS MATRIX (COMMODITY X COMMODITY),1978-79
(Rs.Lakhs)

SECTORS	1	2	3	4	5	6	7	8
1 Agriculture	830597	0	0	7	421599	113616	10236	19879
2 Coal & lig.	100	930	0	10	3140	2124	603	163
3 Cr.pet & N.gas	2	0	0	0	113	31	8	0
4 Iron & oth.Min.	1	0	0	10	367	17	79	1
5 Food,bev.& tob.P	33801	0	0	0	104028	2064	63	113
6 Cotton text.	6789	0	0	0	2911	120753	11183	304
7 Wool,silk etc.	15	0	0	0	42	5786	13579	28
8 Jute,hemp & mesta	1541	0	0	1	6397	1560	302	1681
9 Txt.pd.inc.w.app.	2361	0	0	0	133	212	1465	647
10 Wood & wood pd.	825	254	2	87	6848	1645	736	29
11 Paper & paper pd.	421	173	7	47	6372	1797	2331	159
12 Leather & its pd.	0	0	0	0	75	497	9	0
13 Rubber & plastic	337	0	0	25	2485	670	356	64
14 Petroleum prod.	55733	531	408	801	5399	2948	1301	289
15 Coal tar pd.	4	0	0	39	175	132	1077	9
16 Heavy chemicals	103	0	4	20	3126	6893	2807	80
17 Fertiliser	142568	0	0	0	128	7	22	0
18 Paints,pest.etc.	19249	2391	0	681	13229	16973	54371	1573
19 Cement	0	0	162	0	0	0	0	1
20 Oth.non m.min.pd.	145	0	430	2	3707	156	115	17
21 Iron & Steel	278	3	0	1	1666	1594	376	275
22 Other metals	14	0	0	4	790	11	30	1
23 Met.p.exc.mch.&tpt.	1329	175	2	327	10035	2698	958	390
24 Non el.machinery	6934	7322	1584	472	5295	7420	2552	539
25 Elec.machinery	181	0	0	0	17	16	8	2
26 Transport eqpt.	1150	224	0	73	21	59	10	2
27 Other man.Ind.	80	71	1	1	382	337	121	2
28 Construction	33564	280	256	36	4880	3129	1397	377
29 Electricity	24914	3569	23	1241	7441	14536	3231	1453
30 Gas & water sup.	50	1	1	0	336	850	223	2
31 Rly.tpt.service	14081	486	73	113	4172	1601	489	166
32 Oth.tpt.service	15547	2212	36	396	14483	14548	1499	1278
33 St.& Warehousing	0	0	0	0	0	0	0	0
34 Communication	1075	78	121	53	1374	876	402	77
35 Oth.services	143756	2525	972	1468	114425	80857	25636	7656
total	1337545	21225	4082	5915	745511	412413	137575	37257
net ind.taxes	36751	2695	643	986	36708	21707	31800	1767
gva	3424462	50554	37901	37563	149574	158932	48625	16196
g.output	4798758	74474	42626	44464	931793	593052	218000	55220

contd.

TABLE - 3C contd.

SECTORS	9	10	11	12	13	14	15	16
1 Agriculture	5381	23400	4498	19933	9654	44	73	1283
2 Coal & lig.	192	29	1345	13	260	201	7581	828
3 Cr.pet & N.gas	0	0	0	0	72	146516	11	1068
4 Iron & oth.Min.	6	6	513	6	113	2	32	1555
5 Food,bev.& tob.P	53	152	530	810	107	65	8	910
6 Cotton text.	36024	148	531	54	873	13	5	200
7 Wool,silk etc.	8697	13	73	10	610	0	0	4
8 Jute,hemp & mesta	964	117	763	264	295	205	127	825
9 Txt.pd.inc.w.app.	7412	247	567	342	1272	6	0	7
10 Wood & wood pd.	740	12225	440	847	463	415	34	362
11 Paper & paper pd.	607	146	33953	305	557	411	30	604
12 Leather & its pd.	17	19	27	11620	1	0	0	1
13 Rubber & plastic	816	530	1381	1979	10224	165	12	363
14 Petroleum prod.	1359	589	1285	136	1777	6298	349	3321
15 Coal tar pd.	32	4	20	1	5	26	933	539
16 Heavy chemicals	710	164	3520	1736	2734	1184	435	13740
17 Fertiliser	1	0	0	0	0	13	5	594
18 Paints,pest.etc.	4852	943	3595	1532	18166	2319	283	3377
19 Cement	0	0	0	0	2	0	2	6
20 Oth.non m.min.pd.	67	130	104	139	317	420	46	513
21 Iron & Steel	394	675	763	284	745	212	66	503
22 Other metals	369	150	738	9	271	3	3	1597
23 Met.p.exc.mch.&tpt.	987	963	1290	530	1574	1241	215	1225
24 Non el.machinery	1074	496	3198	6	703	1220	234	2068
25 Elec.machinery	7	30	25	4	11	3	1	6
26 Transport eqpt.	6	26	16	6	109	3	0	7
27 Other man.Ind.	212	19	44	160	14	3	0	85
28 Construction	747	330	1404	112	792	1106	238	1335
29 Electricity	1696	1084	4184	352	2126	1612	440	5398
30 Gas & water sup.	41	8	904	5	45	129	121	285
31 Rly.tpt.service	340	895	1356	195	395	492	2728	886
32 Oth.tpt.service	1390	2888	1047	839	841	2874	1002	1175
33 St.& Warehousing	0	0	0	0	0	0	0	0
34 Communication	523	230	689	179	317	119	17	265
35 Oth.services	27318	13864	18914	10161	15693	9290	5331	10951
total	103024	59722	87725	52569	71138	176610	20362	55806
net ind.taxes	11884	4037	12345	4982	13596	14387	1570	9732
gva	99346	57969	52340	22639	26611	18940	5037	27443
output	214254	121726	152410	80190	111345	209937	26969	92981

contd.

TABLE - 3C contd.

SECTORS	17	18	19	20	21	22	23	24
1 Agriculture	75	23263	1	839	398	80	349	541
2 Coal & lig.	809	1473	3114	4627	13567	521	818	278
3 Cr.pet & N.gas	934	7542	0	92	12	0	5	15
4 Iron & oth.Min.	2688	758	2749	4067	8467	6930	558	86
5 Food,bev.& tob.P	276	15079	0	43	18	10	18	4
6 Cotton text.	1	3665	0	212	46	23	47	25
7 Wool,silk etc.	0	59	0	2	2	1	43	31
8 Jute,hemp & mesta	3454	1815	5123	1268	276	550	240	242
9 Tot.pd.inc.w.app.	0	150	0	59	414	10	104	14
10 Wood & wood pd.	111	5079	21	949	536	213	824	1401
11 Paper & paper pd.	65	10014	32	888	240	130	564	647
12 Leather & its pd.	0	19	0.	1	66	1	54	32
13 Rubber & plastic	450	1977	9	249	182	39	364	1998
14 Petroleum prod.	8238	4756	372	2908	7169	1389	1628	1675
15 Coal tar pd.	420	413	21	224	7344	352	438	374
16 Heavy chemicals	8597	40669	41	2679	2402	2447	920	977
17 Fertiliser	7717	318	0	28	0	0	4	0
18 Paints,pest.etc.	1653	56452	0	1157	354	101	1220	1550
19 Cement	0	129	28	1885	32	13	4	0
20 Oth.non m.min.pd.	612	3956	309	10185	1422	67	307	398
21 Iron & Steel	235	1143	875	3048	89517	3331	37659	60637
22 Other metals	33	3308	0	126	17602	17847	11167	7268
23 Met.p.exc.mch.&tpt.	694	6245	613	1258	16852	1375	4730	7046
24 Non el.machinery	2964	3418	1236	2578	14918	1193	2324	29698
25 Elec.machinery	3	33	1	65	1128	26	236	3718
26 Transport eqpt.	4	44	1	25	130	5	379	1346
27 Other man.Ind.	51	182	1	70	4929	127	286	89
28 Construction	2119	3222	324	1099	5053	651	965	2051
29 Electricity	7526	6076	3878	2869	13696	5966	2261	2846
30 Gas & water sup.	439	546	12	79	889	59	202	600
31 Rly.&pt.service	1867	1848	1706	3205	12308	605	2058	2773
32 Oth.trpt.service	1692	3759	522	2816	4935	750	1465	2221
33 Stg.& Warehousing	0	0	0	0	0	0	0	0
34 Communication	136	1133	66	545	762	179	586	1254
35 Oth.services	16213	44445	6898	17400	50859	9022	14876	29303
total	69866	252898	27953	67545	276525	54013	87623	161122
net Ind.taxes	11213	43191	2374	7858	36961	12582	16212	22327
GVA	24189	101957	9670	164975	99558	20161	49963	88029
g. output	105188	398046	39997	240378	413044	86676	153798	271478

Contd.

TABLE - 3C contd.

SECTORS	25	26	27	28	29	30	31	32
1 Agriculture	108	752	1229	27134	166	0	0	11386
2 Coal & lig.	115	1500	902	2189	19226	94	3267	21
3 Cr.pet & N.gas	2	12	3	0	214	4398	0	0
4 Iron & oth.Min.	41	30	187	14271	20	0	0	0
5 Food,bev.& tob.P	32	7	234	0	7	1	0	3595
6 Cotton text.	122	77	169	29	78	0	407	4
7 Wool,silk etc.	9	22	348	0	6	0	0	0
8 Jute,hemp & mesta	1000	309	1225	6037	17	8	0	0
9 Txt.pd.inc.w.app.	19	50	89	0	1366	0	31	679
10 Wood & wood pd.	3047	1295	2986	46955	132	23	632	19
11 Paper & paper pd.	2217	665	2107	469	294	160	752	2737
12 Leather & its pd.	6	11	261	0	2	0	0	149
13 Rubber & plastic	4648	8318	1606	54	10	20	375	33868
14 Petroleum prod.	1747	3087	1840	184	2168	284	4784	65198
15 Coal tar pd.	91	165	27	17831	6	35	0	0
16 Heavy chemicals	7459	1097	2935	0	579	882	0	37
17 Fertiliser	0	0	35	19	0	0	0	0
18 Paints,pest.etc.	14320	1860	17185	24773	192	79	22	366
19 Cement	4	7	8	38831	8	0	0	0
20 Oth.non m.min.pd.	2403	305	3206	155321	55	12	782	152
21 Iron & Steel	27357	34453	24623	105070	1786	31	4980	60
22 Other metals	21499	5416	6539	1	385	0	0	0
23 Met.p.exc.mch.&tpt.	4175	7521	10034	118	156	358	6133	1928
24 Non el.machinery	2039	5925	1614	3617	123	1008	823	832
25 Elec.machinery	20589	2393	2573	32703	6675	21	5026	3671
26 Transport eqpt.	214	37061	1818	107	125	16	37928	41827
27 Other man.Ind.	134	859	4718	2032	34	47	156	3013
28 Construction	1828	4457	645	140	7551	1609	15149	4520
29 Electricity	2162	4127	2778	15768	64816	8366	4734	972
30 Gas & water sup.	185	405	121	764	1619	5841	176	412
31 Rly.tpt.service	1402	2603	1693	17060	7519	210	3618	5269
32 Oth.tpt.service	2066	2523	1601	22912	1681	491	2817	59226
33 St.& Warehousing	0	0	0	0	52	0	0	0
34 Communication	1005	880	1965	409	922	638	480	3772
35 Oth.services	26432	23957	22548	149588	16039	1255	10951	65599
total	148477	152229	119852	685186	134029	25807	104023	309312
net ind.taxes	30832	26815	16158	75314	12035	1630	9393	83011
gva	71042	124135	26562	464596	140283	10019	102789	345844
g.output	250351	303179	162572	1225096	286347	37456	216205	738167

contd.

TABLE - 3C contd.

SECTORS	33	34	35	int.use	PFCE	GFCE	GFCF	CIS
1 Agriculture	0	0	113034	1637635	3044048	747	8760	79479
2 Coal & lig.	0	0	2473	72753	2551	0	0	-266
3 Cr.pet & N.gas	0	0	2352	163410	0	0	0	4328
4 Iron & oth.Min.	0	0	374	43934	0	0	0	1987
5 Food,bev.& tob.P	2	0	26132	180192	652217	506	0	66465
6 Cotton text.	0	0	4029	189522	334336	0	0	46864
7 Wool,silk etc.	0	0	347	27727	178047	0	0	8496
8 Jute,hemp & mesta	17	0	8330	44955	0	36	0	1294
9 Txt.pd.inc.w.app.	6	0	1640	19382	122396	1420	0	4938
10 Wood & wood pd.	3	40	12677	100728	13745	950	4195	897
11 Paper & paper pd.	76	1407	45156	115560	27976	16217	0	8464
12 Leather & its pd.	0	0	119	12787	41575	213	0	-5630
13 Rubber & plastic	34	1	5402	77011	8663	1226	18016	3260
14 Petroleum prod.	23	123	4226	194323	39143	15843	0	1583
15 Coal tar pd.	0	0	144	30081	0	0	0	-3764
16 Heavy chemicals	62	0	1067	110826	0	0	0	1412
17 Fertiliser	0	0	207	151666	0	214	0	-9623
18 Paints,pest.etc.	22	0	89710	354578	60954	107	0	13955
19 Cement	0	0	11	41133	0	0	0	5615
20 Oth.non m.min.pd.	0	0	2429	180208	29680	1	913	1796
21 Iron & Steel	0	0	5092	407732	0	143	21957	8646
22 Other metals	0	0	1123	96284	0	0	2328	5526
23 Met.pr.exc.mch.&tpt.	15	16	3757	77153	20536	538	22579	6872
24 Non el.machinery	177	16	3353	110735	11944	2282	166727	28942
25 Elec.machinery	0	1574	3006	82744	29569	2038	160100	-19586
26 Transport eqpt.	1	261	2160	125134	57119	3945	106278	5639
27 Other man.Ind.	32	71	16750	75763	48126	60920	25044	1713
28 Construction	219	1610	45491	146635	0	72407	1006005	0
29 Electricity	833	272	28121	251372	28114	6856	0	0
30 Gas & water sup.	6	14	2541	17911	7526	12023	0	0
31 Rly.tpt.service	107	1214	17979	115212	75642	11755	3096	0
32 Oth.tpt.service	223	1360	223477	398595	307455	9813	1718	0
33 St.& Warehousing	2	0	14396	14450	0	6	0	0
34 Communication	329	0	20302	41667	20503	17626	0	0
35 Oth.services	974	1283	322773	1319352	1638786	683210	58090	0
total	3196	9270	1029129	7046620	6801451	921050	1605806	269292
net ind.taxes	283	820	62570	677037	238481	31544	103979	0
GVA	11057	70415	2728242	8887338	0	0	0	0
gr.output	14456	80513	3819921	16610947	7039932	952594	1709785	269292

contd.

TABLE - 3C contd.

SECTORS	EXP	IMP	T.F.USE	T.OUTPUT
1 Agriculture	55243	29927	3159150	4798755
2 Coal & lig.	284	848	1721	74474
3 Cr.pet & N.gas	7	125119	-120784	42626
4 Iron & oth.Min.	11743	13207	523	44457
5 Food,bev.& tob.P	86565	62158	743595	931787
6 Cotton text.	22342	9	403533	593055
7 Wool,silk etc.	5772	4031	188274	218081
8 Jute,hemp & mesta	8967	31	10266	55221
9 Txt.pd.inc.w.app.	68385	2189	194958	214260
10 Wood & wood pd.	1339	327	20799	121727
11 Paper & paper pd.	5532	22340	35849	152489
12 Leather & its pd.	31872	31	67199	80186
13 Rubber & plastic	2890	1718	32337	111348
14 Petroleum prod.	2435	43391	15613	209936
15 Coal tar pd.	17	163	-3910	26971
16 Heavy chemicals	3109	22365	-17844	92982
17 Fertiliser	2	37072	-46479	105187
18 Paints,pest.etc.	15319	46881	43454	398052
19 Cement	140	6890	-1135	39998
20 Oth.non m.min.pd.	68582	48824	52168	240376
21 Iron & Steel	24597	50030	5313	413845
22 Other metals	9974	27434	-9686	86678
23 Met.p.exc.mch.&tpt.	12483	6362	56646	153799
24 Non el.machinery	16851	74251	152495	271480
25 Elec.machinery	18934	23446	167609	250383
26 Transport eqpt.	12675	7659	177997	307181
27 Other man.Ind.	35818	44033	126818	182571
28 Construction	0	0	1078412	1225877
29 Electricity	0	0	34970	286342
30 Gas & water sup.	0	0	19549	37440
31 Rly.tpt.service	10581	0	100994	216206
32 Oth.tpt.service	44447	23660	339573	738189
33 St.& Warehousing	0	0	5	14456
34 Communication	1742	1022	38249	88518
35 Oth.services	132133	16778	2495449	3813881
total	709092	742336	9564361	16610961
net ind.taxes	2331	0	376335	1053344
gva	0	0	0	8887338
g.output	711429	742336	9940696	26551643

TABLE - 3D

INPUT - OUTPUT COEFFICIENTS MATRIX
(A Matrix)

