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INDIA'S IMPORTS DURING THE LAST THREE DECADES : AN ECONOMETRIC STUDY*

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SUMMARY. The paper seeks to identify empirically the major determinants of India's imports during the period 1951-81. Estimated regression equations show that the aggregate import or the import of each of the three selected groups, namely, manufactured goods, machinery and transport equipment and cereals, could be satisfactorily explained by some or all of the variables reflecting pressures of domestic demand, efforts of import substitution, foreign exchange availability and the relative price of the group.

1. Introduction

The purpose of the present paper is to make an empirical study of the factors which have influenced India's imports during the period 1951–81. The importance of imports of various kinds of goods in a developing economy needs no special mention. The process of industrialization requires resources and since these are lacking in adequate amounts in developing economies, imports of materials and machines become all the more necessary, at least in the initial stage. But apart from the needs arising out of the process of industrialization, other factors like the capacity to import, import substitution policies, various other import control measures etc. also influence imports. The present paper attempts to identify some of these factors empirically.

The plan of the paper is as follows. Section 2 makes a review of the factors which have been emphasized in the literature to explain imports of various categories of goods, particularly in the Indian context. Section 3 reports the various regression equations estimated in the present study to explain India's imports—both aggregate imports as well as imports of three major groups, viz., machinery and transport equipment, manufactured goods and cereals. Section 4 makes concluding observations. The Appendix presents some further regression equations estimated and the data used in the study, along with the required notes on the data.

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2. Explanatory Variables in Import Functions

A number of variables has been conceived in the literature to explain the import of an item or a group of items. Such variables have also been considered in various empirical studies on Indian imports[1]. These variables include (i) a variable representing the pressure of domestic demand, like national income, index of industrial production etc., (ii) a variable capturing the effects of possible import substitutions, like the amount of domestic production of the group of items imported, (iii) the relative price of a group (i.e., its domestic price *vis-a-vis* its import price), and (iv) variables reflecting effects of foreign exchange scarcities and/or import restrictions.

The relevance of these variables in explaining India's imports may be appreciated best if one takes a look into India's import policies. Imports in India had always been licensed and over the years the licensing policies had varied in degrees of restrictiveness. To quote Bhagwati and Srinivasan (1975, p. 18), import licensing 'was rather light during the First Plan, intensively severe during the Second, somewhat less so during the Third (except in the last two years) and perhaps equally so since then'. Further, licensing procedures had also been very much involved. Thus, imports of each category were to be permitted only if they were "essential" as inputs for production and "not available indigenously", both features being required to be certified by some designated authorities (Bhagwati and Srinivasan, 1975, pp. 36–37). Such import restrictions continued in one form or another at least upto the mid-seventies. It was only during the Fifth Plan period that imports tended to be allowed most liberally (Upadhyaya, 1980, p. 180).

These two features—chronic foreign exchange scarcities and continued import control policies—had important implications as far as the determinants of India's imports were concerned. First of all, a major emphasis of these policies was on import substitution. Import substitution had indeed been quite impressive in India. Examining the type of import substitution during the period 1951–63, Desai (1970, pp. 33–37) observed that over the First Plan period import substitution was done largely in consumer goods, but later substitution in investment goods tended to dominate[2]. It thus appears that

[1] A number of empirical studies have so far been made on India's imports. Some of these studies are quite old, analysing import behaviour before or immediately after India's Independence (Murty and Sastry, 1951; Banerjee, 1959; Dutta, 1964, 1965). On the other hand, some studies on imports are embedded in complete macroeconometric models developed by individual authors, (Narasimham, 1956; Agarwala, 1970; Marwah, 1970, 1973; Ahluwalia, 1979; Pani, 1977). Some of the studies in this group are quite aggregative in nature, considering either total import or imports of a few selected groups of items. Studies like Sharma (1975), Patel (1977, 1980) and Murty and Nambiar (1978) are exclusively on import functions.

the domestic production of both consumer and investment goods would be important in explaining the imports of these two types of goods, respectively.

Secondly, the relative price of an item/a group of items (i.e., its domestic price *vis-a-vis* its import price) assumed a significance of a different nature in influencing its imports. True, import restriction policies interferred with the inflow of so-called competitive imports. Some earlier econometric studies also tended to argue that India's imports were relatively insensitive to variations in relative prices, owing either to the absence of domestic production of similar items (e.g., Narasimham, 1956; Agarwala, 1970) or to the presence of trade restrictions (e.g., Dutta, 1965). However, later studies (e.g., Marwah, 1972; Sharma, 1974; Pani, 1977; Patel, 1977, 1980; Murty and Nambiar, 1978) emphasized the role of relative prices in affecting imports of selected groups. The underlying mechanism is spelt out clearly in Patel (1970, 1977). The scarcity conditions and market imperfections created by various import control measures helped to keep the domestic price of an item much above its landed c.i.f. price and to the extent this price differential was not covered in full by tariffs, considerable premium element existed in the domestic price. Thus the larger the price differential, the higher would be the premium rates which, in turn, would induce industrialists and traders to manage for a higher amount of imports. Over time, the premium or scarcities in specific sectors might influence administrations to allot higher imports.

Thus imports had been influenced not merely by domestic demand and supply conditions, but probably also by import premium rates which were caused by scarcity conditions and various import controls and which varied in accordance with the variation in the relative price structure[3].

Thirdly, the behaviour of India's imports has been considerably conditioned by the flows of payments received from abroad. One category in these flows merits special attention, viz., inflows of foreign aid received over the years. This category has been found to be very important, particularly in the case of import of capital goods, since much of the external assistance

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[2] For a discussion on import substitution in some important areas upto the seventies, see Upadhyaya (1980, pp. 247-60).

[3] Official import price indices available in India are presumably based on c.i.f. values of imports. We have used these official indices. It would, of course, have been better to use a relative price variable in which import prices were inclusive of tariffs. It may, however, be pointed out that in India tariff policy had been relatively unimportant except for a beginning in this direction in 1965 (Bhagwati and Srinivasan, 1975, p. 36.) and that variations in tariff rates had been infrequent (Patel, 1977, p. 147).

in this case has been in the form of tied loans. From the mid-fifties to the later part of the seventies, foreign aid had helped to finance 30 to 60 per cent of India's total imports. The percentage was very high (more than 50) in the second half of the sixties (Upadhyaya, 1980, p. 253). However, over time India's debt servicing payments by way of interest, service charges and amortisation had been growing. These payments which were relatively small in the first two plan periods accounted for about 10 per cent of foreign aid received during the Third Plan period. This percentage rose subsequently, being 60 to 78 in the early years of the seventies (Upadhyaya, 1980, 264–66). Thus the relevant total to be considered as an explanatory variable in import functions is not the gross foreign aid, but what remains after making debt service payments, i.e., the *net* foreign aid.

Finally, over time variations in the stock of foreign exchange reserves were one of the factors influencing the intensity and coverage of import control measures. India had experienced almost an uninterrupted decline in her foreign exchange reserves from the mid-fifties to the mid-sixties when it stood at only Rs. 116 crores. Despite some improvement in this regard in the late sixties, the situation was never very comfortable at least upto the mid-seventies, (see Table A.6 in the Appendix).

The purpose of the foregoing discussion was to point out various factors which might have influenced the behaviour of India's imports. The empirical exercises reported in the next section try to measure the effects of these variables or their proxies on the various import functions estimated.

3. Empirical results

We shall try to explain not only aggregate imports, but imports of three groups as well, viz., machinery and transport equipment, manufactured goods and cereals. The variables to be used in the study and abbreviations used for them are given below :

Dependent variables :

A : aggregate imports,

MG : imports of manufactured goods (i.e., section 6 in the RITC classification)

MT : imports of machinery and transport equipment (i.e., section 7 in the RITC classification),

CR : import of cereals,

where A, MG and MT are values (Rs. crores) at constant prices (i.e., at 1961-62 import prices of respective groups) while CR is measured in million tonnes.

Explanatory variables : *Demand and price variables* :

NNP : net national product (Rs. crores) at 1970-71 prices,

X : index of industrial production—all commodity (base 1960 = 100),

N : population (millions),

DP_i : domestic price index of the i-th group of items,

IP_i : import price index of the i-th group,

RP_i : relative price index of the i-th group (i.e., DP_i/IP_i),

where $i = a$, mg, ml or cr for the four categories of imports respectively and the base period of these price indices is 1961-62 = 100.

Foreign aid and foreign exchange variables :

NFA : net foreign aid (Rs. crores) at 1961-62 (all commodity import) prices,

PL : PL 480 imports (Rs. crores) at 1961-62 (cereals import) prices,

$NFAEX$: net foreign aid excluding PL 480 imports (Rs. crores) at 1961-62 (all commodity import) prices,

FER : foreign exchange reserves (Rs. crores) at the beginning of a year at the all-commodity import price of the previous year,

FER^{av} : three-year average value of FER.

Import substitution variables :

Q : total production of cereals (million tonnes),

X_{ml} : index of industrial production of machinery and transport equipment,

X_{bm} : index of industrial production of basic metals,

X_{bnm} : index of industrial production of basic metals and non-metallic minerals,

X_{smg} : index of industrial production of selected manufactured goods.

All these indices are expressed with base 1960 = 100.

The sample size for A is 30 with financial year observations from 1951-52 to 1980-81. For each of MG and MT we have considered financial year observations from 1952-53 to 1980-81. For CR we have taken calendar year observations from 1951 to 1980. All the regression equations reported in the study are estimated by the ordinary least squares method. We now turn to a discussion of these equations.

3.1. *Import of machinery and transport equipment.* In the Revised International Trade Classification (RITC) section 7, called the machinery and transport equipment, consists of machinery other than electrical machinery, electrical machinery etc. and transport equipment. These are all capital goods and we try to explain the 'real' import of these goods (MT) which is derived by deflating imports of section 7 at current prices by the import price index of this section (IP_{mt}). Both linear and log-linear regression equations have yielded good results. However, linear equations have been found to be better, particularly in respect of values of D.W. statistic. Therefore, linear equations are reported in the text in Table 1. The log-linear counterparts of these equations as well as some additional linear equations are given in Tables A.1 and A.1a in the Appendix.

Since the demand for capital goods is generated throughout the economy and particularly in the industrial sector, net national product at constant prices (NNP), or more appropriately the index of (all commodity) industrial production (X), is expected to be the relevant demand variable to explain MT. Initially, two other explanatory variables are also considered—the relative price of machinery and transport equipment (RP_{mt}) and net foreign aid at constant prices (NFA). The result involving three regressors[4], viz., X, NFA and RP_{mt}, is shown in eq. (1). All coefficients are seen to be statistically significant with expected signs and value of $\bar{R}^2$ is also quite high (0·77). The only unsatisfactory feature is, however, the low value of the D.W. statistic.

We next try to examine whether the import substitution in capital goods had exerted any appreciable impact on the import of such goods. To examine this point two alternative series of domestic production of machinery and transport equipment have been considered, namely the current series of this index (X_{mt}) and a one year lagged series[5] of this index ($(X_{mt})_{-1}$). The coefficient of X_{mt} has never come out to be significant in any regression equation

[4] The index of industrial production was usually available on a calendar year basis, while imports have been considered here on a financial year basis. This implies that X is being assumed to affect MT after a lag of three months. In other words, index of industrial production in say calendar year 1952 influences MT in the financial year 1952-53. This could perhaps be justified on the ground that the investment demand is expected to be related to the future level of production and that the latter may be predicted on the basis of the past values. Of course, no such lag is required to be assumed for NNP, the alternative demand variable considered later, which is recorded over financial years.

[5] For the current and one year lagged series we have used the series of this index lagged by three months and fifteen months, respectively. In other words, if $(X_{mt})_{-1}$ is used as a regressor, this means that the domestic production in say 1951 is being taken to influence imports in 1952-53.

TABLE 1 : LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : MT

eq. no.	coefficients of explanatory variables									$\bar{R}^2$	D.W.
	constant term	NNP	X	BP_{mt}	$(X_{mt})_{-1}$	DP_{mt}	IP_{mt}	FER	NFA		
1	−116.200 (−2.400)		0.538 (4.386)	3.149 (5.620)					0.214 (3.710)	0.770	0.80
2	−205.122 (−3.410)		2.049 (3.710)	2.742 (4.890)	−1.424 (−2.227)				0.286 (4.561)	0.801	0.98
3	−288.841 (−4.549)		2.737 (2.777)	3.304 (5.984)	−1.376 (−2.383)			0.086 (2.543)	0.378 (5.629)	0.838	1.49
4	−129.583 (−2.072)		4.412 (4.214)		−2.846 (−4.231)	1.908 (4.547)	−0.738 (−4.152)		0.458 (6.300)	0.800	1.46
5	−144.737 (−2.304)		4.354 (4.209)		−2.722 (−4.057)	1.864 (4.457)	−0.864 (−4.290)	0.054 (1.274)	0.484 (6.418)	0.806	1.55
6	−293.888 (−3.269)	0.013 (2.602)		2.742 (4.830)	−0.689 (−1.768)				0.203 (4.493)	0.797	1.11
7	−347.659 (−4.022)	0.011 (2.347)		3.295 (5.647)	−0.612 (−1.710)			0.079 (2.205)	0.369 (5.299)	0.825	1.51
8	−173.724 (−1.648)	0.016 (2.603)			−1.039 (−2.251)	1.366 (2.040)	−0.844 (−3.528)	0.058 (1.182)	0.438 (5.006)	0.732	1.23

Note : The bracketed figure below a coefficient is its t-ratio. $\bar{R}^2$ is the coefficient of determination adjusted for degrees of freedom. D.W. is the Durbin-Watson statistic. The same procedure is followed for all the tables in the text and Appendix which show estimated regression equations.

and has also been found to have the wrong sign (positive) in most cases[6]. On the other hand, the coefficient of $(X_{mt})_{-1}$ is found to be significant with the right sign[7] (eq. (2)). It may further be noted that compared to eq. (1), eq. (2) shows some improvement in values of both $\bar{R}^2$ and D.W. statistic and all coefficients are significant with right signs.

We next try to examine whether and to what extent foreign exchange scarcities had affected India's imports of capital goods. We have used two alternative proxy variables for this[8]—FER and FER^{ov}. Both variables have performed well. However, FER has yielded slightly better results in most cases. Eq. (3) shows that the coefficient of FER is statistically significant with right sign (positive) while other coefficients also remain significant; the value of $\bar{R}^2$ is now 0·84 and the value of D.W. statistic has improved a lot[9].

We have carried out two other exercises—(a) the one replacing RP_{mt} by its two constituent price indices, namely DP_{mt} and IP_{mt}, and (b) the other replacing X by NNP as an indicator of demand. To discuss (a) first, when two individual prices are introduced separately, results remain more or less the same, as can be seen from eqs. (4) and (5). The coefficients of DP_{mt} and IP_{mt} come out to be significant with expected signs[10], but coefficients of FER and $(X_{mt})_{-1}$ turn out to be non-significant in some cases. There is also some fall in $\bar{R}^2$ in most cases. Finally, equations with NNP (in place of X) as a regressor have yielded, in general, worse results. In all cases, the values of $\bar{R}^2$ are lower and in some cases the coefficient of $(X_{mt})_{-1}$ is seen to be non-significant. (eqs. (6)–(8)).

Thus the equation which is to be chosen to explain MT is eq. (3). This being a linear equation, the elasticities of MT with respect to various explanatory variables may be computed at the sample means of these variables.

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[6] Some such regression results are given in Table A.1a in the Appendix ; see, in particular, eqs. (1) – (2).

[7] That the domestic production of machinery and transport equipment might influence imports of such goods only after some lag is what is to be expected, since it takes time to install and use machines, even after their production at home.

[8] See Section A.2 of the Appendix for definition and construction of the two series.

[9] Some equations with FER^{ov} as one regressor are given in Table A.1a.

[10] One interesting result in all log-linear equations is that the estimated coefficient of RP_{mt} is very close to those of two individual prices (Table A.1).

The estimated elasticities with respect to the five regressors X, RP_{mt}, $(X_{mt})_{-1}$, FER and NFA are 1·55, 0·97, —0·96, 0·14 and 0·34, respectively[11].

3.2. *Import of manufactured goods.* This group includes all the items covered in the RITC section 6, called 'manufactured goods classified chiefly by materials'. Items included in this section are leather and leather manufactures, rubber manufactures, wood and cork manufatures, paper and paper boards etc., textile yarn and fabrics etc., non-metallic mineral manufactures, iron and steel, non-ferrous metals and other manufactures of metals. Imports of some of these items were small in magnitude during the period under study. Further, some of these items might be called capital goods. However, a large part consists of consumer goods. We here attempt to explain India's import of this group of items at constant prices (MG) which is obtained by deflating imports under section 6 at current prices by the import price index of this section (IP_{mg}). Results of log-linear regression equations have been found to be worse than those of their respective linear counterparts, particularly from the point of view of values of $\bar{R}^2$ and D.W. statistic. Therefore, linear regression equations are reported in the text in Table 2. The log-linear counterparts of these equations as well as some more linear equations are given in Tables A.2 and A.2a in the Appendix.

Eqs. (1) and (2) involving two regressors, namely NNP and RP (the relative price of the group) show that both coefficients are significant with right signs. In order to examine the effect of import substitution we have considered three alternative indices of domestic production—(a) production of some selected manufactured goods, (b) production of basic metal and non-metallic mineral industries and (c) production of basic metal industries[12]. For each index we have tried two alternative series represented by its current value and a one-year lagged value[13]. For each index the current series has

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[11] These elasticities are seen to differ slightly from the estimated values of corresponding coefficients in the log-linear version (eq. (3) of Table A.1). The elasticity figure for the relative price is, however, close to that estimated by Patel (1977, p. 143). It may also be pointed out that our result in respect of NFA contradicts that of Pani (1977, pp. 132-33) who asserted that imports of capital goods were relatively insensitive to the net foreign aid available.

[12] As explained in Section A.2 in the Appendix, the three groups differ only in respect of coverage of items, group (a) being the largest set inclusive of groups (b) and (c). Items included in group (c) are iron and steel basic, non-ferrous basic metal, copper, aluminium and brass manufacturing etc.

[13] Since these indices are available by calendar year while MG is considered by financial year, by the current series and one year lagged series of an index we mean the values of this index lagged by three months and fifteen months respectively.

TABLE 2: LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE: MG

eq. no.	coefficients of explanatory variables								$\bar{R}^2$	D.W.
	constant term	NNP	RP_{mg}	X_{bm}	DP_{mg}	IP_{mg}	FER	NPA		
1	−13.252 (−0.234)	0.0074 (4.123)							0.364	0.47
2	−300.146 (−3.131)	0.0082 (5.374)	3.130 (3.461)						0.547	0.40
3	−600.969 (−6.638)	0.0272 (7.004)	3.897 (5.852)	−1.989 (−5.086)					0.768	1.22
4	−576.515 (−8.396)	0.0190 (5.480)	4.431 (8.560)	−1.261 (−3.730)			0.122 (4.440)		0.868	1.37
5	−604.531 (−9.519)	0.0211 (6.455)	3.934 (7.674)	−1.564 (−4.718)			0.159 (5.440)	0.160 (2.449)	0.890	1.99
6	−31.672 (−0.381)	0.0077 (1.257)		−0.892 (−2.408)	3.002 (6.551)	−1.586 (−7.972)			0.851	0.84
7	−62.761 (−0.774)	0.0088 (1.495)		−0.720 (−1.975)	2.657 (5.600)	−1.595 (−8.413)	0.057 (1.856)		0.864	0.73
8	−138.770 (−1.692)	0.0116 (2.069)		−1.057 (−2.871)	2.394 (5.289)	−1.418 (−7.392)	0.099 (2.909)	0.152 (2.249)	0.885	1.01

performed much better than its lagged series[14]. We shall report regression equations involving current series of these indices which will be denoted by X_{sug}, X_{bam} and X_{bm} for the three indices mentioned in (a), (b) and (c) above, respectively. Among these three indices best results have been obtained by using X_{bm} and we report only these equations in the text[15]. With X_{bm} as a third regressor, eq. (3) shows considerable improvements in values of both $\bar{R}^2$ and D.W. statistic (compared to those in eq. (2)) and all coefficients are significant with right signs.[16]

We next try to measure the possible effects of foreign exchange scarcities and not foreign aid on *MG*. Eqs. (4) and (5) consider as regressors *NNP*, RP_{mg}, X_{bm} and either only *FER* or both *FER* and *NFA*; not only all coefficients are significant with expected signs, but considerable improvements are observed in values of $\bar{R}^2$ and D.W. statistic[17].