SECTORS	1	2	3	4	5	6	7
1 Agriculture	0.173085	0	0	0.000157	0.452459	0.191578	0.046954
2 Coal & lig.	0.000020	0.012487	0	0.000224	0.003369	0.003581	0.002766
3 Cr.pet & N.gas	0.000000	0	0	0	0.000121	0.000052	0.000036
4 Iron & oth.Min.	0.000000	0	0	0.000224	0.000393	0.000028	0.000362
5 Food,bev.& tob.P	0.007043	0	0	0	0.111642	0.003480	0.000288
6 Cotton text.	0.001414	0	0	0	0.003124	0.203612	0.051298
7 Wool,silk etc.	0.000003	0	0	0	0.000045	0.009756	0.062288
8 Jute,hemp & mesta	0.000321	0	0	0.000022	0.006865	0.002630	0.001385
9 Txt.pd.inc.w.app.	0.000492	0	0	0	0.000142	0.000357	0.006720
10 Wood & wood pd.	0.000171	0.003410	0.000046	0.001956	0.007349	0.002773	0.003376
11 Paper & paper pd.	0.000087	0.002322	0.000164	0.001057	0.006838	0.003030	0.010692
12 Leather & its pd.	0	0	0	0	0.000080	0.000038	0.000041
13 Rubber & plastic	0.000070	0	0	0.000562	0.002666	0.001129	0.001633
14 Petroleum prod.	0.011614	0.007130	0.009571	0.018014	0.005794	0.004970	0.005967
15 Coal tar pd.	0.000000	0	0	0.000877	0.000187	0.000222	0.004940
16 Heavy chemicals	0.000021	0	0.000093	0.000449	0.003354	0.011622	0.012876
17 Fertiliser	0.029709	0	0	0	0.000137	0.000011	0.000100
18 Paints,pest.etc.	0.004011	0.032105	0	0.015315	0.014197	0.028619	0.249408
19 Cement	0	0	0.003800	0	0	0	0
20 Oth.non m.min.pd.	0.000030	0	0.010087	0.000044	0.003978	0.000263	0.000527
21 Iron & Steel	0.000057	0.000040	0	0.000022	0.001787	0.002687	0.001724
22 Other metals	0.000002	0	0	0.000089	0.000847	0.000018	0.000137
23 Met.p.exc.mch.&tpt.	0.000276	0.002349	0.000046	0.007354	0.010769	0.004549	0.004394
24 Non el.machinery	0.001444	0.098316	0.037168	0.018615	0.005682	0.012511	0.011706
25 Elec.machinery	0.000037	0	0	0	0.000018	0.000026	0.000036
26 Transport eqpt.	0.000239	0.003007	0	0.001641	0.000022	0.000099	0.000045
27 Other man.Ind.	0.000016	0.000953	0.000023	0.000022	0.000324	0.000568	0.000555
28 Construction	0.026994	0.003759	0.006085	0.000809	0.005237	0.005276	0.006408
29 Electricity	0.005191	0.047922	0.000539	0.027910	0.007985	0.024510	0.014821
30 Gas & water sup.	0.000210	0.000013	0.000023	0	0.000360	0.001433	0.001022
31 Rly.tpt.service	0.002934	0.006525	0.001712	0.002541	0.004477	0.002699	0.002243
32 Oth.tpt.service	0.023239	0.029701	0.000844	0.028986	0.015543	0.024530	0.006876
33 St.& Warehousing	0	0	0	0	0	0	0
34 Communication	0.000224	0.001047	0.002838	0.001191	0.001474	0.001477	0.001844
35 Oth.services	0.029956	0.033904	0.022802	0.033015	0.122902	0.136340	0.117596

contd.

TABLE - 3D contd.

'A' matrix

SECTORS	8	9	10	11	12	13	14
1 Agriculture	0.359996	0.025115	0.192235	0.029512	0.248572	0.086703	0.000209
2 Coal & lig.	0.002951	0.000896	0.000238	0.008824	0.000162	0.002335	0.000957
3 Cr.pet & N.gas	0	0	0	0.000052	0	0.000646	0.697904
4 Iron & oth.Min.	0.000018	0.000028	0.000049	0.003365	0.000074	0.001014	0.000209
5 Food,bev.& tob.P	0.002046	0.000247	0.001248	0.003477	0.010101	0.000960	0.000309
6 Cotton text.	0.005505	0.168136	0.001215	0.003484	0.000673	0.007840	0.000061
7 Wool,silk etc.	0.000507	0.040592	0.000106	0.000478	0.000124	0.005478	0
8 Jute,hemp & mesta	0.030441	0.004499	0.000961	0.025006	0.003292	0.002649	0.000976
9 Txt.pd.inc.w.app.	0.011716	0.034594	0.002029	0.003720	0.004264	0.011423	0.000028
10 Wood & wood pd.	0.000525	0.003453	0.100430	0.002886	0.010562	0.004158	0.001976
11 Paper & paper pd.	0.002079	0.002833	0.001199	0.222774	0.003803	0.005002	0.001957
12 Leather & its pd.	0	0.000079	0.000156	0.000177	0.144925	0.000008	0
13 Rubber & plastic	0.001159	0.003808	0.004354	0.009061	0.024678	0.091822	0.000785
14 Petroleum prod.	0.005233	0.006342	0.004838	0.008431	0.001695	0.015959	0.029999
15 Coal tar pd.	0.000162	0.000149	0.000032	0.000131	0.000012	0.000044	0.000123
16 Heavy chemicals	0.001448	0.003313	0.001347	0.003095	0.001648	0.024554	0.005639
17 Fertiliser	0	0.000004	0	0	0	0	0.000061
18 Paints,pest.etc.	0.020486	0.022646	0.027746	0.003587	0.019124	0.163150	0.011846
19 Cement	0.000019	0	0	0	0	0.000017	0
20 Oth.non m.min.pd.	0.000327	0.000312	0.001067	0.000682	0.001733	0.002847	0.002000
21 Iron & Steel	0.004780	0.001838	0.005545	0.005006	0.000541	0.006690	0.001009
22 Other metals	0.000018	0.001722	0.001232	0.004042	0.000112	0.002433	0.000014
23 Met.p.exc.mch.&tpt.	0.007262	0.004606	0.007911	0.008464	0.006607	0.014136	0.005911
24 Non el.machinery	0.007762	0.005012	0.004074	0.008982	0.000074	0.006313	0.005011
25 Elec.machinery	0.000036	0.000032	0.000246	0.000164	0.000049	0.000078	0.000014
26 Transport eqpt.	0.000036	0.000028	0.000213	0.000104	0.000074	0.000978	0.000014
27 Other man.Ind.	0.000036	0.000989	0.000156	0.000289	0.001995	0.000125	0.000214
28 Construction	0.006627	0.003486	0.002711	0.005211	0.001096	0.007113	0.005269
29 Electricity	0.006512	0.007915	0.008905	0.007452	0.004597	0.019095	0.007678
30 Gas & water sup.	0.000236	0.000191	0.000065	0.000701	0.000262	0.000404	0.000014
31 Rly.tpt.service	0.000206	0.001586	0.007352	0.000077	0.000431	0.003547	0.000343
32 Oth.tpt.service	0.000143	0.002440	0.000725	0.000069	0.010462	0.007553	0.010609
33 St.& Warehousing	0	0	0	0	0	0	0
34 Communication	0.000094	0.002441	0.001009	0.004520	0.001230	0.000047	0.000565
35 Oth.services	0.103045	0.127502	0.107023	0.124099	0.110711	0.140940	0.044251

contd.

TABLE - 30 contd.

'A' matrix

SECTORS	15	16	17	18	19	20	21
1 Agriculture	0.002706	0.013798	0.000713	0.058442	0.000025	0.001498	0.000963
2 Coal & lig.	0.281100	0.038905	0.007698	0.003700	0.077855	0.019240	0.032846
3 Cr.pet & N.gas	0.002407	0.011486	0.000879	0.018947	0	0.000382	0.000029
4 Iron & oth.Min.	0.001186	0.016723	0.025554	0.021924	0.003730	0.018519	0.000499
5 Food,bev.& tob.P	0.000296	0.009786	0.002623	0.037882	0	0.000178	0.000043
6 Cotton text.	0.000105	0.002150	0.000029	0.009207	0	0.000081	0.000111
7 Wool,silk etc.	0	0.000043	0	0.000148	0	0.000008	0.000004
8 Jute,hemp & mesta	0.004729	0.000872	0.032836	0.004559	0.125264	0.005275	0.000669
9 Txt.pd.inc.w.app.	0	0.000075	0	0.000376	0	0.000245	0.001882
10 Wood & wood pd.	0.001262	0.003093	0.001055	0.012759	0.000325	0.003947	0.001297
11 Paper & paper pd.	0.001112	0.006495	0.000617	0.005157	0.000800	0.003694	0.000581
12 Leather & its pd.	0	0.000010	0	0.000247	0	0.000084	0.000159
13 Rubber & plastic	0.000444	0.003904	0.004278	0.004966	0.000225	0.001035	0.000440
14 Petroleum prod.	0.012948	0.035716	0.078316	0.011948	0.009300	0.012097	0.017356
15 Coal tar pd.	0.004595	0.005776	0.003972	0.001037	0.000535	0.000071	0.017780
16 Heavy chemicals	0.010129	0.147772	0.001727	0.102171	0.001220	0.011144	0.005015
17 Fertiliser	0.000135	0.005038	0.075360	0.000799	0	0.000116	0
18 Paints,past.etc.	0.010490	0.005019	0.015714	0.141022	0	0.004610	0.000057
19 Cement	0.010074	0.001004	0	0.000024	0.000700	0.007841	0.000077
20 Oth.non m.min.pd.	0.001705	0.005517	0.025616	0.007708	0.007715	0.041070	0.003442
21 Iron & Steel	0.002447	0.005429	0.002234	0.002071	0.001075	0.011050	0.014725
22 Other metals	0.000111	0.017170	0.000710	0.000010	0	0.000024	0.012015
23 Met.p.exc.mch.&tpt.	0.007972	0.010174	0.006502	0.015097	0.010025	0.000233	0.040779
24 Non el.machinery	0.000673	0.002401	0.009170	0.000080	0.000702	0.010724	0.001017
25 Elec.machinery	0.000207	0.002034	0.000020	0.000052	0.000005	0.000170	0.000730
26 Transport eqpt.	0	0.000075	0.000030	0.000110	0.000025	0.000104	0.000014
27 Other man.Ind.	0	0.000714	0.000484	0.000256	0.000025	0.000091	0.011933
28 Construction	0.000024	0.014757	0.000144	0.000094	0.000120	0.004571	0.015203
29 Electricity	0.011745	0.050054	0.071540	0.015044	0.001957	0.014075	[illegible]
30 Gas & water sup.	0.004501	0.000765	0.004473	0.004771	0.000702	0.000710	0.000152
31 Rly.tpt.service	[illegible]	0.000509	0.015047	0.004142	0.040153	[illegible]	0.000779
32 Oth.tpt.service	0.007157	0.040474	0.014055	[illegible]	0.013052	[illegible]	0.011947
33 St.& Warehousing	0	0	0	0	0	0	0
34 Communication	0.000470	0.000550	[illegible]	[illegible]	0.001150	[illegible]	0.001044
35 Oth.services	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

contd.

TABLE - 3D contd.

'A' matrix

SECTORS	22	23	24	25	26	27	28
1 Agriculture	0.000922	0.002269	0.001992	0.000431	0.002480	0.007559	0.022148
2 Coal & lig.	0.006010	0.005318	0.001024	0.000459	0.005211	0.005548	0.001786
3 Cr.pet & N.gas	0	0.000032	0.000055	0.000007	0.000039	0.000010	0
4 Iron & oth.Min.	0.079952	0.003628	0.000316	0.000163	0.000098	0.001150	0.011648
5 Food,bev.& tob.P	0.000115	0.000117	0.000014	0.000127	0.000023	0.001439	0
6 Cotton text.	0.000265	0.000305	0.000092	0.000487	0.000253	0.001039	0.000023
7 Wool,silk etc.	0.000011	0.000279	0.000114	0.000035	0.000072	0.002140	0
8 Jute,hemp & oesta	0.006345	0.001560	0.000891	0.003994	0.001019	0.007535	0.004927
9 Text.pd.inc.w.app.	0.000115	0.000676	0.000051	0.000075	0.000164	0.000547	0
10 Wood & wood pd.	0.002457	0.005357	0.005160	0.012170	0.004271	0.010367	0.038327
11 Paper & paper pd.	0.001499	0.003667	0.002383	0.000855	0.002193	0.012960	0.000382
12 Leather & its pd.	0.000011	0.000351	0.000117	0.000023	0.000036	0.001605	0
13 Rubber & plastic	0.000449	0.002366	0.007359	0.010565	0.027435	0.009878	0.000044
14 Petroleum prod.	0.016025	0.010585	0.006169	0.006978	0.010182	0.011318	0.000150
15 Coal tar pd.	0.004061	0.002847	0.001377	0.000363	0.000544	0.000166	0.014554
16 Heavy chemicals	0.028231	0.005981	0.003598	0.029794	0.003618	0.010053	0
17 Fertiliser	0	0.000026	0	0	0	0.000215	0.000015
18 Paints,pest.etc.	0.001165	0.007932	0.005709	0.057199	0.006134	0.105707	0.020221
19 Coal pd.	0.000149	0.000026	0	0.000015	0.000023	0.000049	0.031696
20 Other n.m.m.pd.	0.000772	0.001996	0.001466	0.009598	0.001006	0.019720	0.126782
21 Iron & Steel	0.038430	0.244860	0.223358	0.109274	0.113639	0.151459	0.085764
22 Other metals	0.205904	0.072608	0.026771	0.085875	0.017864	0.040222	0.000000
23 Metal exc.mach.tpt.	0.015863	0.030754	0.025954	0.016676	0.024907	0.061720	0.000096
24 Non el.machinery	0.013763	0.015110	0.109364	0.008144	0.019542	0.009927	0.002952
25 Elec.machinery	0.000299	0.001534	0.013665	0.082240	0.007893	0.015826	0.026694
26 Transport eqpt.	0.000057	0.002464	0.004958	0.000854	0.122241	0.011182	0.000087
27 Other man.Ind.	0.001465	0.001859	0.000327	0.000535	0.002833	0.029020	0.002311
28 Construction	0.007510	0.006274	0.007554	0.007301	0.014700	0.003967	0.000114
29 Electricity	0.068831	0.014701	0.010483	0.008635	0.013612	0.017087	0.012870
30 Gas & water sup.	0.000680	0.001313	0.002210	0.000738	0.001335	0.000744	0.000623
31 Rly.tpt.service	0.006980	0.013381	0.010214	0.005600	0.008585	0.010413	0.013925
32 Oth.tpt.service	0.008652	0.009525	0.008181	0.008252	0.008321	0.009847	0.018702
33 St.& Warehousing	0	0	0	0	0	0	0
34 Communication	0.002065	0.003290	0.004619	0.004014	0.002902	0.012086	0.000333
35 Oth.services	0.104088	0.096724	0.107938	0.105579	0.079019	0.138695	0.122103

contd.

TABLE - 3D contd.

'A' matrix

SECTORS	29	30	31	32	33	34	35
1 Agriculture	0.000579	0	0	0.015424	0	0	0.029604
2 Coal & lig.	0.067142	0.002589	0.015110	0.000028	0	0	0.000689
3 Cr.pet & N.gas	0.000747	0.117417	0	0	0	0	0.000615
4 Iron & pth.Min.	0.000069	0	0	0	0	0	0.000097
5 Food,bev.& tob.P	0.000024	0.000026	0	0.004870	0.000138	0	0.006849
6 Cotton text.	0.000272	0	0.001882	0.000005	0	0	0.001264
7 Wool,silk etc.	0.000020	0	0	0	0	0	0.000090
8 Jute,hemp & mesta	0.000059	0.000213	0	0	0.001314	0	0.002180
9 Txt.pd.inc.w.app.	0.004770	0	0.000143	0.000919	0.000415	0	0.000429
10 Wood & wood pd.	0.000460	0.000614	0.002923	0.000025	0.000553	0.000596	0.002000
11 Paper & paper pd.	0.001026	0.004271	0.003478	0.003707	0.006640	0.017475	0.011821
12 Leather & its pd.	0.000006	0	0	0.000201	0	0	0.000031
13 Rubber & plastic	0.000034	0.000533	0.001734	0.045881	0.002351	0.000012	0.001414
14 Petroleum prod.	0.007571	0.007582	0.022127	0.088324	0.001591	0.001527	0.001106
15 Coal tar pd.	0.000020	0.000934	0	0	0	0	0.000037
16 Heavy chemicals	0.002022	0.021411	0	0.000050	0.004288	0	0.000488
17 Fertiliser	0	0	0	0	0	0	0.000054
18 Paints,pest.etc.	0.000670	0.002109	0.000101	0.000495	0.001383	0	0.023498
19 Cement	0.000027	0	0	0	0	0	0.000002
20 Oth.non m.min.pd.	0.000192	0.000320	0.003616	0.000205	0	0	0.000630
21 Iron & Steel	0.006237	0.000827	0.023033	0.000081	0	0	0.001333
22 Other metals	0.001344	0	0	0	0	0	0.000288
23 Met.p.exc.mch.&tpt.	0.000544	0.009557	0.028366	0.002611	0.001037	0.000198	0.001835
24 Non el.machinery	0.000429	0.026911	0.003806	0.001127	0.012244	0.000198	0.000877
25 Elec.machinery	0.023310	0.000560	0.023246	0.004973	0	0.019549	0.000525
26 Transport eqpt.	0.000436	0.000427	0.175426	0.056663	0.000069	0.003241	0.000570
27 Other man.Ind.	0.000118	0.001254	0.000721	0.004081	0.002213	0.000881	0.004385
28 Construction	0.026370	0.042957	0.070067	0.006123	0.015080	0.019996	0.011385
29 Electricity	0.226354	0.223355	0.021895	0.001316	0.057969	0.003378	0.027361
30 Coal & water sup.	0.005653	0.155942	0.000814	0.000558	0.000415	0.000173	0.000665
31 Rly.tpt.service	0.026258	0.005606	0.016734	0.007137	0.007401	0.015078	0.005204
32 Oth.tpt.service	0.005870	0.013108	0.013029	0.002233	0.015771	0.016991	0.258504
33 St.& Warehousing	0.000181	0	0	0	0.000138	0	0.003768
34 Communication	0.003219	0.017033	0.002220	0.005109	0.022689	0	0.005314
35 Oth.services	0.056012	0.033505	0.050651	0.008867	0.067376	0.015935	0.034585