One more observation is to be added. Attempts to estimate the separate effects of two prices have not given improved results (eqs. (6)–(8)). Although these equations have satisfactory $\bar{R}^2$ values and coefficients of DP_{mg} and IP_{mg} are significant with expected signs, coefficients of some other regressors (like *NNP* or *FER*) in some of these equations are seen to be non-significant. What is worse, the values of D.W. statistic are very low.

Thus *MG* may be explained best by the regression eq. (5). The values of elasticities of *MG* with respect to five regressors viz., *NNP*, RP_{mg}, X_{bm}, *FER* and *NFA*, computed at the sample means of these variables, are 3.03, 1.56, −1.25, 0.35 and 0.19, respectively[18].

3.3. *Import of cereals.* We start with a few general observations. First, log-linear regression equations have been found to be very poor compared to their linear counterparts and in many cases coefficients of regressors have assumed wrong signs. Secondly, coefficients of price variables—domestic

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[14] This means that unlike in the case of *MT*, any growth in the domestic production of manufactured goods has taken a much shorter time lag to exert its influence on the import of such goods.

[15] The other two indices have also yielded satisfactory results; the performance of X_{bam} is in fact very close to that of X_{bm}. Linear regression equations with either X_{sug} or X_{bam} as one regressor are given in Table A.2a.

[16] Eqs. (2) and (1) of Table A.2a show that coefficients of each of two alternative production indices X_{sug} and X_{bam} has expected sign (negative) and is also significant.

[17] Regression equations (not reported) using FER^{ov}, instead of *FER*, as an indicator of foreign exchange scarcities also yielded satisfactory results.

[18] The estimated value of elasticity w.r.t. NNP is seen to be quite high. The value of elasticity w.r.t. the relative price is quite close to that estimated by Patel (1977, p. 143).

and import prices of cereals or relative price of cereals—have not been found significant and the coefficient of foreign exchange reserve variable has always come out with a wrong sign. Thirdly, we have estimated regression equations for both the quantity of total import of cereals (CR) and the quantity of per capita import of cereals (CR/N). Table 3 in the text presents linear equations for CR/N while linear equations for CR and some additional linear equations for CR/N are shown in Tables A.3 and A.3a in the Appendix.

India's imports of cereals have widely fluctuated over the years, rising in periods of shortfall in domestic production and falling in years of good harvest. Thus CR is expected to have an inverse relation with the supply of cereals from domestic production. However, there is a difficulty in estimating this supply. For one thing, agricultural production is recorded in India by agricultural year (i.e., July to June) while import figures are given on a calendar/financial year basis. It is, however, an official practice to suppose the production of cereals in an agricultural year (say, July 1950-June 1951) to become available for consumption in the corresponding calendar year (i.e., 1951)[19]. We shall refer to this series as the series of 'current' output of cereals (Q). Secondly, agricultural commodities, in particular cereals, marketed/consumed in a year come not only from the 'current' output, but from the output of the preceding year as well. We therefore consider output of cereals in the preceding year (Q_{-1}) as another production variable to explain import in the current year.

Apart from production variables, two more regressors immediately come to one's mind. One is the PL 480 assistance at constant prices[20] (PL) and the other is the size of population (N). While the former is important due to the fact that for quite a number of years during the sample period cereals imports had been facilitated via the PL 480 funds from America, the latter is to be considered in order to capture the effects of increasing population size on the demand for and hence imports of cereals. The linear regression equation with four regressors, namely Q, Q_{-1}, N and PL, is shown in eq. (1) of Table A.3 in the Appendix. All coefficients are seen to be significant with right signs.

To examine other possible explanatory variables, we note that cereals have been imported even after the inflow of PL 480 funds had stopped in

[19] See any issue of Economic Survey, published annually by the Govt. of India, e.g., the issue of 1978-79, Table 1.9, p. 74; see also Chakrabarti (1970).

[20] The data on PL 480 imports are available only at current prices and it is not known at what prices these imports used to be purchased. We have, therefore, deflated values of such imports at current prices by the import price index of cereals.

TABLE 3: LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE: $\frac{CR}{N}$

eq. nr.	coefficients of explanatory variables									$\bar{R}^2$	D.W.
	constant term	$\frac{Q}{N}$	$\left(\frac{Q}{N}\right)_{-1}$	$\frac{NFA}{N}$	$\frac{NNP}{N}$	RP_{cr}	DP_{cr}	IP_{cr}	$\frac{FER}{N}$		
1	46.784 (4.692)	−0.169 (−2.344)	−0.122 (−1.693)							0.317	0.62
2	32.976 (5.197)	−0.121 (−2.739)	−0.105 (−2.427)	1.058 (6.925)						0.751	1.34
3	33.249 (5.060)	−0.129 (−2.324)	−0.112 (−2.086)	1.047 (6.398)	0.003 (0.232)					0.741	1.40
4	33.857 (4.148)	−0.122 (−2.690)	−0.107 (−2.347)	1.078 (5.862)		−0.006 (−0.177)				0.741	1.34
5	37.211 (5.116)	−0.128 (−2.983)	−0.132 (−2.741)	1.053 (6.108)			0.010 (0.029)	−0.001 (−0.111)		0.750	1.62
6	33.705 (4.026)	−0.128 (−2.242)	−0.112 (−2.004)	1.060 (4.811)	0.002 (0.173)	−0.003 (−0.091)				0.731	1.38
7	47.035 (6.129)	−0.033 (−0.553)	−0.073 (−1.461)	1.376 (6.782)	−0.066 (−2.498)		0.030 (1.784)	0.006 (0.652)		0.795	1.52
8	37.139 (4.353)	−0.137 (−2.769)	−0.109 (−2.469)	0.907 (3.532)					−0.088 (−0.738)	0.746	1.46

1972-73 and hence for later years (and possibly also for earlier years) cereals imports must have been facilitated by the inflow of non PL 480 assistance[21]. We have therefore considered as an additional regressor the net foreign aid excluding PL 480 assistance at constant prices ($NFAEX$). Eq. (2) of Table A.3 shows that the new variable has a significant coefficient of the right sign and coefficients of population and production variables are also significant, but that of PL now turns out to be non-significant. However, the value of $\bar{R}^2$ has improved (from 0·656 to 0·721). We conclude that non-PL 480 aids had influenced cereals imports as much as, or probably more than, the PL 480 funds, but that it is not possible to estimate their effects on cereals imports separately. As an alternative, we therefore replace two separate regressors PL and $NFAEX$ by a single one, the total net foreign aid (NFA). This is done in eq. (3) which shows that all coefficients are significant and values of $\bar{R}^2$ and D.W. statistic are almost the same as those in eq. (2). (Pani, 1977, also considers this variable, i.e., the total net foreign aid at constant prices, in the import function of cereals).

Our next few exercises relate to the inclusion of other possible regressors like NNP, FER, the relative price of cereals etc. Coefficients of none of these variables have ever come out to be significant (see eqs. (4)-(7) of Table A.3).

Thus four variables are found to have affected India's import of cereals significantly, namely, Q, Q_{-1}, NFA and N. Since population size has been seen to be important, we have estimated regression equations in which variables are expressed on a per capita basis (Table 3 in the text). Eq. (2) shows that the per capita import of cereals (CR/N) is explained quite satisfactorily by the per capita 'current' as well as 'lagged' outputs of cereals (Q/N and $(Q/N)_{-1}$) and per capita net foreign aid (NFA/N); further the value of $\bar{R}^2$ is also satisfactory. Eqs. (3)-(8) show regression equations which consider some of the following variables as additional regressors, viz., per capita net national product and foreign exchange reserves and three price variables. None of these additional regressors has significant coefficient. In some cases, coefficients are of wrong signs, e.g., those of NNP/N (eq. (7)), RP_{cr} (eqs. (4) and (6)) and FER/N (eq. (8)).

The reason why domestic or import price of cereals is not important is not difficult to find out[22]. For, the country resorts to large imports of cereals

[21] I am indebted to an anonymous referee for bringing this point to my notice.

[22] Our result contradicts that of Pani (1977, 162, 218) who found significant effects of both these prices on imports of foodgrains.

when it becomes imperative (i.e., in case of bad harvest), irrespective of the level of import prices. On the other hand, although one might expect some positive association between import of cereals and the domestic price of cereals (DP_{cr}), the underlying cause lies in the front of domestic production. In other words, the import of cereals in a year is high, not because, cet. par., its domestic price is high, but because its domestic production is low, thereby causing a high domestic price[23]. Thus, once the domestic production of cereals is already included as a regressor, the inclusion of DP_{cr} as an additional regressor may not add much to the explanation of imports. Our empirical results do corroborate this argument.

Thus the formulation which may be chosen to explain the per capita import of cereals is eq. (2). The estimated values of elasticities (at sample means) with respect to the three regressors Q/N, $(Q/N)^2$, and NFA/N are 0·88, 0·77 and 0·20, respectively.

3.4. *Aggregate imports.* For aggregate imports (M), derived by deflating total merchandise imports of all commodities at current prices by the all commodity import price index (IP_a), both linear and log-linear regression equations have yielded more or less the same results. Since the performances of log-linear equations are slightly better we report in the text log-linear regression equations (Table 4) while their linear counterparts are presented in the Appendix (Table A.4).

The first regressor considered is NNP which presumably seeks to capture the effect of demand on aggregate imports. Its coefficient[24] is significant and the value of $\bar{R}^2$ is quite high (eq. (1)). Eq. (2) considers NFA as a second regressor and both coefficients turn out to be significant with expected signs (positive). In eq. (3) we have considered a third regressor, namely the relative price (RP_a), i.e., the ratio of the all commodity domestic price (DP_a) to the all commodity import price (IP_a). Compared to eq. (2), the regression results in this case are worse, as the value of $\bar{R}^2$ is lower, the coefficient of RP_a is not significant and even the t-ratios of other coefficients are lower. Thus unlike in the case of MC or MT, relative price does not seem to have any appreciable effect on aggregate imports.

To measure the effects of foreign exchange scarcities we have considered two proxy variables, FER and FER^{adv}, both of which have yielded good results

[23] See the empirical study on price behaviour in India by Chakrabarti (1970).

[24] In the linear version this coefficient is usually interpreted as the marginal propensity to import. The estimated value of this coefficient in eq. (1) of Table A.4 is seen to be quite low (0.04)

TABLE 4 : LOG-LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : LOG A

eq. no.	coefficients of explanatory variables (in logarithms)								$\bar{R}^2$	D.W.
	constant term	NNP	NFA	FER	RP_a	DP_a	IP_a	FER^{ar}		
1	−3.103 (−3.069)	0.989 (10.042)							0.776	0.83
2	−2.177 (−2.585)	0.843 (9.759)	0.111 (4.109)						0.856	1.11
3	−2.309 (−3.326)	0.841 (9.527)	0.107 (3.318)		0.035 (0.259)				0.851	1.08
4	−2.242 (−3.048)	0.718 (8.321)	0.201 (5.288)	0.142 (3.023)					0.890	1.41
5	−2.894 (−3.370)	0.888 (7.876)	0.194 (5.174)	0.173 (3.378)	0.186 (1.412)				0.894	1.29
6	0.325 (0.136)	0.382 (1.247)	0.194 (5.168)	0.103 (3.131)		0.402 (1.643)	−0.237 (−1.691)		0.894	1.22
7	−2.832 (−3.521)	0.796 (9.873)	0.180 (4.947)					0.131 (2.372)	0.881	1.40

(eqs. (4) and (7)). Both equations show that the coefficient of the new variable is significant with the right sign (positive), the value of $\bar{R}^2$ improves sufficiently compared to that of eq. (2) and the value of D.W. statistic is now somewhat satisfactory.

Once more the introduction of RP_a or two individual prices (DP_a and IP_a) fails to improve the result and the coefficients of price variables are not significant (eqs. (5) and (8))[25]. We, therefore, conclude that neither the relative price nor the two price indices separately had exerted any impact on the aggregate imports during the period under study. Thus the formulation which seems to explain aggregate imports best is eq. (4). Since the equation is log-linear, the estimated value of a coefficient also represents the elasticity of the function w.r.t. the variable in question. These elasticities are 0·72, 0·20 and 0·14 for NNP, NFA and FER, respectively.

4. Concluding observations

The preceding section has presented and discussed various regression equations which have been estimated in the present study to explain different groups of imports, namely aggregate imports as well as imports of machinery and transport equipment, manufactured goods and cereals. The regression equation which has been chosen in each case is quite satisfactory as the overall explanation (i.e., value of $\bar{R}^2$) is very high and the estimated value of the coefficient of each regressor is highly significant (with t-ratio much higher than two). Thus over the period under study India's imports of different categories of items could be satisfactorily explained by some or all of the following variables, viz., NNP, domestic production, relative price, NFA, FER etc.

The present study has investigated the behaviour of India's imports over a very long period extending over the last three decades. A major emphasis of the study has been to identify empirically the sets of factors which had influenced India's imports of different groups of commodities. As explained in Section 2, these factors or their proxy variables have been selected in the light of the specific features of the Indian economy—in particular, those like import restriction policies and chronic foreign exchange shortages—which had characterized India's external trade for almost the entire period under study. A few other features of our study may be pointed out. First, some of the earlier studies on India's imports tried to show that

[25] Although in the linear regression equation coefficients of both DP_a and IP_a are significant (eq. (6) of Table A.4), this equation suffers from various unsatisfactory features, e.g., the coefficient of NNP is not significant and the value of D.W. statistic is very low (0·91).

aggregate imports were explained, among other things, by the relative price, i.e., the all-commodity domestic price *vis-a-vis* the all commodity import price, (e.g., Marwah, 1970; Sharma, 1975; Patel, 1977). The present study has not found any significant influences of the relative price on aggregate imports. Since India had been suffering from continued foreign exchange scarcity, aggregate imports were likely to have been determined more by the amount of foreign exchange available than by the price variable. Our empirical results do support this contention. This does not, however, mean that the sectoral imports were unresponsive to variations in their relative prices. As our estimated regression equations show, imports of both manufactured goods and machinery and transport equipment had been influenced quite significantly by the relative price ratios of respective groups. Finally, the study brings out the effects of import substitution very clearly. As noted in Section 2, a major emphasis of India's import control measures was on import substitution. In our regression equations all sectoral imports (i.e., those of manufactured goods, machinery and transport equipment or even cereals) were seen to vary inversely with levels of domestic production of respective sectors.

Appendix

We report here some further regression results in connection with various import functions estimated. This is presented in Section A.1. The data used in the study, the sources and construction of these data are discussed in Section A.2.

A.1. *Some further regression results.* Tables A.1–A.4 present some further regression equations for the different groups of imports considered in the study. Tables A.1 and A.2 present log-linear counterparts of the linear regression equations reported in Tables 1 and 2 in the text, respectively. Tables A.3 and A.4 present linear regression equations for total cereal imports (CR) and aggregate imports (A), respectively. Tables A.1a, A.2a and A.3a present some further linear regression equations for the import of machinery and transport equipment (MT), import of manufactured goods (MG) and the per capita import of cereals (CR/N).

A.2. *Notes on the data used.* The data used in this study are presented in Tables A.5–A.9. The data have been taken mainly from the various issues of Economic Survey (ES), published by Govt. of India, Report on Currency and Finance (RCF), published by the Reserve Bank of India (RBI) and

TABLE A. 1 : LOG-LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : LOG MT

eq. no.	coefficients of explanatory variables (in logarithms)									$\bar{R}^2$	D.W.
	constant term	NNP	X	RP_{mt}	$(X_{mt})_{-1}$	DP_{mt}	IP_{mt}	FER	NFA		
	0.056 (0.069)		0.285 (3.558)	0.682 (3.727)					0.231 (4.865)	0.800	0.69
	−2.976 (−1.993)		1.640 (2.785)	0.662 (3.918)	−0.867 (−2.351)				0.361 (5.114)	0.881	1.04
	−3.336 (−2.369)		1.260 (2.170)	0.705 (4.423)	−0.682 (−1.890)			0.139 (2.085)	0.412 (5.847)	0.896	1.17
	−0.004 (−0.003)		1.467 (2.291)		−0.861 (−2.283)	0.815 (2.913)	−0.662 (−3.869)		0.381 (4.913)	0.878	1.14
	−0.056 (−0.043)		1.253 (2.034)		−0.673 (−1.819)	0.697 (2.566)	−0.706 (−4.319)	0.141 (1.909)	0.410 (5.476)	0.891	1.16
	−8.170 (−1.943)	1.030 (2.149)		0.620 (3.486)	−0.245 (−1.279)				0.315 (4.640)	0.870	1.02
	−5.476 (−1.289)	0.571 (1.106)		0.685 (3.959)	−0.114 (−0.586)			0.146 (1.905)	0.359 (5.222)	0.882	1.03
	−2.635 (−0.532)	0.616 (0.992)			−0.114 (−0.563)	0.657 (1.982)	−0.687 (−3.880)	0.147 (1.833)	0.357 (4.892)	0.877	1.03

TABLE A. 1a : LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : MT

eq. no.	coefficients of explanatory variables										$\bar{R}^2$	D.W.
	constant term	NNP	X	RP_{mt}	$(X_{mt})_{-1}$	X_{mt}	DP_{mt}	IP_{mt}	FER^{av}	NFA		
1	−122.479 (−1.229)		0.682 (0.377)	3.153 (5.397)		−0.087 (—0.084)				0.217 (3.047)	0.760	0.80
2	−188.479 (−1.935)		2.605 (1.361)	2.726 (4.726)	−1.445 (−2.192)	0.215 (0.220)				0.279 (3.875)	0.793	0.98
3	−228.800 (−2.152)	0.010 (1.633)		2.625 (4.570)	−1.180 (−2.021)	0.733 (1.116)				0.278 (4.185)	0.799	1.15
4	−308.199 (−4.742)		3.567 (3.609)	2.871 (5.761)	−1.613 (−3.109)				0.090 (2.765)	0.404 (5.770)	0.844	1.58
5	−350.594 (−3.870)	0.013 (2.740)		2.902 (5.299)	−0.712 (−1.935)				0.054 (1.853)	0.365 (4.983)	0.816	1.44
6	−154.070 (−2.236)		4.469 (4.275)		−2.842 (−4.201)		1.686 (3.423)	−0.757 (−4.206)	0.041 (0.869)	0.484 (6.144)	0.793	1.52
7	−183.730 (−1.677)	0.017 (2.636)			−1.093 (−2.317)		1.199 (1.878)	−0.718 (−3.342)	0.033 (0.582)	0.417 (4.689)	0.719	1.18

TABLE A. 2: LOG-LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : LOG MO

eq. no.	coefficients of explanatory variables (in logarithms)								$\bar{R}^2$	D.W.
	constant term	NNP	RP_{mf}	X_{bm}	DP_{mf}	IP_{mf}	FER	NFA		
1	−4.230 (−1.769)	0.923 (3.967)							0.345	0.43
2	−10.902 (−4.395)	1.017 (5.494)	1.292 (4.149)						0.591	0.48
3	−27.398 (−6.353)	2.832 (6.308)	1.750 (6.697)	−0.843 (−4.200)					0.761	1.30
4	−23.117 (−4.672)	2.147 (3.557)	1.826 (7.031)	−0.535 (−1.992)			0.153 (1.655)		0.771	1.03
5	−20.957 (−5.356)	1.796 (3.737)	1.564 (7.326)	−0.500 (−2.602)			0.303 (4.206)	0.252 (4.060)	0.860	1.37
6	−12.664 (−1.708)	1.934 (1.965)		−0.755 (−3.447)	2.280 (4.051)	−1.847 (−6.029)			0.755	1.13
7	−11.385 (−1.543)	1.708 (1.760)		−0.628 (−1.908)	2.123 (3.768)	−1.875 (−0.800)	0.132 (1.333)		0.762	0.97
8	−6.920 (−1.220)	0.878 (1.151)		−0.540 (−2.559)	2.152 (5.026)	−1.639 (−7.607)	0.370 (3.982)	0.269 (4.322)	0.884	1.27