TABLE - 3E

VALUE ADDED COEFFICIENTS

SECTORS	Vi's
1 Agriculture	0.713614
2 Coal & lig.	0.678814
3 Cr.pet & N.gas	0.889152
4 Iron & oth.Min.	0.844795
5 Food,bev.& tob.P	0.160522
6 Cotton text.	0.267989
7 Wool,silk etc.	0.223050
8 Jute,hemp& mesta	0.293299
9 Txt.pd.inc.w.app.	0.463683
10 Wood & wood pd.	0.476225
11 Paper & paper pd.	0.343415
12 Leather & its pd.	0.282316
13 Rubber & plastic	0.238995
14 Petroleum prod.	0.090217
15 Coal tar pd.	0.186769
16 Heavy chemicals	0.295146
17 Fertiliser	0.229199
18 Paints,pest.etc.	0.256143
19 Cement	0.241768
20 Oth.non m.min.pd.	0.686314
21 Iron & Steel	0.241034
22 Other metals	0.232601
23 Met.p.exc.mch.&tpt.	0.324861
24 Non el.machinery	0.324258
25 Elec.machinery	0.283769
26 Transport eqpt.	0.409444
27 Other man.Ind.	0.163386
28 Construction	0.379232
29 Electricity	0.489905
30 Gas & water sup.	0.267487
31 Rly.tpt.service	0.475423
32 Oth.tpt.service	0.468517
33 St.& Warehousing	0.764872
34 Communication	0.874579
35 Oth.services	0.714184

Source : Derived from the Input - Output Transactions Matrix as given in Table - 3C

TABLE - 3F

STRUCTURE OF FINAL DEMAND

SECTORS	Pvt.c.	Pub.c.	G.F.inv.	Ch.in st.	Exp.	Imp.
Agriculture	0.412994	0.020125	0.005323	0.030275	0.094403	0.03961
Coal & lig.	0.001454	0.00049	0	0.023408	0.000221	0.002871
Cr.pet & N.gas	0	0	0	0.009598	0.132693	0.195097
Iron & oth.Min.	0	0.000303	0	0.01127	0.012705	0.07952
Food,bev.& tob.P	0.092863	0.003887	0	0.068232	0.131969	0.076866
Cot.text.	0.038467	0.002312	0	0.101892	0.027519	0.030029
Wool,silk	0.027214	0	0	0.026599	0.003197	0.001286
Jute	0	0.000078	0	0.004055	0.005312	0.000009
Text.p.incl.w.app.	0.018709	0.003101	0	0.015479	0.040743	0.0037
Wood	0.001946	0.001413	0.007546	0.074079	0.001358	0.000287
Paper	0.006677	0.008813	0	0.046945	0.021575	0.019062
Leather	0.005034	0.000849	0	0.006696	0.039757	0.00023
Rubber & pl.	0.005336	0.002075	0.007298	0.023282	0.005078	0.001435
Petro.prod.	0.01276	0.025366	0	-0.17479	0.019636	0.107079
Coal tar pd.	0	0	0	0.020869	0	0
Heavy ch.	0	0	0	0.014076	0.00397	0.027782
Fertiliser	0	0	0	0.021235	0.000003	0.065109
paints,pest.etc.	0.0415	0.000156	0	0.139119	0.044199	0.059133
Cement	0	0	0	0.009794	0	0.001895
Oth.non m.min.pd.	0.001186	0	0.000508	0.00877	0.004873	0.003158
Iron & steel	0	0	0	-0.05357	0.006728	0.070343
Oth.metals	0	0	0	0.097217	0.008376	0.024401
met.pd.excl.m&tpt.	0.001668	0.000707	0.006296	0.028185	0.045585	0.007149
Non el.mach.	0.001155	0.001689	0.125623	0.035342	0.029274	0.178875
el.mach.	0.004518	0.009282	0.067469	0.078039	0.015027	0.048478
Tpt.eqpt.	0.008296	0.021909	0.078125	0.178018	0.021787	0.037327
Oth.man.	0.003905	0.00482	0.026983	0.027029	0.105702	0.021827
Construction	0	0.09597	0.558747	0	0	0
Electricity	0.035359	0.008395	0	0	0	0
Gas & water sup.	0.000927	0.011814	0	0	0	0
Rly.tpt.ser.	0.015202	0.017068	0.002352	0	0.018786	0
oth.tpt.ser.	0.04736	0.020853	0.009683	0	0.019497	0
St.& W.hsing.	0	0.078335	0	0	0	0
Communication	0.021504	0.026978	0	0	0	0
Oth.services	0.201835	0.471396	0.047992	0	0.151795	0
Ind.taxes	0.042133	0.016554	0.075685	0	0.00521	0
Gross opt.	1.000000	1.000000	1.000001	1.000000	1.000000	1.000000

Source : Derived from "A Technical Note on the 7th Five Year Plan"

TABLE - 36

LEVEL OF FINAL DEMAND 1984/85
at current prices

(Rs. lakhs)

SECTORS	PFCE	Pub.con.	GFCF	Ch.in st.	Exp.	Imp.
Agriculture	6648212.	49088.4	24098.30	24171.56	149598.9	77176.12
Coal & lig.	23485.91	1193.248	0	18688.94	350.1966	5593.856
Cr.pet & N.gas	0	0	0	7663.043	210265.3	380126.9
Iron & oth.Min.	0	737.8656	0	8997.968	20132.34	154936.7
Food,bev.& tob.P	1494871.	9465.622	0	54476.42	209118.0	149765.7
Cot.text.	619226.3	5630.182	0	81350.57	43606.60	56.5036
Wool,silk	438089.7	0	0	21236.64	5067.075	2506.577
Jute	0	190.3644	0	3238.302	8418.551	19.28916
Text.p.incl.w.app.	301169.9	7551.555	0	12358.43	64561.35	7209.00
Wood	31325.92	3440.937	34150.93	59144.67	2151.886	559.1900
Paper	107483.6	21461.41	0	37480.00	2495.745	37140.40
Leather	81035.31	2067.484	0	5346.086	62998.94	448.132
Rubber & pl.	85896.79	182.64	33028.55	18588.34	8046.598	2795.954
Petro.prod.	205405.3	61771.28	0	-139553.	31115.20	208632.7
Coal tar pd.	0	0	0	16661.80	0	0
Heavy ch.	0	0	0	11238.51	14213.86	53976.13
Fertiliser	0	0	0	24938.02	4.7538	126858.3
paints,pest.etc.	668050.4	379.8912	0	111072.6	70038.68	113266.3
Cement	0	0	0	7420.329	0	3692.218
Oth.non m.min.pd.	19091.75	0	2299.055	48486.83	7721.755	6153.047
Iron & steel	0	0	0	-40375.8	13830.38	140953.1
Oth.metals	0	0	0	74424.45	1388.109	47542.90
met.pd.excl.m&tpt.	26852.40	748.824	28493.80	22439.75	72710.48	6135.511
Non el.mach.	18592.72	4113.052	568532.0	100552.0	46387.58	255035.8
el.mach.	72696.76	22603.52	305344.4	59911.13	20642.58	78867.33
Tpt.eqpt.	133545.6	4648.796	353570.3	142648.1	33889.84	46424.52
Oth.man.	62861.12	84793.66	31606.13	5594.388	203972.8	42527.72
Construction	0	233706.1	2528721.	0	0	0
Electricity	86267.03	54536.30	0	0	0	0
Gas & water sup.	14922.47	28771.64	0	0	0	0
Rly.tpt.ser.	244715.7	41563.99	12907.29	0	29768.29	0
oth.tpt.ser.	762382.3	55651.62	43822.35	0	30894.94	0
St.& W.hsing.	0	14.34332	0	0	0	0
Communication	24210.79	65696.82	0	0	0	0
Oth.services	3249059.	1634959.	216699.5	0	208208.5	0
Ind.taxes	678240.1	40312.30	342437.0	0	13009.56	0
Gross opt.	16097611	2435201.	4525703.	798400.1	1584601.	1948400.

TABLE - 3H

LEVEL OF FINAL DEMAND & OUTPUT OF 1984-85
at 78/79 prices

(Rs lakhs)

Sectors	PFCE	Pub.con.	GFCF	Ch.in st.	Exp.	Imp.	X(Initial
1 Agriculture	3777393.	27845.68	13687.67	13733.84	84994.88	43858.87	6031169.
2 Coal & lig.	8088.807	412.3724	0	6458.688	121.0238	1933.170	2168882.
3 Cr.pet & N.gas	0	0	0	2648.257	72665.22	131367.4	172548.4
4 Iron & oth.Min.	0	254.9976	0	3109.591	6957.500	53544.32	24663.55
5 Food,bev.& tob.P	898876.1	5636.019	0	32436.34	124513.0	89173.47	1233521.
6 Cotton text.	368699.6	3352.322	0	48437.74	25964.23	33.64336	677571.8
7 Wool,silk etc.	260847.3	0	0	12644.71	3017.037	1492.466	314327.9
8 Jute,hemp& mesta	0	113.3467	0	1928.149	5012.572	11.48514	71788.20
9 Txt.pd.inc.w.app.	179322.5	4496.345	0	7358.456	38441.11	4292.429	252542.4
10 Wood & wood pd.	18652.08	2048.802	20334.14	35215.91	1281.276	332.9533	237950.1
11 Paper & paper pd.	63997.91	12778.55	0	22316.86	1486.016	22114.13	271900.5
12 Leather & its pd.	48250.03	1231.021	0	3183.165	37510.82	266.8266	107429.1
13 Rubber & plastic	51144.65	108.7474	19665.85	11067.87	4791.104	1664.766	218587.5
14 Petroleum prod.	122302.4	36779.84	0	-83093.1	18526.61	124224.0	277997.1
15 Coal tar pd.	0	0	0	9920.772	0	0	54288.30
16 Heavy chemicals	0	0	0	6691.636	8463.215	32138.46	207611.1
17 Fertiliser	0	0	0	14848.59	2.830506	75533.99	130903.1
18 Paints,pest.etc.	397770.4	226.1947	0	66134.83	41702.42	67441.02	1080933.
19 Cement	0	0	0	4418.211	0	2198.419	57458.94
20 Oth.non m.min.pd.	11367.60	0	1368.983	28870.02	4597.686	3663.646	302035.0
21 Iron & Steel	0	0	0	-24040.6	8234.887	83926.27	578608.4
22 Other metals	0	0	0	44313.79	826.5080	28307.99	189104.2
23 Met.p.exc.mch.&tpt	15988.45	445.8646	16965.77	13361.07	43293.26	3653.205	254917.1
24 Non el.machinery	11070.47	2448.993	338515.2	59870.71	27620.08	151853.3	705742.3
25 Elec.machinery	43285.09	13458.58	181808.1	35672.28	12291.00	46959.17	367466.6
26 Transport eqpt.	79515.75	2767.985	210522.7	85054.61	20178.68	27642.08	592413.0
27 Other man.Ind.	37428.76	50487.83	18818.91	3331.010	121449.5	25321.85	259062.1
28 Construction	0	118768.6	1285087.	0	0	0	1630055.
29 Electricity	48309.54	30540.33	0	0	0	0	586869.7
30 Gas & water sup.	8356.586	16112.12	0	0	0	0	52680.29
31 Rly.tpt.service	126560.0	21495.72	6675.288	0	15395.32	0	358096.1
32 Oth.tpt.service	479801.0	35024.03	27579.35	0	19443.55	0	1181392.
33 St.& Warehousing	0	7.706862	0	0	0	0	19125.78
34 Communication	17787.51	48267.85	0	0	0	0	130893.4
35 Oth.services	1856605.	934262.3	123828.3	0	118976.2	0	5038460.
TOTAL	9080382.	1373654.	2552870.	450363.6	893845.9	1099058.	

TABLE - 3I

(I-A)^-1 MATRIX

Sectors	1	2	3	4	5	6	7
1 Agriculture	1.223574	0.012236	0.003178	0.006424	0.649922	0.323643	0.130937
2 Coal & lig.	0.223574	1.012236	0.003178	0.006424	0.649922	0.323643	0.130937
3 Cr.pet & N.gas	0.017260	0.012035	1.008260	0.015770	0.024967	0.020188	0.023872
4 Iron & oth.Min.	0.001995	0.002093	0.001183	1.000898	0.003890	0.002805	0.004219
5 Food,bev.& tob.P	0.011479	0.002988	0.000493	0.001524	1.136222	0.013532	0.018863
6 Cotton text.	0.002896	0.001012	0.000181	0.000510	0.007512	1.259131	0.075626
7 Wool,silk etc.	0.000110	0.000106	0.000024	0.000049	0.000335	0.013286	1.067742
8 Jute,hemp& mesta	0.002459	0.000968	0.000886	0.000482	0.010801	0.005810	0.005587
9 Txt.pd.inc.w.app.	0.000936	0.000620	0.000099	0.000317	0.001494	0.001613	0.000432
10 Wood & wood pd.	0.002810	0.006374	0.001006	0.003202	0.015945	0.009152	0.012400
11 Paper & paper pd.	0.003332	0.006908	0.001338	0.003350	0.019641	0.014164	0.031647
12 Leather & its pd.	0.000024	0.000052	0.000014	0.000018	0.000187	0.001298	0.000197
13 Rubber & plastic	0.002118	0.004099	0.000836	0.002002	0.009286	0.007323	0.007689
14 Petroleum prod.	0.023345	0.015547	0.011645	0.021771	0.032687	0.025269	0.023178
15 Coal tar pd.	0.000783	0.001276	0.000513	0.001265	0.001918	0.001780	0.007216
16 Heavy chemicals	0.007202	0.007463	0.001236	0.003962	0.017004	0.029686	0.060579
17 Fertiliser	0.039304	0.000489	0.000117	0.000257	0.021196	0.010683	0.005042
18 Paints,pest.etc.	0.019450	0.043889	0.002444	0.021183	0.060516	0.072954	0.333022
19 Cement	0.000538	0.000422	0.004180	0.000205	0.000946	0.000785	0.000901
20 Oth.non m.min.pd.	0.002905	0.002683	0.011955	0.001229	0.009866	0.005022	0.008061
21 Iron & Steel	0.013965	0.041778	0.015330	0.009542	0.043503	0.033582	0.027163
22 Other metals	0.003046	0.008735	0.002818	0.002734	0.010984	0.007809	0.010406
23 Met.p.exc.mch.&tpt	0.004090	0.009754	0.002501	0.009564	0.022671	0.013903	0.016441
24 Non el.machinery	0.030526	0.115922	0.043782	0.014776	0.087317	0.060279	0.039434
25 Elec.machinery	0.002202	0.004795	0.001287	0.001733	0.005355	0.004765	0.003630
26 Transport eqpt.	0.004406	0.009659	0.001410	0.004115	0.011565	0.009304	0.006195
27 Other man.Ind.	0.000967	0.002235	0.000475	0.000523	0.003295	0.003210	0.002726
28 Construction	0.013878	0.010511	0.007847	0.003977	0.023459	0.020044	0.019791
29 Electricity	0.030552	0.071536	0.004404	0.039908	0.072374	0.076815	0.053436
30 Gas & water sup.	0.000760	0.001238	0.000302	0.000516	0.002146	0.003676	0.003336
31 Rly.tpt.service	0.008766	0.013096	0.003794	0.005288	0.020117	0.014484	0.012706
32 Oth.tpt.service	0.019580	0.042117	0.005055	0.015043	0.065421	0.067603	0.038797
33 St.& Warehousing	0.000296	0.000325	0.000148	0.000208	0.000995	0.001020	0.000935
34 Communication	0.001632	0.003009	0.003459	0.002026	0.005784	0.005458	0.005883
35 Oth.services	0.077176	0.092838	0.039184	0.052858	0.260748	0.267116	0.245725

contd.