TABLE A. 2a : LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : MG

eq. no.	coefficients of explanatory variables									$\bar{R}^2$	D.W.
	constant term	NNP	RP_{mt}	X_{t-1}	X_{t-2}	DP_{mt}	IP_{mt}	PER	NFA		
1	−668.315 (−6.445)	0.032 (0.349)	3.874 (5.072)	−2.475 (−4.831)						0.756	1.35
2	−436.010 (−5.025)	0.030 (4.999)	4.218 (5.274)		−4.642 (−3.698)					0.695	1.14
3	−641.861 (−8.437)	0.023 (5.451)	4.016 (7.362)	−1.795 (−4.101)				0.157 (5.006)	0.130 (1.922)	0.875	1.81
4	−464.444 (−5.999)	0.019 (3.310)	4.272 (6.554)		−2.693 (−2.255)			0.164 (4.367)	0.109 (1.330)	0.823	1.21
5	−62.765 (−0.711)	0.010 (1.523)		−1.594 (−8.152)		3.059 (7.036)	−1.594 (−8.152)			0.856	0.90
6	67.387 (1.188)	0.008 (1.178)			−2.122 (−2.176)	3.261 (7.613)	−1.697 (−8.229)			0.845	0.94
7	−14.671 (−1.704)	0.012 (2.071)		−1.232 (−2.783)		2.551 (5.814)	−1.448 (−7.560)	0.091 (2.648)	0.134 (2.033)	0.883	0.98
8	0.334 (0.006)	0.009 (1.452)		−2.111 (−2.005)		2.810 (6.220)	−1.505 (−7.726)	0.085 (2.292)	0.123 (1.729)	0.866	0.91

TABLE A. 3 : LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : CR

eq. no.	coefficients of explanatory variables									$\bar{R}^2$	D.W.
	constant term	Q	Q_{-1}	N	NFA	PL	$NFADX$	NNP	RP_{cr}		
1	−1.619 (−2.686)	−0.159 (−3.770)	−0.234 (−3.891)	0.070 (4.710)		0.017 (4.245)				0.650	1.45
2	−0.653 (−0.219)	−0.108 (−1.960)	−0.162 (−2.661)	0.039 (2.180)		0.008 (1.127)	0.014 (2.603)			0.721	1.51
3	−2.072 (−0.937)	−0.119 (−2.187)	−0.174 (−3.013)	0.046 (3.007)	0.010 (5.162)					0.714	1.49
4	−11.719 (−2.214)	−0.095 (−1.809)	−0.167 (−3.050)	0.098 (3.272)	0.009 (4.848)			−0.0000 (−1.934)		0.744	1.38
5	−1.850 (−0.460)	−0.118 (−2.105)	−0.173 (−2.944)	0.046 (2.823)	0.010 (3.964)				−0.003 (−0.161)	0.702	1.47
6	5.054 (3.250)	−0.071 (−1.150)	−0.112 (−1.829)		0.012 (5.957)			0.0003 (1.552)		0.645	1.20
7	5.874 (3.825)	−0.066 (−1.125)	−0.102 (−1.744)			0.003 (0.519)	0.020 (4.090)	0.0002 (1.044)		0.680	1.38

TABLE A. 3a : LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : $\frac{CR}{N}$

eq. no.	coefficients of explanatory variables							$\bar{R}^2$	D.W.
	constant term	$\frac{Q}{N}$	$\left(\frac{Q}{N}\right)_{-1}$	$\frac{NNP}{N}$	$\frac{PL}{N}$	$\frac{NFAEX}{N}$	RP_{cr}		
1	32.673 (3.936)	−0.108 (−1.890)	−0.096 (−1.730)		1.784 (4.434)			0.596	0.88
2	35.396 (5.583)	−0.132 (−3.004)	−0.118 (−2.793)		0.577 (1.414)	1.492 (4.470)		0.767	1.52
3	47.929 (4.889)	−0.235 (−2.796)	−0.188 (−2.243)	0.028 (1.460)				0.344	0.88
4	33.881 (4.248)	−0.171 (−2.643)	−0.159 (−2.511)	0.027 (1.829)	1.768 (4.590)			0.630	1.29
5	35.297 (5.480)	−0.116 (−2.164)	−0.103 (−1.944)	−0.007 (−0.500)	0.477 (1.037)	1.022 (3.800)		0.759	1.45
6	37.849 (4.585)	−0.136 (−2.995)	−0.125 (−2.770)		0.600 (1.439)	1.587 (4.190)	−0.015 (−0.475)	0.759	1.53
7	41.061 (4.589)	−0.104 (−1.861)	−0.097 (−1.822)		0.401 (0.857)	1.971 (3.465)	−0.030 (−0.931)	0.759	1.41

TABLE A. 4 : LINEAR REGRESSION EQUATIONS. DEPENDENT VARIABLE : A

eq. no.	coefficients of explanatory variables								$\bar{R}^2$	D.W.
	constant term	*NNP*	*NFA*	*FER*	RP_e	DP_e	IP_e	FER^{ep}		
1	34.643 (0.262)	0.039 (9.284)							0.746	0.84
2	−79.219 (−0.639)	0.038 (10.093)	0.607 (2.915)						0.800	0.91
3	−79.674 (−0.412)	0.038 (9.756)	0.607 (2.467)		0.006 (0.003)				0.793	0.91
4	−281.110 (−2.337)	0.034 (9.061)	1.197 (4.881)	0.414 (3.427)					0.857	1.35
5	−505.302 (−2.618)	0.032 (8.889)	1.140 (4.667)	0.486 (3.796)	2.539 (1.485)				0.863	1.32
6	140.287 (0.800)	0.003 (0.248)	1.187 (0.074)	0.424 (4.036)		5.720 (4.107)	−2.801 (−3.845)		0.910	0.91
7	−462.314 (−3.716)	0.027 (13.068)	1.272 (0.061)					0.514 (4.725)	0.888	1.45

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The present study considers a long time period spanning over three decades. Two problems have been encountered in collecting the requisite data. *First*, observations on any given index number series are usually available for different years with different years as base periods. However, the values of a given series for all years need to be obtained with a common base. *Secondly*, observations on a series are sometimes available by calender (or financial) year while these are needed by financial (or calendar) year. The procedures which have been adopted to resolve these problems are described below :

(A) *Derivation of values of an index number series in terms of a single base period.* Let I_{xt} be the value of a given index number series for year t with period x as base. Suppose, for different years a series is available with different base periods, e.g., 1, 2, 4, 5 etc. Then, all these figures could be expressed with a common base, say period 3 (i.e., I_{3t} could be obtained for all t), in the following way :

(a) for those t for which indices are available with base year 4 or 5 etc.,

$$I_{3t} = I_{34}.I_{4t}, \text{ or}$$
$$= I_{34}.I_{45}.I_{5t} \text{ etc.};$$

(b) for those t for which indices are available with base year 2 or 1, etc.

$$I_{3t} = I_{2t}/I_{23}, \text{ or}$$
$$= I_{1t}/(I_{12}.I_{23}) \text{ etc.}$$

(B) *Derivation of calendar year figures from financial year figures or vice-versa.* The basic assumption in this derivaton is that the value of a variable for a period is uniformly distributed over this period. Thus, when observations on a variable are given by financial year, its value in a given calendar year, say 1960, may be taken to be equal to 1/4-th of its figure in the financial year 1959-60 *plus* 3/4-th of its figure in the financial year 1960-61. Similarly, when observations on a variable are available by calendar year, its value in a given financial year, say 1960-61, may be computed as 3/4-th of its value in the calendar year 1960 *plus* 1/4-th of its value in the calendar year 1961.

The data on various time series variables are presented in Tables A.5–A.9. The methods of computation and compilation of these data are described below.

Table A.5. It gives data on various price indices by financial year.

TABLE A. 5 : DOMESTIC AND IMPORT PRICE INDICES (BASE : 1961-62 = 100)

financial year	domestic price indices			import price indices			relative price indices		
	all commodity	manufactured goods	machinery and transport equipment	all commodity	manufactured goods	machinery and transport equipment	all commodity	manufactured goods	machinery and transport equipment
	DP_a	DP_{mg}	DP_{mt}	IP_a	IP_{mg}	IP_{mt}	RP_a	RP_{mg}	RP_{mt}
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1951-52	91.4	N.C.	N.C.	112.2	N.C.	N.C.	81.5	N.C.	N.C.
1952-53	79.9	77.2	87.3	110.9	120	110	72.0	64 3	79.4
1953-54	83.6	78.1	85.0	102.0	105	128	82.0	74 4	66.9
1954-55	77.0	78.5	48.7	98.7	104	186	78.9	75.5	45.5
1955-56	73.9	77.7	85.1	96.5	102	150	76.6	76.2	56.7
1956-57	84.2	83.6	86.4	100.9	106	145	83.4	78.9	59 6
1957-58	86.7	84.7	88.8	107.0	107	113	81.0	79.2	78.6
1958-59	90.2	84.2	90.7	101.5	99	95	88.9	85.1	95.5
1959-60	93.6	97.1	93.0	102.0	97	94	91.8	89.8	98.9
1960-61	99.8	98.1	97.7	98.0	101	93	101.8	97.1	105.1
1961-62	100.0	100.0	100.0	100.0	100	100	100.0	100.0	100 0
1962-63	103.8	102.8	103.0	95.9	98	106	108.2	104.9	98.0
1963-64	110.2	105.0	108.3	99.0	93	122	111.3	107.1	88 8
1964-65	122.5	109.5	111.8	101.0	98	112	121.3	111 7	99.8
1965-66	131.6	119.0	117.7	106.1	103	129	124.0	115 5	91.2
1966-67	149.9	128.2	126.5	153.1	163	206	97.9	78.7	61.4
1967-68	167.3	131.5	131.9	138.8	172	167	120.5	76 5	81 0
1968-69	165.4	133.0	132.6	143.9	182	176	114.9	73.1	75 3
1969-70	171.6	144.2	136.4	143.9	193	192	119.2	74.7	71 0
1970-71	181.1	155.1	146.0	143.9	213	165	125.9	72.8	89.7
1971-72	188.4	168.8	159.0	133.8	182	158	140.8	92.7	100.6
1972-73	207.1	178.9	168.3	139.6	191	187	148.4	93.7	90.0
1973-74	254.2	209.1	183.6	198.6	248	202	128.0	84.3	90.9
1974-75	313.8	250.0	241.0	343.9	359	280	91.2	71.3	86.4
1975-76	310.7	252.4	261.7	402.0	420	370	77.1	60.1	70.7
1976-77	319.8	263.7	251.7	400.0	408	408	80.0	65.0	61.7
1977-78	336.5	280.3	255.4	368.3	406	363	93.9	69.0	70.4
1978-79	336.5	298.0	272.2	374.1	406	466	89.9	73.6	58.5
1979-80	394.1	247.9	319.5	518.0	473	563	76.1	73.7	56.7
1980-81	466.0	373.8	354.3	487.5	365	388	95.6	102.4	91.3

Note : In the present table, as well as in each of Tables A.6—A.9, 'N.C.' means 'not computed'.

(a) *Cols.* (2)-(4) : These columns show domestic price indices (with base 1961-62 = 100) for the following groups—all commodity (DP_a), manufactured goods (DP_{mg}) and machinery and transport equipment (DP_{mt}). These are all wholesale prices of the respective groups, taken from various issues of the Monthly Bulletin of the RBI and RCF. Not only the base years of these indices have changed over time, but the coverage of items under the group 'manufactures' has also undergone changes. (i) For years from 1950-51 to 1961-62, the indices of the group 'manufactures' included those of two sub-groups, viz. chemicals and machinery and transport equipment and all the series are available with base 1952-53. The group indices of 'manufactures' have been recomputed by excluding those of the two sub-groups mentioned above. The indices for all groups have later been converted to the base 1961-62. (ii) For years 1961-62 to 1975-76 all group indices are directly available with base 1961-62. However, since the group 'manufactures' included a subgroup called chemical products, the indices of the former have been recomputed by excluding those of the latter. (iii) For years after 1975-76, each series is available with base 1970-71 and the group 'manufactures' is inclusive of the following subbgroups, viz., food products, beverages and tobacco, chemicals and chemical products and machinery and transport equipment. The indices of the former have been recalculated by excluding those of the latter subgroups. All the indices have been converted to the base 1961-62.

(b) *Cols.* (5)-(7) : These columns show import price indices (with base 1961-62 = 100) for the following groups—all commodity (IP_a), manufactured goods (IP_{mg}) and machinery and transport equipment (IP_{mt}). These are all unit value index numbers of imports of respective groups-aggregate, manufactured goods classified chiefly by materials (section 6 in the RITC classification) and machinery and transport equipment (section 7 in the RITC classification). The base years of these indices have been shifted from time to time. Thus in various issues of Monthly Abstract of Statistics, published by the Central Statistical Organization and RCF, indices for any series are available (i) with base 1952-53, for financial years from 1952-53 to 1955-56 and for calendar years from 1950 to 1958, (ii) with base 1958, for calendar years 1959 and 1960 and for financial years from 1960-61 to 1968-69, (iii) with base 1968-69, for financial years from 1969-70 to 1979-80 and (iv) with base 1978-79 for the financial year 1980-81. First of all, figures of each series upto the year 1958 have been converted to a common base 1958 and then wherever financial year figures were not available, these have been computed from calendar year figures. Later, all the series have been converted to the base 1961-62.

It is to be noted that the group indices for machinery and transport equipment are not available for financial years from 1952-53 to 1955-56 and for the calendar year 1956; rather indices of 'machinery' and 'vehicles' are available separately for these years. The group index for each of these years has, therefore, been constructed by taking the weighted average of indices of 'machinery' and 'vehicles', weights being taken to be the share of the sub-groups, viz., 'machinery' (73·3 per cent) and 'transport equipment' (26·7 per cent) in the total import of section 7 (Rs. 137·02 crores) in the year 1952-53.

(a) *Cols.* (8)–(10) : Relative price indices shown in these columns are obtained by dividing the domestic price index of a group by its import price index.

Table A.6. Various aggregates in this table are given at current prices and by financial year.

TABLE A.6 : SELECTED AGGREGATES AT CURRENT PRICES (Rs. Crores)

	Imports of different groups					
financial year	aggregate	manufactured goods	machinery and transport equipment	net foreign aid	PL 480 imports	foreign exchange reserves
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1951–52	969.2	N.C.	N.C.	85.3	0.0	911.8
1952–53	864.7	84.6	137.0	45.7	0.0	861.6
1953–54	569.6	82.4	123.0	19.5	0.0	685.8
1954–55	654.2	101.7	123.6	10.9	0.0	711.7
1955–56	675.2	148.1	194.1	40.4	0.0	695.5
1956–57	845.9	244.1	252.3	87.8	68.5	734.6
1957–58	1002.6	267.2	310.4	200.7	68.5	543.9
1958–59	863.0	180.0	238.0	253.7	117.0	303.4
1959–60	960.8	188.0	270.3	218.8	145.4	261.1
1960–61	1121.6	234.2	333.0	200.2	145.4	245.1
1961–62	1090.1	221.2	367.5	251.3	88.0	185.8
1962–63	1131.5	204.0	387.4	325.9	122.7	179.5
1963–64	1222.0	200.4	437.0	408.3	185.2	177.3
1964–65	1349.0	218.6	477.7	502.8	218.1	188.0
1965–66	1408.5	216.3	492.1	602.0	239.2	115.9
1966–67	1931.5	232.8	536.0	860.0	369.6	182.1
1967–68	2007.6	264.5	503.1	863.0	310.9	295.9
1968–69	1908.6	260.4	513.9	528.0	84.5	356.1
1969–70	1582.1	230.0	395.9	444.0	107.5	394.2
1970–71	1634.2	344.7	304.7	341.0	37.7	548.4
1971–72	1824.5	440.4	470.6	355.0	8.8	435.1
1972–73	1667.4	449.5	532.1	169.0	0.0	480.4
1973–74	2956.4	529.3	651.6	440.0	0.0	478.1
1974–75	4518.8	771.4	895.7	688.0	0.0	350.8
1975–76	5265.0	620.0	935.0	1154.0	0.0	610.5
1976–77	5074.0	677.0	1048.0	844.0	0.0	1491.7
1977–78	6025.0	973.0	1110.0	467.0	0.0	2563.0
1978–79	6814.0	1471.0	1260.0	420.0	0.0	4199.9
1979–80	8908.0	9101.0	1368.0	552.0	0.0	5219.9
1980–81	12524.0	2242.0	1821.0	1358.0	0.0	5163.7

(a) *Cols.* (2)–(4) : These are figures of total imports and imports of sections 6 and 7. These figures have been taken from Thanawala (1967), for years upto 1959-60 and from various issues of Monthly Statistics of Foreign Trade of India and RCF, for years thereafter.

(b) *Col.* (5) : Net foreign aid in a year is taken to be the difference between gross foreign aid and debt service payments in that year. Figures are obtained from various issues of ES. For each of the years from 1951-52 to 1955-56, net foreign aid is taken to be the same as that of utilization of external assistance.

(c) *Col.* (6) : PL 480 imports were obtained only between 1956-57 and 1971-72. Figures for years from 1961-62 to 1971-72 are taken from various issues of ES. For years prior to 1961-62 figures are estimated as follows. (i) The total utilization of PL 480 assistance during the Second Plan period (i.e. from 1956-57 to 1960-61) was Rs. 554·8 crores (*vide* RCF, 1969-70) and (ii) the amount utilized during the three years from 1956-57 to 1958-59 was Rs. 254 crores (*vide* RCF, 1958-59). From (i) and (ii), the amount utilized during 1959-60 and 1960-61 is estimated at Rs. 298·8 crores which are then taken to be distributed equally between these two years. (iii) The fresh authorization of PL 480 imports during 1956-57 and 1957-58 totalled Rs. 137 crores (*vide* RCF, 1957-58). In the absence of any other information, this amount is taken to be the same as the amount of utilization which is further taken to be equally distributed between these two years. From (ii) and (iii) the figure for 1958-59 is estimated at Rs. 117 crores.

(d) *Col.* (7) : The figure shown against a financial year is the amount of foreign exchange reserves at the beginning of that year. Figures are obtained from various issues of ES for the year 1951-52 and for years from 1956-57 onwards. For other years reserves are estimated as follows : (i) RBI's holdings of total assets (i.e., gold and foreign exchange reserves) at the beginning of 1953-54, 1954-55 and 1955-56 were Rs. 803·4, Rs. 832·3 and Rs. 814·1 crores, respectively (*vide* RCF, 1958-59). Since gold holdings remained quite stagnant at Rs. 117·6 crores throughout this period, reserves of foreign exchange for these years are estimated at Rs. 685·8, Rs. 714·7 and Rs. 696·5 crores, respectively. (ii) The table on 'financing of international transactions', given in the 1950-51, 1951-52 and 1952-53 issues of the RCF, shows the extent by which such transactions were financed by drawing down foreign exchange reserves. Increase (+) or decreases (−) in India's foreign exchange assets over the four calendar years from 1949 to 1952 are thus seen to be −141·3, +21·1, −46·3 and +60·4 crores of rupees, respectively. From

these figures of variations over calendar years, variations in reserves over the three financial years 1949-50, 1950-51 and 1951-52 are estimated at −100·7, +4·3 and −49·8 crores of rupees, respectively. From these figures and the figure of foreign exchange reserves at the beginning of 1951-52 (i.e., Rs. 911 crores), figures of reserves at the beginning of the three years 1949-50, 1950-51 and 1952-53 are estimated at Rs. 1007·8, Rs. 907·1 and Rs. 861·6 crores, respectively.

Table A.7. This table gives the various aggregates at constant prices.