TABLE - 31

(I-A)-1 Matrix

Sectors	8	9	10	11	12	13	14
1 Agriculture	0.478726	0.110369	0.277306	0.076087	0.392233	0.164776	0.010030
2 Coal & lig.	0.478726	0.110369	0.277306	0.076087	0.392233	0.164776	0.010030
3 Cr.pet & N.gas	0.020933	0.014060	0.014996	0.018420	0.016948	0.030542	0.720549
4 Iron & oth.Min.	0.002847	0.001898	0.002074	0.007781	0.003051	0.005349	0.001654
5 Food,bev.& tob.P	0.011681	0.007041	0.007052	0.010540	0.021921	0.015665	0.002265
6 Cotton text.	0.012466	0.223592	0.003811	0.009614	0.004999	0.018235	0.000705
7 Wool,silk etc.	0.001386	0.047319	0.000401	0.001160	0.000776	0.007364	0.000067
8 Jute,hemp& mesta	1.033885	0.007086	0.002642	0.009701	0.006594	0.006483	0.002217
9 Txt.pd.inc.w.app.	0.013622	1.036924	0.003068	0.005913	0.006468	0.014038	0.000327
10 Wood & wood pd.	0.006476	0.008162	1.115186	0.009121	0.019016	0.012229	0.004097
11 Paper & paper pd.	0.012894	0.012189	0.007599	1.293920	0.014642	0.021212	0.005568
12 Leather & its pd.	0.000077	0.000368	0.000253	0.000325	1.169530	0.000100	0.000028
13 Rubber & plastic	0.006926	0.008037	0.009558	0.016411	0.036497	1.106362	0.003093
14 Petroleum prod.	0.027124	0.017528	0.019976	0.022014	0.021182	0.034556	1.042880
15 Coal tar pd.	0.001697	0.001318	0.001061	0.001728	0.001400	0.001972	0.000916
16 Heavy chemicals	0.014142	0.017637	0.008384	0.044623	0.041724	0.063612	0.010502
17 Fertiliser	0.015525	0.003746	0.008991	0.002812	0.012939	0.005947	0.000489
18 Paints,pest.etc.	0.267740	0.064056	0.031621	0.053771	0.062206	0.233909	0.016925
19 Cement	0.000868	0.000514	0.000513	0.000850	0.000612	0.000961	0.003306
20 Oth.non m.min.pd.	0.005187	0.003602	0.004149	0.025662	0.006133	0.009987	0.012259
21 Iron & Steel	0.039890	0.019220	0.029597	0.034727	0.032067	0.036453	0.019725
22 Other metals	0.008369	0.007029	0.007453	0.015538	0.007912	0.013933	0.004239
23 Met.p.exc.mch.&tpt	0.016200	0.010973	0.014773	0.018209	0.016320	0.026325	0.009762
24 Non el.machinery	0.071260	0.026186	0.040453	0.045313	0.050563	0.036172	0.040691
25 Elec.machinery	0.005137	0.002556	0.003472	0.004542	0.003689	0.003963	0.002050
26 Transport eqpt.	0.009916	0.004970	0.008523	0.007094	0.009125	0.007861	0.003470
27 Other man.Ind.	0.002655	0.002097	0.002059	0.002348	0.004754	0.002470	0.000927
28 Construction	0.022021	0.012799	0.012820	0.020271	0.014803	0.020758	0.010533
29 Electricity	0.081727	0.075957	0.041129	0.069159	0.048928	0.059654	0.017724
30 Gas & water sup.	0.001614	0.001591	0.001025	0.010381	0.001429	0.002338	0.001314
31 Rly.tpt.service	0.015912	0.008361	0.016238	0.019593	0.013674	0.014139	0.027210
32 Oth.tpt.service	0.064554	0.035496	0.054014	0.032763	0.048894	0.039960	0.024751
33 St.& Warehousing	0.000950	0.000561	0.000711	0.000083	0.000942	0.001001	0.000353
34 Communication	0.005114	0.005339	0.014585	0.005777	0.036275	0.006855	0.003964
35 Oth.services	0.249169	0.126032	0.136657	0.231910	0.247736	0.262905	0.092519

contd.

TABLE - 3I contd.

(I-A)^-1 Matrix

Sectors	15	16	17	18	19	20	21
1 Agriculture	0.025382	0.055095	0.042970	0.142964	0.076407	0.017594	0.020388
2 Coal & lig.	0.025382	0.055095	0.042970	0.142964	0.076407	0.017594	0.020388
3 Cr.pet & N.gas	0.020848	0.054561	0.084557	0.047325	0.017325	0.014315	0.026206
4 Iron & oth.Min.	0.003371	0.024557	0.032027	0.008404	0.071802	0.019837	0.035245
5 Food,bev.& tob.P	0.004477	0.018412	0.009036	0.055953	0.004281	0.002175	0.003419
6 Cotton text.	0.001722	0.005184	0.002256	0.015905	0.002698	0.001932	0.001729
7 Wool,silk etc.	0.000137	0.000289	0.000234	0.000570	0.000308	0.000112	0.000255
8 Jute,hemp& mesta	0.006647	0.013165	0.039449	0.009234	0.133810	0.007605	0.003278
9 Txt.pd.inc.w.app.	0.000662	0.001259	0.001549	0.001535	0.002781	0.000706	0.002174
10 Wood & wood pd.	0.005026	0.009571	0.006256	0.021406	0.004567	0.006254	0.006410
11 Paper & paper pd.	0.000311	0.017208	0.009103	0.045637	0.008222	0.008004	0.007650
12 Leather & its pd.	0.000052	0.000078	0.000057	0.000149	0.000063	0.000036	0.000345
13 Rubber & plastic	0.006054	0.009115	0.009903	0.011196	0.004691	0.003373	0.005162
14 Petroleum prod.	0.026721	0.055397	0.102768	0.031970	0.023312	0.018981	0.035554
15 Coal tar pd.	1.037031	0.008728	0.006624	0.003453	0.002447	0.001942	0.025808
16 Heavy chemicals	0.025006	1.186424	0.112289	0.148072	0.007113	0.016724	0.017316
17 Fertiliser	0.001236	0.010026	1.081388	0.006661	0.002538	0.000831	0.000818
18 Paints,pest.etc.	0.026330	0.065544	0.041795	1.192035	0.020819	0.013234	0.017620
19 Cement	0.000998	0.001324	0.001612	0.001425	1.001641	0.000595	0.001221
20 Oth.non m.min.pd.	0.006757	0.012874	0.014358	0.017694	0.012756	1.046489	0.010493
21 Iron & Steel	0.026626	0.038526	0.034116	0.033320	0.062165	0.029674	1.332333
22 Other metals	0.006134	0.033489	0.009827	0.022649	0.009529	0.004930	0.002740
23 Met.p.exc.mch.&tpt	0.016439	0.023740	0.016179	0.027780	0.025459	0.009690	0.064421
24 Non el.machinery	0.018735	0.044549	0.050954	0.038950	0.051795	0.018705	0.063244
25 Elec.machinery	0.005848	0.005697	0.006600	0.004021	0.007628	0.002476	0.010118
26 Transport eqpt.	0.027259	0.007827	0.009671	0.007083	0.014951	0.005753	0.014446
27 Other man.Ind.	0.002177	0.003091	0.002750	0.002484	0.002550	0.001425	0.018152
28 Construction	0.024372	0.028519	0.036154	0.022080	0.023732	0.010857	0.028663
29 Electricity	0.038704	0.109817	0.127038	0.058814	0.150638	0.026218	0.079469
30 Gas & water sup.	0.006583	0.005979	0.007442	0.003843	0.002234	0.001046	0.004928
31 Rly.tpt.service	0.112684	0.021558	0.028644	0.015921	0.054889	0.018476	0.050819
32 Oth.tpt.service	0.065258	0.039274	0.046473	0.040413	0.043663	0.024154	0.040993
33 St.& Warehousing	0.001023	0.000840	0.001008	0.000879	0.001038	0.000424	0.000935
34 Communication	0.003629	0.006476	0.005144	0.006780	0.005162	0.003746	0.005810
35 Oth.services	0.269724	0.217627	0.261401	0.230502	0.268331	0.111297	0.244227

contd.

TABLE - 3I contd.

(I-A)^-1 Matrix

Sectors	22	23	24	25	26	27	28
1 Agriculture	0.021228	0.022256	9.022993	0.034317	0.023815	0.056381	0.059315
2 Coal & lig.	0.021228	0.022256	0.022993	0.034317	0.023815	0.056381	0.059315
3 Cr.pet & N.gas	0.024486	0.020641	0.017330	0.019840	0.017886	0.026395	0.011369
4 Iron & oth.Min.	0.104840	0.021560	0.014029	0.016877	0.008924	0.015395	0.020705
5 Food,bev.& tob.P	0.003407	0.003476	0.003473	0.007152	0.003166	0.011808	0.004410
6 Cotton text.	0.001691	0.001893	0.001556	0.003257	0.001961	0.005106	0.001725
7 Wool,silk etc.	0.000173	0.000511	0.000353	0.000372	0.000454	0.002724	0.000154
8 Jute,hemp& mesta	0.009967	0.004123	0.003246	0.007826	0.003100	0.011766	0.011790
9 Txt.pd.inc.w.app.	0.001288	0.001768	0.001149	0.001306	0.001344	0.002071	0.000928
10 Wood & wood pd.	0.006758	0.010102	0.010604	0.019757	0.009364	0.027933	0.046582
11 Paper & paper pd.	0.007956	0.010869	0.009876	0.021224	0.008684	0.029683	0.007565
12 Leather & its pd.	0.000081	0.000546	0.000284	0.000129	0.000145	0.002082	0.000079
13 Rubber & plastic	0.003949	0.006546	0.013218	0.026472	0.037790	0.017519	0.004856
14 Petroleum prod.	0.033037	0.027676	0.022723	0.024154	0.023788	0.031923	0.014314
15 Coal tar pd.	0.007845	0.010729	0.009151	0.005378	0.005307	0.006409	0.018166
16 Heavy chemicals	0.046833	0.018696	0.015190	0.057992	0.014158	0.049034	0.010681
17 Fertiliser	0.001036	0.000912	0.000883	0.001601	0.000901	0.002544	0.002064
18 Paints,pest.etc.	0.016355	0.023131	0.023308	0.092225	0.026494	0.150407	0.039832
19 Cement	0.001003	0.000873	0.000877	0.000947	0.001040	0.001118	0.033219
20 Oth.non m.min.pd.	0.005433	0.007583	0.007433	0.016650	0.006954	0.028238	0.136195
21 Iron & Steel	0.098204	0.355708	0.356941	0.185934	0.202049	0.254832	0.134059
22 Other metals	1.270393	0.119160	0.066280	0.135508	0.044750	0.081477	0.014126
23 Met.p.exc.mch.&tpt	0.029289	1.053544	0.050702	0.034832	0.043117	0.086160	0.012246
24 Non el.machinery	0.031347	0.040375	1.145338	0.029682	0.040603	0.038279	0.022040
25 Elec.machinery	0.006231	0.027036	0.021611	1.093734	0.014144	0.023309	0.032680
26 Transport eqpt.	0.007065	0.012448	0.015344	0.008087	1.146439	0.022958	0.009537
27 Other man.Ind.	0.004321	0.007374	0.006366	0.004573	0.007069	1.035144	0.005493
28 Construction	0.020655	0.020481	0.022113	0.022576	0.026966	0.020653	1.011283
29 Electricity	0.132677	0.057270	0.048732	0.049681	0.044098	0.063842	0.043486
30 Gas & water sup.	0.002839	0.003679	0.004916	0.032854	0.003287	0.003388	0.002099
31 Rly.tpt.service	0.020871	0.032091	0.029394	0.019741	0.022049	0.028744	0.028574
32 Oth.tpt.service	0.032634	0.035198	0.035294	0.035825	0.029742	0.040721	0.045542
33 St.& Warehousing	0.000790	0.000303	0.000873	0.000853	0.000564	0.001075	0.000822
34 Communication	0.005442	0.006736	0.008554	0.007935	0.006006	0.016966	0.003446
35 Oth.services	0.203014	0.210324	0.229443	0.224078	0.174140	0.282208	0.216121

contd.

TABLE - 31 contd.

(I-A)^-1 Matrix

Sectors	29	30	31	32	33	34	35
1 Agriculture	0.010828	0.013271	0.016586	0.041965	0.008926	0.005405	0.056372
2 Coal & lig.	0.010828	0.013271	0.016586	0.041965	0.008926	0.005405	0.056372
3 Cr.pet & N.gas	0.012992	0.155157	0.024356	0.075002	0.005105	0.004019	0.009741
4 Iron & oth.Min.	0.002240	0.003424	0.005282	0.001663	0.021038	0.001069	0.001279
5 Food,bev.& tob.P	0.001628	0.002261	0.002171	0.008799	0.001621	0.000811	0.011365
6 Cotton text.	0.002403	0.001246	0.003423	0.001847	0.000711	0.000400	0.002846
7 Wool,silk etc.	0.000380	0.000174	0.000206	0.000504	0.000112	0.000252	0.000256
8 Jute,hemp& mesta	0.001252	0.002117	0.002162	0.001434	0.002116	0.000653	0.003406
9 Txt.pd.inc.w.app.	0.026640	0.002046	0.000890	0.002052	0.001060	0.000243	0.000958
10 Wood & wood pd.	0.003913	0.005656	0.009891	0.003135	0.002484	0.002496	0.005630
11 Paper & paper pd.	0.004954	0.011059	0.029292	0.010127	0.011522	0.023894	0.019720
12 Leather & its pd.	0.000036	0.000049	0.000075	0.000299	0.000027	0.000020	0.000087
13 Rubber & plastic	0.002607	0.004029	0.011417	0.057097	0.004745	0.002359	0.006663
14 Petroleum prod.	0.015185	0.021013	0.033752	0.106241	0.006555	0.005421	0.011004
15 Coal tar pd.	0.001296	0.003267	0.003447	0.000891	0.000650	0.000610	0.000676
16 Heavy chemicals	0.006980	0.034764	0.007224	0.007196	0.007382	0.002617	0.006974
17 Fertiliser	0.000413	0.000699	0.000609	0.001434	0.000352	0.000199	0.001958
18 Paints,pest.etc.	0.009691	0.013665	0.014957	0.012780	0.007959	0.005066	0.037700
19 Cement	0.001430	0.002840	0.002025	0.000782	0.000714	0.000778	0.000619
20 Oth.non m.min.pd.	0.006715	0.012090	0.016466	0.004219	0.003317	0.003626	0.003919
21 Iron & Steel	0.026872	0.036589	0.075531	0.024138	0.011687	0.010132	0.012280
22 Other metals	0.008836	0.006729	0.010590	0.006326	0.002738	0.002940	0.003366
23 Met.p.exc.mch.&tpt	0.005149	0.017696	0.042499	0.009891	0.003618	0.002687	0.004665
24 Non el.machinery	0.005777	0.048628	0.010987	0.014598	0.016824	0.003270	0.012500
25 Elec.machinery	0.035834	0.014005	0.032469	0.008433	0.004071	0.002994	0.002946
26 Transport eqpt.	0.009789	0.007098	0.070029	0.074410	0.004633	0.008780	[illegible]
27 Other man.Ind.	0.001313	0.003036	0.003661	0.006018	0.003127	0.001475	0.005765
28 Construction	0.040459	0.057252	0.051722	0.014154	0.020860	[illegible]	0.014793
29 Electricity	1.303386	0.755290	0.047609	0.015405	0.030670	0.009075	0.020440
30 Gas & water sup.	0.000152	[illegible]	0.000415	0.001494	0.001391	0.000419	0.001454
31 Rly.tpt.service	0.070239	0.002193	1.007690	0.012950	0.012289	0.017470	0.009525
32 Oth.tpt.service	0.019168	0.072265	[illegible]	[illegible]	0.026419	[illegible]	[illegible]
33 St.& Warehousing	0.000647	0.000492	0.000507	0.000581	1.000521	0.000140	[illegible]
34 Communication	0.005673	0.037444	0.024970	0.007729	0.024001	1.000714	0.007193
35 Oth.services	[illegible]	[illegible]	[illegible]	0.157457	0.097665	0.074979	[illegible]

TABLE - 3K

(I-A+W)^-1

	1	2	3	4	5	6	7
1 Agriculture	1.211653	0.010898	0.001604	0.001862	0.594137	0.318792	0.124654
2 Coal & lig.	0.219939	1.010075	0.001613	0.001874	0.597764	0.320738	0.125415
3 Cr.pet & N.gas	0.006189	0.024565	0.567959	0.001929	0.008706	0.007777	0.009739
4 Iron & oth.Min.	0.000419	0.000471	0.000172	0.315531	0.000878	0.000678	0.001082
5 Food,bev.& tob.P	0.010295	0.002510	0.000230	0.000411	1.049895	0.012088	0.016123
6 Cotton text.	0.002790	0.000911	0.000089	0.000148	0.006795	1.258890	0.074799
7 Wool,silk etc.	0.000100	0.000093	0.000011	0.000014	0.000292	0.013204	1.062269
8 Jute,hemp& mesta	0.001615	0.000810	0.000463	0.000133	0.009527	0.005462	0.005027
9 Txt.pd.inc.w.app.	0.000873	0.000564	0.000046	0.000094	0.001295	0.001532	0.008167
10 Wood & wood pd.	0.002545	0.006001	0.000502	0.000974	0.014311	0.008759	0.011632
11 Paper & paper pd.	0.002701	0.005865	0.000622	0.000912	0.015961	0.012341	0.027399
12 Leather & its pd.	0.000020	0.000044	0.000006	0.000005	0.000164	0.001287	0.000187
13 Rubber & plastic	0.001904	0.003679	0.000395	0.000595	0.008084	0.006896	0.007082
14 Petroleum prod.	0.014570	0.039993	0.004394	0.004627	0.019452	0.016314	0.014529
15 Coal tar pd.	0.000577	0.000947	0.000223	0.000376	0.001431	0.001493	0.006871
16 Heavy chemicals	0.004388	0.025516	0.000480	0.000958	0.011735	0.023798	0.047974
17 Fertiliser	0.023969	0.000264	0.000235	0.000045	0.011921	0.006457	0.002914
18 Paints,pest.etc.	0.016992	0.040016	0.001116	0.036127	0.050830	0.066790	0.007196
19 Cement	0.000442	0.000348	0.000269	0.000047	0.000747	0.000674	0.000759
20 Oth.non m.min.pd.	0.002416	0.002279	0.000620	0.000319	0.008454	0.004469	0.007172
21 Iron & Steel	0.009335	0.028510	0.005923	0.002177	0.028557	0.024144	0.019274
22 Other metals	0.001924	0.005738	0.001019	0.000622	0.007113	0.005357	0.007383
23 Met.p.exc.mch.&tpt	0.003259	0.000106	0.001098	0.002864	0.019209	0.012477	0.014642
24 Non el.machinery	0.023099	0.002022	0.019775	0.003571	0.063297	0.047057	0.029641
25 Elec.machinery	0.001693	0.000746	0.002544	0.000452	0.003927	0.023858	0.002852
26 Transport eqpt.	0.003867	0.020745	0.002571	0.001200	0.029697	0.008461	0.005427
27 Other man.Ind.	0.000766	0.001820	0.000202	0.000135	0.002539	0.002743	0.002283
28 Construction	0.012896	0.029705	0.004286	0.001166	0.020566	0.019109	0.018477
29 Electricity	0.007724	0.069554	0.002108	0.012403	0.063907	0.074292	0.049744
30 Gas & water sup.	0.000594	0.001034	0.000141	0.000158	0.001703	0.003518	0.003298
31 Rly.tpt.service	0.007930	[illegible]	0.001740	0.001509	0.017470	0.013559	0.011581
32 Oth.tpt.service	0.010170	0.042525	[illegible]	0.004600	0.058787	0.056152	0.036625
33 St.& Warehousing	0.000257	0.000296	0.000073	0.000062	0.000884	0.000587	0.000988
34 Communication	0.001427	0.002705	[illegible]	0.000618	0.005038	0.005184	0.005495
35 Oth.services	0.059759	0.075185	0.002273	0.015750	0.251562	0.259035	0.233415

contd.