TABLE A.7 : SELECTED AGGREGATES AT CONSTANT PRICES (RS. CRORES)

financial year	imports at 1961–62 prices			net foreign aid (at 1961–62 prices)	net national product (at 1970–71 prices)	foreign exchange reserves	3-year average of FER
	aggregate	manufactured goods	machinery and transport equipment				
	A	MG	MT	NFA	NNP	FER	FER*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1951–52	883.8	N.S.	N.S.	78.0	17086	969.6	1066 8
1952–53	590.4	70.5	124.5	41.2	17699	767 9	925 3
1953–54	558.4	78.5	96 1	19.1	18854	618.1	785.3
1954–55	662.8	97.8	71.8	11.0	19328	700.7	695.7
1955–56	669.7	145.2	129.4	41.9	19953	705.7	674.9
1956–57	838.4	230.3	174.0	87.0	21046	813.1	739.3
1957–58	937.0	249.7	274.6	187.6	20587	558 3	692.1
1958–59	850.2	182.7	250.5	250.0	22329	283.6	551.7
1959–60	942.0	193.8	207.1	214.5	22676	257 2	366 4
1960–61	1144.5	231.9	358.1	306.3	24260	240 3	260.4
1961–62	1090.1	221.2	367.5	251.3	25039	189.6	229.0
1962–63	1179.9	208.2	365.5	339.8	25414	179.5	203.1
1963–64	1235.3	204.5	358.2	412.4	26746	184.9	184.7
1964–65	1335.0	223.1	426.5	497.8	28808	189 9	181.3
1965–66	1327.5	210.0	381.5	567.4	27103	114.8	163 2
1966–67	1284.4	153.7	260.1	561.1	27298	171.6	153.5
1967–68	1446.4	148.0	320.4	621.8	29715	193.3	159 9
1968–69	1328.3	137.6	292.0	236.9	30513	256.6	207.2
1969–70	1000.4	119.2	206.2	308.5	32408	273.9	241 3
1970.71	1135.6	161.8	239.2	237.0	34236	379.7	303 4
1971–72	1363.6	242.0	297.8	265.2	34713	304.4	319.4
1972–73	1337.7	235.3	284.5	113.0	34215	339.0	317.7
1973–74	1488.1	217.5	322.6	221.0	36033	342.5	335.1
1974–75	1314.0	214.9	248.5	200.1	36590	292.4	331.3
1975–76	1300.8	147.6	252.7	280.4	40170	177.5	270 5
1976–77	1208.5	166.7	256.9	211.0	40420	370.2	290 0
1977–78	1691.6	230.7	305.8	130.3	44043	715.8	421.2
1978–79	1821.4	363.8	271.0	112.3	46546	1255 9	790 6
1979–80	1719.7	401.0	243.0	103.6	44085	1395.3	1122.3
1980–81	2569.0	614.2	460.3	278.6	47507	990.9	1216.0

(a) *Cols.* (2)–(4) : These columns present figures (at 1961-62 prices) of aggregate imports (A), imports of manufactured goods (MG) and imports of machinery and transport equipment (MT). These are derived by deflating a series at current prices (given in cols. (2)–(4) of Table A.6) by its corresponding import price series (given in cols. (5)–(7) of Table A.5), except for the year 1966-67. Since there was a devaluation of the Indian rupee in June 1966, reported import price indices for 1966-67 were averages of monthly figures after June in the year. For 1966-67, we have, therefore, calculated import figures at constant prices by making use of the percentage changes in the quantity indices of these groups of imports between 1965-66 and 1966-67.

(b) *Cols.* (5)–(8) : Net foreign aid at 1961-62 prices (NFA) is computed by deflating col. (5) of Table A.6 by col. (5) of Table A.5. Net national product at 1970-71 prices (NNP) is taken from ES (1984-85). Col. (7) shows for any year the amount of foreign exchange reserves at the beginning of that year at the import price index of the preceding year (FER). Figures are computed by deflating col. (7) of Table A.6 by the preceding year figure of col. (5) of Table A.5. Col. (8) gives the three-year average value of FER (FER^{av}). This is calculated as follows. The average value of FER in col. (7) for three years, say 1960-61, 1961-62 and 1962-63, is shown against the year 1961-63. For the initial two years 1951-52 and 1952-53, figures of FER^{av} are calculated with the help of the following data : foreign exchange reserves at the beginning of 1949-50 and 1950-51 were Rs. 1007·8 and Rs. 907·1 crores, respectively (see our note (d) on Table A.6) while all-commodity import price indices (with base 1961-62 = 1) for 1948-50 and 1949-50 were 0·867 and 0·849; thus, FER for 1949-50 and 1950-51 are estimated at Rs. 1162·4 and Rs. 1068·4 crores, respectively.

Table A.8. The table presents data on variables which have been considered in the import functions of cereals. Hence all these data are given by calendar year.

(a) *Col.* (2) : This column gives the domestic price index of cereals (DP_{cr}), i.e., the wholesale price index of cereals by calendar year, which are obtained from various issues of BFS. The series is available for years from 1950 to 1963 with 1952-53 as base, for years from 1963 to 1971 with 1961-62 as base and for years from 1971 onwards with 1970-71 as base. The series has been converted to a common base 1961-62.

(b) *Cols.* (3) *and* (4) : The import price index of cereals (IP_{cr}) is the unit value index of imports of cereals and cereal preparations (henceforth to be referred to as CCP index). In various issues of RCF, Monthly Bulletin

TABLE A. 8 : VARIABLES CONSIDERED IN THE IMPORT FUNCTIONS OF CEREALS

calendar year	price indices of cereals (1961-62 = 100)			total import and production of cereals (million tonnes)		foreign assistance at 1961-62 prices (Rs. crores)			population (million)	net national product (at 1970-71 prices)	per capita figures in real terms						
	domestic price	import price	relative price	import	production	net foreign aid	PL 480	net foreign aid excluding PL 480			net national product	foreign exchange reserves	import of cereals	production of cereals	net foreign aid	PL 480 assistance	net foreign aid excluding PL 480 assistance
										(Rs crores)	(Rs.)	(Rs.)	(Kg.)	(Kg.)	(Rs.)	(Rs.)	(Rs.)
	DP_{cr}	IP_{cr}	RP_{cr}	CR	Q	NFA	PL	$NFAEX$	N	NNP	$\frac{NNP}{N}$	$\frac{FER}{N}$	$\frac{CR}{N}$	$\frac{Q}{N}$	$\frac{NFA}{N}$	$\frac{PL}{N}$	$\frac{NFAEX}{N}$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1951	99.7	81	123.1	4.80	40.02	76.0	0.0	76 0	363.4	16097.3	467.7	27.36	13.21	110.13	2.09	0.00	2.09
1952	96.8	92	105.3	3.92	40.60	49 9	0.0	49.9	369.6	17645.8	474.7	22 14	10 61	109.85	1.35	0.00	1.35
1953	97 8	96	101.9	2.03	45.37	24.8	0.0	24.8	376.1	18565.3	493.0	17 44	5.40	120.63	0.65	0.00	0.65
1954	82.1	95	86.4	0.84	53.44	13.0	0.0	13.0	382.9	19209.5	501.7	17.76	2.19	139.57	0.34	0.00	0.34
1955	71.4	93	76.2	0.71	51.60	34.2	0.0	34 2	390.2	19796.8	507.4	18.05	1.82	132.24	0.88	0.00	0.88
1956	89.0	87	103.3	1.44	60.34	76.7	50.1	24.8	397.8	20772.8	522.2	19.70	3.62	126 55	1.80	1.48	0.02
1957	99.7	103	96.8	3.04	52.08	162.6	80.6	97.4	405.8	20701.8	510.1	15.33	8.97	129.82	4.00	1.64	2.40
1958	102.6	110	93.3	3.22	49.30	234.4	95.4	131.9	414.3	21893.5	528.4	8.50	7.77	119.14	5.66	2.30	3.18
1959	101.7	104	97.8	3.87	57.30	223.4	133.0	87.6	423.3	22589.3	533.6	6.23	9 14	135.36	5.28	3.14	2.07
1960	102 6	101	101.6	5.14	56.77	283.4	144.0	136.5	432.7	23850.5	551 3	5.65	11 88	131.20	6.55	3.33	3.15
1961	99 7	104	95.9	3.40	60.89	205.1	98 5	102.0	442.4	24841.8	561 5	4.57	7.69	137.64	5.09	2.23	3.66
1962	103.0	97	106.8	3.64	81.85	317.7	117.5	199.7	452.2	25320.3	560.0	4.02	8 05	130.78	7.03	2.60	4.42
1963	107 7	97	111.0	4.55	60.19	304.3	174 8	222.0	462.0	26413.0	571.7	3 97	9.85	130.28	8.53	3.78	4.80
1964	129.4	106	122.1	0.26	61.70	470.5	198.0	267.8	472.1	28292.5	599.3	4 00	13.26	130.68	10.09	4.19	5.67
1965	142.7	104	137.3	7.46	67.33	550.0	224 9	326.0	482.5	27529.3	570.6	2.77	15.46	139.54	11.40	4.66	6.78
1966	163 3	139	117.5	10.30	54.60	663 1	237.1	330.0	493.2	27249.3	552 5	3 19	21.01	110.71	11.42	4.81	6.70
1967	205.3	165	124.4	8.67	57.03	600.8	195.8	380.0	504.2	29110.8	577.4	3 73	17.20	114.34	12.03	3.88	7.54
1968	198.8	169	117.6	5.60	72.58	430.6	83 5	330.6	516.4	30313.5	588 2	1.67	11.04	140.82	8.30	1.62	6.41
1969	197.5	164	120.4	3.87	73.14	323.1	62.1	252.4	527.0	31934.3	606.0	5.12	7.34	138.79	6.13	1.18	4.79
1970	202.1	158	127.9	3.65	70.83	254.8	34.9	216.5	538.9	33778.3	626.8	0 56	6.74	142.57	4.73	0.65	4.02
1971	199 1	153	130.1	2.05	84 53	258.2	19.5	240.8	551.3	34593.5	627 5	5 86	3.71	153 33	4.68	0.19	4·48
1972	222.2	196	113.4	0.44	82.32	161.8	0.0	159 1	563.0	34339.5	609.0	6.12	0.78	145.98	2.89	0.00	2.66
1973	257.0	284	90.5	3 01	76 23	194.7	0.0	194.7	576.8	35578 5	616 8	0 01	6.26	132.10	3.38	0 00	3.38
1974	355.3	367	96 8	4.87	82.82	205.5	0 0	205 5	590 0	36450 8	617.8	5.17	8 25	140.37	3.48	0.00	3.48
1975	370.5	446	83 1	7.41	78.50	264.8	0 0	264 8	603 5	39275 0	650 8	3 41	12 28	130.22	4.39	0.00	4.39
1976	302 4	454	66.6	0 95	94.60	229.0	0 0	229 0	617 2	40304 3	654 0	5 22	11.26	153.11	3.72	0.00	3.72
1977	321 0	446	72 1	0 63	87 33	160.6	0.0	160.6	631.3	43139 6	683.3	0.97	1.00	138.33	2.38	0.00	2.38
1978	315 4	469	67.2	0 20	100.13	116 8	0 0	116 8	645 7	45920 3	711.2	17 30	0.31	155.07	1.81	0.00	1.81
1979	333 2	567	59 8	0 02	104.76	108 9	0 0	108 9	660 3	44760 3	677.9	20.60	0.03	158.64	1.64	0.00	1.64
1980	378 1	544	69 5	0 03	88 40	235.0	0 0	235 0	675.2	46651.5	690.9	10.24	0.04	131.00	3.48	0.00	3.48