TABLE - 3K contd.

(I-A+M)^-1

	8	9	10	11	12	13	14
1 Agriculture	0.472591	0.186202	0.273378	0.066749	0.385313	0.158394	0.005766
2 Coal & lig.	0.475476	0.186851	0.275047	0.067156	0.387665	0.159361	0.005802
3 Cr.pet & N.gas	0.007934	0.005393	0.005673	0.006577	0.006385	0.012131	0.281577
4 Iron & oth.Min.	0.000672	0.000469	0.000502	0.002030	0.000743	0.001413	0.000228
5 Food,bev.& tob.P	0.010392	0.006098	0.006289	0.008508	0.019785	0.013415	0.001260
6 Cotton text.	0.012266	0.219583	0.003711	0.007665	0.004803	0.017713	0.000414
7 Wool,silk etc.	0.001355	0.046254	0.000388	0.001831	0.000750	0.007236	0.000037
8 Jute,hemp& mesta	1.033318	0.006782	0.002402	0.007657	0.006183	0.006002	0.001273
9 Txt.pd.inc.w.app.	0.013328	1.018929	0.002975	0.005222	0.006281	0.013611	0.000187
10 Wood & wood pd.	0.006074	0.007776	1.113214	0.007045	0.018557	0.011523	0.002501
11 Paper & paper pd.	0.011194	0.010524	0.006592	1.170791	0.012738	0.018141	0.003092
12 Leather & its pd.	0.000869	0.000349	0.000247	0.000288	1.166114	0.000891	0.000014
13 Rubber & plastic	0.006475	0.007628	0.009226	0.014467	0.035730	1.096684	0.001839
14 Petroleum prod.	0.017478	0.011262	0.012983	0.012899	0.013395	0.022214	0.709489
15 Coal tar pd.	0.001381	0.001140	0.000853	0.001317	0.001111	0.001628	0.000443
16 Heavy chemicals	0.010498	0.013815	0.006247	0.033367	0.033888	0.051006	0.005647
17 Fertiliser	0.009425	0.002205	0.005451	0.001494	0.007798	0.003473	0.000175
18 Paints,pest.etc.	0.061923	0.057920	0.028675	0.044373	0.056472	0.214612	0.011330
19 Cement	0.000750	0.000435	0.000435	0.000676	0.000512	0.000801	0.001305
20 Oth.non m.min.pd.	0.004608	0.003193	0.003763	0.004681	0.005561	0.009053	0.005672
21 Iron & Steel	0.028856	0.013915	0.022065	0.023453	0.023240	0.027087	0.007443
22 Other metals	0.005717	0.005167	0.005426	0.010848	0.005492	0.010315	0.001602
23 Met.p.exc.mch.&tpt	0.014623	0.009950	0.013692	0.015250	0.014862	0.024302	0.005741
24 Non el.machinery	0.055786	0.019772	0.031490	0.031870	0.039100	0.026864	0.014623
25 Elec.machinery	0.004133	0.002038	0.002915	0.003361	0.002917	0.003139	0.000903
26 Transport eqpt.	0.009000	0.004344	0.007823	0.005809	0.007324	0.006987	0.001879
27 Other man.Ind.	0.002216	0.002483	0.001739	0.001788	0.004140	0.002835	0.000438
28 Construction	0.021002	0.012052	0.012165	0.019451	0.013809	0.019394	0.007393
29 Electricity	0.079026	0.033921	0.039384	0.059598	0.046073	0.055949	0.010668
30 Gas & water sup.	0.001435	0.001472	0.000914	0.009276	0.001255	0.002112	0.000798
31 Rly.tpt.service	0.014882	0.007716	0.015562	0.017015	0.012713	0.012958	0.003905
32 Oth.tpt.service	0.062979	0.034053	0.052956	0.028531	0.047273	0.037730	0.015552
33 St.& Warehousing	0.002916	0.000829	0.000689	0.000778	0.000908	0.000953	0.000203
34 Communication	0.004830	0.005092	0.004401	0.007701	0.005759	0.006485	0.001846
35 Oth.services	0.239417	0.218310	0.180970	0.203732	0.238866	0.250288	0.053380

contd.

TABLE - 3K contd.

(I-A+W)^-1

	15	16	17	18	19	20	21
1 Agriculture	0.024202	0.044241	0.024753	0.127961	0.071709	0.016517	0.015827
2 Coal & lig.	0.024350	0.044511	0.024904	0.128742	0.072147	0.016618	0.015924
3 Cr.pet & N.gas	0.008229	0.019833	0.021137	0.020517	0.006102	0.005419	0.008330
4 Iron & oth.Min.	0.000942	0.006299	0.006054	0.002132	0.021620	0.006070	0.008950
5 Food,bev.& tob.P	0.003941	0.014075	0.004816	0.047709	0.003581	0.001844	0.002443
6 Cotton text.	0.001645	0.004256	0.001271	0.014612	0.002495	0.001858	0.001357
7 Wool,silk etc.	0.000129	0.000231	0.000133	0.000510	0.000282	0.000103	0.000199
8 Jute,hemp& mesta	0.006497	0.010825	0.024045	0.008106	0.128659	0.007362	0.002521
9 Txt.pd.inc.w.app.	0.000622	0.000996	0.000896	0.001329	0.002578	0.000657	0.001748
10 Wood & wood pd.	0.004810	0.007715	0.003498	0.019444	0.003995	0.005983	0.025000
11 Paper & paper pd.	0.007265	0.012732	0.004633	0.037983	0.006758	0.006946	0.005423
12 Leather & its pd.	0.000048	0.000060	0.000030	0.000131	0.000053	0.000032	0.000281
13 Rubber & plastic	0.005783	0.007324	0.005739	0.009892	0.004126	0.003137	0.003964
14 Petroleum prod.	0.017771	0.031003	0.042291	0.018895	0.014093	0.012271	0.019487
15 Coal tar pd.	1.036857	0.007120	0.003839	0.002844	0.002001	0.001746	0.001414
16 Heavy chemicals	0.020620	1.001108	0.057832	0.115715	0.005021	0.013582	0.011406
17 Fertiliser	0.000718	0.005165	0.665722	0.003622	0.001459	0.000475	0.000382
18 Paints,pest.etc.	0.023001	0.050427	0.022506	1.107378	0.017045	0.011433	0.012423
19 Cement	0.000893	0.000944	0.000805	0.001141	0.964470	0.000124	0.000905
20 Oth.non m.min.pd.	0.006338	0.010147	0.008074	0.015556	0.011733	1.033150	0.008269
21 Iron & Steel	0.020531	0.024164	0.014901	0.022582	0.046593	0.023090	1.111964
22 Other metals	0.004445	0.022857	0.004151	0.016389	0.006417	0.003485	0.057351
23 Met.p.exc.mch.&tpt	0.015494	0.018610	0.008760	0.024112	0.022615	0.008738	0.052082
24 Non el.machinery	0.014063	0.028411	0.023269	0.026829	0.038510	0.013978	0.041361
25 Elec.machinery	0.004971	0.003947	0.003315	0.002949	0.006103	0.001995	0.007122
26 Transport eqpt.	0.025683	0.035917	0.035218	0.035817	0.013190	0.005185	0.011127
27 Other man.Ind.	0.001869	0.002214	0.001436	0.001927	0.002018	0.001176	0.013698
28 Construction	0.023824	0.023172	0.021313	0.019247	0.022000	0.009471	0.023250
29 Electricity	0.037304	0.098111	0.075613	0.058672	0.141549	0.024320	0.063595
30 Gas & water sup.	0.006496	0.024913	0.004442	0.003341	0.002813	0.002959	0.004089
31 Rly.tpt.service	0.112160	0.017346	0.016943	0.013669	0.051811	0.017736	0.041630
32 Oth.tpt.service	0.064422	0.031665	0.027076	0.035843	0.048326	0.020842	0.032966
33 St.& Warehousing	0.001006	0.002679	0.002591	0.002777	0.002968	0.000403	0.000755
34 Communication	0.003468	0.025183	0.002871	0.005947	0.004679	0.003555	0.024593
35 Oth.services	0.265223	0.175988	0.153371	0.203859	0.258280	0.105803	0.197307

contd.

TABLE - 3K contd.

(I-A+W)^-1

	22	23	24	25	26	27	28
1 Agriculture	0.016355	0.019704	0.016858	0.027496	0.020994	0.047569	0.057304
2 Coal & lig.	0.016455	0.019825	0.016961	0.027664	0.021122	0.047860	0.057654
3 Cr.pet & N.gas	0.007513	0.007284	0.005028	0.006474	0.006308	0.009080	0.004182
4 Iron & oth.Min.	0.027603	0.025691	0.002918	0.023869	0.002182	0.003676	0.006196
5 Food,bev.& tob.P	0.002365	0.002808	0.002320	0.005280	0.002517	0.009198	0.003789
6 Cotton text.	0.001311	0.001693	0.001126	0.002651	0.001740	0.004356	0.001602
7 Wool,silk etc.	0.000133	0.000478	0.000266	0.000306	0.000412	0.002437	0.000139
8 Jute,hemp& mesta	0.008178	0.003656	0.002340	0.006449	0.002697	0.012228	0.011406
9 Txt.pd.inc.w.app.	0.001005	0.001577	0.000808	0.001029	0.001172	0.001726	0.000845
10 Wood & wood pd.	0.025245	0.029337	0.008087	0.016789	0.006474	0.024648	0.046118
11 Paper & paper pd.	0.005590	0.029036	0.006715	0.016199	0.007016	0.023527	0.006399
12 Leather & its pd.	0.000060	0.000516	0.000212	0.000101	0.000125	0.001870	0.000069
13 Rubber & plastic	0.002949	0.005893	0.010173	0.022627	0.035224	0.015199	0.004455
14 Petroleum prod.	0.017464	0.016753	0.011170	0.012999	0.014350	0.018089	0.008776
15 Coal tar pd.	0.006186	0.009254	0.006349	0.003962	0.004297	0.004855	0.017631
16 Heavy chemicals	0.032616	0.013911	0.009177	0.041279	0.010321	0.035406	0.008165
17 Fertiliser	0.000476	0.000487	0.000390	0.000760	0.000479	0.001305	0.001217
18 Paints,pest.etc.	0.010766	0.019418	0.016135	0.073011	0.002177	0.125330	0.035776
19 Cement	0.000728	0.000703	0.000590	0.000701	0.000865	0.000849	0.031913
20 Oth.non m.min.pd.	0.004047	0.006557	0.005292	0.013783	0.005968	0.004472	0.134028
21 Iron & Steel	0.059697	0.270017	0.030748	0.133559	0.157634	0.190041	0.109949
22 Other metals	1.066095	0.075064	0.041870	0.097910	0.033363	0.059142	0.009929
23 Met.p.exc.mch.&tpt	0.022629	1.034110	0.037400	0.027747	0.038094	0.074109	0.010316
24 Non el.machinery	0.019241	0.020605	0.916349	0.019566	0.020969	0.004937	0.016042
25 Elec.machinery	0.004203	0.005435	0.014823	0.959173	0.011372	0.018052	0.026376
26 Transport eqpt.	0.005123	0.012744	0.011273	0.026144	1.027633	0.019044	0.008597
27 Other man.Ind.	0.007069	0.006226	0.004012	0.033194	0.005630	0.970034	0.004651
28 Construction	0.016412	0.018183	0.016343	0.016551	0.024092	0.016749	1.010308
29 Electricity	0.107299	0.049721	0.034698	0.038223	0.070038	0.050271	0.042335
30 Gas & water sup.	0.002235	0.003295	0.003716	0.002256	0.002018	0.002719	0.021940
31 Rly.tpt.service	0.015732	0.020771	0.021478	0.015525	0.019043	0.010074	0.007228
32 Oth.tpt.service	0.020479	0.031611	0.026228	0.029425	0.026381	0.036898	0.043923
33 St.& Warehousing	0.002429	0.002703	0.002654	0.002698	0.003589	0.000715	0.002798
34 Communication	0.004259	0.006137	0.006534	0.006491	0.005410	0.014935	0.003176
35 Oth.services	0.161860	0.159558	0.171957	0.193537	0.154603	0.240279	0.207155

Contd.

TABLE - 3K contd.

(I-A+W)^-1

	29	30	31	32	33	34	35
1 Agriculture	0.010173	0.012008	0.015276	0.040217	0.008432	0.004963	0.054740
2 Coal & lig.	0.010235	0.012082	0.015370	0.040463	0.008483	0.004993	0.055074
3 Cr.pet & N.gas	0.005316	0.005021	0.009225	0.028962	0.001975	0.001517	0.003989
4 Iron & oth.Min.	0.000596	0.000889	0.001387	0.000403	0.000272	0.000283	0.000336
5 Food,bev.& tob.P	0.001398	0.001865	0.001806	0.007917	0.001423	0.000682	0.010344
6 Cotton text.	0.002332	0.001150	0.003324	0.001746	0.000674	0.000362	0.002769
7 Wool,silk etc.	0.000368	0.000162	0.000190	0.000487	0.000106	0.000047	0.000247
8 Jute,hemp& oesta	0.001147	0.001885	0.001954	0.001236	0.002052	0.000617	0.003289
9 Txt.pd.inc.w.app.	0.006503	0.001968	0.000814	0.001973	0.001025	0.000219	0.000917
10 Wood & wood pd.	0.003731	0.005326	0.009495	0.002807	0.002382	0.002385	0.005465
11 Paper & paper pd.	0.004292	0.009645	0.008017	0.008786	0.010325	0.021527	0.017652
12 Leather & its pd.	0.000033	0.000041	0.000067	0.000293	0.000024	0.000018	0.000084
13 Rubber & plastic	0.002388	0.003651	0.010697	0.058242	0.004599	0.002199	0.006463
14 Petroleum prod.	0.010054	0.013296	0.022254	0.071956	0.004282	0.003533	0.007755
15 Coal tar pd.	0.001157	0.002989	0.003012	0.000713	0.000568	0.000546	0.000587
16 Heavy chemicals	0.005448	0.028810	0.005088	0.005306	0.006011	0.001911	0.005353
17 Fertiliser	0.000234	0.000372	0.000339	0.000838	0.000200	0.000110	0.001165
18 Paints,pest.etc.	0.008543	0.011663	0.012684	0.019995	0.007071	0.004274	0.034632
19 Cement	0.001333	0.002432	0.002624	0.000546	0.000667	0.000732	0.000561
20 Oth.non m.min.pd.	0.006385	0.010883	0.015737	0.003363	0.003154	0.003462	0.003667
21 Iron & Steel	0.021247	0.026706	0.076310	0.017766	0.008614	0.007701	0.009071
22 Other metals	0.006605	0.006056	0.013744	0.004506	0.001914	0.002841	0.002435
23 Met.p.exc.mch.&tpt	0.004527	0.016301	0.040215	0.008772	0.003205	0.003274	0.004166
24 Non el.machinery	0.003953	0.036005	0.013491	0.009401	0.013183	0.002893	0.007837
25 Elec.machinery	0.001358	0.011972	0.028156	0.007178	0.003479	0.020130	0.002399
26 Transport eqpt.	0.009154	0.007141	0.197412	0.070365	0.004298	0.006267	0.007468
27 Other man.Ind.	0.001101	0.002583	0.003018	0.005334	0.002789	0.001259	0.005178
28 Construction	0.042081	0.066128	0.050284	0.013176	0.020630	0.022929	0.016446
29 Electricity	1.302400	0.353250	0.045108	0.013721	0.008869	0.006508	0.019556
30 Gas & water sup.	0.009097	1.187747	0.022263	0.001381	0.001347	0.000577	0.001394
31 Rly.tpt.service	0.007844	0.021248	1.026514	0.012227	0.012039	0.017217	0.009189
32 Oth.tpt.service	0.018578	0.030957	0.030230	1.102211	0.020060	0.022581	0.026264
33 St.& Warehousing	0.008635	0.008461	0.008475	0.008563	1.008513	0.008133	0.004244
34 Communication	0.035617	0.023036	0.024648	0.027423	0.023946	1.020695	0.007088
35 Oth.services	0.125717	0.125411	0.123872	0.146314	0.079576	0.074925	1.125081

CHAPTER 4

ICORs AND ELECTRICITY COEFFICIENTS : A MEASUREMENT IN THE INDIAN CONTEXT

ICORs AND ELECTRICITY COEFFICIENTS:A MEASUREMENT IN THE INDIAN CONTEXT

I.ESTIMATION OF ICORS :A SHORT OVERVIEW

Capital-output ratios have been used in the Indian economic planning to estimate the amount of investment needed to achieve certain targets. The relationship between investment and incremental output has been used popularly in many growth models as a simplification of the conventional production function, assuming capital to be the binding contraint in the growth process. But in the actual use like most other aspects in economics any attempt to marry the theoritical conception with its empirical counter-part is an extremely difficult proposition.

Conceptually, the capital stock should be related to capacity rather than output generation. Also when capacity is a function of a number of variable of which capital stock is one of the determinants, the important question is whether we will be measuring partial derivatives i.e., marginal productivity of capital, or a total derivative. Popularly in growth models the attempt is made to relate changes in capital stock and changes in output without any reference to other inputs thereby implicitly assuming that the other factors always maintain the optimum technical relations. But even when capital-output ratio is measured in this limited

sense, two very important dimentions are to be taken care of : (1) the gestation lag between the beginging of the investments in a sector and the time when the capacity is ready for production. This gestation lag varies very much from sector to sector, some times being as high as 7 to 8 years. Indeed if the gestation lad is ignored and the incremental capital output ratio is estimated by the conventional method (with zero gestation lag) then the estimated ICOR will always have an upward bias and the bias will increase with the increase in the rate of growth of income of that sector. (2) Secondly, the valuation of the capital stock and the output generated there from are also very important. If the price index of capital goods, or to be more precise, the composite of contruction and capital goods, is higher than the price index of the corresponding output then in every updating of the base the estimated ICOR will increase in its value. Besides, in any economy where a large part of the capital investment is made in sectors mainly on welfare considerations, the incremental capital output ratio (ICOR) would tend to be higher than one based on technical consideration. Thus, the ICOR that is estimated conventionally from observable series should not be taken as an index of capital productivity purely unconditionally.

II. OUR METHODOLOGY

After having set the stage we will step out to confront reality. We will try to calculate the ICORs of the 35 sectors(according to our classification described before) which figuresin the entire range of the Indian economy. Here we must confess that we are really going to calculate ICORs for 25 sectors (of which 23 fall under manufacturing; the other two being electricity and gas and water supply), which are covered in the Annual Survey of Industries(ASI). The ICORs of the rest of the sectors will be either taken directly or derived from the Technical Note on the Sixth Five Year Plan of India.

The figures that we have collected for our purpose have been taken from the Annual Survey of Industries for the different sectors for a time span of 1973-74 to 1985-86. From the ASI data we have the figure for fixed capital stock[1] (FK), invested capital stock[2] (IK), net value added[3] (NVA) and depreciation

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1. Fixed Capital represents the depreciated value of fixed assets owned by the factory as on the closing day of the accounting year.

2. Invested capital is the total of fixed capital and physical working capital. Here physical working capital is defined to include all physical inventories owned, held or controlled by the factory as on the closing day of the accounting year.

3. Net value added is the increment to the value of goods and services that is contributed by the factory.

for the years 1973-74 to 1985-86. Adding NVA and depreciation gives us the gross value added(GVA). We can also write

$$F\,K\,(t+1) - F\,K\,(t) = GFCF\,(t+1)$$

[fixed capital stock in period (t+1)] − [Fixed capital stock in Period (t)] = [Gross fixe capital forma tion in (t+1)

Similarly,

$$I\,K\,(t+1) - I\,K\,(t) = G\,C\,F\,(t+1)$$

where GCF refers to gross capital formation.

Then we can deflate the GVAs and GFCFs and GCFs to 1978-79 prices using deflaters derived from the National Accounts Statistics. So now we have the GVAs and GFCFs and GCFs for 1974-75 to 1985-86 at 1978-79 prices. The capital stock (both for fixed and invested capital) for the year 1973-74 is given at book value. The value for this year's capital stock has been kept as it is and capital formation (at 1978-79 prices)for other years can now be added successively to get the capital stock (both fixed and invested) in each year. A slight hitch remains with the initial capital stock (as it has not been deflated due to non-availability of appropriate deflator), but since it is a moderately long time series this would not create much of an aberration. So finally we have the GVAs and capital stocks at 1978-79 prices for the years 1973-74 to 1985-86 and the GFCFs and GCFs for the years 1974-75 to 1985-86 (this too at 1978-79 prices).

There are several methods of estimating ICORs. The Technical Note to the 6th five year plan has its own version. It says to estimate the equation

$$GCF(t) = a + b\,[GVA\,(t + L) - GVA\,(t)]/L$$

for different L (which is the lag). Select that L for which R squared is the highest and then the coefficient b will be the estimated ICOR. Since data at our disposal is only for 13 years and for capital formation it is only for 12 years and since L (the lag) may vary from a few months to 7-8 years it is not sensible to use this equation in our case as this may lead to very few degrees of freedom.

Otherwise we may divide each year's increment in GVA by that year's increment in capital stock to get the ICOR for each year and then take out the average. Here there are two difficulties. One is that it does not take care of the lags, implicitly assuming that investment and corresponding outputs are simultaneous. Secondly, the year to year ICORs may vary wildly. We may take moving averages of GVA and capital formation to smoothen out the year to year fluctuations,but this may also lead to (in fact it did lead to as we attempted to use this method in some cases) madly fluctuating ICORs. On the face of this crisis we propose a much simpler method, which will hopefully stay clear of these anomalies. We can estimate the ICORs in two ways. Let us denote invested capital or

total capital stock at time t by TKS (t).

1st way : Estimate TKS (t) = a + b GVA (t)

Then $\frac{d\,TKS(t)}{d\,GVA(t)} = b = ICOR$ (Change in capital stock / Change in GVA)

2nd way : Estimate $GVA(t) = a_1 + b_1 t$

& $TKS(t) = a_2 + b_2 t$

Here $\frac{d\,TKS(t)}{d\,GVA(t)} = \frac{d\,TKS(t)/dt}{d\,GVA(t)/dt} = \frac{b_2}{b_1}$ (The required ICOR

We can choose any one of the two ways provided the R squared is high enough and T statistics are significant and there is no autocorrelation(which will be checked by using Durbin-Watson statistic).

It is more advisiable to use the first way because it is a more direct approach. The obvious hitch in our method is that it does not take care of lags. As mentioned earlier, if we introduce lag in our method of estimation it may reduce the degrees of freedom by quite a bit and consequently the estimate may not be that reliable. Moreover, one may also point out that we have used changes in total capital stock (which includes fixed capital as well as inventoris and physical working capital) and not changes in fixed capital, (which really goes onto enhance productive capacity). Since we are interested in measuring the capital formation requirements with increases in output and since inventories are generally proportional to demand (increases in which triggers off increases in output) our methodology which takes into account changes in total capital stock seems to be on the right track.

III. RESULTS OF THE ESTIMATION OF ICORs

After having decided on the method we will carry on with it empirically. In most cases we have used the first way which has been described earlier. In few cases where there was some autocorrelation while we used the first way we changed over and resorted to the second way. Where R squared has not been reliably high (in two/three sectors such was the case) we have dropped one or two observations, which seemed to be outliers, and then carried on with our estimate. In this way we have calculated ICORs for 25 sectors. Here it may be mentioned that we have used the computer software package TSP5 for our estimation. The ICORs for the remaining ten sectors has been either taken or derived from the Technical Note on the sixth five year plan. There the ICORs are given at 1979-80 prices. We have reduced them to 1978-79 prices using deflators derived from the National Accounts Statistics. The list of ICORs is given in table 4A.

IV. ESTIMATION OF ELECTRICITY COEFFICIENTS

As compared to our ICOR estimation this is much simpler. In the A marix the jth element of the 29th row (one can check that sector number 29 according to our classification is the electricity sector) gives the amount of electricity in rupee terms needed to produce one rupee worth of output of the jth sector (j=1,2,.....35).

TABLE -4A

	SECTORS	ICORs of different sectors
1	Agriculture	3.6
2	Coal & lig.	4.8
3	Cr.pet & N.gas	4.8
4	Iron & oth.Min.	4.799995
5	Food,bev.& tob.P	3.3
6	Cotton text.	1.26
7	Wool,silk etc.	4.099991
8	Jute,hemp& mesta	0.709998
9	Txt.pd.inc.w.app.	2.099998
10	Wood & wood pd.	4.599997
11	Paper & paper pd.	7.999981
12	Leather & its pd.	4.040615
13	Rubber & plastic	2.799989
14	Petroleum prod.	7.099957
15	Coal tar pd.	1.429992
16	Heavy chemicals	5.479994
17	Fertiliser	4.599997
18	Paints,pest.etc.	4.599986
19	Cement	2.899998
20	Oth.non m.min.pd.	4.079994
21	Iron & Steel	8.18
22	Other metals	8.35
23	Met.p.exc.mch.&tpt.	4.599997
24	Non el.machinery	3.599996
25	Elec.machinery	2.759994
26	Transport eqpt.	3.739994
27	Other man.Ind.	1.779999
28	Construction	0.199999
29	Electricity	10.29998
30	Gas & water sup.	3.229997
31	Rly.tpt.service	6.099989
32	Oth.tpt.service	8.199994
33	St. & Warehousing	1.299998
34	Communication	6.399998
35	Oth.services	1.299999

ICORs of sectors 1 to 4 & sectors 31 to 35 are taken/derived from the Tecnical Note on the Sixth Plan. ICORS of the rest of the sectors have been calculated from ASI data.

That is we have the electricity requirement per rupee worth of output in value terms but we have to reduce it to real terms. From the Power Survey reports we have the total electricity consumption in million KWH for 1978-79. From the input-output transaction table for 1978-79 we can have the total electricity used, including both intermediate and final use, in lakh rupees which can be reduced to figures in million rupees. Dividing the electricity used in million rupees by the electricity consumption in million KWH we can have the impilicit price of electricity for that year. Now dividing the 29th row of our A matrix by this implicit price we will get the electricity requirements in KWH per rupee of output produced for every sector. This constitutes our e vector, which is reproduced in table 4B.

TABLE -4B

	SECTORS	Electricity Coefficients (ei's)
1	Agriculture	0.005191
2	Coal & lig.	0.047922
3	Cr.pet & N.gas	0.000539
4	Iron & oth.Min.	0.027910
5	Food,bev.& tob.P	0.007985
6	Cotton text.	0.024510
7	Wool,silk etc.	0.014821
8	Jute,hemp& mesta	0.026312
9	Txt.pd.inc.w.app.	0.007915
10	Wood & wood pd.	0.008905
11	Paper & paper pd.	0.027452
12	Leather & its pd.	0.004389
13	Rubber & plastic	0.019093
14	Petroleum prod.	0.007678
15	Coal tar pd.	0.016315
16	Heavy chemicals	0.058054
17	Fertiliser	0.071548
18	Paints,pest.etc.	0.015264
19	Cement	0.096957
20	Oth.non m.min.pd.	0.011935
21	Iron & Steel	0.033158
22	Other metals	0.068831
23	Met.p.exc.mch.&tpt.	0.014701
24	Non el.machinery	0.010483
25	Elec.machinery	0.008635
26	Transport eqpt.	0.013612
27	Other man.Ind.	0.017087
28	Construction	0.012870
29	Electricity	0.226354
30	Gas & water sup.	0.223355
31	Rly.tpt.service	0.021895
32	Oth.tpt.service	0.001316
33	St.& Warehousing	0.057969
34	Communication	0.003378
35	Oth.services	0.007361

ANNEXURE TO CHAPTER 4

The preceeding four chapters saw the motivation of the problem, setting up of the model and generation of the relevant matrices for our empirical exercise. We may recall from the chapter on model that our linear programming problem consisted of minimising either

$$K\ V\ (I - A + W)^{-1}\ E \quad \text{or} \quad e(I-A+W)^{-1}\ E$$

Subject to $E \leqslant \bar{E}\ (1+r)$

$$\& \quad sZE \geqslant s\bar{F} - sZ\bar{F}$$

$$[\text{where } Z = (I - A)\ (I-A + W)^{-1}\ ]$$

We have taken four values of r viz. 0.25, 0.50, 0.75 & 1.00 showing that in each successive case the export potential rises by 25%, 50%, 75% and 100% respectively. In four different scenarios of hypothetically expanding export potential we want to figure out India's optimal export - product mix if it tries to achieve a goal of balanced trade with minimum investment / electricity use.

We have 35 variables (E1,E2,.....E35) in our objective function. And there are 36 constraints out of which one consists of the trade balance and other 35 consist of the limits to exports from each sector. Since potential exports are taken to be a certain fraction over and above the initial actually exports ; the exports of those commodities which had zero exports in initial period remains so in subsequent cases. They can be termed as non-exportables. After

having set the stage of empirical exercises we are now ready to solve our linear programming problems in each case. For this we have used the computer software package LINDO. The initial scenario[1] and the final scenarios after the solving of the problems is given in tables 4C to 4J. The next chapter tries to provide explanations and interpretations of the results, some of which may appear a little too surprising.

1. The initial scenario is given in table 3H (Page-53)

TABLE - 4C

Final Results of
Investment Minimisation Exercise
(when exp. potential increases by 25%) (Rs. lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	106243	6866573.	43679.33
2 Coal & lig.	151	2183304.	1943.141
3 Cr.pet & N.gas	90831	185498.1	140978.6
4 Iron & oth.Min.	8696	25540.57	55423.05
5 Food,bev.& tob.P	118757	1229319.	88510.97
6 Cotton text.	32455	688464.7	33.73477
7 Wool,silk etc.	3771	315778.6	1484.159
8 Jute,hemp & mesta	6265	73887.70	11.82203
9 Txt.pd.inc.w.app.	48051	262602.8	4464.248
10 Wood & wood pd.	1601	240088.4	336.1238
11 Paper & paper pd.	1857	274671.7	22248.41
12 Leather & its pd.	46888	118447.0	284.2728
13 Rubber & plastic	5988	221873.9	1686.242
14 Petroleum prod.	23158	283883.4	126612.0
15 Coal tar pd.	0	54789.72	0
16 Heavy chemicals	10579	213446.1	32870.70
17 Fertiliser	3.5	131645.1	75959.25
18 Paints,pest.etc.	52128	1100532.	68232.98
19 Cement	0	57626.36	2189.801
20 Oth.non m.min.pd.	5747	304819.6	3657.835
21 Iron & Steel	10293	594422.9	86191.32
22 Other metals	1033	193589.5	28844.83
23 Met.p.exc.mch.&tpt	54116	270023.3	3780.326
24 Non el.machinery	34525	715686.1	155631.2
25 Elec.machinery	15363	371564.9	47188.74
26 Transport eqpt.	25223	600358.4	27616.49
27 Other man.Ind.	151811	288059.0	27941.73
28 Construction	0	1632941.	0
29 Electricity	0	593077.6	0
30 Gas & water sup.	0	53027.30	0
31 Rly.tpt.service	19244	364461.3	0
32 Oth.tpt.service	24304	1193085.	0
33 St.& Warehousing	0	19322.96	0
34 Communication	0	132062.3	0
35 Oth.services	148720	5095779.	0
TOTAL	1047801.		1047801.

TABLE - 4D

Final Results of
Electricity Minimisation Exercise
(when exp. potential increases by 25%)

(Rs. lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	106243	6081855.	43789.36
2 Coal & lig.	151	2198679.	1956.824
3 Cr.pet & N.gas	90831	185392.4	140898.2
4 Iron & oth.Min.	8696	25375.84	55063.84
5 Food,bev.& tob.P	155641	1267687.	91273.47
6 Cotton text.	22970.39	676638.0	33.15526
7 Wool,silk etc.	3771	315651.1	1483.560
8 Jute,hemp & mesta	0	67564.55	10.81032
9 Txt.pd.inc.w.app.	48051	262522.9	4462.890
10 Wood & wood pd.	1601	240356.6	336.4993
11 Paper & paper pd.	1857	274876.9	22265.03
12 Leather & its pd.	46888	118436.8	284.2484
13 Rubber & plastic	5988	221944.8	1686.780
14 Petroleum prod.	23158	283789.9	126570.3
15 Coal tar pd.	0	54517.54	0
16 Heavy chemicals	0	202845.4	31238.19
17 Fertiliser	0	131903.1	76108.12
18 Paints,pest.etc.	52128	1100712.	68244.19
19 Cement	0	57622.76	2189.665
20 Oth.non m.min.pd.	5747	304863.4	3658.361
21 Iron & Steel	0	583303.6	84579.03
22 Other metals	0	191831.8	28582.94
23 Met.p.exc.mch.&tpt	54116	269766.3	3776.728
24 Non el.machinery	34525	716478.3	155802.0
25 Elec.machinery	15363	371527.8	47184.03
26 Transport eqpt.	25223	600397.0	27618.26
27 Other man.Ind.	151811	287945.9	27930.75
28 Construction	0	1632885.	0
29 Electricity	0	592516.1	0
30 Gas & water sup.	0	52955.21	0
31 Rly.tpt.service	19244	364253.5	0
32 Oth.tpt.service	24304	1193531.	0
33 St.& Warehousing	0	19324.83	0
34 Communication	0	137062.2	0
35 Oth.services	148720	5096303.	0
TOTAL	1047027.		1047027.