of RBI etc. CCP index is available (i) for years 1957 and 1958, with 1952-53 as base, (ii) for years from 1958 to 1961 and for years from 1960-61 to 1968-69, with 1958 as base, (iii) for years from 1969-70 to 1979-80, with 1968-69 as base and (iv) for the year 1980-81 with 1978-79 as base. First, all these indices have been converted to a single base 1961-62 and then, wherever needed, indices by financial year have been converted to those by calendar year. Thus IP_{cr} is obtained for each of calendar years from 1957 to 1980. For years prior to 1957, CCP indices are not available. What is available instead is the group index, i.e., unit value index of imports of food, drinks and tobacco (*FDT*). *FDT* indices are available (i) for years 1950-51, 1951-52 and 1952-53, with 1948-50 as base and (ii) for years from 1952-53 to 1955-56 and for the year 1956, with 1952-53 as base. First, *FDT* indices for these years are converted to a single base 1952-53 and then indices by calendar year are computed. The CCP indices have been taken to be the same as *FDT* indices for these years. These have finally been converted to the base 1961-62. Col. (4) gives the relative price index of cereals (RP_{cr}), obtained by dividing col. (2) by col. (3).

(c) *Cols.* (5), (6) *and* (10) : *CR* is the gross import of cereals, figures upto 1975 are taken from various issues of ES and those after 1975 are taken from the table entitled 'imports of foodgrains into India', given in various issues of BFS. *Q* is the net production of cereals, figures being compiled from various issues of ES; (net production is taken as 87·5 per cent of gross production, 12·5 per cent being provided for feed, seed requirements and wastage). Figures of population (*N*) are taken from various issues of ES, in particular the 1984-85 issue.

(d) *Cols.* (7)–(9) : (i) Figures of net foreign aid at 1961-62 prices (*NFA*) by calendar year are derived from those by financial year given in col. (5) of Table A.7. The figure of *NFA* for 1951 is taken to be the same as that for 1951-52. (ii) Figures of PL 480 assistance at current prices by calendar year are computed first from those by financial year given in col. (6) of Table A.6; these are next deflated by col. (3) of the present Table to yield figures at constant prices which are given in col. (8). (iii) Figures of net foreign aid excluding PL 480 assistance at current prices by financial year are first computed by subtracting col. (6) from col. (5) of Table A.6. The figures so derived are next deflated by col. (5) of Table A.5. Finally these figures are computed by calendar year to yield the figures of *NFAEX*.

(e) *Cols.* (11)–(18) : Figures of net national product at 1970-71 prices by calendar year are computed from those by financial year given in col. (6)

of Table A.7; these are next divided by population to yield NNP/N. Figures of foreign exchange reserves are first computed by calendar year from those by financial year given in col. (7) of Table A.7 and are then divided by population to yield FER/N. Cols. (14) to (18) are computed by dividing cols. (5) to (9) of the present Table by the population.

Table A. 9. It presents a number of indices of industrial production with base 1960 = 100, viz., for all commodity (X) as well as for each of the following groups—basic metal (X_{bm}), basic metal and non-metallic mineral (X_{bnm}),

TABLE A. 9. INDICES OF INDUSTRIAL PRODUCTION—ALL COMMODITY AND SELECTED GROUPS (BASE : 1960 = 100)

calendar year	all commodity X	basic metal X_{bm}	basic metal and non-metallic mineral X_{bnm}	selected manufacturing goods X_{smg}	machinery and transport equipment X_{me}
(1)	(2)	(3)	(4)	(5)	(6)
1951	56.5	45.5	43.5	63.8	32.8
1952	58.5	45.6	44.3	65.5	28.1
1953	59.7	43.0	42.9	67.6	28.7
1954	63.8	52.1	51.2	72.9	33.7
1955	70.6	62.7	62.5	75.9	46.2
1956	76.8	54.8	55.7	81.1	62.1
1957	80.0	54.5	57.2	81.8	71.2
1958	82.7	58.5	62.0	82.9	71.8
1959	89.7	76.5	77.7	90.4	78.7
1960	100.0	100.0	100.0	100.0	100.0
1961	109.2	118.7	114.7	109.9	117.1
1962	110.8	143.0	133.9	104.3	146.2
1963	120.7	171.6	157.5	124.9	161.8
1964	140.8	174.4	162.2	131.1	193.7
1965	153.8	180.9	170.1	137.2	233.4
1966	152.7	191.5	177.0	136.0	204.1
1967	152.6	183.8	174.1	133.5	203.2
1968	163.0	194.0	180.9	140.0	215.9
1969	175.0	213.7	201.1	146.5	236.2
1970	184.3	210.0	205.1	151.5	249.6
1971	192.0	215.9	214.7	155.3	265.8
1972	203.1	235.8	232.8	165.3	289.3
1973	206.4	206.6	212.5	159.4	300.0
1974	210.7	207.3	213.1	158.6	323.0
1975	220.6	242.3	241.6	167.0	316.2
1976	242.2	293.4	287.1	181.8	350.4
1977	254.9	304.1	298.4	184.0	367.9
1978	272.4	304.3	301.3	193.0	402.9
1979	275.5	291.7	295.3	193.4	400.9
1980	277.0	260.8	289.6	195.7	422.1

selected manufactured goods (X_{smg}) and machinery and transport equipment (X_{mt}). In many cases a series has been derived by taking a weighted average of indices of its constituent subgroups. Base years of these indices have been shifted from time to time. In various issues of RCF, Monthly Bulletin of the RBI and Statistical Abstract, these indices are available for years from 1951 to 1954 with base 1951, for years from 1954 to 1960 with base 1954, for years from 1960 to 1970 with base 1960 and for years 1970 onwards with base 1970. (a) The indices for all commodity (X) have been converted to a single base 1960 = 100. (b) X_{smg} is a *group* index, consisting of indices of following subgroups—(i) textiles, (ii) paper and paper products, (iii) rubber products, (iv) metal products except machinery and transport equipment, (v) basic metal industries and (vi) non-metallic mineral products. X_{bsm} is another *group* index comprising of indices of (v) and (vi) above while X_{bm} is the *subgroup* index (v). First, any given group index (i.e., X_{smg} or X_{bsm}) is obtained by taking weighted average of indices of its constituent subgroups with a given base period. Later, each group/subgroup index has been converted to the common base 1960. (c) X_{mt} is a *group* index comprising of indices of three subgroups, viz., (i) machinery except electrical machinery, (i) electrical machinery etc. and (iii) transport equipment. First, the group indices are obtained by taking weighted average of these subbgroup indices with a given base period. Next the group indices are converted to a common base 1960 = 100.

References

Agarwala, R. (1970): *An Econometric Model of India 1948-61*, Frank Cass and Co. Ltd., London.

Ahluwalia, Isher J. (1979): *Behaviour of Prices and Outputs in India*, Macmilan Co. of India Ltd.

Dantekar, D. (1959): Analysis of import demand. *Artharijnana*, 1, No. 3.

Bhagwati, J. N. and Desai, P. (1970): *India : Planning for Industrialisation*, Oxford University Press.

Bhagwati, J. N. and Srinivasan, T. N. (1975): *Foreign Trade Regimes and Economic Development : India*, A special Conference Series on Foreign Trade Regimes and Economic Development, National Bureau of Economic Research, New York.

Chakrabarti, S. K. (1977): *Behaviour of Prices in India, 1952-70 : An Empirical Study*, Macmillan and Co.

Desai, P. (1970): *Import Substitution in the Indian Economy, 1951-53*, Hindustan Publishing Co.

Dutta, M. (1964): A prototype model of India's foreign trade. *International Economic Review*, 5, 82-103.

——— (1965): Import structure of India. *Review of Economics and Statistics*, XLVIII, 295-300.

GOVT. OF INDIA : *Bulletin on Food Statistics*, Directorate of Economics and Statistics, Ministry of Agriculture (various issues).

——— : *Economic Survey*, (various issues).

——— : *Statistical Abstract*, Central Statistical Organisation, Ministry of Planning (various issues).

——— : *National Accounts Statistics*, published by CSO, Ministry of Planning, (various issues).

MARWAH, K. (1972) : An econometric model of India : estimating prices, their role and sources of change, *Indian Economic Review*, VII, 53-89.

MARWAH, K. (1970) : Measurement of devaluation impact : Indian case study, *Indian Economic Journal, (Econometric Annual)*, XVIII, No. 0.

MURTY, V. and SASTRY, V. K. (1951) : Elasticities of demand for certain Indian exports and imports, *Sankhyā*, Vol. XI.

MURTY, G. V. S. N. and NAMBIAR, R. G. (1978) : On the estimation of import demand functions in a general functional form framework. *Sankhyā*, Series, D, Vol. 40, Part I July.

NARASIMHAM, N. V. A. (1956) : *A Short-Term Planning Model for India*, North-Holland, Amsterdam.

PANI, P. K. (1977) : *Macroeconomic Model of the Indian Economy*, Macmillan, Delhi.

PATEL, SHARAD CHANDRA K. (1970) : Relative prices in Indian import functions, *The Indian Economic Journal*, 23, No. 4, April-June.

——— (1977) : The role of relative prices in Indian import functions : some quarterly econometric results. *Indian Economic Review*, Vol. XII (New Series), No. 2, October.

——— (1980) : Lagged relationships in Indian import functions : some quarterly econometric results, *Sankhyā*, Series D, Vol. 42, Parts 1 and 2, June and December.

RESERVE BANK OF INDIA : *Monthly Bulletin* (various issues).

——— : *Report on Currency and Finance*, (various issues).

SHARMA, O. P. (1973) : Foreign trade and relative prices in an import substituting economy, *Indian Economic Journal*, 22, January-March.

THANAWALA, K. (1967) : *Statistics Relating to India's Foreign Trade : 1948-94 to 1960-61*, Popular Prakashan, Bombay.

UPADHYAYA, K. K. (1980) : *Import Financing in India*, Chuch Publications, Allahabad

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