TABLE - 4E

Final Results of
Investment Minimisation Exercise
(when exp. potential increases by 50%) (Rs. lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	127492	6023064.	43366.06
2 Coal & lig.	181.5	2118329.	1885.313
3 Cr.pet & N.gas	108997	196437.3	149292.3
4 Iron & oth.Min.	10436.25	26282.42	57032.86
5 Food,bev.& tob.P	0	1105705.	79610.82
6 Cotton text.	38946	698391.0	34.22116
7 Wool,silk etc.	4525	317159.7	1490.651
8 Jute,hemp & mesta	7518	74694.08	11.95105
9 Txt.pd.inc.w.app.	57661	272280.1	4628.762
10 Wood & wood pd.	0	237895.4	333.0536
11 Paper & paper pd.	0	272433.5	22067.11
12 Leather & its pd.	30491	99381.04	238.5145
13 Rubber & plastic	7186	221578.5	1683.997
14 Petroleum prod.	27789	285073.9	127142.9
15 Coal tar pd.	0	55075.39	0
16 Heavy chemicals	12694	216839.8	33393.33
17 Fertiliser	4.24	130800.8	75472.06
18 Paints,pest.etc.	62553	1112194.	68956.04
19 Cement	0	57677.82	2191.757
20 Oth.non m.min.pd.	6896	306389.4	3676.673
21 Iron & Steel	12352	605800.1	87841.02
22 Other metals	1239	196963.0	29347.49
23 Met.p.exc.mch.&tpt	64939	282260.1	3951.642
24 Non el.machinery	41430	717065.2	155972.4
25 Elec.machinery	18436	374922.9	47615.20
26 Transport eqpt.	30268	604939.8	27827.23
27 Other man.Ind.	182174	316498.6	30700.36
28 Construction	0	1632694.	0
29 Electricity	0	590268.1	0
30 Gas & water sup.	0	53077.77	0
31 Rly.tpt.service	23092	368099.8	0
32 Oth.tpt.service	0	1144607.	0
33 St.& Warehousing	0	19397.57	0
34 Communication	0	132271.5	0
35 Oth.services	178464	5115707.	0
TOTAL	1055763.		1055763.

TABLE - 4F

Final Results of
Electricity Minimisation Exercise
(when exp. potential increases by 50%) (Rs. lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	127492	6024422.	43375.84
2 Coal & lig.	181.5	2119696.	1886.529
3 Cr.pet & N.gas	108997	196838.1	149597.0
4 Iron & oth.Min.	10436.25	26071.96	56576.17
5 Food,bev.& tob.P	10673.91	1116922.	80418.44
6 Cotton text.	0	649468.9	31.82398
7 Wool,silk etc.	4525	316669.4	1488.346
8 Jute,hemp & mesta	0	66852.63	10.69642
9 Txt.pd.inc.w.app.	57661	272335.1	4629.698
10 Wood & wood pd.	1921	240208.8	336.2923
11 Paper & paper pd.	2229	275009.9	22275.80
12 Leather & its pd.	56225	129346.2	310.4310
13 Rubber & plastic	7186	223870.0	1701.412
14 Petroleum prod.	27789	286355.7	127714.6
15 Coal tar pd.	0	54713.51	0
16 Heavy chemicals	0	204182.8	31444.16
17 Fertiliser	0	130770.9	75454.82
18 Paints,pest.etc.	62553	1111053.	68885.31
19 Cement	0	57661.28	2191.128
20 Oth.non m.min.pd.	6896	306293.8	3675.526
21 Iron & Steel	0	592042.8	85848.21
22 Other metals	0	194775.2	29021.51
23 Met.p.exc.mch.&tpt	64939	281661.2	3943.257
24 Non el.machinery	41430	718085.1	155695.7
25 Elec.machinery	18436	374937.7	47617.08
26 Transport eqpt.	30268	606695.9	27909.01
27 Other man.Ind.	182174	316478.7	30697.66
28 Construction	0	1672218.	0
29 Electricity	0	587194.4	0
30 Gas & water sup.	0	52929.65	0
31 R'y.tpt.service	23092	367641.4	0
32 Oth.tpt.service	29165	1194872.	0
33 St.& Warehousing	0	19385.43	0
34 Communication	0	132749.5	0
35 Oth.services	178464	5112834.	0
TOTAL	1052733.		1052733.

TABLE - 4G

Final Results of
Electricity Minimisation Exercise
(when exp. potential increases by 75%) (Rs lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	148741	6046081.	43531.78
2 Coal & lig.	0	2120075.	1886.867
3 Cr.pet & N.gas	127164	208111.7	158164.9
4 Iron & oth.Min.	12175	26287.89	57044.73
5 Food,bev.& tob.P	0	1105886.	79623.80
6 Cotton text.	0	651388.8	31.91805
7 Wool,silk etc.	5279	317624.3	1492.834
8 Jute,hemp & mesta	0	65832.75	10.53324
9 Txt.pd.inc.w.app.	67271	282057.5	4794.978
10 Wood & wood pd.	2242	238086.4	333.3210
11 Paper & paper pd.	0	270629.4	21920.98
12 Leather & its pd.	65643	140091.4	336.2193
13 Rubber & plastic	8384	224487.5	1706.105
14 Petroleum prod.	32421	288879.6	128840.3
15 Coal tar pd.	0	54328.45	0
16 Heavy chemicals	0	201696.1	31061.20
17 Fertiliser	0	131168.5	75684.23
18 Paints,pest.etc.	72979	1108887.	68751.03
19 Cement	0	57673.17	2191.580
20 Oth.non m.min.pd.	8045	304998.5	3658.782
21 Iron & Steel	0	573638.6	83177.69
22 Other metals	0	188974.8	28157.25
23 Met.p.exc.mch.&tpt	75736	284086.9	3977.217
24 Non el.machinery	48335	720883.6	156737.3
25 Elec.machinery	21509	375965.5	47747.63
26 Transport eqpt.	35312	611321.1	28120.77
27 Other man.Ind.	46992	189887.1	18419.04
28 Construction	0	1631894.	0
29 Electricity	0	583341.1	0
30 Gas & water sup.	0	52741.40	0
31 Rly.tpt.service	26941	369669.3	0
32 Oth.tpt.service	34026	1199438.	0
33 St.& Warehousing	0	19433.99	0
34 Communication	0	138939.8	0
35 Oth.services	208208	5125705.	0
TOTAL	1047403		1047403

TABLE - 4H

Final Results of
Investment Minimisation Exercise
(when exp. potential increases by 75%) (Rs. lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	148741	6041297.	43923.70
2 Coal & lig.	211	2115472.	1885.565
3 Cr.pet & N.gas	0	136153.5	103663.4
4 Iron & oth.Min.	0	23118.68	50190.42
5 Food,bev.& tob.P	0	1186518.	79992.25
6 Cotton text.	45437	708897.0	35.19875
7 Wool,silk etc.	5279	318559.1	1512.556
8 Jute,hemp & mesta	0	67385.84	10.78083
9 Txt.pd.inc.w.app.	67271	281924.7	4791.836
10 Wood & wood pd.	0	238574.4	333.8268
11 Paper & paper pd.	0	273856.7	22273.22
12 Leather & its pd.	0	63901.93	158.7161
13 Rubber & plastic	8384	222760.4	1696.547
14 Petroleum prod.	32421	288641.6	127457.6
15 Coal tar pd.	0	55241.76	0
16 Heavy chemicals	14810	220917.4	34198.30
17 Fertiliser	4.95	131193.6	75701.61
18 Paints,pest.etc.	72979	1128502.	70408.94
19 Cement	0	57451.76	2198.145
20 Oth.non m.min.pd.	8045	307603.7	3731.194
21 Iron & Steel	6962	609293.9	88377.16
22 Other metals	0	198717.0	29746.98
23 Met.p.exc.mch.&tpt	75763	295028.0	4228.033
24 Non el.machinery	48335	722000.2	155351.5
25 Elec.machinery	21509	377962.6	48300.48
26 Transport eqpt.	35312	606722.5	28309.76
27 Other man.Ind.	212536	345084.0	33730.00
28 Construction	0	1631972.	0
29 Electricity	0	591949.6	0
30 Gas & water sup.	0	53248.16	0
31 Rly.tpt.service	0	345601.1	0
32 Oth.tpt.service	0	1167334.	0
33 St.& Warehousing	0	19542.32	0
34 Communication	0	132741.6	0
35 Oth.services	200200	5154029.	0
TOTAL	1015491.		1015491.

TABLE - 4I

Final Results of
Investment Minimisation Exercise
(when exp. potential increases by 100%) (Rs lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	42496.06	5920894.	42630.44
2 Coal & lig.	242	2100517.	1869.460
3 Cr.pet & N.gas	0	137688.3	104643.1
4 Iron & oth.Min.	0	23293.16	50546.17
5 Food,bev.& tob.P	0	1106771.	79687.51
6 Cotton text.	51928	719373.7	35.24931
7 Wool,silk etc.	6034	319985.5	1503.932
8 Jute,hemp & mesta	0	67906.46	10.86503
9 Txt.pd.inc.w.app.	76882	291774.1	4960.160
10 Wood & wood pd.	0	239823.3	335.7527
11 Paper & paper pd.	0	275669.0	22329.19
12 Leather & its pd.	0	63978.62	153.5487
13 Rubber & plastic	9582	225144.3	1711.097
14 Petroleum prod.	37053	291923.8	130198.0
15 Coal tar pd.	0	55450.76	0
16 Heavy chemicals	16926	225750.3	34765.55
17 Fertiliser	5.66	120851.4	74347.30
18 Paints,pest.etc.	83404	1145303.	71000.84
19 Cement	0	57498.54	2184.944
20 Oth.non m.min.pd.	9195	309795.7	3717.548
21 Iron & Steel	0	613282.6	88925.98
22 Other metals	0	202102.8	30113.33
23 Met.p.exc.mch.&tpt	86596	308976.5	4325.671
24 Non el.machinery	55240	720065.3	158452.2
25 Elec.machinery	24582	381615.0	48465.10
26 Transport eqpt.	40357	612930.6	28194.80
27 Other man.Ind.	242899	373791.0	36257.72
28 Construction	0	1632499.	0
29 Electricity	0	593529.9	0
30 Gas'& water sup.	0	53457.51	0
31 Rly.tpt.service	0	346477.2	0
32 Oth.tpt.service	0	1170667.	0
33 St.& Warehousing	0	19707.26	0
34 Communication	0	133561.1	0
35 Oth.services	237952	5197713.	0
TOTAL	1021373.		1021373.

TABLE - 4J

Final Results of
Electricity Minimisation Exercise
(when exp. potential increases by 100%)

(Rs. lakhs)

Sectors	E(FINAL)	X(FINAL)	M(FINAL)
1 Agriculture	169989	6066171.	43676.43
2 Coal & lig.	0	2119059	1885.962
3 Cr.pet & N.gas	143330	217389.2	165154.9
4 Iron & oth.Min.	13915	26637	57802.29
5 Food,bev.& tob.P	0	1102770	79399.44
6 Cotton text.	0	652390	31.96711
7 Wool,silk etc.	6034	318687.6	1497.831
8 Jute,hemp & mesta	0	65090.5	10.41448
9 Txt.pd.inc.w.app.	76882	291713.3	4959.126
10 Wood & wood pd.	2562	236550.6	331.1700
11 Paper & paper pd.	0	267746.9	21607.49
12 Leather & its pd.	75021	150994.1	362.3858
13 Rubber & plastic	0	215214.6	1635.630
14 Petroleum prod.	37053	291399.9	129964.3
15 Coal tar pd.	0	54115.1	0
16 Heavy chemicals	0	192357.8	29623.10
17 Fertiliser	0	131474.9	75861.01
18 Paints,pest.etc.	0	1023956.	63485.29
19 Cement	0	57660.51	2191.099
20 Oth.non m.min.pd.	9195	304350.6	3652.207
21 Iron & Steel	0	569525.4	82581.10
22 Other metals	0	186802.4	27833.55
23 Met.p.exc.mch.&tpt	84216	288645.4	4041.035
24 Non el.machinery	55240	726121.6	157717.8
25 Elec.machinery	24582	378345.5	48049.87
26 Transport eqpt.	40337	617144.6	28388.65
27 Other man.Ind.	0	145985.6	14160.60
28 Construction	0	1631487.	0
29 Electricity	0	580041.2	0
30 Gas & water sup.	0	52530.36	0
31 Rly.tpt.service	30790	372704.7	0
32 Oth.tpt.service	38887	1204542.	0
33 St.& Warehousing	0	19498.3	0
34 Communication	0	130342.1	0
35 Oth.services	237952	5143011.	0
TOTAL	1045985		1045985

CHAPTER 5

RESULTS AND INTERPRETATION

RESULTS AND INTERPRETATIONS

We have now reached the final stages of our emperical study. Let us first spell out the results of the investment minimisation exercise. Later we will go over to the electricity use minimisation exercise.

I. RESULTS OF INVESTMENT MINIMISATION PROGRAMME

When our export potential increases by 25% the optimum exports of all sectors except food, beverages and tobacco(sector no.5) is carried up to the potential maximum. However, the optimum export of food, beverages and tobacco products not only fails to touch the potential level but is lower than the initial level too. When the export potential increases by 50%, the optimum exports of food, beverages and tobacco, wood and wood products, paper and other transport services fall to zero; optimum export of leather falls below the initial level. The optimum export of the rest of the sectors reach the potential maximum. This trend remains as our export potential broadens. Optimum exports of more and more sectors fall to zero with increasing exporting scope. We can see that in the case of 75% increase in export potential; the optimum exports of food, beverages and tobacco, iron ore and other minerals, crude petroleum and natural gas, jute, wood, paper, leather,rubber and plastics, iron and steel, other metal products, railway transport service

all fall to zero and export of agriculture does not reach it potential maximum. As export potential further bloats up and goes up by 100%, the results are nearly the same as in the earlier case. This time the optimum export of agriculture falls even below the initial level.

We may recall the our objective was to minimise capital formation requirements such that trade is at least balanced in a situation of limited export potential and given final demand. The results obtained point out to the fact that the direct and indirect capital requirements necessary for sustaining one unit increase in the final demand (DIK) of those goods for which optimum exports are either zero or less than the potential level(the number of such goods increases as the frontier of export potential broadens) are relatively higher as compared to other goods. The surprising fact is that quite a few of these goods has been our traditional export items in which seemingly we had a historic comparative advantage. This means that the ICORs of these sectors and the pattern of inter industrial linkages make these sectors capital intensive althoughit may not appear so if we look just at their direct capital coefficients. Let us first ferret out the direct and indirect capital formation requirements necessary for sustaining one unit increas in final demand (DIK) and analyse our results keeping this in view.

II. A THEORITICAL DIGRESSION

From our chapter on model we know that to produce X vector of output the total capital stock needed is KVX . And the total capital formation for an increase in output of (X - X) is KV(X-$\bar{X}$),where $\bar{X}$ is the initial vector of gross output of different sectors

Now, $KVX = KV(I-A+W)^{-1}(\bar{F}+E)$

Let $(I-A+W)^{-1}_{(n\times n)} = \begin{bmatrix} R11 & \cdots & R1n \\ & & \\ Rn1 & \cdots & Rnn \end{bmatrix}$

and $(\bar{F}+E) = Q = \begin{bmatrix} Q1 \\ \\ Qn \end{bmatrix}$

$$So\ KVX = KV \begin{bmatrix} R11 & R12 & \cdots & R1n \\ R21 & R22 & \cdots & R2n \\ \cdot & \cdot & \cdots & \cdot \\ Rn1 & Rn2 & \cdots & Rnn \end{bmatrix} \begin{bmatrix} Q1 \\ \cdot \\ \cdot \\ \cdot \\ Qn \end{bmatrix}$$

$$= KV \begin{bmatrix} R11Q1+R12Q2+\cdots+R1nQn \\ R21Q1+R22Q2+\cdots+R2nQn \\ \cdot \\ Rn1Q1+Rn2Q2+\cdots+RnnQn \end{bmatrix}$$

We know that KV = (K1V1,K2V2.....KnVn)

Therefore KVX = K1V1 (R11Q1+R12Q2+.....+R1nQn)
+K2V2 (R21Q1+R22Q2+ . . . +R2nQn)
+ . . . . . .
+KnVn(Rn1Q1+Rn2Q2+.....+RnnQn)

With a little manipulation KVX can be written as equal to

$$(K1V1R11+K2V2R21+\ldots\ldots\ldots\ldots+KnVnRn1)Q1$$
$$+(K1V1R12+K2V2R22+\ldots\ldots\ldots\ldots+KnVnRn2)Q2$$
$$+\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$+(K1V1R1n+K2V2R2n+\ldots\ldots\ldots\ldots+KnVnRnn)Qn$$

The above expression is the total capital stock required to satisfy a final demand vector Q. Let us denote this total capital stock by B.

Then $B = (\Sigma KiViRli)Q1 + (\Sigma KiViR2i)Q2 + \ldots(\Sigma KiViRni)Q$

Therefore $\frac{\partial B}{\partial Q_j} = \Sigma KiViRji \quad (\forall j = 1, 2 \ldots 35)$

(for all j=1,2...n)

Now $\frac{\partial B}{\partial Q_j}$ = Total increament in capital stock necessary to sustain one unit increament in final demand. Obviously this is our DIK.

The vector of DIK is then $(\partial B/\partial Q1, \partial B/\partial Q2, \ldots \partial B/\partial Qn$

It can be checked that this is same as $KV\,(I-A+W)^{-1}$ This vector is reproduced in table -5A.

III. POSSIBLE INTERPRETATIONS

The theoritical digression provided us with the necessary tool to interprete our results. It can be seen that the DIK is highest in case of electricity which is not an exportable item. The sector with the next highest DIK is food, beverages and tobacco. When the export potential increases by 25%, the optimum export of this sector falls below initial level proving that in order to save capital we have to cut down the export of this item (domestic demand being same as before). Sector 32 (other transport services) has the next highest DIK. As the export potential broadens and

TABLE - 5A

DIK

	Sectors	KV(I-A+W)^-1
1	Agriculture	4.317148
2	Coal & lig.	4.278422
3	Cr.pet & N.gas	2.567710
4	Iron & oth.Min.	1.436464
5	Food,bev.& tob.P	5.323556
6	Cotton text.	3.644891
7	Wool,silk etc.	3.166961
8	Jute,hemp& mesta	4.321925
9	Txt.pd.inc.w.app.	2.563279
10	Wood & wood pd.	4.933664
11	Paper & paper pd.	4.654909
12	Leather & its pd.	4.734705
13	Rubber & plastic	3.098703
14	Petroleum prod.	1.980368
15	Coal tar pd.	1.755990
16	Heavy chemicals	3.164527
17	Fertiliser	1.953835
18	Paints,pest.etc.	3.400006
19	Cement	2.834687
20	Oth.non m.min.pd.	3.599758
21	Iron & Steel	3.513019
22	Other metals	3.483196
23	Met.p.exc.mch.&tpt	3.330604
24	Non el.machinery	2.483321
25	Elec.machinery	2.345890
26	Transport eqpt.	2.966384
27	Other man.Ind.	2.495762
28	Construction	2.017620
29	Electricity	7.157967
30	Gas & water sup.	3.956829
31	Rly.tpt.service	4.320397
32	Oth.tpt.service	5.228675
33	St.& Warehousing	1.938919
34	Communication	5.995189
35	Oth.services	2.039352

goes up by 50%, export of this sector falls to zero alongwith food, beverages and tobacco. Exports of wood and paper also become zero. Their DIK is also relatively high and next only to food, beverages and tobacco and other transport services. This trend continues with increasing export potentials and optimum exports of those commodities having higher DIK either falls to zero or does not reach their potential maximum. One can see that with broadening of export frontiers the optimum exports of a larger number of goods fall to zero. This is natural because as the scope for exports rises there is more scope in specilisation that is one can concentrate on export of those commodities whose DIK is relatively low and cut down the exports of goods having relatively high DIK.

We can see that many of our traditional export products (like food, beverages and tobacco which includes tea, jute,leather etc.,) have relatively higher DIKs. Our optimum solution suggest that we should cut down the export of these items to save scarce capital resources. However there is a hitch in our argument. Till now we have not looked into the employment aspect. Many of our traditional export items are labour intensive. Had we introduced an employment target, then we could have got results in tune with our traditional experience. But this defending of exports of traditional items on the

employment front can also be countered. Our results show that we can save capital resources by bringing down exports of these items and concentrating on other sectors. The capital which is thereby freed can be channeled into other sector to generate more output and employment. Let us look into this aspect a little deeper.

We will now look into the optimum additional capital formation required to achieved our target. The table-5.1 enlists the capital formation requirements.

In the initial year (i.e. 1985-85)the gross capital formation was Rs.5324000 lakhs. When the export potential rises by 25%, to sustain the additional export we need an additional capital formation of Rs. 535101 lakhs over and above that capital stock requirements in the initial period. Now the moot point is whether we can garner such amount of additional funds to achieve our target of trade balance at minimum capital cost. However, it must be noted that as our export potential bloats up the required additional capital formation goes down and it even becomes negative as export potential rises by 75% and above. What everything boils down to is that provided our scope for exports rise sufficiently we can achieve our target with very little additional capital formation. But all this is possible in our ideal hypothetical framework. In hard reality there is great problem in shifting capital (especially fixed) from one

TABLE - 5.1

Results Of
Investment minimisation exercise

When Export Potential Increases by	Addl.Capital Formation Requirements i.e.KV(X-X)
25%	535101
50%	174283.0
75%	-6941.76
100%	-169251.

sector to anotherin order to change the product mix to our advantage. However, our results show the general direction in which we should concentrate our productive ventures.

IV. RESULTS OF ELECTRICITY USE MINIMISATION EXERCISE

We will now turn to our second linear programming problem and spell out the results briefly.

When export potential jumps by 25%, the optimum exports of jute, fetilizer, iron and steel and other metals fall to zero and the export of cotton textiles falls below the initial level. Exports of all other sectors reach the potential maximum. When our export potential further swells up and rises by 50%, we find that optimum exports of cotton textile, jute, heavy chemicals, fertilizers, iron and steel, and other metals all fall to zero. And export of food, beverages and tobacco fails to reach its potential maximum. As before in investment minimisation exercise this trend continues. As our scope for export goes up in all the sectors, we can specialise in more productive sectors and bring down exports of less productive ones.

V. INTERPRETATION OF THE ABOVE RESULTS

We may again recall that this time our objective was to minimise electricity costs such that trade is at least balanced in a situation of limited export potential and given final domestic demand. As before

the results again point out to the fact that the direct and indirect electricity inputs necessary to sustain one unit increase in final demand (DIE) of those goods for which the optimum exports of either zero or less than the potential maximum or relatively higher as compared to other goods. Again the surprising fact is that some of these goods are our traditional export items. Before pondering over this fact let us find out the DIE for each sector.

Drawing analogy from the calculation of DIK we can say that the vector of DIE is $e(I-A+W)^{-1}$, where the notations have the same meaning as described in the chapter on model. The vector DIE is given in table-5B.

From the table it is apparent that the DIE is highest in the sectors-gas and water supply, electricity, and cement(none of which are our exportables). Among the exportables DIE is relatively high in other metal products, followed by jute, cotton textiles, fertilizers, iron and steel and food, beverages and tobacco.

When we resort to electricity minimisation programme we can expect a cut down in the optimum exports of these sectors. Predictably results toe this line. Among the sectors having relatively high DIE, there are ma ny of our traditional export items like jute,cotton and food, beverages and tobacco (which includes tea). As before in the investment

TABLE - 5B

	Sectors	DIE e(I-A+W)^-1
1	Agriculture	0.027724
2	Coal & lig.	0.069554
3	Cr.pet & N.gas	0.002108
4	Iron & oth.Min.	0.012403
5	Food,bev.& tob.P	0.063907
6	Cotton text.	0.074292
7	Wool,silk etc.	0.049744
8	Jute,hemp& mesta	0.079026
9	Txt.pd.inc.w.app.	0.033921
10	Wood & wood pd.	0.039384
11	Paper & paper pd.	0.059598
12	Leather & its pd.	0.046073
13	Rubber & plastic	0.055849
14	Petroleum prod.	0.010668
15	Coal tar pd.	0.037304
16	Heavy chemicals	0.090111
17	Fertiliser	0.075613
18	Paints,pest.etc.	0.050672
19	Cement	0.141549
20	Oth.non m.min.pd.	0.024320
21	Iron & Steel	0.063595
22	Other metals	0.107299
23	Met.p.exc.mch.&tpt	0.049721
24	Non el.machinery	0.034698
25	Elec.machinery	0.038223
26	Transport eqpt.	0.038238
27	Other man.Ind.	0.052271
28	Construction	0.040335
29	Electricity	0.302400
30	Gas & water sup.	0.353250
31	Rly.tpt.service	0.045108
32	Oth.tpt.service	0.013721
33	St.& Warehousing	0.080069
34	Communication	0.008508
35	Oth.services	0.019556

minimisation exercise the results surprisingly point out that tradtionally we have been indulging in erroneous exports. Probably an introduction of employemnt target into our exercise can alter the results and bring it in tune with the traditional pattern.

VI. AN OBSERVATION REGARDING GEMS AND JEWELLERIES

An interesting point is to be noted here. Recently, gems and jewelleries has been India's most buoyant export item. Gems and jewellery comes under the sector : Other manufacturing industries. Here it must be stated that lack of adequate information precludes us from knowing the share of gems and jewelleries in the sector : other manufacturing industries. Hence, the observations and interpretations that follow is really notional. The results of our linear programming problem show that when export potential rises by 25% and 50% export from the sector is optimally carries upto the potential maximum. But when the export potential goes up by 75% in all sectors, optimum export from this sector falls short of potential level. And when our export potential bloats up by 100% the optimum export of this specific sector is zero. This points out to the fact that when the scope for exports in all sectors rise greatly (say 100%) then, gems and jewelleries does not seem to be effective in saving electricity costs. But from a realistic view point

since our export potential is unlikely to rise by that much there is certainly great advantage in increasing the export of gems and jewelleries. Moreover, this sector is also capital saving which is corroborated by the fact that in our investment minimisation programme the optimum export from this sector has always been at the potential maximum.

VII. RESULTS OF ONE MORE EXERCISE WITH NO INCREASE IN EXPORT POTENTIAL

At this juncture we may ask what the ideal export-product mix will be if we carry out the investment /electricity use minimisation programme in a situation where there is no increase in the export potential (meaning thereby exports from each sector can be no more done the exports from those sectors in the initial year),and where we want the trade deficit to be no larger than the deficit in the initial period. Here it may be noted that a balanced trade is obviously not feasible in this case with no increase in export potential.

Such a linear programming exercise in case of investment minimisation gives the following results. (Table-I -45) The optimum exports of all except food, beverages and tobacco are same as in the initial year. The optimum export of food beverages and tobacco are much lower (in fact nearly half) of the initial export. This further proves that since the DIK is highest in this

TABLE - 4L

Final Results of
Investment minimisation exercise
With no increase in export potential
And trade deficit no larger than
In the initial period

(Rs. lakhs)

Sectors	E	X	M
1 Agriculture	84994	5995775.	43592.73
2 Coal & lig.	121	2133273.	1901.431
3 Cr.pet & N.gas	72665	172021.4	130972.2
4 Iron & oth.Min.	6957	24611.00	53430.23
5 Food,bev.& tob.P	64944	1170979.	84652.25
6 Cotton text.	25964	677166.6	33.62324
7 Wool,silk etc.	3017	314310.4	1492.382
8 Jute,hemp& mesta	5012	71220.03	11.39424
9 Txt.pd.inc.w.app.	38441	252465.1	4291.115
10 Wood & wood pd.	1281	237097.2	331.7598
11 Paper & paper pd.	1486	270949.6	22036.79
12 Leather & its pd.	37510	107418.3	266.7999
13 Rubber & plastic	4791	218105.7	1661.096
14 Petroleum prod.	18526	276837.7	123705.9
15 Coal tar pd.	0	54203.00	0
16 Heavy chemicals	8463	206911.6	32030.18
17 Fertiliser	2.8	130193.0	75124.19
18 Paints,pest.etc.	41702	1077904.	67252.06
19 Cement	0	57414.40	2196.715
20 Oth.non m.min.pd.	4597	301530.6	3657.528
21 Iron & Steel	8234	576905.8	83679.31
22 Other metals	826	188679.7	28244.44
23 Met.p.exc.mch.&tpt	43293	253772.3	3636.799
24 Non el.machinery	27620	701972.0	151042.1
25 Elec.machinery	12291	367232.5	46929.26
26 Transport eqpt.	20178	591834.5	27615.08
27 Other man.Ind.	121449	258909.1	25386.90
28 Construction	0	1628829.	0
29 Electricity	0	583062.4	0
30 Gas & water sup.	0	52574.05	0
31 Rly.tpt.service	15395	357054.9	0
32 Oth.tpt.service	19443	1177889.	0
33 St.& Warehousing	0	19053.09	0
34 Communication	0	130593.2	0
	118976	5024664.	0
Total	808178.8		1015094.

TABLE - 4K

Final Results of
Electricity minimisation exercise
With no increase in export potential
And trade deficit no larger than
In the initial period

(Rs. lakhs)

Sectors	E	X	M
1 Agriculture	84994	6014129.	43726.18
2 Coal & lig.	121	2151739.	1917.890
3 Cr.pet & N.gas	72665	171969.6	130932.7
4 Iron & oth.Min.	6957	24483.86	53154.20
5 Food,bev.& tob.P	114626	1222633.	88386.39
6 Cotton text.	0	644708.6	32.01161
7 Wool,silk etc.	3017	313971.6	1490.774
8 Jute,hemp& mesta	0	66253.34	10.59964
9 Txt.pd.inc.w.app.	38441	252399.2	4289.995
10 Wood & wood pd.	1281	237439.5	332.2388
11 Paper & paper pd.	1486	271209.0	22057.89
12 Leather & its pd.	37510	107389.8	266.7292
13 Rubber & plastic	4791	218198.8	1661.805
14 Petroleum prod.	10526	276855.6	123713.9
15 Coal tar pd.	0	53986.69	0
16 Heavy chemicals	0	198230.7	30686.37
17 Fertiliser	0	130521.2	75313.60
18 Paints,pest.etc.	41702	1077847.	67248.49
19 Cement	0	57414.21	2196.708
20 Oth.non m.min.pd.	4597	301654.1	3659.026
21 Iron & Steel	0	568143.3	82408.32
22 Other metals	0	107319.1	28040.77
23 Met.p.exc.mch.&tpt	43293	253725.0	3636.122
24 Non el.machinery	27620	703017.9	151267.1
25 Elec.machinery	12291	367211.4	46926.56
26 Transport eqpt.	20178	591905.5	27618.40
27 Other man.Ind.	121449	258819.8	25298.17
28 Construction	0	1628849.	0
29 Electricity	0	582537.3	0
30 Gas & water sup.	0	52487.85	0
31 Rly.tpt.service	15395	356991.9	0
32 Oth.tpt.service	19443	1178216.	0
33 St.& Warehousing	0	19854.24	0
34 Communication	0	130599.5	0
	118976	5024995.	0
Total	809359		1016273.

sector among exportables it is better to cut down the exports of this sector if we want to save capital resources.

In the case of electricity minimisation programme in a situation where there has been no improvement in the export potential and where trade deficits are no larger than that in the initial period; the results are as follows.[1] Optimum exports of cotton, jute, heavy chemicals, fertilizers, iron and steel, and other metals all fall to zero while that of food, beverages and tobacco fall below the initial level. As noted earlier this sectors have relatively high DIE as compared to other sectors. So any electricity saving exercise will try to bring down exports of these sectors.

These two exercises show that even in case of no improvement in export potential we can save capital and electricity by cutting down exports of many traditional items without any further increase in deficits.

1. Table- 4K

CHAPTER 6

SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

As we draw to a close of our study let us have a brief look at what we have done. We have tried to figure out the optimal export-product mix while trying to minimise the capital formation/electricity use requirements in reaching a target of balanced trade in a situation of limited export potential and given final domestic demand. As discussed in the first chapter our exercises are really important given that we are simultaneously facing a) a resource problem domestically and b) a foreign exchange problem; while political situation would not permit any reduction in final domestic demand. In the previous chapter we have discussed the results of our empirical exercises and the possible interpretations. What we have strangely noted is that some of our traditional export items are not effective in saving investment or electricity costs. So, ideally exports of these should be brought down to achieve our target. For example, food, beverages and tobacco, which includes tea have the highest DIK among our exports. Similarly, the DIE is very high in jute, cotton, etc., Apparently the traditional export bias in these commodities are a reason for our high capital and electricity costs.Here it may be said that both DIK and DIE were measured from observed capital formation and electricity use. The high measure of some of the DIKs and DIEs may be due to

obsolete technology, under utilisation of capacity and sheer inefficiency in input use. This seems to be especially true for some sectors like jute, cotton, etc., Perhaps modernisation efforts can bringdown capital\electricity costs per unit of output in these sectors and make them attractive exportables. However, our calculations based on an observed series show that these sectors are relatively inefficient, (at least realised performance wise) in recent years, and hence exports of these sectors should be cut down to reach our goal.

The question of whether our target of trade balance is feasible has to be tackled on two fronts. Firstly, this feasibility depends on expanding export frontier. Whether we have marketing and other mechanism to expand the export potential so that our target is achievable is a debatable point. We have hypothetically assumed that we can, but reality may not be that rosy. The second point which has to tackled is that whether we can acquire enough capital resources required for the additional capital formation and generate enough electricity to achieve our target. Our analysis on the additional capital requirements show that we definetly can garner such additional capital, simply because they are not much, especially when there is a large increase in our export potential(then we can carry on with very little or infact negative additional

capital formation). Regarding electricity generation capacity we can say that in the case of capital formation minimisation exercise, the required production of electricity in subsequent cases of expanding export potential is a little higher than the production of electricity in the initial period. Hence, one can say that this generation of electricity is achievable with modest efforts. And in the case of electricity minimisation exercise the required production of electricity falls with successive expanding export horizons. In fact, the required production of electricity comes below the initial level when export potential jumps by 75% and above.

All these show that our target, provided of course the assumed increase in export potential takes place, is feasible.

Next comes the question of practicability. Our optimal solution suggests to cut down export of many traditional items. But most of these items are labour intensive. A cut down on the export\production of these items means a pruning of the labour force. Whether this labour force can be absorbed in other sectors where capital has been channelled cannot be predicted with reasonable accuracy. It would have been more prudent on our part to introduce an employment target in our exercises. But lack of employment data of many sectors and limited scope of our study

precludes us from indulging in such exercises. We can say that in terms of social and political reaction it is very difficult to cut down employment in certain sectors when there is no guarantee that they will be absorbed in other sectors. Moreover, in reality there are great technical difficulties in diverting capital, especially fixed, from one sector to another because of the non-shiftability of its character. For example, one cannot just pull out machines from a jute mill and fit into a gems and jewellery work shop. Hence, unfortunately, there is a question mark on the practicability of our target.

Nevertheless our whole analysis points out to the direction in which our efforts and new additional capital formation should be channelled. As India grows up as an economy it should come over the traditional bias of certain sectors and venture out into less traditional but more fruitful areas. If however, the high capital or energy coefficients of some of the traditional exports sector are attributable to the inefficiency of the existing units of these industries and their out-moded state of technology, it may be possible and necessary to modernise them and restore their position among attractive export items.

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